



FORM ACCL-PC1
ACCL WITNESS TEST PROCEDURE AND CHECKLIST

AHRI CERTIFICATION PROGRAM FOR
AIR-COOLED WATER-CHILLING PACKAGES
USING THE VAPOR COMPRESSION CYCLE

ACCL Participant: _____
Date of Test: _____
Witness Test Number: _____
Test Results: _____

Instructions to Laboratory Representatives: The following Witness Test Procedure and Checklist is to be used by the Representative Contracted by AHRI (Representative) to document all steps required to conduct witness tests for the Air-Cooled Water Chilling Packages Certification Program (ACCL). This Witness Test Procedure and Checklist is to be used in conjunction with the AHRI General Operations Manual (OM) for AHRI Certification Programs, the ACCL OM and the latest edition of AHRI Standard 550/590 (I-P) or AHRI Standard 551/591 (SI) (Standard). Where the AHRI General OM, the ACCL OM and this Witness Test Procedure and Checklist differ, the other documents shall prevail. The completed checklist shall be submitted to AHRI upon the completion of the witness test.

Select the Standard to be used to perform this test (select only one):

- _____ AHRI Standard 550/590 (I-P)
_____ AHRI Standard 551/591 (SI)

If the Participant's test facility (Facility) fails to comply with the conditions listed below:

- Notify AHRI
• Notify Participant

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

Pre-Visit

When setting up for a trip to Witness Test an Air-Cooled chiller for AHRI Certification Programs, several information items are required. Verify the following information as received from AHRI:
1. Letter of Authorization (AHRI Selection Letter, refer to Section 3.5 of the ACCL OM) from AHRI for the Third-Party Laboratory contracted by AHRI (Laboratory) to witness the Certification Test
2. Copy of the latest AHRI Test Standard Inspection Approval Report
3. Test Site Location
4. Participant's Contact(s) with Phone and Fax Numbers and email
5. Chiller Model Number
6. Model Performance Ratings
7. Unit rated voltage, amperage and frequency
8. Selection Data Sheet, including Fouling Factor Calculations and Water Side Surface Area for the evaporator
9. Random Operating Point (5th Point)

REPRESENTATIVE INITIALS	DATA POINT (IF APPLICABLE)
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Pre-Visit (contin.)

_____	_____	<p>Verify the following information as received from the Participant:</p> <ol style="list-style-type: none"> 1. Verification of Power Input instrumentation requirements 2. Mutually agreed upon test date of when to arrive at the Participant's specified Test Stand 3. Directions to the Participant's specified Test Stand 4. Estimate of when testing will be completed
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_____	_____	<p>Inform the Participant that the unit can be set-up as per the latest edition of the ACCL OM when the Representative arrives</p>
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_____	_____	<p>Be sure that all Laboratory instrumentation has current calibration stickers. Conduct a quick test to verify that the maximum deviation of the temperature probes from the highest to the lowest readings is within 0.10°F [0.055°C]. This can be done by placing the probes through a wooden board or 1-inch rubber insulation and setting it on a bucket of near-ambient water. Stir the water while checking the temperature readings from each probe. Document the temperature probe readings and recalibrate if necessary. Extreme care must be exercised when handling the temperature probes. Leave the rubber protective sleeves on the probes until you are ready to insert them into the thermo-wells or into the water streams.</p>
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Minimum Laboratory instrumentation required:

_____	_____	<p>Temperature probes including measurement device</p> <ol style="list-style-type: none"> 1. Two (2) for measuring water temperatures 2. Additional probes, equal to the number of aspirating psychrometers
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_____	_____	<p>Differential pressure gauge including measurement device</p>
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_____	_____	<p>Power meter including current transformers and voltage sensing leads</p>
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_____	_____	<p>Barometer</p>
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REPRESENTATIVE
INITIALS

DATA POINT (IF
APPLICABLE)

Day of Test

_____	_____	Upon arrival, request a brief meeting of the involved parties to review the following information: <ol style="list-style-type: none">1. Safety rules at the test site2. Instrumentation List Calibration Summary Sheet (to be placed in the project file)3. Confirm test conditions and unit voltage4. Comparison of Fouling Factor allowance calculations5. Test set-up; location of Laboratory instrumentation
_____	_____	Representative shall unpack and visually inspect all Laboratory instrumentation
_____	_____	Representative shall install all Laboratory instrumentation
_____	_____	Representative shall visually inspect and confirm the test sample chiller nameplate against the AHRI Selection Letter to confirm identity of the chiller under test.
_____	_____	For water pressure drop, the "Zero" measurements shall be recorded and shall be zero, within a tolerance of $\pm 1.0\%$ of the full scale value of the calibration range of the measurement system. This verification can be completed before or after the test has been conducted.
_____	_____	For water flow, the "Zero" measurements shall be recorded and shall be zero, within a tolerance of $\pm 1.0\%$ of the full scale value of the calibration range of the measurement system. This verification can be completed before or after the test has been conducted.
_____	_____	Representative shall verify the type of data reported: <ol style="list-style-type: none">1. Five (5) minute average point (continuous) or2. Instantaneous data point
_____	_____	Representative shall authorize starting the test sample chiller

100% Full Load Test

All verifications shall be conducted at 100% load steady state conditions as the first load test point. Representative shall confirm and record that the Laboratory instrumentation is in agreement with the Test Stand's instruments. If these criteria are not met, interchange the Laboratory instrumentation to confirm they are correct.

Note: The RTD thermowell may be a cause of a temperature difference; not deep enough into the water stream or location. If calibration facilities are available on site, the Participant may wish to recalibrate his equipment and then compare with the Laboratory instrumentation.

Should any of these criteria not be met, steps should be taken to ensure that the discrepancy is resolved. In cases where the discrepancy cannot be resolved and no damage is apparent, the Laboratory instrumentation data for that parameter shall be used.

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| _____ | _____ | 1.1. The water temperature difference across the evaporator as determined by the Test Stand's instrumentation is within 0.2°F [0.11°C] from the Laboratory instrumentation |
| _____ | _____ | 1.2. The Test Stand and Laboratory temperatures values for entering Evaporator temperature are no more than 0.2°F [0.11°C] different |
| _____ | _____ | 1.3. The Test Stand and Laboratory temperatures values for leaving Evaporator temperature are no more than 0.2°F [0.11°C] different |
| _____ | _____ | 1.4. The Facility and Laboratory temperatures at each aspirating psychrometer are no more than 0.3°F [0.17°C] different |
| _____ | _____ | 1.5. The Power Input as determined by the Test Stand's instrumentation is within 2% of the Laboratory's values |
| _____ | _____ | 1.6. The Water Pressure Drop reading determined by the Test Stand's instrumentation is within 2% of the Laboratory's values |
| _____ | _____ | 1.7. Verify air distribution in accordance with the ACCL Air Distribution Checklist |
| _____ | _____ | 1.8. The Test Stand and Laboratory barometric pressure values differ by no more than 0.02 psi [0.14 kPa] |

_____ _____ After the proper refrigerant charge has been established, the refrigerant charging line shall be disconnected and remain off from the test sample during the testing

_____ Verify air distribution in accordance with the ACCL Air Distribution Checklist

_____ The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period.

REPRESENTATIVE INITIALS	DATA POINT (IF APPLICABLE)
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100% Full Load Test (contin.)

The Representative shall confirm all of the following data collected at each test point are in accordance with the Standard:

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|-------|--|
| _____ | 2.1 Data collected in accordance with Section C6.2.1 of the Standard. |
| _____ | 2.2 Entering Evaporator water temperature measurements for each set of instruments |
| _____ | 2.3 Leaving Evaporator water temperature measurements for each set of instruments |
| _____ | 2.4 Evaporator water flow measurements for each set of instruments |
| _____ | 2.5 Power input measurements for each set of instruments |

Instrument Set #1 (next two steps)

- | | |
|-------|--|
| _____ | 2.6 Evaporator water flow as compared to Target |
| _____ | 2.7 Leaving Evaporator water temperature as compared to Target |

Instrument Set #2 (next two steps)

- | | |
|-------|--|
| _____ | 2.8 Evaporator water flow as compared to Target |
| _____ | 2.9 Leaving Evaporator water temperature as compared to Target |
| _____ | 2.10 Mean Entering Condenser dry-bulb air temperature as compared to Target |
| _____ | 2.11 Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target |
| _____ | 2.12 Voltage (average of all phases) as compared to Target |
| _____ | 2.13 Frequency as compared to Target |

The Representative shall confirm all of the following at the conclusion of the test are in accordance with the Standard

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|-------|-------|--|
| _____ | _____ | 3.1 Calculated Capacity (adjusted for Barometric Pressure) is within tolerance |
| _____ | _____ | 3.2 Calculated Efficiency (adjusted for Barometric Pressure) is within tolerance |
| _____ | _____ | 3.3 Calculated Evaporator water pressure drop |

For continuous unloading units, verify that the actual capacity (adjusted for Barometric Pressure) at 100% Full Load is not greater than 105% of the rated performance

REPRESENTATIVE INITIALS	DATA POINT (IF APPLICABLE)
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75% Part-Load Test

_____	_____	Verify air distribution in accordance with the ACCL Air Distribution Checklist
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_____	_____	The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period.
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The Representative shall confirm all of the following data collected at each test point are in accordance with the Standard

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|-------|-----|--|
| _____ | 1.1 | Data collected in accordance with Section C6.2.1 of the Standard. |
| _____ | 1.2 | Entering Evaporator water temperature measurements for each set of instruments |
| _____ | 1.3 | Leaving Evaporator water temperature measurements for each set of instruments |
| _____ | 1.4 | Evaporator water flow measurements for each set of instruments |
| _____ | 1.5 | Power input measurements for each set of instruments |

Instrument Set #1 (next two steps)

- | | | |
|-------|-----|--|
| _____ | 1.6 | Evaporator water flow as compared to Target |
| _____ | 1.7 | Leaving Evaporator water temperature as compared to Target |

Instrument Set #2 (next two steps)

- | | | |
|-------|------|---|
| _____ | 1.8 | Evaporator water flow as compared to Target |
| _____ | 1.9 | Leaving Evaporator water temperature as compared to Target |
| _____ | 1.10 | Mean Entering Condenser dry-bulb air-temperature as compared to Target |
| _____ | 1.11 | Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target |
| _____ | 1.12 | Voltage (average of all phases) as compared to Target |
| _____ | 1.13 | Frequency as compared to Target |

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

75% Part-Load Test (Contin.)

The Representative shall confirm the calculated IPLV is within tolerance at the conclusion of the test are in accordance with the Standard

_____ _____ For continuous unloading units during part-load tests, verify the measured capacities (adjusted for Barometric Pressure) are within tolerance ($\pm 2\%$ of the full load rated capacity). For discrete capacity step units, part-load test points shall be taken as close as practical to the specified part-load rating points as per Table 3 of the Standard.

_____ _____ For discrete unloading units, verify that the mean entering condenser dry-bulb air temperature is based on the measured capacity (adjusted for Barometric Pressure) for the test as per Table 3 of the Standard.

50% Part-Load Test

_____ _____ Verify air distribution in accordance with the ACCL Air Distribution Checklist

_____ The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period per Table 12 of the Standard.

The Representative shall confirm all following data collected during the test are in accordance with the Standard

_____ 1.1 Data collected in accordance with Section C6.2.1 of the Standard.

_____ 1.2 Entering Evaporator water temperature measurements for each set of instruments

_____ 1.3 Leaving Evaporator water temperature measurements for each set of instruments

_____ 1.4 Evaporator water flow measurements for each set of instruments

_____ 1.5 Power input measurements for each set of instruments

Instrument Set #1 (next two steps)

_____ 1.6 Evaporator water flow as compared to Target

_____ 1.7 Leaving Evaporator water temperature as compared to Target

Instrument Set #1 (next two steps)

_____ 1.8 Evaporator water flow as compared to Target

_____ 1.9 Leaving Evaporator water temperature as compared to Target

_____ 1.10 Mean Entering Condenser dry-bulb air-temperature as compared to Target

_____ 1.11 Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target

_____ 1.12 Voltage (average of all phases) as compared to Target

_____ 1.13 Frequency as compared to Target

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

50% Part-Load Test (Contin.)

The Representative shall confirm the calculated IPLV is within tolerance at the conclusion of the test in accordance with the Standard

_____ _____ For continuous unloading units during part-load tests, verify the measured capacities (adjusted for Barometric Pressure) are within tolerance ($\pm 2\%$ of the full load rated capacity). For discrete capacity step units, part-load test points shall be taken as close as practical to the specified part-load rating points as per Table 3 of the Standard.

_____ _____ For discrete unloading units, verify that the mean entering condenser dry-bulb air temperature is based on the measured capacity (adjusted for Barometric Pressure) for the test as per Table 3 of the Standard.

25% Part-Load Test

_____ _____ Verify air distribution in accordance with the ACCL Air Distribution Checklist

_____ The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period per Table 12 of the Standard.

The Representative shall confirm all following data collected during the test are in accordance with the Standard

_____ 1.1 Data collected in accordance with Section C6.2.1 of the Standard.

_____ 1.2 Entering Evaporator water temperature measurements for each set of instruments

_____ 1.3 Leaving Evaporator water temperature measurements for each set of instruments

_____ 1.4 Evaporator water flow measurements for each set of instruments

_____ 1.5 Power input measurements for each set of instruments

Instrument Set #1 (next two steps)

_____ 1.6 Evaporator water flow as compared to Target

_____ 1.7 Leaving Evaporator water temperature as compared to Target

Instrument Set #1 (next two steps)

_____ 1.8 Evaporator water flow as compared to Target

_____ 1.9 Leaving Evaporator water temperature as compared to Target

_____ 1.10 Mean Entering Condenser dry-bulb air-temperature as compared to Target

_____ 1.11 Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target

_____ 1.12 Voltage (average of all phases) as compared to Target

_____ 1.13 Frequency as compared to Target

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

25% Part-Load Test (Contin.)

The Representative shall confirm the calculated IPLV is within tolerance at the conclusion of the test in accordance with the Standard

_____ _____ For continuous unloading units during part-load tests, verify the measured capacities (adjusted for Barometric Pressure) are within tolerance ($\pm 2\%$ of the full load rated capacity). For discrete capacity step units, part-load test points shall be taken as close as practical to the specified part-load rating points as per Table 3 of the Standard.

_____ _____ For discrete unloading units, verify that the mean entering condenser dry-bulb air temperature is based on the measured capacity (adjusted for Barometric Pressure) for the test as per Table 3 of the Standard.

Extra Point (Required for instances when previous points cannot be determined due to discrete step machines that are unloaded at different loads)

_____ _____ Verify air distribution in accordance with the ACCL Air Distribution Checklist

_____ The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period per Table 12 of the Standard.

The Representative shall confirm all following data collected during the test are in accordance with the Standard

- _____ 1.1 Data collected in accordance with Section C6.2.1 of the Standard.
- _____ 1.2 Entering Evaporator water temperature measurements for each set of instruments
- _____ 1.3 Leaving Evaporator water temperature measurements for each set of instruments
- _____ 1.4 Evaporator water flow measurements for each set of instruments
- _____ 1.5 Power input measurements for each set of instruments

Instrument Set #1 (next two steps)

- _____ 1.6 Evaporator water flow as compared to Target
- _____ 1.7 Leaving Evaporator water temperature as compared to Target

Instrument Set #1 (next two steps)

- _____ 1.8 Evaporator water flow as compared to Target
- _____ 1.9 Leaving Evaporator water temperature as compared to Target
- _____ 1.10 Mean Entering Condenser dry-bulb air-temperature as compared to Target
- _____ 1.11 Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target
- _____ 1.12 Voltage (average of all phases) as compared to Target
- _____ 1.13 Frequency as compared to Target

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

Extra Point (Required for instances when previous points cannot be determined due to discrete step machines that are unloaded at different loads)

The Representative shall confirm the calculated IPLV is within tolerance at the conclusion of the test in accordance with the Standard

_____ _____ For continuous unloading units during part-load tests, verify the measured capacities (adjusted for Barometric Pressure) are within tolerance ($\pm 2\%$ of the full load rated capacity). For discrete capacity step units, part-load test points shall be taken as close as practical to the specified part-load rating points as per Table 3 in the latest edition of AHRI Standard 550/590 (I-P) or AHRI Standard 551/591 (SI).

_____ _____ For discrete unloading units, verify that the mean entering condenser dry-bulb air temperature is based on the measured capacity (adjusted for Barometric Pressure) for the test as per Table 3 in the latest edition of AHRI Standard 550/590 (I-P) or AHRI Standard 551/591 (SI).

_____ _____ For discrete unloading units that cannot be unloaded below 25%, 50%, or 75% capacity points, then the unit shall be run at the minimum step of unloading at the condenser entering water or air temperature based on Table 3 for 25%, 50% or 75% capacity points as per Table 3 in the latest edition of AHRI Standard 550/590 (I-P) or AHRI Standard 551/591 (SI).

Random Operating Point (5th Point) (Contin.)

_____ _____ Verify air distribution in accordance with the ACCL Air Distribution Checklist

_____ The Test Stand operator is to inform the Representative when they are ready to initiate the test so the Representative can record test data simultaneously. The Representative shall verify that the Test Stand test conditions remain within the allowable tolerances for the duration of the test period.

The Representative shall confirm all following data collected during the test are in accordance with the Standard

_____ 1.1 Data collected in accordance with Section C6.2.1 of the Standard.

_____ 1.2 Entering Evaporator water temperature measurements for each set of instruments

_____ 1.3 Leaving Evaporator water temperature measurements for each set of instruments

_____ 1.4 Evaporator water flow measurements for each set of instruments

_____ 1.5 Power input measurements for each set of instruments

Instrument Set #1 (next two steps)

_____ 1.6 Evaporator water flow as compared to Target

_____ 1.7 Leaving Evaporator water temperature as compared to Target

Instrument Set #1 (next two steps)

_____ 1.8 Evaporator water flow as compared to Target

_____ 1.9 Leaving Evaporator water temperature as compared to Target

_____ 1.10 Mean Entering Condenser dry-bulb air-temperature as compared to Target

_____ 1.11 Variation of Mean Entering Condenser dry-bulb air temperature as compared to Target

_____ 1.12 Voltage (average of all phases) as compared to Target

_____ 1.13 Frequency as compared to Target

REPRESENTATIVE DATA POINT (IF
INITIALS APPLICABLE)

Random Operating Point (5th Point) (Contin.)

The Representative shall confirm the following are within tolerance at the conclusion of the test in accordance with the Standard

_____ 1. Calculated Capacity (adjusted for Barometric Pressure) is within tolerance

_____ 2. Calculated IPLV (adjusted for Barometric Pressure) is within tolerance

_____ 3. Calculated Evaporator water pressure drop

_____ For continuous unloading units, verify that the actual capacity (adjusted for Barometric Pressure) at 100% Full Load is not greater than 102% of the rated performance

REPRESENTATIVE INITIALS	DATA POINT (IF APPLICABLE)
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Day of Test (contin.)	
_____	After the test is completed, calculate the unobtainable points as per the latest edition of the Standard, if applicable.
_____	Calculate the IPLV using the appropriate efficiency values.
_____	The results are then calculated by the Laboratory (using the Participant data) to compare with the Participant's calculated results as well as a separate Laboratory calculation. Any instrumentation discrepancies shall be included in the final test report. The Participant shall be informed of the final test results, and if the sample met the ACCL Certification Program criteria. If the sample fails, the Participant decides the next course of action as per the ACCL Operations Manual, Section 3.11 <i>Test Failures</i> .
_____	If discrepancies were observed between the program participants and the Laboratory instrumentation, they should be so noted in the Laboratory test report along with any required follow-up. During the next visit to the program Participant's Test Stand, the Representative shall verify that the corrective action was performed.
_____	The Laboratory test report, along with the raw data obtained from both the Test Stand and the Laboratory instrumentation, shall be issued to AHRI. The Laboratory shall invoice AHRI and the Participant in accordance with the AHRI/Laboratory Testing Services Agreement.

This checklist & all supporting documents have been reviewed & approved by:

PRINTED NAME OF REPRESENTATIVE

SIGNATURE OF REPRESENTATIVE

DATE