BUILT FOR SPEED

Time is money on a construction project. Concrete can speed up the process in a number of ways, says Elaine Toogood, from design to practical completion

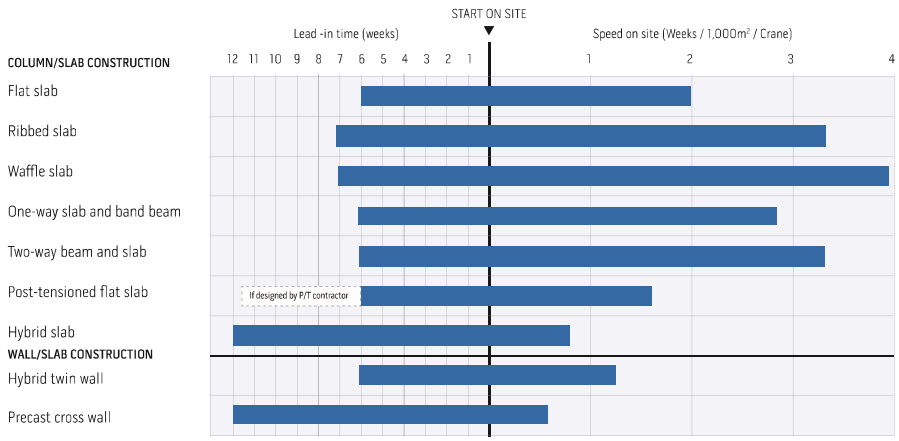
Concrete is highly compatible with fast construction, from rapid mobilisation with readily available materials on demand, through to modern methods of construction, including sophisticated formwork systems, post-tensioning and precast elements. Fast programmes can be associated with reduced costs for site preliminaries, less disruption to neighbours and potentially earlier occupation or practical completion. Speed of construction is not, however, always an overriding necessity for every project or even every element of construction. Managing the pace of a build can be driven by cash flow, for example. For large housing developments, bringing the product to market at the right moment may be more critical. In this instance, the local and ready availability of concrete and masonry products is an advantage, with short order times possible to enable a client to respond to sudden changes in programme.

Generally, buildings with in-situ concrete frames take no longer to construct than steel-framed buildings. Indeed, they can be faster, as shown by cost and programme studies carried out by Davis Langdon to compare structural frame options for different building types. For example, flat slab concrete construction for a commercial building gave an eight-week saving in lead time during which the site would have been established and 75% of the substructure could be constructed.

Of course, the speed of construction is also influenced by the pace of the decision-making process – factors such as agreeing the detailed design or the room layout for services – combined with the procurement route and type of contract. For example, construction management and design-and-build approaches lend themselves to concrete construction, because the ability to accommodate late information and variations is particularly beneficial and the work package can be let before the design of following packages has been finalised.

It can be more important to consider the whole project programme rather than just the speed of one element. There is little benefit in putting up a frame very quickly if the walls and roof can't keep pace, and this situation may even be detrimental for some structural materials, vulnerable to damage if left exposed or subjected to extended periods in changing weather conditions. Such exposure is typically not a problem for concrete.

FIGURE 1: LEAD-IN TIMES AND SPEED OF CONSTRUCTION FOR VARIOUS CONCRETE-FRAME SOLUTIONS



Source: Concrete Framed Buildings, published by The Concrete Centre (2016), based on studies commissioned from Davis Langdon

STANDARDISED FORMWORK SYSTEMS ARE SIMPLE AND QUICK TO ERECT AND MOVE. IT IS NOW STANDARD TO ACHIEVE 500M^2 PER WEEK PER CRANE

With its inherent robustness and resilience to all types of weather it is a natural contender for early installation on site, to provide a safe working environment and protected conditions, allowing services installation and follow-on trades to commence early in the programme. The potentially self-finished, fire-proof nature of concrete also reduces or even eliminates the need for some follow-on trades and minimises fire risks during the construction phase.

Concrete construction has undergone a revolution in speed and efficiency in recent years. Prerequisites for fast construction in any material are design discipline, repetition, integration, simplification and standardisation of design details, and this also applies to concrete. Forming the concrete into shape could potentially be the most costly and labour-intensive part of the process. However, modern high-efficiency modular formwork standardises and mechanises this process, both on and off site. Ready-mixed concrete is usually available for next-day delivery and on site standardised formwork systems are simple and quick to erect and move. It is now standard to achieve 500m^2 per week per crane. Rationalising reinforcement, or prefabricating it, also helps.

Precast concrete can offer further programme savings, depending on the type of system used. Pre-made standardised products such as blockwork or paving are readily available; bespoke structural systems require a longer lead time but can be quickly assembled on site straight from the delivery vehicle.

▶ Motel One

Manchester, Hodder + Partners, 2015

This 330-bed hotel faces Manchester Piccadilly station, and is just outside the Whitworth Street conservation area. The site wraps around a corner pub and sits opposite a grade II-listed fire station. Mindful of the need to reconcile the scale differences between the surrounding buildings, the architect chose to use clean forms and a repetitive facade, with a restrained palette of honed concrete and bronze anodised aluminium. The contractor was Russells Construction, which used a crosswall system and architectural precast cladding supplied by FP McCann. The build programme for the entire structure and cladding was originally 35 weeks, but was completed in just 22.