FIJI ELECTRICITY AUTHORITY

BIDDING DOCUMENT

DESIGN & CONTRUCT 33kV SWITCHING STATION AT NABOU GREEN SIGATOKA CIVIL WORKS ONLY

TENDER NO: MR 101/2016

REVISION SCHEDULE:

Date	Notes	Prepared By		Rev No.
18/09/16	FINAL COPY	Ravind Narayan Rajiv Singh Parth Kantharia		1

INVITATION FOR BIDS

Date: **17th September, 2016**
Tender No: **MR 101/2016**

The Fiji Electricity Authority ("The Employer") invites sealed bids from reputable and suitable Civil Engineering contractors for the design and construction of 33kV Nabou Green switching station building, civil works only.

The bidder is required to submit a bid for:

DESIGN AND CONSTRUCT CIVIL WORKS FOR 33Kv NABOU GREEN SWITCHING STATION BUILDING 3 x CIRCUIT BREAKER/ISOLATOR/VT/CABLE PAD, AND ROAD WORKS FOR SWITCH YARD .

All bids for the contract shall be submitted on the appropriate forms provided and shall include the completed price schedule, technical schedule and schedules of experience etc. The bid shall be on the basis of a lump sum contract based on firm prices.

Bidders may obtain further information from, and inspect and acquire the bidding documents, at

Design & Construction of 33kV Nabou Green Switching Station, Sigatoka – Civil Works Only
Tuvitu Delairewa
General Manager Corporate Services
2 Marlow Street, Suva, FIJI.
Phone: 679 3224 185
Email: TDelairewa@fea.com.fj

The deadline for submission of bids shall be **1600hrs (local time) on Wednesday, 28th September, 2016.**

During evaluation of bids the Authority may invite a bidder or bidders for discussions, presentations and any necessary clarification before awarding the contract price proposal.

A site visit is planned for Wednesday, 21th September, 2016 at 1000hrs (local time). Interested bidders are required to meet at the Nabou Green Generating Station, Nabou, Sigatoka.

Section 1 - Instructions to Bidders

A. General

1. Scope of Bid

1.1 The Fiji Electricity Authority (hereinafter referred to as "the Employer"), wishes to receive bids for the design and construction of Nabou Green Substation building – Civil works only, as defined in these bidding documents (hereinafter referred to as "the Works").

1.2 The successful bidder will be expected to complete the Works within 4 months from the date of commencement of the Works. The commissioning should be completed by October, 2016.

2. Eligible Bidders

2.1 This invitation is open to all Bidders who have sound Financial Background, and have previous experience in handling such civil projects.

3. Eligible Materials, Equipment and Services

3.1 The materials, equipment, and services to be supplied under the Contract shall have their origin from reputable companies as specified by FEA and from various countries and all expenditures made under the Contract will be limited to such materials, equipment, and services. Upon request, bidders may be required to provide evidence of the origin of materials, equipment, and services.

4. Qualification of the Bidder

4.1 To be qualified for award of Contract, bidders shall:

(a) submit a written power of attorney authorizing the signatory of the bid to commit the bidder; and

5. One Bid per Bidder

5.1 Each bidder shall submit only one bid either by itself, or as a partner in a joint venture. A bidder who submits or participates in more than one bid will cause all those bids to be rejected.

6. Cost of Bidding

6.1 The bidder shall bear all costs associated with the preparation and submission of its bid and the Employer will in no case be responsible or liable for those costs.

7. Site Visit

7.1 The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for the design-build and completion of the Works. The costs of visiting the Site shall be at the bidder's own expense.

7.2 Site meeting attendance is compulsory at 10.00am Wednesday 21th September at Nabou Green Generation Site – Sigatoka.

7.3 The bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the bidder, its personnel and agents, will release and indemnify

the Employer and its personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

8. Clarification of Bidding Documents

8.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing by fax (hereinafter the term "fax" is deemed to include electronic transmission such as facsimile, cable and telex), or email at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification which it receives earlier than 10 days prior to the deadline for submission of bids. Copies of the Employer's response, including a description of the inquiry, will be forwarded to all purchasers of the bidding documents.

9. Amendment of Bidding Documents

9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing addenda.

9.2 Any addendum thus issued shall be part of the bidding documents pursuant to Sub-Clause 9.1, and shall be communicated in writing or by fax to all purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum by email and fax to the Employer.

10. Language of Bid

10.1 The bid, and all correspondence and documents related to the bid, exchanged between the bidder and the Employer shall be written in the English language.

11. Bid Form and Price Schedules

11.1 The Bidder shall complete the Bid Form and the appropriate Price Schedules furnished in the bidding documents in the manner and detail indicated therein, following the requirements of Clauses 15 and 16.

12. Bid Prices

12.1 Bidders shall give a breakdown of the prices in the manner and detail called for in the Schedules of Prices.

13. Bid Currencies

13.1 Prices shall be quoted in the following currencies:

(a) The prices shall be quoted in the Fijian currency and either in the currency of the bidder's home country.

14. Bid Validity

14.1 Bids shall remain valid for a period of **180 days** from the date of Deadline for Submission of Bids specified in Sub-Clause 21.1.

15. Format and Signing of Bid

15.1 The bidder shall prepare one original and two (2) copies of the technical proposal and the financial proposal, clearly marking each one as: "ORIGINAL-TECHNICAL & PRICE PROPOSAL", "COPY NO. I - TECHNICAL & PRICE PROPOSAL", etc. as appropriate. In the event of discrepancy between the original and any copy, the original shall prevail.

15.2 The inner and outer envelopes shall

(a) be addressed to the Employer at the following address:

Tuvitu Delairewa
General Manager Corporate Services
2 Marlow Street, Suva, FIJI.
Phone: 679 3224 185
Facsimile: 679 331 1882
Email: TuvituD@fea.com.fj

and

(b) bear the following identification:

- Bid for: Design and Construction of 33kV Nabou Green Switching Station Building – Civil works only
- Bid Tender Number: MR 101/2016
- DO NOT OPEN BEFORE 1600Hrs 29th September, 2016

15.3 In addition to the identification required in Sub-Clause 20.3, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Clause 22.

15.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.

16. Deadline for Submission of Bids

16.1 Bids must be received by the Employer at the address specified above no later than **1600 hours (local time) Wednesday, 28th September.**

16.2 The Employer may, at its discretion, extend the deadline for submission of bids by issuing an addendum in accordance with Clause 11, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

17. Late Bids

17.1 Any bid received by the Employer after the deadline for submission of bids prescribed in Clause 23 will be rejected and returned unopened to the bidder.

17.2 No bid may be modified by the bidder after the deadline for submission of bids, except in accordance with Sub-Clauses 23.2 and 28.2.

Section 2

Employer's Requirements
Scope of Works

SCOPE OF WORKS

1. GENERAL DESCRIPTION

The scope of works for this contract for the **Design & Construction of 33kV Nabou Green Switching Station Building – Civil works only** is to carry out civil works for new building, pad works for 33kV circuit breakers, disconnectors, bus, surge arrestor/VT, and cable support structures and works such as fencing, earthing, Geotech study, cable trenching, laying of crushed metal and carry out other necessary works required for the new extension of 33kV bus.

Nabou Green building will be a new substation site. The main item for civil and electrical works under the scope includes:

1. Design and construction of the new Substation Building as per the attached drawing.
2. Carry out fencing works for the new building and install a roller gate as per attached design.
3. Geo technical studies
4. Cable Trench with concrete covers – as per drawings – minimum depth
5. Construction of 20 Tonne Pad for 33kV circuit breakers, disconnectors, bus, surge arrestor/VT, and cable support structures
6. Installation of high voltage cable conduits for 33kV cables, each circuit shall be 150mm X 6 conduits from Pad to the cable trench, contractor to provide cable ladders across the entire cable trench route.
7. Transformer yard grounding system – 120mm^2 round copper bars
8. Earth GRID
9. Crushed metal works

2. MAJOR PLANT & MATERIAL INCLUDING SPARE PARTS

2.1 INSTALLATION & OTHER SERVICES

2.1.1 Civil Works

All civil works relating to the padding for outdoor switchyard equipment shall be carried out by the Contractor.

CIVIL WORKS

3.1 SITE CLEARANCE

All unwanted materials, debris, etc. shall be removed from the employer's premises.

Unwanted foundations shall be demolished or up-rooted. The Contractor shall clear all areas required for the work. All unwanted materials, debris, etc. shall be removed from the employer's premises.

3.2 SITE FORMATION AND UPKEEPING

The whole of the excavations shall be carried out to the widths, lengths and depths shown on the approved drawings and in accordance with BS CP-8004 and BS 6031 or AS 3789. If top layer of soil is not suitable for the construction it shall be removed or stabilised. The Contractor is to provide all strutting and shoring necessary for the safe execution of the Works. Materials from the excavation may, if approved by the Employer's Representative, be used by the Contractor in the construction Works. Other excavated material shall be back filled where required or deposited where directed by the Employer. Surplus materials shall be removed from the Site by the Contractor. The Contractor shall at all times keep the site free from all surplus materials, rubbish and offensive matter.

The bottom of all excavated areas shall be trimmed, levelled and well rammed. Concrete shall not be deposited thereon until the bottom has been inspected and approved by the Employer's Representative.

All excavation works are to be kept dry and clean, in order that work is not affected or interfered with by water entering the excavations. The Bidder is to allow in his Tender for the costs of pumping, de-watering or other methods of dealing with the water during and after excavation. No concrete, masonry, brickwork or other materials shall be placed or built until the surfaces are properly drained.

If it is required to fill the land, the Contractor shall get approval for the filling material and method of construction before the commencement of work. Filling for trenches, excavations and levelling of the site shall be deposited in layers not exceeding 250 mm uncompacted thickness, each layer watered when necessary and well rammed or otherwise compacted to within 95% of the maximum dry density obtained by the use of a Proctor Standard Compaction Test. Any fill material used within 500 mm of concrete structures cement bound materials shall have a soluble sulphate content not exceeding 2.5 g per litter when tested in accordance with BS 1377 or AS 1289, special precautions shall be taken to protect the concrete or cement bound materials to the approval of the Employer's Representative. Where excavations whether in rock or other material, are made to a greater depth than detailed, the intervening space shall be brought up to the proper level in plain concrete at the Contractor's expense.

Any formation encountered in the excavations which is not sufficiently strong to carry the loads which will be imposed on it, shall be excavated to an adequate load bearing stratum and replaced with mass concrete.
Unless otherwise described, directed or permitted, imported filling shall consist of pervious naturally occurring material, free from mud, silt, clay, peat, vegetable or injurious matter and water soluble salts harmful to copper and other metals. Filling shall be imported only from approved areas.

The Contractor shall be responsible for the stability of embankments, which formed either by cutting or filling, and precautions taken to protect the earthworks from deterioration under adverse weather conditions. Wherever applicable the recommendations contained in the following codes of practice shall be followed in calculations, detailing and performance of the earthworks and drainage. The Earthworks standard that should be used is - BS 6031 or AS 3789.All top surfaces of earthwork shall be finished off level and regular and the sides of cuttings and embankments shall be properly trimmed to the detailed slopes. The soil stability of such slops etc. shall be ensured. The Contractor shall construct where necessary open ditches, bunds, culverts, etc., to divert and protect the site in both the short and long-term from flash floods. If any slips occur in the excavations, banks or filling during the execution of the Works or during the period of maintenance from any cause whatsoever, the Contractor shall execute the necessary remedial work in such manner, and with such materials as approved by the Employer's Representative, at the Contractor's expense.

Explosives shall not be used.

Stone chipping used for substation surfacing are to be clean hard crushed stone graded from 16 - 40 mm. The formation in areas where stone chipping are to be used shall be well compacted to the approval of the Employer's Representative, and treated with an approved total weed killer, used in accordance with the manufacturer's instructions. Approved weed mats has to be installed in the entire yard before stones chips are installed. Geo mat and geo fabric may also be used in areas where water is present. Stone chipping shall be laid and lightly compacted to a minimum finished thickness of 100 mm.

3.3 Building

The building works for the Nabou Green Substation shall be done according to the plan provided. All materials used in the construction of the building to be of metal (steel and aluminium) – no wood should be used for any purpose in the building.

3.4 Geotechnical Study

A detailed geotechnical study is to be conducted on the identified site to determine feasibility for the construction of two transformer pads, their respective bund walls, fire walls, casting of HV cable trenches, laying of earth mat and laying of multicore HV/LV cable conduits as shown on layout drawing.

- The study shall be undertaken by a qualified geotechnical engineer. The said engineer will be tasked with the responsibility of undertaking the geotechnical investigations and providing the necessary geotechnical design parameters that will be used for foundation design and construction.
- Samples shall be taken from a minimum of four (4) borings to determine soil bearing capacities. These shall be tested to determine the physical and chemical characteristics of various strata and of the ground water. A safe bearing capacity shall be determined for the purpose of foundation design.
- A report of the investigation and study carried out shall be submitted. This will serve to clearly inform of the current suitability of the on-site materials for construction of the new transformer yard accounting for a total designed load of 80 Tons per transformer. The study will clearly advise on the sites ability to hold up without fail the combined installation load on the green patch and issue recommendations on type of foundation design.
- The report must also serve to clearly inform the employer of any remedial works that will need to be undertaken so as to ensure the suitability of the site to hold up the transformer yard extension for the new transformers without fail for its projected 60 years' of service life. Detailed excavation work specifications and drawings for all remedial works shall be submitted together with the report.
- The employer's written approval is to be given prior to commencing of any remedial earth works.
- The safe bearing capacity of the sub-strata may be modified at the final design stage when the full site survey and investigation have been completed and the final layout, structural details etc. agreed. No variation in contract price will be made due to any variation in the bearing capacity leading to modification of foundation design at the final design stage. Special attention shall be paid to the ground water table and chemical composition of the ground water and soil in the substation area.
- The following shall be considered as a minimum requirement, assuming uniform conditions over the Site. This shall be extended if significant inconsistencies arise.
- Depth of boreholes shall be continued up to bedrock if it does not meet the hard stratum of N- value more than 50.
- Borehole records shall describe and indicate level of all soils encountered and indicate the natural water table level. Rock core records shall specify total core recovery, solid core recovery and quality of the rock cored.

- Where applicable, samples of soil shall be obtained from all soil strata or at 2 meters intervals in a single stratum and tested to determine physical and chemical properties, particularly with respect to substances, which would react with concrete or other materials to be used for the foundation works.
- Where applicable, in situ soil tests shall be completed for all soil strata or at 2 meter intervals in a single stratum. Standard Penetration test in non-cohesive soils, field vane tests in sensitive cohesive soils.
- Ground water samples shall be obtained from each bore-hole and tested in accordance with approved practice.
- Electrical resistivity of the soil shall be verified on four samples, in accordance with approved practice (IEEE 80-2004 : IEEE Guide for Safety in AC Substation Grounding).

3.5 Cable Trench and Ducts

3.5.1 Control and Power Cable Trenches

The Contractor is responsible for all civil works required for cable runs between outdoor switchgear and building in concrete cable trenches. Cable entries into buildings shall be through ducts or in concrete cable trenches.
Conduits provided shall be sized to suite the cables provided. All other main cable trenches shall have additional capacity of 30% future use. Cable entries into buildings shall be sealed using suitable materials to prevent entry of any water, dust, vermin, etc. Cable entry to the control building shall be provided for future requirements.

3.5.2 Ducts

All cable ducts shall be laid in straight lines and regular gradients between cable pits, as directed. All ducts shall be kept clear from earth, debris and other obstructions during and after laying. Cable ducts may be pitch fibber, PVC, plastic or other material approved by the Employer's Representative and obtained from an approved manufacturer.

3.5.3 Concrete Beds and Casings

Concrete beds and casings to cable ducts and under roads, buildings, floors and foundations shall be of lean concrete and of 100mm minimum thickness. Elsewhere the ducts shall be laid on and surrounded with approved granular material of 150mm minimum bed thickness and 200 mm minimum cover.

3.5.4 Cable Pits

Cable pits shall be provided at interval not exceeding 50 meters and also at the bends of all cable ducts.
Cable pits may be constructed in situ concrete or precast concrete. In each case, the material shall be in accordance with the relevant sections of this Specification. Cable pits shall be sized according to their depth, to provide sufficient working space and access for maintenance. Galvanised malleable iron steps are to be provided in all cable pits over one meter deep and built in as work proceeds. Rates shall include for all necessary crossings shifting any existing obstructions etc. Power cables shall be laid on and surrounded with sand fill in unlined trenches. Pre-cast concrete cable protection covers & PVC marker tape shall be provided over the full width and length of cables in sand filled trenches. Pre-cast concrete marker posts shall be provided along cable runs at 100 meters intervals. Rates shall include for all necessary crossings shifting existing any obstructions etc.

3.6 EXCAVATION OF CABLE TRENCH

- The exact location of each trench shall be agreed at the site with the Employer's Representative before the installation work begins. Permits for excavation shall be obtained from the Employer's Representative.
- Trenches shall be kept as straight and shall be excavated to approved formations and dimensions. Trenches shall have vertical sides and shall be close timbered and strutted where necessary to prevent subsidence.

- The depth of excavated trenches for the installation of HV cables and MV cables shall be according to the Employer's Standards of 600mm and 500mmm wide. The Employer's Representative shall make these standards available to the Contractor upon his request.
- All cable laying and back filling shall be carried out only under the direct supervision of a responsible officer and only in the presence of a representative of the Employer's

3.7 DE-WATERING

All excavation works are to be kept dry and clean to ensure work is not affected or interfered with by water entering the excavations. The Bidder is to allow in his Tender for the costs of pumping, de-watering or other methods of dealing with the water during and after excavation. No concrete, masonry, brickwork or other materials shall be placed or built until the surfaces are properly drained.

3.8 CONTROL & POWER CABLE CONDUIT and CABLE LADDERS

- The Contractor is responsible for all civil works required for building in cable conduits and Trench with covers. Cable entries into buildings shall be through conduits.
- Power cable which passes under roads, hard standing areas or where they would otherwise be at risk shall be laid in approved ducts. 3 sets for each circuit shall be installed and the whole surrounded in a minimum of 150 mm C10 concrete.
- 33kV and control cable conduits shall be encased in concrete casings with minimum thickness of 150mm and at depths of 1200mm and 600mm respectively on entry to the substation.
- 2 x earthing conduits for the transformer shall be encased in concrete casings with minimum thickness of 100mm.
- Fibre conduits shall be encased in concrete casings with minimum thickness of 50mm.
- AC and DC conduits shall be encased in concrete casings with minimum thickness of 50mm separately.
- All cable ducts shall be laid in straight lines and regular gradients between cable pits, as directed. All ducts shall be kept clear from earth, debris and other obstructions during and after being laid.
- Conduit stubs protruding from transformer pads shall extend upwards by 50mm from the top of bund wall so as to inhibit ingress of oil/water should oil/water held in the bund fill up to maximum holding capacity.
- Cable ducts shall be of Polyvinyl Chloride (PVC) type material approved by the Employer's Representative and obtained from an approved manufacturer.
- Each cable conduit shall be housed with galvanized draw wires of sufficient strength and size to pull cables that shall run within the conduits. The galvanized draw wires shall run the full length of the conduits.

3.9 CONCRETE BEDS & CASINGS

Concrete beds and casings shall be applied to all underground cable conduits under roads, buildings, floors and foundations. All casings shall be of lean concrete and of 150mm minimum thickness.

3.10 WATER SUPPLY & DRAINAGE SYSTEM

Embankments and cuttings shall have drainage facilities at their top or bottom. The formation level of switchyard area shall be formed with uniform cross-falls of about 1 in 300 in the same direction as the natural drainage path of the surrounding Area Provision shall be made for the disposal of surface water from roads.

A surface water drainage system covering the switchyard shall be installed. The system may be discharged to natural watercourses or to soak ways as approved. Surface water from roofs of buildings shall be drained to down pipes connected with the site drainage system. The number of runs and out falls and pipe sizing must be sufficient to cope with the severest precipitation, with a factor of safety of 1.2 within switchgear and other areas. It is to be ensured by the contractor that the surface water discharged from the substation does not cause any damage to the properties through which such water is discharge up to natural water courses as approved.

3.11 CHAIN LINK FENCE AND GATE

Chain link fences shall be constructed of galvanised steel wire, and shall be of such manufacture that when any one segment is cut, remaining segments within the pattern retain their rigidity. The bottom of the fence shall be fixed down with staples to a continuous concrete sill in accordance with BS 1722, Part 10.

- Two rows Block minimum 6 inch
- Steel wire for mesh and line wire shall comply with grade A of BS 4102. The galvanized coating on steel wires of mesh and line wires shall be comply with requirements of BS 443.
- All mesh shall be of galvanised steel wire of 3.15 mm diameter with a length of side not exceeding 50 mm. Line wires shall be of galvanised steel wire of the same gauge to adequately support the mesh rigidly. Line wire shall be provided at the top and bottom of the mesh and at two evenly spaced intermediate levels.
- The line wires shall be strained tightly by eyebolt strainers or winders at each straining post and secured to intermediate posts of stirrup wires passed through holes in the posts. The top wire shall be doubled, Mesh and line wires shall comply with BS 4102.
- Chain link mesh shall be strained between straining posts by means of stretcher bars and tied to line wires in accordance with Clause 3.5 of BS 1722, Part 10.
- Galvanized post 50mm “C” grade 6.5mm thickens at every 2.0m intervals
- Straining posts and struts shall be of Galvanised steel to the same standard as above. The posts shall be set in concrete in the ground. The posts shall have cranked tops set at 45 to the posts, to which shall be attached three strands of galvanised barbed wire to BS 4102. All post tops shall be fitted with PVC capping’s to suit.
- All posts at intervals shall be welded with 60 x 50 x 5mm thick earth lugs for provision of connection to the Earth Grid. Lugs shall be drilled with a 13mm diameter hole that shall be 25mm from the edge of 60mm free end.
- Barbed wires shall be strained between straining posts with eyebolts and fixed to intermediate posts with stirrup wires. Droppers shall be fitted at the centre of each Bay of the fence to prevent the wires being bunched together. Intermediate posts shall be provided at centres not exceeding 3 meters. Corner posts and struts shall be provided at all ends, corners, changes in direction, adjacent to gateposts and at intervals not exceeding 35 meters. All fence fittings shall be galvanised.
- The roller gate should be of 4.8m in length and installed as per design attached with 5mm Gothic mesh welded

3.12 EARTHING SYSTEMS

3.12.1 GENERAL

- The earthing of all equipment and the provision of earthing systems, electrodes and connections shall be in accordance with the recommendations in the "Guide for safety in Substation Grounding" IEEE No. 80 and the requirements of this Chapter.
- Steelworks and supporting structures shall be bonded and earthed to the substation earthing system. Earth connections shall be made approximately 250 mm above the top of the finished foundation level. Connections shall be made also to the earth terminals of each transformer.
- Except where the earth connection is bonded to the steelwork, insulated clamps shall be provided for supporting the earthing connection to high level equipment and the earth screen. There shall be an extension of the earth bar system into the substation buildings for connecting to indoor switchgear, control, relay and ancillary equipment.
- All necessary studs, connectors and earth bars shall be provided to permit the connection of each switchboard, motor or other electrical equipment supplies under the Contract to the transformer yard general earthing system.
- The provision for earthing shall be such that no reliance is to be placed on the conductivity of metal to metal joints without the use of special connectors however lightning arresters must be directly connected to the earthing grid.
- The earthing copper conductor shall be minimum 120mm^2 in cross sectional diameter. Total route length is 400m inclusive of the joints. Number of T-joints is 40 and number of lug joints 8.
- Trench earthing copper 50mm X 5mm flat bar route length – 50m and 25 insulator holders.

3.12.2 EXTENT OF WORK

- The Contract includes the Complete design of the substation earthing system including, connections of Plant supplied under this Contract to the main earthing system and all Site Tests as specified in this specification.
- The main earth system shall be installed prior to the construction of the transformer and equipment foundations.
- The Contractor will be required to prepare installation drawings and schedules of material to be provided. These drawings and schedules shall be submitted to the Employer's Representative for approval together with calculations of step, touch and mesh potentials.
- The contractor shall connect the new earthing grid to the existing earthing grids. The Employer's Representative shall approve the position at which the connections are made and the number of connections.

3.12.3 DESIGN OF EARTHING SYSTEMS

- The grounding system shall be designed according to the guideline given in ANSI/IEEE Standard 80.
- The site shall be provided with earth grid of buried conductors designed for an earth fault current specified 40kA for duration of 3 second, keeping the step and touch voltages within the limits as recommended in the guide ANSI/IEEE std. 80.
- The design of earth grid over the area occupied by the new transformer yard and associated apparatus shall be based on a maximum grid spacing of 17m x 15m.

- The Contractor shall carry out Site tests of the ground resistivity not later than one month after the award of the Contract and his final design of the earthing system shall be submitted and approved prior to foundation excavation works.
- Earthing points shall be provided by the Contractor such that the combined resistance of the earth grid and earthing points does not exceed 1 ohm, however combined resistance shall be considered for acceptance provided that the conditions recommended above are satisfied. It is the Contractor's responsibility to provide design calculations.

3.12.4 CONSTRUCTION OF EARTH GRIDS

- The earth grids shall be of hard drawn high conductivity copper conductor 120mm^2, and shall be installed at minimum depth of 600mm approved by the Employer's Representative below the ground level. After the construction of footings and foundations the area shall be backfilled. Cadweld shall be used where two earth conductors are to be joined.
- Connections for the transformer neutrals shall be provided using 50X5mm copper bar.

3.12.5 EARTHING POINTS

- The number of earthing points shall be verified by Site earth resistivity tests after the letting of the Contract.
- Each will consist of at least 15mm diameter copper rod electrodes, driven into undisturbed soil. Each electrode will be complete with approved non-ferrous clamps for the connection of earthing conductors and with a hardened steel tip and cap driving by means of a power hammer.
- Test link chambers and covers for each earthing point are to be provided and the Contractor for the approval of the Employer's Representative shall submit a drawing showing the proposed arrangement.

3.12.6 CONNECTION OF EARTHING POINTS AND SYSTEM NEUTRALS

- The electrodes of an earthing point shall be connected to the test link and there shall be duplicate conductors from each test link to the earth grid.
- Any neutral points for high voltage systems within the substation will have duplicate connections to earth grid.
- Conductors interconnecting the electrodes to a test link and between the test links and the earth grid will have a cross-sectional area of not less than 150 sq. mm. There will be at least two connections from each steel support etc. to the earth grid. Duplicate connections may be in the form of rings.
- Earthing conductors will be of soft annealed high conductivity copper stranded in accordance with Table 4 in BS.6346. Earthing conductors will normally be buried directly in the ground but where necessary they may be cleated to walls, fixed to cable racks or laid in the cable trenches as convenient.

3.12.7 EARTHING EQUIPMENT

- The frames of all electrical apparatus and the bases of all structural steelwork shall be connected by branches running to a group of equipment. All earth terminals and neutral current transformers shall be connected to the earth grid.

- Earthing of new 33kV/11 kV transformer yard shall be properly performed with copper strip 50mmX5mm, which enable connection to the equipment installed in and linked to main grid with more than two wires.

3.12.8 JOINTING AND BONDING

- Connections to plant and equipment shall be made using the earthing terminals specified in the Contract. Where a strip has to be drilled to fit an earth terminal the hole shall not be greater than half the width of the strip.
- Joints in earthing strip shall employ chemical welding or high compression joints.
- The main FEA Grid and the Transformer Grid shall be connected in at least 4 point

3.14.2 FILLING & REINSTATEMENT

- If it is required to fill the land, the Contractor shall get approval for the filling material and method of construction before the commencement of work.
- Filling for trenches, excavations and levelling of the site shall be deposited in layers not exceeding 300 mm of un compacted thickness, each layer watered when necessary and well rammed or otherwise compacted to within 98% of the maximum dry density obtained by the use of a Proctor Standard Compaction Test.
- Any fill material used within 500 mm of concrete structures cement bound materials shall have a soluble sulphate content not exceeding 2.5g per litre when tested in accordance with BS 1377, special precautions shall be taken to protect the concrete or cement bound materials to the approval of the Employer's Representative.
- Where excavations whether in rock or other material, are made to a greater depth than detailed, the intervening space shall be brought up to the proper level in plain concrete at the Contractor's expense.
- Any formation encountered in the excavations which is not sufficiently strong to carry the loads which will be imposed on it, shall be excavated to an adequate load bearing stratum and replaced with mass concrete.
- Unless otherwise described, directed or permitted, imported filling shall consist of pervious naturally occurring material, free from mud, silt, clay, peat, vegetable or injurious matter and water soluble salts harmful to copper and other metals. Filling shall be imported only from approved areas.

3.16 READY MIXED CONCRETE

- 25MPA Ready-mixed concrete shall be provided as defined in BS 5328, which batched off the Site, may be used only with the agreement of the Employer's Representative and comply with all requirements of the Contract.
- The concrete shall be carried in purpose made agitators operating continuously, or truck mixers. The concrete shall be compacted and in its final position within 2 hours of the introduction of cement to the aggregates, unless a longer time is agreed by the Employer's Representative. The time of such introduction shall be recorded on the delivery note together with the weight of the constituents of each mix.
- When truck-mixed concrete is used, water shall be added under supervision, either at the Site or at the central batching plant, as agreed by the Employer's Representative but in no circumstances shall water be added in transit.
- Unless otherwise agreed by the Employer's Representative, truck mixer units and their mixing and discharge performance shall comply with the requirements of BS 5328 part 3.

3.18 33kV CABLE TRENCH COVER REINFORCEMENT

- The Contractor shall ensure that the concrete trench cover reinforcement method is designed to allow for all expected imposed loadings. This is a permanent solution to allow 50Tonne vehicle also to run on top of it.

- The trench cover reinforcement shall be designed with a gradual slope of sufficient length and width to allow the safe entrance of trailer trucks loaded with 20 ton transformer from the entrance of the substation into the transformer yard.

3.19 Crushed metal

- Place weed mat suitable for the substation site. Bidder to submit the type. FEA engineer to approved.
- Dig and lay existing crushed metal – 10 inches from the entire perimeter, new screened crushed metal 40mm size,

3.19 MISCELLANEOUS WORK

Shall be carried out according to the relevant clause of this specification.

Section 3
Form of Proposals and Appendices

1 NOTES ON SCHEDULES

The Schedules are intended to provide the Employer with essential supplementary information in an organized format. Examples of more commonly used Schedules are given herein. Others may be devised and added in accordance with the requirements of the Instructions to Bidders.

All the Schedules are essential for bid evaluation and some in contract execution; they should all be incorporated in the Contract, and appropriate changes introduced with the approval of the Employer or its representative.

The schedules are to be completed and submitted as part of the Technical Proposal and Price Proposal in accordance with the Instructions to Bidders Clause 13, Documents Comprising the Bid. **Bidders whose Bids do not contact the data in the required format will be treated as non-responsive.**

2 SCHEDULE OF PRICES & CONDITIONS OF PAYMENT

2.1 *CONTRACT PRICE*

The Contract Price is comprehensive in that, in consideration of the Contractor meeting all obligations, conditions and liabilities under the Contract, including the Contractor's allowance for the cost of supply of all labour, materials, plant, supervision required to complete the Contract Works, overheads and profit, subject only such adjustment as is provided for the Contract.

2.2 *PAYMENTS TERMS*

1. All payments shall be due and payable by the Employer in accordance with the payments terms detailed below.
2. The payments shall be made on completion of milestones as identified and agreed by both the Employer's Representative and the Contractor.
3. The payments will be made based on the following schedule:

	Particulars	*Milestone*	*Payment (% of contract price)*
1	Advance payment	As per clause 13.2 of Section 3 - Conditions of Particular Application	NIL
2	Civil Works , fence and resurface switchyard	Progress of all civil works per substation	90%
3	Retention	12 months after issuing of performance certificate	10%

1 CONTRACTOR HEALTH & SAFETY PLAN

The bidder shall complete the following sub-sections to provide details in relation to the Health and Safety plans for the project.

CONTRACT DETAILS

Contractor Name: _____
Contractor Address: _____
Contractor Representative:_____
Contract Description: _____
Location of Works: _____
Timing of Works (approximate): Start Date:_____ End Date:_____

RESPONSIBILITIES

Name	*Position Held*	*Safety Responsibilities*	*Contact Number (Direct)*

EMERCENGY CONTACT DETAILS

Contact	*Name*	*Position*	*Contact Number (Direct)*
First Contact			
Second Contact			
Third Contact			
Forth Contact			

SCOPE & TASK DETAILS

List Major Tasks

RISK ASSESSMENT

Risk assessment is a fundamental tool in management of risk. It Involves the identification of hazards and control measures. Describe how you plan to carry out this process for this particular application contract.

SAFE WORK PROCEDURES

After completing the risk assessment, you must compile a safe system of work describing how you plan to control the hazards you have identified. Complete the following section outlining how you will ensure that all employees and subcontractors understand the Safe Work Procedures (SWP). Also attach copies of the relevant SWP.

PERSONAL PROTECTIVE EQUIPMENT

Where risk assessment identifies the need for personal protective equipment (PPE), then PPE must be made available. List down below the PPE you will require for this project.

ACCESSING SITE/TIMES OF WORK

If work is going to be carried out at FEA premises, then it is important to determine when you will be accessing the Site. You may need to sign a PASS and sign in and out. This will avoid conflicts with other activities which may be continuing on site during contract works. Describe below your site access requirements.

FENCING & SEPARATION OF WORK

In order to protect our employees as well as general members of the public, the work areas should, so far as is possible, be physically isolated with barriers like bollards, cones, tapes, netting, etc. Describe below how you will fence or separate your work.

SIGNS AND WARNINGS

Sufficient signs should be erected or placed so that adequate warning is afforded around the worksite. Describe the kinds of notices you will be putting up and places where you will be putting this.

GENERAL STORAGE & DISPOSAL OF WASTE

Describe below what waste you anticipate producing and how you plan to store and/or dispose off waste. You must take into account the nature of the waste e.g. hazardous/flammable.

FIRST AID & INJURY MANAGEMENT

A first aid program for contractors is outlined in FEA Safety Manual. Please describe below any additional first aid needs and specific Injury management process for this contract.

EMERGENCY PROCEDURES

Identify specific emergency procedures or equipment required for the contract.

INCIDENT REPORTING & INVESTIGATION

Describe how incidents will be reported and investigated during the contract.

SPECIALISED WORK OR LICENSING

List any special licences required for the contract.

TRAINING & INDUCTION REQUIREMENTS

Training and inductions for contractors are to be completed in accordance with the FEA Training requirements. List any training required for the contract works in relation to safety, for example safe procedure training and attach training certificates:

SAFETY MONITORING

List any ongoing inspections, hazards management or incident reporting or investigation processes to be used during the works, if relevant.
Describe below your site access requirements.

SUBCONTRACTOR MANAGEMENT

Complete the attached Subcontractor List detailing the subcontractors to be used and the details of the subcontractor management:

Sub Contractor Name	Sub Contractor Representative Name	Description of Work	Date of Local Induction

2 OTHER DOCUMENTS & DRAWINGS TO BE SUBMITTED WITH BID

As a minimum, the following documents & drawings shall be submitted with the Bid.

1. Evidence of Bidder's experience in works similar to this
2. List of standards the Bidder intends to follow, for civil works

Submission of tenders

Bidders are required to submit two (2) hard copies of the tender, one original and one copy in the tender box located at the FEA Head Office, 2 Marlow Street, Suva, Fiji no later than **4:00pm, on Wednesday 28th September, 2016 -** Addressed as:

Tender – MR 101/2016 – Design and Construct 33kV Switching Station at Nabou Green, Sigatoka

The Secretary Tender Committee
Fiji Electricity Authority
Head Office
Suva
Fiji

This tender closes at 4:00p.m (16.00hrs Fiji time) on Wednesday 28th September, 2016.

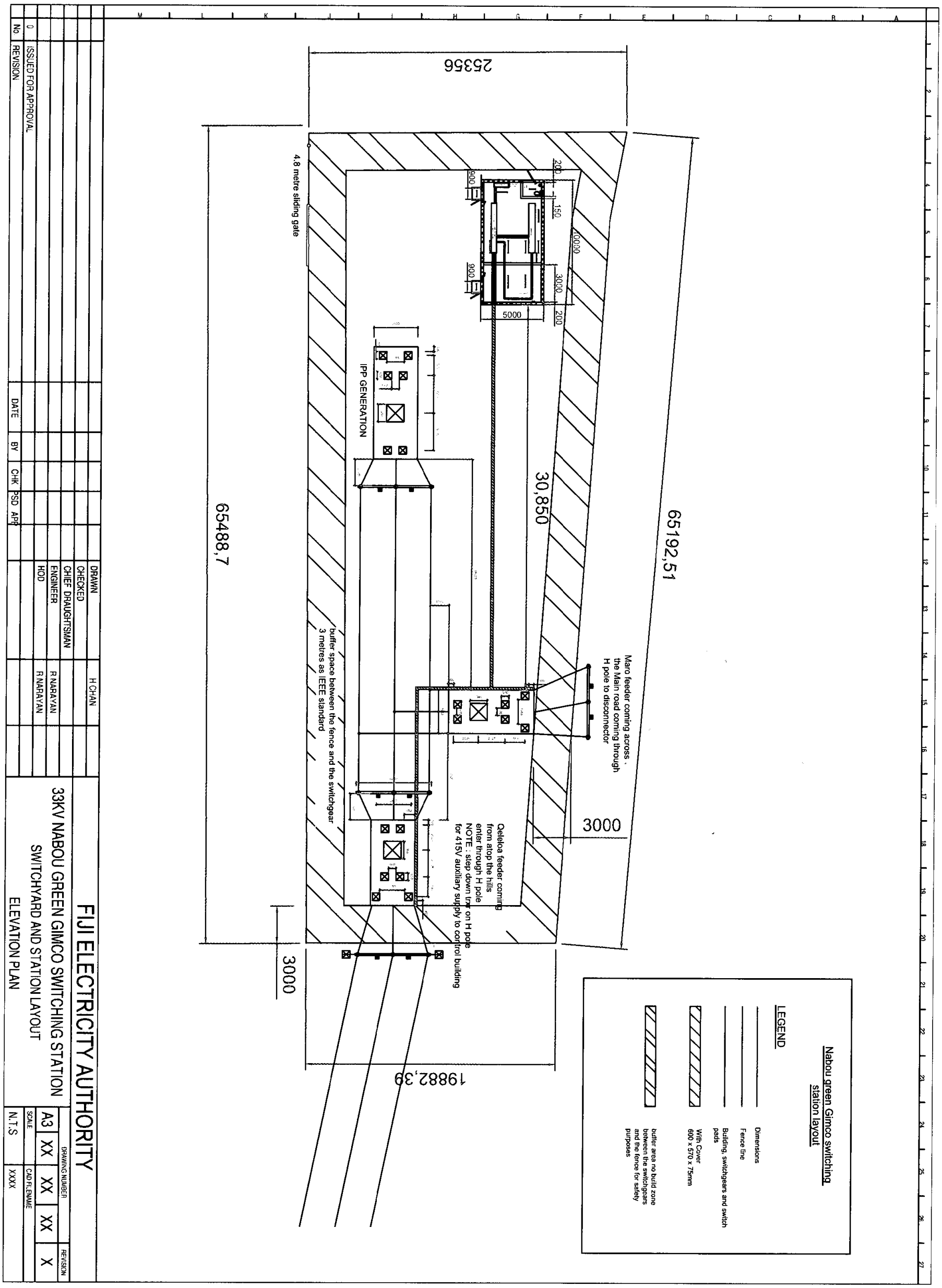
Site Visit: Nabou Green, Sigatoka at 10am Tuesday 20th September, 2016.

Lowest bid will not necessarily be accepted as successful bid.

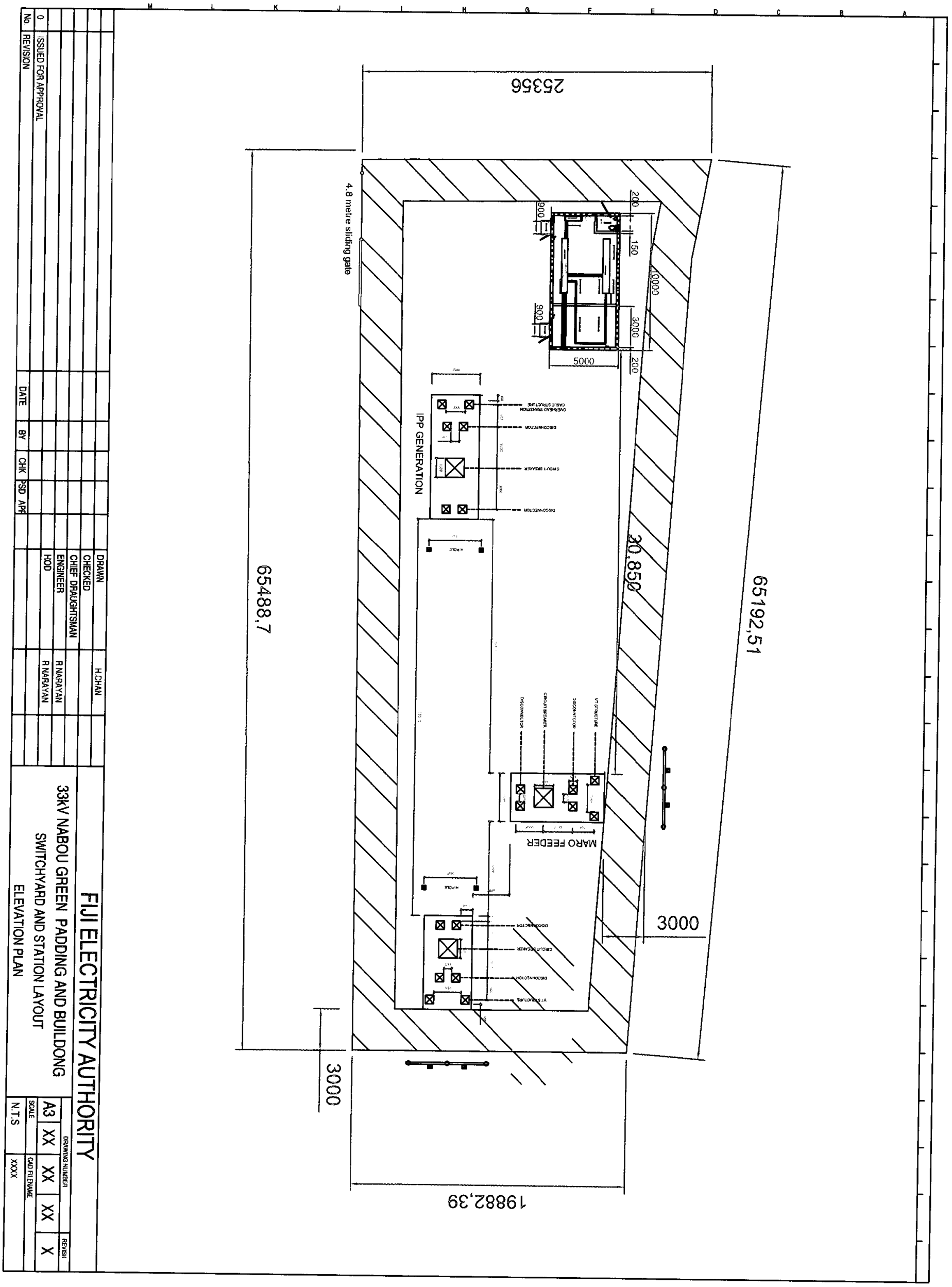
It is the responsibility of the bidder to pay courier chargers and all other cost associated with the delivery of the hard copy of the Tender submission.

Section 4
Drawings

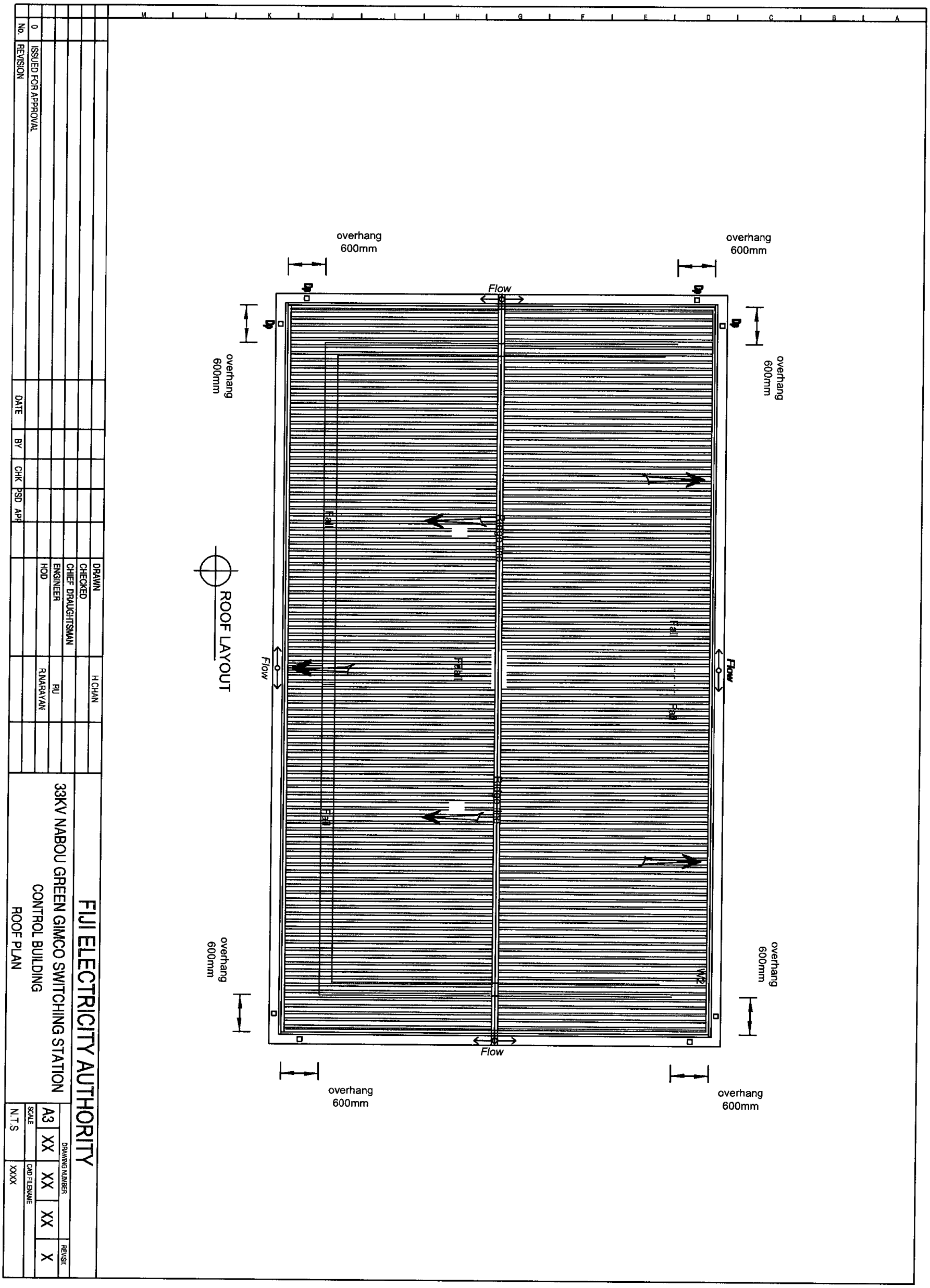
1. Nabou Green Substation Site Layout

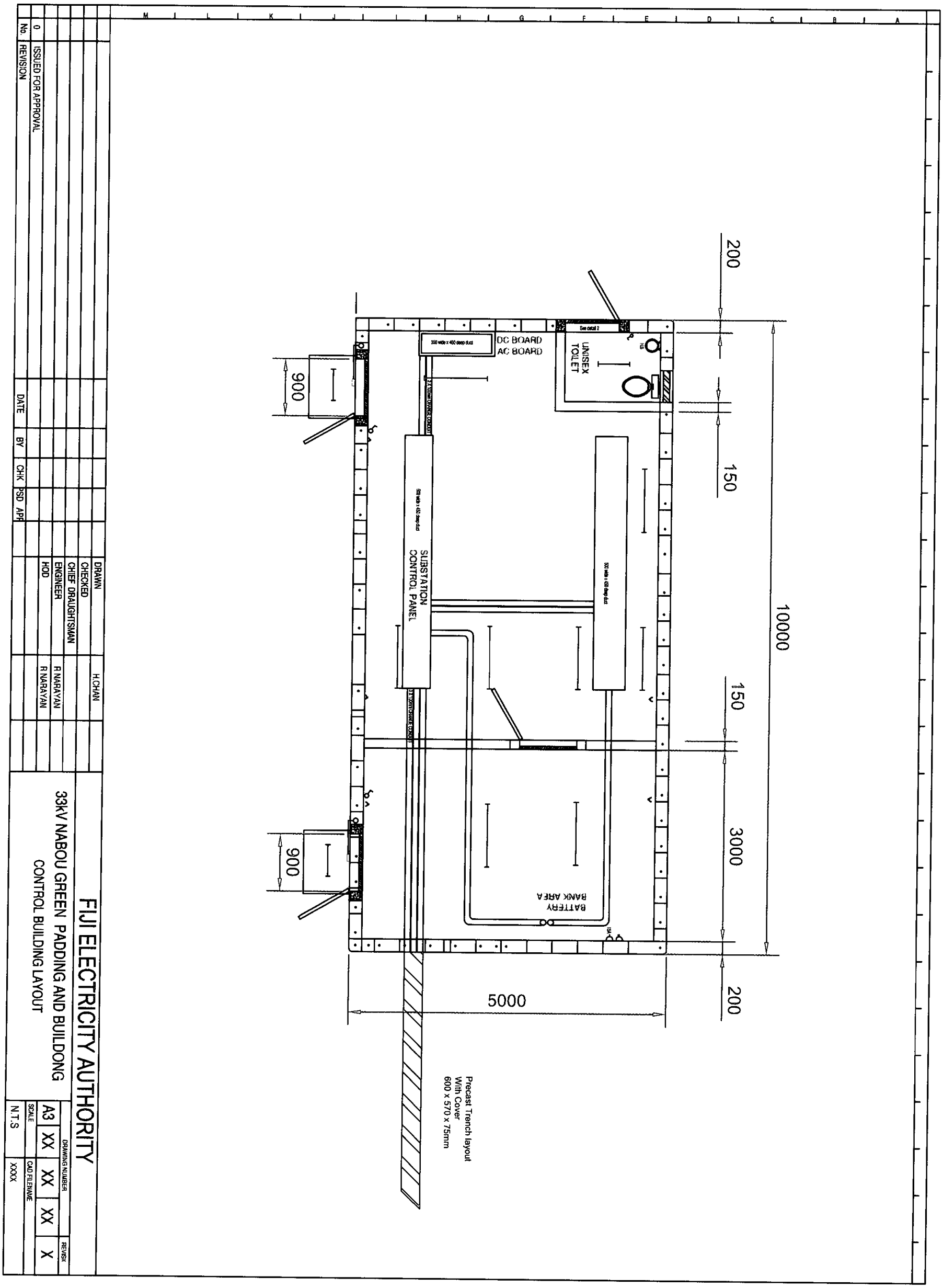


2. Nabou Green Substation Padding and building Switchyard layout

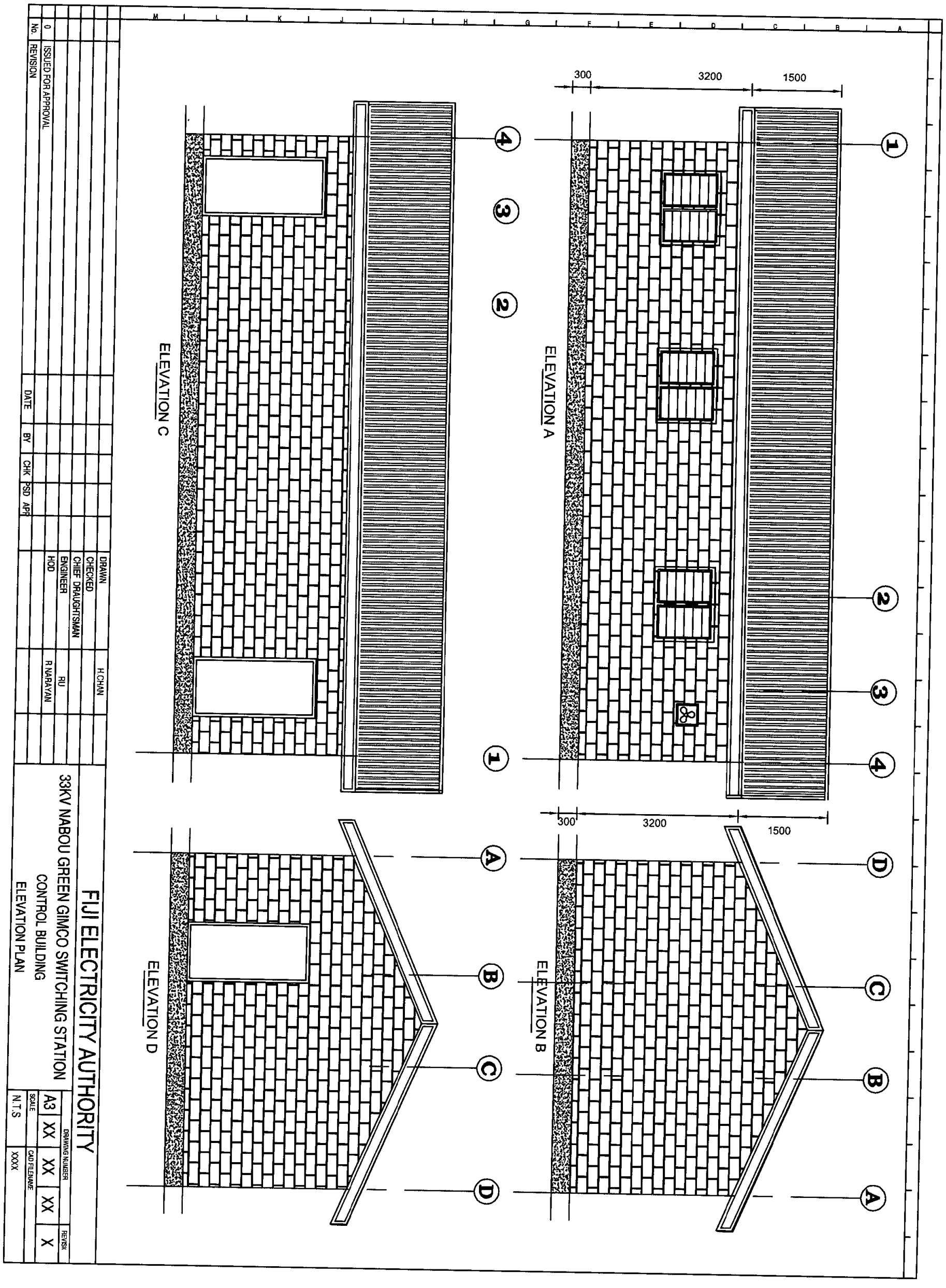


3. Nabou Green Substation control Building Layout



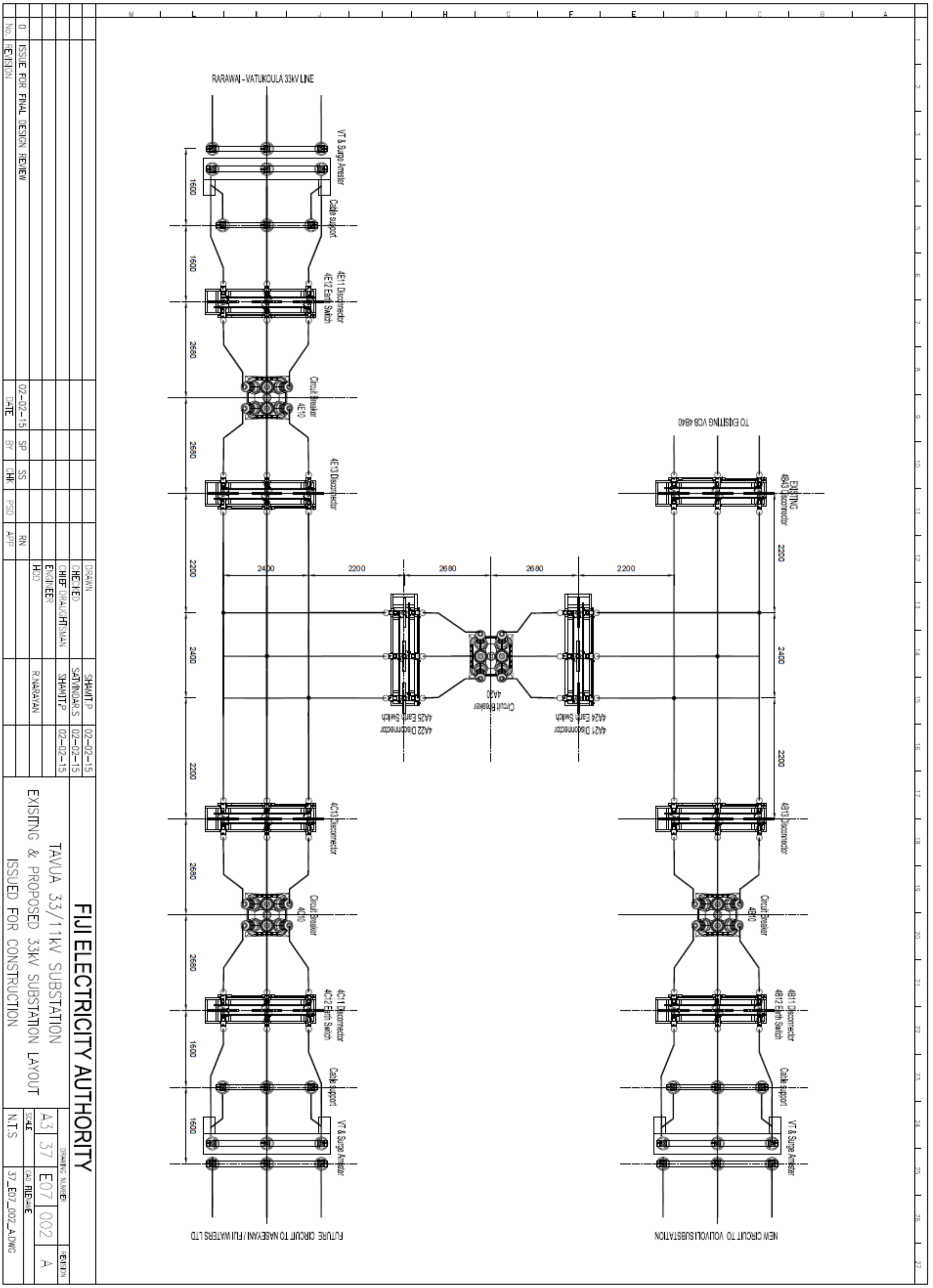

No.
REVISION
0
ISSUED FOR APPROVAL
DATE
BY
CHK
PSD
APR
DRAWN
CHECKED
CHIEF DRAUGHTSMAN
ENGINEER
HOD
H.CHAN
R NARAYAN
R NARAYAN
FIJI ELECTRICITY AUTHORITY
33kV NABOU GREEN PADDING AND BUILDONG
CONTROL BUILDING LAYOUT
DRAWING NUMBER
REVISION
SCALE
A3
XX
XX
XX
X
N.T.S
CAD FILENAME
XXXX
DC BOARD
AC BOARD
UNISEX TOILET
SUBSTATION CONTROL PANEL
BATTERY BANK AREA
See detail 2
350 wide x 450 deep duct
900
900
150
150
200
200
3000
10000
5000
Precast Trench layout
With Cover
600 x 570 x 75mm

4. Nabou Green Substation Elevation Layouts



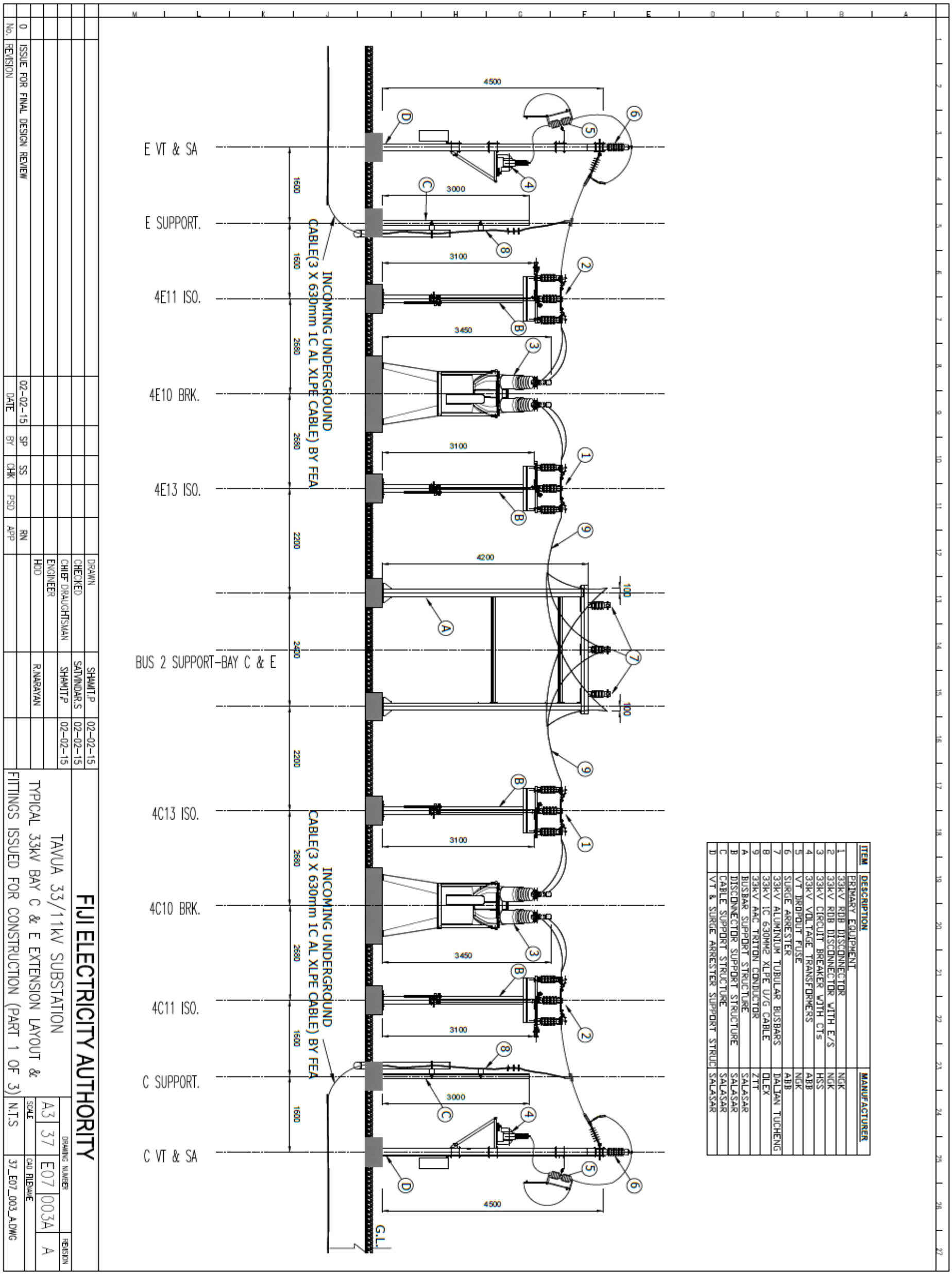
5. Nabou Green Substation 33kV Bus – Proposed Layout

The proposed layout shown below is for the Tavua Substation. Bidders are to consider a similar proposed layout for the Nabou Green substation.



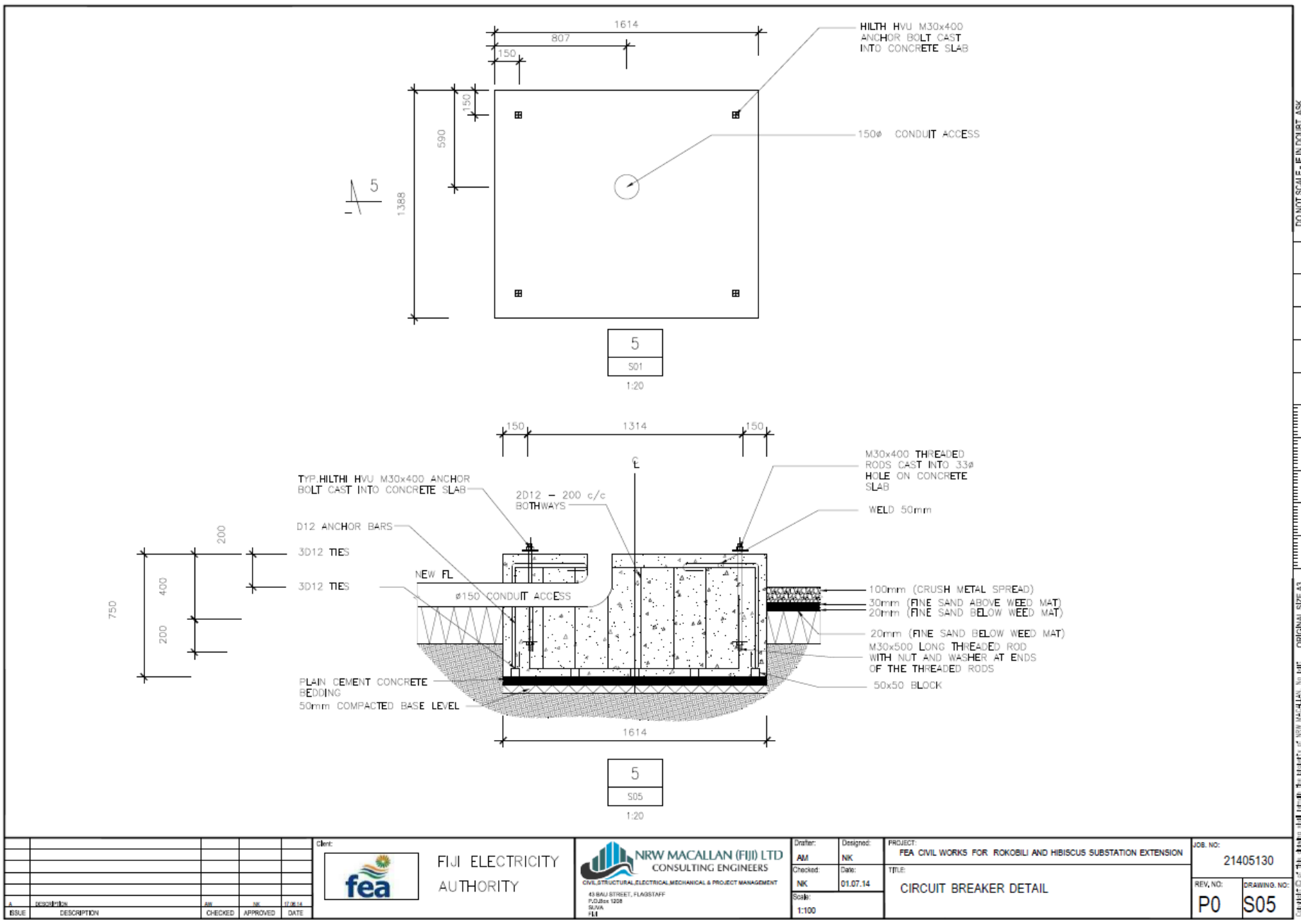
6. Nabou Green Substation 33kV Bus – Typical General Arrangement

The general arrangement shown below is for the Tavua Substation. Bidders are to consider a similar general arrangement layout for the Nabou Green substation.



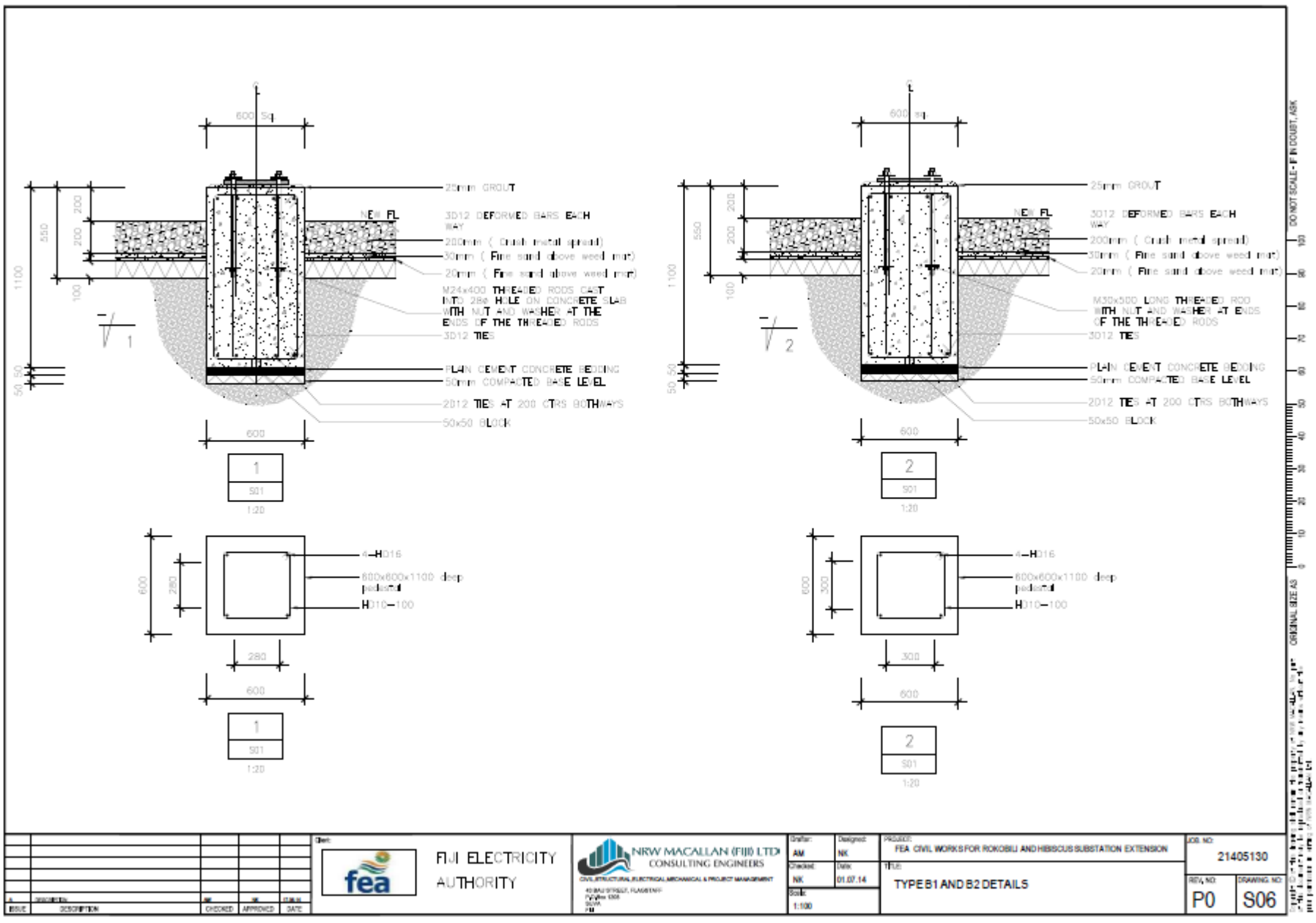
7. Nabou Green Substation 33kV Bus – Type A Foundation Pad Detail - Circuit Breaker

The padding detail for circuit breaker shown below is for the Rokobili Substation. Bidders are to consider a similar padding layout for the Nabou Green substation.



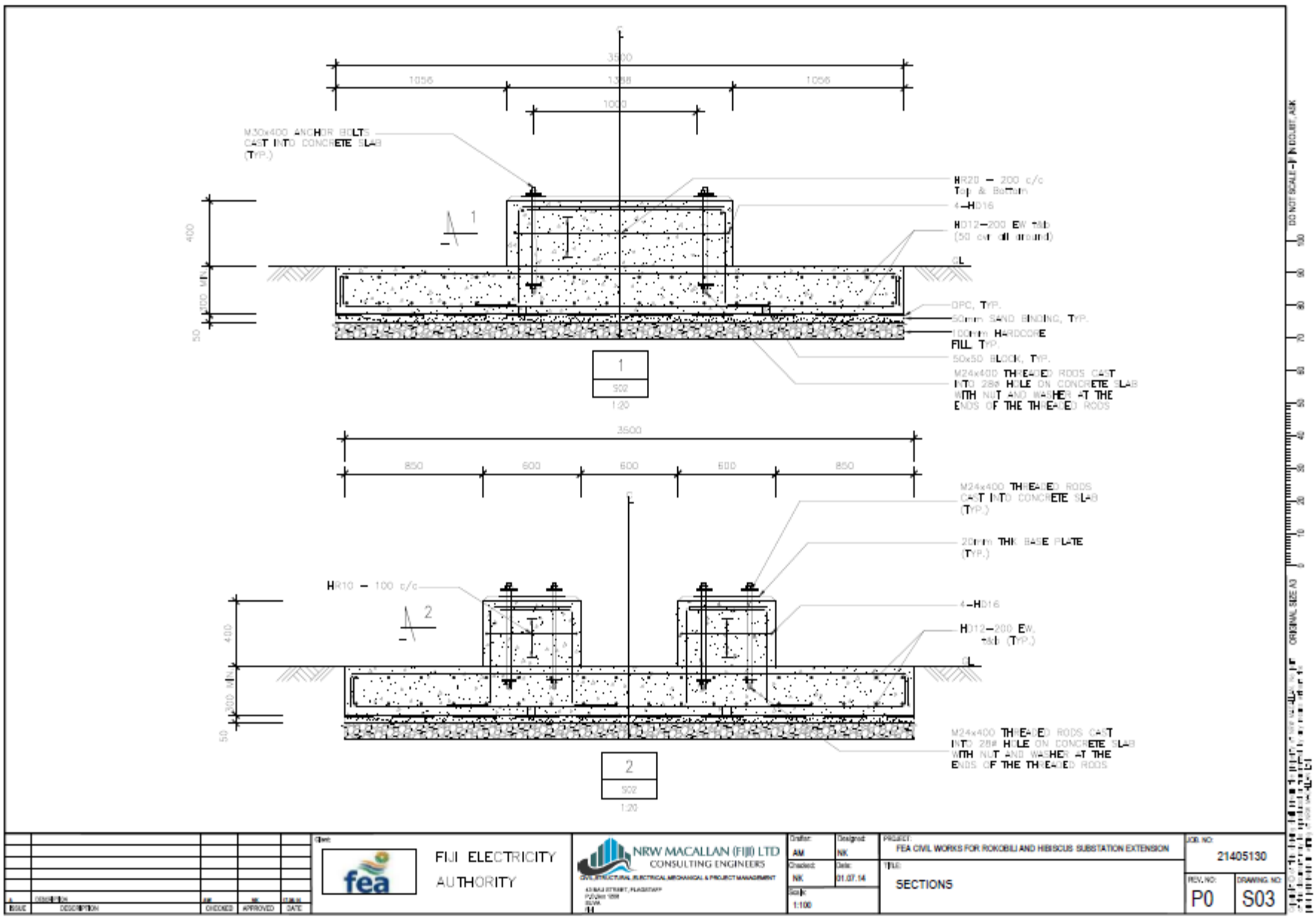
8. Nabou Green Substation 33kV Bus – Type B Foundation Pad Detail – SA, VT, Disconnectors, Bus & Cable Support

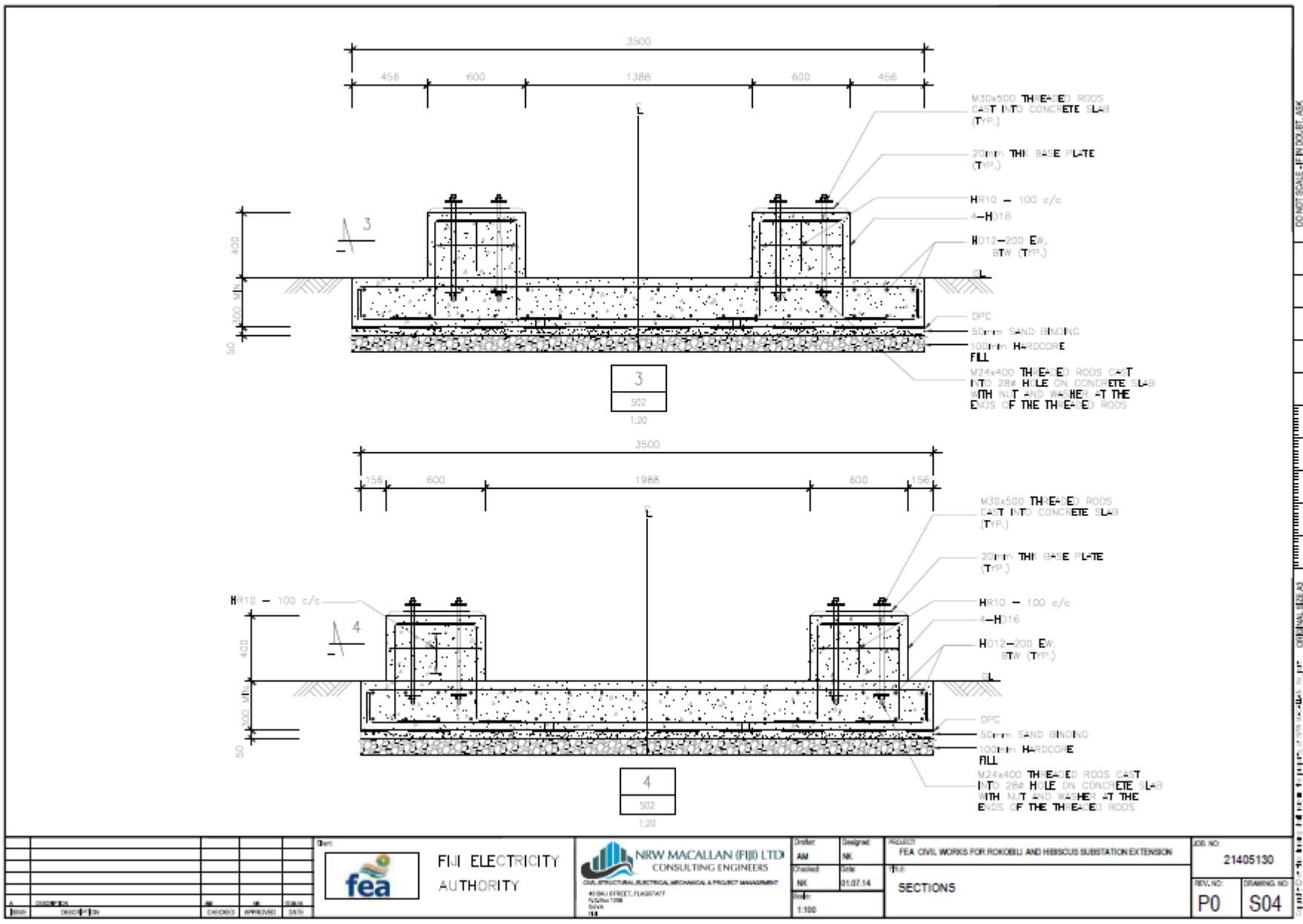
The padding details shown below are for the Rokobili Substation. Bidders are to consider a similar padding layout for the Nabou Green substation.



9. Nabou Green Substation 33kV Bus – Sections Layout

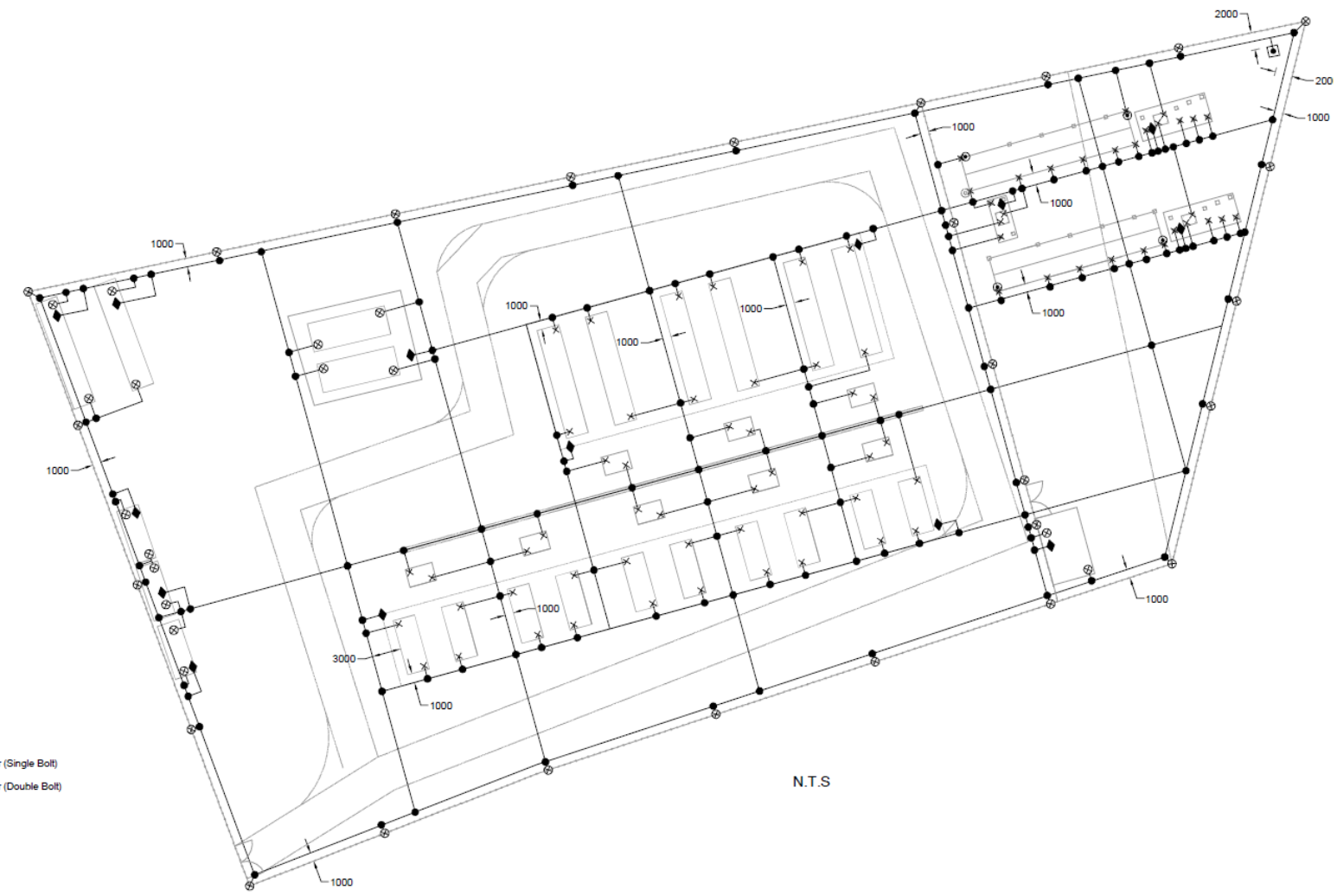
The section layout details shown below are for the Rokobili Substation. Bidders are to consider a similar section layout for the Nabou Green substation.




3500
456
600
1388
600
456
M30x500 THREADED RODS CAST INTO CONCRETE SLAB (TYP.)
20mm THK BASE PLATE (TYP.)
HR10 – 100 c/c
4–H016
H012–200 E.W. BTW (TYP.)
GL
DPC
50mm SAND BINDING
100mm HARDCORE FILL
M24x400 THREADED RODS CAST INTO 28ø HOLE ON CONCRETE SLAB WITH NUT AND WASHER AT THE ENDS OF THE THREADED RODS
3
502
1:20
3500
156
600
1988
600
156
M30x500 THREADED RODS CAST INTO CONCRETE SLAB (TYP.)
20mm THK BASE PLATE (TYP.)
HR10 – 100 c/c
4–H016
H012–200 E.W. BTW (TYP.)
GL
DPC
50mm SAND BINDING
100mm HARDCORE FILL
M24x400 THREADED RODS CAST INTO 28ø HOLE ON CONCRETE SLAB WITH NUT AND WASHER AT THE ENDS OF THE THREADED RODS
4
502
1:20
DO NOT SCALE-IF IN DOUBT, ASK
ORIGINAL SIZE A3
FIJI ELECTRICITY AUTHORITY
NIRW MACALLAN (FIJI) LTD
CONSULTING ENGINEERS
CIVIL,STRUCTURAL,ELECTRICAL,MECHANICAL & PROJECT MANAGEMENT
Drafter: AM
Designed: NK
Checked: NK
Date: 01.07.14
Scale: 1:100
PROJECT: FEA CIVIL WORKS FOR ROKOBILI AND HIBISCUS SUBSTATION EXTENSION
TITLE: SECTIONS
JOB NO: 21405130
REV. NO: P0
DRAWING NO: S04

10. Nabou Green Substation 33kV Bus – Earth Grid Layout

The earth grid shown below is for the Rokobili Substation. Bidders are to consider a similar earth grid layout for the Nabou Green substation.



LEGEND:

- 95mm² Cu Stranded Conductor
- Bolted Connection to Structure/Container (Single Bolt)
- Bolted Connection to Structure/Container (Double Bolt)
- Bolted Connection to Foundation Rebar
- Exothermically Welded Connection
- Fence
- 17.5 m Lightning Mast
- 0.9 m Lightning Rod

N.T.S

NOTES:

1. All dimensions in mm unless otherwise stated.
2. All work, material and construction to comply with installation specification.
3. Main earth grid conductor is 95mm2 HDCu stranded conductor.
4. Main earth grid conductors to be installed at 500mm depth below finished switchyard surface level.
5. Install minimum 150mm thick layer of crushed rock inside security fence.
6. Grid conductor to be installed below cable treches or foundations where they clash.
7. Earth grid dimensions indicative only. Minor adjustments may be made to suit foundation layout.
8. Main grid conductors to be installed nominally 1m from edge of generator containers. Conductors to be installed no more than 100mm from generator foundations if the conductor clashes at 1m from container.
9. Earth grid conductor to clear other services by minimum 100mm at crossings.
10. The fence is to be bonded to the earth grid at intervals of no more than 20m.
11. Earth grid conductor sizing designed for an earth fault current of 9kA for 2 seconds.
12. Install operator earth mats directly below operator standing position.
13. FEA to specify portable earthing connection points.

11. Nabou Green Substation Fence and GATE Details