Optimisation of energy saving features and ensuring safe operation of a new facility requires a combination of good design, quality installation, thorough commissioning and ongoing tuning of operating systems. Often commissioning quality is adversely affected by construction program pressures and shortfalls in understanding the integrated function of systems.

This factsheet emphasises the importance of commissioning and building tuning throughout the various stages of a building’s life by detailing the purpose, timing, frequency, method, and test basis for:

1. New building commissioning
2. Existing building recommissioning
3. Existing building retrocommissioning
4. Building tuning.

Benefits of comprehensive commissioning and tuning include:
- Compliance with specifications, delivery on design performance criteria and operational performance targets
- Lower service costs, fewer breakdowns and improved tenant comfort
- Ease of recommissioning when operational benchmarks are established
- A higher level of safety and reliability of systems
- A reduction in energy and water consumption, which in turn can significantly reduce operating costs
- Compliance with contractual benchmarking targets such as Green Star and NABERS ratings.

1. New Building Commissioning

**Purpose:** Ensure optimum performance of a building
**Timing:** Begin at concept or pre-design stage
**Method:** Reviewing, testing and verifying

Commissioning is a crucial process in the construction of new projects. It is needed to verify that a building and its systems operate as intended at the design stage, and deliver optimal performance for the building owner and tenants.

As responsibility passes from various team members during construction and then occupancy, there are opportunities for processes to go wrong and for misunderstandings to occur. There is a need for a holistic view of how the various disciplines interact, in order to deliver a functional building as a whole package.

It is advised that commissioning:
- Be carried out in accordance with ASHRAE 1 Commissioning Guidelines (for HVAC systems), CIBSE 2 Commissioning Clauses and/or AIRAH 3 DA27 (for all other systems) & AIRAH DA28 (for Building Maintenance and Control systems)
- Be considered early in the design phase to enable consideration of the process when key decisions are made
- Ensure diligent inspection meets both building code regulation and energy performance targets
- Be coordinated and planned across all disciplines
- Be consistent, including delivery standards for documentation and recording of various commissioning activities with confirmation of actual performance.

Training of building maintenance staff as well as transfer of commissioning data should take place after practical completion, and should:
- Provide building operators with a detailed understanding of how to operate and further tune the building, and provide an awareness of potential impacts of future modifications or changes
- Involve training of maintenance staff on how to service systems correctly
- Ensure building and maintenance staff convey necessary information to building occupants so that they are aware of the limits within which they must function in order to maintain design performance.

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2. Chartered Institution of Building Services Engineers www.cibseknowledgeportal.co.uk/cibse-commissioning-codes
3. Table 2.1 from DA 27 – “The different faces of commissioning” Australian Institute of Refrigeration, Airconditioning and Heating www.airah.org.au

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

September 2013
2. Existing Building Recommissioning

**Purpose:** Periodically maintain optimum performance of a building

**Timing:** Periodically, at scheduled intervals or in response to operating problems, typically every 3-5 years

**Method:** Tuning, calibrating, testing and verification

Recommissioning occurs when a building that has already been commissioned undergoes another commissioning process using the same tests used in the original commissioning process. Recommissioning of existing buildings is undertaken with the aim to improve the performance of building services and energy efficiency.

Recommissioning is made easier if existing commissioning data and operations and maintenance manuals are made available to commissioning staff. This information provides an overview of the systems, relative performance benchmarks, how they have performed in the past and what systems have been modified.

Recommissioning of existing buildings will usually take place as partial commissioning, i.e. floor by floor or partial floor, to allow for minimal disruption to occupants and to adjust systems to suit the floor layout according to occupancy. Once partial commissioning is complete, a full recommissioning of all service systems should take place to ensure that they are serving the building correctly and efficiently.

Figure 1 provides an indication of the potential energy savings by building system from recommissioning.

![Figure 1: Typical energy savings that can be made on recommissioning existing building services.](image)

3. Existing Building Retrocommissioning

**Purpose:** Identify and remove barriers to optimum performance of a building

**Timing:** In response to underperforming buildings or buildings that have been modified or updated, typically every 10-15 years

**Method:** Survey and diagnostics, alterations and improvements, testing and verification

Over time as facility requirements change, the operational efficiencies of buildings tend to degrade. Many existing buildings perform below their potential, using more energy and water, and costing more to operate. Retrocommissioning refers to commissioning of an existing building using new tests developed specifically for the project at that particular time in the building’s lifecycle.

**New Plant Systems in Existing Buildings**

Retrocommissioning and tuning of downstream building systems is necessary when replacing existing plant equipment with new, modern equivalents. This is because modern systems are able to achieve maximum energy efficiency by optimising the workings of the system as a whole. Replacing a single item without appropriate consideration for how it functions in the larger system, may not deliver the full benefits available.

Service personnel will often respond to occupancy complaints through the adjustment of valves and dampers. As such, this equipment will require retrocommissioning when a new plant is installed. Old piping may also need to be upgraded to cope with new plant demands. The Building Management System may also need to be adjusted to ensure correct operation. Monitoring is recommended to confirm that the new plant and building systems are operating, as a whole, at optimal performance, validating the high capital cost associated with major plant replacement.

4. Building Tuning

**Purpose:** To continuously maintain optimum performance of a building

**Timing:** Continuously, commencing after building has been commissioned, recommissioned or retrocommissioned

**Method:** Monitoring, trending review and tuning on a seasonal basis

Building tuning across the different seasons ensures optimum occupant comfort and energy efficient services performance throughout the yearly seasonal cycle, and ensures optimum building performance is maintained. Regular and methodical building tuning is the key to making significant carbon dioxide emission reductions through efficient building operation.
Tenant operational changes are a reality in most buildings and rarely take a big picture view of the effect on the rest of the system. This can result in inefficient system operation as the building systems are made to operate differently to their original design intent.

Building tuning should encompass adjustment of building services to the occupancy needs of the building in the most energy efficient way possible, while adjusting to seasonal changes throughout the year, ensuring occupant comfort.

**HVAC HESS**

The Heating, Ventilation and Air-Conditioning High Efficiency Systems Strategy (HVAC HESS) is a ten year strategy under the National Strategy on Energy Efficiency that aims to drive long term improvements in energy efficiency of HVAC systems Australia wide. Under the Energy Efficiency Working Group, the Buildings Committee manages the implementation of the HVAC HESS. This committee is comprised of representatives from Australian, State and Territory Governments.

The Strategy takes a whole of life perspective in targeting HVAC efficiency improvement, encompassing the design, manufacture, installation, operation and maintenance stages of the HVAC lifecycle. The Strategy consists of a number of complementary measures that fall under three broad initiatives – People, Practices and Systems. This Commissioning and Building Tuning factsheet specifically relates to Practices. It is one of a suite of factsheets developed to provide a quick overview and reference to inform, educate, and encourage energy efficiency in the HVAC industry.

A series of HVAC HESS factsheets can be found at: http://ee.ret.gov.au/

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