3 June 2026

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(AEDC IRA# 26-1659)

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STATEMENT OF WORK FOR ENGINEERING ASSESSMENT OF BOTTLE FIELD VESSELS

ARNOLD ENGINEERING DEVELOPMENT COMPLEX

ARNOLD AIR FORCE BASE, TN 37389-9998

FOR

AEDC WHITE OAK

10905 NEW HAMPSHIRE AVENUE, SILVER SPRING, MD 20903-1050

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Appendix A – Bottle Field Vessel Design & Layout

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1. SCOPE

1.1.1 The Arnold Engineering Development Complex (AEDC) White Oak Hypervelocity Wind Tunnel No.9 (Tunnel 9), located at 10905 New Hampshire Ave., Silver Spring, MD 20903-1050, requires an Engineering Assessment of the nineteen (19) individual pressure vessels that comprise Tunnel 9's on-site high-pressure gaseous nitrogen (GN2) storage facility (aka. "Bottle Field"). This assessment will allow Tunnel 9 to determine the optimal safe operating condition of the Bottle Field.

1.1.2 Using AEDC standards, National Consensus Codes (NCS), and requirements identified in Sections 2 & 3 below, the contractor shall complete the Engineering Assessment by the end of Q2 2027 (06/30/2027).

2. APPLICABLE DOCUMENTS

2.1 Government Documents:

2.1.1 AEDC Standard Pressure Vessels, AEDC-ENGR-STD-T-1

2.1.2 AEDC Standard Pressure Piping, AEDC-ENGR-STD-T-2

2.1.3 AEDC Safety, Health, And Environmental Standards (SHE)

2.2 Non-Government Documents:

2.2.1 American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessels Code (BPVC); Section VIII; Division 1, Division 2, & Division 3

2.2.2 American Petroleum Institute (API)/American Society of Mechanical Engineers (ASME), Fitnesss-for-Service; API 579/ASME FFS-1

2.2.3 American Petroleum Institute (API), Pressure Vessel Inspection Code; API 510

3. REQUIREMENTS

3.1 Contractor Capabilities: The Contractor must be able to provide evidence of previous successful experience in**:**

3.1.1 Conducting successful Fitness-for Service (FFS) assessments per API 579/ASME FFS-1 for non-Code pressure vessels operating at >10,000 psig.

3.1.2 Performing and interpreting (directly or via subcontractor) all forms of NDE required for conducting the FFS.

3.2 General: The Scope of Work (SOW) shall be broken into five (5) parts.

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3.2.1 ***PART I: DATA COLLECTION & DOCUMENTATION*** – The Contractor shall establish a baseline design for each of the individual vessels and the operational parameters for the Bottle Field as a whole. This shall be done as follows:

A. Conduct a review of existing design information (drawings, material spec's, etc.) either delivered electronically by Tunnel 9 engineers or physically located in its archives.

B. Confirm and/or obtain design data via on-site inspections, including:

- Direct measurement of each vessel's exterior physical dimensions.
- Wall thickness measurement via Ultrasonic Thickness Testing (UTT).
- Other methods recommended by the Contractor and agreed upon by Tunnel 9 engineers.

C. Establish the range of the Bottle Field's current operating conditions and create a record of its service history by:

- Reviewing documentation supplied by Tunnel 9.
- Meeting with Tunnel 9 engineers and operational personnel.

3.2.2 ***PART II: NON-DESTRUCTIVE EXAMINATION (NDE) PLAN*** – The Contractor shall develop an NDE plan based upon the information gathered in Part I. The plan shall be constructed to obtain the necessary information to build an FFS assessment per API 579/ASME FFS-1. The NDE Plan shall include:

A. Each NDE method to be performed and recommended sequence (if applicable)

B. The resource that will conduct the NDE (Contractor or Contractor's sub).

C. A list of equipment required to perform each NDE method.

D. Pre-exam requirements for each NDE method – Events and resources required prior to performing examination.

E. Post-exam requirements for each NDE method – Events and resources required to return vessels to intended service.

F. Identification of any Tunnel 9 resources (monitors, facility access, etc.) required for each NDE method.

G. It is understood by Tunnel 9 that the NDE Plan will represent a baseline approach and the findings of each NDE method may indicate that additional NDE is required.

H. An initial summary of the NDE plan including the minimum scope of NDE required for an FFS assessment shall be included with the proposal.

3.2.3 ***PART III: NDE PLAN EXECUTION***

A. NDE operations shall be conducted in accordance with relevant AEDC Safety, Health, and Environmental (SHE) Standards

B. Prior to the execution of each battery of NDE in the NDE Plan, the Contractor shall coordinate with Tunnel 9 for:

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- Scheduling and facility access.
- Availability of any required utilities (power, water, etc.)
- A pre-execution/kick-off meeting with pertinent Tunnel 9 personnel and the Contractor's (or Contractor's sub) expected to participate.

C. The Contractor and Tunnel 9 engineers shall hold meetings throughout the NDE process to discuss recent findings and any recommendations to expand NDE scope.

3.2.4 ***PART IV: ENGINEERING ANALYSIS*** – Using the information gathered in PART I & PART III, the contractor will perform an Engineering Analysis of the individual vessels of the Bottle Field. The Engineering Analysis shall include:

A. FFS Assessment per API 579/ASME FFS-1, including, but not limited to:
   - Solid model (Creo .prt/.asm preferred, SOLIDWORKS or STEP files acceptable) based on the findings in PART I.
   - ANSYS Finite Element Analysis (FEA) model constructed from the solid model.

B. ASME-Based Analysis to:
   - Further support and supplement the FFS
   - Enhance the inputs to the FEA.

C. Minimum Design Metal Temperature (MDMT) Evaluation using:
   - Results from A & B above.
   - Other API/ASME techniques & methods if indicated by any of the previous work.

D. Summary of Findings and Recommendations

3.2.5 ***PART V: IN-SERVICE INSPECTION (ISI) PLAN*** – Based on the results of PARTS I thru IV, the Contractor shall provide an ISI Plan. This plan's recommendation will provide guidance for future and recurrent NDE to ensure the continued safe operation of Tunnel 9's Bottle Field. For each method of NDE recommended, the ISI Plan shall include:

A. The recommended inspection frequency.

B. Citation of the NCS/method basis of implementation.

C. Details for areas of special focus (potential "problem areas") identified in PARTS I thru IV.

3.3 Schedule:

3.3.1 The Contractor proposal shall include a proposed schedule including the following:

A. PART I:
   - Number of Contractor personnel required to be on-site.

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- Duration of on-site activities.
- Tunnel 9 assets (personnel & utilities) required.
- NOTE: If “monitors” are required for on-site activities such as confined space access, they will be provided by Tunnel 9.

B. PART II & PART III
- Lead time to develop & deliver the NDE plan.
- Proposed duration and sequence (if applicable) for each NDE method in the NDE Plan.
- Identification of Tunnel 9 assets required.

C. PART IV
- Lead time for the completion & delivery of the Engineering Analysis.

D. PART V
- Lead time for the completion & delivery of the ISI Plan.

3.4 Acceptance: Each Submittal (see Section 3.5.1) is subject to Tunnel 9 review and approval per the following time schedule:

3.4.1 PART I – Fourteen (14) days after receipt of Submittal No. 1.

3.4.2 PART II – Fourteen (14) days after receipt of Submittal No. 2.

3.4.3 PART III – Seven (7) days after receipt of each NDE report included in Submittal No. 3.

3.4.4 PART IV – Twenty-one (21) days after receipt of each Submittal

3.4.5 PART V – Fourteen (14) days after receipt of Submittal No. 5.

3.5 Submittals: A summary table of required submittals is listed at the end of this paragraph.

3.5.1 Submittal Table:

No.	Section Reference	Submittal Description	Due
1	3.2.1	Summary of Design & Operational Review	Twenty-one (21) days upon completion of on-site work
2	3.2.2	NDE Plan	Fourteen (14) days upon completion of PART I
2a	3.2.2	NDE Minimum Scope	With proposal

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No.	Section Reference	Submittal Description	Due
3	3.2.3	NDE Reports upon the completion of each battery	Individual reports due within seven (7) days of the completion of each NDE battery
4.1	3.2.4	Summary of Findings & Recommendations	Thirty (30) days upon completion of PART III
4.2	3.2.4	Solid Model Files (Creo, SOLIDWORKS, STEP)	Thirty (30) days upon completion of PART III
4.3	3.2.4	ANSYS FEA Model Files	Thirty (30) days upon completion of PART III
5	3.2.5	ISI Plan	Thirty (30) days upon completion of PART III

Table I. Required Submittal List

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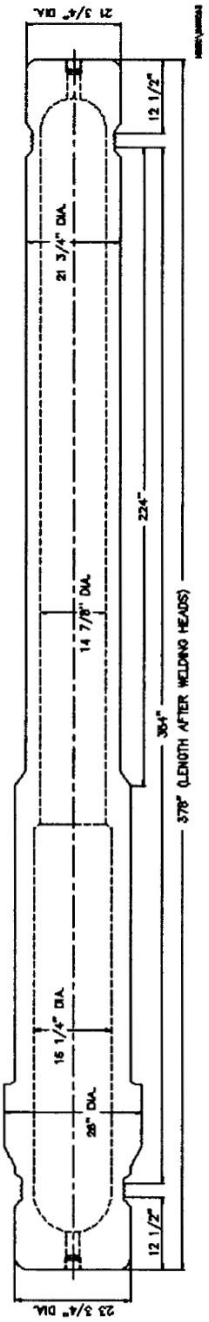

Figure A1. Bottle Field Pressure Vessel Design

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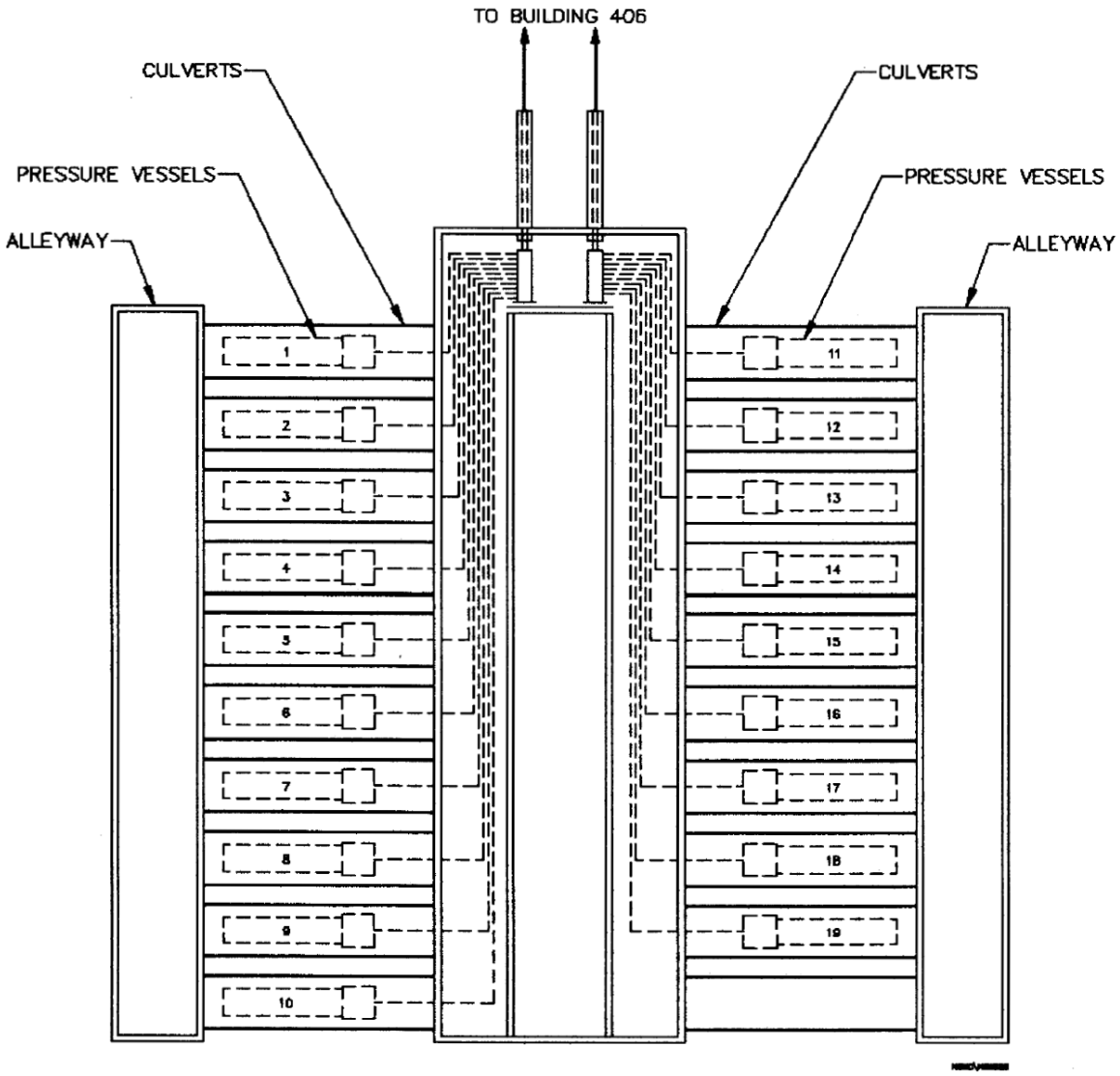

Figure A2. Bottle Field Vessel Layout

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