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## Cost comparison, BSF versus traditional solutions

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One of the first questions we meet when people are evaluating the use of the BSF technology is:

"What is the cost compared to traditional solutions?"

or "What are the savings compared to traditional corbels?"

This Memo is an attempt to summarise the experience from answers to such questions over a period of 8 years, with changing focus on different aspects from more than 10 different countries.

There are no exact answers to the questions, as the cost factors in any direct material cost comparison will vary from one country to the other, and even between various producers in the same country. The main reasons for this are:

- differences in material and labour costs
- differences in production methods, such as:
  - type of mould material (steel, plywood)
  - mould design
  - etc.
- differences in the most common construction methods, such as:
  - type of columns (many or few corbels, columns over one or several stories)
  - underlying corbels, or beams with dapped ends
  - column cross section (rectangular, circular, other shapes)
  - grid systems (corbels on one side or on several sides, beams at an angle)
  - the amount of repetition of similar elements
- degree of capacity utilization.
- to a certain extent the difference in cost of the BSF units.

During the years several detailed comparisons have been made, but they do all at the outset have to be based on a lot of assumptions for the items listed above - and other questions. Consequently different producers will get different results when they use their own cost data.

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Based on the type of comparisons mentioned on page 1, our experience of direct cost comparisons from various parts of the world is as follows:

Increased material cost:	+ 10 to + 60 %
Reduced repair work:	- 2 to - 20 %
Increased mould utilization:	- 5 to - 50 %
Cost reduction in design and planning:	- 5 to - 20 %
Cost reduction in storage, transport and erection	- 2 to - 15 %

As seen from this table, there is ample room for variations. Single cost comparisons can vary from a total cost increase of 30% to a cost reduction of 60% when changing from traditional corbels to the BSF system.

**Most cost comparisons seems to come up with total savings in the order of 10 to 30%.**

However, looking at the comparison question in a broader, and in our opinion more important perspective, we experience the most important economical advantages of using the BSF versus traditional corbels (as well as other corbel free solutions) as being the following three factors (in order of priority):

### 1. ARCHITECTURAL AND DESIGN ADVANTAGES

Some of the architectural advantages are:

- Simplicity and cleaner lines of vision.
- No height reduction due to underlying corbels.
- Column can be several stories high, even with forked ends of the beams.
- Easier to solve the problems connected to columns other than rectangular.
- It is easy to have the beam connection at an angle.

Some of the advantages to the structural engineer are:

- Standardising saves cost in the design and drafting.
- Standardising has quality assurance aspect, and hence there is a cost reduction.
- Small horizontal forces to worry about.
- Ease of fire protection.

The BSF concept gives increased freedom, first of all to the Architect, but also to the Structural designer and the Production planner. Proper communication with these important people during the process will mean economical advantages far beyond the cost of the corbels.

**For the precaster: One more job landed will economically override any direct cost comparison of corbel production cost.**

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### 2. PRODUCTION ADVANTAGES

As mentioned, the advantage will be different from one part of the world to another, due to the differences in production methods, but there will always be an advantage.

The advantage of simpler and more efficient formwork and casting of columns will increase with:

- the number of beam connections at the same level
- the number of column faces where a connection is required
- the number of column variants (on each job and totally)
- the complexity of the grid system, such as:
  - deviations from right angles
  - curved facades
  - variations in floor levels
  - inclined beams.

The flexibility in column production allows for the columns to be cast in erection sequence, rather than being dictaded by the location of the corbels.

Standardising creates repetition in the production, and hence less chanse of mistakes.

### 3. SIMPLICITY AT THE SITE

The economic advantage of the BSF system will increase with increasing demand for simplicity at the site:

- No corbels that can be damaged, and thus create costly and time-consuming repairs.
- Fast erection.
- Easy intermediate storage.
- Little finishing work at the site.
- Accurate erection.

### THE RVK UNIT

Finally some comments about the economic advantages of the RVK unit:

- Precast stairs can be erected at any time during the construction period, independent of other activities.
- Surveys from various parts of the world shows that stairways accounts for unexpected large parts of the construction cost (10 to 20 %). Use of the RVK enables work schedules and solutions that greatly reduces these costs.
- There is no simpler or more economical way to reduce the transfer of impact sound.
- The lifting device and connection detail is the same piece.