DATA PROCESSING GUIDANCE AND RESTRICTIONS FOR THE USE OF WEATHER DATA FOR HVAC-CALCULATIONS. REFERENCE YEAR.

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MAY 1977

REPORT NO 68

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May 1977.

Translation of
EDB-teknisk vejledning samt restriktioner for anvendelsen af Vejrdata for VVS-tekniske beregninger, Referenceår (from the Danish Building Research Institute, Report 89, 26.3.1974)

Data processing guidance and restrictions for the use of Weather data for HVAC-calculations Reference Year.

The Reference Year is available as 80-columns card pictures on magnetic tape according to IBM-standard. Normally it is delivered from the Danish Building Research Institute with the density of 1600 bpi, 9 tracks and without labels. Alternatively the magnetic tape may be arranged to be delivered with 9 tracks, 800 bpi, or with 7 tracks, 800 bpi or 556 bpi.

If none of these specifications are applicable to the user's computer the Reference Year can be delivered on punched cards. However, the data set requires about 9000 cards, so this possibility should only be used if no other solution can be found.

In order to secure the greatest possible compatibility the data of the Reference Year are stored in an external form (numerical characters) with eventually preceding minus sign. Decimal points are left out.

Logical record length is 80 columns (bytes), corresponding to the meteorological data for one hour. Block length is fixed, 1920 bytes, corresponding to 24 hours.

The data set begins with a start block of 24 records, 80 bytes each, which are written out in full in annex 1. It contains names, blocks and check sums of some of the data of the Reference Year and may be used for controlling that no

other data have by mistake been written on top of the Reference Year. This ought to be controlled frequently. The check sums of for example the air temperature is the sum of the hourly values of the whole year without decimal point, thus the air temperature multiplied by 10.
Likewise the data set is ended with a block of 24 records, 80 bytes each. The block contains a description of the single datas' disposition in one record. The ending block is written out in annex 1.
The format of a logical record, data for one hour, is shown in annex 2. It should be noticed that:

1. missing data are indicated with blanks in the Reference Year, therefore a FORTRAN programme with the indicated format codes will read the value 0. No data are missing in the following parameters: air temperature, dew point temperature, relative humidity, enthalpy, maximum and minimum temperature, the three radiation parameters, wind direction and wind velocity.

2. snow height, layer of snow and the condition of the surface of the ground can be read in 2 variables with a general format for the field, for instance 2F4.0. After dividing by 100 of the last value the quotient is converted to an integer, whereby you have the layer of snow. The value of the condition of the ground is obtained by multiplying the division rest by 100.

3. precipitation less than 0.1 mm is indicated with -1.0.

4. 900 mbar has to be added to the recorded value of the air pressure.

5. for weather symbols is used format 6A1. They are not present in all hours. If the weather symbols are not needed it is easier to pass them, for instance by using the format 6X.

6. the data which do not contain an implicit decimal point may just as well be read as INTEGERS if this fits the application better.

It is the intention that the Reference Year documented in the SBI-Report 89 should be the common basis of outdoor climate for various HVAC-calculations (in Denmark). To ensure that calculations based on the Reference Year really will be comparable the following restrictions for using the weather data of the Reference Year have been defined:

1. The Reference Year should not be copied or handed over to other institutions or companies. The Danish Building Research Institute itself wants to make the distribution in order to be able to distribute later supplementary material. (The Thermal Insulation Laboratory has a special permission).

2. Nothing must be modified or added to the data of the Reference Year. On the other hand, abstracts of the Reference Year are allowed to be made, i.e. to omit all data of a certain sort, e.g. the wind velocity or the weather symbols or the like. When selecting data from the Reference Year for calculations, where only certain values are used, one ought to document, when referring to "Reference Year, SBI-report 89", how these single values are selected.

3. The designation "Reference Year, SBI-report 89" should only be used for datamaterial or indicated in connection with calculations to which the Reference Year is used, if the above-mentioned conditions are observed,

4. Apart from the above mentioned conditions, the Danish Reference Year may be used without limitations.

First block, translation.

Weather data for The HVAC-technical calculations
Reference Year.
SBI-report 89.
Statens Byggeforskningsinstitut
Danish Building Research Institute

Block length 24 records. Record length 80.
Block 1 Header.
Block 2 - 366 365 days of 24 hours.
Block 367 Data description.
Check sums (of integer values read from tape):
dbt 696611, Dew point temp. 450693,
Enthalpy 2018044, Global radiation 1024070,
Diffuse rad. 480255, Normal rad. 1203029,
Wind direction 156285, Wind speed 84127,
Hours 8760.

Last block (no. 367), translation

Data description

col.	1 - 4	Dry bulb temperature, deg C.
"	5 - 8	Dew point temperature, deg. C.
"	9 - 11	Rel. humidity, %
"	12 - 13	Entalphy, kJ/kg
"	16 - 23	7 a.m. and 7 p.m. min. and max. temp.
	13	1 p.m., snow cover, snowthickness, state of ground surface
	24	12 p.m., hours with clear sun
col.	24 - 26	Global radiation W/m^2
"	27 - 29	Diffuse radiation W/m^2
"	30 - 32	Normal radiation W/m^2
"	33 - 35	Precipitation mm
"	36	Total cloud cover, in okta's

col.	37 - 38	Wind direction 0-36
"	39 - 40	Wind speed, knots.
"	41 - 42	Visibility
"	43 - 44	Weather
"	45	Weather since last major observation
"	46	Cloud cover, low or medium altitudes, in oktas.
"	47	Cloud types, low altitude.
"	48	Lowest clouds, altitude.
"	49	Cloud types, medium altitudes.
"	50	Cloud types, high altitudes.
"	51	Lowest altitude of cloud cover, $\geq$ 5/8
"	52	Types of clouds.
"	53 - 54	Altitude or vertical visibility.
"	55	Lowest altitude of cloud cover, $\leq$ 4/8
"	56	Types of clouds.
"	58 - 59	Altitude.
"	59 - 62	Barometric pressure, mbar - 900.
"	63	Character of change in pressure.
"	64 - 69	Weather symbols, alphabetical.
"	70 - 72	Indicator for added or interpolated data.
"	73 - 74	Not used.
"	75 - 80	Month, day, hour (1 - 12, 1 - 31, 01 - 24).

5.4.1977 HL

Data in Danish "Test Reference Year"

Observation		Interval or observation time	Synop-code	Location in punched cards	Fortran FORMAT-code
Dry bulb temperature	°C	h	TT	1-4	F4.1
Dew point temperature	°C	h	$T_d T_d$	5-8	F4.1
Relative humidity	%	h		9-11	F3.0
Entalphi, calc.	kJ/kg	h		12-15	F4.1
Minimum temperature Maximum temperature	°C	7 and 19 CET	$T_n T_n$, $T_x T_x$	16-23	2F4.1
Snowcover and-thickness, State of ground surface		13 CET	S_s, E	" "	F4.0,2F2.0
Hours with clear sun	h	24 CET		" "	F4.0, 4X
Global radiation (on horizontal)	W/m^2	h		24-26	F3.0
Diffuse radiation, calc.	W/m^2	h		27-29	F3.0
Normal radiation, calc.	W/m^2	h		30-32	F3.0
Precipitation	mm	1,7,13 and 19 CET	RR	33-35	F3.1
Cloud cover		h	N	36	F1.0
Wind direction		h	dd	37-38	F2.0
Wind speed	knots	h	ff	39-40	F2.0
Visibility		h	VV	41-42	F2.0
Weather		h	ww	43-44	F2.0
Weather since last major observation		h	W	45	F1.0
Cloud cover in low or medium altitude		3h	N_h	46	"
Cloud types, low altitude		3h	C_L	47	"
Altitude of lowest clouds		3h	h	48	"
Cloud types, medium altitude		3h	C_M	49	"
Cloud types, high altitude		3h	C_H	50	"
Cloud cover, lowest clouds ≥ 5/8 of sky		h	N_s	51	"
Cloud type herein		h	C	52	"
Altitude hereof or vertical visibility		h	$h_s h_s$	53-54	F2.0
Cloud cover, lowest clouds ≤ 4/8 of sky		h	N_s	55	F1.0
Cloud type herein		h	C	56	F1.0
Altitude		h	$h_s h_s$	57-58	F2.0
Barometrie pressure	mbar	3h	PPP	59-62	F4.1
Character of change in pressure		3h	a	63	F1.0
Weather symbols (not always present)		h		64-69	6A1
Month, day, hour		h		75-80	3I2
Indicator for artificial data				70-72	I3

1. Weather parameters in the "Reference Year". "h" indicates hourly presence, "3h" every third hour (the "synoptic" hours 1, 4, 7, 10 --- CET). CET means Central European Time ~ GMT + 1. All temperatures are given with 0.1°C, pressure with 0.1 mbar, precipitation 0.1 mm, and radiation with 1 W/m^2 and wind speed with 1 knot as least significant digit