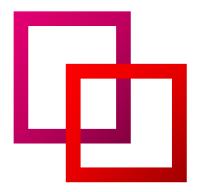
# PORTFOLIO

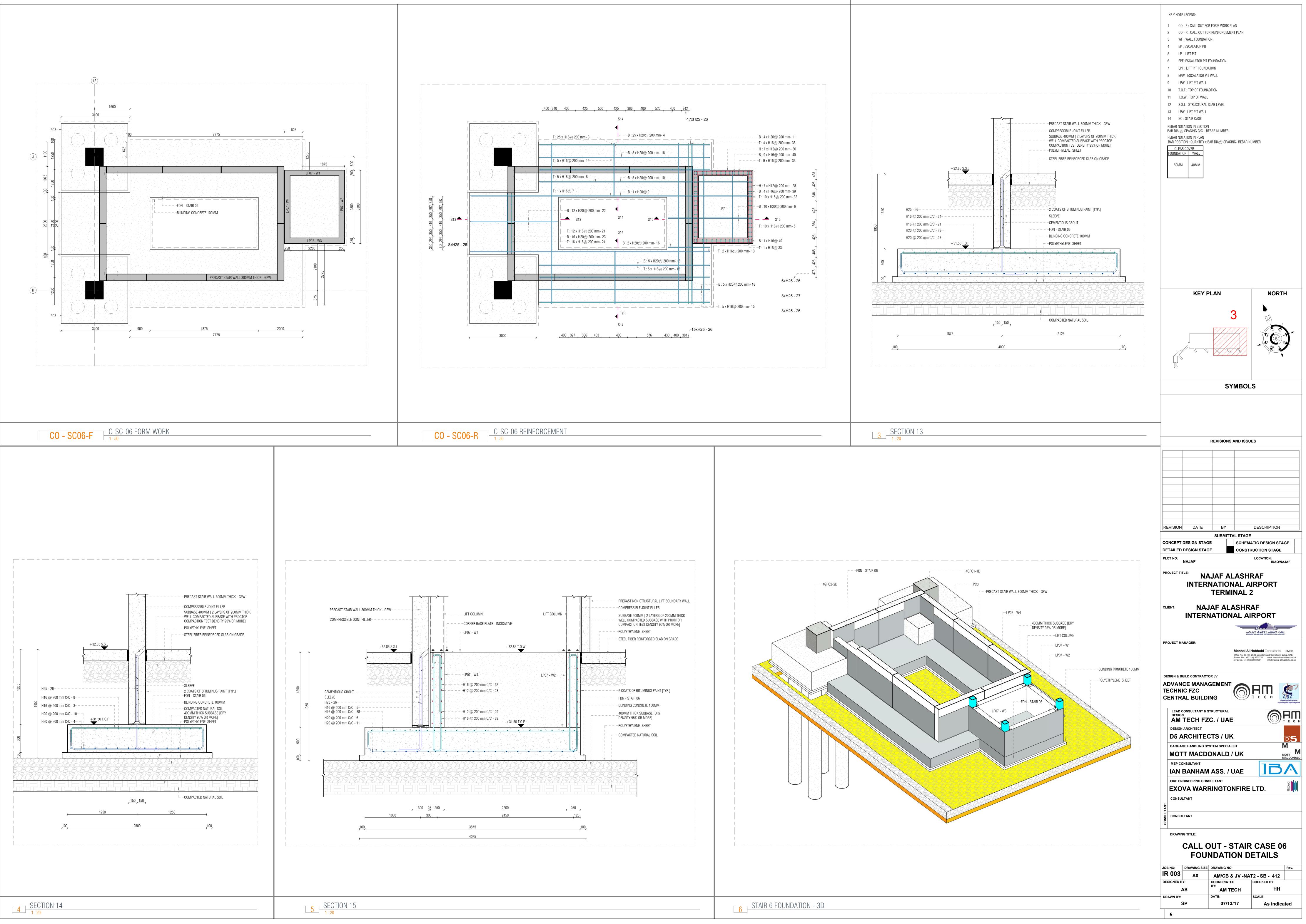
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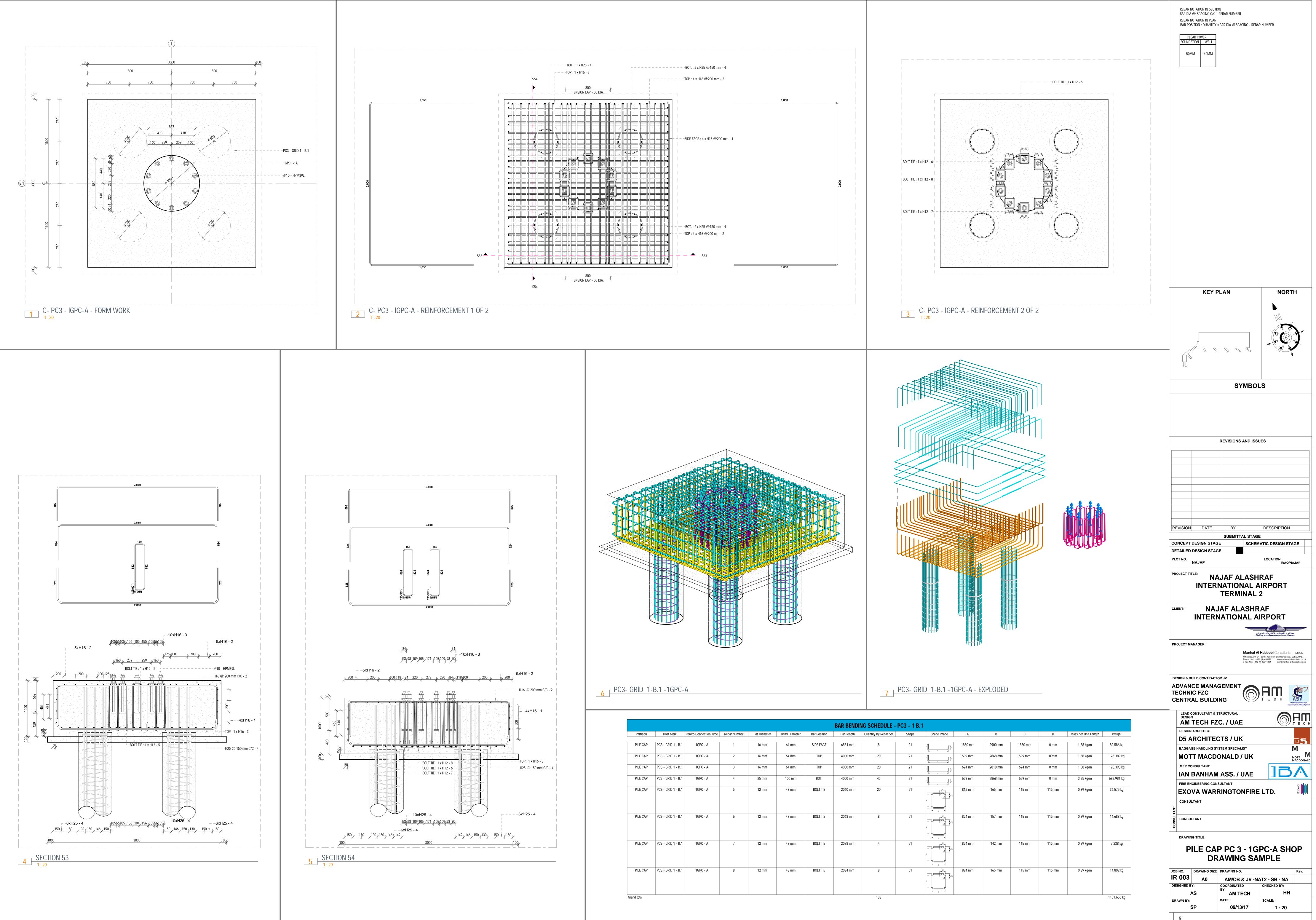
**BIM Structural Engineer** 



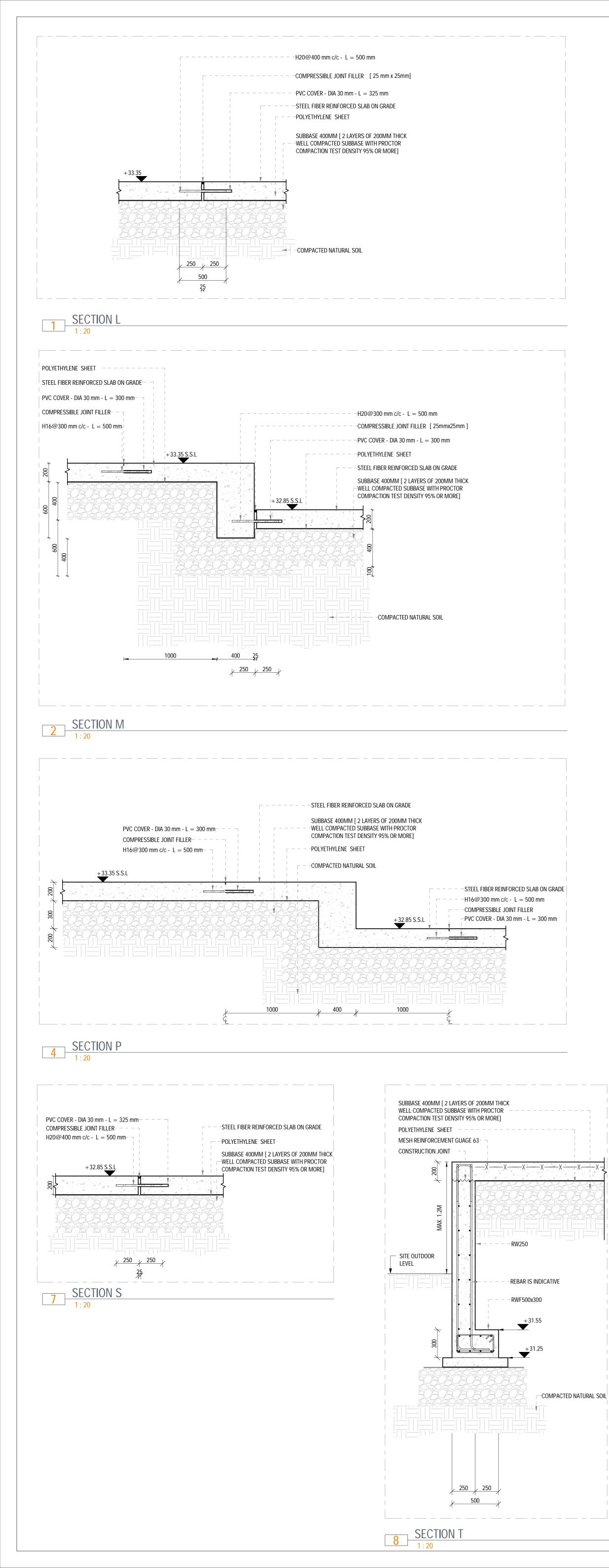
# **REVIT DETAILING**

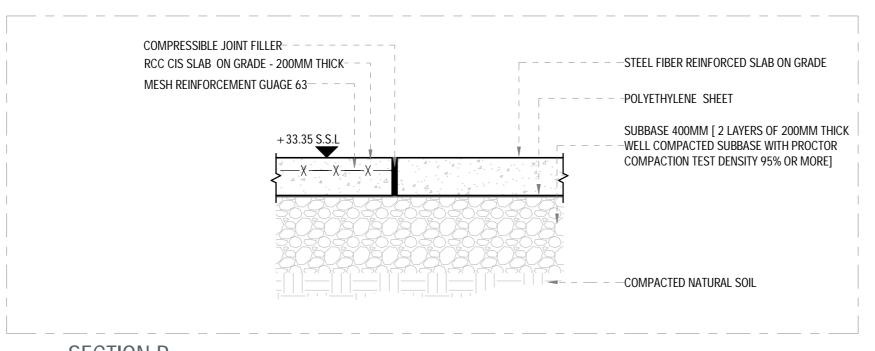
SAMPLES OF WORKS

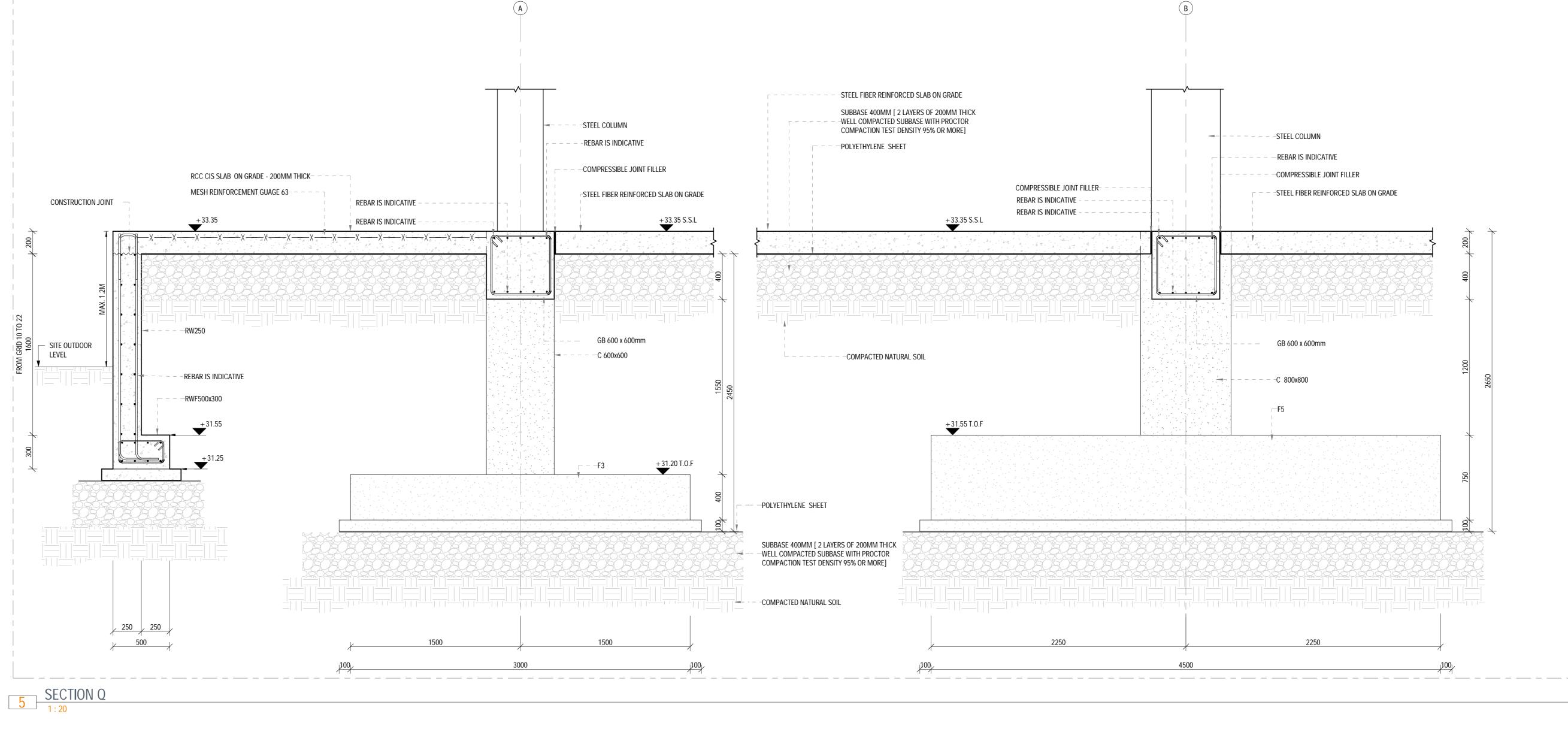




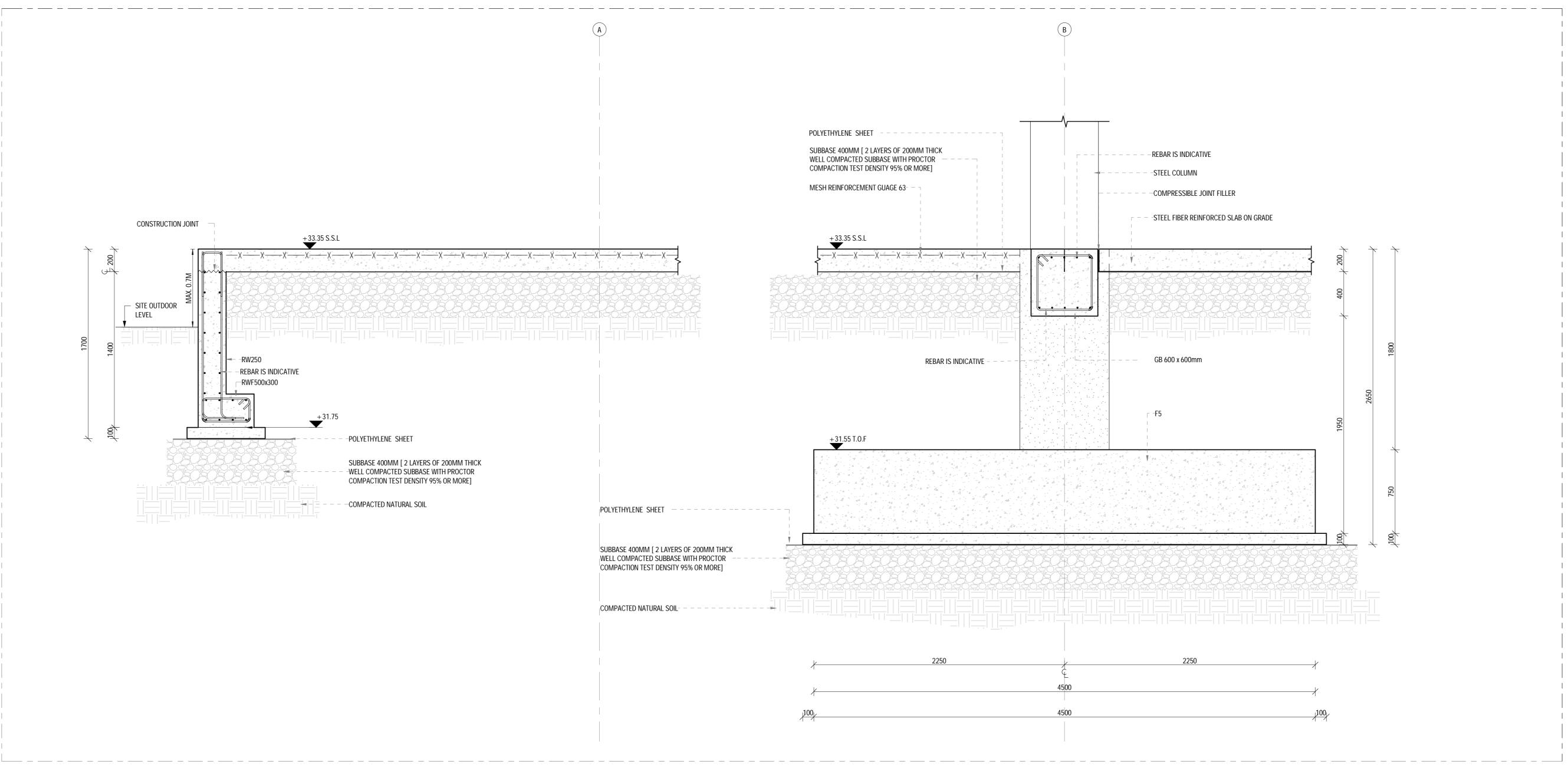
					<b>BAR BENDI</b>	NG SCHEDULE -	PC3 - 1 B.1	l				
onnection Type	Rebar Number	Bar Diameter	Bend Diameter	Bar Position	Bar Length	Quantity By Rebar Set	Shape	Shape Image	А	В	С	D
GPC - A	1	16 mm	64 mm	SIDE FACE	6534 mm	8	21		1850 mm	2900 mm	1850 mm	0 mm
GPC - A	2	16 mm	64 mm	ТОР	4000 mm	20	21		599 mm	2868 mm	599 mm	0 mm
GPC - A	3	16 mm	64 mm	ТОР	4000 mm	20	21		624 mm	2818 mm	624 mm	0 mm
GPC - A	4	25 mm	150 mm	BOT.	4000 mm	45	21		629 mm	2868 mm	629 mm	0 mm
GPC - A	5	12 mm	48 mm	BOLT TIE	2060 mm	20	51		812 mm	165 mm	115 mm	115 mm
GPC - A	6	12 mm	48 mm	BOLT TIE	2068 mm	8	51		824 mm	157 mm	115 mm	115 mm
GPC - A	7	12 mm	48 mm	BOLT TIE	2038 mm	4	51		824 mm	142 mm	115 mm	115 mm
GPC - A	8	12 mm	48 mm	Bolt Tie	2084 mm	8	51		824 mm	165 mm	115 mm	115 mm
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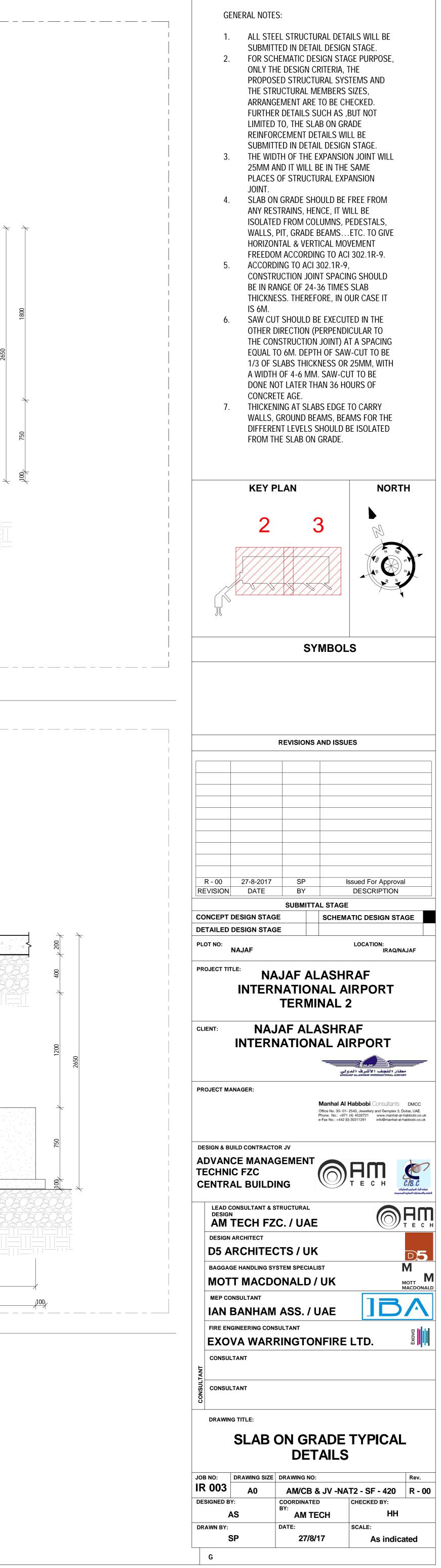


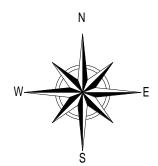




3 SECTION N 1:20

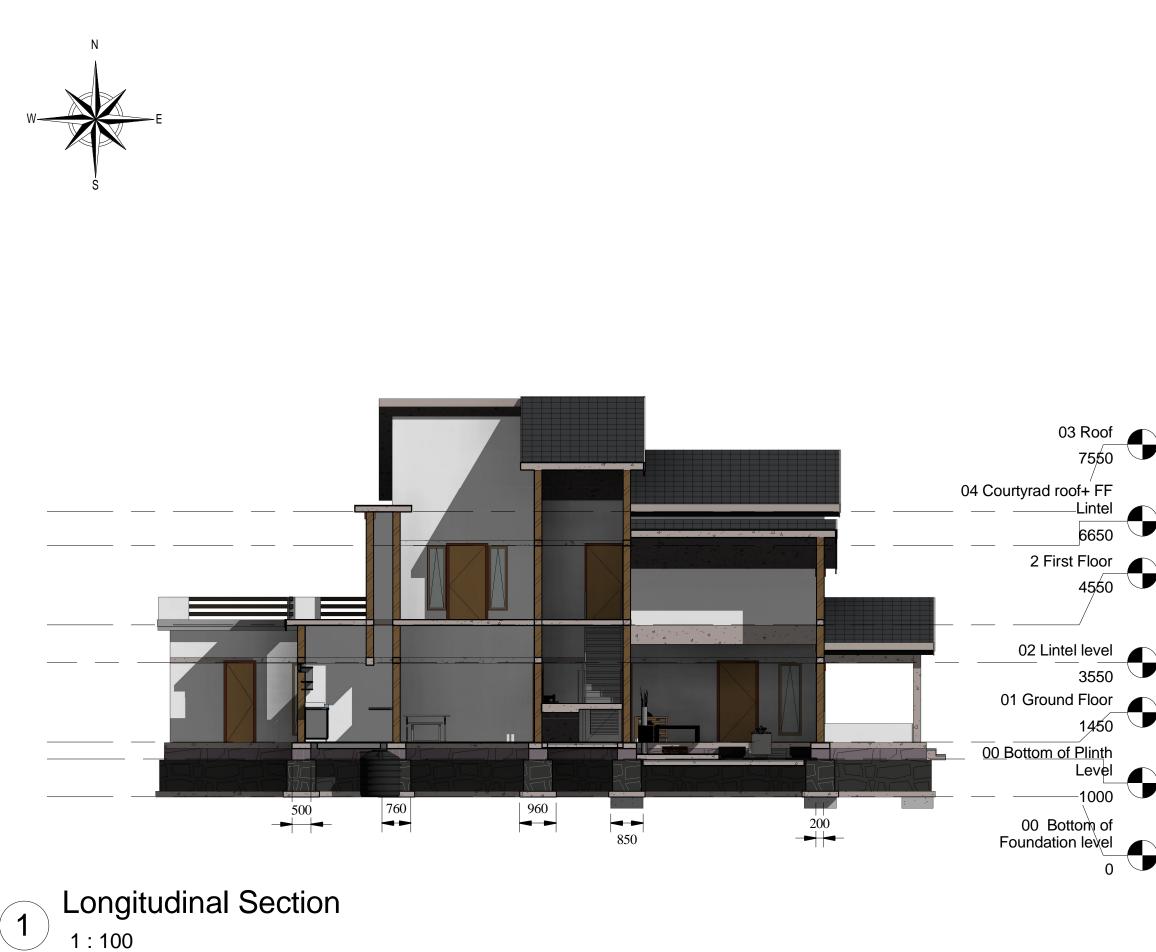


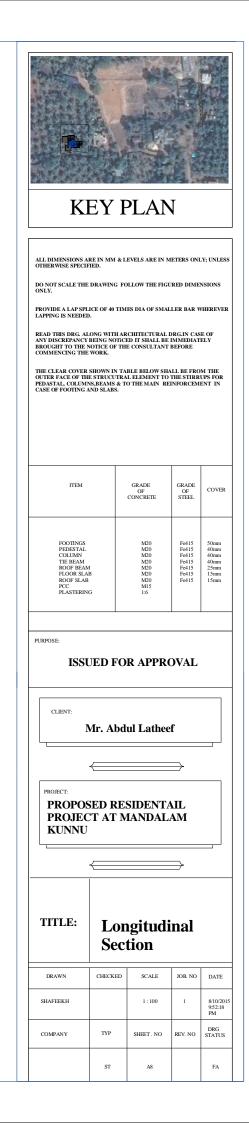


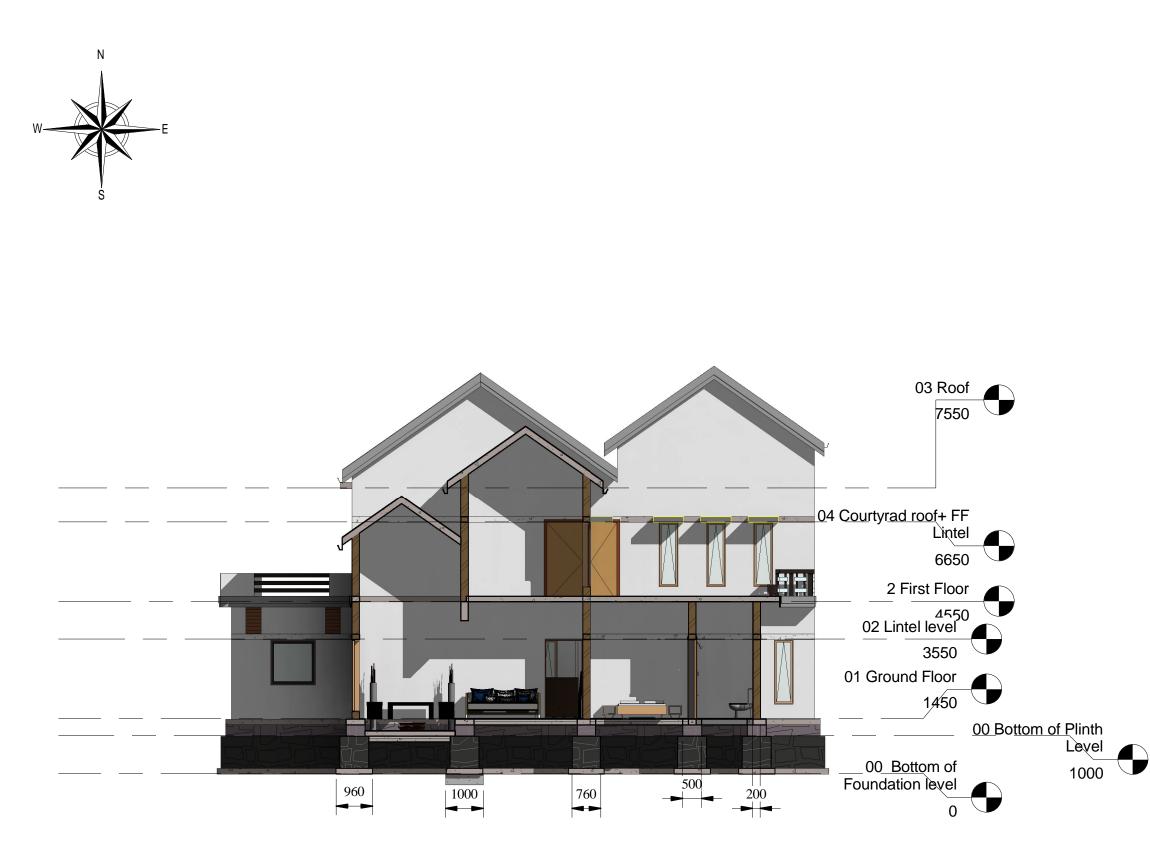




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	Mr. Abo 	dul Lathee	f ⇒	
		ESIDENTA MANDAL		
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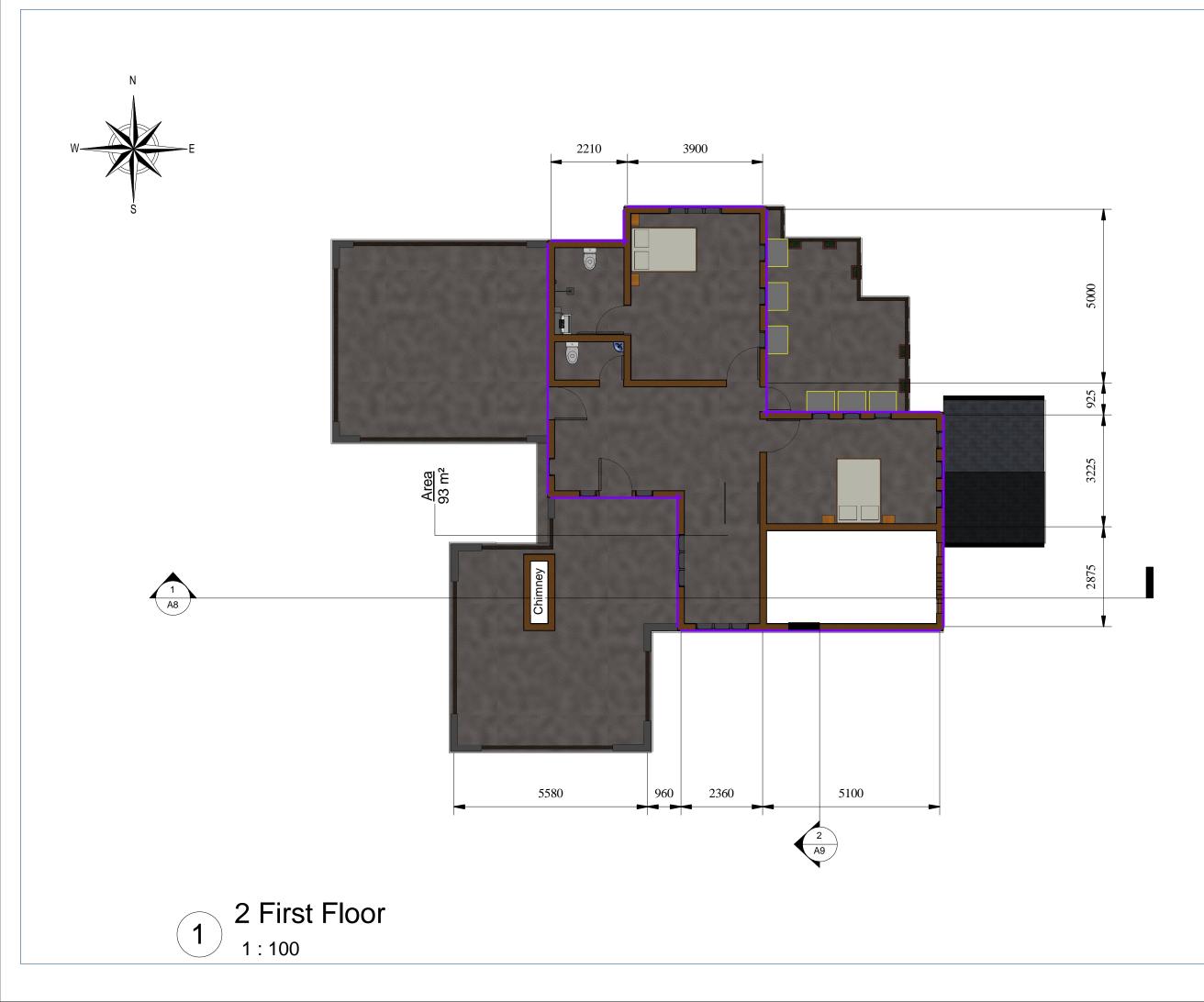


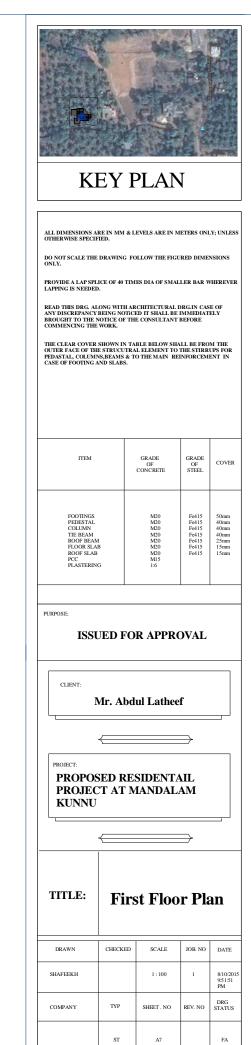


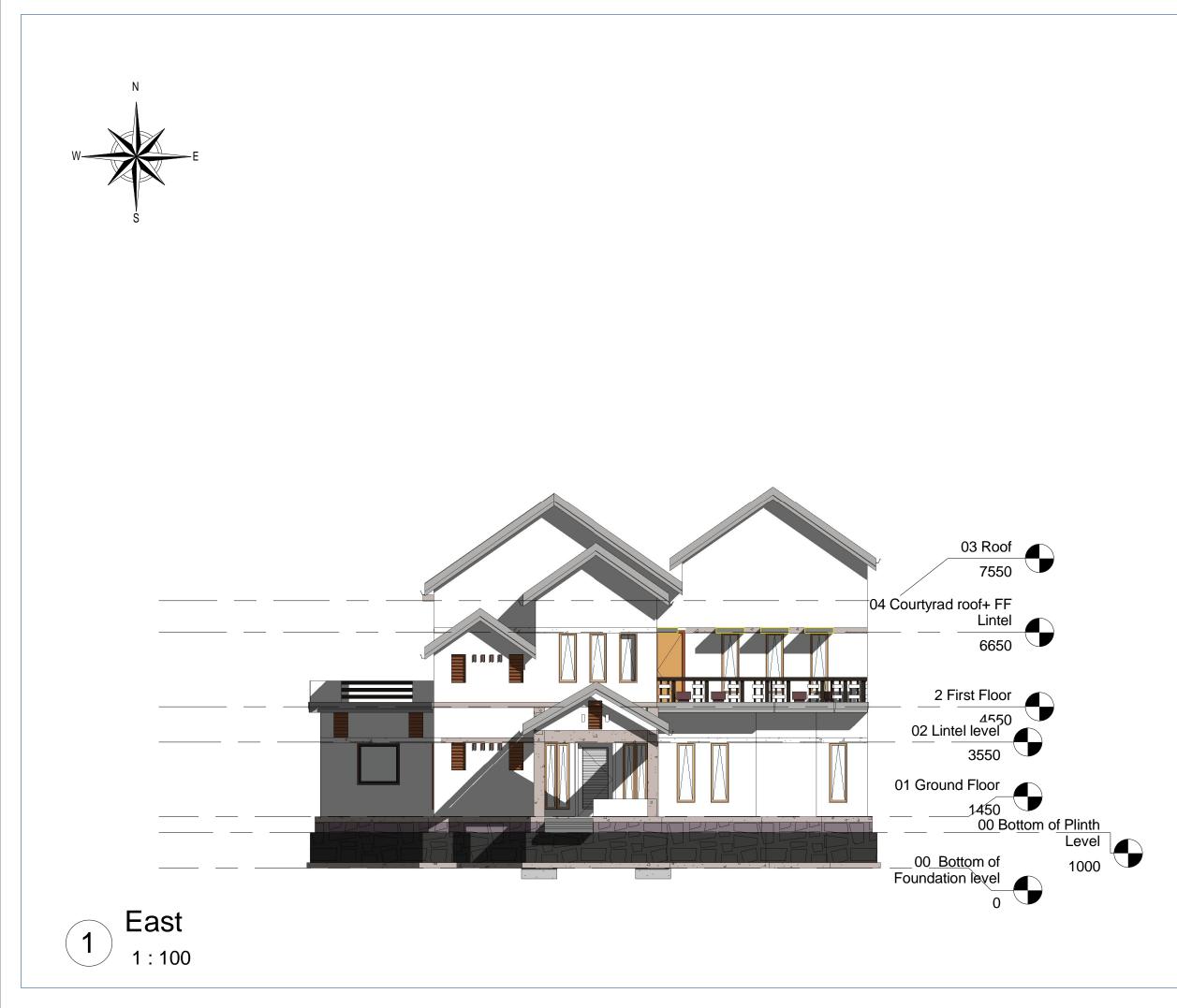


Lateral Section

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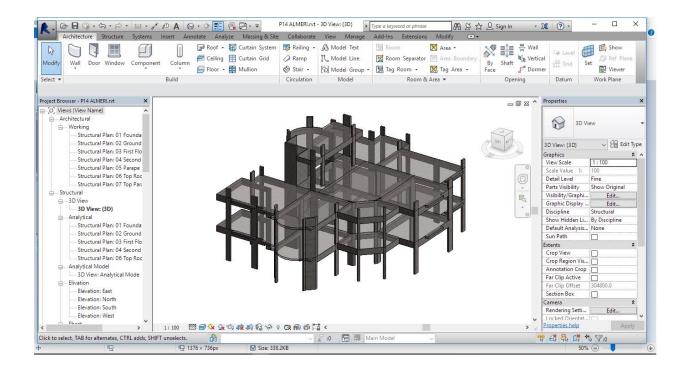
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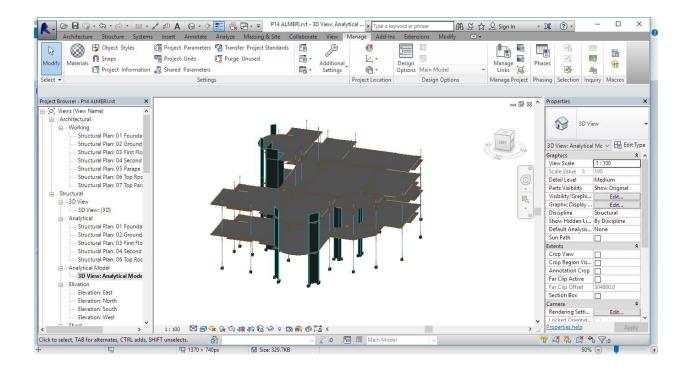
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# **REVIT STRUCTURE**

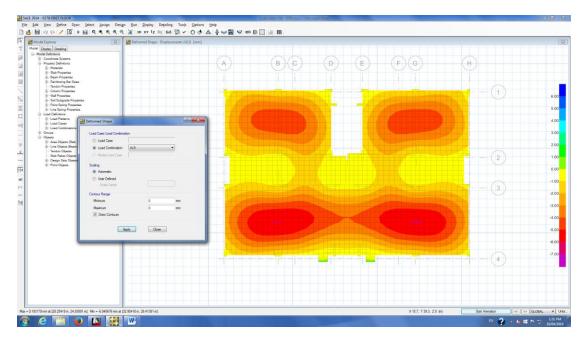
ANALYTICAL MODEL IN REVIT



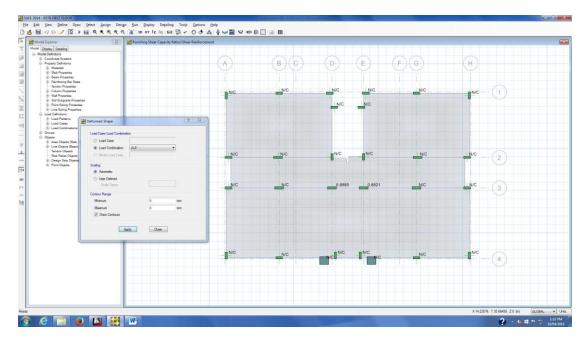


## SAFE

ANALYSIS AND DESIGN OF SLAB

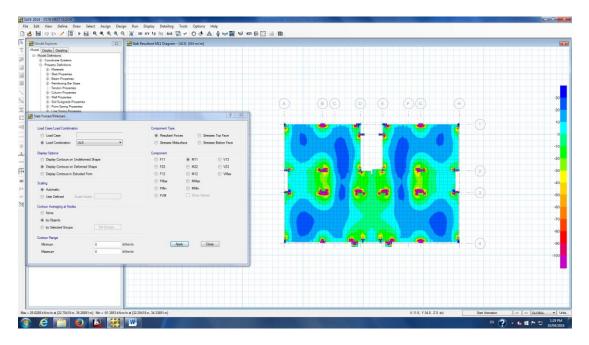


First Floor Downward Displacement-ULS



First Floor Slab Punching Check- No Punching

#### FIRST FLOOR SLAB ANALYSIS

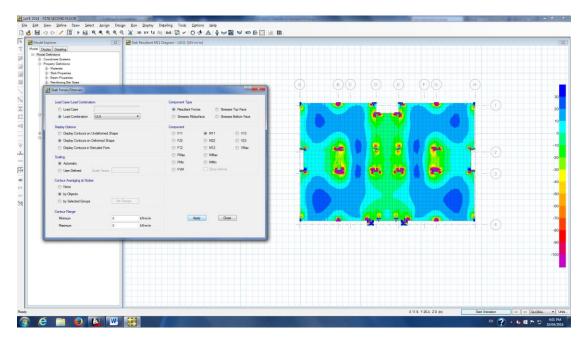


First Floor Slab Moment M11- Load Case- ULS

	itant M22 Diagram - (ULS) [kN-m/m]								
Desting         Desting           ID Contracts Systems         Desting Systems           ID Contracts Systems         Desting Systems           ID State Properties         Desting Systems									
8 - Wal Properties 8 - Sol Subgrade Properties			(B)(C)		(E)	(F)(G)	(H)		96
Point Spring Properties     Autom Source Processes     Stab Forces/Stresses							Y		7
Lood Care-Load Continuation C Lood Care R Load Continuation ULS *	Component Type Resultant Forces Stresses Top Face Stresses Moturtace Stresses Botum Face	2		4	-			0	6 4 3
Daplay Ostore Display Contours on Undeformed Shape Display Contours on Deformed Shape Display Contours in Extunded From Scaling	Component           © F11         © M11         © V13           © F22         ₩ M22         © V23           © F12         © M12         © Max           © MMax         © MMax	-	-	1	×.	-		2	1
Automatic     User Defined Scale Factor Contour Averaging at Nodes     Tone	O PM     O MNn     O PM     Does Arous		**	-	614	015		3	
by Objects     by Selected Groups     Set Groups Contour Range Misinum     0     kHen/m	Apply Come			<b>%</b> ?	9 <sub>8</sub> -			•	-7
Nasmum 0 kHen/m									-10

First Floor Slab Moment M22- Load Case- ULS

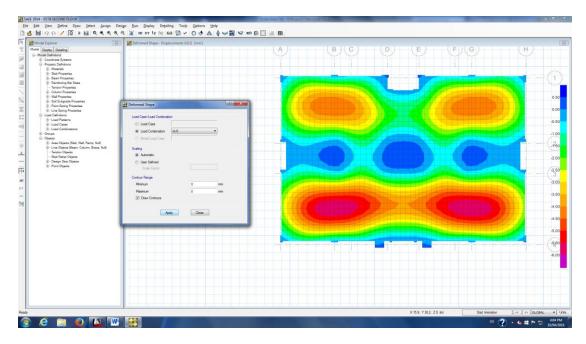
### **TOP ROOF SLAB ANALYSIS**



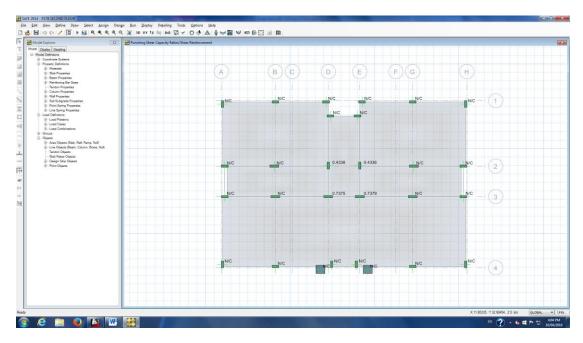
Top Roof Slab Moment M11-ULS

	lab Resultant M02 Diagram - (ULS) [kN-m/m]							
Intel Dasking Model Definitions  Property Definitions  Property Definitions  Misrainin  Strates		A	BC	0	E	(F) (G)	H	
Beam Properties     Reinforcing Bar Stress	8 3	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1	7			C
Load Case/Load Combination	Component Type							
Load Cose     Load Combination     LLS	Resultant Forces     Stresses Top Face     Stresses Modulface     Stresses Bottom Face							
Deplay Options O Deplay Contours on Undeformed Shape	Component © F11 © M11 © V13							
Display Contours on Deformed Shape     Display Contours in Estruded Form	© F22	-	340	*	*	344		0
Scaling Automatic	PMex     MAx     PMex     PMex     PMex     PMex     PMex     Phone     PMex							
Contour Averaging at Nodes	O MM C activities	-	34-0	646	329	6%6		0
None     by Objects								
Contour Range								
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T				9-4	200		4	(1
								C.
-								

Top Roof Slab Moment M22-ULS



First Floor Downward Displacement-ULS



Roof Floor Slab Punching Check- No Punching

Model Explorer	lab Finite Element Design - Top Rebar Intensity (Enveloping) [mm2/m] - Direction 1 - Addi	tional to 12 @ 200 mm					
Hool Definitions     Constriants Systems     Departy Definitions     Property Definitions     Property     State Properties     Properties     Provide State     Properties     Provide State     Properties	(A)	(B)(C)	D E	(F) (G)	Н	1	ŧ
Bisb Design     Concer Daptin Type     Design Bells     Trinic Durinen Based     Tomo Devices Based     Tomos Menum Renforment     Tomos Menum Renforment     Menum     Renforme     Menum     0     medulin	Americang Dendom and Location     Wine Section 1 - Top Peter     Orecton 1 - Beam France     Dendom 2 - Top Rear     Dendom 2 - Beam Rear     Dendom 2 - Beam Rear						1.30 1.20 1.10
Notrue 0 mo2io Corto: Averging et Noble O hore & br Questi O br Selected Groups Set Groups	Nove     Trace Value Reviews Specified Balan     Trace Values Reviews     Trace Values     Trace Values     Second In Stan Reviews     Second Values     Second Values		zs			3	0.90 0.80 0.70 0.60 0.50 0.40 0.30
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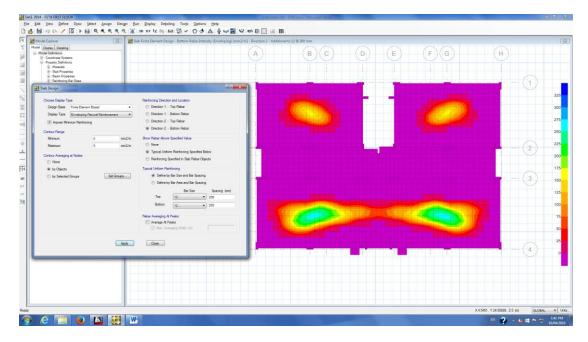
First Floor Slab Rebar Required Area – Direction 1 Top Rebar

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	Com				

First Floor Slab Rebar Required Area – Direction 1 Bottom Rebar

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Deskip (Deskip)     Order (Deskip)     Order Defetor     Order Defetor     Popper Order Deskip     Deship (Deskip)     Deship (Deskip)     Deship (Deskip)     Scholarg (Deskip)	A i	BC	D E	(F) (G)	H (1)
Const Daily Tak     Deep Take Treas Genere Based     Deep Take     Texas Genere Based     Texas Mensue RearRoung     Const Range     Mensue	Perfore Dector ad Locan  Decision 1 - Tipe Rear Decision 1 - Ban Rear Decision 2 - Tipe Rear Decision 2 - Tipe Rear Decision 2 - Tipe Rear Decision 2 - Ban Rear Decision 2 - Ba			0- 8-	
	Com		<b>**</b> *		- (4)

First Floor Slab Rebar Required Area – Direction 2 Top Rebar



First Floor Slab Rebar Required Area – Direction 2 Bottom Rebar

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Image: Second Secon	Hodel Explorer	🕄 🗌 🔡 Slab Finite Element Design - Top Rebar Intensity (Envel	(oping) (mm2/m) - Direction 1	- Additional to 12 @ 200 mm						
<pre>style Toring Style and Listen ************************************</pre>	(i) Considents System     (i) Popular Definitions     (ii) Materials     (iii) Materials     (iii) Materials     (iii) Populars     (iiii) Populars     (iiii) Populars     (iiiii) Populars     (iiiii) Populars     (iiiii) Populars     (iiiiii) Populars     (iiiiii) Populars     (iiiiii) Populars     (iiiiii) Populars     (iiiiii) Populars     (iiiiii) Populars		- Y	B C	D	E	F G	· · ·		E
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r Senter Grage		Reinforcing Specified in Stab Reber Objects					M			0.70
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								X 10.06006 Y 40.08281 Z 0	in) GLOBAL	•

Top Roof Slab Rebar Required Area – Direction 1 Top Rebar

	😥 👔 Sab Finite Element Design - Bottom Rebar Intensity (En	weloping) (mm2/m] - Direction	n 1 - Additional to 12 @ 200 mm					
Morde Dauble, Dealing) = Mord Dechnicors © Consciences Systems © Property Definitions © Alternative © Alternative © Seare Properties © Seare Properties		٢	ВС	D	E	(F) (G)	H,	
Tardon Properties Column Properties Wat Densarties sign	2	-						0.00
e Display Type ign Beas — Frinz Element Dased • Jelay Type — Element Bentlassement • Inspose Minimum Reinforcing ar Range	Revforing Direction and Location Direction 1 - Tap Rebar Direction 1 - Barten Rebar Direction 2 - Barten Rebar Direction 2 - Barten Rebar							0.00 0.00 0.00 0.00
num 0 mm2/m imum 0 mm2/m r Avenging at Nodes fone y Objects	Share Rebur Rorve Specified Value  None  Typical Uniform Revitating Specified Below  Revitation Specified in Sale Rebur Objects  Typical Unitam Revitacing						2	0.0
Selected Groups Set Groups	Bethine by Bar Stee and Bar Speaking     Deline by Bar Asea and Bar Speaking     Ber Stee     Speaking (intri)     Top     12     12     200     Bettern     12     12     200							0.0
	Reber Averaging Al Peaks Macage Al Peaks Mac. Averaging Width (m)							0.0
Acoly	Core	]					4	0.0
-								

Top Roof Slab Rebar Required Area – Direction 1 Bottom Rebar

Model Explorer Model Daptay Desaing	Sab Finite Element Design - Top Rebar Intensity (Enve	eloping) [mm2/m] - Direction.	2 - Additional to 12 @ 200 mm					3
Control Letrands     Control Letrands     Control Letrands     Control Letrands     Control Letrands     Control Letrands     Control Reportes     Column Reportes     Column Reportes     Column Reportes     Column Reportes		A	ВС	D	E	F G	H	E 1.30
sign	-9 <b></b>							1.20
Deplay Type gn Basis Finke Element Based 🔹	Renforcing Direction and Location			The second	Contraction of the			1.10
play Type Enveloping Resural Reinforcement	Direction 1 - Bottom Rebar     Direction 2 - Top Rebar							1.00
Impose Minimum Reinforcing	Direction 2 - Top Rebar     Direction 2 - Bottom Rebar							0.90
vinum 0 mn2/m	Show Rebar Above Specified Value							
dmum 0 mm2/m	<ul> <li>None</li> <li>Typical Uniform Reinforcing Specified Below</li> </ul>							0.80
ur Averaging at Nodes None	Reinforcing Specified in Sab Rebar Objects						(2)	0.70
by Objects	Typical Uniform Reinforcing							0.60
by Selected Groups Set Groups	Define by Bar Size and Bar Spacing Define by Bar Area and Bar Spacing		-			1		0.50
	Bar Sze Specing (mm)							0.40
	Top 12 💌 200							
	Bottom 12 • 200							0.30
	Reber Averaging Al Peaks							0.20
	What Averaging Width (w)							0.10
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7609	Cose			A DEP	-			
							- (4)	
¥							X 13.39283, Y 25.08536, Z 0 (n)	GLOBAL * U

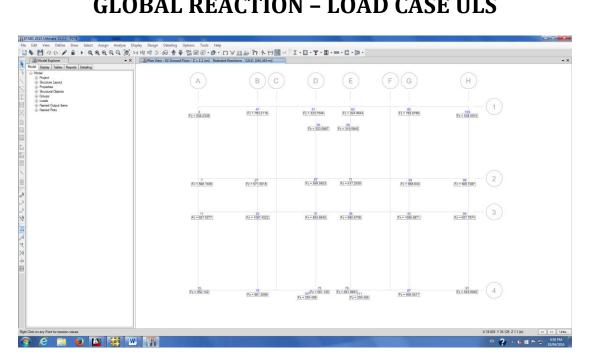
Top Roof Slab Rebar Required Area – Direction 2 Top Rebar

	🔝 🗍 🔡 Slab Finite Element Design - Bottom Rebar Intensity (	Enveloping) (mm2/m] - Direc	tion 2 - Additional to 12 @ 200 mm				
Motel Dastan, Dealing → Mode Definitions → Mode Definitions → Research Definitions → Research → Research → Research → Research → Tendor Properties → Tendor Properties → Tendor Properties		A	B C	D (E	F G	· ·	
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e Display Type sign Basis Frinte Damon Based • play Type Envirol Reinforcement • Incode Minimum Reinforcing ur Range	Perform Direction and Location Direction 1 - Tap Rear Direction 1 - Tap Rear Direction 1 - Barton Rebar Direction 2 - Tap Rebar Direction 2 - Barton Rebar Direction 2 - Barton Rebar		0		0		300 275 250 225
mum 0 mm2/m imum 0 mm2/m # Averaging at Nodes Hone y Objects	Show Robar Above Specified Value Toole Topold Unform Reinforcing Specified Below Topold Unform Reinforcing Social Reinford In Solo Rebaro Objects Typold Unform Reinforcing					· 2	20
y Selected Groups Set Groups	Define by Bir Size and Bir Spacing     Define by Bir Area and Bir Spacing     Bir Size     Battern     12     12     12     12     12     12     12     12     12					3	12 10 7
	Reber Avengeng A Peeks C Avenge A Peeks C Max. Avengeng Width: (n)		0				5
	Core						
						X 15 36685, Y 28,64886, Z 0 (m)	GLOBAL *

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Top Roof Slab Rebar Required Area – Direction 2 Bottom Rebar

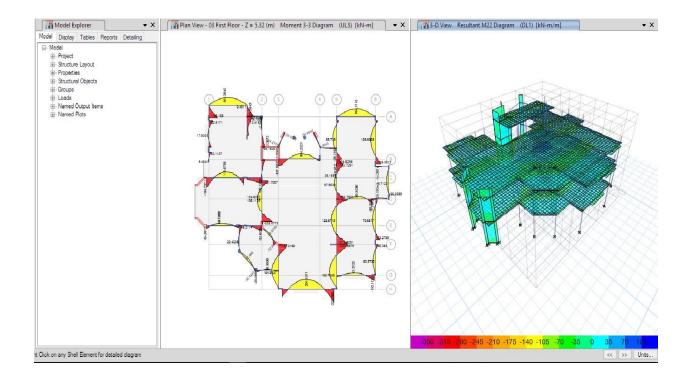
### **GLOBAL REACTION – LOAD CASE ULS**



Force Unit- kN

## **ETABS**

ANALYSIS AND DESIGN OF RESIDENTIAL VILLA



# **ROBOT STRUCTURAL ANALYSIS**

ANALYSIS AND DESIGN OF RESIDENTIALVILLA

This report shows the structural design of the Floors and Global Reaction forces of Columns under load case ULS. The 3D Analytical Model is created and analysed in CSI SAFE 2014 V14.1.1 software. All analysis and design are based on the BS 8110-1997 code. All design parameters are shown through Table 1 to 5.

Concrete	Value	Unit		
Characteristic Compressive Strength, $f_{ck}$	C40	N/mm <sup>2</sup>		
Young Modulus, E:	28000	N/mm <sup>2</sup>		
Poisson Ratio	0.2	—		
Shear Modulus, G	11666.66	N/mm <sup>2</sup>		
Density	25	KN/m <sup>3</sup>		
Damping Ratio	0.15	—		
Thermal Expansion Coefficient	0.000012	(1/°C)		
Table 1				

Steel	Value	Unit	
Yield Strength of Steel, fy:	460	N/mm <sup>2</sup>	
Poisson Ratio	0.3	—	
Shear Modulus, G	80000	N/mm <sup>2</sup>	
Density	77.01	KN/m <sup>3</sup>	
Damping Ratio	0.06	—	
Thermal Expansion Coefficient	0.000012	(1/°C)	
<b>Reduction Factor For Shear</b>	1.54		
Limit Strength for Tension	640	N/mm <sup>2</sup>	
	Tak	ole 2	

Load	Value	Unit
Super Imposed Dead (Floor Finishes + Partition Wall Load)	6	KN/m <sup>2</sup>
Live Load	2.5	KN/m <sup>2</sup>

Table 3

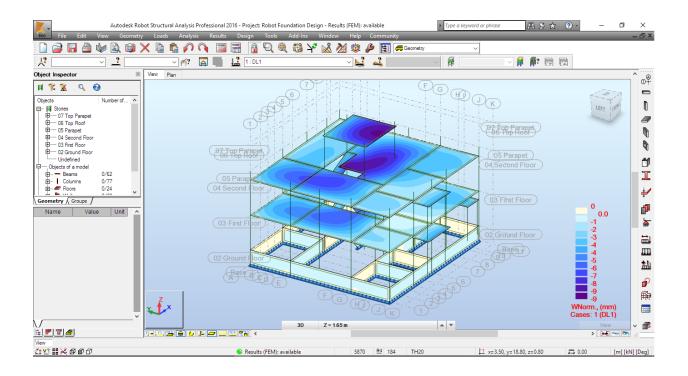
Load Factor	Value	Unit			
Live Load	1.6	_			
Dead Load	1.4	—			
	Table 4				

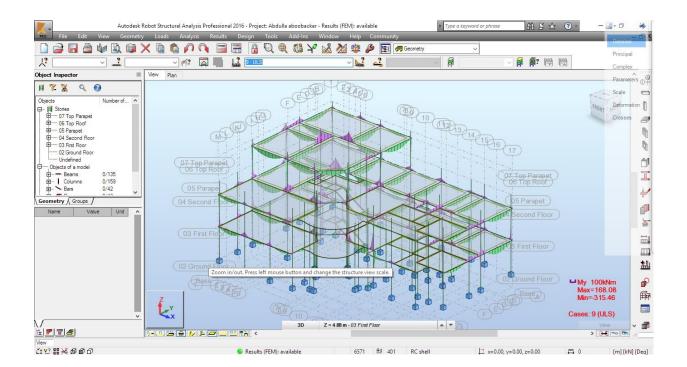
Load Combinations
 Value

 ULS
 1.4DL+1.6LL

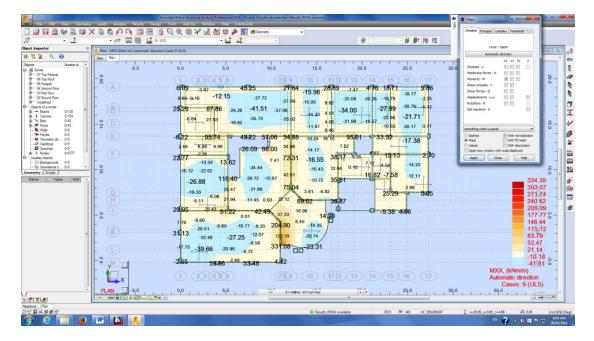
 SLS
 1DL+1LL

 Table 5





#### FIRST FLOOR SLAB ANALYSIS



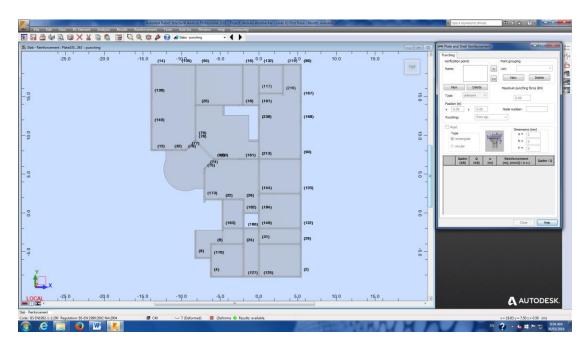
First Floor Slab Moment M11- Load Case- ULS

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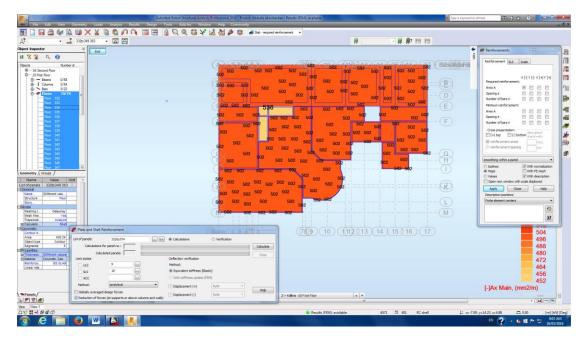
First Floor Slab Moment M22- Load Case- ULS

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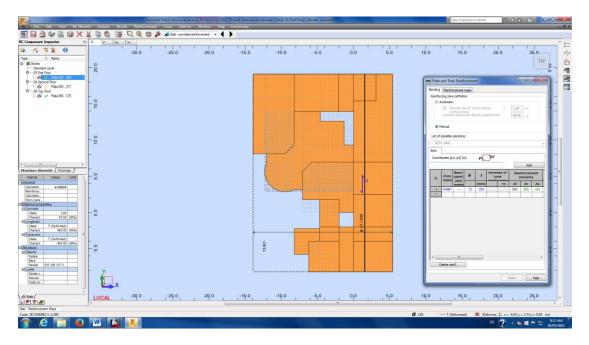
First Floor Downward Displacement-ULS



First Floor Slab Punching Check- No Punching



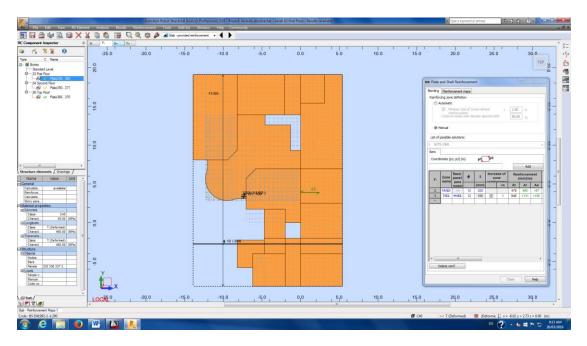
First Floor Slab Rebar Required Area Bottom X direction



First Floor Slab Rebar Provided Area Bottom X direction

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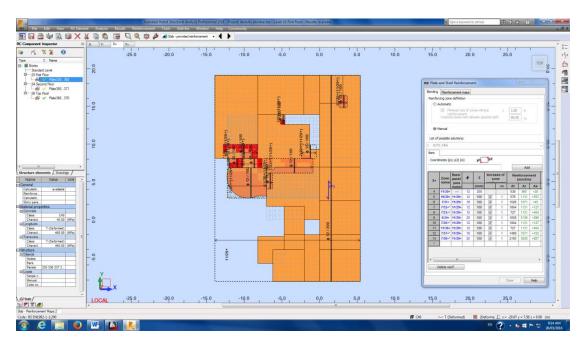
First Floor Slab Rebar Required Area Bottom Y direction



First Floor Slab Rebar Provided Area Bottom Y direction

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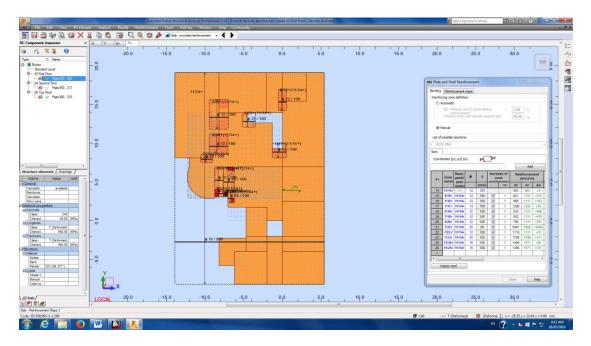
First Floor Slab Rebar Required Area Top X direction



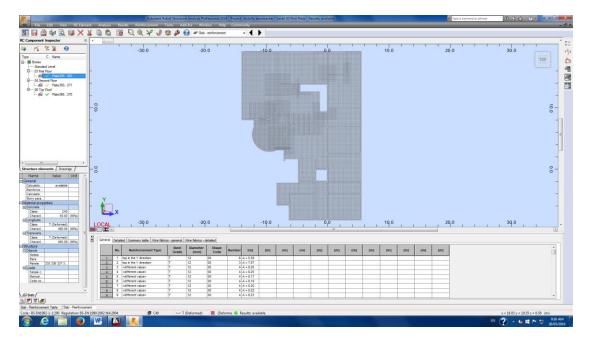
First Floor Slab Rebar Provided Area Top X direction

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First Floor Slab Rebar Required Area Top Y direction



First Floor Slab Rebar Provided Area Top Y direction

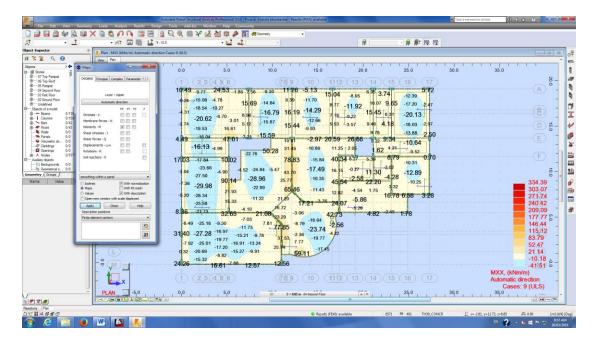


First Floor Slab Rebar Provided Area Top View

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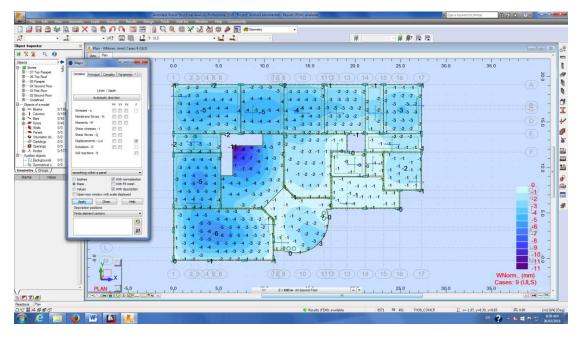
First Floor Slab Rebar Provided Area Bottom View

#### **ROOF FLOOR SLAB ANALYSIS**

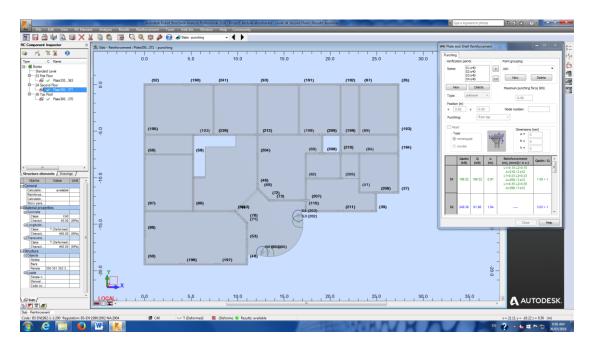


Roof Floor Slab Moment M11-ULS

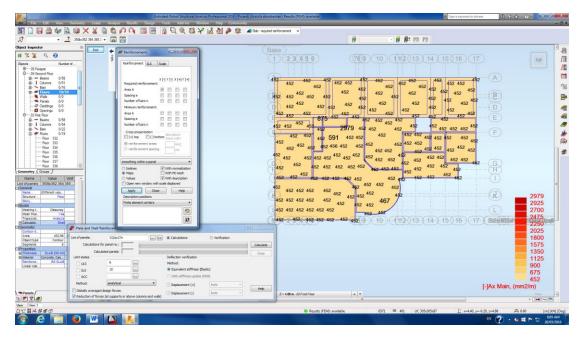
Roof Floor Slab Moment M22-ULS



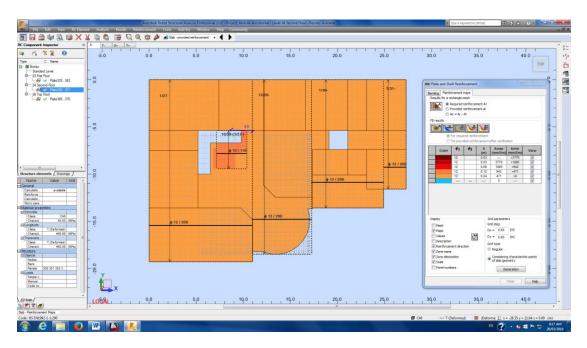
Roof Floor Downward Displacement-ULS



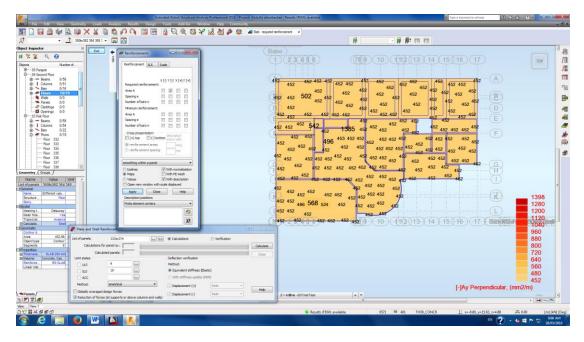
Roof Floor Slab Punching Check- Punching Correction Reinforcement Required at Indicated Green Area



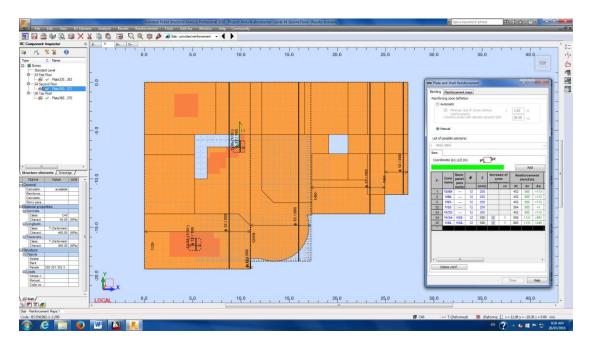
Roof Floor Slab Rebar Required Area Bottom X direction



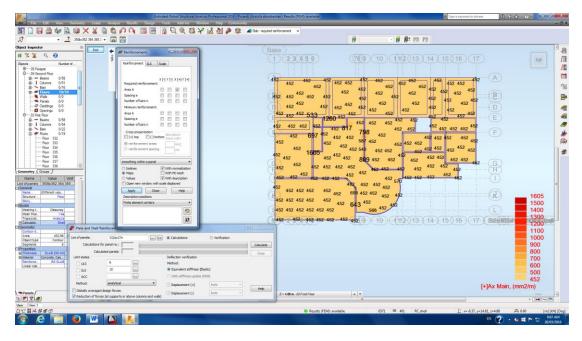
Roof Floor Slab Rebar Provided Area Bottom X direction



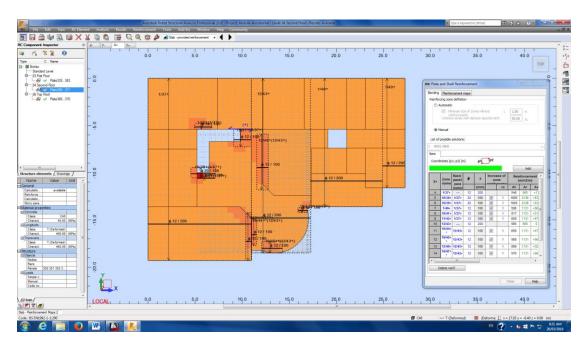
Roof Floor Slab Rebar Required Area Bottom Y direction



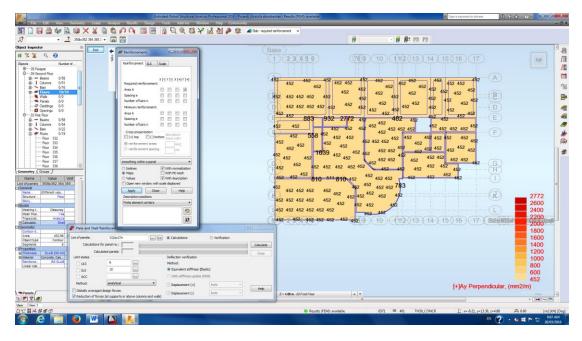
Roof Floor Slab Rebar Provided Area Bottom Y direction



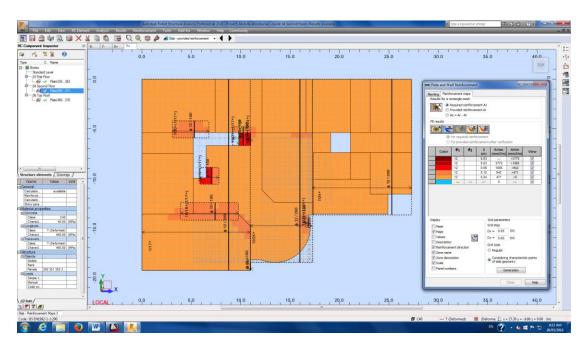
Roof Floor Slab Rebar Required Area Top X direction



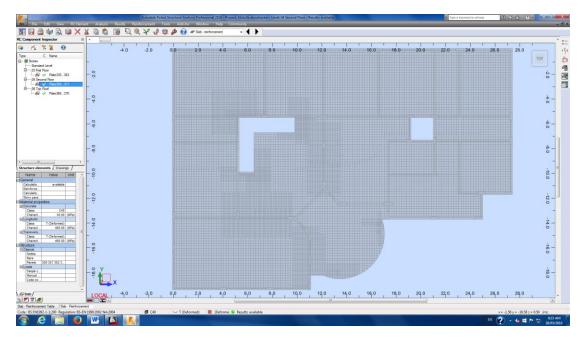
Roof Floor Slab Rebar Provided Area Top X direction



Roof Floor Slab Rebar Required Area Top Y direction



Roof Floor Slab Rebar Provided Area Top Y direction

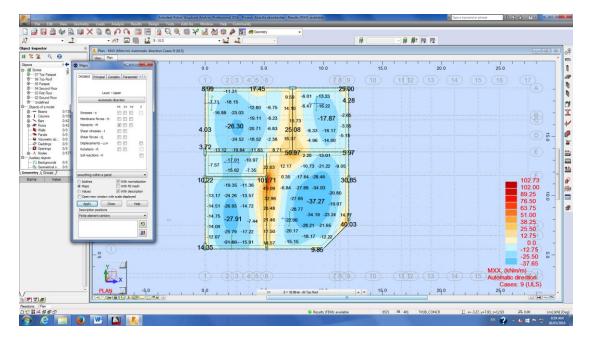


Roof Floor Slab Rebar Provided Area Top View

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Roof Floor Slab Rebar Provided Area Bottom View

## **TOP ROOF SLAB ANALYSIS**



Top Roof Slab Moment M11-ULS

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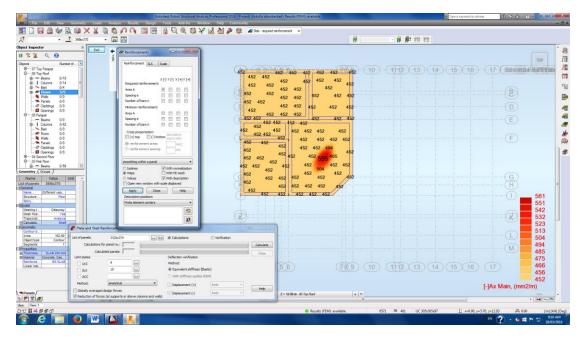
Top Roof Slab Moment M22-ULS

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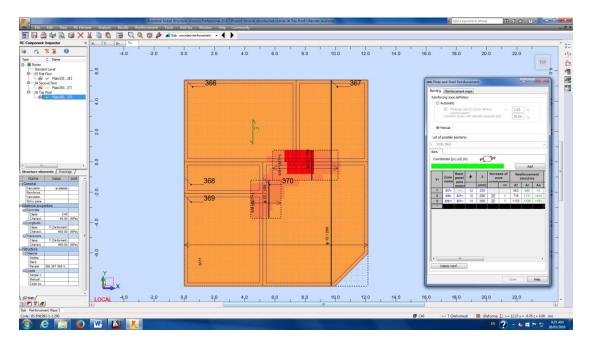
First Floor Downward Displacement-ULS

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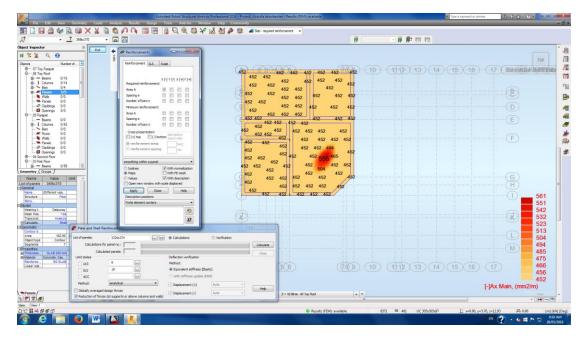
Roof Floor Slab Punching Check- No Punching



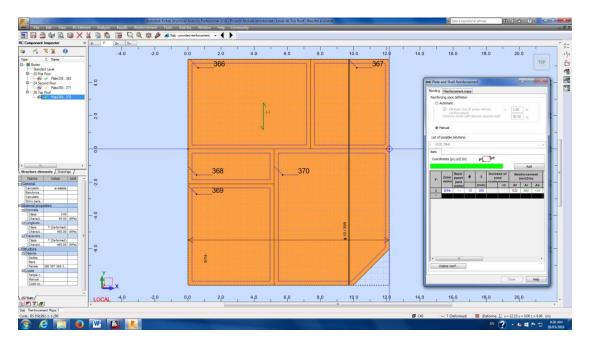
Top Roof Slab Rebar Required Area Bottom X direction



Top Roof Slab Rebar Provided Area Bottom X direction



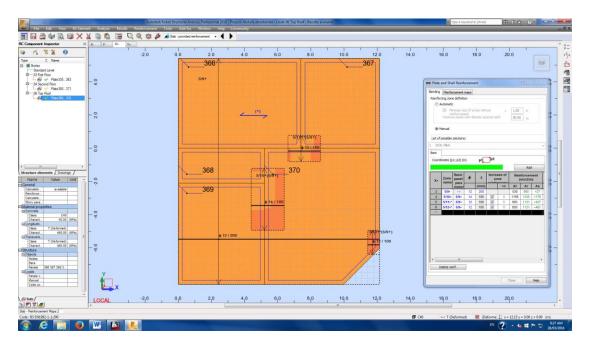
Top Roof Slab Rebar Required Area Bottom Y direction



Top Roof Slab Rebar Provided Area Bottom Y direction

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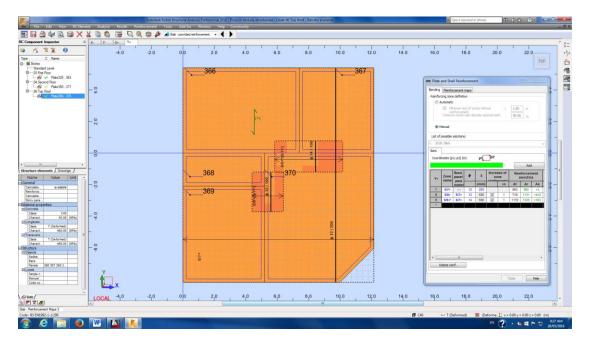
Top Roof Slab Rebar Required Area Top X direction



Top Roof Slab Rebar Provided Area Top X direction

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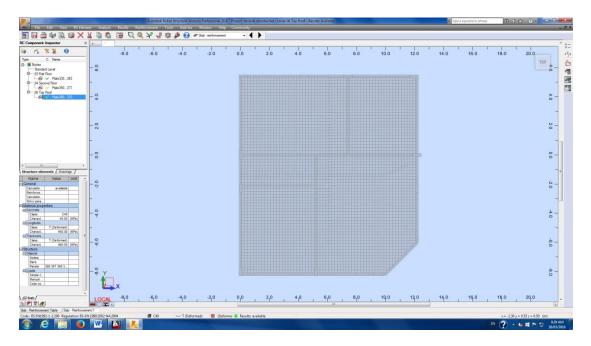
Top Roof Slab Rebar Required Area Top Y direction



Top Roof Slab Rebar Provided Area Top Y direction

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Roof Floor Slab Rebar Provided Area Top View



Roof Floor Slab Rebar Provided Area Bottom View

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## **TEKLA TEDDS**

MANUAL CALCULATION

	Project Sample Calcula	ation			Job Ref.	
ΨIJ	Section DB1				Sheet no./rev. 1	
SHAFEEKH MELANGADI	Calc. by Shafeekh	Date 6/2/2016	Chk'd by	Date	App'd by	Date

#### **RC MEMBER DESIGN**

In accordance with EN1992-1-1:2004 incorporating Corrigenda January 2008 and the UK national annex

Tedds calculation version 3.0.03

#### Concrete details - Table 3.1. Strength and deformation characteristics for concrete

Concrete strength class	C35/45
Aggregate type	Quartzite
Aggregate adjustment factor - cl.3.1.3(2)	AAF = <b>1.0</b>
Characteristic compressive cylinder strength	f <sub>ck</sub> = <mark>35</mark> N/mm <sup>2</sup>
Characteristic compressive cube strength	f <sub>ck,cube</sub> = 45 N/mm <sup>2</sup>
Mean value of compressive cylinder strength	$f_{cm} = f_{ck} + 8 \text{ N/mm}^2 = 43 \text{ N/mm}^2$
Mean value of axial tensile strength	$f_{ctm} = 0.3 \text{ N/mm}^2 \times (f_{ck}/ 1 \text{ N/mm}^2)^{2/3} = 3.2 \text{ N/mm}^2$
Secant modulus of elasticity of concrete	$E_{cm} = 22 \text{ kN/mm}^2 \times [f_{cm}/10 \text{ N/mm}^2]^{0.3} \times AAF = 34077 \text{ N/mm}^2$
Ultimate strain - Table 3.1	$\epsilon_{cu2} = 0.0035$
Shortening strain - Table 3.1	ε <sub>cu3</sub> = <b>0.0035</b>
Effective compression zone height factor	$\lambda = 0.80$
Effective strength factor	η = <b>1.00</b>
Coefficient k1	k <sub>1</sub> = <b>0.40</b>
Coefficient k <sub>2</sub>	$k_2 = 1.0 \times (0.6 + 0.0014 / \epsilon_{cu2}) = 1.00$
Coefficient k <sub>3</sub>	k <sub>3</sub> = <b>0.40</b>
Coefficient k <sub>4</sub>	$k_4 = 1.0 \times (0.6 + 0.0014 / \epsilon_{cu2}) = 1.00$
Partial factor for concrete -Table 2.1N	γc = <b>1.50</b>
Compressive strength coefficient - cl.3.1.6(1)	α <sub>cc</sub> = <b>0.85</b>
Design compressive concrete strength - exp.3.15	$f_{cd} = \alpha_{cc} \times f_{ck} \ / \ \gamma_C = 19.8 \ N/mm^2$
Compressive strength coefficient - cl.3.1.6(1)	$\alpha_{ccw} = 1.00$
Design compressive concrete strength - exp.3.15	$f_{cwd} = \alpha_{ccw} \times f_{ck} / \gamma_C = 23.3 \text{ N/mm}^2$
Maximum aggregate size	h <sub>agg</sub> = <mark>20</mark> mm
Monolithic simple support moment factor	β <sub>1</sub> = <b>0.25</b>
Reinforcement details	
Characteristic yield strength of reinforcement	f <sub>yk</sub> = 500 N/mm <sup>2</sup>
Partial factor for reinforcing steel - Table 2.1N	γs = <b>1.15</b>
Design yield strength of reinforcement	$f_{yd} = f_{yk} / \gamma_S = 435 \text{ N/mm}^2$
Nominal cover to reinforcement	
Nominal cover to top reinforcement	c <sub>nom_t</sub> = <b>35</b> mm
Nominal cover to bottom reinforcement	c <sub>nom_b</sub> = <b>35</b> mm
Nominal cover to side reinforcement	c <sub>nom_s</sub> = <b>35</b> mm
Fire resistance	
Standard fire resistance period	R = <mark>60</mark> min
Number of sides exposed to fire	3
Minimum width of beam - EN1992-1-2 Table 5.5	b <sub>min</sub> = <b>120</b> mm

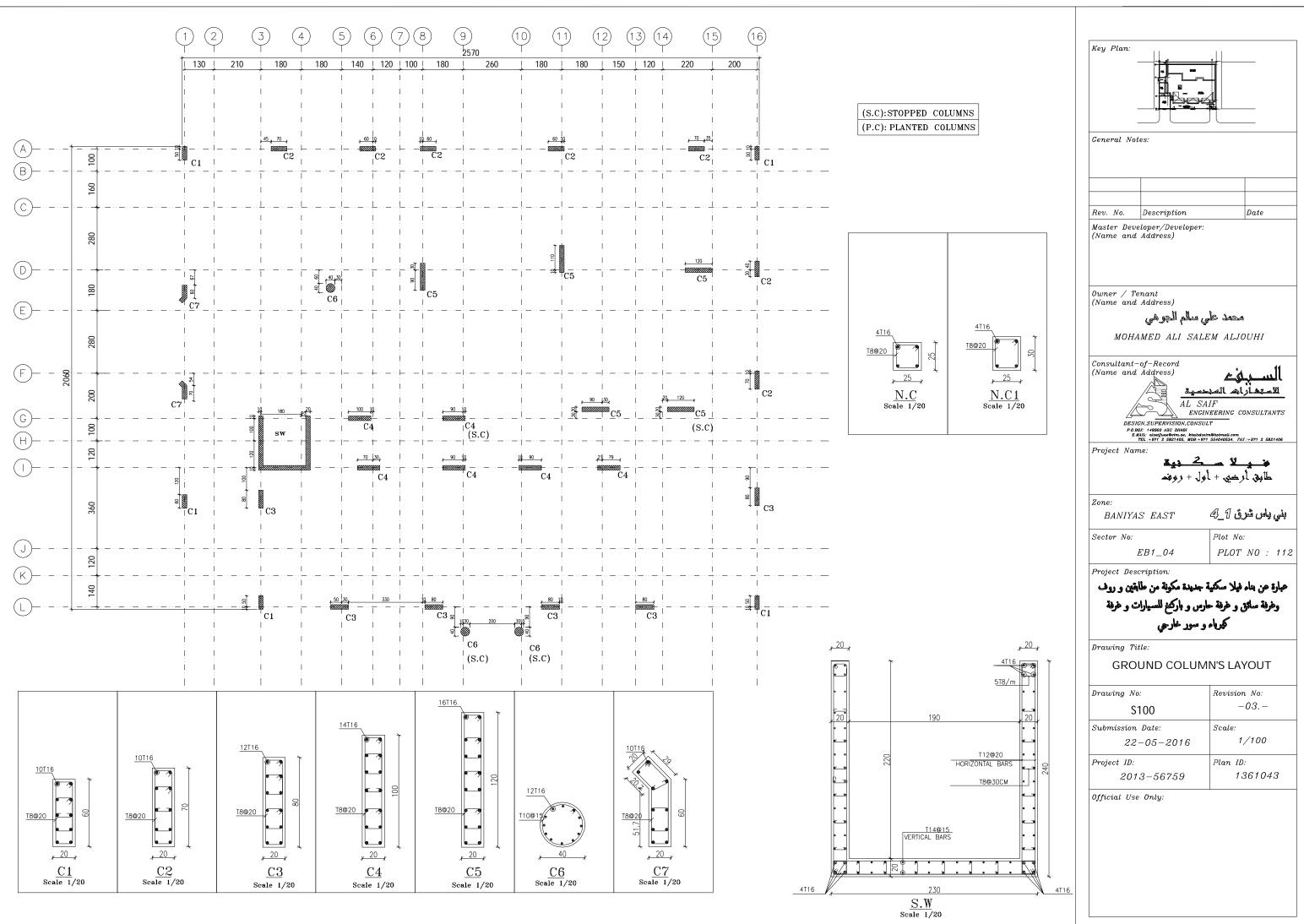
	Project Sample Calc	ulation			Job Ref.	
44	Section DB1				Sheet no./rev. 2	
SHAFEEKH MELANGADI	Calc. by Shafeekh	Date 6/2/2016	Chk'd by	Date	App'd by	Date
Section 1 - Design DB 1						
Rectangular section details						
Section width		b = <mark>300</mark> mm				
Section depth		h = <mark>500</mark> mm				
	200	2 ×	16φ 8 legs @ 250 16φ	) c/c		
Positive moment - section 6.1 Design bending moment Effective depth of tension reinfor Redistribution ratio		$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = min(\delta_{pos_s} K = M / (b \times M))$	$_{s1}, 1) = 1.000$ $d^2 \times f_{ck}) = 0.04$		2 × k2)) × (λ × (δ -	k1) / (2 × k
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Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided	rcement equired rovided	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s1} = M / (b \times W) + (b \times W$	$\begin{aligned} s_{1}, 1) &= 1.000 \\ d^{2} \times f_{ck}) &= 0.04 \\ \alpha_{cc} / \gamma_{C}) \times (1 - K' > K' \\ &< d \times [1 + (1 - 2)] \\ &< d \times [1 + (1 - 2)] \\ &> \lambda = 56 \text{ mm} \\ &\\ s_{yd} \times z) &= 539 \text{ m} \end{aligned}$	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm²	ession reinforcen / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α	nent is rec
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr	rcement equired rovided - exp.9.1N	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s1} = M / (b \times W) + (b \times W$	$(s_{1}, 1) = 1.000$ $d^{2} \times f_{ck}) = 0.04$ $\alpha_{cc} / \gamma_{C}) \times (1 - K' > K' + K' + K' + K' + K' + K' + K' +$	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b ×	ession reinforcen / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α	nent is rec
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement	rcement equired rovided - exp.9.1N - cl.9.2.1.1(3)	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s} + M_s) = 0.207$ $K = M / (b \times M_s) = 0.207$ $Z = \min(0.5 \times M_s) = 0.207$ $Z = \min(0.5 \times M_s) = 0.207$ $Z = \min(0.5 \times M_s) = 0.04$ $A_{s,req} = M / (f + M_s) = 0.04$ $A_{s,min} = \max(0.5 \times M_s) = 0.04$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_c$ ) × (1 - K' > H × $d \times [1 + (1 - 2)]$ $\chi = 56 \text{ mm}$ $\chi_d \times z$ ) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × $b \times h$ = 6000	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b × ) mm <sup>2</sup>	ession reinforcen / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α	<b>nent is rec</b> d) = <b>427</b> m
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement Maximum area of reinforcement	rcement equired rovided - exp.9.1N - cl.9.2.1.1(3)	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s1} = M + M)$ $K = M / (b \times M)$ $K' = (2 \times \eta \times M)$ C = 0.207 $z = \min(0.5 \times M)$ $z = 2 \times (d - Z)$ $A_{s,req} = M / (f = 3 \times 16\phi)$ $A_{s,min} = \max(0.5 \times M)$ $A_{s,min} = \max(0.5 \times M)$ $A_{s,min} = \max(0.5 \times M)$ $A_{s,max} = 0.04$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_c$ ) × (1 - K' > H × $d \times [1 + (1 - 2)]/\lambda = 56 \text{ mm}$ $y_d \times z$ ) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × b × h = 6000 ent provided is	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b × ) mm <sup>2</sup>	ession reinforcer / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α d = <b>225</b> mm <sup>2</sup>	<b>nent is rec</b> d) = <b>427</b> m
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement Maximum area of reinforcement <b>Crack control - Section 7.3</b> Maximum crack width	rcement equired rovided - exp.9.1N - cl.9.2.1.1(3) <b>PASS - Area</b>	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s})$ $K = M / (b \times K' = (2 \times \eta \times 0.207)$ $z = \min(0.5 \times x = 2 \times (d - z \times 0.207)$ $z = 2 \times (d - z \times 0.207)$ $A_{s,req} = M / (f \times 0.207)$ $A_{s,req} = M / (f \times 0.207)$ $A_{s,min} = \max(A_{s,min} = \max(A_{s,min} = 0.04))$ of reinforcements $w_{k} = 0.3 \text{ mm}$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_c$ ) × (1 - K' > H × d × [1 + (1 - 2 $\chi / \lambda = 56 \text{ mm}$ $f_{yd} \times z$ ) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × b × h = 6000 ent provided is	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b × ) mm <sup>2</sup>	ession reinforcer / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α d = <b>225</b> mm <sup>2</sup>	<b>nent is rec</b> d) = <b>427</b> m
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement of Maximum area of reinforcement <b>Crack control - Section 7.3</b> Maximum crack width Design value modulus of elastici	rcement rovided - exp.9.1N - cl.9.2.1.1(3) <b>PASS - Area</b> ity reinf – 3.2.7(4	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s} + K) = M / (b \times K') = (2 \times \eta \times K') = (2 \times K$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_{C}$ ) × (1 - K' > H × $d \times [1 + (1 - 2)]$ $\lambda = 56 \text{ mm}$ $y_d \times z$ ) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × $b \times h = 6000$ ent provided is	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b × ) mm <sup>2</sup>	ession reinforcer / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α d = <b>225</b> mm <sup>2</sup>	<b>nent is rec</b> d) = <b>427</b> m
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement Maximum area of reinforcement <b>Crack control - Section 7.3</b> Maximum crack width Design value modulus of elastici Mean value of concrete tensile s	rcement rovided - exp.9.1N - cl.9.2.1.1(3) <b>PASS - Area</b> ity reinf – 3.2.7(4	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s1} = M + M) = M + M$ $K = M / (b \times K' = (2 \times \eta \times M) = 0.207$ $z = \min(0.5 \times M) = 2 \times (d - z + M) = M + M$ $z = 2 \times (d - z + M) = M + M + M + M$ $A_{s,req} = M / (f + M) = M + M + M + M + M + M + M + M + M + M$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_{C}$ ) × (1 - K' > H × $d \times [1 + (1 - 2)]$ $\lambda = 56 \text{ mm}$ $y_d \times z$ ) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × $b \times h = 6000$ ent provided is	λ × (δ - k <sub>1</sub> ) / (2 <b>&lt; - No compre</b> 2 × K / (η × α <sub>cc</sub> nm <sup>2</sup> , 0.0013) × b × ) mm <sup>2</sup>	ession reinforcer / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α d = <b>225</b> mm <sup>2</sup>	<b>nent is rec</b> d) = <b>427</b> m
Design bending moment Effective depth of tension reinfor Redistribution ratio Lever arm Depth of neutral axis Area of tension reinforcement re Tension reinforcement provided Area of tension reinforcement pr Minimum area of reinforcement of Maximum area of reinforcement <b>Crack control - Section 7.3</b> Maximum crack width Design value modulus of elastici	rcement equired rovided - exp.9.1N - cl.9.2.1.1(3) <b>PASS - Area</b> ity reinf – 3.2.7(4	$M = M_{pos_s1} = d = 449 \text{ mm}$ $\delta = \min(\delta_{pos_s} + k) = M / (b \times k') = (2 \times \eta \times k') = (2 \times k') = (2 \times \eta \times k') = (2 \times k') = (2 \times k') = (2 \times k') = (2 \times k'$	s1, 1) = 1.000 $d^2 \times f_{ck}$ ) = 0.04 $\alpha_{cc} / \gamma_{c}$ ) × (1 - K' > I × $d \times [1 + (1 - 2)] / \lambda = 56 mm$ yd × z) = 539 m mm <sup>2</sup> 0.26 × $f_{ctm} / f_{yk}$ × b × h = 6000 ent provided is N/mm <sup>2</sup> 3.2 N/mm <sup>2</sup>	$\lambda \times (\delta - k_1) / (2$ <b>C - No compre</b> $2 \times K / (\eta \times \alpha_{cc})$ $1 m^2$ $(0.0013) \times b \times b^2$ $mm^2$ <b>S greater than</b>	ession reinforcer / γ <sub>C</sub> )) <sup>0.5</sup> ], 0.95 × α d = <b>225</b> mm <sup>2</sup>	nent is red d) = 427 m

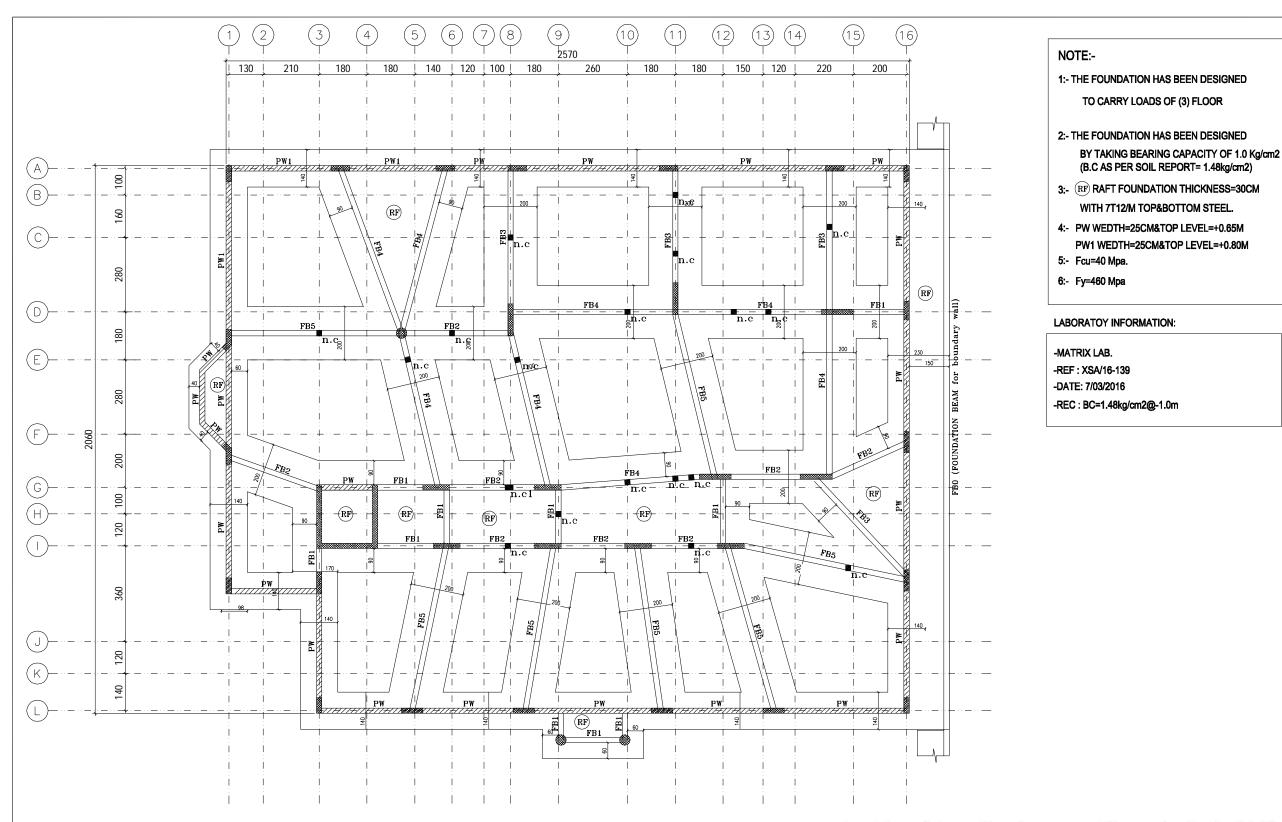
	<sup>&gt;</sup> roject Sample Calcu	ulation			Job Ref.	
	Section				Sheet no./rev	
	DB1				3	
	Calc. by Shafeekh	Date 6/2/2016	Chk'd by	Date	App'd by	Date
Maximum stress permitted - Table 7	.3N	σs <b>= 321</b> N/r	nm²			
Steel to concrete modulus of elast. r	atio	$\alpha_{cr} = E_s / E_{cr}$	n <b>= 5.87</b>			
Distance of the Elastic NA from both	om of beam	$y = (b \times h^2 / mm)$	2 + $A_{s,prov} \times (\alpha_{cr}$	r - 1) × (h - d))	/ (b × h + $A_{s,prov}$	$\times (\alpha_{cr} - 1)) = 24$
Area of concrete in the tensile zone		$A_{ct} = b \times y =$	<b>73854</b> mm <sup>2</sup>			
Minimum area of reinforcement requ	ired - exp.7.1	$A_{sc,min} = k_c \times$	$k \times f_{\text{ct,eff}} \times A_{\text{ct}}  / $	σ <sub>s</sub> = <b>296</b> mm²		
PASS -	Area of tens	ion reinforcer	nent provided	exceeds mini	mum required i	for crack cont
Quasi-permanent moment		$M_{QP} = M_{pos_Q}$	<sub>P_s1</sub> = <mark>65.0</mark> kNm	l		
Permanent load ratio		$R_{PL} = M_{QP} /  $	VI = <b>0.65</b>			
Service stress in reinforcement		$\sigma_{sr} = f_{yd} \times A_s$	$_{\rm req}$ / ${\sf A}_{\rm s,prov}  imes {\sf R}_{\rm Pl}$	∟ <b>= 253</b> N/mm²	2	
Maximum bar spacing - Tables 7.3N		Sbar,max = 184				
	PA	ASS - Maximui	n bar spacing	exceeds actu	al bar spacing i	for crack cont
Negative moment - section 6.1						
Design bending moment		M = M <sub>neg_s1</sub> =	= <mark>35.0</mark> kNm			
Effective depth of tension reinforcem	nent	d = <b>449</b> mm				
Redistribution ratio		$\delta = \min(\delta_{neg})$	<sub>s1</sub> , 1) = <b>1.000</b>			
		$K = M / (b \times$	$d^2 \times f_{ck}$ ) = 0.01	7		
		K' = (2 × η × <b>0.207</b>	$\alpha_{cc}$ / $\gamma_{C}$ ) $ imes$ (1 -	λ × (δ - k <sub>1</sub> ) / (2	$(\mathbf{x} \times \mathbf{k}_2) \mathbf{x} \times (\mathbf{\lambda} \times (\mathbf{\delta}))$	- k <sub>1</sub> ) / (2 × k <sub>2</sub> ))
			K' > K	( - No compre	ssion reinforce	ment is requir
Lever arm		z = min(0.5		-	/ γc)) <sup>0.5</sup> ], 0.95 ×	-
Depth of neutral axis			$(2) / \lambda = 56 \text{ mm}$		, _	,
Area of tension reinforcement requir	ed	-	, f <sub>yd</sub> × z) = 189 m	1m <sup>2</sup>		
Tension reinforcement provided		2 × 16φ				
Area of tension reinforcement provid	led	A <sub>s,prov</sub> = <b>402</b>	mm²			
Minimum area of reinforcement - exp			$(0.26 \times f_{ctm} / f_{yk})$	0.0013) × b ×	d <b>= 225</b> mm <sup>2</sup>	
Maximum area of reinforcement - cl.	9.2.1.1(3)		× b × h = 6000			
ŀ	PASS - Area	of reinforcem	ent provided is	s greater than	area of reinfor	cement requir
Crack control - Section 7.3						
Maximum crack width		w <sub>k</sub> = <mark>0.3</mark> mm	1			
Design value modulus of elasticity re	einf – 3.2.7(4)					
Mean value of concrete tensile stren	gth	$f_{\text{ct,eff}} = f_{\text{ctm}} =$	3.2 N/mm <sup>2</sup>			
Stress distribution coefficient		k <sub>c</sub> = <b>0.4</b>				
Non-uniform self-equilibrating stress	coefficient	k = min(max	x(1 + (300 mm ·	- min(h, b)) × 0	).35 / 500 mm, (	0.65), 1) = <b>1.00</b>
Actual tension bar spacing		s <sub>bar</sub> = (b - (2 <b>198</b> mm	$\times$ (C <sub>nom_s</sub> + $\phi_{s1_v}$	$\phi$ ) + $\phi_{s1_tL1} \times N_s$	. <sub>1_t_L1</sub> )) / (N <sub>s1_t_L1</sub>	- 1) + φ <sub>s1_t_L1</sub> =
Maximum stress permitted - Table 7	.3N	σ <sub>s</sub> = <b>242</b> N/r	nm²			
Steel to concrete modulus of elast. r	atio	$\alpha_{cr} = E_s / E_{cr}$	n <b>= 5.87</b>			
Distance of the Elastic NA from bott	om of beam	$y = (b \times h^2 / mm)$	2 + $A_{s,prov} \times (\alpha_{cr}$	r - 1) × (h - d))	/ (b × h + A <sub>s,prov</sub>	× (α <sub>cr</sub> - 1)) = 24
		111111				
Area of concrete in the tensile zone		$A_{ct} = b \times y =$	<b>74231</b> mm <sup>2</sup>			

	Project Sample Calc	ulation			Job Ref.	
மா	Section DB1				Sheet no./rev.	
SHAFEEKH MELANGADI	Calc. by Shafeekh	Date 6/2/2016	Chk'd by	Date	App'd by	Date
PAS	S - Area of ten	sion reinforcen	nent provided	exceeds minii	num required fo	r crack cor
Quasi-permanent moment			<sub>P_s1</sub> = 35.0kNm			
Permanent load ratio		$R_{PL} = M_{QP} / N_{PL}$				
Service stress in reinforcement		$\sigma_{sr} = f_{yd} \times A_{s}$	$_{\rm req}$ / A <sub>s,prov</sub> × R <sub>P</sub>	∟ <b>= 204</b> N/mm²		
Maximum bar spacing - Tables 7	.3N	$S_{bar,max} = 244$	. <mark>9</mark> mm			
		-		exceeds actua	al bar spacing fo	r crack cor
Minimum bar spacing (Section	8.2)					
Top bar spacing		$s_{top} = (b - (2$	× (C <sub>nom_s</sub> + $\phi_{s1_v}$	) + $\phi_{s1_t_L} \times N_{s'}$	I_t_L1)) / (N <sub>s1_t_L1</sub> -	1) = <b>182.0</b> r
Minimum allowable top bar spaci	ng	$S_{top,min} = max$	$(\phi_{s1_t_L} \times k_{s1}, h)$	<sub>agg</sub> + k <sub>s2</sub> , 20mn	n) = <b>25.0</b> mm	
			PASS - Act	tual bar spacir	ng exceeds mini	mum allowa
Bottom bar spacing		s <sub>bot</sub> = (b - (2	× (Cnom_s + φs1_v	) + $\phi_{s1_b_{L1}} \times N_s$	1_b_L1)) / (Ns1_b_L1	- 1) = <mark>83.0</mark> r
Minimum allowable bottom bar sp	pacing	S <sub>bot,min</sub> = max	$(\phi_{s1\_b\_L1} \times k_{s1}, h)$	n <sub>agg</sub> + k <sub>s2</sub> , 20mr	n) = <b>25.0</b> mm	
			PASS - Ac	tual bar spacir	ig exceeds mini	mum allowa
Section in shear (section 6.2)			PASS - Act	tual bar spacir	ig exceeds mini	mum allowa
Section in shear (section 6.2) Angle of comp. shear strut for ma	aximum shear	$\theta_{max} = 45 \text{ deg}$		tual bar spacir	ig exceeds mini	mum allowa
					ig exceeds mini	mum allowa
Angle of comp. shear strut for ma	3(3)		9		ig exceeds mini	mum allowa
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2.	3(3) cl.6.2.3(3)	$v_1 = 0.6 \times (1)$ $\alpha_{cw} = 1.00$	g - f <sub>ck</sub> / 250 N/m	m²) = <b>0.516</b>	-	
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - c	3(3) cl.6.2.3(3)	$v_1 = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$	g - f <sub>ck</sub> / 250 N/m	m²) = <b>0.516</b>	<b>ig exceeds mini</b> <sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup>	
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer	3(3) cl.6.2.3(3)	$v_1 = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$	g - f <sub>ck</sub> / 250 N/m - N/mm² × b × (	m²) = <b>0.516</b>	-	
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - c Minimum area of shear reinforcer Design shear force at support	3(3) cl.6.2.3(3) ment - exp.9.5N	$v_1 = 0.6 \times (1 \ \alpha_{cw} = 1.00 \ A_{sv,min} = 0.08 \ V_{Ed,max} = V_{Ed},$ $z = 427 \ mm$	g - f <sub>ck</sub> / 250 N/m - N/mm <sup>2</sup> × b × ( max_s1 = <b>50</b> kN	m²) <b>= 0.516</b> f <sub>ck</sub> / 1 N/mm²)º	-	/m
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed}$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$	g - $f_{ck} / 250 \text{ N/m}$ - $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $\times b \times z \times v_1 \times f$	m²) <b>= 0.516</b> f <sub>ck</sub> / 1 N/mm²) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) -	<sup>.5</sup> / f <sub>yk</sub> = <mark>284</mark> mm²	/m kN
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed}$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$	g - $f_{ck} / 250 \text{ N/m}$ - $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $\times b \times z \times v_1 \times f$	m²) <b>= 0.516</b> f <sub>ck</sub> / 1 N/mm²) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) -	<sup>.5</sup> / f <sub>yk</sub> = <mark>284</mark> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b>	/m kN
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $Sign shear force$ $V_{Ed} = 50 \text{ kN}$	g - $f_{ck} / 250 \text{ N/m}$ - $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $\times b \times z \times v_1 \times f$	m²) <b>= 0.516</b> f <sub>ck</sub> / 1 N/mm²) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) <b>less than may</b>	<sup>.5</sup> / f <sub>yk</sub> = <mark>284</mark> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b>	/m kN
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - c Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - D</i> es	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $\text{Sign shear force}$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$	$f_{ck} / 250 \text{ N/m}$ $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $\times b \times z \times v_1 \times f_{s}$ $at support is$ $b \times z) = 0.391 \text{ N}$	m <sup>2</sup> ) = <b>0.516</b> f <sub>ck</sub> / 1 N/mm <sup>2</sup> ) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) <i>less than may</i>	<sup>.5</sup> / f <sub>yk</sub> = <mark>284</mark> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b>	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear stress	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - D</i> es	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $\text{Sign shear force}$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$	$f_{ck} / 250 \text{ N/m}$ $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $\times b \times z \times v_1 \times f_{s}$ $at support is$ $b \times z) = 0.391 \text{ N}$	m <sup>2</sup> ) = <b>0.516</b> f <sub>ck</sub> / 1 N/mm <sup>2</sup> ) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) <i>less than may</i>	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> kimum design si	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear stress	3(3) cl.6.2.3(3) ment - exp.9.5N re - exp.6.9 <b>PASS - Des</b> trut - cl.6.2.3	$v_1 = 0.6 \times (1 \\ \alpha_{cw} = 1.00 \\ A_{sv,min} = 0.08 \\ V_{Ed,max} = V_{Ed}, \\ z = 427 mm \\ V_{Rd,max} = \alpha_{cw}$ bign shear force $V_{Ed} = 50 \text{ kN} \\ v_{Ed} = 50 \text{ kN} \\ v_{Ed} = V_{Ed} / (b \\ \theta = min(max) \\ = 21.8 deg$	$f_{ck} / 250 \text{ N/m}$ $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $x b \times z \times v_1 \times f_{s}$ $at support is$ $(0.5 \times Asin[min])$	m <sup>2</sup> ) = <b>0.516</b> f <sub>ck</sub> / 1 N/mm <sup>2</sup> ) <sup>0</sup> <sub>cwd</sub> / (cot(θ <sub>max</sub> ) <i>less than may</i>	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> <i>cimum design si</i> × f <sub>cd</sub> × v <sub>1</sub> ),1)], 21	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - of Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear stress Angle of concrete compression st	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - Des</i> trut - cl.6.2.3 ired - exp.6.8	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $dign shear force$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$ $\theta = min(max)$ $= 21.8 \text{ deg}$ $A_{sv,des} = v_{Ed} > 0$	$f_{ck} / 250 \text{ N/m}$ $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $x b \times z \times v_1 \times f_{s}$ $at support is$ $(0.5 \times Asin[min])$	$m^{2}) = 0.516$ $f_{ck} / 1 N/mm^{2})^{0}$ $c_{cwd} / (cot(\theta_{max}) - less than max)$ $l/mm^{2}$ $n(2 \times v_{Ed} / (\alpha_{cw} - m)) = 108 mm^{2}/r$	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> <i>cimum design si</i> × f <sub>cd</sub> × v <sub>1</sub> ),1)], 21	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - of Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear stress Angle of concrete compression st Area of shear reinforcement requ	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - Des</i> trut - cl.6.2.3 ired - exp.6.8	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $dign shear force$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$ $\theta = min(max)$ $= 21.8 \text{ deg}$ $A_{sv,des} = v_{Ed} > 0$	$f_{ck} / 250 \text{ N/m}$ $N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $x b \times z \times v_1 \times f_{s}$ $at support is$ $b \times z) = 0.391 \text{ N}$ $(0.5 \times \text{Asin[min]})$ $(b / (f_{yd} \times \text{cot}(\theta))$ $(A_{sv,min}, A_{sv,des}) = 0$	$m^{2}) = 0.516$ $f_{ck} / 1 N/mm^{2})^{0}$ $c_{cwd} / (cot(\theta_{max}) - less than max)$ $l/mm^{2}$ $n(2 × v_{Ed} / (\alpha_{cw} - m)) = 108 mm^{2}/r$	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> <i>cimum design si</i> × f <sub>cd</sub> × v <sub>1</sub> ),1)], 21	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - c Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear force Design shear stress Angle of concrete compression st Area of shear reinforcement requ	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - Des</i> trut - cl.6.2.3 ired - exp.6.8 ired	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $Sign shear force$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$ $\theta = min(max)$ $= 21.8 \text{ deg}$ $A_{sv,des} = v_{Ed} \times A_{sv,req} = max$	$f_{ck} / 250 \text{ N/m}$ $= N/mm^2 \times b \times (max_{s1} = 50 \text{ kN})$ $= b \times z \times v_1 \times f_s$ $= at \text{ support is}$ $= 0 \times z) = 0.391 \text{ N}$ $= (0.5 \times \text{Asin[min]} \times b / (f_{yd} \times \text{cot}(\theta))$ $= (A_{sv,min}, A_{sv,des}) = 250 \text{ c/c}$	$m^{2}) = 0.516$ $f_{ck} / 1 N/mm^{2})^{0}$ $c_{cwd} / (cot(\theta_{max}) - less than max)$ $l/mm^{2}$ $n(2 × v_{Ed} / (\alpha_{cw} - m)) = 108 mm^{2}/r$	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> <i>cimum design si</i> × f <sub>cd</sub> × v <sub>1</sub> ),1)], 21	/m ) kN near resista
Angle of comp. shear strut for ma Strength reduction factor - cl.6.2. Compression chord coefficient - o Minimum area of shear reinforcer Design shear force at support Min lever arm in shear zone Maximum design shear resistanc Design shear force Design shear force Design shear stress Angle of concrete compression st Area of shear reinforcement requ Area of shear reinforcement requ Shear reinforcement provided	3(3) cl.6.2.3(3) ment - exp.9.5N e - exp.6.9 <i>PASS - Des</i> trut - cl.6.2.3 ired - exp.6.8 ired ided	$v_{1} = 0.6 \times (1)$ $\alpha_{cw} = 1.00$ $A_{sv,min} = 0.08$ $V_{Ed,max} = V_{Ed},$ $z = 427 \text{ mm}$ $V_{Rd,max} = \alpha_{cw}$ $dign shear force$ $V_{Ed} = 50 \text{ kN}$ $v_{Ed} = V_{Ed} / (b)$ $\theta = min(max)$ $= 21.8 \text{ deg}$ $A_{sv,des} = v_{Ed} >$ $A_{sv,req} = max$ $2 \times 8 \text{ legs } @$ $A_{sv,prov} = 402$	$f_{ck} / 250 \text{ N/m}$ $f_{ck} = 50 \text{ kN}$	m <sup>2</sup> ) = 0.516 $f_{ck} / 1 N/mm^2)^0$ $c_{cwd} / (cot(\theta_{max}) - 1)^0$ less than max $l/mm^2$ $h(2 \times v_{Ed} / (\alpha_{cw}))$ $= 108 mm^2/m^2$	<sup>5</sup> / f <sub>yk</sub> = <b>284</b> mm <sup>2</sup> + tan(θ <sub>max</sub> )) = <b>77(</b> <i>cimum design si</i> × f <sub>cd</sub> × v <sub>1</sub> ),1)], 21	/m kN near resista 8 deg), 45d

# STRUCTURAL DETAILING

FOR APPROVAL FROM MUNCIPALITY



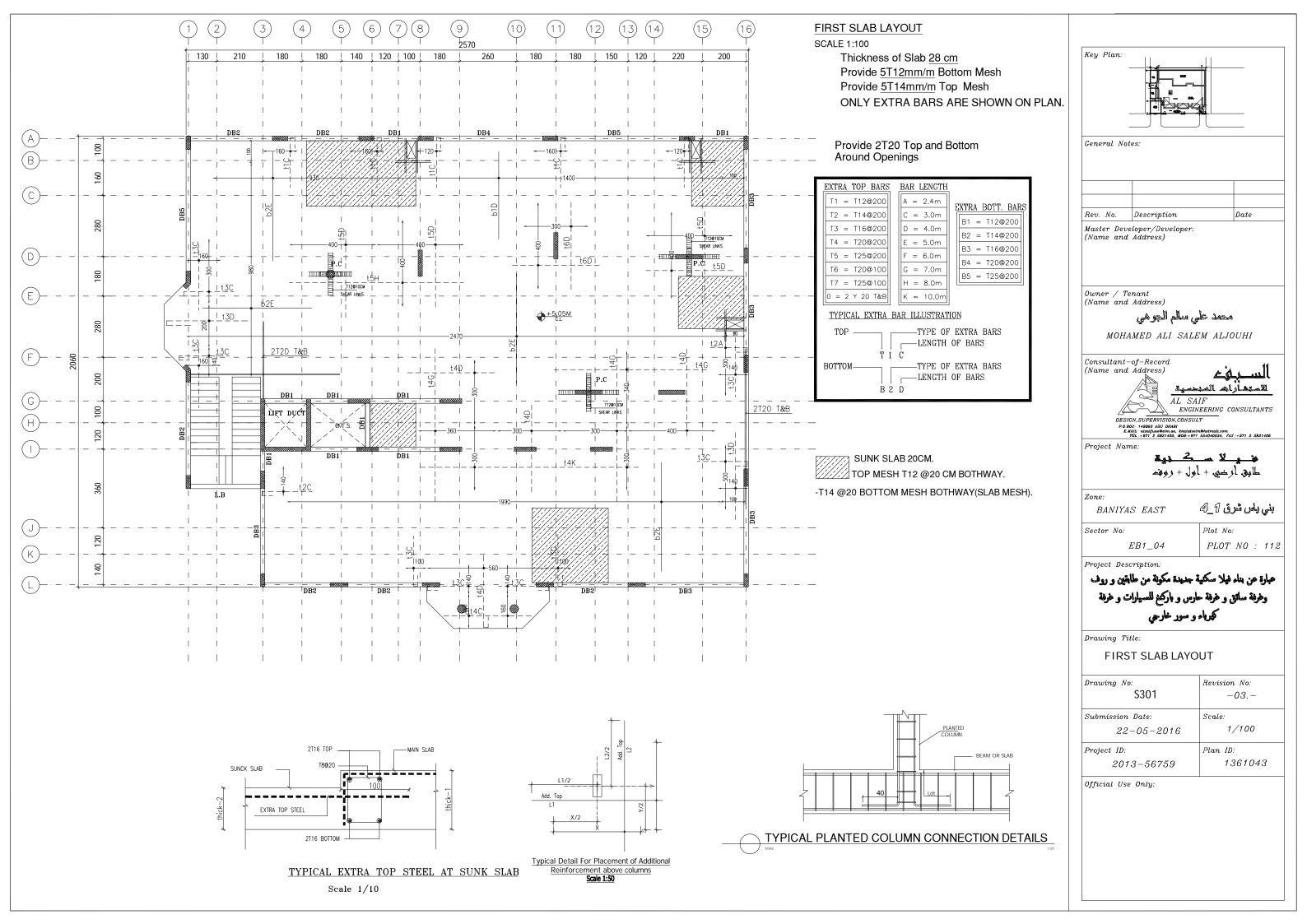


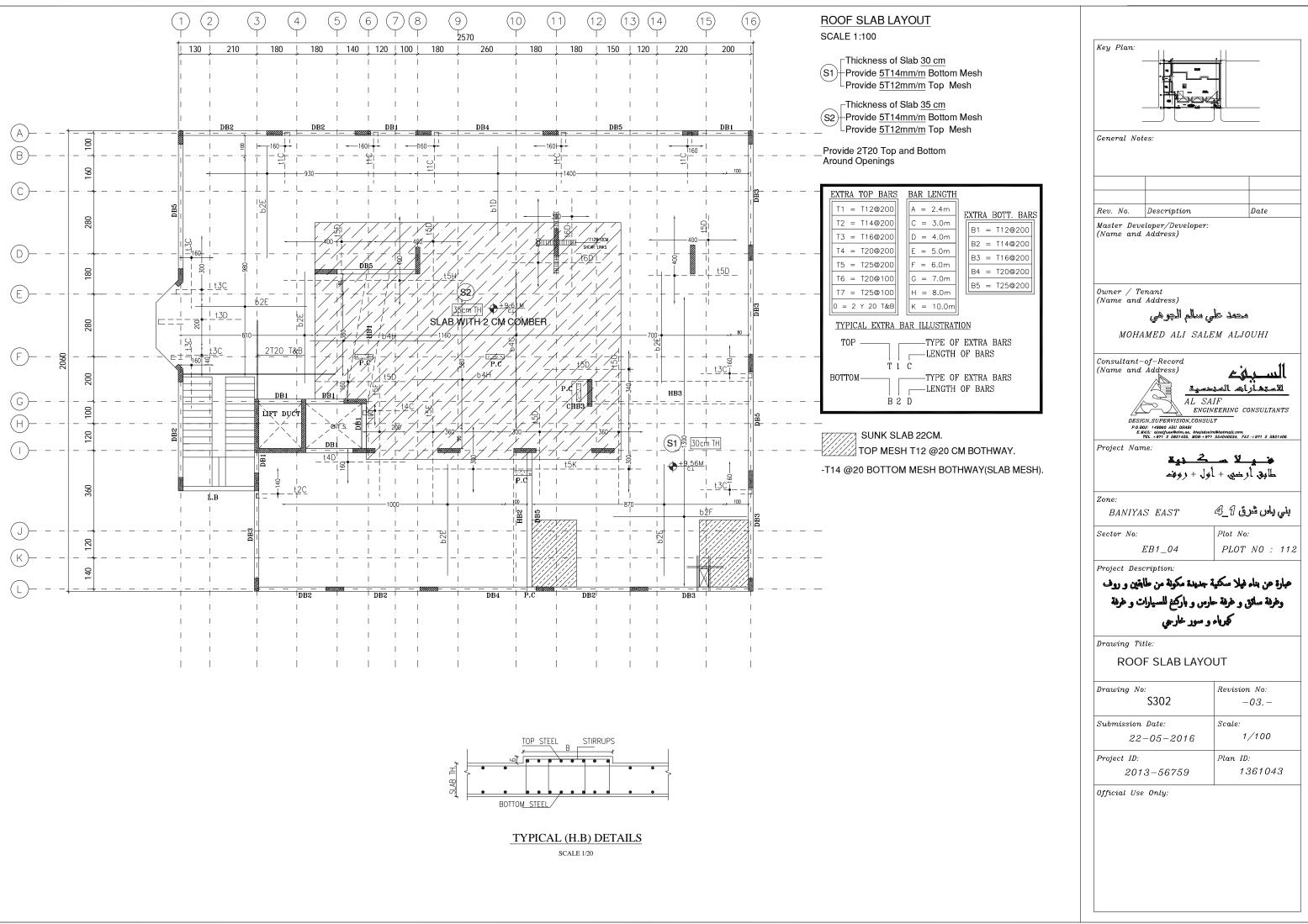
			SC	HEDULI	E OF FOUN	IDTION	BEAMS				
BEAM MARK	BEAM SIZES BxH	REINFORCEMENT								TOP	$\mathbf{x}$
		TOP STEEL		BOTTOM STEEL		STIRRUPS				I EVEI	MARK
		FULL BAR	EXTRA CUT BAR AT MID SPAN	FULL BAR	EXTRA CUT BAR UNDER SUPPORT	UPTO L/3 FROM SUPPORT	MIDDLE SPAN L/3	NO.OF LEGS	SIDE BARS	(m)	REM
FB1	25X110	2T20	2T20	2T20	2T20	T10@15	T10@20	2	2T12@20	+0.10	
FB2	25X110	3T20	2T20	2T20	3T20	T10@15	T10@20	2	2T12@20	+0.10	
FB3	25X110	3T20	3T20	3T20	5T20	T10@15	T10@20	2	2T12@20	+0.10	
FB4	25X110	5T20	3T20	3T20	5T20	T10@15	T10@20	2	2T12@20	+0.10	
FB5	25X110	4T20	4T20	4T20	4T20	T12@15	T12@20	2	2T12@20	+0.10	
PW	25X165	3T20		3T20		T12@20	T12@20	2	2T12@20	+0.65	
PW1	25X180	3T20		3T20		T12@20	T12@20	2	2T12@20	+0.80	

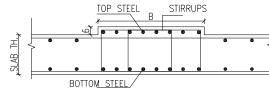
DON'T USE EXTRA CUT BAR AT SUPPORT FOR SIMPLY SUPPOTRED BEAMS

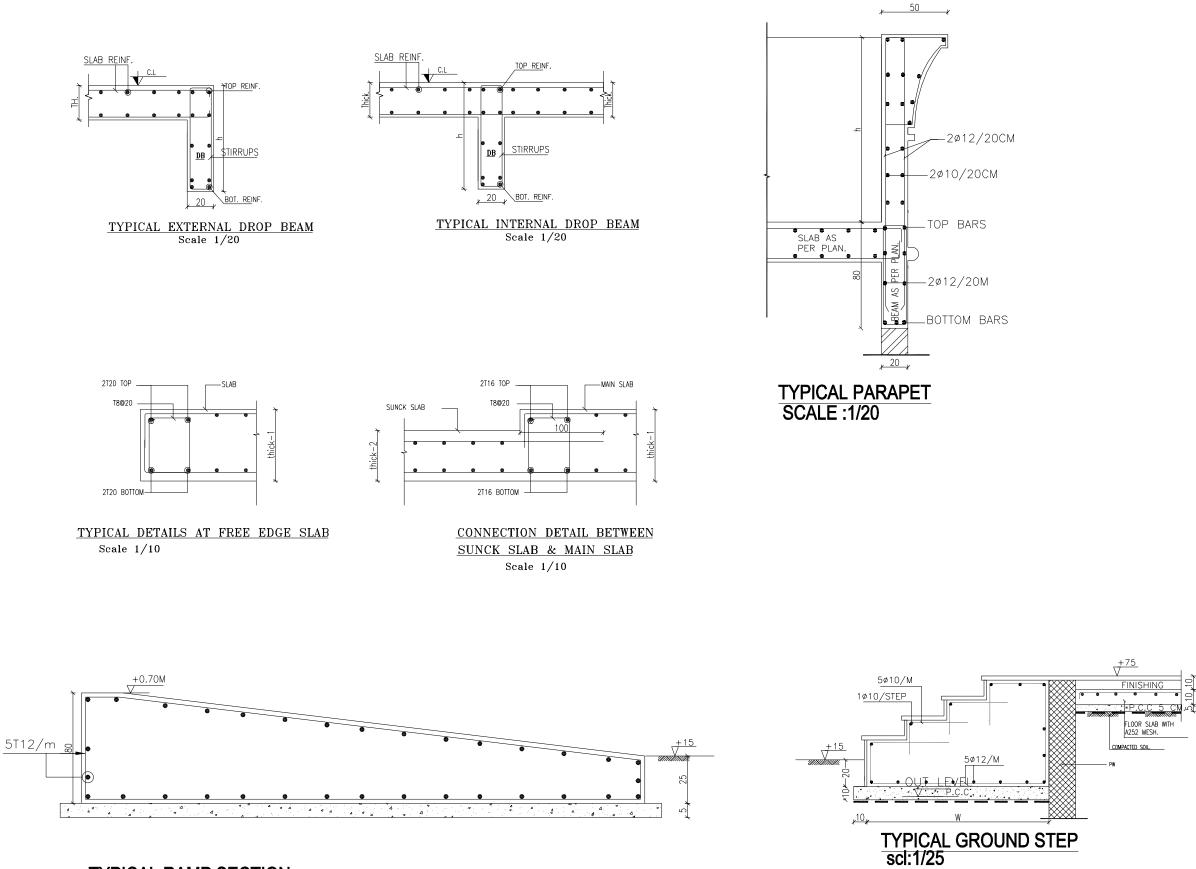
- Excavate and level the existing soil at the proposed Excavation level of 1.25m below existing ground surface.
- Compact using heavy rollers the existing soil at the bottom of excavation at 1.25m below existing ground surface to a minimum of 95% of its maximum dry density at its optimum moisture content obtained from the Modified Proctor Compaction Test.
- Construct one layer of Engineering fill 25cm thickness, compacted to 95% of its maximum dry density at its optimum moisture content obtained from modified Proctor test.
- Lay the Shallow Foundations at the level of 1.0m below the existing ground surface immediately after the compaction of the engineering fill is over.





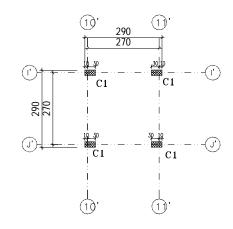


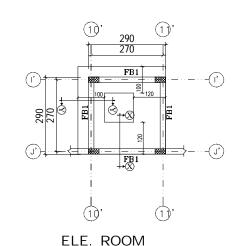




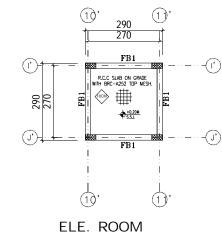
### **TYPICAL RAMP SECTION**

Key Plan: General Notes: Rev. No. Description Date Master Developer/Developer: (Name and Address) Owner / Tenant (Name and Address) محمد علي سالم الجو هي MOHAMED ALI SALEM ALJOUHI Consultant-of-Record (Name and Address) <u>حرفہ</u> للاستهار ابته المنحسية AL SAIF ENGINEERING CONSULTANTS DESIGN,SUPERVISION,CONSULT P.O.BOX: 149060 ABU DHABI E.MAIL: alsaifuae@eim.ae, khi TEL:+971 2 5821405, MOI Project Name: ک ډيک وني لا م طابق أرضي + أول + روقه Zone: بنی یاس شرق 1 🖉 BANIYAS EAST Sector No: Plot No: EB1\_04 PLOT NO : 112 Project Description. **مبارة عن بناء فيلا سكنية جديدة مكونة من طابقين و روف** وغرفة سائق و غرفة حارس و باركنغ للسيارات و غرفة کپریاہ و سور خارجی Drawing Title: TYPICAL DETAILS-1 Drawing No: Revision No: S401 -03.-Submission Date: Scale:1/100 22-05-2016 Plan ID: Project ID: 1361043 2013-56759 Official Use Only:

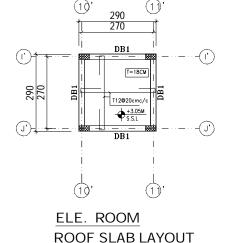




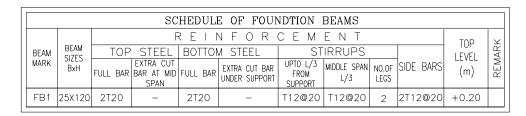
FOUNDATION LAYOUT

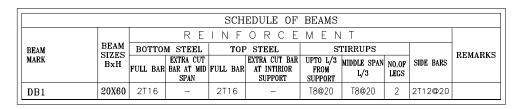


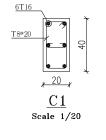


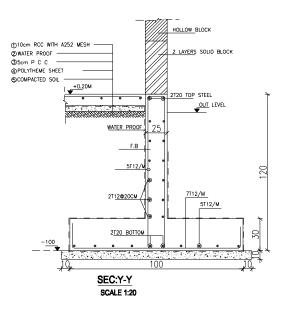


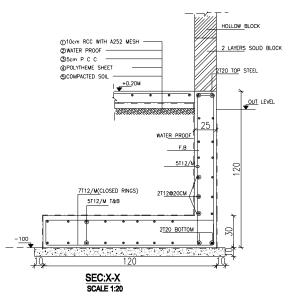
ELE. ROOM COLUMN LAYOUT

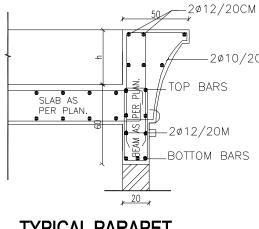












**TYPICAL PARAPET** SCALE :1/20

Key Plan: General Notes: Rev. No. Description Date Master Developer/Developer: (Name and Address) Owner / Tenant (Name and Address) محمد على سالم الجو هي MOHAMED ALI SALEM ALJOUHI Consultant - of - Record(Name and Address) <u>حمہ</u> للاستهارات المنحسية AL SAIF ENCINEERINC CONSULTANTS DESIGN, SUPERVISION, CONSULT P.O.BOX: 149060 ABU DHABI E.MAIL: alsaifuae@eim.ae, kk TEL:+971 2 5821405, MG ©hotmail.com 554040534. FAX. Project Name: <u>خ بو لا سے ډينه</u> طايق أرخين + أول + روفن Zone: بني پاس شرق 1\_4 BANIYAS EAST Sector No: Plot No: EB1\_04 PLOT NO : 112 Project Description: **حبارة عن بناء فيلا سكتية جديدة مكونة من طابقين و روف** وغرفة سائق و غرفة حارس و باركنغ للسيارات و غرفة کېرياء و سوړ خارجي Drawing Title: ELE. ROOM Structure Drawing Drawing No: Revision No: -03.-S504 Submission Date: Scale: 1/100 22-05-2016 Project ID: Plan ID: 1361043 2013-56759 Official Use Only:

-2ø10/20CM