Request for Proposal # 2018-007

Chiller Maintenance Service

Due Date: August 17, 2017
Time: 2:00 pm EST
Receipt Location: Government Center
Administrative Services Procurement Division
500 N. Main Street, Suite #709
Monroe, NC 28112

Pre-Proposal Meeting – See page 2 for details

Procurement Contact Person
Name: David Shaul
Title: Procurement Specialist
E-mail: david.shaul@unioncountync.gov
Telephone: 704.283.3601
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<td>37</td>
</tr>
</tbody>
</table>
SUBMITTAL DEADLINE AND ADDENDUM INFORMATION

Proposal Submission Deadline

Submittals shall be sealed and labeled on the outside “RFP# 2018-007 Chiller Maintenance Service”. RFP’s are to be received by the Union County, Procurement Division by 2:00 p.m., August 17, 2017.

Mail or hand-deliver submission packets to:

Union County Government Building
Administrative Services, Procurement Division
500 North Main Street, Suite #709
Monroe, NC 28112
Attention: David Shaul, Procurement Specialist

The proposal must be submitted electronically on non-returnable CD or flash drive, and in printed form. One (1) original (mark “ORIGINAL COPY”) plus four (4) hard copies of the proposal must be submitted. The original proposal package must have original signatures and must be signed by a person who is authorized to bind the proposing firm. All additional proposal sets may contain photocopies of the original package.

Electronic (email) or facsimile submissions will not be accepted.

There is no expressed or implied obligation for Union County to reimburse firms for any expenses incurred in preparing proposals in response to this request.

Union County reserves the right to reject any or all proposals or to select the proposal, which in its opinion, is in the best interest of the County.

Proposal Questions

Proposal questions will be due on August 8, 2017 at 5 pm EST. The primary purpose of this is to provide participating firms with the opportunity to ask questions, in writing, related to the RFP. The County may respond with an addendum within five (5) calendar days.

Submit questions by e-mail to David Shaul at david.shaul@unioncountync.gov by the deadlines shown above. The email should identify the RFP number and project title. All questions and answers may be posted as addenda on www.co.union.nc.us and www.ips.state.nc.us.

Union County may modify the RFP prior to the date fixed for submission of proposals by the issuance of an addendum.
Any addenda to these documents shall be issued in writing. No oral statements, explanations, or commitments by anyone shall be of effect unless incorporated in the written addenda. Receipt of Addenda shall be acknowledged by the Proposer on Appendix A, Price Form and Anti-Collusion form.

**Pre-Proposal Meeting**

A Pre-Proposal meeting will be held at the time and location listed below. The meeting is not mandatory, but proposers are highly encouraged to attend to ensure a full understanding of the County’s needs.

**DATE:** July 28, 2017  
**TIME:** 1:00 PM EST  
**LOCATION:** Lobby,  
500 N. Main St  
Monroe, NC 28112

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Purpose

Introduction

Union County (hereafter the “County”) through its Public Works Department, Environmental Management & Facilities Division, is seeking proposals for Chiller Maintenance Service.

County

Union County, North Carolina (population 212,756) is located in the central, southern piedmont. The County provides its citizens with a full array of services that include public safety, water/wastewater utilities and sanitation, human services, cultural and recreational activities, and general government administration.

The County currently operates 2 water cooled Chillers in 2 different buildings throughout Union County. An additional two Chillers are in a building currently under construction.

Project Scope

The County is requesting proposals from qualified contractors to provide Chiller Maintenance Services. This includes the furnishing of all material, labor, supervision, tools, supplies, and other expenses necessary to provide full annual service and preventative maintenance services on water cooled chillers ranging in size from 200 tons to 450 tons currently installed or being installed in County buildings. The successful bidder will be required to perform routine annual preventative maintenance and inspections on chiller equipment as well as 24 hour, on-call services for these systems.

Description of Services Desired

Preventative Maintenance Program

This contract is to provide services for scheduled preventative maintenance as described in this document, and twenty four (24) hour on-call response to chiller system failures. Response to chiller system problems during normal business hours and for emergency response after business hours will be on an on-call and as needed basis. In both instances, conditions requiring on-call response will be determined by County staff who will in turn contact the contractor for response, within two (2) hours of initial contact. The selected contractor will provide routine on-call services between the hours of 7:00 A.M. and 5:00 P.M. for all equipment identified in this document. Response to calls after these business hours will be considered emergency response and be paid for on an individual call basis, unless covered through warranties in place (specific warranty coverage to be communicated to the vendor as needed).
The contractor will make every effort to eliminate or vigorously reduce the emission of CFC, HFC, and HCFC refrigerants to the atmosphere that results from the service and maintenance of chiller equipment in order to protect the environment. The contractor will ensure that all field service technicians have passed the test on “Refrigerant Transition and Recovery Certification,” required by Section 608 of the Federal Clean Air Act, that has been approved by the EPA. Contractor will be required to keep accurate records of refrigerant removal and provide that information to the County on an annual basis.

All bidders must have serviced and maintained similar systems of similar design using the same or similar equipment as located in County buildings. All technicians must be fully trained (with documentation) to service the brand of chillers used at the County, which will allow existing warranties to be maintained without issue by original manufacturer.

**Equipment List**

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Building Location</th>
<th>Manufacturer</th>
<th>Type Of Unit</th>
<th>(No.)</th>
<th>Unit Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUDICIAL CTR</td>
<td>400 N MAIN ST Monroe, NC</td>
<td>Trane</td>
<td>centrifugal</td>
<td>(1)</td>
<td>CVHE 450</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2004 model</td>
</tr>
<tr>
<td>GOVERNMENT CTR</td>
<td>500 N MAIN S Monroe, NC</td>
<td>Trane</td>
<td>centrifugal</td>
<td>(2)</td>
<td>CVHE 450</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1997 model</td>
</tr>
<tr>
<td>HEALTH and HUMAN SERVICES</td>
<td>2330 Concord Ave Monroe, NC</td>
<td>Carrier</td>
<td>Rotary-screw</td>
<td>(2)</td>
<td>23XRV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>To be installed</td>
</tr>
</tbody>
</table>

NOTE: * The HHS building is currently under construction; Chillers will not be issued until late 2017 and will have a warranty.

**Maintenance and Inspection Standards**

The contractor shall perform the Annual inspection and maintenance on the chiller equipment listed above during winter months. The goal of these inspections is to maintain optimum equipment performance, reduce the likelihood of unexpected failures, and reduce facility energy bills.

Annual maintenance and inspection shall be performed in accordance Manufacturer’s recommendations, as found in Appendix E; *Trane Installation, Operation, and Maintenance CVHE-SVX02H-EN 2015* manual excerpt, for Trane products, and Appendix F, *Carrier 23XRV Start-up, Operation and Maintenance Instructions* excerpt, for Carrier products.

The Contractor agrees to perform maintenance inspections and repair of the equipment primarily during the business hours of 7:00 A.M. to 4:30 P.M. Monday through Friday. On an infrequent basis, the contractor may be required to flex hours to accommodate the availability of equipment assets and/or mechanical
areas. The contractor agrees when normal services cannot keep the equipment in satisfactory operating condition, and shop repairs of equipment is necessary, the contractor will submit a cost estimate to the Department agent for prior approval and determination if repairs will fall within the bounds of any existing warranty prior to any repairs being made.

**Other Repairs**

A repair is defined as a deficiency which is identified during regular preventive maintenance that is not the result of normal wear and tear and is not because of any improper performance by the Contractor or failure to perform preventative maintenance.

Contractor should prepare and submit to County staff a written not-to exceed estimate of the man hours and materials, based on the labor rate and parts mark-up listed on Appendix A, which will be required to perform any major repairs. Repairs shall be made only with the written Authorization of the Contract Administrator. The County may obtain additional repair cost estimates and authorize major repair work to be done by another contractor when it is determined to be in the best interest of the County.

Parts estimated to be over $30,000 will require competitive bidding. Contractor will not purchase parts over $30,000 until authorized by the County.

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DETAILED SUBMITTAL REQUIREMENTS

Proposal Format

Proposers should prepare their proposals in accordance with the instructions outlined in this section. Each proposer is required to submit the proposal in a sealed package. Proposals should be prepared as simply as possible and provide a straightforward, concise description of the proposer’s capabilities to satisfy the requirements of the RFP. Utmost attention should be given to accuracy, completeness, and clarity of content. All parts, pages, figures, or tables should be numbered and clearly labeled. Response information should be limited to pertinent information only.

The proposal should be organized into sections:

- **Tab A** for Cover Letter / Executive Summary
- **Tab B** for Company Information;
- **Tab C** Staffing resumes;
- **Tab D** for References;
- **Tab E** for Proposed Pricing; and
- **Tab F** for Required Signature Forms.

Omissions and incomplete answers will be deemed unresponsive. Please initial any corrections.

A. **Cover Letter / Executive Summary**

An executive Summary including the name, address, email address, and any other pertinent information about the firm. The summary must be signed by an individual authorized to contractually bind the firm and include an expression of the firm’s ability and desire to meet the requirements of the request for proposal. The Executive Summary should not exceed two (2) pages.

Each Company shall make the following representation and warranty in the cover letter/executive summary, the falsity of which might result in rejection of its proposal: “The information contained in this proposal or any part thereof, including any exhibits, schedules, and other documents and instruments delivered or to be delivered to the County, is true, accurate, and complete. This proposal includes all information necessary to ensure that the statements therein do not in whole or in part mislead the County as to any material facts.”

B. **Company Information**

Include a description of the firm’s background, its organizational structure, length of time in business, assets available to meet County service requirements, and experience in providing the type of services solicited herein.
C. **Staffing**  
Include Proposed Maintenance Mechanic, any backup Mechanic and Maintenance Supervisor resumes, years of experience and licenses held.

D. **References**  
List three (3) maintenance service references for similar groups of Chiller systems currently serviced by your company under a full comprehensive maintenance program. Provide building address, contact name and telephone numbers. List number of Chiller units in each contract.

E. **Proposed Pricing**  
Complete the pricing form, Appendix A

F. **Required Signature Forms**  
Proposers should include signed copies of the following documents:

- Proposal Submission Form, Appendix B
- Addendum Receipt and Anti-Collusion Form, Appendix C
- Iran Divestment Certificate, Appendix D

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EVALUATION CRITERIA

Evaluation of Proposals

The County reserves the right to determine the suitability of proposals on the basis of a proposal's meeting administrative requirements, technical requirements, the review team's assessment of the quality, performance of the services proposed, and cost.

Evaluation Committee will make a selection based on criteria listed below (no particular order) and other relevant RFP information. Evaluation factors will include, but are not limited to, the following:

- Demonstrated ability to provide the services,
- References
- Price/Cost
- Compliance with the information listed in the RFP

If a large number of proposals are received, the County reserves the right to review the proposals using a tiered evaluation system. All proposals will be evaluated based on the Submission Requirements and Cost, with the top candidates advancing as a finalist and receiving a full evaluation as outlined above.

Award Procedures

The award shall be made in the best interest of the County. This Request for Proposal is not subject to any competitive bidding requirements of North Carolina law. The County reserves the right to accept other than the most financially advantageous proposal. The County reserves the right to accept or reject any and all proposals, to waive any informality in proposals, and unless otherwise specified in writing by the Proposer, to accept any items in any proposal. The County may, at its discretion, require one or more proposers to appear before an evaluation committee for an interview or to make a presentation. During such interview, the contractor may be required to orally and otherwise present its proposal and to respond in detail to any questions posed. Additional meetings may be held to clarify issues or to address comments, as deemed appropriate. Proposers will be notified in advance of the time and format of such meetings. Since Union County may choose to award a contract without engaging in discussions or negotiations, the proposal submitted shall define each proposer’s best offer for performing the services described in this RFP.

The commencement of such discussions, however, does not signify a commitment by
Union County to execute a contract or to continue discussions. The County may terminate discussions at any time and for any reason.

A proposal may be rejected if it is incomplete. Union County may reject any or all proposals and may waive any immaterial deviation in a proposal.

More than one proposal from an individual, firm, partnership, corporation or association under the same or different names, will not be considered.

As the County may award a contract based on the initial offer, a bidder should make its initial offer on the most favorable terms available. The County reserves the right, however, to have discussions with those bidders falling within a competitive range, and to request revised pricing offers from them and to make an award or conduct negotiations thereafter.

County may select and enter into negotiations with the next most advantageous Proposer if negotiations with the initially chosen Proposer are not successful.

The award document will be a Contract incorporating, by reference, all the requirements, terms and conditions of the solicitation and the Proposer’s proposal as negotiated.

GENERAL CONDITIONS AND REQUIREMENTS

Terms and Conditions

The County desires a service agreement with an initial term of three (3) years from the effective date. The County would have, at its sole discretion, two (2) one-year renewal options. Either party may cancel this agreement by providing 30 days written notice prior to the expiration of the contract period.

All proposals submitted in response to this request shall become the property of Union County and as such, may be subject to public review.

Union County has the right to reject any or all proposals, to engage in further negotiations with any firm submitting a proposal, and/or to request additional information or clarification. The County is not obligated to accept the lowest cost proposal. The County may accept that proposal that best serves its needs, as determined by County officials in their sole discretion.

All payroll taxes, liability and worker’s compensation are the sole responsibility of the Proposer. The Proposer understands that an employer/employee relationship does not exist under this contract.
Sub-Contractor/Partner Disclosure

The maintenance work shall be performed only by Technicians and Mechanics directly employed and supervised by the Proposer, who are experienced and skilled in maintaining vertical transportation units similar to those to be maintained under this Contract and shall not be assigned or transferred to any agent or subcontractor without the express consent of the County.

Modification or Withdrawal of Proposal

Prior to the scheduled closing time for receiving proposals, any Contractor may withdraw their proposal. After the scheduled closing time for receiving proposals, no proposal may be withdrawn for 90 days. Only written requests for the modification or correction of a previously submitted proposal that are addressed in the same manner as proposals and are received by the County prior to the closing time for receiving proposals will be accepted. The proposal will be corrected in accordance with such written requests, provided that any such written request is in a sealed envelope that is plainly marked “Modification of Proposal – “2018-007 Chiller Maintenance Service”. Oral, telephone, or fax modifications or corrections will not be recognized or considered.

Insurance

At Awarded Bidder/Proposer’s (hereafter “Contractor”) sole expense, Contractor shall procure and maintain the following minimum insurances with insurers authorized to do business in North Carolina and rated A-VII or better by A.M. Best.

A. WORKERS’ COMPENSATION

Statutory limits covering all employees, including Employer’s Liability with limits of:

- $500,000 Each Accident
- $500,000 Disease - Each Employee
- $500,000 Disease - Policy Limit

B. COMMERCIAL GENERAL LIABILITY

Covering all operations involved in this Agreement.

- $2,000,000 General Aggregate
- $2,000,000 Products/Completed Operations Aggregate
- $1,000,000 Each Occurrence
- $1,000,000 Personal and Advertising Injury Limit
- $5,000 Medical Expense Limit
C. COMMERCIAL AUTOMOBILE LIABILITY

$1,000,000 Combined Single Limit - Any Auto

Additional Insurance Requirements

A. Contractor’s General Liability policy shall be endorsed, specifically or generally, to include the following as Additional Insured:

**UNION COUNTY, ITS OFFICERS, AGENTS AND EMPLOYEES ARE INCLUDED AS ADDITIONAL INSURED WITH RESPECT TO THE GENERAL LIABILITY INSURANCE POLICY.**

B. Before commencement of any work or event, Contractor shall provide a Certificate of Insurance in satisfactory form as evidence of the insurances required above.

C. Contractor shall have no right of recovery or subrogation against Union County (including its officers, agents and employees), it being the intention of the parties that the insurance policies so affected shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

D. Union County shall have no liability with respect to Contractor’s personal property whether insured or not insured. Any deductible or self-insured retention is the sole responsibility of Contractor.

E. Notwithstanding the notification requirements of the Insurer, Contractor hereby agrees to notify Union County’s Risk Manager, at 500 N. Main Street # 130, Monroe, NC 28112, within two (2) days of the cancellation or substantive change of any insurance policy set out herein. Union County, in its sole discretion, may deem failure to provide such notice as a breach of this Agreement.

F. The Certificate of Insurance should note in the Description of Operations the following:

   Department: _____________________

   Contract #: _____________________

G. Insurance procured by Contractor shall not reduce nor limit Contractor’s contractual obligation to indemnify, save harmless and defend Union County
for claims made or suits brought which result from or are in connection with the performance of this Agreement.

H. Certificate Holder shall be listed as follows:

   Union County  
   Attention: Risk Manager  
   500 N. Main Street, Suite #130  
   Monroe, NC 28112

I. If Contractor is authorized to assign or subcontract any of its rights or duties hereunder and in fact does so, Contractor shall ensure that the assignee or subcontractor satisfies all requirements of this Agreement, including, but not limited to, maintenance of the required insurances coverage and provision of certificate(s) of insurance and additional insured endorsement(s), in proper form prior to commencement of services.

**Indemnification**

Contractor agrees to protect, defend, indemnify and hold Union County, its officers, employees and agents free and harmless from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees or other expenses or liabilities of every kind and character arising out of or relating to any and all claims, liens, demands, obligations, actions, proceedings, or causes of action of every kind in connection with or arising out of this agreement and/or the performance hereof that are due, in whole or in part, to the negligence of the Contractor, its officers, employees, subcontractors or agents. Contractor further agrees to investigate, handle, respond to, provide defense for, and defend the same at its sole expense and agrees to bear all other costs and expenses related thereto.

**Equal Employment Opportunity**

All Firms will be required to follow Federal Equal Employment Opportunity (EEO) policies. Union County will affirmatively assure that on any project constructed pursuant to this advertisement, equal employment opportunity will be offered to all persons without regard to race, color, creed, religion, national origin, sex, and marital status, status with regard to public assistance, membership or activity in a local commission, disability, sexual orientation, or age.

**Minority Businesses (MBE) or Disadvantaged Businesses (DBE)**

It is the policy of Union County that Minority Businesses (MBEs), Disadvantaged Business Enterprises (DBEs) and other small businesses shall have the opportunity to compete fairly in contracts financed in whole or in part with public funds. Consistent with this policy, Union County will not allow any person or business to be
excluded from participation in, denied the benefits of, or otherwise be discriminated against in connection with the award and performance of any contract because of sex, race, religion, or national origin.

**Licenses**

The successful Contractor(s) shall have and maintain a valid and appropriate business license (if applicable), meet all local, state, and federal codes, and have current all required local, state, and federal licenses.

**E-Verify**

E-Verify is the federal program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program, used to verify the work authorization of newly hired employees pursuant to federal law. Contractor shall ensure that Contractor and any Subcontractor performing work under this contract: (i) uses E-Verify if required to do so; and (ii) otherwise complies with applicable law.

**Iran Divestment Act Notice for Local Governments in North Carolina**

Pursuant to G.S. 147-86.59, any person identified as engaging in investment activities in Iran, determined by appearing on the Final Divestment List created by the State Treasurer pursuant to G.S. 147-86.58, is ineligible to contract with the State of North Carolina or any political subdivision of the State. The Iran Divestment Act of 2015, G.S. 147-86.55 et seq.* requires that each vendor, prior to contracting with the State certify:

1. That the vendor is not identified on the Final Divestment List of entities that the State Treasures has determined engages in investment activities in Iran;

2. That the vendor shall not utilize on any contract with the State agency any sub-contractors that is identified on the Final Divestment List; and

3. That the undersigned is authorized by the Vendor to make this certification.

UNION COUNTY RESERVES THE RIGHT TO REJECT ANY AND/OR ALL QUALIFICATIONS AND TO WAIVE ANY AND ALL TECHNICALITIES.
## APPENDIX A - PRICING FORM

**RFP # 2018-007**  
Chiller Maintenance Service

### Location | Equipment | Model | Annual Cost of Service | Comment
--- | --- | --- | --- | ---
Judicial CTR | Trane | CVHE 450 |  |
Government CTR | Trane | CVHE 450 |  |
Health and Human Services | Carrier | 23XRV |  |
Health and Human Services | Carrier | 23XRV |  |

**Total**

### Hourly Labor Rate:

| HOUFLY LABOR RATE: | $/hr

Enter a labor rate per hour. Hourly rate is established for Repair Work reimbursement only.

### Parts Markup:

| PARTS MARKUP: | %

Enter the percentage of markup on parts provided.

**Company Name:** ________________________________
APPENDIX B - PROPOSAL SUBMISSION FORM

RFP # 2018-007

Chiller Maintenance Service

This Proposal is submitted by:

Provider Name: _________________________________________________________

Representative (printed):__________________________________________________

Representative (signed):__________________________________________________

Address: __________________________________________________________

City/State/Zip:__________________________________________________________

E-Mail Address:__________________________________________________________

Telephone:_____________________________________________________________

Facsimile: __________________________________________________________

It is understood by the Proposer that Union County reserves the right to reject any and all Proposals, to make awards according to the best interest of the County, to waive formalities, technicalities, to recover and rebid this RFP. Proposal is valid for one hundred and eighty (180) calendar days from the Proposal due date.

________________________________       ______________________
Authorized Signature           Please type or print name

Proposer                                                                 Date
APPENDIX C – ADDENDUM RECEIPT AND ANTI-COLLUSION

RFP # 2018-006
Water Treatment

Please acknowledge receipt of all addenda by including this form with your Proposal. Any questions or changes received will be posted as an addendum on www.co.union.nc.us and/or www.ips.state.nc.us. It is your responsibility to check for this information.

<table>
<thead>
<tr>
<th>ADDENDUM #</th>
<th>DATE ADDENDUM DOWNLOADED</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

I certify that this proposal is made in good faith and without collusion with any other offeror or officer or employee of Union County.

(Please Print Name)  Date

Authorized Signature

Title

E-Mail Address

Company Name
APPENDIX D – IRAN DIVESTMENT CERTIFICATE

RFP # 2018-006
Water Treatment

Name of Vendor or Bidder: ________________________________________________________

IRAN DIVESTMENT ACT CERTIFICATION
REQUIRED BY N.C.G.S. 143C-6A-5(a)

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 143-6A-4.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the foregoing statement.

______________________________________________________________________________
Signature Date

______________________________________________________________________________
Printed Name Title

Notes to persons signing this form:

N.C.G.S. 143C-6A-5(a) requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina. The certification is required at the following times:

- When a bid is submitted
- When a contract is entered into (if the certification was not already made when the vendor made its bid)
- When a contract is renewed or assigned

N.C.G.S. 143C-6A-5(b) requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer’s Final Divestment List.

The State Treasurer’s Final Divestment List can be found on the State Treasurer’s website at the address www.nctreasurer.com/Iran and will be updated every 180 days.
APPENDIX E – *Trane Installation, Operation, and Maintenance CVHE-SVX02H-EN*  
2015 manual excerpt

for use with installed Trane products
SAFETY WARNING
Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.
Recommended Maintenance

**WARNING**

**Hazardous Voltage w/Capacitors!**

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06*-EN.

**NOTICE:**

**Check Purge Run-Time for Unit Hemetic Integrity!**

If frequent purging is required, failure to monitor purge pumpout rate, identify and correct source of air or water leak as soon as possible could shorten chiller life expectancy, due to moisture contamination caused by leakage.

**NOTICE:**

**Do Not Use Non-Compatible Parts or Materials!**

Use of non-compatible parts or materials could result in equipment damage. Only genuine Trane® replacement components with identical Trane part numbers should be used in Trane CenTraVac chillers. Trane assumes no responsibility for damages resulting from the use of non-compatible parts or materials.

This section describes the basic chiller preventive maintenance procedures, and recommends the intervals at which these procedures should be performed. Use of a periodic maintenance program is important to ensure the best possible performance and efficiency from a CenTraVac chiller.

Recommended purge maintenance procedures are detailed in Operation and Maintenance Guide: EarthWise™ Purge System with Tracer AdaptiView™ Control for Water-Cooled CenTraVac™ Chillers (PRGD-SVX01*-EN, or the most recent version).

**Record Keeping Forms**

An important aspect of the chiller maintenance program is the regular completion of records. Refer to “Forms and Check Sheets,” p. 79 for copies of the recommended forms. When filled out accurately by the machine operator, the completed logs can be reviewed to identify any developing trends in the chiller’s operating conditions. For example, if the machine operator notices a gradual increase in condensing pressure during a month’s time, he can systematically check, then correct the possible cause of this condition.

**Normal Operation**

**Table 18. Normal operation**

<table>
<thead>
<tr>
<th>Operating Characteristic</th>
<th>Normal Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Evaporator Pressure</td>
<td>6 to 9 psia (41.4 to 62.1 kPaA) / -9 to -6 psig (-62.1 to -41.4 kPaG)</td>
</tr>
<tr>
<td>Approximate Condenser Pressure(a), (b)</td>
<td>17 to 27 psia (117.2 to 182.2 kPaA) / 2 to 12 psig (13.8 to 82.7 kPaG) (standard condenser)</td>
</tr>
<tr>
<td>Oil Sump Temperature Unit not running</td>
<td>140°F to 176°F (60.0°C to 80.0°C)</td>
</tr>
<tr>
<td>Oil Sump Temperature Unit running</td>
<td>95°F to 162°F (35.0°C to 72.2°C)</td>
</tr>
<tr>
<td>Oil Sump Differential Oil Pressure(c)</td>
<td>18 to 22 psid (124.1 to 151.7 kPaD)</td>
</tr>
</tbody>
</table>

(a) Condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of HCFC-123 at a temperature above that of leaving condenser water at full load.

(b) Normal pressure readings for ASME condenser exceed 12 psig (82.7 kPaG).

(c) Oil tank pressure: -9 to -6 psig (-62.1 to -41.4 kPaG). Discharge oil pressure: 7 to 15 psig (48.3 to 103.4 kPaG).

**NOTICE:**

**Equipment Damage!**

Failure to remove the strain relief with the sensor could result in equipment damage. Do NOT attempt to pull sensor bulb through the strain relief; always remove the entire strain relief with the sensor.
### Table 19. Recommended maintenance

<table>
<thead>
<tr>
<th>Daily</th>
<th>Every 3 months</th>
<th>Every 6 months</th>
<th>Annually(a), (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the chiller's evaporator and condenser pressures, oil tank pressure, differential oil pressure and discharge oil pressure. Compare the readings with the values provided in Table 18, p. 69.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the oil level in the chiller oil sump using the two sight glasses provided in the oil sump head. When the unit is operating, the oil level should be visible in the lower sight glass.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete logs on a daily basis.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean all water strainers in the water piping system.</td>
<td>Lubricate the vane control linkage bearings, ball joints, and pivot points.</td>
<td>Lubricate vane operator tang O-rings.</td>
<td>Operate the tang operators manually and check for any abnormalities.</td>
</tr>
<tr>
<td>Perform the annual maintenance procedures referred to in Operation and Maintenance Guide: EarthWise™ Purge System with Tracer AdaptiView™ Control for Water-Cooled ConTravac™ Chillers (PRGD-SVX01*-EN).</td>
<td>Use an ice water bath to verify the accuracy of the evaporator refrigerant temperature sensor (4R10). If the sensor is exposed to temperature extremes outside its normal operating range (0°F to 90°F [-17.8°C to 32.2°C]), check its accuracy at six-month intervals.</td>
<td>Inspect the condenser tubes for fouling; clean if necessary.</td>
<td>Inspect and clean the ifm efector® flow detection sensors. Use Scotch-Brite® or other non-abrasive material to clean scale; do NOT use steel wool, which could cause the probe to rust.</td>
</tr>
<tr>
<td>(a) Every three years, use a nondestructive tube test to inspect the condenser and evaporator tubes. It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.</td>
<td>(b) Contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components. Check the following: chronic air leaks (which can cause acidic conditions in the compressor oil and result in premature bearing wear) and evaporator or condenser water tube leaks (water mixed with the compressor oil can result in bearing pitting, corrosion, or excessive wear).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Recommended Compressor Oil Change

After the first six months of accumulated operation, or after 1,000 hours operation—whichever comes first—it is recommended to change the oil and filter. After this oil change, it is recommended to subscribe to the Trane annual oil analysis program rather than automatically change the oil as part of scheduled maintenance. Change the oil only if indicated by the oil analysis. Use of an oil analysis program will reduce the chiller’s overall lifetime waste oil generation and minimize refrigerant emissions. The analysis determines system moisture content, acid level, and wear metal content of the oil, and can be used as a diagnostic tool. The oil analysis should be performed by a qualified laboratory that is experienced in refrigerant and oil chemistry and in the servicing of Trane® centrifugal chillers.

In conjunction with other diagnostics performed by a qualified service technician, oil analyses can provide valuable information on the performance of the chiller to help minimize operating and maintenance costs and maximize its operating life. A drain fitting is installed after the oil filter for obtaining oil samples.

Notes:
- Use only Trane OIL00022. A full oil change is 9 gallons (34.1 L) of OIL00022.
- One spare oil filter is provided with each new chiller. If not used earlier, use at first recommended oil and filter change.
- This recommended oil change is not covered by factory warranty.

Purge System

The use of low-pressure refrigerant in CenTraVac chillers permits any section of the unit to be below atmospheric pressure, regardless of whether the unit is running. This creates an environment in which air or moisture could enter the unit. If these noncondensables are allowed to accumulate while the chiller is running, they become trapped in the condenser; this situation increases condensing pressure and compressor power requirements, and reduces the chiller’s efficiency and cooling capacity. Therefore, proper maintenance of the purge system is required.

The Trane EarthWise™ Purge is the only purge system available for the CenTraVac chiller. The purge is designed to remove noncondensable gases and water from the refrigeration system. EarthWise Purge unit operation, maintenance and troubleshooting is covered by a separate operation and maintenance manual, which may be obtained from the nearest Trane office.

Leak Checking Based on Purge Pump Out Time

Use the following formula to calculate the annual refrigerant leakage rate based on the daily purge pump out time and the unit refrigerant charge.

Formula: % annual leakage rate = [(X min/day)*(0.0001 lb R-123/min)/(Y lb)]*100

- X= minutes/day of purge pump out operation
- Y=initial refrigerant charge

Figure 44 has been developed to aid in determining when to do a leak check of a chiller based on the purge pump out time and unit size. This figure depicts normal purge pump-out times, small leaks and large leaks based on the chiller tonnage.

If the purge pump-out time is in the small leak region, then a leak check should be performed and all leaks repaired at the earliest convenience. If the purge pump-out time is in the large leak region, a thorough leak check of the unit should be performed immediately to find and fix the leaks.
Recommended Maintenance

Long Term Unit Storage
Contact your local Trane service agency for recommendations for storage requirements for chillers to be removed from service in excess of a normal seasonal shut-down.

Refrigerant Charge

**WARNING**

Refrigerant May Be Under Positive Pressure!
Failure to recover refrigerant to relieve pressure or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in an explosion which could result in death or serious injury or equipment damage. System contains oil and refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Refer to Installation, Operation, and Maintenance: Refrigerant Handling Guidelines - A Guide for the Service Technician's Conservation & Safe Handling of Low-Pressure Refrigerants in Trane® Chillers (CTV-SVX05*-EN, or the most recent revision).

Leak Testing

**WARNING**

Hazard of Explosion!
Failure to follow recommended safe leak test procedures could result in death or serious injury or equipment or property-only-damage. Never use an open flame to detect gas leaks. Explosive conditions may occur. Use a leak test solution or other approved methods for leak testing.

**WARNING**

Hazardous Pressures!
Failure to follow these safety precautions could result in a sudden rise of pressure possibly resulting in a violent explosion which could result in death or serious injury. If a heat source is required to raise the tank pressure during removal of refrigerant from cylinders, use only warm water or heat blankets to raise the tank temperature. Do not exceed a temperature of 150°F. Do not, under any circumstances apply direct flame to any portion of the cylinder.

Important: If leak testing is required, contact a Trane service agency.
Recommended System Maintenance

**NOTICE:**

**Proper Water Treatment!**

The use of untreated or improperly treated water in a CentraVac could result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

**Condenser**

Condenser tube fouling is indicated when the approach temperature (the difference between the condensing refrigerant temperature and the leaving condenser water temperature) is higher than predicted.

If the annual condenser tube inspection indicates that the tubes are fouled, two cleaning methods, mechanical and chemical, can be used to rid the tubes of contaminants. Use the mechanical cleaning method to remove sludge and loose material from smooth-bore tubes.

To clean other types of tubes including internally-enhanced types, consult a qualified service organization for recommendations.

**Evaporator**

Since the evaporator is typically part of a closed circuit, it may not accumulate appreciable amounts of scale or sludge. Normally, cleaning every three years is sufficient. However, periodic inspection and cleaning is recommended on open evaporator systems, such as air washers.

**Waterbox and Tubesheet Protective Coatings**

Trane recommends that coated waterboxes/tubesheets—regardless of the type of protective coating included—be taken out of service within the first one to three months of operation for inspection. Any voids or defects identified upon inspection must be repaired. If the water quality is known to be highly supportive of corrosion (i.e., sea water, etc.), inspect the coating system at one month; if the water quality is known to be relatively benign (i.e., normal treated and clean condenser water), inspect the coating system within three months. Only when initial inspections show no problems are present should subsequent maintenance intervals be increased.

**Sacrificial Anodes**

The replacement schedule for the optional zinc or magnesium anodes can vary greatly with the aggressiveness of the water that is in the system. Some sites could require anode replacement every two to three months while other sites may require anode replacement every two to three years. Trane recommends that anode inspection for wear sometime within the first several months of the anodes being placed into service. If the

**Important:** All of the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning. Remember, however, that whenever the chemical tube cleaning method is used, it must be followed up with mechanical tube cleaning, flushing and inspection.

---

**NOTICE:**

Unit Corrosion Damage!

Failure to follow proper procedures when using corrosive chemicals to clean water side of unit could result in corrosion damage to the unit and tubes. It is recommended that the services of a qualified chemical cleaning firm be used. Proper personal protective equipment as recommended by the chemical manufacturer should be used. Refer to the chemicals MSDS sheet for proper safety procedures.

---

Figure 45. Typical chemical cleaning setup

1. Follow all instructions in “Waterbox Removal and Installation,” p. 75 to remove waterbox covers.
2. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.
3. Thoroughly flush the condenser water tubes with clean water.

Scale deposits are best removed by chemical means. Be sure to consult any qualified chemical house in the area (one familiar with the local water supply’s chemical mineral content) for a recommended cleaning solution suitable for the job.

**Note:** A standard condenser water circuit is composed solely of copper, cast iron, and steel.
observed loss of anode material is small, then the interval between subsequent inspections can be lengthened. Replace the anode and/or shorten the inspection interval if the anode has lost 50 percent or more of its original mass. If anode depletion occurs very quickly, consult a water treatment specialist to determine if the anode material selected is correct for the application.

<table>
<thead>
<tr>
<th>NOTICE:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment Damage!</strong></td>
</tr>
<tr>
<td>Failure to follow instructions could result in equipment damage. Do NOT use Teflon-based tape or paste on anode; a small amount of liquid sealant (Loctite® 242 or equivalent) may be applied to prevent leakage when installing anode, but do not apply so much sealant that it prevents the necessary electrical connection between the anode and the waterbox.</td>
</tr>
</tbody>
</table>

As needed after draining the waterbox, use a 2-1/2 in. (63.5 mm) wrench to remove/install Trane-supplied waterbox anodes.
Waterbox Removal and Installation

Important: Only qualified technicians should perform the installation and servicing of this equipment.

Discussion

This section will discuss recommended hoist ring/clevises and lifting. Proper lifting technique will vary based on mechanical room layout.

- It is the responsibility of the person(s) performing the work to be properly trained in the safe practice of rigging, lifting, securing, and fastening of the waterbox.
- It is the responsibility of the person(s) providing and using the rigging and lifting devices to inspect these devices to ensure they are free from defect and are rated to meet or exceed the published weight of the waterbox.
- Always use rigging and lifting devices in accordance with the applicable instructions for such device.

Procedure

1. Determine the type and size of chiller being serviced. Refer to Trane nameplate located on chiller control panel.
   
2. Select the proper lift connection device from the Table 23, p. 78. The rated lifting capacity of the selected lift connection device must meet or exceed the published weight of the waterbox. Verify the waterbox weight from the latest published literature.
   
3. Ensure that the lift connection device has the correct connection for the waterbox (e.g., thread type [course/fine, English/metric] and bolt diameter [English/metric]).
   
4. Properly connect the lift connection device to the waterbox. Refer to Figure 46, p. 75 and ensure that the lift connection device is securely fastened.
   
CTV units—Install hoist ring on to the lifting connection on the waterbox. Torque to 100 ft·lb (135.6 N·m) for 3/4-in. (19.05-mm) threaded connections and 28 ft·lb (38.0 N·m) for 1/2-in. (12.7-mm) threaded connections.

5. Disconnect water pipes, if connected.

6. Remove waterbox bolts.

7. Lift the waterbox away from the shell.

WARNING

Heavy Objects!

Failure to properly lift waterbox could result in death or serious injury. Each of the individual cables (chains or slings) used to lift the waterbox must be capable of supporting the entire weight of the waterbox. The cables (chains or slings) must be rated for overhead lifting applications with an acceptable working load limit. Refer to Table 22, p. 77 for waterbox weights.

WARNING

Straight Vertical Lift Required!

Failure to properly lift waterbox in straight vertical lift could result in death or serious injury. The proper use and ratings for eyebolts can be found in ANSI/ASME standard B18.15. Maximum load rating for eyebolts are based on a straight vertical lift in a gradually increasing manner. Angular lifts will significantly lower maximum loads and should be avoided whenever possible. Loads should always be applied to eyebolts in the plane of the eye, not at some angle to this plane.

Review mechanical room limitations and determine the safest method or methods of rigging and lifting the waterboxes.

Important: This literature contains rigging and lifting information only for Trane CTV chillers built in La Crosse. For Trane CTV chillers built outside the United States, refer to literature provided by the applicable manufacturing location.
8. Store waterbox in a safe and secure location and position.

   Note: Do not leave waterbox suspended from lifting device.

Reassembly

Once service is complete, the waterbox should be reinstalled on the shell following all previous procedures in reverse. Use new O-rings or gaskets on all joints after thoroughly cleaning each joint.

- Torque waterbox bolts (see Table 21).

Torque Requirements

Table 21. CenTraVac torque

<table>
<thead>
<tr>
<th>Bolt Size in. (mm)</th>
<th>Gasket type O-ring ft·lb (N·m)</th>
<th>Flat ft·lb (N·m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>25 (33.9)</td>
<td>12–18 (16.3–24.4)</td>
</tr>
<tr>
<td>1/2</td>
<td>70 (94.9)</td>
<td>33–50 (44.7–67.8)</td>
</tr>
<tr>
<td>5/8</td>
<td>150 (203.4)</td>
<td>70–90 (94.9–122.0)</td>
</tr>
<tr>
<td>3/4</td>
<td>250 (339.0)</td>
<td>105–155 (142.4–210.2)</td>
</tr>
</tbody>
</table>
Forms and Check Sheets

The following forms and check sheets are included for use with Trane start-up of CVHE, CVHF, and CVHG CenTraVac chillers. Forms and check sheets are used, as appropriate, for installation completion verification before Trane start-up is scheduled, and for reference during the Trane start-up.

Where the form or check sheet also exists outside of this publication as standalone literature, the literature order number is also listed.

- “CenTraVac™ Installation Completion Check Sheet and Request for Trane Service” (CTV-ADF001*-EN)
- “CVHE, CVHF, CVHG Start-up Task List”
- “CVHE, CVHF, CVHG Annual Inspection List”
- “Operator Log”
# CenTraVac™ Installation Completion Check Sheet and Request for Trane Service

**Important:** A copy of this completed form must be submitted to the Trane service office that will be responsible for the start-up of the chiller. Start-up will NOT proceed unless applicable items listed in this form have been satisfactorily completed.

To: ____________________________  Trane Service Office: ____________________________

S.O. Number: ____________________  Serial Numbers: ____________________________

Job/Project Name: ____________________________

Address: _____________________________________________________________________________

The following items are being installed and will be completed by: __________________________________________________

**Important:** Start-up must be performed by Trane or an agent of Trane specifically authorized to perform start-up and warranty of Trane® products. Contractor shall provide Trane (or an agent of Trane specifically authorized to perform start-up) with notice of the scheduled start-up at least two weeks prior to the scheduled start-up. **Equipment not started by Trane is not warranted by Trane.**

Check box if the task is complete or if the answer is “yes.”

## 1. CenTraVac
- [ ] In place and piped.
  **Note:** Do not insulate the CenTraVac chiller or adjacent piping prior to the chiller commissioning by Trane service personnel. The contractor is responsible for any foreign material left in the unit.

## 2. Piping
- Chilled water piping connected to:
  - ( ) CenTraVac
  - ( ) Air handling units
  - ( ) Pumps
- Condenser and heat recovery condenser (as applicable)
  - ( ) CenTraVac
  - ( ) Pumps
  - ( ) Cooling tower
  - ( ) Heating loop (as applicable)
- Make-up water connected to cooling tower
- Water supply connected to filling system
- Systems filled
- Pumps run, air bled from system
- Strainers cleaned
- Rupture disk or RuptureGuard™ ventilation piping installed

## 3. Flow balancing valves installed
- Leaving chilled water
- Leaving condenser water
- Optional heat recovery or auxiliary condenser water

## 4. Gauges, thermometers, and air vents
- Installed on both sides of evaporator
- Installed on both sides of condenser and heat recovery condenser (as applicable)

## 5. Wiring
- Compressor motor starter has been furnished by Trane, or has been configured and installed in compliance with the appropriate Trane Starter by Others specification (available from your local Trane Sales Office)
- Full power available
- Interconnecting wiring, starter to panel (as required)
- External interlocks (flow switch, pumps auxiliary, etc.)
- Chiller motor connection (remote starters)
  **Note:** Do not make final remote starter-to-compressor motor connections until requested to do so by the Trane service representative!
- Chilled water pump (connected and tested)
- Condenser water pump (connected and tested)
- Cooling tower fan rotation checked
- Heat recovery condenser water pump (as applicable)
- 115 Vac power available for service tools
- All controls installed and connected
- All magnetic starters installed and connected
6. Testing

☐ Dry nitrogen available for pressure testing (for disassembled units)  ☐ Material and equipment available for leak testing, if necessary

7. ☐ Refrigerant on job site and in close proximity to chiller

Total amount in cylinders/drum: _______ (specify lb or kg) and fill in specifics below:
Number of cylinders/drum of size _______ (specify lb or kg)
Number of cylinders/drum of size _______ (specify lb or kg)

Note: After commissioning is complete, it is the installer's responsibility to transport empty refrigerant containers to an easily accessible point of loading to facilitate container return or recycling.

8. ☐ Systems can be operated under load conditions

9. ☐ Electrical, control man, and contractor's representative are available to evacuate, charge, and test the CenTraVac under serviceman's supervision

10. Equipment room

☐ Does the equipment room have a refrigerant monitor/sensor capable of monitoring and alarming within the allowable exposure level of the refrigerant?

☐ Does the installation have properly placed and operating audible and visual refrigerant alarms?

☐ Does the equipment room have proper mechanical ventilation?

☐ If it is required by local code, is a self-contained breathing apparatus available?

11. Owner awareness

☐ Has the owner been fully instructed on the proper use and handling of refrigerant?

☐ Does the owner have a copy of the MSDS for refrigerant?

Note: Additional time required to properly complete the start-up and commissioning, due to any incompleteness of the installation, will be invoiced at prevailing rates.

This is to certify that the Trane® equipment has been properly and completely installed, and that the applicable items listed above have been satisfactorily completed.

Checklist completed by (print name): _____________________________________________________________________________

Signature: _____________________________________________ Date: ______________________________

In accordance with your quotation and our purchase order number __________________, we will therefore require the presence of Trane service on this site, for the purpose of start-up and commissioning, by __________________ (date).

Note: Minimum two-week advance notification is required to allow scheduling of the chiller start-up.

Additional comments/instructions:

__________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________

Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.Trane.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.
CVHE, CVHF, CVHG Start-up Task List

Start-up Tasks to be Performed By Trane

Safety Alert!

In addition to the following tasks, you MUST:

- Follow all instructions in the chiller’s Installation, Operation, and Maintenance manual, including warnings, cautions, and notices.
- Perform all required tasks in any applicable Service Alerts and Service Bulletins.
- Review and understand all information provided in Submittals and Design Specifications.

Failure to do so could result in death or serious injury.

General

- Inspect chiller for damage (shipping or rigging).
- Verify and record unit nitrogen holding charge pressure.
- Inspect water piping for proper installation.
  - Inspect strainers, flow sensing devices, isolation valves, pressure gauges, thermometer wells, flow balancing valves, vent cocks, and drains.
  - Inspect cooling tower piping.
- Verify proper clearances.
- Power wiring meets size requirement.
  - Verify proper voltage and amperage rating.
- Verify proper foundation installation.
- Verify unit isolator pads/springs have been installed.
- Verify low voltage circuits are isolated from high voltage circuits.
- Check equipment room for ventilation, refrigerant monitor, rupture disk piping, and PPE.

Note: All conditions which do not conform to the established requirements for unit installation must be corrected prior to start-up. Any non-conforming condition which is not corrected prior to start-up must be noted in the Non-Compliance Form (PROD-ADF001*-EN) by the start-up technician; this information must also be signed by responsible site personnel before start-up and the completed Non-Compliance Form will become part of the start-up record, submitted with a Start-up Check Sheet and a Chiller Service Report.

Pre-Start Operations

- Verify nitrogen holding charge.
- Calibrate the high pressure cutout control (HPC).
- Meg compressor motor.
- Confirm proper oil pump operation.
- Evacuate unit.
- Check condenser installation.
- Check evaporator installation.

NOTICE:

Do Not Apply Electrical Power to a Unit in a Vacuum!

Failure to disconnect power to units with inside-the-delta solid state starters during evacuation or when the unit is in a deep vacuum could cause compressor motor damage. Applying electrical power to a motor in a vacuum could cause damage to the motor. In addition, on units with inside-the-delta solid state starters, all power to the unit must be disconnected prior to evacuating the unit as line power is directly applied to the motor terminals 4, 5, and 6.

- Check electrical and controls.
  - Inspect motor starter and control panel.
  - Confirm all wiring connections are tight, free of abrasion and have no sharp bends in panel and on compressors.
  - Inspect contactors and relays.
- Verify unit wiring (low and high voltage) is correctly isolated, phased, and properly grounded.
- Connect external 120 Vac power to power up the control panel.
- Run the oil pump to verify pump can provide 18 to 22 psid (124.1 to 151.7 kPaD) net pressure.
- Verify and record control parameters.
- Verify all control interlocks are installed and properly functioning.
- Dry run starter (non-AFD).
- Measure condenser pressures and flow.
- Adjust condenser flow sensing device.
- Measure evaporator pressures and flow.
- Adjust evaporator flow sensing device.
- Inspect motor starter panel and perform starter panel checkout procedures.
- Confirm proper phase check incoming power.
- Inspect control panel.
- Apply separate source 120 Vac power to control to perform control panel checkout procedure.
- Review and record unit configuration parameters.
- Confirm oil pump pressure—regulating valve setting.
- Verify vane operator is working properly and moves without binding.
- Dry run test starter (non-AFD).
- Remove separate source power and reconnect wiring.

**Preparation for Start-up**

- Relieve nitrogen holding charge.
- Evacuate and charge the system.
- Apply power to the starter panel.
- Verify current to the oil sump heater.

**Chiller Start-up**

- Set Purge mode to “On.”
- Bump-start the compressor and verify compressor motor rotation.
- Start chiller.
- Verify no unusual noises or vibrations and observe operating conditions.
- If necessary, adjust oil pressure regulator between 18 to 22 psid (124.1 to 151.7 kPaD) net.
- Measure and verify refrigerant pump pressure.
- When chiller is stable, take system log three times at 15-minute intervals.
- Set Purge mode to “Adaptive.”
- Reset the “Starter Energy Consumption” resettable.
- Record a Chiller Service Report.
- Review “AdaptiView Display Customer Training Checklist.”
  - Equipment Description
  - Stopping/Starting Chiller Operation
  - Alarms
  - Reports
  - Data Graphs
  - Equipment Settings
  - Display Settings
  - Security Settings
  - Basic Troubleshooting
CVHE, CVHF, CVHG Annual Inspection List

Follow the annual maintenance instructions provided in the text of this manual, including but not limited to:

**Compressor Motor**
- Motor continuity.
- Motor meg test.
- Check motor terminals.
- Inspect motor terminal board.

**Starter or AFD**
- Inspect starter contacts.
- Check all connections per manufacturer specifications.
- Follow all manufacturer recommendations for starter or AFD maintenance.
- Inspect/clean/service the AFD cooling system (water- or air-cooled AFD).
- Record all applicable starter or starter component settings.

**Oil System**
- Annual oil analysis (follow recommendations).
- Clean and lubricate oil system as required.
- Electrical inspection.
- Pump motor continuity check.
- Run oil pump and check differential oil pressure.

**Condenser**
- Inspect for fouling and scaling in tubes.
- Check operation of condenser water flow sensing device.
- Factory recommendation to eddy current test tubes every three years.

**Evaporator**
- Inspect for fouling and scaling in tubes.
- Check operation of evaporator water flow sensing device.
- Factory recommendation to eddy current test tubes every three years.

**Control Circuits**
- Verify control parameters.
- Test appropriate sensors for accuracy.
- Ensure sensors are properly seated in wells with thermopaste installed.
- Check evaporator leaving water temperature low temperature cutout setpoint.
- Condenser high pressure switch check-out.
- Check adjustment and operation of the inlet guide vane actuator.

**Leak Test Chiller**
- Check purge times and unit performance logs. If warranted, pressure leak test.
- Review oil analysis. If required, submit refrigerant sample for analysis.
- Inspect unit for any signs of refrigerant or oil leakage.
- Check unit for any loose bolts on flange, volutes, or casing.

**Purge Unit**
- Review the purge Installation, Operation, and Maintenance manual and follow maintenance and/or inspection items identified.
- Review purge pump out data.
- Review overall operation of purge and service as necessary.

**Exterior**
- Inlet guide vane linkage.
- Clean and touch-up painted surfaces as needed.
- Repair deteriorated, torn, or missing insulation.
Optional Accessories

- If applicable, lubricate factory-installed gantries.
- After the first month of operation, inspect Heresite® or Belzona® coated waterboxes after first month; thereafter, inspect as needed.
- Inspect anodes.
- Inspect and lubricate hinged waterboxes.
- With water flow sensing option, bleed tubing from waterboxes to transformers.
## Operator Log

**Water-Cooled CVHE, CVHF, CVHG CenTraVac Chiller with UC800 Controller**

<table>
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**Date:**

**Technician:**

**Owner:**

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UNION COUNTY GOVERNMENT RFP # 2018-007  CHILLER MAINTENANCE SERVICE

Revised: 11 Aug 2013
Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.Trane.com.

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CVHE-SVX02H-EN  31 Mar 2015
Supersedes CVHE-SVX02G-EN  (10 Oct 2014)
UNION COUNTY GOVERNMENT RFP # 2018-007  CHILLER MAINTENANCE SERVICE
APPENDIX E – *Carrier 23XRV Start-up, Operation and Maintenance Instructions* excerpt

for use with installed Carrier products.
Start-Up, Operation and Maintenance Instructions

SAFETY CONSIDERATIONS

Screw liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.

Be sure you understand and follow the procedures and safety precautions contained in the machine instructions, as well as those listed in this guide.

⚠️ DANGER

DO NOT VENT refrigerant relief devices within a building. Outlet from rupture disc or relief valve must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE 15 (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers) (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

PROVIDE adequate ventilation in accordance with ANSI/ASHRAE 15, especially for enclosed and low overhead spaces. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

DO NOT USE air to leak test. Use only refrigerant or dry nitrogen. NEVER EXCEED specified test pressures. VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.

DO NOT VALVE OFF any safety device.

BE SURE that all pressure relief devices are properly installed and functioning before operating any machine.

RISK OF INJURY OR DEATH by electrocution. High voltage is present on motor leads even though the motor is not running. Open the power supply disconnect before touching motor leads or terminals.

⚠️ WARNING

DO NOT WELD OR FLAMECUT any refrigerant line or vessel until all refrigerant (liquid and vapor) has been removed from chiller. Traces of vapor should be displaced with dry air or nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.

DO NOT USE eyebolts or eyebolt holes to rig heat exchangers or the machine. The introduction of the wrong refrigerant can cause machine damage or malfunction.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while machine is under pressure or while machine is running. Be sure pressure is at 0 psig (0 kPa) before breaking any refrigerant connection.

CAREFULLY INSPECT all relief valves, rupture discs, and other relief devices AT LEAST ONCE A YEAR. If machine operates in a corrosive atmosphere, inspect the devices at more frequent intervals.

DO NOT ATTEMPT TO REPAIR or RECONDITION any relief valve when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. Replace the valve.

DO NOT INSTALL relief devices in series or backwards.

USE CARE when working near or in line with a compressed spring. Sudden release of the spring can cause it and objects in its path to act as projectiles.

⚠️ CAUTION

DO NOT STEP on refrigerant lines. Broken lines can whip about and move inspection covers or other heavy components. Even if components are light, use mechanical equipment when there is a risk of slipping or losing your balance.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER, TOWER FAN, OR PUMPS. Open the disconnect ahead of the starter, tower fan, and pumps. Shut off the machine. The introduction of the wrong refrigerant can cause machine damage or malfunction.

DO NOT VENT OR DRAIN waterboxes containing industrial brines, liquid, gases, or semisolids without the permission of your process control group.

DO NOT LOOSEN waterbox cover bolts until the waterbox has been completely drained.

DOUBLE-CHECK that coupling nut wrenches, dial indicators, or other items have been removed before rotating any shafts.

DO NOT LOOSEN a packing gland nut before checking that the nut has a positive thread engagement.

PERIODICALLY INSPECT all valves, fittings, and piping for corrosion, rust, leaks, or damage.

PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.
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2. Open the charging valve fully.
3. Slowly open the cylinder regulating valve.
4. Observe the pressure gage on the chiller and close the regulating valve when the pressure reaches test level. Do not exceed 140 psig (965 kPa).
5. Close the charging valve on the chiller. Remove the copper tube if no longer required.

**Repair the Refrigerant Leak, Retest, and Apply Standing Vacuum Test** — After pressurizing the chiller, test for leaks with a soap bubble solution, an electronic leak detector, a halide torch, or an ultrasonic leak detector. Bring the chiller back to atmospheric pressure, repair any leaks found, and retest.

After retesting and finding no leaks, apply a standing vacuum test. Then dehydrate the chiller. Refer to the Chiller Dehydration in the Before Initial Start-Up section, page 55.

**Trim Refrigerant Charge** — If it becomes necessary to adjust the refrigerant charge to obtain optimum chiller performance, operate the chiller at design load and then add or remove refrigerant slowly until the difference between LEAVING CHILLED LIQUID chilled liquid temperature and the EVAP REFRIG LIQUID TEMP reaches design conditions. Do not overcharge. For superheat information, see the Troubleshooting section on page 78.

Refrigerant may be added either through the optional storage tank or directly into the chiller as described in the section entitled, Refrigerant Charging.

To remove any excess refrigerant, follow the procedure in Transfer Refrigerant from Chiller to Pumpout Storage Tank section, Steps 1a, b on page 70.

**WEEKLY MAINTENANCE**

**Check the Lubrication System** — Mark the oil level on the oil sump sight glasses and observe the level each week while the chiller is running. Check the moisture indicator on the motor cooling line.

If the level goes below the bottom of the oil sump sight glass, the oil reclaim system will need to be checked for proper operation. The oil reclaim system is operating properly if the level in the oil sump increases after running the chiller near full load with a 95°F (35°C) or higher CONDENSER TEMPERATURE for 1 hour. If additional oil is required, add it through the oil charging valve (Fig. 2 and 3). A hand pump is required for adding oil against refrigerant pressure. The oil charge for the 23XRV chiller is 7.5 gallons (28 L).

The oil must carry Carrier’s specifications for the 23XRV chillers. Refer to Changing Oil and Oil Filter section. Any oil that is added should be logged by noting the amount and date in Fig. 40 on page 68. Any oil that is added due to oil loss not related to service will eventually return to the sump. Excess oil must be removed when the level is above the top of the oil sump sight glass.

A 530-watt oil sump heater is controlled by the PIC III to maintain oil temperature above 140°F (60°C) or CALC EVAP SAT TEMP plus 53°F (29.4°C) when the compressor is off (see the Controls section on page 12). The ICVC Status- COMPRESS table displays whether the heater is energized or not. If the PIC III shows that the sump heater is energized, but the sump is not heating up, the power to the oil sump heater may be off or the oil level may be too low. Check the oil level, the sump oil heater contactor voltage, and oil heater resistance.

The PIC III will not permit compressor start-up if the oil temperature is less than 140°F (60°C) or CALC EVAP SAT TEMP plus 15°F (8.3°C), whichever is lower. The control will continue with start-up only after the temperature is within limits.

**SCHEDULED MAINTENANCE**

Establish a regular maintenance schedule based on the actual chiller requirements such as chiller load, run hours, and cooler and condenser liquid quality. The time intervals listed in this section are offered as guides to service only. Jobsite conditions may dictate that maintenance schedule is performed more often than recommended.

**Service OnTime** — The ICVC will display a SERVICE ONSTIME value on the MAINSTAT table. This value should be reset to zero by the service person or the operator each time major service work is completed so that time between service can be seen.

**Inspect the Control Center** — Maintenance is generally limited to general cleaning and tightening of connections. Vacuum the control center enclosure to eliminate dust build-up. In the event of chiller control malfunctions, refer to the Troubleshooting Guide section for control checks and adjustments.

Power connections on newly installed equipment may relax and loosen after a month of operation. Turn off power and re-tighten, check annually thereafter.

**CAUTION**

Be sure power to the control center is off when cleaning and tightening connections inside the control center. Failure to be sure power is off will result in severe personal injury or death.

**Check Safety and Operating Controls Monthly** — To ensure chiller protection, the Automated Control Test in the service menu should be done at least once per month. See Table 5 for safety control settings.

**CAUTION**

Do not manually open the oil reclaim isolation valve when the chiller is shut down. Doing so will flood the vaporizer with refrigerant and severely degrade the viscosity of the oil in the sump.

**Changing Oil and Oil Filter** — If the OIL PRESSURE DELTA P approaches the 18 psid (124 kPad) LOW OIL PRESSURE ALARM threshold, change oil filter as needed. Otherwise, change the oil filter on a yearly basis.

Change the oil after the first year of operation. Then, change the oil at least every three years, or as needed. However, if a continuous oil monitoring system is present and/or a yearly oil analysis is performed, the time between oil changes may be extended. See Oil Specification section on page 74 for additional information.

**CAUTION**

Compressor oil is hygroscopic. Containers should remain tightly sealed in a clean and dry environment to prevent moisture absorption from the air.

The 23XRV oil pump and filter can be isolated to change the oil filter and oil while the refrigerant remains inside the chiller. Use the following procedure to change the oil and oil filter (if required): CHANGING OIL

1. Make sure the compressor is off and the CB1 main circuit breaker for the control center is open.
2. Open the CB2 control power and oil heater circuit breaker in order to turn off the power to the oil heater.
3. Record the oil level observed in the oil sump sight glass.

⚠️ CAUTION

Be sure the power to the oil heater is off when the oil sump is drained. If the oil heater remains energized when the sump is empty, it will overheat any residual oil on the heating element and become fouled. Overheating the elements will also significantly reduce their useful life.

4. Connect an oil charging hose to the oil drain valve on the strainer housing. See Fig. 3. Place the other end of the oil charging hose in a clean container suitable for used oil. A portion of the oil drained from the sump should be used as an oil sample and should be sent to a laboratory for proper analysis. Do not contaminate this sample.

5. Slowly open the drain valve in order to drain the oil from the sump.

⚠️ WARNING

The oil sump is at high pressure. Relieve pressure slowly.

6. Charge new oil through the drain valve on the strainer housing. A hand pump or portable electric oil pump will be required to charge oil back into the oil sump against refrigerant pressure.

7. Add oil (approximately 7 gal [23 L]) until it returns to the level noted in Step 3. The oil sight glass will not fill completely since a small amount of gas will be trapped inside (even under vacuum conditions).

8. Apply power through the CB2 controls and oil heater circuit breaker.

Changing Oil Filter

1. Make sure the compressor is off and the disconnect for the compressor starter is open.

2. Close both oil filter isolation valves. See Fig. 43.

3. Place a container underneath the oil filter assembly.

4. When a Schrader valve is provided, use it to relieve the pressure. Slowly open the drain plug, located on the bottom of the oil filter housing, to relieve pressure. Do not remove the plug.

5. Remove the filter canisters by unscrewing the retainer nut. The filter may now be removed and disposed of properly.

6. Install new oil filter. Install the new O-ring. Tighten the retainer nut properly.

7. If a Schrader valve is supplied, evacuate the oil filter by connecting the vacuum pump to the Schrader valve.

8. Slowly open the isolation valve located near the oil pump to equalize the pressure. Fully open both oil filter isolation valves.

Oil Specification — If oil is to be added, it must meet the following Carrier specifications:

- Carrier Part Number ............ PP23BZ110001 (6x1 gal. cans)
- PP23BZ110005 (1x5 gal. can)

- Oil type ................. Inhibited polyolester-based synthetic compressor lubricant suitable for use in screw compressors where high viscosity and compatibility with HFC-134a refrigerants is required.

- ISO Viscosity Grade ............. 220

- Specific Gravity .............. 0.981

- Viscosity, cSt at 40 C (104 F) .......... 198 to 242
  cSt at 100 C (212 F) .............. 18 to 21
  SSU at 100 F (38 C) ............. 1005 ± 100

- Pour Point (maximum) ............ –6 F (–21 C)
- Flash Point (minimum) ............ 428 F (220 C)
- Moisture Content (maximum) .... 50 ppm
- Acid Number (maximum) ........... 0.15 mg KOH/gram
- Critical Solution Temperature with HFC-134a (maximum) ........... 8 F (–22 C)

⚠️ CAUTION

Compressor oil is hygroscopic. Containers should remain tightly sealed in a clean and dry environment to prevent moisture absorption from the air.

This oil (part number PP23BZ110001 [6x1 gal. cans] and PP23BZ110005 [1x5 gal. can]) may be ordered from your local Carrier representative.

Oil Heater — Inspect the oil heater for carbon build-up on the heating element if an adequate oil sump temperature cannot be maintained when the chiller is shut down. It may be necessary to temporarily install the heater element terminal cover to provide additional leverage while threading the oil heater into the sump. The sump oil heater elements must be positioned vertically to allow proper heat convection. See Fig. 43 and 44. The heating element must be installed with the word “TOP” on the threaded fitting facing upward.

Refrigerant Filter/Drier — A refrigerant filter/drier, located on the motor cooling line, should be changed once per year, or as necessary, if the condition of the filter indicates a need for less or more frequent replacement (see Fig. 45). A moisture indicator (dry eye) sight glass is located beyond the filter/drier to indicate the concentration of moisture in the refrigerant. If the moisture indicator indicates moisture, locate the source of the liquid immediately by performing a thorough leak check. Close the isolation valves on either side of the filter. Use the Schrader valve to relieve pressure in the isolated filter/drier. Replace the filter/drier and evacuate the isolated section of tubing with a vacuum pump attached to the Schrader valve.

Oil Strainers — The oil reclaim system has two strainers. One is installed in the VFD refrigerant cooling line between the cooler and condenser. The second strainer is located in the oil sump strainer housing (see Fig. 43). The oil sump strainer must be replaced or inspected with the refrigerant charge isolated in the condenser. Inspect the oil sump strainer for obstructions or damage every time the oil is changed. The strainer threads into the oil sump strainer housing. Install a new strainer o-ring if the entire strainer does not require replacement.

VFD Refrigerant Strainer — A refrigerant strainer is located in the line that supplies refrigerant to the VFD. Three isolation valves in the refrigerant cooling lines must be closed before this strainer is changed. See Fig. 45.

Vaporizer Refrigerant Return Line Orifice — There is a metering orifice where the refrigerant return line attaches to the vaporizer (see Fig. 43). This orifice can only be inspected by cutting the vaporizer refrigerant return line near the vaporizer. This orifice should be inspected if hot condenser gas flow through the vaporizer appears to be obstructed.

Compressor Inlet Bearing Oil Orifice — The oil line leading to the compressor lubrication block is connected to the inlet bearing oil orifice. The orifice is pressed into a standard reducer/expander fitting and protected by a 50 X 50 mesh screen (see Fig. 46). Compressor oil lines and fittings between the oil filter and compressor must be capped during disassembly to prevent contamination. Inspect the inlet bearing oil orifice whenever the oil line between the oil filter and compressor is disconnected.
Inspect Condenser Refrigerant Float System — Perform this inspection when the condenser is opened for service. See Fig. 47.

1. Transfer the refrigerant into the cooler vessel or into a pumpout storage tank.
2. Remove the float access cover.
3. Clean the chamber and valve assembly thoroughly. Be sure the valve moves freely. Ensure that all openings are free of obstructions.
4. Apply thread locking adhesive (P/N 24221 [10 ml] or 24231 [50 ml]) to the 3/8-in. - 16 bolts that hold the float valve in place. See Fig. 47 for a view of the float valve design. Inspect the orientation of the float slide pin. It must be pointed toward the bubbler tube for proper operation.
5. Apply gasket sealant (P/N 19XL680-002) to both sides of new gasket when reinstalling cover.

Fig. 43 — Oil Sump Strainer and Filter

Fig. 44 — Oil Reclaim Cross Section
**Fig. 45 — Refrigerant Filter/Drier**

**Fig. 46 — Compressor Inlet Bearing Oil Orifice**

**Fig. 47 — 23XRV Float Valve Design**

**Legend**

1. Refrigerant Inlet from FLASC Chamber
2. Linear Float Assembly
3. Float Screen
4. Bubbler Line
5. Float Cover
6. Bubble Line Connection
7. Refrigerant Outlet to Cooler
8. Gasket
Inspect Relief Valves and Piping — The relief valves on this chiller protect the system against the potentially dangerous effects of overpressure. To ensure against damage to the equipment and possible injury to personnel, these devices must be kept in peak operating condition. Inspect the relief valves in accordance with local codes.

At a minimum, the following maintenance is required.

1. At least once a year, disconnect the vent piping at the valve outlet and carefully inspect the valve body and mechanism for any evidence of internal corrosion or rust, dirt, scale, leakage, etc.
2. If corrosion or foreign material is found, do not attempt to repair or recondition. Replace the valve.
3. If the chiller is installed in a corrosive atmosphere or the relief valves are vented into a corrosive atmosphere, make valve inspections at more frequent intervals.

Compressor Bearing Maintenance — The compressor bearings are designed to last for the life of the chiller. The key to good bearing maintenance is proper lubrication. Use the proper grade of oil, maintained at recommended level, temperature, and pressure. Inspect the lubrication system regularly and thoroughly.

Excessive bearing wear can be detected through increased vibration. If this symptom appears, contact an experienced and responsible service organization to perform vibration analysis on the compressor.

Compressor Rotor Check — Use Carrier specified oil. Excessive compressor rotor wear is shown by a lack of performance. If a lack of performance is noted, have the compressor rotors inspected by a trained service person.

The rotors can be visually inspected once every 5 to 10 years or as needed depending on chiller operating conditions.

Motor Insulation — Periodic checks of the motor insulation are not necessary. A 500-v megohmmeter test is recommended to assist troubleshooting if there are indications of problems including, but not limited to, moisture in the refrigerant, and chronic current imbalance or over current trips. See guidelines for megohmmeter test in the Before Initial Start-Up, Ground Fault Troubleshooting section on page 58.

Inspect the Heat Exchanger Tubes

COOLER — Inspect and clean the cooler tubes at the end of the first operating season. Because these tubes have internal ridges, a rotary-type tube cleaning system is necessary to fully clean the tubes. Upon inspection, the tube condition will determine the scheduled frequency for cleaning, and will indicate whether liquid treatment is adequate in the chilled liquid/brine circuit. Inspect the entering and leaving chilled liquid temperature sensors for signs of corrosion or scale. Replace the sensor if corroded or remove any scale if found.

CONDENSER — Since this liquid circuit is usually an open-type system, the tubes may be subject to contamination and scale. Clean the condenser tubes with a rotary tube cleaning system at least once per year and more often if the liquid is contaminated. Inspect the entering and leaving condenser liquid sensors for signs of corrosion or scale. Replace the sensor if corroded or remove any scale if found.

Higher than normal condenser pressures, together with the inability to reach full refrigeration load, usually indicate dirty tubes or air in the chiller. If the refrigeration log indicates a rise above normal condenser pressures, check the condenser refrigerant temperature against the leaving condenser liquid temperature. If this reading is more than what the design difference is supposed to be, then the condenser tubes may be dirty or liquid flow may be incorrect. Because HFC-134a is a high-pressure refrigerant, air usually does not enter the chiller.

During the tube cleaning process, use brushes especially designed to avoid scraping and scratching the tube wall. Contact your Carrier representative to obtain these brushes. Do not use wire brushes.

Water/Brine Leaks — Moisture in the refrigerant is indicated during chiller operation by the refrigerant moisture indicator on the refrigerant motor cooling line. See Fig. 2. Leaks should be repaired immediately.

Water/Brine Treatment — Untreated or improperly treated water/brine may result in corrosion, scaling, erosion, or algae. The services of a qualified water/brine treatment specialist should be obtained to develop and monitor a treatment program.

Inspect the Control Center — Before working on any starter, shut off the chiller, open and tag all disconnects supplying power to the control center.

Before working on any VFD, shut off the chiller, open and tag all disconnects supplying power to the starter. After disconnecting input power to a VFD and before touching any internal components, wait 5 minutes for the DC bus capacitors to discharge, then check the voltage with a voltmeter. Failure to observe this warning could result in severe bodily injury or death.

The disconnect on the front of the control center does not deenergize all internal circuits. Open all internal control power and remote disconnects before servicing the starter.
Periodically vacuum or blow off accumulated debris on the internal parts with a high-velocity, low-pressure blower.

Power connections on newly installed control centers may relax and loosen after a month of operation. Turn power off and retighten. Recheck annually thereafter.

Recalibrate Pressure Transducers — Once a year, the pressure transducers should be checked against a pressure gage reading. Check all transducers (up to 9): the oil pressure delta P transducers, discharge pressure transducer, the condenser pressure transducer, the cooler pressure transducer, and the optional liquidside pressure transducers (consisting of 4 optional flow devices: 2 cooler, 2 condenser).

Note the evaporator and condenser pressure readings on the HEAT EX screen (EVAPORATOR PRESSURE and CONDENSER PRESSURE). Attach an accurate set of refrigeration gages to the cooler and condenser Schrader fittings. Compare the two readings. If there is a difference in readings, the transducer can be calibrated as described in the Troubleshooting Guide section. Oil differential pressure (OIL PRESSURE DELTA P on the COMPRESS screen) should be close to zero whenever the compressor is off. The oil pressure delta P transducers indicate the difference between oil pressure leaving filter and oil sump pressure.

Optional Pumpout System Maintenance — For pumpout unit compressor maintenance details, refer to the 19XR Positive Pressure Storage System Installation, Start-Up, and Service Instructions.

OPTIONAL PUMPOUT COMPRESSOR OIL CHARGE — Use oil conforming to Carrier specifications for reciprocating compressor usage. Oil requirements are as follows:
- HFC-134a ISO Viscosity . . . . . . . . . . . . . . . . . . . . . . . 68 or 220
- Viscosity SSU 100 F (38 C). . . . . . . . . . . . . . . . . 300 or 1005
- Carrier Part Number . . PP23BZ-103 or PP23BZ110005

The total oil charge is 13 oz (0.5 L).

Compressor oil is hygroscopic. Containers should remain tightly sealed in clean and dry environments to prevent moisture absorption from the air.

Relieve refrigerant pressure and add oil to the pumpout unit as follows:
1. Refer to Fig. 42. Close service valves 2 and 4.
2. Run the pumpout compressor in Automatic mode for one minute or until the vacuum switch is satisfied and compressor shuts off.
3. Move the pumpout selector switch to OFF. Pumpout compressor shell should now be under vacuum.
4. Oil can be added to the shell with a hand oil pump through the access valve in the compressor base.

NOTE: Compressor access valve has a self-sealing fitting which will require a hose connection with a depressor to open.

OPTIONAL PUMPOUT SAFETY CONTROL SETTINGS (Fig. 48) — The optional pumpout system high-pressure switch should open at 185 psig (1276 kPa) and closes automatically at 140 psig (965 kPa). Check the switch setting by operating the pumpout compressor and slowly throttling the pumpout condenser liquid.

Ordering Replacement Chiller Parts — When ordering Carrier specified parts, the following information must accompany an order.
- chiller model number and serial number
- VFD model number and serial number (if applicable)
- name, quantity, and part number of the part required
- delivery address and method of shipment

TROUBLESHOOTING GUIDE

Overview — The PIC III has many features to help the operator and technician troubleshoot a 23XRV chiller.
- The ICVC shows the chiller’s actual operating conditions and can be viewed while the unit is running.
- The ICVC default screen freezes when an alarm occurs. The freeze enables the operator to view the chiller conditions at the time of alarm. The STATUS screens continue to show current information. Once all alarms have been cleared (by correcting the problems and pressing the [RESET] softkey), the ICVC default screen returns to normal operation.

Fig. 48 — Optional Pumpout System Controls