



## Software Platform for the Integration of Design Code Checks into Building Information Modelling

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### Summary

Due to the great freedom in contemporary structural design, conventional design techniques cannot be applied to all spatial compositions and new materials. Widely available CAE software often tries to automate more common check methods found in (inter)national norms, but does not provide universal solutions. The complexity of modern structures, while economical and aesthetically appealing, requires that the engineer often write his/her own checks or perform manual calculations.

*Design Forms* (SDF) is a new software technology that enables the easy, on-the-fly writing of customised engineering algorithms and design checks by means of simplified programming. The application uses a C#-based, object-oriented scripting language, and is furnished with an intuitive UI, a full set of mathematical and logical operators, possibilities to include text and graphical descriptions, tables, charts and extensive reports. Built-in toolboxes with engineering formulae and libraries help the user-developer create standalone solutions that can be reused, shared, sold commercially, and linked to CAE software where advanced GUI and 3D visualisation possibilities may be used while pre- and post-processing. This paper presents the SDF tool and illustrates its use by means of practical examples of structural design and detailing.

**Keywords:** Design software, Building Information Modelling, Structural standards, Design checks

### 1. Introduction

Practical engineering work is rapidly being integrated into the *Building Information Modelling* (BIM) workflow. The stages of conceptual design, detailing, execution and maintenance are consolidated to ensure better communication between the different specialists and responsible parties. To handle the large amount of data, engineers and contractors need to employ powerful CAE and CAD software in their everyday work. SDF is a software platform that aims to fill the gap created by the use of sophisticated 3D models and the need to still perform design checks according to the appropriate structural standards or technical publications.

SDF is built around the concept that a designer can simply type all necessary formulas, build the report layout, test the resulting outcome in the appropriate range of variables, comment and generate the report, and thus provide a fully automated solution for the considered engineering problem. SDF aims to replace spreadsheets, while providing dynamic graphics, semi-automated reporting and handling of named variables, units, translations and intellectual property protection.

At this moment, files created in SDF can be used stand-alone or be linked to *Scia Engineer* (CAE software for the modelling, analysis, design and detailing of 3D structures), where these serve as plug-in checks. To perform a check, SDF acquires referenced data from the CAE 3D model (cross-section, materials, FEM results, etc.), performs the calculation in the background, and sends the report back to the CAE program, where results are displayed and the check output is appended to the project documentation. A detailed review of SDF functionalities is given in [1].