ACCUGAS

A SAVANNAH ENERGY COMPANY

UNICEM

DOCUMENT NUMBER: 2506600-AGAS-SOW-A-0001

Generic Code	Organization Code	Doc Type Code	Department / Discipline Code	Numeric Sequence Number
2506600	**AGAS**	**SOW**	**A**	**0001**

Scope of Work

for

UNICEM PRMS Upgrade FEED/Detailed Engineering Design Project

Controlled

For Company Use Only

Rev	Date	Prepared By	Reviewed By	Approved By	Description
0	10-Apr- 2025	Olumayokun Adeyanju	Daryon Shahbahrami	Justina Otedoh	Issued for Tender
B	08-Apr- 2025	Olumayokun Adeyanju	Daryon Shahbahrami	Justina Otedoh	Issued for Review

Approvals, Control and Amendment

An approval signature on the front cover indicates approval of this procedure. Controlled copies are identified by controlled status on front cover - only controlled copies will be automatically updated. Amendments to sections of this Scope of work are detailed in the following table. Approval of the amendment is indicated by responsible Manager's initial on master soft copy and original signature on hard controlled copies.

Document history and change record

Issue	Issue date	Description of change
B	08-Apr-2025	Issued For Review
0	10-Apr-2025	Issued For Tender

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DEFINITIONS & ABBREVIATIONS

May:	This indicates a possible course of action
OEM:	The party that designs, manufactures, test, pack, pre-comm & comm. the equipment / package.
OWNER	Accugas – A Savannah Energy Company
Other:	The party that will carry out all the fabrication, construction, installation and tie-in work.
Third Party:	The party that executes certain part of the OEM`s scope of work or carries out inspections for the Company.
Shall:	This indicates a mandatory requirement.
Should:	This indicates a preferred (but not mandatory) course of action.
VENDOR	Company that contacts the OEM and provides Supply of Equipment, Goods, Materials and Documentations as well as associated services Test.
Contractor	Company that provides Engineering design Verification, Supply of Equipment, Materials, Documentations, Modification, Decommissioning, Installation and ancillary services of the Installation of the master flowmeter and other associated work.
API	American Petroleum Institute
BDV	Blow down Valve
BOPD	Barrels of Oil
CTR	Cost Time Resource
DED	Detailed Engineering Design

ESDV	Emergency Shutdown Valve
FEED	Front End Engineering Design
HAZID	Hazard Identification Study
HAZOP	Hazard and Operability Study
LLI	Long Lead Items
MTO	Material Take Off
OPEX	Operating Expenditure
PCV	Pressure Control Valve
PRMS	Pressure Regulation and Metering Station
PSV	Pressure Safety Valve
SDV	Shutdown Valve
UGPF, CPF, UCPF	Uquo Gas/Central Processing Facility
Unicem, LAFARGE	Lafarge Africa Plc, Mfamosing Plant

1 INTRODUCTION

Accugas a member of Savannah Energy is owner and operator of the Uquo Central Processing Facility (UCPF) at Esit Eket LGA of Akwa Ibom State, the Ikot Abasi Gas Receiving Facility (IGRF) at Ikot Abasi in Akwa Ibom State, the Citygate Gas Receiving Facility at Calabar and the UNICEM PRMS Facility at Calabar Cross River State.

The treated and conditioned Sales Gas from the Uquo Central Processing Facility is flowed via the 24" x 69 KM Oron Gas Pipeline to Creektown. The Sales Gas is then flowed via the 18" x 21 KM segment of the East Horizon Pipeline to the Citygate facility, see Figure 1-1

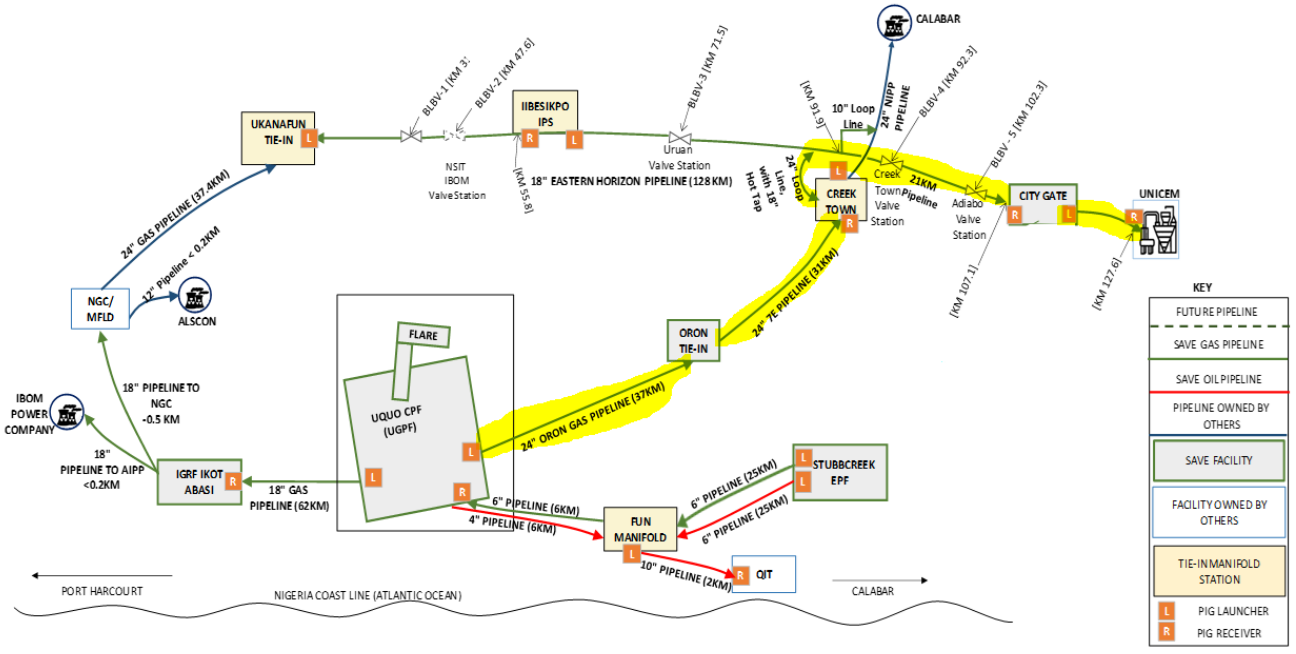


Figure 1-1 – Schematic showing the Uquo CPF and pipeline network with the export route to Unicem PRMS highlighted

The Sales gas is filtered and then superheated (~50°C) in the Boilers at Citygate to ensure the Sales Gas Temperature is increased above the hydrocarbon dewpoint (~28.5°C at 19barg). The Sales Gas pressure is then reduced with the Citygate Pressure Reduction valves to 19 barg and flowed to Unicem via the last segment 18" x 21 KM section of the East Horizon Pipeline to the Unicem facility. The Sales gas pressure is further reduced in the Unicem PRMS to 6.4 barg before the Sales Gas is flowed to LAFARGE.

The UNICEM PRMS consists of filtration, Pressure reduction and Metering facilities.

Filtration: There are (3) three Filter Separators with a rated flow rate of 37,000 Sm^3/hr (FS-02 A/B/C) on each stream, which are installed for the effective removal of solid particles and liquid droplets at the UNICEM PRMS.

Pressure Reduction: There are (3) three pressure regulators (PRF-02 A/B/C) let-down valves with rated flow of 53,100 Sm^3/hr on each stream flowing into the UNICEM PRMS. These pressure regulators are suitable for maintaining the downstream pressure at the pre-set level. They are designed with a built-in slam shut function which is initiated at pressures higher than set pressure. The pressure regulators are pneumatically actuated using the process gas (usually wet process gas).

Gas flow meters: There are (3) three Fiscal TZ turbine meters (TM-02 A/B/C) with rated flow of 37,000 Sm^3/hr designed to measure the volumetric flowrate of the sales gas supplied to LAFARGE. The operating philosophy is to have two duty meters operating and the third is on standby as a master meter for proving of the duty meters.

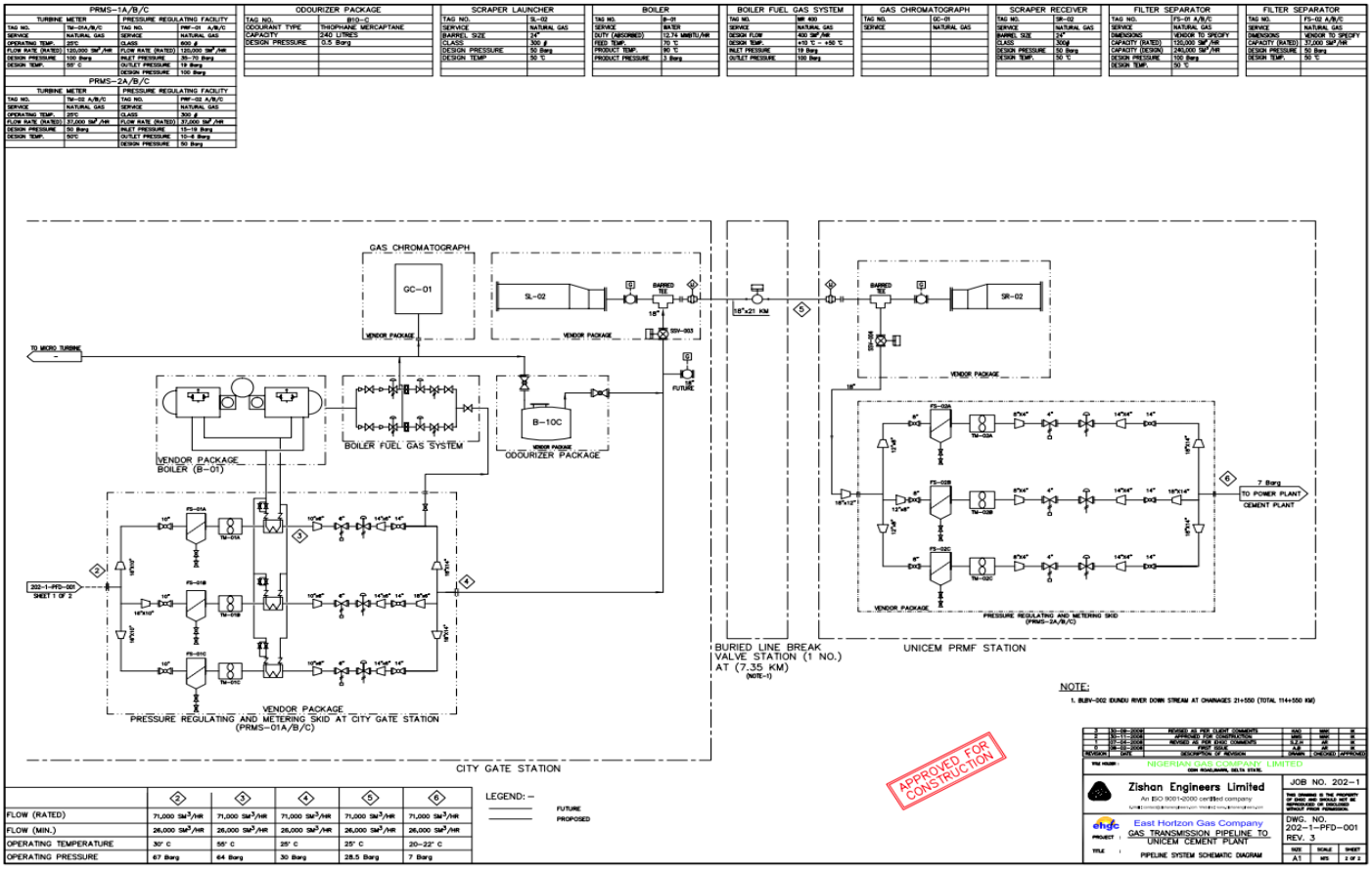


Figure 1-2: Citygate and Unicem Facilities Process Flow Diagram

1.1 Background

In recent years, there have been concerns of disrupted operations of Sales Gas supply from Citygate to Accugas' facility in UNICEM such as: liquid carry over, fluctuating pressure levels and failure of regulators.

The LAFARGE Team have on numerous occasions reported the recovery of some quantities of hydrocarbon condensate downstream the PRMS, with the latest being between the 22nd of September and the 10th of October 2024 when the total reported recoveries amounted to four hundred and ninety-four (494) litres of condensate from the gas line. These identified concerns from gas supply have resulted in significant equipment damage and loss of production for LAFARGE.

Similarly, there were reported cases of fluctuations in the supply pressure of the sales gas to LAFARGE leading to a complete plant shutdown. LAFARGE also reported receiving "off-spec" gas, which allegedly caused significant damage to critical equipment such as flow meters and pressure regulators etc. This, combined with the pressure fluctuations, resulted in substantial production losses and associated financial impacts to UNICEM.

Additionally, the pressure regulating valves (PRVs) has experienced sudden slam shut events due to the ingress of liquids to the pneumatic lines supplying instrument gas to the PRVs.

Considering the above stated challenges, Accugas intends to initiate the upgrade of the UNICEM PRMS facility to guarantee quality sales gas supply to UNICEM.

1.2 Objectives

This document describes the scope of work for the FEED and DED for the UNICEM PRMS Upgrade Project.

The primary objective of this project is to:

- Upgrade the UNICEM PRMS for enhanced reliability and efficiency, ensuring the uninterrupted supply of circa 60 mmscfd of sales gas to LAFARGE and 3 mmscfd of sales gas to the proposed LAFARGE CNG plant.

This project aims to:

- Mitigate the risk of liquid carryover and optimizing system performance.
- Improve the reliability and stability of the gas supply to the LAFARGE plant.
- Confirm and quantify liquid dropout at the UNICEM PRMS under various plant operating conditions and UNICEM take-off rates.
- Evaluate and recommend optimal mitigation strategies for liquid dropout, considering technical feasibility, cost-effectiveness, and schedule implications.
- Develop all necessary IFC documentation to quickly move the project into the procurement and construction phase.

2 APPLICABLE CODES AND STANDARDS

The design shall be in accordance with the requirements of the documents listed below. Where conflict exists between requirements of these documents, it shall be addressed to the COMPANY for clarification. Unless the edition of any code, standard or document is specifically mentioned, the latest editions will apply. Codes and regulations other than mentioned below subject to approval by COMPANY.

2.1 Order of Precedence

The following order of precedence shall be applied:

1. Savannah Energy Recommended Practices
2. Nigerian National Standards (Regulatory requirements)
3. International Standards
4. Project Specifications

2.2 Applicable Codes and Standards

S/N	Codes and Standards	Description
1	API RP 14C	Recommended Practice for Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms
2	API RP 14E	Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems
3	API 12J	Specification of Oil and Gas Separator
4	API STD 520 I	Sizing, Selection, and Installation of Pressure-relieving Devices Part I – Sizing and Selection
5	API STD 520 II	Sizing, Selection, and Installation of Pressure-relieving Devices Part II – Installation
6	API STD 521	Pressure-Relieving and Depressurizing Systems
7	API STD 526	Flanged Steel Pressure- Relief Valves
8	API RP 551	Process Measurement Instrumentation
9	API RP 552	Transmission Systems
10	API RP 554	Process Instrumentation and Control

11	ASME B31.3	Process Piping Code
12	ASME B31.8	Gas Transmission and Distribution Piping Systems
13	GPSA	Gas Processors Suppliers Association
14	API 560	Fired Heaters for General Refinery Service

3 SCOPE OF WORK

This Scope of Work (SOW) outlines the engineering services required for a Front-End Engineering Design (FEED) / Detailed Engineering Design (DED) study to analyse and mitigate liquid dropout at the UNICEM Pressure Reduction and Metering Station (PRMS). Preliminary simulations indicate potential liquid dropout at the UNICEM PRMS arrival conditions and downstream the pressure reduction valves (at 6.4 barg) when the mechanical refrigeration unit (mech ref) at the CPF is offline. This study aims to quantify liquid dropout under various operating scenarios and evaluate suitable mitigation strategies.

The UNICEM PRMS Upgrade Project aims to develop to comprehensive set of engineering drawings, specifications, and documents necessary for the safe, efficient, and environmentally responsible modification and installation of all recommended mitigations and upgrades which would ensure the supply of quality Sales Gas to LAFARGE.

This design phase is critical for ensuring the project meets all regulatory requirements, industry best practices, and the client's specific performance objectives.

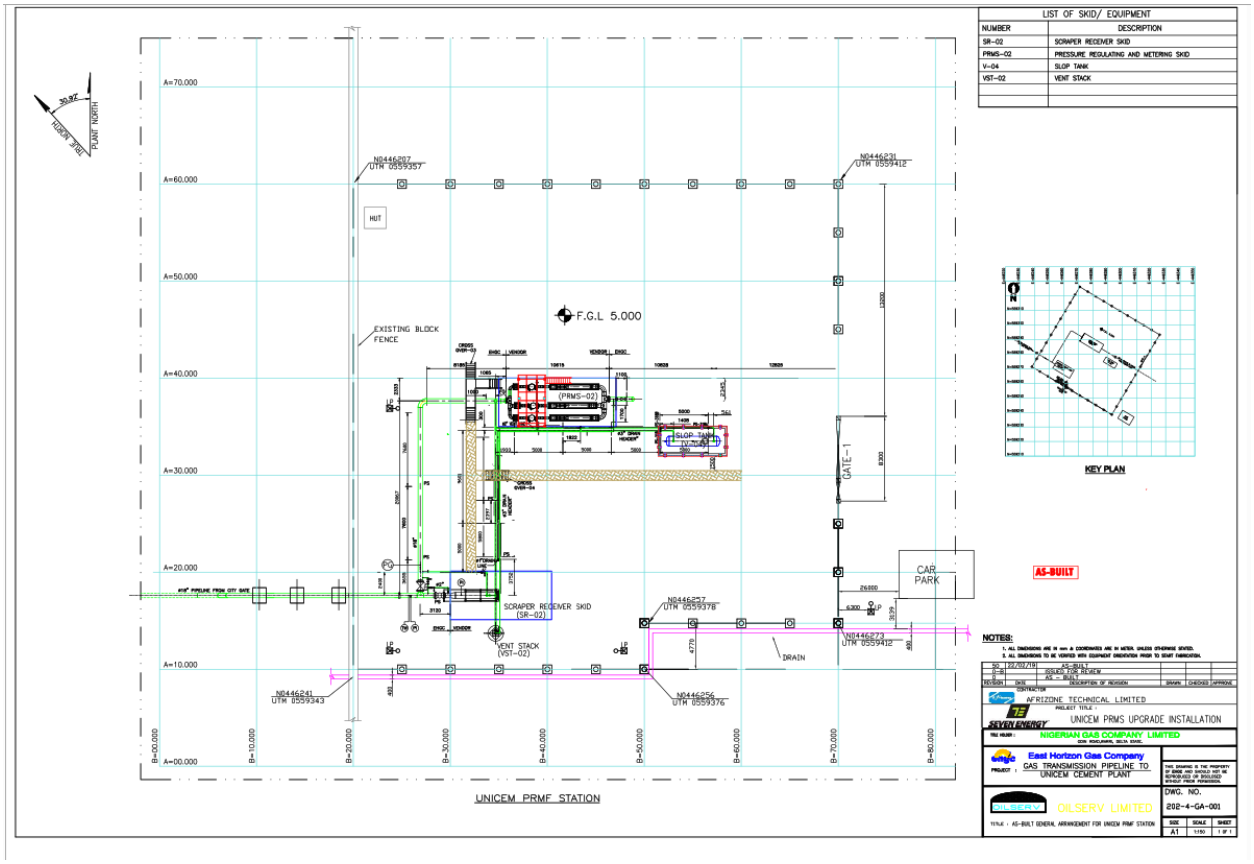


Figure 3 : General Arrangement Drawing for Existing UNICEM PRMS

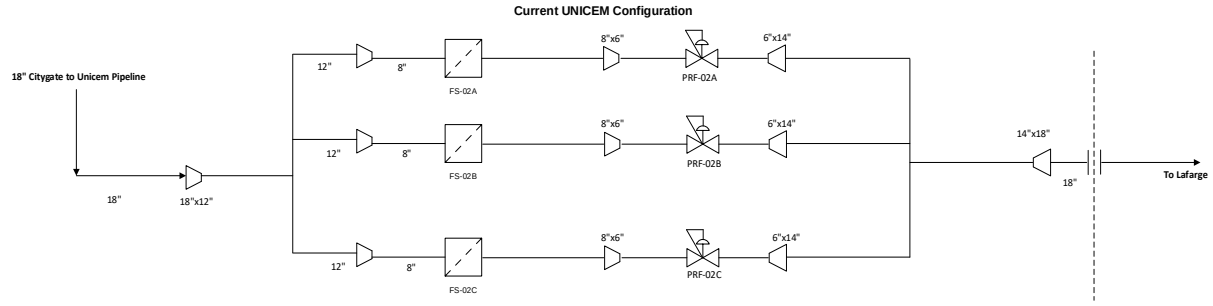


Figure 3-4: Current UNICEM Configuration

The UNICEM Pressure Reduction and Metering System (PRMS) is designed to condition and measure Sales Gas before it is delivered to LAFARGE. The system operates with three parallel processing streams to ensure redundancy and continuous gas supply. The Sales Gas flows into the PRMS via the 18" x 21KM Citygate to UNICEM Pipeline and is directed through a 12" manifold. The manifold splits the incoming Sales Gas stream into three parallel lines, each feeding a separate pressure reduction valve. In each processing stream, the gas first passes through a Filter Separator (FS-02 A/B/C) which are designed to effectively remove solid particles and liquid droplets from the Sales Gas stream, ensuring clean gas for further processing and measurement. Following filtration, the gas enters a Pressure Regulator (PRF-02 A/B/C). These regulators reduce the gas pressure to a pre-set level suitable for the downstream process (circa 6.4 barg). Additionally, each regulator is equipped with a built-in slam shut function that activates in case of overpressure, providing a crucial safety mechanism. After pressure regulation, the gas flow in each stream is measured using a Fiscal TZ Turbine Meter (TM-02 A/B/C). The system operates with two of the three streams on duty mode, actively processing and measuring gas. The third stream serves as a standby or master meter. This standby stream is used for proving (calibration) the duty meters, ensuring the accuracy of the gas measurement and providing redundancy in case of a malfunction in one of the duty streams. Finally, the measured gas from the two operating streams is comingled at a downstream manifold and delivered to LAFARGE.

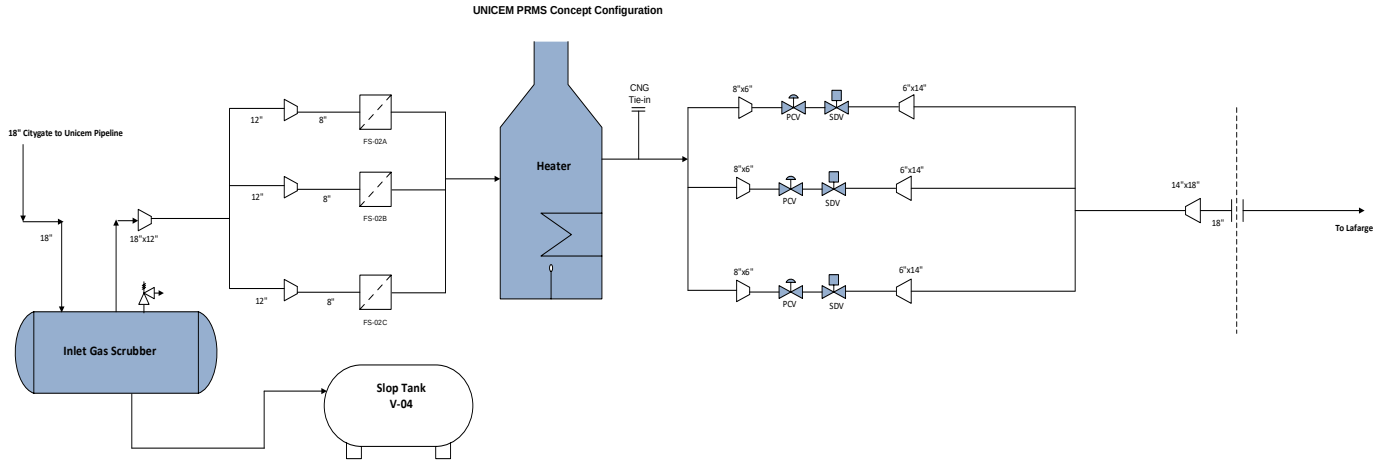


Figure 3-5: UNICEM PRMS Concept Configuration

The Concept involves the installation of an Inlet Gas Scrubber for initial Sales Gas treatment, which is a significant addition for improved pre-treatment to ensure all liquids formed within the 18" x 21 KM Citygate to UNICEM Pipeline are removed from the Sales Gas stream. The installation of a heater is to superheat the Sales Gas to a temperature which would prevent liquid formation downstream the pressure regulating valves. The integrated Slam Shut Valves are replaced with a pressure control valve and a shutdown valve. Considering the UNICEM location and availability of process utilities, the new pressure control valves and shutdown valves will be pneumatically actuated via the use of the Sales Gas as instrument gas. Safety systems should be independent of process control systems. This separation is vital to prevent a single failure from compromising both control and safety functions as per API 14C. In essence, installing separate devices for process control and safety requirements, as emphasized by API 14C, is a critical safety practice. It minimizes the risk of common cause failures, enhances system reliability, and ensures that safety functions remain effective in the event of

abnormal process conditions. Similarly, the Heater will be preferably Gas-fired considering there is no power generated by Accugas at the UNICEM facility.

Note: The concept provided above can be optimised by the Contractor, if sound engineering basis are provided to support recommendations and accepted by the Accugas.

The scope of work for Unicem PRMS Upgrade FEED and DED Design Project shall include the following:

3.1 Liquid Dropout Analysis

- Conduct detailed HYSYS simulations to determine liquid dropout volumes under the following scenarios:
  - I. Both Mech ref offline, current Low Pressure Separator (LP Sep) conditions (~55 barg, 35°C) – Unicem take-off: 25 MMScfd (1 kiln).
  - II. Both Mech ref offline, current LP Sep conditions (~ 55 barg, 35°C) – Unicem take-off: 45 MMScfd (2 kilns).
  - III. Both Mech ref offline, future LP Sep conditions (~ 35 barg, 16.49°C) – Unicem take-off: 25 MMScfd (1 kiln).
  - IV. Both Mech ref offline, future LP Sep conditions (~35 barg, 16.49°C) – Unicem take-off: 45 MMScfd (2 kilns).
- Estimate and report liquid dropout volumes for each scenario.

3.1.1 Liquid Slug Formation Analysis for 18” x 21KM Citygate to UNICEM Pipeline

- Develop a dynamic simulation model of the pipeline system using appropriate software (such as OLGA Dynamic Multiphase Simulator)
- Perform transient simulations for the worst-case scenario for liquid drop out from the cases shown in 3.1 above.

Analyze simulation results to determine:

- Slug formation mechanisms (such as terrain slugging, operational slugging)
- Slug length, volume, and arrival frequency

- Slug velocity and arrival time
- Pressure and temperature profiles along the pipeline
- Conduct sensitivity analyses to evaluate the impact of uncertainties in input data and operating conditions.

3.1.2 Mitigation Recommendations

Develop and evaluate potential slug mitigation strategies, including:

- Operational adjustments (e.g., flow rate control, pressure management)
- Downstream facility modifications (e.g., separator sizing, surge vessels, slug catchers, scrubber)
- Provide recommendations for the most effective and cost-efficient mitigation strategies.
- Conduct a cost-benefit analysis of the recommended mitigation measures.

3.1.3 UNICEM PRMS Upgrade

I. Evaluate the installation of a PCV and SDV on each ligament of the UNICEM PRMS to LAFARGE replacing the existing SSV.

II. Determine the required PCV and SDV sizing based on flow rates, pressure ranges, and control requirements. PCVs and SDVs will be pneumatically controlled locally using process gas.

III. Develop a control philosophy for the PCVs and SDVs, including setpoints, response times, and interlocks.

IV. Determine Optimal Tie-in point for CNG supply to LAFARGE.

3.1.3.1 Pressure Regulation System Evaluation

Assess the performance of existing pressure regulating valves (PRF-02 A/B/C) which drop the Sales gas pressure from 19barg to 6.4barg.

- The Joule-Thompson effect on the Sales Gas to LAFARGE.

- Utilize appropriate thermodynamic models and equations of state (e.g., Peng-Robinson, Soave-Redlich-Kwong) to calculate the temperature drop due to the JT effect under various operating conditions.
- Consider the effects of gas composition, pressure, and temperature on the JT coefficient Valve maintenance history and condition.
- Perform calculations for steady-state operating scenarios at various flow rate variations (i.e. 1Kiln of Sales Gas Supply to LAFARGE ~ 25 mmscfd and 2Kiln of Sales Gas Supply to LAFARGE of Sales Gas Supply to LAFARGE ~ 45 mmscfd)

3.1.3.2 Sales Gas Superheating

The Sales Gas superheating will involve the installation of a Heater/heating element upstream the pressure regulating valves (PRF-02 A/B/C) to superheat the Sales Gas to a temperature (~ 20°C above the Sales Gas Dewpoint).

- Determine the required sales gas outlet temperature to meet dew point specifications.
- Perform heat balance calculations to determine the required heating duty.
- Evaluate different heating options (e.g., direct fired heater, hot oil boiler, electric heater) and recommend the most suitable technology with the most robust & reliable, lowest cost, lowest OPEX heating option. Considering the asset location and availability of power a Gas-fired heater will be preferable; however, the Contractor shall evaluate all options to determine the most practical technology to be applied.
- Design a heater/boiler system capable of raising the Sales Gas temperature to meet the required dew point specifications.

4 CONTRACTOR'S DELIVERABLES

The scope of work shall include the development and execution of the following activities/deliverables for the various engineering disciplines listed below as a minimum.

4.1 Project Management

The CONTRACTOR is responsible for deploying a full project management and controls team to guarantee the efficient, coordinated, and successful execution of the entire Project. The FEED and DED phases are to be delivered within a 12-week timeframe.

- Site visit report
- Project Basis of design
- Project Schedule
- Project Execution Plan
- Project Quality Plan
- Construction Scope of Work
- Design Reviews
- Master Deliverables Register and Progress Measurement System
- Project Weekly, monthly and Close-Out Report

4.1.1 Project Meetings

The following meetings are required for this project:

- Administrative and Technical Kick-off Meeting
- Weekly Progress/Management Meetings.
- Regular discipline engineer meetings (at the discretion of each COMPANY / CONTRACTOR discipline engineer).
- HAZOP Review

The CONTRACTOR shall organize and scribe all the above meetings. The CONTRACTOR will host the weekly progress meetings via MS Teams.

4.1.2 Project Reporting

The CONTRACTOR shall submit the following progress reports:

- Weekly Progress Report: This report, to be issued every week, will detail project progress against planned targets, including an updated S-curve (actual vs. planned), a summary of completed tasks, a forecast of planned activities for the subsequent week, a comprehensive list of open action items from previous meetings, and an updated project schedule.
- Project Close-out Report: A final report summarizing the entire project execution, including key achievements, lessons learned, and final deliverables.

4.2 Process Engineering Design

- Revise Existing PFDs, incorporating all process equipment, piping, instrumentation, and control systems for all modifications. Revised PFDs shall have the following revisions IFR, IFD and AFC.
- Identify major equipment items and their functions which require modification.
- Input to multi-disciplinary equipment selection study.
- Indicate modification to control loops and alarms where applicable.
- Revise existing P&IDs to capture all modifications.
- Develop HYSYS simulation report.
- Develop a control philosophy for the heater/boiler system, including temperature control loops, safety interlocks, and alarm systems.
- Define control loop configurations and control strategies.
- Develop the required equipment process datasheets
- Develop Pressure Control Valve Sizing Calculation.
- Develop equipment selection assessment report.
- Evaluate Flare/Relief System Requirements based on all modifications.
- Liquid dropout mitigation strategy report, including cost and schedule estimations.

- Transient Pipeline Slugging Analysis Report: A comprehensive report documenting the methodology, assumptions, results, and recommendations of the analysis.

4.2.1 Process Simulations

- Conduct process simulations using appropriate software (such as., HYSYS V10) to assess system performance, identify potential bottlenecks, and optimize design parameters.
- Carry out Transient Slugging Analysis for the 18”x 21KM Citygate to UNICEM pipeline using OLGA version 2017.

4.3 HSE

The following HSE documents will be required to be developed by the contractor.

- HSE Design Philosophy
- HAZID Study Report
- HAZOP Study Report

4.4 Mechanical Engineering Design

4.4.1 Equipment Specifications:

- Develop detailed equipment specifications for all new equipment and those which require modification.
- Specify material grades, design pressures, and temperature ratings.
- Define performance requirements, such as flow capacity, pressure drop, and accuracy.
- Include vendor qualifications and quality assurance requirements.
- Prepare datasheets for mechanical items.
- Input to multi-disciplinary equipment selection study

4.5 Piping Engineering Design

- Design the piping system, including pipe sizes, materials specifications, and supports, ensuring compliance with applicable codes and standards (e.g., ASME B31.3)
- Design pipe supports and restraints to withstand loads and vibrations.
- Revise/develop piping isometrics for detailed fabrication and installation.
- Develop detailed LLI, piping materials list, Special Item List & MTOs.
- Piping stress analysis and report
- Piping demolition and modification General Arrangement Drawings.
- Input to multi-disciplinary equipment selection study

4.5.1 Layout Drawings:

- Revise and update the existing layout drawings, including equipment layouts, piping layouts, and platform layouts for all modifications. Revised drawings shall have the following revisions IFR, IFD and AFC
- Design to ensure equipment and piping arrangements to optimize space utilization and accessibility.
- Consider safety and operability factors in the layout design.

4.6 Electrical Engineering Design

- Develop electrical design philosophy for the upgrade and integration with the existing facility.
- Develop Load Schedule, single line diagram and integrate with the existing facility.
- Develop material specifications and datasheet for all electrical equipment in compliance with relevant codes and standards.
- Develop cable calculations, list, schedule and cable routing layout.
- Design Earthing and Lightning protection system in accordance with IEEE 81, BS/EN 62305 and integrate with the existing facility.
- Design lighting and small power layout for the upgrade and integrate with the existing facility.

- Develop Hazardous area schedule and layout for the entire facility.
- Input to multi-disciplinary equipment selection study
- Develop electrical MTO (Unpriced & priced).

4.7 Instrumentation and Control Engineering Design

- Specify Pneumatically (Using Process Gas) Actuated PCVs and SDVs:
  - Specify appropriate Pressure Control Valves (PCVs) and Shut-Down Valves (SDVs), including:
  - Required performance characteristics (e.g., flow capacity, turndown ratio, accuracy, response time).
  - Material selection compatible with the process fluid and operating conditions.
  - Detailed specification of pneumatic actuators, including sizing based on process conditions and valve characteristics.
- Specification of all necessary pneumatic accessories, such as positioners (if required), solenoid valves, limit switches, and local indicators.
- Consideration of process gas as the control medium, including requirements for filtration, pressure regulation, and distribution.

- Select Suitable Instrumentation: Select suitable field instrumentation, including:
  - Pressure transmitters for process monitoring and control. (if applicable)
  - Temperature transmitters for process monitoring. (if applicable)
  - Level transmitters (if applicable).
  - Consideration of instrument suitability for the process environment and compatibility with the control system.
- Review Control System Architecture and detail how the new equipment and valves will tie into the existing control system at the PRMS.

- Outline the redundancy requirements for critical control functions.
- Develop comprehensive cause-and-effect matrices for process shutdowns and safety interlocks, specifically addressing the operation of the pneumatically actuated SDVs.
- Input to multi-disciplinary equipment selection study
- Develop Instrumentation List for the Heater and Inlet Scrubber
- Develop Instrument Datasheets
- Instrumentation MTO (Material Take-Off):
    - Generate a detailed Material Take-Off (MTO) list for all instrumentation and control components, including:
    - Unpriced MTO for initial cost estimation.
    - Priced MTO for budget control and procurement planning.

4.8 Civil and Structural Design

4.8.1 Foundation Design

- Design foundations for all major equipment, considering soil conditions.
- Design foundation types (e.g., pad, RC slab) and Steel.
- Input to multi-disciplinary equipment selection study

4.8.2 Civil Works:

- Design civil works, including clearing, paving and drainage.
- Paving of the PRMS area and sloping the paved surface to adjoining side drain for erosion control.
- Specify paving materials and construction methods.

The list of deliverables stated above is not exhaustive, Contractor to include other deliverables required to facilitate the Construction, fabrication and installation works. The Deliverables issued with AFC status shall have sufficient information for any Fabricator to use and further develop the shop

drawings. This should be in line with the industry standard practice. For example, the piping isometrics AFC shall be sufficient to generate spool drawings by the fabricators and structural AFC design drawings shall be sufficient to prepare the section/block drawings by the Fabricator. All CAD drawings should be developed using AUTOCAD version 2016.

5 CONTRACTOR'S RESPONSIBILITY

CONTRACTOR is expected to provide the following deliverables as a minimum:

- Submit a Technical and Commercial proposal detailing the requirements for executing the scope of work.

Note: This SOW is for an integrated FEED and DED scope. Hence, the CTR should be integrated and not split into distinct scopes of FEED and DED. Documentation review cycle will include IDC, IFR, IFD (Completion of FEED Scope) and AFC (Completion of DED Scope).

5.1 Technical Proposal

CONTRACTOR is expected to submit the following deliverables for technical evaluation purpose.

- Unpriced Cost Time Resource (CTR)
- Project Execution Plan - Providing a comprehensive outline of the methodologies and resources that will be employed to execute the scope of work.
- Project Quality Plan
- Project Schedule including Key Milestones
- NMDPRA Permits.
- HSE policy
- Project controls / information management process or procedure
- Comprehensive details of similar work / projects experience with supporting evidence.
- CVs of key personnel.

5.2 Commercial Proposal

CONTRACTOR is expected to populate and submit their quotation with all required details in a priced Cost Time Resource (CTR).

6 CLIENT'S RESPONSIBILITY

- Provide all required input data input data including design, construction and as-built deliverables of the existing Accugas facilities.
- Provide access to all relevant plant data, including operating conditions, flow rates, and fluid compositions.

7 DOCUMENTATION AND DELIVERABLES

CONTRACTOR shall submit final deliverables in their native formats and pdf format for applicable reports. Deliverables shall be submitted as soft copies. All applicable deliverables must conform to the COMPANY's Document Control/Numbering procedure. All transmittals must come through client Information Management/Documentation Unit and issued to the COMPANY via documentcontroller.nigeria@savannah-energy.com or kingsley.omoruyi@savannah-energy.com.

8 APPENDICES

- Unicem Pipeline System Schematic Diagram – 202-1-PFD-001 Rev.3
- P&ID for Pressure Regulating & Metering Skid at City Gate Station – 202-1-PID-004 Rev.3
- P&ID for Pressure Regulating & Metering Skid at Unicem – 202-1-PID-010
- General Arrangement Drawing for Unicem PRMS - 202-4-GA-001 Rev 50
- CTR Template

PRMS–1A/B/C			
TURBINE METER		**PRESSURE REGULATING FACILITY**	
TAG NO.	TM–01A/B/C	TAG NO.	PRF–01 A/B/C
SERVICE	NATURAL GAS	SERVICE	NATURAL GAS
OPERATING TEMP.	25°C	CLASS	600 #
FLOW RATE (RATED)	120,000 SM^3/HR	FLOW RATE (RATED)	120,000 SM^3/HR
DESIGN PRESSURE	100 Barg	INLET PRESSURE	35–70 Barg
DESIGN TEMP.	55° C	OUTLET PRESSURE	19 Barg
		DESIGN PRESSURE	100 Barg

PRMS–2A/B/C			
TURBINE METER		**PRESSURE REGULATING FACILITY**	
TAG NO.	TM–02 A/B/C	TAG NO.	PRF–02 A/B/C
SERVICE	NATURAL GAS	SERVICE	NATURAL GAS
OPERATING TEMP.	25°C	CLASS	300 #
FLOW RATE (RATED)	37,000 SM^3/HR	FLOW RATE (RATED)	37,000 SM^3/HR
DESIGN PRESSURE	50 Barg	INLET PRESSURE	15–19 Barg
DESIGN TEMP.	50°C	OUTLET PRESSURE	10–6 Barg
		DESIGN PRESSURE	50 Barg

ODOURIZER PACKAGE	
TAG NO.	B10–C
ODOURANT TYPE	THIOPHANE MERCAPTANE
CAPACITY	240 LITRES
DESIGN PRESSURE	0.5 Barg

SCRAPER LAUNCHER	
TAG NO.	SL–02
SERVICE	NATURAL GAS
BARREL SIZE	24"
CLASS	300 #
DESIGN PRESSURE	50 Barg
DESIGN TEMP	50 °C

BOILER	
TAG NO.	B–01
SERVICE	WATER
DUTY (ABSORBED)	12.74 MMBTU/HR
FEED TEMP.	70 °C
PRODUCT TEMP.	90 °C
PRODUCT PRESSURE	3 Barg

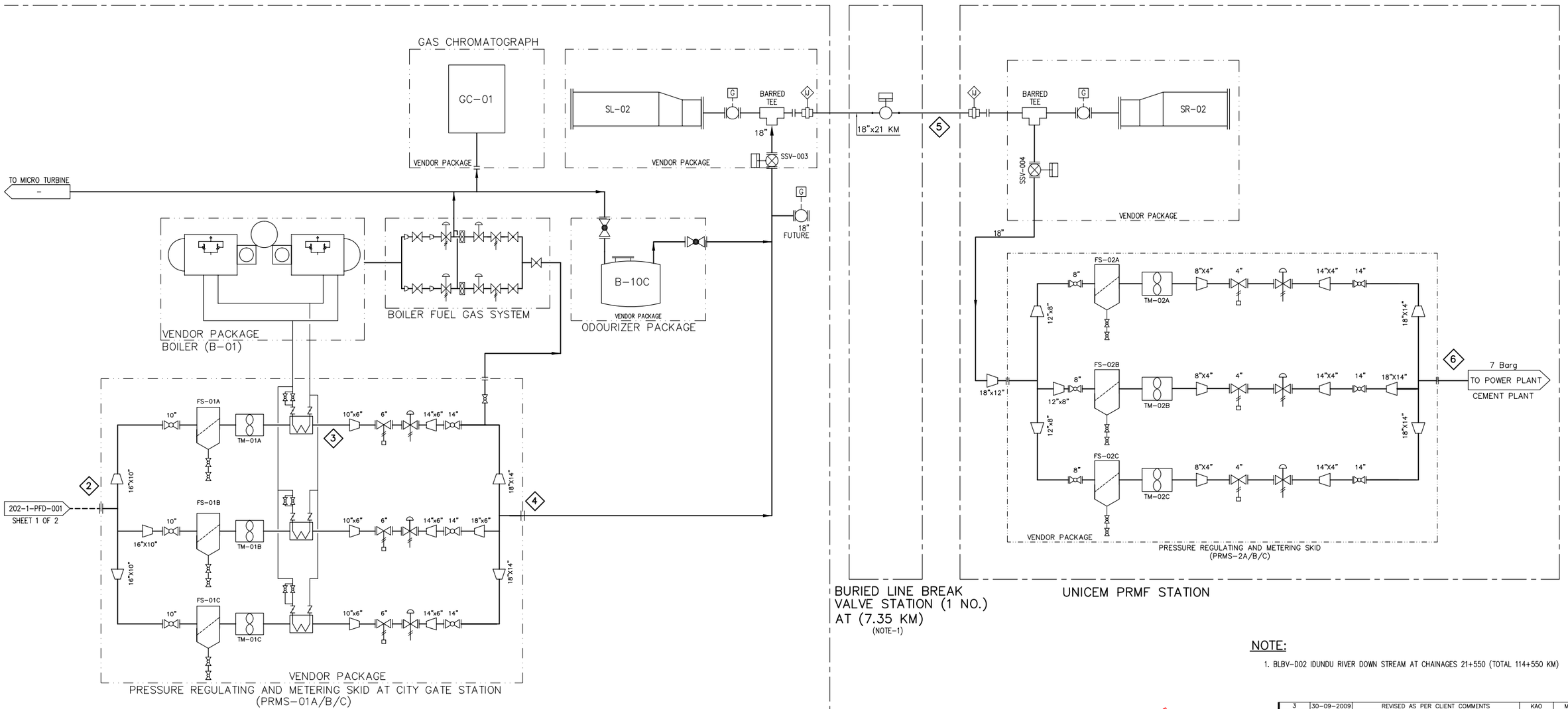
BOILER FUEL GAS SYSTEM	
TAG NO.	MR 400
SERVICE	NATURAL GAS
DESIGN FLOW	400 SM^3/HR
DESIGN TEMP.	+10 °C – +50 °C
INLET PRESSURE	19 Barg
OUTLET PRESSURE	100 Barg

GAS CHROMATOGRAPH	
TAG NO.	GC–01
SERVICE	NATURAL GAS

SCRAPER RECEIVER	
TAG NO.	SR–02
SERVICE	NATURAL GAS
BARREL SIZE	24"
CLASS	300#
DESIGN PRESSURE	50 Barg
DESIGN TEMP.	50 °C

FILTER SEPARATOR	
TAG NO.	FS–01 A/B/C
SERVICE	NATURAL GAS
DIMENSIONS	VENDOR TO SPECIFY
CAPACITY (RATED)	120,000 SM^3/HR
CAPACITY (DESIGN)	240,000 SM^3/HR
DESIGN PRESSURE	100 Barg
DESIGN TEMP.	50 °C

FILTER SEPARATOR	
TAG NO.	FS–02 A/B/C
SERVICE	NATURAL GAS
DIMENSIONS	VENDOR TO SPECIFY
CAPACITY (RATED)	37,000 SM^3/HR
DESIGN PRESSURE	50 Barg
DESIGN TEMP.	50 °C



	2	3	4	5	6
FLOW (RATED)	71,000 SM^3/HR	71,000 SM^3/HR	71,000 SM^3/HR	71,000 SM^3/HR	71,000 SM^3/HR
FLOW (MIN.)	26,000 SM^3/HR	26,000 SM^3/HR	26,000 SM^3/HR	26,000 SM^3/HR	26,000 SM^3/HR
OPERATING TEMPERATURE	30° C	55° C	25° C	25° C	20–22° C
OPERATING PRESSURE	67 Barg	64 Barg	30 Barg	28.5 Barg	7 Barg

LEGEND: –

FUTURE

PROPOSED

NOTE:

1. BLBV–D02 IDUNDU RIVER DOWN STREAM AT CHAINAGES 21+550 (TOTAL 114+550 KM)

APPROVED FOR CONSTRUCTION

REVISION	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED
3	30–09–2009	REVISED AS PER CLIENT COMMENTS	KAO	MAK	IK
2	30–11–2008	APPROVED FOR CONSTRUCTION	MMS	MAK	IK
1	07–04–2008	REVISED AS PER EHGC COMMENTS	S.Z.H	AR	IK
0	08–02–2008	FIRST ISSUE	A.B	AR	IK

TITLE HOLDER : NIGERIAN GAS COMPANY LIMITED
ODIN ROAD,WARRI, DELTA STATE.

Zishan Engineers Limited
An ISO 9001-2000 certified company
E.Mail: contact@zishanengineers.com Website : www.zishanengineers.com

JOB NO. 202–1

PROJECT : East Horizon Gas Company
GAS TRANSMISSION PIPELINE TO UNICEM CEMENT PLANT

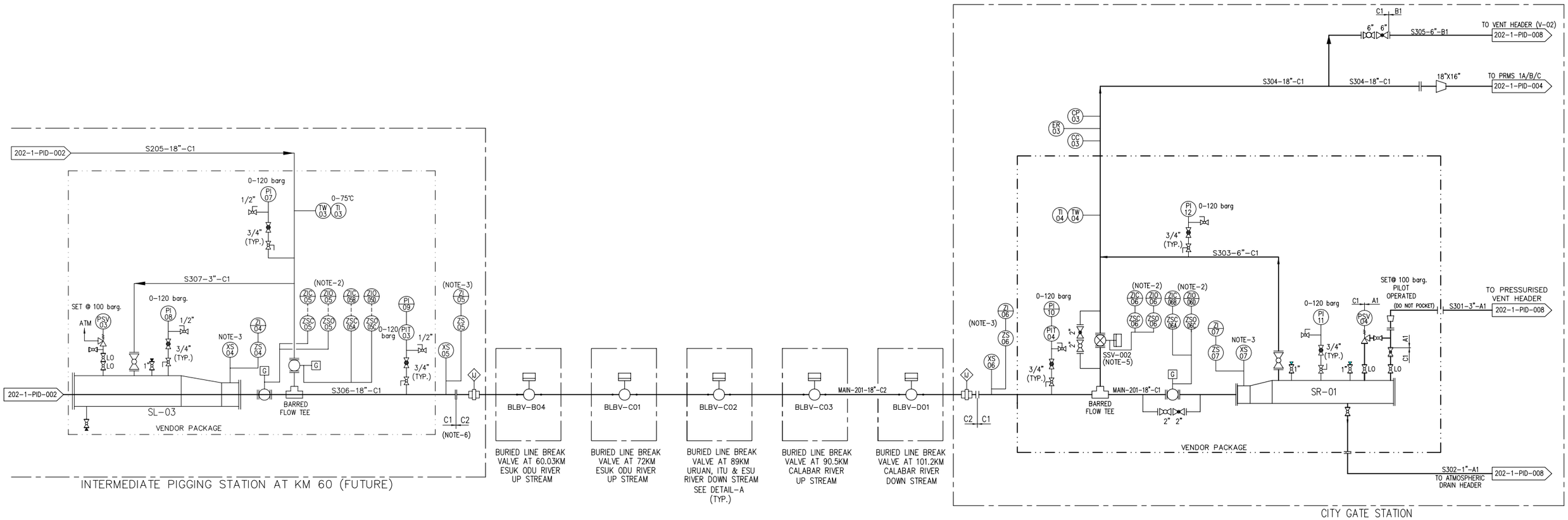
TITLE : PIPELINE SYSTEM SCHEMATIC DIAGRAM

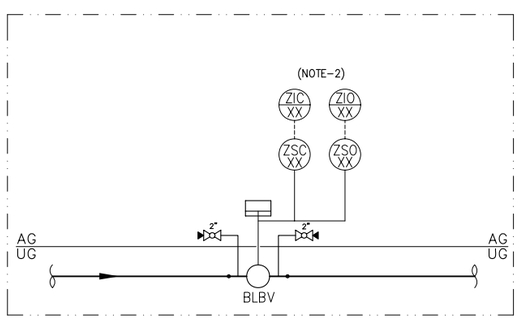
DWG. NO. 202–1–PFD–001 REV. 3

SIZE	SCALE	SHEET
A1	NTS	2 OF 2

SCRAPER LAUNCHER	
TAG NO.	SL-03 (FUTURE)
SERVICE	NATURAL GAS
BARREL SIZE	22"
CLASS	600 #
DESIGN PRESSURE	100 Barg
DESIGN TEMP	50 °C

SCRAPER RECEIVER	
TAG NO.	SR-01
SERVICE	NATURAL GAS
BARREL SIZE	24"
CLASS	600 #
DESIGN PRESSURE	100 Barg
DESIGN TEMP	50 °C





DETAIL-A

APPROVED FOR CONSTRUCTION

LEGENDS:

FUTURE

PRESENT

NOTES:

1. FOR LEGEND & SYMBOLS REF. DWG. NO. 202-1-PID-001
2. LIMIT SWITCHES SHOWN SHALL BE PROVIDED WITH VALVE AND CONNECTED TO CONTROL PANEL AND FUTURE SCADA SYSTEM
3. SCRAPER PASSAGE INDICATOR (PIG SIGNAL) SHALL BE FLAG/ELECTRICAL TYPE AND CONNECTED TO GIVE INDICATION ON CONTROL PANEL AND FUTURE SCADA SYSTEM
4. VENTS/DRAINS SHALL BE CONNECTED INTO COMMON VENT/DRAIN LINES WHICH SHALL BE BROUGHT UPTO THE SKID EDGE.
5. MECHANICAL MANUAL OVERRIDE SHALL BE PROVIDED WITH THE VALVE
6. THIS FLANGE IS PROVIDED FOR THE FUTURE TIE-IN WITH INTERMEDIATE LAUNCHER.

REVISION	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED
3	30-09-2009	REVISED AS PER FINAL DESIGN REVIEW	MIL	QA	MRF
2	30-11-2008	APPROVED FOR CONSTRUCTION	MMS	MAK	IK
1	07-04-2008	REVISED AS PER EHGC COMMENTS	IS	AR	IK
0	08-02-2008	FIRST ISSUE	A.B	AR	IK

TITLE HOLDER : NIGERIAN GAS COMPANY LIMITED
ODIN ROAD,WARRI, DELTA STATE.

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JOB NO. 202-1

East Horizon Gas Company

PROJECT : GAS TRANSMISSION PIPELINE TO UNICEM CEMENT PLANT

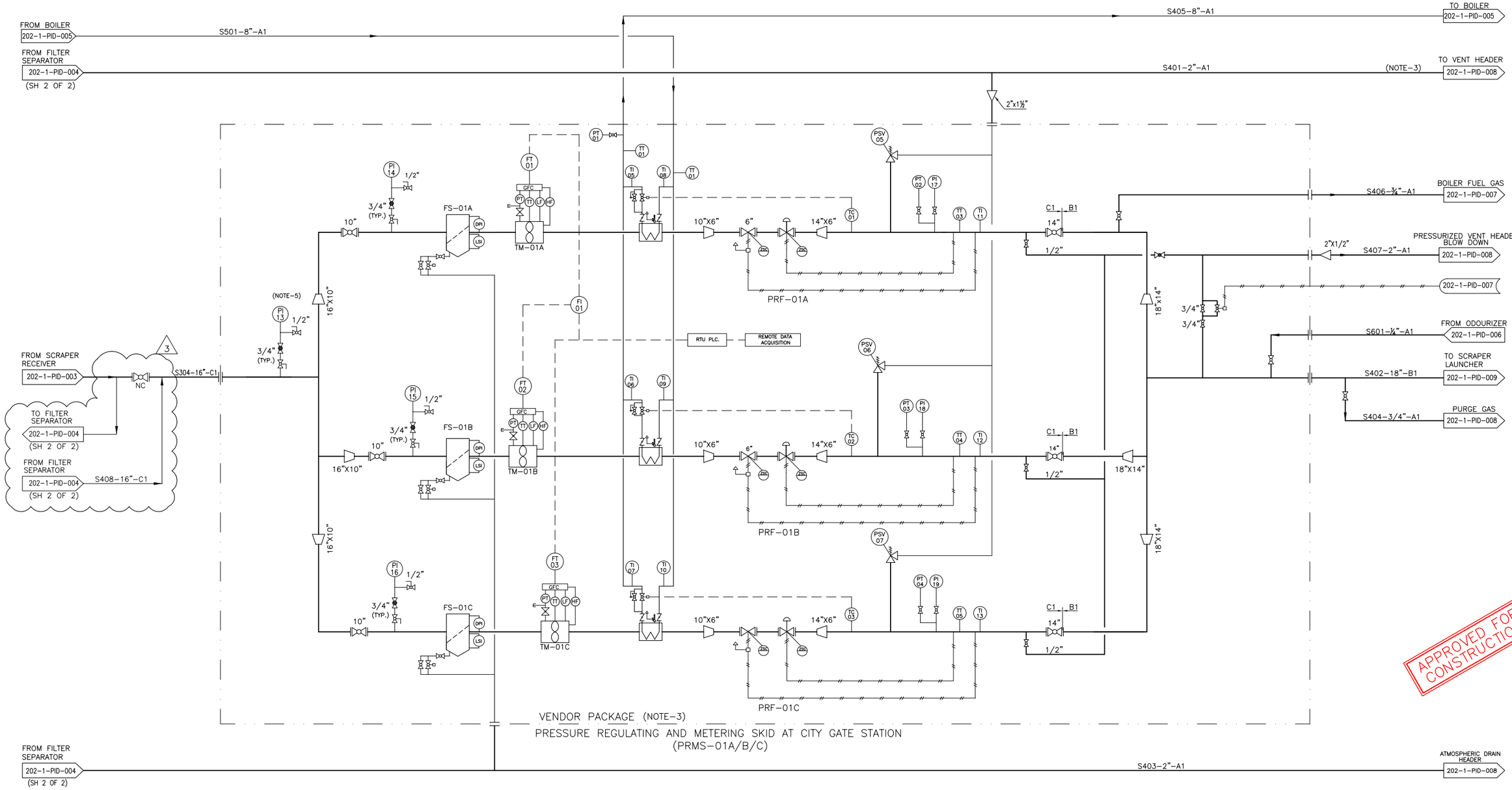
TITLE : P&ID FOR INTERMEDIATE PIGGING STATION AT KM 60, BURIED LINE BREAK VALVE STATIONS & SCRAPER RECEIVER AT CITY GATE

DWG. NO. 202-1-PID-003 REV. 3

SIZE	SCALE	SHEET
A1	NTS	1 OF 1

(PRMS–01A/B/C)			
TURBINE METER.		**PRESSURE REGULATING FACILITY**	
TAG NO.	TM–01A/B/C	TAG NO.	PRF–01 A/B/C
SERVICE	NATURAL GAS	SERVICE	NATURAL GAS
FLOW	120,000 SM3/HR	CLASS	600 #
DESIGN TEMPERATURE	55° C	FLOWRATE (RATED)	120,000 SM3/HR
		INLET PRESSURE	35–70 Barg
		OUTLET PRESSURE	19 Barg
		DESIGN PRESSURE	100 Barg

FILTER SEPARATOR	
TAG NO.	FS–01 A/B/C
SERVICE	NATURAL GAS
DIMENSIONS	VENDOR TO SPECIFY
CAPACITY (RATED)	120,000 SM3/HR
CAPACITY (DESIGN)	240,000 SM3/HR
DESIGN PRESSURE	100 Barg
DESIGN TEMP	50 °C



APPROVED FOR CONSTRUCTION

LEGENDS:

FUTURE

PRESENT

NOTES:

1. FOR LEGEND & SYMBOLS REF. DWG. NO. 202–1–PID–001
2. PRESSURE GAUGE SHALL HAVE A SUITABLE SCALE & SUFFICIENT GRADUATION INTERVALS TO ENABLE READ OUT OF SMALL VARIATIONS & FACILITATE REGULATOR PRESSURE SETTING.
3. VENTS/DRAINS SHALL BE CONNECTED INTO COMMON VENT/DRAIN LINES WHICH SHALL BE BROUGHT UPTO THE SKID EDGE.
4. GAS FLOW COMPUTER ALONG WITH MULTI VARIABLE SENSORS (DP, PRESSURE, TEMPERATURE) SHALL BE INSTALLED TO CALCULATE GAS FLOW RATE THROUGH AGA #3.
5. PI CAN BE INSTALLED UPSTREAM OF THE INLET ISOLATION VALVE ON ANY OF THE PRESSURE LET DOWN STREAM.
6. THIS DRAWING IS BASED ON VENDOR'S DRAWING NO. 0132200R11.

REVISION	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED
3	30–09–2009	REVISED AS PER FINAL DESIGN REVIEW	MIL	MAK	SH
2	30–11–2008	APPROVED FOR CONSTRUCTION	MMS	MAK	IK
1	07–04–2008	REVISED AS PER EHGC COMMENTS	IS	AR	IK
0	08–02–2008	FIRST ISSUE	A.B	AR	IK

TITLE HOLDER : NIGERIAN GAS COMPANY LIMITED
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JOB NO. 202–1

East Horizon Gas Company

PROJECT : GAS TRANSMISSION PIPELINE TO UNICEM CEMENT PLANT

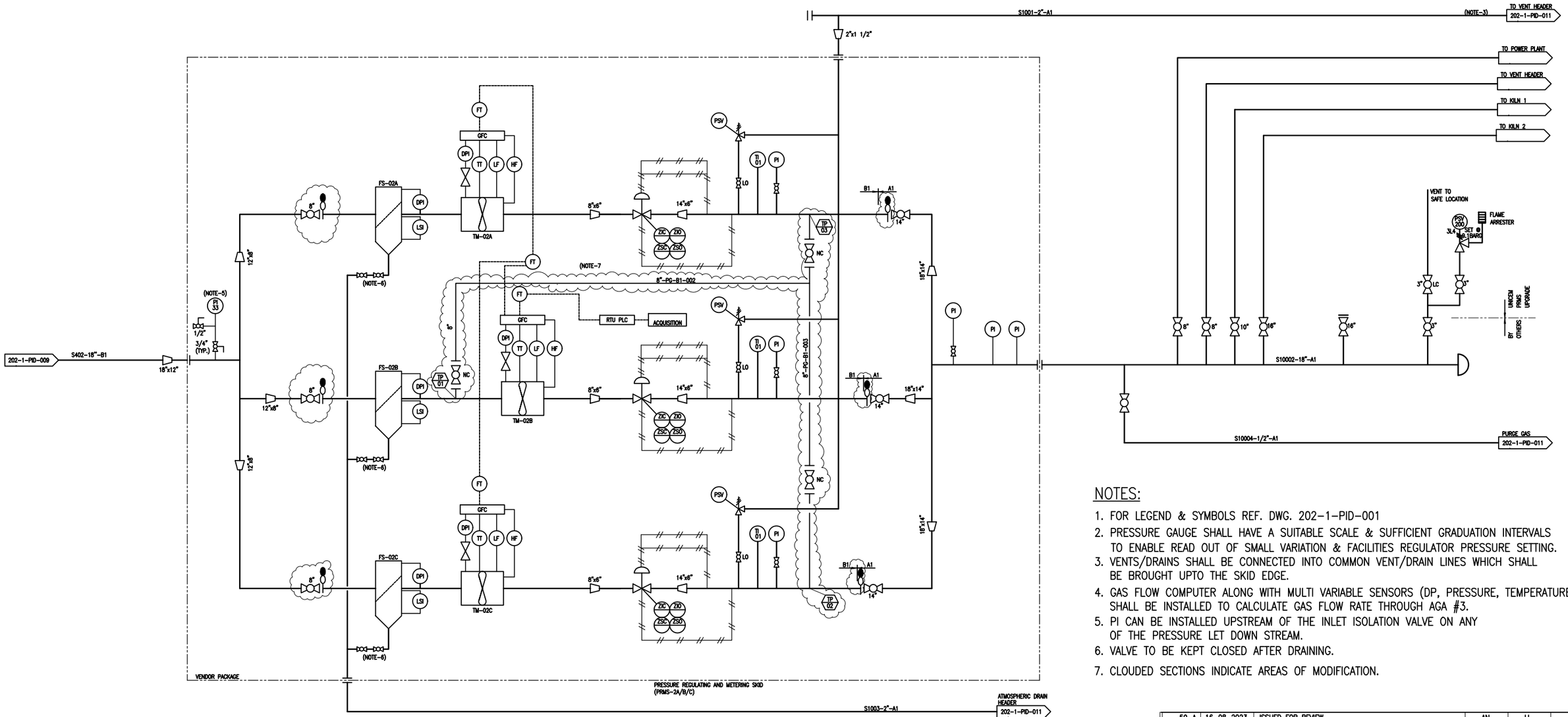
TITLE : P & ID FOR PRESSURE REGULATING & METERING SKID AT CITY GATE STATION

DWG. NO. 202–1–PID–004 REV. 3

SIZE	SCALE	SHEET
A1	NTS	1 OF 2

PRMS-2A/B/C			
TURBINE METER		PRESSURE REGULATING FACILITY	
TAG NO.	TM-02 /A/B/C	TAG NO.	PRF-02 A/B/C
SERVICE	NATURAL GAS	SERVICE	NATURAL GAS
OPERATING TEMP.	25°C	CLASS	300 #
FLOW RATE (RATED)	37,000 SM3/HR	FLOW RATE (RATED)	53,100 SM3/HR
DESIGN PRESSURE	50 Barg	INLET PRESSURE	15-19 Barg
DESIGN TEMP.	60°C	OUTLET PRESSURE	10-6 Barg
		DESIGN TEMP.	60°C

FILTER SEPARATOR	
TAG NO.	FS-02 /A/B/C
SERVICE	NATURAL GAS
DIMENSIONS	VENDOR TO SPECITY
CAPACITY (RATED)	37,000 SM3/HR
DESIGN PRESSURE	50 Barg
DESIGN TEMP.	60°C
OD	0.5188m



NOTES:

1. FOR LEGEND & SYMBOLS REF. DWG. 202-1-PID-001
2. PRESSURE GAUGE SHALL HAVE A SUITABLE SCALE & SUFFICIENT GRADUATION INTERVALS TO ENABLE READ OUT OF SMALL VARIATION & FACILITIES REGULATOR PRESSURE SETTING.
3. VENTS/DRAINS SHALL BE CONNECTED INTO COMMON VENT/DRAIN LINES WHICH SHALL BE BROUGHT UPTO THE SKID EDGE.
4. GAS FLOW COMPUTER ALONG WITH MULTI VARIABLE SENSORS (DP, PRESSURE, TEMPERATURE) SHALL BE INSTALLED TO CALCULATE GAS FLOW RATE THROUGH AGA #3.
5. PI CAN BE INSTALLED UPSTREAM OF THE INLET ISOLATION VALVE ON ANY OF THE PRESSURE LET DOWN STREAM.
6. VALVE TO BE KEPT CLOSED AFTER DRAINING.
7. CLOUDED SECTIONS INDICATE AREAS OF MODIFICATION.

CLOUDED AREA REPRESENTS THE PROPOSED MODIFICATION FOR THE MASTER METER

REVISION	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPROVED
50-A	16-08-2023	ISSUED FOR REVIEW	AN	IJ	JG
50	13-02-2019	AS-BUILT			
3-B	06-02-2019	ISSUED FOR REVIEW			
3	30-09-2009	REVISED AS PER CLIENT COMMENTS	KAO	MAK	IK

CONTRACTOR
AFRIZONE TECHNICAL LIMITED

PROJECT TITLE :
UNICEM PRMS UPGRADE INSTALLATION (MODIFICATION)

TITLE HOLDER :
NIGERIAN GAS COMPANY LIMITED
ODIN ROAD,WARRI, DELTA STATE.

Zishan Engineers Limited
An ISO 9001-2000 certified company
E.Mail : contact@zishanengineers.com Website : www.zishanengineers.com

JOB NO. 202-1

East Horizon Gas Company

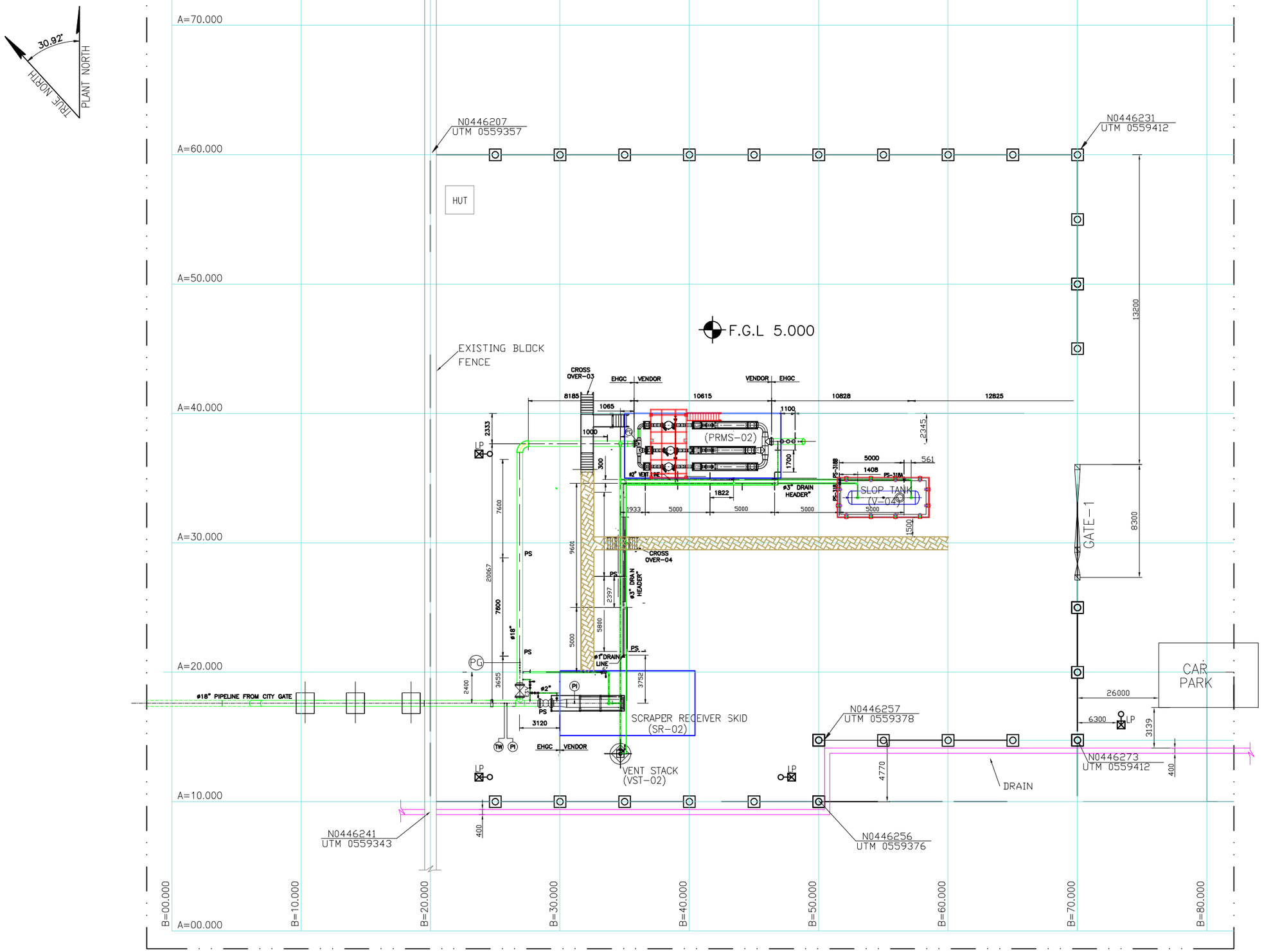
PROJECT : GAS TRANSMISSION PIPELINE TO UNICEM CEMENT PLANT

TITLE : P.I.D FOR PRESSURE REGULATING & METERING SKID AT UNICEM PRMF STATION

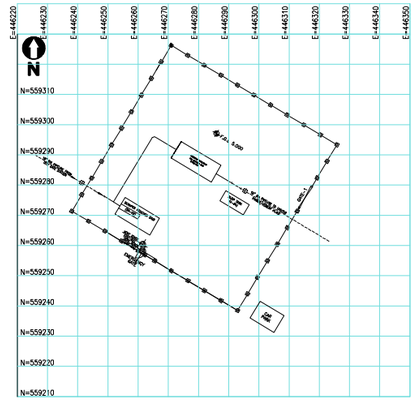
DWG. NO.
202-1-PID-010

SIZE	SCALE	SHEET
A1	NTS	2 OF 2

LIST OF SKID/ EQUIPMENT	
NUMBER	DESCRIPTION
SR-02	SCRAPER RECEIVER SKID
PRMS-02	PRESSURE REGULATING AND METERING SKID
V-04	SLOP TANK
VST-02	VENT STACK



UNICEM PRMF STATION



KEY PLAN

AS-BUILT

NOTES:

1. ALL DIMENSIONS ARE IN mm & COORDINATES ARE IN METER. UNLESS OTHERWISE STATED.
2. ALL DIMENSIONS TO BE VERIFIED WITH EQUIPMENT ORIENTATION PRIOR TO START FABRICATION.

REVISION	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPROVE
50	22/02/19	AS-BUILT			
0-B		ISSUED FOR REVIEW			
0		AS - BUILT			

CONTRACTOR
AFRIZONE TECHNICAL LIMITED

PROJECT TITLE :
UNICEM PRMS UPGRADE INSTALLATION

TITLE HOLDER : NIGERIAN GAS COMPANY LIMITED
ODIN ROAD,WARRI, DELTA STATE.

PROJECT : East Horizon Gas Company
GAS TRANSMISSION PIPELINE TO UNICEM CEMENT PLANT

OILSERV LIMITED

TITLE : AS-BUILT GENERAL ARRANGEMENT FOR UNICEM PRMF STATION

DWG. NO.
202-4-GA-001

SIZE	SCALE	SHEET
A1	1:150	1 OF 1