

OPEN STEEL DESIGN AND GRAPHICS: A PYTHON-BASED FOSS

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Today's construction practices involve huge steel usage as construction material, ranging from commercial buildings, bridges, railway platforms, airports etc. Designing such steel structures needs user friendly softwares, which are presently available in proprietary form. These proprietary softwares are most of the time ingest substantial amount of capital investment, enforcing the designer to set high consulting charges. Additionally high value of capital investment is a big hurdle for growth of small scale industries. Several such issues (including both educational and industrial problems) shows the need of free and open source software (FOSS) for steel design. To fulfill these requirements a pilot project is taken to create a FOSS, named as Open Steel Design and Graphics (Osdag). The important feature of the software lies in the inclusion of graphics for real-time visualisation of the structural details.

Osdag is a model-based platform independent software having several design modules. The primary phases involved in the development of Osdag are:

1. Development of graphical user interface (GUI) and database management

Osdag is based on open source technology with python as the programming language. GUI development is executed with Pyqt4 python binding for Qt GUI toolkit. Interactive user interface is provided with proper validation of user input and maintaining log files. MySQL database is integrated for back end.

2. Structural design and optimization

Osdag uses limit state design philosophy for the structural steel design. All the design calculations are based on Indian standard code of practice for structural steel construction (IS800:2007). For numerical computations, python module functions are used extensively. Design optimization module is also integrated in the software for a robust and economical design.

3. Python-based CAD modeling

Osdag focuses on the visualisation of the structural details by developing CAD model. The design calculation details are fetched from the output database for a better understanding of the structural drawing. The graphics developed from Osdag can be exported as a fabrication drawing for the real-time construction of steel structures.

Osdag contains various modules namely, connection design, tension and compression member design, flexural design, plate girder design. The partial implementation of fin plate connection design in steel construction is executed as a part of this project proposal. Example problems are solved using Osdag and validated with valid sources. Proper log files are maintained which provides the user/designer with the information of design failure criteria. The future scope of work includes the implementation of interactive CAD model of the executed design.

The final objective of Osdag project is to develop a computer tool for structural steel design and graphics in an open-source framework that will be used by design consultants, college teachers and young professionals. The outcome of this project will also be used by students and teachers in almost all engineering colleges in the country.