PROPOSED

EXISTING

KEY PLAN

View point south from south Whitton Road - view 6

4.5 Environment and sustainability

CP1 Sustainable Development

This policy seeks to 'maximise the effective use of resources' including energy, and reduce the associated environmental impacts. This includes achieving standards under the BREEAM scheme. The MEP design will take these requirements into account, and therefore support achieving the required environmental standards.

CP2 Reducing Carbon Emissions

CP2 Reducing Carbon Emissions This policy seeks to minimise carbon emissions through requiring developments to utilise means of energy reduction, and therefore reduce carbon emissions. In addition to the London Plan, the policy stipulates that the development: 1. Evaluate, develop and use decentralised energy, where appropriate, and 2. Achieve a reduction in CO2 emissions of 20% through on-site renewable energy generation. The more recent London Plan Policy 5.2 and Energy Planning: Greater London Authority Guidance on preparing energy assessments (March 2016) require new commercial developments to achieve a 35% reduction in carbon emissions on 2013 Part L.

Solar Shading & Natural Lighting

The design team have explored various methods of solar shading, including positioning of glazing, and other solar control mechanisms to both take advantage of possible passive solar gains in winter time that will reduce the space heating demand, and mitigate any summer time direct solar infiltration into internal spaces, in order to reduce the summer time cooling load.

Lighting

Lighting plays a pivotal role in the level of carbon emissions from a building, and therefore the design team have looked at lighting designs that use energy more efficiently. This will include the use of LED technology, both in the existing and new build parts of the proposed development. The stadium currently features a Mode lighting control system.

Mechanical Plant

High quality and energy efficient mechanical plant will be an influential factor in the reduction of primary energy consumption and carbon emissions. The mechanical plant has been designed to consume energy as efficiently as possible, through incorporation of key efficient plant design measures and technologies. These may include the use of high efficiently boilers and chillers to provide heating and cooling, energy recovery systems to reduce losses, variable speed fans and pumps and a building management system with control strategies that ensure efficient operation of the systems.

Supply Energy Efficiently

As well as demand reduction, the development will seek to incorporate design elements that will use energy as efficiently as possible.

CHP (Combined Heat and Power)

One of the most effective methods of improving energy efficiency for the development is to apply a Combined Heat and Power (CHP) generator to the design.

CHP is the use of a local generator to provide electrical power whilst also recovering the waste heat for use in space heating and hot water generation. This process removes the losses associated with electricity generated for the grid.

This highly efficient use of fuel will significantly contribute towards the reduction in carbon emissions.

More details of the approach to energy and sustainability features of the design are covered in the respective supporting documents.

Green roofs

The configuration of the proposed roof level plan to the proposed new extension comprise two primary enclosed plant spaces with remaining plant located on the new L4A roof wrapping close to the existing stadium structure behind a louvred screen to visually hide the elements of plant. Within the centre zone of the roof; between the two enclosed plant areas, is the Level 5 roof terrace (concourse area) which has a lightweight single-skin canopy covering. After deduction of the level 5 terrace, the enclosed roof plant areas and the screened roof plant areas, the residual roof area to the north and south ends of the extension is 510sqm (to the south) and 360sqm (to the north).

To minimise energy consumption and associated plant ductwork and pump/motor size, the servicing philosophy of the project is wherever possible to locate plant as close to the space or facility served as possible. This approach was also selected to reduce the physical scale and thus associated visual impact of any plant.

In assessing the opportunity of incorporating a green roof, the associated implications have been considered. In a number of cases, the impact associated with installing a green roof would result in increased energy consumption and embodied energy which would appear to be counter-intuitive to a sustainable building design approach.

The east stand faces north east and as a result receives very little if any direct sunlight. Vegetation would be at the least challenged in this area.

Structure and associated loading - The current roof is a lightweight decked and high-performance membrane roof supported on a lightweight steel structure designed for occasional maintenance access to reach surface water roof outlets. The associated supporting structure has similarly been designed to carry no additional roof loading to keep associated beam depths to a minimum

which in turn enables the roof level to be kept lower to achieve the required internal clear ceiling heights to the hospitality space. Any increase in loading and resulting depth will result in an increased building height – height of elevation, increased area of cladding with the associated embodied energy in order to achieve the same qualitative aspects of the internal space (ceiling height). The increased tonneage of steel required to support the green roof has been calculated by the structural engineer to be circa 15Tonnes, the increased depth of structure (or increase in elevation/ building height) would be between 150-175mm (equivalent to an additional 45sqm of facade).

Plant location - In order to increase the associated roof area for potential green roofs, alternative locations for plant have been considered. As noted above, where possible plant is located in or adjacent to the spaces being served. This both improves plant efficiency, but also reduces the envelope required to accommodate the development should significant ducts and vertical risers be required to link spaces to roof level plant. This also reduces plant size and operating energy requirements and allows more control depending on the use profile of the hospitality spaces. Plant located at Level 5 (roof level) is therefore primarily boiler and chillers (within the enclosed plant areas) and air handling units and kitchen AHUs serving the Level 4A spaces (within the screened roof areas). At level 3 for instance, the new plant is slung internally over the spaces served within the proposed extension connected to louvres on the external elevation this reduces excessive air distribution ductwork.

Other options include consideration of locating plant more remotely – within the existing internal South stand plant areas there is no remaining space within existing plantroom for further equipment. To the north, the existing lightweight suspended hospitality boxes to the immediate west of the proposed extension prevent any further roof level plant locations.

The proposed servicing strategy maximises plant efficiency with the associated minimised energy consumption and reduced embodied energy by locating plant closest to its demand location. Any variation from this strategy may increase available roof area, however would have the resultant impact of increasing both embodied energy in the equipment required and in the energy consumption required.

Photovoltaics

It is also proposed to install photovoltaic panels, a renewable source of energy, on the roof of the South Stand. The layout of the array will be subject to further design development but the area identified to accommodate it is shown illustratively in the above indicative diagram.

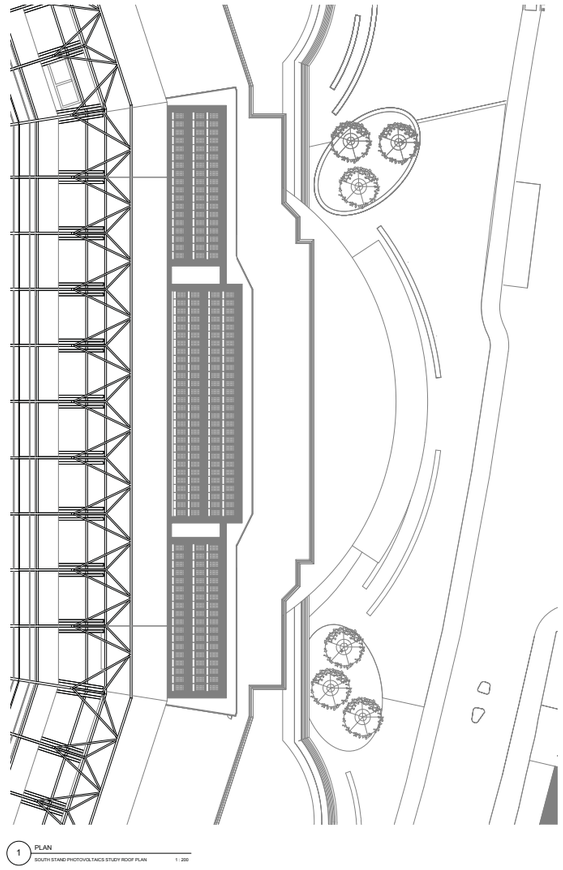


Diagram showing potential photovoltaic locations

4.6 Fire strategy

The primary reference document is BS 9999.

This concept fire strategy is intended to support the design to RIBA stage 3.

Key Fire Safety Outputs

* Two fire fighting shafts are provided within the east stand inclusive of fire fighting lifts, fire fighting lobbies and dry type rising mains. The shafts do not have stairs that directly communicate with the shaft.

The fire fighting lobby will be upgraded with mechanical ventilation. An example is illustrated below for reference.

* Currently the bowl is separated from the east stand hospitality by fire resistant glazing. Where fire resistant glass is not currently in place, it is proposed to provide toughened glass. This provision better reflects the fire loading and risk within the premises and will be further rationalised as the design develops.

Fire Safety Design Features

* Fire resistance of the building is 90 minutes.

* An automatic fire alarm and detection designed to a L3 standard, that incorporates a voice alarm module, will be provided within the development.

* Evacuation calculations are based on a simultaneous evacuation strategy. This will be developed in conjunction with the existing RFU policy & procedures.

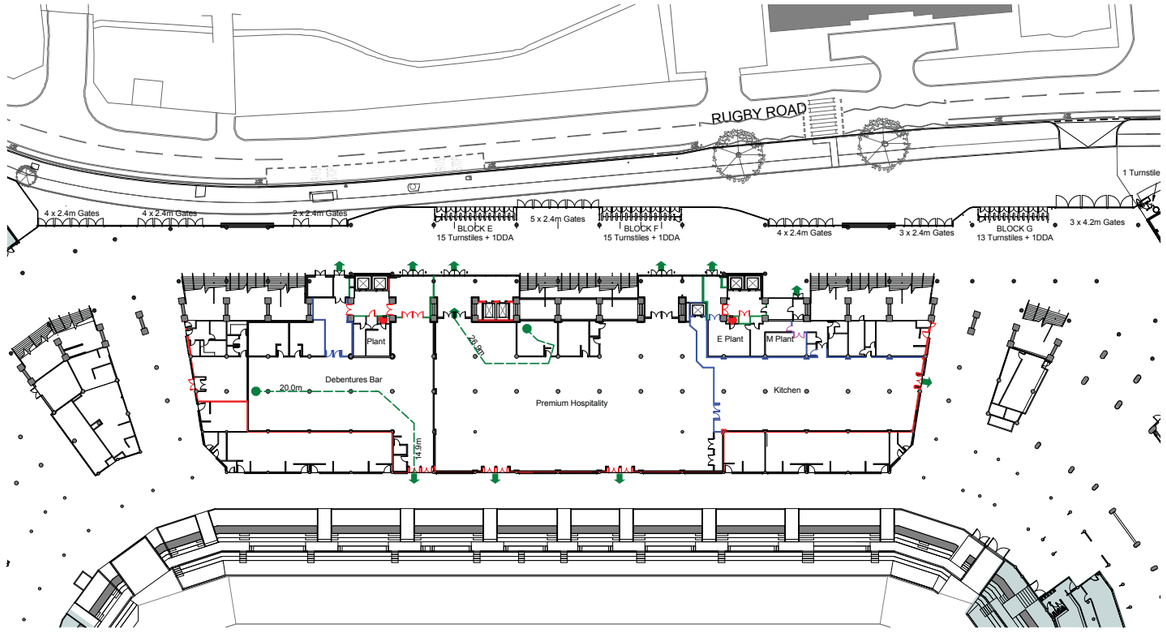
* The fire fighting provisions are as per existing and will be developed as the design continues.

* External fire spread has been assessed with 100% unprotected areas acceptable.

* The compartmentation strategy and fire resistant construction is detailed on the specific locations on the following pages. This includes FR60 compartmentation between concourses and hospitality and FR30 enclosure of higher hazard spaces.

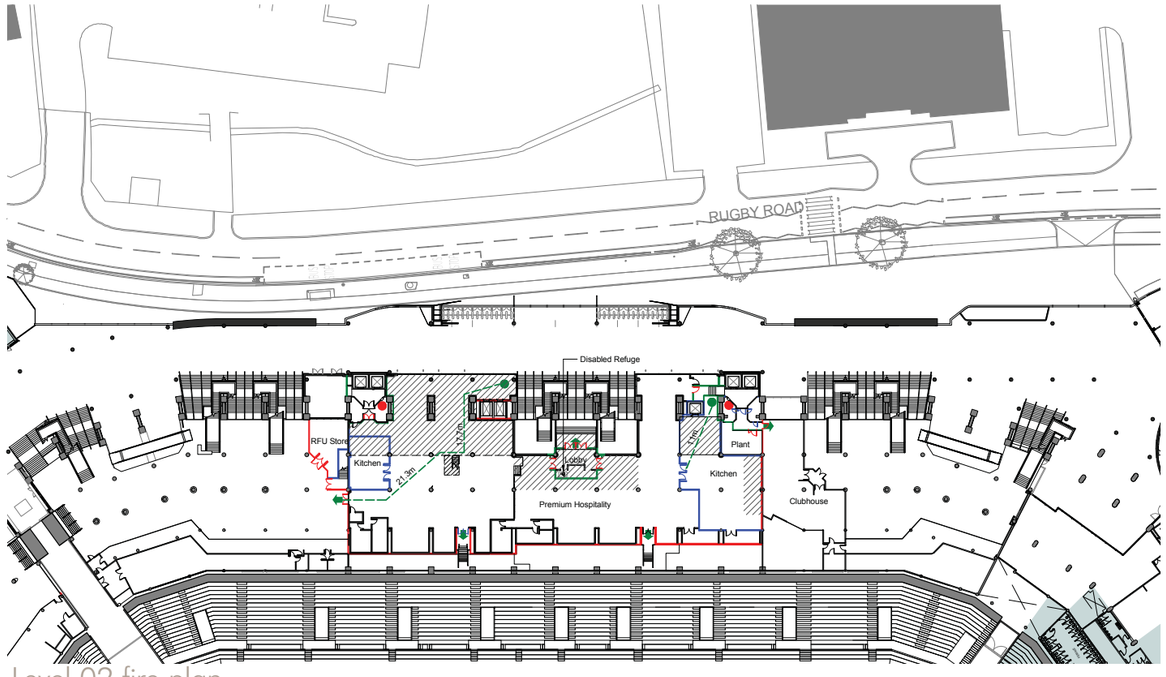
Fire Strategy

The egress analysis, occupant numbers and other fire safety considerations are detailed on a floor by floor basis on the following pages. A table is provided below that illustrates the applicable BS 9999 risk profiles and associated MOE limitations.

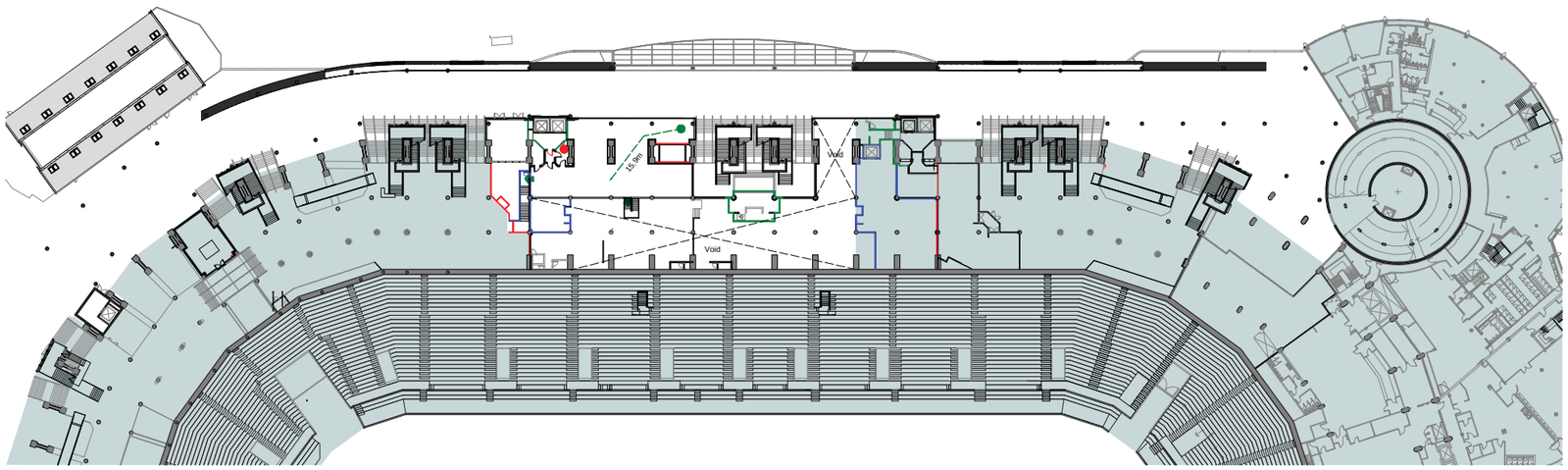


Level 01 fire plan

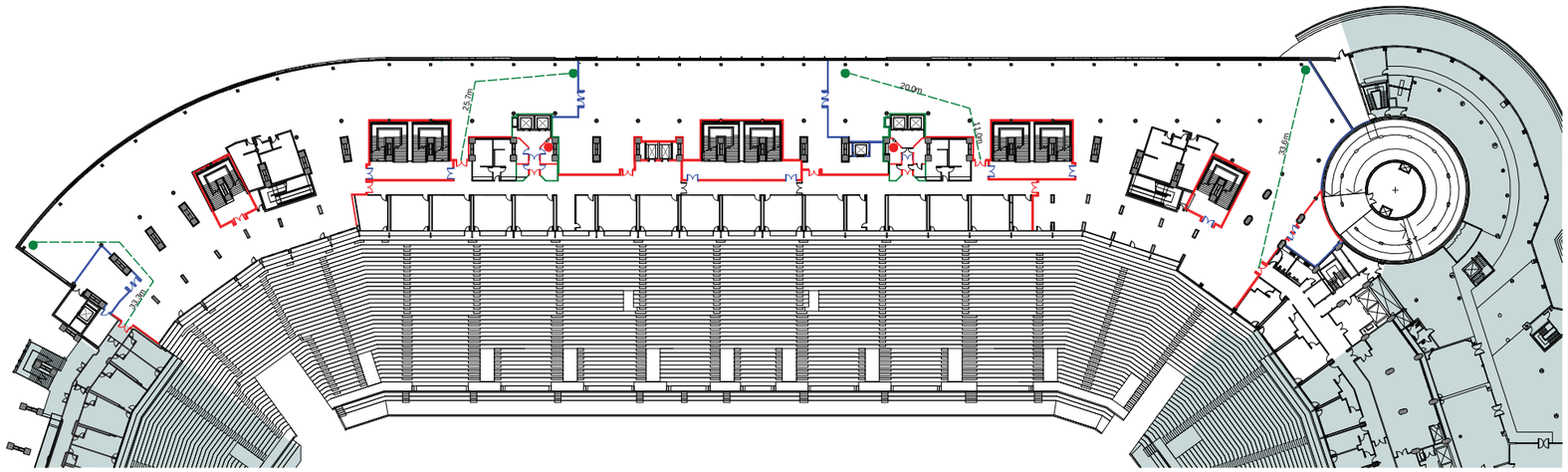
: 500



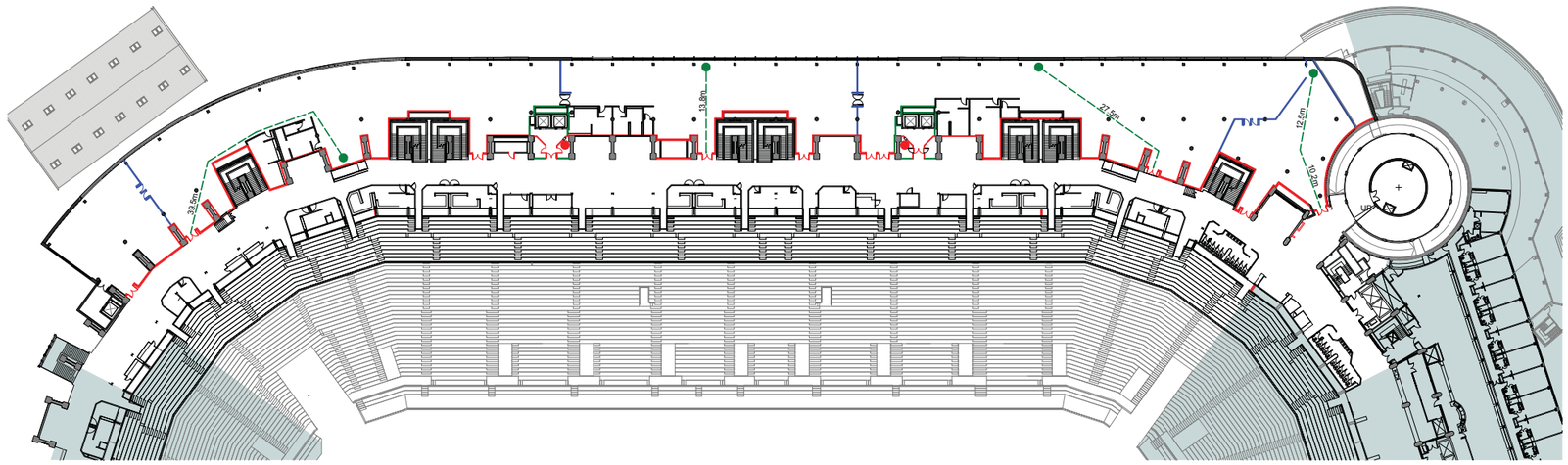
Level 02 fire plan



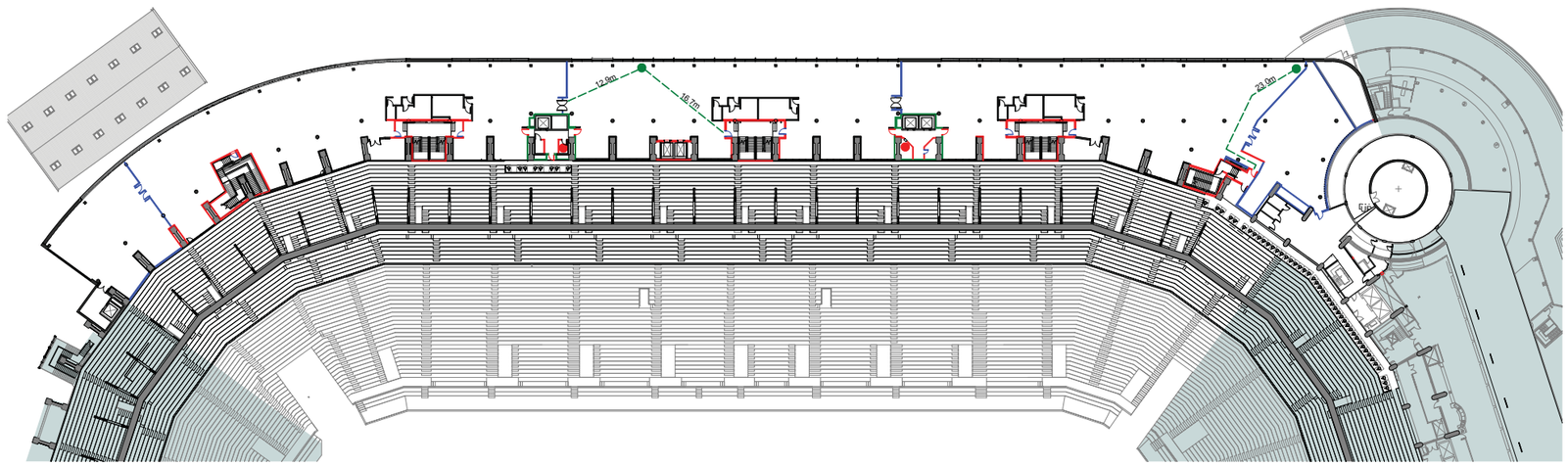
Level 02A fire plan



Level 03 fire plan



Level 04 fire plan



Level 04A fire plan