

► units, which form the underside of the floor slabs. In situ concrete was poured on top of them to make a structurally sound slab. Whiteley describes the units as "like Yorkie bars with reinforcing bars sticking out of them".

The protruding bars were stitched into perimeter beams and additional steel laid to lace the entire floor slab together and the structural concrete topping added.

Apart from its decorative value, the coffered slab concrete frame serves another purpose – that of providing a high thermal mass for the building. In winter, the concrete frame acts like a giant storage radiator which, once warm, radiates heat at a uniform rate. In summer, the concrete draws in heat and helps lower the air temperature.

The thermal properties of the three floors plus mezzanine building led to the selection of a variable air volume displacement air-conditioning system. The system, which is being designed and installed by contractor Haden Young, works by introducing air at a low level, and at a lower velocity and lower temperature than other systems.

Haden Young's Mark Martindale explains: "The idea is to create a reservoir of cool air in a band between floor level and a height of 2-3 m. The benefit is that you are not conditioning all the space in a gallery, just the bit at the bottom."

Air will enter the galleries through

diffusers located about 500 mm above floor level at a temperature of around 22°C. The effects of visitors' body heat and the lighting will raise the temperature by 7-8°C once it reaches the top of the 3 m high band. Air will then be drawn out of the galleries through high-level extracts. Buro Happold's specification calls for the conditioned air to be at a temperature of 22±1°C with a relative humidity of 50±7.5%.

"Although the diffusers are fairly expensive," explains Martindale, "the plant and distribution systems needed are smaller."

Providing for fitting-out

Martindale confesses to a concern: "We have plant rooms dotted all around the building. This means that when fitting-out work starts on the first gallery we will either have to complete our work five to six months early or make temporary arrangements to reroute the services to the gallery. We are discussing what services we will have to provide for the fitting-out contractors – heating, ventilation, security, humidity control, lighting, small power, or whatever."

"My concern is getting the building up to its operating temperature. There are a lot of doors and windows. It's like a church in that you don't get much temperature fluctuation but it takes time to reach a comfortable temperature."



MARTIN WHITELEY

The units are like Yorkie bars with reinforcing bars sticking out of them

ODD JOBS MAN

SIMON DAVIS, HEERY'S senior project manager, has probably got one of the most unusual jobs going. As head of Heery's management contract for the £7m fit-out, he deals with model-makers, artists, film-makers, cabinet-makers and the Armouries conservators, as well as suppliers of the multimedia and interactive gadgetry to be installed in the museum. He is also responsible for supplying the horses, hunting dogs and birds of prey for open-air jousting and hunting displays.

So far, 14 packages have been let. One of the highest priced is the £1.2m package with Yorkshire TV to make 44 films depicting aspects of arms or armour for show in the museum. The first is a 15-minute film covering the battle of Agincourt.

Some of the contracts are with a single person such as a model-maker. With that sort of contract, Davis says: "You can't tie them into a JCT contract with £35 000 worth of liquidated damages if they don't perform."

For the five contracts involving individuals, agreement was reached to pay them "up-front". Subsequent payments are staged and linked to the completion of agreed amounts of work. Heery also shoulders the risk that "if the individual is run over by a bus or fails to deliver on time – we have to suffer that. You just can't use a back-to-back contract to cover your risks when dealing with people like that," says Davis.

In the run-up to the fit-out, McAlpine's main efforts are concentrated on the one-coat spray plastering and bricklaying operations. Whiteley adds: "We need to build up the resources on the plastering."

However, the problems that dogged the start of the brickwork package have been resolved. Although Leeds is renowned for its red brick and sandstone buildings, architect DWA chose Staffordshire blue engineering bricks to clad the museum. The first bricks laid on the contract started to stain. Whiteley explains: "These Staffordshire blues can suffer from a phenomenon called peacocking which produces iridescent colours on the surface which can't be removed by acid washes."

The Brick Development Association was consulted and it came up with suggested steps to eliminate the problem, which is triggered by moisture in either the bricks or mortar.

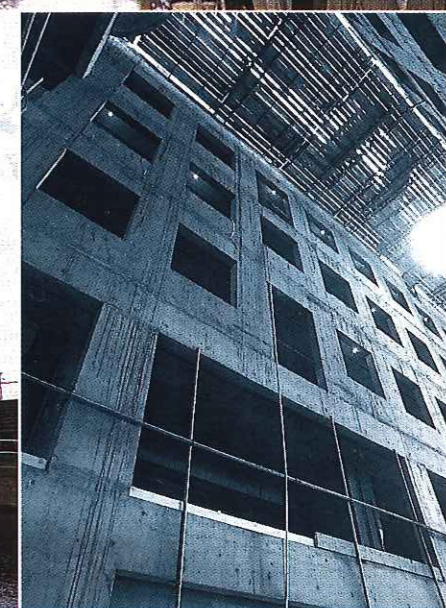
First, the bricks were stored under cover and only loaded out on the access scaffolding immediately prior to laying. The BDA also advised a switch to site batching of mortar. The final step was to protect the brickwork from the elements with polythene sheeting for up to eight weeks while the mortar sets.

The Staffordshire blues are specified for all the elevations with a thin stone granite banding used for the bottom 7 m of the building. To enliven the external appearance, an octagonal glazed tower is located where the museum nestles in the spit of land bounded by the river Aire and Clarence Dock. The tower, which has been dubbed the Hall of Steel, has a central concrete core. Around this winds a spiral staircase which, in turn, is encased in a steel and glass envelope. Its function is twofold. It is the main route from the catering and public areas on the ground floor to the exhibits on the upper floors. And it will also be used to mount about 3000 exhibits and serve as a taster for what is in the rest of the museum.

Steelwork for the tower is being fabricated by Westbury Tubular Structures and Pilkington is supplying the Planar structural glazing. Says Whiteley: "We didn't want all the hassle that you get when dealing with the interfaces between steel and glass, so we let the contract as a single package." He adds: "It's probably the best decision I've taken on the project."

Whiteley reports that the project is "broadly on programme – we are ahead in some areas and slightly behind in others". However, the crunch will come when fit-out starts at the end of September when Clayton's warnings about Heery's major task being "making sure everyone is ready when they should be" will be tested.

By then Clayton will have another little problem to solve concerning the birds of prey. "We've been told their droppings have to be treated as toxic waste and disposed of accordingly."



Main picture: This concrete canyon will become the atrium street leading visitors into the museum. Inset, left: The 27 400 m² building sits on derelict land next to the River Aire. Inset, right: Scaffolding at the top of the street heralds the start of fixing the atrium glazing.