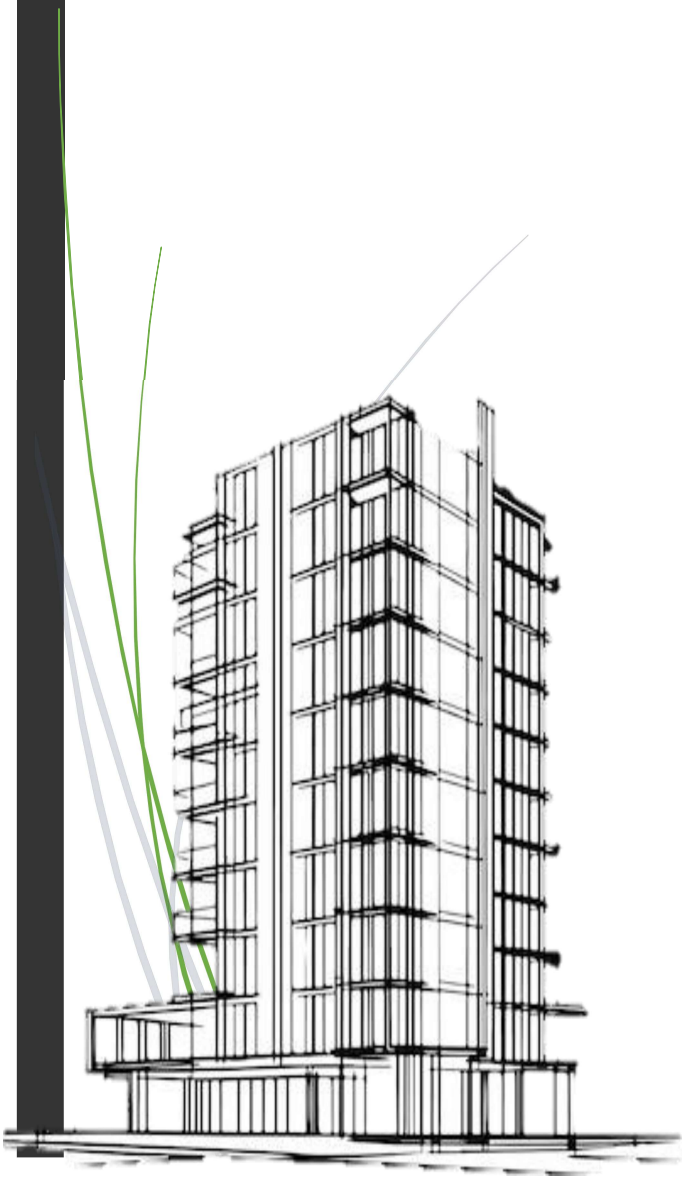
Gridline
Engineering and Construct

4/3/2026

Structural Design Portfolio



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Er. Biswajyoti Das
Er. Deep H. Gandhi
Er. Abhay K. Kamath

FOREWORD

Engineering excellence is not measured by the complexity of calculations that go into a structure, it is measured by how well that structure serves the people who occupy it, and how efficiently it was built. At Gridline Engineering and Construct, we believe that rigorous structural engineering is one of the most effective cost-management tools available to a client. When a building is designed with precision, it is built without waste, without rework, and without the expensive surprises that poorly coordinated documentation invariably produces.

This portfolio presents three ongoing projects that reflect the breadth of our practice — from multi-storey residential construction, to industrial steel structures, to heritage civil infrastructure. Each project is different in nature. Each is identical in our standard of delivery.

OUR PRACTICE

Gridline Engineering and Construct is a structural engineering consultancy. Our founding partners hold Master's degrees in Structural Engineering and bring broad project experience across building typologies, construction materials, and site conditions across India.

Our practice is grounded in internationally recognised engineering methodology — the principles of structural analysis, material design, and connection detailing that underpin Indian Standards (IS), Eurocode (EC2 / EC3), American Concrete Institute (ACI 318), American Institute of Steel Construction (AISC 360), and ASCE 7 are fundamentally consistent. We are equally equipped to serve clients whose projects are governed by any of these frameworks, and we have a demonstrated working familiarity with the requirements of each.

PARTNERS:

- **Er. Biswajyoti Das** — M.Tech (Structural Engineering), Guwahati, Assam
- **Er. Deep H. Gandhi** — M.Tech (Structural Engineering), Ahmedabad, Gujarat
- **Er. Abhay K. Kamath** — M.Tech (Structural Engineering), Bangalore, Karnataka

PROJECT 01

B + G + 4 Residential Building

Udupi, Karnataka, India | Project No. UK-01

The structure is a six-storey reinforced concrete residential building, Basement through to Terrace in Udupi, a coastal city in Karnataka, southern India. Our scope covered the complete structural engineering package: foundation design, column reinforcement, beam scheduling, slab design, and staircase detailing.

STAAD Pro and ETABS Verified Design: Eliminating the Cost of Over-Engineering

To ensure the highest level of structural integrity, we developed a comprehensive 3D digital twin of the entire building in STAAD Pro. This allowed us to rigorously simulate every realistic scenario from occupancy patterns to environmental forces, validating our design against the most demanding conditions to ensure every structural member is perfectly optimized for safety.

This process has a direct and quantifiable impact on project cost. A building designed without this level of analysis is, by necessity, conservatively over-engineered. Columns are made uniform and heavy, footings are made large and repetitive, because without knowing the precise load on each element, the engineer must assume the worst for everything. Our approach does the opposite: each element is sized to its actual demand. Upper-floor columns, which carry less load, are reinforced accordingly. Lower-level columns, where forces are greatest, are reinforced to match. This graduated, analysis-driven methodology typically reduces structural steel consumption by 15 to 25 percent on a building of this scale, without any compromise to structural safety.

A Foundation Strategy Tailored to the Site

The foundation design on this project employed sixteen distinct footing types, a deliberate and considered response to the varying column loads across the building footprint. Lightly loaded columns received compact isolated footings. Columns in close proximity shared combined footings. The most heavily loaded bay was addressed with a raft footing. Each solution was calibrated to the load it carries and the soil it bears upon.

Drawings That Protect the Client on Site

The value of precise construction drawings extends well beyond the design office. When a contractor receives documentation that is complete, unambiguous, and fully scheduled, there is no room for improvisation, substitution, or interpretation on site. The reinforcement schedule for the beams on this project, for example, documents every beam individually, bar diameter, bar count, curtailment position, and stirrup spacing, segment by segment. A steel-fixer follows the drawing. There is no judgment call to be made, and no variation claim to be raised.

This level of documentation discipline is what prevents cost overruns in the final stages of construction, when they are most difficult and most expensive to resolve.

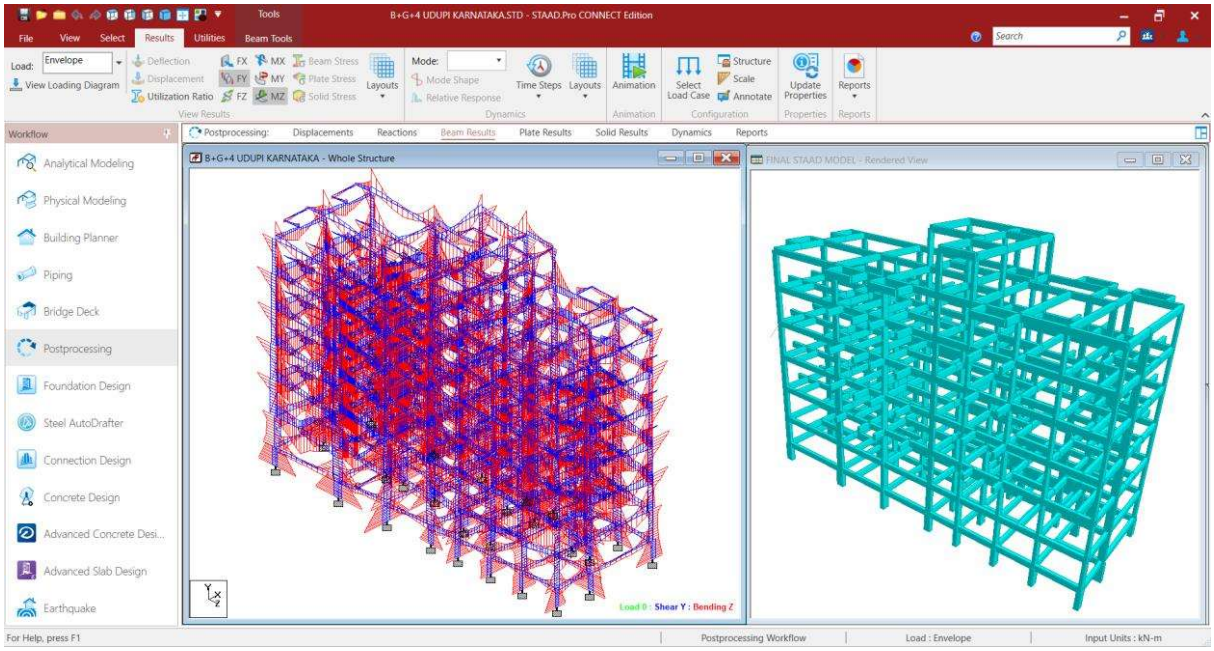
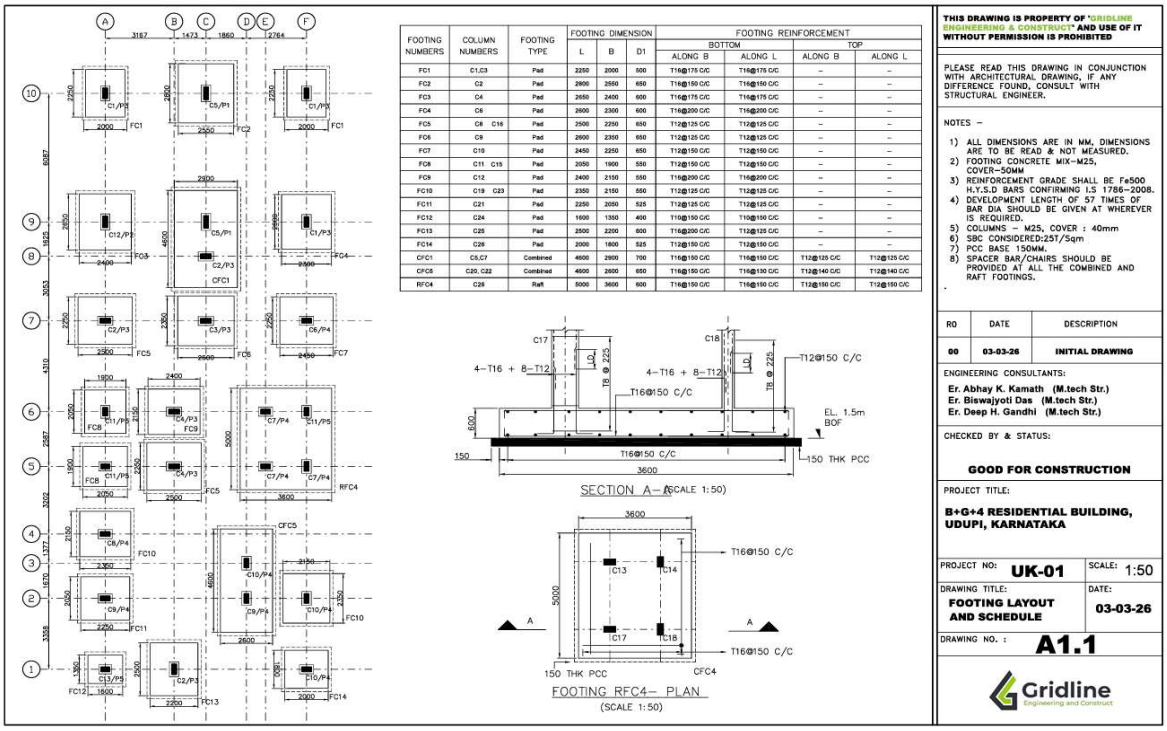


Fig 1: The 3D structural model of the building, analysed under its governing load envelope in STAAD.Pro, forms the computational basis for all reinforcement decisions. Force diagrams across every beam and column drive the design output. The fully coordinated spatial model with columns, beams, and slab levels was developed prior to drawing issue to resolve structural-architectural conflicts before reaching the construction site.

Detailed engineering drawing sheets are presented below:



FOOTING NUMBERS	COLUMN NUMBERS	FOOTING TYPE	FOOTING DIMENSION			FOOTING REINFORCEMENT			
						BOTTOM		TOP	
			L	B	D1	ALONG B	ALONG L	ALONG B	ALONG L
FC1	C1,C3	Pad	2250	2000	600	T16@175 C/C	T16@175 C/C	–	–
FC2	C2	Pad	2900	2550	650	T16@150 C/C	T16@150 C/C	–	–
FC3	C4	Pad	2550	2400	600	T16@175 C/C	T16@175 C/C	–	–
FC4	C6	Pad	2600	2300	600	T16@200 C/C	T16@200 C/C	–	–
FC5	C8 C16	Pad	2500	2250	650	T12@125 C/C	T12@125 C/C	–	–
FC6	C9	Pad	2600	2350	650	T12@125 C/C	T12@125 C/C	–	–
FC7	C10	Pad	2450	2250	650	T12@150 C/C	T12@150 C/C	–	–
FC8	C11 C15	Pad	2050	1900	550	T12@150 C/C	T12@150 C/C	–	–
FC9	C12	Pad	2400	2150	550	T16@200 C/C	T16@200 C/C	–	–
FC10	C19 C23	Pad	2350	2150	650	T12@125 C/C	T12@125 C/C	–	–
FC11	C21	Pad	2250	2050	525	T12@125 C/C	T12@125 C/C	–	–
FC12	C24	Pad	1600	1350	400	T10@150 C/C	T10@150 C/C	–	–
FC13	C25	Pad	2500	2200	600	T16@200 C/C	T12@125 C/C	–	–
FC14	C26	Pad	2000	1800	525	T12@150 C/C	T12@150 C/C	–	–
CFC1	C5,C7	Combined	4600	2900	700	T16@150 C/C	T16@150 C/C	T12@125 C/C	T12@125 C/C
CFC5	C20, C22	Combined	4600	2600	650	T16@150 C/C	T16@150 C/C	T12@140 C/C	T12@140 C/C
RFC4	C26	Raft	5000	3600	600	T16@150 C/C	T16@150 C/C	T12@150 C/C	T12@150 C/C

SECTION A–A (SCALE 1:50)

FOOTING RFC4– PLAN
(SCALE 1:50)

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PLEASE READ THIS DRAWING IN CONJUNCTION WITH ARCHITECTURAL DRAWING, IF ANY DIFFERENCE FOUND, CONSULT WITH STRUCTURAL ENGINEER.

NOTES –

1) ALL DIMENSIONS ARE IN MM, DIMENSIONS ARE TO BE READ & NOT MEASURED.
2) FOOTING CONCRETE MIX–M25, COVER–50MM
3) REINFORCEMENT GRADE SHALL BE Fe500 H.Y.S.D BARS CONFIRMING I.S 1786–2008.
4) DEVELOPMENT LENGTH OF 57 TIMES OF BAR DIA SHOULD BE GIVEN AT WHEREVER IS REQUIRED.
5) COLUMNS – M25, COVER : 40mm
6) SBC CONSIDERED:25T/Sqm
7) PCC BASE 150MM.
8) SPACER BAR/CHAIRS SHOULD BE PROVIDED AT ALL THE COMBINED AND RAFT FOOTINGS.

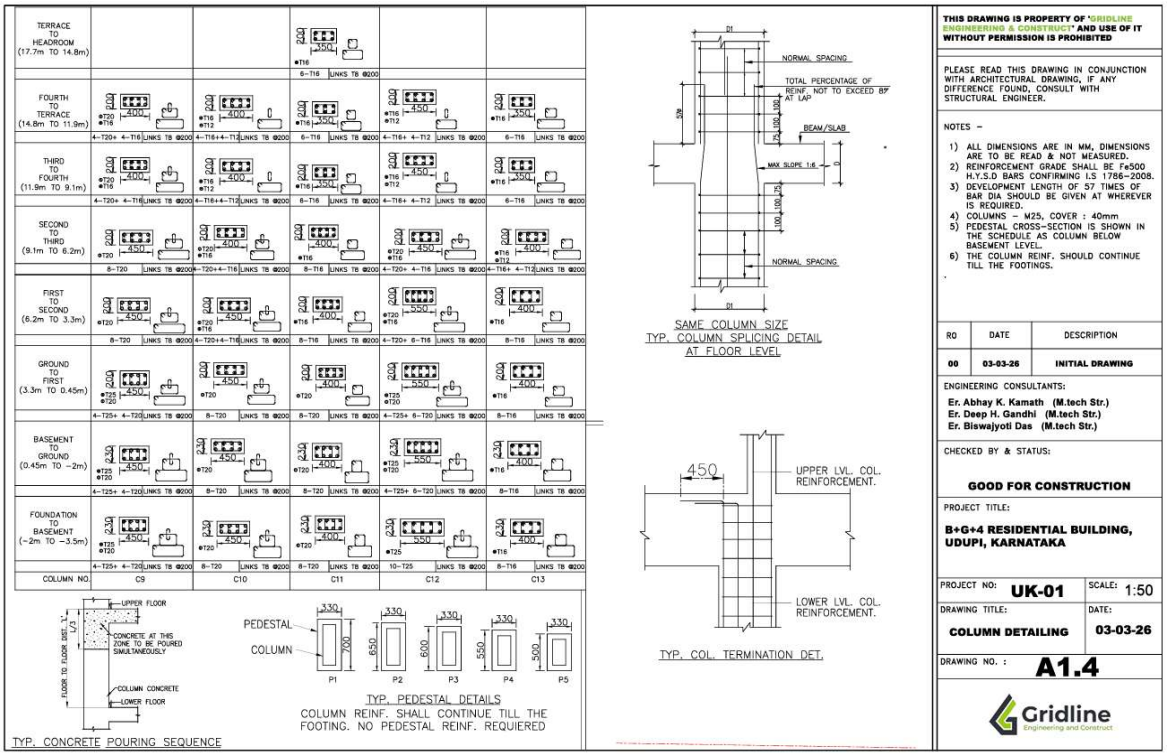
RO	DATE	DESCRIPTION
00	03-03-26	INITIAL DRAWING

ENGINEERING CONSULTANTS:
Er. Abhay K. Kamath (M.tech Str.)
Er. Biswajyoti Das (M.tech Str.)
Er. Deep H. Gandhi (M.tech Str.)

CHECKED BY & STATUS:
GOOD FOR CONSTRUCTION

PROJECT TITLE:
B+G+4 RESIDENTIAL BUILDING, UDUPI, KARNATAKA

PROJECT NO: UK-01 | SCALE: 1:50
DRAWING TITLE: FOOTING LAYOUT AND SCHEDULE | DATE: 03-03-26
DRAWING NO. : A1.1



SAME COLUMN SIZE
TYP. COLUMN SPLICING DETAIL AT FLOOR LEVEL

TYP. COL. TERMINATION DET.

TYP. CONCRETE POURING SEQUENCE

TYP. PEDESTAL DETAILS
COLUMN REINF. SHALL CONTINUE TILL THE FOOTING. NO PEDESTAL REINF. REQUIERED

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2) REINFORCEMENT GRADE SHALL BE Fe500 H.Y.S.D BARS CONFIRMING I.S 1786–2008.
3) DEVELOPMENT LENGTH OF 57 TIMES OF BAR DIA SHOULD BE GIVEN AT WHEREVER IS REQUIRED.
4) COLUMNS – M25, COVER : 40mm
5) PEDESTAL CROSS–SECTION IS SHOWN IN THE SCHEDULE AS COLUMN BELOW BASEMENT LEVEL.
6) THE COLUMN REINF. SHOULD CONTINUE TILL THE FOOTINGS.

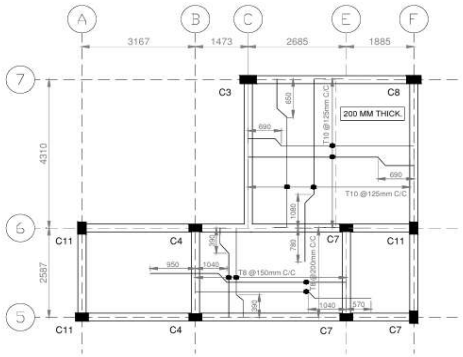
RO	DATE	DESCRIPTION
00	03-03-26	INITIAL DRAWING

ENGINEERING CONSULTANTS:
Er. Abhay K. Kamath (M.tech Str.)
Er. Deep H. Gandhi (M.tech Str.)
Er. Biswajyoti Das (M.tech Str.)

CHECKED BY & STATUS:
GOOD FOR CONSTRUCTION

PROJECT TITLE:
B+G+4 RESIDENTIAL BUILDING, UDUPI, KARNATAKA

PROJECT NO: UK-01 | SCALE: 1:50
DRAWING TITLE: COLUMN DETAILING | DATE: 03-03-26
DRAWING NO. : A1.4



HEAD ROOM SLAB DETAIL LAYOUT

UNLESS OTHERWISE MENTIONED ALL SLABS ARE 125MM THICK.
UNLESS OTHERWISE MENTIONED PROVIDE 8MM @ 200MM C/C

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DRAWING TITLE: **HEAD ROOM SLAB DESIGN**

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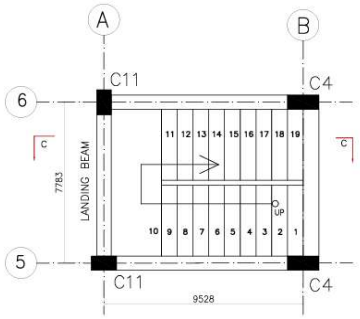
2) REINFORCEMENT GRADE SHALL BE Fe500 H.Y.S.D BARS CONFIRMING I.S 1786–2008.
3) DEVELOPMENT LENGTH OF 57 TIMES OF BAR DIA SHOULD BE GIVEN AT WHEREVER IS REQUIRED.
4) SLABS AND BEAMS – M20, COVER : 20mm
5) ALL SLABS THICKNESS 125mm.
6) THE REINFORCEMENT SHOWED IN LAYOUT FOR THE PARTICULAR SLABS NEEDS TO BE FOLLOWED ACCORDINGLY.
7) REMAINING SLABS T8 @200mm C/C BOTH WAYS.
8) SUNKEN SLABS ARE MENTIONED WITH HATCH (FILLING DEPTH 200mm).

RO	DESCRIPTION
00	INITIAL DRAWING

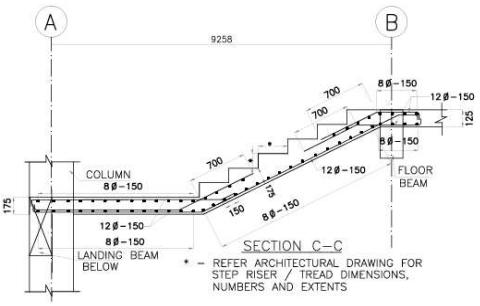
ENGINEERING CONSULTANTS:
Er. Abhay K. Kamath (M.tech Str.)
Er. Deep H. Gandhi (M.tech Str.)
Er. Biswajyoti Das (M.tech Str.)

CHECKED BY & STATUS: **GOOD FOR CONSTRUCTION**

PROJECT NO: **UK-01**
SCALE: 1:50
DRAWING NO. : **A1.5**
PROJECT TITLE: **B+G+4 RESIDENTIAL BUILDING, UDUPI, KARNATAKA**
DATE: **14-03-26**

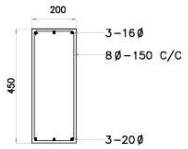


STAIRCASE LAYOUT



SECTION C–C

* – REFER ARCHITECTURAL DRAWING FOR STEP RISER / TREAD DIMENSIONS, NUMBERS AND EXTENTS



TYP C/S OF LANDING BEAM DETAIL

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NOTES –

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2) GRADE OF CONCRETE – CONC MIX : M20 , COVER : 20mm.
3) REINFORCEMENT GRADE SHALL BE Fe500 H.Y.S.D BARS CONFIRMING I.S 1786–2008.
4) DEVELOPMENT LENGTH OF 57 TIMES OF BAR DIA SHOULD BE GIVEN AT WHEREVER IS REQUIRED.
5) LANDING BEAMS – M20
6) WAIST SLAB THK – 175mm
7) FOR DIMENSIONS OF RISER & TREADS, REFER ARCHITECTURAL DRAWINGS.

RO	DATE	DESCRIPTION
00	11-03-26	INITIAL DRAWING

ENGINEERING CONSULTANTS:
Er. Abhay K. Kamath (M.tech Str.)
Er. Deep H. Gandhi (M.tech Str.)
Er. Biswajyoti Das (M.tech Str.)

CHECKED BY & STATUS: **GOOD FOR CONSTRUCTION**

PROJECT TITLE: **B+G+4 RESIDENTIAL BUILDING, UDUPI, KARNATAKA**

PROJECT NO: **UK-01**
SCALE: 1:50
DRAWING TITLE: **STAIRCASE LAYOUT AND DETAILING**
DATE: **11-03-26**
DRAWING NO. : **A1.9**

PROJECT 02

Steel Shed Structure with Mezzanine Deck
Badarpurghat, Assam, India | Project No. BGA-02

The structure is an industrial steel shed spanning approximately 22 metres by 16.5 metres in plan, located in Badarpurghat, Assam, north-eastern India. The brief required a ground-level industrial floor and a full mezzanine level above a composite steel-and-concrete deck system capable of carrying substantial working loads of an office.

Composite Engineering: More Space from Less Material

The mezzanine floor on this project is not simply a concrete slab laid on steel beams. It is a **composite system,** where the concrete slab and the steel joists are mechanically connected through shear studs so that they act together as a single structural unit. A composite member carries a given load with significantly less steel depth than a non-composite beam of equivalent span.

In practical terms, shallower beams mean greater clear height between the ground floor and the mezzanine soffit. Greater clear height means more usable industrial space within the same building envelope. The engineering decision to specify a composite system translated directly into additional usable floor area for the client at no additional cost to the structural frame.

Every joist in this structure was verified for deflection in **ETABS,** an internationally recognised structural analysis platform under its full working load. The maximum recorded mid-span deflection across the mezzanine is under 5 millimetres on a 5.5-metre span. Equipment and materials placed on this floor will not experience any perceptible movement.

Connection Engineering: Where Steel Structures Succeed or Fail

In steel construction, a correctly sized beam connected to an undersized or poorly detailed joint is not a correctly sized beam. On this project, four categories of connection were fully detailed and documented: two base plate variants for the column-to-foundation interface, a beam-to-joist connection, and a beam-to-column connection. Each is specified with plate dimensions, bolt grade, bolt count, weld leg size, and stiffener placement.

This level of connection documentation serves two purposes. First, it ensures structural integrity the connection has been engineered to transfer the forces

the analysis demands. Second, it eliminates the fabrication ambiguity that generates variation orders.

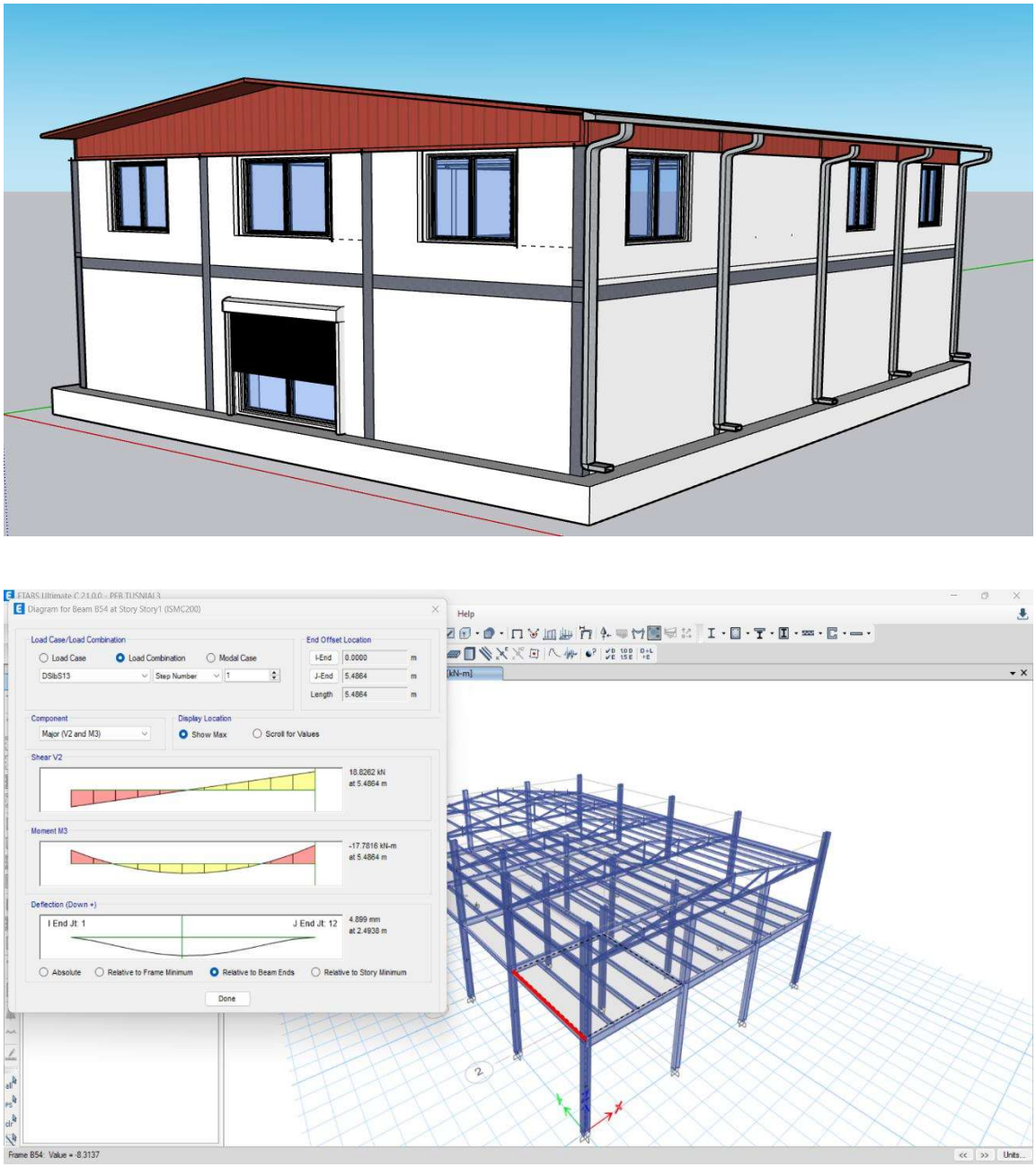
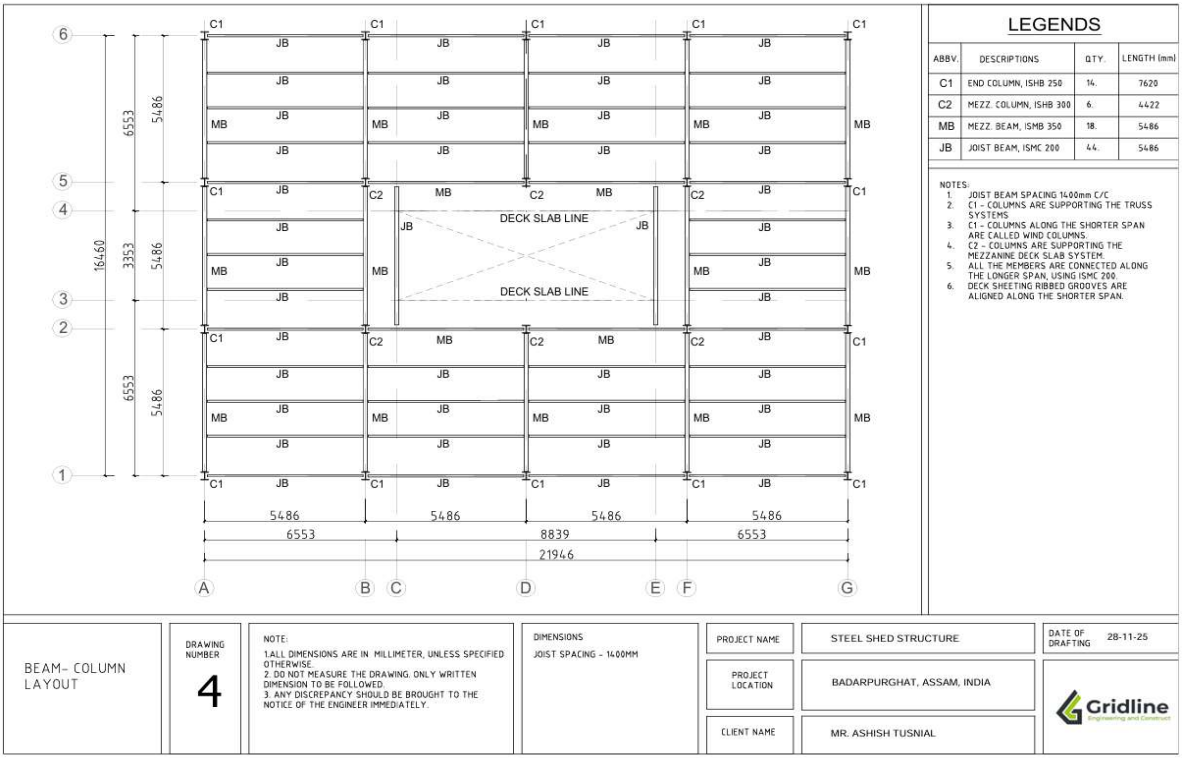
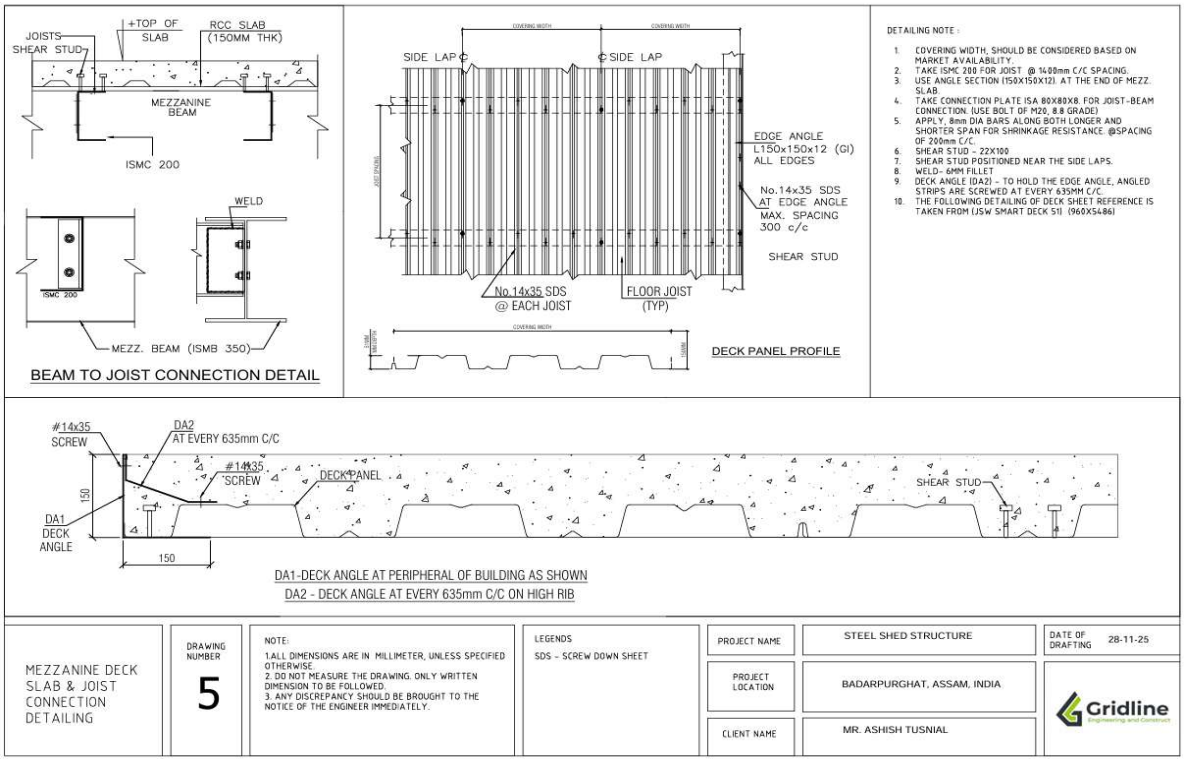
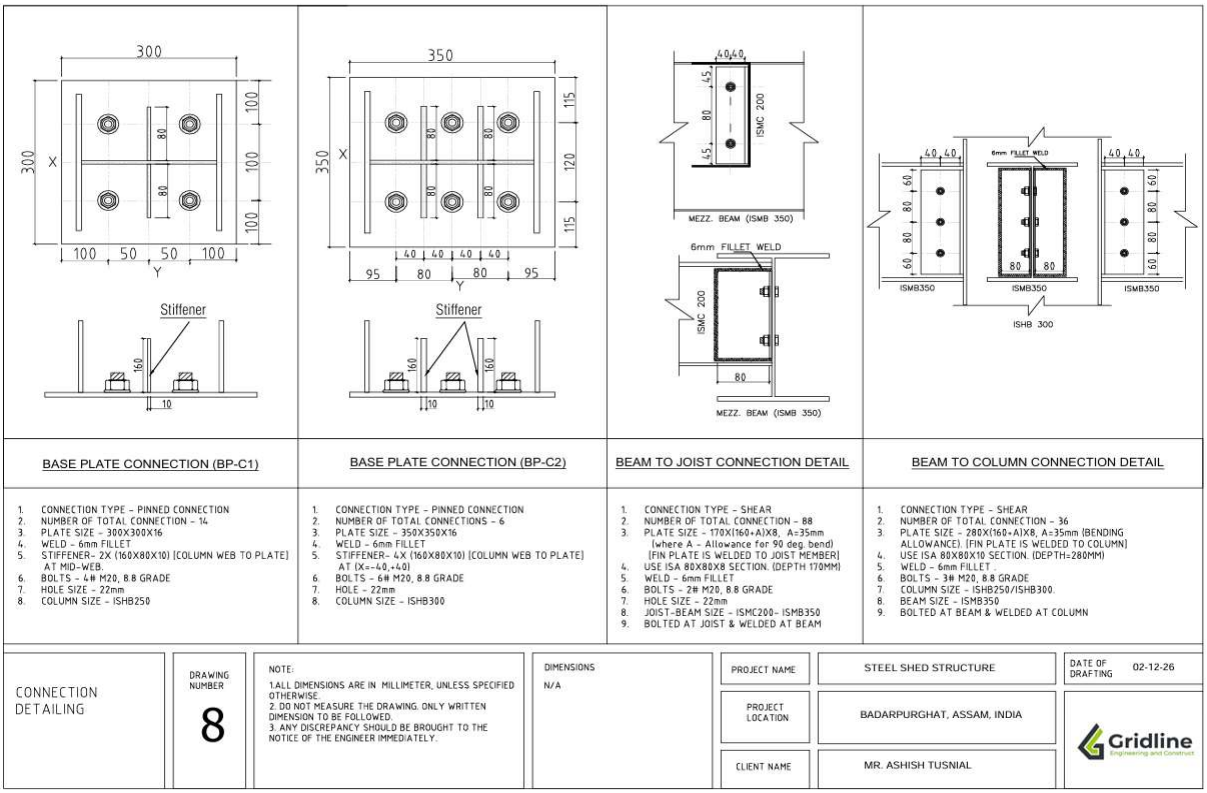


Fig 2: Post-processing output from **ETABS** for the governing mezzanine joist under its design load combination, showing the shear force envelope, bending moment diagram, and deflection curve. This is the computational verification that underpins every section size in the mezzanine system. The structure was proven on screen before it was fabricated in steel.

Detailed engineering drawing sheets are presented below:







PROJECT 03

Temple Pushakarini — Ghat Steps

Udupi, Karnataka, India | Project No. UK-02

A **Pushakarini** is a sacred stepped pond found at the ceremonial heart of South Indian Hindu temples. The stone steps descend from ground level into the water and are used daily for ritual observance. Designing the structural renewal of such a feature requires more than technical competence. It requires an understanding of why the traditional form exists, what forces act upon it, and how to engineer a solution that is durable, site-appropriate, and entirely faithful to its architectural heritage.

The Right Structural Solution for the Right Problem

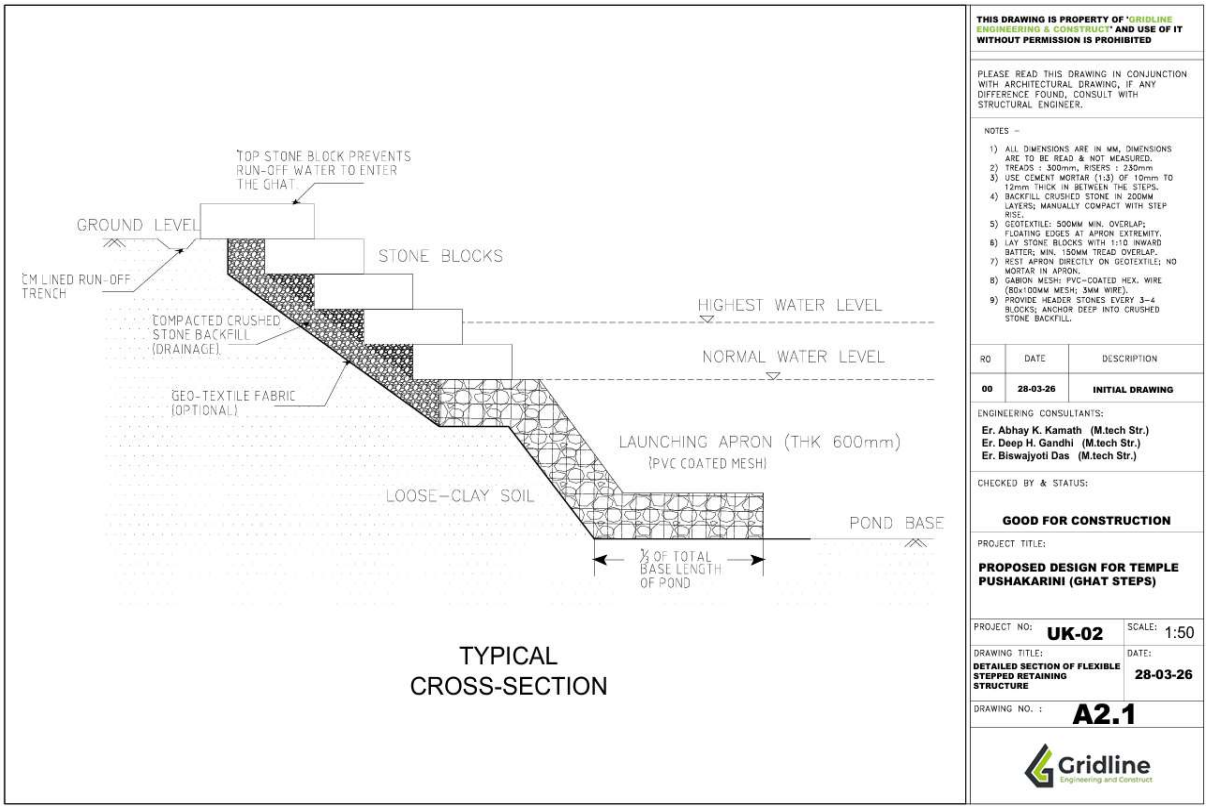
The instinctive modern response to a failing retaining structure is a reinforced concrete wall. For this site, that would have been the wrong answer. The subsoil at this location is soft clay — a condition that produces ongoing, gradual settlement. A rigid concrete structure on such ground will crack, and once

cracked, it will deteriorate rapidly under the combined action of water ingress and seasonal ground movement.

Our solution was a **flexible stone-block stepped retaining structure**, the same structural form that traditional builders arrived at over centuries, now engineered with precision and documented with modern construction drawings. The stone blocks are laid with a slight inward batter, so gravity holds the structure together rather than relying on tension in the joints. Behind the face, a free-draining crushed stone backfill eliminates the hydrostatic pressure that is the primary cause of retaining wall failure. A geotextile membrane between the backfill and the native clay prevents the migration of fine soil particles into the drainage layer, a failure mechanism that develops slowly and invisibly over decades.

At the base, where the steps meet the pond floor, a **gabion mesh launching apron** extends beneath the water surface. This flexible, self-adjusting component protects the toe of the structure against scour, the gradual undermining by water movement that is responsible for the majority of Ghat collapses. Also, the stone boulders under the water promotes aquatic life to flourish inside the gaps and surface of the stone boulders.

Detailed engineering drawing sheets are presented below :



A NOTE ON INTERNATIONAL ENGAGEMENTS

Gridline Engineering and Construct welcomes enquiries from clients whose projects are located outside India or are governed by European or North American design standards.

Structural engineering is, at its foundation, a universal discipline. The behaviour of reinforced concrete, structural steel, and soil under load does not change with geography. What changes between **Indian Standards, Eurocode, ACI, and AISC** is the precise format in which safety requirements are expressed. The load factors, combination rules, and design checks that each code prescribes. Our team works with these frameworks as a matter of regular professional practice, and we are fully equipped to produce design documentation compliant with the code of jurisdiction applicable to your project.

Clients considering engagement with Gridline for international projects are encouraged to contact us directly to discuss scope, standards applicability, and project requirements.

CLOSING

The projects in this portfolio span different building types, different structural materials, and different engineering challenges. What they share is a consistent approach: thorough analysis before documentation, complete documentation before construction, and a commitment to ensuring that every decision we make on behalf of a client is defensible, efficient, and built to last.

We would welcome the opportunity to bring this standard to your next project.