

Broadstone Headquarters and Technical Training Centre for Dublin Bus

M&E Services Basis of Design

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1.0 General

1.1 Introduction

The following report outlines proposals for the provision of mechanical, public health and electrical services associated with the refurbishment of the furniture store and unit store to provide a new headquarters for Dublin Bus and refurbishment and extension of the existing Dublin Bus technical training facility.

1.2 Objectives

The objective of this report is to record Cundall's proposals for mechanical, public health and electrical services following discussions and workshops with the Iarnrod Eireann architectural team and their associated stakeholders to establish an agreed scope of work prior to proceeding to detailed design.

The document also records the mechanical and electrical design parameters that will form the basis of our design.

Following review with Iarnrod Eireann and their associated stakeholders, this document will be revised and reissued as confirmation of the agreed scope of the mechanical, public health and electrical services.

1.3 Scope of Report

A visual non-intrusive survey was carried out by Dominic Fay and Lais Breen on Wednesday 23rd March 2022, Lais Breen and David Deane on 19th May 2022 and David Deane 27th May 2022. A condition report describing the extent and condition of existing services based upon the survey was presented on 1st June 2022.

This document will focus on the proposed new systems to be installed during the refurbishment project and the following sections are broken into the various systems that will form part of the work.

This document should be read in conjunction with the Furniture Store Natural Ventilation Study report that has been issued under separate cover.

1.4 Stakeholders

The following lists the various stakeholders involved in the project and who this document will be circulated for review and comment.

- Client – Iarnrod Eireann Infrastructure
- Architect – Iarnrod Eireann Infrastructure
- Fire Consultant – Eamon O'Boyle and Associates
- Acoustic Consultant - TBA
- Project Managers – TBA
- Quantity Surveyor - TBA
- Mechanical and Electrical Engineers – Cundall (Ireland) Ltd.

2.0 M&E Design Parameters

1.5 Introduction

The main Standards and Design Parameters relative to the mechanical and electrical services installations are as follows:

- The Building Regulations - Technical Guidance Documents
- IS 10101:2020 National Wiring Rules for Electrical Installations
- IS 3217: 2013+A1:2017 – Emergency Lighting Standard - NSAI
- IS 3218: 2013+A1:2019 – Fire Alarm Standard – NSAI
- Irish Water Regulations
- CIBSE – Various best practice guidelines in relation to Heating, Ventilation, Air Conditioning and Plumbing Services.
- IS 291: 2015 Portable Fire Extinguishers

1.6 Low Energy and Sustainable Design

The mechanical and electrical services will be designed with a low energy usage in mind. The new systems selected (such as lighting) will be cost effective, maintainable, and present clear energy saving opportunities over the lifetime of the facility.

1.7 General Internal Area Design Parameters

The environment of offices and other habitable areas during occupied business hours shall be designed to provide the following conditions.

- 23 °C +/- 2 °C Summer Condition
- 20 °C +/- 2 °C Winter condition
- Relative Humidity 40 - 70%, uncontrolled
- 300 - 500 lux at 1.2 metres from the finished floor level
- Maximum noise level shall generally be 45 to 55 dB and as specifically listed below:
- General open plan office – NR38
- Private offices – NR35
- Meeting rooms – NR30
- Natural Ventilation
- Mechanical Ventilation (where provided) at 10 litres per second per person

Where feasible and verified by CFD, the buildings will be naturally ventilated. Where natural ventilation is not feasible, we will design mechanical ventilation systems to deliver 10 litres of fresh air per person per second based upon a diversified population to comply with Part F of the building regulations.

All mechanical and electrical equipment will be accessible and removable from the installed location for servicing and maintenance and the access arrangement will meet local regulatory accessibility requirements. If existing M&E equipment is being retained and it is not cost effective to relocate, its existing position shall be retained.

The MEP design will be coordinated to ensure that adequate maintenance access is coordinated with ceiling and floor grids.

3.0 Space Heating & Comfort Cooling

3.1 Introduction

Space heating and comfort cooling systems in the Dublin Bus Headquarters and Technical Training Building will operate on electricity. The existing natural gas installation pipework that serves unit heaters in the technical training building workshop will be removed to decarbonise the space heating system.

The CME offices that adjoin the Unit Store and a paper file store adjacent to the Technical Training Building are heated by a gas fired wet central heating system. The boiler that serves this system is installed in the Unit Store and will be relocated to facilitate the project.

3.2 Dublin Bus Headquarters

Space heating and comfort cooling of habitable areas will be provided by Hybrid VRF systems. VRF systems circulate refrigerant as the heating and cooling medium between an outdoor heat pump that absorbs or rejects heat to ambient air and fan coil units located in the conditioned rooms that heat or cool depending on the local space requirement. Hybrid VRF systems contain an additional component called a hybrid branch control box (HBC) where the refrigerant circuit transfers its energy to a sealed water system. Each fan coil unit is separately connected to the HBC by a pair of water pipes. The fan coil units at first floor level will be wall mounted chassis type in enclosures designed by the architects. Units serving the ground floor will be mounted at ceiling level. The HVRF systems will provide simultaneous heating and cooling with heat recovery.

Stairs and other non-habitable areas will be heated by wall mounted electrical panel convactor heaters.

Separate DX air conditioning systems will be provided to cool the Comms Rooms. Each room will be served by two separate systems to provide 100% redundancy.

3.3 Dublin Bus Technical Training Building

Space heating and comfort cooling of habitable areas will be provided by a Hybrid VRF system. The fan coil units at first floor level will be wall mounted chassis type in enclosures designed by the architects. Units serving the ground floor will be mounted at ceiling level. The HVRF system will provide simultaneous heating and cooling with heat recovery.

Stairs and other non-habitable areas will be heated by wall mounted electrical panel convactor heaters.

The workshop will be heated by horizontal radiant panels mounted at high level.

Separate DX air conditioning systems will be provided to cool the Comms Room. The room will be served by two separate systems to provide 100% redundancy.

4.0 Public Health Services & Compressed Air

4.1 Introduction

Potable water for consumption at drinking water points will be connected to new incoming mains water services. New sealed cold water storage tanks will be provided in the Dublin Bus Headquarters and Technical Training Building to comply with Irish Water Regulations. Hot water will be generated and stored in local electric water heaters.

New above ground soils and waste systems will be provided.

4.2 Dublin Bus Headquarters

4.2.1 Domestic Water Services

A new mains water connection will be taken from an existing hydrant main located below the external courtyard. This service will run at high level through the ground floor to a service yard at the rear of the building where an external cold water storage tank will be located. Branches will be taken from this service to serve drinking water taps as it passes through the building.

A cold water pressurisation pump set will be installed in a plant room adjacent to the storage tank. A boosted cold water service will run from the pump to deliver cold water to sanitary fittings including cleaners sinks, wash hand basins, WC cisterns and shower mixing valves.

The boosted cold water service will also feed local electric water heaters located adjacent to wash hand basins, sinks and showers.

Thermostatic mixing valves will be provided at ablutionary fittings to guard against scalding.

4.2.2 Soils & Waste systems

Above ground soil and waste systems will be designed to connect to a below ground drainage system at agreed locations. The below ground drainage is outside the scope of our service.

4.3 Dublin Bus Technical Training Building

4.3.1 Domestic Water Services

The existing water connection that serves the technical training building appears to come from a fire hose reel main in an adjoining building. This is undesirable for human consumption and further investigation will be required during detailed design to locate a mains water source to serve the building. This new service will run at high level through the ground floor to a cold water storage tank mounted on a service mezzanine beside the workshop. Branches will be taken from this service to serve drinking water taps as it passes through the building.

A cold water pressurisation pump set will be installed adjacent to the storage tank. A boosted cold water service will run from the pump to deliver cold water to sanitary fittings including cleaners sinks, wash hand basins, WC cisterns and shower mixing valves.

The boosted cold water service will also feed an electric water heater located in a plant room at first floor level.

Thermostatic mixing valves will be provided at ablutionary fittings to guard against scalding.

4.3.2 Soils & Waste systems

The above ground soil and waste system will be modified where necessary.

4.3.3 Compressed Air

The training bays and vehicle inspection pit are provided with compressed air outlets for handheld tools.

The existing compressed air system Kaeser SM13 packaged aircenter will be retained for relocation in the workshop. New galvanised steel compressed air pipework will be provided to connect new outlets to the aircenter.

5.0 First Aid Fire Protection

5.1 Introduction

This section describes the extent of first aid firefighting equipment that will be specified by Cundall. This proposal may be revised following consultation with the fire consultant.

5.2 Dublin Bus Headquarters

5.2.1 Fire Hose Reel System

We do not propose to provide first aid fire hose reels in the Dublin Bus Headquarters.

5.2.2 Fire Extinguishers

Foam and CO₂ fire extinguishers will be provided in accordance with IS 291: 2015.

5.3 Dublin Bus Technical Training Building

5.3.1 Fire Hose Reel System

A galvanised steel fire hose main enters from the adjoining building to serve wall mounted first aid fire hose reels. This will be modified for reuse or removed depending on the fire consultant's advice.

5.3.2 Fire Extinguishers

Foam and CO₂ fire extinguishers are mounted on wall brackets in the training area and garage. These will be retained for relocation to suit the new layout. Additional foam and CO₂ fire extinguishers will be provided in accordance with IS 291: 2015.

6.0 Ventilation

6.1 Introduction

Fresh air ventilation will be provided by a combination of natural and mechanical systems.

This method of ventilation where natural ventilation is combined with mechanical ventilation and mechanical cooling is known as Hybrid Ventilation. In addition to delivering fresh air, hybrid systems exploit free cooling by mixing cooler outdoor air with the indoor air when prevailing outdoor condition allows. When the outdoor condition does not afford adequate cooling in the naturally ventilated areas, mechanical cooling by the HVRF system will be available to ensure the maintenance of thermal comfort.

6.2 Dublin Bus Headquarters

Where feasible and verified by CFD, the building will be naturally ventilated. Where natural ventilation is not feasible a mechanical ventilation system will deliver 10 litres of fresh air per person per second based upon a diversified population to comply with Part F of the building regulations.

The air handling unit will be located in a service yard at the rear of the building. An integral heat pump will heat or cool the ventilation air before it is delivered to the building. Fresh air will be distributed via sheet metal ductwork to the areas served. Vitiating air will pass to common areas via transfer grilles and rise through the natural ventilation voids to high level on the first floor where it will be collected in extract ducts and returned to the air handling unit for heat recovery.

Mechanical ventilation will be provided in toilets by separate toilet ventilation systems. Heat recovery mechanical ventilation units will be mounted above first floor toilets with supply and extract ductwork distributing to the toilets below.

6.3 Dublin Bus Technical Training Building

A hybrid ventilation system will also be applied, where feasible, in the training building. Where natural ventilation is not feasible a mechanical ventilation system will deliver 10 litres of fresh air per person per second based upon a diversified population to comply with Part F of the building regulations.

The air handling unit will be located on a service mezzanine above the tyre store. An integral heat pump will heat or cool the ventilation air before it is delivered to the building. Fresh air will be distributed via sheet metal ductwork to the areas served. Vitiating air will return via sheet metal ductwork to the air handling unit for heat recovery.

Mechanical ventilation will be provided in the toilets by separate toilet ventilation systems. A heat recovery mechanical ventilation unit will be mounted above the first floor toilets with supply and extract ductwork distributing to the toilets below.

7.0 External Mechanical Services

7.1 Introduction

The mechanical work proposed external to the buildings is limited to the decommissioning of the natural gas installation pipe that serves the Technical Training Building, modifying the natural gas that serves the CME offices gas fired central heating system, and provision of new potable mains water supplies for both buildings.

7.2 Natural Gas

There are two RVG G65 DN50 gas meters located at the northeast corner of the courtyard on the external wall of the stores building. Two installation pipes rise to high level externally before entering the stores building. The installation pipe that serves the Technical Training Building will be decommissioned and removed.

A G10 meter is located at low level on the southern side of the courtyard beside the entrance to the unit store. An installation pipe enters the building at low level and rises to a wall mounted central heating boiler that serves a wet central heating system in the CME offices and a paper file store on the other side of the courtyard. This system will be modified by providing a new boiler and associated plant in a new boiler room beside the CME offices. An alternative method of heating the paper file store will also be required but this is outside our scope of work at present.

The route of the gas service pipework below the courtyard is unknown.

7.3 Mains Water

A hydrant main passes below the courtyard between the furniture store and technical training building. The actual route of the hydrant main is unknown. We propose to locate this main by excavation during the construction stage and provide a new connection to the Dublin Bus Headquarters.

A new connection will also be required to provide potable mains water to the Technical Training building. There may be a suitable supply in the building adjoining the training building, alternatively a new connection could be taken from the hydrant main as proposed for the Dublin Bus Headquarters.

7.4 Underground Drainage

Underground drainage is outside the mechanical and electrical scope of work and is not included in this report.

8.0 LV Switchgear

8.1 Introduction

The main LV Switchgear room for the Broadstone is located adjacent to the ESB MV substation with access gained from the external Courtyard. The incoming LV supply is split in this room to feed 2 no main boards, 1 no for Dublin Bus and 1 no for Bus Eireann. Both main boards have separate ESB meters. From there, the various buildings are fed by armoured cables underground and at high level on/in buildings. All boards will have surge protection provided. All installation work will comply with IS 10101 for the National Wiring Rules.

8.2 Dublin Bus Main Board

The incoming unmetered ESB LV supply is connected to the Dublin Bus main board and is split into the Dublin Bus metered supply and the Bus Eireann metered supply, in the main board.

The Dublin Bus LV main board has a 1000A ACB incomer and the following outgoing circuit breakers:

- 1000A MCCB to Dublin Bus
- 630A MCCB for future Power factor Correction
- 400A MCCB Spare
- 2 no 250A MCCBs Spare
- 5 No 125A MCCBs Spare

The 630A MCCB for the future power factor correction will be used to feed the new LV main board for the refurbished furniture store and unit store.

8.3 Bus Eireann Distribution Board

The Bus Eireann LV main board serves a large number of locations across the Broadstone site.

The following locations that are fed from the Bus Eireann LV main board which will be affected by this project are:

- The Furniture Store
- The Bus Eireann Garage
- Unit Stores (Including the Gig E Room)
- CME Offices
- Training Unit

The following locations will be removed from the Bus Eireann LV main board and will be fed from the Dublin Bus LV main board:

- The Furniture Store
- Unit Stores (Including the Gig E Room)
- CME Offices
- Dublin Bus Training Centre
- Central Control Operations (CCO)

8.4 New Furniture and Unit Store LV Main Board

A new LV main board will be provided to serve the furniture store and the unit store, as both areas will become a combined space.

The new LV main board will be Form 4b and be backed up by a new emergency standby generator.

The 630A MCCB for the future power factor correction will be used to feed the new LV main board for the refurbished furniture store and unit store.

The new LV main board will serve local Form 3b distribution boards throughout the furniture store and unit store. It will also serve the existing IT equipment in the Gig E Room.

8.5 New Dublin Bus Training Centre LV Main Board

The Dublin Bus Training Centre LV main board located within the building will be supplied from an existing spare 250A MCCB in the Dublin Bus main board.

A new LV main board will be provided to serve the modified Dublin Bus Training Centre.

The new LV main board will be Form 4b and will serve the new local LV Form 3b distribution boards.

8.6 New Local distribution Units

New local Form 3b distribution boards will be provided in each building to serve the lighting, general lighting, and small power.

Each comms room will have its own individual distribution board.

Each board will comprise of the following:

- Main isolator
- Surge protection
- Separate isolator for lighting, general services, and small power sections of the board
- Energy meters for each section
- The general services will be protected by 20A Type A, B curve RCBOs
- The lighting services will be protected by 10A C curve MCBs
- The small power will be protected by C curve MCBs, rating dependent on loads

8.7 Existing CCO Temporary Building

The existing CCO temporary building appears to be fed from the Bus Eireann main board. This needs to be confirmed by the Irish Rail electrical contractor.

9.0 Standby Generator

9.1 Introduction

A 400 KVA LV emergency standby generator will be provided to support the furniture store and unit store. It will be enclosed in a soundproof enclosure and have a fuel tank in the base of the enclosure.

It will be located in the enclosed space between the east wall of the furniture store and the boundary wall.

The automatic transfer switch (ATS) will be located in the furniture and unit store LV main board.

Offloading cables from the emergency standby generator to the furniture and unit store LV main board at high level through the ground floor, on containment.

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10.0 LV Distribution Cables

10.1 Introduction

All distribution cables will be XLPE SWA LSZH.

10.2 Replacement of the Existing LV Supply cables to the Bus Eireann Garage

The existing LV supply cables serving the Bus Eireann Garage, located at the south end of the site, are installed on cable ladder at high level on the outside of the north face of the furniture store and on cable ladder at high level inside the furniture store on the west side.

New LV cables are to be installed underground from the Bus Eireann LV main board to the existing Bus Eireann Garage main LV board, to avoid the routing of these cables through the furniture store.

The existing LV cables and cable ladder are to be removed.

Note that the tyre store is fed from the Bus Eireann garage LV main board.

The shutdowns required to carry out the work will have to be co-ordinated with all stakeholders on the site.

10.3 Replacement of the Existing LV Supply Cable to the CME Offices

The existing LV supply cable serving the CME offices is installed through the unit store at high level on the east side and feed the existing CME LV main board top entry (located inside the existing main door).

New LV cables are to be fed from the existing 125A MCCB in the Bus Eireann LV main board by new underground to the existing CME LV main board.

The cable will enter the building and rise to serve the existing CME LV main board.

The existing LV supply cable will be disconnected and removed.

10.4 New Furniture Store and Unit Store LV Supply cable

A new LV supply cable will be installed in new underground ducting between the Dublin Bus LV main switchboard 630A MCCB labelled for future power factor correction and the new furniture and unit store LV main board.

10.5 New Dublin Bus Training centre LV Supply Cable

The existing LV supply cable serving the existing Dublin Bus Training Centre LV main board is to be disconnected and removed.

A new LV supply cable is to be provided from a spare 125A MCCB on the Dublin Bus LV main board. The new LV supply cable will be installed in new underground ducting to the new Dublin Bus Training Centre LV main board.

11.0 General Services and Small Power

11.1 Introduction

General services and small power supplies will be provided to serve desk mounted equipment, fixed equipment, IT equipment and fire and security equipment.

It will take the form of 13A switched socket outlets, switched fused flex outlets with indicators and unswitched fused flex outlets with indicators.

The wiring will generally be singles LSZH 4 mm² in conduit and trunking.

11.2 Furniture and Unit Store

The furniture and unit store workstations will be provided with 2 no twin switched 13A under desk socket outlets below the desks, with the exception of the CCO area that will have 4 no twin 13A socket outlets. 1 no 13A twin desk top mounted socket outlet will be provided at each workstation with 2 no USB type C outlets, on each floor.

The ground floor outlets will be provided by desk top modules plugged into dado trunking where workstations are beside walls, chased into walls or in floor boxes cast into the floor.

The first floor outlets will be provided by desk modules plugged into power track located under the raised floor.

Power points will be provided for the following:

- AVL (Automatic Vehicle Location System)
- Ticketing System
- Printers
- AV equipment and screens
- Digital Signage
- Hand Dryers
- Water Heaters
- Electric Showers
- Fire Alarm Equipment
- Security Equipment

Dedicated power supplies will be provided from local distribution boards to data cabinets. Each data cabinet will have rack mounted UPS back up, as agreed with Dublin Bus IT department.

11.3 Dublin Bus Training Centre

The Dublin Bus Training Centre workstations will be provided with 2 no twin switched 13A socket outlets below the desks and 1 no 13A twin switched socket outlet with 2 no USB type C desk top mounted outlets will be provided at each workstation on each floor.

The ground floor outlets will be provided by desk top modules plugged into dado trunking where workstations are beside walls, chased into walls or in floor boxes cast into the floor.

The first floor outlets will be provided by desk modules plugged into power track located under the raised floor.

Power points will be provided for the following:

- Compressor/Various Machines
- Hand Dryers
- Water Heaters
- Electric Showers

- Fire Alarm Equipment
- Security Equipment

In the workshop area the following socket outlets will be provided mounted at the work benches and fed from a dedicated distribution board:

- 230V switched 13A twin socket outlets
- 230V industrial outlet
- 400V industrial outlet
- 110V socket outlet
- 24V socket outlet

The 110v and 24V outlets will be fed from central transformers located at the dedicated distribution board.

Emergency stops will be provided at the work bench locations, required.

12.0 EV Chargers

12.1 EV Charger Points

5 no 22kW EV charger points will be provided to charge electrical cars.

The supplies will be derived from the furniture/unit store.

The cables feeding the chargers will be installed in new underground ducting to the charging points.

The location of the charging points are located to the west of furniture store. The final locations are to be confirmed by Dublin Bus and the architects.

13.0 Supplies for Mechanical Plant

13.1 Mechanical Plant Supplies

New electrical supplies will be provided to suit the new mechanical plant.

Electrical Supplies to the mechanical plant will entail the following items:

- Heat Pumps
- Circulation Pumps
- Air Handling Units
- Internal ventilation Units
- MCCs
- Air Conditioning Units
- For the comms rooms
- Controls Sensors and Equipment

14.0 Lighting

14.1 Furniture and Unit Store General & Emergency Lighting Systems

General Lighting will be provided by means of LED linear suspended luminaires to suite the workstations and the structure.

Absence/presence lighting controls combined with daylight harvesting will be installed to provide an energy efficient lighting installation.

The emergency lighting will be a mixture of combined general and emergency lighting and discrete emergency luminaires. Exit signs will generally be suspended blade type. The emergency lighting will comply with IS3217: 2013: + A1: 2017. All emergency lighting will be self-contained 3 hour non-maintained, with the exception of exit signs which will be self-contained 3 hour maintained.

The wiring will be LSZH 2.5 mm² single cores in trunking and conduit.

All luminaires will be agreed with the architects.

14.2 Dublin Bus Training Unit General & Emergency Lighting Systems

General Lighting will be provided by means of LED linear suspended luminaires to suite the workstations and the structure.

The lighting in the workshop training area will be as follows:

- Linear LED IP65 suspended luminaires at high level with lighting controls
- Linear LED IP65 wall mounted luminaires in the inspection pit with local switching
- Linear LED IP65 wall mounted luminaires located over the workshop workstations with local switching

Absence/presence lighting controls combined with daylight harvesting will be installed to provide an energy efficient lighting installation.

The emergency lighting will be a mixture of combined general and emergency lighting and discrete emergency luminaires. Exit signs will generally be suspended blade type. The emergency lighting will comply with IS3217: 2013: + A1: 2017. All emergency lighting will be self-contained 3 hour non-maintained, with the exception of exit signs which will be self-contained 3 hour maintained.

All luminaires will be agreed with the architects.

15.0 External Lighting

15.1 Building Mounted External Luminaires

Building mounted external combined general and emergency luminaires will be provide over external doors.

Control will be by astronomical time clocks located in the local distribution boards.

15.2 Pole mounted External Luminaires

Pole mounted external luminaires will be provided to illuminate external areas previously illuminate off the furniture store and unit store.

Control will be by astronomical time clocks located in the local distribution boards.

15.3 New Courtyard Area

Decorative pole mounted luminaires, inground luminaires and bollards will be provided to illuminate the new plaza area.

The lighting arrangement will be agreed with the architect.

Control will be by astronomical time clocks located in the local distribution boards.

16.0 Fire Alarm and Security Systems

16.1 Furniture and Unit Store Fire Alarm System

The furniture and unit store will be provided with an addressable fire alarm system, installed to L1 standard as set out in IS3218: 2013 +A1: 2019.

The system will be open protocol and consist of the following:

- Fire alarm panel located the main entrance.
- Smoke and heat detectors and break glass units.
- Beam detectors to protect the first-floor areas with high apex roofs.
- Interfaces with the security systems, mechanical systems, lifts, and security system.
- A digi dialler connection to an external alarm company or internal security base.

The wiring will be enhanced PH120 fire alarm cables.

16.2 Dublin Bus Training Centre

The furniture and unit store will be provided with an addressable fire alarm system, installed to L1 standard as set out in IS3218: 2013 +A1: 2019.

The system will be open protocol and consist of the following:

- Fire alarm panel located the main entrance.
- Smoke and heat detectors and break glass units.
- Beam detectors to protect the first-floor areas with high apex roofs.
- Interfaces with the security systems, mechanical systems, lift and security system.
- A digi dialler connection to an external alarm company or internal security base.

The wiring will be enhanced PH120 fire alarm cables.

16.3 Fire Strategy

The fire alarm systems will be designed in accordance with the fire consultants fire Strategy.

17.0 ICT Enabling Works

17.1 Introduction

The existing incoming fibre optic fibre cable into the Broadstone Complex comes in underground from the Phibsborough Road underneath the arch and is terminated in the existing Gig E Room in the unit store comms room. This connection is provided by Irish Rail.

The existing incoming fibre optic eir 200MB connection into the Broadstone complex comes in underground from the north end of the complex. It terminates in the Procurement Building IT Room.

From the Gig E Room fibre optic cable connections are provided to the Bus Eireann Garage, Other Bus Eireann buildings and to the existing Dublin Bus CCO building comms room. The Bus Eireann Garage fibre optic cable, fed from the Gig E Room is routed through the furniture store and will need to be removed.

Another fibre optic cable connection is provided from the Procurement IT Room to the existing Dublin Bus CCO building comms room, thus providing the existing Dublin Bus CCO building with resilience, if one of the fibre optic links fails.

The Bus Eireann existing system does not have 2 no fibre optic links and therefore has no resilience or diverse routes if the main optical fibre connection fails.

The Gig E Room must be kept live during the refurbishment of the furniture and unit store as Bus Eireann has no resilience built into its network. This causes difficulties as a new floor slab is to be constructed above the Gig E Room as part of the refurbishment works. This is to be coordinated with the architects.

The existing CCO building also has a fibre optic link to the Dublin City Council (DCC) traffic information to be kept functioning. This is installed directly from the main entrance to the complex and terminated in the existing CCO building.

The existing PABX cabling and punch down frames in the Gig E Room are to be maintained as not all locations in the Broadstone Complex use VoIP telephones.

This section should also be read with the e-mail from Irish Rail, sent 03-06-2022 setting out the Dublin Bus IT requirements.

17.2 New Bus Eireann Fibre Optic cable

The existing fibre optic cable serving the Bus Eireann Garage will be stripped out along it's entire route through the furniture store, trye store and in the underground duct.

A new fibre optic cable will be provided along a new underground ducting route around the furniture and trye stores to the existing Bus Eireann Garage comms room.

17.3 Removal of the Existing CCO building

We believe that the existing CCO building will be demolished after the furniture and unit store are refurbished (to be clarified by Irish Rail).

At present there are 2 no diverse fibre optic cable links to the existing CCO comms room. There are links to other areas and WiFi points located externally to serve the bus parking areas. It was noted on the site walk 27/05/2022, that the Dublin Bus Phibsborough Depot and external WiFi will be required to be maintained after removal of the existing CCO building.

To maintain the existing services following demolition of the existing CCO building, a kiosk will be provided adjacent the existing CCO building. New fibre optic cables will be provided to replace the existing fibre optic cables in new underground pipe ducts.

17.4 Dublin Bus Training Unit Fibre Optic Cable

The existing Dublin Bus Training Unit comms room is provided with a fibre optic cable connection from the Procurement IT Room.

A new fibre optic cable will be provided in new underground ducting from the Procurement IT Room to the new Dublin Bus Training Unit comms room.

17.5 Bus Eireann CME Offices Fibre Optic

The existing Bus Eireann CME offices fibre optic cable from the Gig E Room is routed through unit store.

A new fibre optic cable will be provided in a new external underground duct over to the existing CME offices comms cabinet.

The existing fibre optic cable will be stripped out.

18.0 New ICT Installations

18.1 Furniture and Unit Store

New fibre optic cables will be provided to the furniture and unit store by diverse routes to the new main comms room. One fibre optic cable will be from the Gig E room and the other from the Procurement IT Room.

The new local comms rooms will be served from the new main comms room by fibre optic cables by diverse routes.

All comms rooms will be provided with 42U high 800mmx800mm cabinets.

The cabinets shall be equipped with fibre optic patch panels, copper patch panels, rack mounted UPS back up and double layered switches. The switches will be client supply.

It has been agreed with the Dublin Bus IT Department that CAT 6A cables will be installed throughout.

The CCO unit on the first floor will be provided with 3 no CAT 6A data points. All other areas will be provided with 1 no CAT 6A point.

All telephones will be VoIP.

Active equipment will be provided by the client.

Data points will also be provided for the following:

- Printers
- WiFi
- Projectors
- Meeting rooms requirements
- Digital signage
- AVL and ticketing external access points
- Tech development and ticket office
- Additional desks/workstations that may arise
- DCC traffic information
- External WiFi points for AVL and ticketing

The existing router located in the existing CCO comms room, used for the bus drivers canteen and WiFi points, will be relocated to the new main comms room, located on the ground floor.

All active equipment will be supplied by Dublin Bus.

All the CAT 6A and fibre optic cables in the building will be contained on cable tray/basket.

Wiring to the desks will be provided to suit the desk design.

All cables installed in the first floor, will be installed on cable tray within the floor void.

Wall mounted points will be installed in galvanised steel conduit, where they are recessed into walls they will have to be agreed with the architect.

18.2 Dublin Bus Training Unit

A new optical fibre cable will be provided from the Procurement IT Room to the new comms room in the Dublin Bus Training Unit. It will be installed underground using the existing ducts, where possible.

The comms room will be provided with 42U high 800mmx800mm cabinets.

The cabinet shall be equipped with fibre optic patch panels, copper patch panels, rack mounted UPS back up and double layered switches. The switches will be client supply.

Where raised floors are provided, the CAT 6A cables will be installed on cable tray in the floor void.

Where raised floors are not provided the CAT 6A cables will be installed in floor boxes and galvanised conduit cast into the floor.

Wall mounted outlets will be installed in galvanised steel conduit, where they are recessed into walls they will have to be agreed with the architect.

All telephones will be VoIP.

Data points will also be provided for the following:

- Printers
- WiFi
- Projectors
- Meeting rooms requirements
- Digital signage
- Additional desks/workstations that may arise

18.3 External WiFi and Kiosk Installation

To maintain external WiFi coverage and the connection to Dublin Bus Phibsborough Depot, a Kiosk will have to be provided to replace the existing comms facilities served from the CCO comms room. The CCO building will be demolished. The Kiosk will be located near to the location of the existing CCO building. All work in relation to this work will have to be undertaken with the agreement of the stakeholders.

A new fibre optic cable will be provided from the Procurement IT Room to the Kiosk to form one of the resilience routes to the Kiosk. The other resilience route will be an optic fibre cable from Gig E Room.

The Kiosk will house the following:

- PoE Switches
- Patch Panels
- UPS
- LV Power supplies

New external WiFi points will be provided on existing and new lighting poles. The cable type will depend on the length of run from the Kiosk.

18.4 Gig E Room

The existing Gig E Room has the following services cabinets located in it:

- In coming fibre optic cable connections out to Dublin Bus and Bus Eireann
- CCTV cabinet

The Dublin Bus cable connections go to the following:

- Procurement Building
- Dublin Bus Training Area
- Broadstone Technical Office
- Dublin Bus Depot
- CCO

The Bus Eireann (BE) cable connections go to the following:

- BE CME Department
- BE Main Building
- BE Security Hut
- BE Cash Office

- BE Area Office Cab 1
- BE Garage Inspectors
- BE Trye Store
- BE Garage Regional Engineers Office
- BE Areas Office Cab 2
- BE Garage Parts Store

As mentioned previously the Dublin Bus network has resilience through the Procurement Building IT Room but the Bus Eireann network has no resilience provided.

It is possible to take down the Gig E Room and leave the Dublin Bus network operational but all of Bus Eireann would be lost.

At some stage during the refurbishment, the Gig E Room will need to be shut down. This will require detailed phasing of the project during the detailed design stage.

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19.0 Security

19.1 Intruder Alarm

Separate standalone intruder alarm systems will be provided for the furniture /unit store and the Dublin Bus Training Unit.

The intruder alarm systems will consist of the following:

- Intruder alarm keypad located at entrance door
- Intruder alarm panel and PSU located in a cupboard
- External sounder
- Door and window contacts
- PIRs
- Digi dialler to external monitoring station
- Wiring installations

19.2 Access control

Separate standalone access control systems will be provided for the furniture /unit store and the Dublin Bus Training Unit.

The access control systems will consist of the following:

- Keypads (Type to be confirmed by Irish Rail)
- Electric locks (Types to be confirmed by the architect)
- Door releases
- Control panels
- Wiring installations

19.3 CCTV

Separate standalone Digital CCTV systems will be provided for the furniture /unit store and the Dublin Bus Training Unit.

The CCTV systems will consist of the following:

- External IP CCTV 3MP cameras, building mounted
- Internal IP CCTV 3MP cameras
- NVR(s)
- Monitors
- Wiring Installations

The recording duration to be confirmed by Irish Rail.

20.0 Stripping Out

20.1 Existing LV Installations

The existing LV installations in the following buildings are to be stripped out and made safe:

- Furniture Store
- Unit Store
- Dublin Bus Training Unit
- Existing CCO building

20.2 Existing ELV Installations

The existing ELV installations in the buildings below, are to be stripped out. The appointed electrical contractor will have to survey each building before any work commences.

- Furniture Store
- Unit Store
- Between the Unit store and the CME offices
- Between the Furniture Store and the Bus Eireann Garage installed at high level
- Between the Furniture Store and back to the building with the main switch board

21.0 Lifts

21.1 Furniture and Unit Store

2 no lifts will be provided for travel between the ground and first floor, 1 no located in the furniture section and the other in the unit store section.

21.2 Dublin Bus Training Unit

A lift will be provided for travel between the ground and first floor.

22.0 Sustainability

22.1 Sustainability Approach

The sustainability strategy for the project is one of reuse of the building where possible, the use of passive and efficient mechanical and electrical systems and incorporating renewable energy within the design of the project. The sections below outline the sustainable elements of the project.

22.2 Building Fabric

A holistic sustainable approach has been adopted for the building fabric. Where possible elements of the building fabric will be reused to limit the amount embodied carbon that is required in the construction of the new spaces, e.g. as part of the project the external walls are to be maintained, and enhanced with insulation to provide a low energy external envelope while reusing the existing building and limiting the amount of up-front embodied carbon spent on the building,

For all elements of the building envelope that are to be replaced with new materials, the build-up of these elements will as a minimum meet the current requirements of Part L requirements for thermal performance to reduce the amount of heat loss and energy required to heat the building. All glazed section will incorporate solar control layers to reduce the amount of solar gain to the spaces while maintaining sufficient levels of natural daylight to avoid the use of electric lighting where every possible with the building.

22.3 Natural Ventilation

As part of the sustainable strategy, a natural ventilation study will be produced to forecast and evaluate the thermal comfort conditions in the Dublin Bus Headquarters and Technical Training Centre buildings across all year. The study will predict the areas of the buildings that have the capability to be naturally ventilated to reduce the amount of mechanical cooling wherever possible. This study will be carried out using the IES Virtual Environment suite of simulation software and will analyse the temperature that will be achieved in the space and the levels of carbon dioxide to ensure that each space that is to be naturally ventilated does not exceed the limits set out by the CIBSE for natural ventilation.

22.4 Building Services

Using energy efficient building service equipment, the operational energy of the building will be kept to a minimum while providing a comfortable environment for the occupants.

The building services will adopt the strategy below to ensure the most advanced low energy equipment and systems are selected to provide the lighting, heating, cooling and ventilation for the occupants.

- Specify high efficiency low energy LED fittings with presence and day light control where appropriate in each space.
- Specifying high efficiency heating and cooling plant, including a decarbonised solution utilising a Hybrid VRF System.
- Providing natural ventilation where applicable and low energy ventilation in areas that require to mechanical ventilation.
- Specifying fans with low specific fan powers and variable speed drives.
- Specifying pumps with variable speed drives.

22.5 Renewable Energy

It is proposed to provide Photovoltaic panels (PV) on the roof of the buildings to provide the base load of energy that will provide sustainably generated electrical energy for use in the buildings throughout the year.

It is proposed to maximise the area of PV provided on the roof to offset the amount of electrical energy required for the building. With the area of roof that is available for the installation of PV, we estimate that a minimum of 10-20% of the annual energy requirement will be satisfied by the PV panels.

Existing natural gas fired heating will be removed from the Technical Training Building. Space heating in the headquarters building and technical training building will be provided by hybrid variable refrigerant flow (HVRF) heat pump systems. The HVRF heat pump systems will contribute to decarbonisation of the space heating installations as the proportion of electricity generated by renewable sources increases.

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