



***Specifications for SWC #700
Electrical, HVAC, Plumbing, Boiler, and Chiller
Systems Maintenance & Repair
Event # 32110-13686***

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A. Definitions

Agency	Each State of Tennessee board, commission, committee, department, officer, or any other unit of State government except for those governmental entities identified in Tenn. Code Ann. § 12-3-102(a).
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers; the State of Tennessee follows the standards set by this organization. Awarded Contractors shall follow these standards.
Authorized User Personnel	Any Authorized User employee who is authorized to make decisions for their entity's Facility; (e.g., a Facility Administrator or a person designated by the Facility Administrator).
Contract Administrator	Contractor's main point of contact at the Central Procurement Office
Contractor Service Personnel	A Contractor's employee designated to perform work at a Facility, e.g. service technician.
CPO	Central Procurement Office.
Authorized User	The entity that is authorized to purchase off of this SWC and has requested service (e.g., Tennessee State Agencies; Tennessee local governmental agencies; the board of trustees of the University of Tennessee system, the Tennessee Board of Regents system). See Terms and Conditions for more details.
EPA	United States Environmental Protection Agency: the State of Tennessee follows the standards set by this organization. Awarded Contractors shall follow these standards.
Estimate	The approximate total cost to complete the work requested.
Facility	The building, site, or location owned or leased by the State of Tennessee or Authorized Users where work is requested and will be completed.
Firm Quote	A fixed sell price offered by the Contractor. When a Firm Quote is given, it means that the Contractor offering the quoted price is committing to sell the services at that price.
Job Log	This document shall be used to sign in and sign out of a Facility by the Contractor Service Personnel.

Normal State Operating Hours	Monday through Friday 8:00 a.m. – 4:30 p.m. local, excluding legal State holidays. Contractors shall obtain prior written approval from an Authorized User Personnel prior to conducting any work outside of the normal State operating hours.
OSHA	Occupational Safety and Health Administration; the State of Tennessee follows the standards set by this organization. Awarded Contractors shall follow these standards.
Premium Time	Rates apply to services rendered Monday through Friday during the hours of 6:01 p.m. - 6:59 a.m. local time. Premium Time rates also apply to twenty-four (24) hours on Saturday, Sunday, and all legal State holidays.
Preventive Maintenance	The servicing of equipment for the purpose of maintaining said equipment while still functional to prevent failure or defect.
Regular Time	Rates that apply to services rendered during the hours of 7:00 a.m. – 6:00 p.m. local time, Monday through Friday, excluding legal State holidays.
Specialized Equipment	Equipment that cannot be provided by the Contractor but that is needed in order to fulfill services within the Contract scope of work. Specialized Equipment may require a license or qualified operator.
State Building Commission (SBC)	Created by the Tennessee Legislature in 1955 (TCA 4-15-101) to oversee construction of all State public buildings.
Technical Assistance	Any advice, assistance, and training provided by the Contractor to the Authorized User.
Trip Charge	A single charge per round trip.
TOSHA	Tennessee Occupational Safety and Health Administration; the State of Tennessee follows the standards set by this organization. Contractors shall follow these standards.
Diagnostic	For the purposes of this contract, if a Contractor is required to visit a job site, pull tools off their truck, and troubleshoot equipment for longer than one (1) hour to provide an estimate, this would be considered as a Diagnostic.
Contractor A	The Contractor awarded as the main Contractor in a specified county per each job category.
Contractor B	The Contractor awarded as the first emergency or back-up Contractor in a specified county per each job category.
Contractor C	The Contractor awarded as the second emergency or back-up Contractor in a specified county per each job category.
Contractor D	The Contractor awarded as the third emergency or back-up Contractor in a specified county per each job category.
Contractor E	The Contractor awarded as the fourth emergency or back-up Contractor in a specified county per each job category.

B. Scope of Contract

The purpose of this Statewide Contract ("SWC") is to establish a network of Contractors to provide commercial and residential maintenance and repair services for five job categories: 1) Electrical, 2) Heating, Ventilation, and Air Conditioning ("HVAC"), 3) Plumbing, 4) Boiler, and 5) Chiller Systems to assist in the day-to-day operation of Facilities across the State. The State intends to award multiple contracts, per job category and per county. Services rendered as a part of this Contract shall comply with all specifications and guidelines in the Terms and Conditions and the Specifications. The State intends to establish and maintain coverage for up to five (5) Contractors per county for Electrical, HVAC, and Plumbing Systems maintenance and repair and up to three (3) Contractors per county for boiler and Chiller Systems maintenance and repair.

This SWC covers Facilities within the State of Tennessee and the Military bases located in Catoosa, Georgia and Fort Campbell, Kentucky. The Contractor shall provide all goods or services required by this Contract to all Tennessee State Agencies and shall also make this Contract available to all Authorized Users, as defined in the Terms and Conditions. This Contract is not limited to the Facilities that are owned or leased by the State or Authorized User at the time of Contract award.

The Contractor shall provide all services included in their awarded category or categories to all Facilities within their awarded county or counties as requested by the State. Contractors shall be able to be on site within two (2) hours to all Facilities within their awarded county or counties.

The Authorized User shall maintain control of any equipment or system serviced under this Contract and shall have full authority to determine if and when a Contractor may be contacted to perform work. Authorized User Personnel shall make all decisions as to whether the Authorized User's maintenance department or the Contractor shall perform a repair. Contractor shall use first-quality materials and best commercial practices when performing work.

The Contractor shall place the highest priority on energy conservation and shall coordinate all activities with the Authorized User Personnel or their designee for the most economical operation of building(s) equipment or systems. Pursuant to T. C. A. § 12-3-905, State of Tennessee agencies shall use energy efficiency standards prescribed by Energy Star for the purchase of energy consuming products.

B.1. Electric Maintenance & Repair: Contractor(s) awarded this category shall provide electrical maintenance and repair services including scheduled maintenance, repairs, additions, retrofits, upgrades, and replacements on all of the following systems:

All Lighting Systems	High Mast Lighting
Breakers	Light Controls
Cables	Light Sensors
Commissioning	Light fixtures
Electrical Transformer	Metering
Electrical Utility Lines	Panels
Electrical Wiring	Poles
Fuses	Underground Electrical

B.2. HVAC Maintenance & Repair: Contractor(s) awarded this category shall provide HVAC maintenance and repair services including scheduled maintenance, preventive maintenance, repairs, additions, retrofits, upgrades, replacements, testing, inspections, calibrations, vibration tests, and eddy current tests on all of the following systems:

Air Handlers	Refrigeration Units
Condenser units	Variable Air Volume (VAV) Systems
Freezers	Variable Refrigerant Flow (VRF) Systems
Geothermal Equipment	Walk-in Coolers
Heat Pumps	Walk-in Freezers
Ice Makers	Water Coolers
Motors	Water Heaters
Multi-splits	Water Source Heat Pumps
Pumps	

Repair services for HVAC systems shall include any peripheral equipment that is a component whose function is required for proper operation of the system(s) under contract which may include, electric wiring, insulation, controls, starters, gas piping and fan coils units.

B.3. Plumbing Maintenance & Repair: Contractor(s) awarded this category shall provide plumbing maintenance and repair services including scheduled maintenance, repair, additions, retrofits, upgrades, and replacements on all of the following systems:

Actuators	Operating Systems
Grinder Pumps	Underground Chilled and Hot Water
Mechanical Lines	Underground Natural Gas Lines

Scope shall also include all plumbing equipment and fixtures to include installation of backflow preventers in State building(s) or grounds.

B.4. Boiler Maintenance & Repair: Contractor(s) awarded this category shall provide boiler maintenance and repair services including scheduled maintenance, repairs, additions, retrofits, upgrades, and replacements on all the following systems are considered within scope:

All electrical wiring to all boilers	Pressure gauge replacement
Blower motor testing with reports and replacement if needed	Pump motor testing and replacement
Boiler inspections of all steam, hydronic and domestic units	Pump seal replacement
Boiler safety relief valve testing and replacement	Pump motor and pump testing with reports
Boiler vent valve testing and reports	Steam trap testing and reporting
E stop installation to meet boiler code	Testing of all gas valves with reports to make sure valves are sealing. Reports are part of CSD1 report
Electrical troubleshooting and replacement	Testing of all temperature switches for proper operation with paperwork
Flame safeguard testing with paperwork	Testing of differential switches on hydronic units with reports
Flame safeguard upgrades with the latest equipment	Testing of gas pressure high and low for proper working order for safety purpose with reports. This is part of CSD1 inspection
Hydronic, steam and domestic gas train CSD 1 inspection with reports	Testing of pressure switches on steam boiler for proper operation with paperwork. This is part of CSD1 report
Low water controls upgrade and testing with reports	Wiring to building management system
Loop circuit setting testing and calibration	Conduct NOx emission testing per permitted requirements and/or Authorized User specifications
Carbon monoxide testing in mechanical areas of direct or associated (non- electrical) combustible equipment	Efficient operation of applicable air relief systems (closed loop)

a. Contractors shall be able to provide the following services:

Boiler and hot water units' annual inspections which involves draining boiler opening boilers inspecting boilers with reports	Repair refractory in firebox of boilers
Boiler Tube Replacement	Boiler refractory inspection to include cement, brick, and insulation
Repair hot spots on boiler and document hot spots with infrared	Repair steam, and condensate piping on steam system

Repair supply and return piping on hot water system	Repair copper piping
Repair circulating pumps primary and secondary	Repair and test steam traps on steam system
Repair air vents on hot water systems	Repair condensate feed tanks on steam systems
Repair blow down systems on steam systems	Test and set hydronic flow valves with test reports
Repair underground steam and condensate piping	Repair underground hot water supply and return piping
Natural gas piping	Propane piping
#2 oil piping	Repair steam heat exchangers
Repair hydronic heat exchangers	Repair domestic heat exchangers
Stack exhaust installations and repairs	Boiler installations of all types
Pipe insulation of all types	Permit and working with boiler inspectors
Assist the Authorized User during applicable boiler/vessel inspection processes per TDOL requirements	Assist the authorized user with corrosion monitoring systems, equipment, and analysis processes when/where applicable

Any maintenance and repair work which is required to be done to the boiler shall be in compliance with the Tennessee Department of Labor and Workforce Development Division of Boiler and Elevator Inspection Board of Boiler Rules as published by the Tennessee Secretary of State's Office, currently available online at <https://publications.tnsosfiles.com/rules/0800/0800.htm> and Tenn. Code Ann. § 68-122-101 et seq. Work requiring an R-Stamp is in scope of the Boiler Maintenance and Repair Job Category.

- B.5. Chillers and Cooling Towers:** Contractor(s) awarded this category shall provide chiller maintenance and repair services including scheduled maintenance, preventative and predictive maintenance, seasonal maintenance services, repairs, additions, retrofits, upgrades, replacements, testing, inspections, calibrations, vibration tests, eddy current tests and cleaning chiller tubes on all of the following systems:

Air cooled and water-cooled chillers	Hermetic and semi hermetic compressors
Air to air transfer condensers	Hydronic piping
Air to water or glycol condensers	Low voltage control circuits
Chilled water loop technology	Misters and fans in cooling towers
Chilled water units in excess of 25 tons	Motors
Chiller and refrigerant monitoring equipment	Oil filtration systems
Chiller and tower gearboxes	Pneumatic controls
Chiller control equipment	Pumps
Chiller exchanger and condenser units	Purge tanks
Cooling tower fill media	Recirculating pumps

Cooling tower pumps liquid medium condensers	Refrigerant recovery
Cooling towers	Thermistors
Drive couplers	Variable air volume (VAV) systems
Fan controls	Zone controls

Repair services for Chiller systems shall include any peripheral equipment that is a component whose function is required for proper operation of the system(s) under contract which may include, electrical wiring, insulation, controls, starters, and fan coils units.

C. Exclusions. The following shall be excluded from this contract:

C.1. State Building Commission Approval. Certain projects are under the jurisdiction of the State Building Commission (“SBC”) and are therefore excluded from being purchased under this Statewide Contract, without prior SBC approval. Authorized Users should consult Item 2, Jurisdiction, of the most current version of the *Policy and Procedure of the State Building Commission of Tennessee* to determine applicability. (For more information, please see the Office of the State Architect’s website currently available at <https://www.tn.gov/content/tn/osa/general-information/policy---procedure.html>). If further clarification is needed, the Authorized User should contact their development manager with the State of Tennessee Real Estate and Asset Management or the Contract Administrator. Any documentation of SBC Approval shall be maintained by the Authorized User.

C.2. Additional Contract Exclusions*

- a. Handling of Asbestos
- b. Septic Tank Related Services
- c. Maintenance and Repair of Energy Management Systems
- d. Maintenance and Repair of Fuel Monitoring Systems
- e. Installation of Water Treatment Feeder Units
- f. Monitoring System Services
- g. Programming and Software Upgrades
- h. Duct Cleaning Services
- i. Water Treatment Services, including but not limited to sewer lift stations, treatment plants, & collection systems.
- j. Server Room HVAC Units
- k. Fire Hydrants
- l. Electrical Utility Lines

*The services listed above shall be excluded from this Contract unless the Contractor agrees to perform the services using the Contractor’s rates as set forth in the Contract (no additional mark-ups shall be allowed, including no mark-ups for Rental Equipment utilized in the performance of the excluded work).

D. Job Performance Requirements

D.1. Contract Usage

- a. Successful Contractors shall provide a toll-free telephone number and an email address to the CPO Contract Administrator to be used by Authorized Users seeking to obtain services that is continuously answered/monitored seven (7) days a week and twenty-four (24) hours a day. An automated answering system shall not be acceptable as a contact. Service calls may include, but are not limited to, dispatching service technicians, providing technical assistance via telephone or email. Service calls, including technical assistance via shall be provided at no cost to the State.
- b. The Contractor shall designate a contract manager for the contract. The contract manager will be a single point of contact for the Contract Administrator and be responsible for addressing broad contract issues and requests. The contract manager should have the authority and competence to address and correct any issues related to the contract. The Contractor shall notify the Contract Administrator in writing within three (3) business days of assigning a new contract manager. Authorized Users must be able to reach out to each contact with questions including, but not limited to billing, invoices, and other service questions. The Contractor shall also designate an emergency contract manager for the contract in cases when an emergency job arises.
- c. The Contractor shall respond to all requests for estimates and Firm Quotes from Authorized Users, regardless of the Contractor's intent to bid, the dollar value of the job, or the emergency status of the request.
- d. All services shall be coordinated with Authorized User Personnel and scheduled at such a time that is mutually agreed upon by the Contractor and the Authorized User.
- e. No work shall commence without prior written approval by Authorized User Personnel.
- f. All services and repairs shall be performed in accordance with the equipment manufacturer's recommended procedure and as detailed in the scope of work for each individual job. If available and requested, maintenance manuals shall be provided to the Authorized User at no additional cost.
- g. Once provided with the authorization from the Authorized User to complete the job, the Contractor Service Personnel is required to arrive on-site at the Facility with all the proper equipment, parts, and materials needed to complete the job. It is the Contractor's responsibility to ensure that this occurs. Contractors may request an on-site visit prior to providing an Estimate or Firm Quote to know what materials are required, if needed. The Contractor shall not charge for time away from the site to obtain parts (see Section E.3).
- h. Contractors shall provide an estimated timeline of project completion and a dedicated point of contact for all jobs. If a contractor does not complete a job within the original estimated timeline provided, it is up to the discretion of the Authorized

User to seek additional Estimates/Firm Quotes as applicable if it is in their best interest.

D.2. Emergency Jobs

The Contractor shall **respond to all requests for Estimates and Firm Quotes from Authorized Users**, regardless of the Contractor's intent to bid, the dollar value of the job, or the emergency status of the request.

The Contractor shall **respond to the initial call within thirty (30) minutes and shall be on-site within two (2) hours.**

The two (2) hour timeframe begins when the Contractor receives authorization from the Authorized User via phone or email to perform services and ends when the Contractor arrives on-site.

The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time.

- a. Contractor A shall be contacted first and asked to respond to a critical situation. The critical situation is defined as an "emergency" by the Authorized User. The cost of repair is unknown, and the job shall be resolved immediately.
- b. If Contractor A is unavailable to perform the work, is unreachable after **thirty (30) minutes** of initial contact, or is unable to **be on-site within two (2) hours** or agreed upon time frame, the Authorized User shall proceed to Contractor B.
- c. If Contractor B is unavailable to perform the work, is unreachable **after thirty (30) minutes** of initial contact, or is unable to be **on-site within two (2) hours** or agreed upon time frame, the Authorized User shall proceed to Contractor C. The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time.
- d. If Contractor C is unavailable to perform the work, is unreachable after **thirty (30) minutes** of initial contact, or is unable to be **on-site within two (2) hours** or agreed upon time frame, the Authorized User shall proceed to Contractor D. The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time.
- e. If Contractor D is unavailable to perform the work, is unreachable after **thirty (30) minutes** of initial contact, or is unable to be **on-site within two (2) hours** or agreed upon time frame, the Authorized User shall proceed to Contractor E. The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time.
- f. If no Contractors are able to perform the work, are unreachable, or fail to respond telephonically within **thirty (30) minutes**, as it is required that the Contractor be **on-site within two (2) hours**, the Authorized User shall be allowed to contact any awarded Contractors in neighboring counties or non-contract suppliers.

- g. Contractor shall utilize the Job Log for all emergency jobs, per the guidelines set in section E.3. Time Verification.
- h. If a verbal Estimate or Diagnostic is accepted, the Contractor shall still provide the Authorized User Personnel, a written Estimate or Diagnostic utilizing Attachment A "Pricing Template."
- i. Estimates and Diagnostics shall be broken down according to the item numbers on the contract.
- j. When applicable, a parts and materials list shall be included in an Estimate and Diagnostic (parts and materials shall be broken out per each item).
- k. In the event an Authorized User has an emergency situation and is given a job cost that equals or exceeds ten thousand dollars (\$10,000), the Authorized User is not required to follow the Firm Quote guidelines set in Section D.4. It is up to the discretion of the Authorized User to seek Firm Quotes if it is in their best interest.
- l. Note: Facilities, such as the Tennessee Department of Correction Prisons, that are twenty-four (24) hours a day, seven (7) days a week (24/7) may have high urgency requests that are deemed an emergency due to the population served. These Facilities may follow the emergency requests procedures more frequently. Contractor shall arrive at the Facility within the time frame specified with Contractor Service Personnel.
- m. Immediately upon the realization that an emergency job will exceed the bond thresholds as defined by Terms and Conditions Sections 8.17. and 8.18., the Contractor shall inform the Authorized User immediately and provide bonds in accordance with Terms and Conditions Sections 8.17. and 8.18.

D.3. Non-Emergency Jobs Under \$10,000

- a. Jobs under ten thousand dollars (\$10,000) shall be performed by Contractor A awarded to perform work in the facility's county. This work shall be conducted using the Contract labor rates and Trip Charges (see Section E.4. for detailed information on Trip Charges).
 - (1) The Contractor **shall respond to all requests for Estimates and Firm Quotes** from Authorized Users, regardless of the Contractor's intent to bid, the dollar value of the job, or the emergency status of the request.
 - (2) For all non-emergency jobs regardless of the dollar amount of the job, the Contractor shall respond to an Authorized User's service request **within one (1) business day** to confirm if the Contractor will be providing an Estimate/Firm Quote/Diagnostic.
 - (3) Estimates shall be provided to the Authorized User **within three (3) business days** after the initial request is made.

- (4) Estimates shall be provided *free of charge* to the Authorized User. The Contractor may charge for any time on-site associated with putting together and providing a Diagnostic as detailed in Section D.8.
 - (5) The Contractor shall utilize the State template (Attachment A "Pricing Template") to provide a written Estimate or Diagnostic. If deemed acceptable by the Authorized User Personnel, the Contractor may provide a verbal Estimate over the phone or in-person.
 - (6) If a verbal Estimate or Diagnostic is accepted, the Contractor shall still provide the Authorized User Personnel, a written Estimate or Diagnostic utilizing Attachment A "Pricing Template."
 - (7) Estimates and Diagnostics shall be broken down according to the item numbers on the contract.
 - (8) When applicable, a parts and materials list shall be included in an Estimate and Diagnostic (parts and materials shall be broken out per each item).
 - (9) The repair cost cannot exceed the amount Estimated/Diagnosed without justification from the Contractor and prior written approval from Authorized User Personnel. Note: the invoice shall reflect actual time worked, as verified by the Job Log, on-site which may be less than that of the estimated number of hours. Note: if the Contractor has to work over the estimated number of hours to complete the job, the Contractor shall get prior written approval of the Authorized User Personnel or their designee.
 - (10) The repair cost cannot exceed the amount Estimated/Diagnosed without justification from the Contractor and prior written approval from Authorized User Personnel. Note: the invoice shall reflect actual time worked, as verified by the Job Log, on-site which may be less than that of the estimated number of hours. Note: if the Contractor has to work over the estimated number of hours to complete the job, the Contractor shall get prior written approval of the Authorized User Personnel or their designee.
 - (11) Estimates and Diagnostics shall be monitored by Authorized User Personnel for accuracy.
 - (12) The Contractor shall perform the services as described in the Estimate or Diagnostic, upon request from the Authorized User.
 - (13) Usage of Specialized Equipment shall be contemplated in the Estimate for the job and cannot be added as an additional charge at a later date.
- b. The Contractor shall be required to sign in and sign out using Attachment B "Job Log" in accordance with Section E.3.
 - c. Contractor Service Personnel shall arrive at the Facility within the time frame specified by the Authorized User for **at least seventy-five percent (75%)** of all jobs.

The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time.

- d. If Contractor A does not respond to an Authorized User's service request within **one (1) business day**, or is otherwise unable to provide work on a specific job then the Authorized User should then, and only then, move to Contractor B. The same process shall apply if Contractor B is unable to perform the work and move to Contractor C. The same process shall apply if Contractor C is unable to perform the work and move to Contractor D. The same process shall apply if Contractor D is unable to perform the work and move to Contractor E.
- e. Requests for Job Estimates: If Contractor A gives an Estimate which seems unreasonably high, or if the Authorized User wants to obtain Estimates from several Contractors, the Authorized User reserves the right to contact the other Contractors awarded in their county and awarded Contractors in neighboring counties for Estimates based on Contract prices bid and parts (if applicable) for the same job. The Authorized User shall be required to award to the Contractor providing the lowest Estimate and meeting specifications. Once the Authorized User has accepted an Estimate for a job and has authorized the work, the Contractor shall coordinate completion of the job with the Authorized User Personnel. In cases when the Authorized User awards to another Contractor besides Contractor A for the county, it shall document the circumstances on the request document.
- f. Authorized Users may request Estimates from non-Contract suppliers for a job. For example, when the awarded Contractors in the county are unavailable or non-responsive within the response timeframe as listed in Section D.5. Service Level Agreements, or when the Estimates or Diagnostics provided seem unreasonably high, the Authorized User may request non-Contract suppliers to provide an Estimate. State Agencies shall not utilize a non-Contract supplier for a job without prior written authorization from the Contract Administrator.

D.4. Non-Emergency Jobs \$10,000 and Over

- a. Jobs ten thousand dollars (\$10,000) and over may be performed by Contractor A, B, C, D, or E. The Authorized User shall solicit Firm Quotes from all the Contractors awarded a Contract in the county in which the Facility is located and award the job to the Contractor with the lowest Firm Quote.
 - (1) The Contractor **shall respond to all requests for Estimates and Firm Quotes** from Authorized Users, regardless of the Contractor's intent to bid, the dollar value of the job, or the emergency status of the request.
 - (2) For all non-emergency jobs regardless of the dollar amount of the job, the Contractor shall respond to an Authorized User's service request **within one (1) business day** to confirm if the Contractor will be providing an Estimate/Firm Quote/Diagnostic.
 - (3) Firm Quotes shall be provided to the Authorized User **within five (5) business** days after the initial request is made.

- (4) Contractors shall provide a Firm Quote for **75% or greater** unless otherwise approved in writing by the Contract Administrator.
- (5) The Contractor shall utilize the State template (Attachment A "Pricing Template") to provide a written Firm Quote. Verbal Firm Quotes shall be deemed unacceptable.
- (6) Firm Quotes shall be provided *free of charge* to the Authorized User. The Contractor may not charge for any time on-site, or travel costs associated with putting together and providing a Firm Quote.
- (7) The repair cost cannot exceed the amount quoted.
- (8) Firm Quotes shall be monitored by Authorized User Personnel for accuracy.
- (9) The Contractor shall perform the services as described in the Firm Quote, upon request from the Authorized User.
- (10) Firm Quotes shall be provided to the Authorized User within the timeframe specified by the Authorized User. If no timeframe is specified, Firm Quotes shall be provided to the Authorized User within five (5) business days after the initial request is made by the Authorized User.
- (11) Usage of Specialized Equipment shall be contemplated in the Firm Quote for the job and cannot be added as an additional charge at a later date.
- (12) If the firm quote job requires a Diagnostic to determine the full scope of work, then the process outlined in Section D.8. shall be followed.
- (13) Firm Quotes shall come with a detailed report that presents the full scope of work being completed.
- (14) Upon completion of work, invoices for Firm Quote jobs shall include any parts, materials, rental equipment, subcontracting, etc. receipts for the Firm Quote job.
- (15) Contractor Service Personnel shall arrive at the Facility within the time frame specified by the Authorized User for **at least seventy-five percent (75%)** of all jobs.

The Authorized User has the discretion to be flexible for the Contractor arrival time; however, the Contractor is required to be on-site within the agreed upon arrival time
- (16) Contractors shall provide an estimated timeline of project completion and a dedicated point of contact for all Firm Quote jobs.

b. It is up to the discretion of the Authorized User to seek additional Firm Quotes from Contractors in neighboring counties or non-Contract suppliers. Should the

Authorized User seek additional Firm Quotes, the following process shall be followed:

- (1) Firm Quotes shall be sought by Contractors awarded in the facility's county in addition to Contractors in neighboring counties or non-Contract suppliers.
 - (2) In the event a non-Contract supplier provides the lowest Firm Quote; it is the responsibility of the Authorized User to obtain approval from the Contract Administrator to use a non-Contract supplier. The Authorized User shall also be responsible for obtaining all requisite bonds, licensure checks, insurance, etc.
- c. The Contractor shall be required to sign in and sign out of the Job Log; the Contractor shall be required to coordinate with the Authorized User to schedule the work.
- d. The Contractor shall not be allowed to invoice the Authorized User an amount any higher than what was provided on the initial Firm Quote (unless a scope change occurs, see Section D.6). The Authorized User shall pay the full amount of the invoice as it appeared on the Firm Quote in accordance with Terms and Conditions Section 6. Payment Terms and Conditions.

D.5. Service Level Agreements

- a. Contractor shall meet or exceed with all Service Level Agreements (SLAs) specified below unless otherwise approved by the Authorized User.
- (1) The Contractor shall **respond to all requests** for estimates and Firm Quotes from Authorized Users, regardless of the Contractor's intent to bid, the dollar value of the job, or the emergency status of the request.
 - (2) Contractors shall provide a Firm Quote for **75% or greater** unless otherwise approved in writing by the Contract Administrator.
 - (3) Non-Emergency Jobs: For all non-emergency jobs regardless of the dollar amount of the job, the Contractor shall respond to an Authorized User's service **request within one (1) business day** to confirm if the Contractor will be providing an Estimate/Firm Quote/Diagnostic.
 - (4) Emergency Jobs: The Contractor shall **respond within thirty (30) minutes to the initial call and shall be on-site within two (2) hours**. The two (2) hour timeframe begins when the Contractor receives authorization from the Authorized User via phone or email to perform services and ends when the Contractor arrives on-site.
 - (5) Estimates shall be provided to the Authorized User **within three (3) business days** after the initial request is made.

- (6) Firm Quotes shall be provided to the Authorized User **within five (5) business days after** the initial request is made.
 - (7) A toll-free telephone number and an email address shall be provided to the CPO Contract Administrator by the successful Contractors that is to be answered/monitored **seven (7) days a week and twenty-four (24) hours a day**.
 - (8) Contractor Service Personnel shall arrive at the Facility within the time frame specified by the Authorized User for **at least seventy-five percent (75%) of all jobs**.
 - (9) **Eighty-Five percent of 85%** of invoices submitted by the Contractor are submitted within in accordance with Terms and Conditions Section 6.4 Invoice Requirements upon the completion of a job without errors or disputes.
- b. Contractor compliance with the Service Level Agreements shall be monitored by the Contract Administrator with assistance from the Authorized Users.
 - c. If at any time during the contract period, a Contractor is found to not be in compliance with the Service Level Agreements, the Authorized Users and/or Contract Administrator may file a Formal Supplier Complaint with the Central Procurement Office.
 - d. If a Contractor is found to not be in compliance with Service Level Agreements three (3) times or more in a calendar year, then the State may exercise additional action, including but not limited to the following:
 - (1) The Authorized Users and/or Contract Administrator may file a Formal Supplier Complaint with the Central Procurement Office.
 - (2) Lower placement on the Contractor listing for a particular Facility or county (e.g. moving from Contractor A to Contractor B).
 - (3) Authorized User could be granted bypass approval for that Contractor.
 - (4) The Contractor's Contract may be terminated per contract Terms and Conditions Sections 7.9. and 7.10.
 - e. If an Authorized User raises concerns with Contractor performance outside of the Service Level Agreements, a reasonable effort to resolve the problem should be made by the Authorized User. If the problem still exists, the State may exercise any of the actions described in Section D.5.d.

D.6. Job Changes

- a. The Authorized User shall notify the awarded Contractor immediately if there is a job scope change, schedule change, or any other change that impacts the job.
- b. If a Contractor discovers the need for a scope change, schedule change, or any other change that impacts the job, the Contractor shall notify the Authorized User immediately. The Contractor shall provide a supplemental Estimate or supplemental Firm Quote if there is a change in cost due to the job scope change.
- c. The Authorized User has the sole discretion to approve the scope change with the originally awarded Contractor or may send the new scope of work to all other Contractors qualified in the county and allow them to provide a new Estimate or Firm Quote. This can be done either once a change is discovered or after the awarded Contractor submits the new Estimate or Firm Quote to reflect the change in job scope
- d. Any schedule changes shall only be allowed with the mutual agreement of both parties. In the event the awarded Contractor is unable to meet the requested schedule changes, the Authorized User shall seek:
 - (1) An Estimate from the next awarded Contractor in the facility's county.
 - (2) The Contractor who provided the second lowest Firm Quote.
- e. In the event the initially awarded Contractor has already performed some services, and a change to the date or job scope prevents said Contractor from being able to complete the job, the Authorized User shall pay the initially awarded Contractor for costs incurred. The Contractor shall provide detailed written documentation of the services provided, costs incurred, and reason for inability to complete the job.
- f. Immediately upon the realization that a change in cost due to a job scope change shall exceed the bond thresholds as defined by Terms and Conditions Sections 8.17. and 8.18., the Contractor shall inform the Authorized User immediately and provide bonds in accordance with Terms and Conditions Sections 8.17. and 8.18.

D.7. Additional Job Requirements:

- a. All Contractors contacted to provide an Estimate or Firm Quote should visit the Facility or Facilities to take exact measurements and examine the premises to become familiar with any problems or unusual circumstances which might exist. No allowances shall be made by the State for errors in Estimates or Firm Quotes due to any Contractor not visiting the sites prior to submitting their Estimate or Firm Quote. Contractors shall be responsible for their own measurements.
- b. If required by the Authorized User, the awarded Contractor shall schedule and attend a pre-construction conference before work can begin. The Contractor shall not charge the Authorized User for attending the pre-construction conference.

- c. The Contractor shall also schedule and attend a final inspection with the Authorized User Personnel, unless requirement is waived in writing by the Authorized User, before payment is issued. The Contractor shall not charge the Authorized User for attending the final inspection.
- d. Contractors shall provide Payment and/or Performance Bonds if applicable as required in Terms and Conditions Sections 8.17. and 8.18. Contractors shall provide the required bonds at no additional cost to the State. Contractors shall provide a digital copy of the bond to the Contract Administrator and obtain Contract Administrator approval prior to sending the physical bond(s).

D.8. Diagnostic:

- a. A Diagnostic fee may be necessary if an Authorized User is unable to provide a detailed scope of work to obtain a free Estimate or Firm Quote.
- b. Contractors shall utilize their Regular Time, technician rate as their hourly Diagnostic Fee.
- c. Authorized Users shall utilize the Contractor A for the Diagnostic work and shall note that the request is a Diagnostic request in the service call. If Contractor A is unreachable or unable to provide the Diagnostic, then the Authorized User shall follow the process outlined in Section D.3.d.
- d. Diagnostic work that takes less than one (1) hour on-site shall not be considered billable time under the contract.
- e. Upon completion of the Diagnostic, the Contractor shall provide the full results of the Diagnostic to the Authorized User. Upon the receipt of the Diagnostic results, the Authorized User may either award the job to Contractor A (if it is less than \$10,000), or provide the Diagnostic to the other awarded Contractors in the county to obtain a Firm Quote.
- f. If the awarded Contractor is the same Contractor that performed the Diagnostic, the Contractor shall waive the Diagnostic Fee.

E. General Requirements

E.1. Hourly Charge Schedule

- a. Regular Time Rates – Regular Time rates apply to services rendered during the hours of 7:00 a.m. – 6:00 p.m. local time Monday through Friday, excluding legal State holidays. If a Contractor anticipates that a job will take more than eight (8) consecutive hours in one day, they may charge Premium Time rates for each additional consecutive exceeding hour with the prior written approval from the Authorized User; this shall be identified on the Estimate.
- b. Premium Time Rates – Premium Time rates apply to services rendered Monday through Friday during the hours of 6:01 p.m. - 6:59 a.m. local time. Premium Time rates also apply twenty-four (24) hours on Saturday, Sunday, and all legal State

holidays. Authorized User Personnel shall approve Premium Time rates in writing prior to work being performed.

- c. The State shall make every effort to have work scheduled during Normal State Operating Hours; however, it may be necessary to change the work schedule to a time other than Normal State Operating Hours to accommodate conditions at the Facility. If such a situation arises, all services shall be coordinated with Authorized User Personnel and scheduled at such a time that is mutually agreed upon by the Contractor and the Authorized User.
- d. Contract rates shall apply for all emergency jobs and for all jobs that do not require a Firm Quote.

E.2. Worker Categories and Requirements

a. Categories

- (1) Technician: an employee trained and with a minimum three (3) years of experience in performing installation, modification, inspection, troubleshooting, repair and maintenance within their respective disciplines; completed formal education courses recognized and approved by the State of Tennessee, and factory trained in manufacturer's equipment.
- (2) Helper: an employee trained to assist in the performance of installation, modification, inspection, troubleshooting, repair and maintenance within their respective disciplines: completed formal education courses recognized and approved by the State of Tennessee, and factory trained in manufacturer's equipment.

b. Requirements

- (1) The Contractor shall use trained personnel who are trained to work on the equipment or system(s) as described or as listed to perform the services as requested. The trained personnel can be Contractor Service Personnel or Subcontractor Personnel.
- (2) At the Authorized User's request, the Contractor may be required to furnish evidence of training or certification.
- (3) Should the Authorized User be dissatisfied with Contractor Service Personnel dispatched to their location, the Contractor shall replace the Contractor Service Personnel, or any assigned technician or helper at the request of the Authorized User, provided it does not violate applicable laws or regulations, at no additional cost.
- (4) The Contractor agrees that its personnel shall wear professional and identifiable uniforms while on a jobsite.

c. Contractor Licenses and Work Requirements

- (1) The Contractor shall meet or exceed the standards set in ASHRAE 90.1-2019 (but instead shall meet or exceed the current adopted State standard per the Tennessee Sustainable Maintenance Guidelines).
- (2) The Contractor shall hold all current licenses or permits necessary to perform the tasks within their awarded discipline per Tenn. Code Ann. § 62-6-101 et seq. At the Authorized User's request, the Contractor may be required to furnish copies of licenses and/or permits. The Contractor shall be required to provide the CPO a copy of their current licenses or permits necessary to perform their awarded discipline annually.
- (3) A list of applicable and required licenses can be found on Attachment C "Required Licenses & Certifications." This is not an all-inclusive list. If any work requested and within the scope of this Contract requires licenses or certification not listed on Attachment C "Required Licenses & Certifications" the Contractor is required to hold the license or certification to do the work.
- (4) The Contractor shall comply with all industry standards and guidelines to ensure compliance with all federal, state and local guidelines including but not limited to OSHA/TOSHA/EPA regulations.
- (5) The Contractor shall comply with all codes, standards, and regulations in executing projects. This includes, but is not limited to:
 - i. determining if there are above or underground electrical cables or lines,
 - ii. underground water, sewer or gas lines, and obtaining the required permits to complete the job requirements.
 - iii. Contractor shall work with the Authorized User to determine any above or underground obstacles prior to starting the job.
- (6) It is the responsibility of the Contractor to disclose any repair issues within the Facility beyond their scope of work to the Authorized User immediately upon discovery and/or with the submittal of the Estimate, Diagnostic, or Firm Quote.

d. Specialized Certifications

- (1) Disclosure Requirement - Contractors may disclose to the State all specialized certifications held by the Contractor and/or its personnel, including but not limited to manufacturer-specific, system-specific, or trade-specific certifications (e.g., geothermal systems, OSHA Confined Space certifications, non-standard boiler certifications, non-standard chiller certifications, etc.) for information purposes.
- (2) Notification of Changes - For all Contractor disclosed specialized certifications, the Contractor shall provide written notice to the State within ten (10) business days of any additions, expirations, revocations, or other material changes to the certifications disclosed under this Section.

- (3) Verification - The State reserves the right to request documentation verifying the validity and current status of any disclosed certification at any time during the term of the Contract.

e. Contractor Equipment

- (1) The Contractor shall have access to, and bring all equipment, materials, supplies, and tools, necessary to perform the responsibilities of the Contract for the specified job.
- (2) The Contractor shall have a supply of stock replacement parts available for immediate use. The Contractor shall bill the Authorized User for stock parts in accordance with Contract Terms and Conditions Section 7.2. "Proof of Cost for Parts Not in a Catalog or Price List", Specifications Section E.8. "Parts Requirement".
- (3) The Contractor shall have access to non-stock replacement parts.
- (4) The Contractor shall utilize, all tools, equipment, materials and supplies considered industry standard for maintenance and repair services in the trade(s) that they have been awarded on this Contract/

E.3. Time Verification

The Contractor Service Personnel shall be required to sign in and sign out on the Job Log (see Attachment B "Job Log") the actual time worked with an Authorized User Personnel, for all on-site services provided. All Facilities shall be required to utilize the Job Log for the signing in and out of Contractor Service Personnel.

- a. The Job Log (Attachment B "Job Log") shall be utilized regardless of the dollar amount or emergency status of the total job. However, the Job Log shall only be used as a tool to verify time worked on jobs under ten thousand dollars (\$10,000); jobs over ten thousand dollars (\$10,000) shall be provided using the Firm Quote.
- b. A Contractor Job Log shall be provided at a location designated by the Authorized User. The Contractor Service Personnel signing in shall provide their employer (i.e., Contractor) name, their name, a detailed explanation for the visit, and the times in and out as defined in Attachment B "Job Log".
- c. The Contractor Service Personnel shall sign in and sign out on the Job Log with an Authorized User Personnel when arriving or leaving from the facility for any reason. This shall also include, but is not limited to, the following situations:
 - (1) for a lunch period if and when taken during a workday;
 - (2) when going to obtain parts;
 - (3) when going to another building

- d. The Authorized User shall pay the established hourly rate for actual time worked on- site only for all jobs under ten thousand dollars (\$10,000). Labor rates begin upon sign in and end upon sign out at the Facility. Labor rates shall not be charged for travel time.
- e. The Authorized User shall pay for only one (1) technician to perform the service requested; unless otherwise agreed upon by the Authorized User prior to start of the job, the Contractor may determine that they need a helper or more than one (1) technician to complete the job. Jobs requiring one (1) or more helper(s) or more than one (1) technician shall have prior written approval from Authorized User Personnel.
- f. Once work has commenced on a job it shall continue uninterrupted during Normal State Operating Hours until the job is completed satisfactorily as defined by the Authorized User Personnel, unless otherwise agreed upon by Authorized User Personnel.
- g. Time off-site cannot be charged to the Authorized User without prior written approval from the Authorized User Personnel (e.g. preparation of materials for use on the job anywhere off-site). If off-site work is required, the Contractor shall identify it on the Estimate provided for all jobs under ten thousand dollars (\$10,000).
 - (1) Off-site work charged cannot exceed the hourly rate as set in the Contract.

E.4. Trip Charges

- a. Contractors may charge a single Trip Charge per invoice.
- b. Trip charges shall *not* be applied when providing Estimates, Firm Quotes, or Diagnostics.
- c. Trip charges apply to the county in which the work is being completed regardless of where the Contractor Service Personnel originates.
- d. Trip charges shall not apply to return trips due to incomplete work. See Section E.9. for instruction on Warranty/Incomplete work.
- e. Trip charges shall not apply to Contractor Service Personnel leaving the Facility during job to obtain parts.
- f. For any job requiring more than three (3) working days, Contractors may request approval to include additional trip charges. Contractors shall not include additional trip charges unless requested in writing with the Firm Quote or Estimate and approved in writing by the Authorized User prior to the start of the work. Without written approval from the Authorized User, the Contractor may not charge for more than one (1) trip charge.
- g. Trip charges are not applicable to the provision of off-site telephonic Technical Assistance and apply only to on-site technician regular and premium time and helper regular and premium time.

E.5. Work Reports

- a. A written work report shall be completed and left with Authorized User Personnel at the time service is completed regardless of the dollar amount or emergency status of the total job. The work report shall be itemized and contain the following information:
 - (1) description of work performed;
 - (2) labor time (time-in/time-out);
 - (3) list of parts used, when applicable;
 - (4) all findings, which concern the Authorized User, or operation, of the equipment or system under contract; and
 - (5) any recommendation for repair or additional service.
- b. Prior to use at a Facility, the Contractor shall provide a Safety Data Sheet ("SDS") for substances or materials for which a SDS is required.

E.6. Subcontracting

- a. Contractor shall not use a Subcontractor without prior written approval by the Central Procurement Office. Contractor shall provide all documentation as requested by the Central Procurement Office.
- b. Subcontractor Personnel are required to sign in and sign out of the Job Log and shall comply with Sections E.6.b. – E.6. d.
- c. The Contractor shall not charge any higher labor rates to the Authorized Users than the Contract price even though the Subcontractor may be charging a higher labor rate to the Contractor. Parts may be charged in accordance with Contract Terms & Conditions Section 7.2 "Proof of Cost for Parts Not in a Catalog or Price List" and Contract Specifications Section E.8. The Contractor shall provide the Subcontractor's invoice as proof of cost.
- d. The Contractor is responsible for paying any Subcontractors.
- e. If the Contractor does not obtain CPO approval before using a Subcontractor, the Contractor may not be paid for work performed by the Subcontractor. Contractors must provide the CPO the subcontractor's applicable license(s) and a valid certificate of insurance to obtain approval.
- f. Personnel coming on-site to perform government inspections are not to be considered subcontractors. This cost shall be billed as a pass-through cost to the Authorized User and the invoice from the inspection shall be provided as proof of cost.

E.7. Specialized Equipment

- a. No Specialized Equipment shall be used without the Authorized User's prior written approval. The use of Specialized Equipment shall be identified in the Estimate, Diagnostic, or Firm Quote.
- b. If the approved Specialized Equipment is rented, a copy of the rental invoice shall be attached to the Contractor's invoice when submitted for payment. The Authorized User reserves the right to obtain prices for the same type of rental equipment for comparison to prices provided by the Contractor, and if the price estimated or quoted appears to be too high, the Authorized User may obtain Estimates or Firm Quotes for the job in accordance with the Contract specifications.
- c. Rental equipment shall be permitted only as a temporary measure while a Contractor is completing a job to create a permanent solution. Rental equipment costs shall be billed as a pass-through cost to the Authorized User, and the invoice from the inspection shall be provided as proof of cost.
- d. For Contractor-owned Specialized Equipment, the Contractor may charge the current rate that is charged by rental companies for the same type of equipment, provided that this rate is not higher than the Contractor's current rate for usage of the equipment. To substantiate the Contractor's requested rate, Contractor shall provide rental rate documentation from a minimum of two (2) rental companies.
- e. The Contractor shall be allowed a mark-up as specified in the Terms & Conditions Section 7.2 "Proof of Cost for Parts Not in a Catalog or Price List." In the event that the Specialized Equipment, whether rented or owned, requires an operator other than Contractor Service Personnel or Subcontractor Personnel, the Contractor shall be allowed to include the cost for the operator on the parts line. Any operator other than Contractor Service Personnel or Subcontractor Personnel shall comply with Sections E.2.b. and E.2.c. The cost for the operator shall be based on the same requirements as listed above in Sections E.7.b and E.7.c for the equipment.
- f. The Contractor warrants that no equipment shall be rented from a business or company in which the Contractor or Contractor's employees have direct or indirect financial interest and will be compensated directly or indirectly for equipment being rented to perform work specified in the Contract. Any exception taken by the Contractor for obtaining rental equipment shall be considered a violation of the Contract and may result in Contract cancellation.
- g. Non-Emergency Jobs over ten thousand dollars (\$10,000): Usage of Specialized Equipment shall be contemplated in the Firm Quote for the job and cannot be added as an additional charge at a later date, unless required and approved per Section D.6 of the Contract Specifications.

E.8. Parts Requirements

- a. The Contractor shall be allowed a mark-up as specified in the Terms & Conditions Section 7.2 "Proof of Cost for Parts Not in a Catalog or Price List". A copy of the original invoice(s) incurred with the procurement of chargeable parts, materials, and supplies shall be required as documentation to substantiate cost.
- b. All parts, materials, supplies and equipment used in the performance of the Contract work shall be new unless otherwise specified within the contract.
- c. Manufacturer parts, manufacturer-approved parts, or equal, as per the Authorized User's equipment, shall be used to maintain the integrity of the equipment or system(s) under the Contract.
- d. All parts, materials, supplies, and equipment utilized and chargeable to the Authorized User, shall be invoiced as per the Terms & Conditions Section 7.2. "Proof of Cost for Parts Not in a Catalog or Price List".
- e. All new equipment shall be Energy Star certified, WaterSense certified, and/or meet or exceed low flow standards as per the Tennessee High Performance Building Requirements where applicable.
- f. The Contractor shall make every effort to dispose of old equipment in an environmentally responsible way and as required by Local, State, and Federal laws and regulations and in accordance with Terms and Conditions Section 8.8 "Procurement of Recovered Materials". The removal of the old equipment shall be the responsibility of the Contractor installing the new equipment. Following installation of the new equipment, the old equipment shall be removed and all scrap metal components shall be recycled using an entity selected by the Contractor. Upon request from the Authorized User Personnel, the Contractor may be required to submit written proof of recycling or destruction. Documentation for the disposition of the equipment shall be retained by the installer including serial or model numbers, recycling supplier, and date(s), should the Authorized User require proof of proper disposal.
- g. Parts from Contract Stock
 - (1) When chargeable parts, materials, supplies and equipment are utilized from the Contractor's stock, a copy of the original purchase invoice shall be required as documentation to substantiate cost.
 - (2) If no invoice is available, the Authorized User may elect to verify current market value, and if necessary, amend the invoice to reflect fair market prices.
- h. Authorized User Purchased Parts

If agreed upon by the Contractor and Authorized User, the Authorized User may provide parts for use by the Contractor. The Contractor shall honor their warranty on labor per Section E.9.

E.9. Warranty/Incomplete Work Coverage

- a. Services requiring the Contractor to return to the Facility due to equipment or system(s) failure with reference to services previously provided by the Contractor shall be at no charge to the Authorized User. This service request shall be made within thirty (30) days after completion of the job.
- b. The Contractor shall absorb all cost incurred for replacement, repair, or corrections made to Authorized User equipment or system(s) due to the following:
 - (1) faulty equipment or parts installed by the Contractor; and/or
 - (2) equipment or system(s) failure due to the Contractor's poor workmanship, as defined by the Authorized User.
- c. The Authorized User shall not assume ownership of new equipment or system(s), or equipment, parts and materials used by the Contractor on the equipment or system(s) under Contract, until work is fully completed as determined by the Authorized User in writing.
- d. The Contractor shall give the Authorized User the manufacturer warranty agreements for equipment, parts and materials used by the Contractor on the equipment or system(s) under Contract, when ownership is assumed.
- e. Ownership is considered assumed when work is fully completed as determined by the Authorized User.
- f. For equipment, parts, or materials that are under warranty of the manufacturer, and are owned by the Authorized User, said warranty shall be honored.
- g. Technical Assistance
 - (1) There may be instances whereby the Contractor shall require manufacturer's Technical Assistance. The Contractor may invoice at the hourly rate bid for the technician or helper, regular time, if the assistance was conducted at the Facility.
 - (2) Charges incurred as a result of Technical Assistance while not at the Facility shall be borne by the Contractor.
 - (3) Telephone Technical Assistance - telephone response: no more than eight (8) hours from notification to the Contractor during Normal State Operating Hours.
- h. The Contractor shall warranty workmanship for one (1) year after work is fully completed as determined by the Authorized User in writing. The Contractor shall provide documentation of the Contractor's workmanship warranty to the Authorized User.

- i. Contractor shall provide the manufacturer's warranty against defects for the duration of the manufacturer's standard warranty period after work is fully completed as determined by the Authorized User in writing. The Contractor shall provide documentation of the manufacturer's standard warranty to the Authorized User.
- j. In the case an Authorized User has an active warranty on a piece of equipment, the Authorized User may request approval from the Central Procurement Office Contract Administrator to utilize the Contractor that holds said warranty.
- k. Default on the Contract or expiration of the Contract shall not relieve the Contractor from warranty requirements.
- l. For incomplete work, the Contractor shall be required to return to the Facility to complete the job within the Non-Emergency Job response times listed in Section E.6. If the Contractor fails to meet these required timeframes, the Authorized User is authorized to contact other awarded Contractors in accordance with the Section. At the request of the Authorized User Personnel, the Contractor shall be required to provide documentation of estimated time of arrival for parts and equipment and shall be required to provide back-up equipment within the time as specified by the Authorized User Personnel to ensure that the Facility is kept operational.

E.10. Security Requirements

- a. All Contractor Service Personnel, including subcontractors, shall be uniformed or have visible identification, while on State property, at all times. Contractor Service Personnel shall be required to provide photographic identification for inspection upon entering all State Facilities.
- b. Contractor Service Personnel shall provide proper Government issued identification to enter any Facility, may be subject to search, and are restricted to the work area site.
- c. Contractor Service Personnel and Subcontractor Personnel may be subject to a fingerprint-based background check by the Tennessee Bureau of Investigation (TBI). Upon request by the Authorized User for background check(s), the Contractor shall absorb all costs to obtain the requested TBI background check(s).
- d. Visits to all State Facilities require proper check in and check out; on no occasion shall service be provided without proper contact with the Authorized Agency Personnel in charge of the Facility. Security provisions for all State Facilities shall be strictly observed and the Contractor shall coordinate access to the State Facility with the Authorized Agency Personnel or their designee.
- e. The State reserves the right to inspect and search all Contractor Service Personnel or vehicles at any time while on the Facility grounds.
- f. The Contractor and Contractor Service Personnel shall strictly abide by all State policies and procedures at all times. Deviations from these policies by the Contractor, Contractor Service Personnel or Subcontractor Personnel shall not be tolerated and may be considered grounds for Contract cancellation.

- g. All State Facilities are non-smoking; the Contractor, Contractor Service Personnel and Subcontractor Personnel shall adhere to this requirement.
- h. If the Authorized User Personnel deems it necessary, the Contractor Service Personnel and/or Subcontractor Personnel may be required to leave the premises.
- i. Select State Facilities including State correctional Facilities and Tennessee National Guard Military Bases may require special conditions for access. It is the responsibility of the Contractor to comply with all current security mandates provided by those Authorized Users.

F. HVAC Requirements and Preventative Maintenance

Contractors that are awarded Contracts that contain HVAC services are required to be in compliance with the following standards for HVAC maintenance and repair. Contractors not awarded Contracts that contain HVAC services may disregard this section.

F.1. Refrigerant Conservation Services.

The Contractor shall ensure compliance with all Federal, State and Local regulations concerning HVAC refrigerant, and have recovery equipment certified by the EPA per Attachment C “Required Licenses & Certifications.” The Contractor shall not be allowed to charge for the recovery of refrigerant bottles, tanks and related equipment unless authorized by the Authorized User Personnel.

F.2. Preventive Maintenance Requirements and Suggested Maintenance Schedule.

The Authorized User may schedule Preventive Maintenance with the lowest Firm Quote provided (per instructions for obtaining a Firm Quote in Section D.4. The following is a list of maintenance requirements to be fulfilled upon request and a list of equipment with suggested preventive and annual maintenance schedules. At the discretion of the Authorized User the maintenance schedules outlined can be used for any HVAC equipment.

After the preventive maintenance inspection has been completed, the Contractor shall provide a checklist that demonstrates that all required checks were conducted per the Authorized User Personnel’s instruction. The checklist shall include detailed information for each area inspected. The Contractor shall identify equipment and/or parts requiring additional maintenance and the estimated cost to have the work completed. Providing this information to the Authorized User does not guarantee work to that Contractor; the Authorized User shall be required to follow guidelines on obtaining quotes as identified in Section D.4.

- a. Cooling Towers – Annual and quarterly inspection or preventive maintenance as per the manufacturer’s recommended maintenance instructions as described in the applicable manufacturer’s cooling towers manual that apply to the system and its mode of operation shall be performed by the Contractor, if requested. If the system has significant water loss, planned or unplanned, the cost of the chemicals required

to bring the water back to normal water chemical levels shall be billed as parts or materials reimbursement as per Section E.8.

(1) Maintenance Specifications, Annual:

- i. Inspect the general condition of the towers.
- ii. Clean all debris from the inside of the tower and the air inlet louvers.
- iii. Remove the chamber strainer, clean and reinstall.
- iv. Turn the fan by hand to ensure rotation without obstruction.
- v. Check the fan motor for proper fan rotation.
- vi. Adjust the belt tension on the power train fan drive system.
- vii. Check float operated make-up valve to be sure it is operating freely.
- viii. Lubricate the fan shaft bearings and replace if required. The Authorized User Personnel may request that a vibration test be performed.
- ix. Fill cold water sump with fresh water to the overflow level.
 1. At restart-up where the sump was completely drained; the initial biocide treatment should be applied.
 2. Following a shutdown where the sump was not completely drained: an initial shock treatment of appropriate biocides should be administered.
- x. Set the float on the make-up valve to shut off the valve when the float is approximately 1/2" below the overflow level.
- xi. Prime and start the water circulating pump(s) and adjust system flow rate to design.
- xii. Open the valve in the tower bleed line and adjust bleed to the recommended rate.
- xiii. Check the voltage and current of all three legs of the fan motor. The current should not exceed the nameplate rating. If a prolonged shutdown occurs, the motor insulation should be checked with a "megger" insulation tester prior to restarting the motor. Caution: rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of 6 on- off cycles per hour.
- xiv. Inspect protective finish. Inspect the inside and outside of the towers for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with ZRC (zinc-rich compound).

(2) Maintenance Specifications, Quarterly:

- i. Inspect general condition of towers.
- ii. Inspect and clean as necessary:
 1. Chamber strainer.
 2. Cold water sump.
 3. Air inlet louvers.
- iii. Check and adjust water level in cold water sump
- iv. Drain, clean, and flush with fresh water the entire cold-water sump (with strainer in place) to remove silt and sediment

- v. Check operation and adjust as necessary the make-up valve.
 - vi. Check bleed rate and adjust.
 - vii. Power train:
 - 1. Check condition of belt.
 - 2. Readjust tension on belt.
 - viii. Lubricate the fan shaft bearings and replace if required. The Authorized User Personnel may request that a vibration test be performed.
 - ix. Lubricate motor base adjusting screw.
 - x. Clean outside of fan motor.
 - xi. Inspect protective finish.
 - 1. Inspect the inside and outside of the towers for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with ZRC (zinc-rich compound).
 - 2. If system cleaning is necessary, it shall be limited to 1 - 2 days duration.
 - 3. Maximum temperature of the cleaning solution should not exceed any of the following:
 - (a) 5.0% sodium hydroxide.
 - (b) 5.0% sodium meta silicate.
 - (c) 2.0% sodium carbonate.
 - (d) 2.0% tetra sodium pyrophosphate.
 - (e) 0.5% trisodium phosphate.
 - (f) 0.5% sodium nitrate.
 - (g) 5-10% butyl cellosolve.
 - xii. Inspection of the following:
 - 1. controls systems
 - 2. calibration of thermostats
 - 3. checking for air leaks of pneumatics
- b. Air Handlers – Annual and quarterly inspection or preventive maintenance.
- (1) Maintenance Specifications, Annual:
- i. Inspect belts, bearings, pulleys, and tension belts.
 - ii. Grease the bearing.
 - iii. Inspect the coils for dirt and inform Authorized User if cleaning is necessary.
 - iv. Clean drain pan and inspect for leaks.
 - v. Use pan treatment tablets (or equivalent).
 - vi. Change filters at the request of the Authorized User Personnel.
 - vii. Check seals and dampers on all doors.
 - viii. Treat coils with a biocide when necessary.
 - ix. Check for smooth operation of dampers, damper motors, and linkages and lubricate where applicable.

- x. Check amps, volts, and wear of contacts on motors and motor starters (or frequency drives).
- xi. Tighten all electrical connections.
- xii. Check motor mounting and isolation pads.
- xiii. Check operation of chilled water and hot water valves.

(2) Maintenance Specifications, Quarterly:

- i. Inspect belts, bearing, pulleys, and tension belts.
- ii. Inspect coils for dirt and inform Authorized User if cleaning is necessary.
- iii. Change filters at the request of the Authorized User Personnel.
- iv. Inspect drain pan and install pan treatment tabs (or equivalent).
- v. Check amps, volts, and wear of contacts on motors and starters (or frequency drives).
- vi. Tighten all electrical connections.
- vii. Check operation of dampers and damper motors.
- viii. Check operation of chilled water and hot water valves.

c. Hot Water Heaters – Annual and quarterly inspection or preventive maintenance.

(1) Maintenance Specifications, Annual:

- i. Visually inspect and test the following:
 - 1. Air switch
 - 2. Operating control
 - 3. Gas pressure switch
 - 4. Low fire start switch
 - 5. High limit switch
 - 6. Oil pressure switch
- ii. Check operation of the following:
 - 1. Modulation motor
 - 2. All linkages
 - 3. Combustion blower
- iii. Start burner and check:
 - 1. Pilot operation
 - 2. Main flame ignition
- iv. Inspect for leaks:
 - 1. All access doors
 - 2. All fuel piping (gas and oil)
 - 3. All boiler tubes
- v. Check operation: (where applicable)
 - 1. Condensate tank

2. Condensate pumps and controls
 3. Hot water pumps and controls
 4. Steam converter
 5. D. A. Tank
 6. Boiler sight glass
 7. Expansion tank
- vi. Perform safety check:
1. Shut pilot gas off and check for flame failure
 2. Shut main fuel off and check for flame failure and electric valve closure
 3. I. W. C. O.
- vii. Perform combustion analysis on primary fuel:
1. Record analysis
 2. Complete a written report for the Authorized User
- (2) Maintenance Specifications, Quarterly:
- i. Perform combustion analysis
 - ii. Check operation of boiler and related safety controls
 - iii. Check operation of related elements of boiler steam system or hot water system such as the expansion tanks and the D.A. Tanks

G. Plumbing Preventive Maintenance

Contractors that are awarded Contracts that contain Plumbing services are required to be in compliance with the following standards for Plumbing maintenance and repair. Contractors not awarded Contracts that contain Plumbing services may disregard this section.

- a. The Authorized User may schedule Preventive Maintenance with the lowest Firm Quote provided (per instructions for obtaining a Firm Quote in Section D.4.). After the preventive maintenance inspection has been completed, the Contractor shall provide a checklist that demonstrates that all required checks were conducted per the Authorized User's instruction. The checklist shall include detailed information for each area inspected. The Contractor shall identify equipment and/or parts requiring additional maintenance and the estimated cost to have the work completed. Providing this information to the Authorized User does not guarantee work to that Contractor; the Authorized User shall be required to follow guidelines on obtaining quotes as identified in Section D.4.
- b. Annual and quarterly inspection or preventive maintenance on all items and fixtures detailed in Section B.3.

H. Boiler Preventative Maintenance

Contractors that are awarded Contracts that contain Boiler services are required to be in compliance with the following standards for Boiler maintenance and repair. Contractors not awarded Contracts that contain Boiler services may disregard this section.

- a. The Authorized User may schedule Preventive Maintenance with the lowest Firm Quote provided (per instructions for obtaining a Firm Quote in Section D.4. The following is a list of maintenance requirements to be fulfilled upon request and a list of equipment with suggested preventive and annual maintenance schedules. After the preventive maintenance inspection has been completed, the Contractor shall provide a checklist that demonstrates that all required checks were conducted per the Authorized User's instruction. The checklist shall include detailed information for each area inspected. The Contractor shall identify equipment and/or parts requiring additional maintenance and the estimated cost to have the work completed. Providing this information to the Authorized User does not guarantee work to that Contractor; the Authorized User shall be required to follow guidelines on obtaining quotes as identified in Section D.4.

(1) Maintenance Specifications, Annual:

i. Visually inspect and test the following:

1. Air switch
2. Operating control
3. Gas pressure switch
4. Low fire start switch
5. High limit switch
6. Oil pressure switch

ii. Check operation of the following:

1. Modulation motor
2. All linkages
3. Combustion blower

iii. Start burner and check:

1. Pilot operation
2. Maintain flame ignition

iv. Inspect for leaks:

1. All access doors
2. All fuel piping (gas and oil)
3. All boiler tubes

v. Check operation: (where applicable)

1. Condensate tank
2. Condensate pumps and controls

3. Hot water pumps and controls
 4. Steam converter
 5. D. A. Tank
 6. Boiler sight glass
 7. Expansion tank
- vi. Perform safety check:
1. Shut pilot gas off and check for flame failure
 2. Shut main fuel off and check for flame failure and electric valve closure
 3. I. W. C. O.
- vii. Perform combustion analysis on primary fuel:
1. Record analysis
 2. Complete a written report for the Authorized User
- (2) Maintenance Specifications, Quarterly:
- i. Perform combustion analysis
 - ii. Check operation of boiler and related safety controls
 - iii. Check operation of related elements of boiler steam system or hot water system such as the expansion tanks and the D.A. Tanks
 - iv. Boiler refractory inspection to include cement, brick, and insulation
 - v. efficient operation of applicable air relief systems (closed loop)

I. Preventive Maintenance Requirements and Suggested Maintenance Schedule.

The Authorized User may schedule Preventive Maintenance with the lowest Firm Quote provided (per instructions for obtaining a Firm Quote in Section D.4. The following is a list of maintenance requirements to be fulfilled upon request and a list of equipment with suggested preventive and annual maintenance schedules. After the preventive maintenance inspection has been completed, the Contractor shall provide a checklist that demonstrates that all required checks were conducted per the Authorized User's instruction. The checklist shall include detailed information for each area inspected. The Contractor shall identify equipment and/or parts requiring additional maintenance and the estimated cost to have the work completed.

Providing this information to the Authorized User does not guarantee work to that Contractor; the Authorized User shall be required to follow guidelines on obtaining quotes as identified in Section D.4.

a. Chiller (Centrifugal) – Annual and quarterly inspection or preventive

- (1) Maintenance Specifications, Annual:
- i. Pressurize the unit and conduct a leak check.
 - ii. Check oil level.
 1. Add oil as necessary.
 - iii. Check refrigerant level.

1. Report need of refrigerant to Authorized User Personnel.
 2. Add refrigerant when authorized.
 3. Refrigerant shall be charged as parts or materials reimbursement as per the parts term and condition.
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- iv. Check oil sump and purge oil heater and temperature.
 - v. Check and test all operating and safety controls.
 - vi. Check the starter operation.
 - vii. Start chilled water pump.
 - viii. Start condenser water pump and cooling tower.
 - ix. Start chiller and calibrate controls.
 - x. Check purge unit operation.
 - xi. Log operating conditions after system and unit have stabilized.
 - xii. Check auxiliary equipment operation.
 - xiii. Review operating procedures and Authorized User's log with operator.
 - xiv. Check compressor-motor assembly for the following items and performing preventative maintenance tasks as indicated:
 1. Record voltages
 2. Meg and record motor winding resistance
 3. Lubricate open motor
 4. Check alignment on open drive units
 5. Check the coupling for wear
 6. Check shaft seal assembly
 7. Check inlet vane operator and linkage, lubricate where required
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- xv. Check the compressor oil system for the following items:
 1. Change oil, oil filter and dryer
 2. Conduct analysis on oil and oil filter at an independent laboratory and provide a written report
 3. Check oil pump, seal and motor
 4. Clean the dirt leg
 5. Check oil heater and thermostat for proper operation
 6. Check all other oil system components including cooler, strainer and solenoid valve where applicable
 - xvi. Check motor starter and perform the following tasks:
 1. Run diagnostic check
 2. Check starter cooling system
 3. Meg motor windings
 4. Check all terminals and tighten connections
 5. Check overloads trip set points and adjust if required
 6. Dry run starter and check status lights
 - xvii. Review the control panel for the following items:
 1. Run diagnostic check of micro control panel
 2. Check safety shutdown operation
 3. Check all terminals and tighten connections

4. Check display data accuracy and set points
- xviii. Review purge unit of the following items:
1. Check operation of the unit
 2. Change oil
 3. Replace filter dryer
 4. Clean orifice in the liquid feedline to coil
 5. Clean solenoid valves
 6. Clean purge drum, check and clean float valve, replacing gaskets
 7. Check heater operation
 8. Check all other components for proper condition and operation; record pressure control set point
- xix. Check the condenser for the following items:
1. Check the water flow
 2. Check flow switch operation
 3. Remove condenser heads and inspect end sheets
 4. Mechanically brush clean condenser water tubes
- xx. Check the cooler for the following items:
1. Check the water flow
 2. Check flow switch operation
 3. Check refrigerant level
 - (a) Report need of refrigerant to Authorized User Personnel.
 - (b) Add refrigerant when authorized.
 - (c) Refrigerant shall be charged as parts or materials reimbursement as per the parts term and condition.
- xxi. Check the system for the following:
1. Conduct a leak check and identify leak sources for repair
 - (a) Report leak check findings to Authorized User Personnel.
 - (b) Authorized User Personnel shall authorize leak repair.
 - (c) Leak repair shall be charged at the hourly rate.
 - (d) Leak repair refrigerant shall be charged as parts or materials reimbursement as per the parts term and condition.
 2. Record condition of sight glasses and replace if required.
 3. Check the refrigerant cycle to verify the proper operation balance
 4. Check condenser water and chilled water heat transfer
- xxii. General inspection included:
1. Repair insulation removed for inspection and maintenance procedures
 2. Clean equipment and surrounding area upon completion of work
 3. Consult with the operator at completion of service

4. Provide a written report of deficiencies and repairs that may be required.

(2) Maintenance Specifications, Quarterly:

General Operation:

- i. Inspect general condition of towers.
- ii. Inspect and clean as necessary:
 1. Chamber strainer
 2. Cold water sump
 3. Air inlet louvers
- iii. Check and adjust water level in cold water sump.
- iv. Drain, clean, and flush with fresh water the entire cold-water sump (with strainer in place) to remove silt and sediment.
- v. Check operation and adjust as necessary the make-up valve.
- vi. Check bleed rate and adjust.
- vii. Power train:
 1. Check condition of belt
 2. Readjust tension on belt
- viii. Lubricate the fan shaft bearings and replace if required. The Authorized User Personnel may request that a vibration test be performed.
- ix. Lubricate motor base adjusting screw.
- x. Clean outside of fan motor.
- xi. Inspect protective finish.
 1. Inspect the inside and outside of the towers for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with ZRC (zinc-rich compound).
 2. System cleaning:
 - (a) If system cleaning is necessary, it shall be limited to 1 - 2 days duration.
 - (b) Maximum temperature of the cleaning solution should not exceed any of the following:
 - (i) 5.0% sodium hydroxide
 - (ii) 5.0% sodium meta silicate
 - (iii) 2.0% sodium carbonate
 - (iv) 2.0% tetra sodium pyrophosphate
 - (v) 0.5% trisodium phosphate
 - (vi) 0.5% sodium nitrate
 - (vii) 5-10% butyl cellosolve

J. Electrical Preventive Maintenance

Contractors that are awarded Contracts that contain Electrical services are required to be in compliance with the following standards for Electrical maintenance and repair. Contractors not awarded Contracts that contain Electrical services may disregard this section.

- a. The Authorized User may schedule Preventive Maintenance with the lowest Firm Quote provided (per instructions for obtaining a Firm Quote in Section D.4. After the preventive maintenance inspection has been completed, the Contractor shall provide a checklist that demonstrates that all required checks were conducted per the Authorized User's instruction. The checklist shall include detailed information for each area inspected. The Contractor shall identify equipment and/or parts requiring additional maintenance and the estimated cost to have the work completed. Providing this information to the Authorized User does not guarantee work to that Contractor; the Authorized User shall be required to follow guidelines on obtaining quotes as identified in Section D.4.
- b. Annual and quarterly inspection or preventive maintenance on all items and fixtures detailed in Section B.1.
- c. Any electrical preventive maintenance program should be performed in accordance with accepted industry standards and work/ safety practices. This includes, but is not limited to, the latest releases of the following:
 1. National Fire Protection Association (NFPA) 70B, Recommended Practice for Electrical Equipment Maintenance
 2. National Fire Protection Association (NFPA) 70, National Electrical Code
 3. National Electrical Manufacturer's Association (NEMA) Standard AB4, Procedures for Verifying Field Inspections and Performance Verification of Molded Case Circuit Breakers
 4. International Electrical Testing Association (NETA), Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems
 5. IEEE (Institute of Electrical and Electronics Engineers) Std P1415 Motor Maintenance and Failure Analysis
 6. National Electrical Manufacturer's Association (NEMA) Standard MG1
 7. International Electrical Testing Association (NETA), Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems
 8. OSHA Applicable Standards
 9. IEEE STD 1415, IEEE Guide to Introduction Machinery Maintenance Testing and Failure Analysis
 10. National Fire Protection Association (NFPA) 70B, Recommended Practice for Electrical Equipment Maintenance
 11. International Electrical Testing Association (NETA), Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems

12. EEE STD 43, IEEE Recommended Practice for Testing Insulations
Resistance of Rotating Machinery

d. Switchgear

1. Enclosures

- i. Ensure that all enclosure panels, doors, and structures are well-maintained in accordance with the manufacturer's specifications. During de-energized maintenance, enclosures are to be vacuum cleaned of all loose dirt and debris—use of compressed air is not recommended since this may cause foreign particles to become embedded in the insulation or damage insulators. Any buildup of dirt or other contaminants that shall not come off with vacuuming should be cleaned with lint-free rags using cleaning solvents recommended by the manufacturer. All vents and fan grills are to be cleaned of all dust and/or dirt accumulations. Ensure that ventilation openings are not obstructed. Where seals and/or gaskets are installed, these should be examined and repaired or replaced as necessary. All doors and access panels should be properly secured during operation. Where heater elements are installed, these should be cleaned, examined for damage and/or deterioration, and tested. Repair or replace heater elements as necessary. In environments where there is an extreme exposure to adverse conditions, the frequency of maintenance for enclosures should be increased as conditions warrant. Electrical equipment rooms or vaults should be kept cleaned of dirt and/or dust accumulations on a regular basis. Doors and windows should be maintained in proper working order and kept closed during routine operation. Access doors should be clearly marked to alert personnel that live electrical equipment is in use. Where ventilation and/ or air conditioning is used, all fan motors should be cleaned and examined for signs of wear and deterioration. Fan blades should be cleaned of dirt and dust and bearings should be properly lubricated. Vent openings should be cleaned of all dust and dirt accumulations. Filters should be cleaned and/or changed as recommended by the manufacturer or more often if conditions warrant. Electrical equipment rooms should never be used as storage areas. Electrical equipment rooms or vaults should be examined for evidence of water seepage. The tops of electrical equipment enclosures should be examined for evidence of water since this is a common entryway that often goes undetected until a failure occurs. The source of the water should be immediately identified and corrective measures taken to permanently correct the condition.

2. Insulators, Supports, and Connectors

- i. Inspect insulators and conductor supports for signs of cracking, broken pieces, and other physical damage or deterioration. Clean all loose dirt with lint-free rags. For contaminants that will not remove easily, solvents approved by the manufacturer may be used. Examine for evidence of moisture that may lead to tracking or flashover while in operation. Examine surrounding areas for signs of tracking, arcing, or overheating. Repair or replace damaged insulators and supports as necessary. Examine all bolts and connecting devices for signs of deterioration, corrosion, or overheating. Ensure that bolts and connecting devices are tight, according to manufacturer's specifications. Be careful not to over-torque bolts and connecting devices since insulators are easy to damage and difficult to replace. Where copper and aluminum conductors and/or connectors are used together, examine connections for signs of galvanic action. Ensure that the connectors are properly used and installed in accordance with manufacturer's specifications. Apply an antioxidant compound to all aluminum-to-copper connections.

3. Conductors

- i. Examine insulation for signs of deterioration, cracking, flaking, or overheating. Examine all connections for signs of overheating, cracked or broken connectors, and signs of tracking or arcing. Ensure that conductors are clean and dry. Examine and clean all connections, and torque to manufacturer's recommendations.

e. Molded-Case Circuit Breakers

Molded-case circuit breakers should be kept clean for proper ventilation of the breakers. These types of breakers are usually tripped by a thermal element that senses an increase in temperature due to excessive current draw. However, if dirt accumulates on the surrounding of the breaker, the heat build-up may not be permitted to dissipate properly and result in nuisance tripping. Clean the breaker housing and inspect it for cracks or signs of overheating. Tighten all connections. Exercise the breaker several times to ensure the mechanism has freedom of movement and to allow contact wiping. In addition, larger duty circuit breakers (225 amps or above) should be electrically trip tested to ensure proper operation of the trip elements and trip linkages. Refer to the latest edition of the National Electrical Manufacturer's Association (NEMA) Standard AB4, Procedures for Verifying Field Inspections and Performance Verification of Molded-Case Circuit Breakers. If possible, test contact resistance to ensure

quality of breaker contacts. All molded-case circuit breaker panels should be cleaned of all dirt, dust, and debris using a vacuum.

f. Protective Relays

1. Inspection, maintenance and testing of protective relays should be done on an annual basis in order to ensure proper and reliable operation. All necessary precautions should be taken while working with protective devices to ensure personnel safety and to avoid any unplanned interruption of service. In particular, when working on control circuits, all current transformer (CT) secondaries should be shorted to ground and never left open-circuited in order to avoid serious injury to maintenance personnel.
2. Visual and Mechanical Inspection
 - i. Inspect relays for physical damage and deterioration. Inspect gaskets and covers for damage and/or excessive wear, and repair or replace as necessary. Examine and clean the relay and enclosure of foreign materials, such as dust, dirt, and moisture contamination. Examine the condition of the spiral spring, disc clearances, contacts, and case shorting contacts (if present). Check mechanism for freedom of movement, proper travel and alignment, and tightness of mounting hardware and plugs.
3. Electrical Testing
 - i. Using an appropriate testing instrument, suitable for the relays being tested, conduct electrical testing of the relays in accordance with manufacturer's recommendations and IEEE testing standards. For overcurrent relays, test the following functions of the relay at the established settings specified by the system engineer or manufacturer:
 - ii. Pickup contacts should close when a current equal to the relay tap setting is applied to the induction coil. Adjust the spring as needed to allow for proper operation.
 - iii. Timing tests should be performed corresponding to two (2) or more points on the relay's time current curves. One of the tests should be done at the specified time dial setting.
 - iv. Instantaneous pickup test should be performed for the specified instantaneous setting, if applicable.

- v. Seal-in units should be tested to ensure that the contacts hold closed with the minimum specified current applied.
- vi. Relay target should indicate when the relay has operated.
- vii. If possible, the relays should be tested to ensure that operation of the relay will in fact cause a tripping action of the respective circuit breaker. Relays that do not test satisfactorily or are found to be defective should be replaced immediately to maintain the integrity of the protection systems.