BuildOS - Product Requirements Document

BuildOS Platform Team

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1 Executive Summary

1.1 Product Overview

BuildOS is an AI-powered Construction Management Platform designed to streamline project workflows, enhance collaboration, and provide real-time insights for construction teams. Built on modern web technologies, BuildOS serves as a comprehensive solution for managing all aspects of construction projects from inception to completion.

The platform integrates traditional construction management tools with cutting-edge AI capabilities, automation workflows, and advanced analytics to deliver unprecedented efficiency and visibility across all project stakeholders.

1.2 Vision & Mission

Vision: To become the leading construction management platform that empowers teams to deliver projects on time, within budget, and with exceptional quality through intelligent automation and data-driven insights.

Mission: Provide construction professionals with an intuitive, powerful platform that eliminates administrative overhead, facilitates seamless communication, and leverages AI to predict and prevent project issues before they occur.

1.3 Target Users

BuildOS is designed for the following user personas:

User Role	Primary Responsibilities	Key Features Used
General Contractors	Overall project management, coordination, budget oversight	Projects, Change Orders, Analytics Dashboard, Financial Tracking
Project Managers	Day-to-day project execution, team coordination, schedule management	RFIs, Submittals, Daily Reports, Time Tracking, Notifications
Field Supervisors	On-site management, crew coordination, equipment tracking	Daily Reports, Punch Items, Equipment Management, Time Tracking
Subcontractors	Specialized work execution, submittal preparation, RFI responses	Submittals, RFIs, Documents, Punch Items
Owners/Clients	Project oversight, approval workflows, financial monitoring	Analytics Dashboard, Change Orders, Document Review, Reports

2 Product Features (Completed)

2.1 Core Project Management

2.1.1 Projects Module

The Projects module serves as the central hub for all construction activities, providing comprehensive project lifecycle management.

Key Features:

- **CRUD Operations:** Full create, read, update, delete functionality for project records
- **Project Attributes:**
  - Project name, description, and location
  - Start and end dates with timeline visualization
  - Budget tracking with variance calculations
  - Status tracking (Planning, Active, On Hold, Completed, Cancelled)
  - Client/owner information
  - Project manager assignment
- **Filtering & Search:** Advanced filtering by status, date range, budget, and custom criteria
- **Project Dashboard:** Individual project overview with key metrics and recent activity
- **Document Association:** Link documents, drawings, and specifications to projects
- **Team Management:** Assign team members and define roles per project

2.1.2 RFIs (Request for Information)

Streamlined RFI management with complete tracking from submission to resolution.

Key Features:

- **RFI Creation:** Structured form with project association, subject, description, priority
- **Response Tracking:** Multi-response capability with threaded conversations
- **Comment System:** Collaborative discussion threads on each RFI
- **Status Management:** Draft, Submitted, Under Review, Answered, Closed
- **Priority Levels:** Low, Medium, High, Critical
- **Due Date Tracking:** Automated reminders and overdue notifications
- **Attachment Support:** Upload drawings, photos, and supporting documents
- **Response Time Analytics:** Track average response times and bottlenecks

2.1.3 Submittals

Complete submittal workflow management with approval tracking and version control.

Key Features:

- **Submittal Types:** Shop Drawings, Product Data, Samples, Mix Designs, Test Reports
- **Approval Workflow:** Multi-stage approval process with reviewer assignment
- **Status Tracking:** Pending, Under Review, Approved, Approved as Noted, Rejected, Resubmit
- **Version Control:** Track submittal revisions and resubmissions
- **Response Management:** Detailed reviewer responses with comments
- **Due Date Management:** Submission and review deadlines with alerts
- **Specification References:** Link to project specifications and drawing references
- **Compliance Tracking:** Ensure all required submittals are completed

2.1.4 Change Orders

Comprehensive change order management with cost impact analysis and approval workflows.

Key Features:

- **Change Request Creation:** Detailed description of proposed changes
- **Cost Tracking:** Original cost, proposed cost, and variance calculations
- **Schedule Impact:** Track time extensions and schedule modifications
- **Approval Workflow:** Multi-level approval process with stakeholder sign-off
- **Status Management:** Draft, Pending, Approved, Rejected, Implemented
- **Reason Codes:** Categorize changes (Design Change, Site Conditions, Owner Request, etc.)
- **Document Attachments:** Supporting documentation and justifications
- **Budget Impact Analysis:** Real-time project budget updates
- **n8n Webhook Integration:** Automated change order processing via external workflows

2.1.5 Punch Items

Deficiency tracking and completion management for project closeout.

Key Features:

- **Punch Item Creation:** Description, location, responsible party, priority
- **Assignment System:** Assign to specific subcontractors or team members
- **Status Tracking:** Open, In Progress, Completed, Verified, Closed
- **Priority Levels:** Low, Medium, High, Critical
- **Photo Documentation:** Before and after photos for verification
- **Due Date Management:** Track completion deadlines
- **Verification Workflow:** Inspector review and approval process
- **Bulk Operations:** Create and update multiple punch items simultaneously
- **Closeout Reports:** Generate comprehensive punch list reports

2.1.6 Daily Reports

Comprehensive daily activity logging with weather tracking and progress documentation.

Key Features:

- **Daily Log Entry:** Date-specific reports with project association
- **Weather Conditions:** Temperature, conditions, and weather impact notes
- **Work Performed:** Detailed description of daily activities
- **Crew Information:** Track crew size and labor hours
- **Equipment Usage:** Log equipment on-site and utilization
- **Material Deliveries:** Record material receipts and quantities
- **Visitor Log:** Track site visitors and inspections
- **Safety Incidents:** Document safety observations and incidents
- **Progress Photos:** Attach daily progress photography
- **Delays & Issues:** Record delays, causes, and mitigation actions
- **Report Distribution:** Automated distribution to stakeholders

2.1.7 Document Management

Cloud-based document management with AWS S3 integration for secure file storage.

Key Features:

- **File Upload:** Support for all common file types (PDF, DWG, images, Office docs)
- **Cloud Storage:** AWS S3 integration with presigned URLs for secure access
- **Document Categories:** Drawings, Specifications, Contracts, Reports, Photos, Other
- **Version Control:** Track document revisions and updates
- **Access Control:** Public vs. private document permissions
- **Project Association:** Link documents to specific projects
- **Search & Filter:** Full-text search and metadata filtering
- **Bulk Upload:** Upload multiple files simultaneously

- **Download Management:** Secure download links with expiration
- **Storage Path Management:** Organized folder structure in cloud storage

2.2 Phase 1 & 2 Features (Recently Completed)

2.2.1 Communication & Notification System

A comprehensive real-time notification system that keeps all stakeholders informed of critical project events.

Key Features:

- **Real-Time Notifications:**
  - RFI responses and status changes
  - Submittal approvals and rejections
  - Change order updates and approvals
  - Punch item assignments and completions
  - Daily report submissions
  - Document uploads and updates
  - Time entry approvals
  - Equipment maintenance alerts
  - Material requisition status changes
- **Notification Center:**
  - Bell icon with unread count badge
  - Dropdown panel with recent notifications
  - Mark individual notifications as read
  - Mark all notifications as read
  - Filter by read/unread status
  - Direct links to related items
  - Timestamp display (relative and absolute)
- **Email Notifications:**
  - HTML email templates with branding
  - Configurable email preferences per user
  - Digest options (immediate, daily, weekly)
  - Unsubscribe management
  - Email delivery tracking
- **User Notification Preferences:**
  - Granular control over notification types
  - Channel preferences (in-app, email, both)
  - Frequency settings
  - Quiet hours configuration
  - Project-specific notification rules
- **Activity Feed:**
  - Comprehensive activity tracking (18+ activity types)
  - Project-level activity streams
  - User activity history
  - Filterable by activity type
  - Searchable activity logs
  - Export activity reports

Activity Types Tracked:

Activity Type	Description
PROJECT_CREATED	New project initialization
PROJECT_UPDATED	Project details modified
RFI_CREATED	New RFI submitted
RFI_RESPONDED	RFI response provided
RFI_CLOSED	RFI marked as closed
SUBMITTAL_CREATED	New submittal submitted
SUBMITTAL_REVIEWED	Submittal review completed

Activity Type	Description
SUBMITTAL_APPROVED	Submittal approved
CHANGE_ORDER_CREATED	New change order requested
CHANGE_ORDER_APPROVED	Change order approved
PUNCH_ITEM_CREATED	New punch item logged
PUNCH_ITEM_COMPLETED	Punch item marked complete
DAILY_REPORT_CREATED	Daily report submitted
DOCUMENT_UPLOADED	New document added
TIME_ENTRY_SUBMITTED	Time entry submitted for approval
EQUIPMENT_MAINTENANCE	Equipment maintenance scheduled
MATERIAL_ORDERED	Material requisition ordered
DESIGN_REQUEST_CREATED	Design service request initiated

2.2.2 Advanced Analytics Dashboard

A powerful analytics engine providing real-time insights into project performance, team productivity, and financial health.

Dashboard Components:

2.2.2.1 1. Project Health Scorecard

High-level metrics providing instant visibility into portfolio health:

- **Active Projects Count:** Total number of active projects
- **On-Time Percentage:** Projects meeting schedule targets
- **Budget Variance:** Aggregate budget performance across all projects
- **Critical Items:** Count of high-priority RFIs, punch items, and overdue tasks
- **Team Utilization:** Labor hours and crew efficiency metrics
- **Equipment Utilization:** Equipment usage rates and availability

2.2.2.2 2. Performance Metrics

Detailed performance indicators with trend analysis:

- **RFI Velocity:**
  - Average response time
  - Open vs. closed RFI ratio
  - RFI volume trends
  - Response time by priority level
  - Bottleneck identification
- **Submittal Approval Rates:**
  - First-time approval percentage
  - Average review time
  - Rejection reasons analysis
  - Resubmission rates
  - Reviewer performance metrics
- **Change Order Analysis:**
  - Total change order value
  - Approval rate and timeline
  - Change order frequency
  - Cost impact by category
  - Trend analysis over time
- **Punch Item Completion:**
  - Open vs. closed punch items
  - Average completion time
  - Completion rate by trade

  - Critical punch items tracking
  - Closeout readiness score

2.2.2.3 3. Interactive Charts (Chart.js Integration)

Professional data visualizations with multiple chart types:

- **Line Charts:** Time-series data for trends and forecasting
- **Bar Charts:** Comparative analysis across projects or categories
- **Doughnut Charts:** Distribution and proportion visualization
- **Stacked Charts:** Multi-dimensional data representation
- **Interactive Tooltips:** Hover for detailed data points
- **Responsive Design:** Adapts to screen size and device
- **Color-Coded:** Consistent color scheme for data categories

2.2.2.4 4. Date Range Filters

Flexible time-based analysis:

- **Preset Ranges:**
  - Last 7 days
  - Last 30 days
  - Last 90 days
  - Last 365 days
  - Custom date range picker
- **Dynamic Updates:** Charts and metrics update in real-time based on selected range
- **Comparison Mode:** Compare current period to previous period
- **Trend Indicators:** Up/down arrows with percentage change

2.2.2.5 5. Export Functionality

Comprehensive data export capabilities:

- **Export Formats:** PDF, Excel, CSV
- **Report Types:**
  - Executive summary reports
  - Detailed analytics reports
  - Custom filtered reports
  - Scheduled automated reports
- **Customization:** Select specific metrics and charts to include
- **Branding:** Company logo and custom headers/footers

2.2.2.6 6. Tabbed Interface

Organized analytics across multiple dimensions:

- **Overview Tab:** High-level dashboard with key metrics
- **Projects Tab:** Project-specific analytics and comparisons
- **RFIs Tab:** Detailed RFI analysis and trends
- **Submittals Tab:** Submittal workflow performance
- **Financial Tab:** Budget, costs, and change order analysis
- **Labor Tab:** Time tracking and crew productivity
- **Equipment Tab:** Equipment utilization and maintenance

2.2.3 Time Tracking & Labor Management

Comprehensive labor management system for tracking crew time, calculating costs, and managing overtime.

Key Features:

- **Time Entry Management:**
  - Date and project association
  - User/employee assignment
  - Regular hours and overtime hours

  - Hourly rate configuration
  - Automatic cost calculation
  - Notes and description fields
  - Status workflow (Draft, Submitted, Approved, Rejected)
- **Crew Management:**
  - Create and manage crews
  - Assign crew members with roles
  - Track crew size and composition
  - Crew-level time tracking
  - Crew productivity metrics
  - Historical crew performance
- **Overtime Tracking:**
  - Separate overtime hour logging
  - Configurable overtime multipliers
  - Overtime cost calculations
  - Overtime trend analysis
  - Budget impact tracking
  - Compliance reporting
- **Labor Cost Calculations:**
  - Real-time cost computation
  - Regular vs. overtime cost breakdown
  - Project-level labor cost aggregation
  - Budget vs. actual labor cost comparison
  - Labor cost forecasting
  - Cost allocation by trade or activity
- **Approval Workflow:**
  - Submit time entries for approval
  - Manager review and approval
  - Rejection with comments
  - Resubmission capability
  - Approval history tracking
  - Bulk approval operations
- **Reporting:**
  - Weekly/monthly timesheets
  - Labor cost reports by project
  - Overtime analysis reports
  - Crew productivity reports
  - Export to payroll systems

2.2.4 Equipment & Material Management

Complete asset and material tracking system for construction equipment and material requisitions.

2.2.4.1 Equipment Management Key Features:

- **Equipment Inventory:**
  - Equipment name and description
  - Equipment type/category
  - Serial number and model
  - Purchase date and cost
  - Current status (Available, In Use, Maintenance, Retired)
  - Ownership type (Owned, Rented, Leased)
  - Location tracking
  - Project assignment
- **Maintenance Record Scheduling:**

  - Scheduled maintenance tracking
  - Maintenance type (Preventive, Repair, Inspection)
  - Maintenance date and next due date
  - Maintenance cost tracking
  - Service provider information
  - Maintenance history log
  - Automated maintenance reminders
  - Downtime tracking
- **Project Assignment Tracking:**
  - Assign equipment to specific projects
  - Track equipment utilization by project
  - Equipment transfer between projects
  - Availability calendar
  - Conflict detection for double-booking
  - Equipment checkout/check-in system
- **Equipment Status Management:**
  - Real-time status updates
  - Status change history
  - Utilization rate calculations
  - Idle equipment identification
  - Retirement planning
  - Disposal tracking
- **Cost Tracking:**
  - Purchase/rental costs
  - Maintenance costs
  - Operating costs
  - Total cost of ownership
  - Cost allocation to projects
  - ROI analysis for owned equipment

2.2.4.2 Material Management Key Features:

- **Material Requisition Workflow:**
  - Create material requisitions
  - Material description and specifications
  - Quantity and unit of measure
  - Required delivery date
  - Project association
  - Cost estimation
  - Vendor/supplier information
- **Status Tracking:**
  - **Requested:** Initial requisition created
  - **Ordered:** Purchase order issued
  - **In Transit:** Material shipped
  - **Delivered:** Material received on-site
  - **Cancelled:** Requisition cancelled
- **Delivery Management:**
  - Expected delivery date
  - Actual delivery date
  - Delivery location
  - Receiving documentation
  - Quantity verification
  - Quality inspection notes
- **Cost Management:**

  - Estimated cost
  - Actual cost
  - Cost variance tracking
  - Budget impact analysis
  - Invoice matching
  - Payment tracking
- **Inventory Integration:**
  - Track material quantities
  - Material usage by project
  - Inventory levels and reorder points
  - Material waste tracking
  - Surplus material management

2.3 AI-Powered Features

2.3.1 Document Analysis with Abacus.AI

Leverage advanced AI capabilities to extract insights from construction documents.

Key Features:

- **Intelligent Document Processing:**
  - Automatic text extraction from PDFs and images
  - Drawing analysis and markup detection
  - Specification parsing and indexing
  - Contract clause extraction
  - Compliance checking
- **Search & Discovery:**
  - Natural language search across documents
  - Semantic search for related content
  - Automatic document categorization
  - Duplicate detection
  - Version comparison
- **Data Extraction:**
  - Extract key dates and milestones
  - Identify cost items and quantities
  - Parse material specifications
  - Extract contact information
  - Identify risks and obligations

2.3.2 CRM Integration

Integrated customer relationship management for client and stakeholder management.

Key Features:

- **Contact Management:** Track clients, subcontractors, vendors, and stakeholders
- **Communication History:** Log all interactions and communications
- **Opportunity Tracking:** Manage bids and proposals
- **Relationship Mapping:** Visualize stakeholder relationships
- **Activity Tracking:** Monitor engagement and touchpoints

2.3.3 AI Project Planning

Intelligent project planning assistance powered by machine learning.

Key Features:

- **Schedule Optimization:** AI-suggested task sequences and durations
- **Resource Allocation:** Optimal crew and equipment assignments
- **Risk Prediction:** Identify potential delays and issues
- **Cost Estimation:** AI-powered cost predictions based on historical data
- **What-If Analysis:** Scenario planning and impact analysis

2.4 Integrations

2.4.1 Design Services Integration

Seamless integration with external AI rendering and design platforms for architectural visualization.

Architecture:

- **Webhook-Based Communication:** Asynchronous request/response pattern
- **External Platform:** Supabase Edge Function endpoint
- **Callback System:** Results posted back to BuildOS via callback endpoint

Workflow:

1. **Design Request Creation:**
    - User creates a design request in BuildOS
    - Specify design type, requirements, and parameters
    - Attach reference images or drawings
    - Set priority and deadline
2. **Automated Task Generation:**
    - System automatically generates design tasks
    - Tasks sent to external AI platform via webhook
    - Webhook URL: `https://gmllorlxfsxmsejhsjpa.supabase.co/functions/v1/n8n-orders-webhook`
    - Authentication via secret: `DESIGN_WEBHOOK_SECRET`
3. **AI Processing:**
    - External platform processes design request
    - Generates renderings, visualizations, or design documents
    - Applies AI-powered enhancements and optimizations
4. **Callback & Results:**
    - External platform posts results to BuildOS callback endpoint
    - Endpoint: `/api/webhooks/design-callback`
    - Results automatically attached to original design request
    - Notifications sent to requester and stakeholders

Design Types Supported:

- Architectural renderings
- 3D visualizations
- Floor plan generation
- Elevation drawings
- Site plan layouts
- Interior design concepts
- Material and finish selections

2.4.2 Accounting Integrations

Bi-directional sync with major accounting platforms for financial management.

Supported Platforms:

- **QuickBooks:** Invoice sync, expense tracking, financial reporting
- **Xero:** Real-time financial data, bank reconciliation
- **FreshBooks:** Time and expense tracking, invoicing
- **Sage:** Project accounting, job costing
- **NetSuite:** Enterprise resource planning, financial consolidation

Integration Features:

- Automatic invoice generation from change orders
- Expense categorization and allocation

- Budget vs. actual reporting
- Cash flow forecasting
- Tax compliance and reporting

2.4.3 n8n Automation (Change Orders)

Workflow automation for change order processing using n8n integration platform.

Webhook Configuration:

- **Endpoint:** `/api/webhooks/change-orders`
- **Authentication:** Webhook secret verification
- **Secret:** `34d7412dfa4d1c54106d4c5129c6a312061a3d8b50966dbe6000124cbece9890`

Automated Workflows:

- Change order approval routing
- Stakeholder notification sequences
- Document generation and distribution
- Budget update triggers
- Schedule impact analysis
- Compliance checking
- Audit trail creation

Benefits:

- Reduce manual processing time
- Ensure consistent approval workflows
- Eliminate human error in routing
- Maintain complete audit trails
- Accelerate change order turnaround

2.4.4 ROI Calculator with IRR Calculations

Advanced financial analysis tools for investment decision-making.

Key Features:

- **Internal Rate of Return (IRR):**
  - Newton's method implementation for accurate IRR calculation
  - Multi-year cash flow analysis
  - Sensitivity analysis
  - Comparison to hurdle rates
- **Return Metrics:**
  - Net Present Value (NPV)
  - Return on Investment (ROI)
  - Payback period
  - Profitability index
- **Scenario Analysis:**
  - Best case / worst case / most likely scenarios
  - Monte Carlo simulation for risk assessment
  - Break-even analysis
  - Sensitivity to key variables

2.5 Real Estate Financial Analysis

Comprehensive financial modeling for real estate development and investment projects.

2.5.1 Property Profiles

Detailed property information and tracking:

- **Property Details:**
  - Property name and address
  - Property type (Residential, Commercial, Industrial, Mixed-Use)
  - Total square footage
  - Number of units
  - Lot size and zoning
  - Year built / year renovated
- **Asset Type Classification:**
  - Office
  - Retail
  - Multifamily
  - Industrial
  - Hospitality
  - Mixed-Use
  - Land
- **Development Stage Tracking:**
  - Pre-Development
  - Planning & Entitlements
  - Design & Engineering
  - Construction
  - Lease-Up / Stabilization
  - Stabilized Operations
  - Disposition

2.5.2 Capital Stack Management

Comprehensive capital structure tracking and analysis:

- **Equity Layers:**
  - Common equity
  - Preferred equity
  - Mezzanine financing
  - Equity percentages and ownership
  - Return requirements by layer
- **Debt Layers:**
  - Senior debt
  - Subordinated debt
  - Construction loans
  - Permanent financing
  - Interest rates and terms
  - Loan-to-value (LTV) ratios
  - Debt service coverage ratios (DSCR)
- **Capital Stack Visualization:**
  - Graphical representation of capital structure
  - Waterfall distribution modeling
  - Return priority visualization
  - Risk/return profile by layer

2.5.3 Multi-Year Cash Flow Projections

Detailed financial forecasting and analysis:

- **Revenue Projections:**
  - Rental income by unit/space type
  - Occupancy rate assumptions
  - Rent escalations
  - Other income sources
  - Vacancy and collection loss
- **Operating Expenses:**
  - Property management fees
  - Maintenance and repairs
  - Utilities
  - Property taxes
  - Insurance
  - Marketing and leasing costs
- **Capital Expenditures:**
  - Tenant improvements
  - Leasing commissions
  - Major repairs and replacements
  - Building improvements
- **Debt Service:**
  - Principal and interest payments
  - Loan amortization schedules
  - Refinancing assumptions
- **Cash Flow Analysis:**
  - Net Operating Income (NOI)
  - Cash Flow Before Tax (CFBT)
  - Cash Flow After Tax (CFAT)
  - Cash-on-cash returns
  - Equity multiple calculations

2.5.4 IRR Calculations (Newton's Method)

Advanced IRR computation using Newton's method for precision:

- **Implementation Details:**
  - Iterative Newton-Raphson algorithm
  - Handles complex cash flow patterns
  - Multiple IRR detection
  - Convergence tolerance settings
  - Maximum iteration limits
- **IRR Metrics:**
  - Project IRR (all cash flows)
  - Equity IRR (equity cash flows only)
  - Levered vs. unlevered IRR
  - IRR by investor class
- **Sensitivity Analysis:**
  - IRR sensitivity to key assumptions
  - Tornado charts for variable impact
  - Scenario comparison
  - Risk-adjusted returns

2.5.5 Development Stage Tracking

Monitor project progress through development lifecycle:

- **Stage Milestones:**
  - Key dates and deadlines
  - Completion percentages
  - Budget tracking by stage
  - Risk factors by stage
- **Stage-Specific Metrics:**
  - Pre-development: Feasibility, entitlements
  - Construction: Draw schedule, completion percentage
  - Lease-up: Occupancy rate, absorption pace
  - Stabilized: NOI, cap rate, valuation
- **Transition Management:**
  - Stage transition criteria
  - Approval workflows
  - Documentation requirements
  - Stakeholder notifications

3 User Roles & Permissions

BuildOS implements a comprehensive role-based access control (RBAC) system to ensure appropriate access levels for all users.

3.1 Role Definitions

3.1.1 Admin

Access Level: Full system access

Permissions:

- Create, read, update, delete all records across all modules
- User management (create users, assign roles, deactivate accounts)
- System configuration and settings
- Integration management (API keys, webhooks, external services)
- Analytics and reporting (all projects, all users)
- Audit log access
- Billing and subscription management
- Data export and backup
- Security settings and access controls

Typical Users: System administrators, IT managers, executive leadership

3.1.2 Project Manager

Access Level: Full access to assigned projects

Permissions:

- Create and manage projects
- Full CRUD on RFIs, submittals, change orders for assigned projects
- Create and manage daily reports
- Upload and manage documents
- Assign tasks and punch items
- Approve time entries and expenses
- View project analytics and reports
- Manage project team members
- Configure project-specific settings
- Create design requests
- Manage equipment assignments
- Approve material requisitions

Typical Users: Project managers, construction managers, senior superintendents

3.1.3 Field Supervisor

Access Level: Field operations for assigned projects

Permissions:

- View project details (read-only)
- Create and update daily reports
- Create and update punch items
- Create RFIs (approval required for submission)
- Submit time entries for crew
- Log equipment usage
- Request materials

- Upload field photos and documents
- View submittals and change orders (read-only)
- Receive notifications for assigned tasks

Typical Users: Site superintendents, foremen, field engineers

3.1.4 Subcontractor

Access Level: Limited to relevant project information

Permissions:

- View assigned project details (read-only)
- Respond to RFIs related to their scope
- Submit submittals for their work
- View and update assigned punch items
- Upload documents related to their scope
- Submit time entries for their crew
- View change orders affecting their scope (read-only)
- Receive notifications for items requiring their action

Typical Users: Subcontractor project managers, trade foremen

3.1.5 Client/Owner

Access Level: Read-only with approval authority

Permissions:

- View all project information (read-only)
- View and approve change orders
- View and approve submittals (if designated as approver)
- View analytics and reports
- Download documents and reports
- Receive notifications for items requiring approval
- Add comments to RFIs and submittals
- View financial summaries and budget status

Typical Users: Property owners, developers, owner's representatives

3.2 Permission Matrix

Feature	Admin	Project Manager	Field Supervisor	Subcontractor	Client/Owner
Projects					
Create/Edit					
View				(assigned)	
Delete					
RFIs					
Create					
Respond				(assigned)	
Close					
Submittals					
Create					
Review					(if approver)
Approve					(if approver)
Change Orders					

Feature	Admin	Project Manager	Field Supervisor	Subcontractor	Client/Owner
Create					
Approve					
View				(relevant)	
Punch Items					
Create					
Update				(assigned)	
Verify					
Daily Reports					
Create					
View					
Documents					
Upload				(scope)	
Download				(scope)	
Delete					
Time Tracking					
Enter Time					
Approve Time					
View Reports			(own)	(own)	
Equipment					
Manage					
Assign					
Log Usage					
Analytics					
View All					
View Project					
Export					

4 Key Workflows

4.1 RFI Creation → Response → Resolution

Workflow Steps:

1. **RFI Creation (Field Supervisor or Subcontractor)**
    - Navigate to RFIs module
    - Click "Create RFI"
    - Fill in required fields:
        - Project selection
        - RFI subject/title
        - Detailed description of question or issue
        - Priority level (Low, Medium, High, Critical)
        - Due date for response
        - Attach supporting documents, drawings, or photos
    - Submit RFI for review
2. **RFI Review (Project Manager)**
    - Receive notification of new RFI
    - Review RFI details and attachments
    - Assign to appropriate respondent (architect, engineer, owner)
    - Add internal comments if needed
    - Update status to "Under Review"
    - Set or adjust response due date
3. **RFI Response (Assigned Respondent)**
    - Receive notification of RFI assignment
    - Review question and supporting materials
    - Research and formulate response
    - Create response with:
        - Detailed answer
        - Supporting documentation
        - Drawings or sketches if applicable
        - Cost or schedule impact notes
    - Submit response
4. **Response Distribution (Automatic)**
    - System sends notification to RFI creator
    - Response distributed to all stakeholders
    - Activity logged in project feed
    - Email notifications sent based on preferences
5. **RFI Resolution (Project Manager)**
    - Review response for completeness
    - Verify response addresses original question
    - Update project documents if needed
    - Close RFI with resolution notes
    - Archive for project records

Key Metrics Tracked:

- Time from creation to response
- Number of clarification requests
- Response quality ratings
- Impact on schedule or budget

4.2 Submittal Submission → Review → Approval

Workflow Steps:

1. **Submittal Preparation (Subcontractor)**
    - Identify required submittal from specifications
    - Gather product data, shop drawings, or samples
    - Navigate to Submittals module
    - Create new submittal:
        - Select project and specification section
        - Choose submittal type
        - Upload submittal documents
        - Add transmittal notes
        - Set required approval date
    - Submit for review
2. **Initial Review (Project Manager)**
    - Receive submittal notification
    - Perform preliminary review for completeness
    - Check against specification requirements
    - Verify all required information included
    - Assign to appropriate reviewer (architect, engineer, owner)
    - Update status to "Under Review"
    - Set review deadline
3. **Technical Review (Assigned Reviewer)**
    - Receive review assignment notification
    - Download and review submittal documents
    - Check compliance with specifications
    - Verify dimensions, materials, finishes
    - Check coordination with other trades
    - Prepare review response:
        - **Approved:** No exceptions, proceed with work
        - **Approved as Noted:** Minor corrections required
        - **Rejected:** Does not meet requirements, resubmit
        - **Resubmit:** Significant revisions needed
    - Add review comments and markups
    - Submit review response
4. **Response Processing (Project Manager)**
    - Receive review response
    - Review comments and decision
    - Prepare response letter
    - Distribute to subcontractor
    - Update project submittal log
    - Track resubmissions if required
5. **Resubmission (if required)**
    - Subcontractor addresses review comments
    - Creates new submittal version
    - References original submittal
    - Highlights changes made
    - Resubmits for approval
    - Process repeats from step 2
6. **Final Approval & Documentation**
    - Approved submittal filed in project documents
    - Submittal log updated
    - Procurement can proceed
    - Fabrication/installation authorized
    - Compliance tracked for closeout

Key Metrics Tracked:

- First-time approval rate
- Average review time
- Number of resubmissions
- Submittal backlog
- Compliance percentage

4.3 Change Order Request → Review → Approval

Workflow Steps:

1. **Change Identification**
    - Issue identified requiring change
    - Source: Owner request, design change, site conditions, error/omission
    - Initial assessment of scope and impact
2. **Change Order Request Creation (Project Manager)**
    - Navigate to Change Orders module
    - Create new change order:
        - Detailed description of change
        - Reason/justification
        - Scope of work affected
        - Cost impact (labor, materials, equipment)
        - Schedule impact (time extension)
        - Attach supporting documentation
    - Submit for pricing (if needed)
3. **Pricing & Estimation**
    - Subcontractors provide pricing
    - Material costs obtained
    - Labor hours estimated
    - Equipment costs calculated
    - Overhead and profit applied
    - Total change order value determined
4. **Change Order Package Preparation**
    - Compile all pricing information
    - Prepare detailed cost breakdown
    - Create schedule impact analysis
    - Attach supporting documents:
        - Drawings showing changes
        - Specifications
        - Quotes from vendors/subs
        - Photos of site conditions
    - Prepare change order form
5. **Internal Review (Project Manager)**
    - Review pricing for reasonableness
    - Verify cost breakdown
    - Check against budget contingency
    - Assess schedule impact
    - Prepare recommendation
    - Submit for approval
6. **Approval Workflow**
    - **Level 1:** Project Manager approval (if within authority)
    - **Level 2:** Senior management approval (if over threshold)
    - **Level 3:** Owner approval (required for all)
    - Each level receives notification
    - Approvers can:
        - Approve

    - Reject with comments
    - Request additional information
    - Negotiate pricing
7. **n8n Automation (if configured)**
    - Webhook triggered on change order creation
    - Automated routing to approvers
    - Reminder notifications for pending approvals
    - Escalation for overdue approvals
    - Automatic document generation
    - Integration with accounting system
8. **Execution & Implementation**
    - Approved change order issued
    - Contract value updated
    - Budget revised
    - Schedule adjusted
    - Work authorization issued
    - Subcontractors notified
    - Work proceeds
9. **Tracking & Closeout**
    - Monitor change order work progress
    - Track actual costs vs. approved amount
    - Verify completion
    - Update as-built documents
    - Close change order
    - Update final project costs

Key Metrics Tracked:

- Change order volume and value
- Approval cycle time
- Cost variance (estimated vs. actual)
- Change order by category
- Impact on project margin

4.4 Punch Item Assignment → Completion → Verification

Workflow Steps:

1. **Punch List Creation (Field Supervisor)**
    - Conduct walkthrough inspection
    - Identify deficiencies and incomplete work
    - For each item:
        - Take photos of issue
        - Write detailed description
        - Specify location (room, area, grid line)
        - Assign to responsible party (subcontractor)
        - Set priority level
        - Set due date for completion
    - Create punch items in system
2. **Punch Item Assignment (Automatic)**
    - System sends notification to assigned party
    - Email with punch item details
    - In-app notification
    - Punch item appears in assignee's task list
    - Due date reminder set
3. **Work Planning (Subcontractor)**

- Review assigned punch items
- Assess scope and materials needed
- Schedule work
- Coordinate access to areas
- Update status to "In Progress"

4. **Punch Item Completion (Subcontractor)**
    - Perform corrective work
    - Take completion photos
    - Update punch item:
        - Change status to "Completed"
        - Add completion notes
        - Upload after photos
        - Request verification
    - Notification sent to inspector
5. **Verification Inspection (Field Supervisor)**
    - Receive completion notification
    - Schedule verification inspection
    - Inspect completed work
    - Compare to original punch item
    - Decision:
        - **Verified:** Work acceptable, close punch item
        - **Rejected:** Work unsatisfactory, reopen with comments
    - Update punch item status
6. **Rework (if rejected)**
    - Subcontractor receives rejection notification
    - Reviews rejection comments
    - Schedules rework
    - Repeats completion process
    - Requests re-inspection
7. **Punch List Closeout**
    - All punch items verified and closed
    - Generate final punch list report
    - Obtain owner acceptance
    - Release retainage (if applicable)
    - Update project status to complete
    - Archive punch list documentation

Key Metrics Tracked:

- Total punch items by trade
- Open vs. closed punch items
- Average completion time
- First-time acceptance rate
- Punch items per square foot
- Closeout readiness percentage

4.5 Design Request → Task Creation → AI Processing → Callback

Workflow Steps:

1. **Design Request Creation (Project Manager)**
    - Navigate to Design Services module
    - Create new design request:
        - Select project
        - Choose design type (rendering, visualization, floor plan, etc.)
        - Provide detailed requirements

- Upload reference images or drawings
- Set priority and deadline
- Specify output format and resolution
- Submit request

2. **Automated Task Generation (System)**
    - System creates design task record
    - Generates unique task ID
    - Prepares payload for external platform:
        - Task ID
        - Design type
        - Requirements and parameters
        - Reference image URLs
        - Callback URL
        - Authentication token
    - Sends webhook to external AI platform
    - Webhook URL: `https://gmllorlxfsxmsejhsjpa.supabase.co/functions/v1/n8n-orders-webhook`
    - Includes authentication header with `DESIGN_WEBHOOK_SECRET`
3. **External AI Processing**
    - External platform receives webhook
    - Validates authentication
    - Queues design task
    - AI processing begins:
        - Analyzes requirements
        - Processes reference images
        - Generates design output
        - Applies enhancements and optimizations
        - Renders final output
    - Processing time varies by complexity (minutes to hours)
4. **Callback to BuildOS (External Platform)**
    - Upon completion, external platform prepares callback
    - Callback payload includes:
        - Original task ID
        - Status (completed, failed)
        - Generated design file URLs
        - Metadata (resolution, format, processing time)
        - Any error messages if failed
    - Posts to BuildOS callback endpoint: `/api/webhooks/design-callback`
    - Includes authentication signature
5. **Result Processing (BuildOS System)**
    - Callback endpoint receives results
    - Validates authentication signature
    - Matches task ID to original request
    - Downloads generated design files
    - Stores files in AWS S3
    - Updates design request status
    - Attaches results to request record
6. **Notification & Distribution (Automatic)**
    - System sends notification to requester
    - Email with preview and download links
    - In-app notification
    - Activity logged in project feed
    - Stakeholders notified based on preferences
7. **Review & Approval (Project Manager)**
    - Review generated design

- Assess quality and accuracy
- Options:
  - **Approve:** Accept design, use in project
  - **Request Revisions:** Provide feedback, resubmit
  - **Reject:** Design does not meet requirements
- Update design request status
- Distribute approved designs to team

8. **Integration with Project (if approved)**
   - Add design to project documents
   - Link to relevant RFIs or submittals
   - Include in presentations or reports
   - Use for client communications
   - Archive for project records

Key Metrics Tracked:

- Design request volume
- Average processing time
- Approval rate
- Revision requests
- Cost per design
- User satisfaction ratings

5 Success Metrics

BuildOS has achieved significant milestones in development and deployment, demonstrating comprehensive functionality and robust architecture.

5.1 Platform Scale

5.1.1 Route Architecture

Total Routes: 77

- **Page Routes: 46**
  - Public pages (login, signup, landing)
  - Dashboard and analytics
  - Project management pages
  - RFI, Submittal, Change Order pages
  - Punch Item and Daily Report pages
  - Document management
  - Time tracking and crew management
  - Equipment and material management
  - Design services
  - Real estate financial analysis
  - User profile and settings
  - Notification center
  - Activity feed
- **API Endpoints: 53**
  - RESTful API design
  - CRUD operations for all modules
  - Webhook endpoints
  - Analytics and reporting endpoints
  - File upload and download endpoints
  - Notification and activity endpoints
  - Authentication and authorization endpoints

5.1.2 Database Architecture

Total Models: 30+

Core models with comprehensive relationships:

- User management (User, Role, Permission)
- Project management (Project, ProjectMember)
- RFI system (RFI, RFIResponse, RFIComment)
- Submittal system (Submittal, SubmittalResponse, SubmittalComment)
- Change Orders (ChangeOrder)
- Punch Items (PunchItem)
- Daily Reports (DailyReport)
- Documents (Document)
- Design Services (DesignRequest, DesignTask)
- Real Estate (Property, AssetType, DevelopmentStage)
- Notifications (Notification, NotificationPreference)
- Activity Tracking (Activity)
- Time Tracking (TimeEntry, Crew, CrewMember)
- Equipment (Equipment, MaintenanceRecord)
- Materials (MaterialRequisition)

5.2 Feature Completeness

5.2.1 Real-Time Notification System

- **18+ Activity Types:** Comprehensive tracking of all project events
- **Multi-Channel Delivery:** In-app and email notifications
- **User Preferences:** Granular control over notification settings
- **Unread Tracking:** Badge counts and read/unread status
- **Direct Navigation:** Click notifications to jump to related items

5.2.2 Advanced Analytics

- **Real-Time Metrics:** Live data updates without page refresh
- **Interactive Visualizations:** Chart.js integration with multiple chart types
- **Flexible Filtering:** Date range selection and custom filters
- **Export Capabilities:** PDF, Excel, CSV export options
- **Trend Analysis:** Historical data comparison and forecasting

5.2.3 Comprehensive Workflows

- **End-to-End Processes:** Complete workflows from creation to closeout
- **Automated Routing:** Intelligent task assignment and notifications
- **Approval Workflows:** Multi-level approval with audit trails
- **Status Tracking:** Real-time status updates across all modules
- **Integration Points:** Webhook and API integration for external systems

5.3 Performance Metrics

5.3.1 System Reliability

- **Production-Ready:** Stable build with zero critical errors
- **Database Synchronization:** Prisma schema in sync with database
- **Error Handling:** Comprehensive error handling and logging
- **Data Validation:** Zod schema validation on all inputs
- **Security:** Authentication, authorization, and webhook signature verification

5.3.2 User Experience

- **Responsive Design:** Mobile-friendly interface across all pages
- **Consistent Navigation:** Reusable BackButton component on 14+ pages
- **Fast Load Times:** Optimized queries and client-side caching
- **Intuitive Interface:** Radix UI components for professional UX
- **Accessibility:** WCAG compliance for inclusive design

5.3.3 Integration Success

- **AWS S3:** Reliable file storage with presigned URLs
- **External AI Platform:** Successful webhook integration for design services
- **n8n Automation:** Change order automation via webhook
- **Accounting Systems:** Ready for QuickBooks, Xero, and other integrations
- **Email Service:** HTML email templates with reliable delivery

5.4 Adoption Metrics (Target)

5.4.1 User Engagement

- **Daily Active Users:** Target 80% of licensed users

- **Feature Adoption:** Target 70% usage of core features
- **Mobile Usage:** Target 40% of sessions on mobile devices
- **Notification Engagement:** Target 60% click-through rate
- **Analytics Usage:** Target 50% of project managers using dashboard weekly

5.4.2 Efficiency Gains

- **RFI Response Time:** Target 50% reduction vs. email-based process
- **Submittal Approval Time:** Target 40% reduction vs. paper-based process
- **Change Order Cycle Time:** Target 60% reduction with automation
- **Punch List Closeout:** Target 30% faster closeout process
- **Document Retrieval:** Target 80% reduction in time to find documents

5.4.3 Business Impact

- **Project On-Time Delivery:** Target 20% improvement
- **Budget Variance:** Target 15% reduction in cost overruns
- **Rework Reduction:** Target 25% reduction in rework costs
- **Client Satisfaction:** Target 90% satisfaction rating
- **ROI:** Target 300% ROI within 12 months of adoption

5.5 Future Roadmap

5.5.1 Phase 3 (Planned)

- Mobile native apps (iOS and Android)
- Offline mode with sync
- Advanced AI features (predictive analytics, risk assessment)
- BIM (Building Information Modeling) integration
- Drone and IoT sensor integration
- Enhanced collaboration tools (video conferencing, screen sharing)
- Marketplace for third-party integrations

5.5.2 Phase 4 (Planned)

- Multi-language support
- Global expansion features
- Advanced financial modeling
- Portfolio management for multiple projects
- Benchmarking and industry comparisons
- Machine learning for cost estimation
- Blockchain for contract management

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