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Heating, Ventilation & Air Conditioning (HVAC) - High Efficiency Systems Strategy (HESS)

Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency

AIRAH Presentation – February 2012



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WA Property & Buildings



GHD at-a-glance



Today's Agenda

- HVAC HESS - Project Background
- Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency (“Guide”)
 - Project Scope
 - The Process
 - Guide Overview
- Questions

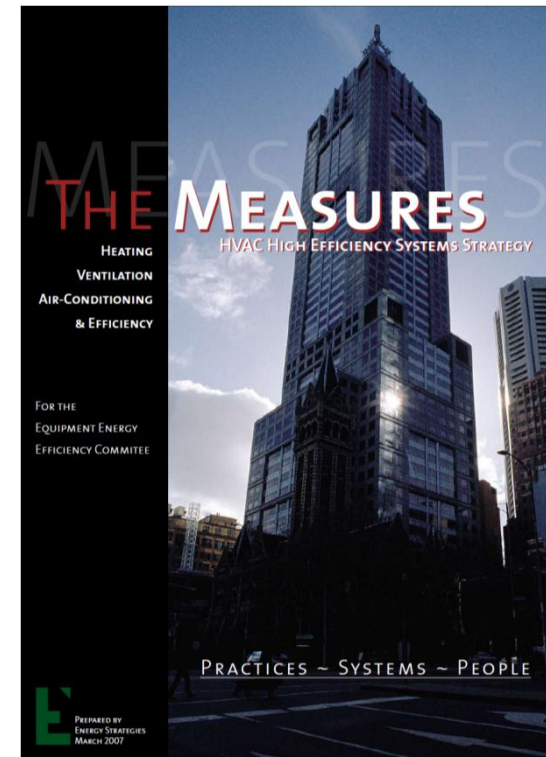


HVAC HESS Project Background

The Measures, HVAC High Efficiency Systems Strategy, M McCann, 2007

HVAC HESS 6 projects

- P1 - Code of Best Practice for Maintenance and Operation
- P2 - The Building Services Log Book
- P3 - Clean Efficiency
- P4 - Calculating Cool Tool
- P5 - Measurement, monitoring and metering
- P6 - Finding Shared Incentives



P1 - Code _ Project Scope

Design and establish a Code of Best Practice for Maintenance of Commercial Heating, Ventilation and Cooling (HVAC) Systems that is cognizant of international programs, customized to Australian conditions, integral to Chain of Custody documentation standards, compliant with requirements of Green Leases and the National Energy and Greenhouse Reporting System (NGERS), involves the Australian Building Codes Board, and is designed **to improve maintenance outcomes, documentation standards, minimize losses of working gases and improve both energy and water efficiency.**



P1 - Code _ Choko's Dream

My Vision for the document

- Starting point for new owners & facility managers
- It's not an encyclopaedia of HVAC but neither should it be a dummy's guide
- Central document for all stakeholders and the initial point of discussion
- Identify processes, benchmarks and checkpoints



Guide_ The Process

WA Industry Reference Group Meeting (27 May 2010)

- Representation by:
 - AIRAH National, CIBSE WA, AMCA WA, FMA WA, PCA WA, GBCA WA, Office of Energy, Universities & Mechanical Contractors
- Aims:
 - Identify Key drivers and incentives
 - Identify Main Standards, AIRAH – DA19 HVAC&R Maintenance, ASHRAE, CIBSE, HVCA, BCA & Australian Standards
 - Determine industry Knowledge of Green Star, NABERS & Green Leases
 - Chain of Custody Documentation?
 - Life Cycle Analysis?
 - Determine the current “industry” process to start a new maintenance contract



Guide _ The Process cont...

National Reference Group Meeting (10 September 2010)

- Representation by:
 - AIRAH, CIBSE, FMA, PCA, GBCA, SA Government, JLL, Colliers & Green Leases
- Aims:
 - Kick the tyres “Draft Guide V5” and obtain feedback
 - Identify drivers nationally was it different from WA?
 - Review the document structure and useability for Green Lease and BCA.



Guide _ The Process cont...

- Industry Consultation and Feedback Process
(November 2010 – January 2011)
- National Reference Group Meeting
(June 2011 & August 2011)
- Guide Presented to Client
(September 2011)
- Guide Published
(January 2012)



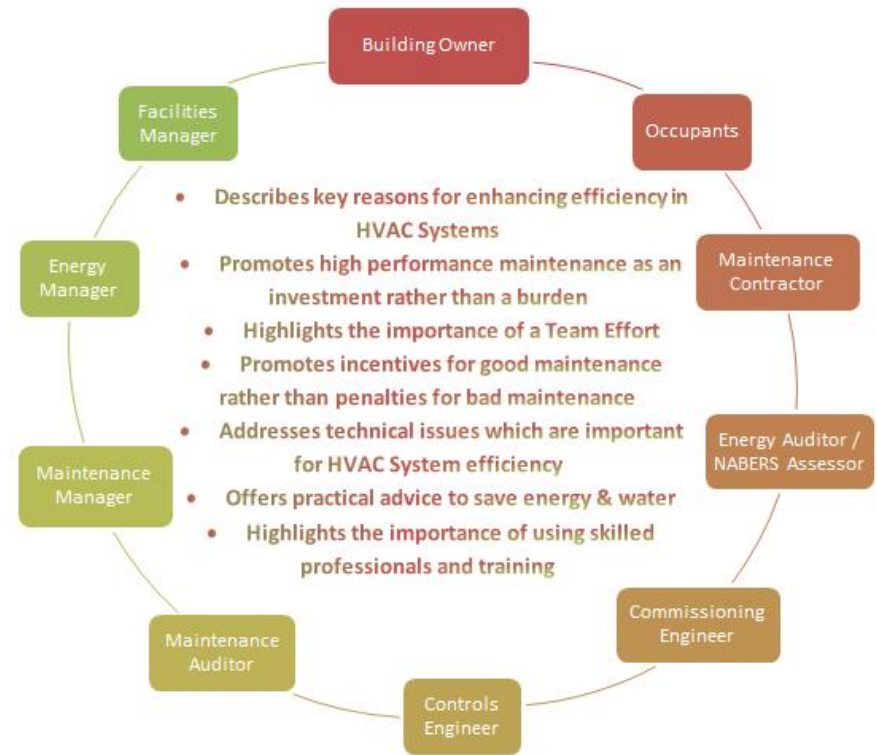
Guide _ Overview

1. Introduction to this Guide
2. HVAC Maintenance Implementation Process
3. Building Operation
4. Documentation
5. Financial & Environmental Evaluation
6. HVAC Equipment & Efficiency
7. Appendices



Guide _ Introduction

- Why consider efficiency in HVAC Systems?
- Who Would Benefit from This Guide?



Guide _ Introduction cont.

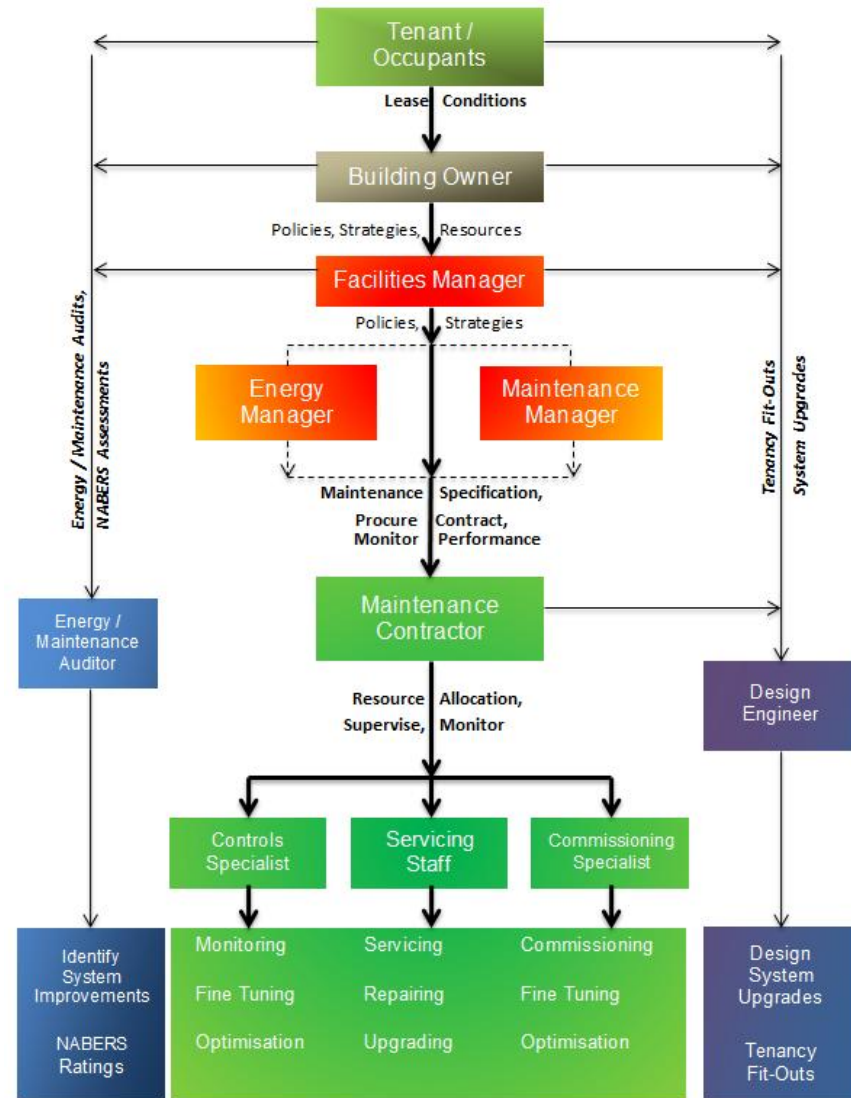
Figure 1.3 Document Structure

		1 Introduction	2 HVAC Maintenance Implementation	3 Building Operation	4 Documentation	5 Financial & Environmental Assessment	6 HVAC Equipment & Efficiency	Appendix A: Definitions of Key Words	Appendices B-H: Check Sheets
Stakeholders	Building Owners	C	B	A	A	B	A	C	C
	Facilities Managers	C	C	C	C	C	B	C	C
	Occupants (Tenants)	C	A	C	B	A	A	C	C
	Maintenance Service Providers	C	B	C	C	C	C	C	C
	Energy & Maintenance Auditors	C	A	A	A	A	C	C	C
	Design Engineers	C	A	B	C	C	C	C	C
	Controls & Commissioning Specialists	C	A	A	B	A	C	C	C



Guide _ Introduction cont.

- Stakeholder Responsibilities

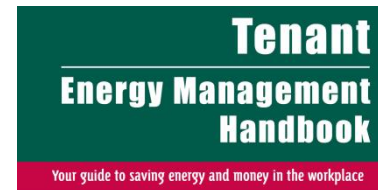


Guide _ HVAC Maintenance Implementation Process

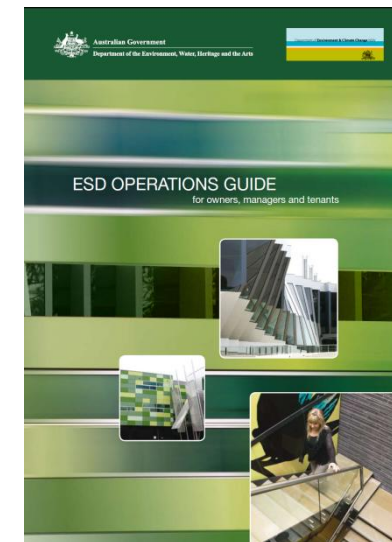


Guide _ Building Operation

- Building Owner
- Facilities Manager
- Occupants & Tenants
- Maintenance Service Provider

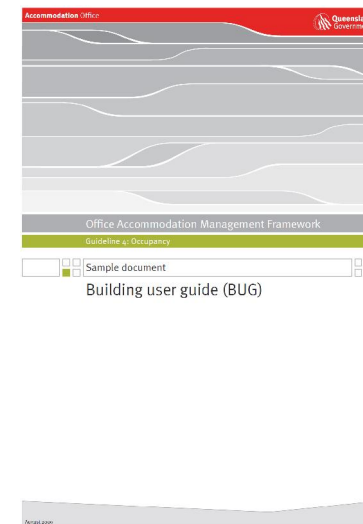
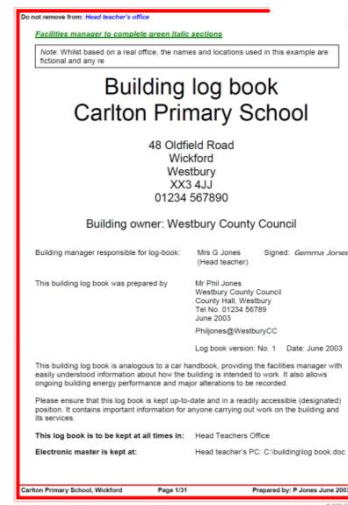


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Guide _ Documentation

- General
- Operating & Maintenance Manuals
- Maintenance Log Books
- Building User Guides
- Tenancy Fit-out Guidelines



Guide _ Documentation cont.

Asset Register

Table 4.1 Information in Asset Register

Information	Comments
Asset Number	A unique identifier or reference number.
Description	E.g. PHWHP 1. Primary hot water heating pump P1. (As referenced in as-built plant room schematic drawings).
Quantity	Typically 1, but multiple small items may be designated under one asset number. E.g. twelve thermostatic radiator valves in a room could be given one asset number, with a suffix/1-n.
Manufacturer	Include contact details of supplier if possible.
Model	As supplied by the manufacturer.
Serial No.	As supplied by the manufacturer. Also include any particular modifications carried out. E.g. Pump impellor trimming or fan pitch adjustment.
Misc. Information	E.g. Installation date, cost, condition, major overhaul dates.
EIR	See section below.



Guide _ Documentation cont.

- Environmental Impact Rating (EIR)
 - The power rating of the equipment
 - The usage factor
 - The efficiency of the equipment
 - The operating hours per year



Guide _ Financial & Environmental Evaluation

Introduction

Simple Payback Period

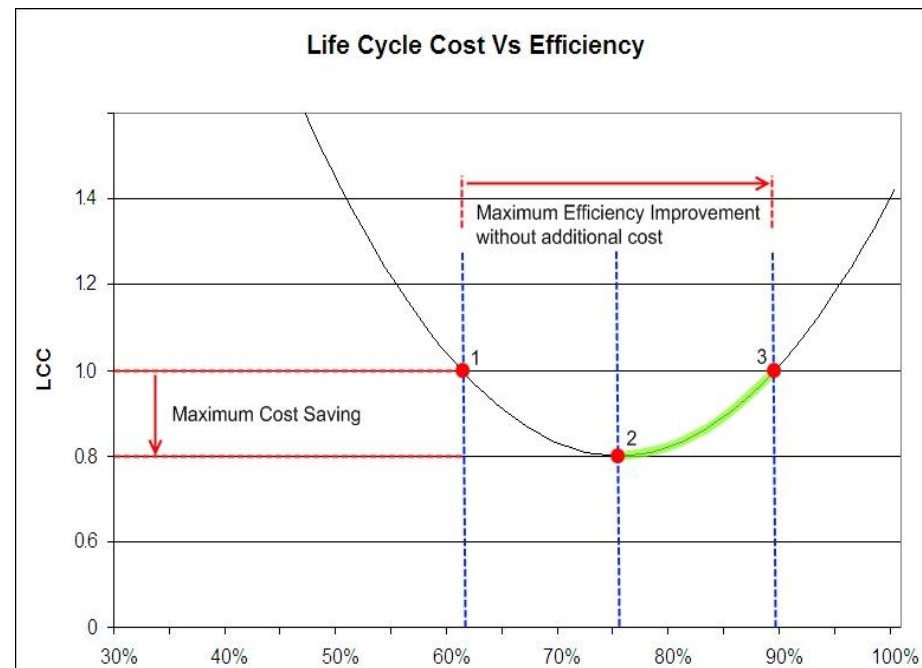
Net Present Value

Internal Rate of Return

Life Cycle Analysis

Benefits of Economic Analysis

Environmental Evaluation



Guide _ HVAC Equipment & Efficiency

Chillers

Cooling Towers

Air Handling Units & VAV Boxes

Boilers

Pumps

Fans

Humidification & De-Humidification

Packaged HVAC Systems

Power Factor Correction

Building Management Systems

Commissioning & Building Tuning



Guide _ Appendices

Appendix A : Definitions of Key Words

Appendix B : Checklist - Building Owner

Appendix C : Checklist - Facilities Manager

Appendix D : Checklist - Building Occupant/Tenant

Appendix E : Checklist - Maintenance Service Provider

Appendix F : Checklist - Energy and Maintenance Auditor

Appendix G : Checklist - Controls Specialist

Appendix H : Checklist - Design Engineer



Guide _ Appendices

Appendix B: Checklist - Building Owner

Task	Action	Section in Guide	
Set- up Sustainability Policies			
1	Prioritise efficient HVAC operation & maintenance.	1.2, 1.5	<input type="checkbox"/>
2	Ensure environmental & maintenance policies are in place, taking into account aspirations of Building Occupants. Provide corporate direction for sustainability objectives.	2.1, 2.2	<input type="checkbox"/>
3	Ensure that agreed service conditions in leases (temperature, humidity, after hours operations) are not wasteful. Where necessary, negotiate with Building Occupants.	3.1	<input type="checkbox"/>
Develop Maintenance Strategies			
4	Ensure maintenance strategy is developed.	2.3	<input type="checkbox"/>
5	Ensure sustainability benchmarks & HVAC KPIs are developed.	2.4	<input type="checkbox"/>
6	Consider incentives to Maintenance Contractors for enhancing efficient operation & maintenance of HVAC systems, rather than penalties for non-performance.	2	<input type="checkbox"/>
7	Ensure adequate energy and water metering is installed.	2.5.3	<input type="checkbox"/>
8	Where an existing contract has a long tenure remaining, discuss and negotiate energy saving opportunities with the Maintenance Contractor.	2	<input type="checkbox"/>



Guide _ Appendices

Appendix F: Checklist - Energy and Maintenance Auditor

Task	Action	Section in Guide	
1	Review environmental and maintenance policies, are they current?	2.2, 2.3	<input type="checkbox"/>
2	Compare performance Benchmarks for building.	2.4.3	<input type="checkbox"/>
3	Review energy and water Metering Systems and recording systems.	2.5.3	<input type="checkbox"/>
4	Review building KPIs.	2.4.3	<input type="checkbox"/>
5	Carry out an Energy Audit in accordance with AS/NZS 3598.	2.5	<input type="checkbox"/>
6	Review documentation:	4	<input type="checkbox"/>
	O&M manuals, Commissioning Data, As installed Drawings	4.2	<input type="checkbox"/>
	Maintenance Log Books, Service Callouts and Reports	4.3	<input type="checkbox"/>
	Building User Guide	4.4	<input type="checkbox"/>
	Tenancy Fit-out Guide	4.5	<input type="checkbox"/>
	Asset Register	4.6	<input type="checkbox"/>
7	Review building Operational Practices. Walk through tenancies.	3	<input type="checkbox"/>
8	Inspect condition of Building Fabric including façade, solar shading and air tightness.	3	<input type="checkbox"/>



Thank you!



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