strategy / design / evaluation

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Medical Architecture

QUEEN SQUARE ELECTRICAL INFRASTRUCTURE UPGRADE

National Hospital for Neurology and Neurosurgery, Queen Square

NHS
University College London Hospitals
NHS Foundation Trust

Design and Access Statement

Issue date: 05/12/2019

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Company Registration No. 0264 8058 VAT No. 609 8096 13

Medical Architecture

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SUMMARY

The electrical infrastructure upgrade scheme proposes a series of alterations and reconfigurations of the existing buildings part of the National Hospital for Neurology and Neurosurgery, Queen Square. The proposal includes the grade II listed building identified as Albany wing and the 1980s building identified as Chandler wing. The proposals are mainly located at the basement level of both buildings, with other minor implications at ground floor level and plant installed on the existing flat roof at the second floor level.

The proposed scheme is the result of a robust and rigorous design process involving a high number of stakeholders from all levels of the Trust who would be impacted by the design. Through the design stages, the process went through a high number of iterations that addressed each obstacle and risk individually. The design team estimates that the current proposal represents the optimal response to design requirements in terms of: design brief, Building Regulations, Health Building Notes, Health Technical Memoranda, UKPN (UK Power Network) requirements, fire safety legislation, health and safety legislation, infection control guidelines. Special consideration has been given to matters of listed building, as these have been a priority from the very beginning of the process. These matters are further considered in the Heritage Statement.

The following chapters present the scheme following the guidelines and structure set out by Camden Council: description of the existing property, an explanation of the design principles behind the proposal, a description of the intended use, a description of the layout, details on the scale of the development, a description of how public/private spaces will be landscaped, a description of the appearance of the proposed development, details of the proposed access for vehicular and disabled access to the building. Matters regarding local planning context and listed building are further considered in the Heritage Statement.

EXISTING PROPERTY AND SITE

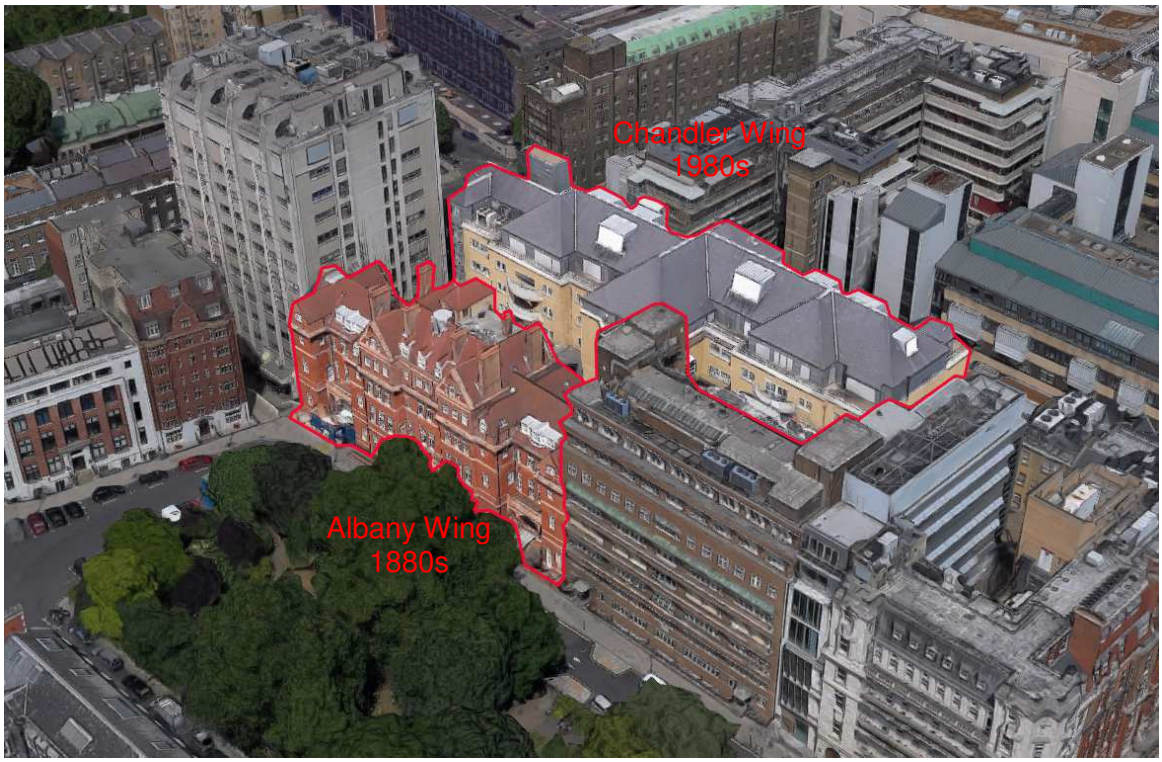

Figure 1. Aerial view of the main site buildings

Address: National Hospital for Neurology & Neurosurgery, Queen Square, London, WC1N 3BG

The National Hospital for Neurology and Neurosurgery (NHNN), Queen Square, is the UK's largest dedicated neurological and neurosurgical hospital. It has been established for 150 years and provides comprehensive services for the diagnosis, treatment and care of all conditions that affect the brain, spinal cord, peripheral nervous system and muscles. Services include specialist neurosurgery, a brain tumour unit, the Hyper-acute Stroke Unit (HASU), an acute brain injury unit, the National Prion Clinic, a pioneering neuro-rehabilitation unit, the UK's first interventional MRI scanner, the largest specialised neurosurgical ITU and the only neuromedical ITU in the country. Together with its neighbour, the Institute of Neurology, it is a major international centre for research and training. The Hospital is part of University College London Hospitals NHS Foundation Trust (UCLH).

The hospital site is an assembly of multiple interconnected buildings constructed over a span of more than a hundred years. The relevant history of the site can be analysed in further detail within the Heritage Statement. Today, the result of all developments is a high density site with various types of building fabric spanning over six floors or more, connected by corridors, ramps, lobbies, etc. Distances between buildings are small, resulting in small courtyards and an absence of green spaces. Additionally, activities that take place within the buildings are co-dependent. This means that the buildings rely on each other for the provision of care services. Common areas such as the delivery and

service yard are shared not only between buildings of the NHNN but also of adjacent sites such as Queen Square House and Great Ormond Street Hospital, belonging to other organisations. This mode of operation involves a complex system of leasing arrangements and land use agreements between the organisations. In a similar way, the electrical infrastructure that supports all clinical activities within the hospital has evolved organically over time and has resulted today in a shared network of cables, ducts, panels, switches, stations, and emergency generators, scattered throughout the site, across building boundaries.

The Albany wing and the Chandler wing are the two buildings that are affected by the present proposal (see Figure 1). The Albany Wing is the oldest building on site, currently classified as a grade II listed building. The listing and past alterations are described in further detail within the Heritage Statement. The Chandler Wing has been built in the 1980s.

The main location for the proposal is at the basement level of Albany wing and Chandler wing, with some minor developments at the ground and second floors. It is worth noting here that the basement levels of both buildings have been mainly used over time as technical areas and plant rooms.

For a more detailed presentation, see attached photographic survey (5829-MAA-91-ZZ-RP-A-011).

PROJECT BACKGROUND AND OBJECTIVES

A failure within The National Hospital for Neurology and Neurosurgery (NHNN) substation, which saw a power outage across The Hospital in July 2016, including other buildings on Queen Square, Queen Square House (QSH) and 33 Queen Square (33QS), impelled The Trust for both immediate mitigation of the failure, and to also commence planning for the replacement and upgrade of the hospital's electrical infrastructure. The existing substation located in the Guildford Street service yard is currently exceeding its capacity. The substation is non-compliant because it does not operate in an N+1 regime, meaning that should the existing substation fail to function, there is no back-up substation to carry power to hospital services. In addition, the existing equipment is at the end of its life 25-30 year cycle.

The key drivers for this project are to increase capacity of the electrical infrastructure to allow for safe and compliant, continued development at the NHNN, with the installation of new, reliable infrastructure. All future possible refurbishments, reconfigurations and extensions, as well as the replacing or upgrading of medical equipment, are reliant on the availability of electrical capacity. Without the capacity to develop, not only are patients' lives at risk of site wide power failure, but the hospital is likely to see impact on forecast operational capacity should a restriction for development/electrical growth be realized.

The electrical demand of the existing Yard substation is approximately 2338kVA, which significantly exceeds the original 1600kVA transformer capacity. Consequently, the N+1 resilient transformer provision has been lost as both transformers within the substation

are now utilised to meet the facilities demand. The proposal involves providing new and resilient electrical infrastructure with a capacity defined by a 25 year growth forecast plan. The plan assumes a minimal 3% growth over a 25 year period, as advised within the Department of Health Technical Memorandum HTM 06-01: Electrical services supply and distribution. After the review of several capacity options, it was deemed that the provision of a capacity of 4000kVA would be sufficient to support present day services and meet future demand for the defined horizon.

The physical embodiment of the electrical infrastructure was translated into a number of new rooms to be placed on the site: UKPN (UK Power Network) room, substation with switch room, Albany Wing switch room, Chandler Wing switch room; and a series of minor Essential Electrical Works (such as panels, ducts and boards) throughout the site. As will be seen from the following chapter, a design process was undertaken to appraise multiple options for the location of each room listed above, to achieve optimum performance criteria, but also to minimise impact on services and on the building fabric.

DESIGN PROCESS

The undertaken design process follows policies and business case protocols established by UCLH, which are based on industry standards such as the RIBA Plan of Work. The design process is led by a project manager. The design itself is developed by the design team (the design team leader is the services engineer, and includes the architect, the structural engineer, the CDM consultant, and others) with continuous input from UCLH stakeholders such as facilities managers, fire safety advisors, infection control officers, clinical leads. The design is based on drawing information provided by UCLH, on historical as-built drawings for Albany and Chandler Wing, on measured surveys by design team members and on specialised invasive surveys carried out by sub-contracted parties. At each milestone of the design process, the proposal has been submitted to the Trust board for review and approval. The following paragraphs shall detail the design process on a stage by stage basis to indicate key decisions and criteria.

The main objectives of stage 0 have been to develop an outline proposal for new electrical infrastructure in terms of equipment, scaling the proposal in terms of spatial requirements, and proposing a long list of potential locations for the equipment. In terms of electrical equipment multiple configurations were explored, from a single N+1 transformer to multiple transformers, each with different capacities. Implicitly, each transformer configuration implied a different spatial arrangement, the two going hand in hand. At the same time, the challenge has been to locate the transformers and their switch gear on a dense site, where all potential locations presented obstacles. In this regard, the design team performed multiple site surveys and consulted facilities managers and clinical leads to identify potential locations. A total 14 options were produced, which listed the spatial capacity of each location. For example, some of the proposed locations were on existing roofs, in proximity to other plant areas, on top of existing roofs, or in basements. Of these, four options were selected based on criteria such as: spatial capacity, proximity to existing electrical cable networks, impact on clinical services, and impact on building fabric. These options were further evaluated during stage 1 of the project.

Stage 1 of the process aimed to appraise the short listed options with the intention of selecting the optimal solution to be developed within the following stage. The options focused on the appraisal for a location of the new substation. The existing substation was located in the service yard, and was scheduled to be demolished within the medium term.

The first option has been to locate the substation in the room previously occupied by the Broadcrown generator (emergency back-up generator). This option was based on the condition that the generator would be moved to another location. This option was eventually discarded due to the uncertainty surrounding the relocation of the generator.

The second option proposed to locate the substation above the main courtyard. The design team argued that, while technically feasible, this option would significantly impact the architectural qualities of the courtyard, already reduced to a minimum footprint by consecutive developments taking place over the past few decades. By proposing an extension to the existing Chandler wing, the natural light arriving in the courtyard would be reduced to minimum. Additionally, it would undermine the architectural qualities of the Albany wing listed buildings, by obstructing views towards it.

The third option has been to place the substation on the roof of Chandler Wing, adjacent to existing plant. This option was discarded for a number of reasons: longer cable routes were required to existing cable networks, severe visual implications for the Chandler wing roof, difficult access to be provided for UKPN (who require 24h access to their equipment). The option was discarded due to these complications.

The fourth and final option proposed to relocate the medical illustration department to another site and to use the premises for the new substation (Figure 2). This option was chosen for several reasons: the footprint presented suitable spatial capacity to host the transformers and required switch gear, strategic location in terms of connections to existing cable networks, the reconfiguration of the space into a plant room would have minimal impact on clinical services, the basement location would have minimal impact on the external visual appearance of the buildings.

Figure 2. External street view of the medical illustration department at the time of the survey, chosen for the location of the substation

The aim of stage 2A has been to develop a schematic design in response to project requirements that would respect fire safety, building control, and infection control. Additionally, given that the proposal is located in a grade II listed building, a major objective has been to protect the original building fabric, and to preserve as much as possible. One of the major challenges in the design has been to achieve head height requirements that would allow the installation of the equipment. This was achieved by stripping out suspended ceilings and services. Another has been to allow for the delivery of the heavy equipment (one transformer weighs 8 tonnes). This was achieved by creating an access hatch in the ground floor flat roof, where transformers would be carried to by using a load-handling cranes placed on the adjacent road. Additionally, due to the heavy load, the existing floor slab would also need to be reinforced and even locally replaced with new reinforced concrete. The large sizes of equipment implied that the existing walls would need to be demolished and replaced with box frames, allowing passing through of equipment. The issue that was discussed the most, however, has been around resolving ventilation requirements for the plant room. Initially, it was expected that all the existing windows and doors on the street elevation would be removed and replaced with louver panels. Additionally, it was expected that further penetrations would be required on the courtyard elevation. This solution was deemed unacceptable from a listed building perspective and alternatives were investigated. Finally, a different ventilation system was proposed, using Computer Room Air Conditioning units. The units function on the same principles of regular air conditioning units, but have a higher performance specification. The use of the units negated the need for ventilation openings on both elevations.

The current proposal submitted for planning permission and listed building consent has been approved by the design team, by UCLH stakeholders such as fire safety advisors, infection control officers, clinical leads, as well as the UCLH board. It responds to project requirements as well as national guidance and standards such as Building Regulations, Health Building Notes and Health Technical Memoranda. No extensions are proposed as part of the current scheme. In some instances, the proposal improves the external visual appearance of the listed building: the access hatch replaces the existing non-original double pitch vent with a flush modular hatch system. In other instances, it produces unavoidable alterations to the building fabric: new trenches required for cables at basement level. The proposal shall be presented and detailed in the following chapters. Additionally, the proposal shall be appraised in relation to the national planning policy framework, guidelines, and heritage legislation in the annexed Heritage Statement.

OVERVIEW OF THE PROPOSAL

Reference: 5829-MAA-ZZ-RF-DR-A-157 – Location

The proposal involves reconfiguring the existing building fabric at basement, ground and second floor levels of the site. The UKPN room and substation are located at the basement level of Albany wing and are replacing the existing Medical Illustration department. The existing Albany wing switch room is relocated next door, in the location of an existing office and store room. The existing remaining space is transformed into office space and storage space. In a similar way, the Chandler wing switch room is relocated into the existing offices belonging to the catering department. The remaining room is refurbished into office spaces. At ground floor level of Albany Wing, an access hatch is provided for the delivery of equipment into the substation from street level. On the courtyard side of Albany wing cable ducts are provided to support high voltage cables from the substation to the Chandler wing switch room. At the second floor level the condenser units are installed on the external flat roof of the building, adjacent to other existing plant equipment.

USE

The main use of the refurbished spaces is associated with plant rooms. This includes: the UKPN room, the substation and adjacent rooms such as the access lobby and the storage space, the Albany wing switch room, and the Chandler wing switch room. It is worth differentiating between UCLH use of plant rooms and the use by UKPN personnel. In this regard, special access provisions have been made for UKPN, detailed within the Access chapter.

A secondary use is that of office space and administrative storage spaces. This includes: the office and store in Albany wing and the two offices in Chandler wing.

AMOUNT

The proposal is limited to the refurbishment and reconfiguration of existing floor areas within the site. In this regard, no new floor area or extensions of any kind are proposed.

The refurbished GIFA for the substation is approximately 164m^2. The Albany wing GIFA, including the refurbished offices amount to approximately 45m^2. The Chandler wing GIFA, including refurbishment of offices, involves approximately 74m^2.

LAYOUT

References:

- Substation existing plan - 5829-MAA-SS-B1-DR-A-160
- Substation proposed plan - 5829-MAA-SS-B1-DR-A-161

The substation requires wide and tall spaces that allow for equipment movement, installation and the passing of cables. In this regard, most of the existing partitions are removed, to be replaced with structural box frames and reinforced concrete slabs as required. The existing suspended ceiling and all services are to be removed as well. It is worth noting here that the UKPN room has special requirements in terms of fire protection, access and construction, detailed in the attached UKPN requirements document. In particular, the 4 hour fire rating implies that the partition walls need to be constructed in double layer brickwork and that the ground floor slab soffit needs to be lined with fire rated steel sheets. The main substation, however, only requires 1 hour fire rating, on the basis that a fire suppression system shall be installed. The corridor leading into the main HV transformer area has been designed around rotation circles for the delivery of the transformers. The large doors leading into the substation are designed to allow for the passing of equipment. Due to the high voltage values of electrical current, some electro magnetic effects may produce interference with the clinical equipment located at ground floor level. For this reason, the walls and ceiling of the substation are lined with electro-magnetic shielding, fixed to the underside of the slab (to achieve maximum head height requirements). At this stage it has not yet been determined what kind of EM shielding is required. As such, a provisional worst case scenario build-up of 200mm has been included in the proposal. The existing external windows have been retained, a white protection film applied on the internal face. The internal side of the window opening has been filled with blockwork for fire rating purposes. The sliding metallic curtain indicated as D08 has the purpose to restrict access to main transformer areas only to qualified personnel, while giving access to maintenance of ventilation units and fire suppression system. The plant roof floor shall be finished with industrial floor paint. The walls and ceilings shall remain unfinished as it will be necessary to identify any items for future adaptations and maintenance. The implications to the listed building are further discussed within the Heritage Statement.

References:

- Albany wing existing plan - 5829-MAA-AW-B1-DR-A-162
- Albany wing proposed plan - 5829-MAA-AW-B1-DR-A-163

The Albany wing switch room shall have a similar treatment to the substation: stripping out of all existing finishes and ceilings, new openings and reinforcement of slab as required in order to support equipment loads, new trenches. Ventilation requirements impose that the existing windows be removed and replaced with louvers. Additionally, the fire safety strategy requires that a primary and a secondary escape route be provided in the space. The routes must not lead to the same location as this would not diminish the risk of escape. For this reason, the secondary fire escape route is required to penetrate the external wall, towards the light well. As a result, one of the window openings will be transformed into a door opening by retaining the existing width while removing the brickwork below the window sill. Additionally, the new cable trays shall require high level penetrations through structural walls. These will be undertaken by diamond drill through the walls, to be filled with fire stopping systems after installation of cables. The existing switch room shall be transformed into an office and a store. The existing finishes shall be

removed and replaced with vinyl floors. The existing window panel shall be removed and replaced with a double glazed window. The implications to the listed building are further discussed within the Heritage Statement.

References:
- Chandler wing existing plan - 5829-MAA-CW-B1-DR-A-164
- Chandler wing proposed plan - 5829-MAA-CW-B1-DR-A-165

Chandler wing is not part of the listed building. However, the site is located within a conservation area. Additionally, it is worth noting that the basement section of the elevation, where the switch room is located, is only a few meters away from the Great Ormond Street Hospital building. The section of the elevation is not visible from the street level. In fact that section of the elevation can only be seen from the external ramp (see photographic survey 5829-MAA-91-ZZ-RP-A-011-S3-P03). The proposal for Chandler wing involves alterations to the external elevation as follows: the existing office window shall be removed and the elevation infilled with brickwork to match existing external wall cladding, the existing glazed window in the manager's office shall be removed and replaced with a louver, the new manager's office shall have a new double glazed window, the door in the new office shall be removed and replaced with a glazed door, also used as a secondary fire escape route. The implications to local plan shall be further discussed within the Heritage Statement.

References:
- Access hatch existing plan - 5829-MAA-LW-00-DR-A-180
- Access hatch proposed plan - 5829-MAA-LW-00-DR-A-181

At the ground floor level of Albany Wing an access hatch is provided for the delivery of substation and UKPN equipment. The hatch involves alterations to the existing flat roof, which does seems to be a later addition to the original listed building (further details in the Heritage Statement). In addition, it is assumed that the flat roof is currently used as a secondary fire escape route. This involves a requirement to keep the surfaces free of any obstacles. The proposal involves the removal of the existing double pitch roof vent and the creation of a modular floor access hatch that is flush with the existing roof. A new layer of asphalt is expected to cover the remaining opening and provide a waterproof layer. The access hatch covers shall be superficially sealed with water resistant sealant. It is recognized here that the design of the floor access hatch, however, does not allow for a fully waterproof solution. As such, drainage solutions involving drip details are provided internally at high level and a drainage gutter is provided in the lobby below. This shall direct any excess water and moisture towards the light well. It is expected that the hatch will achieve minor improvements in the visual quality of the street elevation. The proposal also improves circulation on the flat roof for fire escape. Implications for listed building are further considered in the Heritage Statement.

References:
- Flat roof existing plan - 5829-MAA-CR-00-DR-A-182
- Flat roof proposed plan - 5829-MAA-CR-00-DR-A-183

On the courtyard side of Albany wing ground floor cable duct penetrations are made to the existing flat roof. It is assumed here that the roof and ramp located below are later additions to the original listed building (further details in the Heritage Statement). The

proposal involves a cable riser penetrating through the flat roof. It is expected that the riser shall be covered with a coping and that the roof surface shall be made good, including the provision of any flashings required to maintain water proof details. The cables rising from the substation located are basement level are directed towards: the Chandler wing switch room and the Queen Square House switch room. The cables towards Chandler wing shall be supported on a cable ladder and will enter the building through a high level penetration. They shall be carried above the suspended ceiling, on a cable tray hung from the ceiling. The cables directed towards the Queen Square House switch shall be carried on a cable ladder and will penetrate through the Albany wing wall adjacent to Queen Square House. The works undertaken from that point onwards shall be carried out by others, as they are part of the UCL demise. It is worth noting here that this section of the building elevations of Chandler wing and Albany wing are not visible from the street level. Further implications are considered in the Heritage Statement.

References:
- Plant deck existing plan - 5829-MAA-CR-02-DR-A-197
- Plant deck proposed plan - 5829-MAA-CR-02-DR-A-198

The proposed location for the condenser units is at the second floor of Chandler wing, on the existing flat roof, adjacent to existing plant rooms. For health and safety purposes, protection barriers need to be installed.

SCALE

References:
- Substation S01 existing - 5829-MAA-SS-SC-DR-A-166
- Substation S01 proposed - 5829-MAA-SS-SC-DR-A-167
- Substation S02 existing - 5829-MAA-SS-SC-DR-A-168
- Substation S02 proposed - 5829-MAA-SS-SC-DR-A-169
- Albany wing S01 existing - 5829-MAA-AW-SC-DR-A-170
- Albany wing S01 proposed - 5829-MAA-AW-SC-DR-A-171
- Chandler wing S01 existing - 5829-MAA-CW-SC-DR-A-172
- Chandler wing S01 proposed - 5829-MAA-CW-SC-DR-A-173

The existing buildings on the site are high density developments of six storeys or more. By comparison, the proposed scheme impacts the existing elevations mainly at basement level, with few interventions at ground floor. The interventions to the elevations are superficial, involving the replacement of windows, or the provision of new openings and hatches. No extensions or volumetric alterations are proposed within the scheme. Therefore, the scale of the intervention is reduced to minimum. Further implications are considered in the Heritage Statement.

LANDSCAPING

No landscaping is involved in the current proposal.

APPEARANCE

References:

- Substation E01 existing - 5829-MAA-SS-FC-DR-A-102
- Substation E01 proposed - 5829-MAA-SS-FC-DR-A-103
- Substation E02 existing - 5829-MAA-SS-FC-DR-A-105
- Substation E02 proposed - 5829-MAA-SS-FC-DR-A-106
- Albany wing E01 existing - 5829-MAA-AW-FC-DR-A-193
- Albany wing E01 proposed - 5829-MAA-AW-FC-DR-A-194
- Chandler wing E01 existing - 5829-MAA-CW-FC-DR-A-220
- Chandler wing E01 proposed - 5829-MAA-CW-FC-DR-A-221
- Access hatch perspective - 5829-MAA-LW-ZZ-DR-A-241

The intention has been to protect and retain as much as possible of the original building fabric and character of the Albany wing listed building. In this regard, the scheme seeks to retain as many of the window openings as possible. The glazing of the retained window is covered with a white adhesive film on the internal face. The window openings are filled with blockwork internally for fire rating purposes. The removed windows are carefully extracted to maintain the brickwork intact. Where required, the brickwork shall be made good with new brickwork to match existing, as per original design. The new doors and louvers are installed within the existing openings. The door to the new Albany wing switch requires that the existing window and the brickwork below the sill be removed. The brickwork and arch at high level are retained. A new sill and louver door are installed.

At ground floor level a hatch is installed, as detailed in the Layout chapter. It is estimated that the elevation appearance is improved as the obstructive vent is removed.

On Chandler wing, the elevation appearance is altered slightly at basement level. The opening of the window that is removed shall be filled with brickwork that matches the existing finish. The lintel is retained for any future possible use. The proposed double glazed window and door shall have the same frame colour and structure as the existing windows. The proposed louvers shall have the same metallic grey colours as the existing panel façade.

The implications for planning context and listed building are further considered within the Heritage Statement.

ACCESS

UKPN requirements state that 24 hour access needs to be provided to the UKPN room. In this regard, it has been arranged that access would be provided to UKPN from street level in Queen Square. Access would be made via the existing stair leading into the light well, through the existing security gate. Access into the building would be made through door D01. For deliveries of equipment, the ground floor access hatch would be used, and would be accessed using a crane placed on the street.

All plant room areas would have restricted access protocols, only to be accessed by trained staff. In this context, the guidance does not require that inclusive access devices be provided. The transformer area of the substation would be accessed via D04, D05, D06, with controlled deliveries of large equipment being made via the access hatch. The switch gear area would be accessed via D10, with a secondary access point at D09. Switch gear deliveries would be made via standard corridor delivery routes. The fire suppression system and ventilation units maintenance access points would be accessed via D07. For deliveries of equipment the ground floor access hatch would be used, provided that the D08 metallic curtain would be folded. Albany wing plant room access point for maintenance and deliveries are doors D12 and D13. Chandler wing plant room access point is door D15.

All other areas have level access points via doorways, ensuring inclusive access.

PLANNING CONTEXT

The relation to all national and local planning legislation and guidance are analysed in the Heritage Statement. The only item addressed separately is the Development policy DP28 relating to noise and vibration, detailed hereafter.

Development policy DP28. Noise and vibration

Policy: *"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for: a) development likely to generate noise pollution; or b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided."*

The response is relevant in relation to the condenser units installed at second floor level. For reference see plans:

- Plant deck existing plan - 5829-MAA-CR-02-DR-A-197
- Plant deck proposed plan - 5829-MAA-CR-02-DR-A-198

In response to the policy, see attached noise assessment report:

- Noise impact assessment - 5829-SBN-ZZ-ZZ-RP-Y-001

ANNEX LIST

Document	File Name / Document Number
Drawing package (see drawing list within for individual drawings)	5829-MAA-ZZ-ZZ-DR-A-242
Photographic survey	5829-MAA-91-ZZ-RP-A-011
Heritage Statement	5829-KMH-ZZ-ZZ-RP-J-001
Noise assessment report	5829-SBN-ZZ-ZZ-RP-Y-001
UKPN design requirements	UKPN Building FAQ_Jan 2016