

Construction Management System - Requirements Document

Document Control

Version	Date	Author	Changes
1.0	January 12, 2026	Paul Kawalya	Initial comprehensive requirements document

1. EXECUTIVE SUMMARY

1.1 Purpose

This document defines the comprehensive functional and technical requirements for a construction management system that combines the Common Data Environment (CDE) capabilities of Asite with the field-to-finance execution strengths of Procore, delivering a unified platform for construction project lifecycle management.

1.2 Core Philosophy

The system shall provide a **Single Source of Truth with Field-to-Finance Execution**, enabling seamless data flow across the entire construction lifecycle:

- **Design → Construction → Handover:** Complete project lifecycle coverage
- **Documents → Tasks → Costs → Compliance:** Integrated data relationships
- **Web + Mobile, Offline-First:** Accessible anywhere, functional without connectivity

1.3 Scope

The system encompasses all phases of construction project management, from initial design documentation through project closeout and handover, serving all stakeholders including owners, contractors, subcontractors, consultants, and regulatory authorities.

2. SYSTEM-WIDE REQUIREMENTS

2.1 Platform Architecture

REQ-SYS-001: The system shall provide web-based access through modern browsers (Chrome, Firefox, Safari, Edge) without requiring plugins.

REQ-SYS-002: The system shall provide native mobile applications for iOS and Android devices.

REQ-SYS-003: The system shall support offline functionality with automatic synchronization when connectivity is restored.

REQ-SYS-004: The system shall maintain data consistency across all access points (web, mobile, offline).

REQ-SYS-005: The system shall support multi-language interfaces for international deployments.

2.2 Performance Requirements

REQ-SYS-006: The system shall support concurrent access by unlimited users without performance degradation.

REQ-SYS-007: Page load times shall not exceed 3 seconds under normal network conditions.

REQ-SYS-008: Mobile app synchronization shall complete within 5 minutes for typical daily field data.

REQ-SYS-009: The system shall support projects with up to 1 million documents without performance impact.

REQ-SYS-010: Real-time dashboard updates shall reflect changes within 30 seconds.

2.3 Data Security & Privacy

REQ-SYS-011: All data transmission shall be encrypted using TLS 1.3 or higher.

REQ-SYS-012: All data at rest shall be encrypted using AES-256 or equivalent.

REQ-SYS-013: The system shall maintain comprehensive audit logs for all data access and modifications.

REQ-SYS-014: Audit logs shall be immutable and retained for minimum 7 years.

REQ-SYS-015: The system shall support GDPR, CCPA, and other relevant data protection regulations.

3. COMMON DATA ENVIRONMENT (CDE) MODULE

3.1 Document & Drawing Management

3.1.1 Central Repository

REQ-CDE-001: The system shall provide a centralized, cloud-based document repository accessible to all authorized project participants.

REQ-CDE-002: The system shall support storage of all common file formats including:

- CAD drawings (DWG, DXF, DGN)
- Documents (PDF, DOC, DOCX, XLS, XLSX, PPT)
- Images (JPG, PNG, TIFF, BMP)
- Models (IFC, RVT, NWD, NWC)
- Videos (MP4, AVI, MOV)

REQ-CDE-003: Individual file size limits shall be minimum 2GB per file.

REQ-CDE-004: Total project storage shall scale to accommodate projects of any size.

3.1.2 Folder Structure & Organization

REQ-CDE-005: The system shall support hierarchical folder structures configurable by:

- Project
- Discipline (Architectural, Structural, MEP, Civil, etc.)
- Document type
- Contract package
- Custom taxonomies

REQ-CDE-006: The system shall support multiple folder structure templates that can be applied to new projects.

REQ-CDE-007: The system shall allow folder structures to be modified during project execution without breaking links.

REQ-CDE-008: The system shall support bulk folder creation and copying between projects.

3.1.3 Drawing Registers

REQ-CDE-009: The system shall maintain automated drawing registers with metadata including:

- Drawing number
- Drawing title
- Discipline
- Revision number
- Issue date
- Status
- Author/originator
- Scale
- File format

REQ-CDE-010: Drawing registers shall be automatically updated when new drawings are uploaded or revised.

REQ-CDE-011: The system shall support custom drawing numbering conventions per project or organization.

REQ-CDE-012: Drawing registers shall be exportable to Excel, PDF, and other standard formats.

3.1.4 Version Control & Comparison

REQ-CDE-013: The system shall automatically version all documents, creating new versions on each update.

REQ-CDE-014: The system shall retain all previous versions with full metadata and content.

REQ-CDE-015: Users shall be able to view any previous version without overwriting the current version.

REQ-CDE-016: The system shall provide side-by-side comparison of document versions.

REQ-CDE-017: For drawings, the system shall provide visual markup showing differences between versions.

REQ-CDE-018: The system shall prevent accidental overwriting of documents by concurrent users.

REQ-CDE-019: The system shall support check-out/check-in functionality for controlled editing.

REQ-CDE-020: Version history shall include metadata: who, when, what changed, and why (if provided).

3.1.5 Markups & Annotations

REQ-CDE-021: The system shall provide built-in markup tools for PDFs and drawings without requiring external software.

REQ-CDE-022: Markup tools shall include:

- Text annotations and comments
- Cloud/callout shapes
- Arrows and lines
- Highlighting
- Stamps (approved, rejected, custom)
- Measurement tools
- Freehand drawing

REQ-CDE-023: Markups shall be saved as separate layers that can be toggled on/off.

REQ-CDE-024: Multiple users shall be able to add markups to the same document simultaneously.

REQ-CDE-025: Each markup shall be attributed to the user who created it with timestamp.

REQ-CDE-026: Markups shall be exportable as a flattened PDF or as XML for import to CAD systems.

REQ-CDE-027: The system shall support markup sets that can be applied to multiple drawings.

3.1.6 File Transmittals

REQ-CDE-028: The system shall support creation of document transmittals for formal document exchange.

REQ-CDE-029: Transmittals shall include:

- Transmittal number (auto-generated or manual)
- From/To organizations and individuals
- Subject and description
- Document list with purpose codes
- Required actions
- Response due dates

REQ-CDE-030: The system shall support standard transmittal templates per organization or project.

REQ-CDE-031: Recipients shall receive notifications of new transmittals via email and in-app.

REQ-CDE-032: Recipients shall be able to respond to transmittals directly within the system.

REQ-CDE-033: Transmittal status shall be tracked (sent, received, acknowledged, responded).

REQ-CDE-034: The system shall maintain a complete transmittal register with search and filter capabilities.

3.1.7 Access Control & Permissions

REQ-CDE-035: The system shall support granular permission controls at folder, document, and field levels.

REQ-CDE-036: Permission levels shall include minimum:

- No access
- View only
- Download
- Comment/markup
- Upload
- Edit
- Delete
- Manage permissions

REQ-CDE-037: Permissions shall be assignable by:

- Individual users
- User roles
- Organizations

- Project teams

REQ-CDE-038: The system shall support temporary access grants with automatic expiration.

REQ-CDE-039: Permission changes shall be logged in the audit trail.

REQ-CDE-040: Users shall only see folders and documents they have permission to access.

3.1.8 ISO 19650 Compliance

REQ-CDE-041: The system shall implement the ISO 19650 information management workflow with distinct containers:

- Work in Progress (WIP)
- Shared
- Published
- Archive

REQ-CDE-042: Document status transitions shall follow ISO 19650 defined workflows.

REQ-CDE-043: The system shall enforce suitability codes according to ISO 19650 standards.

REQ-CDE-044: The system shall maintain the Common Data Environment (CDE) as defined in ISO 19650.

REQ-CDE-045: The system shall support ISO 19650 Level 2 and Level 3 (BIM Level 2 and 3) requirements.

REQ-CDE-046: The system shall generate ISO 19650 compliant naming conventions and metadata.

3.1.9 Audit Trail

REQ-CDE-047: The system shall log all document activities including:

- Uploads
- Downloads
- Views
- Edits
- Deletions
- Permission changes
- Status changes
- Transmittal actions

REQ-CDE-048: Audit logs shall capture: user, timestamp, action, affected items, and source (IP/device).

REQ-CDE-049: Audit trails shall be searchable and filterable by date range, user, action type, and document.

REQ-CDE-050: Audit logs shall be exportable for compliance and legal purposes.

REQ-CDE-051: The system shall prevent users from modifying or deleting audit log entries.

3.2 Document Workflows

3.2.1 Review & Approval Process

REQ-CDE-052: The system shall support configurable multi-step review and approval workflows.

REQ-CDE-053: Workflows shall support both sequential (step-by-step) and parallel (simultaneous) approval paths.

REQ-CDE-054: Workflow steps shall include:

- Review and comment
- Revise and resubmit
- Approve
- Reject
- Conditional approval
- Information only

REQ-CDE-055: Each workflow step shall allow comments and attachments.

REQ-CDE-056: The system shall support workflow templates that can be applied to document types or folders.

REQ-CDE-057: Workflows shall support conditional routing based on document attributes or previous responses.

REQ-CDE-058: Users shall be able to delegate workflow tasks to other users.

REQ-CDE-059: The system shall maintain complete workflow history for each document.

3.2.2 SLA Tracking

REQ-CDE-060: The system shall support Service Level Agreement (SLA) tracking for workflow steps.

REQ-CDE-061: SLA targets shall be configurable by:

- Workflow type
- Document type

- Priority level
- Organization or role

REQ-CDE-062: The system shall calculate and display time remaining for each workflow task.

REQ-CDE-063: SLA compliance metrics shall be visible on dashboards and reports.

REQ-CDE-064: The system shall identify overdue and at-risk workflow tasks.

REQ-CDE-065: SLA performance shall be tracked by user, team, and organization.

3.2.3 Automated Reminders

REQ-CDE-066: The system shall automatically send reminders for pending workflow tasks.

REQ-CDE-067: Reminder frequency shall be configurable (daily, every 2 days, weekly, etc.).

REQ-CDE-068: Reminders shall escalate to supervisors or alternate users if tasks remain incomplete.

REQ-CDE-069: Users shall receive reminders via email, in-app notifications, and optionally SMS.

REQ-CDE-070: The system shall send advance warnings before SLA deadlines are breached.

3.2.4 Status Tagging

REQ-CDE-071: The system shall support standard document status tags including:

- Work in Progress (WIP)
- Shared (for review/collaboration)
- Published (approved for use)
- Archived (superseded/obsolete)

REQ-CDE-072: The system shall support custom status tags per project or organization.

REQ-CDE-073: Status changes shall be controlled by workflow completion or manual override with permissions.

REQ-CDE-074: Document lists and searches shall be filterable by status.

REQ-CDE-075: Status changes shall trigger notifications to relevant stakeholders.

REQ-CDE-076: Only the latest "Published" version shall be visible to field users unless they specifically request historical versions.

4. PROJECT EXECUTION & FIELD MANAGEMENT MODULE

4.1 Daily Site Operations

4.1.1 Daily Logs

REQ-FIELD-001: The system shall provide mobile-optimized daily log entry forms.

REQ-FIELD-002: Daily logs shall capture:

- Date and weather conditions
- Manpower by trade and hours worked
- Equipment on site and hours operated
- Work activities and locations
- Visitors and deliveries
- Progress achieved
- Issues and delays
- Safety observations
- Photos and videos

REQ-FIELD-003: Daily logs shall support offline entry with automatic sync when online.

REQ-FIELD-004: The system shall support multiple daily logs per project (by supervisor, area, or trade).

REQ-FIELD-005: Daily logs shall be time-stamped and locked after submission to prevent alteration.

REQ-FIELD-006: Historical daily logs shall be searchable and viewable by authorized users.

REQ-FIELD-007: The system shall generate summary reports from daily log data across date ranges.

4.1.2 Weather Tracking

REQ-FIELD-008: The system shall allow manual entry of weather conditions including:

- Temperature (high/low)
- Precipitation type and amount
- Wind speed and direction
- General conditions (clear, cloudy, rainy, etc.)

REQ-FIELD-009: The system shall optionally integrate with weather data services to auto-populate conditions based on location.

REQ-FIELD-010: Weather data shall be associated with daily logs and available for reporting.

REQ-FIELD-011: Weather history shall be exportable for claims and delay analysis.

4.1.3 Manpower & Equipment Logs

REQ-FIELD-012: The system shall maintain manpower logs capturing:

- Trade/classification
- Number of workers
- Hours worked (regular, overtime)
- Tasks performed
- Associated cost codes

REQ-FIELD-013: The system shall maintain equipment logs capturing:

- Equipment type and ID
- Hours operated
- Operator
- Tasks performed
- Fuel consumption
- Maintenance alerts

REQ-FIELD-014: Manpower and equipment data shall integrate with cost tracking modules.

REQ-FIELD-015: The system shall support crew composition templates for recurring work teams.

4.1.4 Site Photos & Videos

REQ-FIELD-016: The mobile app shall provide direct camera access for capturing photos and videos.

REQ-FIELD-017: Photos and videos shall automatically capture metadata:

- GPS location
- Timestamp
- User who captured
- Device information

REQ-FIELD-018: Users shall be able to add descriptions, tags, and location references to photos/videos.

REQ-FIELD-019: Photos and videos shall be organized by:

- Date
- Location/area

- Activity type
- User
- Custom tags

REQ-FIELD-020: The system shall support photo markup and annotation.

REQ-FIELD-021: Photos and videos shall be linkable to inspections, tasks, RFIs, and other records.

REQ-FIELD-022: The system shall support time-lapse photo sequences of construction progress.

4.1.5 Offline Functionality

REQ-FIELD-023: The mobile app shall allow all daily logging functions to work fully offline.

REQ-FIELD-024: Offline data shall be stored securely on the device with encryption.

REQ-FIELD-025: Upon reconnection, the app shall automatically synchronize offline data to the server.

REQ-FIELD-026: The system shall detect and resolve conflicts if multiple users edit the same records offline.

REQ-FIELD-027: Users shall receive confirmation when offline data has been successfully synchronized.

REQ-FIELD-028: The system shall allow selective sync (e.g., sync logs first, then photos) for bandwidth management.

4.2 Quality & Safety Management

4.2.1 Inspections & Checklists

REQ-QS-001: The system shall provide customizable inspection templates and checklists.

REQ-QS-002: Inspection templates shall support:

- Multiple question types (yes/no, pass/fail, numeric, text, dropdown, multiple choice)
- Conditional questions based on previous answers
- Required vs optional fields
- Photo requirements
- Signature capture
- GPS location capture

REQ-QS-003: The system shall support inspection scheduling and assignment.

REQ-QS-004: Inspections shall be performable offline on mobile devices.

REQ-QS-005: Inspection results shall automatically calculate pass/fail status based on defined criteria.

REQ-QS-006: Failed inspections shall automatically generate tasks or NCRs for resolution.

REQ-QS-007: The system shall maintain inspection history linked to locations, activities, and contracts.

REQ-QS-008: Inspection reports shall be automatically generated and distributable via the system.

4.2.2 Non-Conformance Reports (NCRs), Defects & Snag Lists

REQ-QS-009: The system shall support creation and management of non-conformance reports (NCRs), defects, and snag items.

REQ-QS-010: NCR/Defect records shall capture:

- Description and location
- Severity/priority
- Responsible party
- Due date
- Associated costs
- Photos and attachments
- Root cause
- Corrective actions
- Status

REQ-QS-011: NCRs/Defects shall support workflow routing for review and approval.

REQ-QS-012: The system shall track NCR/Defect status (open, in progress, resolved, verified, closed).

REQ-QS-013: NCRs/Defects shall be linkable to inspections, drawings, specifications, and contracts.

REQ-QS-014: The system shall generate snag lists by location, trade, or package.

REQ-QS-015: Snag lists shall be exportable and suitable for handover documentation.

REQ-QS-016: The system shall track NCR/Defect metrics (count, resolution time, repeat occurrences).

4.2.3 Safety Observations & Incidents

REQ-QS-017: The system shall support safety observation reporting including:

- Safe behaviors (positive observations)
- Unsafe conditions
- Unsafe acts
- Near misses
- Hazards

REQ-QS-018: Safety observations shall capture:

- Type and category
- Location
- Personnel involved
- Photos
- Immediate actions taken
- Follow-up required

REQ-QS-019: The system shall support incident reporting for:

- Injuries (first aid, medical treatment, lost time)
- Property damage
- Environmental incidents
- Security breaches

REQ-QS-020: Incident reports shall capture:

- Date, time, and location
- Personnel involved
- Witnesses
- Description of incident
- Injuries sustained
- Treatment provided
- Property damage description
- Photos and diagrams
- Immediate response actions

REQ-QS-021: Incident reports shall trigger notifications to safety managers and designated personnel.

REQ-QS-022: The system shall support injury classification per OSHA or local regulatory standards.

4.2.4 Root Cause & Corrective Actions

REQ-QS-023: The system shall support root cause analysis workflows for NCRs and incidents.

REQ-QS-024: Root cause analysis shall include:

- 5 Whys methodology
- Fishbone/Ishikawa diagrams
- Failure mode categorization
- Contributing factors

REQ-QS-025: The system shall support corrective and preventive action (CAPA) tracking.

REQ-QS-026: Corrective actions shall include:

- Description of action
- Responsible party
- Due date
- Implementation status
- Verification method
- Effectiveness review

REQ-QS-027: The system shall link corrective actions to the originating NCR or incident.

REQ-QS-028: The system shall track repeat issues and patterns requiring systemic changes.

4.3 RFIs & Submittals

4.3.1 RFI Management

REQ-RFI-001: The system shall provide request for information (RFI) creation, tracking, and management.

REQ-RFI-002: RFI records shall capture:

- RFI number (auto-generated or manual)
- Subject and description
- Drawing/specification references
- Cost impact (yes/no/unknown)
- Schedule impact (yes/no/unknown)
- Priority
- Requested by
- Assigned to
- Required response date
- Attachments and photos

REQ-RFI-003: RFIs shall support workflow routing for review and response.

REQ-RFI-004: The system shall track RFI status (draft, submitted, under review, answered, closed).

REQ-RFI-005: RFI responses shall capture:

- Response description
- Attachments and sketches
- Cost implications
- Schedule implications
- Responder and date

REQ-RFI-006: RFIs shall be linkable to drawings, specifications, submittals, and change orders.

REQ-RFI-007: The system shall maintain an RFI register with search and filter capabilities.

REQ-RFI-008: The system shall track RFI metrics (response time, open count, cost/schedule impacts).

REQ-RFI-009: RFI responses shall be automatically distributed to relevant stakeholders.

4.3.2 Submittals

REQ-SUB-001: The system shall provide submittal creation, tracking, and management.

REQ-SUB-002: Submittal records shall capture:

- Submittal number
- Specification section reference
- Type (shop drawings, product data, samples, etc.)
- Description
- Submitted by
- Required action (review, approval, etc.)
- Required response date
- Status
- Attachments

REQ-SUB-003: The system shall maintain a submittal register/log.

REQ-SUB-004: Submittals shall support workflow routing for review and approval.

REQ-SUB-005: Submittal responses shall include:

- Action taken (approved, approved as noted, revise and resubmit, rejected)
- Comments
- Marked-up documents
- Responder and date

REQ-SUB-006: The system shall track submittal status through multiple review cycles if needed.

REQ-SUB-007: Submittals shall be linkable to drawings, specifications, contracts, and RFIs.

REQ-SUB-008: The system shall track submittal metrics (response time, approval rate, revision cycles).

4.3.3 Linking to Project Information

REQ-RFI-010: RFIs shall be linkable to specific drawings with location markup.

REQ-RFI-011: RFIs shall be linkable to specification sections and contract documents.

REQ-SUB-009: Submittals shall be linkable to specification sections and related drawings.

REQ-SUB-010: When viewing drawings or specifications, users shall see all related RFIs and submittals.

REQ-RFI-012: The system shall display RFI/submittal markers on drawing views showing their locations.

4.3.4 Response Time Tracking

REQ-RFI-013: The system shall track time elapsed from RFI submission to response.

REQ-RFI-014: The system shall identify overdue RFIs based on required response dates.

REQ-SUB-011: The system shall track time elapsed from submittal submission to response.

REQ-SUB-012: The system shall identify overdue submittals based on required response dates.

REQ-RFI-015: Response time metrics shall be available on dashboards and reports by project, responder, and time period.

5. TASK & WORKFLOW ENGINE MODULE

5.1 Task Management

REQ-TASK-001: The system shall provide comprehensive task creation and management capabilities.

REQ-TASK-002: Task records shall capture:

- Title and description
- Assigned to (user or role)
- Created by
- Priority (low, normal, high, critical)
- Due date

- Status (not started, in progress, completed, on hold, cancelled)
- % complete
- Actual start and finish dates
- Estimated hours
- Actual hours
- Location/area
- Cost code
- Tags/categories

REQ-TASK-003: Tasks shall support file attachments and links to project documents.

REQ-TASK-004: Tasks shall be linkable to:

- Documents and drawings
- RFIs
- Submittals
- Inspections
- NCRs/Defects
- Contracts
- Schedule activities
- Cost codes

REQ-TASK-005: The system shall support task dependencies (predecessor/successor relationships).

REQ-TASK-006: The system shall support parent-child task hierarchies (subtasks).

REQ-TASK-007: The system shall support recurring tasks (daily, weekly, monthly, custom).

REQ-TASK-008: Tasks shall be viewable in multiple formats:

- List view
- Kanban board
- Calendar view
- Gantt chart
- Map view (location-based)

5.2 Role-Based Assignment

REQ-TASK-009: Tasks shall be assignable to:

- Individual users
- Roles (e.g., Project Manager, Site Engineer)
- Teams/groups
- Organizations

REQ-TASK-010: When assigned to a role or team, the system shall notify all members.

REQ-TASK-011: Team members shall be able to self-assign tasks from their team queue.

REQ-TASK-012: The system shall support task reassignment with notification to previous and new assignees.

REQ-TASK-013: The system shall track task workload by user and team for capacity planning.

5.3 Escalation Rules

REQ-TASK-014: The system shall support configurable escalation rules based on:

- Time overdue
- Priority level
- Task type
- Assigned user or role

REQ-TASK-015: Escalations shall automatically reassign tasks or send notifications to:

- Supervisors/managers
- Alternate users
- Project leadership

REQ-TASK-016: The system shall log all escalations in the task history.

REQ-TASK-017: Users shall be notified before escalation occurs (configurable warning period).

REQ-TASK-018: Escalation rules shall be configurable at organization and project levels.

5.4 Notifications

REQ-TASK-019: The system shall send notifications for task events including:

- New task assignment
- Task due soon
- Task overdue
- Task status change
- Task comments added
- Task completed
- Task escalation

REQ-TASK-020: Notifications shall be delivered via:

- Email
- In-app notifications

- Mobile push notifications
- SMS (configurable)

REQ-TASK-021: Users shall be able to configure notification preferences by event type and delivery method.

REQ-TASK-022: Notification frequency shall be configurable (immediate, daily digest, etc.).

REQ-TASK-023: The system shall support @mentions in task comments to notify specific users.

REQ-TASK-024: Unread notifications shall be visible in a notification center accessible from all system views.

6. COST, CONTRACTS & COMMERCIALS MODULE

6.1 Cost Management

6.1.1 Project Budgets

REQ-COST-001: The system shall support creation and management of project budgets.

REQ-COST-002: Budgets shall be structured by:

- Cost codes (hierarchical)
- Contract packages
- Project phases
- Work breakdown structure (WBS)
- Custom categories

REQ-COST-003: The system shall support multiple budget versions (original, revised, approved).

REQ-COST-004: Budget line items shall include:

- Cost code
- Description
- Quantity
- Unit of measure
- Unit cost
- Total budgeted cost
- Contingency
- Notes

REQ-COST-005: The system shall support budget imports from Excel and other systems.

REQ-COST-006: Budget modifications shall require approval workflow if configured.

REQ-COST-007: The system shall maintain complete budget change history.

6.1.2 Cost Codes

REQ-COST-008: The system shall support hierarchical cost code structures (CSI, custom, or hybrid).

REQ-COST-009: Cost codes shall be applicable across all cost transactions:

- Budgets
- Commitments
- Change orders
- Invoices
- Time and materials
- Actuals

REQ-COST-010: The system shall support master cost code libraries that can be applied to multiple projects.

REQ-COST-011: Cost codes shall support multiple levels of detail (summary to granular).

REQ-COST-012: Users shall be able to map external cost codes to internal codes for reporting.

6.1.3 Commitments

REQ-COST-013: The system shall track commitments (contracts and purchase orders) against budget.

REQ-COST-014: Commitment records shall capture:

- Commitment number
- Vendor/contractor
- Description
- Cost codes
- Original commitment amount
- Approved change orders
- Pending change orders
- Revised commitment amount
- Invoiced to date
- Retainage held
- Amount remaining

REQ-COST-015: The system shall prevent commitment creation if budget is insufficient (with override permission).

REQ-COST-016: Commitments shall be linkable to contracts and subcontracts.

REQ-COST-017: The system shall track commitment status (draft, approved, in progress, completed, closed).

6.1.4 Variations / Change Orders

REQ-COST-018: The system shall support creation and management of change orders for all contract types.

REQ-COST-019: Change order records shall capture:

- Change order number
- Related contract/commitment
- Description
- Reason for change
- Cost codes
- Amount
- Schedule impact
- Status (draft, pending approval, approved, rejected)
- Approval chain
- Backup documentation

REQ-COST-020: Change orders shall support multi-level approval workflows.

REQ-COST-021: The system shall track change order status through approval process.

REQ-COST-022: Approved change orders shall automatically update commitment and budget values.

REQ-COST-023: The system shall maintain a change order log/register per project.

REQ-COST-024: Change orders shall be analyzable by reason code, cost code, and contractor.

6.1.5 Forecasting

REQ-COST-025: The system shall provide cost forecasting capabilities.

REQ-COST-026: Forecasts shall include:

- Committed costs (contracts + approved COs)
- Pending costs (pending COs)
- Estimated cost to complete
- Total forecasted cost at completion
- Variance to budget

REQ-COST-027: The system shall support multiple forecast scenarios (optimistic, expected, pessimistic).

REQ-COST-028: Forecasts shall be updatable based on actual progress and trends.

REQ-COST-029: Forecast assumptions and basis shall be documentable in the system.

REQ-COST-030: The system shall track forecast accuracy over time against actuals.

6.1.6 Actual vs Budget Tracking

REQ-COST-031: The system shall provide real-time actual vs budget reporting by:

- Cost code
- Contract
- Phase
- Time period
- Custom groupings

REQ-COST-032: Cost reports shall display:

- Original budget
- Revised budget (with approved changes)
- Committed costs
- Actual costs (invoiced and paid)
- Forecasted final cost
- Variance (amount and %)
- Budget remaining

REQ-COST-033: The system shall provide earned value management (EVM) metrics:

- Planned value (PV)
- Earned value (EV)
- Actual cost (AC)
- Schedule variance (SV)
- Cost variance (CV)
- Schedule performance index (SPI)
- Cost performance index (CPI)

REQ-COST-034: Cost dashboards shall use color coding to highlight budget issues (green, yellow, red thresholds).

REQ-COST-035: The system shall provide trend analysis showing cost performance over time.

6.2 Contract Management

6.2.1 Main Contracts

REQ-CONT-001: The system shall support management of main/prime contracts with clients/owners.

REQ-CONT-002: Contract records shall capture:

- Contract number and title
- Client/owner
- Contract type (lump sum, unit price, cost plus, GMP, etc.)
- Contract value
- Start and end dates
- Retainage percentage
- Payment terms
- Insurance requirements
- Performance bond details
- Contract documents (uploaded files)

REQ-CONT-003: The system shall support contract amendments and modifications with version control.

REQ-CONT-004: Contract values shall integrate with project budgets and forecasts.

REQ-CONT-005: The system shall track contract status (draft, executed, active, completed, closed).

6.2.2 Subcontracts

REQ-CONT-006: The system shall support management of subcontracts and purchase orders.

REQ-CONT-007: Subcontract records shall include all elements of main contracts plus:

- Scope of work description
- Schedule of values
- Insurance certificates
- Bond information
- Licenses and qualifications
- Safety compliance requirements

REQ-CONT-008: Subcontracts shall be linkable to cost commitments.

REQ-CONT-009: The system shall support subcontract close-out workflows.

REQ-CONT-010: The system shall track subcontractor performance metrics for future selection.

6.2.3 Payment Applications

REQ-PAY-001: The system shall support creation and processing of payment applications (progress claims).

REQ-PAY-002: Payment applications shall include:

- Application number and period
- Schedule of values with line items
- Work completed this period
- Stored materials
- Total completed to date
- Retainage held
- Amount due this period
- Change orders included
- Supporting documentation

REQ-PAY-003: For subcontractor payments, the system shall support review and approval workflow.

REQ-PAY-004: For owner payments, the system shall generate standard forms (AIA G702/G703 or equivalent).

REQ-PAY-005: The system shall track payment application status (draft, submitted, under review, approved, paid).

REQ-PAY-006: Payment history shall be maintained and accessible for all contracts.

REQ-PAY-007: The system shall reconcile payments against contract values and commitments.

6.2.4 Retentions (Retainage)

REQ-PAY-008: The system shall automatically calculate retainage based on contract terms.

REQ-PAY-009: Retainage rates shall be configurable per contract and may vary by milestone.

REQ-PAY-010: The system shall track:

- Retainage withheld to date
- Retainage released
- Retainage remaining

REQ-PAY-011: The system shall support partial or full retainage release upon contract completion or milestones.

REQ-PAY-012: Retainage release shall require approval workflow.

6.2.5 Certificates

REQ-CERT-001: The system shall support upload and tracking of certificates including:

- Insurance certificates
- Payment and performance bonds
- Professional licenses
- Safety certifications
- Quality certifications (ISO, etc.)

REQ-CERT-002: The system shall track certificate expiration dates.

REQ-CERT-003: Users shall receive alerts before certificates expire (configurable lead time).

REQ-CERT-004: Expired certificates shall be highlighted in contractor records and reports.

REQ-CERT-005: The system shall maintain certificate history for compliance audits.

6.2.6 Claims Management

REQ-CLAIM-001: The system shall support creation and tracking of contract claims.

REQ-CLAIM-002: Claim records shall capture:

- Claim number and title
- Claimant and respondent
- Contract reference
- Basis of claim (delay, disruption, extra work, etc.)
- Amount claimed
- Time extension requested
- Description and supporting narrative
- Documentation (schedules, correspondence, photos, etc.)
- Status (draft, submitted, under review, negotiating, settled, disputed)
- Resolution and outcome

REQ-CLAIM-003: Claims shall support attachment of supporting documents, schedules, and cost breakdowns.

REQ-CLAIM-004: The system shall track claim negotiations and responses.

REQ-CLAIM-005: Claims shall be linkable to related RFIs, change orders, and correspondence.

REQ-CLAIM-006: The system shall maintain a claims register with search and reporting capabilities.

7. PLANNING & PROGRESS CONTROL MODULE

7.1 Program of Works (Schedule)

REQ-PLAN-001: The system shall provide integrated scheduling capabilities with Gantt chart visualization.

REQ-PLAN-002: The system shall support import of schedules from MS Project, Primavera P6, and other scheduling tools.

REQ-PLAN-003: Schedule activities shall include:

- Activity ID and name
- Duration
- Start and finish dates (planned, actual, forecasted)
- Predecessors and successors
- Calendar and working days
- Resource assignments
- Cost codes
- Location/area
- % complete
- Float/slack
- Critical path indication

REQ-PLAN-004: The system shall automatically calculate critical path based on activity relationships.

REQ-PLAN-005: The system shall support multiple schedule baselines (original, approved, current).

REQ-PLAN-006: Schedule changes shall be tracked with history and comparison to baseline.

REQ-PLAN-007: The system shall support resource leveling and workload balancing.

REQ-PLAN-008: Schedules shall be exportable in standard formats (MPP, XER, PDF, Excel).

7.2 Milestones

REQ-PLAN-009: The system shall support creation and tracking of project milestones.

REQ-PLAN-010: Milestones shall include:

- Name and description
- Target date
- Actual date

- Status (not started, in progress, achieved, missed)
- Responsible party
- Dependencies

REQ-PLAN-011: Milestone achievements shall trigger notifications to stakeholders.

REQ-PLAN-012: Milestones shall be displayable on project dashboards and timelines.

REQ-PLAN-013: The system shall track milestone performance (on-time, delayed, early completion).

7.3 Look-Ahead Planning

REQ-PLAN-014: The system shall support short-term look-ahead planning (typically 2-6 weeks).

REQ-PLAN-015: Look-ahead plans shall include:

- Activities planned for the period
- Resource requirements
- Material requirements
- Constraints and dependencies
- Prerequisite completions

REQ-PLAN-016: Look-ahead plans shall be updateable weekly or per configured period.

REQ-PLAN-017: The system shall compare look-ahead plans to actual execution for reliability tracking.

REQ-PLAN-018: Look-ahead plans shall integrate with procurement and resource planning.

7.4 Progress Tracking

REQ-PLAN-019: The system shall support multiple methods of progress tracking:

- % complete (manual entry)
- Units completed vs planned
- Start/finish dates
- Earned value
- Physical measurement

REQ-PLAN-020: Progress updates shall be capturable on mobile devices from the field.

REQ-PLAN-021: Progress shall be updateable at activity level and roll up to summary levels.

REQ-PLAN-022: The system shall calculate schedule performance metrics:

- Planned vs actual progress
- Schedule variance
- Activities ahead/on-time/behind
- Critical activities status

REQ-PLAN-023: Progress shall be visualized through:

- Gantt charts with progress bars
- S-curves (planned vs actual)
- Histograms
- Trend charts

7.5 Integration with Other Modules

REQ-PLAN-024: Schedule activities shall be linkable to:

- Cost codes and budgets
- Tasks and workflows
- Inspections and quality records
- Submittals and RFIs
- Progress photos

REQ-PLAN-025: Cost progress shall be comparable to schedule progress for earned value analysis.

REQ-PLAN-026: Delays captured in daily logs shall be linkable to schedule activities for impact analysis.

REQ-PLAN-027: Progress updates shall automatically update related tasks and notifications.

8. REPORTING & DASHBOARDS MODULE

8.1 Real-Time Dashboards

REQ-DASH-001: The system shall provide role-based dashboards with real-time data.

REQ-DASH-002: Dashboard widgets shall include:

- Key performance indicators (KPIs)
- Charts and graphs
- Data tables
- Maps
- Activity feeds
- Alerts and notifications
- Quick action buttons

REQ-DASH-003: Users shall be able to customize their dashboards by adding, removing, and arranging widgets.

8.1.1 Project Health Dashboard

REQ-DASH-004: Project health dashboards shall display:

- Overall project status (on track, at risk, critical)
- Schedule performance (ahead, on time, behind)
- Cost performance (under budget, on budget, over budget)
- Quality metrics (inspections pass rate, defect trends)
- Safety metrics (incident rate, observations)
- Outstanding items count (RFIs, submittals, tasks)
- Recent activities and updates

REQ-DASH-005: Health indicators shall use visual cues (colors, icons) for quick assessment.

REQ-DASH-006: Users shall be able to drill down from summary metrics to detailed data.

8.1.2 Cost Performance Dashboard

REQ-DASH-007: Cost dashboards shall display:

- Budget vs actual vs forecast
- Commitments and remaining budget
- Cash flow (projected vs actual)
- Change order summary
- Cost variance by code/package
- Top cost drivers
- Payment status

REQ-DASH-008: Cost charts shall include:

- Budget consumption curves
- Cost breakdown by category
- Forecast trends
- Variance analysis charts

8.1.3 Task Status Dashboard

REQ-DASH-009: Task dashboards shall display:

- Tasks by status (not started, in progress, completed, overdue)
- My tasks and team tasks
- High-priority tasks
- Tasks due soon

- Task completion trends
- Workload by team member

REQ-DASH-010: Task visualizations shall include Kanban boards, calendars, and lists.

8.1.4 File Activity Dashboard

REQ-DASH-011: Document activity dashboards shall display:

- Recently uploaded files
- Pending reviews and approvals
- Overdue workflow tasks
- Most accessed documents
- Storage usage
- Document status distribution
- Transmittal activity

8.1.5 Compliance Indicators

REQ-DASH-012: Compliance dashboards shall display:

- ISO 19650 compliance status
- Overdue submittals and RFIs
- Expired certificates
- Incomplete inspections
- Open NCRs and defects
- Safety observation trends
- Audit findings

REQ-DASH-013: Compliance indicators shall highlight items requiring immediate attention.

8.2 Custom Reports

8.2.1 Report Builder

REQ-REP-001: The system shall provide a custom report builder with drag-and-drop interface.

REQ-REP-002: Report builder shall support:

- Selection of data sources (documents, tasks, costs, etc.)
- Field selection and ordering
- Filtering and sorting
- Grouping and subtotals
- Calculated fields and formulas
- Charts and visualizations
- Headers, footers, and branding

REQ-REP-003: Users shall be able to save custom report templates for reuse.

REQ-REP-004: Report templates shall be shareable across projects and organizations.

REQ-REP-005: The system shall include a library of pre-built report templates for common needs.

8.2.2 Export Formats

REQ-REP-006: Reports shall be exportable in formats including:

- PDF
- Excel (XLSX)
- CSV
- Word (DOCX)
- HTML
- PNG/JPG (for charts)

REQ-REP-007: Exported reports shall maintain formatting and layout.

REQ-REP-008: Large reports shall support pagination and sectioning.

8.2.3 Scheduled Reports

REQ-REP-009: The system shall support scheduling of recurring reports.

REQ-REP-010: Scheduled reports shall be configurable for:

- Frequency (daily, weekly, monthly, quarterly)
- Specific dates/times
- Recipients (email distribution list)
- Format preferences
- Filter criteria

REQ-REP-011: Scheduled reports shall be automatically generated and distributed at specified times.

REQ-REP-012: Users shall receive confirmation when scheduled reports are sent.

REQ-REP-013: Failed report generation shall trigger alerts to administrators.

8.2.4 Government & Client Templates

REQ-REP-014: The system shall support upload and use of custom report templates provided by clients or regulatory agencies.

REQ-REP-015: Template mappings shall allow system data to populate specific fields in external templates.

REQ-REP-016: The system shall include templates for common forms including:

- AIA forms (G702, G703, etc.)
- OSHA forms
- Project status reports
- Progress reports
- Handover documentation

REQ-REP-017: Template-based reports shall be validatable before submission to ensure completeness.

9. USER & ACCESS MANAGEMENT MODULE

9.1 Multi-Project Support

REQ-USER-001: The system shall support unlimited projects per organization.

REQ-USER-002: Users shall have access to multiple projects based on their roles and permissions.

REQ-USER-003: Users shall be able to switch between projects without logging out.

REQ-USER-004: The system shall provide a project selector accessible from all screens.

REQ-USER-005: Users shall be able to set a default project that loads upon login.

REQ-USER-006: Project-specific settings and preferences shall be maintained separately for each project.

9.2 Role-Based Permissions

REQ-USER-007: The system shall support flexible, role-based access control (RBAC).

REQ-USER-008: Standard roles shall include:

- System Administrator
- Organization Administrator
- Project Administrator
- Project Manager
- Site Manager/Supervisor
- Engineer
- QA/QC Manager

- Safety Manager
- Document Controller
- Contractor/Subcontractor
- Consultant
- Client/Owner Representative
- Read-Only User

REQ-USER-009: Organizations shall be able to create custom roles with specific permission sets.

REQ-USER-010: Permissions shall be granular, controlling access to:

- Modules and features
- View, create, edit, delete actions
- Approval authorities
- Report access
- Data fields
- Folders and documents

REQ-USER-011: Users shall be assignable to multiple roles per project.

REQ-USER-012: Role permissions shall be inheritable and overridable at project level.

REQ-USER-013: Permission changes shall take effect immediately without requiring user logout.

9.3 Organization-Level Access

REQ-USER-014: The system shall support hierarchical organization structures.

REQ-USER-015: Organization structures shall include:

- Parent company
- Divisions/business units
- Project teams
- Subcontractors
- Consultants

REQ-USER-016: Users shall inherit base permissions from their organization.

REQ-USER-017: Organization administrators shall manage users within their organization.

REQ-USER-018: Inter-organization permissions shall control data sharing between companies on shared projects.

REQ-USER-019: The system shall support organization-level templates, settings, and standards.

9.4 Two-Factor Authentication

REQ-USER-020: The system shall support two-factor authentication (2FA) for enhanced security.

REQ-USER-021: 2FA methods shall include:

- Authenticator apps (Google Authenticator, Authy, etc.)
- SMS codes
- Email codes
- Hardware tokens (optional)

REQ-USER-022: Organizations shall be able to mandate 2FA for all users.

REQ-USER-023: Users shall be able to configure trusted devices to reduce 2FA prompts.

REQ-USER-024: The system shall provide backup codes for 2FA recovery.

9.5 Audit & Activity Logs

REQ-USER-025: The system shall maintain comprehensive activity logs for all user actions.

REQ-USER-026: Activity logs shall capture:

- User login/logout
- Access attempts (successful and failed)
- Data access (view, download)
- Data modifications (create, edit, delete)
- Permission changes
- Configuration changes
- Report generation
- Export activities

REQ-USER-027: Activity logs shall include:

- User identity
- Timestamp
- Action type
- Affected resources
- Source (IP address, device type)
- Result (success/failure)

REQ-USER-028: Activity logs shall be searchable and filterable by user, date range, action type, and resource.

REQ-USER-029: Activity logs shall be exportable for compliance and security audits.

REQ-USER-030: Activity logs shall be tamper-proof and immutable.

REQ-USER-031: Administrators shall receive alerts for suspicious activities (multiple failed logins, unusual access patterns, etc.).

10. INTEGRATION & INTEROPERABILITY

10.1 API Access

REQ-INT-001: The system shall provide a comprehensive RESTful API for external integrations.

REQ-INT-002: API access shall be secured using API keys and OAuth 2.0 authentication.

REQ-INT-003: API documentation shall be comprehensive, including endpoints, parameters, responses, and examples.

REQ-INT-004: The API shall support all major system functions including document management, tasks, costs, and reporting.

REQ-INT-005: API rate limits shall be configurable per organization and use case.

10.2 Common Integration Points

REQ-INT-006: The system shall support integration with:

- Accounting systems (QuickBooks, Sage, SAP, etc.)
- ERP systems
- BIM/CAD software (Autodesk Construction Cloud, Revit, Navisworks, etc.)
- Scheduling tools (MS Project, Primavera P6, etc.)
- Document management systems
- Email systems (Outlook, Gmail)
- Single sign-on (SSO) providers

REQ-INT-007: Integrations shall support bi-directional data sync where applicable.

REQ-INT-008: Integration errors shall be logged and alert appropriate users.

10.3 Data Import/Export

REQ-INT-009: The system shall support bulk data import via:

- Excel spreadsheets
- CSV files
- XML
- JSON

REQ-INT-010: Import templates shall be provided for common data types.

REQ-INT-011: Import processes shall validate data and report errors before committing.

REQ-INT-012: The system shall support bulk export of all data types in common formats.

REQ-INT-013: Exports shall include all metadata and relationships.

11. NON-FUNCTIONAL REQUIREMENTS

11.1 Scalability

REQ-NFR-001: The system shall scale horizontally to support organizational growth.

REQ-NFR-002: Performance shall not degrade as data volume increases up to defined limits per module.

REQ-NFR-003: The system shall support 10,000+ concurrent users across all projects.

11.2 Reliability & Availability

REQ-NFR-004: The system shall maintain 99.9% uptime during business hours (excluding scheduled maintenance).

REQ-NFR-005: Scheduled maintenance windows shall be announced 7 days in advance.

REQ-NFR-006: The system shall provide automated backups at minimum daily frequency.

REQ-NFR-007: Disaster recovery capabilities shall enable restoration within 4 hours of a failure.

11.3 Usability

REQ-NFR-008: The user interface shall be intuitive and require minimal training for basic operations.

REQ-NFR-009: The system shall provide context-sensitive help and tooltips.

REQ-NFR-010: The mobile app interface shall be optimized for touch interaction and small screens.

REQ-NFR-011: The system shall be accessible to users with disabilities (WCAG 2.1 Level AA compliance).

11.4 Browser & Device Support

REQ-NFR-012: The web application shall support latest versions of Chrome, Firefox, Safari, and Edge browsers.

REQ-NFR-013: The mobile app shall support iOS 14+ and Android 10+ devices.

REQ-NFR-014: The mobile app shall function on phones and tablets.

11.5 Data Retention

REQ-NFR-015: Project data shall be retained for minimum 7 years after project completion (configurable per region).

REQ-NFR-016: Deleted data shall be retained in archive for recovery period (minimum 90 days) before permanent deletion.

REQ-NFR-017: Organizations shall be able to export complete project archives for long-term offline storage.

12. TRAINING & SUPPORT

12.1 Documentation

REQ-SUP-001: Comprehensive user documentation shall be provided covering all modules and features.

REQ-SUP-002: Documentation shall include:

- Getting started guides
- Module-specific user guides
- Administrator guides
- API documentation
- Video tutorials
- FAQs

REQ-SUP-003: Documentation shall be accessible within the application.

REQ-SUP-004: Documentation shall be maintained and updated with each system release.

12.2 Training Programs

REQ-SUP-005: Training programs shall be available for:

- End users
- Administrators
- API developers
- Super users/champions

REQ-SUP-006: Training delivery methods shall include:

- Live webinars
- Recorded video courses
- In-person training (where applicable)
- Self-paced learning modules

REQ-SUP-007: Training materials shall be customizable for organization-specific configurations.

12.3 Technical Support

REQ-SUP-008: Technical support shall be available via:

- Email
- Phone
- Live chat
- Support ticket system

REQ-SUP-009: Support response times shall be defined by service level agreement (SLA):

- Critical issues: 1 hour
- High priority: 4 hours
- Medium priority: 24 hours
- Low priority: 48 hours

REQ-SUP-010: The system shall include an in-app support widget for submitting tickets.

REQ-SUP-011: Support shall maintain a knowledge base of common issues and solutions.

13. COMPLIANCE & STANDARDS

13.1 Industry Standards

REQ-COMP-001: The system shall comply with ISO 19650 for information management.

REQ-COMP-002: The system shall support BIM Level 2 and Level 3 workflows.

REQ-COMP-003: Cost coding shall support CSI MasterFormat and UniFormat standards.

REQ-COMP-004: The system shall generate reports compliant with AIA contract document standards.

13.2 Regional Regulations

REQ-COMP-005: The system shall comply with data protection regulations applicable in deployment regions including:

- GDPR (European Union)
- CCPA (California, USA)
- PIPEDA (Canada)
- Other regional requirements

REQ-COMP-006: The system shall support data residency requirements (data stored in specific geographic regions).

REQ-COMP-007: The system shall support localized formats for dates, numbers, currencies, and measurements.

13.3 Security Standards

REQ-COMP-008: The system shall maintain SOC 2 Type II certification for security controls.

REQ-COMP-009: The system shall comply with ISO 27001 information security standards.

REQ-COMP-010: Regular security audits and penetration testing shall be conducted (minimum annually).