**Unit Air-conditioning Guidelines for Residential Projects:**

1. Capacity: (Note:- Below guidelines are based on glass U value of 2.8 w/sqm-K – DGU type)
    a. If FTF height is <= 3.45 m, 1 TR for every 175 sq. ft. of carpet area in the room.
        i. In living room, ~150 sq. ft. on account of leakage of cooled air into passage.
        ii. TR to be increased by 10-15% if room has direct exposure to east or west.
        iii. Further, TR to be increased by 10% if unit is on top floor (to adjust for heat gain from terrace)
    b. If FTF height is > 3.45 m, TR to be increased by further 15% on the basis calculation using Point No. a.
    c. Above details are guidelines for initial space planning /costing, however final AC machine selection shall be as per Heat Load Calculations with actual design conditions/inputs. HOC approval shall be required for deviations requiring higher usage, if any, in final selected TR w.r.t above guidelines.
2. Multiple units for high wall units to be considered only if required capacity is > 2 TR.
3. AC units to be located in a practical manner such that:
    a. The cooling within the room should be evenly spread.
    b. Piping length from Outdoor Unit (ODU) to Indoor Unit (IDU) in minimized. – Preferably should be 4m and in any case should not exceed 12 m.
    c. Pipes from ODU to IDU are taken through sleeves, rather than below beam, avoiding costs of boxing etc.
    d. All drain pipes are given connected into a water drainage channel/not left open (concern for units used for key common areas where AC units are planned late and attention is not paid to drainage).
    e. Insulation shall be Nitrile rubber Insulation of 13mm thick for refrigerant pipes and 6mm thick for condensate drain pipes to be considered. All insulation on external refrigerant pipework shall be covered with two coats of a trowel or hand-applied weather proof vapour barrier mastic with an open weave canvass cloth embedded

    f. Supports for Pipes and cables shall be Hot dipped galvanized. a) Rubber lined split clamp for single ODU b). Z Channel and threaded rod with rubber lined

holding steel strip for multi ODUs as per standard installation details. Supports for ODU should be given rust convertor and 2 coats of enamel paint before installation.

g. ODU for ACs must be easily accessible from inside the flat – a person should feel safe in that area and need not step over a wall more than 750 mm high to get to the ODU.

4. If hideaway type AC units are used:
    a. The internal duct/ceiling area within 1 m of the grill should be painted (not left grey behind false ceiling).
    b. Any lights within 1 m of the grill should have a dark colour (black) cap/cover on their internal side to avoid light being reflected and seen through grill.
    c. Separate duct for air delivery and return air should be provided in each room.
    d. Each IDU should have separate air delivery ducts. Only return air ducts can be shared between IDUs.
    e. Flexible connection shall be provided between machine and ductwork.
    f. The duct must be connected to the grill/ diffuser. The grills must be ordered with the collar for the duct termination.
    g. The acoustic and thermal insulation serves different purpose and one doesn't supplement others. Wherever the acoustic insulation is provided inside the duct, thermal insulation must be provided on the outside of the duct.
    h. Wherever fibre, mineral or glass wool based insulation is used for the insulation purpose, the edge of the insulation must be taped properly.
5. In case of hi-wall split ACs, the IDU should be chosen in discussion with the Project Architecture team to ensure aesthetic match at the time of rate contract
6. The location of the IDU within a room should be placed centrally for uniform air distribution.
7. The IR remote control reception panel of the AC should be easily viewable from most parts of the room, so that the remote can function effectively.
8. All AC's should have independent viz. cordless remotes (corded remotes are not acceptable)
9. In high-end and luxury projects, door (most likely sliding) is to be provided to kitchen if the living room is air-conditioned.
10. If a unit is stated to be air-conditioned, all areas except kitchen, bathrooms and service areas (e.g. Store, utility, staff bedroom) are expected to be air-conditioned. Rooms

which are NOT air-conditioned should have some other ventilation provision eg. Window, fan provision, fresh-air flow. In rooms which are air-conditioned, any ancillary attached room should also be air-conditioned eg. Walk-in wardrobe attached to bedroom – if such ancillary room is > 60 sq. ft. in carpet area, the ancillary room should have a separate AC Control (unit may or may not be shared with the main room).

11. Minimum energy efficiency rating of AC unit should be as follows:

    a. Overarching clause: AC efficiencies corresponding to the proposed star ratings, valid at the time of launch shall remain in force until the handover of the marketing project (even if the star rating scheme is revised by the BEE prior to handover of the project.)

    b. **Hi end/Luxury/Aspi/Select Casa** (Palava^,Amara*) – 5 Star inverter Split Units

    ^Due to our long-term vision of Palava as a world-class city wherein sustainability will be of significant value

    *Since large no of buildings in this neighbourhood/project have already been delivered with 5 star inverter.

    c. **All Casa** (except that is covered in b.) / **Crown** / **EWS Sale Component** – 3 Star fixed speed AC (Window AC or Split Units, as applicable)

12. A separate note highlighting advantages of 5* inverter ACs is also appended with this policy CFD analysis for ODU heat discharge and de-rating for stacked units for buildings above 100M to be added in vendor SOW.

13. Outdoor units shall be suitable to operate at 36 Degree C ambient temperature (Minimum) without de-rating in performance in cooling mode. And at 52 Degree C ambient temperature without tripping of the compressor in cooling mode.

14. Supports for ODU shall be MS with Enamel painted and construction shall be as per standard installation details. Or as recommended by the OEMs.

15. AC machine TR selection preferably shall be based on DCFM for ductable units.

16. Minimum 70% perforation is recommended in the screen/louvers in service shafts where the ODUs are located in front of the screen/louvers. Minimum gap of 300mm should be maintained between ODU face and screen/louvers.

17. U-trap shall be provided in condensate drain line for ductable and hide away units if same is connected to waste water stack..

18. Access door for Hideaway/ductable AC units upto 3Tr shall be located such a way that the Drain/Refrigerant connection and air filter can be accessible from same access door of preferable 1200mm x 900 mm size.
19. Access door for AHU above ceiling shall be equivalent to the size of AHU.
20. Power supply provision shall be provided near to IDUs for AC units up to 2 TR capacity.
21. Closed Cell Elastomeric Nitrile Rubber is recommended for Duct thermal Insulation material and open cell elastomeric nitrile rubber for duct acoustic liners.
22. ODUs location should be with adequate ventilation and proper access for installation and maintenance. If multiple ODUs are located in Chowk/shaft with inadequate ventilation provisions then CFD simulation is recommended and decision to be taken based on the CFD report.

**Unit Ventilation Guidelines for Residential Projects:**

23. Propeller type fans shall be direct driven ring mounted with rust proof ABS body and of the capacities as shown in table below or as indicated in the schedule of equipment.
24. Exhaust fans shall be provided with permanent split capacitor or shaded pole motor, mounting plate, accessories like wire guard, bird screen and gravity type louvers for weather protection as required.

    Fan drive shall be single phase motors for 220±6% volts 50 cycles AC supply or as indicated in the Schedule of Equipment and shall be complete with starter.
25. **Fans sizes / capacities shall be as follows:**

| Sr.No. | Area Served | Fan size | Airflow (cfm) | Frame Size** | | Fixing Dimension (Opening) | | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Toilet | 150mm | 100 | 200mm | 200mm | 150mm Dia | |  Standard Type |
| 2 | Kitchen | 150mm | 200 | 235mm | 235mm | 190mm* | 190mm* | For kitchen size upto 100 sq.ft carpet area with 2.5m Ceiling Ht. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | |  |
| 3 | Kitchen | 200mm | 350 | 290mm | 290mm | 240mm* | 240mm* | For kitchen sizes from 100-170 sq.ft carpet area with 2.5m Ceiling Ht  |

Note:

1. * Round or square as per Fan Model selected by the Arch.
2. ** Thickness of frame shall be as per Fan Model selected by the Arch.

26. For non-naturally ventilated toilets:
    a. Centralised extract system to be designed with Extract fans @ terrace / service floors as applicable. Extract air quantity shall be calculated based on latest ASHARE 62.1 standard (i.e. 25 CFM per WC/Urinal) to be considered.
    b. Fresh air for toilets shall be provided through door undercut with flow rate equal to 50% of the extract rate. In case this is deemed to be insufficient, tap off from nearest AC unit may be considered in Luxury residential.

27. For lobbies without natural ventilation, treated fresh air supply to be provided at rate of 0.6 CFM/Sqm of floor area based on ASHRAE 62.1. Temperature of such spaces should be maintained at 25-26 deg C. Further, for the units located off such lobbies, fresh air of 5 CFM/person + 0.6 CFM/sqm of habitable carpet area shall be provided through centralized system in living room/common corridor of such unit. Lobbies without natural ventilation should generally be avoided except in luxury/hi-end residential and offices.

28. In air conditioned areas where entry and exit are immediately exposed to atmosphere air curtains are to be provided only where automatic motorised sliding doors are used. Where fixed hinged framed doors (with overlap of air seal) are used Air curtains are need not to be provided.

## APPENDIX – 1

### NOTE ON ENERGY AND ENVIRONMENTAL BENEFITS OF 5 STAR ACs OFFERRED BY LODHA

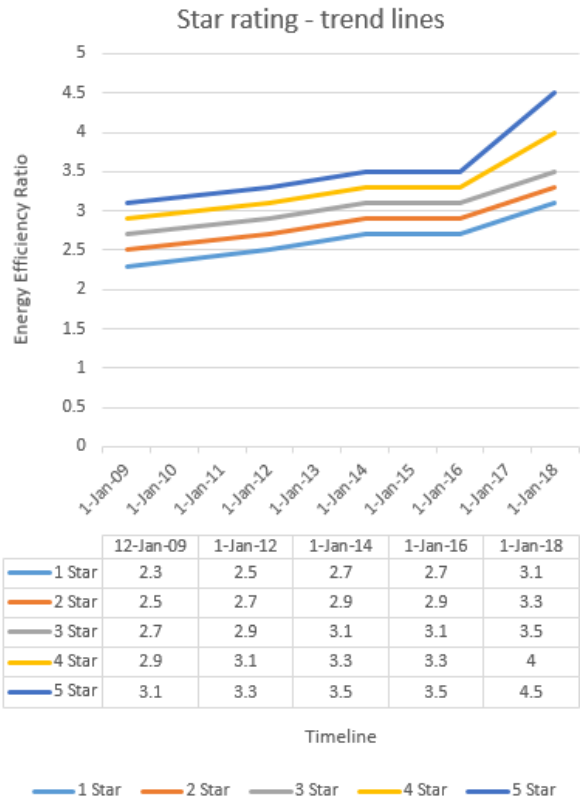
1. We are not offering just a 5* ac, we are infact offering a 5*++ ac. Our offering is:
   - 5* inverter ac ratings as per BEE (Bureau of Energy Efficiency) is min. 4.5ISEER, against which our offering is with a higher ISEER (5.24)
   - 5* inverter, which is superior to 5* fixed speed (see item 4)
   - Saving potential compared to what we were offering till Dec 2017, which our customers will be using now, is upto 35-40%.

   (ISEER: Indian Seasonal Energy Efficiency Ratio)

| Product | Rating year | ISEER | CSEC kWh | Savings on 3* fixed (2017) | |
|---|---|---|---|---|---|
| 5* inverter | 2018 | 5.24 | 520 | -37% | we are offering now |
| 5* inverter | 2018 | 4.5 | 600 | -28% | is starting of a 5* inverter ac in the market |
| 3* fixed | 2018 | 3.6 | 756 | -9% | |
| 3* fixed | 2017 | 3.1 | 828 | | we have been providing this till now |

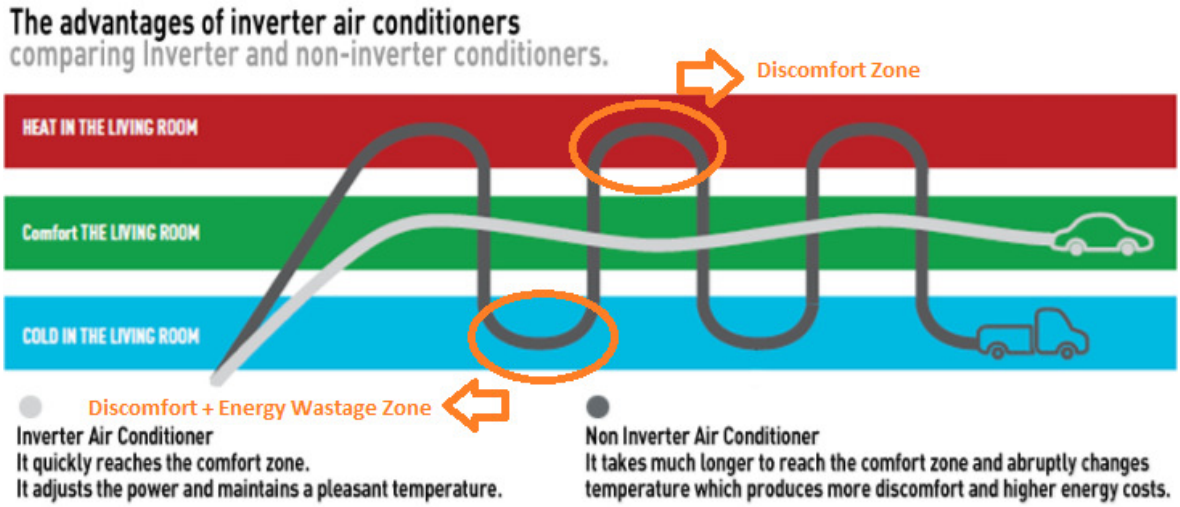
CSEC: kWh consumption for 1600hrs of operation in average Indian climatic conditions

2. It is historically seen that BEE upgrades the star rating every 2 years with ISEER incrementals of 0.5. Therefore our ACs may remain 5* rated for several years, i.e. they may survive a rating downgrade in 2019 (speculative).




| | 12-Jan-09 | 1-Jan-12 | 1-Jan-14 | 1-Jan-16 | 1-Jan-18 |
|---|---|---|---|---|---|
| 1 Star | 2.3 | 2.5 | 2.7 | 2.7 | 3.1 |
| 2 Star | 2.5 | 2.7 | 2.9 | 2.9 | 3.3 |
| 3 Star | 2.7 | 2.9 | 3.1 | 3.1 | 3.5 |
| 4 Star | 2.9 | 3.1 | 3.3 | 3.3 | 4 |
| 5 Star | 3.1 | 3.3 | 3.5 | 3.5 | 4.5 |

3. Air conditioners are a main contributor to the peak electricity demand, which stresses the grid of the nation. Having the most efficient equipment relaxes the peak demand, and the saved electricity can be used on productive pursuits of the nation.
4. Inverter ACs are better for comfort also, as depicted in the diagram below.
    - Fixed speed compressors switch on and keep reducing the temperature until they achieve room temperatures below the set level, then the compressor switches off, to get triggered back again when the room is above the set temperature.
    - Inverter acs reach and maintain the room temperature by adjusting their speed through the drives.




5. These air conditioners are with R410* refrigerant which has no ODP (Ozone Depletion Potential) as compared to the R22 which had ODP and was in use in the earlier air conditioners (offered until Dec 2017).

6. Our marketing team may also collaborate with the supplying vendor to detail out additional marketable features of the offered units.

*Note: R410 still has high GWP (Global Warming Potential) as compared to R32, R290 recommended by RMI. However only Daikin offers R32 refrigerant.

Note: - This policy updation (Rev7) shall be implemented as per Architectural policy no 122.