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AIR CONDITIONING IN PRIVATE HOUSES

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AIR CONDITIONING IN PRIVATE HOUSES

By K. G. SMITH

Proper temperature is the most noticeable factor contributing to comfort in an artificially heated house. Another factor which is now recognized as being of great importance both for health and comfort is the humidity, or moisture in the air. Air everywhere contains moisture in varying amounts, depending on the locality and temperature. Air near large bodies of water is more moist than the air of the inland areas. Warm air has a much greater capacity for moisture than cold air and usually contains more moisture than cold air, though it may feel drier.

It is not the actual amount of moisture in the air at any time which causes it to feel dry or moist, it is the amount of moisture present compared to what the air could hold at that temperature. This relative amount of moisture is expressed as a percentage, 30%, 40%, 50%, as the case may be. Air containing all the moisture it can hold is said to be saturated, or to have a relative humidity of 100%.

The common impression is that heating air dries it out. This statement is not true, although it expresses the effect of artificial heat. What actually happens is that the capacity of the air for moisture is greatly increased by heating and hence the relative humidity is diminished and the air feels drier and is drier, not because it contains less moisture, but because it could contain so much more.

It is not definitely known as yet just what conditions of temperature and humidity are best for health and it is quite possible that a varying temperature and humidity approximating outdoor conditions is best. Good authorities state that a humidity of 40% and a temperature of 68° is about right. If the temperature falls, the humidity should be increased, and vice versa. The reason for this is that if the body is surrounded by very dry air, evaporation takes place rapidly thus producing a cooling effect. The person so situated "feels cool" or "does not

feel the heat.'' On the other hand if the body is surrounded by moist air, evaporation takes place slowly, the cooling effect is much less pronounced, and the person so situated feels warm, though the actual air temperature may be lower. A combination of moisture and heat produces the oppressive ''muggy'' condition of the atmosphere preceding a summer rainstorm.

It is rather difficult to keep the humidity of the air in a dwelling house up to 40%, but it should not be less than 30%. As a matter of fact, the humidity in many houses in the winter time is below 20%, which is as dry as desert air. This very dry air has a bad effect on the membranes of the throat and nose and predisposes persons breathing it to throat and lung troubles. Everyone has noted how it shrinks up wood and dries glue, causing furniture to drop to pieces.

SUPPLYING MOISTURE TO THE AIR

A considerable amount of moisture is required in cold weather to keep the humidity up, more than is generally realized. If the temperature is zero and the outdoor humidity at the average of 70%, it requires about one gallon of water every twelve hours to properly moisten the air required by one person when it is warmed to a room temperature of 70°. The moisture must be supplied to the air in the form of vapor or steam. To evaporate water with sufficient rapidity to supply this moisture requires either a large surface, a high temperature, or both. Pans which hang on the back of a radiator do not have a large surface and are not highly heated, hence they are not very effective. A small tube attached direct to the radiator and discharging steam into the room is also used. This supplies vapor faster than the pans, providing there is steam pressure. Some persons dislike the slight noise and the odor from escaping steam. One of the most effective pans made has a water space in the middle and a wick to give a large evaporating surface. If kept full of warm water, these pans evaporate a surprising amount. No one has yet devised a satisfactory method of moistening the air in houses heated by hot water, the radiator temperature is too low to evaporate rapidly from pans, and no steam is available. Pans may be made somewhat more effectively by placing sheets of blotting paper or asbestos

beneath them and punching a needle hole in the bottom of the pan. The paper absorbs the water and increases the evaporating surface. The difficulty with this arrangement is to control the flow of water. Another method is to make a wick of blotting paper or asbestos and let one end rest in the water pan and the other hang down over the radiator. Water will be carried upward a short distance and over the edge of the pan as oil is lifted by a lamp wick.

In a warm air furnace the problem is simple. The heater is in the basement and all that is necessary is a pan of water properly placed upon it inside the jacket. The water pan in any furnace should be of good size and set well up into the the warm air space so as to make evaporation as rapid as possible. A small water pan set low down in the furnace has practically no effect. Many modern furnaces are fitted with satisfactory humidifiers automatically controlled. A furnace with a small or unsatisfactory pan may be fitted up with a home-made pan in the following manner: Cut a hole in the front of the jacket with a pair of tin snips and insert a good sized shallow pan directly above the heating surface. Make an inlet and overflow connection, close the hole and cover with asbestos. No solder should be used on the pan or connections and it should be heavy enough to resist rusting and corrosion. A heavy cast iron skilet is quite satisfactory. The pan should be supported so that the bottom is not less than 1½ inches above the top of the furnace or it will impede the air circulation and cause the furnace to burn through at this point. Keep the pan full or nearly full of water all the time.

Another method, devised by Professor W. H. Meeker of Iowa State College, which does not involve so much cutting is the following: Cut a slot 4 inches long and ½ inch wide, with the long dimension horizontal, near the top of the furnace jacket and directly over the water pan. Fold a piece of wire netting 8 inches wide and 4 feet long through the center and insert between the two layers a sheet of asbestos folded the same way. Sew up the open side of the netting. Slip this wick through the slot in the casing and draw the lower end into the water pan at the bottom. Open the upper end as a funnel and directly above it install a small pet cock connected to the water supply.

Allow water to drip upon the wick fast enough to supply the necessary moisture. In mild weather less is needed than in cold weather.

To accurately measure the actual amount of moisture in the air at any time, a hygrometer is necessary. A rough practical test is the frosting of an exposed window. If such a window does not frost up freely in cold weather, the air in the room is too dry. Another way to test more accurately is use an ordinary dairy thermometer for the purpose. Take the average room temperature as near as possible on the thermometer, then tie a small piece of porous muslin around the bulb and saturate it with water. Whirl the thermometer around on the end of a string about twelve inches long. The temperature will fall rapidly and the drier the air is the more rapidly it will fall. Note the wet bulb temperature when it becomes stationary, which will be in two or three minutes. Subtract this temperature from the average room temperature. The difference indicates a certain percentage of humidity which must be read from a table. Such a table is given on page 7 of this bulletin. To illustrate its use: Suppose the room temperature is 68°. Make use of a wet bulb thermometer as indicated in the preceding paragraph. If the wet bulb temperature becomes stationary at 54° the difference between the two is 14°. To use the table run across the horizontal headings to the column headed 14. Run down this column until in line with the air temperature marked 68. The figure in the 14 column at this point is 39. This means that the air has a relative humidity of 39%. If the difference is greater, the humidity is less than 39%. At ordinary room tempeatures of 68° and 70° the difference should not be more than 12° to 16°. A greater difference than this indicates that the air is too dry.

Air Temp.	Depression or Difference Between Dry and Wet-bulb Thermometers.																						
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
60	83	78	73	68	63	58	53	49	44	40	35	31	27	22	17	11	9	1	1	Relative Humidity			
61	84	78	74	68	64	59	54	50	45	40	36	32	22	24	18	14	10	3	2				
62	84	79	74	69	64	60	55	50	46	41	37	33	29	25	20	16	12	5	4	1			
63	84	79	74	70	65	60	56	51	47	42	38	34	30	26	21	19	13	7	5	2			
64	84	79	75	70	66	61	56	52	48	43	39	35	31	27	22	20	15	9	7	4	1		
65	85	80	75	70	66	62	57	53	48	44	40	36	32	28	24	21	16	11	8	5	3		
66	85	80	76	71	66	62	58	53	49	45	41	37	33	29	25	22	17	12	10	7	4		
67	85	80	76	71	67	62	58	54	50	46	42	38	34	30	26	23	18	14	11	8	6	1	
68	85	81	76	72	69	63	59	55	51	47	43	39	35	31	27	24	20	15	13	10	7	3	
69	85	81	77	72	68	64	59	55	51	47	44	40	36	32	28	25	21	16	14	11	9	4	
70	86	81	77	72	69	64	60	56	52	48	44	40	37	33	29	26	22	17	15	12	10	6	3
71	86	82	77	73	69	64	60	56	53	49	45	41	38	34	30	27	23	19	16	13	12	7	4
72	86	82	78	73	69	65	61	57	53	49	46	42	39	35	31	28	24	20	18	15	13	9	5
73	86	82	78	73	70	65	61	58	54	50	46	43	40	36	32	29	25	21	19	16	4	10	6
74	86	82	78	74	70	66	62	58	54	51	47	44	40	37	33	29	26	23	20	17	15	11	7
75	86	82	78	74	70	66	62	59	55	51	48	44	41	38	34	30	27	24	21	18	16	12	8

Relative Humidity Table

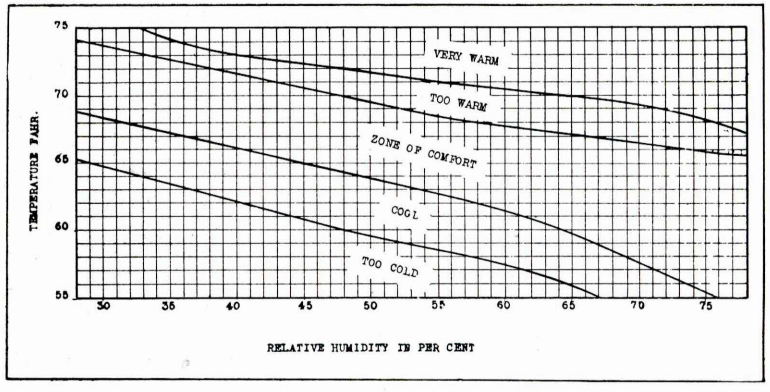

Diagram Showing Relation of Temperature and Humidity to Bodily Comfort

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