# RenoPilot AI - Complete B2B SaaS User Manual

Welcome to the **RenoPilot AI User Manual**. This comprehensive, step-by-step guide is designed to walk you through the entire end-to-end workflow of the RenoPilot AI platform.

This manual models the exact interactive walkthrough scripts implemented in the sandbox, detailing every core feature, compliance gate, role-based flow, and design element.

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## 1. Introduction & Core Framework Basics

### Singapore B2B Renovation Ecosystem

RenoPilot AI is built specifically for Singapore's renovation and interior design sector. The system incorporates structural safety guidelines from the **HDB Housing & Development Board**, pricing transparency regulations from the **CCCS (Competition and Consumer Commission of Singapore)**, and deposit escrow/payment schedules aligned with **CaseTrust accreditation standards**.

### Sandbox Personas & Role Switcher

In the lower-left corner of the viewport, an interactive **Role Switcher** allows you to hot-swap between personas at any point:

- **John Koh (Owner):** Full administrative and financial control over the tenant firm.
- **Chloe Tan (Designer):** Coordinates design briefs, quotes, CAD planning, and tenders.
- **Devi Prasad (Project Manager):** Directs site operations, safety permits, Gantt schedules, and subcontractor claims.
- **Ah Hock (Subcontractor):** Submits bids, completes trade tasks, reports defects, and files invoices.
- **Marcus & Sarah (Homeowners):** Access the private customer portal to sign contracts, view progress, pay invoices, and file defects.
- **RenoPilot Admin (Super Admin):** Multi-tenant system administrator overseeing registration, suspensions, threat metrics, and global pricing pack unit rates.

### Platform Visual Identity: The "Frozen Mist" Scheme

The visual framework utilizes a custom **Frozen Mist** palette to optimize accessibility and convey premium value:

- **Background (#FCF8D8):** Soft warm cream base reducing eye strain during long drafting sessions.
- **Accent (#DD700B):** Cinnamon Orange highlighting core action items, navigation headers, active states, and focus frames.
- **Body Text (#2C2D2B):** Monochromatic charcoal charcoal ensuring crisp text contrast.
- **Metadata & Secondary Text (#7C7D75):** Warm slate-gray preventing page clutter.
- **Borders (#D9DADF):** Very soft grey lines separating dashboard cards and spreadsheet grid cells.

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## 2. Phase 1: Company Registration & Settings Setup

### Step 1: Self-Service Firm Registration & ACRA UEN Lookup

1. Go to the login screen at `/login`.
2. Click **"Register your renovation firm"** in the footer links to load the `/register` wizard route.
3. **Step A (Account Details):** Input your work email address, your name, and a password. Click **Next**.
4. **Step B (ACRA UEN Verification):** Type a valid Singapore Unique Entity Number (e.g. `202412345G` or `T18FC0001A`) and click **Verify with ACRA**. The simulator parses UEN formats and retrieves company registration details (e.g., *Vanguard Design Pte Ltd*). Click **Next**.
5. **Step C (Subscription Tier & Billing):** Choose a subscription plan (Starter, Growth, or Professional). Toggle the billing duration switch to **Annually** to apply the upfront `15%` discount calculation.
6. Enter credit card details (card starting with `4` for Visa, or `51` for Mastercard) and click **Establish Connection**.
7. Watch the terminal loader execute database seed functions (initializing floor plan templates, default leads, and subcontractors). Once completed, you are logged in and routed to `/dashboard`.

### Step 2: Simulated Password Reset Flow

1. Go to the login screen at `/login`.
2. Click the link **"Forgot password? Try resetting"**.
3. Enter your account email (e.g. `chloe@premierdesign.sg`) and click **Simulate Reset Link**.
4. A sandboxed email notification inbox card will pop up on the page. Click the **Reset Password Link** inside the message.
5. In the update password form, enter a new password (e.g. `chloe123`), confirm it, and submit. The system updates the virtual auth

credentials, returning you to the login screen.

### Step 3: Core Singapore API Connectors & Integrations

1. Log in as **John Koh (Owner)**.
2. Select **Settings** from the sidebar, then click the **Integrations & Connectors** tab in the sub-header.
3. Locate the core connection cards (Stripe Connect, Xero Accounting, SG PayNow QR, WhatsApp Gateway, and ACRA BizFile). Notice they default to a grey `Disconnected` status.
4. On the **PayNow SG QR** card, click **Connect**.
5. Input a simulated API Key and webhook secret, then click **Verify & Establish connection**.
6. View the real-time setup progress logs executing handshakes, validating signatures, and syncing callbacks. Once finalized, the card displays a green ● `Connected` badge.
7. Go to **Sarah Lim's project details** Payments tab. Notice that a green ● `PayNow Live API Active` badge displays next to the *Progressive Payment Milestone List* header.

### Step 4: Sandbox Staff Invitations & Onboarding

1. Log in as **John Koh (Owner)** and navigate to **Settings**.
2. Under the **Staff Members** section, click **Add Member** in the panel header.
3. Input name "`Musa Ibrahim`", select role "`Subcontractor`", specify specialty "`Painting`", and click **Confirm Invitation**. The grid updates to show Musa as an active invitation.
4. Copy the invitation URL listed under Musa's card (e.g. `/accept-invitation?tenantId=tenant-1&role=subcontractor`).
5. Open this URL in the browser. Enter name "`Musa Painting`", check specialty "`Painting`", choose a password, and click **Create Account**. Musa is now added as a selectable identity in the platform.

### Step 5: B2B Subscription Tiers & Billing Checkout

1. Log in as **John Koh (Owner)** and navigate to **Settings** -> **Integrations & Connectors**.
2. Locate the **Subscription Plan & Metered Billing** section.
3. Toggle the Billing Term switch between **Monthly** and **Annually** to watch pricing cards adjust to show standard vs. `15%` discount rates:
   - **Starter Plan:** S$999/mo (Monthly) vs. S$849/mo (Annually)
   - **Growth Plan:** S$1,999/mo (Monthly) vs. S$1,699/mo (Annually)
   - **Professional Plan:** S$3,999/mo (Monthly) vs. S$3,399/mo (Annually)
4. Click the upgrade button on the **Growth** tier.
5. In the custom Stripe Sandbox checkout modal, observe the item description and GST calculator. Enter card credentials, click **Pay**, and observe the glassmorphic spinner: Gateway Connection -> Authentication -> Syncing Ledger.
6. Click **Download Invoice Receipt** to save the payment voucher locally, and click **Complete Checkout** to update your account status.

### Step 6: Platform Super Admin Control Room

1. Switch your persona to **RenoPilot Admin (Super Admin)**.
2. Note that the system redirects you to the secure admin Command Center at `/dashboard/admin`.
3. Review the global metrics: Singapore ARR, Total Registered Firms, CaseTrust Accredited Firms, and Suspended Firms.
4. Locate "Modern Heritage Renovations" in the Registered Firms table, and click **Suspend Tenant**. The firm's status updates to `Suspended`, blocking its designers and managers from dashboard access.
5. Monitor the **Global System Security Log** on the right to track real-time security logs across all tenancies.

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## 3. Phase 2: Lead Generation & Client Intake

### Step 7: Public Landing Page & Features Animation Simulator

1. Navigate to the root path `/` to view the public landing page.
2. Under the **Singapore Renovation Compliance & Trust Ecosystem** infographic section, inspect the visual stages: *CCCS Price Audits* (Stage 01), *HDB Safety Inspections* (Stage 02), and *CaseTrust Milestones* (Stage 03).
3. Scroll to the **Hero Onboarding Simulator** card. Input a mock firm name (e.g. "`Vanguard Interior`"), choose property type "`4-Room HDB BTO`", and click **Run AI Onboarding**. Watch the sequential loader progress ticks.
4. Scroll to the **Live Feature Playground**. Under the *CCCS Margin Auditor* tab, click **Run Margin Audit** to watch the scan highlight low-markup carpentry lines.
5. Under the *Auto-Shift Gantt Scale* tab, drag the **Wet Work Delay** slider and watch dependent timelines shift in real-time.

### Step 8: Client Intake Questionnaire (Guest Route)

1. Go to the guest questionnaire URL: `/guest/questionnaire?leadId=lead-lester` (or create a new lead).

2. **Step 1 (Contact Info):** Input Lester Tan, phone `+65 9111 8888`, email `lester@gmail.com`, and address `Blk 305 Tampines Ave 5 #06-12`. Click **Next**.
3. **Step 2 (Scope):** Select property type `Condo` and check rooms `Living Room`, `Kitchen`, and `Master Bedroom`.
4. **Step 3 (Aesthetic):** Click the **Scandinavian** style card to display its visual photo mockup.
5. **Step 4 (Budget & Schedule):** Set the budget slider to `S$42,000`, urgency to `High`, pick a target move-in date, and click **Create My Renovation Brief**. The screen shows a success page assigning Lester to Designer Chloe Tan.

### Step 9: Lead CRM Management & AI Design Brief Generator

1. Switch persona to **Chloe Tan (Designer)**.
2. Navigate to **Leads CRM** in the sidebar.
3. Locate **Lester Tan** in the Lead Inbox and click his row.
4. Review the details showing status "`qualified`", budget `S$42,000`, and style `Scandinavian`.
5. Click **Build AI Design Brief** in the top-right. The AI evaluates room dimensions, budget alignment, and outputs a structured rooms breakdown.
6. Click **Convert to Project**. The lead changes status to converted and is added to the active projects list.

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## 4. Phase 3: Design, Drafting, and CAD Blueprints

### Step 10: Interactive 2D Space Planner (Upload, Layout, Rotation)

1. Switch persona to **Chloe Tan (Designer)**.
2. Open **Projects**, click **Sarah Lim's HDB Renovation**, and select the **Space Planner** tab.
3. Click **Upload 2D Plan**. Select a floor plan image file (PNG/JPG).
4. Use the **Plan Opacity** slider to adjust the background drawing transparency, and toggle the **Show Template Walls** checkbox to hide default lines.
5. Click **Furniture Planner** in the mode selector (top-right).
6. Click **Sofa** or **Dining Table** in the left catalog to drop them onto the floor plan.
7. Click and drag items directly on the SVG canvas to translate coordinates. Click any item to reveal CAD decorators: drag the top circular handle to **rotate** to any angle, or click the red "×" button to **delete**.

### Step 11: Wall Hacking Tool & HDB Safety Compliance Gate

1. Under the **Space Planner** tab, select **Wall Hacking Tool** in the mode selector.
2. Hover over the partition wall between the Kitchen and Living Room (highlighted in blue).
3. Click the partition wall. The wall converts to a dashed pattern, and the sidebar calculates a pending hacking cost of S$1,500. Click **Convert Hacking to VO** to auto-generate a Variation Order.
4. Hover over the structural column near the kitchen corner (highlighted in red).
5. Click the column. The action is immediately blocked, and a red warning banner alerts: **"HDB Safety Compliance Warning: Structural load-bearing columns cannot be hacked or modified."**

### Step 12: Axonometric 3D CAD Blueprint Visualizer

1. Under the **Space Planner** tab, click **3D CAD View** in the mode selector.
2. The SVG editor transforms into a Three.js axonometric WebGL workspace. If you uploaded a custom floor plan, it maps flat as a ground blueprint, while rooms and furniture rise as extruded 3D blocks.
3. Use the sidebar controls: Click **Orbit ◂ / ▸**, **Tilt ▲ / ▼**, or **Zoom + / -** to spin the model. Toggle **Auto-Rotate** for a continuous rotation showcase.
4. Notice that if you hacked the kitchen partition wall in 2D mode, it is automatically removed from the 3D rendering.

### Step 13: AI Moodboard & Design Inspiration Visualizer

1. In Sarah Lim's project details, click the **AI Moodboard** tab.
2. Inspect the **Reference Layout Linked** card. It displays a thumbnail of the 2D floor plan uploaded in the Space Planner.
3. Select Room: "`Living Room`", Style: "`Japandi`", and input prompt "`Warm oak styling, fluted TV wall, indirect LED`".
4. Click **Generate AI Concept**. The render console streams progressive generation logs: "*Parsing uploaded custom 2D floor plan...*" followed by coordinate mappings.
5. Review the high-resolution Japandi living room concept image. Click **Save to Site Photos** to archive it to the project gallery.

### Step 14: AI 3D CAD Playground & Coordinated Multi-Model Switcher

1. Scroll to the bottom of the Space Planner tab to find the **AI 3D CAD Engines Playground**.
2. **Gemini Layout Orchestrator:** Select the **Layout** tab and click **Orchestrate Room Layout**. Review the structured JSON coordinates, then click **Apply Coordinates to 2D Canvas** to update furniture positions.
3. **Claude Procedural CAD:** Select the **Procedural** tab. Select **Suspended TV Console** and click **Generate Three.js Script**. Watch

Three.js JavaScript assemble inside the editor and render in the WebGL window.

4. **Tripo3D Mesh Synthesizer:** Select the **Generative** tab. Input "`Oak wood dining chair`" and click **Generate Mesh** to watch the Generative API build a 3D model.
5. **Coordinated Hybrid Pipeline:** Select the **Hybrid** tab. Click **Run Coordinated Engine** to run layout orchestration, cabinetry scripting, and mesh synthesis in a single multi-agent pipeline.

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## 5. Phase 4: Estimations, Auditing, and Contracts

### Step 15: Smart CCCS Price Estimator & Quote Prefiller

1. Switch persona to **Chloe Tan (Designer)**.
2. In Sarah Lim's project workspace, go to the **Quotation Builder** tab and click **Smart CCCS Estimator**.
3. Under HDB Flat Preset, select **4-Room BTO (~92 sqm)**. Under Category, select **Carpentry**.
4. Notice the estimated run value defaults to `16` feet.
5. **Access Control Check:**
    - *Under Designer Chloe:* The **Estimated Unit Rate** input displays a 🔒 **Locked** badge and is disabled, enforcing the market reference rate of S$320.
    - *Under Super Admin:* The field is active. Change the rate to `350` and watch the estimated total update to `S$5,600`.
6. Click **Apply to Quote Builder**. The estimator auto-fills the quotation form: Cost (Est.) is computed as `Unit Rate / 1.25` (e.g. `256`), Markup is set to `25%`, and the Description field appends the CCCS unit rate disclosure notes.

### Step 16: Quotation Builder Spreadsheet & Est. Cost/Markup Calculator

1. In the **Quotation Builder** form, review the pricing calculator banner.
2. Under **Est. Cost (S$)**, type `1200`. Under **Markup (%)**, type `25`.
3. The calculator banner instantly shows the customer-facing unit price: `S$1,500.00`.
4. Click **Insert Item** to save it to the quotation items grid.
5. Review the quotation grid columns to confirm that the added item displays the itemized breakdown showing **Cost (Est.)** and **Markup** alongside the final unit price and line total.

### Step 17: AI Quote Auditing & Compliance Checks

1. In the **Quotation Builder** tab, click **Audit Quote with AI**.
2. The AI assistant scans each item for transparency and compliance:
    - It flags vague descriptions (e.g. writing just *"Painting"* instead of specifying coats and brand is marked as a CCCS violation).
    - It warns about margins that fall below standard business sustainability thresholds.
3. Click **Approve & Lock Quote** to lock the baseline scope. The quote status changes to approved, and the contract document is generated.

### Step 18: Contract Electronic Signing (E-Signature Canvas)

1. Switch persona to **Marcus & Sarah (Homeowners)**.
2. Open Sarah Lim's project details and select the **Contract Sign** tab.
3. Scroll to the signature panel.
4. Draw your signature inside the digital canvas, or type your name in the text input box.
5. Click **Submit Signature**. The contract status shifts to signed, and the construction Gantt schedule activates.

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## 6. Phase 5: Task Scheduling & Construction Management

### Step 19: Drag-and-Drop Gantt Chart Scheduling (Shift, Stretch, Scale)

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Go to the project details page and select the **Tasks & Timeline** tab. Click **Gantt Chart** in the view selectors.
3. Hover over a task bar (e.g., *"Fabricate cabinets at Johor workshop"*) to view a floating tooltip detailing task progress, duration, subcontractor assignments, and trade-specific scopes.
4. Click and drag the **Lay floor protective sheets** task bar to the right to shift its dates forward. Downstream dependent task bars (such as Hacking and Carpentry) shift forward automatically.
5. Drag the **Timeline Scale** slider in the toolbar (or drag horizontally directly on the **Timeline** date row header) to stretch or compress day columns.
6. Click **Fit to Screen (One Page View)** to compress the entire timeline onto a single viewport page without horizontal scroll bars.

### Step 20: HDB DRC Structural Safety Compliance & Subcontractor Sign-off

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Open Sarah Lim's project details and select the **HDB Compliance & Safety** tab.
3. Review the permit fields (Permit number, status, flat type). Check the structural safety rules (no load-bearing walls) and neighbor notification requirements.
4. Switch persona to **Ah Hock (Subcontractor)**.
5. Open the **Subcontractor Portal** (via sidebar) and click the **Safety Sign-Off** tab.
6. Check the safety rules checklist to confirm alignment with timing and noise limits, sign in the digital canvas, and click **Submit Sign-off**.
7. Switch back to PM Devi and verify that Ah Hock's safety signature shows as completed with a green checkmark.

### Step 21: Subcontractor Task Management & Progress Uploads

1. Switch persona to **Ah Hock (Subcontractor)**.
2. In the **Subcontractor Portal**, locate your active task checklist.
3. Click on the **Carpentry Framing** task.
4. Click **Upload Photo** to attach a mock site photo.
5. Click **Mark Completed**. The task status updates to completed.
6. Switch back to **Devi Prasad (Project Manager)**, navigate to the project **Tasks & Timeline** tab, and verify Hock's progress updates in real-time.

### Step 22: Subcontractor Assignment Notifications (SMS/WhatsApp Receipts)

1. Switch persona to **Devi Prasad (Project Manager)**.
2. In the **Tasks & Timeline** tab, find an unassigned task and select **Ah Hock** from the subcontractor dropdown list.
3. Click **Notification Receipts** in the timeline header.
4. In the modal, verify the log receipt confirming the WhatsApp/SMS dispatch: *"SMS dispatched to Ah Hock: New Carpentry task assigned for Sarah Lim's project."*

### Step 23: Live Notification Hub & Sliding Toast Overlay

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Assign a task to subcontractor Ah Hock.
3. Watch the sliding toast notification slide in from the top-right corner of the viewport: *"SMS Dispatched: Notification receipt generated for Ah Hock."*
4. Click the **Notification Bell** icon in the dashboard header next to the Singapore Time display.
5. Click **Mark all read** to reset the notification counter badge.

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## 7. Phase 6: Procurement, Invoicing, and Accounting

### Step 24: AI Quote-to-PO Extraction & Purchase Order Issuance

1. Switch persona to **Chloe Tan (Designer)**.
2. Go to Sarah Lim's project details page and select the **AI Procurement Hub** tab.
3. Under the **Purchase Orders (POs)** sub-tab, click **AI Quote-to-PO Extractor**.
4. Watch the AI parse the approved quote items and generate three draft POs for Blum, Hafary, and Nippon Paint.
5. Click **Issue Order** on the Nippon Paint PO to change its status to issued. Click **Print** to output a supplier-ready PO invoice layout.

### Step 25: Subcontractor Tender Package Broadcasting & Bidding

1. In the **AI Procurement Hub**, select the **Tenders & Bidding** sub-tab.
2. Click **Broadcast Trade Package**.
3. Input package title "`Living Room Carpentry`", trade "`Carpentry`", description, and budget `5000`. Click submit.
4. Switch persona to **Ah Hock (Subcontractor)**.
5. Open the **Subcontractor Portal** (via sidebar) and locate the **Open Project Tenders** card in the right sidebar.
6. Select the Living Room Carpentry package. Click **Place Tender Bid**, enter `4800` (SGD), input details, and click submit.

### Step 26: AI Tender Bid Audit & Award Flow

1. Switch persona to **Chloe Tan (Designer)**.
2. Go to the project details page -> **AI Procurement Hub** -> **Tenders & Bidding**.
3. Under the Carpentry package card, locate Ah Hock's bid.
4. Inspect the **AI Bid Auditor** card comparing the bid against your budget.
5. Click **Award Trade Bid**. Ah Hock is automatically hired and assigned to the Carpentry task on the timeline.

### Step 27: Subcontractor Progressive Claim Submission

1. Switch persona to **Ah Hock (Subcontractor)**.
2. Go to the **Subcontractor Portal**.
3. Scroll to the **Progressive Claims & Invoices** card and click **Submit Progressive Claim**.
4. In the form, select Sarah Lim's project, enter amount `1500`, select trade `Carpentry`, input description *"Carpentry laminate framing completed"*, and click submit. The claim is added to the list with status `Submitted`.

### Step 28: Subcontractor Payment Certificates (PC) Generation

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Go to Sarah Lim's project details page -> **AI Procurement Hub** -> **Payment Certificates**.
3. Locate Ah Hock's progressive claim of S$1,500.
4. Click **Certify Work Progress**. Set the certified amount to `1500` and retention amount to `75`. Click submit.
5. The system generates the official Payment Certificate. Click **Print Cert** to preview the layout.

### Step 29: Subcontractor Tax Invoice Submission

1. Switch persona to **Ah Hock (Subcontractor)**.
2. In the **Subcontractor Portal**, scroll to **Progressive Claims & Invoices**.
3. Next to the approved claim, click **Submit Tax Invoice**.
4. Enter invoice number `INV-HOCK-101` and submit.

### Step 30: AI 3-Way Auto-Matching (Invoice vs. PC vs. Bid)

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Go to the project details page -> **AI Procurement Hub** -> **Accounts Payable**.
3. Locate Ah Hock's submitted invoice.
4. Click **Run AI Audit**. The matching engine compares the invoice billing value against the Payment Certificate (S$1,500) and the awarded contract bid value.
5. Confirm the invoice status updates to `Matched`.

### Step 31: Accounts Payable Remittance & Payment Vouchers (PV)

1. On the matched invoice, click **Approve & Pay**.
2. Select payment method `FAST Bank Transfer` and click **Approve & Remit Funds**.
3. The payment voucher is generated and added to the accounts ledger. Click **Print PV** to view the printable voucher.

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## 8. Phase 7: Variations, Handover, and Disputes

### Step 32: Variation Order (VO) Drafting, Approvals, and Re-Tallying

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Open Sarah Lim's project details page and select the **Variation Orders** tab.
3. Click **Draft Variation Order**. Input cost S$1,500, delay of 2 days, description *"Add fluted paneling background behind TV console"*, and submit.
4. Switch persona to **Marcus & Sarah (Homeowners)**.
5. Under the **Variation Orders** tab, locate the pending VO. Click **Approve VO** and sign in the canvas.
6. Verify that the project contract value updates to S$44,300 in the hero banner.

### Step 33: Joint Defect Inspection Checklist & Pinning Defect Coordinates

1. Switch persona to **Devi Prasad (Project Manager)**.
2. Go to Sarah Lim's project details page -> **Handover & Warranty** tab.
3. Click **Add Item** under the Joint Inspection Checklist, type *"Aircon pressure check"*, and click add.
4. Go to the **Defects Log** tab and click **Report Defect**.
5. On the floor plan layout grid, click directly inside the kitchen area to drop a red coordinate pin.
6. Enter description *"Plumbing pipe union has minor drip"* and click submit. The defect is logged showing the visual pin on the plan.

### Step 34: Handover Certificate & Workmanship Warranty Sign-off

1. Switch persona to **Marcus & Sarah (Homeowners)**.
2. Go to the **Handover & Warranty** tab.
3. Try to sign the handover document. Note: The signature block displays a warning and is disabled because checklist items are not marked as Passed.
4. Switch back to **Devi Prasad (PM)**. Under the Joint Inspection Checklist, toggle all items to **Pass**. In the Defects tab, resolve outstanding defects.
5. Switch back to **Marcus (Homeowner)**. The warning is removed, and the signature block is active. Draw your signature and click

**Sign Handover Certificate**.
6. The project shifts to the `Warranty` phase, and a workmanship warranty card is generated.

### Step 35: Warranty Defect Claims Reporting, Assignment, and Resolution

1. Switch persona to **Marcus & Sarah (Homeowners)**.
2. Under the **Handover & Warranty** tab, click **Report Warranty Claim**.
3. Select Category: **Carpentry**, Description: *"Kitchen cabinet door warping"*, Room: **Kitchen**, and submit.
4. Switch persona to **Devi Prasad (PM)**. Go to the Handover tab, locate the warranty claim, click **Assign Subcontractor**, and select Ah Hock.
5. Switch persona to **Ah Hock (Subcontractor)**. In the Subcontractor Portal, locate the warranty claim under active tasks.
6. Click **Upload Rectification Photo** to upload a photo and click **Mark Resolved**.
7. Switch persona to **Marcus (Homeowner)**. Navigate to the Handover tab, click **Sign Off Resolution**, draw your signature, and submit. The claim status updates to closed.

### Step 36: Project Documents Archive & Automated CaseTrust Receipts

1. Open Sarah Lim's project details and select the **Documents Archive** tab.
2. Confirm the auto-archived files list: **Interior Design Brief** and **Approved Quotation**.
3. When Marcus paid the hacking milestone, the system automatically generated an official **CaseTrust Progressive Payment Receipt** with CaseTrust-compliant warranty disclosures.
4. Locate the receipt in the Documents list and click **Print / Export** to open the styled print layout.

### Step 37: Dispute Evidence Compiler & CaseTrust Legal Pack Export

1. Open the RenoPilot AI Copilot chat widget (bottom-right).
2. Select the **AI Dispute Agent** in the chatbot headers.
3. Click the quick command **Compile Dispute Evidence**.
4. The agent compiles the project audit trail: signed contract details, payment milestones, defect records, and communication histories.
5. Once compiled, click the **Print Evidence Pack** button inside the chat stream to open a print-ready legal document pack.

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## 9. Phase 8: Business Intelligence, Security, and System Configurations

### Step 38: AI Cashflow Forecasting & Gross Margin Advisory

1. Switch persona to **John Koh (Owner)**.
2. Go to the main **Operations Overview** dashboard.
3. Under the **Overview** tab, scroll to the bottom to view the **12-Month AI Cashflow Forecast** chart showing collections (bars) vs. subcontractor payouts (line trends).
4. Review the **AI Margin Advisory** widget on the right. Inspect the Gross Margin Health gauge (`45.6% - Healthy`) and individual sub-trade markup audits.

### Step 39: AI Weekly Business Reports & Email Dispatch Simulator

1. Switch persona to **John Koh (Owner)**.
2. In the sidebar, select **Dashboard** and go to the **AI Weekly Report** tab.
3. Click **Compile Weekly Business Summary** to generate the executive summary.
4. Click **Email to Staff** to trigger a simulated dispatch notification toast.
5. Click **Print Summary** to format the executive overview as a printable corporate memo.

### Step 40: Strict Role-Based Access Control (RBAC) & Security Audits

1. Switch persona to **John Koh (Owner)**. Navigate to **Settings**.
2. Under Staff Members, locate **Chloe Tan (Designer)**. Click the **Shield Check** icon.
3. Uncheck **View Project Financials** and save.
4. Switch persona to **Chloe Tan (Designer)**. Open Sarah Lim's project details and select the **Milestone Payments** tab.
5. Verify the financials card is hidden behind a glassmorphic blurred overlay: *"Financial Margins Restricted — financials_view Required"*.
6. Click the **AI Procurement Hub** tab. Verify the page is blocked. Click **Request Permission From Owner**.
7. Switch back to **John Koh**. Go to **Settings** -> **Security & Access Audits**. The table logs Chloe's blocked attempt with Singapore IP addresses and browser user agents.

### Step 41: Metered AI Credits & Dynamic Deductions

1. Under any role, check the floating **AI Copilot** header or the **Settings** page to view your current **AI Credits Balance**.
2. Operations deduct from your balance:

- **Chat message:** `10` credits
- **AI Audits (Quote, Compliance, Delay, Dispute):** `50` credits
- **2D Concept Render:** `200` credits
- **3D Mesh Synthesis:** `250` credits
- **Coordinated Hybrid Pipeline:** `150` credits

3. If your balance is insufficient, the system blocks the action and displays an alert.
4. To top up: Log in as **John Koh**, go to Settings -> billing plan, select the top-up credit tier, complete the Stripe sandbox checkout, and verify the balance increases.

### Step 42: Mobile Responsiveness Enhancements & Navigation Slider

1. Resize your browser window to a mobile width (less than `1024px`).
2. **Dashboard Shell:** The sidebar collapses. Click the **hamburger menu** in the top header to reveal the touch-friendly navigation drawer.
3. **Tab Menus:** The main project detail tabs, AI CAD engine switcher, and Copilot tabs scroll horizontally with touch swipe gestures.
4. **Data Tables:** All spreadsheets, audit logs, and claim grids are wrapped in scrollable containers (`overflow-x-auto`) to fit mobile layouts.
5. **Copilot Chat:** The chatbot transforms into a full-screen drawer on mobile viewports for easier typing.