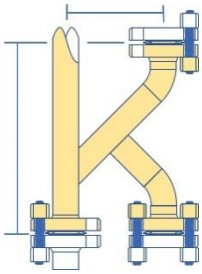

Project Execution Plan

Prepared exclusively for

Kearns Technical Solutions Ltd (KTS)

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Table of Contents

Executive Summary

This Project Execution Plan is a strategic framework. It is designed to reduce ambiguity, support traceability, and align stakeholders around clarity of purpose.

The methodology integrates Artificial Intelligent systems (AI) at every level — from governance and engineering to safety, quality, and reporting. This PEP outlines how predictive analytics, digital twins, and real-time dashboards transform traditional project controls into proactive systems, continuously updated to reflect project realities and stakeholder priorities.

1. Objectives

The primary objective of the project is to deliver a technically robust, commercially viable, and operationally safe facility that meets client requirements and regulatory standards. This plan provides a framework for achieving this through a structured, AI-enhanced methodology that ensures clarity, accountability, and continuous improvement.

Secondary objectives include fostering a culture of proactive risk management, embedding quality and safety from the outset, and ensuring that all stakeholders — from client to contractor — are aligned through transparent communication and traceable decision-making. AI tools support these goals by surfacing early warnings, tracking dependencies, and enabling data-driven interventions.

2. Scope

The scope of this project encompasses the full lifecycle from concept design through commissioning and handover. It includes all engineering disciplines (process, piping, civil, electrical, instrumentation), procurement of long-lead items, construction management, and integration of AI systems for monitoring and control.

Scope boundaries are defined, using AI dashboards to track scope creep, manage change requests, and ensure that all deliverables remain aligned with contractual obligations. Exclusions and interfaces are clearly documented, and scope evolution is governed through a structured change control process.

3. Execution Strategy

A phased execution strategy balances agility with control. Early works packages are decoupled from long-lead procurement to accelerate progress, while AI-supported decision gates ensure that each phase is validated before proceeding. Modular delivery enables parallel workstreams and reduces interdependency risk.

Digital collaboration platforms underpin the execution strategy, enabling real-time coordination across disciplines and geographies. AI tools provide predictive insights on schedule drift, resource bottlenecks, and productivity trends, allowing the project team to act before issues escalate.

4. Applicable Codes and Standards

The following standards shall apply, where applicable:

- PMBOK® Guide – Seventh Edition (Project Management Institute)
- ISO 9001:2015 – Quality Management Systems
- ISO 45001:2018 – Occupational Health & Safety Management Systems
- ISO 14001:2015 – Environmental Management Systems
- ASME B31.3 – Process Piping (and other design codes as appropriate)
- API Standards relevant to operations (e.g., API 610 for pumps, API 650 for tanks)

Where conflicts arise, project-specific standards shall take precedence unless otherwise approved by the Project Manager. Deviations must be documented and approved via formal change control.

5. Roles and Responsibilities

Roles are defined through a hybrid governance model that blends traditional RACI matrices with AI-enabled accountability. Each function — from Owner/Client to Engineering, QA, HSE, Construction, and Commissioning — is mapped against decision rights, reporting lines, and data responsibilities.

AI systems are treated as active participants in the project team. They monitor compliance, flag anomalies, and provide decision support. This integration ensures that human expertise is augmented, not replaced, and that every role is empowered with timely, relevant insights.

📌 Governance Diagram (RACI + AI overlay)

RACI is a widely used framework for clarifying project roles and responsibilities. It stands for:

- R – Responsible: The person or team who does the work to complete the task.
- A – Accountable: The person who owns the task and makes final decisions.
- C – Consulted: People who provide input or expertise before the task is completed.
- I – Informed: People who need to be kept updated on progress or decisions.

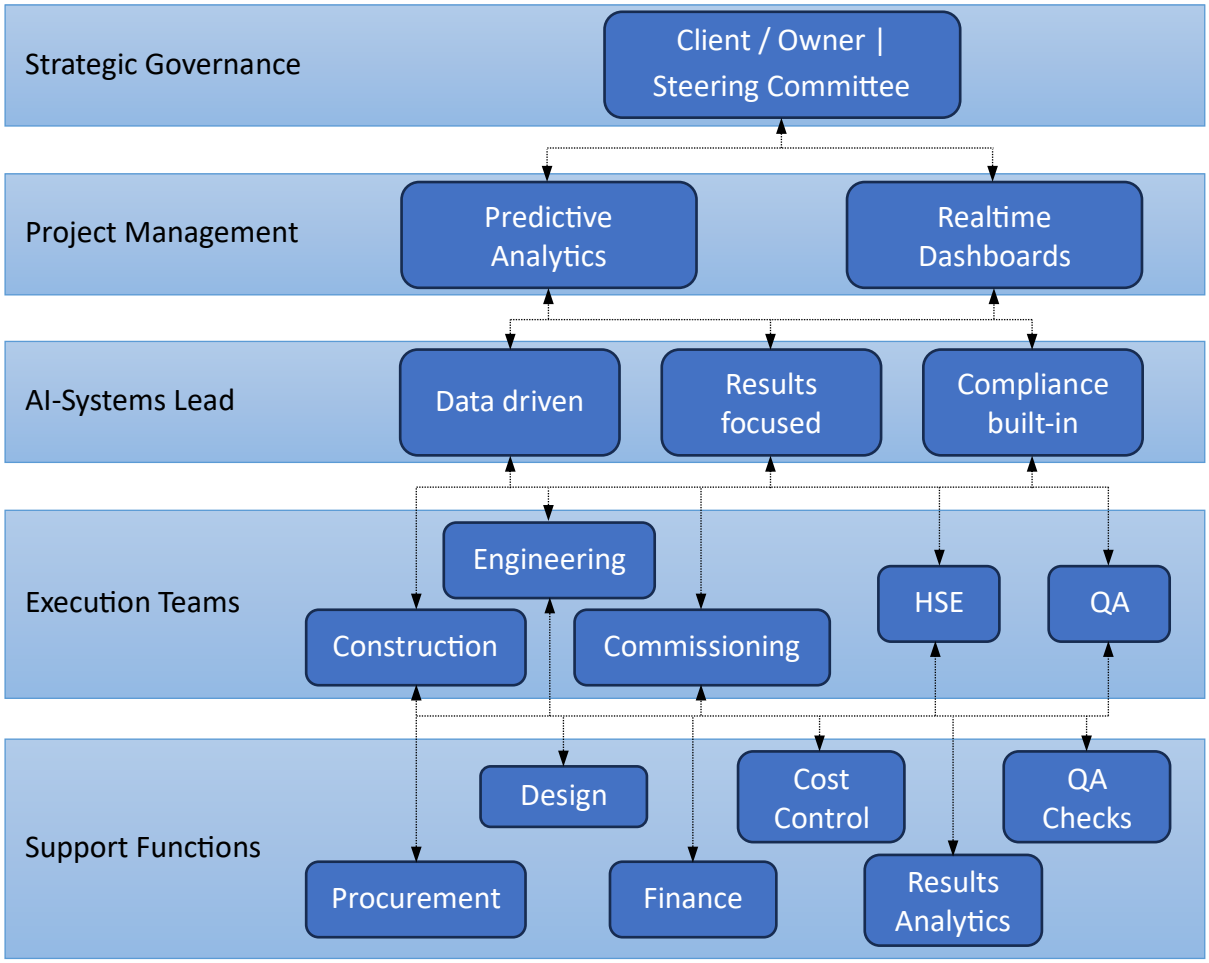
It is often shown in a matrix to make sure everyone knows their role for each deliverable.

Project Governance Structure

- Owner/Client, Steering Committee
- Project Management: PMO, Project Manager, AI Systems Lead
- Execution Teams: Engineering, QA, HSE, Construction, Commissioning
- Support Functions: Finance, Procurement, AI Analytics

Task / Deliverable	Responsible	Accountable	Consulted	Informed
Project Charter	PM	Client	AI Lead	All
Risk Assessment	HSE	PM	AI Lead	QA
AI Workflow Integration	AI Lead	PM	Eng Lead	All
Quality Compliance	QA	PM	AI Lead	Client

Project Execution Plan Integrated RACI Matrix and AI Overlay



6. Engineering Execution Framework

Building on the objectives, scope, execution strategy, applicable codes, and defined roles and responsibilities, this section establishes the core framework for engineering delivery. It sets out how KTS integrates design, documentation, safety, procurement, and commissioning into a unified, AI-supported methodology.

The framework ensures that:

- Design data is identified, validated, and incorporated into the project ecosystem with traceability to environmental impact statements.
- Documentation deliverables are created, controlled, and monitored through AI-enabled systems that enforce compliance and reduce rework.
- Process modelling (PFDs, P&IDs, utilities, safety systems) is linked to hazard studies and action management, supported by predictive analytics.
- Mechanical and instrumentation disciplines are aligned with procurement, vendor evaluation, and lifecycle traceability.
- 3D modelling and plant layout provide the spatial backbone for GA drawings, isometrics, bulk take-offs, and digital twin population.
- Materials management integrates selection philosophies, inspection and test plans, and reporting dashboards.
- Commissioning and handover are embedded from the outset, ensuring operating manuals, maintenance schedules, and digital twin continuity.
- Change management is governed by structured controls, with AI alerts surfacing scope creep and undocumented revisions.

6.1 Design Data Integration (AI-Supported)

Design data forms the foundation of engineering execution. KTS ensures that all inputs — client specifications, regulatory codes, site data, and environmental impact statements — are systematically identified, validated, and incorporated into the project ecosystem. This process guarantees traceability, compliance, and alignment with contractual obligations.

AI Support Includes:

- Smart Tagging & Metadata Capture: AI tools embed searchable metadata into design inputs (e.g. line class, pressure rating, environmental compliance tags), ensuring traceability across all downstream deliverables.
- Automated Standards Mapping: AI systems cross-reference inputs against applicable codes (ISO, ASME, API) and flag deviations or gaps for early resolution.
- Predictive Compliance Checks: Environmental impact data is analysed by AI dashboards to highlight potential conflicts with design intent (e.g. emissions, noise, qwaste thresholds).
- Digital Twin Pre-Population: Design inputs are automatically structured into the digital twin, anchoring inspection history and lifecycle traceability from the outset.
- Change Detection: AI monitors revisions to client specifications or regulatory updates, triggering alerts and initiating structured change control.

Responsibility:

- **Project Engineering Manager** — accountable for the accuracy and completeness of design inputs, for discipline deliverables, vendor coordination, compliance, and timely issue. (If there is a separate Process Engineering Manager, that role shall include responsibility for Process deliverables, also).
- **AI-Systems Lead** — responsible for digital integration, metadata compliance, predictive analytics, change detection, QA dashboards, and digital twin population across all engineering disciplines.

Candidate AI Ecosystems:

The following platforms are proposed to support engineering execution across design, documentation, modelling, QA, and handover. Their capabilities span multiple disciplines:

- **AVEVA™ Engineering & Operations Suite**
  - Centralised design data integration
  - Document control and compliance monitoring
  - Digital twin population and lifecycle traceability
- **Autodesk Plant 3D / BIM 360**
  - 3D modelling, GA drawings, and isometrics
  - Collaborative document workflows linked to models
  - Instrumentation layouts and control system architecture
- **Bentley iTwin™ Platform**
  - Digital twin integration across disciplines
  - Hazard study traceability and inspection history
  - Metadata-driven document and model management
- **Google Cloud Vertex AI**
  - Predictive analytics for risk, compliance, and maintenance
  - Automated change detection and alerting
  - Custom AI models for deliverable validation
- **IBM Maximo + Watsonx**
  - Asset lifecycle management and maintenance scheduling
  - Integration of QA, inspection, and vendor data
  - Predictive maintenance and reliability modelling

6.2 Documentation & Deliverables (AI-Supported)

Documentation underpins the integrity of engineering execution. Deliverables shall be created, controlled, and issued through a structured, AI-enabled document management process. This guarantees traceability, compliance, and alignment with contractual and regulatory obligations.

Scope of Deliverables:

i. Foundational Inputs & Specifications

- Technical specifications (design, fabrication, testing, installation)
- Philosophy documentation (control, safety, utilities, materials)
- Environmental impact statements and compliance records

- **Automated Standards Mapping:** AI cross-references specifications against ISO, ASME, and API codes, flagging gaps early.
- **Smart Metadata Capture:** Specifications and philosophy documents are tagged with compliance and discipline identifiers for traceability.
- **Predictive Compliance Dashboards:** AI analyses environmental impact statements to highlight potential conflicts with design intent

ii. Core Design Outputs

- Process deliverables: PFDs, P&IDs, utilities schematics
- Discipline datasheets (mechanical, electrical, instrumentation)
- Equipment lists and line lists
- 3-D models, GA drawings, isometric drawings

- **Automated Drafting Assistance:** AI-enabled generators produce datasheets, equipment lists, and line lists from validated inputs.
- **Model-Linked Metadata:** AI embeds searchable tags into 3-D models, GA drawings, and isometrics, ensuring downstream traceability.
- **Clash Detection:** AI overlays identify inconsistencies in PFDs, P&IDs, and utilities schematics before formal reviews.

iii. Review & Validation Deliverables

- Design reviews (HAZOP, HAZID, ALARP, SIL, model reviews)
- Technical bid evaluations and vendor requisitions
- Quality plans and compliance records

- **Action Tracking:** AI captures and monitors closure of points raised in HAZOP, HAZID, ALARP, SIL, and model reviews.
- **Vendor Evaluation Support:** AI compares technical bids against specifications, highlighting compliance gaps and lifecycle risks.
- **Automated QA Reviews:** AI systems check quality plans against standards, reducing rework and enhancing assurance.

iv. Execution & Control Deliverables

- Procedures (fabrication, testing, inspection, installation)
- Change management logs and revision histories
- Progress reports and schedule updates

- **Procedure Validation:** AI reviews fabrication, testing, and inspection procedures against specifications and historical NCRs.
- **Change Control Monitoring:** AI detects undocumented revisions or scope creep, triggering alerts and initiating structured change workflows.
- **Progress Analytics:** AI dashboards track deliverable status, schedule adherence, and bottlenecks across disciplines.

v. Completion & Handover Deliverables

- Commissioning dossiers and test packs
- Operating manuals and maintenance management plans
- Final handover documentation and digital twin population

- **Commissioning Dashboards:** AI validates test packs and commissioning dossiers against design data and inspection records.
- **Lifecycle Traceability:** AI integrates operating manuals and maintenance plans into the digital twin for post-handover support.
- **Predictive Maintenance Inputs:** AI models feed inspection and test data into asset management systems for long-term reliability.

6.3 Process Modelling (AI-Supported)

Process modelling translates design inputs into engineering outputs that define the plant's operating philosophy and safety envelope. KTS ensures that all process deliverables are developed, validated, and integrated into the wider design ecosystem, with AI support enhancing accuracy, traceability, and risk management.

Scope of Deliverables:

- Process Flow Diagrams (PFDs) and Piping & Instrumentation Diagrams (P&IDs)
- Utility schematics and system interfaces
- Equipment lists and line lists
- Safety system schematics (fire, emergency, relief)
- Hazard studies and design reviews (HAZID, HAZOP, ALARP, SIL)

AI Support Includes:

- Automated validation of PFDs and P&IDs against design inputs
- Clash detection and dependency mapping across utilities and safety systems
- Action tracking from hazard studies and design reviews
- Predictive risk analytics to highlight operability and safety concerns
- Digital twin population for lifecycle traceability

6.4 Mechanical and Instrumentation (AI-Supported)

Mechanical and instrumentation deliverables define the physical and control backbone of the plant. KTS ensures that equipment specifications, vendor evaluations, and control philosophies are developed and validated in a structured, AI-enabled workflow. This guarantees technical integrity, lifecycle traceability, and alignment with project objectives.

Scope of Deliverables (Chronological Hierarchy):

- Mechanical and instrumentation philosophies and basis of design.
- Equipment and Instrument datasheets, I/O lists, and control system architecture.
- Vendor requisitions, bid evaluations, and compliance records.
- Inspection and Test Plans (ITPs) and quality documentation.
- Installation procedures, progress reports and NCR (Non-Conformance Report) logs.
- Commissioning dossiers, operating manuals, and digital twin integration.
- Change management records linked to equipment and instrumentation.

AI Support Includes:

- Automated datasheet generation and metadata tagging
- Vendor evaluation analytics and compliance checks
- Predictive maintenance modelling for equipment reliability
- Control system validation against process and safety requirements
- QA dashboards integrating FAT, SAT, and ITP results
- Digital twin population for lifecycle traceability

6.5 3D Modelling & Plant Layout (AI-Supported)

3D modelling and plant layout provide the spatial backbone of engineering execution. KTS ensures that models, drawings, and take-offs are developed and validated in a structured, AI-enabled workflow, supporting safety, access, and lifecycle traceability.

Scope of Deliverables (Chronological Hierarchy):

- General Arrangement (GA) drawings and isometric drawings
- 3D plant models and model review records
- Bulk take-offs (piping, instruments, electrical)
- Congestion, access, and safety zoning studies
- Digital twin integration and layout metadata

AI Support Includes:

- Automated clash detection and congestion analysis
- Safety zoning overlays and access validation
- Metadata tagging of models for traceability across disciplines
- Predictive analytics for layout optimisation and constructability
- Digital twin population anchored to plant layout data

6.6 Materials & Quality Assurance (AI-Supported)

Materials, materials management, and quality assurance ensure that all components meet specification, safety, and lifecycle requirements. KTS applies a structured, AI-enabled workflow to material selection, inspection, and compliance monitoring.

Scope of Deliverables:

- Material selection philosophies and compliance records

- Inspection and Test Plans (ITPs) and quality procedures
- Fabrication and testing documentation
- Vendor certificates and compliance dossiers
- Progress and QA reports
- Final quality records integrated into the digital twin

AI Support Includes:

- Automated standards checks for material compliance (ISO, ASME, API)
- Predictive analytics for material performance and lifecycle risk
- Smart tagging of inspection records for traceability
- QA dashboards integrating ITPs, NCRs, and vendor certificates
- Change detection for revisions in material specifications
- Digital twin integration of QA and inspection data

6.7 Commissioning and Handover (AI-Supported)

Commissioning and handover ensure that the plant is delivered safely, fully tested, and ready for operation. KTS applies a structured, AI-enabled workflow to validate systems, capture test results, and integrate final documentation into the digital twin.

Scope of Deliverables:

- Commissioning dossiers and test packs
- System completion certificates and punch-list closure records
- Operating manuals and maintenance schedules
- Training materials and handover reports
- Digital twin integration of commissioning and operational data

AI Support Includes:

- Automated validation of test packs against design and QA records
- Real-time dashboards tracking punch-list items and closure status
- Integration of commissioning data into the digital twin for lifecycle continuity
- Predictive analytics to identify reliability risks before handover
- Structured capture of operating manuals and maintenance plans for asset management

6.8 Change Management (AI-Supported)

Change management ensures that all modifications to scope, design, or deliverables are controlled, documented, and traceable. KTS applies a structured workflow, supported by AI, to prevent scope creep, maintain compliance, and safeguard project integrity.

Scope of Deliverables:

- Change request forms and approval records
- Revision histories and updated deliverables
- Impact assessments (schedule, cost, quality, safety)
- Change logs integrated with project documentation

- Closure reports and compliance confirmation

AI Support Includes:

- Automated detection of undocumented revisions or scope changes
- Predictive alerts for potential schedule or cost impacts
- Smart tagging of change records for traceability across disciplines
- Dashboards tracking approval workflows and closure status
- Integration of change data into the digital twin for lifecycle continuity

7. Quality Assurance (QA)

Quality is embedded from the outset, not inspected at the end. ASME, API, and ISO standards shall apply, with AI tools providing real-time compliance checks, automated inspection test plans (ITPs), and predictive quality alerts. This reduces rework, enhances traceability, and ensures that quality is a continuous process.

The QA framework includes digital checklists, AI-assisted document reviews, and automated NCR (non-conformance report) tracking. Lessons learned are captured and fed into the KTS knowledge base, ensuring that each project benefits from the experience of the last.

8. Health, Safety & Environment (HSE)

Safety is non-negotiable. AI is integrated into its HSE systems to identify hazards, monitor compliance, and support behavioural safety initiatives. Digital permit-to-work systems, real-time site monitoring, and AI-driven trend analysis ensure that risks are identified and mitigated early.

Environmental compliance is tracked through digital logs and AI-supported audits. Emissions, waste, and energy use are monitored continuously, with alerts triggered when thresholds are approached. This proactive approach ensures that HSE is not just a policy — it is a practice.

9. Risk Management

A live risk register shall be maintained, continuously updated through AI inputs and stakeholder reviews. Risks are categorised by likelihood and impact, with mitigation strategies assigned and tracked. AI tools surface emerging risks based on pattern recognition and historical data.

Escalation protocols are clearly defined, and risk ownership is embedded in the governance structure. Opportunities are tracked alongside risks, ensuring that value engineering and innovation are not overlooked.

📌 Insert: Risk Matrix

10.Schedule & Milestones

The project schedule is built around a critical path methodology, with AI tools providing float analysis, dependency mapping, and real-time progress tracking. Milestones are clearly defined and linked to deliverables, enabling transparent performance measurement.

AI dashboards highlight schedule drift, resource clashes, and productivity trends. This allows the team to intervene early, reallocate resources, and maintain momentum. The schedule is not static — it evolves with the project, guided by data.

📌 Insert: Critical Path Gantt Chart

📌 Insert: Dependency Diagram

11.Deliverables

This Deliverables are defined across engineering, procurement, construction, and commissioning. Each deliverable is tracked through a digital document control system, with AI tools flagging overdue items, inconsistencies, and approval bottlenecks.

Sample deliverables include:

- Engineering: P&IDs, 3D models, datasheets

- Procurement: Vendor data books, inspection reports

- Construction: Method statements, redline drawings

- Commissioning: Test packs, handover dossiers

📌 Insert: Sample AI Dashboard

12.Governance, Reporting & Close-Out (AI-Supported)

This section defines how project performance is monitored, reported, and formally closed, applying structured governance processes, supported by AI, to ensure transparency, accountability, and lifecycle continuity.

Scope of Deliverables:

- Governance framework and reporting protocols
- Project dashboards and KPI tracking
- Risk registers and mitigation records
- Stakeholder communication logs and meeting minutes
- Final project report and lessons-learned documentation
- Archival of project data into the digital twin

AI Support Includes:

- Automated KPI tracking and performance dashboards
- Predictive analytics for risk and schedule variance
- Smart tagging of governance records for traceability
- Real-time reporting to stakeholders with automated summaries
- Structured capture of lessons learned and integration into knowledge bases
- Digital twin population with final project data for lifecycle continuity

13.Glossary and Definitions

For clarity and consistency, the following terms are defined as used in this specification. These definitions reflect KTS's proprietary workflows, digital integration strategy, and discipline-specific terminology.

Term	Definition
3D-Modelling	Creation of three-dimensional plant models to support GA drawings, isometrics, and digital twin integration.
ALARP	"As Low As Reasonably Practicable" — principle applied to risk reduction and safety justification.
Automated mapping	AI-enabled cross-referencing of inputs against codes and standards to flag deviations or gaps
Decision gates	Formal checkpoints in project execution where progress is validated before moving to the next phase.
Digital collaboration platforms	Cloud-based tools enabling real-time coordination across disciplines and geographies.
Digital Twin	A structured digital representation of the physical piping system, including metadata, inspection history, and lifecycle traceability.
DMS	Document Management System used for version control, metadata tracking, and controlled document issuance.
FAT (Factory Acceptance Test)	Test performed at the vendor's facility to verify equipment compliance before shipment.
GA MSD (General Arrangement / Master Site Drawing)	High-level drawing showing plant layout, equipment positioning, and spatial coordination.
Gantt Chart	Visual schedule tool showing tasks, durations, and dependencies along a project timeline.
HAZID	Hazard Identification study conducted to identify potential risks early in design.
HAZOP	Hazard and Operability study used to systematically review process designs for safety and operability.
HSE (Health, Safety & Environment)	Framework ensuring occupational safety, environmental compliance, and proactive risk management.
I/O List	Instrumentation deliverable listing input/output signals for control systems.
ITP (Inspection and Test Plan)	Document outlining inspection and testing requirements for materials, fabrication, and installation.
Metadata	Structured labels embedded in documents, models, and records to enable traceability across disciplines.
Modular delivery	Execution strategy using pre-fabricated modules to accelerate progress and reduce interdependency risk.
MSD	Material Selection Diagram—visual overlays showing material boundaries and line class assignments across the plant layout.
NCR (Non-Conformance Report)	Formal record of deviations from specifications, standards, or procedures.
P&ID (Piping & Instrumentation Diagram)	Detailed schematic showing piping, instrumentation, and control systems.

PFD (Process Flow Diagram)	Diagram showing process streams, major equipment, and operating conditions.
PMBOK	Project Management Body of Knowledge — global standard published by PMI for project management practices.
PMO (Project Management Office	Centralised function overseeing governance, reporting, and project controls.
Predictive Analytics	AI-driven modelling that forecasts risks, schedule drift, or equipment reliability based on historical and live data.
QA (Quality Assurance)	Framework ensuring deliverables meet specifications and standards through inspections, audits, and compliance checks.
RACI	Governance tool defining roles as Responsible, Accountable, Consulted, and Informed for each deliverable.
Realtime Dashboards	Live digital interfaces showing project KPIs, risks, and progress updates.
SAT (Site Acceptance Test)	Test performed at the project site to verify equipment and systems after installation.
SIL (Safety Integrity Level)	Classification of safety instrumented functions based on risk reduction requirements.
Smart Tagging	The use of AI tools to embed searchable metadata in drawings and documents, enabling traceability and automated indexing.
Spec Generator	AI-enabled tool used to produce discipline specifications based on predefined templates and project inputs.