Right Side Mosul
Low Cost House Units

2019-08-24
Sanitation Drawings
# Sanitation

## LIST OF DRAWING

<table>
<thead>
<tr>
<th>NUM</th>
<th>TITLE</th>
<th>SCALE</th>
<th>PAPER</th>
<th>REVISION</th>
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<td>Ground Floor Sewage Plan - Type D</td>
<td>1:200</td>
<td>A3</td>
<td>REV - 04</td>
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<tr>
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<td>Typical Floor Sewage Plan - Type D</td>
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<td>WS-PL-05</td>
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<td>WS-PL-06</td>
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<td>WS-DPL-01</td>
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<td>Water Tank connection</td>
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- This drawing is to be read in conjunction with all other relevant drawings.

**Legend:**

**Project:**
- Right Side Mosul Buildings

**Location:**
- Mosul

**Scale:**
- N/A

**Format:**
- A3

**Arch:**
- Shahyan Lutfi

**Approved:**
- R. Almasri

**Client:**
- UN-HABITAT
Notes:
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Legend:
Symbol | Description
--- | ---
[ ] | PVC drain pipes
[ ] | Manhole

Project: Right Side Mosul Buildings
Drawing: Typical Floor Sewage Plan-Type D
Location: Mosul
Scale: 1:200
Format: A3

Arch: Taif Alkaabi
Approved by: R. Almasri

Client: UN-HABITAT
PVC drain pipes
manhole
Ø110 WS,UP
wash basin PVC drain pipes
RS,DN
Notes:
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Legend:
Symbol
Description
- Cold water, PPR pipe
- Hot water, PPR pipe

Project:
Right Side Mosul Buildings

Drawing:
Ground Floor - Water supply plan

Type:
D

1/200 rev.

Description

Detail No. 01
Detail No. 02

SN:
WS-PL-01
UN-HABITAT
FOR A BETTER URBAN FUTURE

Notes:
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Legend:
Symbol | Description
--- | ---
Water dispenser pipe
Water supply pipe
Water tank, 1000 L

Project:
Right Side Mosul Buildings

Drawing: Roof Plan Water supply plan Type D
Location: Mosul

Scale: 1/200
Format: A3

Rev. | Description | Date
--- | --- | ---
A | Tendering | 04-04-2019
B | Tendering | 07-03-2019
C | Tendering | 27-03-2019
D | Tendering | 14-04-2019
E | Tendering | 19-06-2019
F | Concept Design | 10-11-2019

Arch: Shahyan Lutfi
Approved by: R. Almasri
Client: UN-HABITAT
Water Supply Schematic for Type C

Water Supply Schematic for Type D
Right Side Mosul
Low Cost House Units
2019-08-25
Architectural Documents for type D
# Architectural List of Drawings

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<tr>
<th>NUM.</th>
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<td>AR-PL-01</td>
<td>Site Plan</td>
<td>1:1000</td>
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<td>REV - 06</td>
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<tr>
<td>AR-PL-02</td>
<td>Typical Apartment Plans</td>
<td>1:100</td>
<td>A3</td>
<td>REV - 06</td>
</tr>
<tr>
<td>AR-PL-03</td>
<td>Typical Handicap Apartment Plans</td>
<td>1:100</td>
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<td>AR-PL-04</td>
<td>Ground Floor Plan - Type D</td>
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<td>AR-Ele-02</td>
<td>Elevation A::B - Type D</td>
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<td>Section AA::BB - Type D</td>
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<td>A3</td>
<td>REV - 06</td>
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<td>Door Schedule and Drawings</td>
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<td>AR-WN-01</td>
<td>Window Schedule and Drawings</td>
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<td>REV - 06</td>
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<td>AR-DTP-01</td>
<td>Floor Ceramic Details Above Reinforced Slab</td>
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<td>A3</td>
<td>REV - 06</td>
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*Notes:*
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---

**Legend:**
- **Arch:** R.Almasri
- **Mosul Buildings**
- **Drawing:** List of Drawings - Architectural Works
- **Project:** Right Side Mosul Buildings
- **Location:** Mosul
- **Arch:** Shahyan Lutfi
- **Approved by:** R.Almasri

---

**UN-HABITAT**

**FOR A BETTER URBAN FUTURE**
<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Apartment entrance</td>
</tr>
<tr>
<td>02</td>
<td>Main hall</td>
</tr>
<tr>
<td>03</td>
<td>Master bedroom</td>
</tr>
<tr>
<td>04</td>
<td>Bedrooms</td>
</tr>
<tr>
<td>05</td>
<td>Kitchen</td>
</tr>
<tr>
<td>06</td>
<td>Bath rooms</td>
</tr>
<tr>
<td>07</td>
<td>Main Corridor</td>
</tr>
<tr>
<td>08</td>
<td>Main Stairs</td>
</tr>
</tbody>
</table>

Gross Area : 61.3m²
Total Area B : 78.8m²
Total Area C : 80.4m²

---

Gross Area : 61.3m²
Total Area B : 78.8m²
Total Area C : 80.4m²
Type | Location
--- | ---
01 | Apartment entrance
02 | Main hall
03 | Master bedroom
04 | Bedrooms
05 | Kitchen
06 | Bath rooms
07 | Main Corridor
08 | Main Stairs

Gross Area: 61.3m²
Total Area B: 78.8m²
Total Area C: 80.4m²

---

Gross Area: 61.3m²
Total Area B: 78.8m²
Total Area C: 80.4m²
Notes:
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Legend:
Symbol | Description
--- | ---
E | Exit Signage
D | Fire Extinguisher

Project: Right Side Mosul Buildings
Drawing: Typical Floor Plan (Type D)
Location: Mosul
Scale: 1/200
Format: A3

Arch: Shahyan Lutfi
Approved by: R. Almasri

UN-HABITAT
Notes:

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Legend:

Symbol | Description
--- | ---
E | Exit Signage
D | Fire Extinguisher

Project:

Right Side Mosul Buildings

Drawing:

Ground Floor Plan (Type D)

Location:

Mosul

Scale:

1:200

Format:

A3

Arch: Shahyan Lutfi

Approved by:

R. Almasri

Date:

UN-HABITAT
Notes:
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Legend:
Symbol | Description
---|---
E | E-E Signage

Project:
Right Side Mosul Buildings

Drawing:
Roof Floor Plan (Type D)

Location:
Mosul

Scale: 1/200

Legend:
Symbol: Exit Signage
Symbol: Fire Extinguisher

Arch: Shahyan Lutfi
Approved by: R. Almasri

Details:
UN-HABITAT
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Elevation A

Elevation B
Section B-B

Section A-A

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Section A-A

Section B-B
<table>
<thead>
<tr>
<th>Name</th>
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<th>Material</th>
<th>Quantity</th>
<th>Movement</th>
<th>Dimension</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>Handicap Bath rooms</td>
<td>PVC door</td>
<td>One in each</td>
<td>One flap door</td>
<td>100*200</td>
</tr>
<tr>
<td>D2</td>
<td>Typical Bath rooms</td>
<td>PVC door</td>
<td>One in each</td>
<td>One flap door</td>
<td>100*200</td>
</tr>
<tr>
<td>D3</td>
<td>Typical Bath rooms</td>
<td>Metal door</td>
<td>Two in each</td>
<td>One flap door</td>
<td>105*200</td>
</tr>
<tr>
<td>D4</td>
<td>Handicap Bath rooms</td>
<td>PVC door</td>
<td>One in each</td>
<td>One flap door</td>
<td>100*200</td>
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</tbody>
</table>

**Notes:**
- All dimensions are in centimeters unless noted.
- Project: Right Side Mosul Buildings
- Door Schedule and Drawings
- Location: Mosul
- Scale: N/V
- Format: A3
- SN: AR-DR-01
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- Arch: Shahyan Lutfi
- Approved by: R. Almasri
- Client: UN-HABITAT

**Legend:**
- **Type:** QTY typical floor (Type C), QTY typical floor (Type D), QTY One Building (Type C), QTY One Building (Type D)
- **Quantity in one apartment:**
  - **Type:** QTY typical floor (Type C), QTY typical floor (Type D), QTY One Building (Type C), QTY One Building (Type D)
  - **Quantity for the whole project:**

---

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<thead>
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<th>Type</th>
<th>Quantity in one apartment</th>
<th>QTY typical floor (Type C)</th>
<th>QTY typical floor (Type D)</th>
<th>QTY One Building (Type C)</th>
<th>QTY One Building (Type D)</th>
<th>Quantity for the whole project</th>
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<td></td>
<td>14</td>
<td>14</td>
<td>56</td>
<td>42</td>
<td>210</td>
</tr>
<tr>
<td>D2</td>
<td></td>
<td>2</td>
<td>24</td>
<td>24</td>
<td>98</td>
<td>368</td>
</tr>
<tr>
<td>D3</td>
<td></td>
<td>12</td>
<td>24</td>
<td>44</td>
<td>44</td>
<td>164</td>
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<tr>
<td>D4</td>
<td>1 (Handicap apartments)</td>
<td>4 (Handicap apartments)</td>
<td>4 (Handicap apartments)</td>
<td>4 (Handicap apartments)</td>
<td>5 (Handicap apartments)</td>
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<tr>
<td>Name</td>
<td>Quantity</td>
<td>Movement</td>
<td>Dimention</td>
<td></td>
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<tr>
<td>---------------</td>
<td>----------</td>
<td>---------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One flap window</td>
<td>One in each apartment</td>
<td>Bath rooms</td>
<td>40*60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVC window (blurred glass)</td>
<td>One each apartment</td>
<td>Main hall, Kitchen, Master bedroom, Bedroom</td>
<td>120*100</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity in one apartment</th>
<th>QTY typical floor (Type C &amp; D)</th>
<th>QTY One Building (Type C)</th>
<th>QTY One Building (Type D)</th>
<th>Quantity for the whole project</th>
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<td>W1</td>
<td>4</td>
<td>48</td>
<td>152</td>
<td>144</td>
<td>720</td>
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<tr>
<td>W2</td>
<td>1</td>
<td>12</td>
<td>48</td>
<td>36</td>
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<td>27/03/2019</td>
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<td>Tendering</td>
<td>16/06/2019</td>
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<tr>
<td>Concept Design</td>
<td>15/11/2018</td>
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Arch: Shahyan Lutfi
Approved by: R. Almasri
Client: UN-HABITAT
Mosaic Ceramic Tiles (30*30*4) cm
Cement Mortar Layer with Thickness of (4) cm
Casting Concrete Floor with Thickness of (8) cm
Compact Sub-base Material with Thickness of (12) cm

Detail No.01: Floor Ceramic Details for Ground Floor

Detail No.02: Floor Ceramic Details above Reinforced Slab

Detail No.05: Waterproofing layer

Detail No.03: Floor Ceramic Details for Stairs

Detail No.04: Metal Handrail Details
## Finishing Schedule

### Interior Cladding

<table>
<thead>
<tr>
<th>Space number</th>
<th>Space function</th>
<th>Floor cladding</th>
<th>Wall cladding</th>
<th>Ceiling cladding</th>
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<tr>
<td>1</td>
<td>FS/01</td>
<td>Mosaic tiling</td>
<td>Gypsum Plastering</td>
<td>Gypsum Plastering</td>
</tr>
<tr>
<td></td>
<td>Master bed room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bed room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main hall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kitchen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>FS/02</td>
<td>Mosaic tiling</td>
<td>Cement plaster + paint</td>
<td>Cement plaster + paint</td>
</tr>
<tr>
<td></td>
<td>bathroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>FS/03</td>
<td>Mosaic tiling</td>
<td>Cement plaster + paint</td>
<td>Cement plaster + paint</td>
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<tr>
<td></td>
<td>Main Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>FS/04</td>
<td>Mosaic tiling</td>
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<td>Cement plaster + Paint</td>
</tr>
<tr>
<td></td>
<td>Main Stairs</td>
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### Exterior Facade Cladding

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<tr>
<td>1</td>
<td>windows</td>
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<td></td>
<td>PVC</td>
</tr>
<tr>
<td>2</td>
<td>walls</td>
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<tr>
<td></td>
<td>Cement plaster + Paint</td>
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Right Side Mosul
Low Cost House Units
2019-08-24
Electrical Drawings
# Electrical List of Drawings

<table>
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<th>TITLE</th>
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<td>A3</td>
<td>REV - 06</td>
</tr>
<tr>
<td>ELE-PL-01</td>
<td>Type D - Ground Floor Sockets and Lighting</td>
<td>1:200</td>
<td>A3</td>
<td>REV - 06</td>
</tr>
<tr>
<td>ELE-PL-02</td>
<td>Type D - Typical Floor Sockets and Lighting</td>
<td>1:200</td>
<td>A3</td>
<td>REV - 06</td>
</tr>
<tr>
<td>ELE-PL-03</td>
<td>SDB Panels</td>
<td>N/A</td>
<td>A3</td>
<td>REV - 06</td>
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<td>ELE-PL-04</td>
<td>DB6 to DB8</td>
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<td>REV - 06</td>
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<td>DB9-1 to DB9-2</td>
<td>N/A</td>
<td>A3</td>
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**Project:**
Right Side Mosul Buildings

**Location:** Mosul

**Scale:** N/A

**Format:** A3

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<tr>
<th>Rev</th>
<th>Description</th>
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<td>30-06-2019</td>
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<td>B</td>
<td>Tendering</td>
<td>04-04-2019</td>
</tr>
<tr>
<td>C</td>
<td>Tendering</td>
<td>07-03-2019</td>
</tr>
<tr>
<td>D</td>
<td>Tendering</td>
<td>06-03-2019</td>
</tr>
<tr>
<td>E</td>
<td>Tendering</td>
<td>14-04-2019</td>
</tr>
<tr>
<td>F</td>
<td>Tendering</td>
<td>20-06-2019</td>
</tr>
</tbody>
</table>

**Arch:** Shahyan Lutfi

**Approved by:** R.Almasri

**Client:** UN-HABITAT
ENG: Rawand

Approved by:
R. Almasri

Client: UN-HABITAT

Notes:
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This drawing is to be read in conjunction with all other relevant drawings.

Legend:
- LED Lamp 18W/220V - IP 65
- LED Lamp 8W/220V
- LED Tube Lamp 18W/220V
- LED Tube Lamp 8W/220V
- One-way switch / 10A
- Two-way switch / 10A
- GDB - Distribution Board
- Electrical Outlet / 220V / 16A
- Electrical Outlet / 220V / 10A
- Electrical Outlet / 220V / 6A
- Electrical Outlet / 220V / 3A
- Stand alone Smoke Detectors

Project:
Right Side Mosul Buildings

Drawing:
Type D - Ground Floor - Sockets and Lighting

Location:
Mosul

Scale:
1/200

Format:
A3

SN:
ELE-PL-01

Description:

SDB - Distribution Board

Electrical Outlet / 220V / 16A

LED Tube Lamp, 18W/220V

Two-way switch / 10A

LED Lamp 8W/220V

TV Electrical Outlet / 220V / 16A

For Heater

& TV Socket

Electrical Outlet / 220V / 10A

LED Lamp 18W/220V - IP 65

ENG: Rawand

Approved by:
R. Almasri

Client: UN-HABITAT

Notes:
All dimensions are in centimeters unless otherwise stated.
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This drawing is to be read in conjunction with all other relevant drawings.

Legend:
- LED Lamp 18W/220V - IP 65
- LED Lamp 8W/220V
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- Electrical Outlet / 220V / 16A
- Electrical Outlet / 220V / 10A
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- Electrical Outlet / 220V / 3A
- Stand alone Smoke Detectors

Project:
Right Side Mosul Buildings

Drawing:
Type D - Ground Floor - Sockets and Lighting

Location:
Mosul

Scale:
1/200

Format:
A3

SN:
ELE-PL-01

Description:

SDB - Distribution Board

Electrical Outlet / 220V / 16A

LED Tube Lamp, 18W/220V

Two-way switch / 10A

LED Lamp 8W/220V

TV Electrical Outlet / 220V / 16A

For Heater

& TV Socket

Electrical Outlet / 220V / 10A

LED Lamp 18W/220V - IP 65

ENG: Rawand

Approved by:
R. Almasri

Client: UN-HABITAT
SDB PANEL (Typical)

FOR LAST FLOORS LEVELS OF TYPE C

SN:
ELE-PL-03

SDB Panels

ENG: Rawand

Approved by:
R. Almasri

Client:
UN-HABITAT
Right Side Mosul
Low Cost House Units

22/09/2019
UPDATE STRUCTURAL PACKAGES
TYPE D
<table>
<thead>
<tr>
<th>NUM.</th>
<th>TITLE</th>
<th>SCALE</th>
<th>PAPER</th>
<th>REVISION</th>
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<tbody>
<tr>
<td>ST-000</td>
<td>List Of Drawing</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-001</td>
<td>General Notes</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-002</td>
<td>General Details</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-03</td>
<td>Foundations Plan</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-04</td>
<td>Foundations Details</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-05</td>
<td>Axis Of Columns &amp; Details</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-06</td>
<td>Ground Beams, Slab On Grade &amp; Details</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-07</td>
<td>Ground &amp; First Beams Details (1)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-08</td>
<td>Ground &amp; First Beams Details (2)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-09</td>
<td>Second Beams Details (1)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-10</td>
<td>Second Beams Details (2)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-11</td>
<td>Ground, First &amp; Second Framing Plan</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-12</td>
<td>Ground, First &amp; Second Floor Reinf. Plan (X Dir.)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-12</td>
<td>Ground, First &amp; Second Floor Reinf. Plan (Y Dir.)</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
<tr>
<td>ST-14</td>
<td>Stair Details</td>
<td>A1</td>
<td>REV - 01</td>
<td></td>
</tr>
</tbody>
</table>
**A - GENERAL NOTES:**
1. The contractor shall verify all dimensions prior to starting construction and the consultant shall be notified of any discrepancies.
2. All materials to be used in the construction shall comply with the requirements of current relevant British Standards unless noted below.
3. Concrete:
   - All concrete to be used in the construction shall comply with the requirements of British Standards BS 8110 and BS 5328.
   - Minimum compressive strength 20MPa for grade C20/15.
   - Concrete to be used in the ground floor shall be designed with a minimum compressive strength of 25MPa for grade C25/20.
4. Reinforcement:
   - All reinforcing steel to be used shall be in accordance with the requirements of BS 4449.
   - Minimum yield strength 500 MPa for grade 500.
5. Ground bearing slabs:
   - Concrete grade C30 for all ground floor areas.
   - Minimum thickness 200mm.
6. All dimensions are in centimeters unless otherwise specified.

**B - MATERIALS:**
1. GENERAL: All materials to be used in the construction shall comply with the requirements of current relevant British Standards unless noted below.
2. CONCRETE: All concrete to be used in the construction shall comply with BS 8110 and BS 5328. Minimum compressive strength 20MPa for grade C20/15. Concrete to be used in the ground floor shall be designed with a minimum compressive strength of 25MPa for grade C25/20.
3. REINFORCEMENT: All reinforcing steel to be used shall be in accordance with BS 4449. Minimum yield strength 500 MPa for grade 500.

**C - GROUND BEARING SLABS:**
1. Backbone to comprise granular materials placed in layers 250mm thick and compacted to a minimum density of 1800 kg/m³.
2. Unless shown on the drawing, the ground bearing slabs shall be cast monolithically with the tie beams and columns.

**D - CONSTRUCTION JOINTS AND SHRINKAGE STRIPS:**
1. All construction joints shall be constructed using materials placed in layers 150mm thick and compacted to a minimum density of 1800 kg/m³.

**E - FOUNDATIONS:**
1. After the construction foundation level, experienced geotechnical engineer should be consulted to ensure the safety requirements of the site.

**F - CAMBER NOTES:**
- Camber notes shall be provided for all structural elements.

**G - GENERAL REQUIREMENT OF CONCRETE:**

<table>
<thead>
<tr>
<th>TESTS</th>
<th>TEST METHOD</th>
<th>SPECIFICATION LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUBE</td>
<td>ASTM C39</td>
<td>N.F.</td>
</tr>
<tr>
<td>COMPRESSIVE STRENGTH</td>
<td>4.5 x 10^6 N/m²</td>
<td></td>
</tr>
<tr>
<td>MOISTURE CONTENT</td>
<td>ASTM D2216</td>
<td>N.F.</td>
</tr>
<tr>
<td>AIR voids</td>
<td>ASTM C2050</td>
<td>N.F.</td>
</tr>
</tbody>
</table>

**H - CONCRETE:**

1. **CONCRETE STRONGER THAN 20 MPa:**
   - C20/15

**I - REINFORCEMENT:**
1. **STEEL:**
   - Reinforced concrete shall be designed in accordance with BS 8110 and BS 4449.
**Notes:**

All dimensions are in centimeters unless noted.

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This drawing is to be read in conjunction with all other relevant drawings.

---

**Project:** Right Side Mosul Buildings

**Drawing:**

**List of Drawings (Type D)**

- A  Concept Design  15-11-2018
- B  Tendering  16-12-2018
- C  Tendering  04-03-2019
- D  Tendering  23-06-2019
- E  Tendering  22-09-2019

**Legend:**

- 1/100
- ST-LD-02
- UN-HABITAT

---

**Schedule of InsituLintels UNO.**

<table>
<thead>
<tr>
<th>Size</th>
<th>Max Span</th>
<th>Reinforcement A (Bot)</th>
<th>B (Top)</th>
<th>Links</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>100X200</td>
<td>1500</td>
<td>#14 #14</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100X300</td>
<td>3000</td>
<td>#18 #18</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150X200</td>
<td>1500</td>
<td>#16 #16</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150X300</td>
<td>3000</td>
<td>#20 #20</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200X200</td>
<td>2000</td>
<td>#12 #12</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200X300</td>
<td>3000</td>
<td>#18 #18</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250X300</td>
<td>3000</td>
<td>#18 #18</td>
<td>#8/150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. BEARING ON BLOCK WALL ON EITHER SIDE OF OPENING SHALL BE AT LEAST EQUAL TO THE OVERALL DEPTH OF THE LINTEL.
2. OVERALL LINTEL DEPTHS COULD BE INCREASED TO SUIT BLOCKWORK COURSING.
Notes:
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UN-HABITAT

Project:
Right Side Mosul Buildings

Drawing:
Ground Beams & Slab On Grade Details(ST-06)-Type D

Location:
Mosul

Scale: 1/100
SN: ST-DT-06
Format: A3

Arch: Sara Faruq
Approved by: R. Almasri

REFERENCE:
REFER TO THE GENERAL STRUCTURAL NOTES ON DRAWING NO. : ST-001
REFER TO THE GENERAL STRUCTURAL DETAILS ON DRAWING NO. : ST-002
CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
REINFORCEMENT FY400
There is a waterproofing layer for each element underground.
Project:
Right Side Mosul Buildings

Drawing:
Ground & first floor beams and details (ST-07) Type D

Location:
Mosul

Scale:
1/100

Format:
A3

SN:
ST-DT-7

Arch:
Sara Faruq

Approved by:
R. Almasri

Client:
UN-HABITAT

REFERENCE:
REFER TO THE GENERAL STRUCTURAL NOTES ON DRAWING NO. : ST-001
REFER TO THE GENERAL STRUCTURAL DETAILS ON DRAWING NO. : ST-002

CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
REINFORCEMENT FY400

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Project:
Right Side Mosul Buildings

Drawing:
Ground & first floor beams and details(ST-08)-Type D

Location:
Mosul

Scale: 1/100
SN: ST-DT-08
Format: A3

Reference:
Refer to the general structural notes on drawing no. ST-001
Refer to the general structural details on drawing no. ST-002

Concrete C30 for vertical elements & C25 for others
Reinforcement FY400

Arch: Sara Faruq
Approved by:
R. Almasri
Client:
UN-HABITAT
Right Side Mosul Buildings

Drawing: Second Floor Beams Details
(1) ST-09-Type D

Location: Mosul

Scale: 1/100
Format: A3

Summary:

- Dimensions are in centimeters unless noted.
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- This drawing is to be read in conjunction with all other relevant drawings.

Legend:
- REFER TO THE GENERAL STRUCTURAL NOTES ON DRAWING NO.: ST-001
- REFER TO THE GENERAL STRUCTURAL DETAILS ON DRAWING NO.: ST-002
- CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
- REINFORCEMENT FY400

A: Concept Design 15-11-2018
B: Tendering 16-12-2018
C: Tendering 04-03-2019
D: Tendering 28-05-2019
E: Tendering 22-09-2019

Arch: Sara Faruq
Approved by: R. Almasri
Client: UN-HABITAT

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**References:**

- Reference to the General Structural Notes on Drawing No.: ST-001
- Reference to the General Structural Details on Drawing No.: ST-002

**Concrete:**
- C30 for vertical elements
- C25 for others

**Reinforcement:**
- FY400

**Drawing:**
- Right Side Mosul Buildings
- Second Floor Beams Details
- ST-10 - Type D

**Location:**
- Mosul

**Scale:**
- 1:100

**Format:**
- ST-DT-10

**Arch:**
- Sara Faruq

**Approved by:**
- R. Almasri

**Client:**
- UN-HABITAT
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This drawing is to be read in conjunction with all other relevant drawings.

UN-HABITAT Architects

Arch: Sara Faruq
Approved by: R. Almasri
Client: UN-HABITAT

Project: Right Side Mosul Buildings
Drawing: GF 1F & 2F Rein. Plan (Y Dir.)(ST-13)-Type D
Location: Mosul
Scale: 1/100
Format: A3

REFERENCES:
REFER TO THE GENERAL STRUCTURAL DETAILS ON DRAWING NO. : ST-002
CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
REINFORCEMENT FY400
RIGHT SIDE Mosul Buildings

Date: 16-11-2018

Legend:
Scale: 1/100
Notes:
All dimensions are in centimeters unless noted.

A
B
C
D
E
F
G
H
I
J

Ground, First & Second Floor Rein. Plan (Y Dir.)
SML: 1/100
Right Side Mosul
Low Cost House Units

15/09/2019
INTERNAL ROADS WITH BUILDING LEVEL AND EXCAVATION
PLAN FOR BUILDINGS TYPE D
REFERENCE:
REFER TO THE GENERAL STRUCTURAL NOTES ON DRAWING NO.: ST-001
REFER TO THE GENERAL STRUCTURAL DETAILS ON DRAWING NO.: ST-002
CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
REINFORCEMENT FY400

Project: Right Side Mosul Buildings
Drawing: STREET LEVEL
Location: Mosul
Scale: 1/100
Format: A3

Concrete slab level +0.9
Existing soil level −0.6
Excavation level −1.5

Concrete slab level +0.2
Existing soil level −0.8
Excavation level −1.8

Approved by: R. Almasri
UN-HABITAT

Notes:
All Dimensions are in centimeters unless noted.
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This drawing is to be read in conjunction with all other relevant drawings.

Legend:

UN-HABITAT FOR A BETTER URBAN FUTURE
Excavation Type D
Excavation Type D
EXCAVATION PLANE - Type D

Right Side Mosul Buildings

Date: 17-09-2019

Client: Approved by: R. Almasri

CONCEPT DESIGN

SCALE: SN: 1/200 EP-02

CONCRETE C30 FOR VERTICAL ELEMENTS & C25 FOR OTHERS
REINFORCEMENT FY400

There is a waterproofing layer for each element underground.
Calculation Sheet of

Residential building

(12 Apartments, Three stories)
Contents

1 Introduction ................................................................................................................................. 1
2 Material ...................................................................................................................................... 2
   Introduction .............................................................................................................................. 2
   2.1 Material Characteristics ................................................................................................. 2
3 Loads ........................................................................................................................................ 3
   Introduction
   3.1 Static load cases ............................................................................................................... 3
   3.2 Loads Combinations ....................................................................................................... 3
   3.3 Loads value on various areas .......................................................................................... 3
4 Model Description .................................................................................................................... 4
   Introduction .............................................................................................................................. 4
   4.1 Procedure .......................................................................................................................... 4
   4.2 Model .................................................................................................................................. 4
5 Section Analysis ........................................................................................................................ 14
   Introduction .............................................................................................................................. 14
   5.1 General methodology for slabs, beams and walls......................................................... 14
      5.1.1 Design of Flexure ....................................................................................................... 14
      5.1.2 Design of Shear ......................................................................................................... 16
      5.1.3 Design of Torsion ..................................................................................................... 16
      5.1.4 Deflection ................................................................................................................. 17
   5.2 Floor Slabs ......................................................................................................................... 17
   5.3 Beams ............................................................................................................................... 32
   5.4 Columns ............................................................................................................................. 43
6 Ground Works ............................................................................................................................ 51
   Introduction .............................................................................................................................. 51
   6.1 Foundation ......................................................................................................................... 51
1 Introduction:

The project consists of three residential stories and as shown below.

2 Materials:

Introduction:

The design was prepared considering the following Materials like reinforcement steel and Concrete

Material characteristics:

The modulus of elasticity is based on the cylinder strength of the concrete based on the formula from the ACI 318-08

\[ E_c = 4700 \cdot \sqrt{f_c} \]
### Table: Material Properties - Summary

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>$E$ (kN/m²)</th>
<th>$\nu$</th>
<th>Unit Weight (kN/m³)</th>
<th>Design Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY400</td>
<td>Rebar</td>
<td>200000000</td>
<td>0.3</td>
<td>76.9729</td>
<td>$F_y=400000$ kN/m²</td>
</tr>
<tr>
<td>$F_c=25$MPa</td>
<td>Concrete</td>
<td>23500000</td>
<td>0.2</td>
<td>25</td>
<td>$F_c=25000$ kN/m²</td>
</tr>
<tr>
<td>$F_c=30$MPa</td>
<td>Concrete</td>
<td>25743000</td>
<td>0.2</td>
<td>25</td>
<td>$F_c=30000$ kN/m²</td>
</tr>
</tbody>
</table>

### Table: Material List by Element Type

<table>
<thead>
<tr>
<th>Element Type</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>$F_c=25$MPa</td>
</tr>
<tr>
<td>Column</td>
<td>$F_c=30$MPa</td>
</tr>
<tr>
<td>Beam</td>
<td>$F_c=25$MPa</td>
</tr>
<tr>
<td>Floor</td>
<td>$F_c=25$MPa</td>
</tr>
</tbody>
</table>

### 3 Loads:

**Introduction:**

For the structural design of this building Dead, super dead loads (walls + finishes), Live loads and their combinations have been used.

**3.1 Static load cases:**

### Table: Load Patterns

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Self Weight Multiplier</th>
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<tr>
<td>DL</td>
<td>Dead</td>
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<tr>
<td>LL</td>
<td>Live</td>
<td>0</td>
</tr>
</tbody>
</table>
### 3.2 Load Combination:

#### TABLE: designing Load Combinations

<table>
<thead>
<tr>
<th>Name</th>
<th>LOAD</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN</td>
<td>1.4DL+1.7LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>CLASSIC</td>
<td>DL+ LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EX1P</td>
<td>1.4 DL +1.1EX1+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EX1N</td>
<td>1.4 DL -1.1EX1+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EX2P</td>
<td>1.4 DL +1.1EX2+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EX2N</td>
<td>1.4 DL -1.1EX2+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY1P</td>
<td>1.4 DL +1.1EY1+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY1N</td>
<td>1.4 DL -1.1EY1+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY2P</td>
<td>1.4 DL +1.1EY2+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY2N</td>
<td>1.4 DL -1.1EY2+0.55LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX1P</td>
<td>0.89 DL +1.1EX1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX1N</td>
<td>0.89 DL -1.1EX1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX2P</td>
<td>0.89 DL +1.1EX2</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX2N</td>
<td>0.89 DL -1.1EX2</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYY1P</td>
<td>0.89 DL +1.1EY1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYY1N</td>
<td>0.89 DL -1.1EY1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYY2P</td>
<td>0.89 DL +1.1EY2</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYY2N</td>
<td>0.89 DL -1.1EY2</td>
<td>Linear Add</td>
</tr>
</tbody>
</table>

#### TABLE: Load Combinations for checking stresses under foundations

<table>
<thead>
<tr>
<th>Name</th>
<th>LOAD</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASSIC</td>
<td>DL+ LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXXX1N</td>
<td>0.83 DL -0.71 EX1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXXX2N</td>
<td>0.83 DL -0.71 EX2</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYYY1N</td>
<td>0.83 DL -0.71 EY1</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EYYY2N</td>
<td>0.83 DL -0.71 EY2</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX1-N</td>
<td>0.95 DL -0.54EX1+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX2-N</td>
<td>0.95 DL -0.54EX2+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY1-N</td>
<td>0.95 DL -0.54EY1+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY2-N</td>
<td>0.95 DL -0.54EY2+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX1-p</td>
<td>1.05 DL +0.54EX1+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EXX2-p</td>
<td>1.05 DL +0.54EX2+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY1-p</td>
<td>1.05 DL +0.54EY1+0.75LL</td>
<td>Linear Add</td>
</tr>
<tr>
<td>EY2-p</td>
<td>1.05 DL +0.54EY2+0.75LL</td>
<td>Linear Add</td>
</tr>
</tbody>
</table>
3.3 Loads on various areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Value (KN/m²)</th>
<th>Area</th>
<th>Value (KN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrace</td>
<td>LL=3 &amp; SDL=3</td>
<td>Bed room</td>
<td>LL=2 &amp; SDL=2</td>
</tr>
<tr>
<td>Stair case</td>
<td>LL=3 &amp; SDL=4</td>
<td>Dressing room</td>
<td>LL=2 &amp; SDL=2</td>
</tr>
</tbody>
</table>

4 Model Description:

Introduction

For the detailed analysis of the building a structural model has been made of the Chalet. The model is used to retrieve results for all the structural elements of the building.

4.1 Procedure:

The following procedure has been followed for all the elements analysis in Etabs:

1. Build 3D model
2. Define all slabs, beams and walls
3. Reduce element stiffness appropriately.
4. Define element releases, support conditions etc.
5. Define loads (Section 3.1)
   a. Self-weight (SW)
   b. Dead Load (DL)
   c. Live Load
6. Design elements (floors, beams and columns)

4.2 Model:

The finite element models are built using Etabs 2016 ver16.0.0 (Fig 1). The model was built as a 3D model.

The following model files are used:

BUILDING(12-3STORIES).EDB
Frame elements are used for all beams & columns, and shell elements are used for slabs. The shell elements have a constant thicknesses throughout which are defined in the next table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Material</th>
<th>Slab Type</th>
<th>Element Type</th>
<th>Slab Thickness</th>
<th>One-Way Load Distribution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>S15</td>
<td>F'c=25MPa</td>
<td>Uniform</td>
<td>Shell-Thin</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>S12</td>
<td>F'c=25MPa</td>
<td>Uniform</td>
<td>Shell-Thin</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>S20</td>
<td>F'c=25MPa</td>
<td>Uniform</td>
<td>Shell-Thin</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Beam Elements sections are defined as next depending on framing plans in Etabs as figures (2 to 4).

Fig (2): Ground Floor Framing Plan
Fig (3): first Floor Framing Plan

Fig (4): second Floor Framing Plan
5 Sections Analysis:

Introduction

After retrieving all element results from the structural model, every element in the building can be checked against the relevant combinations of loads. For the different elements the capacity is calculated and compared to the actual combination of section forces as found in the model.

5.1 General methodology for slabs, beams and walls

As a tool to check the floor slabs, walls and beams in the building, they have to be compared with maximum capacity of the section which calculated as following depending on ACI 318-08:

5.1.1 Design of Flexure:

\[
\phi = 0.90 \quad \text{Flexure strength reduction factor (Tension-controlled section)}
\]

**Section at Balance case:**

\[
\begin{align*}
\varepsilon_c &= 0.003 \\
\varepsilon_s &= \varepsilon_y = \frac{f_y}{E_s} \\
d_t &= H - d_c \\
C_b &= \frac{\varepsilon_c}{(\varepsilon_c + \varepsilon_y)} \\
0.85 &= \beta \geq 0.85 - 0.05\left(\frac{f_{c28}}{7}\right) \geq 0.65 \\
Y_b &= \beta C_b \\
A_{sb} &= \frac{f_{c28}}{B}Y_b \\
M_{ub} &= \phi \left(0.85f_{c28}B^2Y_b\left[dt - \frac{Y_b}{2}\right]\right)
\end{align*}
\]

- Concrete ultimate compressive strain
- Reinf. tensile strain
- Effective depth
- Neutral axis depth
- Equivalent depth factor
- Equivalent compressive block depth
- Balanced area of steel
- Balanced resistance moment, where \(\phi = 0.65\)
Singly Reinforced Section (Tension-Controlled Section)

\[ \epsilon_c = 0.003 \]
\[ \epsilon_s = 0.005 \]
\[ d_t = H - dc \]
\[ C_t = \frac{[c_t/(ec+es)]}{\epsilon_t} \]
\[ 0.85 \geq \{\beta \geq 0.85 - 0.05[(f'c-26)/7]\} \geq 0.65 \]
\[ Y = \beta_t C_t \]
\[ A_s = \{(0.85*f'c*B*Y)/fy\} \]
\[ M_u = \phi \{(0.85*f'c*B*Y*[dt-(Y/2)]\} \]

Concrete compressive strain
Reinf. tensile strain
Effective depth
Neutral axis depth
Equivalent depth factor
Equivalent compressive block depth
Maximum area of steel for singly reinforced section
Maximum resistance moment for singly reinforced section

Doubly Reinforced Section (Tension-Controlled Section)

\[ \epsilon_c = 0.003 \]
\[ \epsilon_s = 0.005 \]
\[ Y = Y_l \]
\[ T_s = A_{st} \times f_y \]
\[ C_s = A_{sc} \times f'c \]

Strain
Stress
5.1.2 Design of Shear:

\[ \phi = 0.75 \quad \text{Shear strength reduction factor} \]

Concrete shear strength

\[ V_{cn} = \phi \cdot 0.17 \cdot \sqrt{f_c} \cdot B \cdot d \]

Check sufficient of section

\[ V_{sn\text{(max)}} = \phi \cdot 0.66 \cdot \sqrt{f_c} \cdot B \cdot d \quad \text{Maximum shear force can be carried by shear reinforcement} \]

\[ V_{n\text{(max)}} = V_{cn} + V_{sn\text{(max)}} \quad \text{Maximum shear force can be carried by section} \]

5.1.3 Design of Torsion:

\[ \phi = 0.75 \quad \text{Strength reduction factor} \]

Threshold torsion

\[ T_s = T_{cr/4} = \phi \cdot 0.083 \cdot \sqrt{f_c} \cdot (A_{cp} \cdot 2 / P_{cp}) \quad \text{Threshold torque = one-quarter of cracking torque} \]

Check sufficient of section size

\[ v_{u\text{max}} = \phi \cdot 0.83 \cdot \sqrt{f_c} \quad \text{Maximum allowable stresses due to combined shear and torsion} \]

\[ v_u = \sqrt{(v_{u\text{max}}/(B \cdot d))^2 + ((U+\phi)/(1.7 \cdot A_{oh} \cdot 2))^2} \quad \text{applied stresses due to combined shear and torsion} \]

\[ A_{oh} = X_0 \cdot Y \quad \text{Area enclosed by centerline of outermost closed transverse torsional reinforcement} \]

5.1.4 Deflection:

*Maximum Allowable Deflection

Immediate deflection due to live load

Floors not supporting or attached to nonstructural elements likely to be damaged by large deflection (L/360)

Total deflection due to sustained loads and additional live load

Roof or floor construction supporting or attached to nonstructural elements not likely to be damaged by large deflections (L/240)

5.2 Floor Slabs:

There are two types of slabs, which are one way solid slab and two way solid slab.

All slabs have been checked according to the steps described in Paragraph 5.1,
Slabs elastic deflections is under service loads and Moment diagrams under factored loads are clarified on figures (5 to 13) depending on ETABS 2016 Results as next

Fig (5): Ground Floor Deflection Contour (mm)

Fig (6): Ground Floor Moment Diagram-M11 (t.m/m)
Fig (7): Ground Floor Moment Diagram-M22 (t.m/m)

Fig (8): First Floor deflection contour - (mm)
Fig (9): First Floor Moment Diagram-M11 (t.m/m)

Fig (10): First Floor Moment Diagram-M22 (t.m/m)
Fig (11): Second Floor Deflection contour (mm)

Fig (12): Second Floor Moment Diagram-M11 (t.m/m)
5.3 Beams:

All beams are designed and checked according to the same procedures, which are very similar to the procedures followed for the floor slabs as per Paragraph 5.1.

Beams Moment and shear diagrams are clarified on figures (14 to 19) depending on Etabs Results as next
Fig (14): Ground Floor Beam Moment diagram (M3-t.m)

Fig (15): Ground Floor Shear diagram (Shear2-2-t)
Fig (16): 1st Floor Beam Moment diagram (M3-t.m)

Fig (17): 1st Floor Shear diagram (Shear2-2-t)
Fig (18): 2nd Floor Beam Moment diagram (M3-t.m)

Fig (19): 2nd Floor Shear diagram (Shear2-2-t)
5.4 Columns

The columns sections are designed in Etabs Model, SEE the column sections in The following figures (20 to 29), show the reinforcements that used throughout in the building. Please refer to the structural plans and sections for locations.

Fig (20): Columns on grid A Column P-M-M interaction Ratio
Fig (21): Columns on grid B Column P-M-M interaction Ratio

Fig (22): Columns on grid C Column P-M-M interaction Ratio
Fig (23): Columns on grid D Column P-M-M interaction Ratio
Fig (24): Columns on grid E Column P-M-M interaction Ratio

Fig (25): Columns on grid F Column P-M-M interaction Ratio
Fig (26): Columns on grid H Column P-M-M interaction Ratio
Fig (27): Columns on grid I Column P-M-M interaction Ratio

Fig (28): Columns on grid J Column P-M-M interaction Ratio
6 Ground Works:

Introduction

For ground works the results from the Safe ver 16.0.0 model have been used to check the foundation according to provided soil investigation report (Bearing Capacity 40 t/m²). The capacity of the foundation elements is compared to the resulting loads and the foundation is designed accordingly.

6.1 foundation

Foundations are isolated with thickness = 50cm, Please refer to the structural plans and sections for locations. Design for flexure under combination of factored loads, where figures (37 & 39) are clarifying bending moments in the foundations.

Fig (29): Columns on grid K Column P-M-M interaction Ratio
Fig (30): punching shear ratio

Fig (31): FOUNDATION Soil Pressure (t/m²)
Fig (32): FOUNDATION Moment M11 (t.m/m):

Fig (33): FOUNDATION Moment M22 (t.m/m):