**Steel Structure Details for 141 Solar Panels (Ground Mount)**

**1. Basic Assumptions**

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| --- | --- |
| Parameter | Value |
| No. of Panels | 141 |
| Panel Size | 550W (approx. 2.27m × 1.13m) |
| Total Area | ~586 m² (excluding spacing) |
| Mounting Type | Ground-mounted fixed tilt |
| Tilt Angle | ~15°–25° (optimal for Sudan) |
| Row-to-row spacing | ~1.5–2.5 m (to avoid shading) |
| Wind Load Zone | Up to 150 km/h (Sudan average) |
| Foundation Type | Concrete footing or driven piles |

**2. Structural Breakdown**

**A. Mounting Frame Design (Typical per Table/Structure Unit)**

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| --- | --- |
| Component | Specification |
| Columns/Posts | Hot-dip galvanized steel C-Channel or SHS (Square Hollow Section) 80x80x3 mm or 100x100x4 mm |
| Beams (Rails) | C/U Channel 60x40x2 mm or Aluminum Rails (if lighter structure preferred) |
| Purlins | C/U Channel 50x30x2 mm, spaced ~1m |
| Bracing | Flat bar 30x5 mm or angle 25x25x3 mm (diagonal) |
| Fasteners | SS 304 bolts and nuts, 8.8 grade minimum |
| Panel Clamps | Mid & end clamps, anodized aluminum or SS |

**B. Module Table Configuration**

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| --- | --- |
| Design Option | Details |
| Modules per Table | 6 (2 vertical × 3 horizontal) |
| Number of Tables | ~39 |
| Table Area | ~5.5 m × 3.5 m per structure |
| Tilt Angle | 20° facing true south |
| Foundation Type | Concrete footings 300x300x800 mm or driven steel piles (if soil allows) |

**3. Foundation Design**

|  |  |
| --- | --- |
| Parameter | Recommended |
| Depth | 600 mm to 1000 mm (based on soil) |
| Width | 300–400 mm |
| Type | RCC (M20/25), with rebar cage |
| Quantity | 2–4 foundations per table (depends on design span) |

**4. Wind Load Consideration**

* **Wind Speed Design Value**: up to 150 km/h
* **Structure Design Standard**: Follow **ASCE 7** or **Eurocode 1**
* **Add Bracing** for lateral stability and anti-uplift mechanisms (embed depth or anchors)

**5. Material Summary (Approximate for Full 141 Panels)**

|  |  |
| --- | --- |
| Item | Quantity (Approx.) |
| Steel posts (80x80x3 mm) | ~160–200 pcs |
| Beams/Rails | ~1500–1800 meters |
| Fasteners (bolts, nuts, washers) | ~3000–4000 sets |
| Concrete (for foundations) | ~30–35 m³ |
| Panel clamps (mid + end) | ~800–900 pcs |

**6. Other Requirements**

* **Anti-corrosion**: All steel should be **hot-dip galvanized** (min. 80 microns coating)
* **Drainage/ground clearance**: Minimum 0.5–0.6 m from ground to bottom of panel
* **Earthing/Bonding**: Every table grounded with copper wire (min. 16 mm²)
* **Access paths**: Leave 0.8–1 m access between tables for maintenance