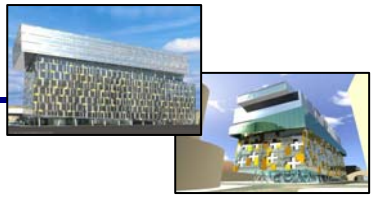


IV. Building Background

Architecture and General Information

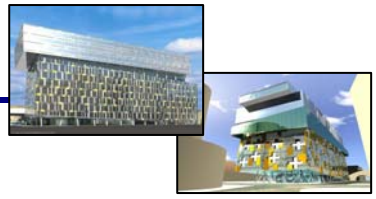
The Palestra development is currently the largest office building currently under construction in London, England. Located across the street from the Southwark tube station, and just minutes from the Tate Modern museum as well as Waterloo Station, Palestra was destined to be a high-profile building. The location only enhances the 'quirky' design of the architect, Will Alsop from Alsop Architects in London.

Figure 3.1 Palestra under Construction

This twelve story design is not your average office building, incorporating many dramatic features including two-story 'dancing' columns, large cantilevers, and tilted façade. The raked columns on the 1st and 7th stories were dubbed 'dancing columns' for the movement perceived by the observer due to the striking angles they are erected at. The entire design team finds humor in the community's reaction to Palestra. One concerned neighbor even wrote a letter to the project manager voicing concerns about these columns that were severely out of plumb, not realizing the intention of the architect.

The average passerby also notices that the building appears to be two large boxes set atop one another. This effect is achieved at the 9th story where there is a 1.5 meter overhang on three sides of the building, and then a spectacular 9 meter cantilever overhanging Blackfriars road on the fourth side. The result is very much a floating effect where there are no visible signs as to how the top box is held in place with the absence of any diagonal bracing or tensioned cables.

Accenting these unusual yet inspiring characteristics is the slanted façade present on the lower 'box' enhancing the raked columns. All of the floors are horizontal while the façade is at an ll



degree slant. This degree is sufficient enough for the façade to touch ground level on the east side while elevated 2 stories high on the west side. This creates a very appealing and open pedestrian walkway while creating an inviting entrance to those travelers exiting the tube station.

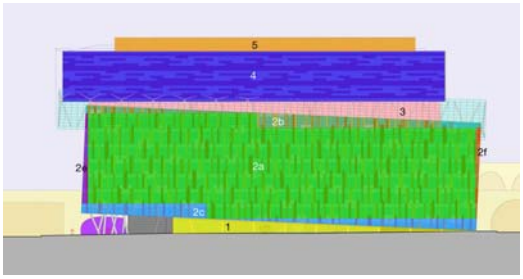


Figure 3.2 North Façade Elevation

Building Envelope

The building is fully glazed, with acoustic glazing on the North and West sides of the bottom 'box,' utilizing 5 different types of double glazing. There is an additional colored ceramic frit pattern across the façade incorporating three colours. These ceramic frits are 60% solid and 500mm wide.

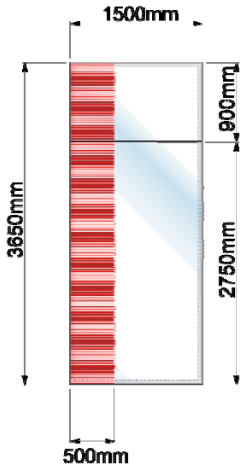
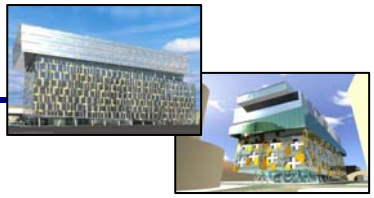


Figure 3.4 Typically Glazing Panel

The façade would allow sufficient daylight to enter the space so that for a high percentage of the time the electric lighting in the perimeter areas could be switched off if, resulting to energy savings. Efficient use of systems and controls and any further energy saving measures will ensure that the above targets are achieved and the impact of the building on the environment is minimised.

Construction

Build-ability was a large concern from the beginning of the design process for Palestra because of the site's close proximity to roads, the main railway line from Charing Cross, and the Jubilee line on the underground. Any crane over 8.5 ton is deemed a 'controlled lift' requiring special supervision from National Rail, so every effort was made to remain below this weight. The result was composite steel beams that were structurally efficient as well as



light-weight and east to assemble on site. The steel frame was also strong enough to hold its own dead loads, so that the slabs could be poured at a later date.

Figure 3.5 Steel Erection on Palestra Site

Because there was a substation located in the basement of the existing building, a temporary substation also needed to be erected on the Gambia street side to service the site and several surrounding buildings during the construction process and to decommission and remove the old substation as well.

Primary Project Team

Owner: Blackfriars Investments and Royal London Asset Management

- **Website:** www.blackfriars-uk.com, www.rlam.co.uk

Architect: Alsop Architects (Will Alsop)

- **Website:** www.alsoparchitects.com

MEP Engineers: Buro Happold Ltd.

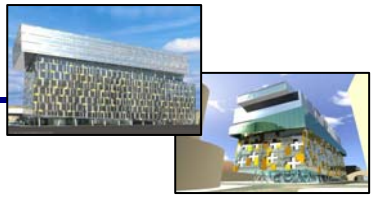
- **Website:** www.burohappold.com

General Contractor: Skanska UK

- **Website:** www.skanska.com

Structural Engineers: Buro Happold Ltd.

- **Website:** www.burohappold.com



The Palestra Building
London, England

Building Systems

ELECTRICAL

A 4MVA substation will be installed in the basement plant room to service Palestra and surrounding buildings formerly dependent on the substation in Orbit House. The load will be fed by 4 transformers of 1,000kVA, 1600 amp, each with a capacity of 2 No. 1600 amp, 1000kVA low voltage supplies from this substation would feed landlord plant on the roof. 4 No. 800 amp, 500kVA low voltage supplies service tenant load via busbar risers.

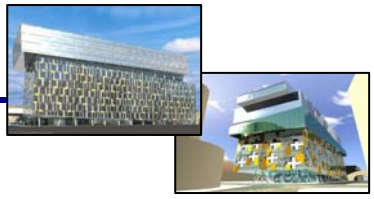
Tenant supplies are based on following electric loadings:

Lighting	15W/m^2		
Small Power	30W/m^2		
FCU	15W/m^2		
Sub-Total	60W/m^2		
Office Area	26,000 m^2		
Total	1560kW	1835kVA	2780amp

The busbars extend to roof level with a capacity of 4 x 800 amp = 3200 amp, leaving 420 amp, 275 kVA capacity not used by the tenants. This supplies the Landlord's non-essentials loads in the basement and at ground level. Then the landlord main distribution board can be located on the roof adjacent to the main landlord loads.

The main landlord switchboards in the basement feed…

- Boilers and associated pumps
- Sprinkler pumps
- Entrance area lighting and power
- Car Park and plant room lighting and power
- Core Lighting and power on Levels B to 5
- Substation Ventilation



- External Lighting
- Security/Fire control center
- Water tanks and associated pumps
- Loading Dock Lighting and power

The two main landlord LV switchboards at the roof level will be fed by 1600 amp supplies in XLPE/SWA/LSF cables/busbars from the LE substation, via isolators in the basement, so the service can be isolated by the landlord's staff without entering the LE substation.

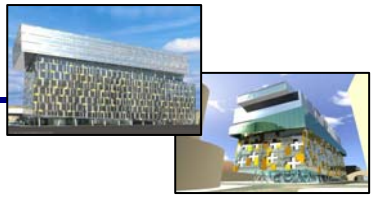
Each of these main switch panels will have the facility to incorporate power factor correction equipment to achieve an optimum power factor of 0.95 lagging.

Four tenant distribution boards are provided on each floor serving the area corresponding to one tenant and fed by metered tap-offs from the busbar risers. These boards feed the lighting, Fan Coil Units (FCUs), and a small number of 'cleaners' sockets on the cores. There will also be a raised accessible flooring system to provide electrical and data services with maximum versatility.

Back-up power supplies for Fire Alarm, emergency lighting, voice alarm, BMS head-end, security systems will be provided by battery power.

LIGHTING

Lighting to the open plan office spaces will be provided using recessed modular fluorescent luminaries, fitted with high frequency control gear and providing brightness management complying with the requirements of LG3 category 2. The lighting will be arranged on a 'checkerboard' grid with 2.1m between fittings. All luminaries will be plugged into a lighting relay box mounted in the ceiling. This will allow for local switching to be installed as partitions are moved around by the tenant, as well as space for additional luminaries to be



installed. These 'cores' will also allow for future linking of automatic time-based switching and daylight control.

When possible in the office areas low energy compact source lamps will be installed for energy efficiency and ease of maintenance.

The car park and plant room spaces will be fitted with robust fluorescent fittings with lighting controls designed to minimize lighting of unoccupied spaces.

External lighting will be designed in partnership with the Architect, but will provide adequate lighting for security and closed-circuit television (CCTV).

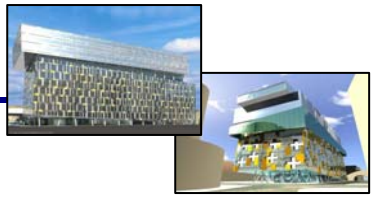
Lighting in toilets, stairs, toilet lobbies, and car parks will be controlled by presence detectors. Lighting in the main lobbies will be BMS time clock controlled to correspond with the tenant occupancy levels.

Emergency lighting will be battery units with a three hour life at reduced output, and where possible they will be integrated into the general luminaries.

MECHANICAL

The Palestra building is equipped with a gas-fired central boiler and chiller plant. And due to the close proximity to surrounding structures as well as the public transport, high quality fresh air is limited requiring a mechanically ventilated design.

The boiler room is located on the roof, and runs on four boilers, three of which run at 100% to met the daily demands while the fourth is a backup during times of maintenance or it can be used as a 'booster boiler' to generate the morning warm-up. These boilers service a low



temperature hot water system fed to AHU ventilation systems, fan coil units (FCU), and heater batteries.

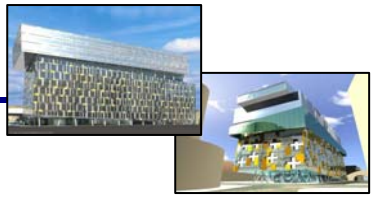
Fig 3.6 Existing Air-Cooled Screw Chillers

Fig 3.7 Boiler Pump in Rooftop Plant

Fig 3.8 Central Boiler Plant

The chiller plant is located on the roof and consists of seven packaged air-cooled chiller units, six of which run at full load daily, while the seventh serves as a backup unit. These units run the building's chilled water system fed to the fan coil units and cooling coils in the air handling plant. The primary and secondary constant temperature pumps and circuits are located on the room next to the chiller units. On the office levels the owner required the design team to achieve a versatile open floor plan layout. Therefore one FCU was placed in each structural bay. Depending on the desired office layout of the tenant more FCUs can be added for increase climate control for the employees. This is based on a four-pipe fan coil system used on each office level, including water-side controls for responsible operation, room temperature sensors, and variable speed heating and chilled water pumps to conserve energy.

Because the reception area could be operating 24 hours, it was found to be more efficient to have an independent system to run separately at off-peak hours. This area is mechanically heated, cooled and ventilated in the same manner as the rest of the building. However instead



of the standard FCU a Direct Expansion FCU was chosen, utilizing heat pumps rather than LTHW or chilled water.

To meet the minimum fresh air requirements two roof-mounted fresh air ventilation plants were installed.

All mechanical components are routed through the building's BMS (Building Management System) to maximize efficiency.

STRUCTURAL

Fig 3.9 Steel Framework of Palestra

The structural systems of Palestra are probably one of its main selling points. As previously mentioned there are two stories of double height 'dancing columns' (raked) on the Ground-First floors as well as the 7th - 8th floors. Each column is paired so that when one is leaning one way, there is another column leaning the exact opposite. However, the pairings are spread out so that this isn't quickly apparent to an observer. While these loads balance one another, they also create a strong twisting moment in the floor slabs that is directed to the stair and lift cores which use the conventional steel K-braced frames.

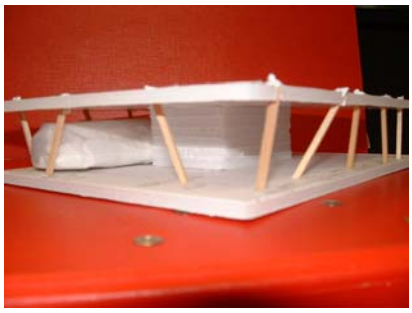
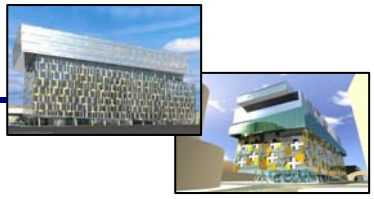


Fig 3.10 Raked Column Design

There a larger 9m cantilever on the west side of the building as well. Because the architect placed firm restrictions on the use of diagonal bracing and more traditional support methods the result is a fully fixed Vierendeel girder from the 9th to 12th floors and tied to the primary cores. This member is made up of very substantial plate girders with flanges made from 70-80mm plates. There is as much steel on the ninth floor as the third through sixth floors combined.



Everything between the first and seventh floor is vertical. Then there are two stories of 'dancing columns,' and at the ninth floor the steel grid changes from 10m x 7.5m to 12m x 7.5m because of the 1.5m cantilever all around. Due to this transition none of the columns from the 8th floor meet those on the 9th and the entire grid is offset to the west by 7.5m.

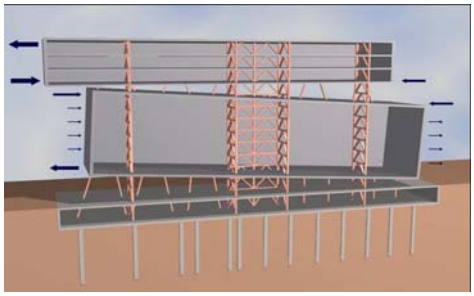


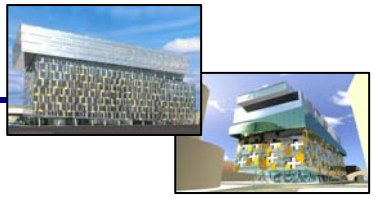
Fig 3.11 Lateral Load Schematic

FIRE PROTECTION

Provision has been made for mechanical smoke extract to exit through the current ventilation extract system, extracting up to 6 air changes per hour. In basement areas the 10 air changes per hour will be provided. The loading bay will be naturally ventilated with 2.5% of the floor area open to fresh air.

The upper floors will have sprinkler systems installed, following BS 5306 Part 2 regulations. Basement and ground floors' sprinklers will be serviced by the town mains, while the upper floors will be serviced by a 180 cubic meter water storage tank in the basement. The system is distributed to the east and west cores and rise throughout the building.

Two fire fighting shafts shall be provided with smoke control within each shaft using the alternative 'chimney' design of smoke shaft following BRE standards. Each shaft will also be fitted with a dry riser with an outlet at each fire fighting lobby and inlets located at ground level.



PLUMBING

There are 2 No 150mm fire supplies from alternate water supplies in Blackfriars Rpad and Union Street. There are also three water supplies entering the site, one on Blackfriars Road, one in Union Street, and one in Gambia Street. The Blackfriars supply will service the building's domestic water demands because the supply on Gambia is only 100mm diameter and the 175mm main in Union is already servicing the fire main.

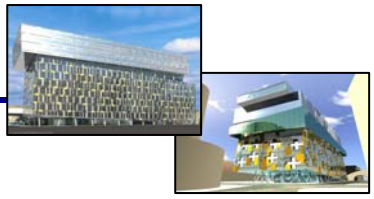
The building's demand is approximately 4.1L/s with a 4" main.

TELECOMMUNICATIONS

Communication risers will be provided at four locations around the building with two risers servicing each tenant. Using galvanized cable trays the risers can handle copper, fiber optic or blown fiber cables as required by the tenant.

Landlord installation will include a structured data cabling scheme servicing the plant rooms, lift motor rooms, reception, and one outlet per tenant area (4 outlets per floor). A landlord telephone exchange will be installed to provide for future additions to a building telephone exchange connection. The BMS and Access Control terminals will also be connected through the structured data cabling system.

Tenant installation will include the installation and routing of data cabling from wire closets to user equipment through access flooring provided. Communication links between the communication risers is limited but can accommodate for fiber optic or multi-pair telephone cables.



TRANSPORTATION

The central passenger transportation will consist of seven lifts located in the central core. Each lift will be sized at 1600kg/21 persons each, operate at 1.6 m/s, and meet disabled access requirements, achieving a waiting time of 30 seconds as recommended by BCO. Each lift will service all twelve floors, with one serving the basement additionally. The basement access will be monitored through a card swipe controlled by the BMS. The lift motors will be located in the roof plant area.

Two 630kg/8person fire fighting lifts have been provided, one in the east core and one in the west core following BS 5266 and BS 5588. They will have electric traction lift drives and operate at 1 m/s and will service ground floor through the 11th floor.

An additional goods lift is located in the east core of the building. The good lift is 3000kg/40 persons and will also have the electric traction lift drives and service -1 through 11. The motor room will be located in the roof plant area, with an additional hoisting system on the 11th floor to lift materials onto the roof.

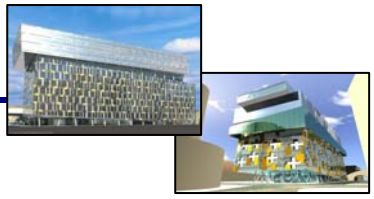
SPECIAL SYSTEMS

Security

A security system will be installed providing CCTV, access control, entry phone, and intruder detection. CCTV cameras will be located at all entrances and lobby areas in the building and will run 24 hours a day. A card access system will allow access into the building and then between certain areas within the building (i.e. basement lift).

Lightning Protection

A lightning protection scheme will be provided to fully protect the building, its contents and occupants against possible lightning strikes. Generally an air termination network is installed



across the site, providing an inter-linked grid pattern of high conductivity copper tape located at roof level. A down conductor network will be provided around the perimeter, leading to the earth termination network via a test link.

Building Management System (BMS)

The system should have the ability to monitor and or control the following

- Heating, Ventilation and Comfort Cooling Plant and equipment
- AHU plant (fans enable/disable and status<alarm>, filter status <alarm>, flow <alarm>, damper/valve monitoring)
- Chiller
- Boilers (if appropriate)
- FCUs in tenanted areas to be fitted with controllers and networked for monitoring and control.
- Pump(s)
- Pressurization Unit
- Toilet Extract Fans
- Gas Valve
- Car Park extract system
- Basement ventilation system
- Cold water booster sets
- Electricity, gas and chilled and low temperature hot water meters
- LV distribution networks
- Fire and Smoke Control System
- Fire Alarm Systems
- Automatic Sprinkler system
- Emergency Generators
- Lifts