Manchester Central University NHS Foundation Trust

Manchester Royal Infirmary

Life Cycle Works – Steamline & Condensate Infrastructure Upgrades

Supporting Information Document

Company	CM Oxendale Ltd & Bradbury Consulting	**Job Reference**	2022.096
Site Address	Manchester Royal Infirmary, Oxford Road, Manchester, M13 9WL		
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Description of the Works

The works associated with this application are for the installation of replacement steam and condensate lines to serve the Phase I/II buildings, west side of the main site, and also a set of connections which will be left for an ongoing development named Project RED (Manchester Royal Infirmary Emergency Department). This a new A&E department which requires the new steam connections for its heating and hot water amenities.

The new pipelines will replace the existing lines which are now undersized due to the new Project RED development and for the future expansion of the site and are reaching the end of their designed lifespan.

Two separate 300mm diameter steam lines, two separate 159mm diameter condensate lines and mounting space for a future 150mm diameter cold water main are to be installed as part of this project which will emanate from the existing main boiler house (Energy Centre) and travel along North Road to the Phase I/II buildings.

The new steam and condensate design is a N+1 arrangement with 100% resilience i.e. 2 No steam lines & 2No condensate lines should one of the steam lines fail.

This project forms part of the on-going Life Cycle works being undertaken at the Manchester Royal Infirmary site. This project is therefore considered a public service infrastructure development & is fundamental to the ongoing safe operation of the hospital site.

Existing Installation Arrangement

The existing installation consists of a single 250mm diameter steam line and single 159mm diameter condensate line which run between the Energy Centre Building and the Phase I/II MRI Building within an existing dilapidated cladded above ground service corridor along the North Road boundary. This is denoted on the site; elevation & street scene drawings provided and can be seen on the appended Photographic Schedule.

The steam lines then enter a small below ground service duct, travel beneath North Road and onto the roof of the Phase I/II building via an existing riser, where they then travel across the roof to serve various roof mounted plantroom locations across the site.

The existing lines are now undersized for the expanding site and the Project RED development and are reaching the end of their designed lifespan.

Proposed Installation Arrangement

The proposed installation consists of 2 x 300mm diameter steam lines (550mm diameter once insulated & clad), 2 x 159mm diameter condensate lines (350mm diameter once insulated & clad) and a future 150mm diameter cold water main (300mm diameter once insulated & clad).

This is in order to provide an increase in capacity to suit the expanding site and the Project RED development and to allow one set of mains to be shut down for maintenance purposes in the event of a failure whilst the other remains live.

The new steam and condensate design is a N+1 arrangement with 100% resilience i.e. 2 No steam lines & 2No condensate lines should one of the steam lines fail.

Due to the increase in size / number of steamlines and the need to carry out the proposed installation whilst the existing arrangement remains operational - The existing service ducts do not have capacity to accommodate the proposed installation.

Therefore, the proposed installation involves the new mains being installed on top of the existing above ground service corridor along the North Road boundary, mounted on a new steel support frame, as shown on enclosed drawings.

The new mains will then cross North Road via a new gantry support structure which will carry the new pipework at high level onto the roof of the Phase I/II MRI building. The mains will then be distributed across the roof areas to various existing roof mounted plantroom locations.

There is also a set of connections which will be left for a ongoing development named Project RED (Manchester Royal Infirmary Emergency Department). This a new A&E department which requires the new steam connections for its heating and hot water amenities.

Option Appraisal

Option 1 – Replacement underground service duct

The initial design intent for the scheme was to install a new, larger underground service duct to replace the small duct which carries the existing steamline installation arrangement beneath North Road to the Phase I/II building currently.

This option would have allowed the new installation to pass underneath North Road without the need for an exposed steel gantry structure.

As part of the appraisal for Option 1, a ground penetrating radar survey was carried out along the extent of North Road where the new underground service duct would be located.

This survey confirmed the locations of a large amount of below ground services in the vicinity of the proposed service duct location which included:

- Foul & surface water sewers, their associated manhole chambers and interconnecting pipework.
- Electricity cables.
- Gas pipework.
- Water mains.
- Fibre & telecoms cables.

These services are all live and serve various parts of the existing MRI buildings at the site – Therefore it was deemed non-viable to excavate and install a new below ground service duct without significant disruption to the operation of the hospital site itself and a prolonged closure of the road network within the site whilst this large excavation took place.

Therefore Option 1 was discounted.

Option 2 – Above ground gantry structure to 'Icon' building

As an underground service duct was deemed unviable, Option 2 consisted of the installation of a new above ground gantry structure to carry the new steamline installation up and over North Road.

The initial design intent for this option was to keep the gantry structure as compact as possible in order to minimise it's visual impact. To do this, the gantry was to take the shortest and most direct crossing location from the end of the existing above ground service corridor on the North Road boundary, across to the roof of the 'Icon' building as labelled on the provided site plan drawings.

This option was progressed to a detailed design phase, appeared to be the most viable option initially and was included in the original planning submission. However, during the detailed design phase it was discovered that the 'Icon' building (as labelled on the provided site plan drawings) was of a timber framed construction and that the lifespan of this building would not outlast the lifespan of the new steamline.

Therefore, the structural capacity of the 'Icon' building was deemed unsuitable to support the weight of the new steamline installation and Option 2 was discounted.

Option 3 – Above ground gantry structure directly to Phase I/II Building

Adjacent to the existing above ground service corridor on the North Road boundary is a detached sub-station building (as labelled on the provided site plan drawings). This building is operated by the utility provider and is subject to various easements which prevent the new gantry being positioned in the airspace over the sub-station.

This therefore dictates the proposed larger diagonal route of the gantry structure as shown on the revised site, elevation & street scene drawings being submitted as part of this application.

The size and scale of the new gantry structure and the steamlines themselves have been kept to a minimum dictated by the following design principles:

- The required diameter of the new steam, condensate and water main lines themselves.
- The weight / loading of the new lines therefore dictates the size of the steel members required to support the structure.
- The height of the new gantry structure is dictated by the need to allow the passage of heavy goods vehicles along North Road, which have a maximum legal height of 4.95 metres.

Due to the above design principles needing to be met and Option 1 & 2 being deemed non-viable - The proposed Option 3 gantry structure has therefore been deemed the only viable option to carry the required steamlines over North Road to the Phase I/II building.

Therefore, this option has been progressed through a substantial detailed design process to date.

Visual Impact

The revised planning submission documentation includes further information and details on the visual impact of the proposed works, including a view assessment document, 3D images, architectural elevations, structural isometric drawings as well as street scene drawings which show the scale of the works in relation to their existing surroundings.

The visual impact of the steamline installation along the boundary of North Road is deemed to be relatively low impact when viewed from the surrounding buildings and public roads – Namely Upper Brook Street (A34) due to the fact that the steamline will only be marginally visible from street level above the boundary wall, except for 2 locations as labelled on Elevation E.

The proposed gantry structure as it rises up and over North Road is the main element of visual impact being applied for as part of this planning application.

Whilst the addition of aesthetic external cladding of the gantry structure has been considered at length and was included on the original planning submission drawings, this was discounted as a viable option for the following reasons:

- The exposed structure of the gantry and the steamlines themselves allow wind and rain to pass through the structure – Therefore reducing wind loading and subsequently the overall size of the structural members required.
- Fitting the gantry with cladding would increase wind loadings on the structure and therefore the overall size of the gantry structure would increase.
- Enclosing the gantry structure would then create the need for walkways, work platforms, ladder and stairway access to be installed throughout the gantry in order for operatives to access and maintain the steamlines themselves. This would increase the size and visual impact of the gantry structure substantially.
- Keeping the structure of the gantry and the steamlines themselves exposed allow maintenance to be carried out using MEWP & Cherry picker units if necessary.

Proposed Materials

The following materials will be used in the proposed installation:

- Galvanised steel support frame mounted over existing service corridor, fixed back to existing masonry boundary along North Road.
- Galvanised steel gantry support structure
- Roof mounted pipework runs to be supported via new ‘Roof-pro’ support systems as per the appended Data Sheet example.
- All exposed pipework is to be finished in an insulated metal cladding system as per the appended data sheet / example images. This will be in a ‘dull’ finish to ensure it does not cause glint & glare issues to any surrounding areas.