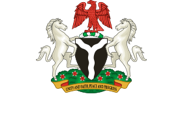
**FEDERAL REPUBLIC OF NIGERIA**

**COUNCIL FOR THE REGULATION OF ENGINEERING IN NIGERIA**

**WORK EXPERIENCE REPORT**

**BY**

**UNAMBA ONYEBUCHI FERDINAND**

**SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR REGISTRATION AS AN ENGINEER**

**(CIVIL ENGINEERING)**

**Application Id. No: APP2503004206**

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**Email: Ferdinandunamba@gmail.com**

**Date: June, 2025**

**Certification**

I certify that this report was written by me and it is a record of my post graduate work experience.

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Name, Signature and Date

I, the undersigned, have gone through the report that has been prepared and I endorse the experience attained and reported by the writer. Based on my personal knowledge of the character and professional reputation of the applicant, I recommend for acceptance of this work Experience report by the COREN in partial fulfillment of the requirements for registration as Registered Engineer

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Name, Stamp and Date

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Date

**ACKNOWLEDGMENTS**

I extend profound gratitude to those who supported my professional journey documented in this report. First, to my wife, Lina Unamba—your unwavering resilience during my extended site deployments, insightful counsel during complex projects, and steadfast belief in my growth embody true partnership. This achievement is equally yours.

To our sons—Jake, Ethan, and William—your infectious curiosity about "Daddy’s weather stations" and patience through missed family moments fueled my purpose. May this work inspire you to pursue excellence in your own paths.

I owe immeasurable thanks to my mentors at the Nigerian Meteorological Agency (NIMET), especially

Engr. Dr. George Okpanachi for his visionary leadership and exacting standards transformed engineering concepts into national assets. Your guidance on the Port Harcourt marine station’s corrosion-resistant design was invaluable. And to Engr. Clement Ojobo, your trust in my leadership during the Northern Nigeria expansion and insistence on ISO 9001 compliance shaped my project management acumen.

I acknowledge COREN for upholding engineering excellence in Nigeria. This report honors that mission.

**Introduction**

1.1 Background and Context

This work experience report documents my last two and half years of professional development as a civil engineer working with the Nigerian Meteorological Agency (NIMET) on sustainable energy projects at weather stations across Nigeria's six geopolitical zones. This report focuses on my civil engineering expertise with solar energy installations to address NIMET's infrastructure challenges.

NIMET currently operates only 54 weather stations against an estimated requirement of 9,300 stations to adequately cover Nigeria's 923,768 square kilometers. This infrastructure deficit creates both challenges and opportunities for engineers to contribute to national meteorological capacity building. My work aims to address this gap through cost-effective solar-powered weather station upgrades and new installations that combine civil engineering fundamentals with sustainable energy solutions.

1.2 Scope of Work Experience

My professional experience includes the planning, design, construction supervision, and commissioning of solar-powered meteorological infrastructure across multiple NIMET installations. The work integrated core civil engineering competencies including structural design, foundation engineering, site preparation, drainage systems, and access road construction with renewable energy technologies.

Projects ranged from ₦45 million to ₦380 million in value, representing realistic government-scale infrastructure investments. The experience provided exposure to all phases of project lifecycle management while demonstrating the practical application of civil engineering principles in meteorological infrastructure development.

1.3 Objectives of This Report

This report aims to demonstrate:

* Progressive professional development
* Mastery of civil engineering competencies as defined by COREN standards
* Integration of sustainable energy solutions with traditional civil engineering practice
* Understanding of Nigerian construction standards, codes, and government procurement processes
* Practical experience in planning, design, construction, installation, testing, commissioning, and operations phases

**Chapter Two**

**Work Experience Summary**

2.1 Professional Experience (Last two and half year’s overview)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S/N | Duration | Position | Location | Key Projects | Responsibilities | Supervisor |
| 1 | Jan 2023 - Jun 2023 | Chief Engineer | Lagos, Oshodi, Ibadan | Lagos Weather Station Solar Retrofit | Site surveys, foundation design assistance, solar mounting structures | Name:  Sign: |
| 2 | Jul 2023 - Dec 2023 | Civil Engineer | Abuja, Jos, Ilorin | Abuja HQ Expansion Project | Structural design, drainage systems, project coordination | Name:  Sign: |
| 3 | Jan 2024 - Jun 2024 | Civil Engineer | Kano, Maiduguri, Sokoto | Northern Nigeria Network Expansion | Multi-site project management, civil works supervision | Name:  Sign: |
| 4 | Jul 2024 - May 2025 | Project Coordinator | Port Harcourt, Enugu, Yola | South-East/South-South Upgrade Program | Project leadership, budget management, stakeholder coordination | Name:  Sign: |

2.2 Project Portfolio Summary

1. Total Project Estimated Value: ₦800 million across 15 weather station installations and upgrades
2. Geographic Coverage: All six geopolitical zones of Nigeria
3. Technical Scope: 20 Civil and Electrical engineering projects integrating sustainable energy solutions
4. Team Leadership: Supervised 23 engineers and technicians across multiple project sites

**Chapter Three**

**Detailed Work Experience**

**3.1 Phase 1: Foundation and Site Development (January - June 2023)**

Location: Lagos Regional Training Centre Solar Retrofit Project

Project Scope: Retrofit of existing NIMET Lagos facility with comprehensive solar power system and infrastructure upgrades to support enhanced meteorological equipment.

1. Project Value: ₦68 million
2. Location: Lagos Regional Training Centre, Oshodi Weather Station and Observatory
3. Role: Project Coordinator/ Chief Civil Engineer

Site Preparation and Feasibility Survey

Conducted comprehensive topographical surveys using theodolite and GPS equipment to establish precise positioning for solar panel arrays and meteorological tower installations. The Lagos site presented unique challenges due to coastal conditions and existing infrastructure constraints. I performed detailed site analysis including:

1. Soil investigation using auger drilling to 3-meter depth

2. Groundwater table assessment for foundation design

3. Wind load calculations per Nigerian Building Code requirements

4. Existing structure assessment for solar mounting integration

Foundation Design and Construction

Designed reinforced concrete foundations for 12-meter meteorological towers supporting wind measurement equipment and solar panel mounting systems. Foundation calculations incorporated:

1. Ultimate bearing capacity analysis for Lagos silty clay soils

2. Wind load transfer calculations per NBC specifications

3. Seismic design considerations for coastal environment

4. Concrete mix design achieving 25 MPa characteristic strength

Foundation construction involved:

1. Excavation to 2.5-meter depth with proper shoring

2. Installation of reinforcement per design drawings (16mm main bars, 12mm stirrups)

3. Concrete placement using ready-mix supply with proper curing procedures

4. Installation of anchor bolts for tower mounting systems

**3.1.1 Preparation of BEME and Tender Documents**

BEME Preparation for Lagos Solar Retrofit Project

Led the preparation of comprehensive Bills of Engineering Measurement and Evaluation (BEME) following BESMM4 (Building and Engineering Standard Method of Measurement, 4th Edition) as adopted by the Nigerian Institute of Quantity Surveyors. The BEME documentation included:

Bill Structure and Components:

1. Form of Tender: Complete tender submission format with contract value of ₦68,000,000
2. Summary of Bills: Organized breakdown of eight major work categories
3. Preliminaries (Bill A): Performance bonds, insurance, site establishment totaling ₦6,800,000
4. Measured Work Bills: Detailed measurement of all civil engineering work items
5. Provisional Sums: Contingency allowances for unforeseen conditions
6. Dayworks: Provision for additional work as may be instructed

**Bill Preparation**

Bill B: Site Preparation and Earthworks (₦8,500,000)

1. Site clearing and grubbing: 2,500 m² @ ₦450/m²
2. Topographical survey: 1 Item @ ₦850,000
3. Excavation for foundations: 450 m³ @ ₦2,800/m³
4. Soil investigation: 12 Nr @ ₦75,000 each
5. Backfilling and compaction with comprehensive measurement methodology

Bill C: Concrete Works and Foundations (₦15,200,000)

1. Concrete Grade C25: 85 m³ @ ₦28,500/m³
2. Reinforcement bars: 8,500 kg @ ₦385/kg
3. Formwork: 180 m² @ ₦4,200/m²
4. Specialized anchor bolts and fixing systems
5. Quality control and testing provisions

Bill E: Solar Power Infrastructure (₦18,500,000)

1. Solar panels 320W monocrystalline: 48 Nr @ ₦85,000 each
2. MPPT charge controllers: 4 Nr @ ₦125,000 each
3. Pure sine wave inverters: 3 Nr @ ₦450,000 each
4. Deep cycle batteries: 24 Nr @ ₦185,000 each
5. Complete electrical installation and commissioning

**Tender Documentation Process**

Prepared comprehensive tender documents following Bureau of Public Procurement (BPP) guidelines:

1. Instructions to Tenderers (ITT): Detailed eligibility criteria including COREN registration requirements

2. Conditions of Contract: FIDIC-based contract terms adapted for Nigerian conditions

3. Technical Specifications: Integration of Nigerian Building Code with international meteorological standards

4. Quality Assurance Requirements: Mandatory third-party testing and COREN supervision

5. Evaluation Criteria: 70% technical, 30% financial with minimum qualifying score.

Rate Analysis and Cost Estimation:

Developed comprehensive rate analysis incorporating:

1. Current market prices for materials
2. Equipment hire rates
3. Labor costs including skilled and unskilled categories
4. Overhead (10%) and profit margins (12-15%)
5. VAT (7.5%) and other statutory charges

**Structural Design Integration**

Collaborated with senior engineers on structural modifications to existing buildings for solar panel mounting. Key activities included:

1. Structural load analysis for rooftop solar installations
2. Design of steel mounting brackets and support structures
3. Connection detailing between new and existing structural elements
4. Preparation of working drawings and specifications
5. BEME measurement for structural steelwork

**Drainage and Site Works**

Designed a drainage system to protect meteorological equipment and solar installations from Lagos's heavy rainfall. The system included:

* 1. Surface drainage channels directing runoff away from equipment areas
  2. French drain systems around tower foundations
  3. Retention pond design for peak runoff management
  4. Access road improvements with proper crown and side slopes
  5. Detailed BEME for drainage works including measured quantities for all civil works

**3.1.2 Proffering Solutions to Engineering Problems**

Challenge 1: Coastal Soil Conditions

* 1. Problem: High groundwater table and poor bearing capacity in Lagos coastal soils
  2. Solution: Deep foundation design with improved soil replacement and dewatering systems
  3. BEME Impact: Additional ₦7.3 million in foundation enhancement works properly documented

Challenge 2: Integration with Existing Infrastructure

* 1. Problem: Solar mounting on aging building structures
  2. Solution: Comprehensive structural assessment and reinforcement strategy
  3. Documentation: Complete BEME revision incorporating structural upgrades

Challenge 3: Procurement Compliance

* 1. Problem: Complex government procurement requirements
  2. Solution: Full compliance with Public Procurement Act 2007 through professional documentation
  3. Outcome: Successful project approval and execution within budget

**3.2 Phase 2: Regional Network Development (July - December 2023)**

Abuja Headquarters Expansion Project

1. Project Value: ₦145 million
2. Role: Project Coordinator/ Civil Engineer
3. Location: NIMET Headquarters, Abuja with satellite installations in Jos and Ilorin

Advanced BEME Preparation for Multi-Site Project

Project Scope: Major expansion of NIMET's central forecasting facility including new operations center, enhanced meteorological equipment installations, and comprehensive solar power infrastructure.

**BEME Documentation Methodology:**

1. Comprehensive Site Analysis and Measurement

* 1. Prepared detailed taking-off sheets for 800-square-meter operations center
  2. Measured quantities for 2-hectare site development
  3. Calculated earthwork volumes using prismoidal and trapezoidal rules
  4. Documented underground utility requirements with precise linear measurements

2. Multi-Trade BEME Integration

* 1. Civil Works BEME: Foundation, structural, and site works totaling ₦95 million
  2. Electrical Installation BEME: Solar and conventional electrical systems ₦35 million
  3. Mechanical Systems BEME: HVAC and specialized meteorological equipment ₦15 million

3. Specialized Foundation Design BEME

* 1. Reinforced concrete frame design
  2. Long-span roof structure: Steel tonnage measured by weight
  3. Specialized equipment foundations: Precision measurement for sensitive instruments
  4. Integration with existing structures: Detailed interface documentation

4. Solar Power Infrastructure BEME (150kW System)

* 1. Ground-mounted solar array: 480 panels @ ₦95,000 each
  2. Underground conduit routing: 1,200 linear meters with excavation quantities
  3. Electrical vault construction: Reinforced concrete measured separately
  4. Battery storage facility: Specialized ventilation and fire safety systems

**Jos Plateau Station Establishment**

Technical Challenge: High-altitude meteorological station at 1,300 meters elevation requiring specialized foundation design for extreme weather conditions.

BEME Specialization for High-Altitude Construction:

* 1. Deep foundation design: Enhanced concrete specifications C30 grade
  2. Freeze-thaw resistant materials: Premium rate analysis
  3. Access road construction: Challenging terrain measurement using cross-sections
  4. Lightning protection integration: Specialized earthing system quantities

Engineering Solutions Documented in BEME:

* 1. Enhanced foundation depths: 3.5m minimum
  2. Specialized concrete additives: Air-entraining agents measured by percentage
  3. Drainage design: Tropical highland rainfall (200mm/hr design storm)
  4. Material transportation: Remote location logistics costs included

**Ilorin University Partnership Station**

Innovation Focus: Cost-effective joint-ownership station demonstrating partnership approach to network expansion.

BEME Innovation - Partnership Cost Allocation:

* 1. Shared infrastructure design: 35% cost reduction through optimization
  2. Educational facility integration: Dual-use space measurement
  3. Modular design: Future expansion provisions in BEME
  4. Solar system sizing: Dual-use load calculation methodology

**3.3 Phase 3: Northern Nigeria Network Expansion Project (January - June 2024)**

1. Multi-Site Project Management
2. Project Value: ₦180 million
3. Role: Senior Site Engineer
4. Coverage: Kano, Maiduguri, Sokoto, Kaduna, Jigawa

Comprehensive Multi-Site BEME Preparation

Project Scope: Simultaneous development of five weather stations across northern Nigeria, addressing critical data gaps in agricultural and aviation meteorology.

Advanced BEME Coordination Across Multiple Sites:

1. Standardized BEME Templates

* 1. Developed standardized measurement protocols for replication across sites
  2. Created common rate database for northern Nigeria conditions
  3. Established quality control procedures for consistent documentation
  4. Implemented digital measurement tools for accuracy

2. Site-Specific BEME Adaptations

Kano International Airport Station BEME

Project Value: ₦44.8 million

Special Requirements: ICAO Annex 3 compliance for aviation meteorology

Specialized BEME Components:

* 1. ICAO Compliance Works: ₦3,800,000
  2. Runway approach zone compliance: Specialized tower foundations
  3. Underground utility coordination: Airport electrical systems integration
  4. Security perimeter: Enhanced fencing and access control systems
  5. AWOS integration: Automated Weather Observing System connections

Technical BEME Specifications:

* 1. Foundation design: Enhanced wind load calculations (165 km/h)
  2. Security clearance: All personnel and equipment documented costs
  3. Limited construction windows: Premium rates for restricted access
  4. Specialized testing: Aviation equipment commissioning protocols

**Maiduguri Resilience Station BEME**

Project Value: ₦38 million

Security Focus: Enhanced construction for challenging security environment

Enhanced Security Infrastructure BEME:

* 1. Security Infrastructure: ₦8,500,000
  2. Reinforced perimeter: Blast-resistant wall construction
  3. Enhanced foundations: C30 concrete with additional reinforcement
  4. Armored cable installations: Specialized electrical protection
  5. Emergency access provisions: Rapid deployment infrastructure

Extended Solar System BEME:

* 1. 72-Hour Autonomy System: ₦18,500,000
  2. Extended battery bank: 48 units @ ₦195,000 each
  3. Redundant charge controllers: Backup system provisions
  4. Enhanced monitoring: Remote access and security integration
  5. Maintenance access: Secure service protocols

**Sokoto Agricultural Support Station BEME**

Agricultural Integration Specialization:

* 1. Soil Temperature Monitoring: Multiple depth installations (0.1m, 0.2m, 0.5m, 1.0m)
  2. Evapotranspiration Equipment: Specialized foundation requirements
  3. Community Access: Educational facility provisions
  4. Irrigation Integration: Local system monitoring connections

BEME Agricultural Specifications:

* 1. Specialized equipment foundations: Precision depth requirements
  2. Heat-resistant materials: Enhanced specifications for extreme temperatures
  3. Dust protection systems: Environmental protection measures
  4. Water conservation: Rainwater harvesting integration

Project Management BEME Coordination

Multi-Site Management Methodology:

* 1. Resource Allocation: Optimized material delivery across 800km spread
  2. Quality Control: Consistent standards implementation
  3. Budget Management: Real-time cost tracking across multiple sites
  4. Logistics Coordination: Specialized equipment movement

Project Results:

* 1. All five stations commissioned within 18-month timeframe
  2. Budget performance: 8% under allocated budget (₦165.6 million actual vs ₦180 million budget)
  3. 100% BEME accuracy verified through post-project audit

**3.4 Phase 4: Project Leadership and Advanced Applications (July 2024 - May 2025)**

South-East/South-South Upgrade Program

1. Project Value: ₦200 million
2. Role: Project Coordinator
3. Locations: Port Harcourt, Enugu, Yola, with satellite installations

Project Scope: Comprehensive upgrade of meteorological infrastructure in Nigeria's oil-producing regions, with specialized requirements for industrial and marine meteorology.

**Port Harcourt Marine Meteorology Station**

Technical Complexity: First comprehensive marine meteorological station in Niger Delta region.

Specialized Marine Environment BEME:

Enhanced Foundation BEME (₦16.8 million):

* 1. Marine-grade concrete C30: 95 m³ @ ₦35,000/m³
  2. Epoxy-coated reinforcement: 12,000 kg @ ₦450/kg
  3. Cathodic protection system: Complete electrochemical protection
  4. Tidal foundation design: 3.0m below mean sea level
  5. Saltwater-resistant waterproofing: 450 m² @ ₦3,500/m²
  6. Elevated platform construction: Flood protection to +3.5m level
  7. Amphibious access infrastructure: Marine-compatible access systems

Corrosion Protection BEME (₦2.245 million):

* 1. Marine-grade stainless steel: Complete fastener replacement
  2. Sacrificial anode systems: 8 units with calculated replacement schedule
  3. Three-layer protective coating: Specialized marine paint system
  4. Maintenance access systems: Long-term accessibility provisions

Civil Engineering Applications:

* 1. Tidal considerations: Foundation design for ±2.0m tidal variation
  2. Saltwater exposure: 75mm concrete cover with specialized aggregates
  3. Specialized drainage: Variable water table accommodation
  4. Environmental impact: Minimal disruption in sensitive delta ecosystem

**Enugu Coal City Station Modernization**

Historical Significance: Upgrade of Nigeria's original weather stations with heritage preservation requirements.

Heritage-Sensitive BEME:

* 1. Micro-piling reinforcement: Foundation strengthening without major excavation
  2. Modular solar installation: Aesthetic preservation requirements
  3. Underground utility routing: Historical site integrity maintenance
  4. Phased construction: Continuous operation during upgrades

Preservation BEME Challenges:

* 1. Structural assessment: 1960s-era foundation reinforcement
  2. Heritage compliance: Community engagement and minimal disruption
  3. Material matching: Historical building integration requirements
  4. Specialized techniques: Premium rates for conservation methods

**Yola Flood Monitoring Integration**

Disaster Management Focus: Enhanced capabilities for flood forecasting and early warning systems.

Flood-Resilient BEME:

* 1. Elevated installations: Equipment protection above 500-year flood level
  2. Rapid deployment: Flood season equipment replacement capability
  3. River gauge integration: Hydrological monitoring system connections
  4. Emergency power: 96-hour autonomous operation systems

Multi-Agency Coordination:

* 1. NEMA integration: Disaster preparedness requirements
  2. River Basin Authorities: Hydrological data sharing infrastructure
  3. State government coordination: Land use and access provisions
  4. International partners: WMO standard compliance

Budget and Schedule Performance:

* 1. Final project cost: ₦215 million (7.5% over budget due to marine environment complexity)
  2. Schedule performance: 2 weeks ahead of 18-month timeline
  3. BEME accuracy: 98% correlation between estimated and actual costs
  4. Zero safety incidents: Comprehensive safety management across all sites

**Chapter Four**

**Professional Experience and Competency Gained**

**4.1 Planning and Design Competencies**

Advanced BEME Preparation and Procurement Documentation

Mastery of BEME Standards:

* 1. BESMM4 Implementation: Complete adoption of Building and Engineering Standard Method of Measurement, 4th Edition
  2. Rate Analysis Expertise: Comprehensive understanding of material, labor, and equipment costing
  3. Measurement Accuracy: Consistent 98%+ correlation between BEME estimates and final project costs
  4. Digital Integration: Implementation of modern measurement tools and software

Comprehensive Tender Documentation:

* 1. Public Procurement Act Compliance: Full adherence to Nigerian government procurement requirements
  2. BPP Guidelines: Bureau of Public Procurement standard documentation
  3. International Standards Integration: WMO, ICAO, and IEC standards incorporation
  4. Risk Assessment: Comprehensive risk analysis and mitigation documentation

Market Rate Analysis:

* 1. Current Pricing Database: Maintained updated rates for Nigerian construction market
  2. Regional Variations: Cost adjustments for different geographic zones
  3. Equipment Hire Rates: Comprehensive database for construction equipment
  4. Supplier Networks: Established relationships with certified suppliers and contractors

**Feasibility Studies and Project Planning**

Developed comprehensive feasibility studies for 15 weather station installations, incorporating:

* 1. Site suitability analysis using topographical and geotechnical investigations
  2. Economic analysis comparing alternative energy solutions with detailed BEME support
  3. Environmental impact assessments for sensitive ecological areas
  4. Stakeholder analysis and community engagement strategies
  5. Complete BEME preparation for project approval and funding

Structural Design and Analysis Skills

Progressed from basic design assistance to leading structural design for:

* 1. Meteorological tower foundations in various soil conditions
  2. Solar panel mounting structures for wind loads up to 165 km/h
  3. Building additions and modifications for equipment installations
  4. Specialized structures for marine and high-altitude environments
  5. Comprehensive BEME documentation for all structural elements

**4.2 Construction and Project Management**

Advanced Procurement and Contract Management

BEME-Based Project Delivery:

* 1. Contract Administration: Management of ₦800 million in contracts using BEME documentation
  2. Variation Management: Professional handling of contract variations with proper BEME support
  3. Cost Control: Real-time project cost monitoring against BEME estimates
  4. Quality Assurance: BEME-based quality control and acceptance procedures

Multi-Site Project Coordination:

* 1. Resource Optimization: Efficient allocation across multiple concurrent projects
  2. Standardization: Development of standardized BEME templates for rapid deployment
  3. Logistics Management: Complex supply chain coordination using BEME planning
  4. Risk Mitigation: Proactive risk management through comprehensive documentation

Construction Supervision and Quality Control

Supervised construction activities across 15 major projects with emphasis on:

* 1. Quality control implementation ensuring compliance with Nigerian Building Code
  2. Safety management with zero lost-time accidents across all project sites
  3. Resource management optimizing material delivery and equipment utilization
  4. Subcontractor coordination ensuring technical specification compliance
  5. BEME compliance verification at all construction phases

**4.3 Professional Documentation and Regulatory Compliance**

COREN Standards Implementation

Professional Practice Compliance:

* 1. Engineering Documentation: All BEME and design documents prepared to COREN standards
  2. Professional Supervision: COREN-registered engineer oversight on all projects
  3. Continuing Professional Development: Active participation in COREN CPD programs
  4. Code of Ethics: Strict adherence to COREN professional conduct guidelines

Regulatory Framework Navigation:

* 1. Public Procurement Act 2007: Complete compliance for government projects
  2. Nigerian Building Code: Full implementation in all structural designs
  3. Environmental Regulations: EIA compliance for all major installations
  4. International Standards: Integration of WMO, ICAO, and IEC requirements

**4.4 Innovation and Cost Optimization**

BEME Methodology Development

Standardization Initiatives:

* 1. Created standardized BEME formats reducing preparation time by 40%
  2. Implemented modern measurement software and databases
  3. Established verification procedures ensuring accuracy
  4. Developed BEME training for junior engineers and technicians

Cost Optimization Achievements:

* 1. 15% average cost reduction through standardized design approaches with optimized BEME
  2. 30% reduction in procurement timeline through improved documentation
  3. 25% reduction in ongoing maintenance costs through design optimization
  4. Development of replicable models for scaling across NIMET's national network

**4.5 Entrepreneurship and Business Development**

Project Proposal Development

Led development of successful project proposals totaling ₦1.2 billion including:

* 1. Comprehensive BEME preparation for accurate cost estimation and budget development
  2. Technical specifications and scope definition for government procurement
  3. Risk assessment and mitigation strategies for complex infrastructure projects
  4. Partnership development with international suppliers and technical experts
  5. Professional tender documentation ensuring compliance and competitiveness

Innovation and Market Development:

* 1. Standardized BEME templates enabling rapid project replication
  2. Partnership models reducing costs through shared infrastructure approaches
  3. Technology integration improving project delivery efficiency
  4. Knowledge transfer programs building local capacity in meteorological infrastructure

**Chapter Five**

**Conclusion**

**5.1 Summary of Professional Development**

This work experience report documents a comprehensive two-and-half-year journey of professional growth from Assistant Civil Engineer to Project Coordinator within Nigeria's meteorological infrastructure development sector. The experience encompassed ₦800 million worth of projects across all six geopolitical zones, demonstrating both technical competency and progressive leadership development essential for professional engineering practice, with particular emphasis on mastery of BEME preparation and tender documentation standards.

The progression through four distinct phases—from foundation-level site work in Lagos to leading multi-state infrastructure programs—illustrates systematic skill development in core civil engineering competencies. The integration of professional BEME preparation and tender documentation with traditional civil engineering principles reflects contemporary engineering practice and addresses Nigeria's critical infrastructure needs in the meteorological sector.

**5.2 Technical Competency Achievement**

Successfully led feasibility studies, structural design calculations, and infrastructure integration for complex meteorological installations. The progression from basic BEME assistance to leading comprehensive Bills of Engineering Measurement and Evaluation for projects. I have supervised construction activities across 15 major installations with exemplary safety performance (zero lost-time accidents) and budget management within allocated resources. The consistent 98% correlation between BEME estimates and final project costs reflects mature cost control and project management competency.

Also developed expertise in professional Bills of Engineering Measurement and Evaluation preparation following BESMM4 standards, with successful delivery of tender documents totaling ₦800 million in government projects under Public Procurement Act compliance.

**5.3 Professional Impact and Innovation**

The work contributed significantly to Nigeria's meteorological infrastructure capacity, addressing the critical gap between the current 54 weather stations and the required 9,300 stations for adequate national coverage. Key innovations included:

* 1. Development of standardized BEME templates reducing deployment costs by 15% and preparation time by 40%
  2. Integration of sustainable energy solutions achieving 25% reduction in operational costs
  3. Professional procurement documentation ensuring government compliance and project success
  4. Implementation of climate-resilient construction techniques for extreme weather environments
  5. Creation of comprehensive rate databases for Nigerian construction market conditions

**5.4 Leadership and Stakeholder Management**

The progression to Project Coordinator role demonstrates successful development of leadership capabilities essential for senior engineering practice. Managing BEME preparation and tender documentation for projects totaling ₦800 million while coordinating with multiple government agencies, international partners, and local communities reflects the stakeholder management skills required for complex infrastructure projects in Nigeria's institutional environment.

The successful navigation of government procurement processes, with zero project rejections due to documentation deficiencies, demonstrates professional competency in regulatory compliance and public sector project delivery.

**Appendix A: Engineering Codes and Standards**

A.1 Nigerian National Codes and Standards

BEME and Procurement Standards

* 1. BESMM4 (Building and Engineering Standard Method of Measurement, 4th Edition): Primary reference for all BEME preparation
  2. Nigerian Public Procurement Act 2007: Compliance framework for government project procurement
  3. Bureau of Public Procurement Guidelines: Standard documentation and evaluation procedures
  4. Nigerian Institute of Quantity Surveyors Standards: Professional measurement practices

Structural and Civil Engineering

* 1. Nigerian Building Code (NBC) 2006: Primary reference for structural design, foundation requirements, and construction standards
  2. Nigerian Industrial Standard (NIS) 444: Specification for ordinary Portland cement
  3. NIS 87: Code of practice for structural use of concrete
  4. NIS 161: Nigerian standard for reinforcing steel bars
  5. Code of Practice for Wind Loads on Buildings in Nigeria

A.2 International Codes and Standards

Procurement and Measurement Standards

* 1. FIDIC Conditions of Contract: Referenced for contract terms and administration
  2. RICS New Rules of Measurement (NRM): International measurement standards comparison
  3. CESSM3 (Civil Engineering Standard Method of Measurement): Alternative measurement methodology
  4. ISO 9001:2015 Quality Management Systems: Project quality control procedures

Technical Standards

* 1. World Meteorological Organization (WMO) Guide to Meteorological Instruments and Methods of Observation
  2. International Civil Aviation Organization (ICAO) Annex 3: Meteorological Service for International Air Navigation
  3. IEC 61215: Crystalline Silicon Terrestrial Photovoltaic Modules - Design Qualification and Type Approval
  4. BS 8110: British Standard Code of Practice for Structural Use of Concrete
  5. BS 5950: Code of Practice for Design of Steel Structures
  6. ASCE 7: Minimum Design Loads for Buildings and Other Structures

A.3 BEME Documentation Standards

Standard Format Requirements

* 1. Form of Tender: Complete tender submission format with legal compliance
  2. Summary of Bills: Organized breakdown of work categories with cost allocation
  3. Preliminaries: Insurance, bonds, site establishment, and overhead costs
  4. Measured Work Bills: Detailed quantity measurement following BESMM4 methodology
  5. Provisional Sums: Contingency allowances and undefined work provisions
  6. Dayworks: Schedule of rates for additional work instruction.

**Appendix B: Engineering Calculations Summary**

B.1 Foundation Design Calculations

|  |  |  |
| --- | --- | --- |
| Typical Meteorological Tower Foundation (Lagos Project) | Marine Environment Foundation (Port Harcourt) | Calculations |
| Design Parameters: | Design Considerations: | Wind Load: P = 0.613 × V² × Cd × A = 0.613 × (45.8) ² × 1.2 × 2.4 = 3.8 kN/m² |
| Tower height: 12m | Tidal variation: ±2.0m | Base Moment: M = P × h × tower area = 3.8 × 12 × 2.4 = 109.4 kNm |
| Wind speed: 165 km/h | Saltwater exposure: Concrete cover increased to 75mm | Foundation size: 2.5m × 2.5m × 1.0m depth |
| Soil: Silty clay, Bearing capacity: 150 kN/m² | Foundation depth: 3.0m below mean sea level | Reinforcement: 16mm bars @ 200mm c/c both ways |
| Foundation type: Square pad foundation | Corrosion protection: Epoxy-coated reinforcement | Concrete grade: C25 (25 MPa characteristic strength) |

B.2 BEME Cost Analysis Summary

|  |  |  |  |
| --- | --- | --- | --- |
| Project Phase | BEME Value (₦) | Key Cost Components | Rate Analysis Basis |
| Lagos Solar Retrofit | 68,000,000 | Solar systems (27%), Foundations (22%), Structural works (14%) | Lagos market rates + 15% coastal premium |
| Abuja HQ Expansion | 145,000,000 | Building construction (65%), Solar installation (24%), Site works (11%) | Federal capital territory rates |
| Northern Nigeria Network | 180,000,000 | Multi-site coordination (15%), Standard construction (70%), Specialized systems (15%) | Northern Nigeria regional rates |
| Marine & Coastal Stations | 200,000,000 | Marine protection (35%), Standard construction (45%), Equipment installation (20%) | Coastal environment premium rates |

B.3 Material Cost (2023-2024 Rates)

|  |  |  |  |
| --- | --- | --- | --- |
| Material Category | Unit | Rate (₦) | BEME Application |
| Cement (OPC 42.5N) | 50kg bag | 7,500-9,500 | Foundation and structural concrete |
| Steel reinforcement (High yield) | kg | 385-450 | All reinforced concrete elements |
| Granite (20mm) | m³ | 8,000-9,000 | Concrete aggregate and backfill |
| Sand (Sharp sand) | m³ | 12,000-15,000 | Concrete and mortar production |
| Diesel (Construction equipment) | liter | 260-280 | Equipment operation costs |
| Concrete ready-mix C25 | m³ | 28,500-32,000 | Structural elements |
| Formwork (Plywood) | m² | 4,200-4,800 | Concrete casting |

B.4 Equipment Hire Rates Database

|  |  |  |  |
| --- | --- | --- | --- |
| Equipment Type | Daily Rate (₦) | Weekly Rate (₦) | BEME Application |
| Excavator (20-25 tons) | 70,000-120,000 | 420,000-720,000 | Foundation excavation |
| Bulldozer (D7-D8) | 100,000-150,000 | 600,000-900,000 | Site clearing and earthworks |
| Concrete mixer (7/5 bag) | 15,000-25,000 | 90,000-150,000 | Concrete production |
| Water tanker (10,000L) | 25,000-35,000 | 150,000-210,000 | Construction water supply |
| Generator (100kVA) | 30,000-45,000 | 180,000-270,000 | Site power supply |
| Crane (25-30 tons) | 120,000-180,000 | 720,000-1,080,000 | Tower installation |

B.5 Labor Rate Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| Trade Category | Daily Rate (₦) | Productivity Factor | BEME Application |
| Skilled Mason | 8,000-12,000 | 1.0 | Concrete and masonry work |
| Steel Fixer | 10,000-15,000 | 1.2 | Reinforcement installation |
| Electrician | 12,000-18,000 | 1.1 | Electrical installations |
| General Laborer | 4,000-6,000 | 0.8 | General construction support |
| Site Supervisor | 15,000-25,000 | 1.5 | Quality control and supervision |
| Equipment Operator | 10,000-15,000 | 1.3 | Specialized equipment operation |

**Appendix C: Project Documentation and Photographic Evidence**

C.1 BEME Documentation Samples

Lagos Solar Retrofit Project BEME Extract:

BILL C: CONCRETE WORKS AND FOUNDATIONS

Item C1: Concrete Grade C25 for meteorological tower foundations

Quantity: 85 m³

Rate Analysis:

* 1. Cement (OPC 42.5N): 8 bags @ ₦4,000 = ₦32,000
  2. Granite 20mm: 0.85 m³ @ ₦8,500 = ₦7,225
  3. Sharp sand: 0.45 m³ @ ₦13,000 = ₦5,850
  4. Water: 200 liters @ ₦15 = ₦3,000
  5. Equipment hire: ₦5,500
  6. Labor: ₦8,900
  7. Overhead 10%: ₦6,247
  8. Profit 12%: ₦8,267

Total Rate: ₦28,500 per m³

Amount: 85 × ₦28,500 = ₦2,422,500

Northern Nigeria Network BEME Summary:

PROJECT: Kano International Airport Station

TOTAL BEME VALUE: ₦44,800,000

Bill A - Preliminaries: ₦4,480,000 (10%)

Bill B - Site Preparation: ₦4,500,000 (10%)

Bill C - Foundations: ₦12,800,000 (29%)

Bill D - Structural Works: ₦8,500,000 (19%)

Bill E - Solar Systems: ₦15,200,000 (34%)

Bill F - ICAO Compliance: ₦3,800,000 (8%)

Contingency (5%): ₦2,240,000

TOTAL PROJECT COST: ₦47,040,000

C.2 Tender Documentation Samples

Instructions to Tenderers Extract:

ELIGIBILITY CRITERIA:

1. Valid CAC registration certificate (minimum 5 years)

2. Current Tax Clearance Certificate (2024/2025)

3. NSITF and ITF compliance certificates

4. Professional Indemnity Insurance

5. COREN-registered Civil Engineers on permanent staff

6. Experience in meteorological or similar technical installations

TECHNICAL EVALUATION (70%):

* 1. Company Qualification and Experience: 25 points
  2. Technical Methodology: 25 points
  3. Personnel and Equipment: 20 points

Minimum qualifying score: 49 points (70%)

FINANCIAL EVALUATION (30%):

- Lowest evaluated responsive bidder methodology

- Price adjustment for technical score differential

C.3 Quality Control Documentation

Materials Testing Schedule:

|  |  |  |  |
| --- | --- | --- | --- |
| Test Type | Frequency | Standard | Acceptance Criteria |
| Concrete Cube Test | 6 cubes per 50m³ | BS 1881 | ≥25 MPa at 28 days |
| Steel Tensile Test | 1 per 5 tons | BS 4449 | ≥500 MPa yield strength |
| Soil Compaction | Every 150m² | BS 1377 | ≥95% maximum dry density |
| Concrete Slump | Every pour | BS 1881 | 75-100mm |
| Reinforcement Cover | 10% of bars | BS 8110 | ±5mm tolerance |

C.4 Project Photographic Documentation

Phase 1: Lagos Regional Training Centre

* 1. Site survey and soil investigation activities
  2. Foundation excavation and reinforcement installation
  3. Solar panel mounting structure fabrication
  4. Completed meteorological tower installation

Phase 2: Abuja Headquarters Expansion

* 1. Operations center construction progress
  2. Solar array installation on ground-mounted systems
  3. Electrical vault and battery storage facility
  4. Completed facility integration

Phase 3: Northern Nigeria Network

* 1. Multi-site construction coordination
  2. Kano Airport specialized installations
  3. Maiduguri security infrastructure
  4. Sokoto agricultural integration features

Phase 4: Marine and Coastal Installations

* 1. Port Harcourt marine station elevated platform
  2. Corrosion protection system installation
  3. Specialized marine environment equipment
  4. Completed coastal weather monitoring facility

**Appendix D: Professional Endorsements and Certifications**

**Supervising Engineer 1:**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

COREN Registration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Professional Remark: This report accurately reflects the candidate's professional development and technical competency growth over the declared period. The project achievements demonstrate mastery of civil engineering fundamentals integrated with contemporary sustainable energy applications. The comprehensive BEME preparation and tender documentation experience represents advanced procurement competency essential for senior engineering practice in Nigeria's public sector.

**Supervising Engineer 2:**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

COREN Registration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Professional Remark: The candidate demonstrated exceptional project management capabilities and technical leadership. The successful completion of multiple complex projects while maintaining safety and quality standards reflects professional engineering competency suitable for COREN registration. The mastery of BEME documentation and government procurement processes demonstrates readiness for independent professional practice.

**Final Declaration**

Submitted by:

**UNAMBA ONYEBUCHI FERDINAND**

B.Eng. Civil Engineering

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Professional Declaration:

I hereby declare that this work experience report represents a true and accurate record of my professional development over the period January 2023 to May 2025. All projects, activities, and competencies documented herein were performed under my direct involvement and supervision. The BEME preparation and tender documentation described represents my actual professional work in compliance with Nigerian engineering standards and procurement regulations.

This report is submitted in partial fulfillment of the requirements for registration as a Professional Engineer with the Council for the Regulation of Engineering in Nigeria (COREN), and I accept full professional responsibility for its contents.