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No. 67

THE CLIMATE OF THE
AYR — KILMARNOCK — IRVINE
REGION OF AYRSHIRE

by J. A. Plant

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FOREWORD

The Meteorological Office at 26 Palmerston Place, Edinburgh, EH12 5AN and the Glasgow Weather Centre at 118 Waterloo Street, Glasgow, C2, receive an ever increasing number of requests from all sections of the community, especially from members of the building and construction industries, for information about the past weather at places in Scotland.

It is not yet possible to issue precise long range weather forecasts and one can only plan or design on the basis of past experience i.e. by consulting recorded facts and statistics of the type contained in this Report, but from these one can at least set limits and assess the probabilities.

This Report on the climate of the Ayr-Kilmarnock-Irvine region of Ayrshire is similar in general content to the previously published Meteorological Office Reports on Edinburgh, Glasgow, Aberdeen, the Coastal Region of the Moray Firth and West Lothian and includes certain data which will be of particular interest at the tendering or design stages of a building contract. For example, building contractors will be interested in the figures showing the probable amount of working time during which outdoor work may be hampered or have to cease because of rainfall, low temperatures and high winds. Similarly, engineers concerned with the design and efficiency of heating and air conditioning installations will wish to consult the detailed statistics of temperature and relative humidity. Advice is also given on maximum windspeeds for the calculation of wind loading on buildings, glass specifications etc. Statistics of rainfall amounts and intensities have been included for the guidance of drainage engineers concerned with the design of sewers and culverts etc and there are many other facts and figures which will be of interest to architects and engineers.

The Ayr-Kilmarnock-Irvine region of Ayrshire is part of the most north-westerly agricultural district of considerable size in the British Isles and the opportunity has been taken to include in this Report, certain kinds of information which will be of particular interest to farmers and growers. It is hoped that the information contained in this Report will also be of interest to students and the general reader.

August 1971

Meteorological Office
26 Palmerston Place
EDINBURGH
EH12 5AN

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It is not yet possible to issue precise long range weather forecasts and one can only plan on the basis of past experience i.e. by consulting recorded facts and statistics of the type contained in this Report, but from these one can make a better estimate of the probabilities.

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THE CLIMATE OF THE AYR-KILMARNOCK-IRVINE REGION OF AYRSHIRE

by J A PLANT *

The area under consideration occupies that part of the Ayrshire Plain which comes down to the sea at the beaches and sand dunes between Irvine and Ayr and stretches inland for about 10 to 15 miles before the high hills are reached.

A short distance inland from the coast, the terrain is distinctly undulating in character with an average elevation of 300 or 400 feet and there are numerous low hills. The river Irvine flows along the northern boundary of the region and, just south of the Irvine, there are two areas of hilly ground - the Dundonald Hills and the Craigie Hills (477 and 514 feet respectively). Near the centre of the region there is a scattering of low "hog-backed" hills rarely below 400 feet and culminating in Mauchline Hill at 642 feet. To the south and southwest, the Ayrshire Plain ends rather abruptly in the much higher ground of the Southern Uplands which also extend northwards to enclose the eastern flank of the Plain and join with the Eaglesham Heights and Renfrew Hills in the northeast and north to form a crescent shaped ring of high ground on the landward side of the region.

Although the network of recording stations on the whole western side of Scotland is very scant, particularly in the Highlands of northwest Scotland, there is no doubt that the driest, mildest and sunniest places all lie on the low-lying coastal strip which reaches its widest extent in the Ayrshire Plain.

The mildness of the weather on the Ayrshire coast, especially in winter, is well known, but it is not generally realised that the area under consideration has less rainfall than any other area of comparable size in the western half of Scotland as a whole. Indeed, the available records of rainfall show that a short stretch of coast near Prestwick is one of the driest regions on the whole of the west coast of the British Isles. There is the further point that by Scottish standards, the coastal region of Ayrshire is comparatively sunny, particularly the area around Troon.

* Meteorological Office, 26 Palmerston Place, Edinburgh EH12 5AN

The genial climate has undoubtedly contributed to the popularity of the holiday resorts and golf courses along the Ayrshire coast and perhaps it should also be borne in mind that the Ayrshire Plain is the most north-westerly agricultural district of considerable size in the British Isles. Two of the main agricultural activities are dairy farming and the growing of early potatoes which serve as further indications of the mild conditions and the length of the growing season. The attractive countryside and coastline, coupled with the favourable climate must also have contributed in part in attracting to the area during recent years, a remarkable diversity of manufacturing industries.

The separate aspects of the climate of this region are discussed in more detail in the following paragraphs under the headings of Rainfall, Temperature, Relative Humidity, Sunshine, Winds, Visibility, Snow and Thunderstorms.

1. RAINFALL

It can be seen from the rainfall map at Figure 1 that the annual average rainfall ranges from a value of less than 35 inches per year over the coast near Prestwick to more than 50 inches over the hills to the north and southeast and that much the greater part of the area under consideration has less than 40 inches per year. Annual averages of rainfall for other locations on or near the west coasts of Scotland, England and Wales are given below for purposes of comparison:

	<u>inches</u>
Ullapool	49.5
Oban	56.7
Glasgow Airport	40.7
Dumfries	42.7
Morecambe	38.4
Liverpool	35.1
Cardiff	42.1
Ilfracombe	38.3
Plymouth	37.8

Monthly and annual averages of rainfall for a number of rainfall measuring stations in or near the region are given in Tables 1 and 1A. The rainfall averages quoted in Table 1 are actual averages over the 35 years from 1916 to 1950 (the standard period for rainfall averages in current use in the British Isles), while the averages in Table 1A have been estimated from short term or broken periods of records.

Cumulative averages of daily rainfall for Ayr Cemetery, from which the average rainfall over any period of the year can be calculated, are given in Table 1B. Ayr Cemetery is the oldest established rainfall measuring station in the region.

Statistics of monthly and annual rainfalls for Ayr Cemetery are given in Table 1C.

Total monthly and annual durations of rainfall recorded at Prestwick Airport during the 20 years from 1950 to 1969 are given in Table 1D. The Meteorological Office at Prestwick Airport is the only location in the region for which this type of information is available.

It can be seen from Table 1D that at Prestwick Airport, rain falls in measurable amounts for 735 hours per year, that is about one hour in twelve. Over nearly all southeast England, rain falls in measurable amounts for about 500 hours in the year, that is about one hour in seventeen.

Cumulative frequencies of daily rainfall for Ayr Cemetery which show the total number of days in 50 years with specified amounts of rain (i.e. the number of days with 0.5 inches or more, 1 inch or more, 2 inches or more etc) are given in Table 1E.

Maximum daily rainfalls recorded at Ayr Cemetery are given in Table 1F.

Wettest months

The daily rainfalls recorded at Ayr Cemetery in the seven wettest months during the years from 1913 to 1969 are given in Table 1G.

Intense falls of rain in short periods of time

Examination of rainfall records reveals that the intensity is always changing and that within any period of rain, a shorter period will always be found where the intensity is greater than that of the whole. Usually, the most intense falls of short duration are associated with thunderstorms or thundery activity. The Ayr-Kilmarnock-Irvine region of Ayrshire does experience intense falls of short duration but since the frequency of thunderstorms in this region is less than in the upland parts of Scotland and the more thundery areas in central and southwest Scotland, it is reasonable to suppose that the probability of an intense fall of rain in a short period of time is less than in these more thundery areas. Parts of central and southern England have two to three times as many thunderstorms and therefore the probability of an intense rainfall of short duration in the area under consideration is much less than in the south.

Table 1H gives the number of days in each year from 1947 to 1969 with specified

amounts of rain falling in specified times at the Meteorological Office at Prestwick Airport. The total number of days over the whole period of 23 years is shown at the foot of the Table. Prestwick Airport is the only location in the region for which statistics of this type are available for a reasonably long period of years but a period of 23 years of recorded rainfall intensities is too short a term from which to obtain a reliable assessment of the long term relationship between intensity and frequency at any individual recording station. There is the further point that it is by no means certain whether the intensities of rainfall recorded at Prestwick Airport during the years from 1947 to 1969 are typical of the intensities experienced at other locations in the region e.g. Kilmarnock which lies much nearer to the hills bordering the north and east of the region.

There are very few long period records of rainfall intensities for places in Scotland and therefore drainage engineers make fairly wide use of the Bilham formula⁽¹⁾ for obtaining probabilities of intense falls of rain in short periods of time. Following a recent investigation by D J Holland⁽²⁾ it has become necessary to modify the frequencies obtained from Bilham's formula in respect of intensities greater than 1.25 inches per hour and the figures given in the upper table of Table 1I, which refer to falls with durations of 2 hours or less, are based on Bilham's formula modified where necessary by Holland. However, it can be seen from Table 1J which compares the estimated frequencies obtained from the modified Bilham formula with observed frequencies obtained from the Prestwick Airport records, that for durations up to about 2 hours, the frequencies obtained from the modified Bilham formula appear to be much too high when related to Prestwick Airport.

Experience suggests that for durations up to about 2 hours, the frequencies obtained from the modified Bilham formula could be halved when applied to towns like Ayr, Prestwick, Troon, Irvine and Kilmarnock i.e. a return period of "1 day per 5 years" obtained from the upper table of Table 1I would become "1 day per 10 years". Alternatively, for durations up to 2 hours, a 20 per cent reduction could be made to the amounts quoted in the upper table of Table 1I to relate the intensities calculated

from the modified Bilham formula to these towns.

Perhaps it should be emphasised that the Kilmarnock area is probably a "border-line case" as far as reductions to the Bilham frequencies are concerned and although the reductions mentioned in the previous paragraph should be in order for the Burgh of Kilmarnock, similar reductions could not be recommended for locations in or near the hills immediately to the north and east of Kilmarnock in view of the higher frequency of thunderstorms and thundery downpours over these hills.

The reader will also notice from Table 1J that for rainfalls with durations in excess of 2 hours, the observed frequencies at Prestwick Airport are much nearer to the frequencies estimated from the Bilham formula and in one case (viz 0.8 inches in 8 hours or less) the observed frequency is actually higher than the estimated frequency. At Kilmarnock and other places a short distance inland from the coast, the frequencies of heavy falls with durations of 4 to 5 hours or more are probably higher than the estimated frequencies obtained from the Bilham formula.

So far, the data discussed refer to rainfall at a point, but areal rainfall is required for most design purposes. Because of the variability of intense rain in space and time, the areal rainfall for a given duration and return period is always smaller than the corresponding point rainfall. To obtain areal rainfall, the point rainfall should be multiplied by the appropriate factor in the lower table of Table 1I. These factors were derived from a formula by D J Holland, assuming a roughly circular area and a roughly equal contribution to the drainage system from all parts of the area. The formula is based on results from an experimental rain gauge network at Cardington near Bedford⁽³⁾. Advice on how to apply these factors to the more difficult cases can usually be given by the Meteorological Office or the Road Research Laboratory of the Ministry of Transport.

Driving Rain

Measurements from raingauges set into the walls of buildings have shown that the amount of rain driven on to a wall is directly proportional to the product of the rainfall on the ground and the wind speed during the rain. Use of this knowledge was made by R E Lacy and H C Shellard in their joint paper "An Index of Driving Rain" - (Meteorological Magazine 1962, Vol 91) in which an index of driving rain was calculated for several locations in the British Isles by taking the product of the annual average rainfall in millimetres and the annual average wind speed in metres per second. However, for a small selection of stations in the British Isles for which records of hourly rainfalls and associated hourly winds are available, the computer has been used to accumulate the products of hourly rainfall of 0.1 mm or more and the associated mean wind speeds of 2 m/sec or more to determine more precisely the total annual driving rain index averaged over the 10 year period 1957 to 1966 for a selection of stations. The data are given below for Prestwick together with the mean index calculated from hourly records over the same period of 10 years at other places in the British Isles.

<u>Location</u>	<u>Mean Annual Total Index of Driving Rain - 10 years from 1957 to 1966</u> (millimetres x metres per second)
Prestwick Airport	5694
Glasgow Airport	5508
Edinburgh Airport	3680
Kinloss near Forres	2993
Wick, Caithness	6373
Stornoway, Hebrides	9341
Manchester Airport	4875
Valley near Holyhead	8181
Birmingham Airport	3881
Cardiff	5821
Plymouth	9082
London Airport	3371

When selecting the hours which qualify for inclusion in the total driving rain index, the hourly wind directions are noted and the total driving rain index associated with different sectors of the compass is computed. The mean annual total index of 5694 for Prestwick Airport distributed according to wind direction is given below together with the maximum index calculated for a single hour during the 10 years from 1957 to 1966.

<u>Hourly Wind Direction</u>	<u>Mean Driving Rain Index</u> <u>1957 to 1966</u>	<u>Absolute Maximum Index</u> <u>for Single Hour</u>
350 - 010 degrees	57	69
020 - 040 "	190	125
050 - 070 "	309	91
080 - 100 "	300	66
110 - 130 "	351	51
140 - 160 "	419	59
170 - 190 "	1107	65
200 - 220 "	930	58
230 - 250 "	1040	60
260 - 280 "	635	71
290 - 310 "	289	97
320 - 340 "	67	65
Total	5694	

It can be seen from the above figures, that the index of driving rain at Prestwick Airport from wind directions in the quadrant between south (180 degrees) and west (270 degrees) is much greater than the index for winds blowing from an easterly point. On the other hand, it is worthy of note that during the 10 years from 1957 to 1966, the "worst" hour with driving rain at Prestwick Airport (ie the single hour with the absolute maximum index) occurred during the 60 minutes between 1900 and 2000 hours GMT on 13 August 1966 when 13.5 millimetres (0.53 inches) of rain fell in association with an hourly mean wind speed of 9.3 m/sec (21 mph) from direction 020 degrees (north-north-east) giving an hourly index of 125. It is also worthy of note that during the same 10 years period from 1957 to 1966, the "worst" hour with driving rain at both Edinburgh and Glasgow Airports was an hour in which winds were also blowing from a north-easterly direction.

Although an index of driving rain is useful when comparing one location with another it has rather obvious shortcomings from a quantitative building design point of view. When assessing the standard of performance or suitability of various building components, the following table which gives an analysis of average wind speeds and associated rainfalls at Prestwick Airport during the 12 years from 1957 to 1968 will be of more interest.

Cumulative Frequencies Per Annum of Average Wind Speeds and Associated Rainfalls at Prestwick Airport - 12 years from 1957 to 1968

		<u>Average Wind Speed</u>								
		knots	>20	>24	>28	>32	>36	>40	>44	>48
		m/sec	>10	>12	>14	>17	>19	>21	>23	>25
		mph	>23	>28	>32	>37	>41	>46	>51	>55
A.	Average Number of Hours per Year with Wind Speeds exceeding the specified limits	<u>hours</u>	404	123	38.3	11.8	2.8	0.8	0.2	0.0
B.	Number of Hours in Line A with Rain falling (0.1 mm or more per hour)	<u>hours</u>	133	41.3	13.8	4.3	1.0	0.2	0.1	0.0
C.	Total Amount of Rain falling in hours in Line B.	<u>mm</u>	97.4	29.4	8.8	2.8	0.7	0.1	0.1	0.0

Performance requirements for windows

Specifications of tests to be applied for weather tightness of windows, including their resistance to wind driven rain, are given in Technical Note No 1 "Performance requirements for windows" published in 1970 by the Directorate of Research and Information of the Ministry of Public Building and Works on behalf of the Interdepartmental Sub-Committee for Component Co-ordination.

Rain as a Factor interrupting Outdoor Work

Table 1K gives the total number of days per month during the 10 years from 1960 to 1969 on which 0.1 millimetres (.004 inches) or more of rain fell at Prestwick Airport during the working part of the day ie between 0700 and 1700 hours Greenwich Mean Time (8 am and 6 pm British Standard Time). Similarly, Table 1K also gives for the same 10 year period, the total number of hours per month between 0700 and 1700 hours GMT with a total of 0.1 millimetres or more of rain falling within the hour. Days and hours with only a few spots of rain amounting to less than .05 millimetres have not been included in Table 1K but otherwise this Table includes all occasions of 'measurable' rain ie all occasions of 'slight' 'moderate' and 'heavy' rain.

There is practically no experimental evidence on the subject of rain as a factor affecting outdoor work but after consultation with the Building Research Station, Ministry of Public Building and Works, it was decided that the lower limit of precipitation (rain, drizzle, snow etc) contributing to time lost in the building industry should be set a rate of 0.5 millimetres or more per hour. The rate of 0.5 mm/hr corresponds to the lower limit of the Meteorological Office classification of "moderate" rainfall ie rain falling fast enough to form puddles rapidly. Thus, occasions with rain falling at a rate of 0.5 mm/hr or more can be thought of more simply as occasions with "moderate" or "heavy" rain.

Table 1L gives the total duration in hours and tenths of rain falling at a rate of 0.5 mm/hr or more between the hours of 0700 and 1700 GMT during the 10 years from 1960 to 1969. However, the actual amount of working time lost in a day because of rain will seldom keep in step with the duration of moderate or heavy rain on that day. For example, if moderate or heavy rain fell continuously for a period of say 30 minutes during part of the working day, the working time lost from the cessation to the resumption of work would almost certainly be considerably more than 30 minutes. It should also be borne in mind that, more often than not, a period of "moderate" or "heavy" rain is preceded or followed by a period of "slight" rain.

Thus, it should be realised, that in the majority of cases, the duration figures quoted in Table 1L underestimate, perhaps grossly underestimate, the probable amount of time which would be lost on outdoor work. However, the duration figures in Table 1L are useful in that they serve as an indication of the extreme lower limit of the working time likely to be lost because of rain.

A more satisfactory alternative to the figures in Table 1L are figures which show the number of hours during which moderate or heavy rain fell for some time during the hour. Table 1M provides this type of information and comprises the total number of days per month over the 10 years from 1960 to 1969 on which moderate or heavy rain fell at some time during the working day from 0700 to

1700 hours GMT. Similarly, this Table also gives the total number of "hours" per month between 0700 and 1700 hours GMT in which moderate or heavy rain fell at some time during the hour. The figures in Table 1M may overestimate the actual time lost on outdoor work because of rain although there is little doubt that these figures will provide a safer and perhaps more realistic guide for planning or tendering purposes than the figures giving the actual durations of moderate or heavy rain.

Perhaps it should be stressed that while the figures in Tables 1K to 1M provide a guide to the duration of rainfall during the working part of the day, the figures do not provide a guide to the duration of the effects of the rain. For example, a localised heavy downpour of rain of short duration could flood a building site (especially at the excavation or earth-moving stage) bringing work to a standstill for several days, but such a downpour might contribute a value of say only one or two extra hours with moderate or heavy rain. Clearly, a heavy downpour of rain falling outside the ten hour period from 0700 to 1700 hours could bring about a similar stoppage.

The Meteorological Office at Prestwick Airport is the only location in the region for which it is possible to provide the types of data contained in Tables 1K, 1L and 1M. However, it is considered that the figures in Tables 1K and 1M should give a reasonably good guide to the region as a whole although the duration figures in Table 1L may be on the low side when applied to Kilmarnock and other places on the wetter eastern fringe of the region.

When consulting Tables 1K to 1M it should be borne in mind that the figures relate to a 7-day working week and not to a 5-day working week.

A table for converting amounts of rainfall in millimetres into amounts in inches is given at Table 1N.

Evaporation

Estimated average values of potential transpiration (ie the water loss from an established turf surface assuming that the roots never run short of water) are given below for the coastal strip of Ayrshire within 5 miles approximately of the coast, and also for a mean county height of 500 feet.

	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Summer Total</u>	<u>Winter Total</u>	<u>Annual Total</u>
<u>Potential Transpiration in inches of water</u>									
Coastal Strip	2.25	3.50	3.75	3.40	2.75	1.85	17.50	3.90	21.40
Average Height of 500 feet	2.00	3.25	3.50	3.20	2.55	1.50	16.00	2.50	18.50

The water losses due to potential transpiration are not directly comparable with water losses from an open water surface. However, from some seasonal ratios of potential transpiration to open water evaporation listed below it can be seen that, during the main evaporation period of the year, the evaporation from an open water surface is of the order of 25 per cent higher than the losses due to potential transpiration.

Ratio of Potential
Transpiration to
Open Water Evaporation

May to August	0.8
September to October and March to April	0.7
November to February	0.6

The available evidence suggests that the maximum evaporation from an open water surface in the area under consideration (ie during very warm weather with low humidities and fresh winds) is likely to be of the order of 0.3 inches in a day, 1.25 to 1.50 inches in a week and 3.00 to 4.00 inches in a month.

Further general information on this subject is given in Technical Bulletins Nos 4 and 16 of the Ministry of Agriculture, Fisheries and Food (published by HM Stationery Office) which have the respective titles "The calculation of irrigation need" and "Potential transpiration".

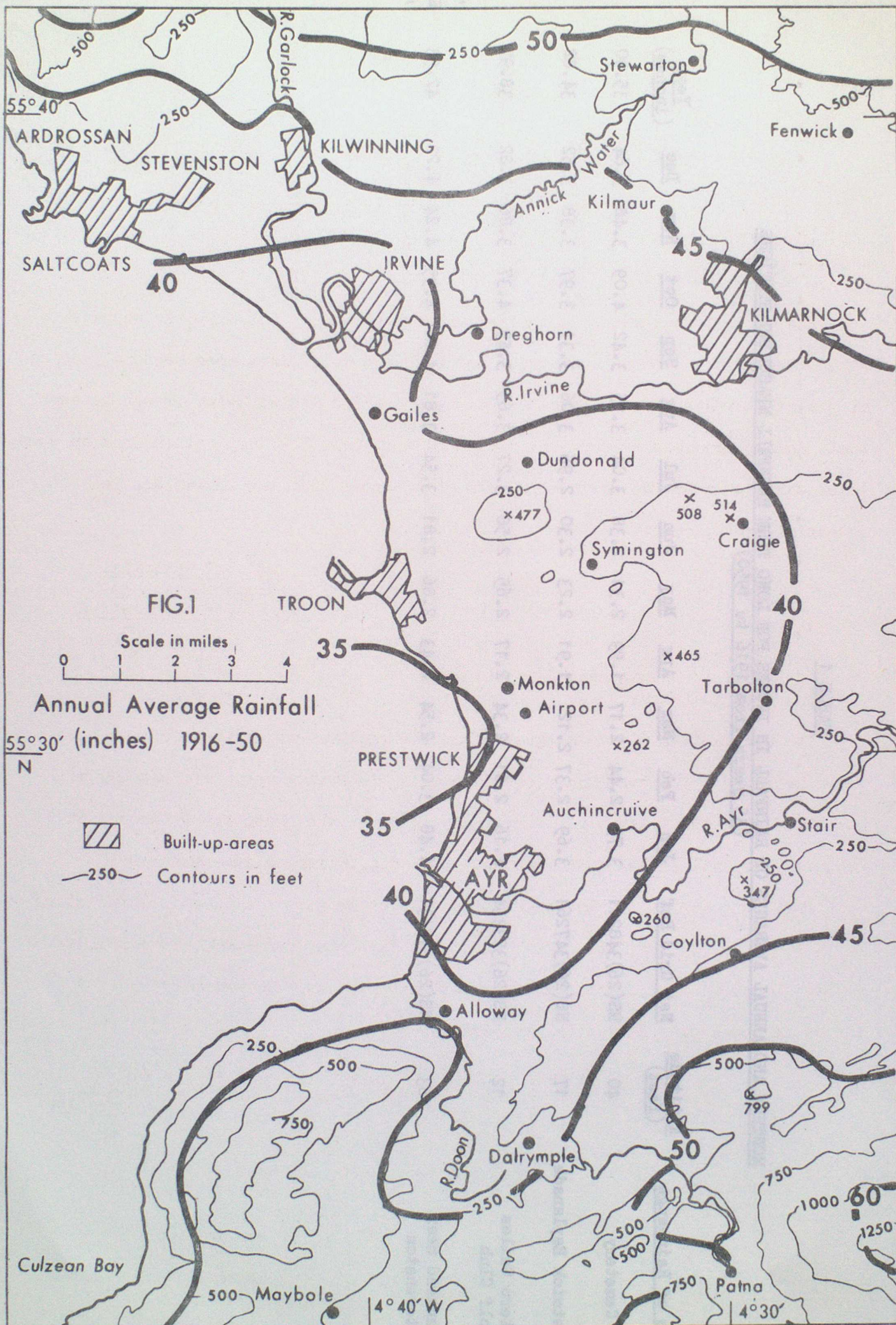


TABLE 1

MONTHLY AND ANNUAL AVERAGES OF RAINFALL IN INCHES FOR LONG TERM RAINFALL MEASURING STATIONS
(35 years from 1916 to 1950)

<u>Site of Raingauge</u>	<u>Altitude (feet)</u>	<u>Nat Grid Ref</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year (inches)</u>
Ayr Cemetery	40	NS(26)348211	3.79	2.44	2.17	1.99	2.31	2.38	3.04	3.15	3.42	4.09	3.48	3.64	35.90
Prestwick Esplanade	17	NS(26)347261	3.69	2.37	2.12	1.91	2.23	2.30	2.96	3.06	3.31	3.97	3.38	3.52	34.82
Western Gailes Golf Club	12	NS(26)323354	4.16	2.61	2.34	2.17	2.65	2.58	3.27	3.65	3.49	4.37	3.86	3.82	38.97
Greenhead near Stevenston	183	NS(26)273437	4.48	3.04	2.54	2.43	2.86	2.81	3.54	3.81	4.01	4.95	4.24	4.22	42.93

TABLE 1A

MONTHLY AND ANNUAL AVERAGES OF RAINFALL IN INCHES (35 years from 1916 to 1950) ESTIMATED FROM SHORT TERM RECORDS

<u>Site of Raingauge</u>	<u>Altitude (feet)</u>	<u>Nat Grid Ref</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year (inches)</u>
Doonholm near Alloway	90	NS(26)338175	4.78	3.01	2.70	2.43	2.79	2.87	3.72	3.80	4.20	5.14	4.29	4.51	44.24
Hillhead near Mauchline	564	NS(26)494283	4.82	3.17	2.77	2.50	2.63	2.86	3.53	3.88	4.29	5.18	4.46	4.55	44.64
Auchincruive	147	NS(26)389236	4.18	2.68	2.41	2.17	2.52	2.60	3.35	3.47	3.75	4.50	3.83	3.98	39.44
Ladykirk	185	NS(26)388270	4.04	2.62	2.36	2.13	2.40	2.47	3.19	3.35	3.61	4.38	3.69	3.80	38.04
Prestwick Airport	30	NS(26)358269	3.92	2.51	2.25	2.03	2.36	2.44	3.14	3.25	3.51	4.21	3.58	3.73	36.93
North Craig Reservoir	319	NS(26)438412	4.94	3.49	2.88	2.61	2.98	2.88	3.91	4.23	4.37	5.17	4.56	4.51	46.53
Kilmarnock	115	NS(26)421377	4.33	2.91	2.58	2.41	2.70	2.70	3.45	3.83	3.90	4.70	4.04	4.04	41.59
Montgreenan near Kilwinning	180	NS(26)344443	5.01	3.55	2.79	2.70	3.03	2.93	3.88	4.35	4.45	5.31	4.68	4.64	47.32
Ravenspark Hospital Irvine	24	NS(26)309407	4.37	2.90	2.41	2.29	2.61	2.57	3.39	3.72	3.85	4.66	4.05	4.05	40.87
Ardrossan Filters	167	NS(26)235444	4.66	3.13	2.52	2.48	2.79	2.70	3.57	3.83	4.09	5.01	4.31	4.44	43.53

TABLE 1B

CUMULATIVE MEAN DAILY RAINFALL IN INCHES FOR AYR CEMETERY
(35 years from 1916 to 1950)

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	.17	3.89	6.30	8.45	10.42	12.79	15.17	18.24	21.38	24.83	28.96	32.45
2	.31	3.97	6.35	8.52	10.45	12.85	15.28	18.32	21.46	24.95	29.12	32.61
3	.45	4.07	6.40	8.58	10.50	12.94	15.41	18.35	21.56	25.16	29.25	32.70
4	.56	4.16	6.48	8.63	10.59	13.04	15.51	18.42	21.66	25.30	29.40	32.83
5	.67	4.27	6.57	8.68	10.68	13.11	15.59	18.49	21.71	25.45	29.54	32.93
6	.82	4.42	6.65	8.72	10.77	13.21	15.75	18.60	21.83	25.57	29.61	33.05
7	.97	4.53	6.75	8.79	10.82	13.30	15.87	18.75	21.95	25.72	29.73	33.15
8	1.12	4.67	6.85	8.86	10.87	13.38	15.96	18.87	22.02	25.88	29.86	33.27
9	1.27	4.76	6.91	8.93	10.95	13.45	16.05	18.94	22.15	26.08	30.00	33.39
10	1.39	4.82	6.93	9.01	11.00	13.52	16.16	19.02	22.26	26.24	30.10	33.48
11	1.52	4.92	6.98	9.09	11.06	13.56	16.24	19.12	22.37	26.32	30.24	33.57
12	1.66	5.00	7.04	9.16	11.16	13.73	16.34	19.19	22.49	26.46	30.36	33.65
13	1.76	5.07	7.07	9.25	11.24	13.80	16.49	19.27	22.65	26.57	30.44	33.73
14	1.89	5.17	7.13	9.34	11.30	13.88	16.58	19.42	22.78	26.64	30.54	33.84
15	1.97	5.28	7.18	9.41	11.44	13.94	16.71	19.53	22.88	26.76	30.61	33.95
16	2.07	5.35	7.26	9.50	11.55	14.02	16.78	19.64	23.15	26.88	30.69	34.08
17	2.20	5.40	7.34	9.57	11.65	14.10	16.87	19.79	23.33	27.01	30.78	34.21
18	2.33	5.49	7.44	9.62	11.74	14.21	16.99	19.88	23.42	27.11	30.92	34.32
19	2.46	5.58	7.51	9.71	11.80	14.26	17.08	20.01	23.57	27.20	31.03	34.43
20	2.56	5.64	7.59	9.75	11.88	14.36	17.17	20.19	23.69	27.32	31.11	34.57
21	2.64	5.71	7.68	9.81	11.93	14.44	17.24	20.27	23.78	27.51	31.23	34.67
22	2.74	5.79	7.74	9.88	12.03	14.54	17.36	20.34	23.94	27.62	31.36	34.78
23	2.87	5.84	7.81	9.97	12.10	14.60	17.41	20.40	24.01	27.75	31.54	34.89
24	3.02	5.91	7.86	10.07	12.19	14.64	17.49	20.51	24.10	27.94	31.64	35.01
25	3.14	5.97	7.92	10.14	12.23	14.68	17.56	20.64	24.21	28.10	31.78	35.13
26	3.24	6.07	7.97	10.20	12.33	14.75	17.62	20.75	24.29	28.23	31.88	35.27
27	3.32	6.14	8.04	10.26	12.44	14.88	17.72	20.89	24.36	28.33	31.96	35.35
28	3.45	6.17	8.10	10.29	12.50	14.97	17.84	20.99	24.48	28.39	32.05	35.49
29	3.57	6.23	8.18	10.35	12.54	15.03	17.95	21.08	24.59	28.57	32.17	35.64
30	3.64		8.28	10.39	12.62	15.08	18.06	21.14	24.69	28.67	32.26	35.79
31	3.79		8.40		12.70		18.12	21.27		28.78		35.90

Note: The entry opposite any particular date is the mean rainfall from January 1 to that date. The mean rainfall for any period of the year can be obtained from the table by subtracting the cumulative total at the beginning of the required period from the corresponding total at the end of the required period.

TABLE 1C

STATISTICS OF MONTHLY AND ANNUAL RAINFALLS IN INCHES FOR AYR CEMETERY

(Period of Record = 57 years from 1913 to 1969)

Statistics of Monthly Rainfalls

<u>Month</u>	<u>Highest Rainfall</u>	<u>Rainfall Seldom* Above</u>	<u>Median[†]</u>	<u>Rainfall Seldom* Below</u>	<u>Lowest Rainfall</u>
January	8.41 in January 1928	4.62	3.44	2.48	0.49 in January 1941
February	5.05 in February 1915	3.80	2.15	0.94	Nil in February 1932
March	6.03 in March 1921	2.75	2.08	1.35	0.37 in March 1944
April	4.39 in April 1947	2.71	1.75	1.18	0.16 in April 1938
May	6.74 in May 1925	3.24	2.13	1.31	0.51 in May 1939
June	6.53 in June 1919	3.21	2.09	1.26	0.34 in June 1914 and June 1925
July	5.67 in July 1931	4.05	2.88	1.98	0.51 in July 1919
August	5.90 in August 1956	4.81	3.36	1.84	0.30 in August 1947
September	7.81 in September 1950	4.67	3.34	1.80	0.90 in September 1933
October	7.67 in October 1954	5.43	3.61	2.03	0.55 in October 1946
November	6.45 in November 1963	4.87	3.56	1.82	0.15 in November 1945
December	8.46 in December 1929	4.60	3.72	2.06	0.77 in December 1927

Statistics of Annual Rainfalls

<u>Period of Record</u>	<u>Highest Annual Rainfall</u>	<u>Annual Rainfall Seldom* Above</u>	<u>Median[†]</u>	<u>Annual Rainfall Seldom* Below</u>	<u>Lowest Annual Rainfall</u>
57 years from 1913 to 1969	46.29 in 1928	38.29	34.71	30.33	25.81 in 1941

*Seldom = 20 per cent of occasions or one year in 5;
the figures given are the upper and lower
quintiles.

[†]Median = the "middle" value ie half the rainfalls
exceed it and half fall below it.

TABLE 1D

TOTAL DURATION IN HOURS OF MEASURABLE* RAIN RECORDED IN EACH MONTH AND
YEAR DURING THE 20 YEARS FROM 1950 TO 1969 BY THE AUTOGRAPHIC RAIN
RECORDING INSTRUMENT AT PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>
	(hours)												
1950	64	87	55	59	25	47	69	81	128	60	65	40	780
1951	65	80	78	50	31	43	56	64	39	20	110	115	751
1952	112	31	56	33	44	56	40	67	45	64	75	111	734
1953	56	33	18	61	34	33	84	42	95	61	117	81	715
1954	89	79	69	30	48	78	77	68	85	124	96	118	961
1955	59	39	27	49	57	56	27	25	38	39	35	104	555
1956	61	39	29	19	34	55	92	108	54	53	37	62	643
1957	72	56	60	47	44	36	50	59	63	101	37	55	680
1958	66	102	43	35	51	71	73	55	35	47	22	64	664
1959	33	46	41	46	27	67	65	12	27	76	86	98	624
1960	81	58	42	61	35	39	62	67	47	37	86	78	693
1961	49	62	40	93	26	41	59	67	85	81	73	57	733
1962	101	60	33	48	36	38	49	94	103	35	70	89	756
1963	24	14	82	58	74	52	45	77	46	79	111	17	679
1964	69	21	26	56	64	44	44	87	79	63	77	88	718
1965	83	21	49	51	57	76	69	62	121	78	43	113	823
1966	43	78	89	53	69	115	41	73	84	63	97	125	930
1967	51	62	83	57	112	37	51	56	69	103	65	73	819
1968	91	48	94	32	91	31	57	45	78	123	66	34	790
1969	84	28	22	39	70	55	48	32	39	44	104	85	650
20-year mean	68	52	52	49	51	53	58	62	68	68	74	80	735

*The autographic rain recording instrument does not register the duration of very small amounts of rain, drizzle, snow etc eg occasions with only a "few spots" of rain.

TABLE 1E

CUMULATIVE FREQUENCIES OF DAILY RAINFALLS IN INCHES FOR AYR CEMETERY
(50 years from 1916 to 1965)

Daily Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All Months
3.50 or more						1							1
3.00 "						1							1
2.50 "						1							1
2.40 "						1			1				2
2.30 "						1	1	1	2				5
2.20 "						1	1	1	2				5
2.10 "						1	1	1	2				5
2.00 "						1	1	1	2				5
1.90 "						1	1	1	2				5
1.80 "						1	1	2	2				6
1.70 "						1	1	3	2				7
1.60 "						1	2	4	2				9
1.50 "						1	2	4	2	2			11
1.40 "		1				1	3	5	2	3	1		16
1.30 "	2	1				1	4	6	2	3	1	2	22
1.20 "	2	1			1	1	4	6	3	3	3	2	26
1.10 "	2	1	1		2	3	6	10	7	8	5	2	47
1.00 "	4	2	1		4	5	11	16	11	14	7	5	80
0.90 "	8	3	3	1	9	8	18	23	19	19	11	8	130
0.80 "	12	8	4	2	12	12	23	30	27	26	18	14	188
0.70 "	36	12	8	4	18	16	34	39	45	41	31	27	311
0.60 "	49	20	13	17	28	26	52	57	63	66	59	43	493
0.50 "	90	30	26	26	42	47	71	82	92	101	84	67	758
0.40 "	131	60	56	53	66	81	112	128	139	158	125	128	1237
0.30 "	215	104	105	92	107	123	168	198	200	231	186	213	1942
0.20 "	348	203	206	173	192	205	280	295	328	365	321	374	3290
0.10 "	526	377	338	318	364	339	435	461	490	561	504	578	5291
0.005 "	895	717	645	642	641	656	761	814	811	869	809	906	9166

*Less than 0.005	655	696	905	858	909	844	789	736	689	681	691	644	9097
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Total Number of Days in 50 years	1550	1413	1550	1500	1550	1500	1550	1550	1500	1550	1500	1550	18263
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*Including days with no rain.

Example: In the 50 Januarys during the years from 1916 to 1965, there was a total of 90 days with 24 hour rainfall amounts of 0.50 inches or more.

Note: The contents of the raingauge at Ayr Cemetery are emptied and measured once-daily at 0900 hours Greenwich Mean Time (10 am British Standard Time) to obtain the 24 hour amount of precipitation collected in the gauge since the measurement made at 0900 hours on the previous day. When the raingauge contains solid precipitation in the form of snow or hail, the contents are melted by warming to give the equivalent amount of rain water. The above frequency table has been calculated from records of the 24 hour (0900 hours on one day to 0900 hours on the next day) measurements made during the 50 years period from 1916 to 1965.

TABLE 1F

<u>MAXIMUM DAILY RAINFALLS IN INCHES RECORDED AT AYR CEMETERY DURING THE 57 YEARS FROM 1913 TO 1969</u>												
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
Maximum Daily* Fall	1.39	1.40	1.12	0.98	1.28	3.57	2.34	2.31	2.45	1.53	1.40	1.37
Year of Occurrence	1960	1940	1933	1944	1922	1919	1931	1949	1940	1949	1927	1931

*24 hours from 0900 hours GMT on one day to 0900 hours GMT on the next day

Example: The maximum daily fall of 1.39 inches which occurred in January 1960 is the highest daily fall recorded at Ayr Cemetery in any January during the years from 1913 to 1969.

TABLE 1G

DAILY RAINFALLS AT AYR CEMETERY DURING THE SEVEN WETTEST MONTHS IN THE
57 YEARS FROM 1913 TO 1969

(Wettest Month = Month with total of more than 7 inches of rainfall)

Date	December 1919	January 1928	December 1929	December 1932	October 1938	September 1950	October 1954
	inches	inches	inches	inches	inches	inches	inches
1st	.54	Nil	Nil	.74	Nil	.06	.05
2nd	.08	Nil	.60	.66	.36	.05	Nil
3rd	.23	.20	.25	.15	1.07	.07	.47
4th	.30	.38	.18	.07	.05	.15	.38
5th	.32	.37	.25	Nil	.34	Nil	.09
6th	.37	.28	.15	Nil	.27	1.03	Nil
7th	Nil	.55	.16	Nil	.21	.44	.38
8th	Nil	.15	.15	Nil	.80	Nil	Nil
9th	.03	.21	.20	Nil	.09	Nil	.09
10th	.68	.25	.30	Nil	.36	.78	.04
11th	.27	.75	.98	.04	.31	.40	Nil
12th	.23	.07	.47	.01	.31	.34	.01
13th	.15	.47	.20	.05	.22	.15	.48
14th	.09	.45	.20	.48	Nil	.10	.02
15th	.14	.18	.02	.45	.25	Nil	1.19
16th	.10	Nil	Nil	.91	.27	.57	.64
17th	.02	.14	.02	.72	.02	.59	1.07
18th	.28	.74	Nil	1.06	.14	Nil	.60
19th	.10	.31	.40	1.37	.02	.21	.08
20th	.44	.11	.86	Nil	Nil	.16	.10
21st	.38	.35	.15	.10	.45	.31	.06
22nd	.22	.04	.51	.09	.27	.11	.35
23rd	.48	.65	Nil	.17	Nil	.60	.15
24th	.22	.53	.38	Nil	.36	.25	Nil
25th	Nil	.15	.38	Nil	.14	.29	.24
26th	.40	.03	.29	.03	.25	.04	.05
27th	.24	.20	.03	Nil	Nil	.26	.90
28th	.10	.24	.37	.01	.03	.25	.22
29th	.01	.28	.48	.13	.25	.08	.01
30th	.70	.03	.15	Nil	.03	.52	Nil
31st	Nil	.30	.33	.03	.49		Nil
Totals	7.12	8.41	8.46	7.27	7.36	7.81	7.67

Note: The "daily" rainfalls refer to the 24 hour period following 0900 hours Greenwich Mean Time on the date to which they have been credited.

INTENSITIES OF RAINFALL RECORDED AT PRESTWICK AIRPORT

Number of Days with Specified Amounts of Rain falling in specified times (23 years from 1947 to 1969)

Year	Amount of 5 mm (0.2 inch) falling within			Amount of 10 mm (0.4 inch) falling within			Amount of 15 mm (0.6 inch) falling within			Amount of 20 mm (0.8 inch) falling within			Amount of 25 mm (1.0 inch) falling within				
	5 mins	10 mins	15 mins	5 mins	15 mins	30 mins	1 hr	15 mins	30 mins	1 hr	2 hrs	4 hrs	1 hr	2 hrs	4 hrs	8 hrs	16 hrs
1947	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	-	-	-	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1949	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	-	-	-	0	1	0	1	0	0	0	0	0	0	0	0	0	0
1952	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	1	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0
1959	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	2	0	1	1	2	0	0	0	0	0	0	0	0	0	0
1967	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Totals	0	4	9	0	2	3	15	0	1	2	9	35	0	0	4	10	33
Number of years of Record	14	14	14	23	23	23	23	23	23	23	23	23	23	23	23	23	23

Note: Records of amounts of 5 millimetres (0.2 inch) falling within 5 minutes, 10 minutes and 15 minutes are not available for the years before 1956.

TABLE 1I

MAXIMUM RAINFALL IN INCHES FROM MODIFIED BILHAM FORMULA

Return Period (years)

Duration (minutes)	1 day per Annum	1 day per 2 years	1 day per 5 years	1 day per 10 years	1 day per 20 years	1 day per 50 years	1 day per 100 years
2 minutes or less	0.09	0.11	0.14	0.16	0.19	0.22	0.24
4 minutes or less	0.15	0.18	0.23	0.27	0.31	0.36	0.40
6 minutes or less	0.18	0.23	0.30	0.35	0.40	0.48	0.54
8 minutes or less	0.21	0.27	0.35	0.41	0.48	0.58	0.65
10 minutes or less	0.24	0.30	0.39	0.47	0.55	0.66	0.75
15 minutes or less	0.28	0.36	0.48	0.58	0.68	0.83	0.96
20 minutes or less	0.31	0.40	0.54	0.66	0.79	0.97	1.12
25 minutes or less	0.34	0.43	0.58	0.72	0.87	1.09	1.27
30 minutes or less	0.36	0.46	0.62	0.77	0.94	1.18	1.39
40 minutes or less	0.40	0.50	0.68	0.85	1.05	1.34	1.59
50 minutes or less	0.43	0.54	0.73	0.91	1.13	1.46	1.75
60 minutes or less	0.46	0.58	0.78	0.96	1.19	1.56	1.88
90 minutes or less	0.52	0.66	0.88	1.09	1.35	1.78	2.18
120 minutes or less	0.58	0.72	0.96	1.19	1.47	1.94	2.38

Example: The maximum rainfall in 60 minutes or less on one day in 50 years = 1.56

FACTORS FOR CONVERTING POINT RAINFALLS INTO AREAL RAINFALLS

Duration (minutes)

Area (acres)	2	6	10	15	30	60	120
100	0.94	0.95	0.96	-	-	-	-
150	0.92	0.94	0.95	0.95	0.96	-	-
200	0.91	0.93	0.94	0.94	0.95	0.95	0.96
300	0.89	0.91	0.92	0.93	0.94	0.94	0.95
500	0.86	0.89	0.90	0.91	0.92	0.92	0.93
700	0.83	0.87	0.88	0.89	0.90	0.91	0.92
1000	0.80	0.85	0.86	0.87	0.88	0.89	0.90
1500	0.75	0.81	0.83	0.84	0.86	0.87	0.88
2000	-	-	0.80	0.82	0.83	0.85	0.86
3000	-	-	-	0.78	0.80	0.82	0.83
5000	-	-	-	-	0.74	0.76	0.77
7000	-	-	-	-	-	0.72	0.73

TABLE 1J

COMPARISON OF OBSERVED AND ESTIMATED INTENSITIES OF RAINFALL
FOR THE PRESTWICK AREA OF AYRSHIRE

Number of Days in 10 years with specified amounts of rain falling in specified times

	A	B	C	D
	<u>Observed</u> <u>Frequency</u> (number of days in 10 years)	<u>Estimated</u> <u>Frequency</u> (number of days in 10 years)	<u>Observed Fre-</u> <u>quency as</u> <u>Percentage of</u> <u>Estimated</u> <u>Frequency</u>	<u>Period of</u> <u>Record used</u> <u>for Calcula-</u> <u>tion of A</u> (years)
<u>Amount of 0.2 inches falling within</u>				
5 minutes or less	0.0	5.5*	0%	14
10 minutes or less	2.9	14.9	19%	14
15 minutes or less	6.4	22.3	29%	14
<u>Amount of 0.4 inches falling within</u>				
15 minutes or less	0.9	3.5*	26%	23
30 minutes or less	1.3	7.3	18%	23
60 minutes or less	6.5	14.6	45%	23
<u>Amount of 0.6 inches falling within</u>				
30 minutes or less	0.4	2.2	18%	23
1 hour or less	0.9	4.4	20%	23
2 hours or less	3.9	8.8	44%	23
4 hours or less	15.2	17.6	86%	23
<u>Amount of 0.8 inches falling within</u>				
2 hours or less	0.9	3.6	25%	23
4 hours or less	4.8	7.2	67%	23
8 hours or less	16.1	14.4	112%	23
<u>Amount of 1.0 inches falling within</u>				
4 hours or less	1.7	3.6	47%	23
8 hours or less	4.3	7.2	60%	23
16 hours or less	14.3	14.4	99%	23

Notes

1. The observed frequencies in column 'A' above have been calculated from intensities of rainfall recorded at Prestwick Airport during the 23 years from 1947 to 1969 - see Column 'D' and Table 1H.
2. The estimated frequencies in column 'B' above were mainly obtained from Bilham's formula:

$$n = \frac{1.25t}{(r + 0.1)^{3.55}}$$

where:

- n = frequency (number of days in 10 years)
t = duration in hours
r = rainfall in inches

But the following modification due to D J Holland for intensities greater than 1.25 inches per hour was used to estimate the frequencies marked with an asterisk:

$$\frac{r \exp \left(1 - \frac{0.8r}{t} \right)}{(r + 0.1)^{3.55}}$$

TABLE 1K

NUMBER OF DAYS WITH 0.1 MILLIMETRES OR MORE OF RAIN FALLING AT SOME TIME DURING
THE 10 HOUR PERIOD BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME (0800
AND 1800 HOURS BRITISH STANDARD TIME) IN EACH MONTH AND YEAR
DURING THE 10 YEARS FROM 1960 TO 1969 AT
PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u> <u>Total</u>
<u>Number of Days</u>													
1960	9	13	8	10	4	6	18	10	10	8	19	18	133
1961	11	13	12	16	7	9	9	14	15	17	11	12	146
1962	17	11	7	11	11	9	9	15	13	7	9	16	135
1963	3	1	15	15	17	14	12	15	12	15	16	5	140
1964	10	9	6	11	15	12	8	13	14	15	11	18	142
1965	14	3	8	16	12	13	10	13	15	10	7	18	139
1966	7	14	16	10	13	17	10	11	10	14	14	20	156
1967	9	14	22	11	19	9	9	10	13	18	8	10	152
1968	13	9	14	8	13	6	5	6	16	19	9	7	125
1969	18	6	6	9	14	11	10	9	12	10	21	13	139
10-year mean	11.1	9.3	11.4	11.7	12.5	10.6	10.0	11.6	13.0	13.3	12.5	13.7	140.7

NUMBER OF HOURS DURING THE 10 HOUR PERIOD BETWEEN 0700 AND 1700 HOURS GREENWICH
MEAN TIME WITH 0.1 MILLIMETRES OR MORE OF RAIN FALLING AT SOME TIME
DURING THE HOUR IN EACH MONTH AND YEAR DURING THE 10 YEARS
FROM 1960 TO 1969 AT PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u> <u>Total</u>
<u>Number of Hours</u>													
1960	43	31	31	29	20	16	58	30	34	21	48	54	415
1961	48	47	27	48	29	23	38	62	56	59	44	47	528
1962	73	45	23	37	22	29	23	60	42	23	44	56	477
1963	10	6	46	36	54	41	34	48	31	52	66	19	443
1964	42	25	15	33	47	30	27	50	59	43	53	85	509
1965	65	11	17	41	35	37	40	40	58	56	33	86	519
1966	33	60	59	31	50	69	25	43	39	55	69	84	617
1967	37	38	82	39	72	22	24	36	48	68	25	46	537
1968	65	32	75	25	45	15	16	30	47	87	46	22	505
1969	63	15	16	31	33	36	29	26	34	34	79	54	450
10-year mean	47.9	31.0	39.1	35.0	40.7	31.8	31.4	42.5	44.8	49.8	50.7	55.3	500.0
10-year mean expressed as percentage of total working time	15%	11%	13%	12%	13%	11%	10%	14%	15%	16%	17%	18%	14%

TABLE 1L

TOTAL DURATION IN HOURS AND TENTHS OF RAIN FALLING AT A RATE OF 0.5 MILLIMETRES
OR MORE PER HOUR BETWEEN THE HOURS OF 0700 AND 1700 HOURS GREENWICH
MEAN TIME (0800 AND 1800 HOURS BRITISH STANDARD TIME) IN EACH
MONTH AND YEAR DURING THE 10 YEARS FROM 1960 TO 1969 AT
PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u> <u>Total</u>
<u>Total Duration in Hours and Tenths</u>													
1960	29.0	14.9	17.9	8.2	9.9	7.0	22.1	11.9	21.5	6.9	19.3	21.2	189.8
1961	15.6	23.5	8.1	24.3	13.0	10.0	17.9	30.9	23.3	18.7	17.7	14.3	217.3
1962	27.8	18.1	9.5	18.8	7.1	9.1	12.3	39.4	17.7	8.1	14.2	19.4	201.5
1963	2.2	2.6	20.4	14.6	27.8	14.7	11.7	26.0	9.3	24.7	36.4	7.6	198.0
1964	18.3	4.4	4.0	11.4	16.1	10.1	16.6	26.5	32.0	24.4	23.4	30.2	217.4
1965	30.9	9.1	6.0	16.6	13.8	14.4	20.6	14.9	27.6	31.5	14.9	35.7	236.0
1966	17.1	29.0	22.4	8.5	23.3	32.3	9.4	20.6	16.9	22.5	27.4	41.5	270.9
1967	20.9	16.4	26.5	17.3	29.4	9.9	10.1	17.0	23.4	36.2	8.9	23.2	239.2
1968	30.3	10.7	41.9	14.4	17.0	6.3	10.5	15.4	24.8	33.2	27.0	11.9	243.4
1969	24.4	4.3	7.4	15.3	16.9	13.3	15.1	11.0	15.9	15.9	36.5	26.9	203.1
10-year mean	21.7	13.3	16.4	14.9	17.4	12.7	14.6	21.4	21.2	22.2	22.6	23.2	221.6
10-year mean expressed as percentage of total working time	7%	5%	5%	5%	6%	4%	5%	7%	7%	7%	8%	7%	6%

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TABLE 1M

NUMBER OF DAYS WITH RAIN FALLING AT A RATE OF 0.5 MILLIMETRES OR MORE PER HOUR
BETWEEN THE HOURS OF 0700 AND 1700 HOURS GREENWICH MEAN TIME (0800 AND
1800 HOURS BRITISH STANDARD TIME) IN EACH MONTH AND YEAR DURING
THE 10 YEARS PERIOD FROM 1960 TO 1969 AT
PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
<u>Number of Days</u>													
1960	9	13	7	9	2	6	18	9	10	8	17	17	125
1961	11	12	10	13	7	8	7	14	15	16	10	10	133
1962	17	11	7	11	10	9	6	15	12	6	7	14	125
1963	2	1	12	13	16	11	8	11	12	13	14	4	117
1964	9	7	5	10	15	10	7	13	13	13	10	17	129
1965	13	3	5	14	11	11	9	10	12	10	7	16	121
1966	6	13	16	8	12	16	9	9	10	12	14	19	144
1967	9	13	21	11	17	5	9	9	12	17	8	9	140
1968	13	7	14	7	9	6	3	6	14	18	9	7	113
1969	15	5	5	8	10	9	8	8	11	9	19	12	119
10-year mean	10.4	8.5	10.2	10.4	10.9	9.1	8.4	10.4	12.1	12.2	11.5	12.5	126.6

NUMBER OF HOURS WITH RAIN FALLING AT A RATE OF 0.5 MILLIMETRES OR MORE PER HOUR
BETWEEN THE HOURS OF 0700 AND 1700 HOURS GREENWICH MEAN TIME (0800 AND
1800 HOURS BRITISH STANDARD TIME) IN EACH MONTH AND YEAR DURING
THE 10 YEARS PERIOD FROM 1960 TO 1969 AT
PRESTWICK AIRPORT

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
<u>Number of Hours</u>													
1960	39	30	28	20	12	13	50	22	32	17	35	48	346
1961	40	36	19	34	24	21	25	53	49	54	41	31	427
1962	66	33	18	33	16	26	19	56	35	17	22	41	382
1963	3	4	33	24	43	29	22	36	29	45	53	18	339
1964	30	19	10	21	35	23	21	38	51	37	41	64	390
1965	52	11	9	37	26	30	32	31	35	48	28	61	400
1966	27	45	51	18	38	51	18	27	24	39	51	69	458
1967	30	33	68	27	49	14	18	26	43	61	22	38	429
1968	43	19	59	20	28	13	11	23	39	66	41	18	380
1969	47	11	11	23	25	22	22	20	28	27	67	39	342
10-year mean	37.7	24.1	30.6	25.7	29.6	24.2	23.8	33.2	36.5	41.1	40.1	42.7	389.3
10-year mean expressed as percentage of total working time	12%	9%	10%	9%	10%	8%	8%	11%	12%	13%	13%	14%	11%

NOTE: The numbers of days and numbers of hours quoted in the above tables should not be taken to mean that rain has fallen continuously at a rate of 0.5 millimetres or more per hour throughout the day between 0700 and 1700 hours GMT or continuously at the same rate throughout an hour during this period. For example, the above tables include days and hours when rain fell at a rate of 0.5 millimetres or more per hour for only a few minutes.

TABLE 1N

TABLE FOR CONVERTING AMOUNTS OF RAINFALL IN MILLIMETRES TO INCHES

<u>mm</u>	<u>inch</u>	<u>mm</u>	<u>inch</u>	<u>mm</u>	<u>inch</u>
.1	.004	10	.394	100	3.937
.2	.008	15	.591	200	7.874
.3	.012	20	.787	300	11.811
.4	.016	25	.984	400	15.748
.5	.020	30	1.181	500	19.685
.6	.024	35	1.378	600	23.622
.7	.028	40	1.575	700	27.559
.8	.031	45	1.772	800	31.496
.9	.035	50	1.969	900	35.433
				1000	39.370
1	.039	55	2.165		
2	.079	60	2.362		
3	.118	65	2.559		
4	.157	70	2.756		
5	.197	75	2.953		
6	.236	80	3.150		
7	.276	85	3.346		
8	.315	90	3.543		
9	.354	95	3.740		
10	.394	100	3.937		

2. TEMPERATURE

In winter, temperature conditions in the British Isles are influenced to a very large extent by the sea surface temperature of the surrounding seas, with the lines of equal mean temperature running north and south over the British Isles and the west coast being a degree or two warmer than the east coast. Thus, in winter, temperatures in the British Isles decrease from west to east and not from south to north as might be supposed.

The following comparison of mean temperatures in January serves as an illustration of the similarity in mean temperatures in mid-winter at Prestwick and other places on the western side of Scotland, England and Wales:

<u>Place</u>	<u>January Mean Temperature</u> <u>°F</u>
Stornoway	39.7
Prestwick, Ayrshire	38.9
Morecambe	38.7
Liverpool	39.2
Cardiff	39.9
Cheltenham	38.8

In spring, summer and autumn, the effect of latitude on the heat received from the sun is the dominant factor and temperatures in Ayrshire and the remainder of Scotland are a few degrees lower than in England with the greatest differences occurring in summer. However, on the credit side, it should be mentioned that there are fewer excessively warm days and nights in Ayrshire and daytime temperatures during the summer months are usually ideal for outdoor activity.

In the Ayr-Kilmarnock-Irvine region of Ayrshire, very mild spells often occur in the winter months during which maximum temperatures rise well above 50°F. Occasionally, in early spring, maximum temperatures may reach 70°F. However, in sharp contrast to the mild winter spells are the frosty spells which frequently occur in the late winter and early spring. These frosty spells are often associated with light north-easterly winds, which, robbed by the sheltering hills of the cloud and precipitation which bedevil eastern and central Scotland, bring crisp bright weather to the Ayrshire Plain during the daytime but severe frosts at night.

Averages and Extremes of Air Temperature for Prestwick Esplanade, Auchincruive and Kilmarnock are given in Tables 2, 2A and 2B. The station at Prestwick Esplanade lies on the sea front and the moderating influence of the sea is reflected in the figures given in Table 2 with the slightly lower maximum temperatures during the daytime being offset by higher minimum temperatures during the night period. Because of the proximity of the sea, one could reasonably expect even greater differences in maximum and minimum temperature between the station at Prestwick and the stations at Auchincruive and Kilmarnock which both lies some distance inland from the coast. The reason for the rather surprisingly small differences is not fully understood but may be due in part to the very sandy nature of the soil at the Prestwick station.

Hourly Averages and Extremes of Air Temperature at Prestwick Airport are included in the Tables of Relative Humidity in the following section (Section 3) of this report.

Statistics of Monthly and Annual Mean Temperatures for Auchincruive are given in Table 2C.

Statistics of Monthly Maximum and Minimum Temperatures for Auchincruive are given in Tables 2D and 2E.

Statistics of Annual Maximum and Minimum Temperatures for Prestwick Esplanade, Auchincruive and Kilmarnock are given in Table 2F.

The Percentage Amounts of Time with Air Temperatures between certain limits at Prestwick Airport are given in Table 2G. The Meteorological Office at Prestwick Airport is the only location in the region for which hourly readings of air temperature are available and the only location for which it is possible to calculate figures of this type.

The Number of Days with Maximum Temperatures at Auchincruive equal to or exceeding 60°F, 65°F, 70°F, 75°F, are given in Table 2H.

The Actual and Average Numbers of Days with Air Frost at Prestwick Airport, Auchincruive and Kilmarnock are given in Table 2I. Again, it is rather surprising to find that a location like Prestwick Airport which lies only about

one mile from the sea has a slightly higher frequency of air frosts than the "inland" stations at Auchincruive and Kilmarnock. The reason for this may again be due in part to the sandy nature of the soil at the Airport. However, the main cause is almost certainly the fact that the stations at Auchincruive and Kilmarnock lie on sloping ground thus permitting the downhill drainage of cold air in contrast to the Airport site at Prestwick where the flat or saucer-shaped terrain restricts the drainage of cold air and encourages stagnation.

There is no doubt that the downhill drainage and stagnation of cold air on frosty nights (the "frost hollow" effect) is widespread throughout the undulating terrain a short distance inland from the coast. The areas worst affected will be hollows and flat ground near the foot of slopes and the valleys of the numerous streams. The minimum temperatures experienced in these low-lying, relatively sheltered places are likely to be several degrees lower than those recorded at Prestwick, Auchincruive and Kilmarnock and they will also have a much higher frequency of frosts.

Average and Extreme Dates of First and Last Frosts are given in Table 2J.

Ground Frost

It is difficult to provide representative statistics of "ground" frost as conditions will vary considerably over quite short distances from place to place depending on the composition of the surface (eg grass, bare soil, tarmacadam or concrete) and whether a particular site lies in a sheltered place or is exposed to the wind. Because of the excellent insulating characteristics of grass, a grass-covered surface will normally have a higher frequency of "ground" frosts than the other surfaces mentioned because the grass seals off the only source of heat during the night period, ie the soil. At a low-lying and sheltered grass-covered site away from the Ayrshire coastline, the average number of "ground" frosts per year over a grass-covered surface could be twice as high as the average number of air frosts.

Low Temperatures during the Working Part of the Day

Experience suggests that building contractors are interested in the number of

working days and working hours with temperatures "below 32°F", "below 34°F" and "below 36°F" during the winter months.

Tables 2K, 2L and 2 M have been compiled from records of hourly readings of air temperature made at Prestwick Airport between 0700 and 1700 hours Greenwich Mean Time (8 am and 6 pm British Standard Time) on each day during the 10 years from 1960 to 1969. Owing to the convention formerly in use in the Meteorological Office whereby tenths of a degree Fahrenheit were rounded off and recorded in the records to the nearest whole degree, "below 31.6°F", "below 33.6°F", and "below 35.6°F" are the nearest precise values of temperature available from the records to the temperature thresholds of "below 32°F", "below 34°F", and "below 36°F".

The number of days quoted in these Tables may slightly underestimate the true number of days on which the air temperature fell to below the stated levels because on several days the minimum temperature could have fallen below these levels for a short time during the 60 minutes between the routine hourly readings.

It should be borne in mind when consulting Tables 2K, 2L and 2M that there will be occasions when the ground is frozen for several hours with an air temperature higher than 33.6°F or 35.6°F; perhaps the number of these occasions will be approximately counter balanced by the number of occasions when outdoor building work is able to proceed even though the air temperature is below 33.6°F or 35.6°F.

Prestwick Airport is the only location in the region from which hourly readings of temperature are available but the Prestwick Airport figures in Tables 2K, 2L and 2M should give a reasonably good guide for planning purposes, to the region as a whole. The figures in these Tables relate to a 7-day working week and not to a 5-day working week.

Growing Season

The most generally accepted threshold temperature for initiating growth is 42°F (5.6°C) and in the region of Ayrshire under consideration, mean daily temperatures normally attain this value around the middle of March and continue above this value until about the last week in November.

"Accumulated Temperatures in Degree Days" above the 42°F datum are often used as a measured of growth and/or ripening potential and values based on 29 years of temperature records from Auchincruive are given below as being of fairly general application to the region as a whole. The sharp increase in May and June contrasted with the much slower decline in autumn will be noted.

Average Values of Accumulated Temperature above 42°F - Auchincruive

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>
(degree days)												

62	51	107	137	267	417	511	499	387	229	95	65	2827
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Averages and Extremes of Soil Temperature at depths of 10 cm (4 in) and 20 cm (8 in) calculated from readings made once-daily at Auchincruive are given in Tables 2N and 2O. Auchincruive is the only location in the region for which readings of soil temperature at these depths are available. The temperature at both depths is subject to large diurnal variations which make these once-daily readings difficult to interpret but the 0900 hours GMT reading at 10 cm (4 in) in the summer half year is a reasonable guide to the mean for the day at that depth.

The complete data clearly indicate a definite tendency for the considerable penetration of frost into the soil during periods of hard winter weather and emphasise the relative absence of protective snow covering during cold spells when compared with other districts of Scotland. For example, during the severe winter of 1947 the ground at Auchincruive was frozen to a depth of at least one foot for 26 days following 24 February 1947. In the 1963 spell, the soil was intermittently frozen at the 8 inch depth over a period of 38 days, which included unbroken periods of 13 and 15 days. Frost was probably continuous for 58 days (9 January to 5 March 1963) at 10 cm (4 in)⁽⁴⁾.

Averages and Extremes of Earth Temperature at depths of 30 cm (1 ft) and 122 cm (4 ft) for Auchincruive and Kilmarnock are given in Tables 2P and 2Q. At the 30 cm (1 ft) depth, the range of the diurnal variation of temperature could amount to 5 degrees in summer but is quite small at the 122 cm (4 ft) depth.

The minimum temperature at a depth of 30 cm (1 ft) usually occurs around 0900 hours and the maximum at about 2000 hours. It can be seen from Tables 2P and 2Q that the annual variation is quite large at both the 30 cm (1 ft) and 122 cm (4 ft) depths. At 30 cm (1 ft), the highest and lowest temperatures in a year usually occur in the months with the highest and lowest air temperatures but at 122 cm (4 ft), the extremes usually lag about one month behind.

Estimated averages of earth temperature at a depth of 1 metre

From Tables 2P and 2Q it is possible to estimate averages of earth temperature at 1 m by calculating an average thermal diffusivity between 30 cm (1 ft) and 122 cm (4 ft) and then using two harmonic analyses to estimate the amplitude of the mean temperature variation at 1 m. The estimated averages of earth temperatures at a depth of 1 m calculated in this way are shown in Table 2R.

A table for converting degrees Fahrenheit to degrees Centigrade is at Table 2S.

TABLE 2
AVERAGES OF DAILY MAXIMUM, MINIMUM AND MEAN $\left[\frac{1}{2}(\text{MAX} + \text{MIN})\right]$ TEMPERATURES
IN DEGREES FAHRENHEIT
(30 years from 1931 to 1960)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<u>PRESTWICK ESPLANADE</u> (altitude 17 feet)													
Maximum	43.3	44.4	48.4	52.3	58.3	62.4	64.2	64.2	61.0	55.0	49.1	45.3	54.0
Minimum	34.5	34.7	37.2	40.1	43.9	49.6	53.2	52.9	49.8	45.1	39.6	37.0	43.2
Mean	38.9	39.5	42.8	46.2	51.1	56.0	58.7	58.5	55.4	50.1	44.3	41.1	48.6
<u>AUCHINCRAIVE</u> (altitude 147 feet)													
Maximum	43.3	44.6	48.7	53.1	59.4	63.7	65.3	65.3	61.3	55.2	49.1	45.3	54.5
Minimum	33.1	33.6	36.1	38.7	42.6	47.8	51.6	50.9	48.0	43.3	37.8	35.2	41.5
Mean	38.2	39.1	42.4	45.9	51.0	55.8	58.5	58.1	54.8	49.3	43.5	40.3	48.0
<u>KILMARNOCK</u> (altitude 115 feet)													
Maximum	42.9	44.4	49.0	53.6	60.3	64.8	66.0	66.3	62.0	55.3	48.9	44.9	54.9
Minimum	32.5	33.2	35.7	38.6	42.7	48.1	51.7	51.0	47.7	42.8	37.3	34.8	41.3
Mean	37.7	38.8	42.3	46.1	51.5	56.5	58.9	58.7	54.9	49.0	43.1	39.9	48.1

NOTES

1. The standard period for averages of maximum, minimum and mean temperature in current use in the Meteorological Office is the 30 year period from 1931 to 1960.
2. Temperature recordings from Prestwick Esplanade and Auchincruive are not available for the whole standard period of 30 years and the averages quoted above for these stations have been estimated from recordings made during the years from 1932 to 1959 in the case of Prestwick Esplanade and 1932 to 1960 in the case of Auchincruive. (The station at Prestwick Esplanade closed at the end of 1959).
3. The averages quoted above for Kilmarnock have been calculated from recordings made at two sites in Kilmarnock viz May 1931 to December 1949 for Kay Park, Kilmarnock - altitude 130 feet; January 1950 to December 1960 from Springhill House, Kilmarnock - altitude 115 feet.

When consulting subsequent tables of air or earth temperature for Kilmarnock included in this report, the reader may wish to note the following moves of the temperature recording site:

Agricultural College, Kilmarnock (altitude 90 feet)
from January 1914 to May 1931

Kay Park, Kilmarnock (altitude 130 feet)
from May 1931 to December 1949

Springhill House, Kilmarnock (altitude 115 feet)
from January 1950 to May 1965

Annanhill, Kilmarnock (altitude 113 feet)
from June 1965 to December 1969

TABLE 2A
AVERAGES OF THE HIGHEST AND LOWEST TEMPERATURES EACH MONTH
IN DEGREES FAHRENHEIT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<u>PRESTWICK ESPLANADE</u> (altitude 17 feet) - 28 years from 1932 to 1959													
Average of the Highest each Month	52	51	58	61	69	74	75	72	69	62	56	53	78*
Average of the Lowest each Month	21	23	27	30	33	40	45	43	37	32	28	24	18**
<u>AUCHINCROIVE</u> (altitude 147 feet) - 29 years from 1932 to 1960													
Average of the Highest each Month	52	52	58	62	71	76	75	74	71	63	56	53	79*
Average of the Lowest each Month	20	21	25	28	32	38	42	41	35	30	27	23	17**
<u>KILMARNOCK</u> (altitude 115 feet) - 30 years from 1931 to 1960													
Average of the Highest each Month	52	52	59	63	73	77	77	76	71	63	56	53	81*
Average of the Lowest each Month	19	21	24	27	31	39	42	40	34	28	25	21	16**

* = Average of the Highest each Year
** = Average of the Lowest each Year

Note: For Kilmarnock see Note 3 of Table 2

TABLE 2B

ABSOLUTE HIGHEST AND LOWEST TEMPERATURES IN DEGREES FAHRENHEIT
RECORDED IN EACH MONTH

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<u>PRESTWICK ESPLANADE</u> (altitude 17 feet) - 28 years from 1932 to 1959													
Absolute Highest in each Month	58	55	70	70	79	85	88	82	79	67	62	57	88*
Absolute Lowest in each Month	11	11	10	25	28	36	40	36	30	25	19	13	10**
<u>AUCHINCRAIVE</u> (altitude 147 feet) - 38 years from 1932 to 1969													
Absolute Highest in each Month	58	56	68	70	79	85	87	82	79	72	62	57	87*
Absolute Lowest in each Month	5	12	10	21	24	30	36	35	27	23	20	11	5**
<u>KILMARNOCK</u> (altitude 115 feet) - 56 years from 1914 to 1969													
Absolute Highest in each Month	57	57	71	73	84	87	90	87	79	76	62	58	90*
Absolute Lowest in each Month	2	10	6	14	22	30	35	33	24	19	13	8	2**

* = Absolute Highest during Whole Period

** = Absolute Lowest during Whole Period

Note: For Kilmarnock see Note 3 of Table 2

TABLE 2C

STATISTICS OF MONTHLY AND ANNUAL MEAN $\left[\frac{1}{2} (\text{MAX} + \text{MIN}) \right]$ TEMPERATURES
IN DEGREES FAHRENHEIT FOR AUCHINCRAIVE NEAR AYR
(38 YEARS FROM 1932 TO 1969)

Statistics of Monthly Mean Temperatures

<u>Month</u>	<u>Highest Monthly Mean</u>	<u>Monthly Mean Seldom * Above</u>	<u>Median†</u>	<u>Monthly Mean Seldom * Below</u>	<u>Lowest Monthly Mean</u>
January	43.7°F in January 1932	40.6°F	38.5°F	36.2°F	30.5°F in January 1941
February	43.9°F in February 1945	41.4°F	39.3°F	36.7°F	29.9°F in February 1947
March	47.6°F in March 1957	44.5°F	42.3°F	39.5°F	35.7°F in March 1947
April	49.2°F in April 1943	47.6°F	45.9°F	43.8°F	42.7°F in April 1936 and 1941
May	54.1°F in May 1959	52.3°F	50.4°F	48.9°F	47.7°F in May 1967 and 1968
June	59.3°F in June 1940	56.8°F	55.5°F	54.6°F	53.5°F in June 1956
July	61.3°F in July 1934	59.4°F	57.9°F	56.7°F	54.1°F in July 1965
August	62.9°F in August 1947	59.2°F	57.7°F	56.1°F	53.1°F in August 1956
September	58.3°F in September 1941	55.9°F	54.8°F	52.9°F	50.3°F in September 1952
October	54.1°F in October 1969	50.7°F	49.6°F	47.9°F	45.3°F in October 1939
November	47.4°F in November 1938	45.0°F	43.1°F	41.0°F	38.7°F in November 1965
December	44.8°F in December 1934	42.2°F	40.1°F	37.7°F	34.2°F in December 1950

Statistics of Annual Mean Temperatures

<u>Period of Record</u>	<u>Highest Annual Mean</u>	<u>Annual Mean Seldom * Above</u>	<u>Median†</u>	<u>Annual Mean Seldom * Below</u>	<u>Lowest Annual Mean</u>
38 years	49.6°F in 1949	48.7°F	47.7°F	47.2°F	46.2°F in 1963

* Seldom = 20 per cent of occasions or 1 year in 5; the figures given are the upper and lower quintiles.

† Median = the "middle" value, ie half the mean temperatures exceed it and half fall below it.

TABLE 2D

STATISTICS OF MONTHLY MAXIMUM TEMPERATURES IN DEGREES FAHRENHEIT FOR
AUCHINCRAIVE NEAR AYR
(Period of Record = 38 years from 1932 to 1969)

<u>Month</u>	<u>Highest Monthly Maximum Temperature</u>	<u>Monthly Maximum Temperature Seldom* Above</u>	<u>Median†</u>	<u>Monthly Maximum Temperature Seldom* Below</u>	<u>Lowest Monthly Maximum Temperature</u>
January	58°F in January 1950 and 1958	54°F	52°F	50°F	45°F in January 1941
February	56°F in February 1939	54°F	52°F	50°F	38°F in February 1947
March	68°F in March 1945 and 1946	61°F	57°F	53°F	49°F in March 1955
April	70°F in April 1939	65°F	63°F	58°F	57°F in April 1941 and 1947
May	79°F in May 1941	75°F	71°F	67°F	62°F in May 1962
June	85°F in June 1936	78°F	75°F	72°F	67°F in June 1938
July	87°F in July 1948	78°F	74°F	71°F	67°F in July 1954
August	82°F in August 1947	78°F	73°F	70°F	65°F in August 1956
September	79°F in September 1934	74°F	69°F	66°F	63°F in September 1952 and 1962
October	72°F in October 1959	64°F	63°F	60°F	57°F in October 1944
November	62°F in November 1946	58°F	56°F	54°F	51°F in November 1966
December	57°F in December 1954 and 1957	55°F	53°F	51°F	47°F in December 1935

*Seldom = 20 per cent of occasions or 1 year in 5; the figures given are the upper and lower quintiles.

†Median = the "middle" value, i.e. half the mean temperatures exceed it and half fall below it.

TABLE 2E

STATISTICS OF MONTHLY MINIMUM TEMPERATURES IN DEGREES FAHRENHEIT FOR
AUCHINCRAIVE NEAR AYR
(Period of Record = 38 years from 1932 to 1969)

<u>Month</u>	<u>Highest</u> <u>Monthly</u> <u>Minimum</u> <u>Temperature</u>	<u>Monthly</u> <u>Minimum</u> <u>Temperature</u> <u>Seldom*</u> <u>Above</u>	<u>Median</u> [†]	<u>Monthly</u> <u>Minimum</u> <u>Temperature</u> <u>Seldom*</u> <u>Above</u>	<u>Lowest</u> <u>Monthly</u> <u>Minimum</u> <u>Temperature</u>
January	27°F in January 1937 and 1964	24°F	21°F	14°F	5°F in January 1940
February	29°F in February 1943 and 1945	26°F	21°F	18°F	12°F in February 1947
March	36°F in March 1957	29°F	25°F	22°F	10°F in March 1947
April	34°F in April 1949	31°F	28°F	25°F	21°F in April 1936
May	41°F in May 1964	34°F	32°F	29°F	24°F in May 1935
June	43°F in June 1934 and 1963	41°F	38°F	35°F	30°F in June 1936
July	48°F in July 1944	44°F	42°F	40°F	36°F in July 1965
August	47°F in August 1947	43°F	40°F	38°F	35°F in August 1944 and 1964
September	45°F in September 1946	40°F	35°F	31°F	27°F in September 1943
October	39°F in October 1969	34°F	30°F	27°F	23°F in October 1939
November	36°F in November 1953	29°F	27°F	24°F	20°F in November 1937 and 1952
December	30°F in December 1934	27°F	22°F	18°F	11°F in December 1938 and 1950

*Seldom = 20 per cent of occasions or 1 year in 5; the figures given are the upper and lower quintiles.

†Median = the "middle" value, i.e. half the minimum temperatures exceed it and half fall below it.

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TABLE 2F

STATISTICS OF ANNUAL MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES FAHRENHEIT

	Period of Record	Annual Maximum Temperatures °F					Annual Minimum Temperatures °F			
		Highest	Seldom* Above	Median†	Seldom* Below	Lowest	Lowest	Seldom* Below	Median†	Highest
<u>PRESTWICK ESPLANADE</u> (altitude 17 feet)	27 years	88	82	77	74	71	10	14	20	25
<u>AUCHINCROVE</u> (altitude 147 feet)	38 years	87	82	78	75	72	5	12	17	25
<u>KILMARNOCK</u> (altitude 115 feet)	56 years	90	83	80	77	72	2	13	18	24

*Seldom = 20 per cent of occasions or 1 year in 5; the figures given are the upper and lower quintiles.

†Median = the "middle" value, i.e. half the temperatures exceed it and half fall below it.

Note = For Kilmarnock see Note 3 of Table 2

TABLE 2G

PERCENTAGE AMOUNT OF TIME WITH AIR ("SHADE") TEMPERATURES BETWEEN CERTAIN
LIMITS IN DEGREES CENTIGRADE AT PRESTWICK AIRPORT

(computed from hourly readings of air temperature made at each hour on the hour during the 10 years from 1957 to 1966)

[illegible]

TABLE 2H

NUMBER OF DAYS WITH MAXIMUM AIR TEMPERATURES EQUAL TO OR EXCEEDING
60°F, 65°F, 70°F and 75°F AT AUCHINCRAIVE NEAR AYR
(10 years from 1960 to 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days with Maximum Air Temperatures Equal to or Exceeding 60°F</u>													
1960			1	0	23	26	31	30	16	3			130
1961				2	8	19	24	29	21	7			110
1962				3	4	19	26	20	8	4			84
1963				2	5	21	25	21	11	4			89
1964				2	13	19	27	25	20	3			109
1965			3	1	8	25	17	23	9	5			91
1966				3	8	21	27	27	19	1			106
1967				0	2	19	29	26	20	2			98
1968				3	7	24	27	28	17	6			112
1969				3	9	22	27	28	22	15			126
10-year mean	0.0	0.0	0.4	1.9	8.7	21.5	26.0	25.7	16.3	5.0	0.0	0.0	105.5
<u>Number of Days with Maximum Air Temperatures Equal to or Exceeding 65°F</u>													
1960					12	17	10	12	1				52
1961					1	5	2	5	8				21
1962					0	7	5	2	0	1			15
1963					3	14	9	4	2				32
1964					9	5	8	8	5				35
1965					2	5	4	8	1	1			21
1966					4	6	7	6	3				26
1967					0	8	12	10	2				32
1968					5	12	9	20	4				50
1969				2	1	9	14	16	6	2			50
10-year mean	0.0	0.0	0.0	0.2	3.7	8.8	8.0	9.1	3.2	0.4	0.0	0.0	33.4

TABLE 2H (contd)

NUMBER OF DAYS WITH MAXIMUM AIR TEMPERATURES EQUAL TO OR EXCEEDING
60°F, 65°F, 70°F and 75°F AT AUCHINCUIVE NEAR AYR

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days with Maximum Air Temperatures Equal to or Exceeding 70°F</u>													
1960					3	10	1	3					17
1961					0	1	0	2	1				4
1962					0	3	1	0					4
1963					1	5	3	2					11
1964					4	1	0	1					6
1965					1	0	0	2					3
1966					0	2	3	0					5
1967					0	1	1	2					4
1968					0	6	1	3	1				11
1969					0	6	6	9					21
10-year mean	0.0	0.0	0.0	0.0	0.9	3.5	1.6	2.4	0.2	0.0	0.0	0.0	8.6
<u>Number of Days with Maximum Air Temperatures Equal to or Exceeding 75°F</u>													
1960						5							5
1961								1					1
1962							1						1
1963						1	1						2
1964					1								1
1965								1					1
1966													0
1967													0
1968													0
1969						1		2					3
10-year mean	0.0	0.0	0.0	0.0	0.1	0.7	0.2	0.4	0.0	0.0	0.0	0.0	1.4

Note: The absolute maximum temperature recorded at Auchincruive during the 10 years from 1960 to 1969 was 79°F on 23 June 1960.

TABLE 2I

NUMBER OF DAYS WITH AIR FROST (MINIMUM AIR TEMPERATURE LESS THAN 32°F)
AT PRESTWICK AIRPORT, AUCHINCRAIVE AND KILMARNOCK
(14 YEARS FROM 1956 to 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>PRESTWICK AIRPORT</u> - altitude 30 feet*													
1956	13	20	3	11	1	0	0	0	0	2	6	2	58
1957	7	10	0	1	1	0	0	0	1	0	6	7	33
1958	13	13	18	5	0	0	0	0	0	0	4	11	64
1959	22	11	1	2	0	0	0	0	0	0	1	4	41
1960	17	18	3	1	0	0	0	0	0	1	6	16	62
1961	16	2	0	3	0	0	0	0	0	0	6	18	45
1962	8	8	14	3	3	0	0	0	0	4	10	14	64
1963	25	24	7	1	0	0	0	0	0	0	7	16	80
1964	11	8	13	4	0	0	0	0	1	0	6	10	53
1965	15	16	10	4	2	0	0	0	0	0	15	11	73
1966	15	10	3	7	0	0	0	0	0	2	13	5	55
1967	8	7	3	6	2	0	0	0	0	1	7	11	45
1968	9	20	9	9	2	0	0	0	0	0	8	17	74
1969	6	14	17	9	0	0	0	0	0	0	14	16	76
14-year total	185	181	101	66	11	0	0	0	2	10	109	158	823
14-year mean	13.2	12.9	7.2	4.7	0.8	0.0	0.0	0.0	0.1	0.7	7.8	11.3	58.7
*On 1st April 1962, the thermometers at Prestwick Airport were transferred to a new site at an altitude of 51 feet above sea level.													
<u>AUCHINCRAIVE</u> - altitude 147 feet													
1956	14	21	5	13	2	0	0	0	1	2	6	5	69
1957	8	11	0	2	2	0	0	0	1	0	5	8	37
1958	13	15	19	6	1	0	0	0	0	0	4	14	72
1959	23	10	2	1	0	0	0	0	0	1	2	3	42
1960	16	16	4	1	0	0	0	0	0	1	6	17	61
1961	13	3	0	3	0	0	0	0	0	0	5	21	45
1962	9	10	17	5	1	0	0	0	0	1	9	11	63
1963	25	25	5	1	0	0	0	0	0	0	8	12	76
1964	5	7	10	3	0	0	0	0	0	0	4	12	41
1965	13	15	9	3	1	0	0	0	0	0	15	10	66
1966	12	10	2	7	0	0	0	0	0	2	11	6	50
1967	8	7	2	4	2	0	0	0	0	1	6	10	40
1968	9	18	5	8	1	0	0	0	0	0	10	16	67
1969	5	17	17	4	0	0	0	0	0	0	11	12	66
14-year total	173	185	97	61	10	0	0	0	2	8	102	157	795
14-year mean	12.4	13.2	6.9	4.4	0.7	0.0	0.0	0.0	0.1	0.6	7.3	11.2	56.8

TABLE 2I (Contd)

NUMBER OF DAYS WITH AIR FROST (MINIMUM AIR TEMPERATURE LESS THAN 32°F)
AT PRESTWICK AIRPORT, AUCHINGRUIVE AND KILMARNOCK
(14 YEARS FROM 1956 to 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>KILMARNOCK*</u>													
1956	18	21	3	7	1	0	0	0	0	3	5	3	61
1957	6	9	1	2	1	0	0	0	0	0	5	10	34
1958	13	15	19	7	1	0	0	0	0	0	4	13	72
1959	25	11	1	0	1	0	0	0	0	1	1	2	42
1960	17	17	3	1	0	0	0	0	0	3	6	19	66
1961	12	3	1	3	0	0	0	0	0	0	6	18	43
1962	8	8	15	5	0	0	0	0	0	0	9	12	57
1963	24	21	4	1	0	0	0	0	0	0	8	13	71
1964	5	8	5	1	0	0	0	0	0	1	4	11	35
1965	14	15	8	2	0	0	0	0	0	1	16	11	67
1966	13	11	4	6	0	0	0	0	0	1	14	9	58
1967	9	7	2	5	3	0	0	0	0	0	7	16	49
1968	11	17	7	7	3	0	0	0	0	0	7	12	64
1969	7	18	16	8	0	0	0	0	0	0	14	12	75
14-year total	182	181	89	55	10	0	0	0	0	10	106	161	794
14-year mean	13.0	12.9	6.4	3.9	0.7	0.0	0.0	0.0	0.0	0.7	7.6	11.5	56.7

* For Kilmarnock see Note 3 of Table 2

TABLE 2J

AVERAGE AND EXTREME DATES OF FIRST AND LAST FROSTS DURING THE
14 YEARS PERIOD FROM 1956 TO 1969

	<u>Average Date of First</u> <u>Air Frost</u>	<u>Average Date of Last</u> <u>Air Frost</u>
Prestwick Airport	27 October	27 April
Auchincruive	26 October	27 April
Kilmarnock	1 November	25 April

	<u>Earliest Date of First</u> <u>Air Frost</u>	<u>Latest Date of Last</u> <u>Air Frost</u>
Prestwick Airport	21 September 1964	31 May 1962
Auchincruive	1 September 1956	26 May 1962
Kilmarnock	11 October 1960	20 May 1968

Note: For Kilmarnock see Note 3 of Table 2

TABLE 2K

TOTAL NUMBER OF DAYS IN EACH MONTH WITH AN HOURLY AIR TEMPERATURE READING OF LESS THAN 31.6°F BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME AT PRESTWICK AIRPORT (10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days</u>													
1960	5	9	1	0	0	0	0	0	0	1	4	11	31
1961	5	1	0	1	0	0	0	0	0	0	3	11	21
1962	4	1	12	0	0	0	0	0	0	0	5	5	27
1963	19	18	4	0	0	0	0	0	0	0	5	8	54
1964	3	3	4	1	0	0	0	0	0	0	3	5	19
1965	10	10	7	0	0	0	0	0	0	0	8	7	42
1966	8	4	0	4	0	0	0	0	0	1	6	3	26
1967	5	3	2	0	0	0	0	0	0	0	2	8	20
1968	6	13	3	2	0	0	0	0	0	0	6	11	41
1969	2	12	12	2	0	0	0	0	0	0	8	7	43
10-year mean	6.7	7.4	4.5	1.0	0.0	0.0	0.0	0.0	0.0	0.2	5.0	7.6	32.4

TOTAL NUMBER OF HOURS BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME IN EACH MONTH WITH AIR TEMPERATURES LESS THAN 31.6°F AT PRESTWICK AIRPORT (10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Hours</u>													
1960	19	38	2	0	0	0	0	0	0	1	8	36	104
1961	18	3	0	1	0	0	0	0	0	0	9	72	103
1962	19	1	31	0	0	0	0	0	0	0	16	31	98
1963	95	76	5	0	0	0	0	0	0	0	14	35	225
1964	10	11	7	1	0	0	0	0	0	0	7	17	53
1965	49	30	23	0	0	0	0	0	0	0	26	30	158
1966	36	13	0	4	0	0	0	0	0	2	13	9	77
1967	21	7	3	0	0	0	0	0	0	0	4	40	75
1968	18	40	6	3	0	0	0	0	0	0	14	38	119
1969	11	53	26	2	0	0	0	0	0	0	28	25	145
10-year mean	29.6	27.2	10.3	1.1	0.0	0.0	0.0	0.0	0.0	0.3	13.9	33.3	115.7
10-year mean expressed as percentage of total working time	10%	10%	3%	<1%	0%	0%	0%	0%	0%	<1%	5%	11%	3%

TABLE 2L

TOTAL NUMBER OF DAYS IN EACH MONTH WITH AN HOURLY AIR TEMPERATURE READING OF LESS THAN
33.6°F BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME AT
PRESTWICK AIRPORT
(10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days</u>													
1960	6	13	2	0	0	0	0	0	0	1	5	14	41
1961	7	1	0	1	0	0	0	0	0	0	3	15	27
1962	5	6	14	0	0	0	0	0	0	1	8	11	45
1963	24	22	7	0	0	0	0	0	0	0	6	11	70
1964	7	8	8	3	0	0	0	0	0	1	3	8	38
1965	12	14	9	2	0	0	0	0	0	0	10	10	57
1966	14	9	2	7	0	0	0	0	0	2	12	3	49
1967	7	5	2	3	1	0	0	0	0	0	4	8	30
1968	7	16	4	5	0	0	0	0	0	0	7	15	54
1969	5	15	16	4	0	0	0	0	0	0	10	10	60
10-year mean	9.4	10.9	6.4	2.5	0.1	0.0	0.0	0.0	0.0	0.5	6.8	10.5	47.1

TOTAL NUMBER OF HOURS BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME IN EACH MONTH WITH
AIR TEMPERATURES LESS THAN 33.6°F AT PRESTWICK AIRPORT
(10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Hours</u>													
1960	29	56	3	0	0	0	0	0	0	1	13	61	163
1961	25	3	0	1	0	0	0	0	0	0	11	98	138
1962	25	16	43	0	0	0	0	0	0	1	25	64	174
1963	154	111	10	0	0	0	0	0	0	0	23	62	360
1964	18	28	15	3	0	0	0	0	0	1	8	41	114
1965	71	50	42	2	0	0	0	0	0	0	45	44	254
1966	65	40	2	9	0	0	0	0	0	5	28	17	166
1967	35	13	4	3	1	0	0	0	0	0	11	51	118
1968	33	54	9	11	0	0	0	0	0	0	21	62	190
1969	17	81	39	4	0	0	0	0	0	0	38	45	224
10-year mean	47.2	45.2	16.7	3.3	0.1	0.0	0.0	0.0	0.0	0.8	22.3	54.5	190.1
10-year mean expressed as percentage of total working time	15%	16%	5%	1%	<1%	0%	0%	0%	0%	<1%	7%	18%	5%

TABLE 2M

TOTAL NUMBER OF DAYS IN EACH MONTH WITH AN HOURLY AIR TEMPERATURE READING OF LESS THAN
35.6°F BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME AT
PRESTWICK AIRPORT
(10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days</u>													
1960	12	16	3	0	0	0	0	0	0	1	5	14	51
1961	13	1	1	3	0	0	0	0	0	0	6	19	43
1962	6	10	19	2	0	0	0	0	0	2	11	14	64
1963	27	27	11	1	0	0	0	0	0	0	7	14	87
1964	8	9	14	3	0	0	0	0	1	2	4	11	52
1965	15	16	12	4	0	0	0	0	0	3	13	10	73
1966	17	11	5	10	0	0	0	0	0	3	13	8	67
1967	8	7	3	5	1	0	0	0	0	2	8	12	46
1968	10	22	8	6	0	0	0	0	0	0	7	15	68
1969	8	20	22	5	0	0	0	0	0	0	12	13	80
10-year mean	12.4	13.9	9.8	3.9	0.1	0.0	0.0	0.0	0.1	1.3	8.6	13.0	63.1

TOTAL NUMBER OF HOURS BETWEEN 0700 AND 1700 HOURS GREENWICH MEAN TIME IN EACH MONTH WITH
AIR TEMPERATURES LESS THAN 35.6 F AT PRESTWICK AIRPORT
(10 YEARS FROM 1960 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Hours</u>													
1960	52	71	8	0	0	0	0	0	0	3	18	87	239
1961	55	4	2	4	0	0	0	0	0	0	18	136	219
1962	32	30	61	2	0	0	0	0	0	3	51	92	271
1963	213	168	21	1	0	0	0	0	0	0	32	96	531
1964	32	44	36	4	0	0	0	0	1	3	11	67	198
1965	96	65	57	4	0	0	0	0	0	3	68	59	352
1966	118	78	9	16	0	0	0	0	0	6	43	38	308
1967	49	21	5	5	1	0	0	0	0	3	17	81	182
1968	61	96	21	14	0	0	0	0	0	0	27	95	314
1969	33	115	69	6	0	0	0	0	0	0	63	79	365
10-year mean	74.1	69.2	28.9	5.6	0.1	0.0	0.0	0.0	0.1	2.1	34.8	83.0	297.9
10-year mean expressed as percentage of total working time	24%	25%	9%	2%	< 1%	0%	0%	0%	< 1%	1%	12%	27%	8%

TABLE 2N

AVERAGES AND EXTREMES OF SOIL TEMPERATURE IN DEGREES FAHRENHEIT FROM READINGS MADE
ONCE DAILY AT 0900 HOURS GREENWICH MEAN TIME FROM A THERMOMETER EXPOSED
AT A DEPTH OF 10 CM (4 IN) BELOW A SURFACE OF BARE SOIL AT
AUCHINCRAIVE NEAR AYR - ALTITUDE 147 FEET

(SEE NOTE ON PAGE 52 REGARDING TYPE OF SOIL)

Actual Means of 0900 hours GMT Readings of 10 cm (4 in) Soil Temperature recorded
in each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	37.0	35.9	40.0	46.5	53.7	60.2	58.8	58.4	53.2	47.8	41.9	36.4	47.5
1961	35.4	40.5	43.9	46.6	52.7	56.0	57.4	56.4	55.2	48.5	41.8	36.3	47.6
1962	37.1	38.1	35.3	42.9	50.4	55.7	56.8	55.6	52.6	49.4	41.8	38.0	46.1
1963	30.4	30.3	37.9	43.7	49.5	57.9	58.2	56.6	53.1	49.3	42.6	35.9	45.5
1964	38.4	37.6	37.9	45.0	53.8	57.0	59.2	58.4	54.1	46.9	42.8	37.6	47.4
1965	35.3	34.3	38.0	45.5	52.2	58.5	58.3	57.4	52.7	48.0	38.6	37.6	46.4
1966	35.7	37.2	41.7	41.9	52.5	56.8	58.8	55.4	54.0	45.6	39.3	39.1	46.5
1967	37.8	38.7	40.3	42.7	47.9	57.5	58.4	57.8	53.3	47.3	40.9	38.4	46.7
1968	37.9	33.5	39.0	43.3	48.9	58.3	58.1	57.9	53.8	50.6	40.3	36.8	46.5
1969	38.3	33.8	35.6	42.0	50.0	57.0	58.4	59.2	54.5	51.3	39.4	37.9	46.5
10-year means	36.3	36.0	39.0	44.0	51.2	57.5	58.2	57.3	53.7	48.5	40.9	37.4	46.7

Absolute Highest 0900 hours GMT Readings of 10 cm (4 in) Soil Temperature recorded
in each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	45	46	45	51	57	67	61	61	59	53	48	45	67
1961	40	45	48	53	55	59	61	59	59	55	48	45	61
1962	44	44	39	50	53	59	60	59	58	53	48	45	60
1963	33	32	44	50	57	63	62	63	57	54	49	43	63
1964	44	44	43	51	62	63	63	63	59	53	50	46	63
1965	44	41	47	51	58	64	62	61	56	55	48	45	64
1966	44	45	46	52	63	61	66	59	58	51	47	43	66
1967	43	47	45	50	54	64	62	62	58	57	46	48	64
1968	46	38	47	51	57	65	63	62	57	56	47	45	65
1969	44	38	41	46	54	64	66	64	59	56	52	45	66
10-year means	43	42	45	51	57	63	63	61	58	54	48	45	64
10-year extremes	46	47	48	53	63	67	66	64	59	57	52	48	67

TABLE 2N (CONTD)

Absolute Lowest 0900 hours GMT Readings of 10 cm (4 in) Soil Temperature recorded in each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	33	31	34	39	48	51	56	55	47	40	36	31	31
1961	30	35	38	37	49	53	54	54	51	42	36	29	29
1962	30	34	32	38	47	51	53	53	47	40	33	30	30
1963	26	28	30	37	45	53	54	53	49	45	35	30	26
1964	32	31	34	38	48	51	53	53	46	40	34	31	31
1965	28	28	32	41	47	55	53	53	48	40	33	29	28
1966	30	31	37	33	47	54	55	51	50	32	35	34	30
1967	32	34	35	35	41	52	54	55	49	38	35	30	30
1968	31	32	34	34	42	54	53	53	49	44	34	31	31
1969	32	29	33	36	45	52	54	53	47	42	33	34	29
10-year means	30	31	34	37	46	53	54	53	48	40	34	31	29
10-year extremes	26	28	30	33	41	51	53	51	46	32	33	29	26

Note: The author is indebted to the West of Scotland College of Agriculture at Auchincruive for the following assessment of the soil profile at Auchincruive:

General description: Imperfectly drained brown forest soil

Horizons (soil "layers")

- 0 to 30 cm = Brown sandy clay loam with no clear horizons.
- 30 to 75 cm = Layer of quite severely compacted loamy sand with gravel and a few larger stones. There is evidence of deposition around the stones and some manganese staining along root channels can be noted.
- 75 to 100 cm = A layer of reddish sand and gravel with slight mottling. The water table appears at around 90 cm.
- 100 cm = The clay content increases here to give a reddish sandy loam type of material.

General: The above profile fits most closely to a soil of the 'Dreghorn' series - although far from a perfect example. The parent material will be raised beach deposit.

TABLE 2 0

AVERAGES AND EXTREMES OF SOIL TEMPERATURE IN DEGREES FAHRENHEIT FROM READINGS MADE
ONCE DAILY AT 0900 HOURS GREENWICH MEAN TIME FROM A THERMOMETER EXPOSED
AT A DEPTH OF 20 CM (8 IN) BELOW A SURFACE OF BARE SOIL AT
AUCHINCRAIVE NEAR AYR - ALTITUDE 147 FEET

(SEE NOTE AT FOOT OF TABLE 2N REGARDING TYPE OF SOIL)

Actual Means of 0900 hours GMT Readings of 20 cm (8 in) Soil Temperature recorded in
each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	38.6	37.2	41.2	46.5	52.8	58.6	58.2	58.2	54.2	49.1	43.5	38.6	48.1
1961	37.1	41.3	44.5	46.6	51.9	54.9	56.6	56.2	55.6	50.1	43.9	38.6	48.1
1962	38.1	39.7	37.0	43.2	49.9	54.4	56.2	55.5	53.2	50.6	43.8	40.2	46.8
1963	33.0	32.5	38.4	43.5	48.4	56.0	56.6	56.3	53.5	50.0	44.4	37.8	45.9
1964	39.6	39.5	39.6	44.7	51.9	54.8	57.3	57.1	54.1	48.6	44.9	40.0	47.7
1965	37.7	36.4	38.8	44.2	49.8	55.9	56.3	56.2	53.1	49.3	41.6	39.5	46.6
1966	37.6	38.6	42.4	42.0	49.2	55.5	57.8	55.3	54.4	47.5	41.0	40.6	46.8
1967	39.0	39.8	41.2	42.9	47.4	56.1	57.7	57.6	54.0	48.3	42.4	39.9	47.2
1968	38.6	35.2	39.4	43.6	48.4	(57.2)	57.7	58.0	(53.7)	50.8	41.5	38.1	46.9
1969	38.9	35.1	36.3	42.1	49.5	56.3	58.1	59.4	55.3	52.3	41.5	(38.6)	46.9
10-year means	37.8	37.5	39.9	43.9	49.9	56.0	57.3	57.0	54.1	49.7	42.9	39.2	47.1

Absolute Highest 0900 hours GMT Readings of 20 cm (8 in) Soil Temperature recorded
in each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	44	44	45	50	56	64	60	61	59	53	48	47	64
1961	40	45	47	51	55	58	59	57	59	55	49	45	59
1962	42	43	40	49	52	58	59	58	57	53	48	44	59
1963	35	33	43	49	54	60	60	62	56	52	49	42	62
1964	44	45	42	49	58	59	60	60	57	53	49	45	60
1965	42	40	44	47	54	59	59	59	55	54	49	43	59
1966	43	43	45	48	54	59	62	58	57	53	46	45	62
1967	43	46	44	49	51	62	61	61	57	55	47	47	62
1968	45	40	45	51	56	(63)	62	62	(56)	56	47	45	63
1969	44	39	41	46	53	63	63	63	59	55	52	(43)	63
10-year means	42	42	44	49	54	61	61	60	57	54	48	45	61
10-year extremes	45	46	47	51	58	64	63	63	59	56	52	47	64

TABLE 2 0 (CONTD)

Absolute Lowest 0900 hours GMT Readings of 20 cm (8 in) Soil Temperature recorded in each month during the 10 years from 1960 to 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1960	35	34	37	41	49	54	56	55	50	45	40	34	34
1961	34	37	41	41	49	50	54	55	52	45	40	33	33
1962	33	37	34	37	48	50	54	54	49	45	38	34	33
1963	32	32	32	39	45	54	55	54	51	47	38	32	32
1964	35	35	37	39	48	51	54	54	49	43	39	35	35
1965	34	33	34	41	46	52	53	53	51	45	36	34	33
1966	34	33	39	38	42	52	55	51	51	41	37	37	33
1967	34	36	38	37	42	51	55	54	51	42	38	34	34
1968	33	33	35	37	43	(53)	53	54	(50)	45	36	33	33
1969	33	32	34	38	45	52	54	54	50	48	36	(35)	32
10-year means	34	34	36	39	46	52	54	54	50	45	38	34	33
10-year extremes	32	32	32	37	42	50	53	51	49	41	36	32	32

Note: The soil temperatures enclosed in brackets have been estimated from incomplete records.

TABLE 2P

AVERAGES AND EXTREMES OF EARTH TEMPERATURE IN DEGREES FAHRENHEIT FROM READINGS MADE ONCE DAILY AT 0900 HOURS GMT FROM THERMOMETERS EXPOSED AT DEPTHS OF 30 CM (1 FT) AND 122 CM (4 FT) UNDER A SHORT GRASS COVERED SURFACE AT AUCHINCRAIVE NEAR AYR - ALTITUDE 247 FEET

(SEE NOTE AT FOOT OF TABLE 2N REGARDING TYPE OF SOIL.)

Period of Record 16 years from 1945 to 1960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<u>At 30 cm (1 ft)</u>													
Monthly Mean of Daily Readings	39.0	38.7	40.8	45.3	50.5	55.4	58.5	58.5	55.6	50.9	45.7	41.9	48.4
Highest Monthly Mean of Daily Readings	42.4	41.5	44.8	47.7	53.4	57.9	60.8	62.4	57.7	53.2	47.7	45.1	62.4
Lowest Monthly Mean of Daily Readings	35.8	33.3	34.2	41.7	47.1	53.2	56.1	55.6	54.0	48.4	42.6	37.8	33.3
Absolute Highest Daily Reading	46	45	48	51	59	63	64	64	62	57	52	49	64
Absolute Lowest Daily Reading	33	32	31	39	42	50	54	54	50	43	38	35	31
<u>At 122 cm (4 ft)</u>													
Monthly Mean of Daily Readings	43.2	41.7	42.3	44.4	47.7	51.4	54.7	55.9	55.2	52.9	49.3	45.9	48.7
Highest Monthly Mean of Daily Readings	45.7	43.9	43.9	46.6	49.5	53.1	56.1	57.2	56.8	55.0	50.4	48.0	57.2
Lowest Monthly Mean of Daily Readings	41.2	39.4	37.6	41.7	45.0	49.8	53.2	54.1	53.8	50.9	47.8	43.5	37.6
Absolute Highest Daily Reading	47	44	45	48	52	55	57	57	59	56	52	49	59
Absolute Lowest Daily Reading	40	38	36	40	43	48	52	54	53	49	45	40	36

Notes: The means quoted above have been obtained by averaging readings made during the 16 years from 1945 to 1960.

The "Highest and Lowest Monthly Means of Daily Readings" relate to the single January, February, March etc during the period from 1945 to 1960 which had the highest or lowest monthly mean of daily readings.

The "Absolute Highest and Lowest Daily Readings" are the absolute highest and lowest readings recorded during the period from 1945 to 1960.

TABLE 2Q

AVERAGES AND EXTREMES OF EARTH TEMPERATURE IN DEGREES FAHRENHEIT FROM READINGS MADE ONCE DAILY AT 0900 HOURS GMT FROM THERMOMETERS EXPOSED AT DEPTHS OF 30 CM (1 FT) AND 122 CM (4 FT) UNDER A SHORT GRASS COVERED SURFACE AT KILMARNOCK* - ALTITUDE 115 FEET

(TYPE OF SOIL: CLAY LOAM)

Period of Record 12 years from 1949 to 1960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<u>At 30 cm (1 ft)</u>													
Monthly Mean of Daily Readings	37.8	37.2	41.2	46.2	52.7	58.5	61.3	60.3	56.5	50.7	44.1	40.1	48.9
Highest Monthly Mean of Daily Readings	40.8	42.3	45.3	48.6	55.4	61.0	63.9	63.1	59.4	53.6	46.9	44.1	63.9
Lowest Monthly Mean of Daily Readings	34.3	35.2	36.0	42.6	48.7	56.8	58.6	56.3	53.4	46.9	40.8	35.4	34.3
Absolute Highest Daily Reading	46	46	48	53	61	66	68	66	62	59	49	49	68
Absolute Lowest Daily Reading	32	33	33	39	42	51	55	53	48	41	34	34	32
<u>At 122 cm (4 ft)</u>													
Monthly Mean of Daily Readings	43.7	42.1	42.6	45.0	48.6	52.9	56.1	57.6	56.8	54.0	49.8	46.2	49.6
Highest Monthly Mean of Daily Readings	46.6	45.1	44.8	47.5	51.1	56.3	59.0	61.2	60.4	58.1	53.2	49.6	61.2
Lowest Monthly Mean of Daily Readings	40.8	40.5	39.9	42.3	45.3	50.4	54.3	55.0	54.7	51.6	48.4	43.0	39.9
Absolute Highest Daily Reading	48	46	46	49	55	58	61	62	61	59	56	52	62
Absolute Lowest Daily Reading	40	40	34	41	44	48	52	55	54	50	45	41	34

Notes: The means quoted above have been obtained by averaging readings made during the 12 years from 1949 to 1960.

The "Highest and Lowest Monthly Means of Daily Readings" relate to the single January, February, March etc during the period from 1949 to 1960 which had the highest or lowest monthly mean of daily readings.

The "Absolute Highest and Lowest Daily Readings" are the absolute highest and lowest readings recorded during the period from 1949 to 1960.

* The earth thermometers were sited at Kay Park, Kilmarnock in 1949 and at Springhill House, Kilmarnock during the years from 1950 to 1960 (see Note 3 of Table 2).

TABLE 2R

ESTIMATED AVERAGES OF EARTH TEMPERATURE AT A DEPTH OF 1 METRE FOR
AUCHINCRAIVE AND KILMARNOCK IN DEGREES FAHRENHEIT

At one metre (100 cm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Auchincraive	42.3	41.2	41.7	44.1	47.7	52.0	55.4	56.7	55.2	52.2	48.0	44.6	48.4
Kilmarnock	42.1	41.2	41.9	44.6	48.7	53.4	57.0	58.5	56.8	53.1	48.6	44.8	49.3

Note: The method of calculating the estimated averages quoted above is explained on page 34.

TABLE 2S

TABLE FOR CONVERTING DEGREES FAHRENHEIT TO DEGREES CENTIGRADE

<u>°F</u>	<u>°C</u>	<u>°F</u>	<u>°C</u>	<u>°F</u>	<u>°C</u>
0	minus 17.8	32	0.0	64	17.8
2	minus 16.7	34	1.1	66	18.9
4	minus 15.6	36	2.2	68	20.0
6	minus 14.4	38	3.3	70	21.1
8	minus 13.3	40	4.4	72	22.2
10	minus 12.2	42	5.6	74	23.3
12	minus 11.1	44	6.7	76	24.4
14	minus 10.0	46	7.8	78	25.6
16	minus 8.9	48	8.9	80	26.7
18	minus 7.8	50	10.0	82	27.8
20	minus 6.7	52	11.1	84	28.9
22	minus 5.6	54	12.2	86	30.0
24	minus 4.4	56	13.3	88	31.1
26	minus 3.3	58	14.4		
28	minus 2.2	60	15.6		
30	minus 1.1	62	16.7		

3. RELATIVE HUMIDITY

In the Ayr-Kilmarnock-Irvine region of Ayrshire as elsewhere in the British Isles, the relative humidity reaches 90 per cent or thereabouts on most nights of the year. As a good approximate rule, the highest values of relative humidity occur in association with the lowest air temperature of the day i.e. usually around dawn, while the lowest values of relative humidity occur in association with the highest air temperature of the day i.e. usually in the middle of the afternoon. The main departures from this general rule occur in misty or foggy weather or when rain is falling.

In addition to the well marked diurnal range of relative humidity, there is also a change from season to season and in the region under consideration, the mean relative humidity is highest during the winter months and lowest during the months of March to June.

Perhaps it should be mentioned that in the Meteorological Office, values of relative humidity are obtained from simultaneous readings of dry and wet bulb temperatures registered by thermometers exposed outdoors inside a ventilated thermometer screen at a height of four feet above ground level. Thus, the reader will readily appreciate that depending on heating, ventilation and other factors, considerable differences can occur between the relative humidity prevailing indoors and the Meteorological Office values of relative humidity obtained from readings made outdoors.

The Meteorological Office at Prestwick Airport is the only weather station in the region for which hourly records of dry and wet bulb temperatures are available and all the statistics of relative humidity and wet bulb temperature included in this Report have been calculated from the Airport records. From the planning or design point of view, the Prestwick Airport figures should give a reasonably good guide to the region as a whole although significant differences in temperature and relative humidity could exist from place to place within the region at a particular time of day depending on the local weather conditions prevailing at the time. For example, the onset of a sea breeze on the coast could lead to a sharp

fall in temperature coinciding with a marked rise in relative humidity particularly on a warm day in the summer.

Averages and Extremes of Relative Humidity and Air Temperature for each hour of the day are given on a monthly basis in Table 3.

The Percentage Amounts of Time with Relative Humidities between Certain Limits are given in Table 3A.

Averages and Extremes of Wet Bulb Temperature are given in Table 3B.

The Percentage Amounts of Time with Wet Bulb Temperatures between Certain Limits are given in Table 3C.

TABLE 3

HOURLY AVERAGES AND EXTREMES OF AIR TEMPERATURE AND RELATIVE HUMIDITY FOR PRESTWICK AIRPORT - CALCULATED FROM HOURLY OBSERVATIONS MADE AT EACH HOUR ON THE HOUR DURING THE 10 YEARS FROM 1957 TO 1966

J A N U A R Y												
Time of obser- vation GMT	Air Temp °F			Rel Humidity %			Air Temp °F			Rel Humidity %		
	Average			Average			Average			Average		
	° F	Max	Min	° F	Max	Min	° F	Max	Min	° F	Max	Min
0000	37	52	16	86	100	48	38	52	19	85	100	48
0100	37	52	13	87	100	54	38	51	19	86	100	51
0200	37	53	11	87	100	61	38	52	21	86	100	55
0300	37	53	9	86	100	61	38	53	20	86	100	51
0400	37	54	10	87	100	67	37	53	16	86	100	44
0500	37	54	12	86	100	65	37	53	15	86	100	49
0600	37	54	13	87	100	62	37	54	14	87	100	46
0700	37	54	15	87	100	56	37	53	12	86	100	51
0800	37	53	13	86	100	56	37	53	8	87	100	41
0900	37	57	12	86	100	56	38	53	14	85	100	43
1000	38	59	14	85	99	50	39	55	19	83	100	34
1100	39	58	15	83	99	54	41	56	20	80	99	22
1200	40	59	20	81	99	44	42	56	29	77	99	21
1300	41	58	20	80	99	36	43	56	29	76	99	18
1400	41	57	23	80	99	47	43	55	29	75	100	18
1500	41	57	21	80	99	43	43	56	30	76	99	28
1600	40	57	19	82	99	49	43	53	30	77	98	31
1700	39	56	17	83	100	53	41	53	29	80	99	35
1800	39	56	13	84	100	60	41	53	27	82	98	29
1900	38	57	10	85	100	53	40	53	25	83	100	31
2000	38	57	6	85	100	52	39	52	21	84	100	34
2100	38	55	8	86	100	59	39	51	22	84	100	40
2200	38	53	9	86	99	53	39	51	19	85	98	34
2300	37	53	13	86	100	52	38	51	20	85	100	42
Average for month	38	-	-	85	-	-	39	-	-	83	-	-
Extreme for month	-	59	6	-	100	36	-	56	8	-	100	18

March/April overleaf

TABLE 3 (Contd)

M A R C H										A P R I L									
Time of Obs- vation GMT	Air Temp °F			Rel Humidity %			Air Temp °F			Rel Humidity %			Time of obs- vation GMT						
	Average		Absolute	Average		Absolute	Average		Absolute	Average		Absolute							
	°F	°F	°F	%	%	%	°F	°F	°F	%	%	%							
0000	41	59	21	83	99	46	43	56	28	85	100	58	0000						
0100	41	59	18	84	100	39	43	55	28	86	100	63	0100						
0200	40	59	15	85	100	39	43	55	27	86	99	66	0200						
0300	40	57	15	85	100	50	42	53	27	87	100	61	0300						
0400	40	55	15	86	100	51	42	54	26	87	100	66	0400						
0500	40	57	14	86	100	56	42	53	26	87	100	63	0500						
0600	39	55	14	85	100	51	42	54	27	87	100	63	0600						
0700	39	58	13	85	100	48	43	54	27	85	100	61	0700						
0800	40	57	15	84	100	43	45	54	32	82	99	58	0800						
0900	42	59	20	81	100	37	47	57	35	78	99	50	0900						
1000	43	59	26	77	98	35	48	59	37	74	99	41	1000						
1100	45	62	28	74	97	31	49	59	37	72	98	29	1100						
1200	46	64	28	72	98	31	50	63	37	70	96	34	1200						
1300	46	65	28	71	99	30	50	62	38	70	97	30	1300						
1400	47	64	29	69	98	29	51	62	37	69	97	25	1400						
1500	47	66	29	70	99	32	51	63	38	68	98	23	1500						
1600	47	64	29	71	99	31	51	63	37	69	99	29	1600						
1700	46	62	29	73	98	36	50	63	37	70	99	33	1700						
1800	45	61	28	76	99	40	49	61	36	73	99	40	1800						
1900	43	57	28	79	99	49	48	59	35	76	99	42	1900						
2000	42	54	27	81	100	42	46	58	32	80	99	52	2000						
2100	42	57	25	82	98	47	45	56	32	82	100	53	2100						
2200	41	58	20	83	99	51	45	56	31	83	99	52	2200						
2300	41	57	19	83	98	50	44	53	29	85	100	66	2300						
Average for Month	43	-	-	79	-	-	46	-	-	79	-	-	-						
Extreme for Month	-	66	13	-	100	29	-	63	26	-	100	23	23						

TABLE 3 (Contd)

MAY

JUNE

Time of Obser- vation GMT	Air Temp °F			Rel Humidity %			Air Temp °F			Rel Humidity %			Time of Obser- vation GMT
	Average			Average			Average			Average			
	°F	Max	Min	°F	Max	Min	°F	Max	Min	°F	Max	Min	
0000	47	62	34	85	99	54	53	66	37	86	100	56	0000
0100	47	61	33	85	100	60	52	65	36	87	100	57	0100
0200	46	61	32	87	100	64	51	64	35	88	100	53	0200
0300	46	59	31	87	100	63	51	63	34	88	100	57	0300
0400	45	58	31	87	100	64	51	61	34	89	100	63	0400
0500	45	56	31	87	100	67	51	61	34	88	100	66	0500
0600	47	58	33	86	100	59	53	64	37	87	100	61	0600
0700	49	59	37	82	99	47	54	67	43	83	99	50	0700
0800	51	62	39	78	98	49	56	70	46	80	99	48	0800
0900	52	65	40	75	98	44	57	73	47	77	99	39	0900
1000	54	67	41	72	97	41	58	75	49	74	99	36	1000
1100	55	69	40	70	95	37	59	78	50	73	99	31	1100
1200	55	75	41	69	97	32	60	79	50	71	99	32	1200
1300	56	77	41	68	97	28	61	81	49	70	97	27	1300
1400	56	78	42	67	99	28	61	82	50	70	99	27	1400
1500	57	78	43	67	98	27	61	80	51	70	98	22	1500
1600	56	75	43	67	99	30	61	82	49	70	99	27	1600
1700	55	74	42	69	99	28	60	82	50	71	98	30	1700
1800	55	73	42	71	99	29	59	84	49	73	98	32	1800
1900	53	71	42	73	100	33	58	79	48	76	99	36	1900
2000	52	67	41	77	99	46	57	76	46	78	99	45	2000
2100	51	64	38	79	99	48	56	71	44	81	100	49	2100
2200	49	63	35	82	100	52	54	67	41	84	99	35	2200
2300	48	62	34	83	99	51	53	67	39	85	100	54	2300
Average for Month	51	-	-	77	-	-	56	-	-	79	-	-	-
Extreme for Month	-	78	31	-	100	27	-	84	34	-	100	22	22

TABLE 3 (Contd)

J U L Y										A U G U S T									
Time of Obser- vation GMT	Air Temp °F				Rel Humidity %				Time of Obser- vation GMT	Air Temp °F				Rel Humidity %					
	Average		Absolute		Average		Absolute			Average		Absolute		Average		Absolute			
	°F		°F		%		%			°F		°F		%		%			
	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min	Max	Min	Max	Min		
0000	54	66	44	44	88	100	61	55	67	40	88	100	64	0000					
0100	54	65	41	41	89	100	64	54	67	39	89	100	61	0100					
0200	53	66	38	38	89	100	57	54	67	38	89	100	63	0200					
0300	53	65	36	36	89	100	62	53	69	36	89	100	62	0300					
0400	53	65	35	35	90	100	65	53	66	36	90	100	68	0400					
0500	53	64	35	35	90	100	69	53	66	35	90	100	71	0500					
0600	54	65	39	39	88	100	64	53	66	36	90	100	69	0600					
0700	55	65	44	44	86	100	61	55	66	42	88	100	67	0700					
0800	57	68	48	48	83	99	59	56	69	48	85	100	59	0800					
0900	58	70	50	50	80	98	52	58	70	50	82	99	55	0900					
1000	59	73	51	51	78	99	52	59	73	53	79	99	53	1000					
1100	60	75	52	52	76	99	46	60	75	51	77	100	38	1100					
1200	60	77	52	52	75	98	45	61	75	53	75	99	36	1200					
1300	61	77	52	52	73	99	46	61	75	53	74	99	37	1300					
1400	61	78	51	51	73	98	41	61	77	52	73	99	40	1400					
1500	61	78	51	51	72	98	36	61	76	51	73	98	41	1500					
1600	61	78	48	48	73	98	37	61	76	51	74	98	45	1600					
1700	61	76	47	47	74	99	41	61	77	51	75	97	40	1700					
1800	60	75	47	47	75	99	43	60	75	51	77	99	47	1800					
1900	59	76	47	47	77	99	44	59	72	50	79	98	54	1900					
2000	58	75	47	47	80	99	48	57	70	48	83	99	59	2000					
2100	57	71	46	46	84	99	52	56	68	45	85	98	66	2100					
2200	56	67	45	45	85	100	58	55	68	44	87	100	66	2200					
2300	55	66	45	45	87	100	48	55	67	42	88	100	65	2300					
Average for Month	57	-	-	-	81	-	-	57	-	-	82	-	-	-	-				
Extreme for Month	-	78	35	35	-	100	36	-	77	35	-	100	36	36	36				

TABLE 3 (Contd)

Time of Obser- vation GMT	S E P T E M B E R						O C T O B E R						Time of Obser- vation GMT
	Air Temp °F			Rel Humidity %			Air Temp °F			Rel Humidity %			
	Average			Absolute			Average			Absolute			
	°F	°F	°F	%	Max	Min	°F	°F	°F	%	Max	Min	
0000	53	63	37	88	100	65	49	62	34	87	100	53	0000
0100	52	63	36	88	100	66	49	62	32	88	100	56	0100
0200	52	63	35	89	100	68	48	62	31	88	100	49	0200
0300	52	62	34	89	100	67	48	62	30	88	100	47	0300
0400	51	64	34	89	100	66	48	60	28	88	100	55	0400
0500	51	63	33	89	100	70	48	60	28	88	100	51	0500
0600	51	63	33	90	100	63	48	59	28	88	100	53	0600
0700	52	63	34	89	100	65	48	59	27	88	100	61	0700
0800	53	65	37	86	100	65	49	61	27	88	100	59	0800
0900	55	69	41	83	99	63	50	62	32	85	100	59	0900
1000	57	71	48	79	99	56	52	67	38	82	100	56	1000
1100	58	72	49	77	99	44	53	71	41	80	99	50	1100
1200	59	75	50	75	99	44	54	72	42	77	97	48	1200
1300	59	75	48	74	99	44	55	73	43	76	99	41	1300
1400	59	77	48	74	97	41	55	74	43	76	97	43	1400
1500	59	75	49	74	98	43	54	74	42	76	98	45	1500
1600	59	75	49	75	99	46	54	73	39	78	99	46	1600
1700	58	74	48	76	99	46	53	70	36	81	99	50	1700
1800	57	74	48	79	98	49	51	68	33	84	100	61	1800
1900	56	71	47	83	99	58	50	64	31	85	100	61	1900
2000	55	68	45	85	99	62	50	64	33	86	100	62	2000
2100	54	67	43	86	99	62	49	64	31	87	100	60	2100
2200	53	66	39	87	100	61	49	62	33	87	100	62	2200
2300	53	65	39	87	100	62	49	61	34	88	100	59	2300
Average for Month	55	-	-	83	-	-	51	-	-	84	-	-	-
Extreme for Month	-	77	33	-	100	41	-	74	27	-	100	41	-

November/December overleaf

TABLE 3 (Contd)

Time of Obser- vation GMT	N O V E M B E R						D E C E M B E R						Time of Obser- vation GMT
	Air Temp °F			Rel Humidity %			Air Temp °F			Rel Humidity %			
	Average		Absolute	Average		Absolute	Average		Absolute	Average		Absolute	
	°F	°F	°F	%	%	°F	°F	%	%	°F	°F	%	
0000	43	57	24	87	100	64	39	54	15	87	100	63	0000
0100	42	57	25	88	100	63	39	54	15	87	100	62	0100
0200	42	57	24	88	100	63	39	55	15	87	100	50	0200
0300	42	55	23	87	100	62	39	55	15	87	100	53	0300
0400	42	55	23	87	100	59	39	55	15	87	100	57	0400
0500	42	56	24	88	100	58	39	54	15	87	100	58	0500
0600	42	56	24	88	100	52	39	53	15	87	100	51	0600
0700	42	56	22	88	100	57	39	52	15	87	100	46	0700
0800	42	57	20	88	100	59	39	52	16	87	100	54	0800
0900	42	57	20	87	100	62	39	51	19	87	100	51	0900
1000	44	57	24	85	100	61	39	52	19	87	99	43	1000
1100	45	57	26	83	100	56	41	52	23	85	100	38	1100
1200	46	58	30	81	99	56	41	53	25	83	99	39	1200
1300	47	58	33	79	98	54	42	53	26	82	99	36	1300
1400	47	57	33	79	98	46	42	53	28	83	99	34	1400
1500	47	57	33	80	99	55	42	53	29	83	99	38	1500
1600	46	56	32	82	100	59	41	53	27	84	99	41	1600
1700	45	56	30	84	98	61	41	53	27	85	99	42	1700
1800	44	56	29	85	99	56	40	53	23	85	99	46	1800
1900	43	56	28	86	99	56	40	54	22	85	99	42	1900
2000	43	56	27	86	100	60	40	52	23	85	99	47	2000
2100	43	57	26	87	100	57	40	53	21	86	99	59	2100
2200	43	57	25	87	100	57	39	53	20	86	99	48	2200
2300	42	57	24	88	100	61	39	54	17	86	100	60	2300
Average for Month	44	-	-	85	-	-	40	-	-	86	-	-	-
Extreme for Month	-	58	20	-	100	46	-	55	15	-	100	34	-

TABLE 3A

PERCENTAGE AMOUNT OF TIME* WITH RELATIVE HUMIDITY AT OR BETWEEN CERTAIN LIMITS
AT PRESTWICK AIRPORT

(10 years from 1957 to 1966)

Relative Humidity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	%	%	%	%	%	%	%	%	%	%	%	%	%
0-19%	0.0	0.0+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0+
20-24%	0.0	0.0+	0.0	0.0+	0.0	0.0+	0.0	0.0	0.0	0.0	0.0	0.0	0.0+
25-29%	0.0	0.0+	0.0+	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0+
30-34%	0.0	0.2	0.3	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0+	0.1
35-39%	0.0+	0.1	0.4	0.2	0.6	0.5	0.1	0.0+	0.0	0.0	0.0	0.1	0.2
40-44%	0.0+	0.3	0.7	0.8	0.9	0.7	0.1	0.1	0.2	0.1	0.0	0.1	0.3
45-49%	0.1	0.3	1.5	1.9	1.8	1.3	0.5	0.3	0.4	0.2	0.0+	0.1	0.7
50-54%	0.2	0.7	2.7	2.7	3.1	2.2	1.0	1.0	0.8	0.5	0.1	0.1	1.3
55-59%	0.4	1.5	3.6	3.6	4.6	3.7	2.6	2.3	1.8	1.0	0.6	0.3	2.2
60-64%	1.3	2.7	4.5	4.9	6.3	5.5	4.9	4.2	3.4	2.5	1.5	0.9	3.5
65-69%	3.1	4.3	6.6	6.6	8.1	8.6	8.2	6.0	5.3	4.4	3.5	1.8	5.5
70-74%	6.1	7.4	8.3	10.0	10.8	9.7	9.2	8.3	8.5	7.8	6.1	5.0	8.1
75-79%	13.3	13.2	12.9	13.7	12.5	11.8	11.4	11.6	12.1	12.2	10.5	11.7	12.2
80-84%	20.4	18.7	15.9	16.3	15.6	14.1	14.8	16.1	16.5	15.9	17.4	19.4	16.8
85-89%	24.2	23.4	20.3	18.7	16.3	17.2	19.6	20.5	19.6	21.3	24.1	25.0	20.9
90-94%	20.7	19.3	16.0	14.4	13.1	16.1	17.5	18.2	18.6	20.6	23.4	25.0	18.6
95-98%	8.5	7.0	5.8	5.1	5.3	7.1	8.7	9.7	10.8	10.4	11.1	9.3	8.2
99%	1.2	0.5	0.3	0.7	0.4	1.0	0.9	1.3	1.3	1.7	1.0	0.9	0.9
100%	0.5	0.4	0.2	0.2	0.2	0.3	0.5	0.4	0.7	1.4	0.7	0.3	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Calculated from hourly values of relative humidity obtained from simultaneous readings of dry and wet bulb temperature made at each hour on the hour during the 10 years from 1957 to 1966.

TABLE 3B

AVERAGES OF WET BULB TEMPERATURE IN DEGREES FAHRENHEIT FOR EACH HOUR OF THE DAY
CALCULATED FROM HOURLY READINGS MADE AT PRESTWICK AIRPORT DURING THE
10 YEARS FROM 1957 TO 1966

<u>Hour</u> <u>GMT</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>
0000	36	36	39	42	45	51	53	53	51	47	41	38
0100	36	36	39	41	45	50	52	52	51	47	41	38
0200	36	36	39	41	45	50	52	52	50	47	41	38
0300	36	36	39	41	44	49	52	52	50	47	41	37
0400	36	36	38	41	44	49	51	52	50	47	41	37
0500	36	36	38	40	44	49	51	52	50	47	41	37
0600	36	36	38	40	45	51	52	52	50	46	41	37
0700	36	36	38	41	46	52	53	53	50	47	41	37
0800	36	36	39	43	47	53	54	54	51	47	41	37
0900	36	37	40	44	48	53	55	55	53	48	41	37
1000	36	38	41	45	49	54	55	55	53	49	42	38
1100	37	39	42	45	50	55	56	56	54	50	43	39
1200	38	40	42	45	50	55	56	56	54	51	44	40
1300	39	40	43	46	51	55	56	57	55	51	44	40
1400	39	40	43	46	51	55	56	57	55	51	44	40
1500	39	40	43	46	51	55	56	57	55	51	44	40
1600	38	40	43	46	51	55	56	57	55	50	43	39
1700	38	39	42	46	50	55	56	56	54	50	43	39
1800	37	39	41	45	50	55	56	56	54	49	42	39
1900	37	38	41	45	49	54	55	55	53	48	42	39
2000	37	37	40	44	49	53	55	55	52	48	42	38
2100	36	37	40	43	48	53	54	54	52	47	41	38
2200	36	37	39	42	47	52	53	53	51	47	41	38
2300	36	37	39	42	46	51	53	53	51	47	41	38
Mean	37	38	40	43	48	53	54	54	52	48	42	38

Absolute Highest and Lowest Hourly Readings of Wet Bulb Temperature in degrees
Fahrenheit Recorded at Prestwick Airport in Each Month during the
10 years from 1957 to 1966

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>
Absolute Highest	54	52	57	55	63	67	67	67	67	64	55	53
Absolute Lowest	6	7	13	25	29	33	35	35	33	27	20	14

(computed from hourly readings of wet bulb temperature made at each hour on the hour during the 10 years from 1957 to 1966)

(computed from hourly readings of wet bulb temperature made at each hour on the hour during the 10 years from 1957 to 1966)

[illegible]

4. SUNSHINE

By Scottish standards, the area under consideration is comparatively sunny and although the stations recording sunshine duration are very few and far between, there is little doubt that Troon and perhaps other nearby places along the Ayrshire coast rank among the sunniest places on the western mainland coast of Scotland. Indeed, the annual average duration of 1,381 hours at Troon compares very favourably with the central London districts of Kingsway and Regent's Park which have average durations of 1,359 and 1,353 hours per year respectively.

Monthly Average and Daily Mean Durations of Sunshine for Troon, Auchincruive and Kilmarnock are given in Table 4. The sunshine recording instruments at all three locations have relatively free horizons with no obstructing hills, buildings or trees to cut off the sunshine and the lower durations of sunshine at Auchincruive and Kilmarnock are probably due to the general tendency for cloud to form inland during the day. It is interesting to note the tendency for spells of bright weather during the first six months of the year which is reflected by an excess of 14% in the average sunshine total for these months when compared with the average total for the six months from July to December.

Statistics of Monthly and Annual Sunshine Durations for Auchincruive, based on recordings made during the 38 years from 1932 to 1969, are given in Table 4A.

The path of the sun across the sky depends on the latitude and the time of the year. Figure 2 is a solar chart for the Ayr-Kilmarnock-Irvine region (latitude 56 degrees North) which shows the altitude and azimuth of the sun at various times of day, for the solstices, equinoxes and for certain intermediate dates. For a given site, the various obstructions can be plotted on the chart and their effect in cutting off the sun's radiation at various times can then be evaluated. For example, it can be seen from Figure 2 that at 8.30 am on 23 August, the sun is at an altitude of 30 degrees with an azimuth of 117 degrees. It can also be seen that on 22 December, the maximum altitude of the sun is 10½ degrees at 12 noon with an azimuth of 180 degrees. Thus, in midwinter, there would be no direct sunshine at any place in the region with a hill to the south whose top subtended an angle of 10½ degrees or more.

TABLE 4.

AVERAGES OF SUNSHINE DURATION IN HOURS - MONTHLY TOTALS AND DAILY MEANS OVER
30 YEARS PERIOD FROM 1931-1960

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.
<u>TROON</u>													
Monthly Total	45	69	110	153	209	195	167	153	118	81	50	31	1,381
Daily Mean	1.45	2.47	3.53	5.10	6.73	6.51	5.40	4.94	3.93	2.62	1.65	1.00	3.78
<u>AUCHINCRAIVE</u>													
Monthly Total	45	68	105	146	197	181	150	144	113	79	51	34	1,314
Daily Mean	1.45	2.42	3.38	4.88	6.37	6.02	4.85	4.63	3.77	2.56	1.71	1.10	3.59
<u>KILMARNOCK*</u>													
Monthly Total	43	67	102	146	203	186	157	144	115	79	47	30	1,319
Daily Mean	1.38	2.41	3.30	4.85	6.54	6.21	5.08	4.64	3.83	2.54	1.58	0.96	3.62

Note: The averages of sunshine quoted above for Troon and Kilmarnock have been calculated from recordings made during the 30 years period from 1931 to 1960 which is the standard period for sunshine averages in current use in the Meteorological Office. The averages quoted for Auchincruive have been estimated from recordings made during the period from 1932 to 1960.

* The sunshine recorder was sited at Kay Park, Kilmarnock from May 1931 to December 1949; at Springhill House, Kilmarnock from January 1950 to September 1959 and at Annanhill, Kilmarnock, from October 1959 to December 1960.

TABLE 4A

STATISTICS OF MONTHLY AND ANNUAL SUNSHINE DURATIONS FOR AUCHINCRAIVE NEAR AYR
 (Period of Record 38 years from 1932 to 1969)

Statistics of Monthly Sunshine Durations

Month	Highest Sunshine Duration	Sunshine Duration Seldom* Above	Median†	Sunshine Duration Seldom* Below	Lowest Sunshine Duration
January	96 hours in January 1959	61 hours	44 hours	35 hours	24 hours in January 1944
February	126 hours in February 1963	85 hours	72 hours	53 hours	42 hours in February 1966
March	138 hours in March 1955	117 hours	109 hours	90 hours	47 hours in March 1957
April	219 hours in April 1942	182 hours	153 hours	116 hours	79 hours in April 1937
May	281 hours in May 1935	214 hours	199 hours	163 hours	133 hours in May 1967
June	289 hours in June 1957	216 hours	181 hours	138 hours	111 hours in June 1966
July	275 hours in July 1955	181 hours	147 hours	125 hours	97 hours in July 1944
August	281 hours in August 1947	169 hours	145 hours	122 hours	90 hours in August 1942
September	170 hours in September 1933	135 hours	113 hours	91 hours	77 hours in September 1965
October	129 hours in October 1939	97 hours	79 hours	65 hours	38 hours in October 1940
November	93 hours in November 1965	63 hours	53 hours	42 hours	33 hours in November 1939 & 1953
December	56 hours in December 1935 & 1961	46 hours	38 hours	27 hours	11 hours in December 1934

Statistics of Annual Sunshine Durations

<u>Period of Record</u>	<u>Highest Annual Sunshine Duration</u>	<u>Annual Sunshine Duration Seldom* Above</u>	<u>Median†</u>	<u>Annual Sunshine Duration Seldom* Below</u>	<u>Lowest Annual Sunshine Duration</u>
38 years	1575 hours in 1960	1413 hours	1322 hours	1260 hours	1081 hours in 1944 and 1954

*Seldom = 20 per cent of occasions or one year in 5; the figures given are the upper and lower quintiles.

†Median = the "middle" value, i.e. half the sunshine durations exceed it and half fall below it.

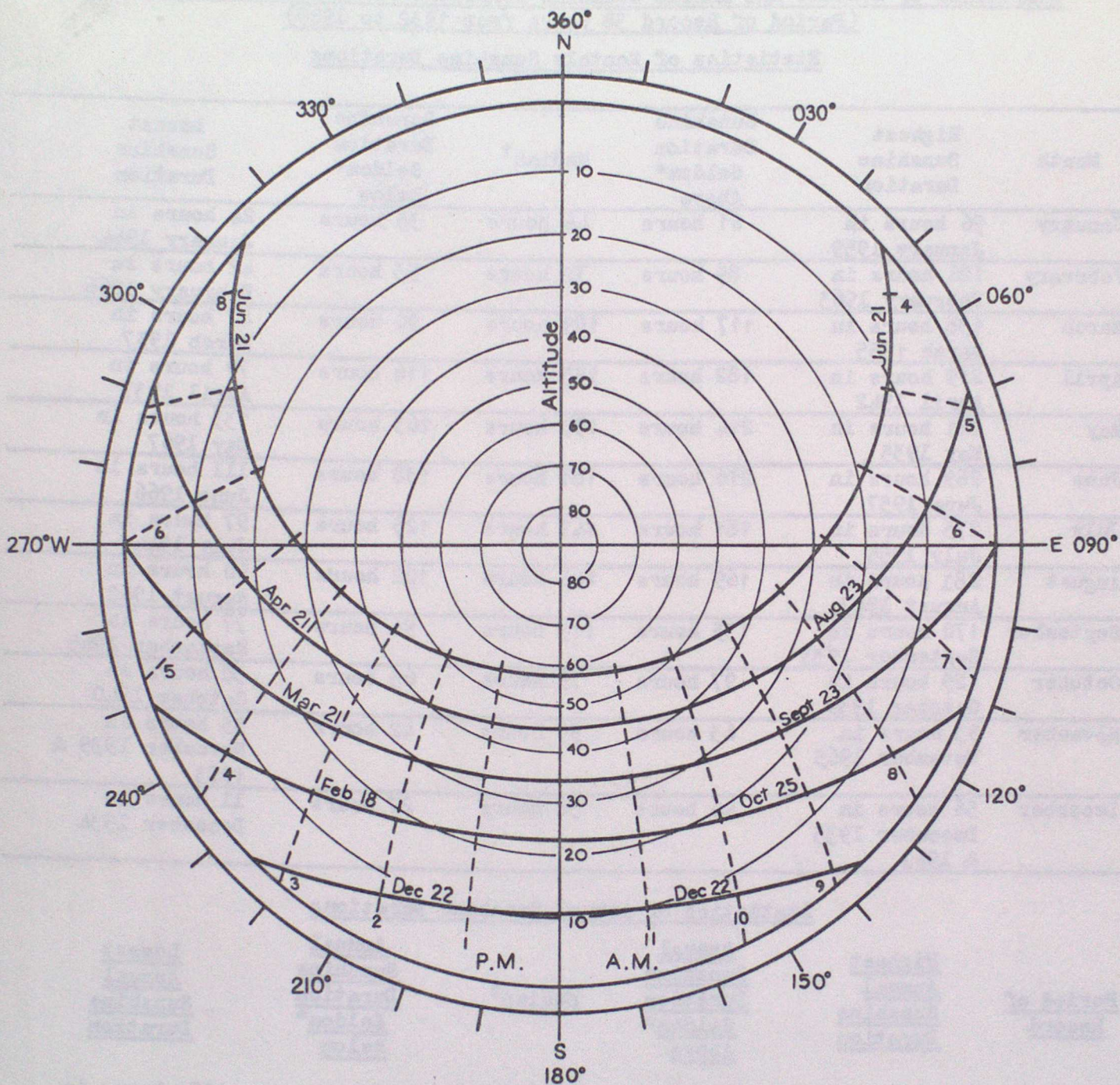


Fig.2

SOLAR CHART FOR LATITUDE 56°N

5. WINDS

The high frequency of gales and strong winds is one of the main features of the climate of the coastal areas of west and north-west Scotland. However, the area under consideration is sheltered by high ground from the south-east to the south-west and therefore the frequency of gales is comparatively low. Westerly, north-westerly and easterly gales can and do occur with about the same frequency as more exposed areas at the same latitude. For this reason high gusts of wind are recorded every year in the area although the frequencies of gusts greater than 38 and 54 mph are also much lower than might be expected.

Annual and Monthly Frequencies of Wind Direction and Velocity for Prestwick Airport are given in Tables 5 and 5A. The Meteorological Office at Prestwick Airport is the only location in the region for which detailed wind records are available and the only location for which it is possible to calculate frequencies of this type. It is interesting to note from Table 5 that over the year as a whole, there is no "prevailing wind" in the usual sense of the term and that the frequency of winds from different points of the compass is remarkably uniform. Although westerly winds predominate, it can be seen that there is a high frequency of easterly winds which find their way into the region through the gaps in the high ground to the east.

Extreme Hourly Mean Wind Speeds

A statistical treatment of the highest hourly mean wind speeds (i.e. the highest wind speeds averaged over the 60 minutes between hours) recorded at Prestwick Airport in each year during the 25 years from 1944 to 1968 yields the following results.

Maximum Hourly Mean Wind Speeds at 10 metres (33 feet)
above the ground likely to be exceeded on the average
only once in the stated number of years

<u>10 years</u>	<u>20 years</u>	<u>50 years</u>	<u>100 years</u>
53 mph	56 mph	61 mph	63 mph

While the maximum hourly mean wind speed likely to be exceeded on the average only once in, say, 50 years is often referred to as the "1 in 50 year" hourly mean speed it is actually that speed which is likely to be exceeded with a probability of $0.02 = 1/50$ (or a 2 per cent probability) in any one year. Similarly, the "1 in 100 year" speed is that speed likely to be exceeded with a probability of $0.01 = 1/100$ (or a 1 per cent probability) in any one year.

When studying the probabilities of occurrence of maximum hourly mean wind speeds given above, it should be borne in mind that until 1958, the wind recording instrument at Prestwick Airport was obstructed by buildings to the west, north and north-east and to the south-east by a nearby clump of trees. From October 1958 onwards, the instrument has been sited in an unobstructed location in the centre of the airfield. A comparison of the speeds recorded at the two sites reveals that the speeds recorded at the "new" unobstructed location are higher than those recorded at the former site near the airport buildings but insufficient records are available from the new site to consider re-computations of extreme speeds.

Estimation of Maximum Wind Speeds for the Calculation of Wind Loadings on Buildings and Structures

The recommended procedures for the calculation of wind loadings on buildings are explained in 'Wind Loads' - CP3 - Chapter V - Part 2 of the British Standard Code of Practice published on 31 July 1970.

It can be seen from the Code of Practice that the first step in the assessment of wind load is to estimate the value of the maximum 3-second gust speed likely to be exceeded on the average only once in 50 years at a height of 10 metres (33 feet) above ground level in open level country in the locality of the structure. The available evidence suggests that in the Ayr-Kilmarnock-Irvine region of Ayrshire this speed is 51 metres per second (114 mph). However, it is necessary to adjust this basic gust speed by using two factors (S_1 and S_2) which depend on the actual site and the nature and size of the building.

Topography Factor - S_1

This factor, described more fully in the Code, takes account of the effect of topography on the exposure of the site. In general, the topography factor for places like Ayr, Kilmarnock and Irvine and other towns and villages in the region will be 1.0. However, a topography factor of between 1.05 and 1.10 would be appropriate for structures to be erected near the tops of low hills which rise abruptly from the general level of the terrain by 100 metres or more.

Ground Roughness, Building Size and Height above Ground Factor - S_2

It is also necessary to adjust the basic maximum gust speed by the S_2 factor which combines the effects of ground roughness, building size and the variation of wind speed with height. The ground roughness is dependent on the number and size of obstacles on the surface and may be described as "smooth" in open level country, "moderate" in country with windbreaks and scattered houses, "rough" in woods, towns or the outskirts of cities and "very rough" in the centre of large cities. Broadly speaking, it is a measure of the power of these obstacles to

slow down the wind in the layers near the ground. However, before combining the S_2 factor with the basic gust speed of 51 metres per second, it should be realised that it takes a little time for the slowing-down process to take effect and that in the region under consideration, the transition from built-up area to open country is very abrupt - considerably more abrupt for example, than in cities like London, Birmingham and Manchester. Consequently, there is little doubt that strong winds on the outskirts of the towns and villages in the Ayr-Kilmarnock-Irvine region are able to bring something like their full effect into the built-up areas.

The reader will notice from Table 3, page 15 of the Code of Practice that the S_2 factors for height and surface roughness have been classified under four categories of terrain numbered 1 to 4. Because of the "open" nature of the region under consideration, it is considered that the S_2 factors quoted in the Code for "city centres" (viz Category 4 factors) are not applicable to any location in the region and, in general, it is thought that places in the region are more closely related to the height and surface roughness factors quoted in Categories 1 to 3 with the following classifications of environment.

Category 1 - open fairly level country immediately outside the towns and villages.

Category 2. - small towns and villages and districts on or near the fringe of the main built-up areas.

Category 3. - parts of the Burghs of Ayr, Kilmarnock and Irvine in which the existing buildings are closely packed together.

The reader may wish to note that advice on design wind speeds, topographical effects etc can be given for a specific site and if there are any unusual features of local topography, exposure, or of the structure itself, advice on the appropriate gust speed and factors to be used should be sought from the Meteorological Office at 26 Palmerston Place, Edinburgh EH 12 5AN quoting the National Grid Reference of the site in question.

Terms used by the Meteorological Office for describing the wind strength

<u>Term</u>	<u>Average speed near the ground</u>
Calm	Less than 1 mph (less than 1 knot)
Light	1 to 12 mph (1 to 10 knots)
Moderate	13 to 18 mph (11 to 16 knots)
Fresh	19 to 24 mph (17 to 21 knots)
Strong	25 to 38 mph (22 to 33 knots)
Gale	39 to 46 mph (34 to 40 knots)
Severe Gale	Over 46 mph (over 40 knots)

The average speeds quoted above would be considerably exceeded in gusts. For example, in a gale, gusts of over 50 mph are common and may exceed 100 mph at exposed places in a severe gale. A gale warning is issued when the gusts are expected

to reach 50 mph or more, even if the average speed may be rather less than the limits shown in the above table.

The average duration of a high gust of wind is of the order of 2 to 3 seconds but it is high gusts of wind which are usually responsible for the more common types of "gale damage" e.g. the removal of roof tiles and chimney pots, blown down fences and hoardings, damage to trees, crops and glass window panes etc.

The Exceptionally Severe Gale of 15 January 1968

The westerly gale which affected the central belt of Scotland during the early hours of 15 January 1968 was the worst in living memory and caused enormous damage and considerable loss of life.

Greenock, Glasgow and many other places in the Clyde/Forth Valley were particularly hard-hit and the damage to buildings alone has been assessed at £18m. In addition, some 17,000 acres of woodland, representing about 40m cubic feet of timber, were devastated.

It can be seen from Table 5B that at Prestwick Airport, the gale reached its peak strength between 0300 and 0400 hours GMT on 15 January 1968 with an average wind speed over this period of 60 minutes of 58 mph from direction 250 degrees (west-south-west) and a highest gust of 104 mph at 0345 hours GMT.

The Actual Numbers of Days with Gales at Prestwick Airport during each month and year during the 28 years from 1942 to 1969 are given in Table 5C. At Prestwick Airport, gales have blown from all points of the compass between east-north-east through south to north-north-west although the most frequent and severe gales have blown from directions in the sector between south-west and north-west. Although less frequent than westerly gales, strong winds and gales from easterly directions are by no means uncommon at Prestwick Airport. Details of the very severe westerly gale of 15 January 1968 have already been given in this Report but one of the worst easterly gales during recent years occurred during the evening of 16 November 1965 when the anemograph at Prestwick Airport recorded an average wind speed of 48 mph from east-north-east at 2000 hours GMT and a highest gust of 69 mph from due east at 2140 hours GMT.

It will be noted from Table 5C that gales have occurred at Prestwick Airport in all months of the year except July and that the frequency of gales during the winter half-year from October to March is considerably higher than in the summer half-year.

The Numbers of Days and Hours with Gusts to 39 mph or more and 55 mph or more at Prestwick Airport during the 10 years from 1960 to 1969 are given in Tables 5D and 5E.

A Frequency Table showing the Speeds and Directions from which High Gusts of Wind blow at Prestwick Airport is at Table 5F.

High Winds during the Working Part of the Day.

Strong winds often lead to hazardous working conditions on building sites and can also cause serious interruptions of work particularly at sites where tower cranes are in use.

It is not possible to decide a precise threshold of wind speed above which work on a building site would be hampered or have to stop because this will clearly depend on a number of complex factors including the exposure of the site, the type of work, the height above ground level at which men are working, the materials being used etc. However, experience suggests that in general, conditions become critical when high gusts of wind of about 40 mph or more are occurring.

Records showing the incidence of gusts of 40mph or more during the working part of the day are not readily available but at Prestwick Airport, gusts of 40 mph or more, first start to occur when the hourly mean wind speed reaches the level of about 20 mph and gusts to 40 mph or more, become quite frequent with hourly mean wind speeds of 25 mph or more. Accordingly, in view of the gusty nature of the winds in the Ayr-Kilmarnock-Irvine region, statistics of hourly mean wind speeds of 25 mph or more should serve as a good indication of the incidence of fairly frequent gusts to 40 mph or more.

Table 5G gives the total number of days at Prestwick Airport on which the hourly mean wind speed reached 25 mph or more in at least one hour between 0700 and 1700 hours GMT during the 10 years from 1960 to 1969 and also the total number of hours in which hourly mean speeds of 25 mph or more were recorded between 0700 and 1700 hours GMT.

It should be borne in mind when studying Table 5G that the average wind speeds of 25 mph or more were recorded at a height of 33 feet (10 metres) above ground level and that considerably higher speeds could be experienced at heights in excess of 33 feet above the ground. For example, an hourly mean speed of 25 mph or more with gusts to 40 mph or more at a height of 33 feet above the ground would become something like an hourly mean speed of 30 mph or more with gusts to 45 mph or more at a height of 150 feet above the ground at an exposed site. When consulting Table 5G it should be noted that the figures relate to a 7-day working week and not to a 5-day working week.

A table for converting miles per hour into metres per second is at Table 5H.

TABLE 5

ANNUAL PERCENTAGE FREQUENCY OF WIND DIRECTION AND VELOCITY AT
PRESTWICK AIRPORT - (10 YEARS FROM 1959 TO 1968)

Mean Wind Speed	Wind Directions in Degrees (true)												
	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	All Directions
0 mph	-	-	-	-	-	-	-	-	-	-	-	-	3.8%
1- 3 "	-	-	-	-	-	-	-	-	-	-	-	-	11.5%
4- 7 "	0.6	1.1	1.5	1.9	2.8	1.6	1.2	0.6	1.0	1.6	0.9	0.7	15.5%
8-12 "	0.6	1.6	2.7	2.4	2.4	2.2	3.3	2.4	4.2	3.3	2.2	1.4	28.7%
13-18 "	0.3	1.0	2.6	2.0	1.7	1.6	3.7	3.9	5.5	3.0	3.2	0.9	29.4%
19-24 "	0.0+	0.1	0.6	0.5	0.5	0.3	0.9	1.2	1.5	1.0	1.0	0.2	7.8%
25-31 "	0.0+	0.0+	0.1	0.3	0.2	0.1	0.3	0.3	0.5	0.5	0.4	0.1	2.8%
32-38 "			0.0+	0.0+	0.1	0.0+	0.0+	0.0+	0.1	0.1	0.1	0.0+	0.4%
39-46 "				0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.1	0.0+	0.1%
47-54 "									0.0+	0.0+	0.0+		0.0+%
55-63 "									0.0+	0.0+			0.0+%
Total	1.5	3.8	7.5	7.1	7.7	5.8	9.4	8.4	12.8	9.5	7.9	3.3	100.0%

Notes

1. This frequency table has been calculated from values of wind direction and speed averaged over each hour during the 10 years from 1959 to 1968.
2. Wind directions are measured in degrees from True North and relate to the direction from which the wind is blowing. For example:-

Direction	360 degrees	=	wind blowing from North
"	090	=	" " East
"	180	=	" " South
"	270	=	" " West

3. Adding the columns of the above table vertically gives the percentage amount of time in the year with winds from the stated directions.
4. Adding the columns of the above table horizontally gives the percentage amount of time in the year with winds in the stated speed ranges.

TABLE 5A

MONTHLY PERCENTAGE FREQUENCIES OF WIND DIRECTION AND VELOCITY AT
PRESTWICK AIRPORT

(10 years from 1959-1968)

	Wind Direction in Degrees (True)												
Mean Wind Speed	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	All Directions
<u>JANUARY</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	17.1%
4-12 mph	1.7	2.6	5.3	6.2	6.6	2.9	3.8	2.5	2.0	1.5	1.8	2.8	39.7%
13-24 mph	0.1	1.2	3.3	2.6	2.7	2.5	6.0	4.9	6.5	3.1	3.3	1.4	37.6%
25-38 mph			0.1	0.5	0.6	0.4	0.6	0.5	1.1	0.8	0.5	0.1	5.2%
39 mph or more				0.1					0.1	0.1	0.1		0.4%
Total	1.8	3.8	8.7	9.4	9.9	5.8	10.4	7.9	9.7	5.5	5.7	4.3	100.0%
<u>FEBRUARY</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	17.3%
4-12 mph	1.1	3.0	4.2	5.8	6.4	3.9	3.7	2.2	2.4	1.9	2.1	1.2	37.9%
13-24 mph	0.2	1.2	3.1	5.9	3.1	2.1	5.8	7.1	4.8	3.3	2.1	0.9	39.6%
25-38 mph			0.3	0.4	0.8	0.1	0.6	0.7	0.6	1.0	0.6	0.0+	5.1%
39 mph or more								0.0+	0.0+	0.0+	0.1		0.1%
Total	1.3	4.2	7.6	12.1	10.3	6.1	10.1	10.0	7.8	6.2	4.9	2.1	100.0%
<u>MARCH</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	10.1%
4-12 mph	0.9	2.4	4.3	4.5	4.9	3.4	2.9	3.1	3.0	3.1	2.4	1.5	36.4%
13-24 mph	0.1	0.9	4.2	4.7	5.1	3.0	4.6	7.7	6.9	4.4	5.0	1.3	47.9%
25-38 mph	0.0+		0.3	0.6	0.6	0.2	0.5	0.7	0.8	0.8	0.9	0.1	5.5%
39 mph or more					0.0+	0.0+				0.1			0.1%
Total	1.0	3.3	8.8	9.8	10.6	6.6	8.0	11.5	10.7	8.4	8.3	2.9	100.0%
<u>APRIL</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	13.0%
4-12 mph	1.3	3.4	3.8	4.0	4.1	2.7	3.5	2.5	6.1	5.3	2.8	1.5	41.0%
13-24 mph	0.6	1.2	6.1	4.1	2.7	2.4	5.4	4.8	7.1	3.1	4.5	1.0	43.0%
25-38 mph		0.0+	0.4	0.5	0.1	0.3	0.3	0.1	0.4	0.3	0.5	0.1	3.0%
39 mph or more							0.0+						0.0+
Total	1.9	4.6	10.3	8.6	6.9	5.4	9.2	7.4	13.6	8.7	7.8	2.6	100.0%

TABLE 5A (Contd)

MONTHLY PERCENTAGE FREQUENCIES OF WIND DIRECTION AND VELOCITY AT

PRESTWICK AIRPORT

(10 years from 1959-1968)

	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	All Directions
<u>MAY</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	13.5%
4-12 mph	1.3	4.1	5.1	4.1	4.3	3.3	4.4	2.7	6.9	7.6	3.0	1.7	48.5%
13-24 mph	0.2	2.2	3.8	2.1	2.0	2.4	4.8	3.9	6.2	2.9	5.0	0.5	36.0%
25-38 mph			0.0+	0.4	0.1	0.1	0.3	0.0+	0.2	0.5	0.3	0.0+	1.9%
39 mph or more											0.1		0.1%
Total	1.5	6.3	8.9	6.6	6.4	5.8	9.5	6.6	13.3	11.0	8.4	2.2	100.0%
<u>JUNE</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	13.7%
4-12 mph	1.0	2.7	3.4	2.6	2.9	3.1	3.9	3.2	8.6	9.1	4.0	1.5	46.0%
13-24 mph	0.1	1.1	2.2	0.9	0.8	1.0	4.0	5.3	10.7	6.0	6.0	1.0	39.1%
25-38 mph		0.0+	0.0+		0.0+	0.1	0.3	0.2	0.2	0.2	0.2		1.2%
39 mph or more													0.0%
Total	1.1	3.8	5.6	3.5	3.7	4.2	8.2	8.7	19.5	15.3	10.2	2.5	100.0%
<u>JULY</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	15.1%
4-12 mph	0.7	2.0	4.1	2.2	2.6	2.3	3.9	3.4	10.2	10.4	5.8	1.9	49.5%
13-24 mph	0.1	0.8	3.7	0.5	0.3	1.3	4.0	4.0	8.2	4.5	6.6	0.6	34.6%
25-38 mph			0.0+				0.0+	0.1	0.3	0.3	0.1		0.8%
39 mph or more													0.0%
Total	0.8	2.8	7.8	2.7	2.9	3.6	7.9	7.5	18.7	15.2	12.5	2.5	100.0%
<u>AUGUST</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	15.5%
4-12 mph	1.0	3.0	5.0	3.2	4.0	2.9	4.4	3.4	8.4	7.8	5.5	1.8	50.4%
13-24 mph	0.1	1.0	2.4	1.6	0.6	0.9	3.6	4.1	8.4	4.7	5.2	0.7	33.3%
25-38 mph		0.0+		0.0+		0.0+	0.2	0.2	0.2	0.1	0.1		0.8%
39 mph or more													0.0%
Total	1.1	4.0	7.4	4.8	4.6	3.8	8.2	7.7	17.0	12.6	10.8	2.5	100.0%

TABLE 5A (Contd)

MONTHLY PERCENTAGE FREQUENCIES OF WIND DIRECTION AND VELOCITY AT

PRESTWICK AIRPORT

(10 years from 1959-1968)

	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	All Directions
<u>SEPTEMBER</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	21.0%
4-12 mph	0.7	1.6	3.0	3.8	5.7	6.6	7.1	3.9	5.9	5.7	3.7	2.0	49.7%
13-24 mph	0.1	0.7	1.3	1.3	1.2	1.5	5.4	4.0	4.7	2.9	4.0	0.7	27.8%
25-38 mph		0.0+	0.1		0.1	0.0+	0.2	0.2	0.3	0.4	0.1	0.0+	1.4%
39 mph or more							0.1	0.0+					0.1%
Total	0.8	2.3	4.4	5.1	7.0	8.1	12.8	8.1	10.9	9.0	7.8	2.7	100.0%
<u>OCTOBER</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	15.1%
4-12 mph	1.3	2.0	3.5	5.7	7.4	4.3	6.9	3.9	3.3	2.3	2.3	2.1	45.0%
13-24 mph	0.5	0.8	3.3	2.7	2.4	1.6	4.0	5.8	6.8	4.4	2.6	1.3	36.2%
25-38 mph			0.1	0.2	0.1	0.1	0.3	0.6	1.2	0.6	0.3	0.2	3.7%
39 mph or more									0.0+				0.0+
Total	1.8	2.8	6.9	8.6	9.9	6.0	11.2	10.3	11.3	7.3	5.2	3.6	100.0%
<u>NOVEMBER</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	16.2%
4-12 mph	1.5	3.2	4.2	5.6	7.1	4.9	4.2	2.6	2.8	1.6	2.0	3.2	42.9%
13-24 mph	1.0	2.1	3.2	2.9	3.1	2.0	3.5	4.3	5.9	3.7	2.1	1.6	35.4%
25-38 mph		0.1	0.6	0.6	0.2	0.1	0.3	0.4	0.7	1.3	0.5	0.3	5.1%
39 mph or more				0.1			0.0+		0.0+	0.1	0.2		0.4%
Total	2.5	5.4	8.0	9.2	10.4	7.0	8.0	7.3	9.4	6.7	4.8	5.1	100.0%
<u>DECEMBER</u>													
Under 4 mph	-	-	-	-	-	-	-	-	-	-	-	-	16.3%
4-12 mph	1.5	2.4	4.2	4.5	7.2	4.7	5.0	2.2	2.7	1.9	1.9	3.8	42.0%
13-24 mph	0.3	0.4	2.1	1.5	2.0	3.1	4.9	5.5	7.0	4.1	3.6	1.9	36.4%
25-38 mph			0.1	0.4	0.3	0.1	0.4	0.6	1.0	1.0	1.1	0.1	5.1%
39 mph or more										0.1	0.1	0.0+	0.2%
Total	1.8	2.8	6.4	6.4	9.5	7.9	10.3	8.3	10.7	7.1	6.7	5.8	100.0%

TABLE 5B

THE VERY SEVERE GALE OF 15 JANUARY 1968

Hourly Mean Wind Directions and Speeds and Speeds of Highest Gusts recorded at the Meteorological Office at Prestwick Airport between 1800 hours GMT on 14 January 1968 and 1800 hours GMT on 15 January 1968

<u>Hour - Greenwich Mean Time</u>	<u>Wind Direction averaged over 60 minutes</u>	<u>Wind Speed averaged over 60 minutes</u>	<u>Highest Gust during 60 minutes</u>
<u>Date: 14 January 1968</u>			
Between 1800 and 1900 hours	From 220 degrees	17 mph	37 mph
" 1900 " 2000 "	" 220 "	19 "	35 "
" 2000 " 2100 "	" 210 "	21 "	61 "
" 2100 " 2200 "	" 230 "	28 "	60 "
" 2200 " 2300 "	" 230 "	30 "	58 "
" 2300 " 2400 "	" 240 "	35 "	63 "
<u>Date: 15 January 1968</u>			
Between 0000 and 0100 hours	From 240 degrees	39 mph	84 mph
" 0100 " 0200 "	" 250 "	52 "	92 "
" 0200 " 0300 "	" 250 "	52 "	86 "
" 0300 " 0400 "	" 250 "	58 "	104 "
" 0400 " 0500 "	" 260 "	55 "	96 "
" 0500 " 0600 "	" 270 "	46 "	80 "
" 0600 " 0700 "	" 270 "	43 "	69 "
" 0700 " 0800 "	" 270 "	38 "	62 "
" 0800 " 0900 "	" 270 "	35 "	61 "
" 0900 " 1000 "	" 270 "	33 "	57 "
" 1000 " 1100 "	" 270 "	31 "	54 "
" 1100 " 1200 "	" 280 "	33 "	54 "
" 1200 " 1300 "	" 280 "	35 "	57 "
" 1300 " 1400 "	" 290 "	27 "	47 "
" 1400 " 1500 "	" 270 "	25 "	40 "
" 1500 " 1600 "	" 270 "	23 "	40 "
" 1600 " 1700 "	" 270 "	20 "	40 "
" 1700 " 1800 "	" 260 "	17 "	32 "

Note:

The highest gust of 104 mph was recorded at 0345 hours GMT.

TABLE 5C

NUMBER OF DAYS WITH GALES AT PRESTWICK AIRPORT
(28 years from 1942 to 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
1942	2	0	0	0	0	0	0	0	1	2	0	0	5
1943	0	6	2	5	1	0	0	1	0	2	4	2	23
1944	4	3	4	0	0	1	0	0	2	0	5	2	21
1945	2	3	0	0	0	0	0	0	1	1	0	1	8
1946	1	3	0	0	0	1	0	0	1	0	0	0	6
1947	0	0	0	5	0	0	0	0	1	0	0	0	6
1948	0	2	1	0	0	0	0	2	0	0	0	0	5
1949	1	2	1	0	0	0	0	0	0	3	0	2	9
1950	0	0	0	0	0	0	0	0	0	2	0	0	2
1951	1	0	0	0	0	0	0	0	0	0	0	1	2
1952	0	0	0	0	0	0	0	0	0	0	1	1	2
1953	1	0	0	1	0	0	0	0	0	0	0	0	2
1954	3	0	1	0	1	0	0	0	2	1	2	6	16
1955	0	0	0	0	0	0	0	0	0	1	1	2	4
1956	2	0	1	0	0	0	0	1	0	0	0	3	7
1957	1	2	0	0	0	0	0	0	0	0	1	0	4
1958	2	0	0	0	0	0	0	0	1	0	0	1	4
1959	1	0	0	1	0	0	0	1	0	1	2	1	7
1960	0	0	0	0	0	0	0	0	0	0	1	0	1
1961	1	1	0	0	0	0	0	0	1	2	0	1	6
1962	5	3	0	0	1	1	0	0	0	0	0	3	13
1963	1	1	0	0	0	0	0	0	0	0	2	0	4
1964	0	0	1	0	0	0	0	0	0	0	0	1	2
1965	2	1	1	0	0	0	0	0	0	0	2	0	6
1966	1	0	2	1	2	0	0	0	0	0	3	1	10
1967	0	1	3	0	0	0	0	0	0	0	0	0	4
1968	2	0	2	0	0	0	0	0	0	0	0	0	4
1969	0	0	0	1	0	0	0	0	1	0	0	0	2
28 years total	33	28	19	14	5	3	0	5	11	15	24	28	185
28 years mean	1.2	1.0	0.7	0.5	0.2	0.1	0.0	0.2	0.4	0.5	0.9	1.0	6.7

TABLE 5D

NUMBER OF DAYS AND HOURS WITH GUSTS OF 39 MPH OR MORE AT PRESTWICK AIRPORT
(10 years from 1960 to 1969)

<u>Year</u>		<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
1960	Days	6	9	5	6	3	1	0	0	3	3	7	10	53
	Hours	31	38	24	42	22	8	0	0	5	3	39	54	266
1961	Days	11	11	7	0	3	3	4	6	4	8	7	5	69
	Hours	55	47	14	0	15	3	25	9	24	65	38	22	317
1962	Days	15	13	3	4	5	7	0	6	5	6	3	10	77
	Hours	120	104	11	21	45	42	0	22	28	47	6	57	503
1963	Days	2	4	7	6	6	1	1	1	5	8	10	5	56
	Hours	25	32	39	29	16	1	1	1	28	28	55	20	275
1964	Days	5	5	7	2	6	0	5	1	2	4	8	10	55
	Hours	39	23	55	5	20	0	26	1	8	9	52	66	304
1965	Days	10	3	15	8	2	4	0	1	0	4	9	10	66
	Hours	68	27	74	34	3	20	0	5	0	39	82	48	400
1966	Days	12	10	13	11	9	3	1	2	6	3	13	10	93
	Hours	84	66	88	71	42	15	2	10	33	4	87	99	601
1967	Days	7	15	23	7	6	2	0	0	3	13	6	8	90
	Hours	30	102	171	28	17	7	0	0	15	81	27	26	504
1968	Days	11	2	13	4	1	0	0	0	4	7	8	6	56
	Hours	61	14	86	13	2	0	0	0	7	43	25	22	273
1969	Days	4	6	4	4	3	1	1	0	7	9	12	2	53
	Hours	27	26	8	35	5	3	1	0	41	38	74	8	266
10 year means	Days	8.3	7.8	9.7	5.2	4.4	2.2	1.2	1.7	3.9	6.5	8.3	7.6	66.8
	Hours	54.0	47.9	57.0	27.8	18.7	9.9	5.5	4.8	18.9	35.7	48.5	42.2	370.9

TABLE 5E

NUMBER OF DAYS AND HOURS WITH GUSTS OF 55 MPH OR MORE AT PRESTWICK AIRPORT
(10 years from 1960 to 1969)

<u>Year</u>		<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
1960	Days	0	0	0	1	0	0	0	0	0	0	1	0	2
	Hours	0	0	0	2	0	0	0	0	0	0	7	0	9
1961	Days	2	2	0	0	0	0	0	0	1	4	1	1	11
	Hours	9	5	0	0	0	0	0	0	9	10	1	4	38
1962	Days	7	5	0	0	1	1	0	0	1	2	0	4	21
	Hours	22	29	0	0	3	5	0	0	1	2	0	15	77
1963	Days	1	1	0	0	0	0	0	0	1	0	3	1	7
	Hours	6	1	0	0	0	0	0	0	2	0	5	1	15
1964	Days	0	1	2	0	2	0	0	0	0	0	0	1	6
	Hours	0	1	3	0	2	0	0	0	0	0	0	2	8
1965	Days	3	1	1	1	0	0	0	0	0	0	3	2	11
	Hours	11	4	9	3	0	0	0	0	0	0	12	2	41
1966	Days	3	1	4	1	2	1	0	1	0	0	3	4	20
	Hours	8	1	11	2	10	2	0	1	0	0	26	16	77
1967	Days	0	3	7	0	0	0	0	0	0	1	0	0	11
	Hours	0	12	12	0	0	0	0	0	0	3	0	0	27
1968	Days	4	0	3	0	0	0	0	0	0	0	0	0	7
	Hours	19	0	33	0	0	0	0	0	0	0	0	0	52
1969	Days	1	0	0	2	0	0	0	0	2	1	2	0	8
	Hours	2	0	0	3	0	0	0	0	2	1	2	0	10
10-year means	Days	2.1	1.4	1.7	0.5	0.5	0.2	0.0	0.1	0.5	0.8	1.3	1.3	10.4
	Hours	7.7	5.3	6.8	1.0	1.5	0.7	0.0	0.1	1.4	1.6	5.3	4.0	35.4

TABLE 5F

DIRECTIONS FROM WHICH HIGH GUSTS OF WIND BLOW AT THE METEOROLOGICAL OFFICE AT
PRESTWICK AIRPORT
(27 YEARS FROM 1943 TO 1969)

Speed of Gusts	Direction of Gusts measured in Degrees from True North												Total
	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	
21 to 30 mph				1									1
31 to 40 mph		1		1	1	1	7	7	5	4	11	1	39
41 to 50 mph	2		4	5	3	4	11	7	11	19	11	5	82
51 to 60 mph			2	4	4	4	8	21	17	28	22	5	115
61 to 70 mph				1	2	2	2	4	11	12	19	1	54
71 to 80 mph							3	2	4	7	7	1	24
81 to 90 mph									1	4	1	2	8
91 to 100 mph													0
101 to 110 mph										1			1
Total	2	1	6	12	10	11	31	41	49	75	71	15	324
% Total	<1	<1	2	4	3	3	10	13	15	23	22	5	100%

Notes

1. The data used to calculate the above frequencies were the highest gusts (direction and speed) recorded at Prestwick Airport in each month during the 27 years from 1943 to 1969 ie 27 years x 12 months = 324 highest monthly gusts.
2. The absolute highest gust recorded at Prestwick Airport during the 27 years from 1943 to 1969 was 104 mph from direction 260 degrees on 15 January 1968.

TABLE 5G

NUMBER OF DAYS ON WHICH THE HOURLY MEAN WIND SPEED REACHED 25 MPH OR MORE IN
AT LEAST ONE HOUR BETWEEN 0700 HOURS AND 1700 HOURS GREENWICH MEAN TIME
(0800 AND 1800 HOURS BRITISH STANDARD TIME) AT
PRESTWICK AIRPORT - 10 YEARS FROM 1960 TO 1969

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
<u>Number of Days</u>													
1960	4	3	5	2	2	1	1	0	0	2	3	3	26
1961	3	5	3	0	1	0	4	3	1	7	2	3	32
1962	10	7	0	4	2	3	0	4	1	2	2	7	42
1963	2	3	3	4	4	2	0	1	4	2	7	1	33
1964	2	3	5	1	4	0	3	1	1	0	5	2	27
1965	7	2	8	4	0	2	0	1	0	3	6	3	36
1966	6	8	7	10	4	2	2	2	3	1	5	8	58
1967	4	8	14	2	1	1	0	0	2	5	3	3	43
1968	6	1	3	2	1	0	0	0	0	4	3	1	21
1969	3	4	3	2	3	1	0	0	2	1	5	1	25
10-year mean	4.7	4.4	5.1	3.1	2.2	1.2	1.0	1.2	1.4	2.7	4.1	3.2	34.3

NUMBER OF HOURS BETWEEN 0700 HOURS AND 1700 HOURS GREENWICH MEAN TIME
(0800 AND 1800 HOURS BRITISH STANDARD TIME) WITH HOURLY MEAN SPEEDS
OF 25 MPH OR MORE AT PRESTWICK AIRPORT
(10 YEARS FROM 1960 TO 1969)

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
<u>Number of Hours</u>													
1960	19	7	21	15	17	5	8	0	0	6	11	19	128
1961	16	10	5	0	9	0	10	3	8	33	7	9	110
1962	48	35	0	12	19	9	0	7	6	15	3	23	177
1963	9	13	14	17	9	2	0	1	16	9	16	3	109
1964	9	7	29	1	14	0	6	2	3	0	22	11	104
1965	25	11	40	7	0	5	0	1	0	14	37	12	152
1966	36	25	26	54	15	9	3	8	12	1	33	48	270
1967	9	42	50	10	1	2	0	0	8	19	6	8	155
1968	23	5	17	4	4	0	0	0	0	8	12	1	74
1969	12	17	6	16	7	2	0	0	9	3	19	4	95
10-year mean	20.6	17.2	20.8	13.6	9.5	3.4	2.7	2.2	6.2	10.8	16.6	13.8	137.4
10-year mean expressed as percentage of total working time	%	%	%	%	%	%	%	%	%	%	%	%	%
	7	6	7	5	3	1	1	1	2	3	6	4	4

TABLE 5H

TABLE FOR CONVERTING MILES PER HOUR TO METRES PER SECOND

(1 MILE PER HOUR = 0.44704 METRES PER SECOND)

Miles per Hour	0	1	2	3	4	5	6	7	8	9
	Metres per Second									
0	0.0	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.6	4.0
10	4.5	4.9	5.4	5.8	6.3	6.7	7.2	7.6	8.0	8.5
20	8.9	9.4	9.8	10.3	10.7	11.2	11.6	12.1	12.5	13.0
30	13.4	13.9	14.3	14.8	15.2	15.6	16.1	16.5	17.0	17.4
40	17.9	18.3	18.8	19.2	19.7	20.1	20.6	21.0	21.5	21.9
50	22.4	22.8	23.2	23.7	24.1	24.6	25.0	25.5	25.9	26.4
60	26.8	27.3	27.7	28.2	28.6	29.1	29.5	30.0	30.4	30.8
70	31.3	31.7	32.2	32.6	33.1	33.5	34.0	34.4	34.9	35.3
80	35.8	36.2	36.7	37.1	37.6	38.0	38.4	38.9	39.3	39.8
90	40.2	40.7	41.1	41.6	42.0	42.5	42.9	43.4	43.8	44.3
100	44.7	45.2	45.6	46.0	46.5	46.9	47.4	47.8	48.3	48.7
110	49.2	49.6	50.1	50.5	51.0	51.4	51.9	52.3	52.8	53.2
120	53.6	54.1	54.5	55.0	55.4	55.9	56.3	56.8	57.2	57.7
130	58.1	58.6	59.0	59.5	59.9	60.4	60.8	61.2	61.7	62.1
140	62.6	63.0	63.5	63.9	64.4	64.8	65.3	65.7	66.2	66.6
150	67.1	67.5	68.0	68.4	68.8	69.3	69.7	70.2	70.6	71.1

6. VISIBILITY

The Ayr-Kilmarnock-Irvine region of Ayrshire experiences very good visibility and its remoteness from the industrial and populous areas of Great Britain and their smoke-soiled air means that dirty smoke fogs are relatively unknown.

Except perhaps in the Kilmarnock area, there is very little industrial pollution generated locally and the region is cut off from invasions of external pollution by the high ground. For example, smoke from Glasgow has to surmount the intervening hills before reaching the region, but it does at times bring hazy conditions. Similarly, winds from a south-easterly quarter persisting for a day or more bring smoke from the industrial areas of England although these occasions are very infrequent and visibility seldom falls to below 4 miles in the resulting haze.

Sea fog sometimes forms in the Firth of Clyde when warm moist air carried by light southerly winds spreads over the area in summer. Prestwick Airport is sheltered from south winds to some extent by the Carrick Hills and the Heads of Ayr and sea fog usually disperses before it reaches the Ayr-Prestwick area. If, however, the wind veers to south-west or west, for example when a sea breeze sets in towards midday, the sea fog spreads in over the coast. Since these on-shore winds often persist for several hours, some of the longest spells of bad visibility at Prestwick Airport have been due to sea fog. In winter sea fog is rare. The stretch of coast between about Troon and Irvine is rather more open than Ayr and Prestwick Airport to the light moist south to south-west winds and the coast to the north of Troon may have a higher frequency of sea fogs than Prestwick Airport although experience of this coastal area suggests that sea fogs are by no means a common occurrence and, in general, the frequencies of fog at Prestwick Airport should give a reasonably good guide to the frequency of fog along the coast as a whole.

Observations of visibility at the Meteorological Office at Prestwick Airport are made at each hour on the hour throughout the day and night and the Airport is the only location in the region for which detailed records of visibility are available.

Wind directions associated with poor visibility at Prestwick Airport are shown in Table 6.

The numbers of days and hours with 'Fog', 'Thick Fog' and 'Dense Fog' at Prestwick Airport during the 10 years from 1960 to 1969 are given in Tables 6A and 6B. The remarkably low incidence of fog at Prestwick Airport is immediately noticeable from the figures in these Tables which include all forms of fog, whatever the cause.

Hourly frequencies of visibilities less than 1,100 yards and 220 yards at Prestwick Airport are given in Tables 6C and 6D.

Records are available from Prestwick Airport and the co-operating weather stations at Auchincruive (about 4 miles east-north-east of Ayr) and Kilmarnock of the number of mornings per year on which the visibility at 0900 hours GMT was less than 1,100 yards. The mean number of mornings per year (over the 10 years from 1960 to 1969) at these three locations with visibility less than 1,100 yards is given below:

Prestwick Airport	=	1.1	mornings	per	year
Auchincruive	=	1.7	"	"	"
Kilmarnock	=	10.1	"	"	"

The higher frequency of poor visibilities at Kilmarnock is almost certainly due to the fact that Kilmarnock has a much higher frequency of radiation fogs than Prestwick Airport and Auchincruive and a contributory cause may be a higher output of domestic and industrial smoke from this most thickly populated part of the region. Perhaps it should be explained that radiation fog is a common type of fog which forms overland on nights characterized by light winds, clear skies and moist air in the lower levels which is cooled to below its dew point by contact with the cold ground.

It is also interesting to compare the mean of 1.1 mornings per year with fog at Prestwick Airport during the 10 years from 1960 to 1969 with the mean number of mornings with fog over the same period of 10 years at other major airports in Scotland and England:-

Prestwick Airport	=	1.1	mornings	per	year
*Glasgow Airport	=	18.1	"	"	"
Edinburgh Airport	=	9.8	"	"	"
Aberdeen Airport	=	8.1	"	"	"
London Airport	=	15.3	"	"	"
Birmingham Airport	=	25.4	"	"	"
Manchester Airport	=	15.3	"	"	"

*The mean of 18.1 mornings per year quoted above for Glasgow Airport is based on observations of visibility made at Glasgow (Renfrew) Airport during the period from January 1960 to April 1966 and at Glasgow (Abbotsinch) Airport during the period from May 1966 to December 1969.

TABLE 6

WIND DIRECTIONS ASSOCIATED WITH POOR VISIBILITIES AT PRESTWICK AIRPORT

Total number of hours during the 10 years from 1960 to 1969 with visibilities less than 440 yards, 1,100 yards and 2,200 yards in the Winter half-year from October to March and in the summer half-year from April to September distributed according to the associated hourly wind directions.*

Wind Direction	Winter Half-Year October to March			Summer Half-Year April to September		
	Total Number of Hours with Visibility Less than 440 yards	Total Number of Hours with Visibility Less than 1100 yards	Total Number of Hours with Visibility Less than 2200 yards	Total Number of Hours with Visibility Less than 440 yards	Total Number of Hours with Visibility Less than 1100 yards	Total Number of Hours with Visibility Less than 2200 yards
(degrees)	(hours)	(hours)	(hours)	(hours)	(hours)	(hours)
350-010	0	3	11	0	0	1
020-040	2	9	43	0	1	15
050-070	5	12	42	1	4	9
080-100	17	26	59	3	5	13
110-130	8	21	71	0	3	12
140-160	2	5	32	4	8	14
170-190	0	4	21	0	0	6
200-220	0	3	13	0	2	13
230-250	3	6	25	5	13	40
260-280	0	2	13	0	3	11
290-310	0	1	11	0	0	4
320-340	0	1	3	0	0	0
Calm	56	121	321	8	27	75
Total	93	214	665	21	66	213

*Calculated from observations of visibility and measurements of associated surface wind direction made at each hour on the hour throughout the 10 years from 1960 to 1969.

TABLE 6A

NUMBER OF DAYS WITH "FOG", "THICK FOG" AND "DENSE FOG" AT ANY TIME OF DAY*
AT PRESTWICK AIRPORT
10 YEARS FROM 1960 TO 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Days with "Fog" - Visibility less than 1,100 yards</u>													
1960	0	5	0	0	0	1	0	0	0	1	1	2	10
1961	0	1	1	1	0	0	0	0	1	0	3	3	10
1962	2	1	2	0	1	0	0	0	2	2	0	0	10
1963	0	0	3	2	0	2	1	2	0	0	0	0	10
1964	0	0	0	0	0	1	2	1	1	1	2	0	8
1965	2	4	1	0	1	3	0	0	1	2	0	0	14
1966	1	0	0	0	0	0	0	1	1	1	0	0	4
1967	1	0	0	2	0	1	0	0	1	0	3	0	8
1968	4	0	0	0	1	0	0	1	1	2	0	1	10
1969	2	0	0	0	4	0	0	1	1	1	0	5	14
10-year mean	1.2	1.1	0.7	0.5	0.7	0.8	0.3	0.6	0.9	1.0	0.9	1.1	9.8
<u>Number of Days with "Thick Fog" - Visibility less than 220 yards</u>													
1960	0	2	0	0	0	0	0	0	0	1	1	0	4
1961	0	1	0	0	0	0	0	0	0	0	1	0	2
1962	2	0	0	0	0	0	0	0	0	0	0	0	2
1963	0	0	0	1	0	0	0	0	0	0	0	0	1
1964	0	0	0	0	0	0	1	0	0	0	0	0	1
1965	2	1	0	0	0	0	0	0	1	0	0	0	4
1966	0	0	0	0	0	0	0	0	0	1	0	0	1
1967	0	0	0	0	0	0	0	0	0	0	1	0	1
1968	1	0	0	0	0	0	0	1	0	0	0	1	3
1969	1	0	0	0	0	0	0	0	1	0	0	1	3
10-year mean	0.6	0.4	0.0	0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.2	2.2
<u>Number of Days with "Dense Fog" - Visibility less than 55 yards</u>													
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	1	0	0	0	0	0	0	0	0	1
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	1	0	0	1
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	1	1
10-year mean	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3

*Calculated from hourly observations of visibility made at each hour on the hour

TABLE 6B

NUMBER OF HOURS* WITH "FOG", "THICK FOG" AND "DENSE FOG"
AT PRESTWICK AIRPORT
10 YEARS FROM 1960 TO 1969

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
<u>Number of Hours with "Fog" - Visibility less than 1,100 yards</u>													
1960	0	21	0	0	0	2	0	0	0	2	1	3	29
1961	0	3	1	2	0	0	0	0	2	0	13	11	32
1962	6	1	5	0	5	0	0	0	2	3	0	0	22
1963	0	0	5	4	0	2	2	2	0	0	0	0	15
1964	0	0	0	0	0	1	5	1	1	1	2	0	11
1965	29	9	2	0	2	4	0	0	2	3	0	0	51
1966	4	0	0	0	0	0	0	5	1	5	0	0	15
1967	4	0	0	4	0	1	0	0	2	0	23	0	34
1968	20	0	0	0	2	0	0	1	1	6	0	3	33
1969	7	0	0	0	8	0	0	1	1	2	0	19	38
10-year mean	7.0	3.4	1.3	1.0	1.7	1.0	0.7	1.0	1.2	2.2	3.9	3.6	28.0
<u>Number of Hours with "Thick Fog" - Visibility less than 220 yards</u>													
1960	0	6	0	0	0	0	0	0	0	1	1	0	8
1961	0	1	0	0	0	0	0	0	0	0	2	0	3
1962	3	0	0	0	0	0	0	0	0	0	0	0	3
1963	0	0	0	1	0	0	0	0	0	0	0	0	1
1964	0	0	0	0	0	0	1	0	0	0	0	0	1
1965	15	1	0	0	0	0	0	0	1	0	0	0	17
1966	0	0	0	0	0	0	0	0	0	2	0	0	2
1967	0	0	0	0	0	0	0	0	0	0	6	0	6
1968	2	0	0	0	0	0	0	1	0	0	0	2	5
1969	1	0	0	0	0	0	0	0	1	0	0	6	8
10-year mean	2.1	0.8	0.0	0.1	0.0	0.0	0.1	0.1	0.2	0.3	0.9	0.8	5.4
<u>Number of Hours with "Dense Fog" - Visibility less than 55 yards</u>													
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	1	0	0	0	0	0	0	0	0	1
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	1	0	0	1
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	1	1
10-year mean	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3

*Calculated from hourly observations of visibility made at each hour on the hour

TABLE 6C

HOURLY FREQUENCIES OF VISIBILITIES LESS THAN 1,100 YARDS AT PRESTWICK AIRPORT

Total number of occasions during the 10 years from 1960 to 1969
on which visibility was less than 1,100 yards
at each hour of the day

Hour - GMT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
00h midnight	4	0	0	0	1	0	1	0	1	0	1	3	11
01h	1	1	0	1	1	0	1	0	2	1	1	2	11
02h	3	1	0	0	1	1	1	0	2	1	0	2	12
03h	2	1	1	1	1	2	1	1	0	1	1	1	13
04h	2	3	0	1	1	2	0	1	1	2	3	1	17
05h	1	2	0	3	2	2	0	3	0	0	3	1	17
06h	1	2	2	1	3	1	0	2	1	2	4	2	21
07h	1	2	1	0	0	0	0	2	1	2	4	0	13
08h	2	3	1	0	1	0	0	0	0	1	4	0	12
09h	2	3	0	0	0	0	0	1	0	2	2	2	12
10h	4	2	0	0	0	1	0	0	1	2	3	1	14
11h	3	4	0	0	0	0	0	0	1	0	1	1	10
12h noon	3	1	0	1	0	0	0	0	0	0	1	2	8
13h	4	1	1	1	0	0	0	0	1	0	2	2	12
14h	3	1	1	0	0	0	0	0	0	0	0	1	6
15h	3	1	1	0	0	0	0	0	0	0	0	2	7
16h	3	1	0	0	0	0	0	0	0	0	0	2	6
17h	5	1	2	1	0	0	0	0	0	0	1	2	12
18h	3	1	1	0	0	0	0	0	0	1	1	1	8
19h	4	0	1	0	1	0	0	0	0	2	1	1	10
20h	5	0	1	0	1	0	0	0	0	0	1	1	9
21h	4	1	0	0	1	0	0	0	0	2	1	2	11
22h	4	1	0	0	1	0	2	0	0	2	1	1	12
23h	3	1	0	0	2	1	1	0	1	1	3	3	16
Total	70	34	13	10	17	10	7	10	12	22	39	36	280

Percentage Amount of Total Time in Each Month with
Visibilities less than 1,100 yards at
PRESTWICK AIRPORT

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
%	%	%	%	%	%	%	%	%	%	%	%	%
0.94	0.50	0.17	0.14	0.23	0.14	0.09	0.13	0.17	0.29	0.54	0.48	0.32

Note: The above data have been calculated from hourly observations of visibility made at each hour on the hour during the 10 years from 1960 to 1969.

TABLE 6D

HOURLY FREQUENCIES OF VISIBILITY LESS THAN 220 YARDS AT PRESTWICK AIRPORT

Total number of occasions during the 10 years from 1960 to 1969
on which visibility was less than 220 yards
at each hour of the day

Hour - GMT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
00h midnight	1	0	0	0	0	0	0	0	0	0	0	0	1
01h	1	0	0	1	0	0	1	0	1	0	0	1	5
02h	1	0	0	0	0	0	0	0	1	0	0	1	3
03h	0	0	0	0	0	0	0	0	0	1	0	1	2
04h	0	0	0	0	0	0	0	0	0	0	0	0	0
05h	0	1	0	0	0	0	0	0	0	0	0	0	1
06h	1	0	0	0	0	0	0	0	0	0	1	0	2
07h	1	1	0	0	0	0	0	1	0	0	1	0	4
08h	1	1	0	0	0	0	0	0	0	0	0	0	2
09h	0	1	0	0	0	0	0	0	0	1	1	0	3
10h	2	1	0	0	0	0	0	0	0	1	1	0	5
11h	1	1	0	0	0	0	0	0	0	0	1	0	3
12h noon	1	1	0	0	0	0	0	0	0	0	1	0	3
13h	1	0	0	0	0	0	0	0	0	0	0	0	1
14h	1	0	0	0	0	0	0	0	0	0	0	0	1
15h	1	0	0	0	0	0	0	0	0	0	0	0	1
16h	1	0	0	0	0	0	0	0	0	0	0	1	2
17h	1	0	0	0	0	0	0	0	0	0	0	1	2
18h	1	0	0	0	0	0	0	0	0	0	0	0	1
19h	1	0	0	0	0	0	0	0	0	0	0	0	1
20h	1	0	0	0	0	0	0	0	0	0	0	0	1
21h	1	0	0	0	0	0	0	0	0	0	0	1	2
22h	1	1	0	0	0	0	0	0	0	0	1	1	4
23h	1	0	0	0	0	0	0	0	0	0	2	1	4
Total	21	8	0	1	0	0	1	1	2	3	9	8	54

Percentage Amount of Total Time in Each Month with
Visibilities less than 220 yards at
PRESTWICK AIRPORT

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
%	%	%	%	%	%	%	%	%	%	%	%	%
0.28	0.11	0.00	0.01	0.00	0.00	0.01	0.01	0.03	0.04	0.12	0.11	0.06

Note: The above data have been calculated from hourly observations of visibility made at each hour on the hour during the 10 years from 1960 to 1969.

7. SNOW

The Ayr-Kilmarnock-Irvine region of Ayrshire is well shielded by high ground from the main snow-bearing north to north-easterly winds and is the most snow-free region of Scotland with the exception of the coastal strips of the counties bordering the Solway Firth and low-lying places in the Western Isles.

In common with the remainder of the British Isles, the incidence of snow falling and the persistence of snow cover in the region are two of the most variable of all the meteorological elements. For example, in the winter of 1960/61 there were only 8 days on which snow or sleet fell at Prestwick Airport compared with 34 days of snowfall during the following winter of 1961/62. The Meteorological Office at Prestwick Airport is the only weather station in the region keeping a 24 hour watch on the weather and is the only location for which complete records of snow falling at any time of the day or night are available. However, except perhaps for the tops of the low hills in the region, the Prestwick Airport figures of days with snow falling should give a good guide to the frequency of snowfall in the region as a whole.

The Numbers of Days with Snow or Sleet Falling at Prestwick Airport are given in Table 7.

The Numbers of Mornings with Snow Lying on the Ground at Prestwick Airport, Auchincruive and Kilmarnock are given in Table 7A. A morning with snow lying on the ground is defined as one on which more than half the ground surrounding the observing point is covered with snow at 0900 hours GMT and the reader will notice from Table 7B that in most winters, there are very few mornings when this condition is fulfilled. Indeed, the area under consideration enjoys a remarkable freedom from snow cover and it is generally true to say that, on the average, the region has fewer days with snow-lying per winter than places in the Midlands, East and South-east of England. However, perhaps it should be emphasised at this point that there is a marked increase in the frequency of snow cover over the high ground immediately to the north, east and south of the region and the roads traversing the high ground are sometimes seriously affected by considerable falls of snow or drifted snow - the high moorland stretch of the A.77 road between Kilmarnock and Glasgow being a notable example.

The Number of Mornings per Winter with Snow Lying at Specified Depths are given in Table 7B.

TABLE 7

NUMBER OF DAYS WITH SNOW OR SLEET FALLING AT PRESTWICK AIRPORT
(28 years from 1942 to 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
1942	9	8	6	0	0	0	0	0	0	0	0	3	26
1943	6	1	1	0	1	0	0	0	0	0	1	0	10
1944	0	4	4	1	0	0	0	0	0	0	0	7	16
1945	9	1	0	2	1	0	0	0	0	0	0	0	13
1946	6	1	6	0	0	0	0	0	0	0	0	0	13
1947	7	18	9	0	0	0	0	0	0	0	5	4	43
1948	9	5	0	0	1	0	0	0	0	0	0	2	17
1949	4	2	3	1	0	0	0	0	0	0	0	5	15
1950	5	6	0	1	0	0	0	0	0	0	1	11	24
1951	7	13	6	5	0	0	0	0	0	0	1	3	35
1952	16	6	3	0	0	0	0	0	0	0	7	8	40
1953	1	5	0	0	0	0	0	0	0	0	0	0	6
1954	5	11	5	0	0	0	0	0	0	0	1	3	25
1955	10	11	5	0	1	0	0	0	0	0	0	5	32
1956	9	10	2	0	1	0	0	0	0	0	1	2	25
1957	4	2	0	0	0	0	0	0	0	0	0	3	9
1958	7	7	11	2	0	0	0	0	0	0	0	2	29
1959	9	0	0	0	0	0	0	0	0	0	4	1	14
1960	6	12	1	0	0	0	0	0	0	0	0	2	21
1961	2	2	0	2	0	0	0	0	0	0	0	8	14
1962	4	11	7	4	0	0	0	0	0	0	3	6	35
1963	10	10	0	1	0	0	0	0	0	0	2	5	28
1964	2	4	7	0	0	0	0	0	0	0	3	4	20
1965	8	2	7	1	0	0	0	0	0	0	10	2	30
1966	3	8	4	4	0	0	0	0	0	0	3	6	28
1967	3	6	4	5	2	0	0	0	0	1	3	4	28
1968	9	14	7	3	0	0	0	0	0	1	1	5	40
1969	7	8	8	0	0	0	0	0	0	0	10	3	36
28 years total	177	188	106	32	7	0	0	0	0	2	56	104	672
28 years mean	6.3	6.7	3.8	1.1	0.3	0.0	0.0	0.0	0.0	0.1	2.0	3.7	24.0

TABLE 7A

NUMBER OF MORNINGS WITH SNOW LYING ON THE GROUND AT 0900 HOURS GMT (10 AM BRITISH STANDARD TIME) COVERING HALF OR MORE OF THE GROUND SURROUNDING THE METEOROLOGICAL OFFICE AT PRESTWICK AIRPORT - ALTITUDE 30 FEET (20 YEARS FROM 1950 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
1950	0	0	0	0	0	0	0	0	0	0	0	5	5
1951	4	2	1	0	0	0	0	0	0	0	0	0	7
1952	5	0	0	0	0	0	0	0	0	0	2	2	9
1953	0	4	0	0	0	0	0	0	0	0	0	0	4
1954	5	2	0	0	0	0	0	0	0	0	0	0	7
1955	6	3	1	0	0	0	0	0	0	0	0	0	10
1956	0	3	0	0	0	0	0	0	0	0	0	0	3
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	7	5	0	0	0	0	0	0	0	0	0	0	12
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	3	0	0	0	0	0	0	0	0	0	0	3
1961	0	0	0	0	0	0	0	0	0	0	0	2	2
1962	2	1	0	0	0	0	0	0	0	0	0	3	6
1963	0	3	0	0	0	0	0	0	0	0	0	0	3
1964	0	1	0	0	0	0	0	0	0	0	0	1	2
1965	0	0	4	0	0	0	0	0	0	0	2	0	6
1966	0	2	0	0	0	0	0	0	0	0	1	0	3
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	1	0	1	0	0	0	0	0	0	0	0	2
1969	2	1	0	0	0	0	0	0	0	0	3	1	7
20 year mean	1.5	1.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	4.5

Note: From the winter of 1962/63 onwards, observations were made from a new site on the Airport at an altitude of 51 feet.

TABLE 7A (Contd)

NUMBER OF MORNINGS WITH SNOW LYING ON THE GROUND AT 0900 HOURS GMT (10 AM BRITISH STANDARD TIME) COVERING HALF OR MORE OF THE GROUND SURROUNDING THE WEATHER STATION AT AUCHINCUIVE NEAR AYR - ALTITUDE 14.7 FEET (20 YEARS FROM 1950 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
1950	1	0	0	0	0	0	0	0	0	0	0	6	7
1951	2	3	2	0	0	0	0	0	0	0	0	0	7
1952	7	0	0	0	0	0	0	0	0	0	3	3	13
1953	0	1	0	0	0	0	0	0	0	0	0	0	1
1954	4	3	1	0	0	0	0	0	0	0	0	0	8
1955	7	6	1	0	0	0	0	0	0	0	0	1	15
1956	2	3	0	0	0	0	0	0	0	0	0	0	5
1957	3	1	0	0	0	0	0	0	0	0	0	0	4
1958	6	7	3	0	0	0	0	0	0	0	0	0	16
1959	1	0	0	0	0	0	0	0	0	0	0	0	1
1960	1	5	0	0	0	0	0	0	0	0	0	0	6
1961	0	0	0	0	0	0	0	0	0	0	0	2	2
1962	2	1	0	0	0	0	0	0	0	0	0	3	6
1963	1	2	0	0	0	0	0	0	0	0	0	0	3
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	5	0	0	0	0	0	0	0	1	0	6
1966	0	2	0	0	0	0	0	0	0	0	2	0	4
1967	3	0	0	0	0	0	0	0	0	0	0	0	3
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	1	3	0	0	0	0	0	0	0	0	3	0	7
20 year mean	2.1	1.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7	5.8

TABLE 7A (Contd)

NUMBER OF MORNINGS WITH SNOW LYING ON THE GROUND AT 0900 HOURS GMT (10 AM BRITISH
STANDARD TIME) COVERING HALF OR MORE OF THE GROUND SURROUNDING THE
WEATHER STATION AT KILMARNOCK - ALTITUDE 115 FEET
(20 YEARS FROM 1950 TO 1969)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Total
1950	1	0	0	0	0	0	0	0	0	0	0	11	12
1951	2	1	0	0	0	0	0	0	0	0	0	3	6
1952	21	2	0	0	0	0	0	0	0	0	0	1	24
1953	0	2	0	0	0	0	0	0	0	0	0	0	2
1954	4	1	1	0	0	0	0	0	0	0	0	0	6
1955	8	2	1	0	0	0	0	0	0	0	0	2	13
1956	3	6	0	0	0	0	0	0	0	0	0	0	9
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	6	7	0	0	0	0	0	0	0	0	0	0	13
1959	3	0	0	0	0	0	0	0	0	0	0	0	3
1960	2	10	0	0	0	0	0	0	0	0	0	0	12
1961	0	1	0	0	0	0	0	0	0	0	0	0	1
1962	4	3	0	0	0	0	0	0	0	0	1	2	10
1963	0	9	0	0	0	0	0	0	0	0	0	0	9
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	1	0	4	0	0	0	0	0	0	0	4	3	12
1966	0	2	0	0	0	0	0	0	0	0	1	1	4
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	1	0	0	0	0	0	0	0	0	0	4	5
1969	2	4	0	0	0	0	0	0	0	0	5	1	12
20 year mean	2.9	2.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.4	7.6

TABLE 7B

NUMBER OF MORNINGS WITH SNOW LYING AT 0900 HOURS GMT AT
DEPTHS BETWEEN SPECIFIED LIMITS AT PRESTWICK AIRPORT AND
AUCHINCRAIVE NEAR AYR

Depth - Inches	0-1	2	3-4	5-6	7-8	9-12	Total
PRESTWICK AIRPORT - Altitude 51 feet				Maximum Depth = 7 inches			
Winter of:							
1956-57							0
1957-58	4	4	3	1			12
1958-59		1		1	1		3
1959-60							0
1960-61		1					5
1961-62	4						6
1962-63	6						1
1963-64	1	4					5
1964-65	1	1	1				4
1965-66	2						1
1966-67	1						2
1967-68	2	1					3
1968-69	2	1	1				10
1969-70	8						
Total	31	13	5	2	1	0	52
% Total	59	25	10	4	2	0	100%
AUCHINCRAIVE near AYR - Altitude 147 feet				Maximum Depth = 7 inches			
Winter of:							
1956-57	4						4
1957-58	10	3	2	1			16
1958-59	1						1
1959-60	2		1	2	1		6
1960-61							0
1961-62	4	1					5
1962-63	5	1					6
1963-64							0
1964-65	3	2					5
1965-66	2		1				3
1966-67	5						5
1967-68							0
1968-69	4						4
1969-70	8	2					10
Total	48	9	4	3	1	0	65
% Total	74	14	6	5	1	0	100%

Note: Systematic records of snow depths at Kilmarnock are not available for a sufficient number of winters.

8. THUNDERSTORMS

In common with all the other major centres of population in Scotland, the Ayr-Kilmarnock-Irvine region of Ayrshire has a low incidence of thunderstorms and damaging hail. On the long term average the region has about 8 days per year with thunderstorms, which is similar to the frequency in Edinburgh and Glasgow, but much less than in London and other places in central and southern England which have two to three times as many thunderstorms.

Thunderstorms have occurred in the region under consideration in all months of the year but thunderstorms occur more often in the months of May to August than in the remaining months of the year. As in most other parts of Scotland, thunderstorms during the summer months are rarely accompanied by hail.

The Number of Days with Thunderstorms at Prestwick Airport are given in Table 8. Records of thunderstorms from Auchincruive and Kilmarnock show a slightly lower frequency of thunderstorms than Prestwick Airport. However, this is almost certainly due to the fact that only a very limited watch is kept on the weather at Auchincruive and Kilmarnock in contrast to the continuous watch kept at the Airport and it is considered that the Airport frequencies in Table 8 should give a good guide to the region as a whole.

Although no records of thunderstorms are available for the high ground encircling the region on the landward side, thunderstorm clouds can often be seen during the summer months building up over the high ground and there is little doubt that the frequency of thunderstorms over the high ground is higher, perhaps considerably higher than in the region itself.

TABLE 8

NUMBER OF DAYS WITH THUNDERSTORMS AT PRESTWICK AIRPORT
(20 years 1950 to 1969)

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
1950	0	1	0	0	0	0	1	1	0	2	0	0	5
1951	0	0	0	0	1	0	1	0	1	1	0	0	4
1952	1	0	0	0	0	0	4	1	0	0	1	0	7
1953	0	0	0	0	1	2	1	2	0	0	1	0	7
1954	0	0	0	0	1	2	1	1	2	0	1	0	8
1955	0	0	0	1	0	0	0	1	0	0	0	1	3
1956	0	0	1	0	0	1	1	1	1	2	1	1	9
1957	0	0	0	0	1	0	3	2	1	0	0	0	7
1958	0	0	0	0	0	0	2	1	2	0	0	0	5
1959	0	0	0	1	4	1	1	1	0	1	0	0	9
1960	0	0	0	0	3	2	1	4	0	0	0	3	13
1961	0	0	0	0	1	0	0	0	2	1	0	1	5
1962	2	1	0	0	1	0	0	1	1	3	0	1	10
1963	0	0	0	0	1	2	3	1	1	0	0	0	8
1964	0	0	0	0	1	2	0	2	1	0	1	1	8
1965	3	0	0	3	1	0	1	3	0	0	0	1	12
1966	0	0	2	1	0	3	0	1	0	1	0	1	9
1967	0	0	1	0	2	0	1	1	0	2	0	0	7
1968	0	0	1	0	1	1	2	1	1	1	1	0	9
1969	0	0	0	1	2	2	0	1	0	0	3	0	9
20-year mean	0.3	0.1	0.3	0.3	1.0	0.9	1.1	1.3	0.7	0.7	0.5	0.5	7.7

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