# Introduction

The **CORBEL** software designs reinforced concrete corbels according to ACI 318-19 metric. It is a module of **STRES** structural design suite which offers complete solutions for buildings problems.

STRES-CORBEL has a very simple interface where data entry is a quick and clear process.

The principal features are:

- Design of corbels according to the latest international Codes.
- Graphical window to preview the geometry of the corbel.
- Generation of a design note format Microsoft Word.
- Generation of quality DXF drawings.

Main window
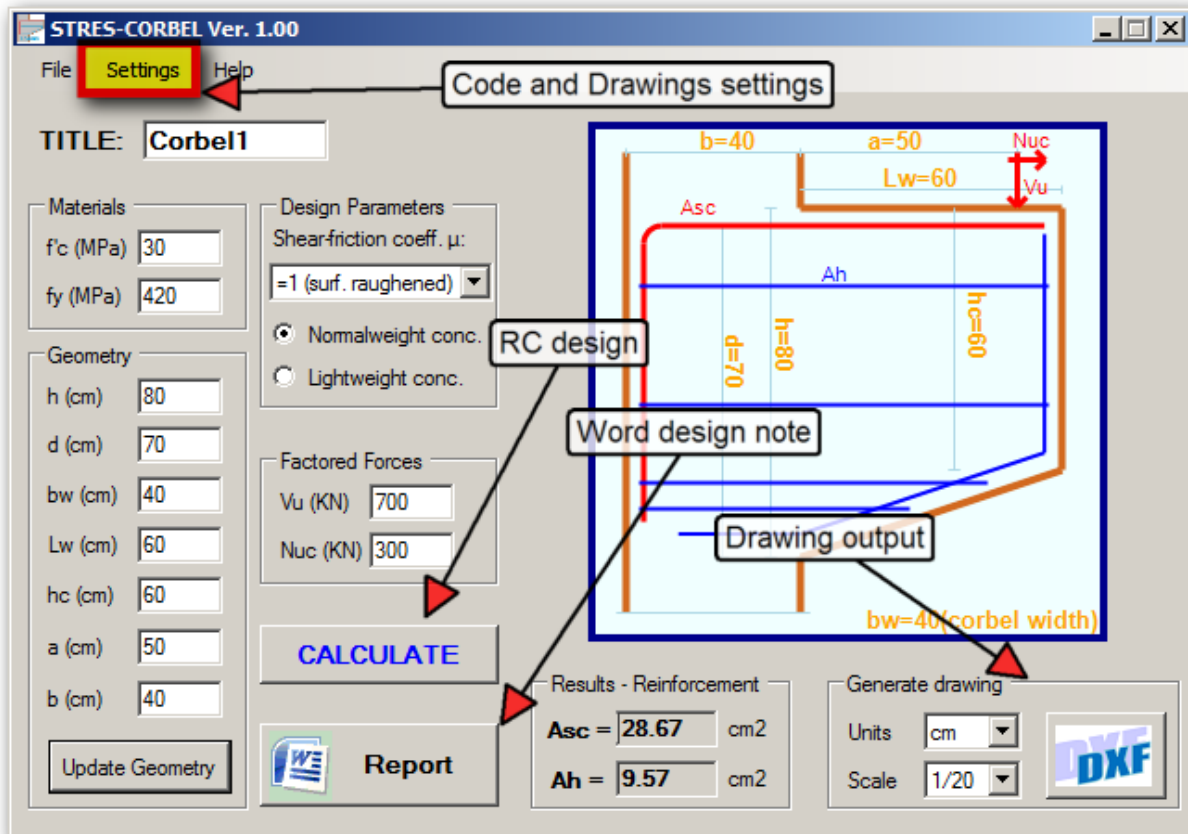
The interface of **STRES-CORBEL** is clear and efficient. All functions are directly accessible to the user.

- The "Update Geometry" button refreshes the graphic window. The width of the corbel "bw" is indicated at the bottom right of the graphic window.
- The "Calculate" button verifies the introduced dimensions in function of the applied forces and generates the reinforcement.
- The "Report" button generates a complete Word report which includes equations and Code references.
- The "DXF" button creates a design drawing compatible with AutoCAD. The drawing includes an elevation and a section both at scale with full annotations. Each component of the drawing (formwork, reinforcement, text….) is included in a separate layer. The layers feature allows the user once the drawing opened in the CAD software, to eventually change the font of the text or lines colors. This will help in customizing the drawing and integrating it within the user's main details.

The Settings menu
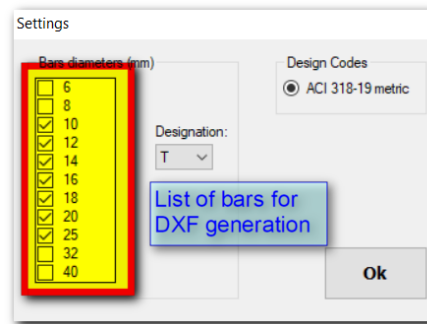
> ➢ Option to choose the design Code.
> ➢ Option to choose the diameters and designation of the bars regarding the **drawing** to be produced.

The settings menu allows customizing the diameters of bars to be used for drawing generation. Furthermore, this tool allows the user to control in an indirect way the number of bars **columns** and the number of bars layers as well.

Indeed, by preventing by example the software from using diameter 25mm, the remaining choices will be to use smaller diameters with additional layers, or to increase the number of bars columns within the width "bw" of the section. These two alternatives are studied by the steel optimization engine of the program in order to provide the most economical reinforcement disposition.

The steel optimization engine investigates several solutions by varying the following parameters:

- The diameters to be used as per the list above.
- The number of bars to be disposed within the width of the corbel without however transgressing the minimal clear distance between two bars allowed by the Code.
- The number of layers.

One should note that the above applies mainly for the main reinforcement "Asc". Regarding the horizontal reinforcement "Ah" the software imposes the three following conditions:

- o At least two rows of stirrups should be disposed within the height of the section, whatever the value of "Ah" is.
- o The spacing between two rows of stirrups cannot exceed 25cm.
- o According to the width "bw" of the section, more than one stirrup **per row** might be needed. For instance, if the width is 80cm, at least two stirrups are required.

These three conditions lead to a provided reinforcement section bigger than the required one. The reason is that besides the required reinforcement obtained by calculation, the provided reinforcement disposition is aimed to uniformly distribute cracks within the section and to minimize their width.