

|||||  
資料  
|||||

# 한국의 냉난방 설계용 외기조건 분석

방 규 원\*

## An Analysis of the Outdoor Design Conditions for Heating and Air Conditioning in Korea

Gyu Won Bang\*

### ABSTRACT

The outdoor design conditions for summer and winter are basic data required for determining the heating and cooling loads and HVAC equipment capacity. The latest study reported was based on the 1960's weather data, which is widely used by HVAC design engineers in Korea.

The purpose of this paper is to update the outdoor design conditions for HVAC loads and equipments based on the weather data for the 1970's.

The weather conditions of 24 sites, namely Sokcho, Chuncheon, Gangreung, Seoul, Incheon, Ulreungdo, Suweon, Seosan, Cheongju, Daejeon, Chupungryeong, Pohang, Gunsan, Daegu, Jeonju, Ulsan, Kwangju, Busan, Chungmu, Mokpo, Yeosu, Jeju, Seogwipo, and Jinju have been analyzed to calculate the outdoor design conditions. This analysis is performed on the basis of TAC 1%, TAC 2.5%, and TAC 5%.

### 1. 서 론

냉난방 설계에서 가장 기본적인 단계는 냉방 부하와 난방부하의 산정이며 이때 냉난방 설계용 외기조건은 필수적인 것으로, 국내 자료로는 60년대의 9개 지방에 대해 분석된 것이 현재까지도 사용되고 있어 본 연구에서는 70년대의 기

상 Data를 전국의 24개 지역에 대해 분석하였다.

냉난방부하 계산에 있어서 필요한 기상 Data로는 여름과 겨울의 건습구 온도이며, 여기에서는 국내 24개 지역에 대해서 TAC 1%, TAC 2.5%, TAC 5%에 따른 설계용 외기조건과 연간 에너지 소요량 계산방법중의 하나인 Heating and Cooling Degree Days를 산정하여, 이들 계산된 값과 60년대의 9개 지역에 대한 값

\* 정회원, 한국건설기술연구원

을 비교 분석하였다. 이를 위해 중앙기상대에서 1970 ~ 1979년 사이의 기상자료를 입수하여 Computer에 입력 분석하였다.

2. 냉난방 설계용 외기조건

냉난방 부하는 Bolier와 A.H.U.의 용량 산정과 직결되는데 냉난방 설계용 외기 온도의 조건으로 여름에는 최고온도, 겨울에는 최저온도를 사용하지 않고 TAC 1%, TAC 2.5%, TAC 5%의 기준온도를 정하여 이를 설계온도로 하고 있다.

TAC 1%, TAC 2.5%, TAC 5%의 결정은 건물의 누기, 단열등 특성에 따라 적용되어야 하나, 국내에서는 일반적으로 TAC 2.5%를 많이 적용하고 있다. 외기 설계온도를 산정하기 위해서 겨울은 12, 1, 2, 3월의 일일 최저온도를 여름은 6, 7, 8, 9월의 최고온도로 Data를 입력하여 년도별로 산정하고 다시 10년의 평균으로서 그 설계온도 조건을 정하였다. 상대습도를 구하기 위해서 겨울은 난방기간 즉 12, 1, 2, 3월중의 평균 상대습도를 구하여 설계온도로 하였으며, 여름의 상대습도는 TAC 1%, 2.5%, 5% 각각의 계산에 의해서 산정된 건구온도를 가지고 그 온도에서 발생된 상대습도를 전부 읽어 평균으로 그 값을 구하였다.

그림(2.1)과 표(2-1)은 국내 24개 지역에 대하여 여름과 겨울의 TAC 1%, TAC 2.5% 및 TAC 5% 값을 년도별로 산정, 평균을 나타내었다.

그림에서 횡축은 국내 24개 지역을 표시하고 있으며 그 순서는 표에 기재된 순서대로 나타나고 있다.

여기에서 TAC 2.5%를 기준으로 볼 때 겨울의 설계온도가 가장 낮은 곳은 -16.7°C의 춘천, -16°C의 수원, -14.9°C의 청주 순이며 가장 따뜻한 곳은 역시 제주지방의 -1.5°C 순으

로 나타나 있다.

또한 여름의 설계온도가 가장 높은곳은 대구의 35.8°C, 포항의 35°C, 울산의 34.6°C이며 가장 낮은곳은 울릉도로 27.6°C로 나타나고 있다. 이는 1960년대에 분석한 자료와 그 분포는 비슷하게 나타나 있다.

즉 겨울의 경우 춘천, 수원, 청주등 내륙지방이 낮게 그리고 여름의 경우 대구, 포항, 울산등의 동남부 지방이 가장높게 나타난다.

그림(2-2), 그림(2-3)과 표(2-2)은 1960년대와 1970년대의 외기조건을 비교하고 있으며 그림에서 횡축의 9개지역은 표에 나타내고 있는 순서와 같다.

그림에서

- |                   |              |
|-------------------|--------------|
| 1) Sokcho         | 2) Chuncheon |
| 3) Gangreung      | 4) Seoul     |
| 5) Incheon        | 6) Ulreungdo |
| 7) Suweon         | 8) Seosan    |
| 9) Cheongju       | 10) Daejeon  |
| 11) Chupungryeong | 12) Pohang   |
| 13) Gunsan        | 14) Daegu    |
| 15) Jeonju        | 16) Ulsan    |
| 17) Gwangju       | 18) Busan    |
| 19) Chungmu       | 20) Mokpo    |
| 21) Yeosu         | 22) Jeju     |
| 23) Seogwipo      | 24) Jinju    |
- 
- |            |            |
|------------|------------|
| A: Seoul   | B: Incheon |
| C: Suweon  | D: Jeonju  |
| E: Gwangju | F: Daegu   |
| G: Busan   | H: Mokpo   |
| I: Ulsan   |            |

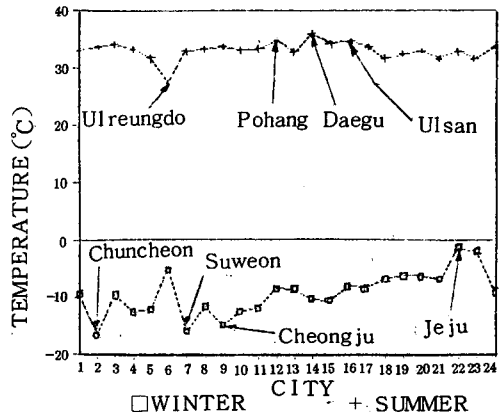


Fig.(2.1) Dry Bulb Temp.(TAC 2.5%)

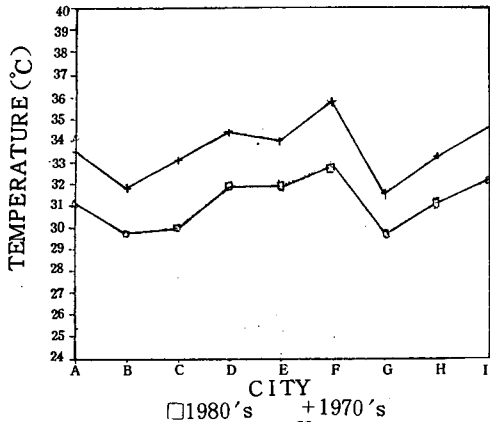


Fig.(2.2) Dry bulb temp. of 1960's & 1970's summer (TAC 2.5%)

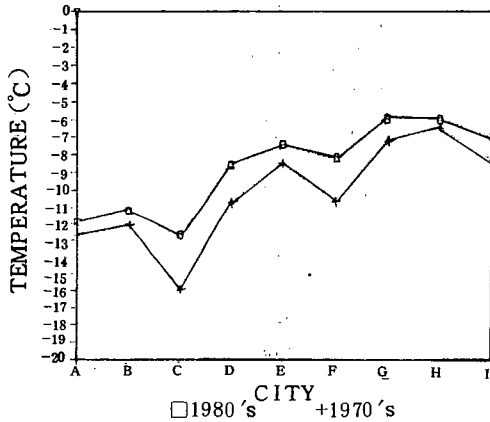


Fig.(2.3) Dry bulb temp. of 1960's & 1970's winter (TAC 2.5%)

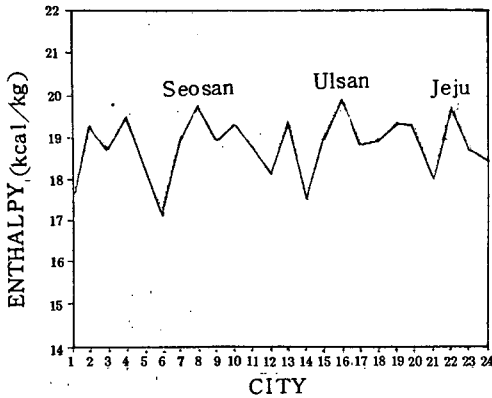


Fig.(2.4) Outdoor air enthalpy summer (TAC 2.5%)

여기에서는 서울지역의 겨울 TAC 1%를 제외하고는 전부 같은 현상을 보이고 있다. 즉, 겨울의 경우는 그 온도가 더욱 저하되었으며 여름의 경우는 그 온도가 더 올라감을 보여주고 있다. 특히 겨울의 경우 수원, 전주, 대구는 각각  $-3.2^{\circ}\text{C}$ ,  $-2.2^{\circ}\text{C}$ ,  $-2.4^{\circ}\text{C}$  씩이나 떨어졌으며 여름의 경우도 역시 수원, 전주, 대구가  $3.1^{\circ}\text{C}$ ,  $2.5^{\circ}\text{C}$ ,  $2.9^{\circ}\text{C}$ 가 올라 수원, 대구, 전주의 순으로 설계온도가 많은 차이를 보이고 있다.

그러나 표(2-3)의 년 평균 온도를 보면 수원, 전주, 대구의 경우에도 그 온도가 여름에는 올라가고 겨울에는 떨어진 현상이 일어나지 않고 있다. 이는 단지 난방기간과 냉방기간 동안의 평균온도는 큰 차이가 없으나 혹한과 혹서의 발생 빈도수가 1960 년대에 비해 현저히 늘고 있음을 알 수 있다.

또한 표(2-4)과 표(2-5)는 년도별 최고, 최저 온도 및 10년중 극치값을 나타내었다.

그림(2-4)와 표(2-6)은 TAC 2.5%를 기준으로 상대습도와 건구온도로서 엔탈피를 나타내어 국내의 24개 지역을 비교하였다.

그림(2-4)에서는 울산( $20\text{ kcal/kg}$ )지역이 가장 높고, 서산( $19.75\text{ kcal/kg}$ ) 제주( $19.7\text{ kcal/kg}$ )의 순이며, 건구온도만을 고려한 대구, 포항, 울산등의 순서와는 틀리는데, 이는 대구 및 포항지방의 습도가 상대적으로 낮기 때문이며, 실제로 피부로 느끼는 정도는 엔탈피의 순서로 될 것이다.

### 3. 냉난방 도일

냉난방 도일은 연간 에너지소요량을 계산하는 방법에서 필요한 데이터로서 이 방법은 에너지소요량에 대한 빠른 추정이 가능하다는 장점이 있으나 경우에 따라서는 상당한 차이가 있을 수 있다는 단점이 있다.

냉난방 도일은 일반적으로  $HD_{x-y}$  혹은  $CD_{x-y}$

로 표시되는데  $X$ 는 유지해야할 실내온도를,  $Y$ 는 보일러나 A.H.U.의 가동 시작온도를 말한다. 겨울의 경우  $X$ 와  $Y$ 의 값이 틀릴수가 있는데 그 이유는 실내발열량, 태양열 등에 의해서 외부온도가 유지해야 하는 실내온도가 됐어도 실제로는 실내온도가 더 높으므로 그 이하의 온도에서 열원기기를 가동하게 된다. 이러한  $Y$ 점의 온도를 Balance Point Temperature라 하며  $T_b = T_i - Q_i / U \cdot A$ 로 표시된다.

여기서,  $T_b$  : Balance Point Temp.

$T_i$  : 유지해야 하는 실내온도

$Q_i$  : 실내 발열량

$U$  : 열관류율

$A$  : 전열면적

그런데,  $Q_i$  및  $U$  값이 건물의 특성에 따라 틀리므로 적절히 선택되어야 한다. 여기에서는 냉난방 도일을 구하기 위해서 70년대의 매일의 평균기온을 Data로 하며 난방도일의 경우는  $HD_{X-Y} = \sum_{i=1}^N (T_i - T_o)$  혹은  $HD_{X-Y} = \sum_{i=1}^{N'} (T_i - T_o')$  냉방도일의 경우  $CD_{X-Y} = \sum_{i=1}^N (T_i - T_o)$ 에 의하여 Heating Degree Day와 Cooling Degree Day를 산출하였다.

$T_i$  : 유지해야 하는 실내온도

$T_o$  : 외기온도

$T_o'$  : 난방시작 온도

$N$  : 외기가  $t_o$  이하인 날수

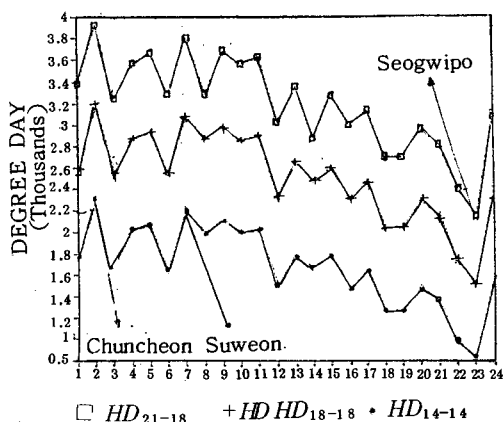


Fig.(3-1) Heating degree days

$N'$  : 외기가  $t_o'$  이하인 날수

이러한 방법에 의하여 나온 결과중  $HD_{18-18}$ 을 나타낸 그림(3-1)과 표(3-1)을 보면 춘천이 3,196, 수원이 3,091, 청주 2,985의 순이며, 서귀포가 1,539로 가장 낮은 값을 나타내고 있으며 이는  $HD_{21-18}$ ,  $HD_{18-14}$  등에서도 유사한 경향을 나타내고 있다.

이러한 순서는 난방도일과 설계온도(TAC 2.5%)와는 거의 비슷한 경향을 나타냄을 알 수 있다.

또한  $CD_{24-24}$ 를 나타낸 그림(3-2)와 표(3-1)을 보면 대구 171, 제주 162.4, 전주 159,

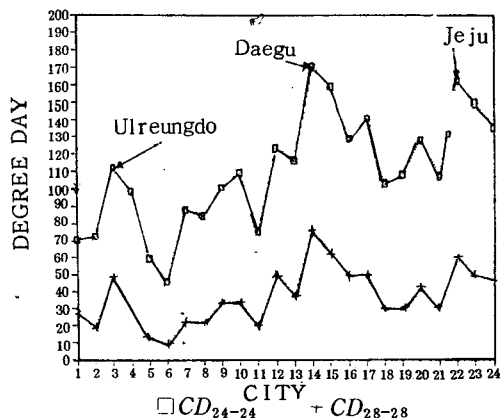


Fig.(3-2) Cooling degree days

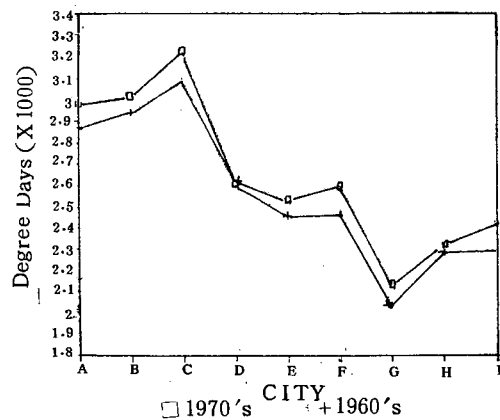


Fig.(3-3) Heating degree day of 1960's & 1970's  $HD_{18-18}$

서귀포 150.3의 순으로 울릉도가 46의 가장 낮은 값을 보이고 있으며 이는 겨울 설계온도(TAC 2.5%)의 온도 순서인 대구 포항 울산 전주와는 약간의 차이를 보이고 있다.

그림(3-3)과 표(3-2)에는 9개 지역에 대하여 난방도일을 비교해 놓았는데 여기에서 난방도일의 값은 70년대가 떨어졌으며 냉방도일 역시 부산을 제외하고는 전부 떨어진 경향을 보이고 있다.

즉, 이는 전체적으로 보아 겨울동안의 평균기온은 약간 올라갔고 여름동안의 평균기온은 약간 떨어짐을 짐작할 수 있으나 표(2-3)의 평균기온의 비교를 보면 알 수 있는바와 같이 겨울의 경우는 일치하나 여름의 경우는 일치하지 않는다.

춘천, 수원, 청주 등 중부내륙지방이며 가장 더운곳은 대구, 포항, 울산등의 동남부 지역이다.

3) TAC 2.5% 기준할때 여름 설계온도의 차는 울릉도를 제외할때 4.2°C에 불과한 반면 겨울 설계온도는 제주도를 제외한다고 해도 11.2°C의 큰 차이를 보이고 있다.

4) 60년대에 비하여 70년대가 여름의 설계온도는 올라가고 겨울의 설계온도는 떨어진점과 냉난방 도일은 공히 떨어지는 점을 고려할때 이는 전체적으로 겨울은 더 추워지고 여름은 더 더워진 것이 아니라 단지 혹한과 혹서의 발생빈도 수만 증가했음을 알 수 있다.

#### 참 고 문 헌

#### 4. 결 론

냉난방 설계용 외기조건과 냉난방 도일에 대하여 국내 24개 지역을 분석한 결과 다음과 같은 결론을 얻었다.

1) Hourly data를 사용하면 더욱 정확한 분석이 이루어지겠으나, 여건상 본 연구에서는 Daily data를 사용하였다.

2) TAC 2.5%를 기준할때 가장 추운곳은

1) American Society of Heating, Refrigerating and Air Conditioning Engineers, INC, 1981, Chap. 24, 25.

2) 김효경, "한국의 공기조화 설계용 외기조건에 관한 연구" 과기처 연구보고서, 1970년도 Vol. MOST-R-70-46-ME

3) Cheol Park 외 2인, "Economizer Algorithm for Energy Management and Control Systems", NBSIR 84-2832

Tab. (2-1) Dry Bulb Temp. & Relative Humidity

Sokcho (1)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-11.6	-9.8	-7	-11.2	-11.7	-9.7	-14.4	-12.5	-10.8		
Winter	2.5%	-10.3	-8.4	-6.1	-11.1	-8.7	-12.2	-12.2	-10.4	-7.8	-9.6°C	55.6%
	5%	-8.4	-7.4	-5.8	-7.8	-9	-7.8	-10.8	-9.1	-6.2	-8.4°C	
Summer	1%	35.2	34.5	34.4	34.6	33.2	33.2	34.1	34.7	34.6	34.2°C	41.5%
	2.5%	32.4	32.9	33.7	34	32.4	32.5	33.3	33.8	33.8	33.2°C	48.1%
	5%	30.9	31.2	33.5	32.1	30.4	32.4	31.2	32.8	31.5	31.9°C	55.3%

Chuncheon (2)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-21.8	-19	-14.6	-17	-20.3	-15.9	-19.3	-19.5	-17.4		
Winter	2.5%	-21	-18	-12.4	-14.6	-15.1	-18	-19	-16.3	-14.2	-16.7°C	69.7%
	5%	-20.8	-17	-12.3	-14.1	-17.8	-14.4	-16.4	-15.8	-13.8	-16.1°C	
Summer	1%	34.1	33.5	35.9	35.3	33.8	32.7	35.5	36.4	33.6	34.5°C	54.3%
	2.5%	33.4	33.1	35.2	34.5	32.6	31.8	34.4	35.9	33.3	33.8°C	54.5%
	5%	32.6	31.9	34.7	34.1	32.4	32.8	31.6	34	32.2	33°C	54.7%

## Gangreung (3)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-12.6	-9.7	-7	-11.4	-12	-9.4	-14	-14	-12.6		
Winter	2.5%	-10.5	-8.6	-6.7	-11.1	-8.6	-12.1	-11.8	-11.4	-7.4	-9.7°C	56.4%
	5%	-9.5	-8.2	-5.7	-8.4	-9.9	-7.4	-10.5	-9.5	-6	-8.6°C	
Summer	1%	35.4	34.5	35.6	36.6	34.1	33.1	37	35.9	34.4	35.3°C	45.6%
	2.5%	34.2	33.6	34.9	35	33.1	32.9	35.6	35.3	34	34.3°C	49.5%
	5%	33.3	32.7	34.8	34.4	32.7	34.2	32.2	35	33.6	33.8°C	51.4%

## Seoul (4)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-17.5	-13	-10.3	-15.6	-14	-11.2	-16.5	-15.8	-14.4		
Winter	2.5%	-15.4	-12.4	-9.1	-11.3	-13.4	-15.5	-15.2	-13.2	-10.8	-12.7°C	65.1%
	5%	-13.3	-11	-8.8	-10.6	-12.5	-10.3	-14.2	-12	-9.6	-11.7°C	
Summer	1%	33.9	33.2	35.2	34.5	33.7	33.5	34.7	36	32.3	34.2°C	54.2%
	2.5%	33.8	32.2	34.2	34.4	32.6	32	34.4	34.8	32.2	33.5°C	57%
	5%	32.4	31.8	32.9	33.3	31.6	33.3	31.3	33.7	33.8	32.6°C	59.8%

Inchon (5)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-16.5	-12.4	-10.8	-15.6	-13	-10.2	-15.4	-15.8	-13		
2.5%	-14.7	-11.7	-9.1	-11	-12.6	-10	-14.3	-15.2	-12.6	-10.1	-12.1°C	
5%	-12.3	-10.3	-8.6	-9.8	-11.4	-9	-12.7	-14	-11.4	-9.2	-10.9°C	
1%	32.7	32.4	30.7	34	31.6	33.6	31.2	33	34.4	32.1	32.6°C	56.1%
2.5%	31.6	31.4	30.4	32.7	30.8	32.6	30.4	32.2	33.7	31.7	31.8°C	57.8%
5%	31	30.6	29.9	31.8	30.4	32.2	29.8	31.6	32.8	31	31.1°C	58.8%

Ulreungdo (6)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	.	-6.4	-4.6	-7.8	-8.4	-6.4	-9.2	-9.5	-7.6		
2.5%	.	-6	-3.2	-7	-7.2	-5.4	-7.4	-8.8	-6.5	-3.2	-5.5°C	
5%	.	-4.5	-3	-6	-6.4	-5	-6.7	-6.4	-6	-3.1	-4.7°C	
1%	.	31.2	30.8	33	30.7	30.8	29.8	32.6	31.4	30	28°C	74.6%
2.5%	.	30.7	30.4	32.6	30.6	30.6	29.2	31.4	31.2	29.5	27.6°C	75.1%
5%	.	30.4	29.7	31.6	29.5	30.6	28.7	30.2	30.8	28.8	27°C	77.1%



Suweon (7)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-20	-19.4	-11.4	-23.6	-20.2	-16.3	-17.3	-18.4	-15.6		
2.5%	-17	-17.9	-10.8	-19.2	-18.2	-15	-16.5	-18	-14.7	-12.7	-16°C	
5%	-16.2	-13.7	-10.2	-12.1	-15	-13.6	-15.3	-17.1	-13.1	-11.8	-13.8°C	
1%	33.5	32.9	34.6	34.2	33.2	33	32.5	34.9	35	33	33.7°C	54%
2.5%	32.4	32.7	34.4	33.5	32.8	32.8	31.7	33.6	34.7	32.8	33.1°C	56.1%
5%	32.1	31.9	32.4	33.3	31.8	32.6	31.1	32.6	33.2	32.2	32.3°C	57.6%

Seosan (8)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-14.2	-12.2	-8	-13.4	-16.2	-11.2	-14.8	-15.5	-12.7		
2.5%	-12.4	-11.2	-7.3	-12.6	-13.2	-10.2	-14.6	-14.7	-11.6	-9.5	-11.7°C	
5%	-11.9	-9.5	-6.9	-9.9	-12.8	-9.6	-12.6	-13.9	-10.8	-7.8	-10.6°C	
1%	33.3	33	35.2	34.7	33.9	34.3	32.6	35.4	35.6	32.8	34.1°C	48.9%
2.5%	32.4	32.1	33.6	33.6	32.5	33.9	31.7	35.2	35	32.6	33.3°C	59.4%
5%	31.9	31	31.9	33.1	32.3	33.7	31.2	33	34.2	32.4	32.5°C	60.7%

Cheongju (9)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-17.2	-20.6	-10.1	-19.6	-22.6	-13	-17.9	-17.8	-15.8		
2.5%	-15.4	-15.4	-9.8	-14.7	-20.7	-12.4	-16.8	-17.1	-14.3	-12.2	-14.9°C	
5%	-14.6	-11.8	-8.6	-11.2	-10.1	-12.2	-16.1	-16.1	-12.8	-11.2	-13.1°C	
Summer	1%	33.7	33.9	35.3	33.4	33.3	33.3	34.9	35.3	34	34.2°C	52.6%
	2.5%	33.5	33.1	34.1	34.4	33.1	33.2	34.4	34.9	33.3	33.7°C	53.1%
	5%	32.5	32.8	33.6	34	32.8	33.1	32	34.1	34.6	33.2°C	54.4%

Daejeon (10)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-16.2	-17	-9.6	-15.6	-17.3	-11	-15.3	-15.6	-13.6		
2.5%	-14	-12.2	-8.7	-12.5	-16	-10	-15	-14.9	-12.8	-10	-12.6°C	
5%	-13	-10.5	-8	-10.4	-14.1	-9.5	-13.9	-14.4	-11.8	-9	-11.5°C	
Summer	1%	34.2	33.5	34.4	35.2	33.4	33.1	35	34.7	33.2	33.8°C	54.5%
	2.5%	33.3	33.1	33.9	34.2	33.2	31.1	34.2	34.5	33	33.3°C	57%
	5%	32.9	32.5	33.7	33.8	32.7	30.8	31.9	33.9	34.2	32.8	32.9°C

## Chupungryeong (11)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-11.3	-13.2	-9.6	-12.4	-14.8	-10.5	-15.3	-15.1	-13		
2.5%	-10.9	-12.1	-9	-11.8	-14.3	-9.9	-13.9	-14.1	-12.1	-11.1	-11.9°C	
5%	-9.9	-10.9	-7.9	-10.3	-13	-9.2	-12.3	-12.5	-10.9	-9.9	-10.7°C	
1%	33.4	34.3	34.3	35.5	34.1	33.6	33	35.7	34.3	32.5	34.1°C	53%
2.5%	33	33.4	33.6	35.3	33.2	33.2	32.5	34.3	33.7	32	33.4°C	53.9%
5%	32.9	33.1	33.3	34.8	32.3	33.1	32	33.4	33.3	31.3	33°C	56.6%

## Pohang (12)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity *
	1%	-11.8	-9.5	-7	-9.7	-10.6	-7.7	-12.3	-12.3	-9.7		
2.5%	-10.1	-8.7	-5.7	-7.2	-9.1	-6.5	-11.6	-11.6	-9	-6.2	-8.6°C	
5%	-8.1	-7.8	-4.8	-6.8	-8.4	-6.1	-10.9	-10.9	-7.2	-5.2	-7.6°C	
1%	35.3	34.8	34.8	36	34.3	34.9	34.4	37.3	36.8	35.3	35.4°C	42.6%
2.5%	34.6	34.7	34.5	35.8	34	34.3	33.7	36.5	36.5	35	35°C	44.9%
5%	34.2	34.3	33.9	35.3	33.3	34	33.4	35.9	35.5	34.4	34.4°C	47.7%

Gunsan (13)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-10.7	-12	-6.1	-9.9	-12.1	-9.1	-11.7	-11.9	-9.9		
Winter	2.5%	-9.9	-8.2	-5.7	-8.5	-9.8	-10.7	-11.7	-9.8	-6.6	-8.8°C	72.3%
	5%	-8.7	-6.9	-4.9	-7.3	-8.3	-10.5	-10.3	-8.2	-5.8	-7.7°C	
Summer	1%	32.3	32.6	34.2	34.4	32.5	34.7	34.7	35	33.2	33.6°C	57.4%
	2.5%	32.1	32.4	33	32.8	31.9	32.2	34.1	34.5	32.6	32.9°C	59.7%
	5%	31.6	32	32	32.6	31.6	32.9	31.8	34.1	32	32.4°C	61.9%

Daegu (14)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-13.3	-11.4	-13.3	-12.6	-12.4	-9.2	-12.2	-13.1	-10.4		
Winter	2.5%	-12.2	-9.6	-12.2	-9.7	-12	-11.5	-12.1	-9.4	-8.3	-10.6°C	59.5%
	5%	-10.8	-8.2	-10.8	-7.8	-11	-10.8	-11.1	-7.9	-6.8	-9.3°C	
Summer	1%	34.9	35.8	35.8	37	36.2	35.9	38.8	36.6	35.3	36.2°C	38.4%
	2.5%	34.7	35	35.3	37	35.3	35.7	37.7	36.5	35.1	35.8°C	39.3%
	5%	34.4	34.7	35	36.4	34.3	35.2	34.9	36.9	36.1	34.2	32.4°C

Jeonju (15)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-14.2	-15	-10.7	-10.2	-12	-10.4	-13.1	-13.9	-12		
Winter	2.5%	-11.7	-11.2	-8.3	-10	-9.3	-12.3	-13.2	-11.4	-8.6	-10.7°C	73.3%
	5%	-10.2	-9.4	-6.8	-8.7	-10.4	-8.6	-11.4	-10.3	-7.1	-9.6°C	
Summer	1%	34.7	34.8	35.1	36.5	34.8	34.8	35.4	36.2	34	35.1°C	49.1%
	2.5%	34.3	34.3	34.1	35	34.4	33.6	35.3	35.4	33.6	34.4°C	51%
	5%	33.9	34.1	33.6	34.2	33.8	33	35	34.5	33.4	33.9°C	51.9%

Ulsan (16)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-12	-9.7	-5.5	-9.9	-10.3	-7.2	-10.5	-12	-9.1		
Winter	2.5%	-9.4	-5	-8	-9.3	-6.4	-10.3	-10.7	-9	-6.3	-8.3°C	63.1%
	5%	-8	-6.9	-4.9	-7.2	-8.4	-6.1	-9.8	-7.6	-5.4	-7.4°C	
Summer	1%	35.4	36	34.2	35	34.8	34.9	36.3	36.5	35.5	35.2°C	51.7%
	2.5%	34.8	35.3	33.5	34.8	33.4	34.2	35.6	35.7	34.2	34.6°C	54.3%
	5%	34.4	34.4	33.4	34.7	32.8	33.3	33.2	34.5	33.3	33.9°C	58.3%

Gwangju (17)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-10.4	-13.9	-6.1	-9	-10.3	-9	-11.3	-12.1	-9.7		
Winter	2.5%	-9.2	-7.8	-5.9	-8.4	-7.8	-10.4	-11.8	-8.6	-6.8	-8.5°C	71.6%
	5%	-8.4	-7.1	-5.4	-6.8	-8	-9.8	-10.1	-8.3	-5.5	-7.6°C	
Summer	1%	35.1	34.2	35.1	34.5	33.8	33.1	36.2	34.7	33.6	34.4°C	49%
	2.5%	34.2	33.7	33.9	33.8	33.7	32.7	36	34.5	33.5	34°C	52.1%
	5%	33.3	32.8	32.6	33.5	33.3	32.9	32.5	34.7	33.1	33.3°C	53.2%

Busan (18)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-10.4	-8.6	-5.2	-8.2	-9	-6.5	-10	-11.8	-8.4		
Winter	2.5%	-8.1	-6.7	-4.1	-6.2	-7.2	-8.9	-10.3	-8	-5.8	-7.1°C	55.3%
	5%	-6.5	-5.7	-3.4	-5.3	-6.4	-4.8	-8.2	-6.3	-4.2	-6°C	
Summer	1%	31.2	32.4	31.8	32.6	30.7	31.2	33	33.2	32.9	32.2°C	62.2%
	2.5%	31	31.5	31.4	32	30.4	30.9	32.4	32.5	31.5	31.6°C	62.7%
	5%	30.6	30.9	30.5	31.6	30.3	31.6	30.6	31.7	31.1	31.1°C	64.7%

## Chungmu (19)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-8.9	-6.9	-4.8	-7.3	-8.4	-5.7	-8	-10.3	-7.8		
Winter	2.5%	-7.4	-5.4	-6.2	-7.3	-5	-7.6	-9.5	-6.8	-4.5	-6.4°C	62.5%
	5%	-6.7	-4.8	-3.6	-5.2	-6	-4.1	-7.4	-6.2	-3.8	-5.5°C	
Summer	1%	33.6	34.5	34.2	34.6	32.1	34.2	33.4	33.6	32.8	33.4°C	59.6%
	2.5%	32.2	32.8	32	33.1	31.6	33	30.7	33.4	32.2	32.4°C	61.3%
	5%	31.9	31.6	31.8	32.6	31.2	32.5	30.4	32.8	31.5	31.9°C	63.9%

## Mokpo (20)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-9	-9	-4.1	-7.2	-9.3	-5.3	-9.1	-9.7	-8.1		
Winter	2.5%	-7.7	-3.8	-6	-7	-5.1	-8.9	-9.2	-7	-4.8	-6.4°C	74.4%
	5%	-6.5	-4.5	-3.4	-4	-5.8	-4.5	-8.1	-6.5	-3.9	-5.5°C	
Summer	1%	34.1	33.7	33.5	35	33.5	34.2	35.1	34.1	34.1	34°C	54.3%
	2.5%	33.2	33.2	32.4	33	33	32.1	33.6	33.9	33.3	33.2°C	56.8%
	5%	32.5	32	31.2	32.5	32.2	31.7	31.7	33.2	33.3	32.5°C	59.6%

Yeosu (21)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-10	-8.6	-5.1	-7.8	-8.9	-6.2	-10.4	-10.8	-8		
Winter	2.5%	-8.2	-8.2	-4.3	-6.6	-6.9	-9.4	-10	-6.9	-4.1	-7°C	61.7%
	5%	-7	-5.4	-3.7	-5.5	-6	-4.9	-8.4	-6	-3.6	-5.9°C	
Summer	1%	32.8	33.1	32.8	33.9	31.5	31.4	32.6	32.8	32.1	32.6°C	55.3%
	2.5%	31.9	32.1	31.6	32.7	31.2	30.9	32.6	32.2	31.2	31.9°C	56.3%
	5%	31.2	31.2	30.8	32.2	31	31.9	30.6	32.1	31.8	31.4°C	61.5%

Jeju (22)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-2.8	-2.3	-1	-2.3	-1.7	-2	-2.9	-5.9	-1.7		
Winter	2.5%	-2.5	-1.2	-0.3	-1.6	-1.3	-2.1	-3.9	-1.4	0	-1.5°C	73.2%
	5%	-0.9	-0.6	0	-0.4	-0.7	-0.4	-3.1	-0.7	0.1	-0.8°C	
Summer	1%	34.2	35.4	32.1	32.9	33.5	33.5	35	34	34	33.8°C	56.3%
	2.5%	32.6	35.2	31.8	32.5	33.3	33.3	34.1	33	33.2	33.2°C	58.1%
	5%	32	34.5	30.9	32	32.4	32.4	31.8	33.1	32.6	32.4°C	61.5%



Seogwipo (23)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-4.3	-3.2	-1.4	-2.5	-2.9	-2.8	-3.2	-5.9	-2.6		
Winter	2.5%	-3.6	-2.1	-0.7	-1.4	-2.1	-2.8	-4	-1.8	-0.6	-2.1°C	67.2%
	5%	-2	-1.3	-0.3	-0.9	-1	-0.8	-2.8	-1.2	0	-0.8°C	
Summer	1%	32.6	33	31.9	31.8	32.7	31.7	32	32.4	32.3	32.2°C	57.5%
	2.5%	32.1	32.7	30.3	30.9	30.9	31.5	31.8	32.1	32.3	31.7°C	61.2%
	5%	31.5	31.9	30.1	30.7	29.9	31.6	31.4	31.2	31.9	31.1°C	66.1%

Jinju (24)

Year Classific.	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Drybulb Average Temperature	Relative Humidity
	1%	-12.4	-12.4	-8	-10.4	-10.4	-9	-11.1	-12.3	-10		
Winter	2.5%	-11.1	-11.1	-7.1	-8.4	-8.3	-10.5	-11.6	-8.7	-7.7	-9.4°C	64.9%
	5%	-10.6	-10.6	-6.2	-7.6	-9.4	-9.9	-10.9	-8.4	-7.4	-8.9°C	
Summer	1%	33.8	33.8	34.5	35.3	34.6	32.7	35.2	34.9	33.9	34.2°C	46.8%
	2.5%	33.5	33.5	33.7	35	33.4	32.5	34.7	34.2	33	33.7°C	50.8%
	5%	32.5	32.5	33.5	34.6	33	32.1	34.2	33.3	32.9	33.2°C	55%

Tab. (2-2) Comparison of Outdoor Design Temperature

(Unit: °C)

Area	T.A.C.	Winter			Summer		
		1960's	1970's	Difference	1960's	1970's	Difference
Seoul (A)	1 %	-14.9	-14.1	+0.8	32.1	34.2	+2.1
	2.5%	-11.9	-12.7	-0.8	31.1	33.5	+2.4
	5 %				29.9	32.6	+2.7
Inchon (B)	1 %	-13	-13.4	-0.4	30	32.6	+2.6
	2.5%	-11.2	-12.1	-0.9	29.7	31.8	+2.1
	5 %				28.6	31.1	+2.5
Suweon (C)	1 %	-14.7	-17.6	-2.9	33	33.7	+0.7
	2.5%	-12.8	-16	-3.2	30	33.1	+3.1
	5 %				29.2	32.3	+3.1
Jeonju (D)	1 %	-10	-12.1	-2.1	32.8	35.1	+2.3
	2.5%	-8.5	-10.7	-2.2	31.9	34.4	+2.5
	5 %				31	33.9	+2.9
Gwangju (E)	1 %	-7.7	-9.9	-2.2	32.7	34.4	+1.7
	2.5%	-7.4	-8.5	-1.1	31.9	34	+2.1
	5 %				30.9	33.3	+2.4
Daegu (F)	1 %	-9.9	-11.7	-1.8	33.9	36.2	+2.3
	2.5%	-8.2	-10.6	-2.4	32.9	35.8	+2.9
	5 %				31.6	32.4	+0.5
Busan (G)	1 %	-6.9	-8.5	-1.7	30.4	32.2	+1.8
	2.5%	-5.8	-7.1	-1.3	29.7	31.6	+1.9
	5 %				29.4	31.1	+1.7
Mokpo (H)	1 %	-6.7	-7.7	-1.0	31.7	34.0	+2.3
	2.5%	-5.9	-6.4	-5.0	31.1	33.2	+2.1
	5 %				30.1	32.5	+2.4
Ulsan (I)	1 %	-9	-9.3	-0.3	33.4	35.2	+1.8
	2.5%	-7	-8.3	-1.3	32.2	34.6	+2.4
	5 %				31.1	33.9	+2.8

Tab. (2-3) Comparison of Average Temperature

(Unit: °C)

Area Classific.		Seoul	Inchon	Suweon	Jeonju	Gwangju	Daegu	Busan	Mokpo	Ulsan
		Winter	1960's	-1.1	-0.7	-1.3	2.2	4.5	1.3	2.9
	1970's	0.3	0.2	-0.6	1.8	2.6	2.5	5	3.6	3.8
Summer	1960's	23	22.3	22.5	23.8	23	21.5	23.1	23.7	23.8
	1970's	23	22.2	22.6	23.8	23.6	23.8	23	23.4	23.1

Tab. (2-4) Maximum Temperature

(Unit: °C)

Year Area	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Ex- treme Value
Sokcho	35.2	35.4	38.2	34.6	33.8	34.1	33.3	34.4	34.7	34.7	38.2
Chuncheon	35	34.4	36	35.4	34.6	34	34	35.5	36.5	34.5	36.5
Gangreung	36.7	36.1	36	37.2	34.4	36.3	33.5	37.2	37.1	35	37.2
Seoul	35	33.2	35.6	35.2	33.9	35.3	34.8	35	36.1	32.6	36.1
Inchon	33	32.8	31.4	34	32.5	33.6	32.2	33.6	35.2	32.4	35.2
Ulreungdo		31.9	31.4	33.1	31.3	31.2	29.8	33.6	31.5	31.1	33.6
Suweon	34.1	33.8	35.2	34.6	33.2	33.6	32.9	35	35.2	34.3	35.2
Seosan	33.4	34.4	35.3	35	35.1	34.6	32.8	35.4	37.7	35	35.4
Cheongju	33.7	35.1	35.6	35.7	34.7	33.6	34.2	34.9	35.9	34.1	35.9
Daejeon	34.5	34.1	35.2	35.3	35	33.1	37.7	35.3	35.2	33.4	35.3
Chupung- ryeong	33.6	35	34.6	35.9	34.4	33.9	33.3	35.9	34.6	33	35.9
Pohang	35.3	34.8	35.1	36.7	34.5	35	34.4	37.9	37.9	35.9	37.9
Gunsan	33.2	33.4	34.4	35.2	33.6	36.3	34.2	34.8	35.2	33.6	36.3
Daegu	34.9	36.3	36.1	37.5	37	36.5	36.5	39.5	37.7	35.6	39.5
Jeonju	35	35.4	35.9	37.2	35.6	35.2	35	36.2	36.4	34.1	37.2
Ulsan	35.5	36	34.7	35.8	33.7	34.8	35.1	36.6	37.4	35.6	37.4
Gwangju	35.2	34.5	36	35.5	34	34.7	33.3	36.3	35.2	33.8	36.3
Busan	31.4	32.8	32.5	32.8	30.8	33.6	31.8	33.4	33.4	32.9	33.6
Chungmu	33.7	34.6	35	34.8	32.3	35	31.5	33.8	34.5	33.1	35
Mokpo	34.2	34	34	35.3	33.6	34.5	33.2	35.2	34.3	34.4	35.3
Yeosu	33.2	34	33.4	34.3	31.8	34.6	31.6	33	33	32.9	34.6
Jeju	35.8	36.5	32.5	33.2	33.6	33.3	33.6	35.1	35.2	35.2	36.5
Seogwipo	33.3	33.1	32.4	33.9	32.5	33.4	31.7	32	33.6	32.4	33.9
Jinju	34.8	34.8	34.6	35.9	33.9	35.7	32.7	35.3	35	34	35.9

Tab. (2-5) Minimum Temperature

(Unit: °C)

Year Area	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Ex- treme Value
Sokcho	-15.0	-10.1	-8.4	-12.1	-12.6	-9.8	-14.7	-14.7	-13.9	-9.4	-15
Chuncheon	-21.8	-23.4	-15.5	-17.9	-27.5	-16.7	-19.9	-20.5	-17.5	-20	-27.5
Gangreung	-14.7	-10.8	-9.2	-12.8	-12.7	-9.6	-15.3	-15.5	-13.6	-10	-15.5
Seoul	-20.2	-16.1	-12	-17.4	-15.5	-11.8	-18.5	-16.8	-16	-13	-20.2
Inchon	-19	15.5	-11	-16.8	-15.1	-10.5	-16.7	-15.9	-14.7	-13.4	-19
Ulreungdo		-6.5	-5.4	-7.8	-8.5	-6.8	-9.6	-9.8	-9	-3.4	-9.8
Suweon	-20.4	-21.5	-11.8	-24.4	-20.4	-17.6	-17.7	-19.4	-17.5	-17.8	-24.4
Seosan	-15.6	-14	-9	-15.6	-16.7	-11.9	-15.7	-15.7	-12.8	-10.7	-16.7
Cheongju	-20	-23.2	-11	-20.6	-23	-15	-17.9	-18.5	-16.9	-15.5	-23.2
Daejeon	-17.9	-17.3	-9.8	-17.7	-18.6	-11.9	-15.3	-15.7	-15.8	-13.3	-18.6
Chupung- ryeong	-17.8	-15.2	-10.6	-17.2	-15.3	-10.5	-15.6	-16	-14.4	-11.9	-17.8
Pohang	-14.4	-10.8	-7.8	-12.9	-11.5	-7.8	-12.8	-12.8	-11	-9.3	-14.4
Gunsan	-13.7	-14.5	-6.3	-13.6	-12.4	-9.2	-12	-12.4	-10.7	-9	-14.5
Daegu	-15.1	-11.6	-15.1	-14	-14.1	-9.9	-13.3	-13.8	-11.3	-9.8	-15.1
Jeonju	-14.6	-15.3	-10.7	-14.2	-13.3	-11.2	-13.8	-14	-12.2	-9.8	-15.3
Ulsan	-12.9	-10.8	-6.8	-12.4	-11	-8.6	-12.1	-12.5	-9.8	-8.5	-12.9
Gwangju	-11.8	-15.7	-6.7	-10	-11.4	-10	-12.8	-12.6	-10.4	-8.2	-15.7
Busan	-12.1	-9.5	-6.2	-10.3	-10.5	-6.8	-11.5	-12.6	-8.5	-8.6	-12.6
Chungmu	-11.2	-8	-4.8	-9.2	-9.4	-6	-9.3	-8.2	-11.6	-7.2	-11.6
Mokpo	-10.1	-9.9	-4.7	-7.4	-10.2	-6.3	-11.6	-10.9	-8.5	-5.8	-11.6
Yeosu	-10.8	-9.8	-5.2	-9.3	-8.9	-6.4	-10.8	-12.6	-8.1	-7	-12.6
Jeju	-4.6	-2.8	-1.4	-2.3	-2.7	-2.5	-3.1	-6	-1.9	-2.6	-4.6
Seogwipo	-6.1	-4	-1.4	-3.3	-3.7	-3	-3.2	-6.3	-3.6	-3	-6.3
Jinju	-12.8	-12.8	-6.2	-12.1	-10.6	-9.4	-14.1	-13.1	-10.7	-8.8	-14.1

Tab. (2-6) Outdoor Air Enthalpy

Summer (TAC 2.5%)

AREA	ENTHALPY (kcal/Kg)	AREA	ENTHALPY (kcal/Kg)
Sokcho	17.5	Chuncheon	19.3
Gangreung	18.7	Seoul	19.5
Inchon	18.3	Ulreungdo	17.3
Suweon	18.9	Seosan	19.8
Cheongju	18.9	Daejeon	19.3
Chupungryeong	18.8	Pohang	18.1
Gunsan	19.4	Daegu	17.5
Jeonju	19	Ulsan	20
Kwangju	18.8	Busan	18.9
Chungmu	19.3	Mokpo	19.3
Yeosu	18	Jeju	19.7
Seogwipo	18.8	Jinju	18.5

Tab. (3-1) Heating and Cooling Degree Day

Sokcho

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3620.8	3488.7	3512.8	3498.1	3752.3	3501	3445.1	3486.8	3265.7	3048	3461.9
HD <sub>21-18</sub>	3540.3	3402.1	3409	3432.7	3666.7	3429.8	3349.9	3417.6	3201.7	2978.4	3382.8
HD <sub>18-18</sub>	2793.3	2664.1	2675	2676.7	2871.7	2688.8	2590.9	2679.6	2496.7	2258.4	2639.4
HD <sub>18-14</sub>	2698.9	2554.8	2571.6	2575.3	2756.2	2596.3	2492.9	2570.2	2410.3	2149.8	2537.6
HD <sub>18-10</sub>	2418	2244.6	2328.2	2299.7	2473.3	2290.2	2300.3	2311.4	2087.9	1887.5	2264.1
HD <sub>14-14</sub>	1918.9	1770.8	1799.6	1775.3	1920.3	1792.3	1736.9	1794.2	1646.3	1425.8	1758
HD <sub>14-10</sub>	1814	1664.6	1716.2	1687.3	1837.3	1690.2	1676.3	1711.4	1543.9	1331.5	1667.3
HD <sub>10-10</sub>	1210	1084.6	1104.2	1075.7	1201.3	1090.2	1052.3	1111.4	999.9	775.5	1070.5
CD <sub>24-24</sub>	50.6	63.6	73.4	116.3	26.7	85.7	56.9	67.3	101.4	65.1	70.7
CD <sub>26-26</sub>	15.8	23.3	29.5	45.5	10	28	23.2	30.6	33.7	27.2	26.7
CD <sub>28-28</sub>	3.1	7.9	6.6	11.8	3.3	7.1	5.2	7	5.3	8.9	6.6

Heating and Cooling Degree Day

Chuncheon

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	4171.5	4074.9	3988.6	3956.2	4233.4	3808.2	4074.5	3903.3	3880.7	3794.3	3988.6
HD <sub>21-18</sub>	4098.8	4034.1	3927.3	3892	4194.6	3750.2	4024.9	3835.5	3818.9	3742.7	3931.9
HD <sub>18-18</sub>	3375.8	3290.1	3160.3	3166	3420.6	3033.2	3256.9	3145.5	3113.9	2995.7	3195.6
HD <sub>18-14</sub>	3304.8	3228.2	3040.2	3072.7	3336	2953.3	3135	3077.2	3051.8	2907.1	3110.6
HD <sub>18-10</sub>	3151.5	2954.5	2797.5	2872.6	3076	2680.4	2903.9	2858.1	2803.9	2634.1	2873.1
HD <sub>14-14</sub>	2524.8	2384.2	2232.2	2268.7	2480	2173.3	2315	2289.2	2243.8	2079.1	2298.9
HD <sub>14-10</sub>	2479.5	2286.5	2146.5	2204.6	2392	2080.4	2235.9	2218.1	2155.9	1994.1	2219.1
HD <sub>10-10</sub>	1807.5	1618.5	1493.5	1536.6	1708	1480.4	1567.9	1578.1	1507.9	1354.1	1565.1
CD <sub>24-24</sub>	65.9	44.8	76.9	131.2	49.4	78.1	34.3	86.8	104.7	57.8	73
CD <sub>26-26</sub>	15.2	10.1	25.8	38.8	5	17.4	4.4	29	28.2	10.3	18.4
CD <sub>28-28</sub>	0.4	0.5	3.4	3.1	0	0	0	9	3	0	1.9

Heating and Cooling Degree Day

Gangreung

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3500.4	3410.5	3356.5	3329.1	3592.4	3349.7	3338.4	3286.8	3124	2955.3	3324.3
HD <sub>21-18</sub>	3426.6	3317.6	3278.9	3259.7	3521.1	3285.3	3231.8	3213.9	3059	2898.5	3249.2
HD <sub>18-18</sub>	2703.6	2606.6	2564.9	2551.7	2750.1	2568.3	2514.8	2514.9	2387	2196.5	2535.8
HD <sub>18-14</sub>	2594.5	2526.2	2454.6	2439.3	2620.7	2485.3	2413.6	2392	2291.7	2097.2	2431.5
HD <sub>18-10</sub>	2367	2220.2	2184.2	2186.5	2374.1	2200.1	2244.8	2171.9	2063.7	1844.4	2185.6
HD <sub>14-14</sub>	1854.5	1754.2	1710.6	1699.3	1848.7	1713.3	1685.6	1688	1583.7	1381.2	1691.9
HD <sub>14-10</sub>	1771	1652.2	1612.2	1610.2	1770.1	1620.1	1628.8	1607.9	1511.7	1296.4	1608.1
HD <sub>10-10</sub>	1175	1084.2	1040.2	1034.5	1166.1	1040.1	1012.8	1043.9	959.7	748.4	1030.5
CD <sub>24-24</sub>	95.8	96.4	120.3	169.6	50.4	134.4	73.6	105.5	178.8	93.9	111.9
CD <sub>26-26</sub>	40.2	42.4	53.8	78.5	17.6	58.6	27	56.3	76.5	38.6	49
CD <sub>28-28</sub>	9.2	11.6	17.4	24.8	3.9	16.7	6.6	23.5	20.3	10.5	14.5

Heating and Cooling Degree Day

Seoul

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3781.5	3729.8	3587.4	3626.5	3853.4	3492	3716.9	3524.3	3515.3	3383.4	3621.1
HD <sub>21-18</sub>	3704.8	3690.4	3520.5	3581.9	3800.1	3432	3647.9	3480.2	3471.6	3321	3565.1
HD <sub>18-18</sub>	3029.8	2970.4	2806.5	2876.9	3071.1	2766.7	2927.9	2808.2	2802.6	2628	2868.8
HD <sub>18-14</sub>	2959.2	2877.3	2707.6	2781.1	2991.9	2668.6	2850.7	2715.2	2727.3	2529.1	2780.8
HD <sub>18-10</sub>	2835.5	2612.5	2466.7	2560.7	2737.9	2430.2	2659.7	2520.7	2459	2379.7	2566.3
HD <sub>14-14</sub>	2243.2	2101.3	1935.6	2025.1	2171.9	1952.6	2066.7	1999.2	1967.3	1809.1	2027.2
HD <sub>14-10</sub>	2199.5	2004.5	1854.7	1944.7	2093.9	1878.2	2003.7	1936.7	1871	1763.7	1955.1
HD <sub>10-10</sub>	1563.5	1396.5	1242.7	1328.9	1449.9	1326.2	1347.7	1352.7	1283	1147.7	1343.9
CD <sub>24-24</sub>	84.1	57.3	82.5	150.7	69.2	151.9	56.5	110.2	146.6	75.9	98.5
CD <sub>26-26</sub>	23.6	13.7	32.3	51.8	15.1	45.6	6.7	31.8	60.2	17.1	29.8
CD <sub>28-28</sub>	2.8	0.8	9.9	11.9	0.9	7.7	0	7.3	18.9	0.3	6.1



Heating and Cooling Degree Day

Incheon

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3908.2	3820	3697.8	3703	3969.3	3600.1	3810.7	3690.7	3608.8	3440.1	3724.9
HD <sub>21-18</sub>	3828.5	3786.2	3615.8	3659	3913	3538.5	3737	3643.1	3562.9	3394.5	3667.9
HD <sub>18-18</sub>	3093.5	3030.2	2874.8	2927	3154	2836.5	2990	2932.1	2863.9	2653.5	2935.6
HD <sub>18-14</sub>	2999.5	2935.8	2773.8	2828.8	3069.3	2747.8	2918.2	2832.1	2787.3	2544.4	2843.7
HD <sub>18-10</sub>	2872.7	2632.8	2517	2578.4	2800.8	2468.7	2711.8	2625.8	2525.8	2361.2	2609.5
HD <sub>14-14</sub>	2255.5	2119.8	1977.8	2032.8	2221.3	1987.8	2106.2	2072.1	1999.3	1800.4	2057.3
HD <sub>14-10</sub>	2216.7	2012.5	1893	1950.4	2136.8	1896.7	2035.8	2005.8	1901.8	1745.2	1979.5
HD <sub>10-10</sub>	1560.7	1392.5	1269	1322.4	1472.8	1324.7	1359.8	1385.8	1277.8	1129.2	1349.5
CD <sub>24-24</sub>	49.6	33.3	26.8	106.4	34.5	100.7	27.6	58.4	110.9	51.6	60
CD <sub>26-26</sub>	9.3	6.9	4.1	24.1	4.3	19	0.4	13.7	38.7	9.6	13
CD <sub>28-28</sub>	0.7	0	0	4.8	0	1.1	0	0.4	8.3	0	1.5

Heating and Cooling Degree Day

Ulreungdo

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	.	3466	3354.5	3395	3635.9	3393.4	3503.8	3360	3201.8	3096.5	3378.5
HD <sub>21-18</sub>	.	3370.3	3249.4	3325.1	3525.2	3323	3398.1	3272.9	3126.3	2989.9	3286.7
HD <sub>18-18</sub>	.	2617.3	2493.4	2563.1	2745.2	2579	2600.1	2543.9	3406.3	2263.9	2534.7
HD <sub>18-14</sub>	.	2520.2	2395.3	2430.1	2627.6	2497	2493.7	2446.9	2306.6	2171.7	2432.1
HD <sub>18-10</sub>	.	2208.5	2099.2	2166	2377.9	2085	2275.5	2170.4	1983.3	1900	2140.6
HD <sub>14-14</sub>	.	1716.2	1591.3	1650.1	1827.6	1673	1705.7	1674.9	1546.6	1427.7	1645.9
HD <sub>14-10</sub>	.	1608.5	1499.2	1566	1745.9	1533	1635.5	1586.4	1435.3	1324	1548.2
HD <sub>10-10</sub>	.	1008.5	899.2	966	113.9	981	995.5	1002.4	887.3	748	955.8
CD <sub>24-24</sub>	.	38.7	26.9	32.7	19.3	72.3	19.5	44.6	83.9	27.8	46.2
CD <sub>26-26</sub>	.	6.3	2.2	20.1	2.7	10.2	4.4	12.6	18.7	5	9.3
CD <sub>28-28</sub>	.	0	0	1.2	0	0.3	0.4	0.1	0.4	0.1	0.3

Heating and Cooling Degree Day

Cheongju

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD <sub>21-21</sub>	2876.2	3832.8	3674.4	3772.8	4070.1	3620.2	2858.1	3662.4	3605.1	3556.7	3752.9
HD <sub>21-18</sub>	3801.1	3792.5	3622.8	3716.5	4020.6	3551.7	3811.2	3613.3	3557.7	3501.9	3698.9
HD <sub>18-18</sub>	3108.6	3078.5	2872.8	2999.5	3273.6	2870.7	3067.2	2935.3	2870.7	2772.9	2985
HD <sub>18-14</sub>	3039.6	3010.5	2778.4	2899.4	3190	2798.4	2970.6	2842	2806.3	2687.3	2902.3
HD <sub>18-10</sub>	2915.2	2745.3	2531.8	2748.3	2915.5	2546.1	2759.1	2588	2564.3	2450.2	2676.4
HD <sub>14-14</sub>	2279.6	2190.5	1978.4	2135.4	2358	2030.4	2162.6	2094	2022.3	1895.3	2114.7
HD <sub>14-10</sub>	2247.2	2097.3	1899.8	2084.3	2267.5	1958.1	2095.1	2008	1940.3	1830.2	2042.8
HD <sub>10-10</sub>	1579.2	1449.3	1267.8	1420.3	1619.5	1370.1	1431.1	1428	1316.3	1210.2	1409.2
CD <sub>24-24</sub>	108.5	97.4	94.2	172.9	73.7	135	55.8	99.9	165.6	96.7	110
CD <sub>26-26</sub>	28.5	31.3	35.6	62.2	20	43	6.9	28.7	62.3	24	34.3
CD <sub>28-28</sub>	0.6	4	6.1	9.3	0.7	1.8	0	3.4	10	0.7	3.7

Heating and Cooling Degree Day

Daejeon

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD <sub>21-21</sub>	3743.8	3661.4	3501.5	3598.7	3908.1	3600.9	3741.5	3555.4	3502	3435.5	3624.9
HD <sub>21-18</sub>	3558.8	3624.8	3431.3	3541.7	3858	3514.1	3690.2	3502.2	3461.2	3370.5	3566.3
HD <sub>18-18</sub>	2998.4	2916.8	2711.3	2830.7	3114	2785.1	2943.2	2839.2	2768.2	2656.5	2856.3
HD <sub>18-14</sub>	2915.8	2838.5	2623.8	2736.2	3017	2675.9	2860.8	2751.5	2689.9	2564.3	2767.4
HD <sub>18-10</sub>	2769.4	2572.4	2364	2565.4	2721.6	2452.9	2620.2	2488.1	2439.7	2343	2533.7
HD <sub>14-14</sub>	2175.8	2038.5	1843.8	1984.2	2209	1927.9	2048.8	2007.5	1921.9	1792.3	1995
HD <sub>14-10</sub>	2125.1	1948.4	1760	1925.4	2105.6	1864.9	1972.7	1920.1	1835.7	1731	1918.9
HD <sub>10-10</sub>	1481.1	1324.4	1156	1285.4	1489.6	1276.9	1324.7	1352.1	1231.7	1119	1304.1
CD <sub>24-24</sub>	131.1	104.6	97.6	170.1	75.8	74.1	67.1	114	175.7	95.8	109.3
CD <sub>26-26</sub>	38.1	36	34.1	61.5	22.7	11	10.8	33.8	65.9	25.6	34
CD <sub>28-28</sub>	1.2	7.7	4.6	5.4	0.3	0	0	4	9.4	0.8	3.3

Heating and Cooling Degree Day

Suweon

Year Deg. Day	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	4037.3	3943.6	3757.5	3876.3	4135.4	3766.3	3983.4	3823.9	3756.7	3638	3871.9
HD <sub>21-18</sub>	3975.4	3902	3690.5	3824.8	4076.9	3697.9	3927.4	3786.7	3713.5	3598.2	3819.3
HD <sub>18-18</sub>	3246.4	3176	2949.5	3101.8	3323.9	3004.9	3171.4	3075.7	3008.5	2851.2	3090.9
HD <sub>18-14</sub>	3154	3099.1	2844.2	3000.9	3257	2908.8	3078.8	2988.5	2939.9	2741.2	3001.2
HD <sub>18-10</sub>	3022.9	2847.5	2580.6	2825	2963.7	2687.2	2878.2	2736.2	2689.5	2521	2775.2
HD <sub>14-14</sub>	2390	2267.1	2044.2	2216.9	2393	2144.8	2250.8	2204.5	2139.9	1961.2	2201.2
HD <sub>14-10</sub>	2354.9	2183.5	1948.6	2161	2295.7	2083.2	2190.2	2124.2	2049.5	1893	2128.4
HD <sub>10-10</sub>	1686.9	1519.5	1316.6	1497	1627.7	1479.2	1502.2	1512.2	1409.5	1265	1330.4
CD <sub>24-24</sub>	83.2	68.8	68.1	132.1	59.7	117.5	46.9	79.7	140.2	79.8	87.6
CD <sub>26-26</sub>	18	15.1	21.7	35.5	7.9	29.8	2.8	21.1	47.5	19.5	21.9
CD <sub>28-28</sub>	1.4	0.2	7	5.5	0	2.5	0	1.8	10.4	0.5	2.9

Heating and Cooling Degree Day

Seosan

Year Deg. Day	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3807.8	3755.2	3605.3	3658.8	3293.5	3524	3737	3615.1	3503.9	3435.1	3593.6
HD <sub>21-18</sub>	3739.4	3713.5	358.3	3611.7	3857.9	3461.3	3685.5	3569	3463.7	3389.4	3285
HD <sub>18-18</sub>	3013.4	2978.5	2797.3	3879.7	3110.9	2762.3	2926.5	2867	2770.7	2648.4	2875.5
HD <sub>18-14</sub>	2916.2	2894.6	2686.6	277	3033.4	2660.1	2826.4	2762.5	2709.2	2540	2530.1
HD <sub>18-10</sub>	2764.7	2618.8	2434.3	2572	2744.7	2415.9	2652.9	2532.9	2461.8	2327.9	2552.6
HD <sub>14-14</sub>	2156.2	2070.6	1898.6	1992.8	2189.4	1908.1	2022.4	2010.5	1913.3	1776	1993.8
HD <sub>14-10</sub>	2108.7	1970.8	1810.3	1928	2092.7	1835.9	2968.9	1932.9	1825.8	1711.9	1918.6
HD <sub>10-10</sub>	1452.7	1322.8	1186.3	1284	1440.7	1255.9	1284.9	1332.9	1189.8	1095.9	1284.6
CD <sub>24-24</sub>	72.3	48.1	51.8	128.6	48.1	136.4	55.6	78.3	147.8	76	84.3
CD <sub>26-26</sub>	12.2	9.4	15	30.9	8	39.8	3.6	23.3	52.2	17.6	21.2
CD <sub>28-28</sub>	0.4	0	3.4	3.1	0	2.2	0	1.3	10.1	0	2.1

Heating and Cooling Degree Day

Chupungryeong

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD21-21	3884.5	3781.4	3701	3678.8	3897.8	3584.8	3972	3566.6	3485.2	3501.3	3705.4
HD21-18	3805.4	3720.1	3634	3615.1	3813.2	3514.7	1917	3490.7	3424.7	3435.3	3637
HD18-18	3079.4	3000.1	2881	2883.1	3066.2	2809.7	2997	2815.7	2737.7	2697.3	2896.7
HD18-14	2992.9	2935.8	2770	2782.6	2970.3	2712.1	2907.5	2738.8	2645.4	2586.9	2804
HD18-10	2859.9	2679	2512	2592.6	2699.6	2435.1	2664.5	2490.1	2420.9	2353.8	2570.8
HD14-14	2216.9	2115.8	1974	2010.6	2162.3	1940.1	2072.5	1986.8	1889.4	1822.9	2019.1
HD14-10	2183.9	2031	1884	1948.6	2071.6	1847.1	2000.5	1910.1	1812.9	1745.8	1943.6
HD10-10	1507.9	1383	1256	1304.6	1443.6	1259.1	1336.5	1330.1	1204.9	1137.8	1334.8
CD24-24	68.7	70.6	70.6	140.9	50	87.7	42.9	78	133.6	49.2	75.5
CD26-26	13.9	19.6	18	41.9	7	20.5	5.8	24.4	35.7	8.1	19.5
CD28-28	0.1	0.5	0.1	0.4	0	0.1	0	3.6	2	0	0.7

Heating and Cooling Degree Day

Pohang

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD21-21	3337.7	3183.2	3119.8	3073.4	3240.5	2993.1	3193.3	3028.2	2867.6	2814.9	3085.2
HD21-18	3281.5	3144	3028.5	2992.6	3170.1	2946.2	3112.6	2968.9	2811.2	2744.6	3020
HD18-18	2564.5	2436	2323.5	2317.6	2438.1	2265.2	2398.6	2293.9	2142.2	2081.6	2326.1
HD18-14	2459	2335.6	2212.3	2223.5	2333.6	2130.6	2314.7	2186.9	2021.1	1998.3	2221.6
HD18-10	2204.7	1985.1	1963.9	1973.6	2103.1	1908.7	2078.2	1959.2	1794.5	1785.1	1975.6
HD14-14	1715	1583.6	1472.3	1511.5	1597.6	1450.6	1574.7	1514.9	1361.1	1302.3	1508.4
HD14-10	1620.7	1453.1	1391.9	1425.6	1531.1	1384.7	1494.2	1443.2	1282.5	1233.1	1426
HD10-10	1036.7	921.1	819.9	877.6	959.1	860.7	910.2	927.2	770.5	681.1	876.4
CD24-24	121	113.6	89.6	202.7	68.3	146.3	69.8	114.5	207	105	123.8
CD26-26	42.8	52.6	28	95.3	21.5	55.5	26.7	53.8	96.3	40.5	51.3
CD28-28	7.4	12.9	2.8	23.5	3.8	9.9	2.4	19.4	23.6	11.6	11.7

Heating and Cooling Degree Day

Gunsan

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3559.7	3495.8	3417.4	3393	3584.6	3323.2	3512.4	3380.5	3294	3203.8	3416.3
HD <sub>21-18</sub>	3483.3	3463.3	3360.5	3345.1	3536.9	3263.9	3428.7	3327	3246.2	3140.8	3359.6
HD <sub>18-18</sub>	2790.3	2740.3	2616.5	2628.1	2798.9	2573.9	2711.7	2637	2562.2	2432.8	2649.2
HD <sub>18-14</sub>	2712.6	2670.3	2530.3	2536.8	2701.1	2463.8	2626	2533.1	2478.7	2328.6	2558.1
HD <sub>18-10</sub>	2532.5	2350	2259.1	2299.4	2459.9	2242.5	2429.9	2268.9	2215.4	2133	2319.1
HD <sub>14-14</sub>	1968.6	1866.3	1742.3	1768.8	1901.1	1743.8	1854	1805.1	1722.7	1596.6	1796.9
HD <sub>14-10</sub>	1900.5	1750	1651.1	1691.4	1831.9	1674.5	1781.9	1712.9	1631.4	1537	1716.3
HD <sub>10-10</sub>	1268.5	1150	1043.1	1083.4	1203.9	1106.5	1133.9	1156.9	1047.4	941	1113.5
CD <sub>24-24</sub>	113	94.3	71	165.6	70.2	165.3	85	117	198.8	86.9	116.7
CD <sub>26-26</sub>	27	25.7	22.6	37.8	23.1	56.8	20	36.9	86.2	26.3	38.2
CD <sub>28-28</sub>	0.3	1.8	3.7	5.9	0.4	6	1	4.5	12.7	0.7	3.7

Heating and Cooling Degree Day

Daegu

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3403	3314.5	3206	3162.9	3345.6	3155.9	3379.3	3136.2	3004.9	2995.7	3210.2
HD <sub>21-18</sub>	3340	3266.6	3139.6	3100.4	3276.8	3136	3315.6	3065.5	2942.3	2935	2869.5
HD <sub>18-18</sub>	2665	2588.6	2440.9	2440.4	2595.8	2435.6	2595.6	2426.5	2306.3	2269	2476.4
HD <sub>18-14</sub>	2582.6	2502.4	2344	2365.1	2491.1	2340.6	2516.9	2310.1	2200.1	2173.5	2382.6
HD <sub>18-10</sub>	2374.6	2229.1	2114.3	2165	2314.7	2072.3	2323.1	2133.3	1983.4	1989.7	2170
HD <sub>14-14</sub>	1862.6	1750.4	1616	1653.1	1775.1	1612.6	1760.9	1662.1	1524.1	1481.5	1669.8
HD <sub>14-10</sub>	1778.6	1657.1	1534.3	1585	1726.7	1536.3	1699.1	1601.3	1447.4	1425.7	1599.2
HD <sub>10-10</sub>	1182.6	1085.1	954.3	1005	1138.7	1000.3	1075.1	1069.3	911.4	861.7	1028.4
CD <sub>24-24</sub>	157.7	153.2	138.3	286.6	115.2	184.9	114.9	166.6	262.5	128.8	170.9
CD <sub>26-26</sub>	59.8	68.3	55.6	156.2	48.7	73.4	49.4	79.3	131.5	43.7	76.6
CD <sub>28-28</sub>	12.4	20.6	8.7	59.9	9.2	17.9	10.8	33	38.9	10.6	22.6

Heating and Cooling Degree Day

Jeonju

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3454.5	3395.7	3237.6	3357.1	3485.1	3265.6	3430.7	3278	3259.1	3177.2	3334.1
HD <sub>21-18</sub>	3375.8	3360.9	3180.2	3292.3	3438.6	3207.9	3363.5	3214.9	3215.2	3115.4	3278.5
HD <sub>18-18</sub>	2730.8	2670.9	2487.2	2617.3	2721.6	2541.9	2661.5	2577.9	2552.2	2419.4	2598.1
HD <sub>18-14</sub>	2662	2609.3	2400.5	2533.7	2621.8	2427.9	2571.4	2477.3	2463.3	2296.2	2506.3
HD <sub>18-10</sub>	2517.3	2324.8	2157.5	2328.2	2389	2185.9	2389.2	2230.8	2253.8	2111.4	2288.8
HD <sub>14-14</sub>	1946	1829.3	1660.5	1801.7	1869.8	1735.9	1823.4	1773.3	1739.3	1592.2	1777.1
HD <sub>14-10</sub>	1897.3	1732.8	1581.5	1728.2	1797	1649.9	1761.2	1694.8	1669.8	1531.4	1704.4
HD <sub>10-10</sub>	1277.3	1140.8	1005.5	1128.2	1205	1113.9	1133.2	1158.8	1085.8	951.4	1120
CD <sub>24-24</sub>	172.9	139.7	117.3	223.6	99.6	200.8	108.9	158	250	119.5	159
CD <sub>26-26</sub>	68	53.8	44.8	102	40.3	78.7	36.1	51	118.9	42.9	63.7
CD <sub>28-28</sub>	9.2	10.5	9.9	24.1	5.3	13.2	4.3	9.1	29	4.9	12

Heating and Cooling Degree Day

Ulsan

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3278	3132.3	3167.1	3043.7	3165.2	2990.5	3176.4	2995.2	2853.1	2815.4	3061.7
HD <sub>21-18</sub>	3214.4	3075.9	3066.7	2974.1	3086.4	2944.2	3092	2938	2786.1	2751.1	2992.9
HD <sub>18-18</sub>	2512.4	2379.9	2352.7	2284.1	2384.4	2251.2	2378	2248	2123.1	2088.1	2300.2
HD <sub>18-14</sub>	2412.2	2300.1	2246	2183.2	2264.3	2114.2	2281.5	2126.9	2011.9	1994.2	2193.5
HD <sub>18-10</sub>	2182.7	1941.5	1996.7	1945.7	2059.7	1872	2053.7	1880.4	1740.5	1806.5	1947.9
HD <sub>14-14</sub>	1680.2	1540.1	1498	1471.2	1556.3	1426.2	1545.5	1458.9	1339.9	1306.2	1482.3
HD <sub>14-10</sub>	1590.7	1413.5	1412.7	1393.7	1491.7	1356	1465.7	1380.4	1244.5	1246.5	1399.5
HD <sub>10-10</sub>	998.7	885.5	828.7	841.7	923.7	840	877.7	880.4	748.5	686.5	851.1
CD <sub>24-24</sub>	124.8	125.4	91.5	207.3	62.2	164.5	85.4	111.7	218.4	93.4	128.5
CD <sub>26-26</sub>	36.3	51	26	94.3	17.4	62.1	34.2	48.4	100.6	33.8	50.4
CD <sub>28-28</sub>	4.4	11.9	0.4	14.4	1.4	7.4	4.9	14.5	18.4	7.9	8.6

Heating and Cooling Degree Day

## Kwangju

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD21-21	3336.9	3302.9	3163.2	3173.1	3343.2	3143.9	3343.8	3142.1	3096	3016.1	3206.1
HD21-18	3247.6	3262.4	3114.2	3122	3286.4	3083.7	3274.6	3103.7	3039.9	2949.9	3148.4
HD18-18	2602.6	2563.4	2403.2	2435	2575.4	2417.7	2560.6	2440.7	2382.9	2268.9	2465
HD18-14	2534	2494.1	2305.3	2350.7	2467.7	2319	2463.8	2328.6	2289.4	2162.3	2371.5
HD18-10	2357.1	2183.1	2047.8	2137.5	2234.1	2076.2	2249.5	2109.6	2069.2	1968.7	2143.3
HD14-14	1814	1718.1	1569.3	1630.7	1727.7	1627	1715.8	1648.6	1581.4	1466.3	1649.9
HD14-10	1749.1	1611.1	1487.8	1557.5	1654.1	1548.2	1641.5	1581.6	1509.2	1404.7	1574.5
HD10-10	1141.1	1039.1	927.8	977.5	1074.1	1020.2	1033.5	1053.6	949.2	840.7	1005.7
CD24-24	156.7	127.5	103.6	191.8	86.5	180.3	91.6	144.7	223.5	108.9	141.5
CD26-26	58.9	43.1	37.4	70.8	31.7	59.9	26.2	48	97.6	36.9	51.1
CD28-28	5.7	4.1	5.5	7.1	1.0	4.1	1.4	9.4	17.7	3.1	5.9

Heating and Cooling Degree Day

## Busan

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD21-21	3009.3	2851.7	2750.1	2762.2	2873	2751.9	2891.9	2761.4	2627.6	2544.5	2782.2
HD21-18	2924	2766.4	2662	2688.2	2782.1	2688.4	2775.5	2653.8	2562.4	2451.8	2695.5
HD18-18	2255	2103.4	1972	2019.3	2107.1	2022.4	2103.5	2032.8	1920.4	1851.8	2038.8
HD18-14	2168.4	2006.3	1852.7	1900.1	1994.6	1888.5	2015.5	1942.8	1805	1781.8	1935.6
HD18-10	1875.3	1676.9	1586.8	1690.7	1773.6	1648.5	1697.5	1661	1541.6	1495.5	1664.7
HD14-14	1456.4	1314.3	1176.7	1244.1	1322.6	1244.5	1307.5	1298.8	1173	1113.8	1265.2
HD14-10	1351.3	1208.9	1090.8	1178.7	1253.6	1172.5	1193.4	1213	1085.6	1015.5	1176.3
HD10-10	827.3	740.9	594.8	666.7	733.6	696.5	689.4	765	629.6	535.5	687.9
CD24-24	1015	82.2	73.2	168	54.3	145.1	61.3	88	175.6	85.8	103.5
CD26-26	21.4	22.5	18.6	57.7	9.2	42.8	16.6	27.3	63.8	27	30.7
CD28-28	0	1.9	0.9	4.1	0	2.0	0	3.3	5.5	1.9	2

Heating and Cooling Degree Day

Chungmu

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD <sub>21-21</sub>	2985.1	2848.5	2755.4	2764.5	2873	2721.5	2905.6	2761.2	2657.5	2586.5	2785.7
HD <sub>21-18</sub>	2900.5	2759.7	2671.7	2683.9	2792.5	2653.4	2806.4	2648.3	2608.4	2497.4	2702.2
HD <sub>18-18</sub>	2249.5	2102.7	1993.7	2026.9	2126.5	1996.4	2119.4	2036.3	1948.4	1879.4	2047.9
HD <sub>18-14</sub>	2171	1988.2	1888.2	1915.5	2013.3	1854.1	2027.4	1945.8	1842.7	1804.8	1945.1
HD <sub>18-10</sub>	1928.8	1647.4	1627.6	1712.7	1811	1645.8	1750.5	1650	1584.8	1550.5	1690.9
HD <sub>14-14</sub>	1471	1308.2	1204.2	1251.5	1345.3	1230.1	1319.4	1301.8	1186.7	1136.8	1275.5
HD <sub>14-10</sub>	1384.8	1191.4	1123.6	1188.7	1279	1165.8	1222.5	1202	1108.8	1046.5	1191.3
HD <sub>10-10</sub>	840.8	735.4	619.6	664.7	747	685.8	694.5	754	632.8	542.5	691.7
CD <sub>24-24</sub>	125.9	92.8	85.6	174.2	65.5	162.3	54.3	73.1	179.1	76.4	108.9
CD <sub>26-26</sub>	36.3	23.8	25.7	60	10.8	47.3	10.5	14.2	56.9	20.5	30.6
CD <sub>28-28</sub>	1	2.2	2.3	4.1	0	2.5	0	0.3	3.6	0.4	1.6

Heating and Cooling Degree Day

Mokpo

Year Deg. Day	Year										Average
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	
HD <sub>21-21</sub>	3221.7	3188.6	3017.4	2998.5	3155.2	2966.1	3137.7	2997.3	2877.3	2815.2	3032.5
HD <sub>21-18</sub>	3131.4	3089.3	2932.8	2942.4	3083	2912.6	3050.9	2930.2	2843.3	2728.4	2964.4
HD <sub>18-18</sub>	2468.4	2381.3	2248.8	2258.4	2393	2231.6	2357.9	2285.2	2177.3	2077.4	2287.9
HD <sub>18-14</sub>	2410.5	2275.5	2153.1	2168.1	2281.8	2123.7	2284.9	2195.3	2094	1978.4	2196.5
HD <sub>18-10</sub>	2196.7	1970.6	1862.8	1920.1	2052.3	1869.9	2068.5	1915.8	1849.6	1797.3	1950.4
HD <sub>14-14</sub>	1674.5	1547.5	1433.1	1444.1	1557.8	1439.7	1536.9	1507.3	1394	1306.4	1484.1
HD <sub>14-10</sub>	1600.7	1438.6	1330.8	1364.1	1484.3	1361.9	1464.5	1411.8	1317.6	1241.3	1401.6
HD <sub>10-10</sub>	1004.7	906.6	798.8	808.1	916.3	853.9	860.5	907.8	785.6	685.8	852.8
CD <sub>24-24</sub>	132.6	105.7	82.3	170	74.7	200.2	82.4	124.9	207.7	104.5	128.5
CD <sub>26-26</sub>	42.4	29.2	27	55.2	25	76.5	20.1	37.1	78.7	36.1	42.7
CD <sub>28-28</sub>	2.3	3	2.7	4.6	1.1	7.1	0.2	6.3	8.4	1.7	3.7



Heating and Cooling Degree Day

Yeosu

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3102.5	2988.3	2871.4	2891.3	2986	2853.9	3015.5	2834.4	2752.4	2665.5	2896.1
HD <sub>21-18</sub>	3013.9	2915.4	2799.6	2824.9	2912.3	2783.9	2921.2	2731	2694	2574.2	2817
HD <sub>18-18</sub>	2356.9	2234.4	2100.6	2143.9	2234.3	2129.9	2237.2	2113	2049	1959.2	2155.8
HD <sub>18-14</sub>	2295.5	2151.5	1982.8	2040.5	2134.6	2009	2141.3	2028.6	1939.2	1878.1	2060.1
HD <sub>18-10</sub>	2042.4	1825.7	1720.8	1803.8	1927.2	1811	1889.9	1760.5	1708.2	1656.9	1814.6
HD <sub>14-14</sub>	1571.5	1435.5	1294.8	1356.5	1438.6	1353	1425.3	1372.6	1287.2	1218.1	1375.3
HD <sub>14-10</sub>	1482.4	1329.7	1208.8	1275.8	1375.2	1299	1333.9	1284.5	1212.2	1132.9	1293.4
HD <sub>10-10</sub>	922.4	833.7	696.8	747.8	823.2	787.0	777.9	808.5	716.2	608.9	772.2
CD <sub>24-24</sub>	116.4	98.7	79.9	172.5	61.2	163.3	62.3	90.4	169.2	74	108.8
CD <sub>26-26</sub>	30.7	25.2	23.2	58	8.6	52.8	14.1	24.3	54.1	18.1	30.9
CD <sub>28-28</sub>	1	2.5	1.4	2.6	0	4.9	0	1.2	2.6	0.1	1.6

Heating and Cooling Degree Day

Jeju

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	2687.1	2546.4	2397.1	2418.9	2537.6	2432.6	2594.9	2485	2378.8	2258.5	2473.7
HD <sub>21-18</sub>	2616.6	2469.4	2323.8	2345.7	2470.6	2360	2489.2	2390.6	2320.9	2172.3	2396
HD <sub>18-18</sub>	1953.6	1812.4	1654.8	1700.7	1816.6	1721	1817.2	1745.6	1678.9	1563.3	1746.4
HD <sub>18-14</sub>	1877.3	1689.5	1533.5	1580.5	1710	1605.9	1723.6	1618.4	1570.8	1471.1	1638.1
HD <sub>18-10</sub>	1585.2	1293	1219	1280.4	1421.8	1329.8	1390.3	1278.5	1227	1109.8	1313.5
HD <sub>14-14</sub>	1169.3	1017.5	901.5	932.5	1058	977.9	1023.6	1010.4	934.8	831.1	985.7
HD <sub>14-10</sub>	1073.2	885	799	832.4	957.8	889.8	910.3	898.5	815	701.8	876.3
HD <sub>10-10</sub>	561.2	477	379	384.4	493.8	449.8	430.3	518.5	403	293.8	439.1
CD <sub>24-24</sub>	161.1	231.2	113.8	169.5	94.4	242	111	130.4	242.9	127.8	162.4
CD <sub>26-26</sub>	54.6	100.9	37.4	51.5	32.6	107.2	44.9	44.6	93.6	44.4	61.2
CD <sub>28-28</sub>	7.7	31.3	3.9	6.1	4.0	13.2	10	9.1	7.6	5.8	9.9

Heating and Cooling Degree Day

Seogwipo

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	2409.1	2290.9	2191	2207.8	2285.3	2236.8	2360.9	2231.4	2136.8	2034.8	2238.5
HD <sub>21-18</sub>	2311.9	2218.1	2086.6	2120.6	2210.7	2162.2	2247.6	2127.6	2083.6	1971.7	2154
HD <sub>18-18</sub>	1693.9	1594.1	1465.6	1505.6	1568.7	1535.2	1617.6	1536.4	1474.6	1395.7	1538.7
HD <sub>18-14</sub>	1601.2	1484.1	1337.9	1392.8	1448.9	1427.6	1512.9	1424.3	1359.8	1287.8	1427.7
HD <sub>18-10</sub>	1318.8	1107.9	1065.3	1077.8	1155	1128	1107.4	1050	1023.8	862.4	1089.6
HD <sub>14-14</sub>	957.2	864.1	761.9	800.8	852.9	843.6	868.9	856.3	779.8	699.8	828.5
HD <sub>14-10</sub>	870.8	747.9	677.3	699.8	751	740	727.4	734	667.8	546.4	715.2
HD <sub>10-10</sub>	422.8	387.9	289.3	301.8	347	352	347.4	418	311.8	230.4	340.8
CD <sub>24-24</sub>	152.2	202.8	101.8	148.4	89.9	209.2	110.1	139.6	211.8	136.7	150.3
CD <sub>26-26</sub>	52.1	78	26.2	38.9	26.7	74.6	36.7	41.9	77	50.2	50.2
CD <sub>28-28</sub>	4.1	13.9	0.5	1.4	0.7	6.5	3.4	2.8	4.7	7.7	4.6

Heating and Cooling Degree Day

Jinju

Year Deg. Day	Year										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average
HD <sub>21-21</sub>	3370.4	3380.9	3103.7	3086.2	3247.7	3040.6	3298.5	3062.4	3024.6	3032.6	3164.8
HD <sub>21-18</sub>	3307.1	3325.5	3027.2	3017.9	3180.3	2986.8	3241	2998	2977.2	2969.6	3103.1
HD <sub>18-18</sub>	2617.1	2605.5	2328.2	2351.9	2505.3	2320.8	2512	2344	2302.2	2300.6	2419.1
HD <sub>18-14</sub>	2521.6	2506.8	2216.6	2258.8	2419.8	2194	2407.9	2214.6	2197.1	2206.7	2314.4
HD <sub>18-10</sub>	2394.2	2258.6	1968.2	2043.7	2190.7	1993.4	2190.9	1974.1	1978.9	1987.7	2098
HD <sub>14-14</sub>	1805.6	1754.8	1500.6	1562.8	1679.8	1522	1663.9	1562.6	1509.1	1486.7	1604.8
HD <sub>14-10</sub>	1758.2	1666.6	1412.2	1479.7	1614.7	1461.9	1586.9	1478.1	1434.1	1419.5	1531.2
HD <sub>10-10</sub>	1122.2	1074.6	856.2	915.7	1038.7	929.9	982.9	982.1	890.9	851.5	964.5
CD <sub>24-24</sub>	122.5	107	98.7	229.9	113.5	173.6	78.2	120.1	202.2	109.7	135.5
CD <sub>26-26</sub>	33.2	32.2	33.9	102.4	41.6	61.3	22.6	38.9	80.3	35.1	48.2
CD <sub>28-28</sub>	0.8	0.8	3.2	18	4.7	4.2	0.3	6.7	11	4.3	5.4

Tab. (3-2) Comparison of Heating and Cooling Degree Day(HD<sub>18-18</sub>)

Area Classific.	Seoul	Inchon	Suweon	Jeonju	Gwangju	Daegu	Busan	Mokpo	Ulsan
	1960's	2978	3013	3225	2628	2533	2605	2133	2324
1970's	2868.8	2935.6	3090.9	2598.1	2465	2476.4	2038.8	2287.9	2300.2

(HD<sub>14-14</sub>)

Area Classific.	Seoul	Inchon	Suweon	Jeonju	Gwangju	Daegu	Busan	Mokpo	Ulsan
	1960's	2166	2132	2340	1784	1732	1777	1382	1509
1970's	2027.2	2057.3	2201.2	1777.1	1649.9	1669.8	1265.2	1484.1	1482.3

(CD<sub>24-24</sub>)

Area Classific.	Seoul	Inchon	Suweon	Jeonju	Gwangju	Daegu	Busan	Mokpo	Ulsan
	1960's	101.7	73.8	103.6	173.2	154.5	181.1	91.6	143.8
1970's	98.5	60	87.6	159	141.5	170.9	103.5	128.5	128.5