

## Information Sheet 1 – IS 1 Economic Life Factors

### A guide for building owners and managers

This information sheet is offered as an aid to Building Owners and Managers as a guide to plant life expectancies. We trust you will find it of value.

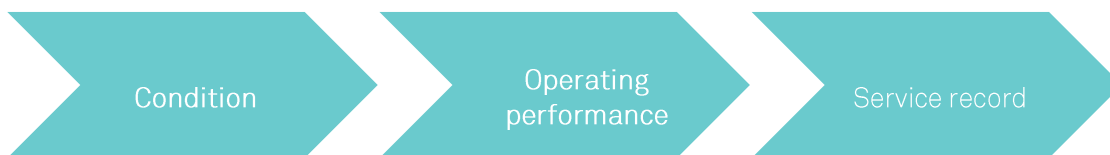
Please contact us if you require assistance with:

- Building Services Plant Condition Audit.
- Building Services Plant Operational Audit.
- Continuous Commissioning programme – (Building Performance Management).

### Plant life expectancy

When dealing with existing buildings and their Building Services plant and equipment it is essential that the future life expectancy for an individual item of plant is considered and understood.

To estimate the future life expectancy for items of plant and equipment it is important to consider the following:



This could be achieved by undertaking a building survey focusing on the following:

- Visual survey of the physical condition of the plant in operation.
- Benchmarking plant performance against an appropriate performance standard (i.e. end user comfort levels, energy usage, etc.).
- Review of the existing service and maintenance records or discussion with the existing service provider.

Such reviews would enable an engineer to assess the plant condition and estimate the remaining life expectancy before there is a significant increase in the risk of plant failure.

## Factors that influence life expectancy

The table below provides indicative life expectancies for typical items of plant and equipment found within most buildings. However, during the life cycle of a system there are many other factors that can influence the actual life of a system component, such as:

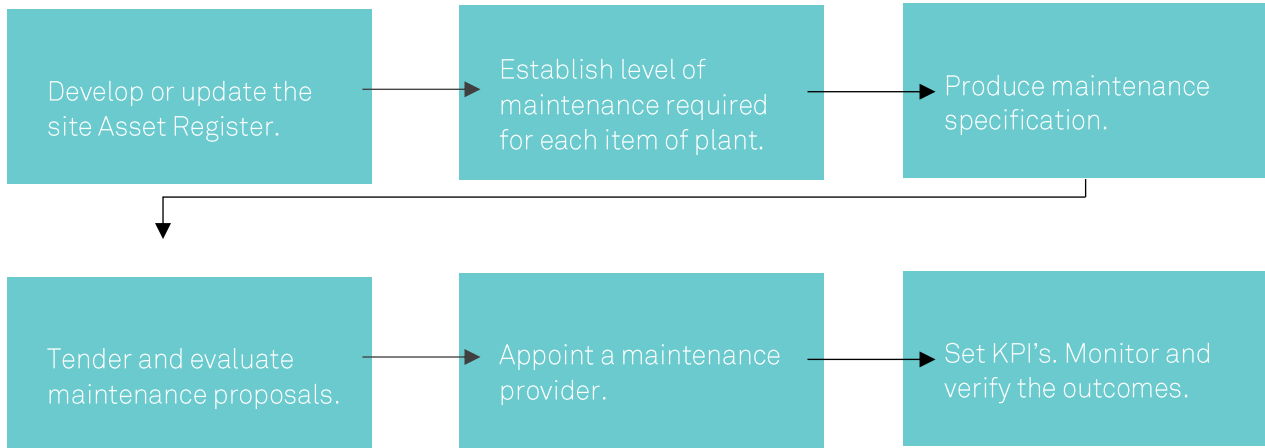
- External Environment – Polluted atmospheres due to urbanisation or proximity to airports, motorways, exposure to severe elements, and coastal conditions - i.e., salt-laden air which exists in many New Zealand locations.
- Internal Environments – Ideally these need to be dry and corrosion free.
- Technology Changes – System and equipment advances may reduce the life expectancy particularly where installed systems become unsupported by manufacturers due to next generation advances and older technologies becoming obsolete. A recent example of this is the rapidly developing VRF / VRV technology (Variable Refrigerant Flow/Volume systems).
- Design and Specification – Commercial buildings, especially those constructed in the 1980's, may show significant variations between the original design intent and the actual conditions / performance observed. This can result from changes in use, building fit-outs, poor maintenance, and changes in end-user.
- Unoccupied / Closed-down Buildings – Where systems have been out of action due to buildings being unoccupied. E.g., electric motors can absorb moisture when left off for long periods, causing issues and possible failure when they are restarted.
- Maintenance – If the standard of maintenance has not been provided in accordance with the minimum standard maintenance criteria and manufacturers recommendations.
- Hours of Operation – The indicative figures referenced in the life expectancy table are based on a 12-hour operational day 5 days per week and 8 hours during a weekend period. Plant serving extended hours facilities such as call centres, data centres etc. will have a correspondingly shorter lifespan.
- Installation Quality – The indicative figures referenced in the life expectancy table assume a high standard of installation and quality control has been implemented. Including adequate space allowance to facilitate proper maintenance.

## Actions to maximise life expectancy of building services plant & equipment.

With a focus and emphasis on existing buildings the key to maximising Building Services plant life expectancy is maintenance. Without appropriate and adequate levels of maintenance, significant increases in unforeseen failures and a consequent reduction in operating life can be expected.

Adopting a suitable maintenance policy / strategy will not only improve life expectancy, but it will also ensure that standards are maintained within the following areas: health & safety (i.e., legionella, refrigerants, etc.), energy use, environmental conditions & energy efficiency.

## SIX steps to good maintenance:



For further information / advice regarding plant life expectancy or maintenance contract procurement contact Jackson Engineering Advisers Ltd.

### Indicative life expectancies (Mechanical services only)

Source: Chartered Institute of Building Services Engineers (CIBSE) – Guide M

| Equipment item  | Indicative life (years) | General remarks & comments from recent experience  |
|---|-------------------------|--|
| <b>Heating Source</b>   |                         |  |
| Boiler Plant  | 20-25                   | Water treatment is especially important. Boiler failures can occur within 5 years unless appropriate water treatment & condition monitoring is undertaken  |
| Boiler Electrodes / Combustion Controls / Instrumentation                     | 8-12                    | High level of regular maintenance required   |
| Dosing Pots / Fans High Temp) / Flue (Mild Steel) / Water Treatment Equipment | 15                      | Flue (Mild Steel) - depends on Thickness of Metal and Corrosion Protection   |
| Flue (Stainless Steel)  | 30                      | Check Quality of Stainless Steel   |
| Gas Burners   | 15-20                   | High level of regular maintenance required   |
| Gas Distribution System for Boiler Plant                                      | 40                      |  |
| <b>Cooling Source</b>   |                         |  |
| Chillers (Centrifugal / Reciprocating / Absorption / Screw)                   | 20-25                   | Maintenance costs may depend on availability of refrigerants such as R11 or R22  |
| Air Cooled or Evaporative Condensers / Dry Air Coolers                        | 20-25                   | Dry air coolers - Consider thickness/ quality of galvanising. Condenser coil treatment and regular washing is essential in coastal environments such as Auckland and Wellington. Failures of untreated |

|   |       |   |
|---|-------|---|
|   |       | coils have been witnessed within 5 years of installation.<br>Chiller frame corrosion can also be an issue |
| Stainless Steel / Ceramic - Cooling Towers                                    | 30-35 | Higher capital cost   |
| Timber Construction / Galvanised Metal / Epoxy Treated Metal - Cooling Towers | 10-15 | Quality of timber preservation can extend life / Consider thickness / quality of galvanising              |
| Plastic Construction / Plastic Coated Metal - Cooling Towers                  | 20-25 | Consider thickness / quality of plastic.<br>Consider thickness, bonding / quality of plastic coatings     |
| <b>Water Installations</b>  |       |   |
| Chilled Water Storage Vessel (Galvanised / Copper / Mild Steel)               | 20    | Galvanised not suitable for soft water or softened water  |
| Plate Heat Exchanger  | 15    | Subject to regular cleaning   |
| Shell and Tube Heat Exchanger   | 25    |   |
| <b>Pumps</b>  |       |   |
| Base Mounted / Centrifugal / Commercial Circulating (Dual Type)               | 20    |   |
| Boiler Feed Pumps / Pipework Mounted Circulating Pumps                        | 15    |   |
| Condensate Circulating Pumps / Glandless Circulating Pumps                    | 10    |   |
| <b>Pressurisation Systems</b>   |       |   |
| Chilled Water / Heating / Combined Heating & Chilled Water                    | 20    |   |
| Expansion Vessel (Unvented Hot Water)   | 15    |   |
| <b>Pipework Systems &amp; Components</b>                                      |       |   |
| Bellow: Expansion (Steel) / Flexible (Steel)                                  | 10    |   |
| Bellow: Flexible (Rubber)   | 8     |   |
| Condensate Pipework System / Condensate Collection Vessel                     | 12    | Consider type of material, wall thickness and water treatment   |
| Expansion vessels - Open  | 10    |   |
| Expansion vessels - Closed (with Membrane)                                    | 15    |   |
| Pipework: Copper (open or closed)   | 45    | Consider tube thickness and quality of copper.  |
| Pipework: Steel (open or closed)  | 25    |   |
| Pipework: Galvanised Steel (closed)   | 35    |   |
| Pipework: Galvanised Steel (open)   | 25    |   |
| Pipework: Refrigerant Pipework Systems  | 30    |   |

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|--|-------|--|
| Pipework: uPVC   | 20    | Small bore uPVC can become brittle with age, especially when used as condenser water e.g., Hydronic units  |
| <b>Water Softeners:</b>  |       |  |
| Base Exchange  | 30    |  |
| De-Alkalisation / De-Ionisation  | 20    |  |
| Water Treatment Plant  | 15    |  |
| <b>Insulation</b>  |       |  |
| Pipework / Ductwork / Tank (Moulded or Blanket Type)                                       | 30    | Consider fire and smoke rating. Some closed cell foam insulation is breaking down before this time, especially if continuously wet, such as 24/7 chilled water plants  |
| Fire Insulation (Intumescent) for Pipes and Ducts  | 20    | Inspection for damage required at frequent intervals   |
| <b>Valves</b>  |       |  |
| Commissioning / Supply-Side Shut-Off / Mild Steel  | 25    |  |
| Motorised Control Valves / Glands  | 15    |  |
| Motorised Control Valve Actuators  | 10    |  |
| Cast Iron / Copper   | 30    |  |
| Glandless  | 20    |  |
| <b>Terminal Units</b>  |       |  |
| Radiant Heaters (Hot Water)  | 20    |  |
| Aluminium / Steel / Cast Iron - Radiators  | 20-25 | Water condition & materials in the system are important  |
| Radiator Paint   | 5     | Use correct type of paint  |
| Underfloor Electric Heating  | 20    |  |
| Underfloor Heating by Plastic Pipes (Concrete Encased)                                     | 30    | Suggest a long-term bonded warranty is obtained; Consider quality of plastic pipe  |
| Chilled Ceiling Panels   | 25    | Flexible water pipework connections 10 years (depending on type)   |
| Chilled Beams / Induction Units / Reheat Units   | 20    | Flexible water pipework connections 10 years (depending on type)   |
| Computer Room Air Conditioning / Double Duct Terminal Units / Fan Coil Units / VAV Units / | 15    | FCU's & VAV boxes often exceed this time if well maintained  |
| Split Systems / VRV or VRF Units   | 10    | Redundant technology and/or corrosion issues can reduce life expectancy below 10 years. VRV / VRF systems can suffer from poor installation (pipework leaks, poor evacuation etc.) and poor maintenance or remedial work. Outdoor unit coil treatment is essential in coastal environments |

|  |       |  |
|--|-------|--|
| Fans - Axial / Roof Mounted Units                              | 15    | Life likely to be reduced if fan motor in air stream   |
| Centrifugal Fans   | 20    | Life likely to be reduced if fan motor in air stream   |
| Propeller Fans   | 10    |  |
| <b>Ductwork Installations:</b>                                 |       |  |
| Galvanised Ductwork (Rectangular and Circular)                 | 40    |  |
| Plastic / Flexible Ductwork                                    | 15    | Expansion / risk of mechanical damage to be considered   |
| Attenuators  | 25    | Consider type of lining, adhesive and fixing of acoustic material  |
| Coils (Aluminium Fins)   | 15    | Consider quality and thickness of aluminium fins and exposure to adverse and wet external conditions.<br>Coil treatment essential for coastal environments |
| Coils (Copper Fins)  | 25    | Consider operational duty (Wet surfaces)   |
| Coils (Electric)   | 10    | Will typically last longer if air is well filtered & coils are kept clean  |
| Dampers (Automatic / Manual)                                   | 15-20 | May be less for outside air dampers in wet / coastal environments  |
| External Louvres (Steel Painted / Anodised Aluminium)          | 20-25 | Early signs of corrosion must be dealt with. Regular cleaning is important to avoid possible breakdown of surface coating                                  |
| Filters (Automatic / Electrostatic / Activated Carbon / Panel) | 15-20 | Excludes media   |
| Filters (Primary Washable)                                     | 10    | 8 hours/day; 5 days/week   |
| Filters (Primary Disposable)                                   | 0.5   | 8 hours/day; 5 days/week   |
| Filters (Secondary Pleated and Bag Types)                      | 1     | 8 hours/day; 5 days/week   |
| Filters (High Efficiency Particulate Arresting (HEPA))         | 2     | 8 hours/day; 5 days/week   |
| Fire Dampers (Curtain Type)                                    | 10    | Must be cleaned and checked for corrosion. Drop testing mandatory  |
| Fire Dampers (Curtain Type)                                    | 10    | Must be cleaned and checked for corrosion. Drop testing mandatory  |
| Extract Hoods  | 30    |  |
| Thermal Wheels   | 15    |  |
| Steam Humidifiers (Electric / Direct)                          | 8-10  | Maintenance is especially important. Scale & corrosion issues with Hard water will reduce life   |
| <b>Packaged Air Handling/Conditioning Units:</b>               |       |  |
| External   | 15    | Consider type of corrosion protection. Life may be less in coastal environments  |
| Internal   | 20    |  |
| Terminal Units (Air Systems)                                   | 25    |  |

| Controls  |    |   |
|---|----|---|
| BMS Head End (Supervisor) / Operating System  | 5  | Regular software updates are required                     |
| BMS Outstations / Plant Controller Remote Display Panels  | 10 | Redundancy due to technology advances can be an issue     |
| BMS Communications Network (Hardwiring)   | 25 | Should be 'Future proofed' with additional cable wireways |
| Electric Controls   | 20 |   |
| Electronic Controls / Hydraulic Valve Actuators   | 10 |   |
| Sensors   | 8  | Periodic loop tuning and calibration should be considered |
| Control Valves / Control Dampers / Variable Speed Drives  | 15 |   |
| Pneumatic Controls - Air Compressor / Pneumatic Controls / Dryer / Receiver / Valves, Connections | 20 |   |
| Pneumatic Valve Actuators   | 15 |   |
| Electronic or Pneumatic Interfaces / Hydraulic Valve Actuators                                    | 10 |   |
| Electronic or Pneumatic Interfaces / Hydraulic Valve Actuators                                    | 10 |   |
| Gas / Refrigerant - Leak Detection  | 10 |   |
| Water Leak Detection  | 15 |   |

Information provided by  
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