



# FOSSEE Winter Internship Report

On

## Testing and UI Enhancement of Material and Loading Modules in Osdag

**Submitted by**

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# Chapter 1

# Introduction

## 1.1 National Mission in Education through ICT

The National Mission on Education through ICT (NMEICT) is a scheme under the Department of Higher Education, Ministry of Education, Government of India. It aims to leverage the potential of ICT to enhance teaching and learning in Higher Education Institutions in an anytime-anywhere mode.

The mission aligns with the three cardinal principles of the Education Policy—**access, equity, and quality**—by:

- Providing connectivity and affordable access devices for learners and institutions.
- Generating high-quality e-content free of cost.

NMEICT seeks to bridge the digital divide by empowering learners and teachers in urban and rural areas, fostering inclusivity in the knowledge economy. Key focus areas include:

- Development of e-learning pedagogies and virtual laboratories.
- Online testing, certification, and mentorship through accessible platforms like EduSAT and DTH.
- Training and empowering teachers to adopt ICT-based teaching methods.

For further details, visit the official website: www.nmeict.ac.in.

### 1.1.1 ICT Initiatives of MoE

The Ministry of Education (MoE) has launched several ICT initiatives aimed at students, researchers, and institutions. The table below summarizes the key details:

| No. | Resource | For Students/Researchers | For Institutions |
|---|---|---|---|
| **Audio-Video e-content** | | | |
| 1 | SWAYAM | Earn credit via online courses | Develop and host courses; accept credits |
| 2 | SWAYAMPRABHA | Access 24x7 TV programs | Enable SWAYAMPRABHA viewing facilities |
| **Digital Content Access** | | | |
| 3 | National Digital Library | Access e-content in multiple disciplines | List e-content; form NDL Clubs |
| 4 | e-PG Pathshala | Access free books and e-content | Host e-books |
| 5 | Shodhganga | Access Indian research theses | List institutional theses |
| 6 | e-ShodhSindhu | Access full-text e-resources | Access e-resources for institutions |
| **Hands-on Learning** | | | |
| 7 | e-Yantra | Hands-on embedded systems training | Create e-Yantra labs with IIT Bombay |
| 8 | FOSSEE | Volunteer for open-source software | Run labs with open-source software |
| 9 | Spoken Tutorial | Learn IT skills via tutorials | Provide self-learning IT content |
| 10 | Virtual Labs | Perform online experiments | Develop curriculum-based experiments |
| **E-Governance** | | | |
| 11 | SAMARTH ERP | Manage student lifecycle digitally | Enable institutional e-governance |
| **Tracking and Research Tools** | | | |
| 12 | VIDWAN | Register and access experts | Monitor faculty research outcomes |
| 13 | Shodh Shuddhi | Ensure plagiarism-free work | Improve research quality and reputation |
| 14 | Academic Bank of Credits | Store and transfer credits | Facilitate credit redemption |

Table 1.1: Summary of ICT Initiatives by the Ministry of Education

## 1.2 FOSSEE Project

The FOSSEE (Free/Libre and Open Source Software for Education) project promotes the use of FLOSS tools in academia and research. It is part of the National Mission on Education through Information and Communication Technology (NMEICT), Ministry of Education (MoE), Government of India.

### 1.2.1 Projects and Activities

The FOSSEE Project supports the use of various FLOSS tools to enhance education and research. Key activities include:

- **Textbook Companion**: Porting solved examples from textbooks using FLOSS.
- **Lab Migration**: Facilitating the migration of proprietary labs to FLOSS alternatives.
- **Niche Software Activities**: Specialized activities to promote niche software tools.
- **Forums**: Providing a collaborative space for users.
- **Workshops and Conferences**: Organizing events to train and inform users.

### 1.2.2 Fellowships

FOSSEE offers various internship and fellowship opportunities for students:

- Winter Internship
- Summer Fellowship
- Semester-Long Internship

Students from any degree and academic stage can apply for these internships. Selection is based on the completion of screening tasks involving programming, scientific computing, or data collection that benefit the FLOSS community. These tasks are designed to be completed within a week.

For more details, visit the official FOSSEE website.


Figure 1.1: FOSSEE Projects and Activities

## 1.3 Osdag Software

Osdag (Open steel design and graphics) is a cross-platform, free/libre and open-source software designed for the detailing and design of steel structures based on the Indian Standard IS 800:2007. It allows users to design steel connections, members, and systems through an interactive graphical user interface (GUI) and provides 3D visualizations of designed components. The software enables easy export of CAD models to drafting tools for construction/fabrication drawings, with optimized designs following industry best practices [1, 2, 3]. Built on Python and several Python-based FLOSS tools (e.g., PyQt and PythonOCC), Osdag is licensed under the GNU Lesser General Public License (LGPL) Version 3.

### 1.3.1 Osdag GUI

The Osdag GUI is designed to be user-friendly and interactive. It consists of

- **Input Dock**: Collects and validates user inputs.
- **Output Dock**: Displays design results after validation.
- **CAD Window**: Displays the 3D CAD model, where users can pan, zoom, and rotate the design.
- **Message Log**: Shows errors, warnings, and suggestions based on design checks.

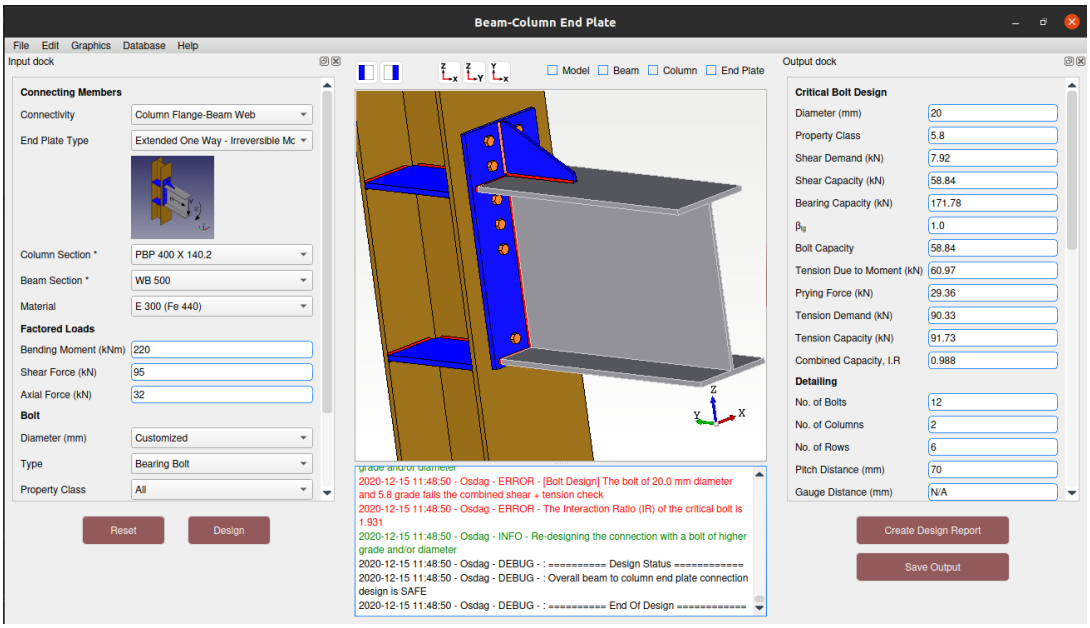


Figure 1.2: Osdag GUI

### 1.3.2 Features

- **CAD Model**: The 3D CAD model is color-coded and can be saved in multiple formats such as IGS, STL, and STEP.
- **Design Preferences**: Customizes the design process, with advanced users able to set preferences for bolts, welds, and detailing.
- **Design Report**: Creates a detailed report in PDF format, summarizing all checks, calculations, and design details, including any discrepancies.

For more details, visit the official Osdag website.

# Chapter 2

# Screening Task

## 2.1 Problem Statement

The screening task involved testing the Column-to-Column Cover Plate Welded module in the test branch of the Osdag software to evaluate its stability, functionality, and performance across multiple input cases.

## 2.2 Tasks Done

### Module Details

- Module: Column-to-Column Cover Plate Welded
- Branch: test
- Operating System: Windows
- Python Version: 3.10+ (osdag-env)

### Mass Testing Performed

- Conducted testing using 10 official .osi files.
- Conducted testing using 10 randomly created .osi files.
- Verified module stability during repeated file loading and multiple Design executions.

## Critical Issues Identified

- **Crash on Reloading .osi Files**
  - Application crashed when a new .osi file was loaded after a previous design execution.
  - Crash occurred consistently during sequential file testing.
- **Crash on Re-Design**
  - Application crashed when the Design button was clicked multiple times without restarting the module.
- **Lock/Unlock Behavior**
  - CAD and output dock disappeared after clicking Unlock.
  - Later clarified by collaborators as expected software behavior.
- **UI Performance Issue**
  - Scroll lag observed in input and output sections.
  - Noticeable delay in UI responsiveness.
- **Console Error**
  - Repeated TypeError observed: `ColumnCoverPlateWeld.preference_type() takes 1 positional argument but 2 were given`.

## Re-Testing and Resolution

- Re-tested after unlocking input dock before loading each file.
- Crash persisted on subsequent files.
- Pulled latest updates from the test branch and re-tested.
- Confirmed that the crash issue related to reloading .osi files was resolved in updated commits.

# Chapter 3

# Internship Task 2: Modification of Material Properties Module

## 3.1 Task 2: Problem Statement

The objective of this task was to enhance and refine the Material Properties module in the Osdag Bridge application. The focus was on improving the user interface, expanding material grade options, and implementing code-based default property assignment in accordance with Indian Standards (IS 2062 for steel and IRC 22 for concrete).

The key goals were:

- Expand available steel and concrete grade selections.
- Improve the Modify Properties dialog UI.
- Implement standard-based default material property logic.
- Ensure better user interaction and input consistency.

## 3.2 Task 2: Tasks Done

The following improvements were implemented:

- Updated material inputs for **Deck, Girder, Cross Bracing, and End Diaphragm**.

- Added IS 2062 steel grades (E 250A to E 650BR) for structural members.
- Added IRC 22 concrete grades (M25 to M90) for Deck.
- Developed an improved **Modify Properties** dialog with editable material parameters.
- Implemented grade-based default material property assignment.
- Added a functional **"Default"** checkbox to restore standard values.
- Improved UI styling and consistency using PySide6 widgets.

## 3.3 Task 2: UI Enhancement and Styling

To improve consistency and usability of input fields, a reusable styling function was implemented for dropdowns and text inputs.

### 3.3.1 Description

- Applied uniform height and size policy for all input widgets.
- Standardized appearance of QComboBox and QLineEdit.
- Improved visual clarity and interaction responsiveness.

### 3.3.2 Python Code Snippet

Listing 3.1: Reusable UI Styling for Material Input Fields

```
1
2  from PySide6.QtWidgets import QComboBox, QLineEdit, QSizePolicy
3
4  def apply_field_style(widget):
5      widget.setSizePolicy(QSizePolicy.Expanding, QSizePolicy.Fixed)
6      widget.setMinimumHeight(28)
7
8      if isinstance(widget, QComboBox):
9          widget.setStyleSheet("""
10             QComboBox{
```

```
                padding: 1px 7px;
                border: 1px solid black;
                border-radius: 5px;
                background-color: white;
                color: black;
            }
            QComboBox::drop-down{
                subcontrol-origin: padding;
                subcontrol-position: top right;
                border-left: 0px;
            }
            QComboBox::down-arrow{
                image: url(:/vectors/arrow_down_light.svg);
                width: 20px;
                height: 20px;
                margin-right: 8px;
            }
            QComboBox QAbstractItemView{
                background-color: white;
                border: 1px solid black;
                color: black;
            }
        """)
    elif isinstance(widget, QLineEdit):
        widget.setStyleSheet("""
            QLineEdit {
                padding: 1px 7px;
                border: 1px solid #070707;
                border-radius: 6px;
                background-color: white;
                color: #000000;
            }
        """)
```

## 3.4 Task 2: Default Property Logic

- Implemented grade-based assignment of strength properties (Fy, Fu for steel and fck for concrete).
- Assigned elastic constants (E, G, Ecm) based on standard provisions.
- Applied Poisson's ratio and thermal expansion coefficient as per relevant code values.
- Automatically updated UI fields when grade selection changed.
- Disabled default mode when user manually edited any parameter.

## 3.5 Task 2: Implementation Notes

- Improved UI consistency across all material input fields.
- Ensured alignment with IS 2062 and IRC 22 provisions.
- Maintained compatibility with existing Osdag architecture.

# Chapter 4

# Internship Task 2: Implementation of Loading Section

## 4.1 Task 2: Problem Statement

The objective of this task was to implement and update the Loading Section UI in the Osdag Bridge application as per the given specifications. The focus was on restructuring the loading inputs and ensuring proper categorization of load types.

## 4.2 Task 2: Tasks Done

The following UI changes were implemented:

- Updated the Loading Section interface as per the provided design instructions.
- Added input sections for:
  - Permanent Loads
  - Live Loads
  - Seismic Loads
  - Wind Loads
  - Temperature Loads
  - Custom Loads

- Structured the UI fields for entering load magnitude and related parameters.
- Implemented support for defining Custom Load cases.
- Added Load Combination options as specified.
- Ensured proper alignment and consistency of UI components across the Loading section.

## 4.3 Task 2: Documentation

The Loading Section updates were documented as per the implemented UI structure and loading categories to maintain clarity and future reference.

# Chapter 5

# Conclusions

## 5.1 Tasks Accomplished

During the course of the internship, the following major tasks were successfully completed:

- Conducted mass testing of the Column-to-Column Cover Plate Welded module in the test branch and systematically reported reproducible issues.
- Identified application crashes, UI inconsistencies, and console errors through structured testing of multiple .osi input files.
- Modified and enhanced the Material Properties module by expanding steel and concrete grade options as per IS 2062 and IRC 22 standards.
- Improved the Modify Properties dialog with grade-based default logic and user override functionality.
- Implemented and restructured the Loading Section UI as per given specifications, including support for Permanent, Live, Seismic, Wind, Temperature, and Custom Loads.
- Implemented load combination options and ensured proper UI alignment and input validation.
- Documented all changes and maintained clear reporting throughout the internship period.

## 5.2 Skills Developed

The internship provided significant technical and professional learning opportunities. The following skills were developed:

- **Software Testing and Debug Reporting**: Systematic module testing, reproducibility analysis, and structured issue reporting.
- **Python Development**: Practical experience working with Python in a real-world engineering application.
- **PySide6 UI Development**: Designing and refining structured graphical user interfaces.
- **Engineering Software Understanding**: Exposure to structural design concepts including material properties and loading systems as per Indian Standards.
- **Problem-Solving and Analytical Thinking**: Diagnosing application behavior and verifying fixes after updates.
- **Version Control and Collaboration**: Working with branches, pull requests, and interacting with collaborators for issue resolution.
- **Technical Documentation**: Writing structured documentation for implemented features and testing outcomes.

The internship experience strengthened both technical competence and professional communication skills while contributing to a real-world engineering software project.

# Chapter A

# Appendix

## A.1 Work Reports

# Internship Work Report

| | | | |
|---|---|---|---|
| Name: | | Aditya Wagh | |
| Project: | | Osdag | |
| Internship: | | FOSSEE Winter intership 2025 | |
| **DATE** | **DAY** | **TASK** | **Hours Worked** |
| 1-Dec-2025 | Monday | understanding of Osdag architecture | 4 |
| 2-dec-2025 | Tuesday | Setup | 3 |
| 3-dec-2025 | Wednesday | Setup | 2 |
| 4-Dec-2025 | Thursday | Setup | 2 |
| 5-dec-2025 | Friday | Project onboarding, development environment setup | 4 |
| 6-dec-2025 | Saturday | understanding of Osdag architecture | 3 |
| 7-dec-2025 | Sunday | Explored Column-to-Column Cover Plate Welded module | 4 |
| 8-Dec-2025 | Monday | Studied module execution flow and structured testing | 2 |
| 9-Dec-2025 | Tuesday | Began testing of Column-to-Column Cover Plate Welded module | 5 |
| 10-Dec-2025 | Wednesday | reviewed input-output structure. | 6 |
| 11-Dec-2025 | Thursday | Continued testing using official .osi files | 3 |
| 12-Dec-2025 | Friday | Tested sequential file loading | 4 |
| 13 Dec-2025 | Saturday | observed CAD disappearance; reported findings | 2 |
| 14 Dec-2025 | Sunday | Submitted structured issue report | 7 |
| 15 Dec-2025 | Monday | Re-tested module after suggested workflow corrections | 6 |
| 16 Dec-2025 | Tuesday | re-tested crash scenarios. | 7 |
| 21 Dec 2025 | Sunday | Started working on the Material properties | 7 |
| 18 Dec 2025 | Thursday | Modify Properties dialog UI and field alignment | 6 |
| 19 Dec 2025 | Friday | changes as per the Figma UI | 7 |
| 20 Dec 2025 | Saturday | Worked on the suggested changes | 5 |
| 21 Dec 2025 | Sunday | fixed the miss-alignment | 6 |
| 22 Dec 2025 | Monday | Implemented grade-based default material property logic | 7 |
| 23 Dec 2025 | Tuesday | Added “Default” checkbox functionality and override behavior | 6 |
| 24 Dec 2025 | Wednesday | Fixed the alignment issues in the deck input boxes | 6 |
| 25 Dec 2025 | Thursday | Added the subscript and superscript to the input text | 5 |

# Internship Work Report

| | |
|---|---|
| Name: | Aditya Wagh |
| Project: | Osdag |
| Internship: | FOSSEE Winter intership 2025 |

| | | | |
|---|---|---|---|
| 26 Dec 2025 | Friday | Added IRC 22 concrete grades for deck inputs. | 7 |
| 27 Dec 2025 | Saturday | Fixed the alignment isses as per sugestion | 6 |
| 28 Dec 2025 | Sunday | Added the missing input | 6 |
| 29 Dec 2025 | Monday | Sqlite file added for the deck values | 5 |
| 30 Dec 2025 | Tuesday | reviewed the suggested changes | 8 |
| 31 Dec 2025 | Wednesday | Final changes as per suggestion | 6 |
| 1 Jan 2026 | Thursday | Started working on Loading Section UI | 7 |
| 2 Jan 2026 | Friday | fixed the missing values and the input boxes | 6 |
| 3 Jan 2026 | Saturday | Added structured input sections for Permanent and Live Loads. | 6 |
| 4 Jan 2026 | Sunday | Implemented Seismic and Wind load input UI fields. | 7 |
| 5 Jan 2026 | Monday | changes as per the document | 6 |
| 6 Jan 2026 | Tuesday | Exam break | 0 |
| 7 Jan 2026 | Wednesday | Exam break | 0 |
| 8 Jan 2026 | Thursday | Fixed the dialog boxes and alignment in the live load | 6 |
| 9 Jan 2026 | Friday | Added Temperature Load and Custom Load input support | 7 |
| 10 Jan 2026 | Saturday | Holiday due to campus drive | 0 |
| 11 Jan 2026 | Sunday | Holiday due to campus drive | 0 |
| 12 Jan 2026 | Monday | Integrated Load Combination options in Loading section | 7 |
| 13 Jan 2026 | Tuesday | Implemented the add dialog in the load combination tab | 6 |
| 14 Jan 2026 | Wednesday | Implemented the custom vehicle dialog in the live load tab | 7 |
| 15 Jan 2026 | Thursday | Fixed the permanent load tab alignments | 6 |
| 16 Jan 2026 | Friday | Worked on the live load tab vehicle table | 5 |

| | | | |
|---|---|---|---|
| Name: | | Aditya Wagh | |
| Project: | | Osdag | |
| Internship: | | FOSSEE Winter intership 2025 | |
| 17 Jan 2026 | Saturday | Fixed the mis alignment issues | 3 |
| 18 Jan 2026 | Sunday | Worked on the custom vehicle dialog box as per suggested | 6 |
| 19 Jan 2026 | Monday | worked on the custom load dialog | 6 |
| 20 Jan 2026 | Tuesday | worked on the suggestion in temperature load tab | 4 |
| 21 Jan 2026 | Wednesday | worked the default button working throughout the loading | 6 |
| 22 Jan 2026 | Thursday | Fixed the Alignment issues | 5 |
| 23 Jan 2026 | Friday | did suggested changes throughout the loading | 4 |
| 24 Jan 2026 | Saturday | UI elements defined in the Ui_field_additional Input file | 6 |
| 25 Jan 2026 | Sunday | All the UI texts moved to the Ui field as suggested | 5 |
| 26 Jan 2026 | Monday | Ui suggestions minor changes as per suggested | 6 |
| 27 Jan 2026 | Tuesday | Final reviews and changes | 4 |
| 28 Jan 2026 | Wednesday | Final reviews and changes | 6 |
| 29 Jan 2026 | Thursday | Material input last suggested changes done | 5 |
| 30 Jan 2026 | Friday | minor changes and Pr submission | 6 |
| 31 Jan 2026 | Saturday | Conflicts resolved | 3 |
| 31 Jan 2026 | Sunday | suggested changes as per instructions | 5 |
| 1 Feb 2026 | Saturday | holiday | 0 |
| 2 Feb 2026 | Saturday | conflicts and pr changes | 6 |
| 3 Feb 2026 | Saturday | Final Pr submitted | 6 |
| 4 Feb 2026 | Saturday | holiday | 0 |
| | | | |
| | | | |

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