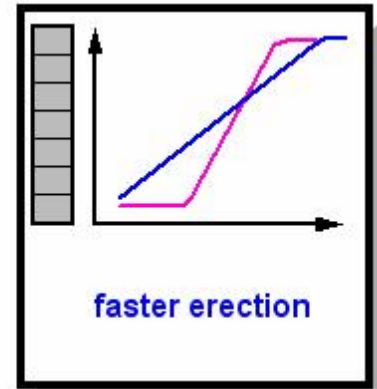


# Why precast concrete ?

Precast concrete shares all the good qualities of in-situ concrete including:

- the ability to be formed to any shape
- inherent durability
- inherent fire resistance

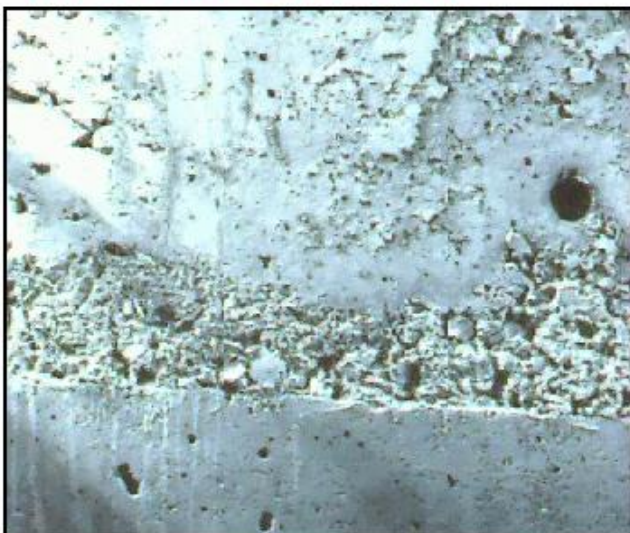
Because precast concrete can be cast at ground level in factory conditions, it has these added features:



## Better finishes

Better finishes can be obtained with precast concrete because the inside surface of the mould is kept in good condition.

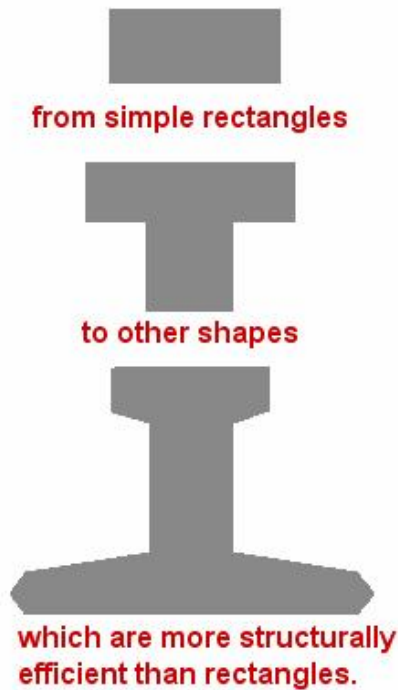
There is no grout loss, such as that from badly fitting formwork, which results in poor quality concrete like this:



By careful selection of materials and finishing processes, a wide range of high quality finishes can be obtained.

# Any shape

Concrete can be placed as a fluid, so it can take any shape:

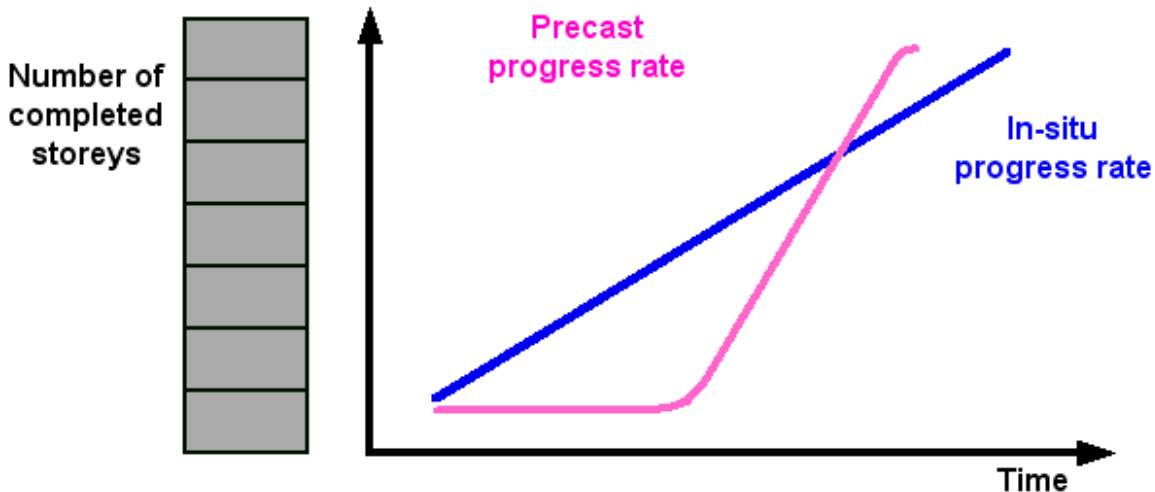


Long span bridge deck

For example -

- long span bridge decks, which are large and complicated to design.

# Faster erection

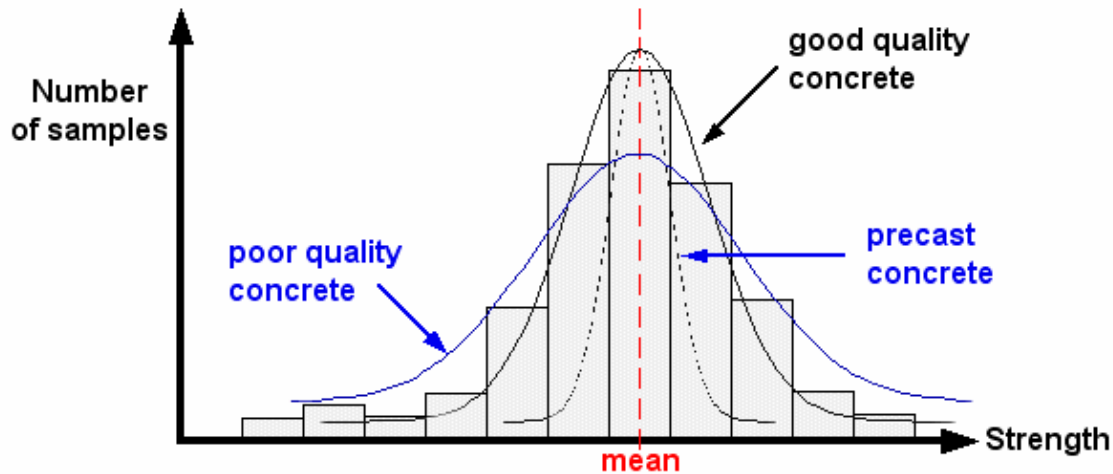


Components are erected straight from the delivery lorry. This leads to faster erection, where the difference between in-situ and precast construction is as follows:

For **precast concrete** there are large amounts of off-site prefabrication giving longer lead times before site construction begins.

However, once site construction begins, the progress is extremely rapid.

# Quality control



A histogram plot of the compressive strength test results would look like:

With precast concrete, the margin is usually about  $2 \text{ N/mm}^2$  or 5% of the mean.

This can be shown as a normal distribution curve.

If the quality control is poor, the margin increases.

If the quality control improves, the margin decreases.

The customer gets -

- a more consistent product
- a more economical product
- more reliability and confidence

## Added feature

No space is needed on site for storing moulds and reinforcement

Precast components are made in a factory and delivered to site where they are lifted straight off the lorry onto the building.

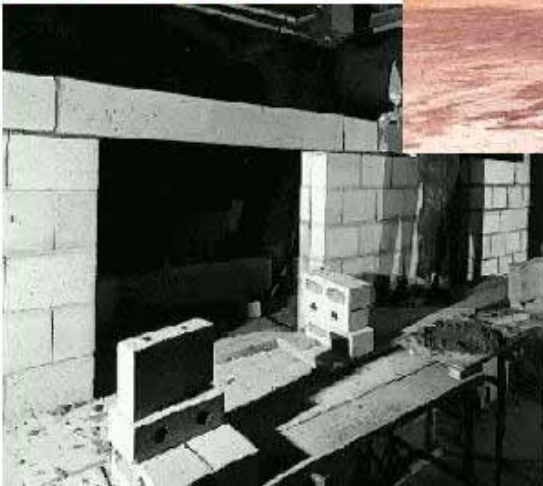


# Wide variety of applications

...from small, simple building products, such as lintels or purlins, weighing several kilograms.....



... to medium size civil engineering products such as retaining walls ...



... and large products, weighing several tonnes, such as drainage culverts.



## Design complexity and size

Complex design



Simple design

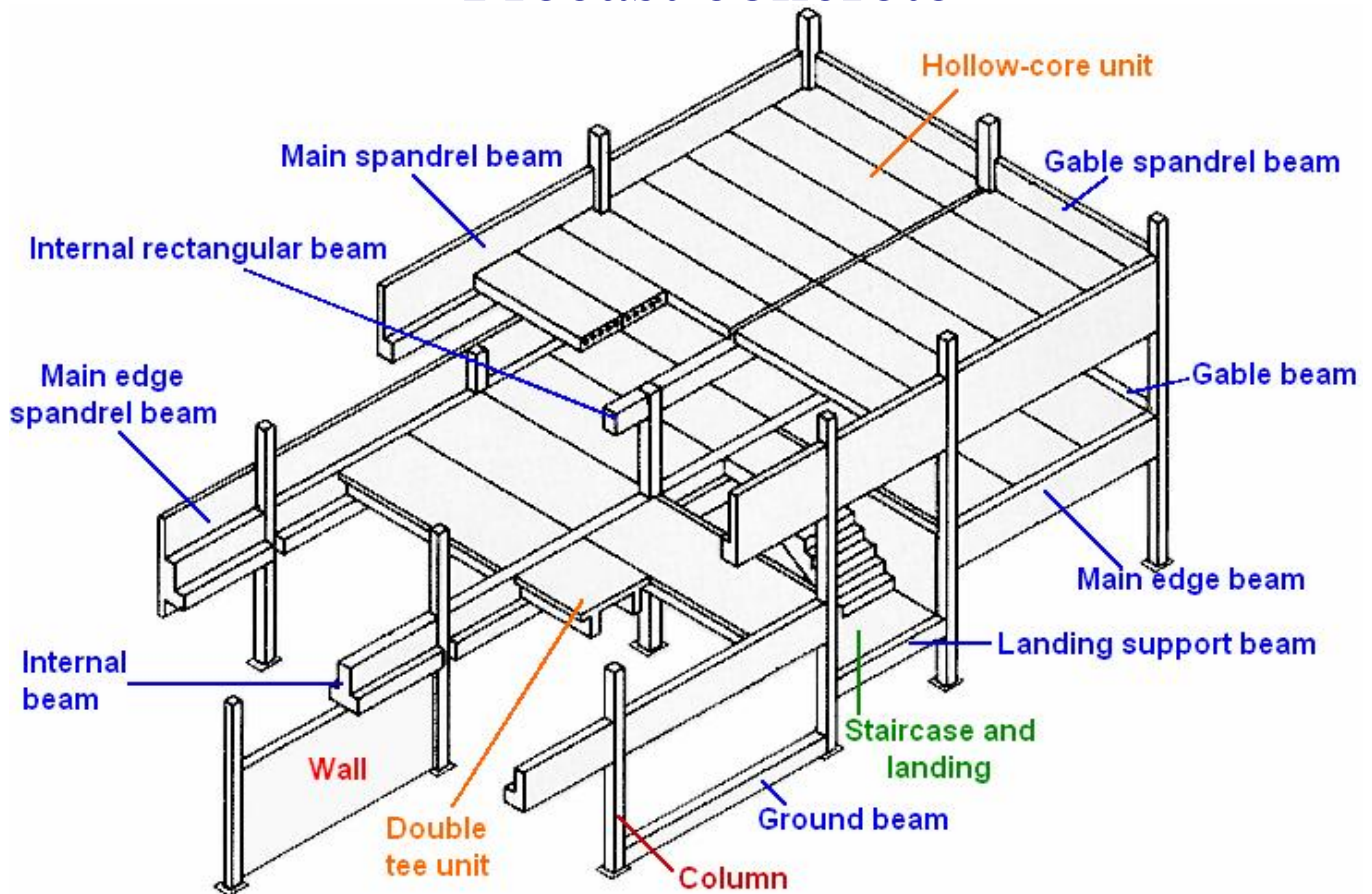


small

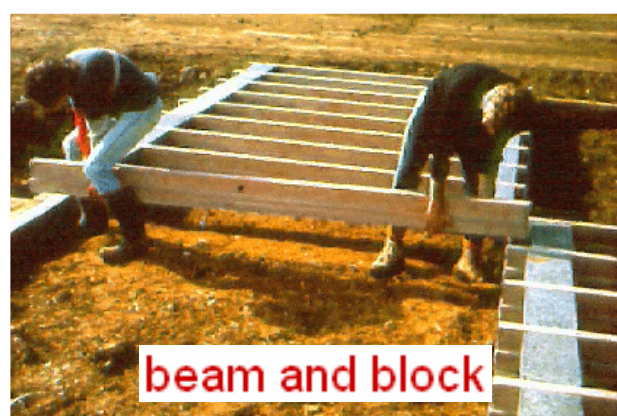
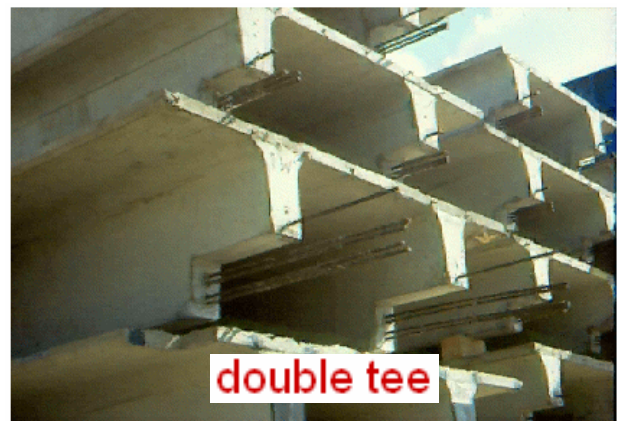
medium

large

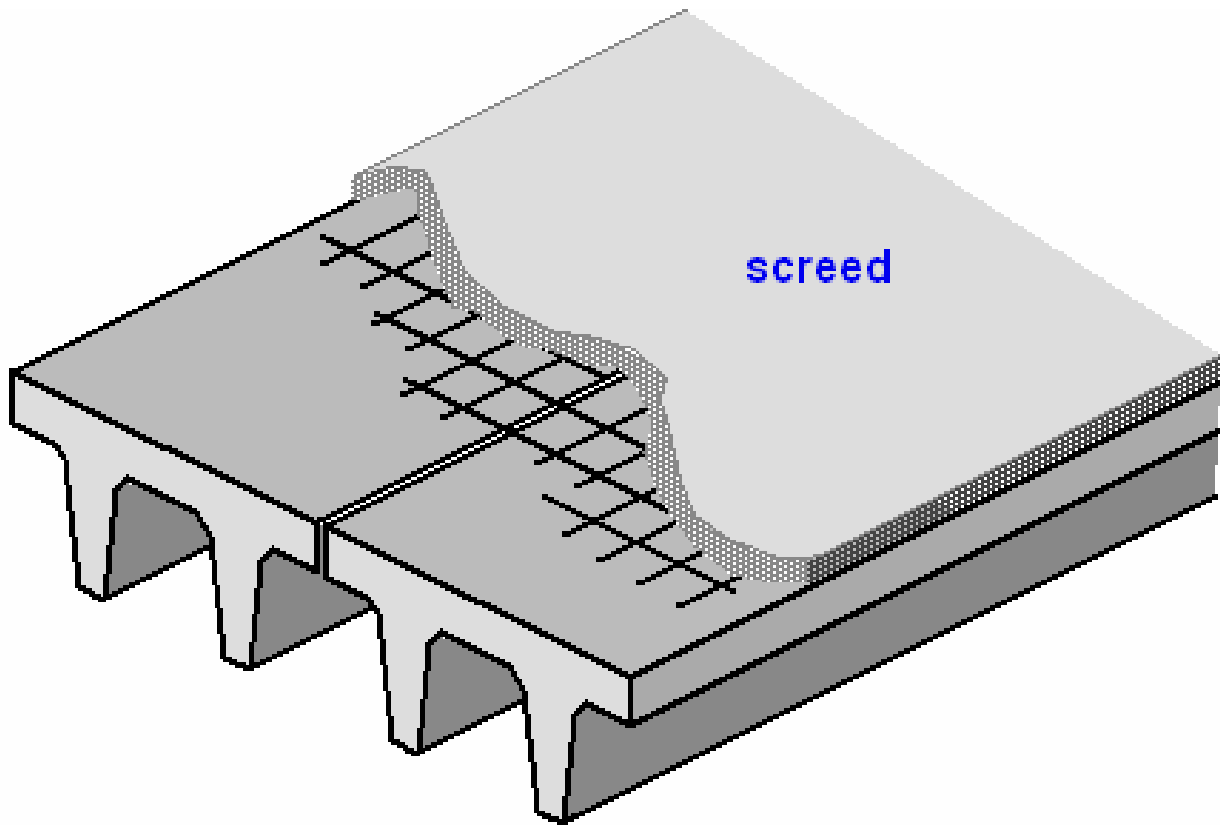
# Precast concrete



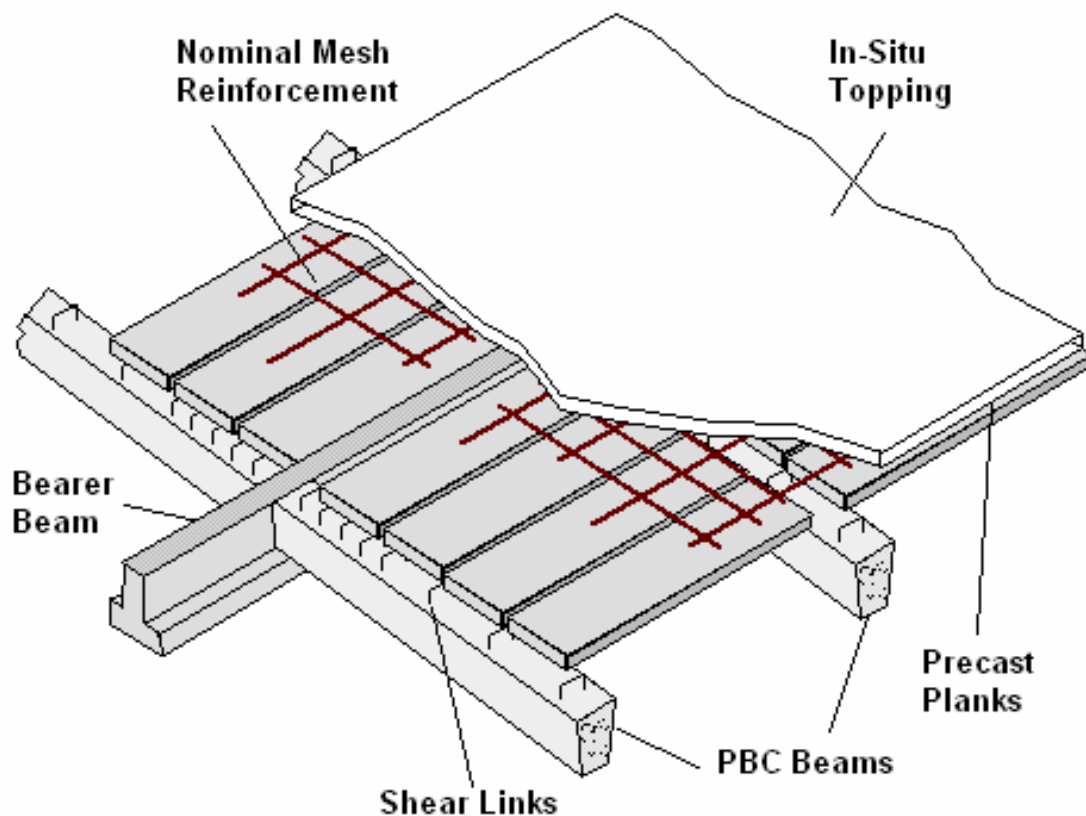
## Roof and floor slabs



## Double tee slab

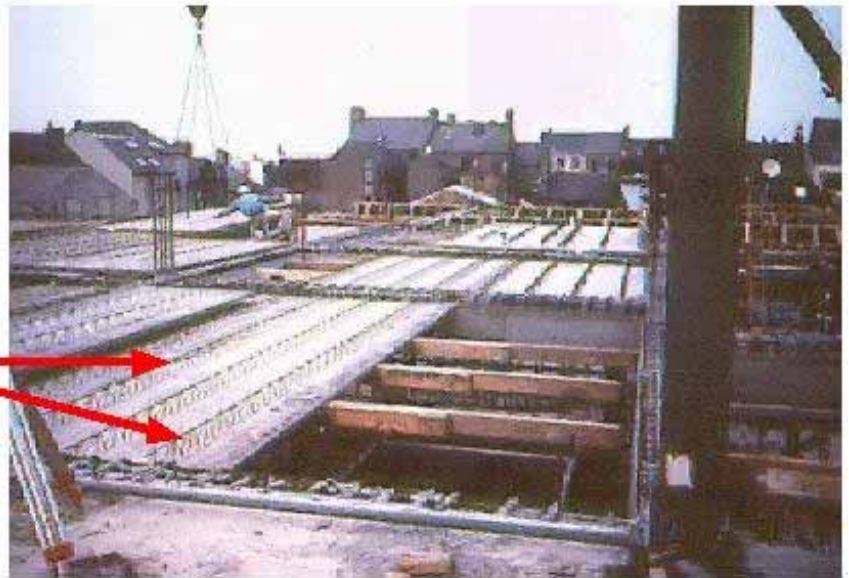


## Precast beam and plank flooring



# Precast beams and plank flooring

The triangulated lattice girders



The lattices provide four important functions:-

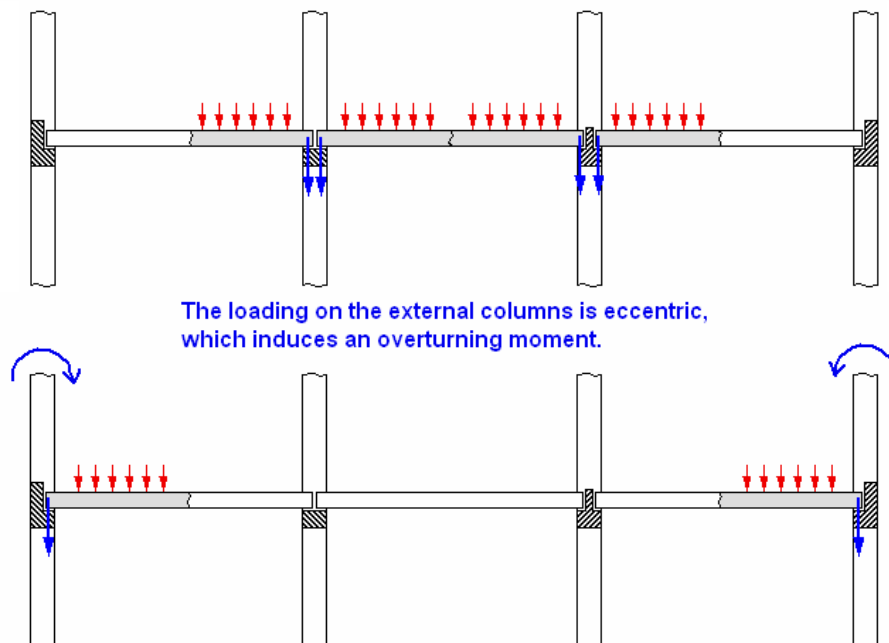
- ensures mechanical bond between the precast and in-situ concrete,
- provides the precast plank with vertical stiffness in the temporary condition,
- the lower bars provide the flexural reinforcement,
- the lattice makes a convenient lifting point.

## Beams

Beams may be classified either as :-

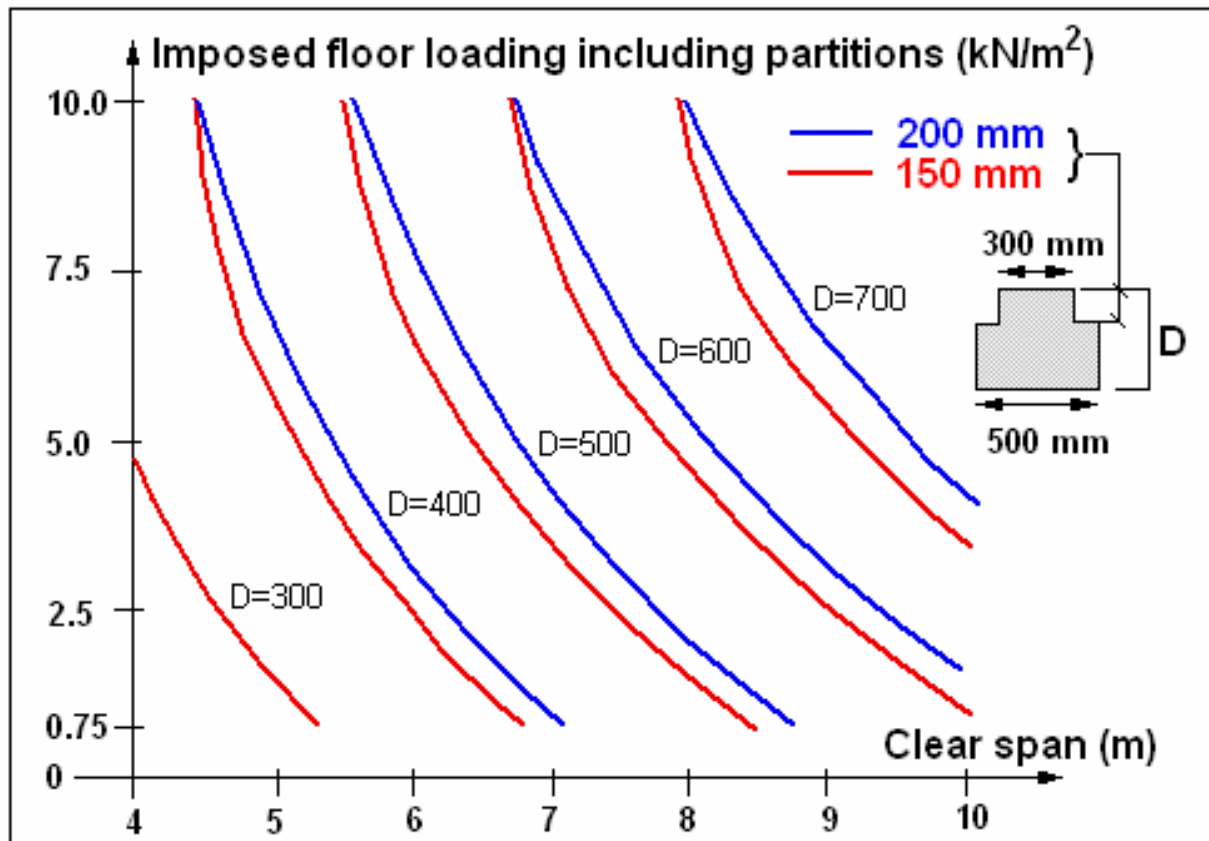
'internal', where floor loading is approximately symmetrical

'external', where floor loading is predominantly non-symmetrical

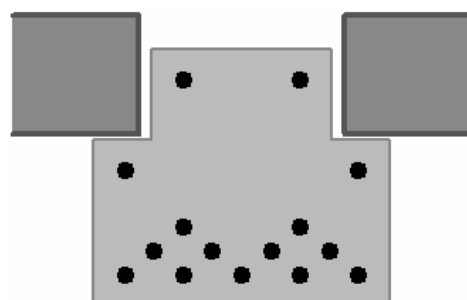


The loading on the external columns is eccentric, which induces an overturning moment.

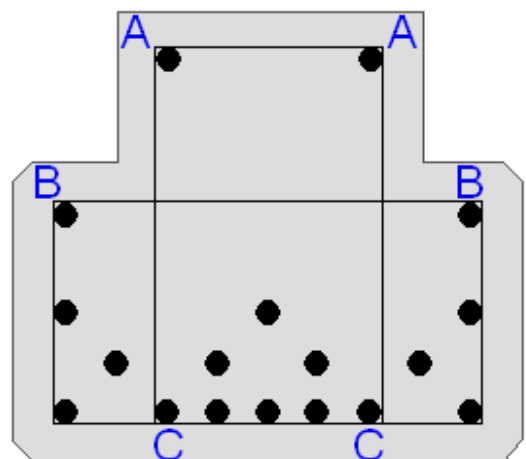
# Design chart



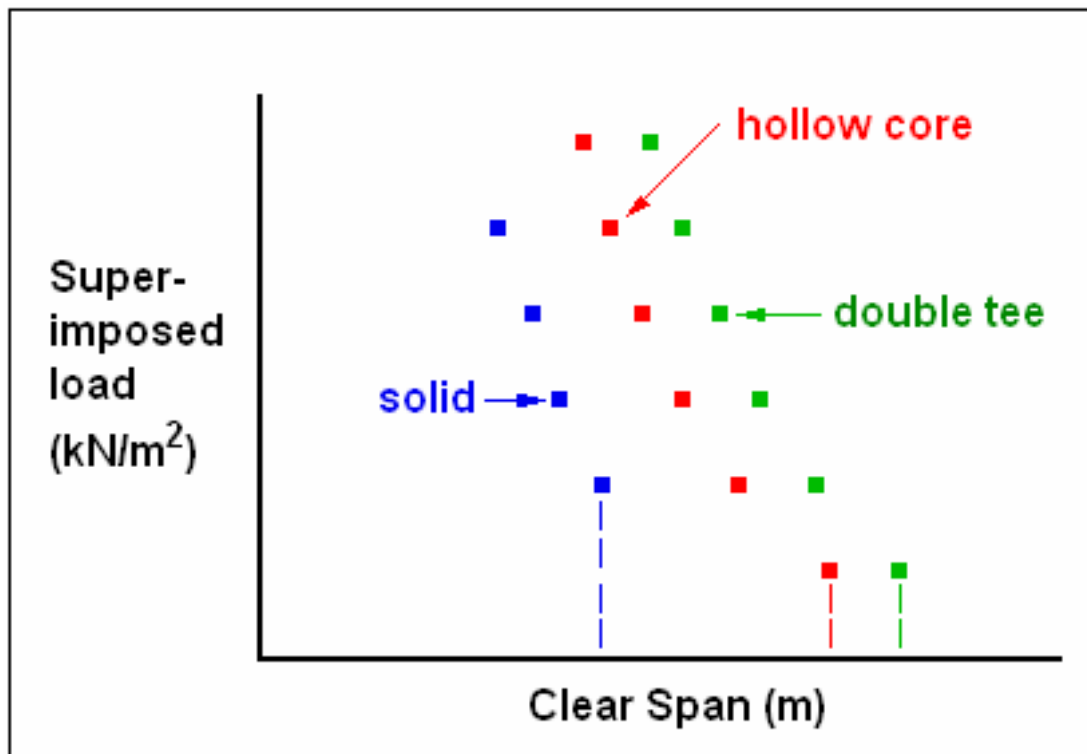
## Prestressed beam



- 2 strands at A to prevent the top splitting;
- 2 strands at B to protect the corner bearing point;
- 2 strands at C to carry the links;
- and the remainder to achieve the desired eccentricity of prestress.

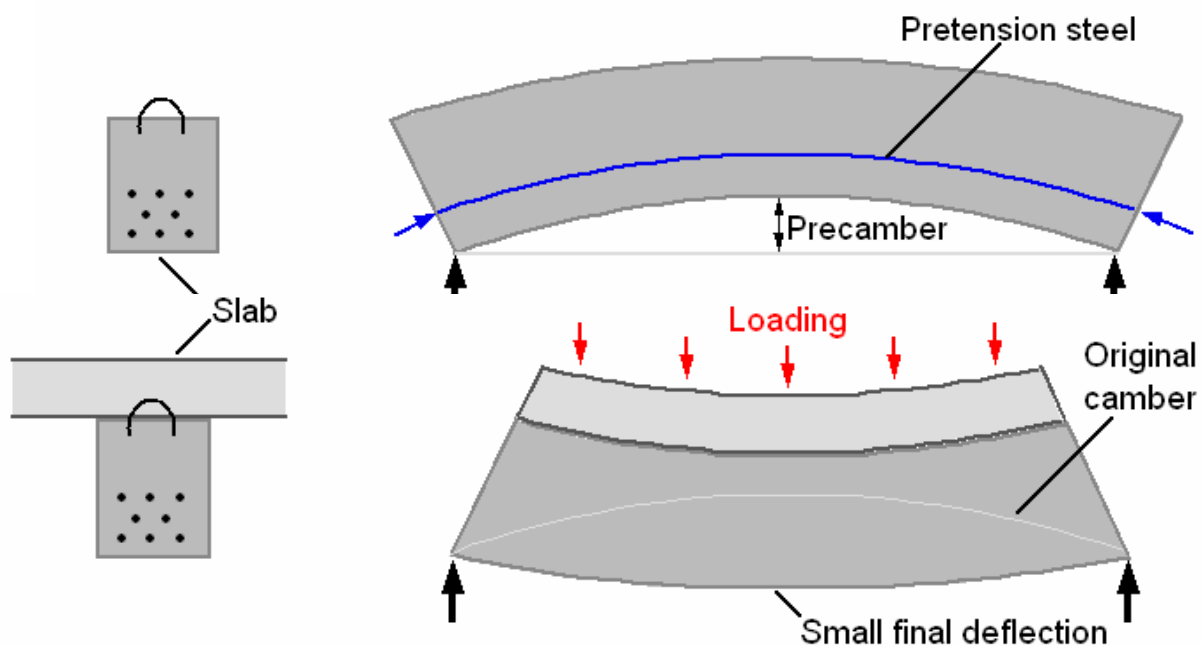


# Load - span



## Precast beam

- the beam may be pretensioned at the factory;
- the beam may act compositely with the floor slab;
- upward precamber (due to prestress) offsets imposed deflections.

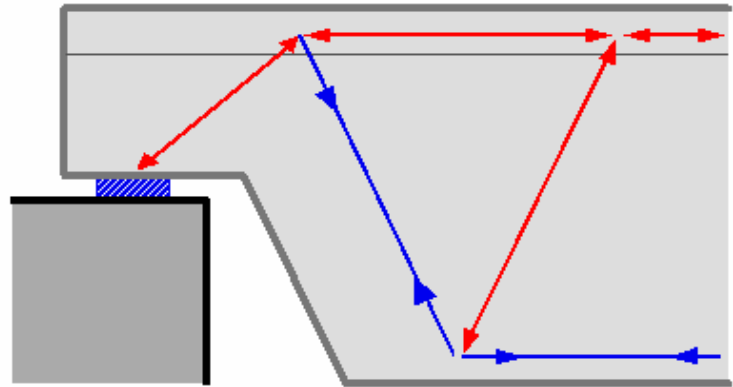


# Truss analogy

A truss analysis is used:-

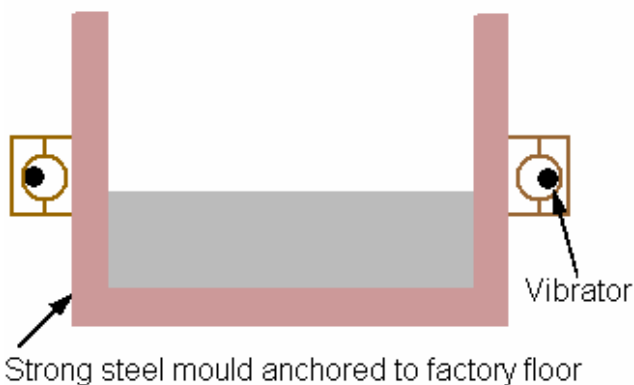
Tension provided by bars

Compression by confined concrete

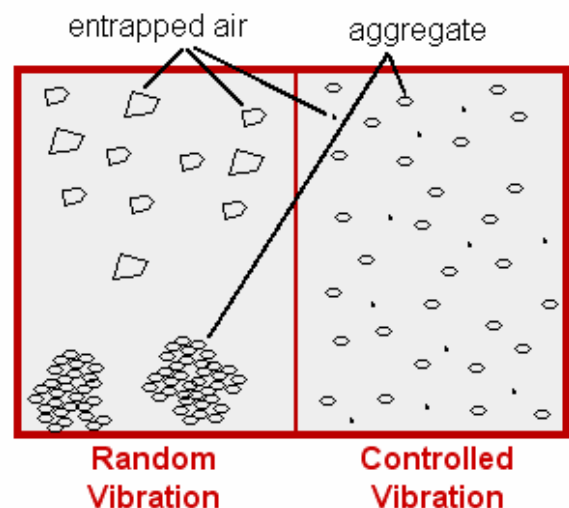


# Durability

Concrete is inherently durable, providing it is produced from a correctly specified mix appropriate for its location and is fully compacted - which is achieved by controlled compaction.



Controlled Vibration

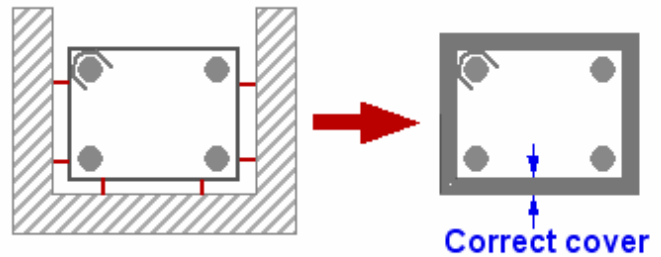


Random vibration results in variable compaction, can lead to segregation of the aggregate, entrapment of unwanted air, reduced durability and loss of strength. Controlled vibration ensures uniform compaction and assists in maximising strength and durability.

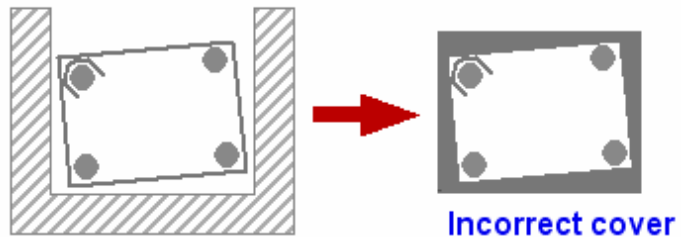
# Fire resistance

Concrete is inherently fire resistant as concrete acts as an insulator, protecting the steel connections and reinforcement from excessive heat.

By precasting, the reinforcement can be accurately positioned in the mould to give the correct cover protection, thereby ensuring durability and maintaining its fire performance.



Without control, the steel may lack adequate cover, reducing durability and lowering protection in the event of fire.



## Columns

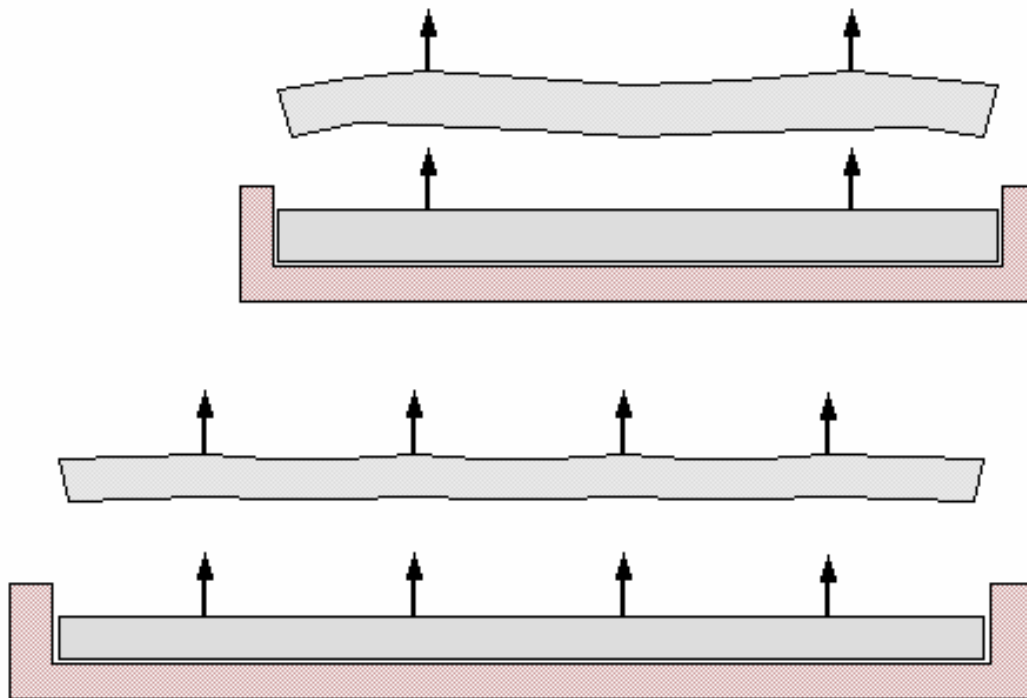
High quality visual concrete in columns has only recently been fully exploited.

Although the increase in cost in using visual concrete compared with plain concrete is between 50% and 200%, depending on the complexity of the finish, a net saving is often made.



# Lifting the column

When lifting the column from its mould and when pitching the column to the vertical on site, the column behaves like a very long, thin "beam".



## Why precast ?

- The good qualities of concrete.
- The added advantages of precast concrete, such as quality control.
- The wide range of uses of precast concrete, from small, structurally simple components such as lintels, to large, complex structures such as bridges.
- An introduction to the structural uses of precast concrete construction such as flooring, frames and cladding.