

**Additional Information on Default Values
for Packaged Air Conditioners**

Default values for COP for the calculation of reference emissions

The proposed methodology is to introduce a water-to-water double-bundle modular heat pump (modular HP) to a new building. The modular HP generates both hot and chilled water, where chilled water is used for air conditioning (A/C) in a communal area of the building.

A/C used in commercial buildings and office buildings is, in general, either packaged A/C or chiller. According to an expert at a construction company in Indonesia, packaged A/C has a limitation in a height difference between indoor and outdoor units. Based on various catalogues of the 2014 models of packaged A/C that the construction company obtained in South-East Asia, the maximum height difference between indoor and outdoor units is approximately 90m. Below are some of the examples that the construction company was involved:

Table 1: Examples of buildings and their A/C types

Application	Country	Completion	No. of floors	A/C type
Office + Commercial	Indonesia	2002	(high-rise)	Packaged
Office	Indonesia	2007	33F	Packaged
Office	Indonesia	2008	28F	Packaged
Office	Indonesia	2008	29F+B5F	Packaged
Office	Indonesia	2008	43F	Packaged
Office	Malaysia	2008	29F	Packaged
Office+ Shopping complex	Singapore	1999	25F	Packaged
Bank + Office	Singapore	1999	17F	Packaged

Since the proposed methodology assumes that the reference emissions is a packaged A/C type, conditions of the height of project building is set according to the maximum height difference between indoor and outdoor units and inserted as one of the eligibility criteria in the methodology. Indonesia has a national standard for A/Cs in buildings. Known as SNI 6390:2011 (Energy Conservation for HVAC System in Buildings), it stipulates a minimum recommended Coefficient of Performance (COP) for split A/C, packaged A/C and chillers. SNI 6390:2011 is adopted in 2011 and applicable to new buildings from 2012 onwards. SNI 6390:2011 states that chillers are used when cooling capacity is greater than 176 kW or 600,000 BTU/hr. For this reason, the first eligibility criterion also requires the modular HP's cooling capacity to be less than 176 kW or 600,000 BTU/hr to assume that the reference scenario is the packaged A/C. Table 2 shows the minimum efficiency recommended by SNI 6390:2011 for the packaged A/C.

Table 2: Efficiencies for packaged A/C recommended by SNI 6390:2011

A/C type	Minimum efficiency	
	COP	kW/TR
Variable Refrigerant value*	3.70	0.951
Split duct	2.60	1.353

* "Variable Refrigerant Value" means Variable Refrigerant Volume A/C system.

Source: SNI 6390:2011

SNI 6390 is still treated as a voluntary performance target in Indonesia in general except in Jakarta city where it is treated as a mandatory requirement under the Governor Regulation No. 38/2012 on Green Building¹ enforced by the Government of Special Capital Region of Jakarta. Governor Regulation No. 38/2012 is put into effect as of April 2013, and the buildings as categorized in Table 3 following must comply with the latest performance standard of SNI 6390 when applying for construction and occupancy permits²:

Table 3: Jakarta City's Governor Regulation No. 38/2012

	Floor area
Office, shopping, apartment	> 50,000 m ²
Hotel and health-related facilities (e.g. hospitals, health care centers, etc.)	> 20,000 m ²
Educational facilities	> 10,000 m ²

Source: Government of Special District of Jakarta

As shown in Table 3, the Jakarta City's application of SNI 6390 is specifically limited to large-scale buildings and facilities. An interview with the government of Jakarta City on 17 December, 2014 confirms that only less than 10 buildings have so far met the Table 3 requirement out of approximately 20,000 building permit requests per year from 2012.

Therefore, it is considered to be appropriate to set the level of efficiency required by SNI-03-6390:2011 in this methodology.

Accordingly, the default value for the efficiency of Packaged A/C is set as follows:

Table 3: Default efficiency of packaged A/C

A/C type	COPs
Packaged A/C	3.70

¹

http://www.gbcindonesia.org/download/doc_download/58-pergub-38-tahun-2012-bangunan-gedung-hijau&sa=U&ei=tIeQVKvVIZft8gW6_oK4Dg&ved=0CB0QFjAB&usg=AFQjCNFA602J0UxOICeYRkHVCdZq1aFaiA

² For existing buildings, different rules applied. Occupancy permit is required to be renewed every 5 years.