



**Intelligent Engineering's Sandwich Plate System (SPS®) is a structural composite material used for floors, walls and cores that is up to 75% lighter than reinforced concrete. A high-precision engineering component manufactured offsite, makes it easy and quick to install.**

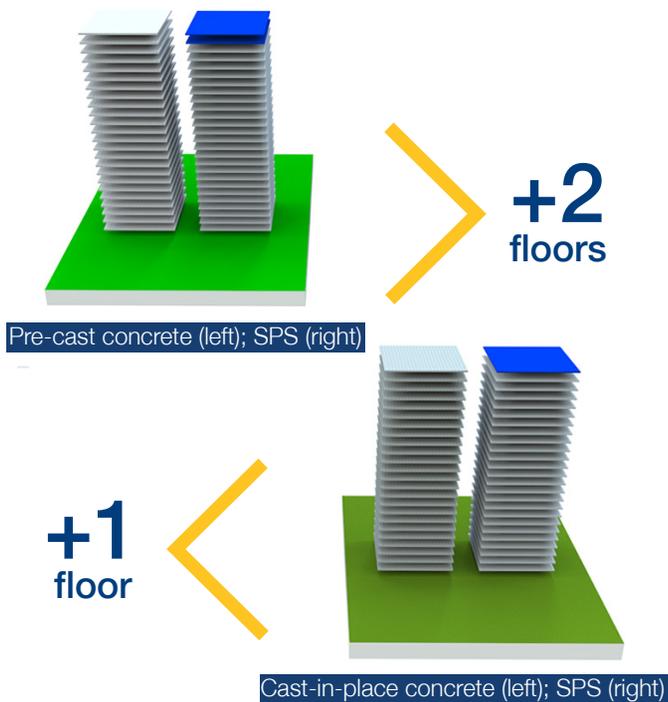
SPS comprises two metal plates bonded with a polyurethane elastomer core. It delivers a high strength to weight ratio making it an excellent alternative to both cast-in-place or pre-cast reinforced concrete. Panels, typically 27/33mm thick, are installed using standard steel working practices.

The design of SPS is simple. SPS panels are isotropic and naturally stiff in all directions. Standard design procedures are used to tailor the geometry and performance of SPS to each particular building.

The use of SPS results in lighter buildings which are simple and safer to construct and are built to more predicable schedules as installation is not weather dependent.

# Building applications

## Tall buildings



Designs for tall buildings are often constrained by building weight and planning heights. SPS addresses both of these issues by substantially reducing the floor weight and floor thickness, allowing an extra storey every 12 floors when compared to pre-cast concrete and an extra storey every 24 floors when compared to cast-in-place concrete. Using SPS allows a 60 storey building to be completed at least 25 weeks ahead of concrete.

## Low rise buildings



SPS enables contractors to rethink build sequences; to compress and accelerate even small build programmes. Modular SPS components can avoid the delays associated with building up complete floor by complete floor. With SPS, each bay can be built from the ground floor to the roof before proceeding to the next bay.

## Elevator/stairwell cores

SPS plates provide shear capacity for shear cores/walls and eliminate the need for concrete core extension in vertical expansion projects. Delivered to site in single storey modules, these core sections have integrated openings, frame and floor connection details, stairs and landings, which allow immediate access.

## Car parks

SPS can be used to create lightweight, factory-finished, modular car parks. All of the following features contribute to a fast installation: the underside of the SPS panel is corrosion protected and the topside is delivered to site with non-slip coatings and guide markings as required; the joints are sealed to ensure a watertight deck and the detailing for edge barriers and other fittings are undertaken in the factory.

## Crash decks



SPS plates and custom supporting frame are installed over a new or existing substructure. With welded or bolted connections the system is designed to absorb energy from dropped objects through plastic deformation of the plate and frame. These are custom designed to meet the requirements for each project and provide a useable working platform with immediate 100% load capacity.

## Auditoriums

Considerable weight savings (75%) over concrete make SPS an ideal material from which to make terraces for indoor venues. Fewer columns and supporting beams are required and installation is easier and quicker than the concrete alternative.

## Concourses & walkway bridges



Large, open, suspended floor areas and walkway bridges benefit from the weight savings, fast installation and easier logistics of SPS. SPS panels permit longer spans with shallower and lighter beams. They are installed quickly and provide immediate 100% design load capacity.

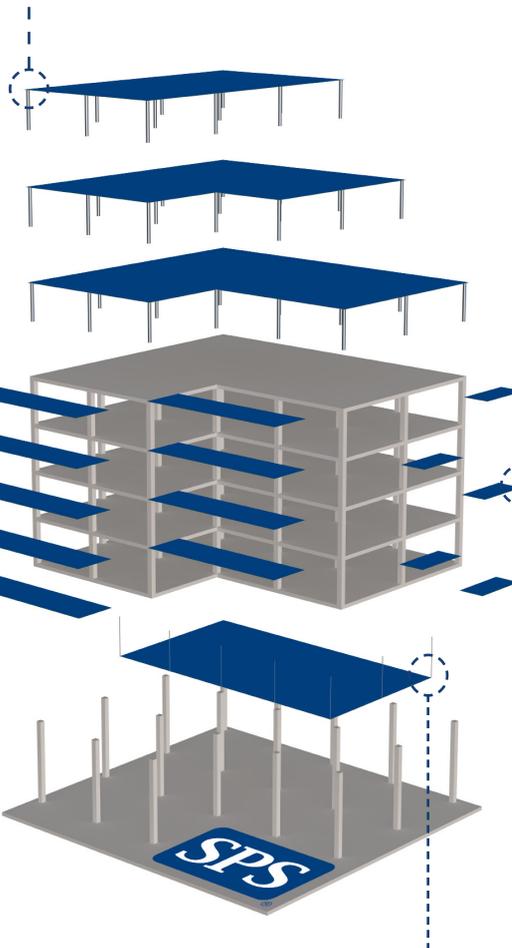
## SPS building expansion

SPS is being used to increase the commercial value of existing and new buildings by adding additional floors, extending floor slabs by up to two metres, or adding balconies, terraces and mezzanines without the need to strengthen or modify the existing structural frame or foundations.



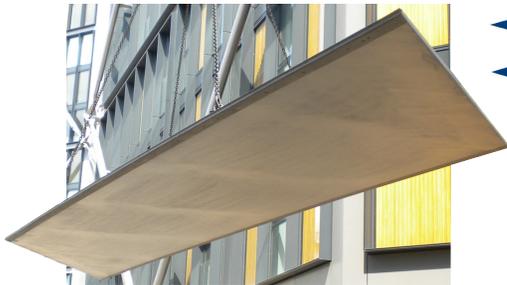
### Extra upper floors

An SPS floor deck is less than a quarter of the weight of a traditional concrete floor. This means that up to three SPS floors can be created within the same weight load of a single concrete floor. The reduced dead weight of the SPS system allows more floor area to be built than traditional systems, without having to strengthen existing structural frames or foundations.



### Slab extension

SPS panels can be used to extend main building slabs by up to two metres in any direction. This means that floors can be extended to create new lettable space and allow building owners to maximise their building footprint while fulfilling all planning requirements.



### Balconies & terraces

SPS panels can be used to create balconies or terraces up to two metres deep, which can help enhance the value of old or tired office space or enable existing office buildings to be converted into residential accommodation. In most cases, this can be achieved without amending the existing slabs, frame or foundations.

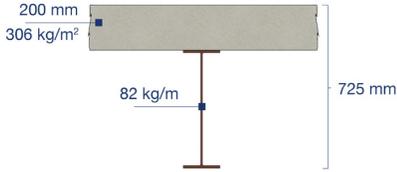
### Mezzanines

SPS panels can be used to create mezzanine areas within larger floor-to-ceiling areas, overcoming weight or marginal height restrictions of heavier and more traditional construction materials. SPS has been used successfully on both residential and commercial mezzanine solutions, particularly in refurbishment projects.

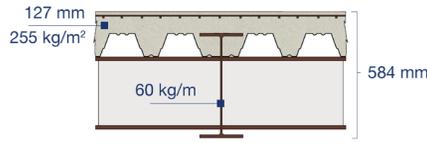


# Benefits

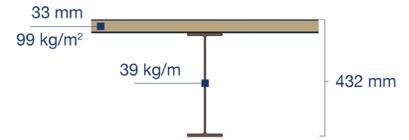
## Pre-cast concrete



## Cast-in-place concrete



## Sandwich Plate System (SPS)



## The economics

SPS reduces costs, shortens schedules, limits risk and increases revenue.

The extra floors achieved through the use of SPS increases the value of structures. Less materials are used as SPS is lighter than concrete and the supporting structure and cladding are also reduced. As panels are manufactured to size waste is eliminated and transportation and storage costs are a quarter of the cost of traditional materials. A shorter, more predictable timetable is achievable which reduces programme costs and related contingencies. An accelerated build and earlier opening means a more rapid return on investment.

## Reduced transport

Over 230m<sup>2</sup> of SPS floor panels can be delivered to site per truck. This is two and a half times more than pre-cast concrete slabs. Cast-in-place concrete would require four truck loads to achieve the same area. Fewer deliveries, simplifies logistics, congestion and improves health and safety.

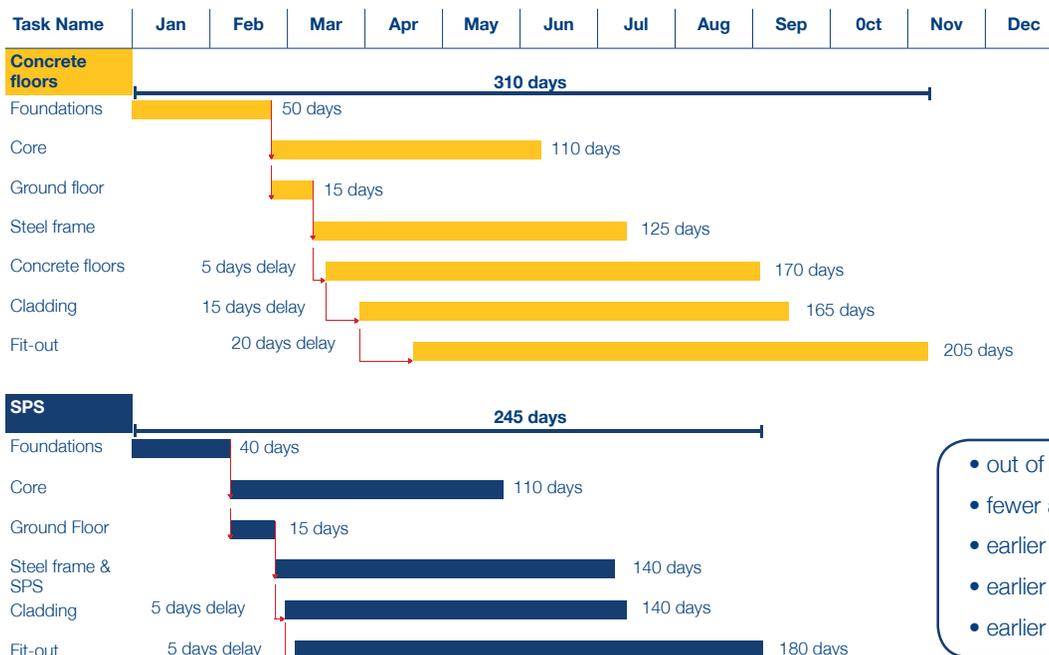
## Weight savings

SPS is a quarter of the weight of its concrete equivalent and up to three additional floors can be installed for every additional concrete floor. No extra foundations or column strengthening is required. SPS is a highly valuable solution where weight and height restrictions exist.

## Shorter construction schedules

SPS eliminates the need for wet and associated trades. With SPS concrete casting schedules become irrelevant. Installation is simple and quick to fit and fasten to the supporting structure with fewer lifts. Panels can be preassembled with their secondary beams, and once installed, the SPS panels provide an immediate working platform. SPS allows contractors to build bay by bay allowing more parallel working.

## Comparative build schedules - 20 storey - 50,000sqm



- out of ground earlier
- fewer actions
- earlier structural completions
- earlier weather-tight structure
- earlier finish



# Performance

**SPS meets all the performance requirements for use in modern, high quality buildings, concourses and car parks.**



## Design

SPS panels are isotropic and naturally stiff in all directions. Once panels are attached to primary and secondary beams they form a rigid horizontal diaphragm that transfers external lateral load to the resisting system. Composite action is achieved by bolting SPS panels to the flanges of the supporting frame. They are designed to withstand local beam or column failure and perform well in areas prone to seismic activity.

## Health and safety

SPS components require fewer workers for movement and handling. The prefabricated SPS panels, with all attachments and openings, reduce operations at ground level and at height.

SPS can take full structural loads and immediately acts as a working platform, material storage and/or a protective crash-deck. Site activity reduced through the offsite manufacturing process.

## Dynamics & acoustics

SPS solutions cover a range of dynamic performance based on the final occupancy category specified by the main consultants.

SPS offers the code required sound insulation when combined with typical floor and ceiling fit outs.



## Fire protection

Using factory or site applied standard fire protection (intumescent, cementitious or board) a fire resistance of 120+ minutes can be achieved for structural stability, integrity and insulation respectively. Where fire ratings of less than two hours are required, the thickness of the structural fire protection is adjusted to suit.

## Approval

SPS has obtained project specific approvals for projects throughout the US. It has been tested for approval to BRE Global's product standard for structural floors which included performance assessment for statics, dynamics, acoustics and fire to international standards, as well as quality control within the SPS supply chain. SPS is approved to US, European and Chinese fire standards.

## Blast & ballistics

Tested by major defence institutes, SPS panels are proven to absorb more blast energy through membrane action than equivalent all-steel structures, resisting rupture and maintaining structural integrity.

With regard to ballistic resistance, SPS resists projectiles at shorter strike ranges and higher angles of attack. It has been proven to be 70%+ more efficient than stiffened steel. It can also withstand extreme loads and absorb impact energy very efficiently.

For more information:  
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# Case studies

## 58 Victoria Embankment, London, UK



The use of SPS at 58 Victoria Embankment shows diversification in usage as it moves into the multi- storey building market. SPS panels were used on four of the seven floors, including the roof.

SPS overcame restricted head height issues faced when reconfiguring the interior floor layout, which could not be resolved using conventional materials.

SPS was fabricated in non-standard shapes to meet the building's requirements.



It allowed long spans. Its weight reduced the number of columns and beams required which increased building layout flexibility.



Intumescent paint was applied to the panels underside to achieve the required fire rating. Service runs were installed under the floors which was quick and easy to do.



## Metropolitan Police Custody Centres, Greater London, UK



The first modular custody centres were built in Croydon for the Metropolitan Police. The flat panel system, delivered by truck, was quickly aligned and installed with the cell roofs forming a load bearing floor for the plant above.

SPS custody centres were built in Brixton, Kingston, Wood Green and Walworth. For these projects, a modular SPS cell system of completed cells was developed. The lightweight cells were craned into position. Connection, penetrations and coatings were all completed during fabrication. Time on-site was dramatically reduced, waste minimised to zero and worker safety increased.

## Studio City, Macau, China



For China's first cinematically themed resort, SPS terrace units were used in the 3,000 seat main arena and a number of boutique small occupancy theatre units. The system's weight meant that it could be installed after the building had been completed, something that is not possible with other alternatives. SPS was able to overcome tight access issues and achieve the required performance and aesthetics criteria.



## Innovation Centre for Engineering, University of Alberta, Canada



SPS was used for a mezzanine floor at the University of Alberta's new Innovation Centre for Engineering. The mezzanine served as a showcase for SPS allowing the University to see other opportunities on infill sites on the campus over the next 10 years.

Key to this trials success was the speed of installation, panel flatness, integrated details and no wet-work. It was a clean, simple, proven and fast solution.

"SPS panels provided many advantages on this project. Installation was easy and took a fraction of the time required for concrete. They eliminated winter heating requirements, risk of freezing damage to finished surfaces and waste materials. Thinner panels gave more headroom (40mm vs. 150mm for concrete). I would highly recommend SPS and Intelligent Engineering."

Robert S Holmes, Senior Superintendent, University of Alberta ICE Project, EllisDon,

## Carnegie Hall, New York, USA



SPS floor panels were used in the renovation project of one of the world's greatest concert halls. Architects iu + bibliowicz were looking to optimise interior space within Carnegie Hall. Due to the shallow depth of SPS this could be realised. The light-weight, easily handled panels simplified installation in a constrained site with restricted access. SPS was light enough to be transported in the site's exterior hoist and provided an early 100% design load capacity deck for the ongoing works. The panels were delivered in shrink wrapped pallets and installed using conventional pump trucks.

## Weston Super Mare's Grand Pier, SW England, UK



This iconic building, gutted by fire in 2008, was rebuilt over the existing 105 year old structure in 2009. SPS was selected as the structural floor as it kept within a restricted maximum structural weight, provided an immediate 100% load capacity platform allowing follow-on work to be sooner and delivered long term durability with minimal maintenance. The risk of weather delays to floor installation on this exposed site were eliminated and allowances could be made for the second highest tidal flow in the world.

"SPS was key in meeting the challenges of rebuilding on an old and damaged structure with limitations on weight, restricted access and a demanding schedule. Intelligent Engineering has gone the extra mile in supporting us from design to installation to ensure the success of the project."

Andy McGoldrick, Project Director, John Sisk & Sons Ltd

## Bankside Health Club, London, UK



Located in one of London's most vibrant cultural destinations, Bankside Health Club was renovated to expand its studio offering. SPS was supplied for the gym's roof. The thin profile of the panels made them ideal for this modern structure. Delivered to site, with coatings applied, the eight roof panels were easily craned into position.

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