COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Electronic Application Of Kentucky Power Company For 1) A Certificate Of Public Convenience And Necessity To Construct A Natural Gas-Fired Combined Cycle Generating Facility In Lawrence County, Kentucky; 2) A Site Compatibility Certificate; 3) A Certificate Of Public Convenience And Necessity To Construct A New Transmission Substation In Boyd County, Kentucky; 4) Approval Of A Short-Term Capacity Purchase Agreement; And 5) For All Other Required Approvals And Relief	))))))))))	Case No. 2026-00324

DIRECT TESTIMONY OF

CLINTON M. STUTLER

ON BEHALF OF KENTUCKY POWER COMPANY

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EXHIBIT	DESCRIPTION
EXHIBIT CMS-1	Natural Gas Infrastructure & Firm Transportation RFP
CONFIDENTIAL EXHIBIT CMS-2	RFP Analysis, Justification

DIRECT TESTIMONY OF
CLINTON M. STUTLER ON BEHALF OF
KENTUCKY POWER COMPANY
BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

CASE NO. 2026-00324

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.

A. My name is Clinton M. Stutler. My business address is 1 Riverside Plaza, Columbus, Ohio 43215. I am employed by American Electric Power Service Corporation ("AEPSC") as the Director of Natural Gas Procurement. AEPSC is a wholly owned subsidiary of American Electric Power Company, Inc. ("AEP") that provides support services to the operating subsidiaries of AEP, including Kentucky Power Company ("Kentucky Power" or the "Company").

II. BACKGROUND

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND BUSINESS EXPERIENCE.

A. I earned a Bachelor's of Science in Business Administration degree, with a major in Transportation & Logistics and Marketing from The Ohio State University in 2002, and a Master's degree in Business Administration from Bowling Green State University in 2007.

I have 24 years of energy industry experience in fuel procurement, logistics, marketing, scheduling, and transportation. My professional background began in 2002 as a Scheduler with Marathon Petroleum Company. In 2008, I joined AEPSC in the Fuel, Emissions, and Logistics organization as a Coal Buyer, with responsibility for the procurement of coal for Ohio Power Company. In 2014, I joined AEP Generation Resources, with responsibilities for purchasing natural gas, coal, urea, and fuel oil, in

addition to marketing fly ash and flue gas desulfurization gypsum. In 2016, I accepted a position in the regulated Commercial Operations organization as a Coal Buyer and became responsible for the procurement of coal for Kentucky Power, Appalachian Power Company ("APCo"), and Southwestern Electric Power Company ("SWEPCO"). On May 4, 2018, I was promoted to Manager of Natural Gas and Fuel Oil Procurement, becoming responsible for the procurement and delivery of natural gas and fuel oil to AEP's regulated generating fleet. On February 3, 2024, I was promoted to Director of Natural Gas Procurement.

Q. WHAT ARE YOUR PRINCIPAL AREAS OF RESPONSIBILITY?

A. I am responsible for the procurement and delivery of natural gas and fuel oil to AEP's regulated generating fleet, which includes regulated power plants owned and/or operated by Kentucky Power and its affiliates.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN ANY REGULATORY PROCEEDINGS?

A. Yes. I submitted testimony and testified before the Public Service Commission of Kentucky (the "Commission") on behalf of Kentucky Power in fuel adjustment clause review cases, including Case No. 2025-00338, Case No. 2025-00073, Case No. 2024-00144, Case No. 2024-00136, and Case No. 2023-00008. I also submitted written testimony and appeared before the Commission in the Company's most recent base rate case, Case No. 2025-00257. In addition, I submitted written testimony and appeared before the Public Service Commission of West Virginia on behalf of APCo and Wheeling Power Company, and before the Oklahoma Corporation Commission on behalf of Public Service Company of Oklahoma. Furthermore, I filed testimony before the Public Utility Commission of Texas and before the Arkansas Public Service Commission on behalf of

SWEPCO, before the State Corporation Commission of Virginia on behalf of APCo and before the Indiana Utility Regulatory Commission on behalf of Indiana Michigan Power Company.

III. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

A. The purpose of my Direct Testimony is to provide an overview of how natural gas is procured and transported in the marketplace. I then discuss the viable natural gas transportation and supply alternatives related to the Combined-Cycle Generation Project, and outline the request for proposal ("RFP") process and the recommended natural gas transportation strategy.

Q. ARE YOU SPONSORING ANY EXHIBITS?

A. Yes. I am sponsoring the following exhibits:

EXHIBIT	DESCRIPTION
Exhibit CMS-1	Natural Gas Infrastructure & Firm Transportation RFP
Confidential Exhibit CMS-2	RFP Analysis, Justification

Q. WERE THESE EXHIBITS PREPARED BY YOU OR UNDER YOUR DIRECTION?

A. Yes.

IV. NATURAL GAS TRANSPORTATION & SUPPLY OVERVIEW

Q. PLEASE DESCRIBE HOW POWER PLANTS ARE SUPPLIED WITH NATURAL GAS.

Natural gas procurement is based on two components: supply and transportation. Natural gas supply agreements provide the commodity used to fuel the power plant. Natural gas pipeline transportation agreements secure the necessary means to transfer the natural gas supply from the source to the plant.

From a natural gas transportation perspective, there are varying levels of services that may be used. Firm transportation contracts provide the highest level of service. Under these contracts, the shipper—which could be a power plant—owns physical space on the pipeline ("capacity") from a specific receipt point, where the natural gas supply is purchased, to a specific delivery point (*i.e.*, the power plant). The shipper compensates the pipeline operator through a fixed monthly reservation fee that is paid regardless of whether the capacity is used. Interruptible transportation contracts provide lower levels of service and can be prone to interruption during periods of high demand. For example, if a shipper is transporting natural gas supply from the receipt point to the delivery point using an interruptible transportation contract, the pipeline operator may "cut" the quantity of supply if transportation capacity is inadequate. The benefit of transporting natural gas via an interruptible transportation contract is that the shipper only pays for the transportation capacity when it uses the transportation capacity.

From a natural gas supply perspective, fixed price baseload purchases may be made many months before flow. Such purchases mitigate the price volatility embedded within the spot market. In addition, spot market purchases may also be pursued, which are made

the day before or the day of flow. In certain cases, "delivered" natural gas supply can be purchased. In this situation, the counterparty is not only supplying the commodity but also owns adequate firm transportation capacity and is able to deliver the natural gas supply to the delivery point.

V. EXISTING NATURAL GAS INFRASTRUCTURE AND DUE DILIGENCE

Q. PLEASE DESCRIBE THE LOCATION OF THE COMBINED-CYCLE GENERATION PROJECT.

A. The Combined-Cycle Generation Project will be located in Louisa, Kentucky, on the same property as the Company's existing Big Sandy Unit 1.

Q. WILL KENTUCKY POWER BE ABLE TO USE ANY OF THE EXISTING NATURAL GAS FACILITIES AT BIG SANDY UNIT 1 TO PROVIDE SERVICE TO THE COMBINED-CYCLE GENERATION PROJECT?

A. No. The delivery pressure capability of the pipeline that serves Big Sandy Unit 1 is not adequate to serve the Combined-Cycle Generation Project. Big Sandy Unit 1 requires minimum delivery pressure of 165 pounds per square inch gauge ("psig"), which is incompatible with the Combined-Cycle Generation Project requirement of a minimum delivery pressure of 600 psig.

Q. PLEASE DESCRIBE THE NATURAL GAS INFRASTRUCTURE THAT IS MOST RELEVANT TO THE COMBINED-CYCLE GENERATION PROJECT.

A. Tennessee Gas Pipeline ("Tennessee Gas") is the closest, high-pressure interstate pipeline, which is located approximately eight miles from the Combined-Cycle Generation Project. The Tennessee Gas pipeline stretches from Texas to New Hampshire. Natural gas supply could originate from the south or the north, providing ample flexibility.

Additionally, TC Energy Corporation operates two high-pressure pipelines that are located approximately 12 miles from the Combined-Cycle Generation Project. The Columbia Gulf Transmission ("Columbia Gulf") pipeline originates in Louisiana and terminates in Kentucky. Columbia Gas Transmission ("Columbia Gas") operates pipelines in the Appalachian Basin, in states such as Kentucky, West Virginia, Virginia, and Ohio, and covers areas in the Northeast, such as Pennsylvania and New York. Natural gas supply transported via Columbia Gulf would originate in the south, whereas natural gas transported via Columbia Gas would originate in the Appalachian Basin.

VI. RFP PROCESS AND RESULTS

Q. PLEASE DESCRIBE THE RFP PROCESS.

A. The most efficient way to understand cost and reliability, and to be sure that all interested parties are included, is to issue an RFP specifically identifying the services requested. On August 27, 2025, AEPSC, on behalf of Kentucky Power, issued an RFP soliciting proposals from bidders to construct, operate, and maintain a natural gas pipeline lateral and the associated natural gas facilities ("Gas Facilities") to support the flow of natural gas to the Combined-Cycle Generation Project. The RFP also sought offers of mainline firm transportation capacity. The submission deadline for the RFP was October 15, 2025. Please refer to Exhibit CMS-1, which provides the entirety of the RFP package.

Q. PLEASE DESCRIBE THE METHODOLOGY USED TO DETERMINE THE MOST ADVANTAGEOUS BID(S) FROM THE RFP.

A. As discussed in the previous question, Kentucky Power sought two distinct services through the RFP: (1) bids to construct, operate, and maintain the Gas Facilities; and (2)

offers of mainline firm transportation capacity. Both are necessary components to ensure the reliable supply of natural gas to the Combined-Cycle Generation Project.

AEPSC received bids that sought to perform one or both of these necessary services. Some bidders were only interested in constructing, operating, and maintaining the Gas Facilities, and had no ability, or interest, in providing mainline firm transportation capacity. Other bidders were interested in the entire package, providing both components sought in the RFP. In evaluating the proposals, AEPSC evaluated whether the least cost, most reliable alternative could have included Company "A" constructing, operating, and maintaining the Gas Facilities and Company "B" providing mainline firm transportation capacity. The optimal offer, or offers, would then be selected by Kentucky Power.

Q. PLEASE DESCRIBE THE RESULTS OF THE RFP.

A. AEPSC received proposals from four bidders: Woodway Energy Infrastructure LLC, Tennessee Gas, Columbia Gulf, and Columbia Gas. Please refer to Confidential Exhibit CMS-2, which includes the RFP analysis and the written justification describing the desired path forward. Kentucky Power has executed a Precedent Agreement with Tennessee Gas, whereby Tennessee Gas will construct, operate, and maintain the Gas Facilities and will provide mainline firm transportation capacity.

Q. BEYOND WHAT IS DISCUSSED IN CONFIDENTIAL EXHIBIT CMS-2, ARE THERE OTHER RISK MITIGATION BENEFITS RELATED TO MOVING FORWARD WITH TENNESSEE GAS?

A. Yes. An additional benefit is the fuel supply diversity created at the Big Sandy site. Big Sandy Unit 1 receives natural gas associated with Appalachian market pricing, while the Combined-Cycle Generation Project will receive natural gas through the Tennessee Gas

Pipeline system, with such supply being associated with Southeastern market pricing. Because these supply arrangements are tied to different gas markets, the Company is not solely dependent on a single natural gas supply region or market index. During periods of market stress, such as severe winter weather events that can cause significant regional price volatility, this diversity helps reduce the Company's exposure to disruptions or price spikes affecting any one market. Importantly, each facility will continue to receive natural gas from its respective supply source; the benefit is the presence of two distinct supply markets serving the Big Sandy site rather than the ability of either facility to switch basins.

Q. WILL KENTUCKY POWER HAVE ANY RESPONSIBILITY WITH REGARD TO CONSTRUCTING OR ACQUIRING THE REQUISITE PERMITS FOR THE GAS FACILITIES?

A. Kentucky Power will not have any responsibility in constructing or acquiring permits for the Gas Facilities. Tennessee Gas will own, operate, and maintain the Gas Facilities. Tennessee Gas will perform all construction, environmental, and permitting work required under state and federal law.

VII. GENERATION PROJECT EVOLUTION AND SYNERGISTIC OPPORTUNITIES

Q. PLEASE DISCUSS HOW THE GENERATION PROJECT HAS EVOLVED SUBSEQUENT TO THE ISSUANCE AND COMPLETION OF THE RFP.

A. Subsequent to the issuance and completion of the RFP, the generation project has evolved from two combustion turbine units requiring transportation capacity of 105,000 MMBtu per day, to the Combined-Cycle Generation Project—a combined-cycle facility requiring transportation capacity of 119,000 MMBtu per day.

Q. DID THE EVOLUTION OF THE GENERATION PROJECT HAVE ANY IMPACT ON THE RFP RESULTS OR THE PATH FORWARD?

A. No. With respect to the RFP process, the primary impact of the evolved project scope is an increased incremental transportation capacity need of 14,000 MMBtu per day. All other changes to the RFP would have been minimal and insignificant. The increased incremental transportation need does not impact the results of the RFP.

Q. IS TENNESSEE GAS WILLING AND ABLE TO AMEND THE PRECEDENT AGREEMENT TO ACCOUNT FOR THE INCREMENTAL 14,000 MMBTU PER DAY REQUIREMENT?

A. Yes.

Q. HAVE ANY SYNERGISTIC OPPORTUNITIES MATERIALIZED FOLLOWING THE EXECUTION OF THE PRECEDENT AGREEMENT?

A. Yes. Another operating subsidiary of AEP is planning the construction of a new combined-cycle plant ("Affiliate Plant"), which will be located nearby.

Q. HOW WILL THE AFFILIATE PLANT IMPACT THE CONTRACTUAL RATE ASSOCIATED WITH THE PROJECT?

A. Instead of Tennessee Gas pursuing two separate pipeline lateral projects, there are economies of scale in pursuing a single, larger project. For example, to serve the Combined-Cycle Generation Project, Tennessee Gas was planning to build a 16-inch pipeline lateral. To serve both projects, the size of the pipeline lateral will increase from 16 inches to 24 inches, but the increase in cost is nonlinear. Therefore, Kentucky Power anticipates the rate submitted by Tennessee Gas via the RFP and documented in the

executed Precedent Agreement to decrease due to the economies of scale associated with the larger overall project.

Q. IS TENNESSEE GAS AGREEABLE TO COMBINING THE COMBINED-CYCLE GENERATION PROJECT AND THE AFFILIATE PLANT PROJECT TO SEIZE THE REFERENCED ECONOMIES OF SCALE?

A. Yes. Tennessee Gas is drafting an amendment to the Precedent Agreement that will document the new rate and quantity requirement.

Q. WHAT IS THE PATH FORWARD FOR KENTUCKY POWER TO ENSURE ADEQUATE NATURAL GAS TRANSPORTATION AND SUPPLY FOR THE PLANT?

A. As referenced earlier, and identified within Confidential Exhibit CMS-2, Kentucky Power has executed a Precedent Agreement with Tennessee Gas Pipeline to construct, operate, and maintain the Gas Facilities, and to provide mainline firm transportation capacity originating at the TGP Zone 1, Station 87 Pool. The Company will amend the Precedent Agreement to account for the required incremental transportation capacity and the decreased rate structure. This will allow the Company to take advantage of the economies of scale associated with the incorporation of the Affiliate Plant project.

VIII. CONCLUSION

Q. GIVEN YOUR EVALUATION OF COMBINED-CYCLE GENERATION PROJECT, FROM A NATURAL GAS TRANSPORTATION AND SUPPLY POINT OF VIEW, IS KENTUCKY POWER PREPARED TO INCORPORATE THE PLANT INTO ITS CURRENT GENERATION FLEET?

A. Yes.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

EXHIBIT CMS-1

Natural Infrastruction & Firm

Transportation RFP

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Request for Proposals
Big Sandy Natural Gas Project

Pursuant to this Request for Proposals – Big Sandy Natural Gas Project ("RFP"), American Electric Power Service Corporation ("AEPSC" or "Company"), as agent for Kentucky Power Company ("KPCO"), is soliciting proposals from bidders (each a "Proposal") to construct, operate and maintain a natural gas pipeline lateral and associated natural gas facilities (collectively, the "Gas Facilities") to the Big Sandy Natural Gas Project ("Plant") located in Louisa, Kentucky. These Gas Facilities will be utilized to supply the Plant with natural gas as the primary fuel source. The Company is also seeking offers of mainline firm transportation capacity.

It is the Company's objective to obtain a reliable supply of natural gas for the Plant beginning on its Commercial Operation Date ("COD") estimated to be September 1, 2030. Fuel for testing must be available at the Plant site prior to the COD. All construction and/or interconnection activities should be completed with sufficient time to provide intermittent startup and fuel for testing beginning approximately May 1, 2030.

1) RFP SCHEDULE

Proposals should be submitted to the Company via e-mail no later than 5:00 p.m. (Eastern Time) on October 15, 2025. Proposals should be emailed to aepfuelsrfp@aep.com. All RFP communication with the Company shall be directed to the RFP Representative:

Clint Stutler
cmstutler@aep.com

Below is a tentative schedule for the RFP process. Notification to bidders will occur if changes to the schedule are required.

Issue Draft RFP	August 27, 2025
Notice to AEPSC of Intent to Bid	September 10, 2025
Submission of Credit Requirements	September 10, 2025
Issue Final RFP	September 17, 2025
Submission of Bids	October 15, 2025
Clarification of Bids	October 15, 2025 – November 19, 2025
Bid Selection	December 3, 2025

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2) SCOPE OF WORK

The Company is soliciting Proposals for the following design scenario:

- Maximum Consumption: 126,600 MMBtu per day (5,275 MMBtu per hour)
- Minimum Consumption: 29,800 MMBtu per day (1,242 MMBtu per hour)
- Minimum Delivery Pressure: 500 psig
- Maximum Delivery Pressure: 700 psig
- Pipeline MAOP: 720 psig

The design scenario described above is detailed in the attached Appendix A: Gas Pipeline RFP Specification.

PROGRESS AND REPORTING

Bidders will be required to prepare and submit to Company, monthly progress reports, describing the status of all on going activities, and an update to the proposed Project and Construction Schedule submitted. The reports shall include significant events or changes, detail of delays, and major activities to be performed in the next month.

3) BIDDER'S REQUIREMENTS

- Submittal of Credit Information (*see* Section 4).
- Proposal inclusive of all Content Requirements (*see* Section 7).
- Timely Submission of Proposals. It is the bidder's responsibility to submit all requested material by the deadlines specified in this RFP.

4) CREDIT INFORMATION

Bidders shall provide the following credit information by September 10, 2025:

1. The most recently published senior, unsecured, unenhanced, long-term debt rating (or corporate issuer rating if an unsecured, unenhanced long-term debt rating is unavailable) from S&P or Moody's Investor Services.

2. If a Credit Rating is not available for the Bidder or its Guarantor, the Bidder or its Guarantor may submit their previous three years of audited financial statements for review. Financial statements shall mean audited Balance Sheet, Income Statement, Cash Flow Statement, and accompanying notes.

5) COMPENSATION / RATE STRUCTURE

The Company is soliciting Proposals in which all costs and fees related to the construction of the lateral, interconnect and delivery facilities are borne by the bidder. The capital cost is to be recovered over a 20-year term, beginning with the expected COD of the Plant ("Initial Term"). The

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Proposal should include the cost to construct, own, operate and maintain the lateral, interconnect and delivery facilities over the Initial Term of the contract. Furthermore, and also incorporated within the 20-year term, the Proposal should include the rate for mainline firm transportation capacity. The lateral, interconnect and delivery facilities portion of the rate should be provided separately from the firm transportation portion of the rate. All costs should be expressed as dollars per MMBtu. *Please see Example 1 below*:

Example 1

Rate Breakdown	$ Per MMBtu
Lateral / Facilities	$0.05
Firm Transportation	$0.20
Total Rate	$0.25

In this example, the bidder has provided a total rate of $0.25 per MMBtu.

For the required 126,600 MMBtu of capacity, the total monthly payment will equal $962,688 [($0.25 per MMBtu * 126,600 MMBtu * 365) / 12].

If the bidder is unwilling to sell mainline firm transportation capacity, if not also awarded the construction of the lateral and associated facilities, that should be noted in the Proposal. For example, if the mainline firm transportation rate provided is contingent on being awarded the construction of the lateral and associated facilities, that should be noted in the Proposal. Otherwise, the Company will assume that a third party can be awarded the construction of the lateral and associated facilities, and that it can secure mainline firm transportation capacity from the bidder at the rate submitted.

Although the Company will not own the lateral pipeline and associated facilities, the Company reserves the right to review and approve engineering drawings for the lateral pipeline and associated facilities to be installed on KPCO property as well as review and approve the procedures for any operational release of gas (e.g., pigging process and/or cleaning blows).

6) REGULATORY FILINGS

KPCO desires to obtain regulatory approval to complete this project. It will be unavoidable for the parties to execute a Precedent Agreement, where the successful bidder will be limited to only performing work required to support any permitting and/or regulatory approvals, engineering, and right of way identification needed to construct the lateral pipeline and associated facilities. In line with a Precedent Agreement, the Company would require that major procurement and construction work not occur until such final Commission approval has been received by KPCO and any Firm Transportation Service Agreement would be contingent upon KPCO receiving such approval. At that time, the parties would agree to terminate the Precedent Agreement and enter into a Firm Transportation Service Agreement. The Company will keep open communications with

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the successful bidder regarding the status of such approval throughout the process and notify the successful bidder once final approval has been granted.

7) PROPOSAL CONTENT REQUIREMENTS

AEPSC expects bidders to furnish information that could impact the cost, construction schedule, reliability, or capability of the project Proposal. If it appears that certain information is inadvertently omitted from a Proposal, AEPSC may contact the bidder to obtain the information. **In order to make the evaluation / review process as efficient as possible, bidders should only include the requested, relevant information.**

Proposals must include the following topics:

Executive Summary: Provide an executive summary of the bid's characteristics and timeline, including any unique aspects and benefits.

Bidder's Information: Bidders must provide the name of the company, its address, and any company representative(s) (name, phone number and email address).

Compensation / Rate Structure: *See* Section 5.

Project and Construction Schedule: Schedules must include major milestones such as expected receipt of all regulatory approvals, completion of engineering design, procurement of construction materials, major construction activities, availability for testing, and the Commercial Operation Date, etc.

Quarterly Pre-Service Cost Estimate Template (Appendix B): The attached Appendix B is a proposed template that the bidder would complete prior to capital being disbursed. This will ensure the Company is aware of potential pre-service cost exposure if the required Commission approval is not granted.

8) RFP REFERENCE DOCUMENTS

In addition to the information provided herein, the following are included as appendices to this document:

- Appendix A: Gas Pipeline RFP Specification
  - Attachment A1 – M&R Yard Process Flow Diagram
  - Attachment A2 – M&R Yard Location Plan
- Appendix B: Quarterly Pre-Service Cost Estimate Template
- Appendix C: Safety Requirements and General Terms & Conditions
  - Appendix C Attachment 1: Safety and Health Requirements (12/18/2020 Rev. 0.1)

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- Appendix C Attachment 2: Natural Gas Venting, Purging, Inerting Procedure (02-01-13)
- Appendix C Attachment 3: PWHA Form
- Appendix C Attachment 4: GEK 110843G – Cleanliness Requirements for Power Plant Installation, Commissioning, and Maintenance

9) BID EVALUATION AND SELECTION PROCEDURES

The objective of the AEPSC bid evaluation is to identify the Proposal or Proposals which best meet the needs identified in this RFP solicitation. The evaluation process will include an assessment of both economic and non-economic criteria. Non-economic factors will be assessed through a due diligence process that will gauge the relative risks and benefits of the Proposal. For example, hourly shaping will be an important aspect of service for the Plant. PJM is likely to increase requirements during peak hours and reduce requirements during off-peak hours. **Bidders should include permissible hourly shaping in their proposal, which will be incorporated into the eventual Firm Transportation Service Agreement.**

The information provided in each initial Proposal will first be evaluated for completeness and consistency with the Proposal content and bid requirements outlined in this RFP. As a result of this screening review, AEPSC will eliminate Proposals that do not meet the requirements described in this RFP from further consideration. AEPSC will limit follow up contacts to clarify Proposals or request additional information only to those Proposals that meet the requirements described in this RFP.

Once Proposals have been evaluated for completeness, preliminary due diligence will be conducted at this stage to identify any flaws associated with the Proposal that are unacceptable to AEPSC. As a result of this screening, AEPSC may either eliminate Proposals from further consideration, or contact bidders to clarify information or request additional material.

The Company has no obligation to accept any Proposal, and the Company may reject any Proposal for any reason at any time in its sole judgment and discretion. The Company has no obligation to disclose the reason or reasons for rejection. AEPSC reserves the right to solicit additional Proposals and the right to submit additional information requests to bidders during the Proposal evaluation process.

10) POST-BID NEGOTIATIONS AND AWARDING OF CONTRACT

AEPSC may request additional information regarding factors that could impact the total cost and/or schedule of the project Proposal in order to periodically reevaluate the Company's economic and risk exposure until such time as AEPSC and the bidder execute an acceptable agreement.

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Neither AEPSC nor its affiliates are obligated to enter into a definitive agreement with any bidder responding to this RFP and may terminate or modify this RFP at any time without liability or obligation to any respondent. AEPSC also reserves the right to negotiate with only those bidders who propose transactions that AEPSC believes offer the best combination of value to KPCO and their customers.

For further information, please contact the Company representative:

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Phone: 614.395.3562
E-mail: cmstutler@aep.com

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Appendix A
Gas Pipeline RFP Specification

See Separate Attachments:

- Appendix A: Gas Pipeline RFP Specification
  - Appendix A Attachment A1 - M&R Yard Process Flow Diagram
  - Appendix A Attachment A2 - M&R Yard Location Plan

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Appendix B
Quarterly Pre-Service Cost Estimate Template*

Bid Item	Description	QX XXXX	QX XXXX	QX XXXX	QX XXXX
1	Estimated cost of acquiring all required regulatory approvals and permits.				
2	Estimated cost of Engineering and Design.				
3	Estimated cost of Environmental Impact Study.				
4	Estimated cost of Identifying and Acquiring Rights of Ways.				
5	Estimated Material Costs.				
6	Estimated Installation and Labor Costs.				
7	Other Estimated Costs.				

*The Company is agreeable to discuss alternative templates or ways to communicate cost estimates.

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Appendix C
Safety Requirements and General Terms & Conditions

See separate attachments:

- Appendix C Attachment 1: Safety and Health Requirements Supplemental Terms and Conditions, 12/18/2020 Rev. 01
- Appendix C Attachment 2: Natural Gas Venting, Purging, Inerting Procedure, 02/01/2013
- Appendix C Attachment 3: PWHA Form
- Appendix C Attachment 4: GEK 110843G – Cleanliness Requirements for Power Plant Installation, Commissioning and Maintenance

Safety requirements outlined in the above-mentioned attachments only apply to work performed on AEP/KPCO owned property.

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Appendix A: Gas Pipeline RFP Specification

BIG SANDY POWER PLANT - GAS PIPELINE RFP SPECIFICATION EXTENT OF WORK

Work Included:

This specification addresses the gas transporter's supply pipe equipment and material requirements of the gas supply to the Big Sandy Power Plant, located in Louisa, Kentucky.

The new Metering and Regulation Yard (M&R Yard) has a target completion date of March 2030.

(a1) The gas supply pipe is to be sized for the largest flow requirement. The design base is for providing a capacity sufficient to deliver fuel gas, at a minimum expected pressure of 500 psig (velocity not to exceed 10,000 feet per minute) for a mass flow of 231,500 lbs./hr. or 126,600 Dth/day, based on an estimated HHV = 22,786 BTU/lb.) to two (2) GE 7FA.05 gas turbines.

(a1.1) Minimum pressure of 500 psig

(a1.2) Maximum pressure of 700 psig

(a1.3) Minimum flow rate compatible with a single CGT @ 93 MW unit heat rate of 12,134 Btu/kWh (LHV), or 1,129 MMBtu/hr (LHV).

(a1.4) Maximum flow rate of 231,500 lbs./hr. or 126,600 Dth/day

(a1.5) Higher heating value (HHV) of 22,786 Btu/lb, With a LHV value of 20,695 Btu/lb.

(a1.6) Velocity no greater than 10,000 feet per second (ft./min.)

The gas supply pipe from the main gas header will come to the Big Sandy site from the north and terminate in a new metering and regulation yard to be located on the north side of Big Sandy property, just west of FM3521. The proposed custody transfer point is assumed to a 26 NPS Class 300 carbon steel flange.

(a2) Design and pipe routing drawings shall be submitted for review and record. The drawings shall show tie-in connections, pipe routing, elevations, burial depth, coordinates at direction changes and equipment layout details, including material and equipment identification. Drawings shall be submitted after award of contract and prior to installation for review.

(a3) All underground pipe shall have a high visibility marker tape placed parallel and above the pipe. The tape shall contain a metal strip for easy detection from the ground surface.

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(a4) All above ground gas piping, on AEP property, to be painted yellow (Federal Std. Color #13655) and labeled with black lettering as "Natural Gas" with flow direction indicated. Labeling shall be at 20 ft. intervals and easily readable from a distance of 25 ft. Lead based paint is not acceptable and shall not be used.

(a5) As close as practical to the gas supply header, the gas supply pipe shall include a filter-separator (with drains tank), a gas chromatograph (if required), revenue meter station, worker monitor regulators and double block and bleed.

(a5.1) The filter-separator shall remove gas condensates, 99.5% of solid particlulates greater than 0.3 micron, and 100% of solid particulates greater than 3 micron from the gas stream. The filter-separator shall have an automatic drain system to remove liquid from the vessel. The filter-separator shall have a thermal relief valve in accordance with ASME Section VIII. Level controls and alarms will be part of the automated drain system.

(a5.2) The gas chromatograph shall be supplied (if required) to report realtime gas composition and the other data as noted in item (a11)

(a5.3) The revenue meter station shall comply with the appropriate AGA requirements, have an accuracy of +/- 0.25% of full flow, and have a measurable range from 1,800 lbs./hr. to 250,000 lbs./hr.

(a5.4) A worker/monitor set of regulators shall be provided, with one regulator (worker) doing the bulk of the regulation with a backup (monitor) provided in case of failure of the worker regulator. Regulators shall be pilot operated, pressure balanced, and soft seated.

(a5.5) a dedicated double block and bleed shall be provided to isolate the M&R yard from the new power plant. This shall be done with two individual block valves with a bleed valve located in the piping between the two valves, No more than 2 ft of pipe shall be supplied between the individual block valves.

(a6) All materials, equipment, services, and future maintenance for the gas supply pipe, to the site termination point will be the gas transporter's responsibility. The pipe internal diameter must be capable of being cleaned using "pigs" and is to be clean and acceptable for service upon completion of the installation. AEP reserves the right to review and approve engineering drawings for any portion of piping and associated facilities installed on AEP property.

(a7) The gas transporter will provide all necessary access roadways for construction activity, future maintenance, and inspection needs. Additionally, any power requirements and lighting will be the responsibility of the transporter.

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(a8) The gas transporter shall restore all construction site areas, other than roadways and access, to an "as-found" condition. Any excavated material shall be distributed evenly to blend in with the general contours of the area, unless otherwise required per any right-of-way agreements.

(a9) The gas transporter shall restore AEP property to "as-found" conditions, including re-seeding of grassy areas, except access and roadways. Any excavated material shall be distributed evenly to blend in with the general contours of the area. Areas immediately under equipment and termination points shall be covered with a 6-inch base of gravel.

(a10) As a minimum, for pipe and equipment installation, the gas transporter must meet the requirements of B31.8 and 10CFR, Title 49, Part 192 safety requirements, NFPA 54 and 56, and applicable AGA measurement standards. Additionally, the gas transporter is to be in compliance with the FERC approved tariff, if applicable, for the associated pipeline the gas transporter is interconnecting to, and the gas transporter must provide physical security of its equipment to safeguard against improper actions.

(a11) The gas transporter's revenue meter station shall provide the following data information to AEP's Process Information system. (All inputs to the AEP system shall be secure and must not be internet addressable. Modbus Serial communication via single mode fiber optic links are preferred.) The gas transporter shall provide a single mode fiber patch panel as the interface point.

1. Gas Heating Value: BTU/SCF
2. Gas Flow: MSCF/HR
3. Gas Used Today: MSCF
4. Gas Used Yesterday: MSCF
5. Heat Input: MMBTU/HR
6. Energy Used Today: MMBTU
7. Energy Used Yesterday: MMBTU
8. Nat Gas Temp: DEG F
9. CO2 Concentration: %
10. N2 Concentration: %
11. Specific Gravity
12. Static Pressure: PSIG
13. Heat Value Signal Failure (this is built into our logic)
14. Instantaneous flow rate (MMBtu/Day)

(a12) All electrical components shall meet Class I, Division II, Group D, requirements for hazardous locations per NEC.

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(a13) The pipe lateral must be cleaned, prior to service, in accordance with NFPA 56, and comply with AEP's "Natural Gas Venting, Purging, Inerting Procedure" dated 1-1-13. The preferred cleaning method is a continuous inert gas (nitrogen or air) blow performed at low pressure and high velocity. Natural gas shall not be used for the cleaning media. Gas blows shall be performed in accordance with General Electric's document: "Cleanliness Requirements for Power Plant Installation, Commissioning, and Maintenance" (GEK110843c), Section V: "Gas Fuel System Cleanliness and Acceptance Criteria".

(a13.1) All appropriate safety considerations shall be addressed in the Pre-Work Hazard Analysis, or Job Safety Analysis, including:

1. barricading off the blow discharge area, exclusion zones
2. ensuring all piping is secure and properly tightened
3. review of blow procedures, including install/remove blow targets
4. evacuation plan, muster point, hearing and eye protection, communication
5. debris is captured, at the discharge point, from becoming projectiles
6. safety related to use of nitrogen (asphyxiation, cryogenic temperatures)

(a13.2) The goal of the cleaning process is to flow the cleaning medium through the piping system to generate higher forces than can be achieved from the flow of natural gas during operation. The line blowing effectiveness is a function of the cleaning force ratio (CFR), as defined in GEK110483F. The gas transporter (contractor) shall conduct pipe flow velocity and CFR calculations. The CFR shall be greater than 1.1, but less than 1.5 throughout the length of the pipe. Calculations shall be submitted to AEP for record, prior to blow.

(a13.3) The pipe cleanliness criteria for the completion of the pipe blow shall be determined by the use and examination of a target plate, as described in GEK110843F, Section VII: "Steam Piping cleaning and Acceptance Criteria".

(a14) Other internal pipe cleaning methods may be acceptable provided the pipe is cleaned from all loose material and adherent material which could become detached during operation of the plant; and all water, oil, grease, and protective coatings are removed.

(a15) If launching and receiving pigging stations are provided, the portions requiring venting of gases will adhere to the NFPA 56 and comply with AEP's "Natural Gas Venting, Purging, Inerting Procedure" dated 1-1-13.

(a16) All below grade piping shall be provided with a fusion bonded epoxy exterior coating and cathodically protected. Cathodic protection design drawings shall be submitted for review and shall be completed by a NACE certified corrosion specialist.

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(a17) Above grade piping shall be electrically isolated from the below grade piping and provided with a minimum of a dioletric insulating flange kit and a solid state decoupler at the below grade to above grade flange joint.

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ATTACHMENT A1 – M&R YARD PROCESS FLOW DIAGRAM

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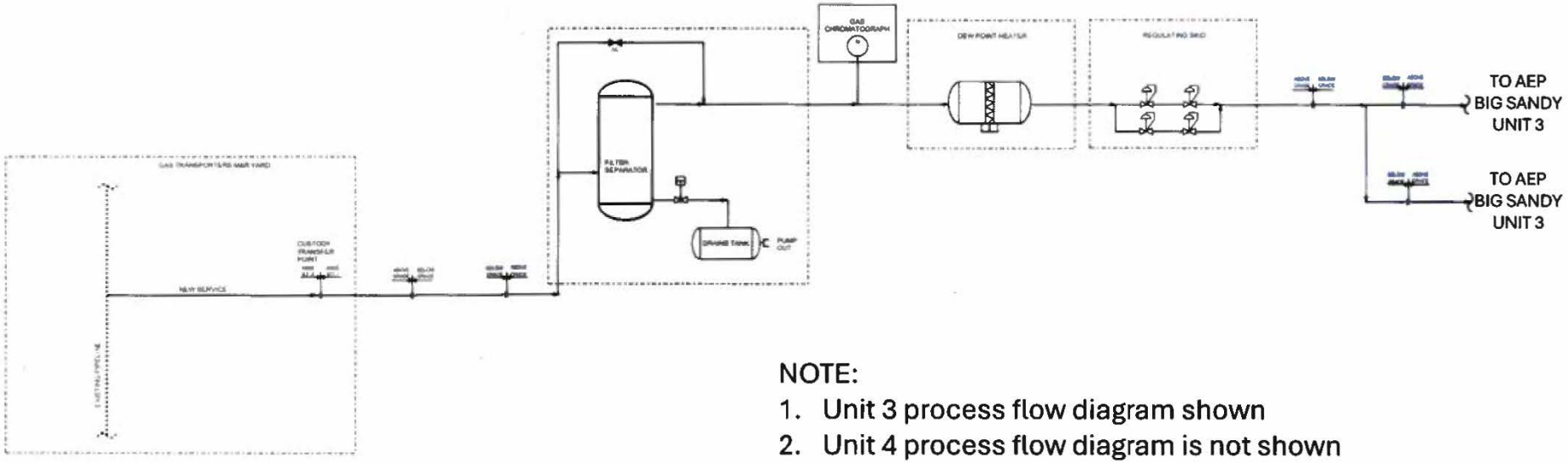
ATTACHMENT A2 – M&R YARD LOCATION PLAN

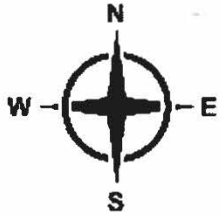
ATTACHMENT A1 - M&R YARD PROCESS FLOW DIAGRAM

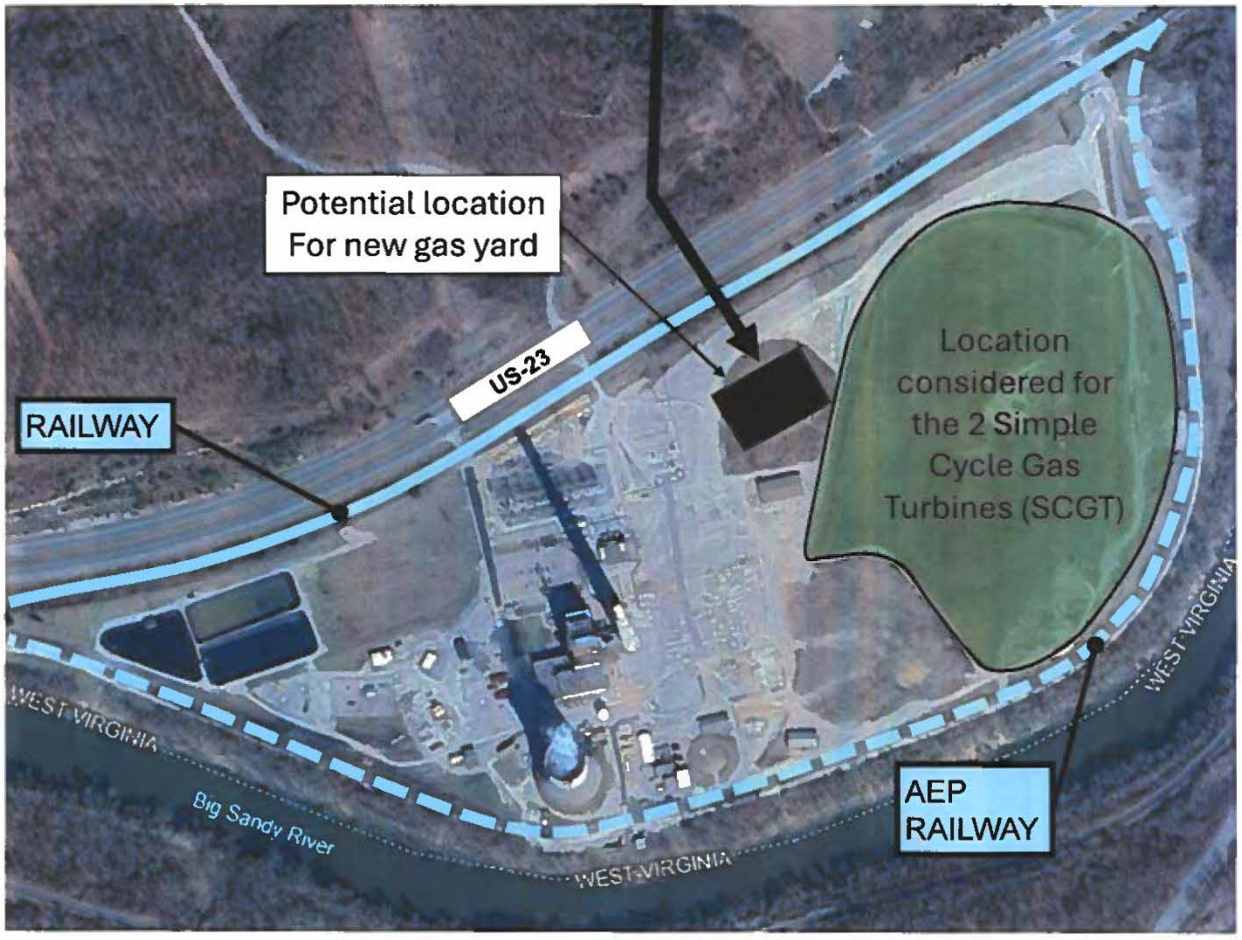


NOTE:

1. Unit 3 process flow diagram shown
2. Unit 4 process flow diagram is not shown
3. Unit 4 process flow diagram is a duplicate of unit 3

ATTACHMENT A2 - M&R YARD LOCATION PLAN





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12/18/2020 Rev. 01

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1.0 INTRODUCTION

1.1 No aspect of operations is more important than the health and safety of people. Zero Harm is at the heart of everything we do at AEP. It means we believe all occupational illnesses and injuries are preventable because we care that everyone goes home in the same or better condition than when they came to Work.

1.2 These safety and health requirements shall be used in conjunction with the applicable AEP General Terms and Conditions for Work performed across the AEP System. These requirements reflect Owner's minimum expectations regarding safety and health practices and may exceed the requirements of federal, state, and local regulatory agencies. By entering into the Contract, Contractor agrees that Contractor shall perform all Work in accordance with these safety and health requirements.

1.3 If Contractor in good faith believes that any rule or procedure set forth herein will put Contractor Personnel or others at risk, or conflicts with Occupational Safety and Health Administration (OSHA), Contractor shall immediately notify Owner and shall cooperate with Owner to develop a mutually acceptable alternative procedure.

1.4 Contractor's safety performance will be monitored and evaluated during the performance of the Contract by Owner's Representative. If warranted by Contractor's poor safety performance, Owner may require Contractor to develop a safety improvement plan. Contractor shall provide plan within five (5) calendar days of written notification for AEP review and mutual agreement and follow said plan until completion.

1.5 AEP Business Units may have additional requirements within their specific Business Unit appendix, which Contractor must comply with during Work for that Business Unit.

1.6 In order to comply with Owner's registration requirement to the VERO Data Management System operated by Safety Management Group (SMG), Contractor shall, at no additional cost to Owner, register with VERO, by going to https://safetymg.com/preregistration or by contacting SMG at admin@safetymg.com.

1.7 Capitalized terms used but not defined in these safety and health requirements shall have the same meaning as in the applicable AEP General Terms and Conditions.

2.0 SAFETY & HEALTH PLANNING

2.1 Contractor shall ensure that all Contractor Personnel exercise planning and forethought regarding the safety and health aspects of all Work performed by Contractor Personnel.

2.2 Job Briefing: Prior to the commencement of Work, before any changes are made in procedures or activities, and prior to resuming Work after any significant breaks (i.e. lunch), Contractor shall perform a Job Briefing and complete a written Job Briefing Form (pursuant to requirements set forth by OSHA).

2.2.1 The Job Briefing Form shall include, at a minimum: 1) Work procedures involved 2) hazards and mitigation associated with the Work, 3) special precautions, 4) energy source controls, 5) personal protective equipment requirements, 6) other contractors or Owner personnel working within or adjacent to Contractor's Work (or as specified in the applicable Business Unit appendix), and 7) task requirements for qualified and competent person(s).

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2.2.1.1 Unless Contractor's Job Briefing Forms are approved in writing by Owner Representative prior to the start of Work, Contractor shall use Owner supplied Job Briefing Form in the applicable Business Unit appendix.

2.2.1.2 Contractor shall take appropriate action for individuals who fail to comply with the Job Briefing including performing Work outside the parameters of the Job Briefing.

2.2.2 Contractor shall make Job Briefing Forms available to all personnel where Work is performed and to Owner, upon request. Contractor shall review the Job Briefing Form with and obtain the signatures of any visitor(s) that arrive at the Jobsite prior to visitor(s) being allowed in the area where Work is taking place.

2.2.3 Contractor shall retain completed Job Briefing Forms pursuant to the record retention section of the Contract.

2.2.4 Owner expects all Contractor Personnel to continuously assess the Jobsite and Work activities for hazards throughout the day. Whenever a problem, circumstance, or result that was not covered in the Job Briefing is encountered during the course of the Work, Contractor shall stop Work immediately, evaluate the situation, and conduct a new or revised Job Briefing before resuming Work. Contractor shall immediately communicate to all affected personnel (see section 2.2.2) any changes to the Job Briefing that occur during the performance of Work.

2.3 Work Safety and Health Plan (WSHP): For high risk, complex, or long duration Work, Contractor may be required to submit a WSHP prior to the start of Work (see Business Unit appendix). The WSHP shall cover the Work of Contractor Personnel. Contractor shall collaborate with Owner on issues or informational "gaps" determined by Owner to be present in submitted WSHP. Contractor agrees and shall cooperate with Owner to modify and update any WSHP to accomplish the Work.

2.4 Emergency Planning: Contractor shall have an emergency action plan that has been documented and communicated to all Contractor Personnel. The emergency action plan shall include, at a minimum, the following:

2.4.1 Emergency contacts;

2.4.2 Jobsite location(s) or addresses;

2.4.3 Location, name, contact information, and directions to closest emergency services and medical facility;

2.4.4 On Jobsite communication methods (cell phone, radio, satellite phone, etc.);

2.4.5 Procedure to follow in the event of an emergency.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.1 Unless otherwise approved by Owner in writing, Contractor shall ensure that Contractor Personnel complete the training, as further described below, prior to being allowed to commence Work.

3.2 Work involving significant safety-related risk exposure ("High Risk Work") requires OSHA training. This High Risk Work includes, but is not limited to, Work: on or near energized equipment; within confined

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spaces; at heights requiring fall protection; during adverse weather (storms); in radiologically contaminated areas; on or near high traffic (land, air, or water) areas; in or around ash ponds; that involves excavation permits; that involves cranes, rigging, or hoisting; that involves chemicals with National Fire Protection Association (NFPA) or Hazardous Materials Identification System (HMIS) rating of 4 in any category; or that involves asbestos, heavy metals, radiation, silica, chromium, or other harmful substances that requires special training.

3.2.1 All Contractor Personnel who are performing High Risk Work on Owner Jobsites shall successfully complete, at a minimum, the OSHA 10-Hour for General Industry or Construction Training OSHA Electric Transmission and Distribution (ET&D) Partnership 10-Hour Training, or have specific written approval from Owner's Corporate Safety and Health Director and Business Unit Operations Manager (AEP Grade 10 or above) allowing equivalent training(s) to be accepted in lieu of OSHA training.

3.2.2 Before assuming a supervisory position, all Contractor Personnel Jobsite supervision for High Risk Work shall successfully complete the Occupational Safety and Health Standards for the General Industry or Construction Training ('OSHA 30-Hour'), OSHA Electric Transmission and Distribution (ET&D) Partnership 20-Hour Training, or have specific written approval from Owner's Corporate Safety and Health Director and Business Unit Operations Manager (AEP Grade 10 or above) allowing equivalent training(s) to be accepted in lieu of OSHA training.

3.2.3 New Contractor Personnel on High Risk Work shall complete such training within fourteen (14) calendar days of starting their first Work assignment on any Owner Jobsite. If Contractor Personnel leave before training is complete, they may not return to the Jobsite until the training is complete.

3.2.4 Owner may also require additional OSHA training at Contractor's expense.

3.3 A minimum of two currently trained Contractor Personnel in First Aid, Cardiopulmonary Resuscitation ('CPR') and Automated External Defibrillator ('AED') shall be present for each Jobsite unless specified otherwise in the Business Unit appendix.

3.4 All costs associated with the above-described training of Contractor Personnel shall be at the expense of Contractor.

3.5 Prior to entering Owner's Jobsite, all Contractor Personnel shall complete the AEP onboarding requirements, which may vary by Business Unit. This training takes approximately two (2) hours. All Contractor Personnel shall refresh such training on an annual basis prior to March 31st.

3.6 Owner may, at its sole discretion, require Contractor to repeat any training as a step towards remedying a Contractor's deficiency.

4.0 SAFETY & HEALTH PROFESSIONAL

4.1 Contractor's Jobsite Safety & Health Professional's sole responsibility and focus shall be safety and health oversight of the Work, specifically including, but not limited to, initiation, enforcement, maintenance, and administration of Jobsite safety and other loss prevention programs associated with Work.

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4.2 The requirements for when Contractor shall provide one (1) or more Jobsite Safety & Health Professional(s) are in the Business Unit appendices, if applicable. Owner may require Contractor to assign additional Safety & Health Professional(s) if Owner determines the Work, Contractor's performance or other circumstances justify additional safety oversight.

4.3 Contractor shall ensure that each Jobsite Safety & Health Professional, at a minimum, has successfully completed OSHA 30-hour training and has one (1) of the following:

4.3.1 A professional safety certification from an industry recognized safety organization; or

4.3.2 A college degree in a safety related field and at least two (2) years demonstrable safety management related experience; or

4.3.3 At least five (5) years of increasing responsibility in professional, technical, safety management and/or electric utility operations experience.

4.4 In addition to the above, Contractor shall ensure that each Jobsite Safety & Health Professional has all of the following:

4.4.1 Current certification in administration of First Aid, Cardiopulmonary Resuscitation ('CPR') and Automated External Defibrillator ('AED') Training

4.4.2 Incident investigation training and experience.

4.5 Owner may request verification of qualifications, resumes, or other documentation for review. Owner reserves the right to reject a Jobsite Safety and Health Professional. Failure by Owner to review the qualifications of a Safety & Health Professional does not relieve Contractor of its obligations under the Contract.

5.0 COMMUNICATION

5.1 Contractor shall ensure that all Contractor Personnel clearly understand oral and written instructions, signs and labels associated with Work.

5.2 Contractor shall provide, at a minimum, two (2) multi-lingual Contractor Personnel that speak English for each non-English-speaking crew. When large crews are used, Contractor shall provide one (1) additional multi-lingual Contractor Personnel for every ten additional (10) crew members.

5.3 Contractor shall ensure multilingual Contractor Personnel are immediately available to support nursing, EMT responses to injuries or incidents, and during Site orientations. Contractor shall make sure their multilingual Contractor Personnel are easily identifiable by such means as the color of their hardhat, clothing, etc…, and inform Owner accordingly.

5.4 Contractor shall ensure, at least one (1) copy of all documents and reports, including Job Briefing Forms, are prepared in English.

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6.0 WORK HOUR / WORK DAY LIMITATIONS

6.1 Contractor shall staff and plan in a manner that prevents Contractor Personnel from working more than sixteen (16) hours in a rolling twenty-four (24) hour period. After working sixteen (16) hours, a minimum of eight (8) hours off Work shall occur before returning to Work.

6.1.1 For emergency assistance, the hour limitation is modified to a maximum of twenty-four (24) consecutive hours, after which a minimum of eight (8) hours off Work shall occur before returning to Work.

6.2 Contractor shall staff and plan in a manner that prevents Contractor Personnel from working more than thirteen (13) consecutive days without a twenty-four (24) hour period off Work.

6.3 Exceptions to the above requirements shall be requested by Contractor and be pre-approved in writing by the Owner's Business Unit management level identified in the Business Unit appendices.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

7.1 During the term of the Contract, Contractor shall maintain an approved qualification status within VERO. If during the Contract term Contractor fails to maintain an approved qualification status within VERO, then, at Contractor's cost and expense, and in addition to any other rights and remedies the Owner may have under the Contract or under the law, the Owner shall have the following rights:

7.1.1 The right to apply a probationary period where all Work performed by Contractor is temporarily stopped until an investigation is performed;

7.1.2 The right to stop the Work under the Contract until Owner is satisfied that the cause for the non-passing grade is remedied; and/or,

7.1.3 The right to terminate the Contract for cause if, in Owner's sole opinion, the grade cannot be improved to a passing level within a reasonable time.

7.2 Contractor shall only use AEP approved contractors (found in VERO) as Subcontractors. To initiate the process to utilize a Subcontractor that is not currently qualified by Owner in VERO, the Contractor shall have the Subcontractor join VERO and obtain an approved qualification status prior to any Subcontractor Work. Any exceptions to this must be approved in writing by Owner's Corporate Safety and Health Director and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Subcontractor Work.

7.3 In the event Contractor chooses to use a Subcontractor(s) to perform Work at a Site without the Contractor present, Contractor shall ensure that such Subcontractor(s) has appointed a qualified and competent individual at the Site to be present at all times, to direct, and observe the Work.

8.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

8.1 Contractor Personnel shall wear, at a minimum, the following PPE while on any Jobsite:

8.1.1 Safety glasses, goggles, or prescription safety glasses with side shields that meet the specifications of ANSI Z87.

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8.1.2 Face shields, in addition to safety glasses or goggles, where employees are performing tasks that could potentially cause flying material objects such as, but not limited to, chipping, welding, grinding, cutting, drilling, chiseling, or chemical hazards to the face. The face shield shall be rated for the type and degree of hazard.

8.1.3 Hardhats that meet the specifications of ANSI Z89.1.

8.1.4 Work gloves that provide protection for the type of work, when required. See BU Appendices for specific work glove requirements.

8.1.5 Hearing protection as required by OSHA and in Owner-designated areas.

8.1.6 Footwear appropriate to the known Jobsite hazards:

8.1.6.1 Open-toed, open-heeled, and athletic footwear shall be strictly prohibited;

8.1.6.2 Protective toe footwear that meet the safety-toe specifications of ASTM F2413 with a compression rating of C75 (i.e. safety toe shoes);

8.1.6.3 Contractor Personnel that climb shall wear footwear with a defined heel, unless waived by Owner's Representative in writing;

8.1.6.4 Additional protection such as sturdy upper portions, metatarsal guards, puncture resistant soles, etc. may be required based upon the Job Briefing for certain Work assignments or special environmental conditions.

8.1.7 Fall protection: 100% fall protection required at all times on poles, towers and similar structures.

8.2 Contractor shall review arc flash potential with Owner's Representative to determine the appropriate PPE.

8.3 Contractor shall wear additional PPE if required by Owner based upon Contractor's PPE assessment or special environmental conditions.

9.0 INDUSTRIAL HYGIENE

9.1 Metals and Heavy Metals:

9.1.1 Unless directed otherwise, Contractor is responsible for personal industrial hygiene sampling when there are any contaminants that may pose an exposure hazard to Contractor Personnel (e.g. arsenic, lead, mercury, hexavalent chromium, cadmium, crystalline silica, etc.). Contractor shall provide copies of industrial hygiene test results to Owner.

9.1.2 Contractor must comply with Owner's Negative Exposure Assessment Guidelines in determining when PPE and regulated area requirements can be removed.

9.1.3 Owner requires regulated areas for all Work involving potential exposure to hexavalent chromium regardless of the type of Work conducted (General Industry or Construction). Owner's competent person for potential hexavalent chromium exposure shall be consulted regarding the appropriate size, location and demarcation of the regulated area.

9.1.4 Owner's respiratory protection and ventilation requirements for welding, cutting and other hot Work are defined in the Welding, Cutting and Brazing Policy (see VERO at https://verodms.com). Filtering face piece respirators may only be used on a voluntary basis (not OSHA required) and only

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in areas where there will not be an exposure above the Permissible Exposure Limits (PEL). Filtering face piece respirators include any fabric "dust mask" type respirators with filter efficiencies from 95 through 100.

9.2 Lead/Cadmium Based Paint:

9.2.1 Structural steel and equipment throughout Owner's facilities may have been coated with lead/cadmium based materials including galvanizing. Contractor shall treat all surfaces as containing lead/cadmium unless tested otherwise prior to performing any grinding, welding, sanding, heating, sandblasting or similar activity. Owner requires that any coating containing lead at a level of 0.05% (500 ppm) or greater be treated as a lead-containing coating.

9.2.2 In nearly all cases, abatement of lead/cadmium-containing coatings is required before any hot Work may be performed. Owner has a specific Post Abatement Hot Work (see VERO at https://verodms.com) process that Contractors must follow to ensure either abatement is effective or that Contractor Personnel are properly protected while performing hot Work after abatement.

9.2.3 Contractor shall submit to Owner, prior to beginning Work, its written lead/cadmium compliance program.

9.2.4 Contractor shall collect all removed lead/cadmium bearing paint and contaminated materials used for the removal of lead/cadmium bearing paint. These materials shall be placed in Contractor supplied packaging meeting the applicable US Department of Transportation requirements for the material and properly labeled and stored per Owner instructions.

9.3 Asbestos Containing Material:

9.3.1 Asbestos-containing materials (ACM) may exist in the form of insulating products, siding, coatings, gaskets and similar materials throughout Owner's facilities.

9.3.2 Contractor shall conduct ACM awareness training to inform Contractor Personnel of the possibility of asbestos on the Jobsite and the appropriate response (STOP and report it immediately) if suspected asbestos-containing material is encountered.

9.3.3 Contractor shall use care and diligence in the execution of its Work to avoid the disturbance of, or damage to, asbestos-containing material not specifically identified as a part of the Work. This may include, but is not limited to, the installation of protective barriers, temporary platforms or any other means deemed necessary by Contractor to comply with this requirement. Contractor Personnel shall immediately report the observance of any ACM or presumed asbestos-containing material (PACM) that is not intact to their supervision for immediate response. Contractor shall immediately notify Owner of any disturbance of or damage to asbestos-containing material, PACM or unknown material. Contractor is responsible for ensuring that its personnel and the public are not exposed to ACM material due to Contractor's disturbance of or damage to the ACM.

9.4 Hazardous Materials Management:

9.4.1 "Hazardous waste" shall have the meaning found at 40 CFR 261.3 and shall also include polychlorinated biphenyls (PCB) as defined at 40 CFR 761.3. "Hazardous chemical" shall have the

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meaning found at 29 CFR 1910.1200© and 40 CFR 355.61. "Hazardous Material" shall have the meaning found at 49 CFR 171.8.

9.4.2 Contractor shall have procedures for proper labeling, storing, and handling of hazardous chemicals and hazardous wastes in a safe and secure manner.

9.4.3 Contractor shall minimize the quantities of hazardous chemicals it intends to use and hazardous waste it expects to generate. Contractor shall keep Owner informed of all hazardous chemicals that Contractor brings on Site and all hazardous wastes generated and its disposal management practices. Hazardous materials shall be packaged and transported in accordance with applicable transportation regulations.

9.4.4 When applicable to Contractor's Work, Contractor shall provide storage containers of adequate size and compatibility for both hazardous chemicals and hazardous wastes with adequate weather protection. Damaged or leaking containers are unacceptable.

9.4.5 See Owner's Representative for Safety Data Sheets for Owner generated and supplied products.

9.4.6 Chemicals containing 1,1,1-Trichloroethane, methylene chloride, trichloroethylene, tetrachloroethylene (perchloroethylene), 1-bromopropane (N-propyl bromide), any confirmed human carcinogen, asbestos, lead or mercury will not normally be approved by Owner.

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

10.1 When performing excavation Work, Contractor shall comply with Owner's excavation policy, including permits.

10.2 Contractor shall comply with the following regarding drilled excavations:

10.2.1 Drilled excavations greater than thirty (30) inches in diameter and six (6) feet deep shall be protected by a guardrail system no less than six (6) feet from the edge of the excavation.

10.2.2 Contractor Personnel who enter the guardrail system shall be protected from falling by a personal fall arrest system.

10.2.3 When performing drilled excavations, Contractor shall have a fall retrieval plan, which includes local EMS rescue capabilities.

10.3 Contractor shall comply with AEP's Confined/Enclosed Space Entry Policy including classification and monitoring tools, permits, and checklists. With prior review by Owner's Representative, Contractor may use its confined or enclosed space entry procedure in accordance with article 9.3 of the AEP Confined/Enclosed Space Entry Policy. Furthermore, through coordination with the Owner's Representative, there may be multiple permits for the same Work if there are multiple contractors in the same area or the Contractor is legally required to have documents for their own purposes. If multiple permits are used, the classifications must be the same or the higher of the two (2) classifications must be used for all permits.

10.4 Barricades shall be used to deter the passage of persons, vehicles, and equipment from restricted areas. Contractor shall routinely inspect and replace signage, labeling and barricade tape that is illegible, damaged, missing, etc.

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10.5 Contractor shall comply with the following regarding the use of mobile cranes and lifting devices (for energized Work involving digger derricks and bucket trucks, see Business Unit appendices Section 3 instead):

10.5.1 Operators shall perform and document daily equipment inspections. Inspections shall include all safety and operational features as per manufacturer's safe operating manual or guidance.

10.5.2 Qualified observers shall be assigned if any equipment will encroach within the trigger distance of energized overhead lines and equipment; or if any part of the equipment, boom, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius, could encroach the trigger distance to energized lines or equipment. All Work activities shall be stopped when the qualified observer becomes unavailable, even only temporarily.

10.5.3 No person shall be permitted within the barricaded radius of a crane while the crane is in operation.

10.5.4 No person shall ride on equipment when in operation.

10.5.5 Cranes shall be equipped with an Anti-Two-Block device.

10.6 All Work performed on or adjacent to existing public roads or rights-of-way shall be performed in conformance to the requirements of the Manual on Uniform Traffic Control Devices (current revision), state, local jurisdiction or AEP operating company.

10.7 Contractor shall keep all substation gates closed and locked at all times unless under direct observation by an attendant.

10.8 Upon entry or exit of a substation, Contractor shall notify the appropriate Dispatch Authority.

10.9 Testing of Grounds – All grounds shall be tested in accordance with state, local, and federal guidelines, and the most current ASTM F2249 Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies Used on De-Energized Electrical Power Lines and Equipment.

10.10 All extension cords and electric hand tools shall be plugged into a Ground-Fault Circuit interrupter (GFCI) provided by the Contractor. Contractor Personnel shall not rely on the existing GFCI receptacles on the Jobsite.

10.11 Unless Contractor's Welding, Cutting, and Brazing policy is approved in writing by Owner's Corporate Safety and Health Director and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Work, Contractor shall comply with Owner's Welding, Cutting, and Brazing policy.

10.12 Unless Contractor's Attentive Driving policy is approved in writing by Owner's Corporate Safety and Health Director and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Work, Contractor shall follow Owner's Attentive Driving Policy while performing Work for Owner.

10.13 Backing motor vehicles should be avoided wherever possible, such as by taking pull through opportunities. If backing cannot be avoided employees should back upon arrival. A second employee, if present, shall be used as a Spotter while backing.

10.14 Contractor shall follow Owner's Workplace Aggression and Police Escort Required Policies.

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11.0 TOOLS

11.1 Prior to the use of any fabricated or modified tools with no original equipment manufacturer, Contractor shall notify Owner and provide for Owner's review design documentation with professional engineer stamped approval. At its sole discretion, Owner may prohibit or restrict Contractor's use of such tools.

11.2 Pocket knives or non-safety utility knives shall not be used for cutting/stripping unless it is impossible to utilize another tool designed for that task. Not having the proper cutting tool available on site is not an excuse for using knives. Cutting tools other than a knife, i.e. wire cutters/strippers, side cutters, snips and other cutting tools shall always be used first. A safety utility knife with an automatic retracting blade or other means of blade protection would be the second selection. The use of a company issued pocket knife or non-safety utility knife is only permitted if a safety utility knife or other cutting tool cannot be used. The second and third option (knives) can only be used in combination with wearing appropriate hand protection, as determined by the Job Briefing.

11.3 No handheld grinder shall be used with a switch that is capable of being locked in the "ON" position unless a hazard analysis determines it is safer. Handheld grinders 4 ½" thru 6" shall be equipped with a safety clutch to aid in preventing kickback and potential personal injury to the user. Contractor(s) shall have a grinder control procedure established to assure that when grinders are being used for either grinding or cutting, front line supervision has determined that a grinder is the safest tool for the Work.

12.0 REPORTING REQUIREMENTS

12.1 Event Reporting: Contractor shall report to Owner all Contractor Personnel safety-related events in accordance with the applicable AEP General Terms and Conditions and the requirements listed below. Safety-related events include but are not limited to the following:

12.1.1 near miss events
12.1.2 good catches
12.1.3 first aid and minor events
12.1.4 OSHA recordable injuries
12.1.5 Flashes
12.1.6 Outages
12.1.7 vehicle incidents
12.1.8 spills/releases that cause safety concerns
12.1.9 underground utility strikes
12.1.10 energy control errors (Clearance Permit, Lock Out Tag Out (LOTO), and Switching and Tagging)
12.1.11 regulatory safety citations/visits
12.1.12 property damage
12.1.13 equipment incidents

12.2 After securing the scene, Contractor shall immediately notify Owner's Representative(s) (verbal notification is sufficient) of the event. Do not disturb the scene of an incident unless necessary to attend to injured persons

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or to prevent additional injury, property damage or loss. If the incident involved a personal injury requiring more than first aid treatment, or significant equipment or estimated property damage in excess of $10,000, Work may not resume and no items at the scene may be moved or discarded until authorized by Owner or other legal authority.

12.3 By 8:00 a.m. the following calendar day, Contractor shall submit a preliminary notification to Owner's Representative(s) using VERO (https://verodms.com).

12.4 Contractor shall submit a detailed written report within five (5) calendar days, unless granted an extension by Owner. This report must be submitted via VERO following Owner's report format and instructions.

12.5 Monthly Reporting: Contractor shall submit monthly reports to Owner that include at minimum, the following::

12.5.1 monthly Work hours

12.5.2 fatalities

12.5.3 OSHA recordable incidents, including lost time and restricted days

12.5.4 preventable vehicle incidents

12.5.5 first aid injuries

12.5.6 good catches and near misses

12.5.7 flashes

12.5.8 outages

12.6 Contractor shall report the above listed information by the 4th Business Day of the calendar month via VERO (https://verodms.com).

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

13.1 Owner or Owner's Representative may conduct random Jobsite safety and health observations and audits. Contractor shall cooperate fully with Owner's Representatives during a Jobsite observation or audit.

13.2 In the event Owner determines that an unsafe condition exists at the Jobsite, Owner shall have the absolute right to require corrective measures be immediately taken or to stop Work until the unsafe condition is corrected by Contractor. Contractor may be responsible for costs and expenses associated with the corrective measures.

14.0 CONTRACTOR JOBSITE OBSERVATIONS

14.1 Contractor representatives, at a minimum, shall perform and document a Job Site Observation (JSO) based on the following table:

Contractor Representative	Minimum Frequency[1]
Front line leader (ex. Foreman/Crew Leader)	Weekly[2]
Site Management (ex. General Foreman/Superintendent)	Weekly[2]
Safety & Health Professional	Daily[3]
Operations Manager	Monthly
Senior Management	Quarterly

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Notes:

1. Minimum frequency is the frequency with which the Contractor representative performs a JSO and can be on one or more Contractor crews and/or Sites.
2. For Generation work, see the Generation Appendix for frequency and documentation method.
3. See Transmission, Distribution, and Vegetation Management Appendices for additional guidance.

15.0 PROHIBITED FROM JOBSITE

15.1 Firearms, alcohol, illegal drugs, or drugs taken for non-medicinal purposes are prohibited on all Owner Jobsites.

15.2 Contractor shall be responsible for all Contractor Personnel who are under the care of a physician and are taking medicine that may alter the employee's physical or mental ability. Contractor shall determine the necessity to modify the employee's job assignment while undergoing such treatment.

15.3 If prohibited firearms or suspected illegal drugs are discovered on any Owner's property or Jobsite, whoever discovers the firearms or suspected illegal drugs shall:

15.3.1 First, if possible without putting themselves or others in harm's way, attempt to secure the location and ensure that others cannot come in contact with the firearms or suspected illegal drugs. Do not handle or move firearms or suspected illegal drugs from their discovered location.

15.3.2 Second, immediately contact Owner's Representative and jointly make a decision whether or not the situation requires a call to the local law enforcement authorities. Immediately call the local law enforcement authorities and report the discovered item(s) if (a) neither Owner's Representative is available; (b) there is a threat of harm to any person; or (c) there is a risk of improper removal or disposal of the firearms or illegal drugs.

15.3.3 Third, call local Owner's security personnel or call Owner's general Security hotline at 1-866-747-5845.

15.3.4 Fourth, for incidents involving Contractor personnel, Contractor shall submit a report(s) to Owner.

15.4 Prior to starting Work, Contractor shall provide Owner a list of all Contractor Personnel that Contractor intends to use on Jobsite. The list shall identify the individuals by their name and the last three digits of the individual's Social Security Number.

15.5 Owner will identify any personnel the Contractor intends to use that are restricted from Owner's Jobsite. Owner, at its sole discretion, may deny access to any individual who has previously been removed from a Jobsite by Owner or any Contractor for any reason.

15.6 Contractor may request restricted Contractor Personnel to be cleared for Work performance. A letter addressing the original safety violation(s) or reason(s) for removal and including any documentation supporting the request shall be sent to Owner for approval. Contractor Personnel shall not perform Work at any of Owner's Jobsites until approved by Owner. Said approval may be granted or withheld at Owner's sole discretion.

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15.7 Owner may deny access to its Jobsites to any person who fails to comply with the applicable AEP General Terms and Conditions, these Supplemental Safety Terms and Conditions, or, in Owner's sole judgment, otherwise demonstrates unsafe or unacceptable behaviors. Examples of unsafe or unacceptable behaviors include, but are not limited to:

15.7.1 Unsafe job performance

15.7.2 Failure to pass drug/alcohol test

15.7.3 Refusal to submit to a drug/alcohol test

15.7.4 Displaying incompetence in performing their job

15.7.5 Employees that are determined to be unfit for project employment

15.7.6 Participating in pranks, horseplay, or practical jokes

15.7.7 Failure to report injuries and/or accident

15.7.8 Making threats, harassing, intimidating, fighting, or committing acts of aggression

15.7.9 Theft or vandalism

15.7.10 Insubordination

15.7.11 Violation of AEP's Universal Life Saving Rules

15.8 Contractor shall immediately provide Owner with the name of any Contractor Personnel removed by Contractor from Owner's property and the reason(s) for his or her removal.

15.9 If a worker(s) has a union affiliation, Contractor shall promptly notify the appropriate local union hall of such worker's removal from Owner's property and the reason(s) for his or her removal.

16.0 AEP POLICIES AND PROCEDURES

16.1 AEP Policies and Procedures that the Contractor shall comply with per the AEP General Terms and Conditions and these AEP Safety and Health Supplemental Terms and Conditions can be found in VERO (https://verodms.com).

16.1.1 Excavation Policy

16.1.2 Lead Exposure Control Post-Abatement Hot Work Procedures

16.1.3 Negative Exposure Assessment (NEA) Guidelines

16.1.4 Scaffolding Safety Procedure

16.1.5 Welding, Cutting and Brazing Policy

16.1.6 Confined Enclosed Space Entry Policy

16.1.7 Attentive Driving

16.1.8 Police Escort Required Policy

16.1.9 Workplace Aggression Policy

16.1.10 AEP's Universal Life Saving Rules

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17.0 DEFINITIONS AND ABBREVIATIONS

17.1 **AEP** means any one or more of the companies of the American Electric Power System as may be specified in the Contracting Instrument to the Contract and means same as Owner as defined in the applicable AEP General Terms and Conditions.

17.2 **AEP General Terms and Conditions** means the applicable AEP general terms and conditions referenced in the Contract which may be one of the following: AEP General Terms for Labor and Services; AEP General Terms and Conditions for Engineering, Procurement and Construction Work; Electric Transmission Texas (ETT) General Terms and Conditions for Labor and Services; OVEC/IKEC General Terms for Labor and Services; or OVEC/IKEC General Terms and Conditions for Engineering, Procurement and Construction Work (as amended from time to time).

17.3 **Business Unit (BU)** means for the purposes of these AEP Safety and Health Supplemental Terms and Conditions, a division of AEP that is responsible for providing a product line or service area to the affiliated companies of the American Electric Power System separately identified so each line or service area is considered a business [For purposes of these AEP Safety and Health Supplemental Terms and Conditions: AEP Distribution, AEP Vegetation Management, AEP Generation, AEP Telecom, AEP Transmission, and AEP Workplace Services].

17.4 **Contractor Personnel** means all employees, crews, workers, and agents of Contractor and all Subcontractors and its employees, crews, workers, and agents involved in the performance of Work.

17.5 **Job Briefing Form** means a document used to identify hazards, procedures, precautions, and mitigating actions to facilitate a pre-Job safety discussion and safely complete the Work as provided to Contractor by Owner, or provided by Contractor, but in accordance with all OSHA requirements.

17.6 **Jobsite** means a Site where the Work shall be performed.

17.7 **Negative Exposure Assessment Guidelines** means an exposure assessment that, with a high degree of certainty, shows exposures are expected to be less than the Permissible Exposure Limit, as defined in 17.10 (or other appropriate exposure guideline).

17.8 **OSHA Electric Transmission and Distribution (ET&D) Partnership** means OSHA Strategic Partnership Agreement between the Occupational Safety and Health Administration and The Electrical Transmission and Distribution Construction Contractors, The International Brotherhood of Electrical Workers (the IBEW), and Trade Associations.

17.9 **Owner's Representative** means the Jobsite or Business Unit representative identified in the contract as the point of contact for the Work.

17.10 **Permissible Exposure Limits (PEL)** means the minimum legal limit as set by either local, state, or federal law in the United States for exposure of an employee to a chemical substance or physical agent.

17.11 **Safety & Health Professional** means a trained and competent person focused on identifying workplace hazards, mitigation actions, and the prevention of workplace injuries.

17.12 **Site** means the definition as stated in the applicable AEP General Terms and Conditions.

17.13 **Work** means the definition as stated in the applicable AEP General Terms and Conditions

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18.0 REVIEW AND REVISION HISTORY

DATE	REVISION #	COMMENTS	REVIEWER
10/1/2019	0	Initial Issue	Contractor Safety Management Technical Committee
12/18/2020	01	Added Appendix G: AEP Energy Supply	Energy Supply, Energy Supply Safety & Health, Corporate Safety & Health, and AEP Legal

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Appendix A: Distribution

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix A: Distribution (this "Appendix") while performing Work for Owner's Distribution Operations. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions.

1.0 INTRODUCTION

NONE

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings:

2.2.1.1 Attachment: Owner's Job Briefing Form

2.3 For Distribution Work a WSHP will not typically be required. For unique long-duration Distribution projects, a WSHP may be required. Owner will specify any Work where a WSHP is required.

2.4 Emergency Planning: Emergency planning information shall be documented on the Job Briefing Form. Contractors shall contact the Distribution Dispatch Center in any case of emergency.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.7 Qualified and Non-Qualified Electrical Employees

3.7.1 Qualified Electrical Employee

3.7.1.1 Owner requires that qualified electrical Contractor crew members involved in the operation, construction, maintenance, or working on or near electric power generation, control, transformation, transmission, and distribution lines and equipment will be qualified as required by OSHA in 29 CFR 1910.269 and 29 CFR 1926 Subpart V.

Owner requires that qualified electrical Contractor crew members involved in the

3.7.1.2 Operation, repairing, testing, verification, or exposure to or working on or near live parts energized at 50 volts or more) will be qualified as required by OSHA 1910 Subpart S and OSHA 1926 Subpart K.

3.7.1.3 Owner defines a qualified electrical employee or "Qualified Employee" as a person having been trained and having demonstrated knowledge in the construction and operation of electrical power generation, transmission and distribution equipment involved and the associated hazards. A Qualified Employee must be trained and competent in (list not all-inclusive):

3.7.1.3.1 The skills and techniques necessary to distinguish exposed live parts of electrical equipment;

3.7.1.3.2 The skills and techniques necessary to determine the nominal voltage of exposed live parts;

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3.7.1.3.3 The minimum approach distances or safe working distances specified by OSHA corresponding to the voltages to which the Qualified Employee will be exposed;

3.7.1.3.4 Training to recognize and avoid electrical hazards;

3.7.1.3.5 Safety practices, including applicable emergency procedures (such as pole top & manhole rescue, first aid/CPR, Lock Out/Tag Out), that are related to the work, and;

3.7.1.3.6 The proper use of special precautionary techniques, personal protective equipment/clothing, insulating, and shielding materials, and insulated tools for working on or near exposed parts of electrical equipment.

3.7.1.4 Until these Qualified Employees have demonstrated proficiency in the work practices involved, they are considered to be employees undergoing on-the-job training and must be under the direct supervision of a qualified person at the all times. Contractor crew members shall only perform Work at the level for which they are qualified.

3.7.1.5 At Owners request, Contractor shall supply documentation concerning the types of skills assessments performed, training programs and how the Contractor will ensure that their Qualified Employees demonstrate competencies. Contractor shall certify that each Qualified Employee has received training required by this section. Certification shall be made when the Qualified Employee has demonstrated proficiencies in the Work assigned.

3.7.1.6 Contractor shall maintain a list of Qualified Employees able to work on or near primary, able to serve as a qualified observer and able to work secondary service. Qualified list shall be available upon request from Owner during normal operation and prior to service restoration.

3.7.1.7 Contractor shall ensure that its Qualified Employees have the appropriate training to perform the Work.

3.7.1.8 Owner, at its sole discretion based on Work observations or for other reasons, may at any time withdraw its acceptance of any previously approved or completed training and require Contractor Personnel to repeat training.

3.7.2 Non-Qualified Electrical Employee

3.7.2.1 Contractor shall provide training for non-qualified electrical Contractor Personnel for the purpose of entering or working within electrical areas (i.e., electrical vaults, manholes, poles). Contractor shall provide training for non-qualified electrical Contractor Personnel who will be working near energized lines or equipment energized at 50 volts or more (i.e., civil contractors, laborers, locators, pole treatment/inspection, etc.). All direct and indirect costs of this training are Contractor's sole responsibility.

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3.7.2.2 Owner defines a non-qualified electrical employee or "Non-Qualified Employee" as a person who has not been trained or authorized to conduct electrical work. A Non-Qualified Employee must be trained and competent in (list not all-inclusive):

3.7.2.2.1 Understanding of electrical hazards;

3.7.2.2.2 Electric shock;

3.7.2.2.3 What is safe to touch and what is not safe to touch in specific areas they will be entering;

3.7.2.2.4 Hazard Reporting;

3.7.2.2.5 The maximum voltage of the area/equipment;

3.7.2.2.6 The minimum approach distances for the maximum voltage within the area, and;

3.7.2.2.7 Recognition and proper use of protective equipment that will be used to provide protection and in the work practices necessary for performing their specific work assignments while working near energized lines or equipment energized at 50 volts or more.

3.7.2.3 At Owners request, Contractor must supply documentation concerning the types of skills assessments performed, training programs and how the Contractor will ensure that their Non-Qualified Employees demonstrate competencies. Contractor shall certify that each Non-Qualified Employee has received training required by this section. Certification shall be made when the Non-Qualified Employee has demonstrated proficiencies in the Work assigned.

3.7.2.4 Contactor shall ensure that Non-Qualified Employees and Subcontractor(s) Non-Qualified Employees have the appropriate training and safety instruction to perform the Work. Contractor shall also ensure that Non-qualified employees do not engage in any Work prior to completing the relevant training.

3.8 Qualified Observer

3.8.1 A qualified observer ("Qualified Observer") is required for any period while Contractor Personnel are performing Work by utilizing insulated gloves on conductors or equipment above six-hundred (600) volts to ground. The Qualified Observer must be positioned on the ground and shall be trained and prepared to perform emergency rescue procedures, if necessary (Emergency tasks that are necessary to safeguard the public are exempt from requiring Qualified Observer).

3.8.2 In addition to OSHA requirements, Qualified Observer shall:

3.8.2.1 Understand the work being observed

3.8.2.2 Be capable of identifying nominal voltages, energized components, minimum approach distances, adequacy of cover-up, and proper safe work practices and PPE/PIPE associated with the work

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3.8.2.3 Have sufficient understanding of the work, to the extent that they can identify errors that could result in injury, so they can alert the person(s) being observed before possible injury occurs

3.8.2.4 Be identified by name on Job Briefing Form

3.8.2.5 Apprentice 4 will be the lowest classification that can serve as a Qualified Observer

3.8.3 Apprentice 4 is one that meets the following criteria: Apprentices can work on secondary voltages up to 600 volts under general supervision. Apprentices may operate cutouts, line switches, recloses, and other sectionalizing devices under direct supervision. Apprentices may also refuse line and transformer devices, test de-energized lines and equipment and remove grounds under direct supervision.

3.8.4 Person in charge of Work Site, with agreement of the worker being observed shall make the final determination if an individual Contractor Personnel is suitable to be a designated "Qualified Observer".

3.8.5 Qualified Observer shall bare a special marking (i.e. arm band, patch, visible label, etc.), clearly identifying them as "Qualified Observer".

3.9 Additional training and qualification requirements:

3.9.1 The following list (not all-inclusive) of Work shall be used as a guide in order to help the Contactor ensure its Contractor Personnel are properly trained, competent, or qualified to perform such Work:

3.9.1.1 Digger Derrick & Bucket Truck operation

3.9.1.2 Qualified Electrical

3.9.1.3 Energy Isolation and Temporary Grounding

3.9.1.4 Confined or Enclosed Space

3.9.1.5 Horizontal Directional Drilling operation

3.9.1.6 Excavation & Trenching

3.9.1.7 Scaffolding

3.9.1.8 Personal Protective Equipment (PPE)

3.9.1.9 Department of Transportation requirements

3.9.1.10 Line Clearance Tree Trimming operation

3.9.1.11 Cranes & Rigging

3.9.2 Contractor may be required to complete Owner operating company specific training such as switching and tagging and customer service training. Owner will specify when this is required and reimburse Contractor for the cost of such training.

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4.0 SAFETY AND HEALTH PROFESSIONAL

4.2 When Contractor has twenty (20) or more total Contractor Personnel on various projects within individual Owner operating companies, Contractor shall have a full-time, Dedicated Safety Professional assigned to ensure Contractor's safety program is being enforced. An additional Dedicated Safety Professional shall be assigned for every increase of fifty (50) Contractor Personnel or two (2) hours of drive time on Owner property. When Contractor has ten (10) or less total Contractor Personnel on various projects within individual Owner operating companies, Contractor shall at minimum visit the various Sites or Work crews weekly to ensure Contractor's safety program is being enforced.

5.0 COMMUNICATION

NONE

6.0 WORK HOUR / WORK DAY LIMITATIONS

6.3 Exceptions to the 16 hour and 13 day rules must be approved by the Incident Commander of the event or the Manager of the department responsible for the Work.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.2 Arc Flash Policy

8.2.1 Contractor Personnel who perform Work on or near energized facilities and equipment shall wear arc rated clothing equal to or greater than Owner's incident energy. Additional personal protective equipment, such as Fire Retardant rated face shields and balaclavas, shall be worn by Contractor Personnel, when Contractor Personnel are exposed to arc flash hazards in excess of the minimum requirements set forth in following table (Table 1).

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Table 1

Minimum Head and Face Protection		
Equipment Required	Arc-Rated Faceshield with a Minimum Rating of 8 cal/cm²*	Arc-Rated Hood or Faceshield with Balaclava
Single-phase, open air	9 – 12 cal/cm²	13 cal/cm² or higher**
Three phase	5 – 8 cal/cm²	9 cal/cm² or higher***

*These ranges assume that employees are wearing hardhats meeting the specifications in 1910.135 or 1926.100(b)(2), as applicable.

**The arc rating must be a minimum of 4 cal/cm² less than the estimated incident energy, note that 1926.960(g)(5)(v) permits this type of head and face protection, with a minimum arc rating of 4 cal/cm² less than the estimated incident energy, at any incident energy level.

***Note 1926.960(g)(5)(v) permits this type of head and face protection at any incident energy level.

8.2.2 Owner shall supply Contractor with appropriate system requirements based on local electrical system configuration. Contractor and Owner shall review owner's incident energy prior to start of Work.

8.2.3 All Contractor Personnel that are covered under these Safety and Health Supplemental Terms and Conditions shall dress in his or her arc rated clothing prior to arrival on Site.

8.2.4 In addition to the requirements as outlined by OSHA and per Owner's policy, the requirements for Contractor Personnel to wear the protective clothing and equipment working on or near exposed, energized part(s) includes, but is not limited to the following examples of potential arc flash exposures:

8.2.4.1 When working within the minimum approach distances;

8.2.4.2 When determined by incident energy analysis;

8.2.4.3 When rubber gloves or rubber gloves and sleeves are required;

8.2.4.4 When performing hot-stick work;

8.2.4.5 When bonding or working "bare hand method";

8.2.4.6 When grounding conductors or equipment;

8.2.4.7 When testing lines or equipment to be de-energized;

8.2.4.8 When performing switching operations;

8.2.4.9 When entering enclosed/confined spaces with energized lines or equipment;

8.2.4.10 When disconnecting or connecting testing meters;

8.2.4.11 When a Contractor Personnel is required to physically assist with energized Work on lines or equipment where mechanical failure or human error could expose employee to a flash.

8.2.4.12 When in a substation, unless labeled or identified as being different, arc flash boundary to exposed, energized parts is fifteen (15) feet. Also, specific to equipment inside a control

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house and unless labeled or identified as being different, arc flash boundary to exposed parts energized from 50 V to less than 300 V is 3 feet 6 inches.

8.2.5 In addition, Contractor Personnel shall comply with the following:

8.2.5.1 All outer layers of clothing shall have the appropriate arc flash rating (including the upper and lower body). When a shirt is worn as the outer layer, it shall be long sleeves. Sleeves shall be rolled down and buttoned with the shirt tails tucked into the trousers. When an additional layer is required (such as, but not limited to, a coat or overalls) the outer layer shall have the appropriate arc flash rating.

8.2.5.2 Arc flash rated clothing shall be worn as constructed by the manufacturer. Altering arc flash rated clothing (i.e. removing sleeves or collars, etc.) is prohibited.

8.2.5.3 Clothing made from acetate, nylon, polyester, or polypropylene that is not arc flash rated shall not be worn under arc flash rated clothing or by itself while employees are exposed to arc flash hazards. Garments made from 100% natural fibers (i.e. cotton, wool) may be worn under arc flash rated clothing, but shall be free from stains or flammable products, screen printing, iron-on transfers, paint, etc.

8.3 All workers within the right-of-way who are exposed to either traffic or work vehicles must wear the appropriate high visibility vest.

9.0 INDUSTRIAL HYGIENE

9.2 Lead is also present throughout Owner's underground facilities (i.e., lead splicing).

9.3.3 Prior to the commencement of Work, both Owner and Contractor shall determine the presence and form of ACM. If ACM is determined to be present, Contractor shall submit a plan to Owner, outlining the appropriate measures Contractor will take while either working around ACM or in the abatement of ACM. Said plan shall be approved by Owner prior to the commencement of Work, and in accordance with Owner's policies including the proper disposal of ACM at Owner's approved waste disposal sites.

9.5 Owner requires any Work task involving Crystalline Silica, such as concrete sawing or drilling, is evaluated by Contractor to determine Contractor Personnel protective controls.

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

10.4 Barricading

10.4.1 Hazardous voltages will exist on equipment should conductive portions inadvertently come in contact with energized conductors during the course of Work. These voltages are extremely harmful if not fatal should Contractor Personnel come in contact with the vehicle or equipment during this time. The barricade is erected to ensure that Contractor Personnel do not come in contact with the vehicle or equipment during that time. Traffic cones and ropes may be used as an alternative in special circumstances. The barricading rope shall encompass all conductive attachments that extend

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from the vehicle or equipment whenever possible. If this arrangement cannot be accomplished, then other measures must be taken to ensure the security of this vehicle.

10.4.2 Derricks and Aerial devices shall be barricaded to prevent Contractor Personnel on the ground from falling objects or touching the aerial device in the event of an accidental contact with energized conductors. The barricaded area shall also be extended beyond temporary ground rod or anchor, if applicable. Contractor Personnel shall not lean across the barricade to access the vehicle while the barricade is in place. When the barricaded area needs to be entered the observer shall confirm that all Work aloft is stopped. They shall communicate with the operator who shall position the derrick or aerial device at minimum ten (10) feet from energized conductors and stop operation while the Contractor Personnel accesses the vehicle. In this situation, the Contractor Personnel accessing the vehicle shall lower the barricade to access the truck and leave it down until no further contact is necessary. Contractor Personnel shall then reinstall the barricade and communicate with the operator that it is safe to resume Work. Work will only restart after the observer has confirmed that the barricaded area is clear.

10.4.3 Before the barricade is installed, a fire extinguisher, a pair of rubber gloves and sleeves, gaffs, climbing belt and fall arrest equipment (for climbing jobs and aerial devices without rescue), handline, rubber blanket (with aerial device), fire resistant clothing, and any additional tools and equipment needed for the job shall be removed from the vehicle or equipment and placed in an accessible location outside the barricaded area.

10.4.4 Barricades shall be installed encompassing all four corners of a vehicle or equipment separated from the vehicle or equipment by non-conductive supports and demarcated by highly visible Danger rope and Danger warning signs to align with degree of hazard attached to those supports or rope.

10.4.5 The following are primary examples of vehicles and equipment where barricading is required – this list is not all inclusive:

10.4.5.1 Bucket trucks

10.4.5.2 Digger derricks

10.4.5.3 Wire puller/tensioner

10.4.5.4 Directional boring machines

10.4.5.5 Backyard machines

10.15 Additional requirements:

10.15.1 Cable Verification – Immediately prior to cutting any control cable, Contractor Personnel shall have a Contractor Personnel verify that it is the proper cable and that it is de-energized.

10.15.2 Guard Structures – All hotline crossings and all road crossings shall be protected by the use of a guard structure. Guard structures (including equipment used as guard structures) shall be installed prior to disconnecting the conductor and shall remain in place until the conductor is clipped in.

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10.15.3 Placement of Grounds – The location of all grounds on Owner's property shall be tracked and documented by Contractor. Grounds shall be installed and removed maintaining minimum approach distance. Grounds shall be inspected prior to each use. All Grounds shall be flagged.

10.15.4 Hose Safety Whip Checks - Hose safety whip checks shall be utilized on all pneumatic air hose assemblies.

10.15.5 Hot Boards

10.15.5.1 When working by the insulating gloves method from the pole on conductors or equipment that is energized at phase-to-ground voltages greater than as defined by Owner's Operating Unit or phase-to-phase voltages greater than as defined by Owner's Operating Unit, an insulating (or insulated) working surface shall be used. When working from the insulating work platform, care must be taken to isolate the employee from the pole by using an insulated fall protection device or rubber blanket to isolate the employee's belt from the pole.

10.15.5.2 The purpose of the insulating platform (hot or buck board) is to isolate the Contractor Personnel from conductive objects at ground potential such as the pole, pole grounds and other hardware. Special care should be exercised to be aware that contacting anything that is grounded will defeat the insulation of the hot board.

10.15.5.3 When working from a hot board, all wires and materials that are grounded or operating at a different voltage from the line or equipment being worked on shall be covered with appropriate cover up material.

11.0 TOOLS

NONE

12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

NONE

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 DISTRIBUTION POLICIES AND PROCEDURES

NONE

17.0 DEFINITONS AND ABBREVIATIONS

NONE

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Appendix B: Vegetation Management

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix B: Vegetation Management (this "Appendix") while performing Work for Owner's Forestry Business Operations. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions.

1.0 INTRODUCTION

NONE

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings:

2.2.1.1 Attachment: Owner's Job Briefing Form

2.3 For Vegetation Management Work, a WSHP will not typically be required. For unique long-duration projects, a WSHP may be required. Owner will specify any Work where a WSHP is required. Furthermore, Contractor may be required to submit an annual safety plan that addresses such things as safety culture, incident and injury prevention, a "good catch" program, jobsite observation frequencies, and upcoming safety related initiatives.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.2 OSHA Training

3.2.1 Until OSHA 10 or equivalent training is developed to be specifically applicable to the vegetation management industry, vegetation management Contractors are exempt from this requirement.

4.0 SAFETY AND HEALTH PROFESSIONAL

4.2 When Contractor has twenty-five (25) or more total Contractor Personnel on various projects within an operating company, Contractor will provide a dedicated Safety and Health Professional (safety manager) to visit the various Work Sites and Work crews to ensure that Contractor's safety program is enforced. An additional full-time dedicated Safety and Health Professional (safety manager) must be provided when Contractor Personnel performing Work for Owner exceeds 250 employees, and for every multiple of 250 Contractor Personnel thereafter.

4.2.1 When Owner requires Contractor to provide Safety and Health Professional(s) in excess of the Contractor safety manager requirements stated above, such Safety and Health Professional position will only be billable for time directly associated with Contractor's Work for Owner.

5.0 COMMUNICATION

NONE

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6.0 WORK HOUR / WORK DAY LIMITATIONS

6.3 Exceptions to the above requirements shall be requested by Contractor and be pre-approved in writing by Owner's representative at the Director or Regional Manager level or above.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1.2 Vegetation management Contractor Personnel are not required to use face shields in the performance of his or her Work.

8.1.4 Vegetation management Contractor Personnel shall be exempt from any work glove requirement.

9.0 INDUSTRIAL HYGIENE

NONE

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

10.5 Vegetation management Contractor Personnel shall comply with the most recent revision of the American National Standard for Arboricultural Operations – Safety Requirements (ANSI Z133) when operating mobile cranes and lifting devices as part of his or her Work.

11.0 TOOLS

NONE

12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

14.1 If Contractor does not have a dedicated Safety & Health Professional, then Contractor's Operations Manager must perform and document a Job Site Observation (JSO) weekly.

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 VEGETATION MANAGEMENT POLICIES AND PROCEDURES

16.1.10 In addition to the requirements in the AEP Safety and Health Supplemental Terms and Conditions and this Appendix, Contractor and Contractor Personnel shall follow AEP Forestry: Vegetation Management Goals, Procedures & Guidelines for Distribution and Transmission Line Clearance Operations in the performance of Work.

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17.0 DEFINITIONS AND ABBREVIATIONS

NONE

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Appendix C: Generation

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix C: Generation (this "Appendix") while performing Work for Owner's Generation Operations. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions.

1.0 INTRODUCTION

1.6 For Mine Safety and Health Administration (MSHA) regulated facilities, Contractor shall comply with the Federal Mine Safety and Health Acts of 1977 and any revisions, amendments, and successor legislation to the extent governing and applicable to the Work. To the extent that this Contract (and particularly within the AEP Safety and Health Supplemental Terms and Conditions herein) references an OSHA definition or requirement(s) and there is an MSHA definition or requirement(s) that is reasonably comparable to such OSHA definition or requirement, then the comparable MSHA requirement shall control, if MSHA has jurisdiction over the referenced subject matter or location. To the extent that this Contract requires compliance to OSHA requirements for which there are no comparable MSHA requirements, or to the extent that this Contract imposes safety and health requirements for which there are no comparable OSHA or MSHA requirements, and which are applicable to the subject matter or location, Contractor shall comply with the strictest of: (i) the OSHA requirement; (ii) any applicable Owner requirement; or (iii) any applicable Contractor rule or procedure.

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings:

2.2.1 In the preparation of the Job Briefing, Contractor shall consult applicable Job Hazard Analysis (JHA's) that may exist for the Work.

2.2.1.1 Attachment: Owner's Job Briefing Form

2.3 WSHP: Owner will provide Contactor with Owner's completed Pre-Work Hazard Assessment (PWHA) which identifies hazards associated with the Work along with requirements for additional planning (i.e. direction on whether Contractor has to complete a WSHP and/or Job Hazard Analysis (JHA). Contractor shall consider the PWHA and understand that the PWHA is informational for initial planning purposes only. The PWHA does not relieve Contractor of its obligation to conduct its own hazard assessments of the Work.

2.3.1 Attachment: Owner's WSHP Form

2.5 Additional Safety Planning Requirements:

2.5.1 Job Hazard Analysis (JHA)

2.5.1.1 If Owner requires a WSHP, Contractor shall prepare a JHA in accordance with its WSHP. Where a WSHP is not required, Contractor shall prepare a JHA for the planned Work subject to review by Owner prior to starting Work.

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2.5.1.2 Owner reserves the right to require Contractor to prepare additional JHAs. Contractor shall use and update JHAs to consistently apply proper safeguards. All JHAs are subject to review by Owner.

2.5.1.3 The WSHP and JHAs shall be signed by the Work Site superintendent to ensure clear understanding of the safety and health plans at the local level.

2.5.1.4 Attachments: Owner's JHA Form

2.5.2 As an aid in performing hazard assessments, some Sites may require each Contractor Personnel to document their assessments using Owner-supplied checklists or equivalent means such as a STAR Card.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.3 The number of Contractor Personnel trained in First Aid, Cardiopulmonary Resuscitation ('CPR') and Automated External Defibrillator ('AED') will be mutually agreed upon by Owner and Contractor during the RFx process based on Work scope and crew size.

3.7 Additional training and qualification requirements:

3.7.1 For Mine Safety and Health Administration (MSHA) regulated facilities, Contractor is responsible for the cost of all MSHA Surface Certification, New Miner, and Miner Refresher Training.

3.7.2 Some Sites may require supervision to attend Owner's "Supervisors' Responsibilities and Expectations Briefing" program. If required, the program must be completed within two weeks after arrival at Owner's Site and takes approximately one hour. Owner will reimburse Contractor the cost of Contractor Personnel attending this training if required.

4.0 SAFETY AND HEALTH PROFESSIONAL

4.2 Contractor shall provide an on-Site full-time Safety and Health Professional for each shift of Work in which the total of craft Contractor Personnel exceeds 40 personnel with an additional Safety and Health Professional for each additional 40 craft Contractor Personnel.

5.0 COMMUNICATION

NONE

6.0 WORK HOUR / WORK DAY LIMITATIONS

6.3 Exceptions to the 16 hour and 13 day rules must be approved by the Owner's Director or Plant Manager of the organization responsible for the Work.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1.4 Attachment: Generation Glove & Sleeve Selection Matrix

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8.1.6 Footwear: With the exception of site office buildings, Contractors personnel shall follow the footwear requirements unless owner agrees with Contractor's WSHP or JHA that justifies less or more stringent requirements.

8.2 Attachment: Arc Flash Protection Policy

9.0 INDUSTRIAL HYGIENE

NONE

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

10.4 Attachment: Barricade Tape and Flagging Guideline

10.14 Additional requirements:

10.14.1 Attachment: Clearance Permit Policy, Procedure, and Form

10.14.2 Attachment: Floor and Wall Opening Permit Procedure

10.14.3 Attachment: 15 ft. Scaffold Access

10.14.4 Attachment: C.OI-730.12.02 – Electric Lines and Equipment Clearance (PC&C)

10.14.5 Attachment: Lifting and Rigging (Plant / Organization Specific)

10.14.6 Generation Substance Abuse Program

10.14.6.1 Testing shall be performed by a third party testing facility certified by Department of Health & Human Services, Drug & Alcohol Testing Industry Association (DATIA) or the Substance Abuse Program Administrators Association (SAPAA). The analytical method for a confirmatory drug test must combine chromatographic separation and mass spectrometric identification (i.e. GC/MS, CL/MS). Alcohol testing shall be performed only by certified Breathalyzer equipment (appearing on the Department of Health and Human Resources conforming product list) and trained breath alcohol technician. All positive breath alcohol tests shall be confirmed by an Evidentiary Breath Test that provides a print out.

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Drug Screening Classes	Screening Cut-Off Limit*** (ng/ml)	Confirmation Cut-Off Limit (ng/ml)
Amphetamines Methamphetamines	500*	250* 250**
MDMA MDA MDEA	500*	250* 250* 250*
Barbiturates	300	200
Benzoylecgonine (Cocaine Metabolite)	150*	100*
Cannabinoids (THC)****	50*	15*
Opiates Codeine Morphine Oxycodone Hydromorphone Hydrocodone 6-Acetylmorphine	2000* 2000 2000 100 300 300 10	2000* 2000 2000 100 300 300 10
Phencyclidine (PCP)	25*	25*
Benzodiazepines	300	300
Methadone	300	300
Propoxyphene	300	300
Breath alcohol content	.040g/210L	.040g/210L

* Cut-off limits established by the Department of Health and Human Services in their mandatory Guidelines for Federal Workplace Drug Testing Programs.

** To be reported positive for methamphetamine, a specimen must also contain amphetamine at a concentration equal to or greater than 100ng/ml.

*** In no event will the cutoff limits set forth in this paragraph be less than the cutoff limits set forth in the Technical Guidelines adopted from time to time by the United States Department of Health and Human Services.

**** The Medical Review Officer will not accept assertions that a positive THC resulted from the use of hemp oil or the injection of hemp products, and therefore verify a marijuana test negative. Individuals should avoid use of such products.

10.14.6.2 For Work not covered by the Building Trades Council, Association, or Craft program terms, Owner will reimburse Contractor at its actual cost, without additional markups, predicated upon Contractor's submittal of copies of the actual invoice(s) for the testing to Owner.

10.14.6.3 If an instant drug test is requested by the Contractor and the Contractor Personnel test results are positive, the Contractor Personnel will be removed from Site until the result can be verified by laboratory analysis. If the result is confirmed positive, the Contractor Personnel will be placed on the ban list. If the result is confirmed negative, the Contractor Personnel may return to the Site. The Owner will not be responsible for back pay to the employee under these circumstances.

11.0 TOOLS

NONE

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12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

14.2 For MSHA regulated facilities, MSHA Surface Certified person to perform required on shift inspection, document, and sign MSHA on shift book.

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 GENERATION POLICIES AND PROCEDURES

16.1.1 Generation Culture Playbook

17.0 DEFINITONS AND ABBREVIATIONS

17.13 Pre-Work Hazard Assessment (PWHA) - Owner's initial hazard assessment for the Work to be executed by Contractor that identifies anticipated hazards as best as can reasonably be determined by Owner that may require elimination or mitigation. The PWHA will be provided to Contractor and is intended to provide a basis for initial planning purposes only and Owner does not make any warrant or representation, express or implied, that the PWHA is accurate, complete, comprehensive, or all-inclusive, or that items not listed will not be present or pose no threat to Contractor Personnel safety or health.

17.14 Job Hazard Analysis (JHA) - A detailed 3-step analysis that helps eliminate and/or reduce risk. This 3 step process breaks each task down into basic job steps, identifies existing and potential hazards associated with each step and provides recommendations/procedures to eliminate, reduce or control hazards, and the option of assessing potential severity.

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Appendix D: Telecom

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix D: Telecom (this "Appendix") while performing Work for Owner's Telecom Operations. This Appendix supplements the corresponding sections, as listed in the AEP Safety and Health Supplemental Terms and Conditions.

1.0 INTRODUCTION

NONE

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings

2.2.1.1 General Telecom Requirements. Contractor shall complete Owner's Job Briefing Form titled, "Job Safety & Hazard Analysis (JSHA) Construction Work Form" (i.e. Fiber Construction, Site Construction and/ or other related form specifically requested by Owner).

2.3 Work Safety and Health Plan (WSHP)

2.3.1 General Telecom Requirements. Notwithstanding the foregoing in Section 2.3 of the AEP Safety and Health Supplemental Terms and Conditions, WSHP shall apply only to Telecom station Work that exceeds five (5) Business Days. Each WSHP shall, at a minimum, include information regarding the following:

2.3.1.1 Project Details
2.3.1.2 Construction / Execution Plan
2.3.1.3 Emergency Planning
2.3.1.4 Environmental Protection Plans
2.3.1.5 Project Safety Management
2.3.1.6 Task Hazard Analysis
2.3.1.7 Civil Work / Excavations
2.3.1.8 Substation / Switchyards
2.3.1.9 T Line Project
2.3.1.10 Material (Delivery / Handling / Laydown Area)
2.3.1.11 Equipment
2.3.1.12 Disciplinary Program
2.3.1.13 Miscellaneous

2.3.2 Contractor shall ensure that the WSHP shall be made available, and the contents communicated to all personnel, Contractor Personnel or otherwise, on Site at any time. The WSHP shall be maintained separate from other safety documentation and be kept readily available on Site.

2.3.3 All Contractor Personnel shall participate in driving the most efficient route to the nearest medical facility prior to any Work occurring on a Site. If the distance to the emergency facility is too great

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and a helicopter is the most appropriate means of transportation, Contractor shall contact the service provider and have an appropriate landing zone planned.

2.4 Emergency Planning

2.4.1 General Telecom Requirements. Contractor shall refer to the JSHA in Section 2.2.1. above for additional information and requirements regarding emergency planning.

2.5 Additional Requirements

2.5.1 General Telecom Requirements

2.5.1.1 Contractors must have one blood borne pathogen kit per crew.

2.5.2 Telecom "Site Construction" Specific Requirements

2.5.2.1 Contractor shall ensure portable eye wash kits are made available for Contractor Personnel's use.

2.5.2.2 For Drilled excavations six (6) feet or more in depth, Contractor Personnel shall be protected from falling by guardrail systems, fences, hard barricades or covers. All Contractor Personnel entering inside the guardrail system shall have and use fall protection equipment in the performance of his or her Work.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.5.1 All Contractor Personnel shall view the transmission safety and environmental videos prior to being on a Jobsite.

3.7 Qualified and Non-Qualified Electrical Employee

3.7.1 Qualified Electrical Employee-

3.7.1.1 Owner requires that qualified electrical Contractor crew members involved in the operation, construction, maintenance, or working on or near electric power generation, control, transformation, transmission, and distribution lines and equipment will be qualified as required by OSHA in 29 CFR 1910.269 and 29 CFR 1926 Subpart V.

3.7.1.2 Owner requires that qualified electrical Contractor crew members involved in the operation, repairing, testing, verification, or exposure to or working on or near live parts energized at 50 volts or more) shall be qualified as required by OSHA 1910 Subpart S and OSHA 1926 Subpart K.

3.7.1.3 Owner defines a qualified electrical employee or "Qualified Employee" as a person having been trained and having demonstrated knowledge in the construction and operation of electrical power generation, transmission and distribution equipment involved and the associated hazards. A Qualified Employee must be trained and competent in (list not all inclusive):

3.7.1.3.1 The skills and techniques necessary to distinguish exposed live parts of electrical equipment;

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3.7.1.3.2 The skills and techniques necessary to determine the nominal voltage of exposed live parts;

3.7.1.3.3 The minimum approach distances or safe working distances specified by OSHA corresponding to the voltages to which the Qualified Employee shall be exposed

3.7.1.3.4 Training to recognize and avoid electrical hazards;

3.7.1.3.5 Safety practices, including applicable emergency procedures (such as pole top

3.7.1.3.6 & manhole rescue, first aid/CPR, Lock Out/Tag Out), that are related to the Work, and;

3.7.1.3.7 The proper use of special precautionary techniques, personal protective equipment and clothing, insulating, and shielding materials, and insulated tools for working on or near exposed parts of electrical equipment.

3.7.1.4 Until these Qualified Employees have demonstrated proficiency in the Work practices involved, they are considered to be employees undergoing on-the-job training and must be under the direct supervision of a qualified person at the all times. Contractor crew members shall only perform Work at the level for which they are qualified.

3.7.1.5 At Owners request, Contractor must supply documentation concerning the types of skills assessments performed, training programs and how the Contractor shall ensure that its Qualified Employees demonstrate competencies. Contractor shall certify that each Qualified Employee has received training required by this section. Certification shall be made when the Qualified Employee has demonstrated proficiencies in the Work assigned.

3.7.1.6 Contractor shall maintain a list of qualified personnel able to Work near primary service, able to serve as a Qualified Observer, and able to work secondary service. Qualified list shall be available upon request from Owner during normal operation and prior to service restoration.

3.7.1.7 Contractor shall ensure that Qualified Employees and Subcontractor(s) Qualified Employees have the appropriate training to perform the Work.

3.7.1.8 Owner, at its sole discretion based on Work observations or for other reasons, may at any time withdraw its acceptance of any previously approved or completed training and require personnel to repeat training.

3.7.2 Non-Qualified Electrical Employee

3.7.2.1 Contractor shall provide training for non-qualified electrical Contractor employees for the purpose of entering or working within electrical areas (i.e., electrical vaults, manholes, poles). Contractor shall provide training for non-qualified electrical Contractor employees who shall be working near energized lines or equipment energized at 50 volts or more (i.e., civil contractors, laborers, locators, pole treatment/inspection, etc.). All direct and indirect costs of this training are Contractor's sole responsibility.

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3.7.2.2 Owner defines a non-qualified electrical employee or "Non-Qualified Employee" as a person who has not been trained or authorized to conduct electrical Work. A Non-Qualified Employee must, at a minimum, be trained and competent in (list not all inclusive):

3.7.2.2.1 Understanding of electrical hazards;

3.7.2.2.2 Electric shock;

3.7.2.2.3 What is safe to touch and what is not safe to touch in specific areas they shall be entering;

3.7.2.2.4 Hazard Reporting;

3.7.2.2.5 The maximum voltage of the area/equipment;

3.7.2.2.6 The minimum approach distances for the maximum voltage within the area, and and;

3.7.2.2.6 Recognition and proper use of protective equipment that shall be used to provide protection and in the Work practices necessary for performing their specific Work assignments while working near energized lines or equipment energized at 50 volts or more.

3.7.2.3 At Owners request, Contractor must supply documentation concerning the types of skills assessments performed, training programs and how the Contractor shall ensure that their Non-Qualified Employees demonstrate competencies. Contractor shall certify that each Non-Qualified Employee has received training required by this section. Certification shall be made when the Non-Qualified Employee has demonstrated proficiencies in the Work assigned.

3.7.2.4 Contactor shall ensure that Non-Qualified Employees and Subcontractor(s) Non-Qualified Employees have the appropriate training and safety instruction to perform the Work. Contractor shall also ensure that Non-qualified employees do not engage in any Work prior to completing the relevant training.

3.8 OPGW Personal Protective Grounding Training Class

3.8.1 Telecom "Fiber Construction" Specific Requirement. Contractor and on Site Contractor Personnel shall attend Optical Ground Wire (OPGW) Personal Protective Grounding Training Class training (incorporated herein by reference) prior to being on Jobsite.

4.0 SAFETY & HEALTH PROFESSIONAL

4.2 For each project with twenty (20) or more total Contractor Personnel on-Site, Contractor shall provide a full-time, dedicated, on-site safety representative. Contractor shall provide an additional full-time, dedicated, on-Site safety representative for each additional twenty (20) Contractor Personnel present thereafter. Even if the Work requires fewer than twenty (20) total Contractor Personnel on Site, if Owner determines the nature

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of the Work justifies additional safety oversight, Owner has the right to request, whereupon Contractor shall provide a full-time, dedicated, safety representative for the Work.

5.0 COMMUNICATION

NONE

6.0 WORK HOUR / WORK DAY LIMITATIONS

6.3 General Telecom Requirements. Contractor requested exceptions to Section 6.0 of the AEP Safety and Health Supplemental Terms and Conditions shall be sent to the Telecom Construction Manager.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.2 Arc Flash Policy

8.2.1 Contractor Personnel who Work on or near energized facilities and equipment shall wear arc rated clothing equal to or greater than the owner's incident energy. Additional personal protective equipment, such as fire retardant rated face shields and balaclavas, shall be worn when employees are exposed to arc flash hazards in excess of the minimum requirements set forth in following table.

Table 1

Minimum Head and Face Protection		
Equipment Required	**Arc-Rated Faceshield with a Minimum Ration of 8 cal/cm²***	**Arc-Rated Hood or Faceshield with Balaclava**
Single-phase, open air	9-12 cal/cm²	13 cal/ cm² or higher**
Three phase	5-8/ cm²	8 cal/ cm² or higher***
* These ranges assume that Contractor Personnel are wearing hardhats meeting the specifications in OSHA 1910.135 or 1926.100(b)(2), as applicable. ** The arc rating must be a minimum of 4 cal/ cm² less than the estimated incident energy, not that OSHA 1926.960(g)(5)(v) permits this type of head and face protection, with a minimum arc rating of 4 cal/ cm² less that the estimated incident energy, at any incident energy level. *** Note OSHA 1926.960(g)(5)(v) permits this type of head and face protection at any incident energy level.		

8.2.2 Owner shall supply Contractor with appropriate system requirements based on local electrical system configuration. Contractor and Owner shall review Owner's incident energy prior to start of Work.

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8.2.3 All Contractor Personnel that are covered under the Safety & Health Supplemental Terms and Conditions shall dress in his or her arc rated clothing prior to arrival on Site.

8.2.4 In addition to the requirements as outlined by OSHA and per Owner's policy, the requirements for Contractor Personnel to wear the protective clothing and equipment working on or near exposed, energized part(s) includes, but is not limited to the following examples of potential arc flash exposures:

8.2.4.1 When working within the minimum approach distances;

8.2.4.2 When determined by incident energy analysis;

8.2.4.3 When rubber gloves or rubber gloves and sleeves are required;

8.2.4.4 When performing hot-stick Work;

8.2.4.5 When bonding or working "bare hand method;"

8.2.4.6 When grounding conductors or equipment;

8.2.4.7 When testing lines or equipment to be de-energized;

8.2.4.8 When performing switching operations;

8.2.4.9 When entering enclosed/confined spaces with energized lines or equipment;

8.2.4.10 When disconnecting or connecting testing meters;

8.2.4.11 When Contractor Personnel are required to physically assist with energized Work on lines or equipment where mechanical failure or human error could expose employee to a flash.

8.2.4.12 When in a substation, unless labeled or identified as being different, arc flash boundary to exposed, energized parts is fifteen (15) feet. Also, specific to equipment inside a control house and unless labeled or identified as being different, arc flash boundary to exposed parts energized from 50 V to less than 300 V is three (3) feet six (6) inches.

8.2.5 In addition, Contractor Personnel shall comply with the following:

8.2.5.1 All outer layers of clothing shall have the appropriate arc flash rating (including the upper and lower body). When a shirt is worn as the outer layer, it shall be long sleeves. Sleeves shall be rolled down and buttoned with the shirt tails tucked into the trousers. When an additional layer is required (such as, but not limited to, a coat or overalls) the outer layer shall have the appropriate arc flash rating.

8.2.5.2 Arc flash rated clothing shall be worn as constructed by the manufacturer. Altering arc flash rated clothing (i.e. removing sleeves or collars, etc.) is prohibited.

8.2.5.3 Clothing made from acetate, nylon, polyester, or polypropylene that is not arc flash rated shall not be worn under arc flash rated clothing or by itself while employees are exposed to arc flash hazards. Garments made from 100% natural fibers (i.e. cotton, wool) may be worn under arc flash rated clothing, but shall be free from stains or flammable products, screen printing, iron-on transfers, paint, etc.

8.3 General Telecom Requirements. All Contractor Personnel are required to wear flame resistant (FR) clothing under the following circumstances:

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8.3.1 Gate to gate in a substation

8.3.2 Aerial construction on transmission or distribution networks

8.3.4 When entering a network manhole or vault

8.3.4 Anytime Site management requires FR clothing to be worn

8.3.5 High visibility reflective vest and shall be FR

9.0 INDUSTRIAL HYGIENE

NONE

10.0 MISCELLANEOUS SITE REQUIREMENTS

10.4.1 Telecom "Fiber Construction" Specific Equipment Barricading Requirements. *Distribution Line only; Equipment Barricading Policy, Aerial Devices (AEP TX ONLY)*- All aerial devices (Digger Derricks & Bucket Trucks) shall be barricaded by Contractor to prevent Contractor Personnel on ground from coming in contact with the aerial device in the event of an accidental electrical contact on any structure or pole with energized conductors. When working in areas where workers have access to the Work area directly under the boom or bucket of the aerial device, the entire Work area shall be barricaded by Contractor. When the barricaded Work area needs to be entered, the Qualified Observer, as defined below, shall confirm that all Work aloft is stopped and the aerial bucket and boom has been moved out to a safe distance from energized conductors or energized sources. Work shall only restart after Qualified Observer has confirmed that the barricaded area is clear. "Qualified Observer" as used in this Appendix means the foreman or equivalent lineman on the ground when energized Work in a bucket is being performed. The Qualified Observer,

i) is responsible for understanding, communicating with, and watching the Work as it progresses;

ii) shall not be assigned other duties while bucket is in the Primary Zone; and

iii) has the authority to STOP Work if Work appears to be departing from the originally communicated plan.

10.4.2 Texas Telecom Aerial Contractor Personnel are required to:

i) have fire extinguisher, spare Class II gloves with leather protectors, and blanket that can be kept in a bag outside the barricaded area during Mobile Operations;

ii) use cover-ups and protective Sleeves when working above the neutral; and

iii) ensure the required equipment is out of the bag and laid out for use when working in the Primary Zone. "Primary Zone" as used in this Section 10.4.2, means above the neutral.

10.15 Tethering

10.15.1 Telecom "Site" Specific Requirements.

10.15.1.1 Tethering Requirements for Aerial Tower Work - All tools and equipment (ex. Cameras, Cellphones, Radios) shall be tethered while in use. All Contractor Personnel shall ensure they are using manufactured tethers that meet industry standards. Tethers shall be designed for the tool and manufacturer weight limits followed. All tools and

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materials that cannot reasonably be tethered shall be placed in sealable tool bags when not in use. All Contractor Personnel shall ensure that tool bags and materials are securely tied off to prevent dropped objects.

10.15.1.2 Tool Tether Inspection - All drop prevention systems shall be inspected prior to use. Excessively worn or damaged tools or materials must be immediately removed from service and replaced.

10.15.1.3 Drop Zone Protection - Contractor shall establish an agreed upon drop zone with the Jobsite AEP Representative and shall prevent entry of personnel not involved with the Work being conducted. Contractor shall police the area prior to a lift and remove all non-essential personnel to a safe location. When materials or equipment are being lifted into position that have the potential to cause injury to occupants in the control building it shall be vacated.

10.16 Side Setting a Pole in Power

10.16.1 Telecom "Fiber Construction" Specific Requirement. All Contractor Personnel shall adhere to Owner's pole installation under power lines standards dated 6/21/2018, as amended from time to time (incorporated herein by reference).

10.17 Rubber Glove Policy

10.17.1 Telecom "Fiber Construction" Specific Requirements. Contractor Personnel working out of an aerial bucket shall wear rubber gloves with approved leather protectors before aerial device is un-cradled and boom lifted into air on any structure/pole with energized conductors. All conductors are considered energized unless tested and grounded on each side of Work location. When Work is required to place fiber above the neutral and working in the "Primary Zone" rubber sleeves (in AEP TX Only) are required to be used in conjunction with rubber gloves and approved leather protectors. Class 2 rubber gloves with approved leather protectors & sleeves (where required, AEP TX Only) shall be required at all structures/poles with energized conductors to 15KV. Class 3 Rubber gloves with approved leather protectors & sleeves (where required, in AEP TX Only) shall be required at all structures/poles with energized conductor voltages 15KV up to 25KV. No fiber shall be placed over any conductors over 25KV (transmission voltage). The Qualified Observer shall verify all personnel has the required rubber gloves with approved leather protectors and sleeves (in AEP TX Only) on before lifting of aerial bucket. FR clothing is required when working out of any aerial device. All rubber goods include; gloves, (sleeves and blankets in AEP TX Only) shall be inspected before each use and tested per all AEP & OSHA standards.

10.17.2 *Rubber Glove Policy for specific to (PSO & SEP), East (APCO, OHIO, KY, I&M ONLY).* Contractor Personnel working out of an aerial bucket shall wear Class 2 rubber gloves with approved leather protectors before aerial device is un-cradled and boom lifted into air on any structure/pole with energized conductors. All conductors are considered energized unless tested and grounded on each

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side of Jobsite. FR clothing is required when working out of any aerial device. All rubber gloves, shall be inspected before each use and tested per all AEP & OSHA standards.

11.0 TOOLS

NONE

12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

NONE

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 TELECOM POLICIES AND PROCEDURES

NONE

17.0 DEFINITIONS AND ABBREVIATIONS

17.14 Work Safety and Health Plan (WSHP): WSHP as used in this Appendix D means a structured document that details the scope of construction Work and related safety controls for management review and tradesman training.

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Appendix E: Transmission

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix E: Transmission (this "Appendix") while performing Work for Owner's Transmission Operations. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions.

1.0 INTRODUCTION

NONE

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings:

2.2.1.1 Contractor shall use Owner supplied Pre-Job Briefing Form located on VERO (https://verodms.com).

2.3 For Work exceeding five (5) days duration, Contractor shall be required to submit a Work Safety and Health Plan (WSHP) no later than five (5) business days after the Effective Date of the Contract. WSHP shall be submitted, via email, to the Owner assigned TCR, Project Manager, Environmental Representative and Safety Representative for the Work. Failure to submit the WSHP in the time frame described herein may result in revocation of contract award. The WSHP template for use is located on VERO (https://verodms.com).

If Work is less than five (5) days in duration but considered to be 'high risk', the AEP Transmission Project Team reserves the right to require the Contractor to submit a WSHP for the project.

Note: : 'High Risk' work may include, but is not limited to: Critical Lifts, Crane Activities, Pier Foundations, Demolition, Steel Erection, Personnel Hoisting, Transferring Conductor, Energized Services, Working

2.3.1 A WSHP shall, at a minimum, include information regarding the following:

- Project Details
- Construction/Execution Plan
- Emergency Planning
- Environmental Protection Plans
- Project Safety Management
- Task Hazard Analysis
- Civil Work/Excavations
- Substation/Switchyards
- T Line Project
- Material (Delivery/Handling/Laydown Area)
- Equipment

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- Disciplinary Program
- Miscellaneous

2.3.2 Contractor shall ensure that the WSHP be made available and the contents communicated to all personnel on Site at any time. The WSHP shall be maintained separate from other safety documentation and be kept readily available on Site.

2.3.3 All Contractor Personnel shall participate in driving the most efficient route to the nearest medical facility prior to any Work occurring on a Site. If the distance to the emergency facility is too great and a helicopter is the most appropriate means of transportation, Contractor shall contact the service provider and have an appropriate landing zone planned.

2.5 Following review of Job Briefing, Contractor Personnel performing specific tasks shall complete a detailed Task Hazard Analysis (THA) at the physical work location that identifies task steps task steps and lists the associated hazards and mitigation controls. Daily, before any Work begins or resumes, and before changing any Work procedures or activity at any Site, Contractor shall perform a documented new THA which identifies all known and potential Work Site risks. The THA shall be either handwritten with dates and original signatures or may be produced electronically – as long as the final document bears the relevant time and date stamp with original signatures. Any duplication by any means, including photocopied, pre-filled, copied and pasted, or other means of replication of any report **shall not be allowed**.

2.5.1 Contractor's assigned supervisor or lead shall review the THA with each Contractor Personnel crewmember prior to the start of each task and anytime the Work procedure changes. Additionally, the Contractor's assigned supervisor or lead shall review the THA with each Contractor Personnel crewmember after lunch and/or after any significant break in the Work.

Contractor's THA shall include:

- A detailed step-by-step plan for the task to be performed, referencing any specific requirements of the associated;
- Specific risk/hazards associated with the task on the associated project;
- Control measures Contractor will implement in order to eliminate or control such potential risks/hazards.

2.5.2 Contractor shall ensure that each Contractor Personnel crewmember performing Work shall sign their name verifying that he or she understands the THA and will adhere to it.

2.5.3 Using Contractor Personnel that is knowledgeable with the applicable scope of Work, Contractor shall conduct a THA review with all personnel who enter the Work zone or Site. Contractor's review shall include a scope of Work and any hazards present at the site.

2.5.4 Contractor shall provide easy access to the THA for all personnel and all contractors on Site at the start of the activity and upon any changes to the THA or upon any requests to review the THA. Contractor shall make THA's available on the Site at all times.

2.5.5 Contractor shall immediately communicate to all personnel on Site, regardless of affiliation, any changes to the THA that occur throughout the performance of the Work.

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3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

3.3 This is applicable to each crew on the jobsite. The exception is to those performing Electrical Work under 600V.

3.7 Qualified and Non-Qualified Electrical Employees

3.7.1 Qualified Electrical Employee

3.7.1.1 Owner requires that qualified electrical Contractor Personnel crew members involved in the operation, construction, maintenance, or working on or near electric power generation, control, transformation, transmission, and distribution lines and equipment will be qualified as required by OSHA in 29 CFR 1910.269 and 29CFR 1926 Subpart V.

3.7.1.2 Owner requires that qualified electrical Contractor Personnel crew members involved in the operation, repairing, testing, verification, or exposure to or working on or near live parts energized at 50 volts or more, will be qualified as required by OSHA 1910 Subpart S and OSHA 1926 Subpart K.

3.7.1.3 Owner defines a qualified electrical employee or 'Qualified Employee" as a person having been trained and having demonstrated knowledge in the construction and operation of electrical power generation, transmission and distribution equipment involved and the associated hazards. A Qualified Employee must be trained and competent in (list not all-inclusive):

3.7.1.3.1 The skills and techniques necessary to distinguish exposed live parts of electrical equipment;

3.7.1.3.2 The skills and techniques necessary to determine the nominal voltage of exposed live parts;

3.7.1.3.3 The minimum approach distances or safe working distances specified by OSHA corresponding to the voltages to which the Qualified Employee will be exposed;

3.7.1.3.4 Training to recognize and avoid electrical hazards;

3.7.1.3.5 Safety practices, including applicable emergency procedures (such as pole top & manhole rescue, first aid/CPR, Lock Out/Tag Out), that are related to the work, and;

3.7.1.3.6 The proper use of special precautionary techniques, personal protective equipment/clothing, insulating, and shielding materials, and insulated tools for working on or near exposed parts of electrical equipment.

3.7.1.4 Until these Qualified Employees have demonstrated proficiency in the work practices involved, they are considered to be employees undergoing on-the-job training and must be under the direct supervision of a qualified person at all times. Contractor Personnel shall only perform Work at the level for which they are qualified.

3.7.1.5 At Owners request, Contractor must supply documentation concerning the types of skills assessments performed, training programs and how the Contractor will ensure that it's

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Qualified Employees demonstrate competencies. Contractor shall certify that each Qualified Employee has received training required by this section. Certification shall be made when the Qualified Employee has demonstrated proficiencies in the Work assigned.

3.7.1.6 Contractor shall maintain a list of qualified personnel be able to work on or near primary, able to serve as a qualified observer and able to work secondary service. Qualified list shall be available upon request from Owner during normal operation and prior to service restoration.

3.7.1.7 Contractor shall ensure that its Qualified Employees and its Subcontractor(s) Qualified Employees have the appropriate training to perform the Work.

3.7.1.8 Owner, at its sole discretion based on Work observations or for other reasons, may at any time withdraw its acceptance of any previously approved or completed training and require Contractor Personnel to repeat training.

3.7.2 Non-Qualified Electrical Employee

3.7.2.1 Contractor shall provide training for non-qualified electrical employees for the purpose of entering or working within electrical areas (i.e., electrical vaults, manholes, poles).

3.7.2.2 Owner defines a non-qualified electrical employee or "Non-Qualified Employee" as a person who has not been trained or authorized to conduct electrical work. A Non-Qualified Employee must be trained and competent in (list not all-inclusive):

3.7.2.2.1 Understanding of electrical hazards

3.7.2.2.2 Electric shock;

3.7.2.2.3 What is safe to touch and what is not safe to touch in specific areas they will be entering;

3.7.2.2.4 Hazard Reporting

3.7.2.2.5 The maximum voltage of the area/equipment;

3.7.2.2.6 The minimum approach distances for the maximum voltage within the area, and;

3.7.2.2.7 Recognition and proper use of protective equipment that will be used to provide protection and in the work practices necessary for performing their specific work assignments while working near energized lines or equipment energized at 50 volts or more.

3.7.2.3 At Owners request, Contractor must supply documentation concerning the types of skills assessments performed, training programs and how the Contractor will ensure that their Non-Qualified Employee demonstrate competencies. Contractor shall certify that each Non-Qualified Employee has received training required by this section. Certification shall be made when the Non-Qualified Employee has demonstrated proficiencies in the Work assigned.

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3.7.2.4 Contractor shall ensure that its Non-Qualified Employees and its Subcontractor(s) Non-qualified Employees have the appropriate training and safety instruction to perform the Work. Contractor shall also ensure that its Non-Qualified Employees and its Subcontractor(s) Non-Qualified Employees do not engage in any work prior to completing the relevant training.

3.8 Contractor shall submit its annual training plan to Owner for review no later than February 1 of the applicable calendar year. Contractor shall make such submission to Owner via the following link http://aeptcs.com. Contractor's Training plans shall, be at a minimum, include a training calendar, learning objectives for that year, and evaluation tools that will be used to measure the success of the training.

3.9 All Contractor Personnel required to enter an Owner energized substation or switchyard shall complete Station Entry Training prior to entry. Contractor Personnel shall, at a minimum, be trained, competent and comfortable with the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, determine the nominal voltage of exposed live parts, and the minimum approach distances corresponding to the voltage to which the Contractor Personnel will be exposed. Contractor shall maintain a record of this training and shall make such records available to Owner upon Owner's request.

3.10 Contractor Personnel entering an energized station Site who are not station entry qualified, per OSHA standards, shall be accompanied by and under the direct supervision of a qualified supervisor. If the qualified supervisor leaves the station Site where Work is being performed; all affected Contractor Personnel shall also leave the Site.

4.0 SAFETY & HEALTH PROFESSIONAL

4.2 For each project with twenty (20) or more total Contractor Personnel on-Site, Contractor shall provide a full-time, dedicated, on-site safety representative. Contractor shall provide an additional full-time, dedicated, on-Site safety representative for each additional twenty (20) Contractor Personnel present thereafter. Even if the Work requires fewer than twenty (20) total Contractor Personnel on Site, if Owner determines the nature of the Work justifies additional safety oversight, Owner has the right to request, whereupon Contractor shall provide a full-time, dedicated, safety representative for the Work.

5.0 COMMUNICATION

NONE

6.0 WORK HOUR/WORK DAY LIMITATIONS

6.3 Exceptions to work hour and workday limitation shall be requested by the Contractor and be pre-approved in writing by the Owner's Construction Manager and Project Manager.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

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8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1.4.1 Work gloves appropriate for the potential hazards of the job tasks. *Note: Jersey gloves are not permitted to be worn as the only means of protection.*

8.2 Arc Flash Policy

8.2.1 Contractor Personnel who work on or near energized facilities and equipment shall wear arc rated clothing equal to or greater than the owner's incident energy. Additional personal protective equipment, such as fire retardant rated face shields and balaclavas, shall be worn when Contractor Personnel are exposed to arc flash hazards in excess of the minimum requirements set forth in following table (Table 1).

Table 1

Minimum Head and Face Protection		
Equipment Required	**Arc-Rated Faceshield with a Minimum Rating of 8 cal/cm²***	**Arc-Rated Hood or Faceshield with Balaclava**
Single-phase, open air	9 – 12 cal/cm²	13 cal/cm² or higher**
Three phase	5 – 8 cal/cm²	9 cal/cm² or higher***

*These ranges assume that employees are wearing hardhats meeting the specifications in 1910.135 or 1926.100(b)(2), as applicable.

**The arc rating must be a minimum of 4 cal/cm² less than the estimated incident energy; note that 1926.960(g)(5)(v) permits this type of head and face protection, with a minimum arc rating of 4 cal/cm² less than the estimated incident energy, at any incident energy level.

***Note 1926.960(g)(5)(v) permits this type of head and face protection at any incident energy level.

8.2.2 Owner shall supply Contractor with appropriate system requirements based on local electrical system configuration. Contractor and Owner shall review owner's incident energy prior to start of Work.

8.2.3 All Contractor Personnel that are covered under these terms shall dress in his or her arc rated clothing prior to arrival on Site.

8.2.4 In addition to the requirements as outlined by OSHA, and per Owner's policy, the requirements for Contractor Personnel to wear the protective clothing and equipment working on or near exposed, energized part(s) includes, but is not limited to the following examples of potential arc flash exposures:

8.2.4.1 When working within the minimum approach distances;

8.2.4.2 When determined by incident energy analysis;

8.2.4.3 When rubber gloves or rubber gloves and sleeves are required;

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8.2.4.4 When performing hot-stick work;

8.2.4.5 When bonding or working "bare hand method";

8.2.4.6 When grounding conductors or equipment;

8.2.4.7 When testing lines or equipment to be de-energized;

8.2.4.8 When performing switching operations;

8.2.4.9 When entering enclosed/confined spaces with energized lines or equipment;

8.2.4.10 When disconnecting or connecting testing meters;

8.2.4.11 When Contractor Personnel is required to physically assist with energized Work on lines or equipment where mechanical failure or human error could expose employee to a flash.

8.2.4.12 When in a substation, unless labeled or identified differently, the arc flash boundary to exposed, energized parts is fifteen feet (15'). Contractor further agrees that specific to equipment inside a control house and unless labeled or identified differently, the arc flash boundary to exposed parts energized from fifty volts (50V) to less than three hundred volts (300V) is three foot, six inches (3'6").

8.2.5 In addition, Contractor shall ensure that Contractor Personnel comply with the following:

8.2.5.1 All outer layers of clothing shall have the appropriate arc flash rating (including the upper and lower body). When a shirt is worn as the outer layer, it shall be long sleeves. Sleeves shall be rolled down and buttoned with the shirt tails tucked into the trousers. When an additional layer is required (such as, but not limited to, a coat or overalls) the outer layer shall have the appropriate arc flash rating.

8.2.5.2 Arc flash rated clothing shall be worn as constructed by the manufacturer. Altering arc flash rated clothing (i.e. removing sleeves or collars, etc.) is prohibited.

8.2.5.3 Clothing made from acetate, nylon, polyester, or polypropylene that is not arc flash rated shall not be worn under arc flash rated clothing or by itself while employees are exposed to arc flash hazards. Garments made from 100% natural fibers (i.e. cotton, wool) may be worn under arc flash rated clothing.

8.2.6 Contractor agrees that any Contractor Personnel, who may be called upon to work on or near exposed, energized part(s) shall either wear the appropriate arc-rated clothing or have them readily available on Site at all times.

8.3.1 The outermost layer of clothing on the upper body shall be 'High Visibility and Reflective'.

9.0 INDUSTRIAL HYGIENE

NONE

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

10.1.1 When excavating inside energized stations, Contractor shall secure a written approval from Owner prior to using any mechanical devices to perform such excavation inside an energized substation. Contractor shall consider Non-destructive excavation methods (i.e. hydro-vac, hand dig, etc.) for

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initial use in energized stations to determine location of potential utilities. Upon review, on an individual Site basis, Owner may require non-destructive excavation be used, or may approve the use of mechanical excavation methods.

10.4.1 Contractor shall ensure that all excavations are barricaded.

10.4.2 Contractor shall define Work areas and drive paths of substations and switchyards with barricades to delineate safe distances to structures, equipment, fixed objects, etc.

10.4.3 Aerial devices shall be barricaded to prevent workers on the ground from falling objects or touching the aerial device in the event of an accidental contact with energized conductors. The barricaded needs to be entered the observer shall confirm that all work aloft is stopped and that the bucket, work platform, or boom has been moved out to a safe distance from nearby energized conductors or sources. Work will only restart after the observer has confirmed that the barricaded area is clear. area shall also be extended beyond any temporary ground rod or anchor. When the barricaded area

10.4.3.1 Aerial devices shall be grounded when in use. Grounding shall be applied to a system ground conductor such as station equipment ground, structure ground, or a grounded structure. Where such previously mentioned grounding sources are not available, a remote temporary ground rod or an anchor shall be used. When a temporary ground rod is used, it is to be driven into the ground for its entire length, if possible, but never less than two feet in the ground to provide the best ground contact. Also, the ground rod or anchor shall be away from the immediate work area to reduce the risk of step potential and be barricaded.

10.4.3.2 Equipment with a boom, mast, bucket, bed, etc. shall be stowed and fully cradled before moving.

10.4.3.3 Before beginning equipment operations, the Contractor shall identify the Work zone to determine if any part of the equipment, boom, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could encroach the trigger distance to energized lines or equipment. The trigger distance for non-qualified electrical workers is defined as twenty feet (20') for less than 345kV and fifty feet (50') for 345kV and greater. For qualified electrical workers these distances are defined as fifteen feet (15') for less than 345kV and thirty feet (30') for 345kV and greater. If the trigger distance to energized lines or equipment is encroached, the Contractor shall:

10.4.3.3.1 Conduct a documented planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the energized lines and/or equipment. The planning meeting shall address the steps and provisions that will be implemented to prevent encroachment, including delineated work zone, positioning of equipment, voltage with applicable minimum approach distance and available

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engineering controls (i.e. proximity alarms, range limiting devices, insulating protective material, barricades, etc.)

10.4.3.3.2 Assign dedicated qualified observer(s) whose sole responsibility is to watch the separation between the conductor and the equipment, load line and load (including rigging and lifting accessories), ensure that the applicable minimum approach distance is not breached through communication with the operator, and warn all persons involved in the work of impending dangers.

10.4.3.3.3 Erect and maintain an elevated warning line, barricade or line of signs, in view of the operator, equipped with flags or similar high-visibility marking at the minimum approach distance.

10.4.3.4 Backing motor vehicles should be avoided wherever possible, such as by taking pull through opportunities. If backing cannot be avoided Contractor Personnel should back upon arrival. A second Contractor Personnel, if present, shall be used as a spotter while backing.

10.4.3.5 Refer to http://aeptcs.com for additional information regarding Section 18.0 Mobile Equipment Requirements.

10.15 HOUSEKEEPING – Contractor shall keep all trash in appropriate containers and shall dispose of it in a proper and timely manner. Contractor shall not store materials within the working space around energized lines or equipment.

10.16 CABLE VERIFICATION – Immediately prior to cutting any control cable, Contractor Personnel shall have a second person verify that it is the proper cable and that it is de-energized.

10.17 GUARD STRUCTURES – All hotline crossings and all road crossing shall be protected by the use of a guard structure. Guard structures (including equipment used as guard structures) shall be installed prior to disconnecting the conductor and shall remain in place until the conductor is clipped in.

10.18 PLACEMENT OF GROUNDS – The location of all grounds on Owner's transmission lines and stations shall be tracked and documented by Contractor. Grounds shall be installed and removed maintaining minimum approach distance. Grounds shall be inspected prior to each use. All Grounds (each cable) shall be flagged.

10.19 WARNING SIGNS - Warning signs shall be installed at locations where overhead lines have been identified. Warning signs shall be visible and considered for all directions of travel, including site ingress and egress. Warning signs shall be no less than 36" x 36" and placed at appropriate height to draw attention. Bilingual warning signs shall be posted whenever prudent.

11.0 TOOLS

11.4 Hose safety whip checks shall be utilized on all pneumatic air hose assemblies.

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12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

14.1.1 If Work exceeds two weeks in duration, a Contractor safety professional shall perform and document at least one project safety observation report on each Site no less than once per month.

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 TRANSMISSION POLICIES AND PROCEDURES

NONE

17.0 DEFINITONS AND ABBREVIATIONS

NONE

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Appendix F: Workplace Services

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the additional requirements set forth in this Appendix F: Workplace Services (this "Appendix") while performing Work for Owner's Workplace Services Business Operations at Owner's facilities. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions.

The AEP Safety and Health Supplemental Terms and Conditions and this Appendix will remain in effect for all High Risk Work regardless of timing. On Real Estate and Workplace Services projects where a Certificate of Occupancy, Temporary Certificate of Occupancy, or similar documentation from an Owner's Representative is granted, the Director of Real Estate and Workplace Services or appropriate Manager of the organization responsible for the Work may relax some of these requirements by designating the changes in writing prior to implementation.

1.0 INTRODUCTION

NONE

2.0 SAFETY & HEALTH PLANNING

2.2 Job Briefings:

2.2.1.1 Attachment: Owner's Job Briefing Form

2.3 For Work exceeding five (5) days duration, Contractor may be required to submit a Work Safety and Health Plan (WSHP) per the RFP no later than five (5) business days after the Effective Date of the Contract. The WSHP shall be submitted to the Owner's Representative via email. Failure to submit the WSHP in the timeframe described herein may result in revocation of contract award. If Work is less than five (5) days in duration but considered to be High Risk, Owner reserves the right to require the Contractor to submit a WSHP for the project. Contractor shall ensure that the WSHP shall be made available, and the contents communicated to all Contractor Personnel on Site at any time. The WSHP shall be maintained separate from other safety documentation and be kept readily available on Site.

2.3.1 Attachment: Owner's WSHP Form

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

NONE

4.0 SAFETY AND HEALTH PROFESSIONAL

4.2 Contractor shall provide an on-site full-time Safety and Health Professional for each shift of Work in which the total of craft Contractor Personnel exceeds 40 personnel with an additional Safety and Health Professional for each additional 40 personnel.

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5.0 COMMUNICATION

NONE

6.0 WORK HOUR / WORK DAY LIMITATIONS

6.3 Exceptions to the 16 hour and 13 day rules must be approved by the Director of Real Estate and Workplace Services or appropriate Manager of the organization responsible for the Work.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

NONE

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1.6 Footwear: With the exception of project Site office buildings, Contractor Personnel shall follow the footwear requirements unless Owner agrees with Contractor's PPE Assessment that justifies less or more stringent requirements.

9.0 INDUSTRIAL HYGIENE

NONE

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

NONE

11.0 TOOLS

NONE

12.0 REPORTING REQUIREMENTS

NONE

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

NONE

15.0 PROHIBITED FROM JOBSITE

NONE

16.0 WORKPLACE SERVICES POLICIES AND PROCEDURES

NONE

17.0 DEFINITONS AND ABBREVIATIONS

NONE

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Appendix G: AEP Energy Supply

As part of Contractor's obligations under the AEP Safety and Health Supplemental Terms and Conditions, Contractor and all Contractor Personnel shall follow the amended language, clarifications and additional requirements set forth in this Appendix G: AEP Energy Supply Clarifications and Additional Requirements (this "Appendix") while performing Work for Owner's Energy Supply projects – inclusive of AEP Energy, AEP Energy Partners, AEP OnSite Partners, and AEP Renewables. This Appendix supplements the corresponding sections as listed in the AEP Safety and Health Supplemental Terms and Conditions dated October 1, 2019.

1.0 INTRODUCTION

Amended language:

1.2 These safety and health requirements shall be used in conjunction with the applicable AEP General Terms and Conditions for Work performed across the AEP System. These requirements reflect Owner's minimum expectations regarding safety and health practices and may exceed the requirements of federal, state, and local regulatory agencies. In the event of a conflict between or among the safety and health practices provided herein and any federal, state or local requirements, the higher standard or greater requirement for Contractor shall prevail. By entering into the Contract, Contractor agrees that Contractor shall perform all Work in accordance with these safety and health requirements.

Additional requirement:

1.8 In the event any reference herein, or in the policies or documents referred to herein, identifies an obligation or responsibility of AEP site staff, AEP personnel, or such other related reference associated with an AEP representative (collectively, "AEP Representative"), such reference shall not transfer or modify the Contractor's obligations for Work to such AEP Representative if Contractor has agreed to such obligation or responsibility pursuant to a Contract between Contractor and Owner.

2.0 SAFETY & HEALTH PLANNING

Amended language:

2.2 Job Briefing: Prior to the commencement of Work and before any changes are made in procedures or activities, ~~and prior to resuming Work after any significant breaks (i.e. lunch).~~ Contractor shall perform a Job Briefing and complete a written Job Briefing Form (pursuant to requirements set forth by OSHA). When returning to Work after a significant break (e.g., lunch), Contractor Personnel shall review the Job Briefing Form and modify it to reflect any significant changes affecting the safety of Contractor Personnel.

Amended language:

2.2.1.1 Unless Contractor's Job Briefing Forms are approved in writing by Owner Representative prior to the start of Work, Contractor shall use Owner supplied Job Briefing Form available on VERO (https://verodms.com) ~~in the applicable Business Unit appendix~~.

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Clarification:

2.3 Owner will notify Contractor if a Work Safety and Health Plan (WSHP) is required. Contractor will use Owner's WSHP form (available on VERO at https://verodms.com) and provide a complete WSHP to Owner prior to start of Work.

Additional requirement:

2.3.1 Owner will provide Contractor with Owner's completed Pre-Work Jobsite Information Summary (PJIS) which identifies characteristics, conditions and design information of plant installations that are related to the safety of the Work, along with requirements for additional pre-Work planning (e.g., direction on whether Contractor must complete a WSHP and/or a Job Hazard Analysis (JHA)). Contractor shall consider the PJIS and understand that the PJIS is informational for initial planning purposes only. The PJIS does not relieve Contractor of its obligation to conduct its own hazard assessment of the Work.

Additional requirement:

2.5 Job Hazard Analysis (JHA)

2.5.1 If Owner requires a WSHP, Contractor shall prepare a JHA in accordance with its WSHP. Where a WSHP is not required, Contractor shall prepare a JHA for the planned Work subject to review by Owner prior to starting Work.

2.5.2 Owner reserves the right to require Contractor to prepare additional JHAs. Contractor shall use and update JHAs to consistently apply proper safeguards. All JHAs are subject to review by Owner.

3.0 GENERAL PERSONNEL TRAINING AND QUALIFICATION REQUIREMENTS

Amended language:

3.2.1 All Contractor Personnel who are performing High Risk Work on Owner Jobsites shall successfully complete, at a minimum, the OSHA 10-Hour for General Industry or Construction Training, OSHA Electric Transmission and Distribution (ET&D) Partnership 10-Hour Training, or have specific written approval from Owner's ~~Corporate~~ Business Unit Safety and Health Designee ~~Director~~ and Business Unit Operations Manager (AEP Grade 10 or above) allowing equivalent training(s) to be accepted in lieu of OSHA training.

Clarification:

3.3 The number of Contractor Personnel trained in First Aid, Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) will be mutually agreed upon by Owner and Contractor prior to beginning Work and will based on Work scope and crew size.

Amended language:

3.5 Prior to entering Owner's Jobsite, all Contractor Personnel shall complete the AEP onboarding requirements, which may vary by Business Unit. This training takes approximately two (2) hours. All Contractor Personnel shall refresh such training on an annual basis ~~prior to March 31st~~.

Additional requirement:

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3.7 Contractor is responsible for providing qualified and capable personnel to perform the Work covered by the Contract and ensuring that Contractor Personnel only perform Work at the level for which they are qualified. Where federal, state and/or local standards require the contractor to train employees in the safety and health aspects of their jobs or limit certain job assignments to employees who are "certified," "competent," or "qualified," Contractor shall ensure Contractor Personnel have the appropriate training and safety instruction to meet applicable requirements. At Owner's request, Contactor must supply documentation including, but not limited to, training records, training programs, and/or skills assessments demonstrating competency and proficiency to safely perform Work, as required.

4.0 SAFETY AND HEALTH PROFESSIONAL

Clarification:

4.2 Contractor shall provide an on-site full-time Jobsite Safety and Health Professional for each shift of Work in which the total of Contractor Personnel exceeds 25 personnel. An additional Safety and Health Professional is required when the total Contractor Personnel exceeds 75 personnel and for each additional 50 Contractor Personnel thereafter, or as described in the Contract.

5.0 COMMUNICATION

NONE

6.0 WORK HOUR / WORK DAY LIMITATIONS

Clarification:

6.3 Exceptions to the 16-hour and 13-day rules must be approved by the Owner's Business Unit Safety & Health Designee or Plant Manager of the Business Unit contracting for the Work.

7.0 CONTRACTOR AND SUBCONTRACTOR QUALIFICATION STATUS

Amended language:

7.2 Contractor shall only use AEP approved contractors (found in VERO) as Subcontractors to perform medium or high risk Work. To initiate the process to utilize a Subcontractor that is not currently qualified by Owner in VERO, the Contractor shall have the Subcontractor join VERO and obtain an approved qualification status prior to any Subcontractor Work. Any exceptions to this must be approved in writing by Owner's ~~Corporate~~ Business Unit Safety and Health Designee ~~Director~~ and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Subcontractor Work.

8.0 PERSONAL PROTECTIVE EQUIPMENT

Amended language:

8.1 Contractor Personnel shall wear, at a minimum, the following PPE while on any Jobsite, unless directed otherwise in the Business Unit Appendices:

Amended language:

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8.1.3 Hardhats that meet the specifications of ANSI Z89.1, Class E. A chinstrap is required when working at heights.

Clarification:

8.1.4 Contractor Personnel shall wear protective gloves as appropriate for the potential hazards of the Work task.

Additional requirement:

8.1.8 When climbing wind turbines, the following additional PPE is required:

8.1.8.1 Headlamp (for lowlight conditions)

8.1.8.2 Full body harness with dorsal and sternal d-rings

8.1.8.3 Double-legged shock absorbing lanyards capable of arresting a free fall of up to six feet (6'). When connecting to an anchorage point above the dorsal d-ring is not possible (such as when working on top of the nacelle), lanyards must be capable of arresting a free fall of up to twelve feet (12').

8.1.8.4 Cable sleeve compatible with vertical ladder safety system

8.1.8.5 Tool tethers/lanyards

8.1.8.6 Rescue kits

8.1.8.7 Suspension trauma relief loops/straps

8.1.9 When climbing wind turbines, the following additional PPE is recommend:

8.1.9.1 Lanyard keepers integrated into full body harness

8.1.9.2 Work positioning d-rings at the hip/side of full body harness

Amended language:

8.2 Contractor shall review arc flash potential ~~with Owner's Representative~~ to determine the appropriate PPE.

Additional requirement:

8.2.1 Contractor shall comply with AEP's Arc Flash Protection Policy, available on VERO (https://verodms.com).

8.2.2 The requirements for Contractor Personnel to wear the protective clothing and equipment working on or near exposed, energized part(s) includes, but is not limited to the following examples of potential arc flash exposures:

8.2.2.1 When working within the minimum approach distances;

8.2.2.2 When determined by incident energy analysis;

8.2.2.3 When rubber gloves or rubber gloves and sleeves are required;

8.2.2.4 When performing hot-stick work;

8.2.2.5 When bonding or working "bare hand method";

8.2.2.6 When grounding conductors or equipment;

8.2.2.7 When testing lines or equipment to be de-energized;

8.2.2.8 When performing switching operations;

8.2.2.9 When entering enclosed/confined spaces with energized lines or equipment;

8.2.2.10 When disconnecting or connecting testing meters;

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8.2.2.11 When Contractor Personnel is required to physically assist with energized Work on lines or equipment where mechanical failure or human error could expose employee to a flash.

8.2.2.12 When in a substation, unless labeled or identified differently, the arc flash boundary to exposed, energized parts is fifteen feet (15'). Contractor further agrees that specific to equipment inside a control house and, unless labeled or identified differently, the arc flash boundary to exposed parts energized from fifty volts (50V) to less than three hundred volts (300V) is three foot, six inches (3'6").

8.2.3 In addition, Contractor shall ensure that Contractor Personnel comply with the following:

8.2.3.1 All outer layers of clothing shall have the appropriate arc flash rating (including the upper and lower body). When a shirt is worn as the outer layer, it shall be long sleeves. Sleeves shall be rolled down and buttoned with the shirt tails tucked into the trousers. When an additional layer is required (such as, but not limited to, a coat or overalls) the outer layer shall have the appropriate arc flash rating.

8.2.3.2 Arc flash rated clothing shall be worn as constructed by the manufacturer. Altering arc flash rated clothing (i.e. removing sleeves or collars, etc.) is prohibited.

8.2.3.3 Clothing made from acetate, nylon, polyester, or polypropylene that is not arc flash rated shall not be worn under arc flash rated clothing or by itself while employees are exposed to arc flash hazards. Garments made from 100% natural fibers (i.e. cotton, wool) may be worn under arc flash rated clothing.

Additional requirement:

8.4 Owner may require the outermost layer of clothing on the upper body be high visibility and reflective.

9.0 INDUSTRIAL HYGIENE

Amended language:

9.1.3 Owner requires regulated areas for all Work involving potential exposure to hexavalent chromium regardless of the type of Work conducted (General Industry or Construction). Contractor shall provide Owner~~'s competent person for potential hexavalent chromium exposure shall be consulted~~ an analysis ~~regarding~~ of the appropriate size, location and demarcation of the regulated area for review.

Amended language:

9.2.1 Structural steel and equipment throughout Owner's facilities and/or the Jobsite may have been coated with lead/cadmium based materials including galvanizing. Contractor shall treat all surfaces as containing lead/cadmium unless tested otherwise prior to performing any grinding, welding, sanding, heating, sandblasting or similar activity. Owner requires that any coating containing lead at a level of 0.05% (500 ppm) or greater be treated as a lead-containing coating.

Amended language:

9.2.4 Contractor shall collect all removed lead/cadmium bearing paint and contaminated materials used for the removal of lead/cadmium bearing paint. These materials shall be placed in Contractor supplied packaging ~~meeting the applicable US Department of Transportation requirements for the~~

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~~material~~, labeled and disposed of per applicable local, state and federal regulations unless specified otherwise in the Contract ~~and properly labeled and stored per Owner instructions~~.

Amended language:

9.4.2 Contractor shall have procedures for proper labeling, storing, and handling of hazardous chemicals and hazardous wastes in a safe and secure manner meeting all applicable local, state and federal regulatory requirements. These procedures shall be available to the Owner for review prior to the start of Work.

10.0 MISCELLANEOUS JOBSITE REQUIREMENTS

Amended language:

10.1 When performing excavation Work, Contractor shall comply with Owner's excavation policy, including permits. All excavations must be barricaded.

Amended language:

10.8 Upon entry or exit of a substation, Contractor shall ~~notify the appropriate Dispatch Authority~~ report their presence to the employee-in-charge.

Amended language:

10.11 Unless Contractor's Welding, Cutting, and Brazing policy is approved in writing by Owner's ~~Corporate~~ Business Unit Safety and Health Designee ~~Director~~ and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Work, Contractor shall comply with Owner's Welding, Cutting, and Brazing policy.

10.12 Unless Contractor's Attentive Driving policy is approved in writing by Owner's ~~Corporate~~ Business Unit Safety and Health Designee ~~Director~~ and Business Unit Operations Manager (AEP Grade 10 or above) prior to the start of Work, Contractor shall follow Owner's Attentive Driving Policy while performing Work for Owner.

Additional Requirements:

10.15 Substance Abuse Program: All Contractor Personnel shall have passed drug and alcohol screening tests, meeting the following requirements, within the previous 12 months of beginning Work at the Jobsite. Testing for the drugs indicated below shall be performed by a third party testing facility certified by Department of Health & Human Services, Drug & Alcohol Testing Industry Association (DATIA) or the Substance Abuse Program Administrators Association (SAPAA). The analytical method for a confirmatory drug test must combine chromatographic separation and mass spectrometric identification (i.e. GC/MS, CL/MS). Alcohol testing shall be performed only by certified Breathalyzer equipment (appearing on the Department of Health and Human Resources conforming product list) and trained breath alcohol technician. All positive breath alcohol tests shall be confirmed by an Evidentiary Breath Test that provides a print out.

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Drug Screening Classes	Screening Cut-Off Limit*** (ng/ml)	Confirmation Cut-Off Limit (ng/ml)
Amphetamines Methamphetamines	500*	250* 250**
MDMA MDA MDEA	500*	250* 250* 250*
Barbiturates	300	200
Benzoylecgonine (Cocaine Metabolite)	150*	100*
Cannabinoids (THC)****	50*	15*
Opiates Codeine Morphine Oxycodone Hydromorphone Hydrocodone 6-Acetylmorphine	2000* 2000 2000 100 300 300 10	2000* 2000 2000 100 300 300 10
Phencyclidine (PCP)	25*	25*
Benzodiazepines	300	300
Methadone	300	300
Propoxyphene	300	300
Breath alcohol content	.040g/210L	.040g/210L

* Cut-off limits established by the Department of Health and Human Services in their mandatory Guidelines for Federal Workplace Drug Testing Programs.

** To be reported positive for methamphetamine, a specimen must also contain amphetamine at a concentration equal to or greater than 100ng/ml.

*** In no event will the cutoff limits set forth in this paragraph be less than the cutoff limits set forth in the Technical Guidelines adopted from time to time by the United States Department of Health and Human Services.

**** The Medical Review Officer will not accept assertions that a positive THC resulted from the use of CBD products, hemp oil or the injection of hemp products, and therefore verify a marijuana test negative.

10.15.1 If an instant drug test is requested by the Contractor and the Contractor Personnel test results are positive, the Contractor Personnel will be removed from the Jobsite until the result can be verified by laboratory analysis. If the result is confirmed positive, the Contractor Personnel will be prohibited from performing work on all AEP owned properties. If the result is confirmed negative, the Contractor Personnel may return to the Jobsite. The Owner will not be responsible for any back pay to the employee.

10.15.2 Contractor shall implement a substance abuse prevention program throughout the duration of the Work. The program shall be provided to Owner for review at least 30 days prior to beginning Work, or within the timeframe described in the Contract.

10.16 Critical Lifts

10.16.1 When performing Work requiring critical lifts, Contractor shall comply with Owner's critical lift policy, including permits. Contractor may use its critical lift policy with prior review and written approval by Owner. To be considered, Contractor must submit its critical lift policy to Owner at least sixty (60) days in advance of critical lift activities.

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10.16.2 All critical lift plans must be submitted to Owner for review at least forty-eight (48) hours in advance of any critical lift.

10.17 Wind Energy Facility Specific Requirements

10.17.1 Contractor access to wind turbines is limited to authorized Contractor Personnel only.

10.17.2. Turbine doors must be closed and locked when unattended.

10.17.3 Lone work by Contractor Personnel in wind turbines is prohibited.

10.17.4 Contractor's plan for working at heights shall comply with ANSI/ASSE Z359.2, *Minimum Requirements for a Managed Fall Protection Program.*

10.17.4.1 While working at heights in wind turbines, at least two Contractor Personnel performing Work at the turbine shall be trained in assisted rescue and self-rescue techniques. All rescue training must be specific to the rescue equipment provided by Contractor for such use.

10.17.4.2 Rescue equipment shall not be used for hoisting.

10.17.4.3 While performing Work in a commissioned turbine, an Automated External Defibrillator ('AED') and fire extinguisher must be present (i.e., in the nacelle when performing Work at heights) and Contractor Personnel must be trained in their use.

10.17.5 Contractor shall have a Dropped Object Prevention Program

10.17.5.1 Pants and shirt pockets shall be empty while climbing. All tools and equipment must be carried in a topped container designed to prevent spillage when inverted.

10.17.5.2 Radios must be holstered and tethered.

10.17.5.3 Appropriately rated tethers or lanyards must be used to secure tooling while it is in use and/or while working next to open hatches, unprotected openings, when Work is being performed from the ladder, or while working on top of the nacelle.

10.17.5.4 Magnetic trays must be used when working with small metallic parts.

10.17.5.5 All hatches must remain closed when not in use.

10.17.5.6 All materials stored in wind turbines must be kept in containers that close and be kept at least four feet from any opening.

10.17.5.7 A drop/fall zone shall be established and delineated commensurate with Work scope, but in no case less than 50 feet from the base of the turbine.

10.17.5.8 When hoisting, containers shall be rated for the intended load, topped and designed to prevent spillage when inverted.

10.17.6 Contractor shall have a program to protect Contract Personnel from the hazards of falling ice from turbines, cranes, and other elevated equipment.

10.18 Energy Storage Facility Specific Requirements

10.18.1 Contractor access to energy storage enclosures shall be limited to authorized Contractor Personnel only.

10.18.2 Contractor shall have a program to train personnel on the significance of different alarms and the corresponding action for personnel to take in case of an alarm while onsite.

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10.19 Substation Facility Specific Requirements

10.19.1 All mobile and aerial equipment requires the use of a spotter when in use in the substation.

11.0 TOOLS

Amended language:

11.2 Use of pocket knives or non-safety utility knives is prohibited. ~~shall not be used for cutting/stripping unless it is impossible to utilize another tool designed for that task. Not having the proper cutting tool available on site is not an excuse for using knives.~~ Cutting tools other than a knife (i.e., wire cutters/strippers, side cutters, snips and other cutting tools) shall always be used first. A safety utility knife with an automatic retracting blade or other means of blade protection would be the second selection. ~~The use of a company issued pocket knife or nonsafety utility knife is only permitted if a safety utility knife or other cutting tool cannot be used.~~ The second option ~~and third option (knives)~~ can only be used in combination with wearing appropriate hand protection, as determined by the Job Briefing.

Additional requirements:

11.4 Grinders shall not be used without machine guarding. Guarding must be installed per manufacturer requirements and appropriate for wheel type.

11.5 Hose safety whip checks shall be utilized on all pneumatic air hose assemblies.

12.0 REPORTING REQUIREMENTS

Amended language:

12.1 Safety Event Reporting: Contractor shall report to Owner all Contractor Personnel safety-related events in accordance with any Jobsite or Work specific contractual arrangements in place between Contractor and Owner or the applicable AEP General Terms and Conditions, and the requirements listed below. Safety-related events include but are not limited to the following:

[Replace existing list with the following:]

12.1.1 Near Miss events

12.1.2 First aid (beyond minor)

12.1.3 OSHA recordable injuries

12.1.4 Fatalities

12.1.5 Arc flash event (those not reported in 12.1.1)

12.1.6 Vehicle incidents, preventable and non-preventable (Owner and Contractor to agree upon reporting threshold)

12.1.7 Spills (any release that makes contact with the earth, or exceeds the local reporting requirements for environmental spills, or any spills that threatens navigable waterways or streams.)

12.1.8 Utility strikes

12.1.9 Energy control errors (Lock Out Tag Out (LOTO), Clearance, and Switching and Tagging)

12.1.10 Visits by a safety regulatory agency

12.1.11 Citations from a safety regulatory agency

12.1.12 Property damage incidents (Owner and Contractor to agree on reporting threshold)

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12.1.13 Equipment incidents (Owner and Contractor to agree on reporting threshold)

Amended language:

12.5 Monthly Reporting: Contractors with a scope of Work greater than or equal to 30 calendar days shall submit monthly reports to Owner that include at a minimum, the following:

[Replace existing list with the following]

12.5.1 Monthly Work hours for all Contractor Personnel

12.5.2 Number and description of monthly OSHA recordable incidents and fatalities, including lost time and restricted days

12.5.3 OSHA recordable incident-rate and OSHA lost time injury rate (year to date and project to date)

12.5.4 Summary of monthly first aid incidents (number, category)

12.5.5 Summary of monthly Near Miss events (number, category)

12.5.6 Summary of monthly vehicle and property damage incidents (number, category)

12.5.7 Summary of monthly Job Site Observations performed per Section 14.0 (number, type, open/resolved)

12.5.8 Description of monthly safety awareness initiatives/campaigns

12.5.9 Description of Contractor's plans to address upcoming Work hazards

13.0 OWNER JOBSITE OBSERVATIONS/AUDITS

NONE

14.0 CONTRACTOR JOBSITE OBSERVATIONS

NONE

15.0 PROHIBITED FROM JOBSITE

Additional requirement:

15.10 Pets are prohibited on all Owner Jobsites.

16.0 AEP POLICIES AND PROCEDURES

NONE

17.0 DEFINITONS AND ABBREVIATIONS

Amended language:

17.2 **AEP General Terms and Conditions** means the applicable AEP general terms and conditions referenced in the Contract which may be one of the following: AEP General Terms for Labor and Services; AEP General Terms and Conditions for Engineering, Procurement and Construction Work; Electric Transmission Texas (ETT) General Terms and Conditions for Labor and Services; OVEC/IKEC General Terms for Labor and Services; or OVEC/IKEC General Terms and Conditions for Engineering, Procurement and Construction

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Work (as amended from time to time). If no separate AEP general terms and conditions are referenced, the capitalized term shall mean the applicable terms and conditions of the Contract.

17.3 **Business Unit (BU)** means for the purposes of these AEP Safety and Health Supplemental Terms and Conditions, a division of AEP that is responsible for providing a product line or service area to the affiliated companies of the American Electric Power System separately identified so each line or service area is considered a business [For purposes of these AEP Safety and Health Supplemental Terms and Conditions: AEP Distribution, AEP Vegetation Management, AEP Generation, AEP Telecom, AEP Transmission, ~~and~~ AEP Workplace Services, and AEP Energy Supply].

Additional definitions:

17.14 **Business Unit Safety and Health Designee** means the AEP Representative designated with authority over safety and health for Work performed for the applicable Business Unit.

17.15 **Contract** means the written agreement creating obligations intended to be enforceable by law by and between AEP and Contractor

17.16 **Contractor** means the entity as specified in the contracting instrument creating the Contract.

17.17 **EMT** means Emergency Medical Technician.

17.18 **EMS** means Emergency Medical Services.

17.19 **Job Briefing** means a discussion of a completed Job Briefing Form led by Contractor Personnel in charge of the job or task that includes all employees on site affected by the job or task scope. At a minimum, the discussion must include: hazards associated with the job, Work procedures involved, special precautions, energy source controls and personal protective equipment requirements.

17.20 **Job Hazard Analysis (JHA)** means a detailed three step analysis that helps eliminate and/or reduce risk. This three-step process breaks each task down into basic job steps, identifies existing and potential hazards associated with each step and provides recommendations/procedures to eliminate, reduce or control hazards, and the option of assessing potential severity.

17.21 **Job Site Observation (JSO)** means a formalized procedure to observe a job task for the purpose of identifying and reinforcing safe behaviors, and eliminating unsafe behaviors. Job Site Observations are not inspections or audits.

17.22 **Near Miss** means an incident in which no property was damaged and no personal injury was sustained, but where, given a slight shift in time or position, damage or injury easily could have occurred.

17.23 **Owner** means any one or all of the companies of the American Electric Power System as may be specified in the Contract.

17.23 **Pre-Work Jobsite Information Summary (PJIS)** means a summary of characteristics, conditions and design information related to the safety of the Work, along with requirements for additional pre-Work planning (e.g., direction on whether Contractor must complete a WSHP and/or a Job Hazard Analysis (JHA)). The PJIS will be provided to Contractor and is intended to provide a basis for initial planning purposes only and Owner does not make any warrant or representation, express or implied, that the PJIS is accurate,

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complete, comprehensive, or all-inclusive, or that items not listed will not be present or pose no threat to Contractor Personnel safety or health.

17.24 **Work Safety and Health Plan (WSHP)** means WSHP is a structured document that details the scope of Work and related safety controls for Owner review.

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AEP	**Natural Gas Venting, Purging, Inerting Procedure**	**Effective Date: 2-1-13**	**Page 1 of 12**

1.0 PURPOSE AND SCOPE

1.1 **Purpose**: This procedure is to:

1.1.1 Ensure that natural gas not be used as the cleaning media for internal pipe cleaning in new construction or cleaning of existing or repaired pipe.

1.1.2 Be used to ensure that natural gas is not introduced or evacuated from process vessels or piping in a manner that would result in a flammable, combustible or explosive mixture inside the vessel or piping.

1.1.3 Ensure that any venting of a flammable gas is performed in a safe manner and that vents discharge to a "Safe Vent Point Location" *(see 2.1.19)*.

1.1.4 Be used as a basis to develop site-specific procedures *(see appendix A for template)* for compliance with NFPA 56. This procedure shall not serve as a substitute for site-specific, system-specific procedures.

1.2 Scope: This applies to AEP Fossil Power Generation facilities downstream of the custody transfer meter where natural gas is used for industrial purposes such as power generation and burner ignition, including new construction. Any deviation from purging requirements must be approved by Plant Manager; One Level above Plant Manager; and Director of Generation Safety and/or their designees.

1.2.1 Applicability

1.2.1.1 This procedure is to be used for new construction as well as maintenance activities that allow process vessels and piping containing natural gas to become exposed to an air atmosphere. To determine applicability, use the Gas Purge Inert Decision Tree found in Appendix D

1.2.1.2 This procedure is to be used for Purging Into Service and Purging Out of Service as defined in NFPA 56.

1.2.2 Non-applicable

1.2.2.1 This procedure does not apply to appliance type equipment such as: ovens, wall mounted space heaters and domestic hot water heaters or where deemed not required per the Gas Purge Inert Decision Tree found in Appendix D.

1.2.2.2 Maintenance work may take place when small leaks from charged natural gas-fed piping or equipment are present. The key determination is if the atmosphere where work is being performed can be maintained below 10% of the LEL. Work may take place, but safeguards such as ventilation, continuous atmospheric monitoring, a hot work permit, fire resistant clothing, and an Emergency Action Plan, must be in place as well.

1.3 Alternative: When applying this procedure and the natural gas cannot be vented to a Safe Vent Point Location or a location that has been deemed safe by an engineering evaluation, then the safeguards defined in section 4.5 must be in place.

2.0 DEFINITIONS AND ABBREVIATIONS

2.1 Definitions:

2.1.1 Continuous Monitoring – The process of sampling the gas being discharged or the piping internal gas concentration at regular intervals to ensure the effectiveness of the purging out of service or the purging into service.

2.1.2 Exclusion Zone – The area around the natural gas venting process that has been cleared of all ignition sources, electrical equipment, hot work, and non-essential personnel.

2.1.3 Flammable Material – Liquids or gases that are considered flammable by National Fire Protection Association (NFPA 704 flammability rating of 1 or higher) or by U.S. Department of Transportation (DOT). Some examples of flammable materials typically used within the AEP Generation system include, Natural Gas, Propane, Propylene, Hydrogen, Acetylene, Gasoline, and Fuel Oil.

2.1.4 Flammable Mixture – A mixture of flammable vapor with air that will sustain combustion.

2.1.5 Gas Detector – A gas monitor, such as Industrial Scientific MX6 or an equal is to be used to verify elimination of oxygen by inert gas purging and complete reintroduction of gas into the system.

2.1.6 Incident Commander – AEP Representative assigned the responsibility of overseeing the venting process.

2.1.7 Inert Gas – A non-reactive gas that is used to displace oxygen and prevent combustion. Examples of inert gases are Argon and Nitrogen. (Note: Carbon Dioxide is used for Hydrogen Cooled Generators).

2.1.8 JSA – Job Safety Analysis. Briefing conducted prior to the commencement of the venting operation with all persons involved in performing the operation to review the procedure, hazards, communication plan and Emergency Response Plan. The JSA discussion will be led by the Incident Commander.

2.1.9 Lower Explosive Limit (LEL) – The minimum concentration of a flammable gas mixed with an air atmosphere that will sustain combustion. Also known as the Lower Flammable Limit (LFL).

2.1.10 Maximum Allowable Operating Pressure (MAOP) - The normal operating pressure of a vessel or piping. The MAOP is typically less than the maximum allowable working pressure (MAWP) established by the manufacturer.

2.1.11 Maximum Allowable Working Pressure (MAWP) – The maximum pressure that a vessel or piping is designed to operate within.

2.1.12 Minimum Oxygen Concentration (MOC) – The oxygen concentration, when oxygen is mixed with a flammable material, below which ignition cannot be supported (also known as Limiting Oxygen Concentration).

2.1.13 Pressure Relief Device (PRD)– A protection device designed to prevent personnel injury and equipment damage from overpressure.

2.1.14 Pressure Purge – The technique of purging process equipment and piping from a zero pressure state by adding an inert gas to the system at a low pressure (typically atmospheric) and raising it to a higher pressure (typically normal operating pressure of the system or 200 psig, whichever is lower) and then venting the system back to the starting pressure. This process is repeated for a predetermined number of cycles to reduce the air concentration below the minimum oxygen concentration level to eliminate flammable conditions.

2.1.15 Purge Cycles – The number of times the pressure purge process is completed to ensure that an air atmosphere that will support combustion does not exist.

2.1.16 Purge Into Service – The act of replacing the air or inert gas in a closed system by a flammable gas.

2.1.17 Purge Out of Service – The act of replacing the normal flammable content of a closed system by inert gas.

2.1.18 Safe Location – an area that is below 10% LEL

2.1.19 Safe Vent Point Location – Natural gas shall not be vented indoors. Natural gas vents are to be located outdoors at elevations 10 feet above any building or structure, including overhead electric lines, within a 50 feet radius column (right-circular cylinder) above the point of discharge. Nearby structures may block air currents and not allow for dilution which, in turn, may allow natural gas being vented to accumulate. If the natural gas were to ignite and explode, a structure typically reflects the blast wave and increases the force of the explosion. In addition, buildings typically have walking/ working platforms that may expose personnel. Overhead electrical lines and, in particular, Transmission equipment is a potential ignition source due corona effects and other operations such as reclosures, and air breakers. In lieu of criteria above, an engineering evaluation shall be used to determine a Safe Vent Point Location.

2.1.20 Sweep Purge – The technique of purging process equipment and piping by adding inert gas at a constant velocity for a specified period of time. The inert gas displaces the flammable gas or air over a period time.

2.1.21 Upper Explosive Limit (UEL) – The maximum concentration of a flammable gas mixed with an air atmosphere that will sustain combustion. Also known as the Upper Flammable Limit (UFL).

2.2 Abbreviations:

2.2.1 AEP – For the purposes of this document, American Electric Power, Inc. and all of its subsidiaries responsible for generating power using fossil fuels.

2.2.2 CEC– Construction Environmental Coordinator

2.2.3 NFPA– National Fire Protection Association

2.2.4 PEC– Plant Environmental Coordinator

2.2.5 P&IDs – Process and Instrument Diagrams

3.0 ROLES AND RESPONSIBILITIES

3.1 Facility Manager shall:

3.1.1 Ensure this procedure is communicated to facility personnel and that they are trained in using this procedure.

3.2 Persons working for or on behalf of AEP Shall:

3.2.1 Be trained in the use of this procedure.

3.2.2 Follow this procedure when process vessels or piping that contains natural gas is exposed to an air atmosphere.

3.3 Supervisors shall:

3.3.1 Conduct a JHA/JSA and ensure that all parameters of this procedure are clearly identified and followed including:

- Number of purge cycles
- Initial purge pressure
- Maximum purge pressure
- Ending cycle pressure
- Appropriate purging equipment
- Final oxygen concentration
- System isolation points (clearance boundaries)
- Inerting location(s)
- Go / no-go, criteria
- Venting location(s)
- Gas detection sample points

3.4 Safety & Health Professionals shall:

3.4.1 Provide resources necessary for supervisors to follow this procedure and conduct the JHA/JSA.

4.0 DETAILS

4.1 General Requirements

4.1.1 Personnel working in the affected area(s) as determined by this procedure shall be informed of the hazards associated with this activity prior to the initiation of any purging/inerting/recharging activities. All non-essential personnel must be removed from the affected area(s) during these activities.

4.1.1.1 Affected personnel shall successfully complete Key Course SAF-Nat Gas Awareness and repeat as defined in the training matrix.

4.1.1.2 Affected personnel shall successfully complete the Key Course SAF-NatGasPurgeVent-O and repeat as defined in the training matrix.

4.1.1.3 Affected personnel shall follow the site specific Job Hazard Analysis (JHA)

4.1.1.4 Affected personnel shall use Mechanical Design Standard document: MDS-PI-20-001 (Nitrogen Purge/Vent Maintenance Tool Assembly) or equivalent to construct the Nitrogen Rig.

4.1.2 P&IDs or Flow Diagrams (whichever is available) shall be assembled for the affected system(s).

4.1.3 SDS or MSDS shall be on hand for the fuel gas as well as the inert purge media.

4.1.4 A thorough assessment of the piping system including determination and evaluation of discharge points, design of temporary piping, location of and access to control valves and the possibility of trapped liquids/solids/deposits shall be prepared.

4.1.5 Any valve which must be operated during this procedure shall be located in a safe location.

4.1.6 Continuous monitoring using gas detectors (Refer to specific gas monitor OEM manual for sample time vs. length of tubing, etc), whether by use of a sample port within the piping system or taking a sample at the point of discharge must be included with steps 4.2, 4.3, 4.4, and 4.5 of this procedure. The monitor shall be located such that levels can be read and recorded from a safe location.

4.1.6.1 The gas detectors are to be configured for the specific measurement needed. For example, when measuring a lean mixture of natural gas, a gas detector configured with oxygen, LEL, and IR sensors is appropriate. The oxygen sensor is used to confirm that the atmosphere is acceptable for the LEL detector to function properly. The LEL detector typically requires at least 10% oxygen to read LEL. The IR sensor is used to measure 0-100% LEL methane in an oxygen deficient atmosphere. It is recommended that dedicated detectors are used for this process and are calibrated and bump tested. When configuring these instruments, one is to be designated for measuring fuel rich mixtures and will be configured only with the IR cell (0-100% Methane by volume) and oxygen since the Catalytic LEL cell will become saturated and quickly be consumed at high concentrations of natural gas. An oxygen sensor is still recommended since high concentration of methane can lead to an oxygen deficient atmosphere. Do not use these dedicated gas detectors for confined space entry since they do not have the standard four gas configuration.

4.1.7 Prior to discharging any gases to the environment, the PEC or CEC shall be contacted to ensure regulatory compliance.

4.1.8 Environmental conditions such as wind, temperature, barometric pressure, topography, and their impact on this procedure shall be evaluated.

4.1.9 Control of ignition sources within the affected area(s) such as smoking, hot work, and static electricity (bonding and/or grounding) shall be addressed.

4.1.10 A communications plan for this procedure which addresses topics such as emergency response, general facility notification of procedure start/stop, and notification of local emergency responders shall be prepared.

4.1.11 Personnel responsible for using monitoring instruments as part of this procedure shall have training on the equipment that will be used.

4.1.12 Where an inert gas is to be used with this procedure, the possibility of an asphyxiating atmosphere exists. A plan to prevent personnel from being exposed to oxygen-deficient atmospheres shall be developed in conjunction with this procedure. All personnel using this procedure shall be informed of the hazards of nitrogen/inert gas through a detailed JSA discussion regarding the hazards and controls to prevent exposure.

4.1.13 Site-specific, system-specific procedures *(see Appendix A)* shall receive an independent safety validation, and the safety validation shall be approved by the Facility Manager prior to the conduct of any purging/inerting/charging activities covered under this procedure.

4.1.14 During the execution of these procedures, atmospheric monitoring with a gas detector is to be conducted as close as practical to the 50' zone around the gas vent location. For vents that are located in safe locations, this is to be conducted as a first time evolution to validate the procedure. Periodic reviews or spot checks of these safe location vents should be conducted to ensure the effectiveness of this procedure. These will be based on the frequency of the use of the procedure and the previous results. The Facility Manager will use these effectiveness tests to review the site's procedures.

4.1.15 Establish Go / NO Go Criteria such as: inverted atmosphere (fog), rain, lightning, or if personnel cannot be located or removed from exclusion zone. Action levels at 10% LEL and 25% LEL must be clearly identified.

4.2 <u>Purge Into Service:</u> Prepare equipment for initial fill or reintroduction (charge/pack) of natural gas {equipment starting in a 100% air-state condition}.

4.2.1 The system is to be controlled by a clearance permit.

4.2.2 Nitrogen is to be used to purge the air from the system and provide an inert atmosphere inside the piping/vessels prior to introduction of natural gas.

4.2.3 Nitrogen may be delivered from cylinders, tube trailers, or cryogenic storage depending on the size of the system to be placed into service.

4.2.4 For inerting, nitrogen is controlled at pressures to optimize purging while preventing overpressure of the system. Table 1 (below) lists the maximum nitrogen pressure, pressure relief device setting, and number of pressure purge cycles for typical maximum allowable operating pressures.

4.2.5 Natural gas vents are to be located outdoors at elevations 10 feet above any building or structure, including overhead electric lines, within a 50 foot radius column (right-circular cylinder) above the point of discharge.

4.2.6 With the vent valve closed and the nitrogen purge valve open, slowly open the nitrogen flow valves to allow the system to reach the nitrogen purge pressure as determined in Table 1 (below) based on the system's maximum allowable operating pressure.

4.2.7 Close the nitrogen flow valve and hold for approximately 10 to 15 minutes to allow the gases to mix.

4.2.8 Use approved leak-testing medium (Snoop®, RC Snoop®, and/or Sherlock5®) or other leak testing procedure (i.e. ultrasonic leak detection, helium test, etc.) to check for leaks in the piping system being placed into service. Leak testing shall be performed on any section of piping which is disturbed and any other areas with suspected or probable leaks. Leak testing is to be performed to avoid the need for another inerting purge cycle after the system is purged into service to make repairs on additional leaks. Depressurize the system and repair any leaks before proceeding.

4.2.9 Slowly open the nitrogen vent valve allowing the system to displace the air and nitrogen mixture and reach a pressure of approximately 0 psig.

4.2.10 Repeat steps 4.2.6 through 4.2.9 for the number of pressure purge cycles as indicated in Table 1 for the nitrogen purge pressure and system maximum allowable operating pressure. When using the same connection for the nitrogen introduction and to vent the system down, additional purge cycles may be required than the number listed in Table 1.

Table 1 – Purging	MAOP 40psig ≤ 80psig	MAOP >80psig ≤ 200psig	MAOP >200psig ≤ 1000psig
N2 Purge Pressure	35 psig	80 psig	200 psig
Into Service Purge Cycles	**3**	**3**	**2**
Out of Service Purge Cycles	4	3	2
Purge System Pressure Relief Device (PRD) Setting	40 psig*	100 psig*	250 psig*

*If the purge system PRD setting is greater than the MAWP (Maximum Allowable Working Pressure), this table cannot be used. Must use engineering calculation worksheet (Appendix C) and a properly sized PRD for the system.

4.2.11 Close the nitrogen vent valve.

4.2.12 Vent down the nitrogen fill hose and disconnect the nitrogen purge system from the system that was purged and inerted.

4.2.13 Measure the oxygen concentration with the gas detector to ensure the oxygen concentration is below 5% (see Appendix B).

4.2.14 The system is ready for gas introduction.

4.2.15 With the system purged of air and inerted, verify that there is natural gas supply pressure and a calibrated and bump tested gas detector that will measure natural gas in nitrogen (i.e. utilizes an infrared, or IR, sensor). The range of the instrument must be 0 to 100% methane by volume. The detector must also be equipped with a sample pump.

4.2.16 Locate the sample point in the vent line that will be used to monitor natural gas introduction. The sample point shall be brought to a safe location for personnel to access throughout the gas charging procedure.

4.2.17 Place the gas detector sample tube into/near sample point and begin gas introduction.

4.2.18 Slowly open the natural gas supply valve to the system and purge nitrogen from the system with natural gas through the vent.

4.2.19 Closely monitor the gas detector watching for natural gas breakthrough (the reading will change from 0%).

4.2.20 The purging process is complete when the gas detector reads 90% by volume or greater.

4.2.21 Close the natural gas supply valve and natural gas vent.

4.2.22 As an alternative for systems that are controlled by Burner Management Systems or Turbine Gas Control Systems, those systems may be placed into service directly from the inert gas state at zero pressure to charging of natural gas to the operating gas pressure state without venting gas to bring the gas composition to the minimum 90% methane level. This is an alternative permitted under NFPA 56 rules where systems with a fuel/burner management system permits and controls a lean fuel mixture during startup.

4.3 Purge Out Of Service: Preparing equipment for maintenance (venting and purging, system that is in the 100% natural gas state).

4.3.1 The system is to be controlled by a clearance permit.

4.3.2 The natural gas that is in the system is to be vented to a Safe Vent Point Location.

4.3.3 The amount of gas to be vented is to be kept to a minimum. Consider consuming as much gas as is possible in the fueled process (i.e. by gradually lowering system pressure as the unit is running, provided it will not impact flame stability or operability) prior to conducting the maintenance activity.

4.3.4 Isolate the natural gas supply from the system to be maintained.

4.3.5 Slowly vent down the natural gas until the system reaches a zero psig state. Take a pressure reading at this time and note this as time zero. The value should be approximately 0 psig.

4.3.6 Install a low pressure pressure gauge to detect a small increase in pressure due to leakage (Dwyer series LPG4 0-35" water column gauge or equivalent). Close the vent valve and allow the system to stabilize for approximately 5 minutes. Take a pressure reading at this time. Ideally this pressure should be approximately 0" water column, indicating that the supply valve has zero leakage. A pressure rise of 15" water column or greater over a 5 minute period may indicate the boundary isolation valves may not be holding and requires a more in-depth questioning attitude.

4.3.7 Nitrogen is to be used to purge the residual natural gas from the system and provide an inert atmosphere for the maintenance activities.

4.3.8 Nitrogen may be delivered from cylinders, tube trailers, or cryogenic storage depending on the size of the system to be placed into service. Careful planning is required to match the source of nitrogen (cylinders, tube trailers, cryogenic supply) for the specific job that is going to take place.

4.3.9 For inerting, nitrogen is controlled at pressures to optimize purging while preventing overpressure of the system. Table 1 lists the maximum nitrogen pressure, pressure relief device setting, and number of pressure purge cycles for typical maximum allowable operating pressures.

4.3.10 Natural gas vents are to be located outdoors at elevations 10 feet above any building or structure, including overhead electric lines, within a 50 foot radius column (right-circular cylinder) above the point of discharge.

4.3.11 With the vent valve closed and the nitrogen purge valve open, slowly open the nitrogen flow valves to allow the system to reach the nitrogen purge pressure as determined in Table 1 based on the system's maximum allowable operating pressure.

4.3.12 Close the nitrogen flow valve and hold for approximately 10 to 15 minutes to allow the gases to mix.

4.3.13 Slowly open the nitrogen vent valve allowing the system to displace the air and nitrogen mixture and reach a pressure of approximately 0 psig.

4.3.14 Repeat steps 4.3.11 through 4.3.13 for the number of pressure purge cycles as indicated in Table 1 for the nitrogen purge pressure and system maximum allowable operating pressure. When using the same connection for the nitrogen introduction and to vent the system down, additional purge cycles may be required than the number listed in Table 1.

Table 1 - Purging	MAOP 40psig ≤ 80psig	MAOP >80psig ≤ 200psig	MAOP >200psig ≤ 1000psig
N2 Purge Pressure	35 psig	80 psig	200 psig
Into Service Purge Cycles	3	3	2
Out of Service Purge Cycles	**4**	**3**	**2**
Purge System Pressure Relief Device (PRD) Setting	40 psig*	100 psig*	250 psig*

*If the purge system PRD setting is greater than the MAWP (Maximum Allowable Working Pressure), this table cannot be used. Must use engineering calculation worksheet (appendix C) and a properly sized PRD for the system.

4.3.15 Close the nitrogen vent valve.

4.3.16 Measure the system contents with the gas detector that is configured with the 0-100% LEL Methane IR to ensure that it is at or below 10% of the LEL of methane.

4.3.17 Vent down the nitrogen fill hose and disconnect the nitrogen purge system from the system that was purged and inerted.

4.3.18 The system is ready to perform the maintenance activities. Danger: Pure nitrogen is heavier than air. Asphyxiation can occur when there is a static head in the piping (vertical runs of pipe) and when there is work being performed below the release area, allowing nitrogen to flow to the work area; therefore, nitrogen shall be air- purged to remove such hazard

4.3.19 When the maintenance work is completed, follow the steps in 4.2 to purge into service.

4.4 Sweep Purge – Sweep purging can only be performed on systems that have injection fittings and vent fittings at the extremities of the piping section. The sweep purge introduces a gas (inert gas in purging out of service) into one end of the piping section and in a slow, controlled manner and shoves out the gas that is inside of the piping system thru the vent at the opposite end of the piping section. In a straight piping

section where little mixing occurs, a volume of purging gas greater than the internal volume of the piping is required to shove out the gas being removed. In piping sections where there are complex piping configurations, differing piping sizes, vessels as part of the section, liquid traps, and elevation changes significantly, an amount of purging gas many times the internal piping system volume is required. Dead legs, closed branches, and large eddy spaces are to be avoided.

4.4.1 When the sweep purge technique is selected for purging a flammable gas piping system into or out of service, substitute the sweep purge at steps 4.2.6 and 4.3.11 and follow the steps below.

4.4.2 Nitrogen may be delivered from cylinders, tube trailers, or cryogenic storage depending on the size of the system to be placed into or out of service.

4.4.3 In sections with relatively straight and same diameter piping starting at 0 psig in the piping, use a low pressure purge (20 psig at injection point) and introduce 2 times the volume of purging gas as the internal volume of the pipe. Ensure that the regulator pressure is set prior to use to prevent stratification of the natural gas and nitrogen.

4.4.4 In piping sections that have non-uniform piping diameters, vessels as part of the piping section, or elevation changes, inject purging gas at a higher pressure (max. operating pressure of the section or 100 psig, whichever is lower) to provide mixing of the purging gas and gas initially inside the piping section. Inject at least 4 times the volume of purging gas as the internal volume of the pipe.

4.4.5 At the completion of injection of gas (in 4.4.3 or 4.4.4), sample the composition of the gas at the vent to ensure that the gas concentration expected is attained (less than 10% of the LEL of methane when purging out of service, and less than 5% O_2 when purging into service).

4.4.6 Vent to a Safe Vent Point Location.

4.5 <u>Vent Not to Safe Location Requirements</u>

4.5.1 Establish an exclusion zone beginning 10 feet below the point of discharge and extending in a radius of 50 feet (right-circular cylinder) around and above the point of discharge. During the purge process, remove or isolate all potential sources of ignition inside the exclusion zone.

4.5.2 Procedures written for the venting process shall include emergency response planning, incident command roles and responsibilities, JHA/JSA and PPE.

4.5.3 Atmospheric monitoring (weather conditions), continuous gas monitoring of the exclusion zone boundaries, and go / no-go criteria (such as lightning near the venting activity) are to be part of the venting process safeguards.

4.5.4 Intrinsically rated (Class I, Div. 1, Group D) radios, lights and Gas Detectors must be used.

4.5.5 Only Gas Detectors with a recent calibration and bump-tested prior to the venting operation shall be used. Redundant Gas Detectors which display combustible gas levels in % LEL are required.

4.5.6 Establish roles and responsibilities including an Incident Commander.
4.5.7 Conduct a JSA prior to conducting the venting operation.
4.5.8 Communication with local emergency responders shall be established.
4.5.9 PPE requirements (such as hard hat, safety glasses, safety toed shoes, Fire Retardant (FR) top layer, FR or cotton under layer and hearing protection) within the exclusion zone and outside of the exclusion zone shall be identified.
4.5.10 Communication and alarm requirements such as use of the phonetic alphabet and three way communication techniques shall be clearly defined.
4.5.11 Establish a headcount system, evacuation routes and muster points.

5.0 REFERENCES

5.1 Crowl, Daniel, Chemical Process Safety: Fundamentals with Applications, Prentice Hall, 1990
5.2 NFPA 56PS, Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems 2012 Edition
5.3 Key Course SAF-NatGasAwareness-O (online)
5.4 Key Course SAF-NatGasPurgeVent-O (online)
5.5 Mechanical Design Standard document: MDS-PI-20-001 (Nitrogen Purge/Vent Maintenance Tool Assembly)

6.0 APPENDICES

6.1 Reference A: Frequently Asked Questions
6.2 Appendix A: Site Specific JHA templates for Pressure Purge & Sweep Purge
6.3 Appendix B: MX-6 Dilution Tube Use
6.4 Appendix C: Engineering Calculation Worksheet
6.5 Appendix D – Gas Purge Inert Decision Tree

7.0 REVIEW AND REVISION HISTORY

7.1 Annually or more often if required to address management of change

DATE	REVISION #	COMMENTS	REVIEWER
1-1-2013	Rev 0	Original	Gas Vent Team

Appendix A: Site Specific JHA templates for Pressure Purge & Sweep Purge
CTRL + Click Link Here =➔
http://ehap/Pages/LaunchJHA.aspx?JobId=8860

Appendix B: MX-6 Dilution Tube Use
Copy web address below and paste in browser =➔
http://aepsharepoint/EnvSafetyandHealth/shdocs/Shared%20Documents/Dilution%20Tube%20Instructions.pdf

Appendix C – Engineering Calculation Worksheet
CTRL + Click Link Here =➔
http://aepsharepoint/EnvSafetyandHealth/shdocs/Lists/Natural%20Gas%20Safety/AllItems.aspx

Appendix D – Gas Purge Inert Decision Tree
Copy web address below and paste in browser ➔
http://aepsharepoint/EnvSafetyandHealth/shdocs/Shared%20Documents/Gas%20Purge%20Inert%20Decision%20Tree.pdf

Pre-Work Hazard Assessment (PWHA)

Work Description:	New gas interconnection
Work Location:	Big Sandy Plant

The scope of this Work may involve certain hazards requiring Contractor to implement controls to eliminate or mitigate personnel exposures. The hazards and hazard-producing activities checked below are anticipated as best as can reasonably be determined by Owner to be those with the potential to pose risks to safety and health during the Work. This list has been developed by Owner for its and Contractor's initial planning purposes only. No claim or representation is expressed or implied that it is comprehensive, all-inclusive, accurate, or complete, or that items not listed will not be present or pose no threat to personnel safety or health. If selected below, ensure that the contractor and contractor oversight reads and understands the applicable AEP Policies and Procedures.

* May require site permit ** Reference AEP Contractor Safety Site

Work Activities

✓	*Numerous, deep, or complex excavation or trenching*		Diving operations	✓	Special PPE Requirements
	Drilling, auguring, boring, or other soil disturbances in areas with congested buried utilities	✓	Prolonged work in tight or awkward locations (ergonomics)		Other items list below
	Working over water		Cutting: ** *Knife Policy Requirements*		
	Operating equipment under or near overhead power lines		*Open, installing, removing grating*		
	Crane use Tons Reach Lift ** *C-OI - Rigging and Hoisting*		*Demolition*		
	Multiple cranes operating simultaneously - ** *C-OI - Rigging and Hoisting*		Helicopter operations		
	*Exposed energized electrical lines or equipment ** *C-OI-Electric Lines and Equipment Clearance*		Pile driving		
	Working at heights - ** Fall Protection Requirement FAQ		Water impoundment (dam, dike, etc.)		
	Scaffolding _____ ft **Gate Req/Suspended Scaffold Rigging/15' Procedure*	✓	Heavy earth-moving equipment		
✓	Stacked work (i.e., working above & below)	✓	*High pressure (air, water, steam, gas)*		
✓	*Permit-required confined space entry* #_____	✓	*Clearance Permit* #_____		
	Explosive use/blasting		*Hot work*		
✓	Highly flammable gases or chemicals _____		Arc Flash		

Worksite Conditions

	High water table, site subject to flooding, or heavy rains	✓	Abandoned-in-place utilities or equipment
	Contaminated soil or water		Low lighting
	Congested work site	✓	Vehicular traffic
✓	Adjacent activities:	✓	Working around Moving/Operating/Energized Equipment
	Combustible dust		Other items list below
	High winds		
	Ice/snow/freezing temperatures		
✓	Rugged, uneven, treacherous terrain or site conditions		
✓	Animals/insects		

Human Performance

✓	First time evolution New/ Inexperienced Workforce Plan		Error Traps _____
	Schedule ** "13 Day Rule " S&H T&C Section 3.8		Other items list below
	Non-English Speaking Employees Bilingual Action Plan	✓	Questioning attitude
	Confusion/Mix-up potential (labeling, look-alike equipment, etc	✓	Stop when uncertain
✓	Distractive environment		

Environmental/IH

	Arsenic**		IDLH atmosphere
	Asbestos		Legionella/biological – circulating water
	Chemical		PCB
	Cadmium**		Lead**
	** Negative Exposure Assessment/Weld fume Specifics	✓	Plants/Weeds
✓	Heat stress		Mercury
	Hazardous Waste		Radiation (ionizing & non ionizing)
	Herbicide/pesticide		Silica
	Hexavalent Chromium**		Welding Fume** (Welding, Cutting, Brazing Policy Section
	Anhydrous Ammonia**		Other items list below
	Noise Current/existing _____ db		
	Noise created during work _____db		

Owner will use the Generation Guideline Implementation of Generation Contractor Supplemental Safety and Health Requirements to determine whether work requires the preparation of a HASP. If a HASP is determined to not be needed (per Decision Flow Chart), the selected contractor will be required to prepare a comprehensive Job Hazard Analysis (JHA) prior to starting work, in accordance with the Safety and Health Requirements. Owner, at its discretion, may waive the HASP requirement if all of the following conditions are met:

1. Low or Limited exposure to the following
   a. Hazardous energy (such as electrical, pneumatic, hydraulic, etc)
   b. Crane use or any rigging or hoisting
   c. Excavation
   d. Working at heights greater than 6' without primary fall protection (i.e., handrail)
   e. Asbestos
   f. Confined Space Entry
   g. Lead or Heavy Metals, including fumes
   h. Potential for high severity consequences
2. Contractor safety and health manual which adequately covers the scope of Work.
3. Contractor prepares a quality JHA for the Work.
4. Contractor demonstrates effective hazard control.
5. Contractor has an effective safety and health training program for its employees.

In accordance with the PWHA and the above guidelines, the contractor who will be selected to perform this work:

☑ is required to prepare a Health and Safety Plan (HASP) and follow the Safety and Health Requirements in their entirety.
☐ may prepare a comprehensive Job Hazard Analysis (JHA) in lieu of a HASP and paragraph 2.11 applies.
☐ is exempt with management approval (see below)

The HASP and/or JHA(s) shall be submitted to Owner for review and discussion before Contractor may start work.

AEP Rep. Signature: Patrick Young Date: 08/25/2025

---------- **ONLY REQUIRED IF EXEMPT** ----------

Name: _____

Signature: _____

Exemption Expiration Date: _____

Note: Any contractor waived from the Safety and Health Requirements Rev 9 shall be done so in writing by the Facility Manager or Department manager (i.e. Plant manager, EP&FS section or department manager) or designee.

Services that could be considered for exemption may include;

ID	TYPE OF CONTRACTOR SERVICE
1	AERIAL SURVEYING
2	ASH SALES AGREEMENTS - Customer/Company has personnel reporting to a plant on a daily basis to perform service contract duties associated with buying/selling Combustion Coal Products.
3	ASH SALES AGREEMENTS - Customer/Company activities associated with Contractors entering plant on a short-term, daily basis for work that could include the plant loading of customer/company trucks.
4	ASH PICKUP BY LOCALS FOR BACKFILL OR BY COUNTY / CITY / STATE FOR USE ON ROADWAYS
5	COPIER, OFFICE OR JANITORIAL SERVICE IN OFFICE OR SERVICE BUILDING
6	ENGINEERING / DESIGN SERVICES
7	ENVIRONMENTAL/GENERAL CONSULTING, MONITORING, AND/OR INSPECTING SERVICES INCLUDING SURVEYING - Except for those activities that may disturb the earth through drilling, shoveling, and/or motorized vehicle traffic.
8	DELIVERY, INSPECTION AND REPAIR OF RENTAL EQUIPMENT
9	MATERIAL DELIVERY OR WASTE HAULING
10	LAWN OR LANDSCAPING SERVICE
11	ON SITE NURSING OR SECURITY SERVICES
12	ROAD MAINTENANCE INCLUDING SNOW REMOVAL EXTERIOR OF PLANT MAIN GATE AND PAVING
13	NO COST SERVICE AGREEMENTS TO ALLOW A VENDOR TO COME ONTO OUR SITES FOR A SITE VISIT, PRE-BID MEETING, ETC.
14	TRAINING PROVIDERS (ONSITE OR OFFSITE)

GEK110843G

GE Power

Cleanliness Requirements for Power Plant Installation, Commissioning, and Maintenance

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the GE Company.

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I. INTRODUCTION

A. Purpose and Scope

This document provides acceptable methodology and criteria for the project to define cleaning procedure.

To provide general rules and guidance for field activity and users regarding system cleanliness acceptance criteria for power plant installations, commissioning and maintenance. Cleanliness issues during manufacturing, installation, and commissioning can cause delays in delivery, performance degradation, and unit damage.

B. General

Technological advancements in the field of power generation have raised the level of importance for maintaining system cleanliness during all phases of manufacturing, installation and operation. Each improvement to efficiency and reduction in emissions require a further tightening in clearances and reduction in the margins for error. The level of cleanliness control which the new power plant installations demand, require a change in the approach to maintaining system cleanliness.

System cleanliness must be a plant lifetime approach ranging from inception to plant operations and maintenance. Strict, in-process controls to prevent contamination and to maintain the system cleanliness level are essential to the successful installation and long-term reliability.

The best practices learned during installations have decreased the average amount of time required to deliver a cleaner, more robust system. Applying these practices is important to obtaining expected performance and equipment life.

IMPORTANT:
Even if cleaning operation is planned, the system shall be maintained clean all along the project lifecycle (manufacturing, storage of equipment, installation, cleaning operation, commissioning and maintenance). Final cleaning operation may not allow complete removal of large debris, particles and rust contained into a system if the cleanliness process and preservation have not been properly implemented along the project life cycle

II. DEFINITIONS AND CONTROL

The purpose of performing a flush or air/steam blow is to remove foreign material from a system or component. Foreign material is defined as any material or object that should not be on or within the system hardware (Figure 1).

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Figure 1. Metal Shavings found in piping following the Fitting Process

A. System Criticality Definitions

Cleanliness control levels will be defined in three categories: Critical, Controlled, and Foreign Material Exclusion (FME). If the system medium flows through components that can be considered to fall into more than one of these categories, the overall requirements for the entire system are categorized to the higher level of control.

Critical systems are defined as those systems where contamination of the system can cause a catastrophic failure. These systems require additional attention to ensure that system integrity is maintained.

Controlled systems are defined as those systems where contamination will cause degradation in unit or component performance or reduced component life.

Foreign Material Exclusion systems are defined as those connected to and have the potential to contaminate systems that are Critical or Controlled. Drain piping is an example of a foreign material exclusion system

B. Control of Foreign Material

To most efficient method of maintaining system cleanliness is to prevent entry of foreign material into system piping or components during installation and maintenance. The following steps should be observed to prevent entry of foreign material into Power Plant systems:

- Temporary covers or plugs (FME covers) shall be installed on all system piping, components, or tank connections opened for work or inspections, except during the time the opening must be uncovered to perform the evolution. This requirement also applies to material in staging and lay down areas.
- During storage phase, piping must be correctly stored, capped and protected against weather. GEK28156 shall be referred for preservation guidelines.
- FME covers shall be such that they cannot fit inside the system opening or have an installed capture device that guarantees their retrieval prior to component installation. The FME cover should cover the entire system opening. FME covers shall be constructed of a rigid, non-fibrous material. The use of wood, especially chip board or plywood, is not a recommended material as it

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can splinter or shed and deposit material within the system. The use of rags or foam is also not a recommended practice (Figure 2 and Figure 3). The soft material may be pushed into a system opening thus becoming foreign material. Tape may be used to fasten the covers in place, but should not be used as a sole source of material exclusion.

- When the work is complete and prior to removal of the FME covers, inspect and thoroughly clean the work area to ensure that no foreign material is present. This includes the removal of loose or flaking rust and residue from grinding, chipping, welding, blasting, or other maintenance activities. It is important that FME devices be accounted for when system closeout is performed.
- Following fit-up of piping or installation of vital system components, a Quality Assurance or individual of supervisory authority should closeout and certify the cleanliness of that portion of the system.



Figure 2. 12" Piece of Foam Material used as an FME Cover, Removed from a Pipe Using Air Blows (Material was not detected during visual inspections)



Figure 3a. Examples of FME Covers utilizing Paper, Linen and Plastic Bags (Not a Recommended Practice)

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C. In-Process Controls

A pareto of system contamination PAC case root causes show inadequate in-process controls to be a leading contributor. Understandably, it is necessary to remove FME covers to perform different maintenance and installation related evolutions. When the covers are removed, appropriate measures should be taken to prevent the introduction of foreign material as a result of the evolution.

All tools and maintenance related material and debris should be removed from the work area and be accounted for prior to replacing the FME cover on the system opening. This requirement would also apply to any material that is to be installed into a system. During maintenance evolutions, care should be taken to prevent foreign material from entering areas that are inaccessible for cleaning and visual inspections. Finally, visual inspections remain an excellent traditional manner of detecting foreign material. This is discussed later in the article.

D. Prohibited material and cleaning equipment

Steel wool, abrasive material, scotch brite materials are prohibited for use to clean the systems in direct connection to the machine,

Deburring tool shall be used to clean the tubes and piping.

E. Clean installation process

1. Material reception and storage

Inspect on site the piping raw material, the prefabricated piping and the equipment from factory: check cleanliness, internal surface state and caps (FME) are applied refer to 362A2412.

In case material cleanliness level is not satisfying, define a cleaning method according to piping pre-fabrication cleanliness guidelines defined in 362A2412.

2. Prefabrication

In case of raw material, prefabrication of the pipe spools on-site is beneficial by allowing pre-cleaning outside the final installation area. Keep working area clean and air blow during pre-fab using compressed air (dry, oil free and filtered air is mandatory). Cleanliness criteria shall meet according to 362A2412.

3. Installation

During installation on site, never leave the pipe open and always maintain the FME caps. When pipes are fitted, seal the gap with tape if not immediately welded. In case of pipe adjustment in situ (cutting & beveling), perform the operation away from the already installed piping when possible. If not, surrounding piping shall be protected. Those modified piping shall be air blown after adjustment and before final closing. Use vacuum cleaner to clean if necessary. Particular care shall be observed regarding welding dams for gas purging. Throughout installation process, perform regular piping internals inspection

4. System cleanliness check

Visual inspection of the welds, borescope is strongly recommended, if cleaning operation required, refer to 362A2412. Hold point (ITPL) shall be defined for inspection prior to each final weld fit-up. Visual inspection of the complete pipe internals with borescope is strongly recommended. Perform final air blow of complete piping system prior pressure test. Flushing hardware can be part of the blown system, can be used to discharge the dirt outside the system. After final installation, perform a

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visual inspection and boroscopic inspection. If cleanliness criteria are not meet, please perform a cleaning operation according to 362A2412 until criteria is met. e. Pressure test the system according to the MLI 0204.

III. LUBRICATING/HYDRAULIC OIL FLUSHING AND ACCEPTANCE CRITERIA

Bearing lubricating oil, hydraulic, lift, seal and trip oil systems are considered as **Critical systems.**

Critical oil systems medium is to be maintained at NAS class 6 or better (refer to Table 1 and Table 2) with water content of <100 ppm (.01%). For sampling practice please refer to GEK32568. Besides NAS Class test, all critical oil system feed lines can be considered acceptable when each feed line individually passes two consecutive strainer mesh tests one hour apart. The following acceptance criteria shall be fulfilled for acceptance of clean screen test (100 mesh strainer).

- Use "naked eye" under normal lighting.
- No magnification or backlighting to be used.
- No hard particles (metallic, sand, etc.) are present in screen (hard particles in any size or any quantity are NOT acceptable).
- Small particles <300 microns that are soft (elastomeric) or crushable with fingernail are acceptable in quantities 3 or fewer per 1 hour flush.

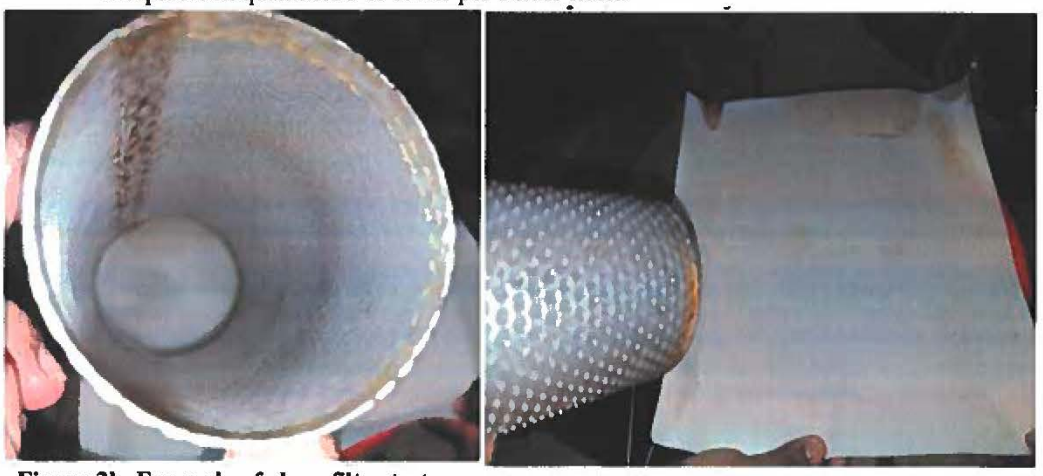

Figure 3b. Example of clean filter test

The 100 mesh bypass strainer may be inspected using 'naked eye' by cleaning the strainer in a spray bottle/clean bcuket with the solvent and flush this contaminated solvent in a coffee filter where the partcles can be easily visible using "naked eye" under normal light.

The following specific flushing procedures defines the detailed segment wise preliminary and phased flush sequences to attain required cleanliness level and these shall be referred based on unit configuration as applicable. When one of the following equipment/project specific flush procedure is applied to the project, these specific GEK's/procedures shall take precedence over this GEK.

GEK121901, Flushing Recommendations, Lube oil system for STF (STEAM TURBINE FRAME) Steam Turbine with SPL (Structured Product Line) Generator
GEK116944, Flushing recommendations, Lube oil system with the units having feedlines inside the drain piping (Guarded piping).

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MLI A125 Lube oil flushing instructions – Multi shaft GT & Generator.
For single shaft units, project specific lube oil system flushing procedure shall be referred.

A. General Guidelines on Flushing

Flushing must take place after piping installation, but prior to system operation. The success of an oil flush is dependent on: Success of efforts to keep contaminants out during storage, fabrication and assembly phases, and the proper conduct of the flush. Clean installation will lead to a successful flushing meeting acceptance criterion in a minimum of time with a minimum of effort.

Before starting cleaning operation, the system shall be prepared:

- All bearings and critical equipment shall be bypassed (bearings, Rexroth, float trap....)
- All opening inspected and cleaned. All piping sections that are not flushed must be inspected (Borescope/visual). All inspections shall be documented.
- Permanent Lube Oil skid is most often used for flushing and an external flushing skid may be used if it has same or higher flow capacity than permanent skid.
- LO skid preparation: Strainer installed upstream heat exchangers, filters cartridges installed, flow restriction as orifices shall be removed, pressure regulating valve fully open, lift oil pumps & block bypassed for initial flush.
- Tank shall be cleaned prior first filling, Oil to be filtered at tank first fill with a strainer mesh ($\beta 10=200$) installed between the tank and tanker truck, oil characteristic shall be verified per GEK called on P&ID

Once system is ready, flushing operation can be started:

- Initial startup to test all lines for leakage, with end line strainer mesh removed (except SDE & BDE at initial start where meshes are installed to prevent contamination of BDE/SDE, piping between end line filters to BDE/SDE shall be inspected free of foreign object prior flush start).
- **Preliminary flush**: Flush all supply lines with max available flow (2 pumps intermittently) to maximize the flow in common supply and return lines to remove larger debris (with no mesh installed in flushing bypass except for GEN to protect BDE/SDE), after a certain period (depending on the configuration) flush the line by segment and record results (pumps amps VS number of lines flushed). Minimum duration 24 hours per bearing (of running operation/alternating every 3 to 5 hours). All along flushing operation oil temperature and flow rate shall be maintained as required high to ensure TURBULENT flow. Lift oil module (pumps and block) are bypassed for preliminary lift oil flush that is performed with lube oil pump)
- **Phased flush**: Flush each segment alternatively and separately, without strainer mesh installed, flow must be TURBULENT. During phased flush, lift oil pumps shall be used to ensure the max TURBULENT flow on each lift oil line and perform validation phases (Flush hardware shall withstand lift oil pressure and interlock of lift oil pump to run on LO feed pressure shall be active). Flush each lube, seal and lift oil feed line using lube oil pump and lift oil pump for 24 hours per flush sequence defined in the project specific flush procedure.
- Flushing records shall be maintained during entire flushing duration, NAS value per line at validation (date, time...), filter clean screen test validation (date, time, signed off by GE representative)
- Tank shall be drained, cleaned and inspected for cleanliness after flushing.
- System restoration, system reconfiguration shall be performed under FME. Specific check list to validate: cleanliness of all sections not flushed, ensure no contamination during reconfiguration, ensure all critical components are correctly re-installed per drawing (orifices, type of gasket, skid component, piping systems, system setting restored).

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- All piping sections not included in the flushing operation must be hand cleaned and inspected. All openings shall be inspected. FME applied. All inspection must be documented. Including piping in the pedestals/bearings (when possible).
- Perform final inspection and check list sign off before final closing of each line
- No modification on the system shall occur after the flushing, in case of modification the system shall be re-flushed and cleanliness shall be validated.

B. Recommendations

Air Blows - In an effort to remove debris resulting from fabrication, storage, and installation, sites should perform air blows on system piping during the installation process. The piping should be blown down during initial fit-up and prior to final installation. The air used for the blows can either be instrument air or clean dry air from an off-base air compressor. After the pipe is installed, any open ends should be capped using a suitable FME cover. This procedure can be applied to nearly any system during the fit-up phase of installation as a useful precautionary measure. Figure 5 and Figure 6 show the effect of proper air blows on flushing effectiveness.

Flush velocity and oil temperature - For Lube oil and Seal oil, general rule is to maintain minimum flush velocity of 15 ft/s in each segment. In order to effectively flush small bore lift oil lines, turbulent flow based on pipe size as given in table 5 is required to flush lift oil lines. The lube oil shall be heated to 140°F - 170°F (60°C – 77°C) for both Preliminary and Phased flush. Temperature cycling is effective in dislodging particles. Temperature cycling of piping will inherently occur as part of the sequencing process from one segment to another as the isolated segment will cool and then reheat when next segment valved in.

Size	SCH	ID (IN)	Min Flow (GPM) required to achieve Turbulent Flow at 160F (Re > 4000)	Min Flow (GPM) required to achieve Turbulent Flow at 140F (Re > 4000)
NPS 2"	XXS	1,503	23,01	31,84
NPS 2"	160	1,687	25,83	35,74
NPS 1.5"	XXS	1,1	16,84	23,31
NPS 1.5"	160	1,338	20,49	28,35
NPS 1.25"	XXS	0,896	13,72	18,98
NPS 1.25"	160	1,16	17,76	24,58
NPS 1"	160	0,815	12,48	17,27
NPS 1"	80	0,957	14,65	20,28
NPS 3/4"	160	0,612	9,37	12,97
NPS 3/4"	80	0,742	11,36	15,72
NPS 1/2"	160	0,466	7,14	9,87
NPS 1/2"	80	0,546	8,36	11,57
NPS 3/8"	160	0,3	4,59	6,36
0.5" Tube	0.065 wall	0,37	5,67	7,84

Figure 3b. Turbulent flush flow rates

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Vibrator - Vibrating and/or hammering the piping while circulating oil is very effective at loosening and dislodging scale, trapped particles, weld slag, splatter etc. and moving debris down drain lines. Pneumatic vibrators, provided by the installer, must be placed on all feed and drain piping. Mount directly to field welded joints. Plan for use of pneumatic vibrators or manual hammering with wood or plastic hammers on both supply and return lines during flush. Assure size of pneumatic vibrator is appropriate especially for smaller feed lines. Operate vibrators and perform hammering during both Preliminary and Phased flush operations. Plan and track application of vibrators and hammering with a map or log.

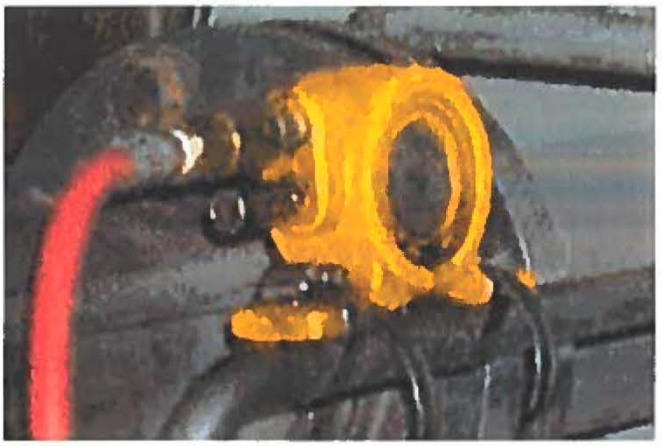

Figure 4. Pneumatic Vibrator

Maintenance Practices - Cleanliness controls in maintenance practices are critical in preventing system contamination. The use of FME covers on system/pipe openings, good housekeeping/clean work areas (free of debris from related or non-related work) and visual inspections cannot be overstated.

Visual Inspections - Visual inspections are essential to ensuring that foreign material is not introduced into or left in the system. All piping and system openings should be inspected prior to final installation/closeout.

CAUTION

Temporary filter mesh or basket shall not be installed in drain line to avoid risk of clogging, overflowing-flooding upstream of the mesh.

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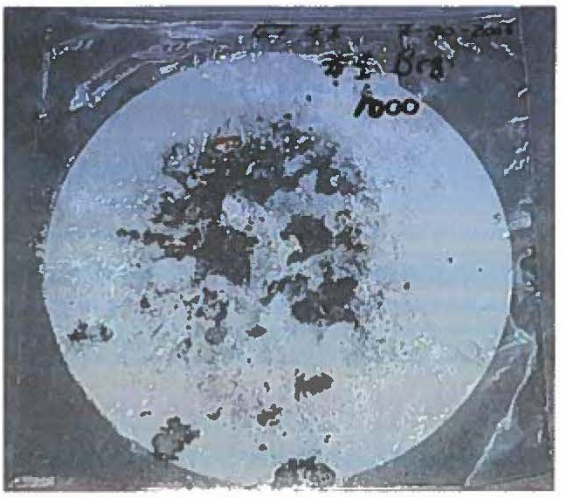

Figure 5. Initial #1 Bearing Flush Results from Lube Oil Piping without Air Blow. Flushes required 18 days

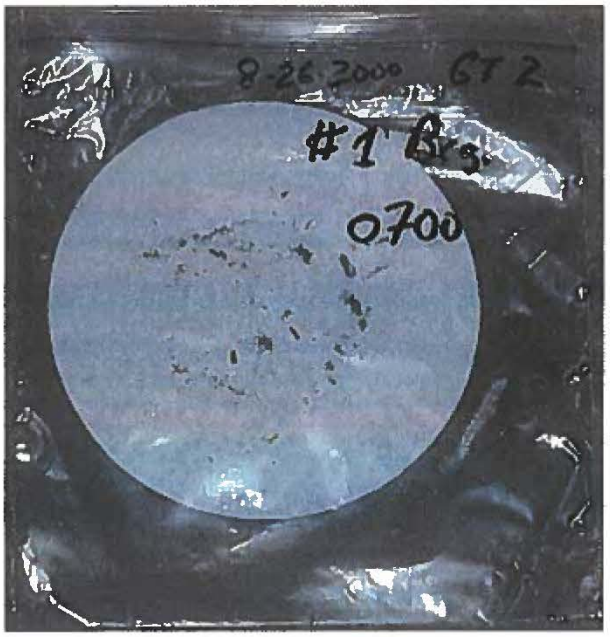

Figure 6. Initial #1 Bearing Flush Results from Lube Oil Piping after Air Blow. Flushes required 10 days

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Figure 7. Y-strainer

C. Contamination Measuring Technique

Sites should use the following guidelines to measure flush performance and system cleanliness:

WARNING

A CUP OF BRAKE SOLVENT CAN DESTROY THE CHEMICAL PROPERTIES OF A 3000 GAL OIL SUMP. CARE MUST BE TAKEN TO ENSURE THAT ELEMENTS ARE CONTAMINATE FREE WHEN RETURNED TO THE SYSTEM.

- NAS SAMPLING: For sampling practice please refer to GEK32568
- At the conclusion of a successful whole system flush, if the flush oil is removed the tank must be cleaned with lint free rags. Use of a truck as storage or source of replenishment fluid should be scrutinized closely. A typical sample of replacement fluid from a truck yields a contamination level of NAS class 10. This is a common source of post-flush contamination. When feasible, replenishment fluid should be polished prior to introduction into the system. It is the responsibility of the installer to ensure that proper filtration, on the order of $\beta_{10} = 200$, is installed between the tanker truck and the oil reservoir to ensure the installed oil meets a minimum cleanliness level. Although, the practice of reusing oil is strongly discouraged by engineering, it is recognized that this practice is occasionally utilized in the field. In the event that the site personnel, end user, and oil vendor all concur that reusing oil is acceptable, it shall not be done without reconditioning. Reconditioned oil shall meet the requirements of the applicable **GEK's by full spectrum oil analysis** by the Original Equipment Manufacturer (OEM) of the lubricant or a qualified third party.
- After the operating oil is charged back into the system, oil analysis should be performed. The quality of the oil shall meet the requirements defined in the appropriate GE specifications.
- Fill oil must be verified to meet cleanliness specifications of the system. Sampling and analysis should be performed at the beginning, middle and end of an oil transfer to verify cleanliness level. Typical refresh oil is several NAS classes less than required.

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Verifying and maintaining a clean oil system will help to ensure proper operation and help attain maximum performance of the system and components.

Table 1. Cleanliness Level Particle Count

NAS 1638 (1964)	Based on 100 ml sample				
	5-15 micron	15-25 micron	25-50 micron	50-100 micron	>100 micron
12	1,024k	182k	32,400	5,760	1,024
11	512k	91,200	16,200	2,880	512
10	256k	45,600	8,100	1,440	256
9	128k	22,800	4,050	720	128
8	64,000	11,400	2,025	360	64
7	32,000	5,700	1,012	180	32
6	16,000	2,850	506	90	16
5	8,000	1,425	253	45	8
4	4,000	712	126	22	4
3	2,000	356	63	11	2
2	1,000	178	32	6	1
1	500	89	16	3	1

Table 2. NAS versus ISO

NAS	12	11	10	9	8
ISO	23/21/18	22/20/17	21/19/16	20/18/15	19/17/14
NAS	7	6	5	4	3
ISO	18/16/13	17/15/12	16/14/11	15/13/10	14/12/9

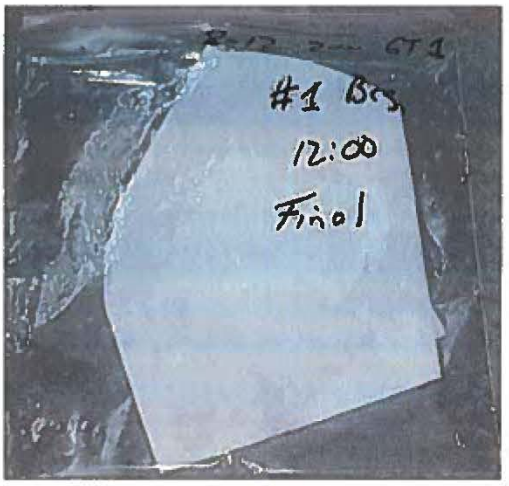

Figure 8. Visually Acceptable Filter Sample Unrelated to NAS Class

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IV. LIQUID FUEL OIL FLUSHING AND ACCEPTANCE CRITERIA

Liquid Fuel Oil systems are controlled systems.

Controlled fuel oil system fluids are to be maintained at an NAS class 10 specification (refer to Table 1 and Table 2) with water content of <0.1 vol. %.

Drain piping is an example of a foreign material exclusion system.

Foreign Material Exclusion fuel oil systems are to be maintained free of debris and water.

A. Contamination Measuring Technique

Sites should use the following guidelines to measure flush performance and system cleanliness:

- Remove the filter element from the system and place on a clean coffee filter or lint free rag. The coffee filter/lint free rag will provide an area for sample collection and inspection.
- The sample should be free of visual contamination and debris for an acceptable level of cleanliness. Two acceptable samples obtained at least two hours apart, are required to verify the cleanliness of the system or portion of the system that is being flushed (Figure 9).

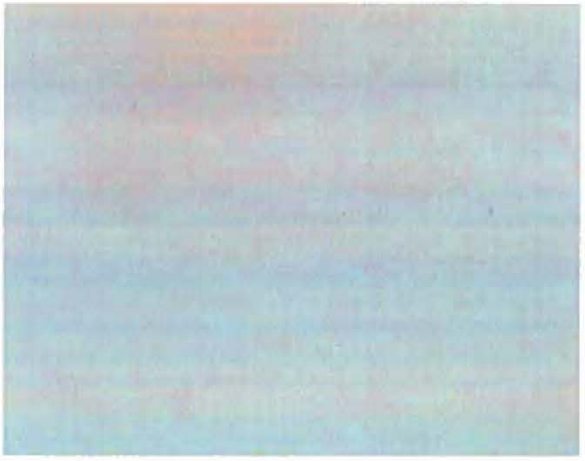

Figure 9. Acceptable Filter Sample - Unrelated to NAS Class

- If normal system fuel oil is used for the flush, the fuel oil may be pumped back to the holding tanks during the course of the flush to be used for subsequent system operation.

Verifying and maintaining a clean fuel oil system will help to ensure proper operation and help attain maximum performance of the system and components.

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V. GAS FUEL SYSTEM CLEANLINESS AND ACCEPTANCE CRITERIA

A. General cleaning information

Verifying and maintaining a clean fuel system will help to ensure proper operation and gain maximum performance of the system and components. Level of cleanliness for customer's equipment scope of supply shall meet cleanliness requirements defined in 362A2412
Gas Fuel system is divided into 3 sections to facilitate the interpretation of this summary instruction. Please consider the following sections as independent systems:
Section-1: **GT On-base system**: from Gas Fuel control Module (FG1) up to GT combustion chambers - CRITICAL system
Section-2: **GT Off-base system**: from GE off base module absolute separator/Scrubber up to GT Gas Fuel Control Module (FG1) including interconnection piping - CONTROLLED system
Section-3: **Gas Fuel Plant system**: Customer supply line to the GRS (Gas Receiving Station), GRS & interconnect piping up to GE GT off base module absolute separator/Scrubber - CONTROLLED system

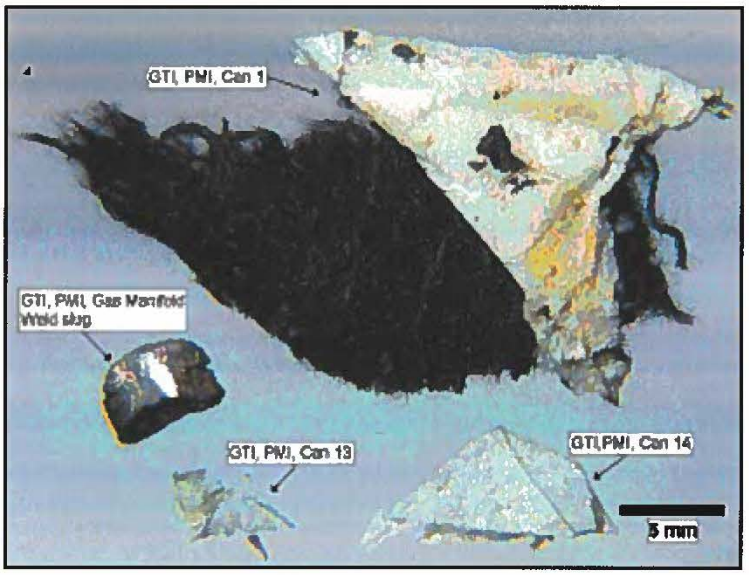

Figure 10. Example Contaminants found in Gas Piping

B. Section-1: GT On-Base system

The following specific cleaning instruction is applicable for On-Base system. 302T5805, Cleaning Instructions, All GT frames – Gas Fuel System cleaning.

SCOPE: GT Gas Fuel ON base piping (MLI 0422): GT ON base From GT Gas Fuel control Module (FG1) up to GT combustion chambers

GT ON base piping is separated into 3 categories; depending on the configuration the cleaning methodology can vary:

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- Category 1: The GT on base piping & gas fuel control module are installed from Factory on the turbine & auxiliary base, piping is already cleaned from factory, no further cleaning required except inspection at Turbine & auxiliary base terminal point during installation.
- Category 2: GT with Gas fuel on base piping already installed & cleaned from factory: Perform borescope inspection at GT enclosure and gas module terminal points, hand clean/air blow separately and inspect/GE witness the installation of the gas fuel piping interconnect spool between Gas Fuel control valve module & GT package terminal points including the purge air interconnect piping.
- Category 3: GT with Gas fuel on base piping not installed from factory (site installation of gas manifold & pigtails)

1. **Cleaning methodology for the Category 3 where air blowing is required up to combustion cans**

See below detailed cleaning methodology for GT with Gas fuel on base piping not installed from factory:

PREREQUISITES: Air reservoir is required and shall be cleaned prior admitting air to GT on base system.
The air purge on base piping is cleaned separately during installation:
With AM module:

- Inspect all openings of the AM modules to confirm cleanliness
- Blow the prefabricated spools between AM modules and turbines (during installation phase), install clean 100% inspected

Without AM module:

- Blow each of the prefabricated spool (during installation phase), install clean 100% inspected
- Then as an option, this clean turbine piping system can be used as reservoir to clean other systems (ideally when system is under pressure test configuration with blind flanges installed).

If GT gas fuel Off base skids system is used as reservoir to clean the On-base part, it shall be cleaned prior to cleaning the GT On base system.

The whole system starting from the first GE GT conditioning area skid (absolute separator or Scrubber) up to FG1 is charged with dry & oil free air at 6 to 7 bar and is generally used as air reservoir to blow the GT On base system.

When required for early completion of the GT On base piping & GT compartment (to avoid waiting on GT Off base modules system to be completed), an external reservoir or the GT Cooling & Sealing piping can be used as reservoir to blow out the GT ON base Gas Fuel piping through the purge valves and/or connected at FG1 through the gas stop & control valves. This option is particularly interesting in case of non-modularized dual fuel configuration as other systems can also be air blown during construction (Atomizing Air/Water Injection/Water Injection purge/Liquid Fuel purge, Water Wash, self-cleaning of air filter), this concept requires special tool kit to be designed/procured and anticipated in advance by the constructor.

CLEANING PROCESS:

- Air blow the gas fuel piping up to the GT combustion cans including pigtails disconnected from combustion cans with all last chance strainers installed (inspect and clean the strainer after the blow prior start-up). Typical expectation: at least a minimum of three blows per group of flex hoses with a discharge time of more than 15 seconds. Adjust the number of opened pigtails according to the air blow duration and reservoir capacity. Cleaning of the system shall be continued up to verifying the cleanliness of the last chance strainers.

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- Pigtails need to be secured tight during blowing to prevent any damages & FME covers are placed on the exposed combustion end-cover openings.
- Prior to performing the blows, the piping system should be air pressure tested for leaks.
- First blow of each manifold is performed using the pigtails at the bottom of the manifold to extract any debris
- Part of the purge system can also be air blow from the gas fuel control module up to an appropriate disconnecting spool piece.
- To perform this blowing the gas purge valves, SOV, stop valves, control valves, vent valves will have to be actuated. Depending on the unit this may require instrument air, hydraulic oil or electrical power supply, in addition the MKVI control & interconnect cables are required to control the actuators. If blows are performed during construction period with an external air reservoir the control of the actuators can be perform with temporary means (injection sources).
- During pressurization of the system take the opportunity to leak & live check all the system up to GCV's including instrumentation and potentially internal leaks of shutoff, Stop & Control Valves.
- Once a gas manifold is completed, the pigtails and end-covers should be inspected and re-connected immediately prior to moving to the subsequent manifold to prevent further contamination.
- 100 % borescopic inspection of all the pigtails and piping is required after air blowing.
- Following the blows the flanges should be inspected and either connected to downstream piping or covered with temporary FME covers.

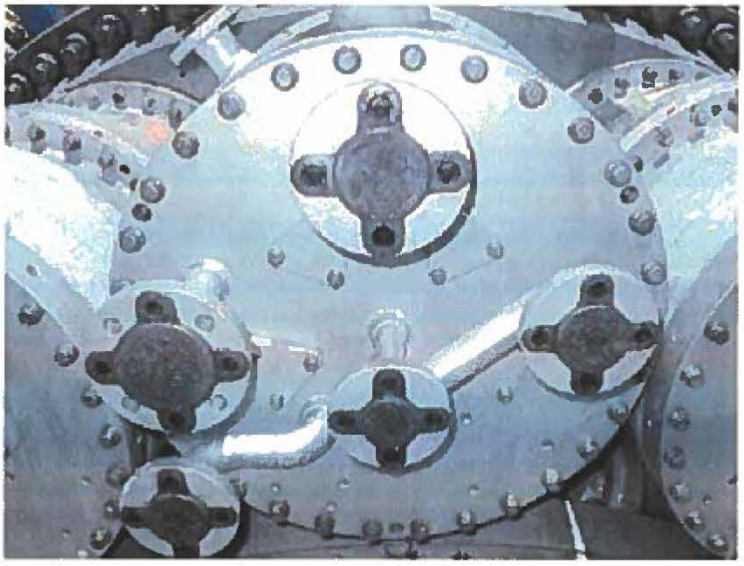

Figure 11. FME Covers On A Combustion Can End-Cover

2. Cleanliness criteria

- Air blow duration: 15 seconds x 3 times (Minimum).
- Last chance strainers to be checked → free of debris after air blowing.
- 100 % borescopic inspection of all the pigtails and piping downstream last chance strainer after air blowing

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- For sections 1, cleaning procedure shall be submitted to GE project team during construction phase. Cleaning results and evidence of clean installation shall be documented and shared with the GE project team and use to confirm cleanliness at the Red Flag Review.

C. Section-2: GT Off-Base system

The following specific cleaning instruction is applicable for GT off Base system. 302T5805, Cleaning Instructions, All GT frames – Gas Fuel System cleaning.

SCOPE: GT Gas Fuel Off Base Modules (MLI 0482): from GE off base module absolute separator /Scrubber up to GT Gas Fuel control Module (FG1) including interconnect piping

1. Cleaning methodology

PREREQUISITES: during engineering phase, ensure air blowing spool pieces according to cleaning concept are installed at strategic locations versus pipe layout and verify pipe routing/distance between skid (before FG1, before each GT off base skids if line upstream is long, downstream & upstream GT off base skids if pigging process is used).

CLEANING PROCESS:

- Perform visual or borescopic inspection on the GT Off base GE skids to check modules cleanliness requirement, open and hand clean if needed.
- Check the off-base interconnect piping for internal piping cleanliness (Carbon Steel & Stainless Steel). If internal piping surface present stuck deposit that cannot be removed by air blowing (muds, sand or metal chips stuck to the pipe surface accumulated during storage/installation or due to poor prefabrication process) clean the piping with high pressure water jetting, drain and dry with air blow immediately after.
- During installation hand clean & inspect the interconnect spool < 10 meters piping length and document the inspection, lines below 4" will be clean by continuous air blow process.
- For interconnect spool between GT Off base modules > 10 meters piping length that cannot not be installed clean, they shall be air blown separately, perform air blowing using GT off base module as reservoir upstream the piping to be clean and install air blow out valve or rupture disk at the discharge of the piping section to be cleaned prior the next GT off base module (GT Off base modules cannot be use to pass air flow if line upstream have not already been cleaned). When using Gas absolute separator as an air reservoir the filters cartridges can be left in place, but the valves upstream shall be closed to not exceed the velocity limit of the filters. The temporary strainers on the GT off base skids shall remain in place during air blow. Flowmeters can also remain in place if upstream part is cleaned (flow conditioner & orifices shall be removed during air blow operation).
- Air blow the interconnect piping using Off base GE skids as a reservoir up to gas fuel control module inlet FG1 (typically 6 to 8" blow valve). SSOV is replaced by a spool or spacer if within the air blow circuit and in some cases the air blow exhaust can be install in place of SSOV if last spool to FG1 is short (if line upstream SSOV is already blown and clean then the SSOV can remain in place in open position within the air reservoir for the air blow process). The whole system starting from GT gas absolute separator or gas scrubber up to FG1 is charged with dry & oil free air at 7 to 8 bar and discharged with blow out valve at FG1. During the first air blows, if bypass of the performance and startup heaters are available they shall be opened and then closed for the next blow. The air blow-out must be repeated at least 3 times or until cleanliness requirements are met. A clear air blow plume shall be visually seen, or a target can be used to monitor blowing from first to last blow: soft material such as brass or aluminum plate installed on the pipe exhaust.

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- Limitation: In case of long interconnect piping length, intermediate spool for air blow might be required to clean the line by section. During engineering phase simulate the velocities versus system volume, line length and discharge valve diameter with objective to maintain velocity from 30 to 60m/sec during the blow on the entire piping length, those velocity are commonly maintained for 5 to 8 sec during each blow.
- Air blows should be done in the direction of flow for the GT gas fuel off base system to avoid to blow backwards through GE equipment as none of the equipement is designed for the reverse flow.

Preserve the modules and Carbon Steel lines immediately after cleaning.

2. Cleanliness criteria

- If interconnect piping present stuck deposit as muds, sand, or metal chips it shall be mechanically cleaned prior to air blowing
- The air blow-out must be repeated at least 5 times or until cleanliness requirements are met with clear air blow plume
- 30 to 60m/sec during the blow on the entire piping length, those velocity are commonly maintained from 5 to 8 sec
- For sections 2, cleaning procedure shall be submitted to GE project team during design phase. Cleaning results and evidence of clean installation shall be documented and shared with the GE project team and use to confirm cleanliness at the Red Flag Review.

D. Section-3: Gas Fuel plant supply system

- The GEK116771 is applicable for the gas fuel plant supply system cleaning.
- GEK116771, Cleaning Recommendation, All GT frames – Fuel Supply System Cleaning for Gas Turbines.
- SCOPE: Gas Fuel Plant Supply system is composed of 3 subsections:
- SubSection-1: Customer supply line to the gas receiving station.
- SubSection-2: Gas receiving station
- SubSection-3: Interconnect piping from gas receiving station to GT off base modules (Gas absolute separator /Scrubber)

1. Cleaning methodology

Cleaning methodology will vary according to the piping section and configuration:

Subsection-1: Pigging (hard pig 2 pass minimum + soft pig 3 pass minimum and no more debris collected), pigging is always followed by quick decompression air blowing (full bore quick decompression at least 3 times or until cleanliness requirements are met)

Subsection-2: Piping spools are mechanically cleaned after prefabrication and capped, installed clean, spools are air blown as required and 100% inspected during installation. In case of long spools not arriving clean to site, other mechanical cleaning alternatives such as high-pressure water jetting followed by air blow-out should be used. If overall gas receiving station cleanliness cannot be confirmed cleaned install per above, it shall be part of the main section 3 air blowing (bypassing critical component like pressure regulation, metering.....). Often the Gas receiving station is used as air reservoir to air blow the downstream interconnect piping (section 3).

Subsection-3: Interconnect piping is recommended to be pigged (refer to section 1). If this is not possible, high pressure water jet is recommended. After pigging or high-pressure water jetting, quick

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decompression air blowing should be conducted (Section-2 can be used as a reservoir), typically 8 to 10" blow valve at least blown 3 times or until cleanliness requirements are met. Pig receiver and air blow exhaust shall be located just upstream GT gas absolute separator /scrubber. In some cases of high piping contamination or contract requirement this line can also be cleaned by chemical cleaning followed by quick decompression air blowing.

2. Cleanliness criteria

Gas fuel quality & gas network pretreatment systems are required to be designed by the Customer in accordance with GEI41040. For sub sections 1, 2 & 3: Cleaning procedures shall be submitted to GE project team during design phase. Cleaning results and evidence of clean installation shall be documented and shared with the GE project team and use to confirm cleanliness at the Red Flag Review.

The gas fuel should be analyzed with sample to ensure GEI41040 specifications are met.

Air blows: Cleanliness verification through visual observation of clean air plume, or service target blow evolution: brass or aluminum target installed on pipe exhaust. Required CFR (>=1.2) should be achieved. Visual inspection of low points, dead ends, and increases in pipe diameter to be verified during reconfiguration.

Pigging: Pigging process shall follow pig supplier instructions, minimum 2 runs with hard pig, 3 runs with soft pig followed by quick air blow decompression or until cleanliness requirements are met.

Maintenance Practices - Cleanliness controls in maintenance practices for fuel gas system are critical in preventing system contamination. The use of FME covers on system/pipe openings, good housekeeping/clean work areas (free of debris from related or non-related work) and visual inspections cannot be overstated.
Visual Inspections - Visual inspections are essential to ensuring that foreign material is not introduced into or left in the system. All piping and system openings should be inspected prior to final installation/closeout.

VI. AIR SYSTEM CLEANLINESS AND ACCEPTANCE CRITERIA

All air systems; excluding service or shop air are controlled systems.
Service/shop air systems are foreign material exclusion systems.
The blowdown of air systems should be conducted.

A. Contamination Measuring Technique

Sites should use the following guidelines to measure and verify system cleanliness:

- During the performance of an air blow to either establish or verify cleanliness, a 100-mesh strainer (140 μm) should be placed in the discharge path to collect any debris from the piping or system.
- The sample should be free of visual contamination and debris for an acceptable level of cleanliness. Two consecutive acceptable samples are required to verify the cleanliness of the system or portion of the system that is being air blown.

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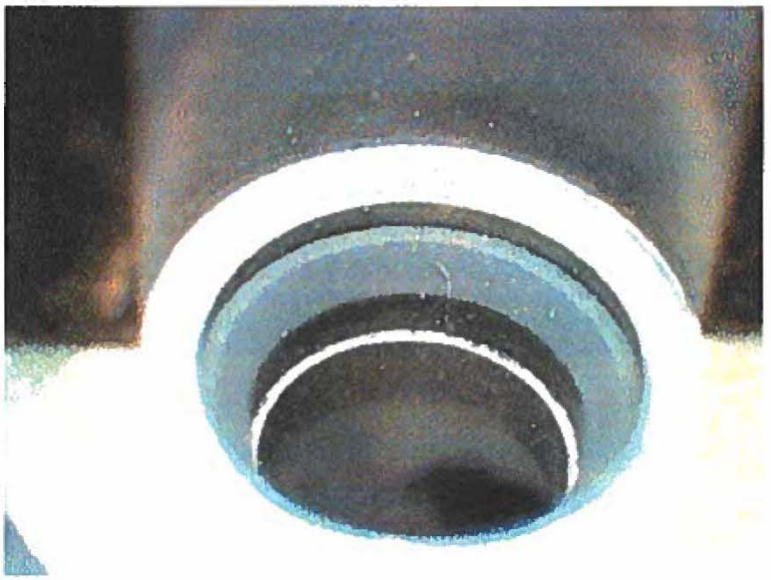

Figure 12. Fine Contamination causing a purge check valve to fail

B. Recommendations

Air Blows - In an effort to remove debris resulting from fabrication, storage, and installation, sites should perform air blows on system piping during the installation process. The piping should be blown down during initial fit-up and prior to final installation. The air used for the blows can either be instrument air or clean dry air from an off-base air compressor. After the pipe is installed, any open ends should be capped using a suitable foreign material exclusion (FME) cover.

The air blows will significantly reduce the amount of debris in the piping. Air blows have proven successful in removing debris when using a 200-gallon receiver charged to 100-125 psig and discharged through a two-inch hose. The blow should last between 5-10 seconds and should be repeated 4-5 times unless cleanliness levels dictate that more blows should be performed. The size of the hose used for the blows should be such that the hose is able to fit into the pipe opening and still allow the maximum flow rate possible. For example, a two-inch hose used to blow a six-inch pipe proved to be successful.

Maintenance Practices - Cleanliness controls in maintenance practices are critical in preventing system contamination. The use of FME covers on system/pipe openings, good housekeeping/clean work areas (free of debris from related or non-related work) and visual inspections will reduce the possibility of introducing foreign material or debris into a piping system.

Visual Inspections - Visual inspections are key to ensuring that foreign material is not introduced or left in the system. All piping and system openings should be inspected prior to final installation/closeout. Inspections should be performed using a flashlight and a mirror where practical and a borescope if required. A visual inspection, with no contamination visual to the naked eye, is sufficient to call an air system "clean".

Obtaining a smear of a dry area of piping near an exit and comparing the smear sample to the examples in paragraph 10 of reference 1 is an option to further confirm the cleanliness of air systems.

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This is not required but represents another opportunity to verify system cleanliness. Table 2 of reference 1 provides recommended contamination levels in mg/m2 for air systems.

Verifying and maintaining a clean air system will help to ensure proper operation and gain maximum performance of the system and components.

VII. STEAM PIPING CLEANING AND ACCEPTANCE CRITERIA

Steam Supply and Steam Seal systems are controlled systems.

Experience has shown the importance of thoroughly cleaning the main steam, reheat steam, and steam seal systems prior to turbine operation or after the completion of a new installation or major repair work to the steam system. Debris left in the system would otherwise be blown into the turbine and cause serious damage to the steam path parts. The temporary fine mesh screens installed on the main stop and combined reheat valves during initial startup are not intended to be a substitute for cleaning the steam lines.

The objective of a chemical cleaning and air or steam blowdown is to minimize the possibility of damage to the turbine by removing pipe scale and other foreign material, which might otherwise be carried over into the machine.

The following equipment and steam piping should be chemically cleaned and air blown or steam blown prior to undertaking plant startup testing.

1. Each heat recovery steam generator and its steam lines.
2. The main steam lines and header from each heat recovery steam generator through to the turbine bypass piping just upstream of the turbine bypass desuperheater valve. The turbine bypass desuperheater valve must not be in the steam path during blowdown. The Purchaser shall supply temporary piping including a blowdown valve to be connected at a point just upstream of the turbine bypass desuperheater valve.
3. The main steam lines and header through to the turbine stop valve(s).
4. The steam seal piping can either be acid cleaned, service steam blown or shot blasted & installed clean. In case of shot blasting it shall be done with steel bullets and not with sand.

A. General Guidelines on Chemical Cleaning of Steam System Piping

Chemical cleaning of the piping upstream of the main stop valve or combined reheat valve will require the installation of special chemical cleaning hardware to protect the turbine and valve internal parts. General Electric can supply the hardware as extra cost items when required.

The acids or caustics used during chemical cleaning attack certain materials commonly used in these turbine assemblies and must be protected. Hydrostatic tests should be completed prior to the installation of the chemical cleaning fixture(s). The chemical fixture may collapse if installed during the hydrostatic tests. The fixture should be installed during the blowdown in order to prevent foreign matter from depositing adjacent to the valve seat and plug.

B. Chemical Cleaning Process

The chemical cleaning method shall be in line with known international standards. Special care has to be taken that the chemicals used will not harm the systems, especially when special alloy material is present.

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Flushing: Objective is to remove big debris, particles, sand, mud…

The system is flushed with demineralized water at velocities as defined by VGB guideline. Intermediate extraction temporary piping shall be added on re-heater, super heater low points CCC (Chemical Cleaning Connections) and if applicable in once through HP Economizers to ensure debris extraction at low points during flushing process and during process draining steps. Flushing can be performed in open loop configuration or in close loop configuration using full flow redundant strainers to ensure debris removal.

Hot degreasing: Objective is to degrease surfaces

After reaching cleanliness criteria of the previous step the systems filled with demineralized water are homogeneously heated until the operative temperatures planned for the cleaning are reached. The required reagents for the degreasing step are added and the solution recirculated until the following criteria have been reached:

- The solution has reached the required operative temperature (usually around 65 to70°C) at the coldest spot of the circuit and has circulated for at least 4h at this temperature
- The absence of oil is confirmed with 3 consecutive samples during the recirculation

Acid cleaning: Objective is to remove mill scale, corrosion products and soluble impurities

Without draining the system the chemical agents (typically inhibited citric acid or hydrofluoric acid) are injected and circulated. For the selection of the optimum agent local regulations and laws related to use and disposal of chemicals and resulting effluents need to be considered. During the entire process the temperature shall be maintained above the required operative temperature (usually > 65 to 70°C) at the coldest point of the circuit. The acid cleaning might be followed by a stabilization step where the corrosivity of the acid phase is gradually reduced by change of pH, concentration of acid or redox potential. After the acid cleaning and / or stabilization step the high concentrated solutions shall be drained completely under N2 atmosphere (except if single volume cleaning is applied).

Rinsing: Objective is to remove left overs of the high concentrated chemical solutions of the previous steps

The system is flushed with demineralized water until the cleanliness criteria are reached. Depending on process the pH of the rinsing water might be adjusted to > 9 by the addition of ammonia.

Passivation: Objective is to form a protective oxide layer on the cleaned surfaces

Passivation agent is added to the solution and circulated to passivate internal surfaces. In order to limit risks of residual chemicals during operation the use of volatile chemicals only is recommended. Otherwise a rinsing step might need to be applied after the passivation step. Depending on passivation agent elevated temperatures might be required. The system is then drained at maximum velocity.

Inspection: Objective is to ensure systems cleanliness by visual checks

All drums are opened and inspected and hand cleaned where required. Dead ends are inspected and cleaned where required. All accessible HRSG low points and temporary openings shall be used for inspection and utilized by high pressure water jetting or other means to remove solid deposits or foreign objects where required. Essentially the CCC (Chemical Cleaning Connections) of the HRSG re-heater and super heater low points will need to be cut to provide inspection access.

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Cleanliness criteria for inspections:

- No loose particles, foreign objects or remaining water accumulation in the system (Puddles)
- Small amounts of rust and dust are acceptable
- Maximum particle size: 0.5 mm

Equipment used for inspections and re-cleaning must have adequate range to be able to 100% inspect and clean the entire low point section. HD image quality with movable camera head and light adaption to verify clean condition according cleanliness criteria in the entire pipe section

Preservation: Objective is to avoid corrosion and impurity accumulation on the cleaned surfaces.

Generally, preservation with dry air is applied. Preservation shall be initiated as soon as possible after chemical cleaning completion. Regular checks of the preservation status shall be done and documented.

C. General Guidelines on Air Blowdowns

There are several proven methods available for cleaning steam pipes by blowing down with either steam or air. A method of cleaning that has been used with success is the proper acid cleaning followed by the compressed air blowdown. This procedure can be use instead of steam blow. Compressed air used during air blowing shall be free of oil & water.

Air blowing must be preceded by a proper pre-operational acid cleaning of the steam parts with final HRSG steam side low points inspection, see description in per chapter VII.B .

Extended bypass operation at maximum load and various overnight shutdown are strongly recommended for each HRSG section prior to start up the Steam Turbine

Cleanliness measurement during air blowing uses the cleanliness validation method as defined for steam blowing. CFR calculation model shall be clearly described in the procedure considering system volume, blowing pressure and pressure drop to ensure CFR along the line being blown.

A log sheet should be used to record data for each blow. Data that should be recorded includes air blow number, date, time, blow starting pressure, blow ending pressure, blow duration, and visual observation (wet, some moisture, dry, debris, etc.). One log sheet should be kept for each system being blown down.

The HP , IP, LP and reheat steam systems will be air blown to targets.

Particular care shall be given during air blow and initial plant startup to check drain pot drip legs by blowing down the air/steam, abnormal clogging shall be investigated.

D. General Guidelines on Steam Blowdowns

Blowing down the steam piping with steam is a cleaning method that has traditionally been the method of choice in the power industry. The use of steam causes thermal cycling which helps to loosen debris, allowing it to be blown out.

Continuous Steam blowing can be either to atmosphere or to the condenser, continuous steam blow is the preferred method.

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Note: Prior to blowing to the condenser, acid cleaning of the steam and water lines is mandatory. BOP steam lines can be cleaned by other methods such as high pressure water jetting or shot blasting along with a clean installation process instead of acid cleaning . In case some critical steam pipe section to the steam turbine is not in the steam blow path , an inspection of this piping shall be performed after the steam blow to condenser, depending of steam pipe routing & bypass take off this inspection can also be performed prior steam blow to condenser . Close attention is to be paid to dead legs in the path to the steam turbine, If the inspection indicates potential contamination, additional mechanical cleaning shall be performed. Steam blow to condenser is validated by target plates.

Discontinuous steam blowing: The procedure consists of pressurizing the boiler, terminating firing, and rapidly opening the temporary blow valve to depressurize the system. This cycle is repeated until the system is judged to be clean by use of targets. The steam is essentially saturated as the water stored in the boiler flashes as pressure decays. This is not the preferred method due the difficulty controlling transients & water carry over into the super-heaters.

Maintenance Practices - Cleanliness controls in maintenance practices are critical in preventing system contamination. The use of foreign material exclusion (FME) covers on system and pipe openings, good housekeeping/clean work areas (free of debris from related or non-related work), and visual inspections will reduce the possibility of introducing foreign material or debris into a piping system.

Visual Inspections - Visual inspections are essential to ensuring that foreign material is not introduced or left in the system. All piping and system openings should be inspected prior to final installation/closeout. Inspections should be performed using a flashlight and a mirror where practical and a borescope if required.

External Vibration - Vibration is not necessary in cleaning or blowing down the steam system because the medium reaches near supersonic speeds during the air or steam blow, thereby creating a greater vibrating force. For a typical steam piping diameter (16"), external attachments to produce a viable vibration would be cumbersome and redundant and, most likely, would add little to no value.

E. Contamination Evaluating Technique

The technique of evaluating cleanliness consists of using a steel target to evaluate the cleanliness of the steam system at rated CFR during a steam or air blow. For air- or steam blows to the atmosphere, the target shall be placed in the temporary piping. For steam blows to condenser, they are located in the plant permanent piping as for example in the LP & HRH bypass line.

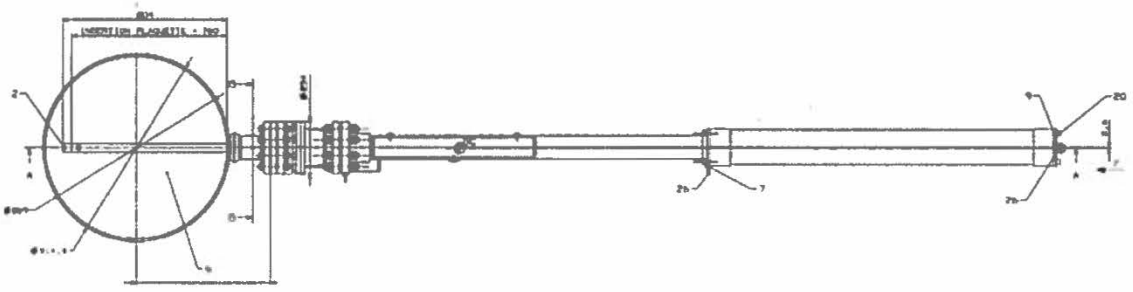

Figure 13. In-Line Target Assembly Example

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Assuming that sufficient mass velocity has been achieved in the blowdown, the progress of the blow-down should be monitored by placing polished targets in the blowdown flow. Particles carried with the flow will cause pitting of the targets.

CFR (Cleaning Force Ratio) requirements:

During target plate exposure to the steam stream, the CFR at the outlet of the steam generator shall remain above ≥1.2 compared to Base load conditions.

Table 3. CFR Requirements

For BL condition	For extreme case conditions such as but not limited to: • Startup cases • Supplementary firing • Single unit operation for Multi units plant configuration
1.2 @ HRSG HP super heater outlet 1.2 @ Hot reheat outlet 1.2 @ LP super heater outlet 1.2 @ IP super heater outlet	1.03 @ HRSG HP super heater outlet 1.03 @ Hot reheat outlet 1.03 @ LP super heater outlet 1.03 @ IP super heater outlet

CFR ≥ 1.03 can only apply to extreme cases of operation reference (see Table 3) and where pre-operational cleaning (acid cleaning) was executed on the steam side of the HRSG & the BOP steam line. BOP steam lines can be cleaned by other methods such as high pressure water jetting or shot blasting along with clean installation process instead of acid cleaning .

Great care shall be taken to make sure that the worst operating conditions of the plant operation range are considered as reference for CFR calculation.

CAUTION

Must be taken to prevent piping configurations that require excessive inlet CFR's. Inlet CFR's, that significantly exceed 1.5 (i.e., 1.8 or greater), may cause system damage and should be avoided.

CFR is calculated using:

$$CFR = \left(\left(\frac{Q_c}{Q_{max}} \right) \right)^2 x \frac{(PV)_c}{(PV)_{max}} x \frac{(P_{max})}{(P_c)}$$

Q_c = calculated flow during cleaning (lb/hr)

Q_{max} = max load flow (lb/hr)

$(PV)_c$ = pressure-specific volume product during cleaning at boiler outlet (ft^3/in^2)

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(P_{max}) = pressure at max load flow at boiler outlet (psia)

(P_c) = pressure during cleaning at boiler outlet (psia)

$(PV)_{max}$ = pressure-specific volume product at max load flow at boiler outlet (ft^3/in^2)

Target Plate requirements:

Preferably the 40 mm width target plate as recommended in VGB shall be used, if this width is unpractical due to pipe diameter or other limitation, a target plate width of 25mm can be used. In case of 25 mm target plates the impact assessment shall be adapted into a 25mm x 64 mm surface.

The target plate's length depends on the piping diameter and preferably shall be at least 0.85 time the inner diameter of the piping where the target plate is inserted.

The target plates shall be made of carbon steel similar to S235JRG2 (St 37), ASTM A36

The hardness of the target plates shall be demonstrated being lower than 160 HB at ambient temperature.

The target plate dimensions shall be as follows:

Target plate width = 40mm
Target plate's length depends on the piping diameter and shall be at least 0.85 time the inner diameter of the piping where the target plate is inserted.

Measuring target plate's surface shall be polished up to a mirrored-finished surface roughness ($Ra \leq 0.2\mu m$).

Each target plates shall be identified with a single stamped marked number.

The installation of target plates directly downstream of pipe bends shall be avoided. Not less than 5 times the nominal width of the line in which the target plate is installed is considered the guide value for an undisturbed inlet section upstream of the target plate.

Target time exposure:

For continuous steam blow, target is exposed during ~ 10 min at required CFR

For discontinuous steam blows & air blow, target is exposed during the entire deflation period, 2 successful consecutives target plate are required for discontinuous steam blows & air blow.

As minimum two sets of target plates with start-up and shutdown/cooling down phase must be compared. The target plates of the last cycle must fulfill the steam blowing criteria

Impact criteria:

The whole target plate exposed surface shall be assessed first to identify the reference area.

Reference area is a square area of 40 x 40 mm selected where the most frequent/largest impacts are observed on the target plate.

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Note: In case the measuring surface of a target plate should be damaged (impact, scratch) before its u se, the default can be marked and documented before the plate insertion if it is minor. Those minor da mages will not be accounted during the plate assessment after its use. Plates with major defaults on their measuring surface shall be scrapped.

Steam circuit cleanliness is considered sufficient if the amount of impacts on the reference area is not exceeding the following:

Less than 4 impacts > 0.5 mm (dia. of equivalent impact surface)

Less than 10 impacts > 0.2 mm (dia. of equivalent impact surface)

No impact > 1 mm (dia. of equivalent impact surface)

The use of a precision scale measuring magnifier (x 8 – x 12; 0.1 mm scale on lens) is recommended to evaluate the amount and size of the impacts.

Note: For un-round impact, diameter of an equivalent circular surface must be considered



Figure 14. Precision scale measuring magnifier

Deviating from this standard, thereby falling short of meeting these acceptance criterion, could endanger the safe and efficient operation of the steam turbine and associated components, shorten the operating life cycle of the turbine or components, and negatively impact the long-term performance of the steam turbine.

F. Safety Considerations

Among the many other safety items to bear in mind in an industrial environment, the following apply to the material discussed in this article. Low point collection of chemical cleaning solution in valves and drains can be a personnel hazard. Site management should be aware of this, and supervisors should prevent craft labor from putting themselves in such a position as to be endangered by this hazard. During air blows, there exists a danger when purging low point drains due to the very low temperatures that could cause cold-related injuries. Conversely, during steam blows, personnel should be aware of the inherent danger in working with and around the high temperatures of steam.

G. Exception For GT Steam Cooled Unit

First stage cooling steam used in the Steam Cooled H-type gas turbine is a critical system.

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Procedures and criteria that are recommended in this document are not applicable to an H-type installation. Consult Dwg 362A2412 for further guidance regarding this matter.

VIII. WATER SYSTEM CLEANLINESS AND ACCEPTANCE CRITERIA

Water wash, water injection, wet compression, and cooling water are all controlled systems. Water wash and systems should be maintained at NAS 10 level, water injection and wet compression at NAS 8 level, cooling water systems should be maintained at NAS class 12 level (refer to Table 1 and Table 2).

A. Contamination Measuring Technique

Sites should use the following guidelines to measure system cleanliness.

During system flushes, flushing effluent should be captured through a flushing cloth (lint free rag) until no debris is found. A water wash flushing procedure for F class units is contained in reference 16. This section serves as contamination measuring augmentation to that procedure.

- The effluent sample is measured against Table 1 to ensure the system meets NAS level requirements.
- The sample should be free of visual contamination and debris for an acceptable level of cleanliness. Two consecutive acceptable samples obtained are required to verify the cleanliness of the system or portion of the system that is being certified.

Verifying and maintaining a clean water system will help to ensure proper operation and help attain maximum performance of the system and components.

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IX. SUMMARY

The values listed in Table 4. System Summary Chart are representative of the standard requirements for clean operation.

Specific requirements for cleanliness written in GE specifications (MLI A125, GEK121901, GEK116944 etc.) or in GE commissioning procedure might be different from the table below according to product factory cleanliness and scope of work at site and shall take precedence over the present GEK.

Table 4. System Summary Chart

System Noun Name	Criticality	NAS Class	Specifics
Lubricating Oil, Seal, lift	Critical	NAS 6	H2O content <100 ppm (.01%).
Hydraulic Oil	Critical	NAS 6	H2O content <100 ppm (.01%) High Pressure, Servo Valve use.
Liquid Fuel	Controlled	NAS 10	H_2O content <1000 ppm (0.1%)
Gas Fuel GT On Base	Critical	NA	Gas Fuel Specs in GEI 41040F
Gas Fuel Off Base	Controlled	NA	Gas Fuel Specs in GEI 41040F
Air Systems-General	Controlled	N/A	
Air Systems-Service/Shop Air	FME	N/A	
Steam-First Stage Cooling (H-Type)	Critical	N/A	
Steam-General	Controlled	N/A	
Water Wash Systems	Controlled	NAS 10	
Water Injection & Wet Compression Systems	Controlled	NAS 8	
Cooling Water Systems	Controlled	NAS 12	

References

1. D 6439-99, Standard Guide for Cleaning, Flushing, and Purification of Steam, Gas, and Hydroelectric Turbine Lubrication Systems.
2. ISO TR 10949, Hydraulic Fluid Power-Methods for Cleaning and for Assessing the Cleanliness Level of Components.
3. ML A125, Lubricant Oil System Flushing Instruction
4. GEK 46506D, Steam Turbine Lube Oil (Recommended Properties & Maintenance Practices)
5. Global Filtration Technology Handbook of Hydraulic Filtration, Parker Filtration
6. GEI 41047H, Turbine Liquid Fuel Specifications
7. GE specification 362A2412, Gas turbine System and Component Cleanliness Requirements
8. GEI 41040, Process Specification Fuel Gases for Combustion in Heavy-Duty Gas Turbines
9. DWG 366A2803, General Piping Cleanliness requirements, Pipe
10. DWG 361A6439, Cleanliness Spec, On-Base Piping

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11. Dwg 363A4220, Water Wash Flushing Procedures
12. PFI Standard ES-5, Cleaning of Fabricated Piping
13. National Aerospace Standard (NAS) Bulletin 1638
14. VGB S513 Internal Cleaning of Water-Tube Steam Generating Plants and Associated Pipework
15. GEK121901, Flushing Recommendations - Lube Oil System for STF Steam Turbine with SPL Generator
16. GEK116944, Flushing Recommendations for Turbine oil systems with motor driven main oil pumps
17. GEK116771, Fuel Supply System Cleaning for Gas Turbines

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PUBLIC EXHIBIT CMS-2

RFP Analysis, Justification

Confidential Exhibit CMS-2 is redacted in its entirety.

VERIFICATION

The undersigned, Clinton M. Stutler, being duly sworn, deposes and says he is the Director of Natural Gas Procurement for American Electric Power Service Corporation, that he has personal knowledge of the matters set forth in the foregoing testimony and the information contained therein is true and correct to the best of his information, knowledge, and belief after reasonable inquiry.

Clinton M. Stutler

Commonwealth of Kentucky)
)
County of Boyd)

Case No. 2026-00324

Subscribed and sworn to before me, a Notary Public in and before said County and State, by Clinton M. Stutler, on November 10, 2026

Marilyn Michelle Caldwell
Notary Public

MARILYN MICHELLE CALDWELL
Notary Public
Commonwealth of Kentucky
Commission Number KYNP71841
My Commission Expires May 5, 2027

My Commission Expires May 5, 2027

Notary ID Number KYNP71841