



## Create Space For An Extra Intermediate Floor By Jacking

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### Abstract

An intermediate floor has been added to an existing 10 storied office reinforced concrete building in a busy city centre by jacking up the last two top floors by 3.6m. This solution was proposed as an alternative to the demolition of the roof and the building bottom up of the new floors which has allowed to significantly reduce the environmental impact of the project. Perimetral restraints have been installed to guide the structure during jacking and provide stability against wind loads. Jacking has been carried out with primary jacks installed in the axis of all building columns and secondary jacks installed on steel clamps working in friction and prestressed against the columns. Relative vertical movements between the columns have been controlled by a combined use of a synchro-pump and a laser-based monitoring system following the progress of the lifting.

**Keywords:** additional floor, jacking, environmental impact, clamps, friction, laser monitoring system.

### 1 Introduction

An intermediate floor has been added to an existing 10 storied office reinforced concrete building in a busy city centre by jacking up the last two top floors by 3.6m.

This solution was proposed by Freyssinet as an alternative to the demolition of the roof and the building bottom up of the new floors which has allowed to significantly reduce the environmental impact of the project.

As preliminary operations, the last two floors (n.9-10) have been laterally restrained by six radial restraints anchored on floor n.8 and then disconnected from the lift shafts. Two radial restraints anchored to the lift shafts have been then added along the disconnected edge.

Jacking has been carried out with primary jacks installed in the axis of all building columns. Steel

clamps working in friction and prestressed against the column by PT bars have been installed below and above the column portion to be cut and removed for allowing the installation of the primary jack. Secondary jacks have been installed between the two levels of clamps for unloading the column before cutting.

The lifting has been carried out by a sequence of jack extensions and contractions intercalated with steel support insertions and bracing installation. Relative vertical movements between the columns had to be maintained below the limit of 2mm and this was achieved by a combined use of a synchro-pump and a laser-based monitoring system following the progress of the lifting.

During the vertical movement, a system of radial jacks sliding against the lateral restraints ensured that all restraints remained engaged (even in storm condition) to maximise the horizontal stiffness of the restraint system.