



CTI Thermal Certification Test Report

T43A-218-25A

2025 Annual Reverification Test

**On the Bell Cooling Towers, Pvt., Ltd. (Bell)
BCTI Series, Model BCTI-050X
1-cell, Induced-Draft, Counterflow Cooling Tower**

**Tested at the Jaquar IMT Manesar
In India**

**For Bell Cooling Towers, Pvt., Ltd.
136 Charmwood Plaza
Eros Garden, Surajkund Road
Faridabad (Haryana) 102009
India**

**Test Date: July 8, 2024
CTI Test Number: T43A-218-25A**

Summary

McHale & Associates, Inc. (McHale) has been designated by the Cooling Technology Institute (CTI) to conduct thermal certification tests as set forth in the CTI STD-201(21) certification standard. An Annual Reverification Test was performed for Bell Cooling Towers, Pvt., Ltd. (Bell) on their BCTI Series, Model BCTI-050X, 1-cell, Induced-Draft, Counterflow Cooling Tower. The test was conducted at the Jaquar IMT Manesar in India. The purpose of the CTI Annual Reverification Test was to verify the thermal performance of the subject tower as required to maintain CTI certification of the line of cooling towers. The work was performed by McHale as an independent contractor licensed by the CTI for STD-201 testing services.

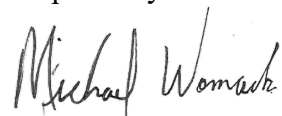
The 2025 Annual Reverification Test was conducted on July 8, 2024, in accordance with the CTI Standard for Performance Rating of Evaporative Heat Rejection Equipment, STD-201RS(21). The test data were acquired in accordance with the CTI Acceptance Test Code for Water-Cooling Towers, ATC-105(22). All thermal parameters were measured with precision platinum RTD temperature probes and recorded using a data acquisition system consisting of a multi-channel data logger interfaced with a laptop computer. The circulating water flow was measured using a hydraulic pitot tube with an air-over-water manometer. Fan motor power was measured with a clamp-on digital kilowatt meter. Following the test, the computer system was used to average the test data, assist with selection of time periods for analysis, and calculate the test results.

The test results were calculated for one time period selected during the Annual Reverification Test by using the manufacturer's expanded ratings table and the methods of analysis as specified in the CTI STD-201 certification standard. The data indicate that the Bell Cooling Towers, Pvt., Ltd. Model BCTI-050X cooling tower was operating at 110.0% of its published capacity during the test on July 8, 2024 which exceeds the 95% minimum allowed by the CTI STD-201.

Therefore, the Bell Cooling Towers, Pvt., Ltd., BCTI Series of cooling towers has fulfilled the test requirement to maintain thermal certification per CTI STD-201.

The CTI STD-201 Certification requires the successful completion of a CTI Annual Reverification Test on a different model each year to remain in effect in the subsequent year.

Prepared by:



Michael G. Womack, P.E.
CTI Thermal Certification Administrator

Test on Bell Model BCTI-050X

July 8, 2024

Cooling Technology Institute

Test Calculations (IP Units: °F, gpm & in-Hg)

File No. BCTI-050X Date 7/8/2024 Time Period** 14:36:00-15:33:00
 Model No. BCTI-050X Location Jaquar IMT Manesar TAN # T43A-218-25A
Note: Evaluated as BCTI-050XE

**Shortened time period due to end of period upset

Test Data

Hot Water, °F = <u>94.01</u>	Cold Water, °F = <u>86.60</u>	Wet Bulb, °F = <u>79.22</u>
Tower Flow, gpm = <u>956.58</u>	Makeup Flow, gpm = <u>N/A</u>	Makeup Temp, °F = <u>N/A</u>
Test Fan Power, Hp = <u>11.68</u>	Oil Pressure, psi = <u>N/A</u>	Barometer, in-Hg = <u>28.72</u>
Rated Fan Power, Hp = <u>12.40</u>	Dry Bulb, °F = <u>83.98</u>	Relative Humidity, % = <u>81.54</u>

Calculated Values

Pump Correction = 0.002966 * psi / Pump Efficiency:	PC = <u>0.00</u> °F
Evaporation = 0.00085 * Flow * Range	Evap = <u>N/A</u> gpm
Makeup Correction = (CWT + PC - MUT) * MUF / (Tower Flow - MUF)	MC = <u>N/A</u> °F
CCWT = CWT + PC + MC	CCWT = <u>86.60</u> °F
Range = HWT - CCWT	Range = <u>7.41</u> °F
Approach = CCWT - WBT	Approach = <u>7.38</u> °F

Cataloged Water Flow for Wet Bulb = <u>79.0</u> °F		
	<u>6.00</u> Range	<u>7.41</u> Range
<u>7.00</u> Approach	<u>965.01</u>	<u>841.58</u>
<u>7.38</u> Approach	<u>1005.69</u>	<u>874.35</u>
<u>8.00</u> Approach	<u>1073.44</u>	<u>928.92</u>

Cataloged Water Flow for Wet Bulb = <u>80.0</u> °F		
	<u>6.00</u> Range	<u>7.41</u> Range
<u>7.00</u> Approach	<u>986.70</u>	<u>862.08</u>
<u>7.38</u> Approach	<u>1028.54</u>	<u>896.84</u>
<u>8.00</u> Approach	<u>1098.22</u>	<u>954.74</u>

Cataloged Water Flow for Wet Bulb = 79.22 °F 879.36

Adjusted Test Flow = Test Flow * [Fan Power (design) / Fan Power (test)] ^(1/3)

Adjusted Test Flow (@ test barometer) = 975.90

Barometric Factor {Inches Mercury} = 1 + (0.0078 *(BPstd - BPtst))

Barometric Factor = 1.009360

Adjusted Corrected Test Flow (with BP correction) = Adjusted Test Flow / Barometric Factor

Adjusted Corrected Test Flow (@ standard barometer) = 966.85

Percent Capability = Adjusted Corrected Test Flow / Predicted Test Flow * 100

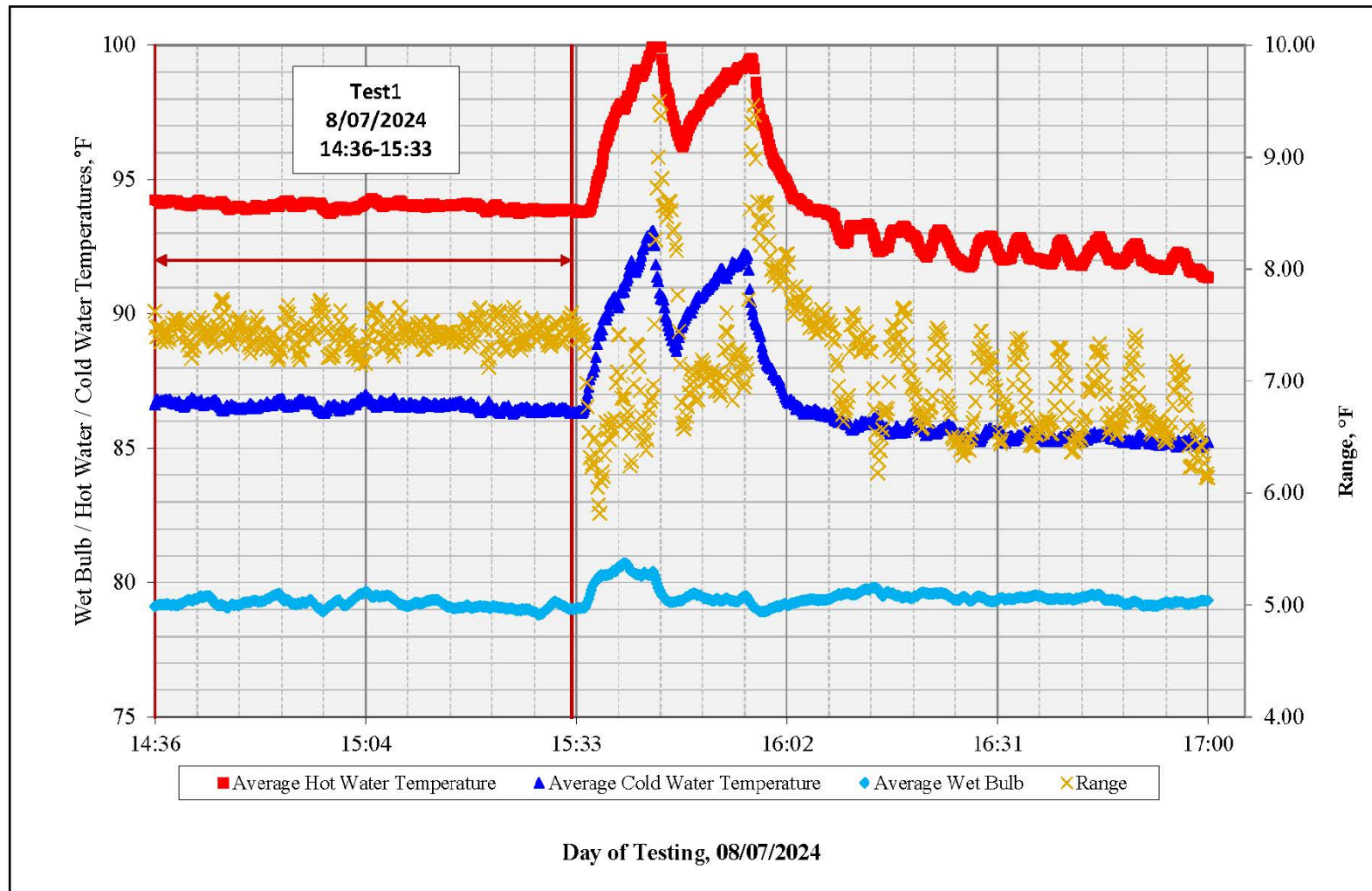
Percent Capability = 109.95 %

Excerpt from Performance Rating Table (Provided by OEM)

1st Data Block		Wet Bulb =	79
Ranges		6.00	7.50
Approach =	7.00	965.01	833.63
Approach =	8.00	1073.44	919.60
2nd Data Block		Wet Bulb =	80
Ranges		6.00	7.50
Approach =	7.00	986.70	854.05
Approach =	8.00	1098.22	945.49

Source: BCTI-XEmatrixRerated29Sep2022.xls

BCTI-50X : Thermal Data



OPERATING CONDITIONS - CTI STD 201 Limits				
Description	Units	CTI STD 201 Limit	Test 1 08/07/24 14:36-15:33	
			Test Value	Pass/Fail
<u>Limits of Thermal Operating Conditions</u>				
Wet Bulb Temperature	Deg F	50 to 90	79.2	PASS
Maximum Process Fluid Temperature	Deg F	125	94.0	PASS
Minimum Range	Deg F	4	7.4	PASS
Minimum Approach	Deg F	5	7.4	PASS
Circulating Water Flow	%	60% to 140%	126.5	PASS
Barometric Pressure	inHg	27 to 31	28.7	PASS
Fan driver output power	%	10	4.25	PASS

CONSISTANCY OF TEST CONDITIONS - CTI ATC 105 Limits				
Description	Units	CTI ATC 105 Limit	Test 1 08/07/24 14:36-15:33	
			Test Value	Pass/Fail
<u>Heat Load</u>				
Range	%	5	4.1	PASS
<u>Wet Bulb Temperature</u>				
Linear Trend	Deg C/hr	1	0.3	PASS
Max Deviation from Test Average	Deg C	1.5	0.4	PASS

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Fan Power Data Sheet - IP

Location Jaquar IMT Manesar

Barometric Pressure 28.72

KW Instrument Fluke 39

Tower Model BCTI-050X

File No. BCTI-050X

TAN # T43A-218-25A

Date 7/8/2024

Time 16:20

Fan ID	Volt (1)	Volt (2)	Amp (1)	Amp (2)	KW (1)	KW (2)	KW Total	Motor Eff.	HP
A	414	414.1	10.16	9.85	4.32	1.34	5.66	0.800	6.07
B	414.8	419	9.63	9.98	4.04	1.21	5.25	0.800	5.63
Averages		415.5	9.9		Sum:		10.910	Sum:	11.700

Motor Nameplate Data

Frame:	Voltage: 415	Manufacturer: New India (NEC)
RPM:	Amps:	Nominal Efficiency: 0.8
HP:	SF:	Power Factor:

Line Loss Calculation

Data:

Wire Length <u>196.8</u>	Wire Size <u>6</u>
Average Ampere <u>9.91</u>	Motor Eff. <u>0.800</u>

Results:

KW - Total (avg.) <u>10.91</u>	HP (measured) <u>11.70</u>
KW (loss) <u>0.02</u>	HP (loss) <u>0.02</u>
KW (net) <u>10.89</u>	Test HP (net) <u>11.68</u>

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Water Flow Data Sheet

FILE NO. BCTI-050X
 TAN# T43A-218-25A

DATE: 07/08/24

PITOT STYLE:	Elliptical	PIPE IDENTITY:	Hot Water Supply
PITOT TYPE:	Standard	NOMINAL PIPE DIAMETER (in):	8.625984252
SERIAL NUMBER:	18006	AVERAGE PIPE AREA (ft ²):	0.40583
DATE CALIBRATED:	February-2024	PITOT FLUID TYPE:	Water
PITOT COEFFICIENT:	0.7609	FLUID TEMPERATURE (°F):	96.8

		TAP: Side		TAP: Top	
		TIME: 15:30		TIME: 16:15	
		DIAMETER (in): 8 5/8		DIAMETER (in): 8 5/8	
STATION NUMBER	RELATIVE LOCATION	LOCATION (in)	DEFLECTION d (in)	LOCATION (in)	DEFLECTION d (in)
1	0.0257	0 4/16	5 10/16	0 4/16	6 12/16
2	0.0817	0 11/16	7 6/16	0 11/16	8 13/16
3	0.1464	1 4/16	8 10/16	1 4/16	11 6/16
4	0.2261	1 15/16	11 0/16	1 15/16	12 0/16
5	0.3419	2 15/16	10 14/16	2 15/16	9 8/16
CP	0.5000	4 5/16	9 0/16	4 5/16	9 13/16
6	0.6581	5 11/16	11 0/16	5 11/16	12 13/16
7	0.7739	6 11/16	6 12/16	6 11/16	6 6/16
8	0.8536	7 6/16	6 10/16	7 6/16	8 12/16
9	0.9183	7 15/16	7 3/16	7 15/16	11 1/16
10	0.9743	8 6/16	6 12/16	8 6/16	11 1/16
		Diam 1 $\sum \sqrt{d}$	28.41	Diam 2 $\sum \sqrt{d}$	31.20
		Diam 1 Avg \sqrt{d}	2.841	Diam 2 Avg \sqrt{d}	3.120
		Pipe Average \sqrt{d}	2.9803		

FLOW, US GPM = 956.6