Part 2 Selection Procedure

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1 Introduction

1.1 Model Selection Procedure

Select the model and calculate the capacity for each refrigerant system according to the procedure shown below.

- Calculate the indoor air-conditioning load, calculate the maximum air-conditioning load for each room or zone.

Selection of an air conditioning system

- Select the ideal air conditioning system for air conditioning of each room or zone.

Design of the control system

- Design a suitable control system for the selected air conditioning system.

Preliminary selection of indoor and outdoor units

- Make preliminary selections that are within the allowable range for the system.

Check the tubing length and elevation difference

- Check that the length of refrigerant tubing and the elevation difference are within the allowable ranges.

Calculation of the corrected outdoor unit capacity

- Capacity correction coefficient for model, outdoor temperature conditions, tubing length and elevation difference.

Calculation of the actual capacity for each indoor unit

- Calculate the corrected indoor/outdoor capacity ratio, based on the corrected outdoor unit capacity and the total corrected capacity of all indoor units in the same system.

Recheck the actual capacity for each indoor unit

- If the capacity is inadequate, reexamine the unit combinations.

1.2 Indoor Unit Selection

Enter INDOOR UNIT CAPACITY TABLES at given indoor and outdoor temperature. Select the unit that the capacity is the nearest to and greater than given load.

Note:
Individual indoor unit capacity is subject to change by the combination. Actual capacity has to be calculated according to the combination by using outdoor unit capacity table.

1.2.1 Calculation of Actual Capacity of Indoor Unit

Because the capacity of a multi air-conditioner changes according to the temperature conditions, tubing length, elevation difference and other factors, select the correct model after taking into account the various correction values. When selecting the model, calculate the corrected capacities of the outdoor unit and each indoor unit. Use the corrected outdoor unit capacity and the total corrected capacity of all the indoor units to calculate the actual final capacity of each indoor unit.

Find the indoor unit capacity correction coefficient for the following items

- Capacity correction for the indoor unit temperature conditions

  From the graph of capacity characteristics, use the indoor temperature to find the capacity correction coefficient.

- Capacity distribution ratio based on the indoor unit tubing length and elevation difference.

  First, in the same way as for the outdoor unit, use the tubing length and elevation difference for each indoor unit to find the correction coefficient from the graph of capacity change characteristics

Capacity distribution ratio for each indoor unit = Correction coefficient for that indoor unit / Correction coefficient for the outdoor unit

1.3 Outdoor Unit Selection

Allowable combinations are indicated in INDOOR UNIT COMBINATION TOTAL CAPACITY INDEX TABLE.

In general, outdoor unit can be selected as follows though the location of the unit, zoning and usage of the rooms may be considered.

The indoor and outdoor unit combination is determined that the sum of indoor unit capacity index is nearest to and smaller than the capacity index at 100% combination ratio of each outdoor unit. Up to 8~16 indoor units can be connected to one outdoor unit. It is recommended to choose a larger outdoor unit if the installation space is large enough.

If the combination ratio is greater than 100%, the indoor unit selection shall be reviewed by using actual capacity of each indoor unit.

INDOOR UNIT COMBINATION TOTAL CAPACITY INDEX TABLE

Outdoor Unit	Indoor Unit Combination Ratio (kW)								
	130%	**120%**	**110%**	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**
8HP	32.8	30.2	27.7	25.2	22.7	20.1	17.6	15.1	12.6
10HP	36.4	33.6	30.8	28.0	25.2	22.4	19.6	16.8	14.0
12HP	43.6	40.2	36.9	33.5	30.2	26.8	23.5	20.2	16.8
16HP	65.52	60.48	55.44	50.4	45.36	40.32	35.28	30.24	25.2
18HP	69.2	63.8	58.5	53.2	47.9	42.6	37.2	31.9	26.6
20HP	72.8	67.2	61.6	56.0	50.4	44.8	39.2	33.6	28.0
22HP	80.0	73.8	67.7	61.5	55.4	49.2	43.1	36.9	30.8
24HP	87.1	80.4	73.7	67.0	60.3	53.6	46.9	40.2	33.5
26HP	101.92	94.08	86.24	78.4	70.56	62.72	54.88	47.04	39.2
28HP	105.56	97.44	89.32	81.2	73.08	64.96	56.84	48.72	40.6
30HP	109.2	100.8	92.4	84.0	75.6	67.2	58.8	50.4	42
32HP	116.35	107.4	98.45	89.5	80.55	71.6	62.65	53.7	44.75
34HP	123.5	114	104.5	95	85.5	76	66.5	57	47.5
36HP	130.65	120.6	110.55	100.5	90.45	80.4	70.35	60.3	50.25

INDOOR UNIT CAPACITY INDEX

Unit Size	Model 22	Model 28	Model 36	Model 45	Model 56	Model 71	Model 80	Model 90	Model 112	Model 140
Capacity Index (kW)	2.2	2.8	3.6	4.5	5.6	7.1	8.0	9.0	11.2	14.0

Unit Size	Model 160	Model 200	Model 250	Model 280
Capacity Index (kW)	16	20	25	28

1.3 Actual Performance Date

Use OUTDOOR UNIT CAPACITY TABLES.

Determine correct table according to the outdoor unit model and combination ratio.

Enter the table at given indoor and outdoor temperature and find the outdoor unit capacity and power input. The individual indoor unit capacity (power input) can by calculated as follows.

IUC=OUC × INX/TNX

Where,

IUC: Each indoor unit capacity

OUC: Outdoors unit capacity

INX: Each indoor unit capacity index

TNX: Total capacity index

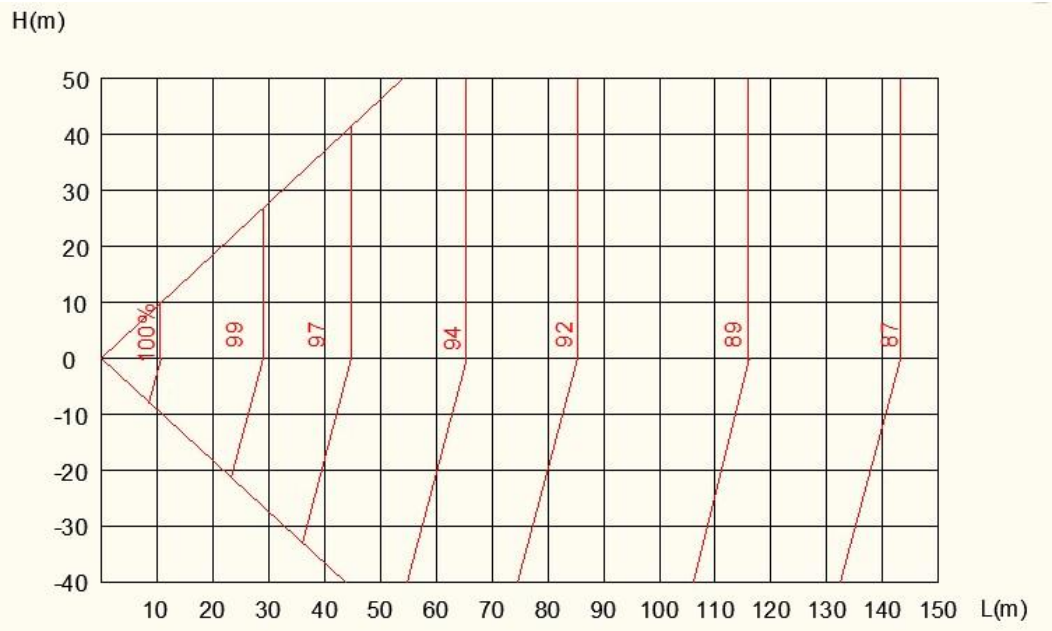
Then, correct the indoor unit capacity according to the piping length.

If the corrected capacity is smaller than the load, the size of indoor unit has to be increased and repeat the same selection procedure.

1.4 Variation in capacity in accordance with the length of refrigerant pipe

1.4.1 Cooling capacity modification

Modification coefficient of the length and high difference of refrigerant pipe:

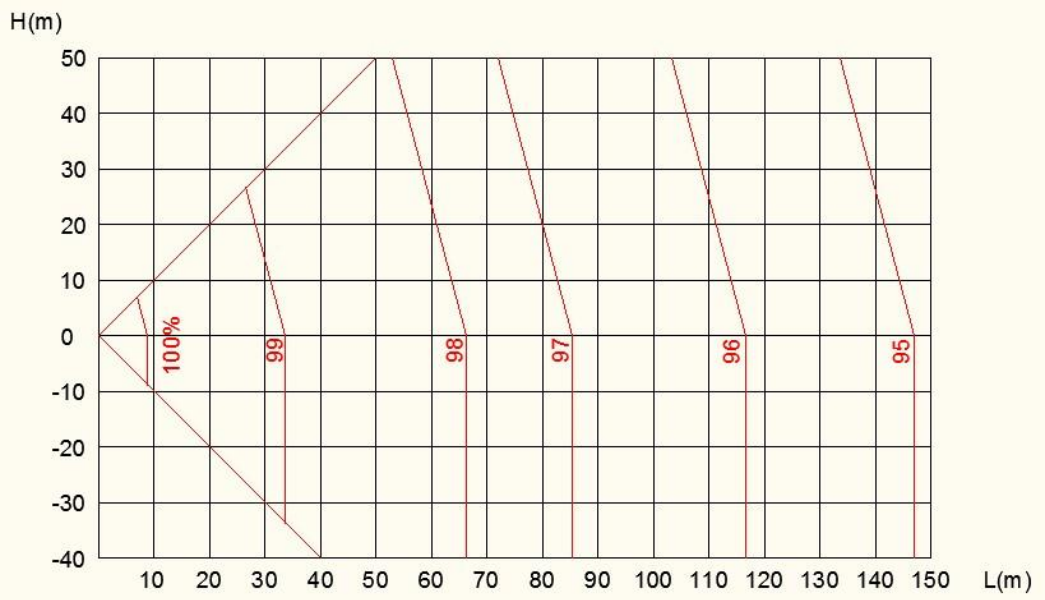


L: Refrigerant pipe equivalent length

H: Height difference between outdoor and indoor unit. Positive data means outdoor unit is top. Negative data means outdoor unit is down.

1.4.2 Heating capacity modification

Modification coefficient of the length and high difference of refrigerant pipe:



L: Refrigerant pipe equivalent length

H: Height difference between outdoor and indoor unit. Positive data means outdoor unit is top. Negative data means outdoor unit is down.

2 Unit Selection (Based on cooling load)

2.1 Given condition

2.1.1 Design condition (Cooling: Indoor 20°C (WB), Outdoor 35°C (DB))

2.1.2 Cooling load

Location	Room A	Room B	Room C	Room D	Room E	Room F
Load (kW)	2.1	2.8	3.5	4.6	5.8	7.2

2.1.3 Power supply unit: Outdoor 380~415V-3Ph-50Hz, Indoor 220~240V-1Ph-50Hz.
2.1.4 Pipe length: 50m
2.1.5 Height difference: 30m

2.2 Indoor unit selection

Select the suitable capacity for condition of 'Indoor 20°C (WB), Outdoor 35°C (DB)' using indoor unit capacity table. The selected result is as follows. (Assuming the indoor unit type is duct)

Location	Room A	Room B	Room C	Room D	Room E	Room F
Load (kW)	2.1	2.8	3.5	4.6	5.8	7.2
Unit size	22	28	36	45	56	71
Capacity (kW)	2.3	2.9	3.7	4.8	6.0	7.5

2.3 Outdoor unit selection

2.3.1 Assume the indoor unit and outdoor unit combination as follows

2.3.1.1 Calculate the total nominal capacity of indoor units in the combination according to the above table:

2.2 × 1 +2.8 × 1+ 3.6 × 1 +4.5 × 1+ 5.6 × 1 + 7.1 × 1 = 25.8kW

2.3.1.2 Select outdoor unit: MDV-280(10)W/DRN1(B) which has nominal cooling capacity: 28kW.

Calculate the proportion between ① and ②: 258/280= 92%

2.3.2 Result : Because the proportion is within 50～130%, it is a "Right" selection.

2.3.3 Real function data with indoor unit combination

● For the 92% combination, calculate the cooling capacity of outdoor unit (MDV-280(10)W/DRN1(B)).

26.65KW ←90% (Indoor temperature : **WB 20°C,** Outdoor temperature: **DB 35°C**)

29.61KW ←100%(Indoor temperature : **WB 20°C**, Outdoor temperature: **DB 35°C**)

Then calculated the outdoor capacity in 92% combination index:

Therefore: 26.65+ {(29.61-26.65)/ 10} ×2= 27.24;

● Outdoor unit (MDV-280(10)W/DRN1(C)) cooling temperature: DB 35°C

● Capacity modification coefficient with pipe length (50m) and height difference (30m): 0.958

● Each indoor unit cooling capacity

MDV-D22T2: 27.24 × 22/258 × 0.958 = 2.22(kW)

MDV-D28T2: 27.24 × 28/258 ×0.958 = 2.83 (kW)

MDV-D36T2: 27.24 × 36/258 ×0.958 = 3.64 (kW)

MDV-D45T2: 27.24 × 45/258 ×0.958 = 4.55 (kW)

MDV-D56T2: 27.24 × 56/258 ×0.958 = 5.66 (kW)

MDV-D71T2: 27.24 × 71/258 ×0.958 = 7.18 (kW)

Location	Room A	Room B	Room C	Room D	Room E	Room F
Load (kW)	2.1	2.8	3.5	4.6	5.8	7.2
Unit size	22	28	36	45	56	71
Capacity (kW)	2.22	2.83	3.64	4.55	5.66	7.18

2.4 Conclusion

Generally, we think this result is acceptable, so we can think we have accomplished the calculation. But if you think this result is not acceptable, you can repeat the above process.

Remark: In this sample, we don't consider the other capacity modification index and assume them are 1.0.

For more details about the effect factor such as outside ambient/inside ambient DB/WD, please refer to the performance table of indoor and outdoor units.