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1. **INTRODUCTION**

75 Fox Street is a multi-storey building located on Fox Street between Sauer Street and Simmonds Street in Johannesburg, Gauteng (see Locality Map):

![Locality Map](image)

The project brief, as issued by GFA, was to conduct an initial assessment of the building HVAC infrastructure and systems and to provide recommendations regarding the repairs and renovations of the building.

### 1.1 Design Criteria and Specifications

This project will be implemented in compliance with all the requirements of the National Building Regulations and SANS10400, with specific focus on Part O (Lighting and Ventilation) and Part T (Fire Protection) of the regulations.

### 1.2 Scope of the Services Scheme Report

This report deals with the HVAC services to be implemented based on the existing systems and proposed architectural changes to the building. This report is based on a visual inspection only of the applicable service installation.
2. PROJECT SUMMARY

2.1 Project Description

75 Fox Street is a multi-storey building located on Fox Street between Sauer Street and Simmonds Street in Johannesburg, Gauteng. The building is currently in use. The HVAC system is installed and currently operational.

3. INSPECTION

This report is based on a visual inspection only of the applicable service installation.

3.1 System Description

75 Fox Street is conditioned by a chilled water system. Two York water-cooled chillers are located in a plant room on 9th Floor. Chilled water is fed to the fresh air units serving the internal zones and fan coil units (FCU’s) through insulated steel chilled water piping. Fresh air is distributed to the spaces via three custom-built air handling units in the 9th floor plant rooms. Chilled water is fed to fan coil units (FCU’s) in the floor void that feed conditioned air to the office spaces via floor grilles.

The ablutions are mechanically ventilated by roof-mounted fans.

The basement parking areas are mechanically ventilated.

The computer rooms are cooled by dedicated water-cooled down-blow units. Dedicated cooling towers located in the 9th floor and 8th floor plant rooms reject heat from these units.

3.2 Chillers

Two York water-cooled screw chillers are located in the 9th floor mechanical plant room. The chiller specifications are as follows:

<table>
<thead>
<tr>
<th>Make</th>
<th>York</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>YS DA CA S3 5 CH A</td>
</tr>
<tr>
<td>Refrigerant</td>
<td>R-22</td>
</tr>
</tbody>
</table>

Table 1 - Chiller Specifications

The chillers appear to have been manufactured in the early 1980’s. Both appeared to be operational at the time of our inspection. However, given their age and operating refrigerant (R-22), we would recommend replacement of the chillers.
Chiller 2 was not running at the time of our inspection due to low ambient temperatures.
3.3 Cooling Towers

Each chiller is cooled by a single BAC open circuit cooling tower located in the 9th floor plant area. The cooling towers are ducted through the roof slab above to discharge to atmosphere. The details of the cooling towers are as follows:

<table>
<thead>
<tr>
<th>Make</th>
<th>BAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>VXT N215C</td>
</tr>
</tbody>
</table>

Table 2 – Cooling Tower Specifications

From the serial numbers we estimate the towers were installed in 1981.

Both cooling towers were operational at the time of our inspection. Both towers appear to be in fair condition with surface corrosion evident. The internal condition and the condition of the tubes could not be ascertained.
The cooling towers are ducted through the plant room roof slab and discharge to atmosphere at roof level through Mentis Grate grids.

The data centre CRAC units are cooled using BAC closed circuit cooling towers. The data centre towers are located in a dedicate plant area on 9th floor and 8th floor. All four towers discharge through the slab in a similar fashion to the main plant towers.

The specifications of the data centre towers are as follows:
Table 3 – Data Centre Cooling Tower Specifications

<table>
<thead>
<tr>
<th>Make (9th Floor)</th>
<th>BAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (9th Floor)</td>
<td>VXI 36-2</td>
</tr>
<tr>
<td>Make (8th Floor)</td>
<td>Evapco</td>
</tr>
<tr>
<td>Model (8th Floor)</td>
<td>LSW 29C</td>
</tr>
</tbody>
</table>

All the towers appeared to be in fair condition and operational at the time of our inspection. No significant corrosion was evident though the tower internals could not be inspected.

3.4 Water Treatment

The water treatment plant is located in the 9th floor plant room. The maintenance company details could not be ascertained.

The plant appeared to be operational at the time of our inspection and there was sufficient dosing chemical in the tanks.

3.5 Chilled Water, Condenser Water Pumps

All chilled water and condenser water pumps are located in the various plant areas (9th floor main plant, 9th floor data centre plant, 8th floor data centre plant). The pumps are as follows:
Chilled Water & Condenser Water

Table 4 – Pumps

All the pumps appeared to be operational at the time of our inspection. Although these would not require immediate replacement, replacement would be required to match chiller duties if the chillers are replace.

<table>
<thead>
<tr>
<th>System</th>
<th>Status</th>
<th>Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled Water</td>
<td>4 off, 9th</td>
<td></td>
</tr>
<tr>
<td>Condenser Water</td>
<td>2 off, 9th</td>
<td></td>
</tr>
<tr>
<td>Data Centre Set 1 Condenser</td>
<td>2 off, 9th</td>
<td></td>
</tr>
<tr>
<td>Data Centre Set 2 Condenser</td>
<td>4 off, 8th</td>
<td></td>
</tr>
</tbody>
</table>

### 3.6 Chilled Water Reticulation

Chilled water is be fed to the air-handling units (AHU’s) and fan coil units (FCU’s) through insulated steel chilled water piping. Condition of the insulation is fair, with damage evident where equipment has been repaired or replaced.

The chilled water piping would be reusable with minor repair and modifications where required.
3.7 Condenser Water Reticulation

The condenser water is fed to the cooling towers through uninsulated steel piping. The piping is in good condition and reusable.

3.8 Air Handling Units

Three Trane fresh air units located in the 9th floor plant room feed treated fresh air to the building. The AHU’s filter the air and are capable of heating cold air through electric resistance heaters or cooling through a chilled water coil.
The unit casings are in good condition and reusable. The heaters are in good condition and operational. The filter banks are generally in good condition though one required repair.

The coils appear to be in poor condition and would require replacement.
3.9 Fan Coil Units

Fan Coil Units (FCU’s) located in the floor voids feed cold air to the office spaces via flexible ducting and floor grilles. The make and models of the units could not be ascertained.

The flow of chilled water is regulated through a 2-way valve at the FCU coil connection.

These FCU’s appear to have reached the end of their economical life expectancy and would require replacement.

3.10 CRAC Units

The data centre is cooled using the following:

- 4 off Liebert Hiross Model 65U down-blow close-control units.
- 8 off Liebert Hiross LMD37W down-blow close-control units.

Various floor standing split units have been used to supplement cooling to the data centre.
The CRAC units are water-cooled package units with the compressors, evaporators and condensers located in the indoor units. Condenser water is fed to the cooling towers in the 8th floor and 9th floor plant rooms.

Although most of the units were operational at the time of our inspection, the installation of filter-driers to all but one of the units indicates that most of the compressors have already been replaced. Also, many of the internal components and casings are rusted as a result of leaking humidifiers. These units require replacement.
### 3.11 Control System

The main plant is controlled by a central Trend control system. The control system is a combination of the original pneumatic valves with new electric actuators. We recommend replacement of this hybrid system with a single new electronic system.

![Figure 34 – Trend Wall Sensor](image)

![Figure 35 – Trend Controllers](image)

### 3.12 Air Distribution

Air is supplied to the office spaces through floor grilles.

![Figure 36 – Floor Grille](image)

![Figure 37 – Floor Grilles](image)

We noted that the grilles are not fitted with dampers for balancing. Furthermore, the internal grids have been replaced in several grilles, leading to different types of grilles in certain areas. We would recommend replacement of the floor grilles with grilles with integrated dampers to allow for balancing and improved control.
3.13 Toilet Ventilation

The ablutions were mechanically ventilated. Toilet fans located at roof level extract air from the ablutions via ducting and disk valves.

All the systems were operational at the time of our inspection.

Some of the disk valve disks were missing and would require replacement.

3.14 Basement Ventilation

The basement parking areas are ventilated mechanically.

The ducted system at gridline A12 was operational at the time of our inspection.

The system at gridline A1 was not running at the time of our inspection.
3.15 Split Units

Various split units have been installed to technical and ancillary areas for cooling, especially in the basement areas.

These were mostly operational at the time of our inspection.

Figure 42 – UPS Room LG Split Unit

Figure 43 – LG Condensers in Basement
4 RECOMMENDATIONS

The remedial work required to meet the minimum national standard and reinstate the HVAC systems is recommended and a high level budgetary cost for the remedial work is presented.

4.1 HVAC

1. Remove and scrap existing chillers.
2. Install new water-cooled chillers.
3. Remove and scrap cooling towers.
4. Install new cooling towers and modify piping to suit.
5. Replace chilled water and condenser water pumps to suit.
6. Remove and scrap existing Air Handling Unit (AHU) cooling coils and scrap.
7. Install new AHU cooling coils and replace fan drive belts. Service motors where necessary. Repair filter banks and heaters where necessary.
8. Refurbish plant room areas and repair louvers and dampers where necessary.
9. Remove and scrap existing water-cooled computer room CRAC units and cooling towers.
10. Install new Dual Coil CRAC units sized and located to suit computer room layouts and loads in N+1 configuration.
11. Install new Data Centre chiller to feed new CRAC units.
12. Remove and scrap all existing in-floor Fan Coil Units (FCU’s).
13. Install new FCU’s, complete with new control valves and controllers.
15. Replace all floor grilles.
16. Replace missing toilet extract disk valves where necessary.