OSDAG Screening Task – Bridge Module Web-Based UI Development

1. Introduction

Osdag is a cross-platform free/libre and open-source software for the design (and detailing) of steel structures. For the screening task, you will develop a **web-based graphical user interface** that handles user input, performs validation checks, manages field dependencies, and loads reference values from provided engineering data tables.

This screening task will assess your ability to:

- Design a clean and intuitive user interface layout
- Implement input validation and clear error feedback
- Use data from external tables (wind, seismic, temperature)
- Handle interactive UI elements and automatic field adjustments
- Write clear, maintainable, and well-structured code

You can set up the Osdag-web development environment using the following references:

1. Automated Script for Windows Setup [SCRIPT] [VIDEO]
2. Linux Installation Guide [LINK]
3. Refer to this report for troubleshooting [LINK]

If you face any issues in the setting up of the development environment, you can reach out to us through the Osdag discord channel.

---

2. Objective

Develop a **web application** titled **Group Design** that includes:

- A **Basic Inputs** tab where the user enters:
    - Type of Structure

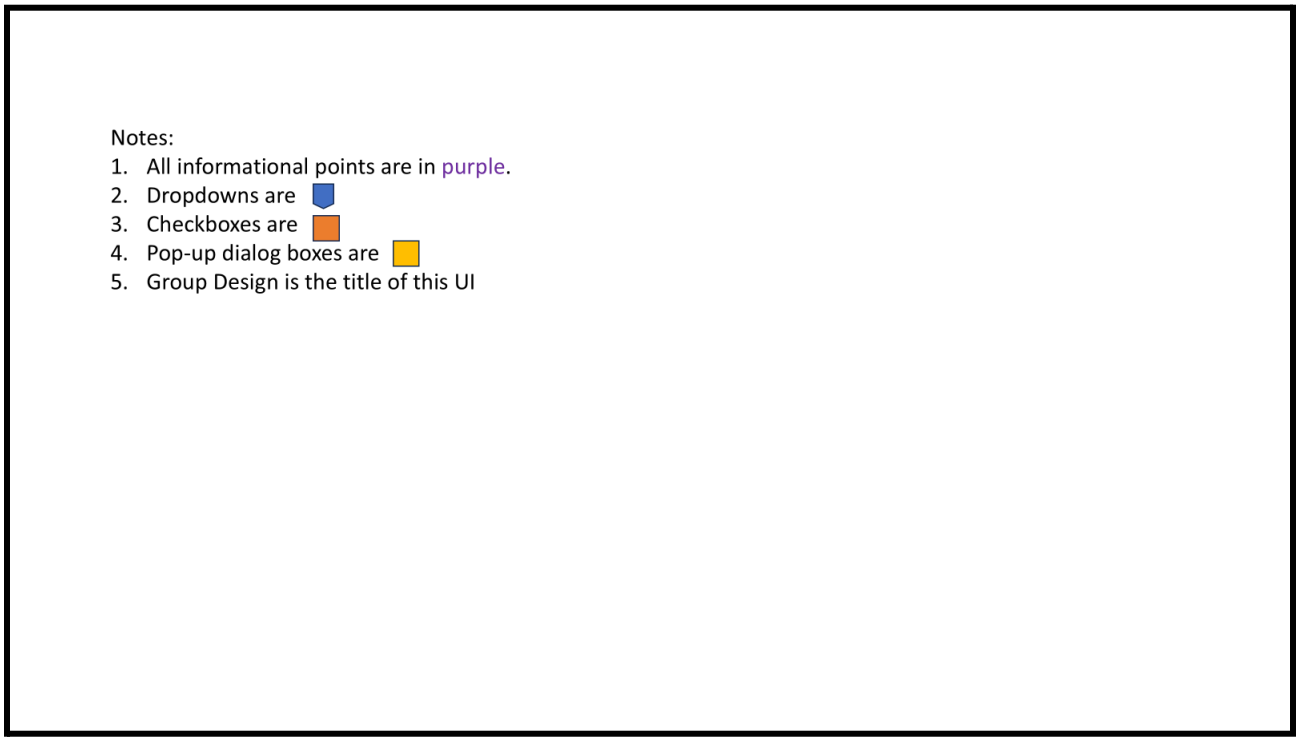
    - Project Location
    - Geometric Inputs
    - Material Inputs
- An **Additional Inputs** tab (visible in the UI, but **no functionality required** in this task)
- A **Bridge Cross-Section and Plan** reference image is displayed beside the input panel
- A **Modify Additional Geometry** button within the basic Inputs tab, which opens a pop-up dialogue box where girder spacing, number of girders, and deck overhang width are interdependent

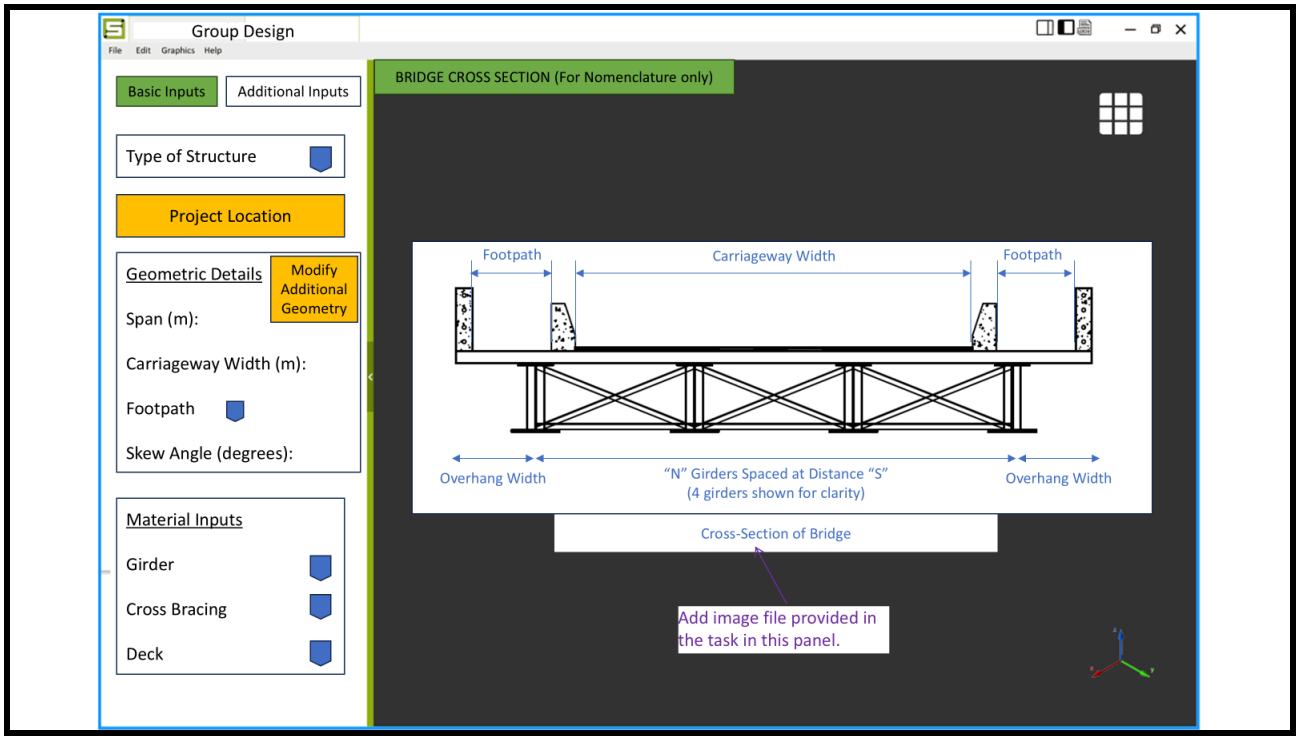
---

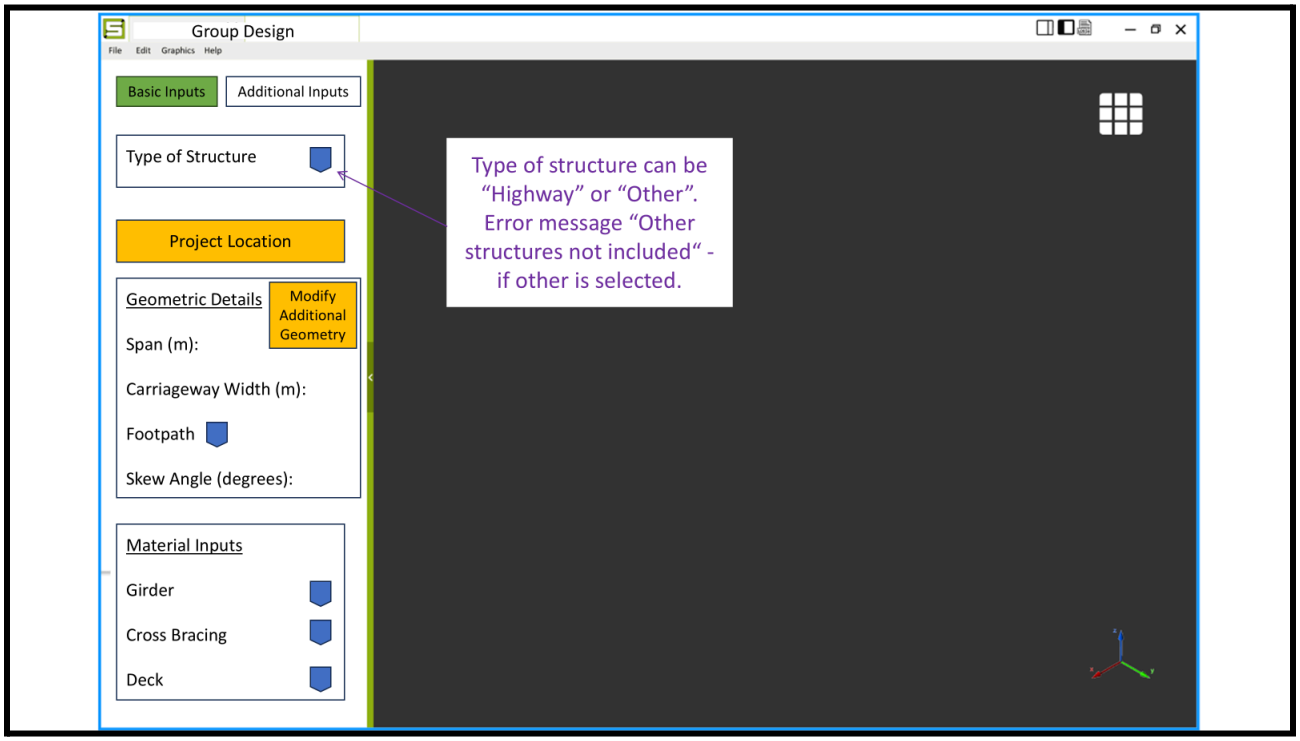
3. Setup and Deployment

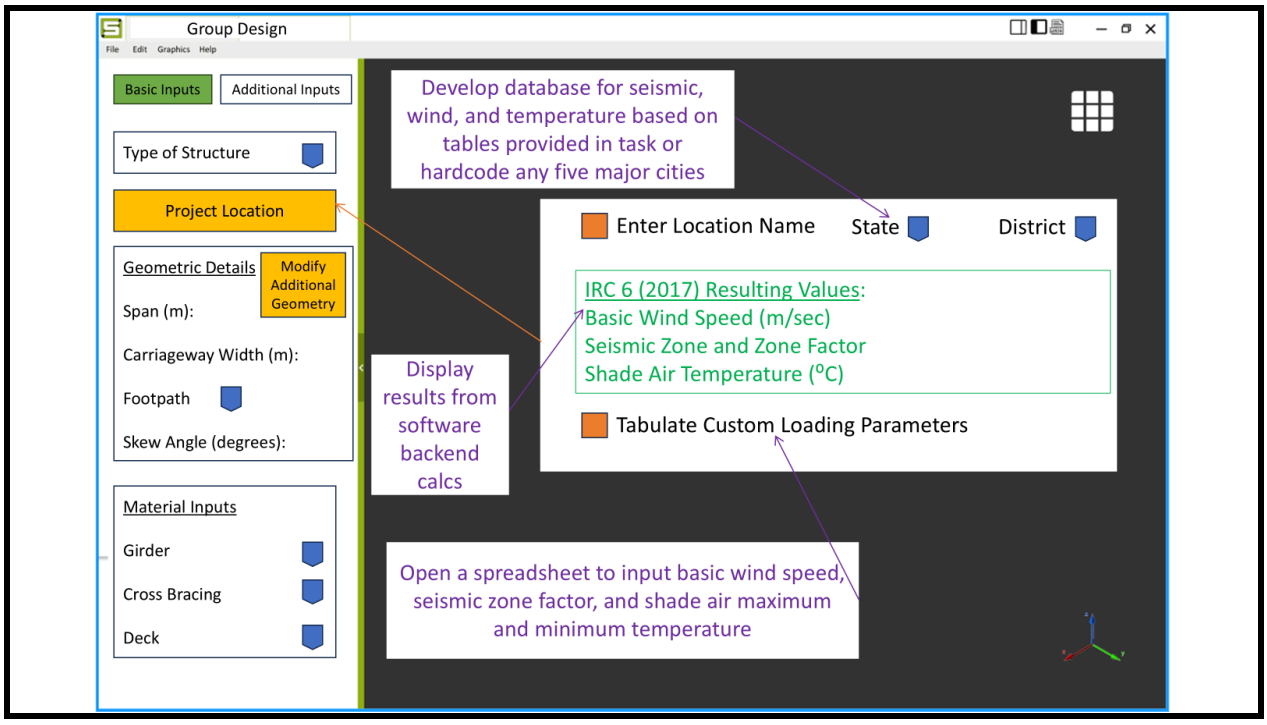
Set up and run Osdag-on-cloud. Ensure proper functionality on your local or preferred cloud environment.

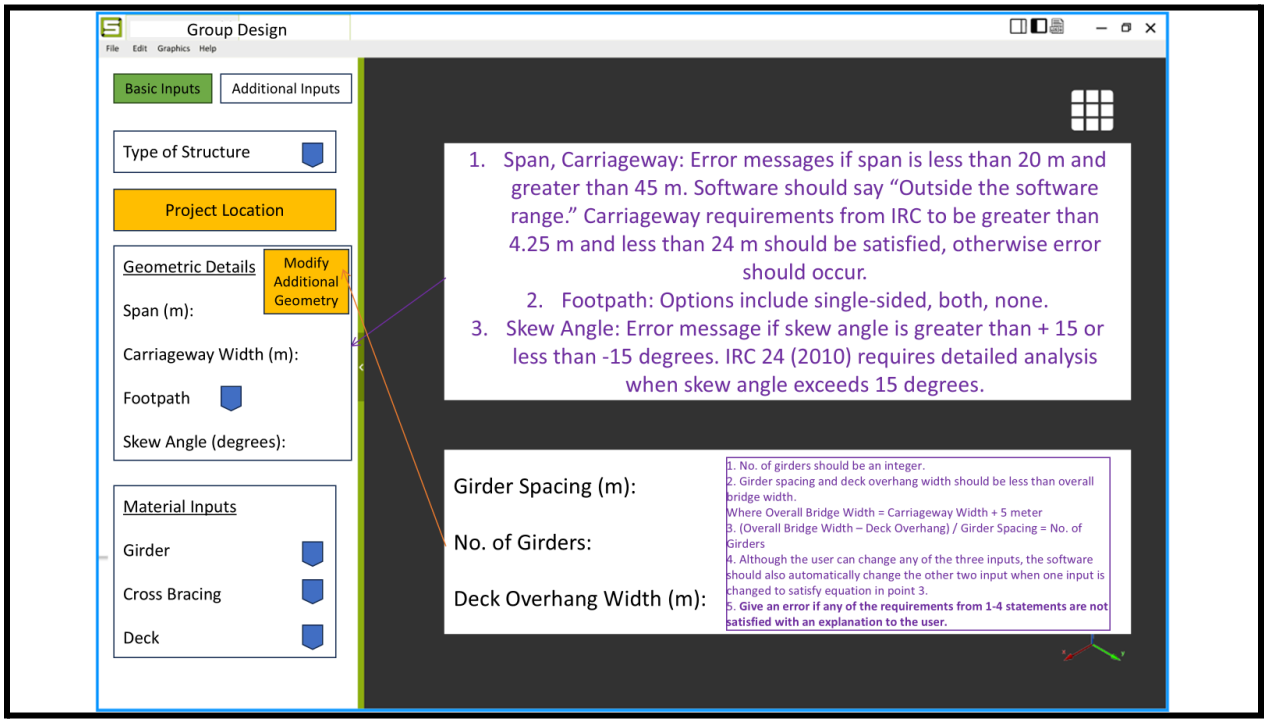
4. Module Development: Visual Flow

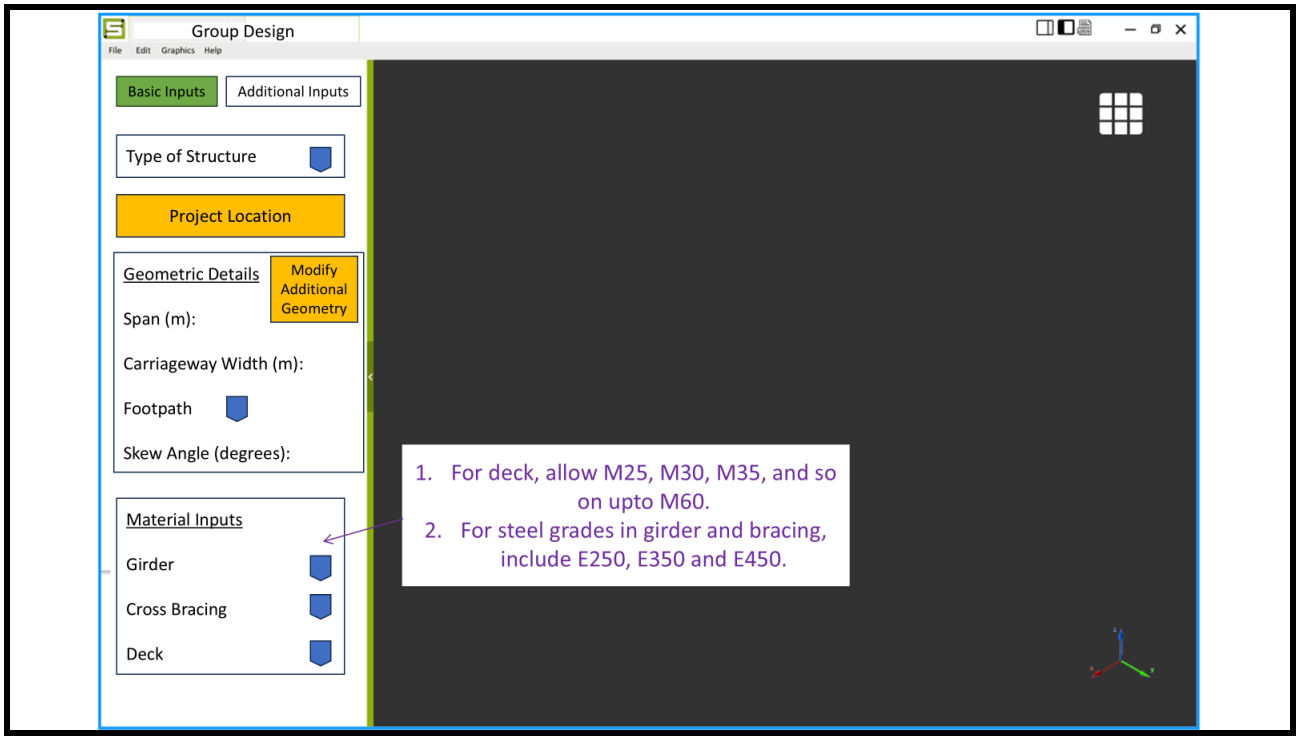



Group Design
File Edit Graphics Help
Basic Inputs
Additional Inputs
Type of Structure
Project Location
Geometric Details
Modify Additional Geometry
Span (m):
Carriageway Width (m):
Footpath
Skew Angle (degrees):
Material Inputs
Girder
Cross Bracing
Deck
BRIDGE CROSS SECTION (For Nomenclature only)
Footpath
Carriageway Width
Footpath
Overhang Width
"N" Girders Spaced at Distance "S"
(4 girders shown for clarity)
Overhang Width
Cross-Section of Bridge
Add image file provided in the task in this panel.


Group Design
File Edit Graphics Help
Basic Inputs
Additional Inputs
Type of Structure
Project Location
Geometric Details
Modify Additional Geometry
Span (m):
Carriageway Width (m):
Footpath
Skew Angle (degrees):
Material Inputs
Girder
Cross Bracing
Deck
Type of structure can be "Highway" or "Other". Error message "Other structures not included" - if other is selected.


Group Design
File Edit Graphics Help
Basic Inputs
Additional Inputs
Type of Structure
Project Location
Geometric Details
Modify Additional Geometry
Span (m):
Carriageway Width (m):
Footpath
Skew Angle (degrees):
Material Inputs
Girder
Cross Bracing
Deck
Develop database for seismic, wind, and temperature based on tables provided in task or hardcode any five major cities
Enter Location Name
State
District
IRC 6 (2017) Resulting Values:
Basic Wind Speed (m/sec)
Seismic Zone and Zone Factor
Shade Air Temperature (°C)
Tabulate Custom Loading Parameters
Display results from software backend calcs
Open a spreadsheet to input basic wind speed, seismic zone factor, and shade air maximum and minimum temperature


Group Design
File Edit Graphics Help
Basic Inputs
Additional Inputs
Type of Structure
Project Location
Geometric Details
Modify Additional Geometry
Span (m):
Carriageway Width (m):
Footpath
Skew Angle (degrees):
Material Inputs
Girder
Cross Bracing
Deck
1. Span, Carriageway: Error messages if span is less than 20 m and greater than 45 m. Software should say "Outside the software range." Carriageway requirements from IRC to be greater than 4.25 m and less than 24 m should be satisfied, otherwise error should occur.
2. Footpath: Options include single-sided, both, none.
3. Skew Angle: Error message if skew angle is greater than + 15 or less than -15 degrees. IRC 24 (2010) requires detailed analysis when skew angle exceeds 15 degrees.
Girder Spacing (m):
No. of Girders:
Deck Overhang Width (m):
1. No. of girders should be an integer.
2. Girder spacing and deck overhang width should be less than overall bridge width.
Where Overall Bridge Width = Carriageway Width + 5 meter
3. (Overall Bridge Width – Deck Overhang) / Girder Spacing = No. of Girders
4. Although the user can change any of the three inputs, the software should also automatically change the other two input when one input is changed to satisfy equation in point 3.
5. Give an error if any of the requirements from 1-4 statements are not satisfied with an explanation to the user.



---

5. Module Development: Flow Description

5.1. UI Title

Group Design

5.2. Layout

Left Panel (Inputs)	Right Panel (Reference Image)
Contains two tabs: • Basic Inputs (implemented) • Additional Inputs (placeholder only)	Must display the provided Bridge Cross-Section image. The image remains visible and is not interactive.

5.3. Tabs within Left Panel

Tab	Requirement
Basic Inputs	Implemented in this task
Additional Inputs	Only create the tab, content not required

5.3.1. Basic Inputs Tab

5.3.1.1. Type of Structure

- Choices: **Highway** or **Other**
- If **Other** is selected:
    - Display: **"Other structures not included."**
    - Disable all remaining inputs

5.3.1.2. Project Location

Provide two mutually exclusive modes, i.e. only one option can be active at a time.

Mode No.	Mode	UI Behavior	Data Source	Resulting Values Shown
1.	**Enter Location Name** (checkbox)	Shows **State** and **District** dropdowns	Provided tables	Basic Wind Speed (m/s), Seismic Zone & Factor, Max/Min Shade Air Temperature (resulting from the reference tables) in the Project Location section
2.	**Tabulate Custom Loading Parameters** (checkbox + button)	Opens a spreadsheet-style pop-up	User manually enters values	Basic Wind Speed (m/s), Seismic Zone & Factor, Max/Min Shade Air Temperature from the user input in the spreadsheet will be visible in the Project Location section

For the first mode with "Enter Location Name," you may choose either of the following approaches for the Project Location data:

- **Option A (Extra Credit +20%)**
  Develop a database for temperature, seismic, and wind values using the tables provided in Section 5. This database should be used to populate the State and District dropdown menus within the Project Location section. When a location is selected, the corresponding Temperature (Max/Min), Basic Wind Speed (m/s), and Seismic Zone & Zone Factor should automatically appear. These values should be displayed in green, as shown in Section 3.

  Correct implementation of this database earns 20% extra credit.

- **Option B (Base Requirement)**
  If you choose to skip the optional database, then inside the code, hardcode temperature, wind, and seismic values for any 5 major cities (e.g.: Mumbai, Delhi, Chennai, Bangalore, Kolkata). These cities should appear in the Project Location dropdown and their corresponding values should be displayed in green.

5.3.1.3. Geometric Details

Field	Validation

Span (m)	If < 20 or > 45 → **"Outside the software range."**
Carriageway Width (m)	Must be ≥ 4.25 m and <24 m
Footpath	Options: Single-sided / Both / None
Skew Angle (°)	If outside ±15° → **"IRC 24 (2010) requires detailed analysis"**

5.3.1.4. Material Inputs

Component	Allowed Grades
Girder Steel	E250, E350, E450
Cross Bracing Steel	E250, E350, E450
Deck Concrete	M25, M30, M35 and so on up to M60

5.3.1.5. Modify Additional Geometry (Pop-Up)

Placed within **Geometric Details**.

Field	Format
Girder Spacing (m)	Float, 1 decimal
No. of Girders	Integer
Deck Overhang Width (m)	Float, 1 decimal

Rules

- Overall Bridge Width = Carriageway Width + 5 meters
- Both spacing & overhang must be < overall width
- Must satisfy:
  (Overall Width – Overhang) / Spacing = No. of Girders
- Changing any field must auto-update the other two
- Clear error messages required if constraints fail

---

6. Frontend and Backend Stack

- Develop the UI for the selected module using React.
- Implement endpoints using Django and Django REST Framework.

7. Provided Files

Link includes:

- Bridge Cross-Section Image
- Wind Table
- Seismic Table

- Temperature Table

---

8. Deliverables

- Video Demonstration: Create a short video (1–3 minutes) demonstrating:
    - Navigation through the UI
    - Project Location selection using both modes
    - The Modify Additional Geometry pop-up and its auto-adjust behavior
    - Any implemented validations or error messages

  If you completed the optional database, show selecting a location and automatic display of temperature, wind, and seismic data in green.
  The video may be silent and does not need editing.
  Upload it as Unlisted on YouTube, and provide the link in your submission.
- If the optional database was completed, include the processed database file (CSV/JSON/SQLite).
- Backend:
    - Endpoints implemented for the selected module in Django and Django REST Framework.
- Frontend:
    - A React-based UI for the selected module.
- Report:
    - Methodology: Describe the approach taken for development.
    - Challenges: Highlight issues faced while setting up and developing the project.
    - References: Include resources used for learning and development.

---

9. Evaluation Criteria

- Backend Development
    - Reusable Code: Modular and efficient design.
    - Code Structure: Well-organized and adheres to Django conventions.
    - API Design: Adherence to RESTful API principles.
- Frontend Development
    - User Experience: Intuitive and responsive UI design.
    - Reusable Code: Modular and reusable React components.
    - Integration: Smooth integration of APIs with the frontend.

Optional Extra Credit (+20%)
Awarded if the candidate develops a database for temperature, wind, and seismic data from the provided tables, integrates it into the State → District dropdown selection, and displays the resulting values within the Project Location tab.

---

10. Notes

- You may enhance the UI or code structure beyond the minimum required.
- The provided tables and image are reference inputs; you may refactor the data format for cleaner use.
- Ensure all dependencies are clearly listed and installable.
- Kindly join the Osdag Discord Server using the provided **[LINK]**.
  For any questions, please use the **screening-task-helpdesk** channel.
