

## CHILLER SCHEDULES

### INTRODUCTION

NATSPEC worksections cover a wide range of chillers including those with centrifugal, screw or scroll compressors with air or water cooling intended for chilled water, heat recovery and air source heat pump applications. Absorption chillers are also included. The chiller worksections also include options for specifying requirements such as IPLV and NPLV. This TECHnote aims to help specifiers to complete the included schedules.

Note that NCC Deemed-to-Satisfy requirements deal with conventional, non-heat recovery duty and make no provision for heat recovery, air source heat pumps or gas-fired chillers which may have poorer cooling performance but better overall heating-cooling energy efficiency. Rather than using NCC Deemed-to-Satisfy values, these should be handled using NCC performance requirements verified by one of the NCC verification methods e.g. *BCA J1V3 Verification using a reference building*.

### IPLV and NPLV

In most projects, the refrigeration chillers are the largest electrical load and the largest, or one of the largest, energy consumers. For this reason, BCA J6D11 mandates minimum Deemed-to-Satisfy COP to AHRI 551/591 at full refrigerant load and for integrated part load (referred to as IPLV in AHRI 551/591). AHRI 551/591 assumes a typical load profile in which the chiller runs for 1% of the time at 100% capacity, 42% at 75% capacity, 45% at 50% capacity and 12% at 25% capacity. As such, it is a measure of the long-term energy consumption of chillers and provides a more (but not completely) realistic assessment of overall energy use than COP at 100% capacity alone. This value is required to demonstrate compliance with MEPS. For a more accurate comparison of chiller energy performance, consider specifying NPLV performance as well as the mandatory IPLV. NPLV may be used to specify higher performance than the minimum set by the NCC and for performance solutions to the NCC. NPLV is based on the same capacity percentages but with time percentages derived from annual energy modelling for the specific project. In some cases, such as a chiller plant with chillers of different capacities, separate time percentages will be required for each chiller.

If specifying NPLV, consider also including non-standard condenser water conditions at part load.

### LIFE CYCLE COST ANALYSIS

For a more comprehensive life cycle cost analysis of chillers, consider calling, in *0121 Tendering*, for tenderers to provide alternative values for these performance items where the equipment offered by the proposed chiller manufacturer does not comply exactly with the design performance requirements. For the purposes of tender evaluation only, consider requesting the following additional information from tenderers based on nominated unit energy cost (\$/kW.h and \$/kV.A):

- Annual equivalent full load running time (h).
- Scrap value (\$).
- Annual maintenance charges (\$).
- Provide relevant economic factors such as discount rate and present worth factor for evaluation.

### NOISE LEVELS

The chiller schedules provide the options of specifying either by maximum sound power or maximum sound pressure level and as either a dB(A) weighted value or dB by frequency spectrum. Delete the options not specified.

The options specified will depend on data available from manufacturers and used for the acoustic design. If specifying sound power, the reference value (usually dB re  $10^{-12}$  watts) must be included. For sound pressure, include the test conditions. These are typically measured at 1.5 m horizontally at any point around the chiller in free field, but other conditions are possible such as at 3 m instead of 1.5 m or vertically as well as horizontally (especially for air cooled chillers). See also AHRI 575.

### ADAPTING SCHEDULES FOR CHILLER OPTIONS

The options in chiller types covered in NATSPEC worksections mean that creating a schedule that covers all options would require including many redundant and potentially conflicting items. For this reason, the chiller worksections only include schedules for a default chiller type with hidden text Guidance on adapting the schedules to other configurations in the following worksections:

- *0715 Chillers – combined.*
- *0716 Chillers – centrifugal.*
- *0717 Chillers - water cooled screw.*
- *0718 Chillers - air cooled screw and scroll.*

Note that there are no guidance options for *0719 Chillers – absorption* as it includes all options in a single **Chillers schedule**.

### Definitions

- COP: Coefficient of performance ( $W_r/W_{\text{input power}}$ ). The ratio of the net refrigerating capacity ( $W_r$ ) to the total input power ( $W_{\text{input power}}$ ) at any given set of rating conditions.
- IPLV: Integrated part load value to AHRI 551/591. It has the same meaning as IPLV.SI in AHRI 551/591.
- MEPS: Minimum energy performance standard to the NCC.
- NPLV: Non-standard part load value to AHRI 551/591. It has the same meaning as NPLV.SI in AHRI 551/591.

### Relevant worksections

- *0715 Chillers – combined.*
- *0716 Chillers – centrifugal.*
- *0717 Chillers - water cooled screw.*
- *0718 Chillers - air cooled screw and scroll.*
- *0719 Chillers – absorption.*

### Relevant standards

AHRI 551/591  
Performance rating of water chilling and heat pump water-heating packages using the vapor compression cycle  
AHRI 575 Method of measuring machinery sound within an equipment space