TIPSHEET

# MINIMUM EFFICIENCY FOR CHILLERS AND VRF SYSTEMS FOR LEEDv4 COMPLIANCE IN TELANGANA STATE, INDIA

The latest and major update to the Energy Conservation Building Code (ECBC) of India was released in 2017. While the Code (ECBC 2017) is still for voluntary adoption in the country, each State has the flexibility to modify the Code as per regional conditions.

## TELANGANA STATE IS LEADING

The State of Telangana in India is particularly taking a lead in developing an energy efficient building stock through the Telengana Energy Conservation Building Code (TSECBC)[1]. In 2017, Telangana became the first Indian state to embed the TSECBC into its building approval system, thereby ensuring widespread compliance and guaranteed energy savings[2]. Since 2014, it is mandatory for new commercial buildings to comply with TSECBC.

It is mandatory for new commercial buildings to comply with minimum equipment efficiencies as listed in the TSECBC. Whereas, LEEDv4 credit Energy and Atmosphere - Minimum Energy Performance requires compliance with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata under Option 1- Whole Building Simulation Approach.

Regarding chiller and VRF equipment efficiencies, the TSECBC is more stringent than ECBC 2017 and comparable with ASHRAE 90.1-2010 requirements. Hence the market is better prepared to comply with Minimum Equipment Efficiency under LEEDv4 credit Energy and Atmosphere - Minimum Energy Performance.

## BRIDGING THE GAP FOR COOLING EQUIPMENT EFFICIENCY

### CHILLERS:

The following table-1 compares the minimum efficiencies required as per TSECBC with the mandatory efficiency requirements under ASHRAE 90.1-2010 for water-cooled and air-cooled

[1] http://tsredco.telangana.gov.in/PDFs/ECBC/4_TS_ECBCGuidelines.pdf
[2] https://www.theclimategroup.org/news/telangana-constructs-energy-efficient-buildings

chillers. The COP values of water-cooled chiller in the capacity range of 150 – 300 TR are slightly more stringent than the values required by ASHRAE 90.1-2010. For other capacities, the ASHRAE COP values are more stringent. Whereas, for air-cooled chillers, the COP values under TSECBC are more stringent than ASHRAE90.1-2010 for all capacities[3].

| **TELANGANA ECBC (TSECBC)**<br>**Minimum space conditioning equipment efficiencies** | | | | | | | | | **LEED v4 BD+C**<br>**Minimum Equipment Efficiency as per ASHRAE 90.1-2010 under EA Credit Energy and Atmosphere – Minimum Energy Performance** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Table 5.1: Chillers efficiency** | | | | | | | | | **Table 6.8.1 C** | | | | | | | |
| **CHILLER CAPACITY (TR)** | **Water Cooled** | | | | | | **Air-Cooled** | | **CHILLER CAPACITY (TR)** | **Water Cooled** | | | | **Air-Cooled** | | |
| | **Centrifugal Compressor** | | **Reciprocating Compressor** | | **Rotary Screw and Scroll Compressor** | | | | | **Centrifugal Compressor** | | **Reciprocating, Rotary Screw and Scroll Compressor** | | | | |
| | **COP** | **IPLV** | **COP** | **IPLV** | **COP** | **IPLV** | **COP** | **IPLV** | | **COP** | **IPLV** | **COP** | **IPLV** | **COP** | **IPLV** | |
| **<74** | 5.0 | 5.25 | 4.2 | 5.05 | 4.7 | 5.49 | 2.9 | 3.16 | **<75** | 5.54 | 5.90 | 4.50 | 5.58 | >=2.8 | >=3.62 | |
| **>=74 to <151** | | | | | | | | | **>=75 to <150** | | | 4.54 | 5.72 | | | |
| **>=151 to <300** | 5.55 | 5.9 | | | 5.4 | 6.17 | 3.05 | 3.32 | **>=150 to 300** | 5.54 | 5.90 | 5.17 | 6.06 | >=2.8 | >=3.62 | |
| **>=300 to <450** | 6.1 | 6.4 | | | 5.75 | 6.43 | | | **>=300 to <600** | 6.10 | 6.40 | 5.67 | 6.51 | | | |
| **>=450** | | | | | | | | | **>=600** | 6.17 | 6.52 | | | | | |

*Table 1 : Chiller efficiency – Telangana ECBC vs ASHRAE 90.1 -2010*

[3] Chiller COP and IPLV are based on Path A of Table 6.8.1C, ASHRAE 90.1-2010.

**VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS:**

The following table-2 compares the minimum efficiencies required as per TSECBC with the mandatory efficiency requirements under ASHRAE 90.1-2010 for VRF systems. The COP requirements under TSECBC are the same as ASHRAE 90.1-2010 for all VRF capacities. Whereas the requirements for ICOP are more stringent under ASHRAE 90.1-2010.

| **TELANGANA ECBC - (TSECBC)** | | | **LEED v4 BD+C** | | |
|---|---|---|---|---|---|
| **Minimum space conditioning equipment efficiencies** | | | **Minimum Equipment Efficiency as per ASHRAE 90.1-2010 under EA Credit Energy and Atmosphere – Minimum Energy Performance** | | |
| **Table 5.2: Electrically Operated Variable Refrigerant Flow Air Conditioners Minimum Efficiency Requirements air cooled (Cooling mode)** | | | **Table 6.8.1 J** | | |
| **VRF CAPACITY (kW)** | **COP** | **ICOP** | **VRF CAPACITY (kW)** | **COP** | **ICOP** |
| **<19** | 3.81 (SCOP) | NA | **<19** | 3.81(SCOP) | NA |
| **>=19 AND <40** | 3.22 | 3.6 | **>=19 AND <40** | 3.22 | 3.78 |
| **>=19 AND <40 (with heat recovery)** | 3.16 | 3.55 | **>=19 AND <40 (with heat recovery)** | 3.16 | 3.72 |
| **>=40 and <70** | 3.11 | 3.46 | **>=40 and <70** | 3.11 | 3.60 |
| **>=40 and <70 (with heat recovery)** | 3.05 | 3.40 | **>=40 and <70 (with heat recovery)** | 3.05 | 3.55 |
| **>=70** | 2.78 | 3.11 | **>=70** | 2.78 | 3.22 |
| **>=70 (with heat recovery)** | 2.73 | 3.05 | **>=70 (with heat recovery)** | 2.73 | 3.16 |

*Table 2: VRF efficiency – Telangana ECBC vs ASHRAE 90.1- 2010*

*Note: SCOP=Seasonal Coefficient of Performance; ICOP=Integrated Coefficient of Performance*

## SUMMARY

Thus, new commercial buildings going for LEEDv4 certification in Telangana State need to comply with minimum equipment efficiencies as per the following tables to meet the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata for LEED Prerequisite EA: Minimum Energy Performance.

ASHRAE TSECBC

| Chiller Capacities (TR) | Minimum Equipment Efficiency | | | | | |
|---|---|---|---|---|---|---|
| | Water Cooled | | | | Air Cooled | |
| | Centrifugal | | Rotary Screw and Scroll Chiller | | COP | IPLV |
| | COP | IPLV | COP | IPLV | | |
| <74 | 5.54 | 5.90 | 4.7 | 5.58 | 2.9 | >=3.62 |
| >=74 to <151 | | | | 5.72 | | |
| >=151 to <300 | 5.55 | 5.90 | 5.4 | 6.06 | 3.05 | >=3.62 |
| >=300 to <600 | 6.10 | 6.40 | 5.75 | 6.51 | | |
| >=600 | 6.17 | 6.52 | | | 3.05 | >=3.62 |

*Table 3:* ***Summary of minimum equipment efficiency requirement for chillers***

| VRF Capacities (kW) | Minimum Equipment Efficiency | |
|---|---|---|
| | COP | ICOP |
| <19 | 3.81 (SCOP) | NA |
| >=19 AND <40 | 3.22 | 3.78 |
| >=19 AND <40 (with heat recovery) | 3.16 | 3.72 |
| >=40 and <70 | 3.11 | 3.60 |
| >=40 and <70 (with heat recovery) | 3.05 | 3.55 |
| >=70 | 2.78 | 3.22 |
| >=70 (with heat recovery) | 2.73 | 3.16 |

*Table 4:* ***Summary of minimum equipment efficiency requirement for VRF***