

PURPOSE

This section provides information on the relationships between air temperature, substrate temperature, relative humidity and dew point and their relevance to successful painting.

INTRODUCTION

In general, paints must be applied to dry surfaces and should not be subjected to condensing humidity until sufficiently cured. To allow a safety margin, normally the substrate temperature must be at least 3°C above the dew point. The dew point is the temperature of a given air-water vapour mixture at which condensation starts, since at that temperature the maximum water content of the air is reached.

Paint is usually applied at temperatures between about 10°C and 35°C. Epoxies are especially sensitive to ambient temperatures, some however will cure at sub-zero temperatures.

Factors such as wind and humidity can also be a constraint. For example, solvent-borne inorganic zinc silicate coatings require a certain minimum humidity of 60% to cure. Most coatings however, prefer dry conditions and have an upper limit of 85% relative humidity. Coatings also generally require movement of air across the surface to aid in the evaporation of solvents or water, this will ensure proper film formation.

DEW POINT DETERMINATION

Using dry bulb and wet bulb temperatures.

Example: A sling psychrometer was used to obtain a wet bulb reading of 17°C and a dry bulb reading of 21°C. The substrate temperature is 19°C. Is the substrate greater or equal to 3°C above the dew point?

$$\begin{aligned} \text{Depression of wet bulb temperature} &= \text{dry bulb temperature minus wet bulb temperature} \\ &= 21 - 17 = 4^\circ\text{C} \end{aligned}$$

From the chart, given a dry bulb temperature of 21°C and a depression of wet bulb temperature of 4°C the dew point is 15°C.

The substrate temperature is 19°C and the dew point is 15°C (i.e. 4°C higher) therefore conditions are acceptable to paint.

DEW POINT DETERMINATION

Using dry bulb temperature and relative humidity.

Example: The ambient temperature is 16°C, at 71% relative humidity and the substrate temperature is 13°C. Are the conditions suitable for painting?

From the chart given a dry bulb temperature of 16°C and a relative humidity of 71% the dew point is therefore 11°C

Given the substrate temperature of 13°C a dew point of 11°C, painting should not proceed as the substrate temperature is only 2°C above the dew point.

CHART FOR DETERMINATION OF RELATIVE HUMIDITY & DEW POINT

Dry Bulb Temp	Depression of Wet Bulb Temperature (Dry Bulb Temperature minus Wet Bulb Temperature)																			
	1°C		2°C		3°C		4°C		5°C		6°C		7°C		8°C		9°C		10°C	
	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP	%RH	DP
5°C	86	3	72	0	58	-	45	-												
6°C	86	4	73	1	60	-	47	-												
7°C	87	5	74	3	61	0	49	-												
8°C	87	6	75	4	63	1	51	-												
9°C	88	7	76	5	64	3	53	0												
10°C	88	8	77	6	65	4	54	1	43	-										
11°C	88	9	77	7	66	5	56	3	46	-	36	-								
12°C	89	10	78	8	68	6	57	4	48	1	37	-								
13°C	89	11	79	9	69	7	59	5	49	3	39	0								
14°C	90	12	79	10	70	8	60	6	51	4	41	1	32	-						
15°C	90	13	80	12	71	10	62	8	52	5	43	3	35	0						
16°C	90	14	81	13	71	11	62	9	54	7	46	4	38	2						
17°C	90	15	81	14	72	12	64	10	55	8	47	6	39	3	32	0				
18°C	91	16	82	15	73	13	65	11	56	9	49	7	41	5	34	2				
19°C	91	17	82	16	74	14	65	12	58	10	50	8	43	6	35	3	28	0		
20°C	91	18	83	17	74	15	66	13	59	12	51	10	44	7	37	5	30	2		
21°C	91	19	83	18	75	16	67	15	60	13	52	11	46	9	39	6	32	4		
22°C	92	21	83	19	76	17	68	16	61	14	54	12	47	10	40	8	33	6		
23°C	92	22	84	20	76	19	69	17	62	15	55	13	48	11	42	9	36	7		
24°C	92	23	84	21	77	20	69	18	62	16	56	15	49	13	43	11	37	10		
25°C	92	24	84	22	77	21	70	19	63	17	57	16	50	14	44	12	38	10	33	8
26°C	92	25	85	23	78	22	71	20	64	19	58	17	51	15	46	13	40	11	35	9
27°C	92	26	85	24	78	23	71	21	65	20	59	18	52	16	47	15	41	13	36	11
28°C	93	27	85	25	79	24	72	22	65	21	59	19	53	18	48	16	42	14	37	12
29°C	93	28	86	26	79	25	72	23	66	22	60	20	55	19	49	17	43	15	38	13
30°C	93	29	86	27	79	26	73	25	67	23	61	22	56	20	50	18	44	17	39	15
31°C	93	30	86	28	80	27	73	26	67	24	62	23	57	21	51	20	45	18	41	16
32°C	93	31	86	29	80	28	74	27	68	25	62	24	57	22	52	21	46	19	42	17
33°C	93	32	87	30	80	29	74	28	69	26	63	25	58	23	52	22	47	20	43	19
34°C	93	33	87	31	81	30	75	29	69	27	64	26	58	25	53	23	48	21	44	20
35°C	93	34	87	32	81	31	75	30	70	30	65	28	60	27	55	24	50	23	45	21
36°C	94	35	87	33	81	32	76	31	70	30	65	28	60	27	55	25	51	24	46	22
37°C	94	36	87	35	82	33	76	32	70	31	65	29	60	28	55	27	51	25	46	23
38°C	94	37	88	36	82	34	76	33	71	32	66	30	61	29	56	28	51	26	47	25
39°C	94	38	88	37	82	35	77	34	71	33	66	31	61	30	57	29	52	27	48	26
40°C	94	39	88	38	82	36	77	35	72	34	67	33	62	31	57	30	53	28	48	27

DP=dew point (°C), %RH=% relative humidity



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Australia
132 101
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0800 735 551
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