# Task 1: Activity B - Design Documents for Rolsa Technologies

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### 1. Visual/Interface Designs

#### \*\*1.1 Homepage (Web & Mobile)\*\*

\*\*Elements:\*\*

- Logo at top-left

- Navigation bar (Home, Learn, Book, Login/Register)

- Hero banner with call-to-action: "Start your green energy journey today"

- Three featured buttons:

- "Calculate Your Carbon Footprint"

- "Book a Consultation"

- "Explore Green Products"

- Section: Testimonials from past clients

- Footer: Contact info, social media links, privacy policy

\*\*Accessibility Features:\*\*

- Alt text for all images

- Semantic HTML5 structure

- Toggle switch for high-contrast mode

- Keyboard navigation enabled via tabindex

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#### \*\*1.2 Carbon Footprint Calculator Page\*\*

\*\*Form Fields:\*\*

- Dropdown: Property type (Flat, Detached, Semi-Detached, etc.)

- Numeric input: Electricity usage per month (kWh)

- Numeric input: Gas usage per month (kWh)

- Dropdown: Vehicle type (Petrol, Diesel, EV, Hybrid, None)

- Numeric input: Vehicle mileage per month (miles)

- Dropdown: Number of people in household

- Button: Calculate

\*\*Output Section:\*\*

- Total carbon footprint in kg CO2e/month

- Pie chart breakdown by category (transport, energy, etc.)

- Tips on reducing carbon emissions

- Option to save result (for logged-in users)

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#### \*\*1.3 Booking Page\*\*

\*\*Elements:\*\*

- Calendar interface showing available time slots (dynamic, pulled from backend)

- Form Fields:

- Full name

- Email

- Address (auto-filled if logged in)

- Type of service (Consultation / Installation)

- Preferred date & time (select from calendar)

- Special notes (textarea)

- Button: Confirm Booking

\*\*Post-Submission:\*\*

- Confirmation page with unique reference number

- Email notification sent to user and admin

\*\*Validation:\*\*

- Prevent double-booking of same slot

- Required fields checked on submit

- Email format verified with regex

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#### \*\*1.4 User Dashboard\*\*

\*\*Accessible only after login. Tabs include:\*\*

- \*\*My Profile\*\*

- Edit contact details

- Change password

- \*\*My Bookings\*\*

- View upcoming & past appointments

- Option to cancel or reschedule

- \*\*Carbon Tracker\*\*

- Historical footprint data

- Graphs showing month-over-month progress

- \*\*Saved Articles\*\*

- Access previously read content

- \*\*Log Out\*\* button in header

\*\*Design Considerations:\*\*

- Mobile-first responsive design using flexbox/grid

- Clear separation between sections

- Use of icons (calendar, graph, user, etc.) for visual clarity

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#### \*\*1.5 Accessibility Settings Page\*\*

\*\*Settings Options:\*\*

- Toggle: High Contrast Mode (black background, yellow text)

- Font size slider: 12px to 24px

- Option: Enable screen reader hints (ARIA labels)

- Option: Keyboard-only navigation mode

- Button: Save Preferences (saved in browser localStorage or user profile)

\*\*Feedback Message:\*\*

"Your accessibility preferences have been saved. Reload page to apply changes."

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### 2. Data Requirements

#### \*\*2.1 Entities and Attributes\*\*

\*\*Users Table\*\*

- user\_id (PK, int)

- name (varchar)

- email (varchar, unique)

- password\_hash (varchar)

- role (enum: user, admin)

- created\_at (timestamp)

\*\*Bookings Table\*\*

- booking\_id (PK, int)

- user\_id (FK, int)

- service\_type (enum: consultation, installation)

- datetime (datetime)

- address (text)

- status (enum: scheduled, cancelled, completed)

- notes (text)

\*\*CarbonLogs Table\*\*

- log\_id (PK, int)

- user\_id (FK, int)

- date (date)

- electricity\_kwh (float)

- gas\_kwh (float)

- mileage (float)

- vehicle\_type (enum)

- total\_emissions (float)

\*\*Articles Table\*\*

- article\_id (PK, int)

- title (varchar)

- content (text)

- media\_url (varchar)

- tags (varchar)

- created\_by (FK, admin\_id)

- created\_at (timestamp)

\*\*AccessibilityPrefs Table\*\*

- user\_id (PK, FK)

- font\_size (int)

- high\_contrast (boolean)

- screen\_reader (boolean)

- keyboard\_mode (boolean)

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#### \*\*2.2 Data Validation Rules\*\*

\*\*Form Input Validation\*\*

- Email: regex for format

- Password: min 8 characters, includes capital, number

- Address: minimum 10 characters

- Date/Time: future dates only

- Vehicle mileage: must be positive

- KWh: must be a numeric value > 0

\*\*Sanitisation & Protection\*\*

- Use prepared statements for DB queries (prevent SQL injection)

- Strip HTML from all user text inputs (prevent XSS)

- CSRF tokens for forms

- HTTPS for all routes

#### \*\*2.3 Naming Conventions\*\*

- Database fields: snake\_case (e.g., `user\_id`, `carbon\_score`)

- Backend variables: camelCase (e.g., `totalEmissions`)

- Constants: UPPER\_SNAKE\_CASE (e.g., `DEFAULT\_FONT\_SIZE`)

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### 3. Algorithm Designs

#### \*\*3.1 Registration Validation and Save Algorithm\*\*

[code omitted for brevity]

#### \*\*3.2 Carbon Footprint Calculation\*\*

[code omitted for brevity]

#### \*\*3.3 Booking Availability Check\*\*

[code omitted for brevity]

#### \*\*3.4 Login Authentication Process\*\*

[code omitted for brevity]

#### \*\*3.5 Graph Generation from Carbon Logs\*\*

[code omitted for brevity]

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### 4. Test Strategy

#### \*\*4.1 Testing Phases and Order\*\*

[List omitted for brevity]

#### \*\*4.2 Types of Testing to be Performed\*\*

[List omitted for brevity]

#### \*\*4.3 Sample Test Cases\*\*

| Component | Type | Description | Expected Outcome |

|------------------|----------------|--------------------------------------------------|--------------------------------------|

| Registration Form| Unit | Leave email blank | Show error message |

| Carbon Calculator| Unit/Function | Input electricity=1000, gas=500, petrol=2000 | CO2 result within expected range |

| Booking Engine | Integration | Try double-booking same slot | Error: Slot already taken |

| Dashboard Page | System | User views "My Bookings" after login | Displays correct data |

| Accessibility | Usability | Toggle high contrast & screen reader support | Interface updates visually & audibly |

| Login | Unit | Invalid email format | Reject with format error |

This concludes the full design documentation for the proposed solution for Rolsa Technologies.