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Calculation Cover Sheet

Complete only applicable items.

1. QA: L

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2. Calculation Title Cumulative Distribution Functions for the Relative Humidity Thresholds for the Onset of Carbon Steel Corrosion			
3. Document Identifier (including Revision Number) B00000000-01717-0210-00016 REV 00			4. Total Pages 9
5. Total Attachments 3		6. Attachment Numbers - Number of pages in each I - 4 , II - 8 , III - 17 3 4 RM 5/28/98	
	Print Name	Signature	Date
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10. Remarks Uses TBV-311. For TSPA-VA Rev. 00 and Rev. 01. EDITORIAL CORRECTION TO BLOCK 6 RM 5/28/98 JHL 5/28/98			
Revision History			
11. Revision No.	12. Date Approved	13. Description of Revision	
REV. 00A	04/02/98	Check Copy	
REV. 00		Final Copy	

Title: Cumulative Distribution Functions for the Relative Humidity Thresholds for the Onset of Carbon Steel Corrosion

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Title: Cumulative Distribution Functions for the Relative Humidity Thresholds for the Onset of Carbon Steel Corrosion
File: *J:\WAPDEG STORAGE\QA\TSPA-VA00\RH-00.DOC*

Document Identifier: B000000000-01717-0200-00016 REV 00

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Draft Date: May 13, 1998

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1.0 Purpose

The purpose of this calculation is to process the cumulative distribution functions (CDFs) characterizing the relative humidity (RH) thresholds for the onset of carbon steel corrosion provided by expert elicitation and minimize the set of values to 200 points for use in WAPDEG.

2.0 Method

The method of calculation is based on interpolation of expert-elicited CDF distributions provided by Geomatrix, Inc. (TBV-311) resulting from the Waste Package Degradation Expert Elicitation Project (WPDEEP) to obtain a CDF consisting of 200 points. In this procedure, two CDFs are created from two CDFs supplied by Geomatrix, Inc. The first CDF, AQRH.cdf, relates to the RH value at which the corrosion mode changes from humid air to aqueous and the second CDF, HARH.cdf, relates to the RH threshold for the onset of humid air corrosion.

The following is an outline of the method:

- (1) The CDFs resulting from the expert elicitations are read.
- (2) 200 cumulative probabilities evenly distributed between 0 to 1 are generated and,
- (3) Relative Humidity values in the supplied CDFs are linearly interpolated to provide the desired relative humidity value to pair to the 200 points found in (2).

For this file to be used as a CDF table in WAPDEG, the first line must contain the number of lines in the CDF file and the maximum CDF probability must be one.

3.0 Assumptions

- 3.1 Temperature values were interpolated linearly between values. The basis for this assumption is that values are well approximated with little loss of information.

4.0 Use of Computer Software

4.1. Software Approved for QA Work

4.2. Software Routines

The software used was Mathcad 7 Professional. The type of computer used was a Dell PowerEdge 2200 with a Pentium II - 266 MHz chip, 128 MB of RAM, in a Windows 95 operating system.

Mathcad 7 is an appropriate application because it provides a wide variety of mathematical functions that are necessary for the calculations used to generate a CDF. Also, the program provides ease of display of equations and rationale employed in the analytical model, which eliminates the need to attach extra explanation and justification for the specific methodology.

One particular routine used within Mathcad is the spreadsheet program Microsoft Excel 97. Microsoft Excel 97 is only an inlay within Mathcad 7 and is used for data input. The spreadsheet is not used to perform any calculations.

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5.0 Calculation Inputs

5.1. Description

See Attachment I.

5.2. Procedure

See Attachment I.

6.0 Results

AQRH.cdf

200	2				89.29853270751498	0.2412060301507538
	80	0			89.34443451280501	0.2462311557788945
83.66675506146201	0.005025125628140704				89.38991946206902	0.2512562814070352
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HARH.cdf

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71.79488814806072 0.7035175879396985
71.8731122913662 0.7085427135678392
71.9529200924228 0.7135678391959799
72.03427927278668 0.7185929648241206
72.11712849955408 0.7236180904522613
72.20161508376937 0.7286432160804021
72.28757356957523 0.7336683417085427
72.37494591016093 0.7386934673366834
72.46367838371637 0.7437185929648241
72.55370174198028 0.7487437185929649
72.64481660636773 0.7537688442211056
72.73686922083364 0.7587939698492463
72.82969866034432 0.7638190954773869
72.92311867256665 0.7688442211055276
73.01693200656521 0.7738693467336684
73.11096376630515 0.7788944723618091
73.20501854825191 0.7839195979899498
73.29891501564418 0.7889447236180904
73.39251996981449 0.7939698492462312
73.48570480163684 0.7989949748743719
73.57837836466614 0.8040201005025126
73.67047150620019 0.8090452261306533
73.76192466840649 0.8140703517587939
73.85270805676009 0.8190954773869347
73.94283759321702 0.8241206030150754

74.03234285365279 0.8291457286432161
74.12126993170503 0.8341708542713568
74.20964619225261 0.8391959798994975
74.29755496820543 0.8442211055276382
74.38509579512603 0.8492462311557789
74.47236737789926 0.8542713567839196
74.55944641073296 0.8592964824120604
74.64647116470664 0.864321608040201
74.73356143344219 0.8693467336683417
74.82084972265444 0.8743718592964824
74.90849767833754 0.8793969849246232
74.99676742910302 0.8844221105527639
75.08629135225245 0.8894472361809045
75.17671325147477 0.8944723618090452
75.26813180118089 0.8994974874371859
75.36084114114136 0.9045226130653267
75.45510966224867 0.9095477386934674
75.55122533155559 0.914572864321608
75.64954475392733 0.9195979899497487
75.75048513550691 0.9246231155778895
75.85450705145749 0.9296482412060302
75.96216157993192 0.9346733668341709
76.07426146823237 0.9396984924623115
76.19159785676192 0.9447236180904522
76.31503542216561 0.949748743718593
76.44641930718677 0.9547738693467337
76.58718976417025 0.9597989949748744
76.7399967333228 0.964824120603015
76.90838120127413 0.9698492462311558
77.09808676006054 0.9748743718592965
77.31758480545544 0.9798994974874372
77.58370472498515 0.9849246231155779
77.9303274953494 0.9899497487437187
78.45849324208153 0.9949748743718593
91.01900000000001 1

Title: Cumulative Distribution Functions for the Relative Humidity Thresholds for the Onset of Carbon Steel Corrosion

Document Identifier: B000000000-01717-0210-00016 REV 00 (*May 13, 1998 (11:58AM)*)

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7.0 References

N/A.

8.0 Attachments

ATTACHMENT	TITLE	NUMBER OF PAGES
I	Relative Humidity (RH) CDF Calculations	3
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III	C-HAC-RH.SCD	17

Relative Humidity (RH) CDF Calculations

The following equations calculate the AQRH.cdf file used in WAPDEG

The following table of values is from Geomatrix Consultants, Inc. (TBV-311) and applies to the RH threshold for the transition from humid-air to aqueous corrosion of the outer Corrosion Allowance Material (CAM).

RH (%)	CDF value
8.00000000E+01	0.00000000E+00
8.00500000E+01	5.37379400E-07
8.01000000E+01	1.12213600E-06
8.01500000E+01	1.81983000E-06
8.02000000E+01	2.69602000E-06
8.02500000E+01	3.81640200E-06
8.03000000E+01	5.24753600E-06
8.03500000E+01	7.05546400E-06
8.04000000E+01	9.30754200E-06
8.04500000E+01	1.20707400E-05

rows(Mi) = 401

cols(Mi) = 2

This is an Excel inlay showing only a partial listing of the 401 values. The entire table is shown in Attachment II.

$$N := 199 \quad ii := 0..N \quad p_{ii} := ii \cdot \frac{1}{N}$$

The vector of cumulative probabilities, p, contains N+1 = 200 equally spaced probabilities, i.e. 0, 1/199, 2/199, . . . , 1.

$$k(p, M, r) := \begin{cases} \min(M) & \text{if } r < 0 \\ \max(M) & \text{if } r > 1 \\ \text{linterp}(p, M, r) & \text{otherwise} \end{cases}$$

k is a function that returns an RH corresponding to the percentile, r, through linear interpolation. M is the vector of Temperatures, and p is the percentile vector.

The output matrix, Mo, has the RH values (interpolated from the input matrix, Mi) in the first column and the cumulative probabilities, from the vector p, in the second column.

$$Mo_{ii,0} := k(Mi^{<1>}, Mi^{<0>}, p_{ii}) \quad Mo_{ii,1} := p_{ii}$$

$$\text{WRITEPRN}(\text{"AQRH.cdf"}) := (\text{rows}(Mo) \text{ cols}(Mo))$$

$$\text{APPENDPRN}(\text{"AQRH.cdf"}) := Mo$$

Below is a graph showing the similarity between the input and output of this procedure:

The following equations calculate the HARH.cdf file used in WAPDEG

The following table of values is from Geomatrix Consultants, Inc. and applies to the RH threshold for the initiation of humid air corrosion of the outer Corrosion Allowance Material (CAM).

RH (%)	CDF value
0.000000000E+00	0.000000000E+00
5.001044000E-02	1.097980000E-07
1.000209000E-01	4.386198000E-07
1.500313000E-01	9.857603000E-07
2.000418000E-01	1.750493000E-06
2.500522000E-01	2.732130000E-06
3.000626000E-01	3.929949000E-06
3.500731000E-01	5.343230000E-06
4.000835000E-01	6.971273000E-06
4.500940000E-01	8.813391000E-06

rows(Mi) = 1821

cols(Mi) = 2

This is an Excel inlay showing only a partial listing of the 1821 values. The entire table is shown in Attachment III.

$$Mo_{ii,0} := k(Mi^{<1>}, Mi^{<0>}, p_{ii})$$

WRITEPRN("HARH.cdf") := (rows(Mo) cols(Mo))

APPENDPRN("HARH.cdf") := Mo

Below is a graph showing the similarity between the input and output of this procedure:

RH threshold for Aqueous corrosion of CAM

401
0.8000000E+02 0.0000000E+00
0.8005000E+02 0.5373794E-06
0.8010000E+02 0.1122136E-05
0.8015000E+02 0.1819830E-05
0.8020000E+02 0.2696020E-05
0.8025000E+02 0.3816402E-05
0.8030000E+02 0.5247536E-05
0.8035000E+02 0.7055464E-05
0.8040000E+02 0.9307542E-05
0.8045000E+02 0.1207074E-04
0.8050000E+02 0.1541190E-04
0.8055000E+02 0.1940004E-04
0.8060001E+02 0.2410307E-04
0.8065000E+02 0.2958863E-04
0.8070000E+02 0.3592785E-04
0.8075000E+02 0.4318818E-04
0.8080000E+02 0.5144224E-04
0.8085001E+02 0.6075972E-04
0.8090000E+02 0.7121000E-04
0.8095000E+02 0.8286849E-04
0.8100001E+02 0.9580595E-04
0.8105000E+02 0.1100913E-03
0.8110001E+02 0.1258091E-03
0.8115001E+02 0.1430255E-03
0.8120000E+02 0.1618152E-03
0.8125001E+02 0.1822600E-03
0.8130000E+02 0.2044308E-03
0.8135001E+02 0.2284125E-03
0.8140001E+02 0.2542806E-03
0.8145000E+02 0.2821107E-03
0.8150001E+02 0.3119925E-03
0.8155001E+02 0.3440035E-03
0.8160001E+02 0.3782219E-03
0.8165001E+02 0.4147427E-03
0.8170000E+02 0.4536402E-03
0.8175001E+02 0.4950132E-03
0.8180001E+02 0.5389445E-03
0.8185001E+02 0.5855167E-03
0.8190001E+02 0.6348350E-03
0.8195001E+02 0.6869858E-03
0.8200001E+02 0.7420547E-03
0.8205001E+02 0.8001547E-03
0.8210001E+02 0.8613758E-03
0.8215001E+02 0.9258073E-03
0.8220001E+02 0.9935715E-03
0.8225001E+02 0.1064750E-02
0.8230001E+02 0.1139472E-02
0.8235001E+02 0.1217834E-02
0.8240001E+02 0.1299932E-02
0.8245001E+02 0.1385906E-02
0.8250002E+02 0.1475857E-02
0.8255001E+02 0.1569888E-02
0.8260001E+02 0.1668148E-02
0.8265002E+02 0.1770745E-02
0.8270001E+02 0.1877788E-02
0.8275002E+02 0.1989437E-02
0.8280001E+02 0.2105788E-02
0.8285001E+02 0.2227013E-02
0.8290002E+02 0.2353230E-02
0.8295001E+02 0.2484558E-02
0.8300002E+02 0.2621183E-02
0.8305002E+02 0.2763230E-02
0.8310001E+02 0.2910827E-02
0.8315002E+02 0.3064172E-02
0.8320001E+02 0.3223376E-02
0.8325002E+02 0.3388648E-02
0.8330002E+02 0.3560132E-02
0.8335001E+02 0.3737966E-02
0.8340002E+02 0.3922378E-02
0.8345002E+02 0.4113516E-02
0.8350002E+02 0.4311532E-02
0.8355002E+02 0.4516673E-02
0.8360002E+02 0.4729094E-02
0.8365002E+02 0.4948957E-02
0.8370002E+02 0.5176529E-02
0.8375002E+02 0.5411939E-02
0.8380002E+02 0.5655468E-02
0.8385002E+02 0.5907290E-02
0.8390002E+02 0.6167583E-02
0.8395002E+02 0.6436646E-02
0.8400002E+02 0.6714667E-02
0.8405002E+02 0.7001827E-02
0.8410002E+02 0.7298453E-02
0.8415002E+02 0.7604691E-02
0.8420002E+02 0.7920883E-02
0.8425002E+02 0.8247227E-02
0.8430002E+02 0.8583924E-02
0.8435002E+02 0.8931143E-02
0.8440002E+02 0.9289687E-02
0.8445002E+02 0.9659179E-02
0.8450002E+02 0.1004020E-01
0.8455003E+02 0.1043296E-01
0.8460002E+02 0.1083769E-01
0.8465002E+02 0.1125480E-01
0.8470002E+02 0.1168446E-01
0.8475002E+02 0.1212708E-01
0.8480003E+02 0.1258290E-01
0.8485002E+02 0.1305216E-01
0.8490002E+02 0.1353531E-01
0.8495003E+02 0.1403258E-01
0.8500002E+02 0.1454429E-01
0.8505003E+02 0.1510365E-01
0.8510002E+02 0.1568847E-01
0.8515002E+02 0.1629308E-01
0.8520003E+02 0.1693047E-01
0.8525002E+02 0.1759508E-01
0.8530003E+02 0.1828766E-01
0.8535003E+02 0.1900879E-01
0.8540002E+02 0.1975890E-01

0.8545003E+02 0.2053191E-01
0.8550003E+02 0.2134209E-01
0.8555003E+02 0.2218360E-01
0.8560003E+02 0.2305727E-01
0.8565002E+02 0.2396343E-01
0.8570003E+02 0.2490317E-01
0.8575003E+02 0.2586952E-01
0.8580003E+02 0.2687792E-01
0.8585003E+02 0.2792297E-01
0.8590003E+02 0.2900474E-01
0.8595003E+02 0.3012405E-01
0.8600003E+02 0.3127361E-01
0.8605003E+02 0.3247031E-01
0.8610003E+02 0.3370808E-01
0.8615003E+02 0.3498739E-01
0.8620003E+02 0.3630900E-01
0.8625003E+02 0.3767424E-01
0.8630003E+02 0.3907449E-01
0.8635003E+02 0.4052828E-01
0.8640003E+02 0.4202998E-01
0.8645004E+02 0.4357937E-01
0.8650003E+02 0.4517736E-01
0.8655003E+02 0.4682541E-01
0.8660003E+02 0.4851370E-01
0.8665003E+02 0.5026348E-01
0.8670004E+02 0.5206788E-01
0.8675003E+02 0.5392671E-01
0.8680003E+02 0.5584138E-01
0.8685004E+02 0.5780145E-01
0.8690003E+02 0.5982877E-01
0.8695004E+02 0.6191735E-01
0.8700004E+02 0.6406646E-01
0.8705003E+02 0.6627689E-01
0.8710004E+02 0.6855021E-01
0.8715003E+02 0.7087489E-01
0.8720004E+02 0.7327484E-01
0.8725004E+02 0.7574335E-01
0.8730003E+02 0.7827897E-01
0.8735004E+02 0.8088313E-01
0.8740004E+02 0.8354375E-01
0.8745004E+02 0.8628469E-01
0.8750004E+02 0.8910053E-01
0.8755003E+02 0.9198863E-01
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0.8785004E+02 0.1108732E+00
0.8790004E+02 0.1142929E+00
0.8795004E+02 0.1177918E+00
0.8800004E+02 0.1213531E+00
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0.8840004E+02 0.1528286E+00
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0.8935004E+02 0.2468449E+00
0.8940005E+02 0.2523769E+00
0.8945005E+02 0.2579203E+00
0.8950005E+02 0.2635139E+00
0.8955005E+02 0.2691369E+00
0.8960004E+02 0.2747523E+00
0.8965005E+02 0.2804092E+00
0.8970005E+02 0.2860521E+00
0.8975005E+02 0.2917271E+00
0.8980005E+02 0.2974073E+00
0.8985005E+02 0.3030579E+00
0.8990005E+02 0.3087281E+00
0.8995005E+02 0.3143609E+00
0.9000005E+02 0.3200052E+00
0.9005005E+02 0.3256471E+00
0.9010005E+02 0.3312693E+00
0.9015005E+02 0.3368689E+00
0.9020005E+02 0.3424461E+00
0.9025005E+02 0.3479969E+00
0.9030005E+02 0.3535198E+00
0.9035005E+02 0.3590139E+00
0.9040005E+02 0.3644776E+00
0.9045005E+02 0.3699072E+00
0.9050005E+02 0.3753032E+00
0.9055005E+02 0.3806624E+00
0.9060005E+02 0.3859848E+00
0.9065005E+02 0.3912682E+00
0.9070005E+02 0.3965106E+00
0.9075005E+02 0.4017119E+00
0.9080006E+02 0.4068712E+00
0.9085005E+02 0.4119858E+00
0.9090005E+02 0.4170568E+00
0.9095005E+02 0.4220815E+00

0.9100005E+02	0.4270611E+00
0.9105006E+02	0.4319941E+00
0.9110005E+02	0.4368795E+00
0.9115005E+02	0.4417184E+00
0.9120006E+02	0.4465096E+00
0.9125005E+02	0.4512528E+00
0.9130006E+02	0.4559490E+00
0.9135006E+02	0.4605986E+00
0.9140005E+02	0.4652006E+00
0.9145006E+02	0.4697566E+00
0.9150005E+02	0.4742662E+00
0.9155006E+02	0.4787315E+00
0.9160006E+02	0.4831526E+00
0.9165005E+02	0.4875298E+00
0.9170006E+02	0.4918652E+00
0.9175006E+02	0.4961602E+00
0.9180006E+02	0.5004147E+00
0.9185006E+02	0.5046314E+00
0.9190005E+02	0.5088109E+00
0.9195006E+02	0.5129557E+00
0.9200006E+02	0.5170676E+00
0.9205006E+02	0.5211469E+00
0.9210006E+02	0.5251973E+00
0.9215006E+02	0.5292197E+00
0.9220006E+02	0.5332159E+00
0.9225006E+02	0.5371889E+00
0.9230006E+02	0.5411407E+00
0.9235006E+02	0.5450725E+00
0.9240006E+02	0.5489877E+00
0.9245006E+02	0.5528876E+00
0.9250006E+02	0.5567755E+00
0.9255006E+02	0.5606534E+00
0.9260006E+02	0.5645228E+00
0.9265006E+02	0.5683874E+00
0.9270007E+02	0.5722489E+00
0.9275006E+02	0.5761092E+00
0.9280006E+02	0.5799713E+00
0.9285007E+02	0.5838375E+00
0.9290006E+02	0.5877092E+00
0.9295007E+02	0.5915902E+00
0.9300006E+02	0.5954811E+00
0.9305006E+02	0.5993856E+00
0.9310007E+02	0.6033046E+00
0.9315006E+02	0.6072403E+00
0.9320007E+02	0.6111954E+00
0.9325007E+02	0.6151716E+00
0.9330006E+02	0.6191702E+00
0.9335007E+02	0.6231933E+00
0.9340006E+02	0.6272423E+00
0.9345007E+02	0.6313196E+00
0.9350007E+02	0.6354263E+00
0.9355006E+02	0.6395631E+00
0.9360007E+02	0.6437322E+00
0.9365007E+02	0.6479351E+00
0.9370007E+02	0.6521716E+00
0.9375007E+02	0.6564435E+00
0.9380007E+02	0.6607518E+00
0.9385007E+02	0.6650962E+00
0.9390007E+02	0.6694793E+00
0.9395007E+02	0.6738997E+00
0.9400007E+02	0.6783593E+00
0.9405007E+02	0.6828580E+00
0.9410007E+02	0.6873951E+00
0.9415007E+02	0.6919722E+00
0.9420007E+02	0.6965887E+00
0.9425007E+02	0.7012441E+00
0.9430007E+02	0.7059385E+00
0.9435007E+02	0.7106714E+00
0.9440007E+02	0.7154434E+00
0.9445007E+02	0.7202535E+00
0.9450007E+02	0.7251002E+00
0.9455007E+02	0.7299845E+00
0.9460007E+02	0.7349049E+00
0.9465007E+02	0.7398604E+00
0.9470007E+02	0.7448504E+00
0.9475008E+02	0.7498745E+00
0.9480007E+02	0.7549302E+00
0.9485007E+02	0.7600190E+00
0.9490007E+02	0.7651376E+00
0.9495007E+02	0.7702864E+00
0.9500008E+02	0.7754639E+00
0.9505007E+02	0.7806261E+00
0.9510007E+02	0.7858561E+00
0.9515008E+02	0.7910622E+00
0.9520007E+02	0.7962793E+00
0.9525008E+02	0.8015466E+00
0.9530007E+02	0.8067744E+00
0.9535007E+02	0.8120390E+00
0.9540008E+02	0.8172550E+00
0.9545007E+02	0.8224508E+00
0.9550008E+02	0.8276685E+00
0.9555008E+02	0.8328238E+00
0.9560007E+02	0.8379410E+00
0.9565008E+02	0.8430622E+00
0.9570008E+02	0.8481086E+00
0.9575008E+02	0.8531377E+00
0.9580008E+02	0.8580856E+00
0.9585007E+02	0.8629662E+00
0.9590008E+02	0.8678211E+00
0.9595008E+02	0.8725824E+00
0.9600008E+02	0.8772607E+00
0.9605008E+02	0.8818955E+00
0.9610008E+02	0.8864269E+00
0.9615008E+02	0.8908908E+00
0.9620008E+02	0.8952448E+00
0.9625008E+02	0.8994920E+00
0.9630008E+02	0.9036657E+00
0.9635008E+02	0.9077218E+00
0.9640008E+02	0.9116569E+00
0.9645008E+02	0.9155031E+00
0.9650008E+02	0.9192225E+00

0.9655008E+02	0.9228292E+00
0.9660008E+02	0.9263033E+00
0.9665009E+02	0.9296377E+00
0.9670008E+02	0.9328569E+00
0.9675008E+02	0.9359360E+00
0.9680008E+02	0.9388675E+00
0.9685008E+02	0.9416825E+00
0.9690009E+02	0.9443668E+00
0.9695008E+02	0.9469563E+00
0.9700008E+02	0.9494346E+00
0.9705009E+02	0.9518350E+00
0.9710008E+02	0.9541553E+00
0.9715009E+02	0.9563969E+00
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0.9750008E+02	0.9699895E+00
0.9755009E+02	0.9716486E+00
0.9760009E+02	0.9732411E+00
0.9765009E+02	0.9747685E+00
0.9770009E+02	0.9762326E+00
0.9775008E+02	0.9776350E+00
0.9780009E+02	0.9789771E+00
0.9785009E+02	0.9802607E+00
0.9790009E+02	0.9814870E+00
0.9795009E+02	0.9826577E+00
0.9800009E+02	0.9837744E+00
0.9805009E+02	0.9848385E+00
0.9810009E+02	0.9858518E+00
0.9815009E+02	0.9868158E+00
0.9820009E+02	0.9877316E+00
0.9825009E+02	0.9886013E+00
0.9830009E+02	0.9894260E+00
0.9835009E+02	0.9902074E+00
0.9840009E+02	0.9909468E+00
0.9845009E+02	0.9916456E+00
0.9850009E+02	0.9923055E+00
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0.9875009E+02	0.9950663E+00
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0.9885009E+02	0.9959442E+00
0.9890009E+02	0.9963397E+00
0.9895010E+02	0.9967079E+00
0.9900009E+02	0.9970498E+00
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0.9915009E+02	0.9979300E+00
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0.9940009E+02	0.9989766E+00
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0.9970010E+02	0.9996920E+00
0.9975010E+02	0.9997668E+00
0.9980009E+02	0.9998310E+00
0.9985010E+02	0.9998857E+00
0.9990010E+02	0.9999316E+00
0.9995010E+02	0.9999694E+00
0.1000001E+03	0.1000000E+01

RH threshold for humid air corrosion of CAM

1821
0.000000E+00 0.000000E+00
0.5001044E-01 0.1097980E-06
0.1000209E+00 0.4386198E-06
0.1500313E+00 0.9857603E-06
0.2000418E+00 0.1750493E-05
0.2500522E+00 0.2732130E-05
0.3000626E+00 0.3929949E-05
0.3500731E+00 0.5343230E-05
0.4000835E+00 0.6971273E-05
0.4500940E+00 0.8813391E-05
0.5001044E+00 0.1086883E-04
0.5501148E+00 0.1313689E-04
0.6001253E+00 0.1561690E-04
0.6501357E+00 0.1830750E-04
0.7001461E+00 0.2120919E-04
0.7501566E+00 0.2432069E-04
0.8001670E+00 0.2764124E-04
0.8501775E+00 0.3117022E-04
0.9001879E+00 0.3490686E-04
0.9501984E+00 0.3885038E-04
0.1000209E+01 0.4300020E-04
0.1050219E+01 0.4735555E-04
0.1100230E+01 0.5191565E-04
0.1150240E+01 0.5667989E-04
0.1200251E+01 0.6164759E-04
0.1250261E+01 0.6681791E-04
0.1300271E+01 0.7219028E-04
0.1350282E+01 0.7776383E-04
0.1400292E+01 0.8353795E-04
0.1450303E+01 0.8951200E-04
0.1500313E+01 0.9568511E-04
0.1550324E+01 0.1020566E-03
0.1600334E+01 0.1086259E-03
0.1650344E+01 0.1153921E-03
0.1700355E+01 0.1223547E-03
0.1750365E+01 0.1295128E-03
0.1800376E+01 0.1368654E-03
0.1850386E+01 0.1444131E-03
0.1900397E+01 0.1521532E-03
0.1950407E+01 0.1600867E-03
0.2000417E+01 0.1682121E-03
0.2050428E+01 0.1765288E-03
0.2100438E+01 0.1850362E-03
0.2150449E+01 0.1937334E-03
0.2200459E+01 0.2026199E-03
0.2250470E+01 0.2116948E-03
0.2300480E+01 0.2209575E-03
0.2350491E+01 0.2304073E-03
0.2400501E+01 0.2400436E-03
0.2450511E+01 0.2498653E-03
0.2500522E+01 0.2598719E-03
0.2550532E+01 0.2700628E-03
0.2600543E+01 0.2804374E-03
0.2650553E+01 0.2909946E-03
0.2700564E+01 0.3017338E-03
0.2750574E+01 0.3126546E-03
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0.2850595E+01 0.3350373E-03
0.2900605E+01 0.3464979E-03
0.2950616E+01 0.3581371E-03
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0.5351117E+01 0.1112854E-02
0.5401127E+01 0.1132372E-02

0.5451138E+01	0.1152032E-02
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0.6151284E+01	0.1441899E-02
0.6201294E+01	0.1463619E-02
0.6251305E+01	0.1485472E-02
0.6301315E+01	0.1507455E-02
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0.6401336E+01	0.1551811E-02
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0.6651388E+01	0.1664944E-02
0.6701399E+01	0.1687950E-02
0.6751409E+01	0.1711080E-02
0.6801420E+01	0.1734333E-02
0.6851430E+01	0.1757710E-02
0.6901441E+01	0.1781209E-02
0.6951451E+01	0.1804831E-02
0.7001462E+01	0.1828572E-02
0.7051472E+01	0.1852434E-02
0.7101482E+01	0.1876416E-02
0.7151493E+01	0.1900517E-02
0.7201503E+01	0.1924736E-02
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0.7301524E+01	0.1973525E-02
0.7351534E+01	0.1998094E-02
0.7401545E+01	0.2022778E-02
0.7451555E+01	0.2047579E-02
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0.8601795E+01	0.2647957E-02
0.8651806E+01	0.2675294E-02
0.8701817E+01	0.2702728E-02
0.8751827E+01	0.2730257E-02
0.8801837E+01	0.2757882E-02
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0.8901858E+01	0.2813417E-02
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0.9001879E+01	0.2869323E-02
0.9051889E+01	0.2897415E-02
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0.9151911E+01	0.2953871E-02
0.9201921E+01	0.2982235E-02
0.9251931E+01	0.3010686E-02
0.9301942E+01	0.3039227E-02
0.9351953E+01	0.3067855E-02
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0.9551994E+01	0.3183230E-02
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0.9702025E+01	0.3270647E-02
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0.1115233E+02	0.4150834E-02
0.1120234E+02	0.4182206E-02
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0.1130236E+02	0.4245128E-02
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0.1140238E+02	0.4308289E-02
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0.1150240E+02	0.4371680E-02
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0.1525318E+02	0.6861720E-02
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0.1555325E+02	0.7065646E-02
0.1560326E+02	0.7099634E-02
0.1565327E+02	0.7133621E-02
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0.1575329E+02	0.7201584E-02
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0.1590332E+02	0.7303498E-02
0.1595333E+02	0.7337457E-02
0.1600334E+02	0.7371409E-02
0.1605335E+02	0.7405356E-02
0.1610336E+02	0.7439294E-02
0.1615337E+02	0.7473222E-02
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0.1625339E+02	0.7541048E-02
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0.1645343E+02	0.7676562E-02
0.1650344E+02	0.7710408E-02

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0.1675350E+02	0.7879402E-02
0.1680351E+02	0.7913150E-02
0.1685352E+02	0.7946877E-02
0.1690353E+02	0.7980587E-02
0.1695354E+02	0.8014274E-02
0.1700355E+02	0.8047942E-02
0.1705356E+02	0.8081589E-02
0.1710357E+02	0.8115212E-02
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0.1720359E+02	0.8182385E-02
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0.1735362E+02	0.8282962E-02
0.1740363E+02	0.8316437E-02
0.1745364E+02	0.8349882E-02
0.1750365E+02	0.8383300E-02
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0.8226717E+02	0.9998696E+00
0.8231718E+02	0.9998718E+00
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0.8241721E+02	0.9998762E+00
0.8246722E+02	0.9998783E+00
0.8251723E+02	0.9998804E+00
0.8256724E+02	0.9998825E+00
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0.8266726E+02	0.9998866E+00
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0.8306734E+02	0.9999022E+00
0.8311735E+02	0.9999040E+00

0.8316736E+02	0.9999058E+00
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0.8446763E+02	0.9999453E+00
0.8451764E+02	0.9999465E+00
0.8456765E+02	0.9999478E+00
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