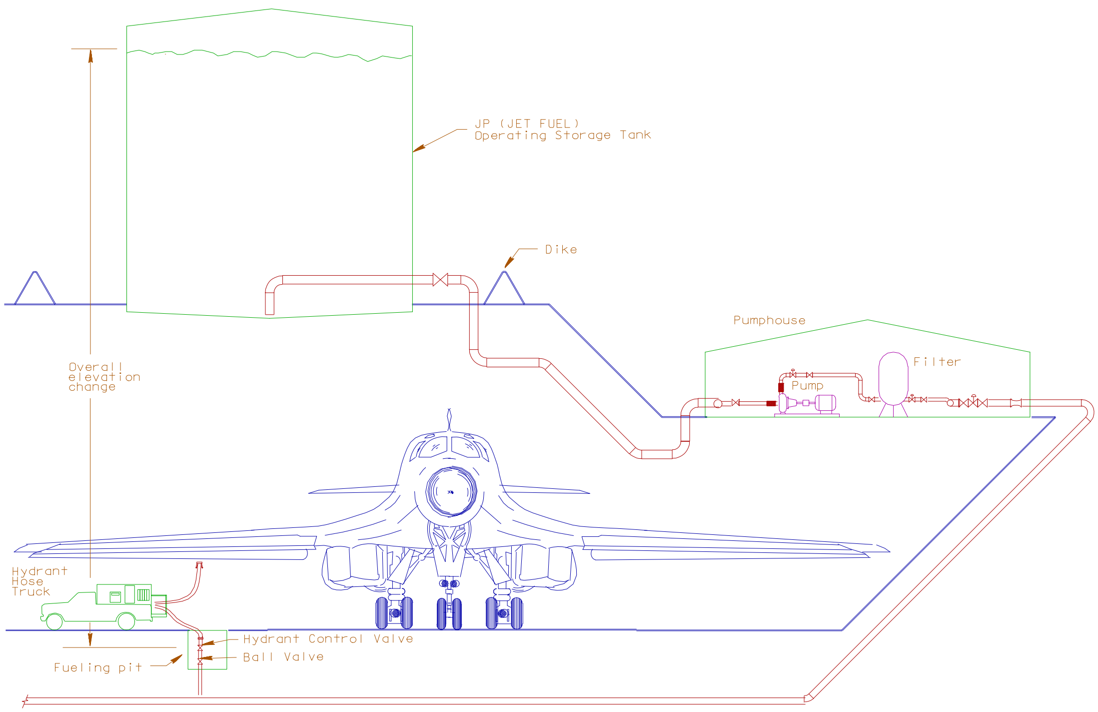
SPECIFICATIONS

DEPARTMENT OF DEFENSE
STANDARD PRESSURIZED HYDRANT FUEL SYSTEM (TYPE III, DIRECT FUELING (TYPES IV AND V), AND CUT-N-COVER STANDARDS)



JULY 2010

Prepared By : U.S. Army Corps of Engineers
Omaha District

JULY 2010 - FUEL STANDARD DRAWINGS AND SPECIFICATIONS

STANDARD TYPE DRAWINGS (ON CD-ROM IN ADOBE PDF AND AUTOCAD .DWG FILES):

A. PRESSURIZED HYDRANT FUELING SYSTEM TYPE III

B. PRESSURIZED HYDRANT DIRECT FUELING SYSTEM

C. CUT 'N' COVER STANDARDS
Storage Tank/Pumphouse and Filter Building

LIST OF FUEL RECOMMENDED STANDARD SPECIFICATIONS

A. RECOMMENDED-DOD-BEST-VALUE-RFP-SELECTION-REQUIREMENTS: MS WORD COPY ON CD-ROM IN "SPECS" FOLDER

00 22 00 Proposal Instructions, Submission Requirements and Evaluation

B. SPECSINTACT FILES AND ATTACHMENT: PDF COPIES ON CD-ROM IN "SPECS" FOLDER

The following list of SPECSINTACT FILES ARE AVAILABLE AT:

http://www.wbdg.org/ccb/browse_org.php?o=70

DIVISION 01 - GENERAL REQUIREMENTS

01 33 00	06/10	SUBMITTAL PROCEDURES
01 33 23.33	02/10	AVIATION FUEL SYSTEM SPECIFIC SUBMITTAL REQUIREMENTS
01 42 00	05/09	SOURCES FOR REFERENCE PUBLICATIONS
01 78 23.33	02/10	OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS

DIVISION 05 - METALS

05 59 10	02/10	ROLLING COVER FOR AVIATION REFUELING VAULTS

DIVISION 33 - UTILITIES

33 01 50.01	02/10	CLEANING FUEL STORAGE TANKS
33 08 53	02/10	AVIATION FUEL DISTRIBUTION SYSTEM START-UP
33 08 53AT		CHECKLIST FOR EQUIPMENT TEST – Copy Attached
33 09 53	02/10	AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM
33 09 54	02/10	AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (TYPE [IV][V])
33 09 55	02/10	AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS)
33 52 43.11	02/10	AVIATION FUEL MECHANICAL EQUIPMENT
33 52 43.12	02/10	AVIATION FUEL PANTOGRAPHS
33 52 43.13	02/10	AVIATION FUEL PIPING
33 52 43.14	02/10	AVIATION FUEL CONTROL VALVES
33 52 43.23	02/10	AVIATION FUEL PUMPS
33 52 43.28	02/10	FILTER SEPARATOR, AVIATION FUELING SYSTEM

SECTION 00 22 00

PROPOSAL INSTRUCTIONS, SUBMISSION REQUIREMENTS AND EVALUATION

INDEX

ATTACHMENTS:

Attachment 1 – Blank Performance Evaluation Forms (DD Form 2626)

SECTION 00 22 00

PROPOSAL INSTRUCTIONS,
SUBMISSION REQUIREMENTS AND EVALUATION

1. WHO MAY SUBMIT

This solicitation is open to both large and small business participation.

All proposers, including joint ventures, must be registered in the Central Contractor Registration (CCR). See paragraph 10 JOINT VENTURES.

There will be no public opening. All proposals submitted will become, upon receipt, the property of the U.S. Government and will not be returned. After evaluation of proposals, the original will be retained for the official contract file. Extra copies of the awardee's proposal will be submitted to the Field and Area Offices in support of their contract administration functions. Any extra copies of the proposals deemed unnecessary by the government will be destroyed.

2. GENERAL REQUIREMENTS

In order to effectively and equitably evaluate all proposals, the Contracting Officer must receive information sufficiently detailed to clearly indicate compliance with the proposal submission requirements.

3. SIZE OF PRINTED MATTER SUBMISSIONS

All written portions (other then the organization chart) shall be in 8-1/2" x 11" format, unless indicated otherwise.

4. WHERE TO SUBMIT

Offerors shall submit their proposal packages to the USACE Contracting Activity at the address shown in Block 8 of Standard Form 1442.

5. SUBMISSION DEADLINE

Offers shall be submitted at the location stated and by the time and date as specified in Section 00 11 00, Page 1.

Due to heightened security at Government installations, those offerors who have their proposals hand-carried* shall contact [ ], Contract Specialist at (402) 995-xxxx prior to delivering to the [U.S. Army Corps of Engineer District, Omaha, 1616 Capitol Ave, Omaha, NE 68102-4901].

[On the date specified and for thirty (30) minutes prior to the specified time, a Contracting representative will be in the lobby to receive proposals. Containers (i.e. envelopes, packages, boxes) will be screened for security purposes. Hand-carried means the individual must be able to carry on their person. If due to size or volume, packages or boxes need to be wheeled in on a cart or dolly, you will be required to go to the dock area located on the northeast side of the facility. After inspection and screening, you will be allowed in the building after presenting valid photo identification. At the time specified in Section 00 11 00, Page 1, local time, it will be announced that receipt of proposals is closed. Official time will be established by time/stamp clock designated by the Contract Specialist.

*This instruction shall also apply to those proposals delivered through a delivery or parcel service.

NOTE: No parking on the street in front of the facility entrances will be allowed. Passenger vehicles will need to locate parking meters or parking garages before delivering proposals. Delivery trucks must go to the dock. The vehicle will be inspected and packages screened at the dock. After inspection and screening, the delivery person will be allowed into the building.]

6. EVALUATION OF PROPOSALS

a. All proposals and documentation which have been properly submitted will be evaluated. Proposals will be evaluated on the basis of the factors stated in the solicitation to select the responsible offeror whose proposal is most advantageous to the Government. Because of the number of proposals anticipated, uniformity of all proposals is essential to assure fair and accurate evaluation. All proposals must comply with the instructions in the solicitation. Proposals that do not generally conform to the RFP requirements may be considered to have a “critical defect”, i.e. a defect that cannot be remedied by exchanges and/or permitted proposal revisions. If a proposal is suspected of having a critical defect, it will be brought to the immediate attention of the appropriate authority who will determine if there is a critical defect. If the determination is made that a critical defect exists, the proposal will not be evaluated further and will be eliminated from further consideration. The affected offeror shall be promptly notified of the decision. Properly conforming proposals will be forwarded to the Source Selection Evaluation Board (SSEB) for evaluation. If, after award, the key personnel or sub-contractors identified in the proposal are replaced, the Contractor shall submit a comparison sheet showing the previously provided personnel and/or subcontractors (from the proposal) and the replacement personnel or sub-contractors with similar skills and experience equal to those presented in the proposal shall be presented to the Contracting Officer for approval. The Contractor shall obtain the Contracting Officer’s written consent before making any substitutions for these designated personnel or sub-contractors.

b. Information obtained from owners, contract administrators, or other points of contact, provided by the offeror may affect the evaluation rating given for the factors being evaluated by those discussions.

c. Evaluations will be conducted in accordance with the Tradeoff Process, FAR 15.101-1. Factors 1 through 5 will be rated using an adjectival methodology with a narrative assessment and Binder #2 (Price) will be evaluated after consensus scoring Factors 1-5. Proposal evaluation is an assessment of the proposal and the offeror's ability to perform the resultant contract successfully. Proposals will be evaluated to determine ratings supported by narratives, and to identify strengths, weaknesses, and deficiencies of the proposed approach in each proposal.

d. Evaluation Definitions.

(1) Strength. A substantive aspect, attribute, or specific item in the proposal that exceeds the solicitation requirements and enhances the probability of successful contract performance.

(2) Weakness. A flaw in the proposal that increases the risk of unsuccessful contract performance. (i.e., meets the RFP requirements, but may have an impact on schedule or quality requirements). A *weakness need not be corrected* for a proposal to be considered for award, but *may* affect the offeror's rating.

(3) Deficiency. A material failure of a proposal to meet a Government requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level. A deficiency *must be corrected* for a proposal to be considered for award.

(4) Omission: is failure to provide information required by the solicitation and depending on the nature and extent of the omission it may be evaluated as a weakness, a significant weakness or a deficiency.

(5) Clarification. Clarifications are limited exchanges between the Government and offerors that may occur when award without discussions is contemplated. If award without discussions is anticipated, offerors may be given the opportunity to clarify certain aspects of their proposals or to resolve minor or clerical errors.

(5) Communications. Communications are exchanges between the Government and offerors after receipt of proposals, leading to establishment of the competitive range.

(6) Discussions. Discussions are negotiations conducted in a competitive acquisition and take place after establishment of the competitive range. Discussions are tailored to each offeror's proposal, and shall be conducted by the Contracting Officer with each offeror within the established competitive range.

(7) Rating. The application of a scale of words, colors, or numbers, used in conjunction with narrative, to denote the degree to which the proposal has met the standard for a non-cost factor. For purposes of this solicitation, ratings will consist of words (adjectival method) used in conjunction with narratives. Ratings will be applied at the factor and subfactor level. If at any level of indentation an Offeror's proposal is evaluated as not meeting a minimum requirement (that is, below the level of acceptable), this fact must be included in the rating and narrative assessment at that level and each higher level of indentation. Therefore, a marginal or unacceptable rating at any level must be carried to the factor (tab) level. The following ratings will be used to evaluate Factors 1 through 5:

Exceptional - Proposer possesses virtually all of the desired attributes and qualities set forth in the RFP, for the particular factor being evaluated. Strengths are present indicating maximum benefit to the government and no significant weaknesses are indicated.

Above Average - Proposer possesses many of the desired attributes and qualities set forth in the RFP, for the particular factor being evaluated. Strengths are present indicating significant benefit to the government. The proposal has only minor weaknesses that have no impact on the proposal as a whole and do not require correction.

Average - Proposer possesses some of the desired attributes and qualities set fort in the RFP, for the factor being evaluated. Strengths are present indicating some benefits to the government. Any weaknesses noted have only a minor impact on the proposal and are easily correctable.

Marginal - Proposer possesses only a few of the desired attributes and qualities expressed in the RFP, for the factor being evaluated. The Government may still receive benefit from the proposal submitted. Weaknesses and deficiencies noted are correctable without major revision of the proposal.

Unacceptable - Proposer lacks the desired attributes and qualities necessary to receive a higher rating. Weaknesses and/or deficiencies noted are uncorrectable without a major revision of the proposal.

Acceptable - The Proposal meets the solicitation requirements of the particular factor or sub-factor. The factor or sub-factor is not evaluated beyond making the determination that it meets the solicitation requirements.

Neutral. In the case of an offeror without a record of relevant past performance or for whom information on past performance is not available, the offeror may not be evaluated either favorably or unfavorably on past performance.

For Binder #1, Factor 4, Past Performance, Construction, a **neutral rating** will be awarded when no past performance records are provided or are otherwise unavailable. Per Federal Acquisition Regulation (FAR) 15.305(a)(2)(iv), "In the case of an offeror without a record of relevant past performance or for whom information on past performance is not available, the offeror may not be evaluated either favorably or unfavorably on past performance."

7. EVALUATION FACTORS FOR AWARD

The areas to be evaluated include Evaluation Factors, which will be evaluated based on the adjectival method of evaluation. The requirements specified in the solicitation are considered to be minimum requirements. A more favorable evaluation rating may be given for exceeding the minimum requirements***. . Note: All evaluation factors, other than price, when combined, are considered approximately equal to price.***

EVALUATION FACTORS

Binder No. 1

Location	Factor	Relative Importance
Tab A	Factor 1 - Proposed Construction Contractor Team Experience	1st
Tab B	Factor 2 - Offeror's Key Personnel Qualifications and Construction Experience	2nd (Slightly less than Factor 1)
Tab C	Factor 3 - Offeror's Subcontractor's Qualifications and Construction Experience	3rd (Slightly less than Factor 2)
Tab D	Factor 4 - Past Performance, Construction	4th (Slightly less than Factor 3)
Tab E	Factor 5 - Utilization of Small Business Concerns	5th (Slightly less than Factor 4)

SUBJECTIVELY EVALUATED FACTORS

Binder No. 2

Price - (approximately equal to the combined Factor elements in Binder 1)

Note: A low evaluation rating for any Factor, or combination of different Factors, may cause the proposal to be evaluated as "Unacceptable". Binder No. 2, Price will be evaluated in accordance the requirements listed in paragraph 9.1.2, EVALUATION OF PRICE.

8. PROPOSAL REQUIREMENTS AND SUBMISSION FORMAT

a. Offerors shall submit the original and four (4) copies of their Binder 1 (containing Tabs A-E) and an electronic copy (1 CD-ROM). Only the original of Binder 2 – Price shall be submitted (additional paper copies of this binder are not required). Binder 1 shall consist of a 3-ring binder with Tabs (dividers) separating Factors 1 through 5. Binder 2 shall be a separate binder containing the information shown below. The binders shall be divided as follows:

Binder No.1

Location	Factor
Tab A	Factor 1 - Proposed Construction Contractor Team Experience
Tab B	Factor 2 - Offeror's Key Personnel Qualifications and Construction Experience

Tab C Factor 3 - Offeror's Subcontractor's Qualifications and Construction Experience

Tab D Factor 4 - Past Performance, Construction

Tab E Factor 5 - Utilization of Small Business Concerns

b. Offerors shall submit the original of their price proposal contained in a 3-ring binder and designated "Binder No. 2".

Binder 2

Binder containing the Solicitation/Contract Form and Pricing Schedule (Section 00 11 00) and Representations, Certifications and Other Statements of Offerors (Section 00 45 00).

All proposals shall contain the information stated herein. Proposal clarity, organization (as requested in this solicitation) and cross referencing is mandatory. No material (information not part of proposal) shall be incorporated by reference.

Note: If you do not want the data submitted below disclosed by the Government, follow the procedure specified in Section 00 21 00 INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS, paragraph: RESTRICTION ON DISCLOSURE AND USE OF DATA. However, portions of the winning proposal will be incorporated into the contract and are subject to disclosure notwithstanding restrictive markings.

8.1. TAB A - FACTOR 1 - PROPOSED CONSTRUCTION CONTRACTOR TEAM EXPERIENCE

8.1.1. Submission Requirements

In this tab, the offeror should submit [four (four)][three (3)] examples of construction projects which best illustrate the experience of the construction contractor on projects of similar function, scope, complexity, and size as the requirements for this solicitation. Each project summary should consist of a one or two page narrative of the example project, discussing the project and providing specifics as noted herein. **No more than** [three (3)][four (4)] **projects may be submitted. If more than** [three (3)][four (4)] **projects are submitted, only the first** [three (3)][four (4)] **listed in the proposal will be evaluated.** Each project cited should have a construction dollar value greater than $_______ million and have been completed within [five (5)][six (6)] years from the date that the proposal for this solicitation is due. Indefinite-Delivery, Indefinite Quantity (IDIQ) Contracts, where numerous Task Orders are summed to meet the minimum construction dollar value identified herein, are not acceptable. Only those projects for which the offeror was the prime contractor or was a Subcontractor with a large percentage (50% or more) of the work should be submitted. All projects submitted should have been completed by the regional office that will be performing the work. The summaries should include project types that are similar to the [Project Name], [Location]. Similar project types are:

[airfield pavement construction on a completed airfield runway and successful start-up of a military or civilian Hydrant Fueling System with features such as a 2400 gpm pumphouse, hydrant control pits, and [cut and cover fuel tanks] [an aboveground fuel storage tank with fixed roof and floating pans].

The government preference is that project examples submitted be of completed projects (i.e. construction complete). Projects still under construction will be evaluated only if they are more than 50 percent complete, though less favorably than completed projects.

Each project summary must include the following for each project: a description/scope; picture/photo; firms on the proposed team that performed this project, construction contract award amount; final construction cost; location; date when the project was started; original contract finish date and actual finish date (if finished). Narratives of each project should include a brief overview of each project and its relevance to this solicitation. All summaries should contain the name, address, telephone, FAX number and e-mail address of a representative of the owner (as well as one alternate individual not affiliated with your firm) familiar with your firm's experience on the project that can verify the experience cited.

8.1.2. Evaluation

Evaluation will be based on the project summaries provided in the offeror's proposal. Higher evaluation ratings will be given for those project examples which are similar in function, scope, complexity, and size to this solicitation and clearly demonstrate the offeror's abilities to execute the projects successfully while maintaining cost and schedule.

Projects meeting the $___M criterion in Paragraph 8.1.1 will be rated higher than those not meeting the minimum. Projects that do not meet the similarity criterion identified in Paragraph 8.1.1 will be rated lower than those projects meeting this criterion. Further, such characteristics as size, complexity, dollar value, the number and types of trades employed may be indicative of similarity.

Projects that appear to have been performed by a Contractor's office other than the regional office that will be performing the work will be rated less favorably than those completed by the regional office. Projects that are not yet complete will be rated lower than those that are complete. Projects cited which indicate the offeror was not the prime contractor will be evaluated less favorably. Omission of requested information will result in lower ratings than those who provide all information identified in the paragraph above.

8.2. TAB B - FACTOR - 2 OFFEROR'S KEY PERSONNEL QUALIFICATIONS AND CONSTRUCTION EXPERIENCE

8.2.1. Submission Requirements

The offeror should submit the names and resumes for key construction personnel that will be assigned to this project. In addition, provide a summary of the duties and responsibilities of these individuals, which clearly indicate separate duties and responsibilities for each individual.

This tab should include data on the following personnel:

Project Manager

Project Superintendent

Contractor Quality Control (CQC) System Manager

The proposal should clearly present the credentials of each person and show that each meets the requirements listed below. Each resume should include the following information:

- Name, assignment for this solicitation, and company employing the person
- Education and degree or professional registration (if applicable)
- Past project experience (<u>including what role or capacity the individual served on each project</u>), as well as the dates (month and year) employed on each project in that capacity, the monetary size of each project cited as experience, and a point of contact familiar with each project. **Resumes should be listed in reverse chronological order, with the latest experience listed first, and all time gaps on each resume fully explained. In addition, the educational qualifications of the proposed personnel should be submitted.**

Prior experience on military construction projects, design/build projects, and projects of this type and size is preferred and will be evaluated more favorably. The proposal should clearly present the credentials of each person, and shall show that each possesses the following qualifications and no individual may be designated more than one position:

- **Project Manager:** The proposed Construction Project Manager shall possess a Bachelor's Degree in Engineering or Sciences, with a minimum of 5 years experience (within the last 10 years) in Construction Project Management. A minimum of 2 of those 5 years as experience, as a Construction Project Manager, in construction and installation of [Hydrant Fueling System] for completed systems.

- **Project Superintendent:** The proposed On-Site Project Superintendent shall have a minimum of 5 years construction related experience (within the last 10 years) as a superintendent on industrial construction projects with a minimum of 2 of those 5 years as experience, as a Construction Superintendent, with the construction of the installation of [Hydrant Fueling Systems].

- **Contractor Quality Control (CQC) System Manager:** The CQC System Manager must be either:

Possess a Bachelor's Degree in Engineering or Sciences with a minimum of 2 years experience (within the last 10 years), as a Construction CQC, in construction of the installation of [Hydrant Fueling System] for completed systems.

or

Have a minimum of 8 years construction experience (within the last 10 years) as a Construction CQC or Superintendent with a minimum of 2 of those 8 years as experience, as a Construction CQC, in construction of the installation of [Hydrant Fueling System] for completed systems.

If, after award, the key personnel identified in the proposal are not able to be utilized on this solicitation, replacement personnel with similar skills and experience shall be presented for acceptance and approval by the Contracting Officer. Replacement individuals for this solicitation shall be required to have qualifications and experience meeting or exceeding those identified in the proposal. The Contractor shall obtain the Contracting Officer's written consent before making any substitutions for these designated personnel.

8.2.2. Evaluation

Qualifications of key construction personnel assigned to this project will be considered. More favorable evaluation ratings will be given for military construction project experience, longevity of experience at the position being proposed and education. Prior experience on military construction projects is preferred and will be evaluated more favorably. Lower evaluation ratings may be given when replacement of key construction personnel has not been acceptable to the owner or Contracting Officer and where the owner or Contracting Officer was not notified about replacement personnel

8.3. TAB C - FACTOR 3 - OFFEROR'S SUBCONTRACTOR'S QUALIFICATIONS AND CONSTRUCTION EXPERIENCE

8.3.1. Submission Requirements

In this portion of the tab, provide the name of the proposed subcontractors listed below, along with a brief resume (1 or 2 sheets) for each company. Also, identify subcontractors' current key personnel (including their roles) involvement with the projects by name, or identify if the work is to be self-performed (and list projects referenced, in Factor 1 that were previously self-performed).

The proposal should only contain the name and resume for <u>one</u> subcontractor for each trade subcontractor listed below. If more than one subcontractor will be used for the trade subcontractor listed below, a second subcontractor for the trade subcontractor listed below may be added if a statement explaining why the second sub-contractor is included. Resumes should consist of a brief narrative of the company, presentation of relevant experience by the sub-contractor on similar projects (relevant experience is defined in Paragraph 8.1.1 above), and any other information pertinent to this project. In addition, indicate the CCASS or DUNS number of the subcontractor on the resume. CCASS Ratings will be pulled (by the government), if available, for the subcontractors and evaluated.

For project experiences sited with each subcontractor, indicate whether the identified subcontractor performed their designated duties or roles for the entire project contract or if they were replaced during the course of the project contract and the owner or Contracting Officer was notified about the replacement. If they were replaced, indicate whether they were replaced with subcontractors acceptable to the owner or Contracting Officer.

a. Mechanical [Hydrant Fuels/Pump House]. The Contractor will be required to show that they have successful experience in construction of fuel hydrant piping (including pits) and piping associated with multiple pumps in a fuel pump house.

b. Electrical [Class I, Division I Fuels Experience]. The contractor will be required to show that they have experience in completing Class I, Division I wiring around fueling systems.

c. Steel Fabricator/Erector (Fuel Tank). Steel Fabricator/Erector (Fuel Tank) will be required to show that they have successful experience in construction of [5,000 barrel or larger fuel storage tanks (as a minimum) with fixed roof and floating pan][_________Cut N Cover Tanks].

d. Airfield Pavement:

The Contractor will be required to show that they have experience in construction of 13-inch thick Portland Cement Concrete (PCC) Paving of 1,000 square yards (as a minimum).

e. System Supplier:

The proposed system supplier/installer shall have been regularly engaged in Hydrant Fueling Systems installation work for at least 5 years. The Offeror shall provide a listing indicating that the system supplier has installed at least five similar Programmable Logical Controllers (PLC) based pump control systems for automatic cycling of pumps based upon varying dispensing demands utilizing multiple pumps for dispensing jet fuel into aircraft in the last 5-year period (including start-up dates). The Offeror shall provide locations and dates for all of the listed systems and list of materials supplied on each of the listed systems that have successfully operated over the last three years and are still currently in service.

8.3.2. Evaluation

The Offeror's Subcontractor Qualifications and Construction Experience will be evaluated. Higher evaluation ratings will be given for providing subcontractors which demonstrate the required successful experience on project examples which are similar in function, scope, complexity, and size to this solicitation and clearly demonstrate the abilities to execute the projects successfully.
Higher evaluations may be given for showing successful experience on multiple projects. Higher evaluations may be given where CCASS ratings show "Exceptional" evaluations. In descending order, lower ratings may be given for CCASS ratings showing "Above Average", "Average", "Satisfactory", "Marginal", and "Unacceptable". If no CCASS or other Construction Performance ratings are available, , a neutral rating will be given to this portion of the evaluation. The Government may, at its discretion, contact references cited to verify the information contained therein.

If, after award the subcontractors identified in the proposal are not able to fulfill this

obligation, replacement subcontractors with equal or better skills and experience shall be presented for acceptance and approval by the Contracting Officer. Replacement subcontractors for this solicitation shall be required to have qualifications and experience meeting or exceeding those identified in the proposal. The Contractor shall obtain the Contracting Officer's written consent before making any substitutions for these designated subcontractors.

8.4. TAB D - FACTOR 4 - PAST PERFORMANCE, CONSTRUCTION

8.4.1. Submission Requirements

Submit past performance ratings. All Construction Contract Administration Support System (CCASS) ratings for all Corps of Engineer projects constructed by the offeror in the past five (5) years should be submitted. In addition, a performance evaluation shall be submitted for all projects listed in Factor 1. For projects cited in Factor 1 which were constructed for other government entities, submit the performance appraisal sheets used by that government entity. For each project cited in Factor 1 that may be private industry work or other Government entity not covered in the CCASS database, submit a Form DD2626 (a blank copy is attached to this section) completed by an owner or owner's representative (and not affiliated with your firm). Offeror shall explain any past performance resulting in significant cost and/or time growth. The government reserves the right to obtain copies of all CCASS records contained in the Corps of Engineers CCASS database. Firms are requested to retrieve their past performance information directly from the Past Performance Information Retrieval System (PPIRS) at http://www.ppirs.gov. PPIRS is an electronic repository of performance information collected by all the major federal performance reporting systems. Logging onto PPIRS will require the following:

All firms must have purchased and installed a Public Key Infrastructure (PKI) certificate. If you do not have this certificate, you cannot access your information. Additional information about the PKI certificate is posted in red at the top, center portion, of the http://www.ppirs.gov web page.

You will also need your DUNS number and Marketing Partner Identification Number (MPIN) to log onto PPIRS. The MPIN number was selected by whoever registered your firm in the Central Contractor Registry at http://www.ccr.gov . If you do not know your MPIN number, you will need to contact the CCR help desk by emailing them from the email link on the http://www.ccr.gov/help.asp web page. Please be aware that they will only release the MPIN number to the person who originally registered your firm.

There are two other ways to obtain a copy of CCASS / ACASS evaluations as follows: (1) Contact your government point of contact for the project you mentioned, and ask them if they can send you a copy, or (2) Apply for "Contractor Corporate Senior Management Representative" access on the following CCASS / ACASS web page: http://cpars.navy.mil/accessforms/userforms.htm . This type of access is issued to only one person within the firm, typically a member of senior management. In addition to access to your completed CCASS / ACASS performance evaluations, you will also be able to view status of evaluations which have not yet been completed. Following receipt of your faxed application request, you will be emailed a logon and access instructions. This type of access will only let you see CCASS / ACASS information, so it is not as complete as PPIRS access which allows access to evaluations prepared by non-DOD federal agencies, as well as the DOD agencies which use CCASS / ACASS. Be aware that you will also need to have a PKI certificate to access the CCASS / ACASS system. This is a DOD requirement. **Offeror shall not have received any overall "unacceptable" performance ratings in [Hydrant Fueling Systems] in the last 5 years.**

8.4.2. Evaluation

The evaluation of past performance will examine how well offerors have performed on previous projects considering such criteria as quality, timeliness, safety, responsiveness to customer concerns, and adherence to budget. Higher evaluation ratings will be awarded for "Exceptional" performance. In descending order, lower ratings may be given for past performance of "Above Average", "Satisfactory", "Marginal", and "Unacceptable" Performance on projects that show significant cost and/or time growth due to factors within the control of the offeror may be rated less favorably. If an offeror has no past performance ratings in CCASS, Performance Evaluation Worksheets, or other Construction Performance Rating Systems, a neutral rating will be given. The Government may, at its discretion, contact references cited to verify the information contained therein. The Government will evaluate the relative merits of each offeror's past performance. The Government reserves the right to consider all aspects of an offeror's performance history, but will attribute more significance to work that was similar in nature, magnitude, and complexity to this solicitation.

8.5. TAB E - FACTOR 5 – UTILIZATION OF SMALL BUSINESS CONCERNS

For submission requirements, see paragraphs: Submission Requirements – Small Business and Submission Requirements – Other Than Small Business.

8.5.1. General Information

8.5.1.1. Eligibility requirements for participating as a member of the Small Business Community (SBC)

(1) To be eligible for membership, a concern must represent itself as a small business, veteran-owned small business, service-disable veteran-owned small business, HUBZone small business, small disadvantaged business, or woman-owned small business concerns.

(2) To represent itself as a member of the SBC, the concern must meet the appropriate definition as indicated at the solicitation clause 52.219-8 Utilization of Small Business Concerns and documented at Federal Acquisition Regulation (FAR) Parts 2.1 and 19.001.

8.5.1.2. Definitions:

(1) **Small Business Concern** means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on government contracts, and qualified as a small business under the criteria and size standards

in 213 CFR Part 121 – Small Business Size Regulation. The term, hereafter referred to as the "**Small Business Community (SBC)**", encompasses the following members:

a. Small Business Concern (SB)

b. Small Disadvantaged Business Concerns (SDB)

c. Historically Underutilized Business Zone SB (HubZone)

d. Service-Disabled Veteran Owned SB (SDVOSB)

e. Veteran Owned SB (VOSB)

f. Woman owned SB (WOSB)

g. Historical Black Colleges & Minority Institution (HBCU/MI)

(2) **Other than Small Business Concerns** are all other entities including Large Business Concerns, State and local governments, Non-profit organizations, Public Utilities, Educational institutions and foreign-owned firms that are awarded federal contracts for performance within the United States.

(3) **Prime Contractor** for the purpose of this solicitation refers to Small Business Community members and "Other than Small"

(4) **"Small Business Subcontracting Goals"** represents the minimum level for small business performance in the indicated small business category.

(5) **Subcontract** means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(6) **Good Faith Effort** entails evidence that an "Other than Small" concern has provided maximum practicable opportunity for SBC members by complying with its subcontracting plan, subcontracting responsibilities with supporting documentation prescribed by 13 CFR §125.3 – Subcontracting assistance. See attached Small Business Administration document, Good Faith Efforts, Maximum Practicable Opportunity & Compliance in Binder 2.

(7) **Contractor Team Arrangements** as used in this solicitation, resultant proposals and contracts means an arrangement in which (1) Two or more companies form a partnership or joint venture to act as a potential prime contractor; or (2) A potential prime contractor agrees with one or more other companies to have them as its subcontractor for the requirement indicated in this solicitation.

8.5.1.3. Not Used

8.5.1.4. Joint Ventures

The Joint-Venture Entity must be registered in Central Contract Registration database at www.ccr.gov.

Contact your assigned Business Opportunities Specialist, Business Development Division at your Servicing SBA District Office for detailed information regarding SBA's requirements.

8.5.2. Submission Requirements - Small Business

For this tab, the qualified Small Business Concern should include a single sheet stating that the contractor is a Small Business Concern, the category of Small Business, and their business size classification based on the NAICS code and size standard as listed in Section 00 21 00 of the solicitation. If the offeror is a Small Business joint-venture, submit a copy of the Contractor Team Arrangement.

8.5.3. Submission Requirements - Other Than Small Business Concerns

All proposers other than Small Business Concerns should demonstrate how they plan to identify, commit, and utilize the Small Business Community as team members, subcontractors and/or suppliers in the performance of the resultant contract and provide assurance that small business concerns will have maximum subcontracting opportunities. The offer should clearly state factors that demonstrate a strong commitment to use small business concerns. The following information shall be submitted for Factor 5:

(1) Subcontracting Goals: "Other than Small Business" offerors are required to develop and identify percentage goals based on planned subcontracting that are challenging yet realistic. Proposers shall identify their goals for the contracts resulting from this solicitation. The U.S. Army Corps of Engineers considers the following goals reasonable and achievable for the performance of the resultant contract:

The small business informational subcontracting goal objectives for this solicitation or request for proposal are based on a percentage of the proposed contract total value rather than a percentage of the subcontracting amount as indicated in FAR clause 52.219.9, Subcontracting Plan.

A subcontracting goal objective of 20% of the total proposed contract value; higher proposed percentage amounts will receive a more favorable evaluation rating. The proposed percentage is applied to each category in the proposed percentages indicated below.

(i) [70] % of subcontracted amount contract amount with small business concerns.

(ii) [6.2] % of subcontracted amount contract amount with those small business concerns owned and controlled by socially and economically disadvantaged individuals.

(iii) [7.0] % of subcontracted amount contract amount with those small business concerns owned and controlled by women.

(iv) [0.9] % of subcontracted amount contract amount with those small business concerns owned and controlled by Service-Disabled Veterans.

(v) [9.8] % of subcontracted amount contract amount with those small business concerns owned and controlled by HUBZones.

(vi) [0.0]% of planned subcontracting dollars to be placed with historical black colleges and universities/minority institutions (HBCU/MI).

(2) Mitigation Plan: "Other than Small Business" offerors should identify efforts that will be made to mitigate the effects of full and open competition on small business concerns. Specific examples of mitigation efforts via subcontracting include (but are not limited to):

Formal teaming agreements with small businesses

Formal Mentor-Protégé agreements

Exceeding the small business subcontracting goals stated above in the sub-factor SUBCONTRACTING GOALS

Applying small business subcontracting goals toward actual dollars awarded rather than a percentage of subcontracting dollars

Ensuring original small business team members have substantial subcontracting opportunities and preferences throughout the life of the contract.

Assurances that all members of the Offeror's team understand the rules, regulations and procedures governing the review of subcontracting plan, subcontracting reporting, and subcontracting compliance audits

Ensuring periodic review of small business subcontracting plan compliance

Offerors are encouraged to utilize the Central Contractor Registration's Dynamic Small Business Search (formerly the Small Business Administration's "Pro-*Net*" database). The U.S. Small Business Administration, the Department of Defense, the Office of Management and Budget and the General Services Administration have taken steps to simplify the federal contracting process by creating an integrated database of small businesses that want to do business with the government. The integration of Pro-*Net* and DOD's Central Contractor Registration (CCR) database has created one portal for entering and searching small business sources. The Dynamic Small Business Search web address, http://www.ccr.gov. Similar to the defunct "Pro-*Net*", the Dynamic Small Business Search is an internet based database of information on small business concerns.

(3) Utilization of Small Business Concerns: "Other than Small Business" offerors should propose their plan for meeting the small business goals stated above, utilizing small

business concerns as team members, subcontractors, and/or suppliers in the resulting contract (FAR Clause 52.219-8, Utilization of Small Business Concern (May 2004)).

(4) Past Performance in Utilization of Small Business Concerns. “Other than Small” offerors should demonstrate the extent to which applicable goals for small business participation under contracts that required subcontracting plans were met or exceeded (15 U.S.C 637(d)(G)(ii)) (FAR Clause 52.219-9 – Small Business Subcontracting Plan). Data submitted should demonstrate overall small business past performance within the last 5 years on government contracts of a similar nature. The data submitted should demonstrate small business performance for goals in each of the aforementioned small business category (SB, SDB, WOSB, HUBZone, SDVOSB, VOSB, & HBCU/MI). As a minimum data should include:

- Name of the Client/Customer
- The Contract Number and/or Identification Number
- Project Description
- Contract Amount
- Project/Program Manager or Point of Contact with address and telephone number.
- Subcontracting Compliance Review/Audit Reports (authentication and verification of subcontracting compliance review by a federal agency such as the Small Business Administration, the Defense Contract Audit Agency, or the U.S. Army Corps of Engineers).
- Standard Form 294, Subcontracting Report for Individual Contracts and Standard Form 295, Summary Subcontract Report
- Other relevant documentation that may include citations, awards, letters of accommodation, etc. that demonstrate successful past performance with utilization of small business concerns.

8.5.4. Evaluation

8.5.4.1. Small Business

Small business concerns will receive the highest evaluation rating under FACTOR 5 - UTILIZATION OF SMALL BUSINESS CONCERNS.

8.5.4.2. Other Than Small Business

Other than Small Offerors will be formally evaluated for the following sub-factors, evaluated in descending order of importance: Subcontracting Goals, Mitigation Efforts, Utilization of Small Business Concerns, and Past Performance in Utilization of Small Business Concerns.

(1) Subcontracting Goals: The target goals suggested in this solicitation are considered to be minimum requirements and for information purposes only. A more favorable evaluation rating may be given for exceeding the suggested minimum requirement, provided the proposed goals are challenging, realistic, obtainable, and demonstrate a strong commitment to the utilization of small business concerns.

(2) Mitigation Plan: Offerors who propose innovative and effective mitigation strategies in small business subcontracting will receive a more favorable evaluation than Offerors who merely meet the Government's minimum requirements.

(3) Utilization of Small Business Concerns: Offerors will be evaluated on their proposed utilization and participation of small business concerns as team members, subcontractors, and/or suppliers in the resulting contract. The Offerors will be evaluated on their commitments that small business concerns will have maximum subcontracting opportunities. Enforceable commitments to use small business concerns will receive more favorable evaluations than non-enforceable commitments.

(4) Past Performance in Utilization of Small Business Concerns: Offeror’s past performance in establishing and achieving realistic yet challenging goals on recent contracts of a similar nature will be evaluated. Offerors who have recently established and achieved higher goals in their small business past performance will be evaluated more favorably.

9. BINDER NO. 2 - PRICE

9.1.1. Submission Requirements

The offeror should submit **only an original** of the following information **in a separate binder**. Five copies of the information in this Tab are **not** required and should not be submitted. The binder shall contain the following information:

a. Section 00 11 00, Solicitation/Contract Form and Pricing Schedule.

Include the completed SF Form 1442 (Pages 00 11 00-1 and 00 11 00-2) of the RFP, along with the completed CLIN Pricing Schedule. The total cost for the construction will be considered for evaluation[, including all options]. Proposed price for the construction of this project will be considered for evaluation and assist in establishment of the competitive range (if one is established).

b. Section 00 45 00, Representations, Certifications and Other Statements of Offerors.

These items are not considered for evaluation, but are required as part of the offeror’s proposal of this solicitation. The information requested in this Section needs to be fully completed along with completion of Online Representations and Certifications Application (ORCA) per FAR 52.204-8 ANNUAL REPRESENTATIONS AND CERTIFICATIONS. The submitted information will be reviewed for completeness by Contracting Personnel.

c. Pre-Award Survey Information (Local Provision) (Sep 93).

In accordance with FAR Clause 52.228-15 PERFORMANCE AND PAYMENT BONDS, the following information should be submitted with each offer. Submission of this information will expedite the award process.

(1) Financial:

a. Name, address, fax number and e-mail address of Financial Institution
b. Name and phone number of finance individual (primary and alternate) to be contacted for information

(2) Bonding Information: Provide the name, address, regular phone number, fax number and e-mail address of the offeror's Surety Company.

9.1.2. Evaluation of Price

Price will be subjectively evaluated for Best Value and Realism by the Government, considering total cost of the basic and all option items to reach the best value for the Government, price and other factors considered.

(a) Best Value is defined as the expected outcome of an acquisition that in the Government's estimation provides the greatest overall benefit in response to the requirement, Technical and Price factors considered.

(b) Realism is defined as costs in an offeror's proposal considered realistic for the work to be performed, reflecting a clear understanding of the requirements, and consistent with the various elements of the offeror's technical proposal (all Factors other than Price). Note that all evaluation factors other than Price, when combined, are approximately equal to the Price evaluation.

Note that all evaluation factors other than Price, when combined, are considered approximately equal to Cost/Price. Other elements requested in Binder No. 2 will not be used in the Best Value Analysis, but are required as part of the proposal.

10. JOINT VENTURES

No contract may be awarded to a joint venture that is not registered in the Central Contractor Register (CCR). Joint ventures may register in the following way:

10.1. REGISTERED IN CCR

The firm that will be the recipient of payments should be registered in the CCR and have a DUNS number. This firm is considered in the CCR to be the "mother firm." If no money is to go to any other firm in the joint venture, the mother firm may make the other firm in the joint venture a "child." This child will be assigned the mother firm's CCR number with an additional four (4) numbers attached. Since the child firm is not receiving any payments, they do not need to get a DUNS number. HOWEVER, in order to cover all possibilities, it might be advisable to have each firm registered in the CCR.

10.2. CONTACT DUNN & BRADSTREET

DUNS & Bradstreet phone number is 1-800-333-0505. See Section 00 21 00 INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS for CCR Registration requirements.

10.3. NEW COMPANY

If the joint venture has a newly created name, then it must have its own DUNS number and register as such in the CCR.

10.4. CONTACT INFORMATION

In the cover letter of your proposal, provide the complete names, addresses, and phone and fax numbers of the two firms in the joint venture.

10.5. SIGNATURE REQUIREMENTS

SF 1442, SOLICITATION, OFFER, AND AWARD (pages 00010-1 and 00010-2), Block 20 requires that the name and title of the person authorized to sign the offer for the joint venture be provided.

10.6. CORPORATE CERTIFICATE

Ensure that joint-venture portion is completed by both firms.

10.7. JOINT VENTURE REQUIREMENTS

In the case of a joint venture, the following is required: A contract with joint ventures may involve any combination of individuals, partnerships, or corporations. The contract shall be signed by each participant in the joint venture in the manner prescribed below for each type of participant. When a corporation is participating, the Contracting Officer shall verify that the corporation is authorized to participate in the joint venture.

10.7.1. Individuals

A contract with an individual shall be signed by that individual. A contract with an individual doing business as a firm shall be signed by that individual, and the signature shall be followed by the individual's types, stamped, or printed name and the words "an individual doing business as ……." [insert name of firm].

10.7.2. Partnerships

A contract with a partnership shall be signed in the partnership name. Before signing for the Government, the Contracting Officer shall obtain a list of all partners and ensure that the individual(s) signing for the partnership have authority to bind the partnership.

10.7.3. Corporations

A contract with a corporation shall be signed in the corporate name, followed by the word "by" and the signature and title of the person authorized to sign. The Contracting Officer shall ensure that the person signing for the corporation has authority to bind the corporation.

10.7.4. Single Point of Contact

In addition to the requirements stated above, and to assure a single point of contact for resolution of contractual matters and payments, the Contracting Officer shall obtain a certificate signed by each participant in the joint venture as follows: In the proposal include the following statement: **"**The parties hereto expressly understand and agree as follows:

a. **(name, title, and company)** is the principal representative of the joint venture. As such, all communications regarding the administration of the contract and the performance of the work thereunder may be directed to him or her. In the absence of **(same name, title, and company), (enter name, title, and company of alternate)** is the alternate principal representative of the joint venture.

b. Direction, approvals, required notices, and all other communications from the Government to the joint venture, including transmittal of payments by the Government, shall be directed to **(enter name, title, and company of principal),** principal representative of the joint venture**."**

11. COMPETITIVE RANGE

Upon completion of initial proposal evaluation, if discussions are determined to be needed, the Government may establish a competitive range for the purpose of conducting written discussion. The competitive range shall be determined on the basis of the factors stated in the solicitation and shall include all of the most highly rated proposals, unless the range is reduced for reasons of efficiency. **<u>The Government intends to award a contract on the basis of initial offers received, without discussions</u>**. Therefore, each initial offer should contain the offeror's best terms from a cost or price and technical standpoint. Notwithstanding, the Government may conduct written discussions with all responsible offerors who submit proposals and are considered within the competitive range. Offerors submitting proposals determined outside of the competitive range (lacking a reasonable chance of being selected for contract award) will be notified in writing prior to the initiation of discussions.

12. CLARIFICATIONS AND DISCUSSIONS.

For definitions of Evaluation terms referenced below, see paragraph 6 (e) above.. The information provided in this paragraph includes procedural information associated with clarifications and discussions.

a. <u>Clarifications</u>**.** During the evaluation, if a proposal requires clarification for the Board to complete its evaluation, a written list of questions and/or comments will be provided to the offeror by the Contracting Representative or Contracting Officer. Any request for clarifications will be issued by letter. Contractors will not be permitted to change their proposals in response to a request for clarifications. All contact with offerors will be through the Contracting Division. There will be no direct contact by the SSEB with any offeror(s).

b. Communications. Communications as defined in paragraph 6(e)(5) above, between the Government and offerors, after receipt of proposals, leading to establishment of the competitive range, will not occur without the participation of the Contracting Officer.

c. Discussions. If discussions, as defined in paragraph 6(e)(6) above are necessary, written and/or verbal, they will be conducted with all firms in the competitive range once a written Determination to hold such discussions has been approved by the Contracting Officer. FAR 15.306(d)(3) and the Comptroller General Decisions indicate that all content of discussions are a matter within the Contracting Officer's judgment. Discussions involve an exchange of information essential to determining the acceptability of a proposal. During the exchange of information, offerors must be informed of all deficiencies and significant weaknesses in their proposals and offered an opportunity to revise their proposals. No technical leveling, transfusion or auction techniques shall result from discussions. Discussions will be concluded as of the date specified for receipt of a Final Revised Proposal from those offerors determined to be in the competitive range in accordance with FAR 15.306(c)(2).

13. FINAL PROPOSAL REVISIONS

If discussions are held, upon their completion, the Government shall issue to all Offerors within the competitive range a request for final proposal revisions specifying the exact date and time for submission of the revision. Any verbal revisions to proposals made during the course of discussions must be included in the offeror's written Final Revised Proposal. Any verbal revisions not included in the final revision will not be considered in re-evaluating the proposals. Any verbal request for a Final Revised Proposal shall be confirmed in writing. The confirmation shall include:

(1) Notice that discussions are concluded.
(2) Notice that this is the opportunity to submit a Final Revised Proposal.
(3) Establishment of a common cutoff date and time that allows the offerors reasonable opportunity for submission of written Proposal revisions.
(4) Notice that Proposal Revisions, and modifications thereto, must be received by the date, time, and in the place specified in the notice, or they are subject to the Late Offers provision in the solicitation in Section 00 21 00.

Following the evaluation of final proposal revisions, the Government will select the offeror whose initial and final proposal revision presents the Best Value and is most advantageous, considering only the factors included in the solicitation, to the Government.

14. DEBRIEFING

Each offeror, successful or unsuccessful, will have the opportunity, in accordance with Federal Acquisition Regulation (FAR) 15.505 and 15.506, to receive one debriefing. Offerors are required to submit a written request for debriefing and discussion of the evaluation of its proposal within three (3) calendar days after receipt of exclusion from competition or notice of award. The debriefing of all offerors, successful or unsuccessful, will be conducted by the Contracting Officer in accordance with the FAR. Each offeror shall be provided only one debriefing, either post award or pre-award, at their choosing. The Contracting Specialist will coordinate and schedule the debriefings. Debriefing participation will include the Contracting Officer, chairperson of the SSEB, and Contracting Specialist with additional support from other members of the SSEB as required. The Contracting Officer will conduct the debriefings.

ATTACHMENT 1

BLANK PERFORMANCE EVALUATION SHEETS

DD Form 2626: Performance Evaluation (Construction) for use in Factor 4 for all Factor 1 projects for which no other evaluation forms exist

Rating Equivalents:

DD Form 2626 = RFP Rating System

Outstanding = Exceptional
Above Average = Above Average
Satisfactory = Average
Marginal = Marginal
Unsatisfactory = Unacceptable

FOR OFFICIAL USE ONLY *(WHEN COMPLETED)*

PERFORMANCE EVALUATION (CONSTRUCTION)	**1. CONTRACT NUMBER**
	2. CEC NUMBER

IMPORTANT: Be sure to complete Part III - Evaluation of Performance Elements on reverse.

PART I - GENERAL CONTRACT DATA

3. TYPE OF EVALUATION *(X one)* ☐ INTERIM *(List percentage ______%)*	☐ FINAL	☐ AMENDED	**4. TERMINATED FOR DEFAULT** ☐
5. CONTRACTOR *(Name, Address, and ZIP Code)*		**6.a. PROCUREMENT METHOD** *(X one)* ☐ SEALED BID ☐ NEGOTIATED b. TYPE OF CONTRACT *(X one)* ☐ FIRM FIXED PRICE ☐ COST REIMBURSEMENT ☐ OTHER *(Specify)*	

7. DESCRIPTION AND LOCATION OF WORK

8. TYPE AND PERCENT OF SUBCONTRACTING

9. FISCAL DATA ▶	a. AMOUNT OF BASIC CONTRACT $	b. TOTAL AMOUNT OF MODIFICATIONS $	c. LIQUIDATED DAMAGES ASSESSED $	d. NET AMOUNT PAID CONTRACTOR $
10. SIGNIFICANT DATES ▶	a. DATE OF AWARD	b. ORIGINAL CONTRACT COMPLETION DATE	c. REVISED CONTRACT COMPLETION DATE	d. DATE WORK ACCEPTED

PART II - PERFORMANCE EVALUATION OF CONTRACTOR

11. OVERALL RATING *(X appropriate block)*

☐ OUTSTANDING ☐ ABOVE AVERAGE ☐ SATISFACTORY ☐ MARGINAL ☐ UNSATISFACTORY *(Explain in Item 20 on reverse)*

12. EVALUATED BY

a. ORGANIZATION *(Name and Address (Include ZIP Code))*		b. TELEPHONE NUMBER *(Include Area Code)*
c. NAME AND TITLE	d. SIGNATURE	e. DATE

13. EVALUATION REVIEWED BY

a. ORGANIZATION *(Name and Address (Include ZIP Code))*		b. TELEPHONE NUMBER *(Include Area Code)*
c. NAME AND TITLE	d. SIGNATURE	e. DATE

14. AGENCY USE *(Distribution, etc.)*

DD FORM 2626, JUN 94 EXCEPTION TO SF 1420 APPROVED BY GSA/IRMS 6-94

FOR OFFICIAL USE ONLY *(WHEN COMPLETED)*

PART III - EVALUATION OF PERFORMANCE ELEMENTS

N/A = NOT APPLICABLE O = OUTSTANDING A = ABOVE AVERAGE S = SATISFACTORY M = MARGINAL U = UNSATISFACTORY

15. QUALITY CONTROL	N/A	O	A	S	M	U
a. QUALITY OF WORKMANSHIP						
b. ADEQUACY OF THE CQC PLAN						
c. IMPLEMENTATION OF THE CQC PLAN						
d. QUALITY OF QC DOCUMENTATION						
e. STORAGE OF MATERIALS						
f. ADEQUACY OF MATERIALS						
g. ADEQUACY OF SUBMITTALS						
h. ADEQUACY OF QC TESTING						
i. ADEQUACY OF AS-BUILTS						
j. USE OF SPECIFIED MATERIALS						
k. IDENTIFICATION/CORRECTION OF DEFICIENT WORK IN A TIMELY MANNER						
17. TIMELY PERFORMANCE						
a. ADEQUACY OF INITIAL PROGRESS SCHEDULE						
b. ADHERENCE TO APPROVED SCHEDULE						
c. RESOLUTION OF DELAYS						
d. SUBMISSION OF REQUIRED DOCUMENTATION						
e. COMPLETION OF PUNCHLIST ITEMS						
f. SUBMISSION OF UPDATED AND REVISED PROGRESS SCHEDULES						
g. WARRANTY RESPONSE						

16. EFFECTIVENESS OF MANAGEMENT	N/A	O	A	S	M	U
a. COOPERATION AND RESPONSIVENESS						
b. MANAGEMENT OF RESOURCES/ PERSONNEL						
c. COORDINATION AND CONTROL OF SUBCONTRACTOR(S)						
d. ADEQUACY OF SITE CLEAN-UP						
e. EFFECTIVENESS OF JOB-SITE SUPERVISION						
f. COMPLIANCE WITH LAWS AND REGULATIONS						
g. PROFESSIONAL CONDUCT						
h. REVIEW/RESOLUTION OF SUBCONTRACTOR'S ISSUES						
i. IMPLEMENTATION OF SUBCONTRACTING PLAN						
18. COMPLIANCE WITH LABOR STANDARDS						
a. CORRECTION OF NOTED DEFICIENCIES						
b. PAYROLLS PROPERLY COMPLETED AND SUBMITTED						
c. COMPLIANCE WITH LABOR LAWS AND REGULATIONS WITH SPECIFIC ATTENTION TO THE DAVIS-BACON ACT AND EEO REQUIREMENTS						
19. COMPLIANCE WITH SAFETY STANDARDS						
a. ADEQUACY OF SAFETY PLAN						
b. IMPLEMENTATION OF SAFETY PLAN						
c. CORRECTION OF NOTED						

20. REMARKS *(Explanation of unsatisfactory evaluation is required. Other comments are optional. Provide facts concerning specific events or actions to justify the evaluation. These data must be in sufficient detail to assist contracting officers in determining the contractor's responsibility. Continue on separate sheet(s), if needed.)*

DD FORM 2626 (BACK), JUN 94

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USACE / NAVFAC / AFCESA / NASA **UFGS-01 33 00 (June 2010)**

Preparing Activity: NASA **Superseding**
UFGS-01 33 00 (May 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS
****

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 33 00

SUBMITTAL PROCEDURES

06/10

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCESA / NASA **UFGS-01 33 00 (June 2010)**

Preparing Activity: NASA **Superseding**
UFGS-01 33 00 (May 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS
****

SECTION 01 33 00

SUBMITTAL PROCEDURES
06/10

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NOTE: This guide specification covers the requirements for general procedures regarding submittals, data normally submitted for review to establish conformance with the design concept and contract documents, called for in other sections of the specifications.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**

This guide specification includes tailoring options for Army, Navy, NASA and for NAVFAC component requirements. Army tailoring options also include DESIGN-BUILD (DB) and CONSTRUCTION, and at least one of these options must be deselected. Do not use this section for Navy DB projects. Use the DB specs in the NAVFAC DB Master posted within the Whole Building Design Guide**. Selection or deselection of a tailoring option will include or exclude that option in the section, but editing the resulting section to fit the project is still required.**
****

PART 1 GENERAL

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

****

NOTE: The SD numbers and names, assigned by the SPECSINTACT Configuration, Control and Coordinating Board, relate to the terminology of the technical sections and should not be changed. Refer to UFC 1-300-02 UNIFIED FACILITIES GUIDE SPECIFICATIONS (UFGS) FORMAT STANDARD **for additional information.**

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SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work) issuance of notice to proceedor commencing work on site or the start of the next major phase of the construction on a multi-phase contract. Includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to start of construction work start of construction work contract notice to proceed or next major phase of construction.

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction Progress Schedule

Network Analysis Schedule (NAS)

Submittal register

Schedule of prices

Health and safety plan

Work plan

Quality control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS)concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

Interim "DD Form 1354" with cost breakout for all assets 30 days prior to facility turnover.

1.1.2 Approving Authority

Office or designated person authorized to approve submittal.

1.1.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2 SUBMITTALS

****

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's QC system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army

projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor QC approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register[; G][; G, [_____]]

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Designer of Record Approved (DA)

Designer of Record (DOR) approval is required for extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, or the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings." Contractor to provide the Government with the number of copies designated hereinafter of all DOR approved submittals. The Government may review any or all Designer of Record approved submittals for conformance to the Solicitation, Accepted Proposal and the completed design. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below. Design submittals to be in accordance with Section [_____] DESIGN AFTER AWARD. Generally, design submittals should be identified as SD-05 Design Data submittals.

1.3.2 Government Approved [G]

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.3 Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section [_____] DESIGN AFTER AWARD covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section [_____] DESIGN AFTER AWARD. Generally, design submittals should be identified as SD-05 Design Data submittals.

1.3.4 Designer of Record Approved/Government Conformance Review (DA/CR)

1.3.4.1 Deviations to the Accepted Design

Designer of Record approval and the Government's concurrence are required for any proposed deviation from the accepted design which still complies with the contract before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction", they are considered to be "shop drawings." If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if deemed necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2 Substitutions

Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR's approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal. If the Contract otherwise prohibits substitutions of equal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, the request is considered a "variation" to the contract. Variations are discussed below in paragraphs: "Designer of Record Approved/Government Approved" and "VARIATIONS"

1.3.5 Designer of Record Approved/Government Approved (DA/GA)

In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is authorized to proceed with material acquisition or installation for any proposed variation to the contract (the solicitation and/or the accepted proposal), which constitutes a change to the contract terms. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings." The Government reserves the right to accept or reject any such proposed deviation at its discretion.

1.3.6 Information Only

Submittals not requiring Government approval will be for information only. For Design-build construction all submittals not requiring Designer of Record or Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.4 FORWARDING SUBMITTALS REQUIRING GOVERNMENT APPROVAL

****

NOTE: Use this article and the following paragraphs only in LANTNAFVFACENGCOM Division projects. In the following paragraphs select only the applicable information in brackets. On A/E projects, the A/E should insert the firm name in the spaces shown, unless it is known that the A/E will not be checking samples and other submittals, including shop drawings and product data.

****

1.4.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the [Commander, NAVFAC Atlantic, Code CI4A1, 6506 Hampton Boulevard, Norfolk, Virginia, 23508-1278] [Architect-Engineer: [_____],] submittals required in the technical sections of this specification, including shop drawings, product data and samples. One copy of the transmittal form for all submittals shall be forwarded to the Resident Officer in Charge of Construction.

[The Architect-Engineer for this project] [NAVFAC Atlantic] will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

1.4.1.1 O&M Data

[The Architect-Engineer for this project] [NAVFAC Atlantic] will review and approve for the Contracting Officer O&M Data to verify the submittals comply with the contract requirements; submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

[1.4.1.2 Submittals Reserved for NAVFAC Atlantic Approval

****

NOTE: Include this optional paragraph for all projects designed by Architect-Engineer consulting firms. Fill in the appropriate specification section numbers and titles for the respective products.

****

As an exception to the standard submittal procedure specified above, submit the following to the Commander, NAVFAC Atlantic, Code CI4A1, 6506 Hampton Blvd, Norfolk, VA 23508-1278:

****
NOTE: Add Section Reference tags where appropriate below when blanks are filled.
****

[a. Section [_____], "[_____]": Pile driving records

][b. Section [_____], "[_____]": All fire protection system submittals

][c Section [_____], "[_____]": All fire alarm system submittals

][d. Section 23 09 53.00 20 SPACE TEMPERATURE CONTROL SYSTEMS: SD-06 field test report submittals

][e. Section 23 09 23.13 20 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC: SD-06 field test report submittals

][f. Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC: All submittals

][g. Section 23 08 01.00 20 TESTING INDUSTRIAL VENTILATION SYSTEMS: All submittals

][h. Section 26 12 19.10 THREE-PHASE PAD-MOUNTED TRANSFORMERS: All submittals

][i. Section 26 12 19.20 SINGLE-PHASE PAD-MOUNTED TRANSFORMERS: All submittals

][j. Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION: Transformer submittals

][k. Section 26 11 16 SECONDARY UNIT SUBSTATIONS: Transformer submittals

][l. Section 26 11 13.00 20 PRIMARY UNIT SUBSTATION: Transformer submittals

]][1.4.1.3 Overseas Shop Drawing Submittals

****
NOTE: For use on overseas jobs only.
****

All submittals shall be sent via overnight express mail service. All costs associated with the overnight express mail service shall be borne by the construction Contractor. Costs associated with the overnight express mail of submittals related to proposed submittal variances of resubmittals necessary as a result of noncompliant or incomplete Contractor submittals shall be the responsibility of the Contractor.

]1.5 PREPARATION

1.5.1 Transmittal Form

****
NOTE: Do not use the following paragraph for Army projects.
****

[Transmit each submittal, except sample installations and sample panels to office of [approving authority]. Transmit submittals with transmittal form prescribed by Contracting [Officer] [Administrator] and standard for project. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled, "Identifying Submittals," of this section. Process transmittal forms to record actions regarding sample[s] [installations] [panels].]

****
NOTE: Use the following paragraph for Army projects only. ENG Form 4025 is not a part of this guide specification; the sample ENG Form 4025 must be added to this section locally. If the Contractor is required to use the QCS software for the contract, that system includes an electronic version of ENG Form 4025.
****

[Use the attached sample transmittal form (ENG Form 4025) for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms [will be furnished to the Contractor][are included in the QCS software that the Contractor is required to use for this contract]. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.]

1.5.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction contract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.5.3 Format for SD-02 Shop Drawings

Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

Present A4 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled, "Identifying Submittals," of this section.

Number drawings in a logical sequence. [Contractors may use their own number system.] Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than [_____] inches on the right hand side of each sheet for the Government disposition stamp.

Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Include the nameplate data, size and capacity on drawings. Also include applicable federal, military, industry and technical society publication references.

1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.

Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.

Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project, with information and format as required for submission of SD-07 Certificates.

Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, submit as specified for SD-07 Certificates.

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will [not] be accepted for expedition of construction effort.

Submit manufacturer's instructions prior to installation.

1.5.5 Format of SD-04 Samples

Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to A4 8 1/2 by 11 inches.

c. Sample of Materials Exceeding A4 8 1/2 by 11 inches: Cut down to A4 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at time of use.

Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.

****
NOTE: To avoid unnecessary effort by the Contractor, use the following paragraph only when there is no color board prepared during design.
****

When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.5.6 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.5.7 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

1.5.8 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.5.9 Format of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply Contractor's approval stamp to document, but to a separate sheet accompanying document.

1.6 QUANTITY OF SUBMITTALS

****
NOTE: The quantities suggested below are consistent with the quantities to be retained by the Government, in paragraph entitled, "QC Organization Responsibilities," of this section; maintain the coordination.
****

1.6.1 Number of Copies of SD-02 Shop Drawings

Submit [six][_____] copies of submittals of shop drawings requiring review and approval only by QC organization and [seven][_____] copies of shop drawings requiring review and approval by Contracting Officer.

1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

1.6.3 Number of Samples SD-04 Samples

****
NOTE: For NAVFAC, require one sample in paragraph "a" and delete the second sentence of paragraph "a".
****

a. Submit [two] [_____] samples, or [two] [_____] sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

1.6.4 Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop drawings.

1.6.5 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

1.6.6 Number of Copies of SD-10 Operation and Maintenance Data

****
NOTE: NAVFAC requires three copies of O&M Data unless OMSI manual is specified. Coordinate with OMSI requirements.
****

Submit [Five][three][_____] copies of O&M Data to the Contracting Officer for review and approval.

1.6.7 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit [two][three] sets of administrative submittals.

1.7 INFORMATION ONLY SUBMITTALS

****
NOTE: Use the following paragraph for Army projects.
****

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. For design-build construction the Government will retain [_____] copies of information only submittals.

1.8 VARIATIONS

Variations from contract requirements require both Designer of Record (DOR) and Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

1.8.1 Considering Variations

Discussion with Contracting Officer prior to submission, after consulting with the DOR, will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

1.8.2 Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government, including the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

****
NOTE: Use the following paragraph for Army projects only.
****

Check the column "variation" of ENG Form 4025 for submittals which include proposed deviations requested by the Contractor. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.8.3 Warranting That Variations Are Compatible

When delivering a variation for approval, Contractor, including its Designer(s) of Record, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.8.4 Review Schedule Is Modified

****
NOTE: Allow a longer additional review period if the construction phase will have geographically scattered reviewers.
****

In addition to normal submittal review period, a period of [10] [_____] working days will be allowed for consideration by the Government of submittals with variations.

****
NOTE: Use the term "Database" in the following paragraphs on NASA projects only.
****

1.9 SUBMITTAL REGISTER [AND DATABASE]

****
NOTE: Create the submittal register from the project specification files, at the conclusion of the design. In SPECSINTACT, choose "Export Submittal Register" from "Process" pull-down menu. Local procedures should be responsive to the requirement that the submittal register, required with the QC plan, is usually due from the Contractor within 20 days after the Notice of Award.
****

****
NOTE: Use bracketed items for Army projects only.
****

****
NOTE: Use the first bracketed sentence of the paragraph if the Contractor is required by the contract to use the Army Quality Control System (QCS). Use the second bracketed sentence of the paragraph if QCS not required. It may not be necessary or beneficial to use the QCS in small, simple, short duration contracts/delivery orders for construction, or for other contracts where its use would not be in the best interest of the Government.
****

Prepare and maintain submittal register, as the work progresses. [Use electronic submittal register program furnished by the Government or any other format.] Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.10 10 QUALITY CONTROL SYSTEM (QCS). [The Government will provide the initial submittal register][in electronic format][with the following fields completed, to the extent that will be required by the Government during subsequent usage.]

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal.

****
NOTE: Use the following paragraph for NASA projects only.
****

The database and submittal management program will be furnished to Contractor on a Writable Compact Disk (CD-R), for operation on Windows based personal computer.

[Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the Government.
]

****
NOTE: Use the following paragraph for Army Design-Build projects only.
****

The Designer of Record shall develop a complete list of submittals during design and identify required submittals in the specifications, and use the list to prepare the Submittal Register. The list may not be all inclusive and additional submittals may be required by other parts of the contract. The Contractor is required to complete the submittal register and submit it to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The approved submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period. Coordinate the submit dates and need dates with dates in the Contractor prepared progress schedule. Submit monthly or until all submittals have been satisfactorily completed, updates to the submittal register showing the Contractor action codes and actual dates with Government action codes. Revise the submittal register when the progress schedule is revised and submit both for approval.

1.9.1 Use of Submittal Register

****
NOTE: Include the bracketed text, invoking the use of the electronic database for submittals, in most

projects. The alternative is a manually processed submittal register initially created from the Submittal Register Program, which may be appropriate for small projects.
****

Submit submittal register[as an electronic database, using submittals management program furnished to Contractor]. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register [database] submitted with the QC plan and the project schedule:

[Column (a) Activity Number: Activity number from the project schedule.

][Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

][Column (h) Contractor Approval Date: Date Contractor needs approval of submittal.

][Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

]1.9.2 Contractor Use of Submittal Register

Update the following fields[in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor] with each submittal throughout contract.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.9.3 Approving Authority Use of Submittal Register

Update the following fields[in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor].

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (l) List date of submittal receipt.

Column (m) through (p) List Date related to review actions.

Column (q) List date returned to Contractor.

1.9.4 Government Review Action Codes Contractor Action Code and Action Code

Entries for columns (j) and (o), are to be used are as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

"A" - "Approved as submitted"; "Completed"

"B" - "Approved, except as noted on drawings"; "Completed"

"C" - "Approved, resubmission required"; "Resubmit"

"D" - "Returned by correspondence"; "Completed"

"E" - "Disapproved (See attached)"; "Resubmit"

"F" - "Receipt acknowledged"; "Completed"

"G" - "Other (Specify)"; "Resubmit"

"X" - "Receipt acknowledged, does not comply"; "Resubmit"

1.9.5 Copies Delivered to the Government

****

NOTE: For NASA projects only. Include the bracketed text, invoking the use of the electronic database for submittals, in most projects. The alternative is a manually processed submittal register initially created from the Submittal Register Program, which may be appropriate for small projects.

****

Deliver one copy of submittal register updated by Contractor to Government with each invoice request. [Deliver in electronic format, unless a paper copy is requested by Contracting Officer.]

1.10 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals. An additional [_____] calendar days will be allowed and shown on the register for review and approval of submittals for [food service equipment] [and] [refrigeration and HVAC control systems].

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

e. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least [15] [_____] working days for submittals for QC Manager approval and [20] [_____] working days for submittals for Contracting Officer approval. Period of review for submittals with Contracting Officer approval begins when Government receives submittal from QC organization.

****

NOTE: At bracket, use 30 working days for projects estimated to require 180 or more calendar days to construct. For projects requiring less than 180 calendar days to complete, use at least 20 working days.

****

f. For submittals requiring review by fire protection engineer, allow review period, beginning when Government receives submittal from QC organization, of [30][_____] working days for return of submittal to the Contractor.

g. Period of review for each resubmittal is the same as for initial submittal.

****

NOTE: Delete this part if submittal schedule is specified elsewhere or is not required due to size or nature of the project.

****

[Within [30][15] calendar days of notice to proceed][At the Preconstruction conference], provide, for approval by the Contracting Officer, the following schedule of submittals:

a. A schedule of shop drawings and technical submittals required by the specifications and drawings. Indicate the specification or drawing reference requiring the submittal; the material, item, or process for which the submittal is required; the "SD" number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date.

b. A separate schedule of other submittals required under the contract but not listed in the specifications or drawings. Schedule will indicate the contract requirement reference; the type or title of the submittal; the Contractor's anticipated submission date and the approved need date (if approval is required).

1.10.1 Reviewing, Certifying, Approving Authority

****
NOTE: Use this subpart for NAVFAC projects only.
****

The QC organization is responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC Manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates Contracting Officer is approving authority for that submittal item.

1.10.2 Constraints

****
NOTE: Use this subpart for NAVFAC projects only.
****

Conform to provisions of this section, unless explicitly stated otherwise for submittals listed or specified in this contract.

Submit complete submittals for each definable feature of work. Submit at the same time components of definable feature interrelated as a system.

When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.

Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.10.3 QC Organization Responsibilities

****
NOTE: Use this subpart for NAVFAC projects only.
****

a. Note date on which submittal was received from Contractor on each submittal.

b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.

c. Review submittals for conformance with project design concepts and compliance with contract documents.

d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

   (1) When QC Manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Approved[/Accepted] Submittals," of the section."

   (2) When Contracting Officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of

submittal determines appropriate action.

e. Ensure that material is clearly legible.

f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is Contracting Officer, QC organization will certify submittals forwarded to Contracting Officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number [_____], is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____________________, Date _______
(Signature when applicable)

Certified by QC Manager _____________________________, Date ______"
(Signature)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number [_____], is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer ______________________, Date ______
(Signature when applicable)

Approved by QC Manager _______________________________, Date _____"
(Signature)

g. Sign certifying statement or approval statement. The QC organization member designated in the approved QC plan is the person signing certifying statements. The use of original ink for signatures is required. Stamped signatures are not acceptable.

h. Update submittal register [database]as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by Contracting Officer.

i. Retain a copy of approved submittals at project site, including Contractor's copy of approved samples.

1.10.4 Government Reviewed Design

****
NOTE: Use this subpart for Army projects only.
****

The Government will review design submittals for conformance with the technical requirements of the solicitation. Section [_____] DESIGN AFTER AWARD covers the design submittal and review process in detail. Government review is required for deviation from the completed design. Review will be only for conformance with the contract requirements. Included are only those construction submittals for which the Designer of Record design documents do not include enough detail to ascertain contract compliance. The Government may, but is not required, to review extensions of design such as structural steel or reinforcement shop drawings.

1.11 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received from QC Manager.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph entitled, "Review Notations," of this section and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date approved submittals. [_____] copies of the approved submittal will be retained by the Contracting Officer and [_____] copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.11.1 Review Notations

Contracting Officer review will be completed within [_____] calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" "or approved except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

1.12 DISAPPROVED[OR REJECTED] SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.13 APPROVED[/ACCEPTED] SUBMITTALS

****

NOTE: For Navy or NASA projects choose construction text. On Army projects choose either construction or design-build text.

****

The Contracting Officer's approval or acceptance of submittals is not be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal.

Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for [dimensions, the design of adequate connections and details, and the satisfactory construction of all work][design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work].

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.14 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

1.15 WITHHOLDING OF PAYMENT

****
NOTE: Choose either construction or design-build construction text.
****

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

****
NOTE: Selection between the use of progress schedule must be coordinated with project management.
****

1.16 PROGRESS SCHEDULE

1.16.1 Bar Chart

[a. Submit the progress chart, for approval by the Contracting Officer, at the Preconstruction Conference in one reproducible and 4 copies.

b. Prepare the progress chart in the form of a bar chart utilizing form "Construction Progress Chart" or comparable format acceptable to the Contracting Officer.

c. Include no less than the following information on the progress chart:

(1) Break out by major headings for primary work activity.

(2) A line item break out under each major heading sufficient to track the progress of the work.

(3) A line item showing contract finalization task which includes punch list, clean-up and demolition, and final construction drawings.

(4) A materials bar and a separate labor bar for each line item. Both bars will show the scheduled percentage complete for any given date within the contract performance period. Labor bar will

also show the number of men (man-load) expected to be working on any given date within the contract performance period.

(5) The estimated cost and percentage weight of total contract cost for each materials and labor bar on the chart.

(6) Separate line items for mobilization and drawing submittal and approval. (These items are to show no associated costs.)

d. Update the progress schedule in one reproduction and 4 copies every 30 calendar days throughout the contract performance period.

]1.16.2 Project Network Analysis

[Submit the initial progress schedule within 21 calendar days of notice to proceed. Schedule is to be updated and resubmitted monthly beginning 7 calendar days after return of the approved initial schedule. Updating to entail complete revision of the graphic and data displays incorporating changes in scheduled dates and performance periods. Redlined updates will only be acceptable for use as weekly status reviews.

Contractor to provide a single point contact from his on-site organization as his Schedule Specialist. Schedule Specialist is to have the responsibility of updating and coordinating the schedule with actual job conditions. Schedule Specialist to participate in weekly status meetings and present current information on the status of purchase orders, shop drawings, off-site fabrication, materials deliveries, Subcontractor activities, anticipated needs for Government furnished equipment, and any problem which may impact the contract performance period.

Include the following in the project network analysis:

a. Graphically display with the standard network or arrow diagram capable of illustrating the required data. Drafting to be computer generated on standard 24 by 36 inch (nominal size) drafting sheets or on small 11 by 17 inch minimum sheets with separate overview and detail breakouts. Provide a project network analysis that is legible with a clear, consistent method for continuations and detail referencing. Clearly delineate the critical path on the display. Clearly indicate the contract milestone date on the project network analysis graphic display.

b. Data is to be presented as a separate printout on paper or, where feasible, may be printed on the same sheet as the graphic display. Data is to be organized in a logical coherent display capable of periodic updating.

c. Include within the data verbal activity descriptions with a numerical ordering system cross referenced to the graphic display. Additionally, costs (broken down into separate materials and costs), duration, early start date, early finish date, late start date, late finish date, and float are to be detailed for each activity. A running total of the percent completion based on completed activity costs versus total contract cost is to be indicated. A system for indicating scheduled versus actual activity dates and durations is also to be provided.

d. Sufficient detail to facilitate the Contractor's control of the job and to allow the Contracting Officer to readily follow progress for portions of the work should be shown within the schedule.]

1.17 STATUS REPORT ON MATERIALS ORDERS

Within [_____] calendar days after notice to proceed, submit, for approval by the Contracting Officer, an initial material status report on all materials orders. This report will be updated and re-submitted every [_____] calendar days as the status on material orders changes.

Report to include list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will be required for each material order listed:

a. Material name, supplier, and invoice number.

b. Bar chart line item or CPM activity number affected by the order.

c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.

d. Current delivery date agreed on by supplier.

e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.

f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

1.18 STAMPS

****

NOTE: Use the following paragraph and stamps for Army projects only.

****

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: ______________________
TITLE: ______________________
DATE: ______________________

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record are to stamp and sign to certify that the submittal meets contract requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA UFGS-01 33 23.33 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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AVIATION FUEL SYSTEM SPECIFIC SUBMITTAL REQUIREMENTS

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****
USACE / NAVFAC / AFCESA / NASA **UFGS-01 33 23.33 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 01 33 23.33

AVIATION FUEL SYSTEM SPECIFIC SUBMITTAL REQUIREMENTS
02/10

****
NOTE: This guide specification covers the requirements for specific contract requirements for aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards Use this Section in conjunction with UFGS 01 33 00 SUBMITTAL PROCEDURES. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**
****

PART 1 GENERAL

1.1 SUBMITTALS

Provide submittals as specified in each individual section and obtain approval as specified before procurement, fabrication, or delivery to the job site. Partial submittals are not acceptable and will be returned without review. In addition to the definitions in Section 01 33 00 SUBMITTAL PROCEDURES, the following provisions apply:

1.1.1 SD-02 Shop Drawings

Drawings shall be a minimum of [ANSI B][11 inches by 17 inches] in size, with a minimum scale of 1/8 inch per foot, except as specified otherwise. Include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted. (Prior to the completion of the contract, on [ANSI D][22 x 34 inch] reproducible drawings, for each system, wiring/control diagram and approved system layout drawing shall be provided to the Contracting Officer with the operation and maintenance manuals specified herein).

1.1.2 SD-03 Product Data

Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. The submittals shall also include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Government, industry, and technical society publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to provide. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.

1.1.2.1 Standards Compliance

When materials or equipment are required to conform to the standards of organizations such as the American National Standards Institute (ANSI), ASTM International (ASTM) , National Electrical Manufacturers Association (NEMA), ASME International (ASME), American Gas Association (AGA), American Petroleum Institute (API), Air-Conditioning and Refrigeration Institute (ARI), and Underwriters Laboratories (UL) or equivalent, submit proof of such conformance to the Contracting Officer. Factory Mutual (FM) listing or CSA International (CSA) listing will be acceptable in lieu of any UL listing requirements. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptable test and is approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard. For materials and equipment whose compliance with organizational - standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, submit a certificate of compliance from the manufacturer. The certificate shall identify the manufacturer, the product, and the referenced standard and shall simply state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the referenced standards listed.

1.1.2.2 Manufacturer's Installation Instructions

Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, furnish printed copies of these recommendations prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.2 STANDARD PRODUCTS/SERVICE AVAILABILITY

1.2.1 Materials and Equipment

Provide materials and equipment that are standard products of a manufacturer regularly engaged in the manufacturer of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for two years prior to [bid opening][proposal]. The two-year use shall include applications of equipment and materials under similar circumstances and of similar size. Contracting Officier approval of materials with less than two years experience is allowed if acceptable by the design agency, [COE/NAVFAC,] and MAJCOM Fuels Engineer.

1.2.1.1 Experience Required

The two-year experience requirement must be satisfactorily completed for a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures.

1.2.1.2 Alternative Service Record

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory test, can be shown. Contracting Officier approval of materials with less than two years experience is allowed if acceptable by the design agency, [COE/NAVFAC,] and MAJCOM Fuels Engineer.

1.2.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.2.3 Manufacturer's Nameplate

Provide a nameplate, on each item of equipment, bearing the manufacturer's name, address, model number, and serial number securely permanely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA **UFGS-01 42 00 (May 2009)**
Preparing Activity: USACE **Superseding UFGS-01 42 00 (November 2008)**

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****

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
05/09

****

NOTE: This guide specification provides a listing of organizations whose publications are referenced in other sections of the specifications.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**

In accordance with FAR 11.201, identification of sources for obtaining documents referenced in the specificatioins must be provided in contract documents.

****

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

****
NOTE: Information regarding standards producing organizations was in agreement with information contained in the Unified Master Reference List (UMRL) as of date of this guide specification.

This paragraph is automatically edited by removal of those organizations not included in other sections of the project specifications when SpecsIntact (Reconcile Addresses item from the Print menu) is use for job processing. However, if publications of organizations in addition to those listed below are used in the project, such additional organizations must be added to this paragraph.
****

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: http://www.concrete.org

ACOUSTICAL SOCIETY OF AMERICA (ASA)
2 Huntington Quadrangle, Suite 1NO1
Melville, NY 11747-4502
Ph: 516-576-2360
Fax: 516-576-2377
E-mail: asa@aip.org
Internet: http://asa.aip.org

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)
2800 Shirlington Road, Suite 300
Arlington, VA 22206
Ph: 703-575-4477
Fax: 703-575-4449
E-mail: info@acca.org
Internet: http://www.acca.org

AIR DIFFUSION COUNCIL (ADC)
1901 N. Roselle Road, suite 800
Schaumburg, IL 60195
Ph: 847-706-6750
Fax: 847-706-6751
E-mail: info@flexibleduct.org
Internet: http://www.fexibleduct.org

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: amca@amca.org
Internet: http://www.amca.org

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
Ph: 703-600-0355
Fax: 703-562-1942
E-mail: fdietz@ahrinet.org
Internet: http://www.ahrinet.org

ALLIANCE FOR TELECOMMUNICATIONS INDUSTRY SOLUTIONS (ATIS)
1200 G Street, NW, Suite 500
Washington, D.C. 20005
Ph: 202-628-6380
Fax: 202-393-5453
E-mail: doccenter@atis.org
Internet: http://www.atis.org

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960
Fax: 703-358-2961
Internet: http://www.aluminum.org

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square
Suite 550
Schaumburg, IL 60173-5774
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: webmaster@aamanet.org
Internet: http://www.aamanet.org

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: http://www.transportation.org

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
1 Davis Drive
P.O. Box 12215
Research Triangle Park, NC 27709
Ph: 919-549-8141
Fax: 919-549-8933
Technical Questions: leonardc@aatc.org
Internet: http://www.aatcc.org

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
2025 M Street, NW, Suite 800
Washington, DC 20036
Ph: 202-367-1155
Fax: 202-367-2155
E-mail: info@americanbearings.org
Internet: http://www.abma-dc.org

AMERICAN BOILER MANUFACTURERS ASSOCIATION (ABMA)
8221 Old Courthouse Road Suite 207
Vienna, VA 22182
Ph: 703-356-7172
Fax: 703-356-4543
Internet: http://www.abma.com

AMERICAN BUREAU OF SHIPPING (ABS)
16855 Northcase Drive
Houston, TX 77060
Ph: 282-877-5800
Internet: http://www.eagle.org

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)
1303 W. Walnut Hill Lane, Suite 305
Irving, TX 75038-3008
Ph: 972-506-7216
Fax: 972-506-7682
E-mail: info@concrete-pipe.org
Internet: http://www.concrete-pipe.org

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
E-mail: mail@acgih.org
Internet: http://www.acgih.org

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)
American Wood Council
ATTN: Publications Department
1111 Nineteenth Street NW, Suite 800
Washington, DC 20036
Ph: 800-890-7732 or 202-463-2766
Fax: 202-463-2791
E-mail: awcpubs@afandpa.org
Internet: http://www.awc.org/

AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street N.W.
Suite 450
Washington, D.C. 20001
Ph: 202-824-7000
Fax: 202-824-7115
E-mail: website@aga.org
Internet: http://www.aga.org

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)
500 Montgomery Street, Suite 350
Alexandria, VA 22314-1581

Ph: 703-684-0211
Fax: 703-684-0242
E-mail: websiter@agma.org
Internet: http://www.agma.org

AMERICAN HARDBOARD ASSOCIATION (AHA)
c/o Composite Panel Association
19465 Deerfield ave., Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588
Internet: http://www.pbmdf.org

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)
2700 Prosperity Ave., Suite 250
Fairfax, VA 22031
Tel: 703-849-8888
Fax: 703-207-3561
E-mail: infonet@aiha.org
Internet http://www.aiha.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: http://www.aisc.org

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)
7012 South Revere Parkway, Suite 140
Centennial, CO 80112
Ph: 303-792-9559
Fax: 303-792-0669
E-mail: info@aitc-glulam.org
Internet: http://www.aitc-glulam.org

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1140 Connecticut Avenue, NW, Suite 705
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6577
E-mail: webmaster@steel.org
Internet: http://www.steel.org

AMERICAN LADDER INSTITUTE (ALI/LADDER)
410 North Michigan Avenue
Chicago, IL 60611
Tel: 312-644-6610
Fax: 312-673-6929
E-mail: jrapp@smithbucklin.com
Internet: http://www.americanladderinstitute.org

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004

E-mail: alsc@alsc.org
Internet: http://www.alsc.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: info@ansi.org
Internet: http://www.ansi.org/

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 303-397-7993
Fax: 303-397-2740
E-mail: greg.kallio@ihs.com
Internet: http://www.api.org

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)
10003 Derekwood Lane, Suite 210
Lanham, MD 20706
Ph: 301-459-3200
Fax: 301-459-8077
Internet: http://www.arema.org

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
1711 Arlingate Lane
P.O. Box 28518
Columbus, OH 43228-0518
Ph: 800-222-2768; 614-274-6003
Fax: 614-274-6899
E-mail: webmaster@asnt.org
Internet: http://www.asnt.org

AMERICAN SOCIETY FOR QUALITY (ASQ)
600 North Plankinton Avenue
Milwaukee, WI 53203
-or-
P.O. Box 3005
Milwaukee, WI 53201-3005
Ph: 800-935-2231; 414-272-8575
Fax: 414-272-1734
E-mail: help@asq.org
Internet: http://www.asq.org

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191-4400
Ph: 703-295-6300 - 800-548-2723
Fax: 703-295-6222
E-mail: member@asce.org
Internet: http://www.asce.org

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329

Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: http://www.ashrae.org

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018-2187
Ph: 847-699-2929
Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: http://www.asse.org

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
901 Canterbury, Suite A
Westlake, OH 44145
Ph: 440-835-3040
Fax: 440-835-3488
E-mail: info@asse-plumbing.org
Internet: http://www.asse-plumbing.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-347-0804
E-mail: smorrison@awwa.org
Internet: http://www.awwa.org

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org or customerservice@awspubs.com
Internet: http://www.aws.org

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
E-mail: email@awpa.com
Internet: http://www.awpa.com

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
E-mail: help@apawood.org
Internet: http://www.apawood.org

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
Ph: 571-323-3636
Fax: 571-323-3630
E-mail: info@awinet.org

Internet: http://www.awinet.org

ASM INTERNATIONAL (ASM)
9639 Kinsman Road
Materials Park, OH 44073-0002
Ph: 440-338-5151
Fax: 440-338-4634
E-mail: memberservicecenter@asminternational.org
Internet:
http://asmcommunity.asminternational.org/portal/site/www/

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: http://www.asme.org

ASPHALT INSTITUTE (AI)
Research Park Drive
P.O. Box 14052
Lexington, KY 40512-4052
Ph: 859-288-4960
Fax: 859-288-4999
E-mail: info@asphaltinstitute.org
Internet: http://www.asphaltinstitute.org

ASPHALT ROOFING MANUFACTURER'S ASSOCIATION (ARMA)
529 14th Steet, NW
Washington D.C. 20045
Ph: 202-207-0917
Fax: 202-223-9741
Internet: http://www.asphaltroofing.org

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
E-mail: info@aabc.com
Internet: http://www.aabchq.com

ASSOCIATION FOR THE ADVANCEMENT OF MEDICAL INSTRUMENTATION (AAMI)
1110 North Glebe Road, Suite 220
Arlington, VA 22201-4795
Ph: 800-332-2264 or 703-525-4890

E-mail: customerservice@aami.org
Internet: http://www.aami.org

ASSOCIATION FOR IRON AND STEEL TECHNOLOGY (AIST)
186 Thorn Hill Road
Warrendale, PA 15086-7528
Ph: 724-776-6040
Fax: 724-776-1880
E-Mail: info@aistech.org
Internet: http://www.aistech.org

ASSOCIATION FOR IRON AND STEEL TECHNOLOGY (AIST) (FORMERLY: IRON & STEEL SOCIETY (ISS))
186 Thorn Hill Road
Warrendale, PA 15086-7528
Ph: 724-776-6040
Fax: 724-776-1880
E-Mail: info@aistech.org
Internet: http://www.aistech.org

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 North 18th Street
P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-2530
Fax: 205-257-2540
Internet: http://www.aeic.org

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS (AHAM)
1111 19th Street NW, Suite 402
Washington, DC 20036
Ph: 202-872-5955
Fax: 202-872-9354
E-mail: info@aham.org
Internet: http://www.aham.org

ASSOCIATION OF THE WALL AND CEILING INDUSTRIES - INTERNATIONAL (AWCI)
513 West Broad Street, Suite 210
Falls Church, VA 22046
Ph: 703-534-8300
Fax: 703-534-8307
E-mail: info@awci.org
Internet: http://www.awci.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: http://www.astm.org

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (Bay Area AQMD)
939 Ellis Street
San Francisco, CA 94109
Ph: 415-771-6000
Fax: 415-928-8560
Internet: http://www.baaqmd.gov/

BAY AREA AIR RESOURCES BOARD (BAARB)
Address and contact information unavailable.

BIFMA INTERNATIONAL (BIFMA)
2680 Horizon Drive SE, Suite A-1
Grand Rapids, MI 49546-7500
Ph: 616-285-3963
Fax: 616-285-3765
E-mail: email@bifma.org
Internet: http://www.bifma.org

BIOCYCLE, JOURNAL OF COMPOSTING AND RECYCLING (BIOCYCLE)
The JG Press Inc.
419 State Avenue
Emmaus, PA 18049
Ph: 610-967-4135, Ext. 22
E-mail: biocycle@jgpress.com
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BRICK INDUSTRY ASSOCIATION (BIA)
11490 Commerce Park Drive
Reston, VA 22091-1525
Ph: 703-620-0010
Fax: 703-620-3928
E-mail: brickinfo@bia.org
Internet: http://www.bia.org

BRITISH STANDARDS INSTITUTE (BSI)
389 Chiswick High Road
London W4 4AL
United Kingdom
Ph: +44 (0)20 8996 9000
Fax: +44 (0)20 8996 7001
E-mail: cservices@bsi-global.com
Internet: http://www.bsi-global.com

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue
17th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
E-mail: assocmgmt@aol.com
Internet: http://www.buildershardware.com

CANADIAN STANDARDS ASSOCIATION (CSA)
178 Rexdale Blvd.
Etobicoke, ON M9W 1R3
CANADA
Ph: 416-747-4104
Fax: 416-747-2475
Internet: http://www.csa.ca/Default.asp?language=english

CSA AMERICA INC (CSA/AM)
8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990
Fax: 216-520-8979
E-mail: cathy.rake@csa-america.org
Internet: http://www.csa-america.org

CSA INTERNATIONAL (CSA)
8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990
Fax: 216-642-3463
E-mail: certinfo@csa-international.org
Internet: http://www.csa-international.org

CALIFORNIA ENERGY COMMISSION (CEC)
Media and Public Communications Office
1516 Ninth Street, MS-29
Sacramento, CA 95814-5512
Ph: 916-654-4287
Internet: http://www.energy.ca.gov/

CARPET AND RUG INSTITUTE (CRI)
P.O. Box 2048
Dalton, GA 30722-2048
Ph: 800-882-8846 or 706-278-3176
Fax: 706-278-8835
Internet: http://www.carpet-rug.com

CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Road, Suite 419
Chattanooga, TN 37421
Ph: 423-892-0137
Fax: 423-892-0817
Internet: http://www.cispi.org

CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)
1500 Lincoln Highway, Suite 202
St. Charles, IL 60174
Ph: 630-584-1919
Fax: 630-584-2003
E-mail: info@cisca.org
Internet: http://www.cisca.org

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)
1600 Clifton Road
Atlanta, GA 30333
Ph: 404-639-3311
Internet: http://www.cdc.gov

CHEMICAL FABRICS & FILM ASSOCIATION (CFFA)
1300 Sumner Avenue
Cleveland OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: cffa@chemicalfabricsandfilm.com
Internet: http://www.chemicalfabricsandfilm.com/

CHLORINE INSTITUTE (CI)
1300 Wilson Boulevard
Arlington, VA 22209
Ph: 703-741-5760
Fax: 703-741-6068
E-mail: aonna@CL2.com
Internet: http://www.CL2.com

COMPOSITE PANEL ASSOCIATION (CPA)
18922 Premeire Court
Gaithersburg, MD 20879-1574
Ph: 301-670-0604
Fax: 301-840-1252
Internet: http://www.pbmdf.com

COMPRESSED AIR AND GAS INSTITUTE (CAGI)
1300 Sumner Avenue
Cleveland OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: cagi@cagi.org
Internet: http://www.cagi.org/

COMPRESSED GAS ASSOCIATION (CGA)
4221 Walney Road, 5th Floor
Chantilly, VA 20151-2923
Ph: 703-788-2700
Fax: 703-961-1831
E-mail: cga@cganet.com
Internet: http://www.cganet.com

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 North Plum Grove Road
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: http://www.crsi.org/

CONCRETE SAWING AND DRILLING ASSOCIATION (CSDA)
11001 Danka Way North, Suite 1
St Petersburg, FL 33716
PH: 727-577-5004
Fax: 272-577-5012
E-mail: info@csda.org
Internet: http://www.csda.org

CONSUMER ELECTRONICS ASSOCIATION (CEA)
2500 Wilson Blvd.
Arlington, VA 22201-3834
Ph: 866-858-1555 or 703-907-7600
Fax: 703-907-7675
E-mail: cea@CE.org
Internet: http://www.CE.org

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)
4330 East-West Highway
Bethesda, MD 20814-4408
Ph: 301-504-7923
Fax: 301-504-0124 or 301-504-0025
E-mail: info@cpsc.gov
Internet: http://www.cpsc.gov

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION (CEMA)
6724 Lone Oak Boulevard
Naples, FL 34109
Ph: 239-514-3441
Fax: 239-514-3470
E-mail: cema@cemanet.org
Internet: http://www.cemanet.org

COOLING TECHNOLOGY INSTITUTE (CTI)
2611 FM 1960 West
Suite A-101

Houston, TX 77068-3730
Ph: 281-583-4087
Fax: 281-537-1721
Internet: http://www.cti.org

COPPER DEVELOPMENT ASSOCIATION (CDA)
260 Madison Avenue
New York, NY 10016
Ph: 212-251-7200
Fax: 212-251-7234
E-mail: questions@cda.copper.org
Internet: http://www.copper.org

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217-3992
Ph: 704-676-1190
Fax: 704-676-1199
Internet: www.mhia.org/psc/PSC_Products_Cranes.cfm

CSA AMERICA, INC. (CSA/AM)
8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990
Fax: 216-520-8979
E-mail: cathy.rake@csa-america.org
Internet: http://www.csa-america.org

DOOR AND HARDWARE INSTITUTE (DHI)
14150 Newbrook Dr.
Chantilly, VA 20151-2232
Ph: 703-222-2010
Fax: 703-222-2410
E-mail: infor@dhi.org
Internet: http://www.dhi.org

DISTRICT OF COLUMBIA MUNICIPAL REGULATIONS (DCMR)
441 4th Street NW, Suite 520S
Washington DC 20001
PH: 202-727-6306
Fax: 202-727-3582
Internet: http://os.dc.gov/info/odai/odai.shtm

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: dasma@dasma.com
Internet: http://www.dasma.com

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)
245 Riverchase Parkway East, Suite O
Birmingham, AL 35244
Ph: 205-402-8700
Fax: 205-402-8730
E-mail: info@dipra.org

Internet: http://www.dipra.org

EIFS INDUSTRY MEMBERS ASSOCIATION (EIMA)
3000 Corporate Center Drive, Suite 270
Morrow, GA 30260
Ph: 800-294-3462
Fax: 770-968-5818
E-mail: lwidzowski@eima.com
Internet: http://www.eima.com

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)
1650 South Dixie Highway, Suite 500
Boca Raton, FL 33432-7462
Ph: 561-750-5575
Fax: 561-395-8557
E-mail: e-mail@egsa.org
Internet: http://www.egsa.org

ELECTRONIC INDUSTRIES ALLIANCE (EIA)
2500 Wilson Boulevard
Arlington, VA 22201-3834
Ph: 703-907-7500
Fax: 703-907-7501
Internet: http://www.eia.org

U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independance Ave. SW
Washington, DC 20585
Ph: 800-342-5363
Fax: 202-586-4403
E-mail: dmteam@hq.doe.gov
Internet: http://www.eh.doe.gov/

ETL TESTING LABORATORIES (ETL)
Intertek Testing Services, ETL SEMKO
70 Codman Hill Road
Boxborough, MA 01719
Ph: 978-263-2662
Fax: 978-263-7086
E-mail: info@etlsemko.com
Internet: http://www.etlsemko.com

EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN/CENELEC)
CEN Management Centre
36, rue de Stassart
B-1050 Brussels
Ph: 32-2-550-08-11
Fax: 32-2-550-08-19
E-mail: infodesk@cenorm.be
Internet: http://www.cenorm.be

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)
25 North Broadway
Tarrytown, NY 10591
Ph: 914-332-0040
Fax: 914-332-1541
E-mail: inquiries@ejma.org
Internet: http://www.ejma.org

FEDERAL ENERGY REGULATORY COMMISSION (FERC)
888 First Street, NE
Washington, DC 20426
Ph: 202-502-6088
E-mail: customer@ferc.gov
Internet: http://www.ferc.gov/default.asp

FLAT GLASS MARKETING ASSOCIATION (FGMA)
White Lakes Professional Bldg.
3310 Harrison St.
Topeka, KS 66611-2279
Ph: 913-266-7013
Fax: 913-266-0272

FLUID CONTROLS INSTITUTE (FCI)
1300 Sumner Avenue
Cleveland, OH 44115
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: fci@fluidcontrolsinstitute.org
Internet: www.fluidcontrolsinstitute.org

FLUID SEALING ASSOCIATION (FSA)
994 Old Eagle School Rd. #1019
Wayne, PA 19087
Ph: 610-971-4850
E-mail: info@fluidsealing.com
Internet: www.fluidsealing.com

FM GLOBAL (FM)
1301 Atwood Avenue
P.O. Box 7500
Johnston, RI 02919
Ph: 401-275-3000
Fax: 401-275-3029
E-mail: information@fmglobal.com
Internet: http://www.fmglobal.com

FOREST STEWARDSHIP COUNCIL (FSC)
1155 30th Street NW
Suite 300
Washington, DC 20007
Ph: 202.342.0413
Fax: 202.342.6589
E-mail: info@fscus.org
Internet: http://www.fscus.org

FORESTRY SUPPLIERS INC. (FSUP)
205 West Rankin Street
P.O. Box 8397
Jackson, MS 39284-8397
Ph: 601-354-3565
Fax: 601-292-0165
E-mail: cs@forestry-suppliers.com
Internet: http://www.forestry-suppliers.com

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)
University of South California

Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032 or 800-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: http://www.usc.edu/dept/fccchr

GEOLOGICAL SOCIETY OF AMERICA (GeoSA)
P.O. Box 9140
Boulder, CO 80301-9140
Ph: 303-357-1000
Fax: 303-357-1070
E-mail: gsaservice@geosociety.org
Internet: http://www.geosociety.org

GEOSYNTHETIC INSTITUTE (GSI)
475 Kedron Avenue
Folsom, PA 19033
Ph: 610-522-8440
Fax: 610-522-8441
Internet: http://www.geosynthetic-institute.org

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614
Ph: 785-271-0208
Fax: 785-271-0166
E-mail: gana@glasswebsite.com
Internet: http://www.glasswebsite.com

GREEN BUILDING INITIATIVE (GBI)
222 SW Columbia St.
Suite 1800
Portland, Oregon 97201
Ph: 877-424-4241
Fax: 503.961.8991
Email: info@thegbi.org
Internet: http://www.thegbi.org/gbi/

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
E-mail: greenseal@greenseal.org
Internet: http://www.greenseal.org

GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)

2211 Newmarket Parkway, Suite 110
Marietta, GA 30067
E-mail: info@greenguard.org
Internet: http://www.greenguard.org/

GYPSUM ASSOCIATION (GA)
810 First Street, NE, Suite 510
Washington, DC 20002

Ph: 202-289-5440
Fax: 202-289-3707
E-mail: info@gypsum.org
Internet: http://www.gypsum.org

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)
P.O. Box 2789
Reston, VA 20195-0789
Ph: 703-435-2900
Fax: 703-435-2537
E-mail: hpva@hpva.org
Internet: http://www.hpva.org

HEAT EXCHANGE INSTITUTE (HEI)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: hei@heatexchange.org
Internet: http://www.heatexchange.org

HOIST MANUFACTURERS INSTITUTE (HMI)
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217
Ph: 704-676-1190
Fax: 704-676-1199
E-mail: hmi@mhia.org
Internet: http://www.mhia.org/psc/PSC_Products_Hoists.cfm

H.P. WHITE LABORATORY (HPW)
3114 Scarboro Road
Street, MD 21154
Ph: 410-838-6550
Fax: 410-838-2802
E-mail: info@hpwhite.com
Internet: http://www.hpwhite.com

HYDRAULIC INSTITUTE (HI)
9 Sylvan Way
Parsippany, NJ 07054-3802
Ph: 973-267-9700
Fax: 973-267-9055
E-mail: webmaster@pumps.org
Internet: http://www.pumps.org

HYDRONICS INSTITUTE DIVISION OF GAMA (HYI)
35 Russo Place
P.O. Box 218
Berkeley Heights, NJ 07922-0218
Ph: 908-464-8200
Fax: 908-464-7818
E-mail: information@gamanet.org
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5360 Workman Mill Road
Whitier, CA 90601
Ph: 562-699-0543
Fax: 562-695-4694

E-mail: es@icc-es.org
Internet: http://www.icc-es.org

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall Street, 17th Floor
New York, NY 10005
Ph: 212-248-5000
Fax: 212-248-5018
E-mail: iesna@iesna.org
Internet: http://www.iesna.org

INDUSTRIAL FASTENERS INSTITUTE (IFI)
6363 Oak Tree Boulevard
Independance, OH 44131
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Ph: 562-699-0541
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Bethesda, MD 20814-3095
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NATURAL RESOURCE, AGRICULTURAL AND ENGINEERING SERVICE (NRAES)
Cooperative Extension
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Ph: 202-781-0000

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Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
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Internet: http://www.nsf.org

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Fax: 514-634-9736
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Internet: http://www.pfi-institute.org

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PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA UFGS-01 78 23.33 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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02/10

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SECTION 01 78 23.33

OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS
02/10

****
NOTE: This guide specification covers the requirements for O&M Manuals for Aircraft Refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

****
NOTE: The project containing this Section does not necessarily require the inclusion of UFGS 01 78 00 CLOSEOUT SUBMITTALS or UFGS 01 78 23 OPERATION AND MAINTENANCE DATA.
****

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

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****

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DLA J4 Handbook	(Part IV) Federal Supply Class Assignments (Numeric and Alphabetic Listing)

1.2 CONTRACTOR RESPONSIBILITY

The Contractor is responsible for providing the technical publications specified herein for all of the components, assemblies, sub-assemblies, attachments, and accessories, required to be supplied in accordance with submittal requirements of each specification section, regardless of whether the item was manufactured and assembled in-house or obtained from other sources. The System Supplier is responsible to the Contractor for providing the technical publications specified herein for all of the components, assemblies, sub-assemblies, attachments, and accessories that the System Supplier provided.

1.3 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

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Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.][information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

System Instructions[; G][; G, [_____]]

PART 2 PRODUCTS

2.1 DEVELOPMENT OF SUBMITTALS

2.1.1 Operation and Maintenance System Instructions (OMSI) Submittal Requirements

OMSI submittals are required in order that complete documentation can be assembled to provide the Government "Activity" with the necessary information and orientation to adequately operate and maintain the new structures/facilities of this project. The Contractor shall submit the OMSI documents and information specified for the equipment listed under the OMSI submittal paragraphs in each technical section. Five copies of each OMSI submittal shall be forwarded to the Contracting Officer no later than 120-days prior to contract completion. OMSI submittals are to be submitted separate from and in addition to Contractor's product approval submittals.

2.1.2 Assembly

****

NOTE: If electronic copies of manuals are required, include last bracketed statement.

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Provide submittals in separate folders consistent with the Contractor's standard practice. Manufacturer's manuals or data for the components, assemblies, subassemblies, and other operating parts which are provided shall be assembled into a loose-leaf notebook-type folder, indexed by major assembly and component in sequential order. Manuals shall be complete in all respects for all equipment, controls, and accessories provided.[In addition, provide an electronic copy of the manuals in Adobe Acrobat 8.0 or later (CD-ROM or DVD-ROM). Utilize Bookmarks to display indexing, and assembly and component requirements.]

2.2 IDENTIFICATION

On each folder identify and mark as follows:

a. Inscribe on the cover, the words, "FUEL SYSTEM OPERATION AND MAINTENANCE MANUAL", the name and location of the building, and the contract number.

b. Equipment manufacturer and/or Contractor's address and telephone number; names, address and telephone numbers of each subcontractor installing equipment; and local representative for each item of equipment.

c. Volume number and title of the folder.

d. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. Sub-divide manuals or provide separate manuals for each of the following categories.

(1) Operating Instructions
(2) Maintenance, Service, and Repair Instructions
(3) Parts Manual

PART 3 EXECUTION

3.1 OPERATING INSTRUCTIONS

The operator's instructions shall include specific instructions and illustrations of the equipment operation required or recommended by the manufacturer as follows:

3.1.1 Safety

Include manufacturer's safety precautions to be observed while operating under all conditions for which the equipment was designed. Clearly list all major hazards to personnel and equipment safety that are peculiar to systems and equipment described in the manual.

3.1.2 Operator Prestart

Include instructions for prestart checks, lubrication, and service requirements necessary for setting up or preparing each system for use, warm up procedures, and verification of normal operation. Include control diagrams with data to explain detailed operation and control of each item of the equipment.

3.1.3 Starting and Shutdown Procedures and Controls

Include a control sequence describing start up operation and provide shutdown procedures and post-shutdown requirements.

3.1.4 Normal Operating Instructions

Instructions shall be sufficient to enable the mechanic to adjust, stop and start, and operate the equipment properly. Special startup precautions shall be noted, as well as other items requiring action before the equipment may be put into service. Include detailed drawings indicating procedure and valve numbers and status as to normally open/closed.

3.1.5 Emergency Operating Procedures

Include action to be taken in the event of a malfunction of the unit, either to permit a short period of continued operation or to prevent further damage to the unit and to the system in which it is installed.

3.1.6 Operator Service Requirements

Include instructions for operator service requirements during operation of the equipment.

3.2 OPERATION INSTRUCTION TO GOVERNMENT PERSONNEL

Furnish the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. A minimum of 1 man-day (8-hours) of instruction shall be furnished for each system specified in other sections. When more than 4 man-days of instruction are specified, approximately half of the time shall be used for classroom instruction. All other time shall be used for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, additional instruction shall be provided to acquaint the operating personnel with the changes or modifications. Government representatives shall be allowed to video tape all classroom and field instructions.

3.3 MAINTENANCE, SERVICE AND REPAIR INSTRUCTIONS

The shop or maintenance manual shall include manufacturer's instructions to maintain the equipment in a safe and serviceable condition. The maintenance or shop manual shall contain all necessary instructions, illustrations, charges and diagrams covering, as a minimum, the items listed below.

3.3.1 Lubrication Instructions

a. Include a table showing recommended lubricants for specific temperature ranges and applications.

b. Include chart(s) with schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities. Provide a lubrication schedule showing service interval frequency.

3.3.2 Table of Preventative Maintenance Instructions

Include frequency in time, miles or hours covering routine servicing, lubrication, and adjustments.

3.3.3 Preventative Maintenance Inspection

Points and checklist should be clearly spelled out as part of operator-type inspection in this section. Include chart with schematic diagram and/or a separate inspection checklist indicating what should be examined for wear or possible malfunction and what should be reported for repair.

3.3.4 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to enable prompt isolation of the cause of a malfunction with corrective maintenance instructions. Instructions shall clearly indicate why the check out is performed and what conditions are to be sought.

3.3.5 Removal and Replacement Instructions

Provide step-by-step procedures for removal, replacement, disassembly and assembly of all components, assemblies, sub-assemblies, accessories, and attachments normally subjected to wear, damage, malfunction, and frequent replacement. These instructions should provide for a judicious combination of text and illustrations.

3.3.6 Maintenance and Repair Procedure

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NOTE: If the Command Fuels Facility Engineer directs the designer to hydrostatically test the system to 1.5 times the design pressure, exceeding the flange rating, the designer shall be required to write the commissioning hydrostatic testing procedures; removing all ball valves, control valves, and instructing the testing people what valves to close, where to connect the hydrostatic test pump, blind flange placements, and other safety requirements. It will also be noted that this test is to be done every five years, as determined by the Command Fuels Facility Engineer.

****

Provide instructions for tolerances, dimensions, settings, and adjustments normally required for performing routine maintenance servicing. Instructions shall provide the necessary information to bring equipment up to the required serviceable standard when it becomes unserviceable. Include instructions for examining equipment for needed repairs and adjustment, and any tests or inspections required to determine whether or not parts must be replaced.

3.4 PARTS MANUAL

3.4.1 Contents

The parts manual shall provide positive identification and coverage for all of the parts of components, assemblies, sub-assemblies, and accessories of the end item normally subject to wear, malfunctioning, damage, or loss. Include any special hardware requirements (eg., high-strength bolts and nuts). The parts manual may cover more than one model or series or equipments, components, assemblies, subassemblies, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice. Identification of the parts shall be such that all parts may be ordered and centrally stocked by the government without further identification to the make, model, and serial number of the equipment being provided.

3.4.2 Illustrations, Drawings, and/or Exploded Views

Provide clear and legible illustrations, drawings, and/or views to enable easy identification of all individual parts, components, assemblies, sub-assemblies, and accessories of the end item. Show part numbers and description on illustrations or list separately. When the illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to listed part. Parts shown in the listings shall be grouped by components, assemblies, and sub-assemblies with individual parts identified to the assembly.

3.4.3 End Item Manufacturer's Part Numbers

Include parts for which the end item manufacturer has proprietary rights or has exercised design control, and for which the end item manufacturer is the logical supplier. The end item manufacturer shall also assign numbers to purchased production parts, if such parts are altered to meet the prime manufacturer's design configuration. (Repainting, marking, or other insignificant operations are not adequate cause for use of exclusively assigned numbers).

3.4.4 Components Assemblies/Parts

Include those components assemblies/parts purchased by the end item manufacturer for which the end item manufacturer does not have control, and shall be identified by the actual manufacturer's name and part numbers. Detail parts in the manufacturer's assembly, as well as attaching parts, for which the manufacturer does not have design control shall also be identified by the applicable actual manufacturer's parts numbers. This paragraph does not restrict the end item manufacturer from assigning part numbers as long as the actual manufacturer's part number and the Federal Supply Code for Manufacturer (DLA J4 Handbook) or manufacturer is shown.

3.4.5 Appendices

End item manufacturer may add an appendix for cross-reference to implement components assemblies/parts requirements when implementation in manual form varies drastically with the style, format, and method of Contractor's standard commercial practice. Subject cross-referenced in an appendix will appear in the following format:

End Item Manufacturer's Alpha Numeric Seq.	Actual Manufacturer's Name and/or FSCM* From DLA J4 Handbook	Actual Manufacturer Part No.
100001	John Doe & Co. 000000	2000002

*Federal Supply Code for Manufacturers
Cataloging Handbook, Name to Code

3.5 VALIDATION

Each submittal shall be validated by the Contractor or Manufacturer as being accurate and applicable to the systems and equipment provided.

3.6 SPECIFIC EQUIPMENT SUBMITTALS

The technical sections of this specification identify the specific equipment or systems for which OMSI submittals are required. This paragraph' and its subparagraph contain a general list of various types of equipment and systems together with the OMSI information required for each type. The applicable OMSI information contained in this paragraph shall be submitted for each specific piece of equipment or system listed under the "OMSI Submittals" paragraph in the technical sections. Operating instructions; maintenance, service, and repair instructions; and parts manuals shall conform to the requirements of their -respective paragraph herein. Provide validation in accordance with paragraph VALIDATION for all submittals.

3.6.1 Pressure Gages

a. Manufacturer's descriptive literature, general.

b. Parts manuals and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

3.6.2 Automatic Pump Controls

Includes Pressure Indicating Transmitters, Flow Switches, Venturi Tubes, Differential Pressure Transmitters.

a. Manufacturer's descriptive literature, general.

b. Parts manual.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normally open or normally closed; voltage of all control components.

h. Name, address and telephone number of the nearest manufacturer's representative.

3.6.3 Meters

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service, calibration instructions, and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.4 Oil/Water separator and Accessories

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.5 Product Recovery Tank and Accessories

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.6 Truck Offload System

a. General description and specifications.

b. Comprehensive discussion of operating program.

c. Installation and initial checkout procedures.

d. Detailed electrical description.

e. Complete troubleshooting procedures, diagrams, and guidelines.

f. Complete alignment and calibration procedures for components.

g. Preventive maintenance requirements.

h. Detailed system schematics, system field assembly drawings, and system component specifications and dimensions.

i. Complete spare parts lists.

j. Complete as-built bill of materials, control drawings, schedules, and sequence of operations.

k. Safety precautions.

l. Control sequence describing start-up, operation, and shutdown. Control sequence shall be integrated with startup and operation of the motor control center.

m. Part list which-shall indicate sources of supply, recommended spare parts, and name of servicing organization.

n. Manufacturer's name, address, and telephone number.

3.6.7 Hydrant Outlet Pits, Isolation Valve Pits, High Point Vent and Low Point Drain Pits

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

e. Name, address and telephone number of the nearest manufacturer's representative.

3.6.8 Operating Tank Level Indicator

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normalcy open or normally closed; voltage of all control components.

h. Name, address and telephone number of the nearest manufacturer's representative.

3.6.9 Pantographs

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Name, address and telephone number of the nearest manufacturer's representative.

h. SSEA approval letter.

3.6.10 Piping and Fittings

a. Certificates of Compliance.

b. Batch run numbers.

c. Manufacturer's descriptive literature, general.

d. Name address and telephone number of manufacturer.

3.6.11 Manual Valves

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Where specified to have limit switches, control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normally open or normally closed; voltage of all control components.

h. Name, address and telephone number of the nearest manufacturer's representative.

3.6.12 Flexible Ball Joints

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

e. Name, address and telephone number of the nearest manufacturer's representative.

3.6.13 Gaskets and Isolating Gasket Kits

a. Manufacturer's descriptive literature, general.

b. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

c. Name, address and telephone number of the nearest manufacturer's representative.

3.6.14 Strainers

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

e. Name, address and telephone number of the nearest manufacturer's representative.

3.6.15 Protective Coatings

a. Manufacturer's descriptive literature, general.

b. Maintenance, service and repair instructions.

c. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

d. Name, address and telephone number of the nearest manufacturer's representative.

e. Product standards compliance and the materials system data sheet.

3.6.16 Sample Connections

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Name, address and telephone number of the nearest manufacturer's representative.

3.6.17 Filter Separators

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

f. Performance data at specified conditions.

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.18 Water Draw-Off System

a. Manufacturer's descriptive literature, general.

b. Maintenance, service and repair instructions.

c. Operating Instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

e. Name, address and telephone number of the nearest manufacturer's representative.

3.6.19 Pumps - Fueling, Offload, Fuel Transfer, Bowser Pumpoff Pump, Product Return

a. Manufacturer's descriptive literature, general.

b. Parts manual and recommended spare parts list.

c. Maintenance, service and repair instructions.

d. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

e. Performance data at specified flow rates. Performance shall include:

(1) Head developed, horsepower required and efficiency.

(2) Pump curves, flow and power requirements, efficiency, head and operating speed. Curves to show operating points at full range of operating conditions.

f. Control wiring diagrams showing all terminations of conductors (and all control devices) labeled to permit identification in the field; part numbers of all control devices; normally open or normally closed; voltage of all control components and operational description.

g. Plan and elevation views of equipment showing clearance required for maintenance and/or replacement.

h. Name, address and telephone number of the nearest manufacturer's representative.

i. Shipping and operating weights.

j. Operating instructions.

k. Factory run test curves indicating flow, head rpm, vibration amplitude and BHP.

3.6.20 Flexible Hoses

a. Manufacturer's descriptive literature, general.

b. Maintenance service and repair instructions.

c. Manufacturer's name, model number, serial number.

d. Name, address and telephone number of the nearest manufacturer's representative.

3.6.21 Control Valves

Submit for each type control valve specified

a. Manufacturer's descriptive literature, general.

b. Operational description of valve and control pilots.

c. Description of valve assembly complete with parts list.

d. Recommended spare parts list for main valve and pilot control systems.

e. Instructions for trouble shooting.

f. Maintenance, service and repair instructions.

g. Manufacturer's name, model number and stock number.

h. Operational Test Data.

3.6.22 Engine-Generator

a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment.

b. A control sequence describing startup', operation, and shutdown.

c. Description of the function of each principal item of equipment.

d. Installation and maintenance instructions.

e. Safety precautions.

f. Diagrams and illustrations.

g. Testing methods.

h. Performance data.

i. Lubrication schedule including type, grade, temperature range, and frequency.

j. Parts list: The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.

k. List qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

3.6.23 Fire Alarm and Fire Detecting System

a. Manufacturer's descriptive literature, general.

b. Parts manual.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Drawing of component arrangement, schedule of components with sizes, types, and ratings, and wiring diagrams.

f. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.24 Motor Control Center

a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment.

b. A control sequence describing startup, operation, and shutdown.

c. Description of the function of each principal item of equipment.

d. Installation and maintenance instructions.

e. Safety precautions.

f. Diagrams and illustrations.

g. Parts list.

h. Drawing of component arrangement, schedule of components with sizes, types, and ratings.

i. Manufacturer's name, model number, serial number.

j. Name, address and telephone number of the nearest manufacturer's representative.

3.6.25 Non-Automatic Transfer Switch

a. Manufacturer's descriptive literature, general.

b. Parts list.

c. Maintenance, service and repair instructions.

d. Operating Instructions.

e. Drawing of component arrangement, schedule of components with sizes, types, and ratings, and wiring diagrams.

f. Manufacturer's name, model number, serial number, Federal Stock Number (if any).

g. Name, address and telephone number of the nearest manufacturer's representative.

3.6.26 Pump Control Panel (PCP)

a. General description and specifications.

b. Comprehensive discussion of both hardware and operating program.

c. Installation and initial checkout procedures.

d. Detailed electrical and logical description.

e. Complete troubleshooting procedures, diagrams, and guidelines.

f. Complete alignment and calibration procedures for components.

g. Preventive maintenance requirements.

h. Detailed system schematics, system field assembly drawings, and system component specifications and dimensions.

i. Complete spare parts lists.

j. Interface requirements and capabilities.

k. Signal identification and timing diagrams.

l. Complete as-built bill of materials, control drawings, schedules, and sequence of operations.

m. Safety precautions.

n. Control sequence describing start-up, operation, and shutdown. Control sequence shall be integrated with startup and operation of the motor control center.

o. Part list which shall indicate sources of supply, recommended spare parts, and name of servicing organization.

p. Manufacturer's name, address, and telephone number.

q. Supplier name, manufacturer and version of all software including: PLC, desktop computer, laptop computer, and "alternate" desktop computer.

-- End of Section --

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USACE / NAVFAC / AFCESA / NASA **UFGS-05 59 10 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
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DIVISION 05 - METALS

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ROLLING COVER FOR AVIATION REFUELING VAULTS

02/10

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCESA / NASA **UFGS-05 59 10 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
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SECTION 05 59 10

ROLLING COVER FOR AVIATION REFUELING VAULTS
02/10

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NOTE: This guide specification covers the requirements for custom fabricated rolling covers installed on new or existing aircraft refueling system vaults constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**
****

PART 1 GENERAL

This specification covers the factory fabrication, assembly, testing, and shipping requirements for custom fabricated rolling covers having steel or aluminum shells as indicated in vault schedule on the vault drawings. Covers are to be field installed by other than the manufacturer on variously sized new and/or existing hydrant fueling system vaults and tanks.

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in

the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA ADM-105	(2005; Errata 2005) Aluminum Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2008; Errata 2008) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2008) Structural Welding Code - Aluminum

ASME INTERNATIONAL (ASME)

ASME B4.1	(1967; R 2009) Preferred Limits and Fits for Cylindrical Parts
ASME B46.1	(2002) Surface Texture, Surface Roughness, Waviness and Lay
ASME BPVC SEC IX	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 276	(2008a) Standard Specification for Stainless Steel Bars and Shapes
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel

ASTM A 500/A 500M	(2009) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.2 ADMINISTRATIVE REQUIREMENTS

Submit manufacturer's catalogue cuts and dimensional sheets. Include a description of the item, materials of construction, and dimensions. Provide data sufficient to indicate compliance with specifications. Mark items pertaining to specifications with a heavy black arrow.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the

Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Assembly Tests[; G][; G, [_____]]
Acceptance Testing; G

SD-02 Shop Drawings

Detail Drawings[; G][; G, [_____]]

SD-03 Product Data

Wheel Assemblies[; G][; G, [_____]]
Materials List[; G][; G, [_____]]
Welding[; G][; G, [_____]]
Welding of Aluminum[; G][; G, [_____]]
Steel Welding Repairs[; G][; G, [_____]]

SD-07 Certificates

Welder Qualifications
Welding of Aluminum

1.4 QUALITY ASSURANCE

1.4.1 Welder Qualifications

Submit certification stating that the welders, welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1/D1.1M, Section 4, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. Require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

1.4.2 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish.

1.4.3 Detail Drawings

Submit detail drawings for metalwork and machine work prior to fabrication. With the detail drawings submit a materials list for fabricated items. Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details, and type, grade, and class of material as appropriate. Also include a sketch showing final wheel to axle mouinting (i..e., washers, nuts, spacers). Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings. Drawings shall include all dimensional and tolerance data for each size of vault being fabricated.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Bolts and Cap Screws

All bolts shall be steel and shall conform to ASTM A 307, Grade A, Hex.

2.1.2 Nuts

Shall conform to ASTM A 563, Grade A, Hex, and shall be of the same finish as the fasteners they are used with.

2.1.3 Washers

Flat washers shall conform to the requirements of ASTM A 276 (stainless steel).

2.1.4 Tube Steel

Structural tubing shall conform to ASTM A 500/A 500M, Grade B.

2.1.5 Structural Steel

Carbon grade steel shall conform to ASTM A 36/A 36M

2.1.6 Rolling Cover Shell

Cover shell material shall be as indicated on the drawings and specified as follows:

2.1.6.1 Aluminum

Aluminum sheets and strips shall comply with ASTM B 209, alloy and temper best suited for the purpose.

2.1.7 Wheel Assemblies

2.1.7.1 Wheels

Provide the heavy duty industrial type that is the product of a company regularly engaged in the production of wheels. The wheels shall have solid rubber tires that are molded onto spoked or solid centers that are either cast, forged, or machined. The rubber shall have a hardness rating of 80-90 Shore A durometer. Tires shall not stretch or work loose from the metal center. The wheels shall have roller bearings and shall be pressure lubricated from a grease fitting when available. The wheels shall work in a temperature range of -40 to +200 degrees F. The entire wheel assembly shall be symmetrical and shall spin concentrically around the bearing. Finish metal centers with either an epoxy paint, a powder coating, or manufacture galvanized. The diameter of the carrier wheels shall be 6 inches and the diameter of the side wheels shall be 3-1/4 inches. The fabricator shall use appropriate washers and spacers to lock the inner bearing bushing to the axle. Wheels shall be similar or equal to the following:

a. 6 inches Dia. x 2 inches wide

b. 3-1/4 inches Dia. x 1-1/2 inches wide

2.1.7.2 Axles

The axle assembly shall be stainless steel and shall be eccentrically machined. A slotted adjustment cam plate shall be attached to the axle by welding as indicated on the drawings. Eccentric offset shall be a minimum of 1/4-inch. Diameter, tolerance and finish of the mating axle shaft shall be coordinated with the wheel manufacturer's diameters and tolerances for a close fit. All fits and tolerances shall be indicated on the shop drawings. Material, weld, and nut shall all be a 300 series stainless steel.

2.2 FABRICATION

2.2.1 General

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating or warping the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown on the drawings. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

2.2.2 Dimensional Tolerances

Dimensions shall be measured by a calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

2.2.3 Steel

Structural steel may be cut, when approved, by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1/D1.1M, Subsection

3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

2.2.4 Aluminum

Laying out and cutting of aluminum shall be in accordance with the AA ADM-105.

2.2.5 Bolted Connections

2.2.5.1 Bolted Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical. Holes for Bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 1/16 inch larger than the diameter of the bolt unless otherwise approved, or as indicated on the drawings or specified below. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes. Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

2.2.5.2 Bolted Aluminum Connections

Punching, drilling, reaming and bolting for bolted aluminum connections shall conform to the requirements of AA ADM-105.

2.3 MACHINE WORK

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch, unless otherwise indicated on the drawings. Sufficient machining stock shall be allowed to ensure true surfaces of solid material. Assembled parts shall be accurately machined and all like parts shall be interchangeable. All drilled holes shall be accurately located.

2.3.1 Finished Surfaces

Surface finishes indicated or specified herein shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in microinches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

2.3.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

2.4 WELDING

****
NOTE: If the WPS is not prequalified designate the submittal in the SUBMITTALS paragraph for Government approval. If it is prequalified, designate as for information only.
****

Submit the Welding Procedure Specification (WPS).

2.4.1 Welding of Structural Steel

Welding shall be in accordance with AWS D1.1/D1.1M. Welding procedures which are considered prequalified as specified in AWS D1.1/D1.1M will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

2.4.2 Welding of Aluminum

Welding of aluminum shall conform to AA ADM-105 or AWS D1.2/D1.2M, Sections 1 through 7, 9 and 10. The welding process and welding operators shall be prequalified as required by AWS D1.2/D1.2M, Section 5 or AA ADM-105 in accordance with the methods described in ASME BPVC SEC IX, Section IX. Submit a certified report giving the results of the aluminum welding qualification tests. Also, submit a complete schedule of the welding process for each aluminum fabrication to be welded prior to commencing fabrication.

2.4.3 Welding Inspection

Maintain an approved inspection system and perform required inspections in accordance with Contract Clause CONTRACTOR INSPECTION SYSTEM. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1/D1.1M, the approved welding procedures and provisions stated in other sections of these specifications.

2.4.3.1 Visual Examination

All completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1/D1.1M, Section 3 and Section 9, Part D.

2.4.4 Steel Welding Repairs

Defective welds shall be repaired in accordance with AWS D1.1/D1.1M, Section 5. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Costs for repairs and retesting shall be borne by the Contractor. Submit repair procedure prior to doing repair.

2.5 MISCELLANEOUS PROVISIONS

2.5.1 Metallic Coatings

Zinc Coatings. Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123/A 123M. Where zinc coatings are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating.

2.5.2 Cleaning of Stainless Steel

Oil, paint and other foreign substances shall be removed from stainless steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion or solvent type.

2.6 SHOP TESTING

2.6.1 Wheel Assembly Testing

The first wheel assembly shall be tested for correct fit and operation in the presence of the Contracting Officer unless otherwise waived in writing. The wheel shall rotate concentricly and smoothly on the bearings. The cam adjuster shall provide at least 1/8 inch of adjustment in each vertical direction. Waiving of tests will not relieve the Contractor of responsibility for any fault in operation, workmanship or material that occurs before the completion of the contract or guarantee.

2.6.2 Assembly Tests

Each rolling cover including the shell, carrier, frame, and temporary brackets shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts. Tolerances shall not exceed those shown on the drawings. Each cover assembly shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be done on a straight and level floor or platform, the frame shall be mounted on temporary supports in a level position. The carrier shall move smoothly and with minimal effort. Misalignment or poor operation, or defects disclosed shall be immediately remedied by the Contractor without cost to the Government. Assembly, testing, and disassembly work shall be performed in the presence of the Contracting Officer unless waived in writing. Provide ten working days notice, in writing, of the first and each proceeding rolling cover assembly to the Contracting Officer.

2.7 PREPARATION FOR SHIPPING

Before disassembly for shipment each rolling cover subassembly shall be match-mark stamped (or as otherwise approved) to facilitate correct reassembly in the field. The location of stampings shall be indicated by circling with a ring of white chalk after the shop finish has been applied or as otherwise directed. Each subassembly shall be wood crated, slatted, skid mounted, or otherwise packaged such that abrasion does not occur during shipment.

PART 3 EXECUTION

3.1 ASSEMBLY

All parts to be assembled shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts, nuts and screws shall be lubricated with a lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

3.2 PROTECTION OF FINISHED WORK

3.2.1 Lubrication After Assembly

After assembly all wheels shall be pressure lubricated or oiled.

3.2.2 Aluminum

Aluminum in contact with structural steel in the area of the cover shell fastener angle clips shall be protected against galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint.

3.3 ACCEPTANCE TESTING

The rolling cover shall be field tested to ensure proper wheel adjustments to eliminate binding and track misalignment. In addition, demonstrate to the Contracting Officer that the cover, and cover tracks are level. The rolling cover shall be rolled the full distance of the tracks. The test shall be repeated a sufficient number of times (minimum of three) to demonstrate proper operation. Misalignment or poor operation, or defects disclosed shall be immediately remedied without cost to the Government. Provide all personnel necessary to conduct the tests. Testing shall be performed in the presence of Contracting Officer. Notify the Contracting Officer, in writing, at least 7 days prior to testing operations.

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA **UFGS-33 08 53 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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DIVISION 33 - UTILITIES

SECTION 33 08 53

AVIATION FUEL DISTRIBUTION SYSTEM START-UP

02/10

-- End of Section Table of Contents --

****
USACE / NAVFAC / AFCESA / NASA **UFGS-33 08 53 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 08 53

AVIATION FUEL DISTRIBUTION SYSTEM START-UP
02/10

****
NOTE: This guide specification covers the requirements for the flushing, cleaning and performance testing of new aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**
****

PART 1 GENERAL

Utilize the Checklist for Equipment Test at the end of this section. Request electronic format of the Checklist from the Contracting Officer.

1.1 ADMINISTRATIVE REQUIREMENTS

****
NOTE: Insert number of days notice. Use the Command Fuel Facilities Engineer on Naval Facilities Engineering Command (NAVFACENGCOM) PROJECTS. On Corps of Engineers (COE) projects, select Government representatives and include in MOU specific Air

Force representatives to be notified when dates are submitted to Contracting Officer.

Develop the example/starting point attachment for the final testing plan in unison with MAJCOM as a function of the system layout.

****

1.1.1 System Start-up Plan

Submit a detailed written plan prepared by the system supplier for implementation of system start-up. Submit the plan shall [60][____] days prior to system start-up. Include a list of personnel by trade, list of key personnel, safety equipment, list of miscellaneous equipment such as two-way radios personnel transportation vehicles etc. and detailed procedures (Start-Up Commissioning example provided by the Contracting Officer) and schedules. The Contractor and system supplier are responsible for implementing system start-up in coordination with ongoing base operations.

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the

"G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

System Start-up Plan[; G][; G, [_____]]

SD-06 Test Reports

Test Reports
Final Reports
Equipment Tests[; G][; G, [_____]]

SD-11 Closeout Submittals

Certification of Entire System

1.3 CLOSEOUT SUBMITTALS

1.3.1 Final Reports

Submit a final report which includes the final settings of the valves and switches and a copy of the strip chart graphs and excel data and charts on CDR media with an explanation of what the graph indicates and what the system is doing.

1.4 QUALITY ASSURANCE

1.4.1 Test Reports

Submit written test reports to the Contracting Officer prior to the final acceptance procedure. Information reported shall include:

a. Elapsed operating time.
b. Tank liquid level readings.
c. System flow rate and meter readings.
d. System pressure gage readings.
e. Number identification of pumps running.
f. Pump RPM, amperage, and voltage.
g. Condition of fuel samples.
h. Hydrant control valve performance (including flow rate and pressure) during emergency shutoff, downstream valve closure, and relief operation.

1.4.2 Certification of Entire System

Prior to the acceptance of the newly constructed system by the Government, all installed mechanical and electrical equipment shall be inspected and approved by the Contracting Officer. Provide the Contracting Officer [30][____] days notice in order to schedule the [Command Fuel Facilities Engineer and the Command Fuels Management Officer (who will act only as a technical consultants to the Contracting Officer and shall not have any contract authority)] [Government representatives] for participation in the inspection and equipment tests and final acceptance procedures and approval. Any deficiencies observed shall be corrected by the Contractor without cost to the Government.

PART 2 PRODUCTS

2.1 GOVERNMENT-FURNISHED MATERIAL AND EQUIPMENT

The Government will furnish the following materials, equipment and services during the performance of the work under this section.

2.1.1 Aircraft Turbine Fuel

The Government will provide the fuel necessary for system testing. The Contractor shall notify the Contracting Officer a minimum of 60 days in advance of the requirements. Additional fuel will be provided by the Government as required for satisfactory flushing of the system. Upon satisfactory completion of the flushing and cleaning operations, the Government will supply the additional quantities of fuel required to complete the other work under this section. Fuel will not be delivered to the system until the Contractor has satisfactorily completed all work and, in particular, the cleaning and coating of the interior surfaces of the operating storage tanks and the removal of preservatives and foreign matter from those portions coming in contact with the fuel valves, pumps, filter separators and other such equipment. Fuel delivered to the system shall remain the property of the Government and the Contractor shall reimburse the Government for shortages not attributable to normal handling losses. The Government shall be reimbursed for fuel lost as a result of defective materials or workmanship. An empty Operating Tank shall never be filled at a velocity greater than 3 feet per second in the fill line until fuel is 3 feet above the fill nozzle.

2.1.2 Tank Trucks

Refueler tank trucks and operation of same will be furnished by the Government.

2.1.3 Hydrant Hose Trucks

The Government will furnish and operate the hydrant hose trucks required for ground refueling and defueling of aircraft at hydrant pits.

2.1.4 Utilities

Electric power required for the performance of the work under this section will be furnished at no charge to the Contractor.

2.1.5 Defuel Cart

****
NOTE: Select defuel cart for systems using hydraulic pantographs.
****

The Government will provide a defuel cart for the defueling operation on systems using pantographs for these fueling and defueling operations.

2.1.6 Pantographs

The Government will provide and operate pantographs for systems not providing enough pantographs to accomplish the full flow startup.

2.2 MATERIAL AND EQUIPMENT

2.2.1 Contractor Furnished

Provide material, equipment and labor not specified to be Government-furnished and required for proper start-up of the system. Equipment shall include but not be limited to the following:

a. Temporary strainers.

b. Pipe spools.

c. Flow meters.

d. Pressure gages.

e. Electronic sensors and recorders for pressure and flow recording are included in the PCP, except a sensor and cable or RF will need to be provided by the Contractor for the data from the Hydrant Control Valve and plugged into the PCP. This equipment shall be used to monitor and record the system during the "Equipment Test" and "Performance Testing" portions of this Specification Section. Recorded data shall be used by the Contractor and equipment factory representatives to achieve final control valve and equipment adjustments. Recorded data shall include:

(1) Fueling pumps discharge pressures.
(2) Supply Venturi flow rates.
(3) Hydrant Control Valve pressures.
(4) Back Pressure Control Valve upstream pressures.
(5) Back Pressure Control Valve downstream pressures.
(6) Return Venturi flow rates.

f. The Contractor must have on hand sufficient filter elements and coalescer cartridges to adequately clean the system. During cleaning operation, Contractor shall provide a flow versus pressure drop graph for each filter separator. Graph format shall be as shown at end of this Section. Contractor shall change coalescers and cartridges upon reaching a differential pressure of 15 psi or when pressure drop is less than previous graph or fails to increase properly. Isolate each filter separator, one at a time and use one fueling pump to obtain rated flow rate (600 GPM). A minimum of one complete set of coaleser elements and separator cartridges for each filter separator shall be turned over to the Government after new coalescer elements and separator cartridges are installed in each filter separator vessel after completion of acceptance testing.

[g. Pigging equipment and services as called out in paragraph PIPELINE PIGGING VERIFICATION, Section 33 52 43.13 AVIATION FUELING PIPING.]

2.2.2 Design Conditions

Use temporary flushing lines and equipment that are equal in strength, stability, and materials to the associated permanent components. However, spools may be carbon steel. Additional design conditions shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT.

PART 3 EXECUTION

3.1 PREPARATIONS FOR FLUSHING

****
NOTE: For Air Force projects, select Contracting Officer and the Command Fuel Facilities Engineer. For Navy/Marine Corps or Army projects, select Contracting Officer and include in MOU specific Navy/Marine Corps or Army representatives to be notified when dates are submitted to Contracting Officer.
****

Upon completion of the system to the satisfaction of the [Contracting Officer and the Command Fuel Facilities Engineer] [Contracting Officer], the Contractor shall make the following preparations for flushing the system.

3.1.1 Protection of Equipment

The following items shall be removed from the system prior to start of flushing operations and, where applicable, replaced with spools of pipe, diameter equal to the item removed.

a. Control valves,including hydrant pit control valves if flushing outlets into tank trucks.
b. Sensors which are exposed to the fluid.
c. Coalescer and separator elements in filter separators.
d. Venturi Tubes and Pressure Indicating Transmitters.
e. Meter.

After flushing, the above items shall be reinstalled in the system and the spool sections turned over to the Contracting Officer.

3.1.2 Strainers

Temporary 100 mesh cone type strainers with minimum 300% open area shall be installed in the suction line ahead of each fueling pump and will be left in place. Any damaged strainers shall be replaced by the Contractor at no additional cost to the Government.

3.1.3 Water Draw-off

Remove any accumulated water from Operating Tanks' sumps and bottoms.

3.2 FLUSHING

****
NOTE: Select permanent pantograph, portable pantograph or hydrant hose truck.
****

Flushing procedures shall precede cleaning procedures. The transfer line, pump house piping, apron loop, supply and return lines to the operating tanks, hydrant laterals, product recovery lines and [permanent pantograph][portable pantograph][hydrant hose truck] lines shall be flushed with fuel until the fuel being delivered is free of construction debris to the satisfaction of the Contracting Officer. Samples of fuel shall be taken and tested by the designated government agency and shall be free of gross contamination, maximum of 8.0 mg/gallon solids and free water not to exceed 2 ml per quart.

3.2.1 Fueling System Piping

The flushing of apron system pipelines shall be accomplished by pumping fuel from one of the operating tanks through the fueling system piping and back to another tank. Air shall be bled from system high points. The procedure shall be continued until the fuel being delivered into the tanks is acceptable to the Contracting Officer. After the system has been flushed to the satisfaction of the Contracting Officer, the Contractor shall remove any water remaining in the low point drains and remove any accumulated water from Operating Tank sumps and bottoms by means of the Water Draw-off systems. Cone strainers shall be kept clean in order to insure maximum flow rate. In addition, baskets from all strainers shall be removed and cleaned.

3.2.1.1 Transfer Line

Flushing of the transfer line shall occur during the filling operations. Samples of the incoming fuel shall be taken at the point of connection with bulk storage supply line. These samples shall be taken at one hour intervals and shall be tested by the designated government agency and turned over to the Contracting Officer.

3.2.1.2 Pump House Piping

Remove equipment as specified in paragraph Protection of Equipment. Perform the following flushing operations by withdrawing fuel from one operating tank and returning it to another tank. Circulate a sufficient amount of fuel for each operation. Bleed air from high points.

a. Position manual valves to circulate fuel through one pump, filter separator combination.

[
b. Provide a temporary connection between the [pantograph,] [hydrant hose truck,] checkout connection and the single point receptacle. Position manual valves to circulate fuel through the checkout connection and back to the transfer line. Flush the checkout lines using one fueling pump.]

****
NOTE: Select this paragraph for type iii design.
Select pantograph or hydrant hose truck.
****

c. Position manual valves to circulate fuel through the bypass line. Flush this line using two fueling pumps.

3.2.1.3 Apron Loop Piping

Remove equipment as specified in paragraph Protection of Equipment. Position manual valves to circulate fuel through the apron loop and back to the operating tank. Begin flushing the apron loop at a flow rate of 600 gpm. Increase flushing flow rate one pump at a time to the maximum available number of pumps for a minimum of 8 hours.

3.2.1.4 Hydrant Outlets

****
NOTE: Delete this paragraph Type IV and V systems.
****

Position a tank truck at the hydrant outlet and flush each hydrant lateral. Sample the fuel at the connection to the truck.

3.2.1.5 Product Recovery Tank Lines

During the flushing of apron loop piping, operate all manual drain lines individually to flush their connection to the product recovery tank. Fill the tank a minimum three times, each time utilizing the fuel transfer pump to drain it by returning the fuel to storage.

3.2.1.6 Pantographs

****
NOTE: Delete this paragraph if pantographs are not required (Type III) or the first set of brackets if the specification is for a Type IV/V system.
****

Utilize the [pantograph check-out connection and single point receptacle][pantograph fueling station fueling adapter] to flush each pantograph. Sample the fuel at the pressure fueling nozzle with the kit provided for this purpose.

3.3 CLEANING

After initial flushing is completed, clean the pump house and apron loop piping in accordance with the procedure specified hereafter. Isolate Operating Tanks from the system and clean as specified in Section 33 01 50.01 CLEANING FUEL STORAGE TANKS.

3.3.1 Preparation for Cleaning

Filter elements shall be installed in the filter separators. Adjust filter separator flow control valve. Valves and equipment removed for flushing shall be reinstalled. Operating Tanks shall be drained, vapor freed and cleaned. Transfer the contents from one operating tank to the other for the purposes of cleaning.

3.3.2 Cleaning Requirements

****
NOTE: Select independent or DOD fuels laboratory, include in MOU. Select pantograph checkout station, pantograph fueling station, or hydrant hose truck check-out station.
****

Cleaning shall continue until the Contracting Officer certifies that the fuel passes the color and particle assessment method as defined in T.O. 42B-1-1 or contains 2 milligrams per gallon or less of particulate. Fuel shall also contain 10 parts per million or less of free water. Sampling shall be performed by the[Government][contractor] and testing shall be done by[the Air Force][a DoD regional fuels testing laboratory][an approved independent testing laboratory].[Also take fuel samples at pantograph [check out station][fueling station].][Also take samples at Hydrant Hose Truck Check-out Station and the truck fill stand.]

3.3.3 Cleaning Procedure

During cleaning procedure periodically bleed air through high point vent and drain water through low point drains.

3.3.3.1 Transfer Line

Continue to receive fuel and circulate it until fuel samples taken at the tanks meet the requirements of paragraph Cleaning Requirements above.

3.3.3.2 Pump House Piping

Pump house piping shall be cleaned as follows:

a. Position manual valves so that fuel is withdrawn from one operating tank, circulated through one fueling pump and filter separator, then returned to the operating tank through the receiving filter separators.

b. Clean the piping system using one pump at a time. Alternate the fueling pumps and filter separators during the operation to clean the individual fueling pump suction and discharge lines.

[

c. Provide a temporary connection between the [pantograph] [hydrant hose truck] connection and the nozzle adaptor. Position valves to circulate fuel through the checkout connection and back to the return line. Clean the checkout lines using two fueling pumps.]

****
NOTE: Select this paragraph for Type III design. Select pantograph or hydrant hose truck checkout.
****

d. Connect truck fill station to a tank truck and clean the line.

e. Monitor pressure drop through the filter separators during each cleaning operation and provide flow vs. pressure drop graphs as specified herein before.

f. Periodically take samples from all sample connections. Cleaning shall continue until the fuel meets the specified requirements.

3.3.3.3 Apron Loop Piping

Apron loop piping shall be cleaned as follows:

a. Position manual valves to circulate fuel through the apron loop and back to the operating tank through the receiving filter separators.

****
NOTE: Delete if pigging launchers and receivers are not in the design. In some cases the pig launcher and receiver is not permanently installed and the specifications will need to be written to indicate

the contractor will need to provide tempory units.
****

[a. The pipe shall be first cleaned using pigs as called out in paragraph PIPELINE PIGGING VERIFICATION, Section 33 52 43.13 AVIATION FUEL PIPING. During this, low point drains and high point vents shall be blown clean. Monitor pressure drop through the filter separators during the cleaning operation.

b. The pipe shall then be inspected as called out in paragraph PIPELINE PIGGING VERIFICATION, Section 33 52 43.13 AVIATION FUEL PIPING.]

c. Initially pump fuel through the apron loop at a flow rate of 600 gpm, then increase flow rate up to the full capacity (all pumps running) starting manually one pump at a time. When pumping at a rate greater than 1200 gpm, by-pass receiving filter separators.

d. Monitor pressure drop through the filter separators during the cleaning operation and provide flow vs. pressure drop graphs as specified herein before.

e. Position a tank truck at the hydrant outlet and clean each hydrant lateral,one at a time.

f. Periodically take samples from all sample connections. Cleaning shall continue until the fuel meets specified requirements of paragraph CLEANING REQUIREMENTS.

3.3.3.4 Product Recovery Lines

Repeat the process described under initial flushing until samples taken at the connection of the pipe line back to storage meet the requirements.

3.3.3.5 Pantographs

****
NOTE: Delete if pantographs are not used.
****

Repeat the process described under initial flushing until samples taken at the pressure fueling nozzle meet the requirements.

3.4 CONTROL VALVE[AND PANTOGRAPH] ADJUSTMENT

Check all control valve settings and field adjust from the factory settings at start-up as necessary to provide a smooth operation. Check the filter separator control valves and fueling pump non-surge check valve[and needle valve on Pantograph venturi] and adjust as follows:

3.4.1 Rate of Flow Control Feature on Fueling Pump Non-Surge Check Valve

Run one pump at a time and adjust rate of flow feature (650 gpm).

3.4.2 Control Valves on Issue Filter Separator Downstream Side

a. Position valves so that one fueling pump can pump through only one filter separator. Close the valve at the entrance of the apron loop, and open the bypass valve, allowing discharge into the circulating line.

b. Start the pump and adjust the filter separator control valve for the rated flow capacity of the filter separator (600 gpm).

c. Repeat above for each remaining filter separator.

3.4.3 Venturi Needle Valve

****
NOTE: Delete if pantographs are not used.
****

Venturi needle valve shall be adjusted to ensure a pressure equal to nozzle pressure at maximum flow possible. After initial setting, valve shall be locked in adjusted position.

3.5 EQUIPMENT TESTS

****
NOTE: For Air Force projects select Contracting Officer and the Command Fuel Facilities Engineer. For Navy/Marine Corps or Army projects, select Contracting Officer and other Government representatives. Include in MOU specific representatives who will participate in inspection of equipment test.
****

After completion of flushing, cleaning, and control valve and electrical components adjusting operations, the tests specified hereinafter shall be performed. After cleaning is complete and prior to performance testing, field adjustment of automatic control valves and automatic pump controls while in operation shall be made only by the valve manufacturer's authorized field test engineer. For final adjustment of installed electrical control equipment the Contractor shall provide an experienced electrical engineer, factory representative of PCP manufacturer and factory representative of PIT and DPT manufacturers. Both the mechanical and electrical components shall be adjusted concurrently. Tests will be witnessed by the [Contracting Officer, the Command Fuel Facilities Engineer and the Command Fuel Management Officer][Contracting Officer and other Government representatives].

3.5.1 Check List For Equipment Tests

System Supplier shall complete and submit to the Check List For Equipment Test provided at the end of this Section.

3.5.2 Operating Tank Low Level Alarm

Position valves to transfer fuel between operating tanks. Start one fueling pump and pump sufficient fuel out of the first operating tank to allow the low level alarm (LLA) to stop the fueling pump. This procedure shall be repeated for each fueling pump and each tank until the low level alarm stops the fueling pump due to low liquid level in operating tank.

3.5.3 Fuel Delivery

****
NOTE: Select valve size and verify flow rate with Command Fuel Facilities Engineer.

****

Deliver fuel to each fueling point against a backpressure at the outlet of the hydrant control valve created by the tank trucks and hoses used during the tests.[The flow rate shall be not less than [600][_____] gallons per minute for a 4-inch valve.][The flow rate shall be not less than [1200][_____] gallons per minute for a 6-inch valve]. Flow rates might be affected by aircraft capability.

3.5.4 Fueling Pump Operation

Operation of all pressure and flow devices to start and stop the fueling pumps at the indicated pressure and flow rates shall be demonstrated by the Contractor in the presence of the Contracting Officer. The operating sequence shall be repeated with each of the pumps being selected as lead pump. For this test, the flow rates shall be measured. Flow rates and test results shall be recorded and witnessed by the Contractor.

3.5.5 Defueling Performance

To test the defueling operation in the "automatic" mode, the Government will furnish a defueling cart or a hydrant hose truck with a 300 gpm pump rated at 165 psi to pump fuel from a government furnished tank truck or bladder back into the system. While this defueling test is in operation, one 600 gpm transfer pump shall be operated providing flow into a tank truck through one hydrant control valve. Demonstrate capability of defueling into the system at the same time a fueling operation is in progress. Also test the defuel capability while in the "Flush" mode.

[3.5.6 Emergency Shutdown

****
NOTE: Delete if not provided.
****

With one fueling pump circulating fuel through the system, test each "Emergency Stop" pushbutton station to verify that the pump stops [and the emergency shutoff solenoid activates and the control valve closes]. Repeat above procedure for each fueling pump and "Emergency Stop" pushbutton station. Conduct tests for both the automatic and manual modes. With all the fueling pumps circulating fuel through the system, push an "Emergency Stop" pushbutton station.

]3.5.7 Hydrant Control Valve

Each Hydrant Control Valve shall be operated to demonstrate the following:

a. Surge shut-down capability. (Surge from shut-off of on-board aircraft fill valve can be simulated by closing a fill line valve to the tank truck or bladder, use a three (3) second closure.)

b. Pressure control at setpoint, + 2 psi (Requires use of a pressure gage at the pressure fueling nozzle).

3.5.8 Filter Separator Float Control Valves with Manual Tester

Using the manual float control test level on each Filter Separator, lift the weight from the float ball slowly and observe the Operation and closure of the water slug shut-off feature on the Filter Separator Control Valve.

3.5.9 Overfill Valve

Place fuel transfer pump in the "off" position. Delivery quantity of fuel to Product Recovery Tank to demonstrate capability of valve to close. Place Fuel Transfer Pump in the "Automatic" position to demonstrate capability of valve to open when fuel level drops below set point.

3.6 PERFORMANCE TESTING

****

NOTE: For Air Force projects, select Contracting Officer and the Command Fuel Facilities Engineer. For Navy/Marine Corps projects, select Contracting Officer, Command Fuels Officer and NAVAIR 4.4.5.1 Representative. For Army projects chhoose Contracting Officer. Include in MOU if Command Fuel Facilities Engineer or his designated will assist Contracting Officer regarding approval of final performance testing.

****

Testing as performed under the above paragraphs shall be considered to be part of the performance testing after the Contractor has made the required adjustments to the various equipment and controls and demonstrates to the satisfaction of the [Contracting Officer and the Command Fuel Facilities Engineer] [Contracting Officier, and NAVAIR 4.4.5.1 Representative] [Contracting Officer[and]], that these portions of the systems are working as specified. Notify the Contracting Officer 15 calendar days in advance of the test to permit arrangement for the use of Government-furnished items. During the time period of final performance testing, no construction activities will be allowed on the project site. The project site shall be considered an operational (fuel) zone (versies a construction zone) during this final performance testing period. Personnel, dressed for fuel’s operation, will be present to witness testing and participate in Contractor provided training.

3.6.1 Final Performance Test

The final performance test shall consist of performance of the fueling system during actual fueling and defueling of an aircraft. The maximum rated capacity of the system shall be tested by using several aircraft simultaneously. If it is not possible to use the number of aircraft required to receive the full flow, the test shall be supplemented through the use of refueling trucks or bladders. Record required data necessary to prepare Test Reports specified in paragraph TEST REPORTS.

3.6.1.1 Satisfactory Performance

****

NOTE: For Air Force Projects, select Contracting Officer and the Command Fuel Facilities Engineer. For Navy/Marine Corps or Army Projects, select Contracting Officer and include in MOU if command specific representative or his designated representative will participate in performance testing.

****

In the event a portion of the system or any piece of equipment fails to meet the test, the Contractor shall make the necessary repairs or adjustments and repeat the Performance Test until satisfactory performance is obtained. The determination of satisfactory performance shall be made by the [Contracting Officer and the Command Fuel Facilities Engineer] [Contracting Officer].

3.6.2 Control Valve Tagging

After the performance testing and system acceptance, tag the control valves with their final adjustments.

3.6.3 Final Acceptance

Fill the system with fuel and operate leak-free prior for acceptance. Anything wet with fuel is considered to be leaking.

3.6.3.1 Operating Tank High Liquid Level Shut-Off Valve Test and Adjustments

During the final filling of operating tanks, check the tank automatic high liquid level shut-off valve for proper functioning at least three times by lowering the fuel level and refilling again. Adjust valve to achieve a safe fill level.

3.6.3.2 Tank Level Indicator Adjustments

Also during the final filling of operating tanks, adjust and calibrate the tank level indicators including the final setting of the high high level (HHLA) and high level (HLA) alarms. Since the HHLA is at a point higher than the High Liquid Level Shut-Off Valve float set point, an artificial method of simulating HHL must be used.

3.6.3.3 Water Draw-Off System Test

During the performance testing, fill Water Draw-off Systems from Operating Tank sump to ensure proper operation. After filling system, allow time for fuel/water mixture to separate. Verify liquid separation through system's sight glasses. Proper operation includes capability to drain separated water and capability to pump separated fuel back to a full Operating Tank.

3.7 START-UP COMMISSIONING PROCEDURES FORMS

****

NOTE: Develop the example/starting point attachment for the final testing plan in unison with MAJCOM as a function of the system layout. Table templates are available at http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf. Edit tables as required for the project and provide to the contractor.

****

Use the forms provided by the Contracting Officer in the System Start-up Plan submittal.[Generic templates of the forms (not specifically prepared for this project) are available at http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.] The Contractor and system supplier are responsible for implementing system start-up in coordination with ongoing base operations.

-- End of Section --

CHECK LIST FOR EQUIPMENT TEST

(To be completed after flushing, cleaning and control valve and electrical component adjustments)

PROJECT: ______________________________

LOCATION: ______________________________

ITEM 1 – 0PERATING TANKS:

FUEL PUMP NO.	OPERATING TANK NO. 1	
	SHUTDOWN ON LOW-LOW LEVEL	
	YES	NO

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

FUEL PUMP NO.	OPERATING TANK NO. 2	
	SHUTDOWN ON LOW-LOW LEVEL	
	YES	NO

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 2 - FUEL DELIVERY - ONE FUELING PUMP RUNNING:

Hydrant Control Valve No.	Size (Inch)	Delivery Pressure at Valve Inlet (PSIG)	Backpressure at Valve Outlet (PSIG)	Hydrant Control Valve Flow Rate (GPM)	Pressure Fueling Nozzle Pressure (PSIG)

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 3 - FUELING PUMP OPERATION - AUTOMATIC MODE

SELECTED MICROPROCESSOR ______1______________

SELECTED LEAD PUMP ________FP-1__________ ___

[_____] ACTUATION POINTS

Measuring Device	Lead Pump Start	Second Pump Start	Third Pump Start	Fourth Pump Start	Fourth Pump Stop	Third Pump Stop	Second Pump Stop	Lead Pump Stop
PIT-1	[60][_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG
Issue Venturi DPT-1		[≥ 560][_____] GPM	[≥ 1180][_____] GPM	[≥1780][_____] GPM	[≥ 2480][_____] GPM	[≥ 1800][_____] GPM	[≥ 1200±] [_____] GPM	
Return Venturi DPT - 3		[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 3 - FUELING PUMP OPERATION - AUTOMATIC MODE

SELECTED MICROPROCESSOR ____________1_____________

SELECTED LEAD PUMP ___FP- [Contracting Officer Choice]_____

[_____] ACTUATION POINTS

Measuring Device	Lead Pump Start	Second Pump Start	Third Pump Start	Fourth Pump Start	Fourth Pump Stop	Third Pump Stop	Second Pump Stop	Lead Pump Stop
PIT-1	[60][_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG
Issue Venturi DPT-1		[≥ 560][_____] GPM	[≥ 1180][_____] GPM	[≥1780][_____] GPM	[≥ 2480][_____] GPM	[≥ 1800][_____] GPM	[≥ 1200±] [_____] GPM	
Return Venturi DPT - 3		[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	

DATE: ____________________

TIME: ____________________

TEMPERATURE: ____________________

TEST CONDUCTED BY: ____________________

ITEM 3 - FUELING PUMP OPERATION - AUTOMATIC MODE

SELECTED MICROPROCESSOR ______2______

SELECTED LEAD PUMP _FP- [Contracting Officer Choice]

[_____] ACTUATION POINTS

Measuring Device	Lead Pump Start	Second Pump Start	Third Pump Start	Fourth Pump Start	Fourth Pump Stop	Third Pump Stop	Second Pump Stop	Lead Pump Stop
PIT-1	[60][_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG	[_____] PSIG
Issue Venturi DPT-1		[≥ 560][_____] GPM	[≥ 1180][_____] GPM	[≥1780][_____] GPM	[≥ 2480][_____] GPM	[≥ 1800][_____] GPM	[≥ 1200±] [_____] GPM	
Return Venturi DPT - 3		[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 40][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	[≤ 700][_____] GPM	

DATE: ____________________

TIME: ____________________

TEMPERATURE: ____________________

TEST CONDUCTED BY: ____________________

ITEM 4 - DEFUELING PERFORMANCE

FUELING PUMP NO.	AUTOMATIC MODE		
	FLOW RATE THRU ISSUE VENTURI (GPM)	FLOW RATE AT HYDRANT CONTROL VALVE (GPM)	FLOW RATE THRU RETURN VENTURI (GPM)

DATE: ____________________

TIME: ____________________

TEMPERATURE: ____________________

TEST CONDUCTED BY: ____________________

FLUSH MODE			
OPERATING TANK NO. _____ LEVEL-START	OPERATING TANK NO. _____ LEVEL-START	PRESSURE GAGE READING AT DEFUEL/FLUSH VALVE	HYDRANT CONTROL VALVE NO.

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 5 - EMERGENCY SHUTDOWN

AUTOMATIC MODE						
FUELING PUMP NO.	"EMERGENCY STOP" PUSHBUTTON NO.	EMERGENCY SHUT-OFF VALVE CLOSURE			FUELING PUMP STOP	
		YES	TIME (SEC)	NO	YES	NO
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 5 - EMERGENCY SHUTDOWN

AUTOMATIC MODE						
FUELING PUMP NO.	"EMERGENCY STOP" PUSHBUTTON NO.	EMERGENCY SHUT-OFF VALVE CLOSURE			FUELING PUMP STOP	
		YES	TIME (SEC)	NO	YES	NO
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						
FP-[______]						

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

MANUAL MODE						
FUELING PUMP NO.	"EMERGENCY STOP" PUSHBUTTON NO.	EMERGENCY SHUT-OFF VALVE CLOSURE			FUELING PUMP STOP	
		YES	TIME (SEC)	NO	YES	NO
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

MANUAL MODE						
FUELING PUMP NO.	"EMERGENCY STOP" PUSHBUTTON NO.	EMERGENCY SHUT-OFF VALVE CLOSURE			FUELING PUMP STOP	
		YES	TIME (SEC)	NO	YES	NO
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						
FP-[_____]						

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 6 - HYDRANT CONTROL VALVE/TRUCK FILL STAND VALVE TEST

HYDRANT CONTROL VALVE NO.	SURGE SHUTDOWN CAPABILITY		PRESSURE CONTROL AT SETPOINT IS ± 2 PSI		DEADMAN CLOSURE WITHIN 2 SECONDS	
	YES	NO	YES	NO	YES	NO

DATE: ______________________________

TIME: ______________________________

TEMPERATURE: ______________________________

TEST CONDUCTED BY: ______________________________

ITEM 7 - FILTER SEPARATOR FLOAT CONTROL VALVE MANUAL TEST

FILTER SEPARATOR NO.			WATER SLUG FEATURE ON FILTER SEPARATOR CONTROL VALVE FUNCTIONED	
			YES	NO

DATE: ____

TIME: ____

TEMPERATURE: ____

TEST CONDUCTED BY: ____

ITEM 8 - OVERFILL VALVE TEST

<table>
<tr><th colspan="5">PRODUCT RECOVERY TANK</th></tr>
<tr><th rowspan="4">OVERFILL VALVE</th><th colspan="2">CLOSED AT 95% FILL LEVEL</th><th colspan="2">OPENED AS TANK LEVEL DROPS BELOW 95% FILL LEVEL</th></tr>
<tr><th>YES</th><th>NO</th><th>YES</th><th>NO</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

DATE: ____

TIME: ____

TEMPERATURE: ____

TEST CONDUCTED BY: ____

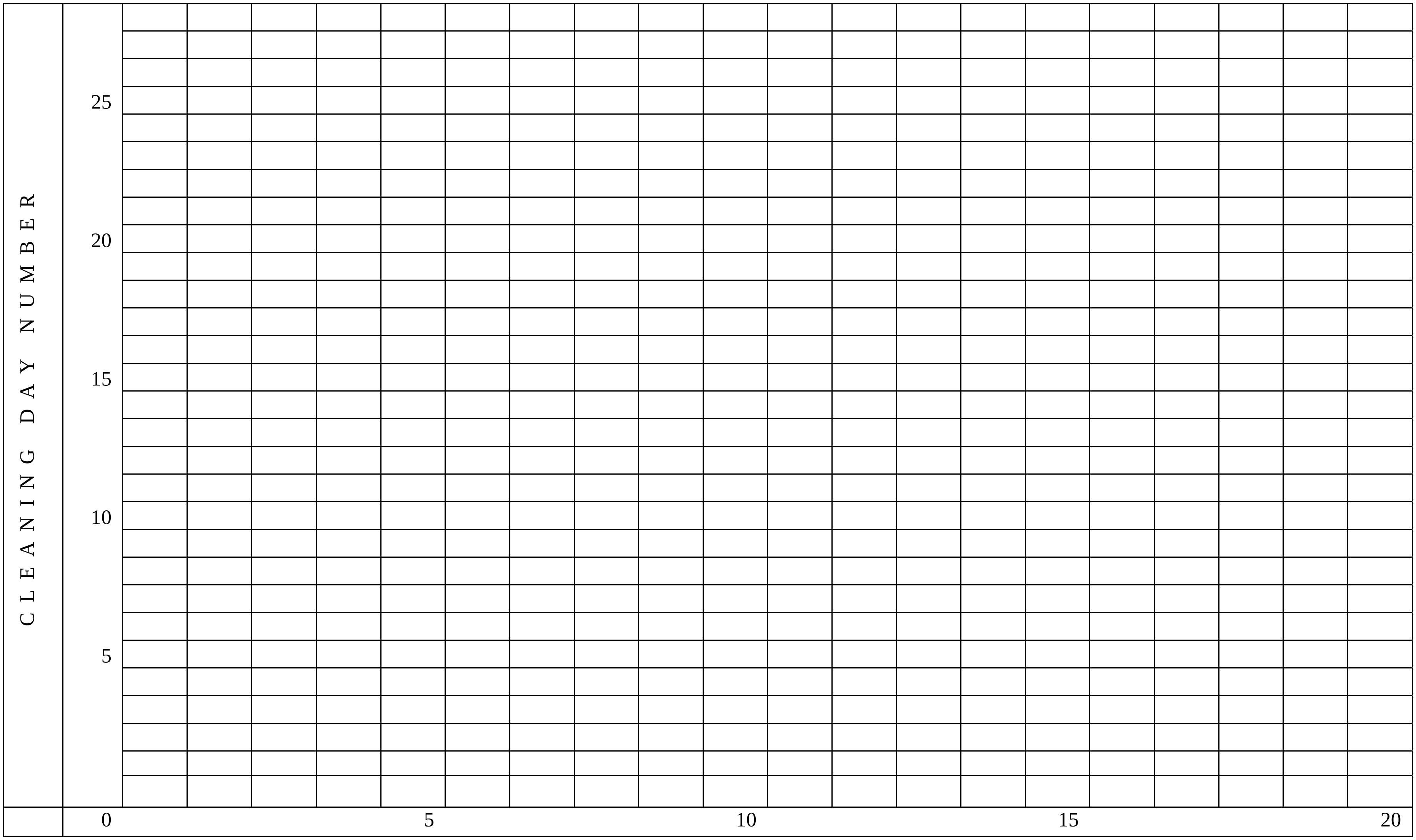
I certify that the values recorded in Items 1-8 are accurate and correct.
DATE:
SIGNATURE:
ORGANIZATION:

I witnessed all tests required to produce values recorded in Items 1-8.
DATE:
SIGNATURE:
ORGANIZATION:

PERSONNEL PRESENT DURING EQUIPMENT TEST

NAME	ORGANIZATION	COMMERCIAL PHONE NO.

REMARKS:

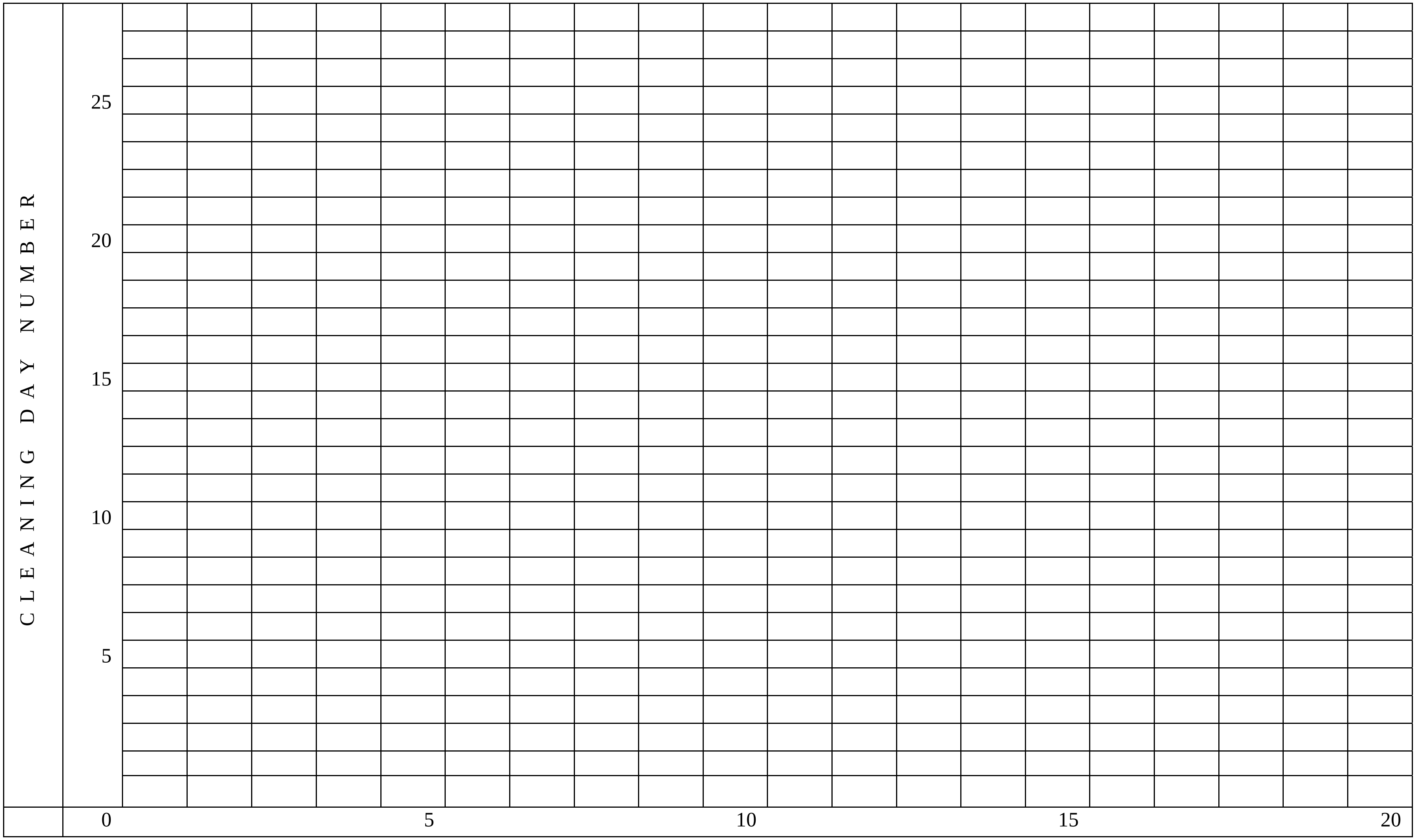


PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSI-1

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ______________________ SIGNATURE: ______________________

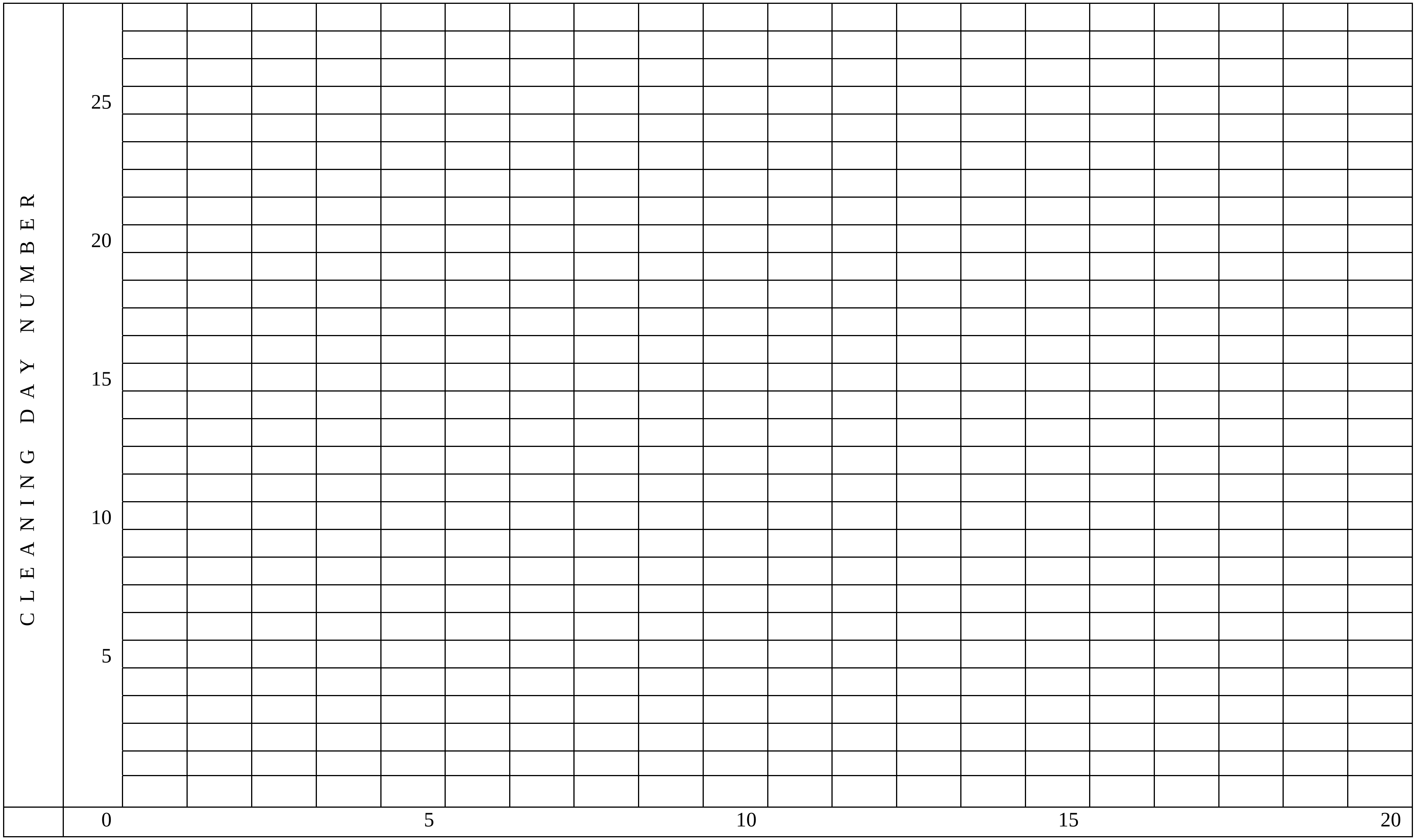


PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSI-2

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ______________________________ SIGNATURE: ______________________________

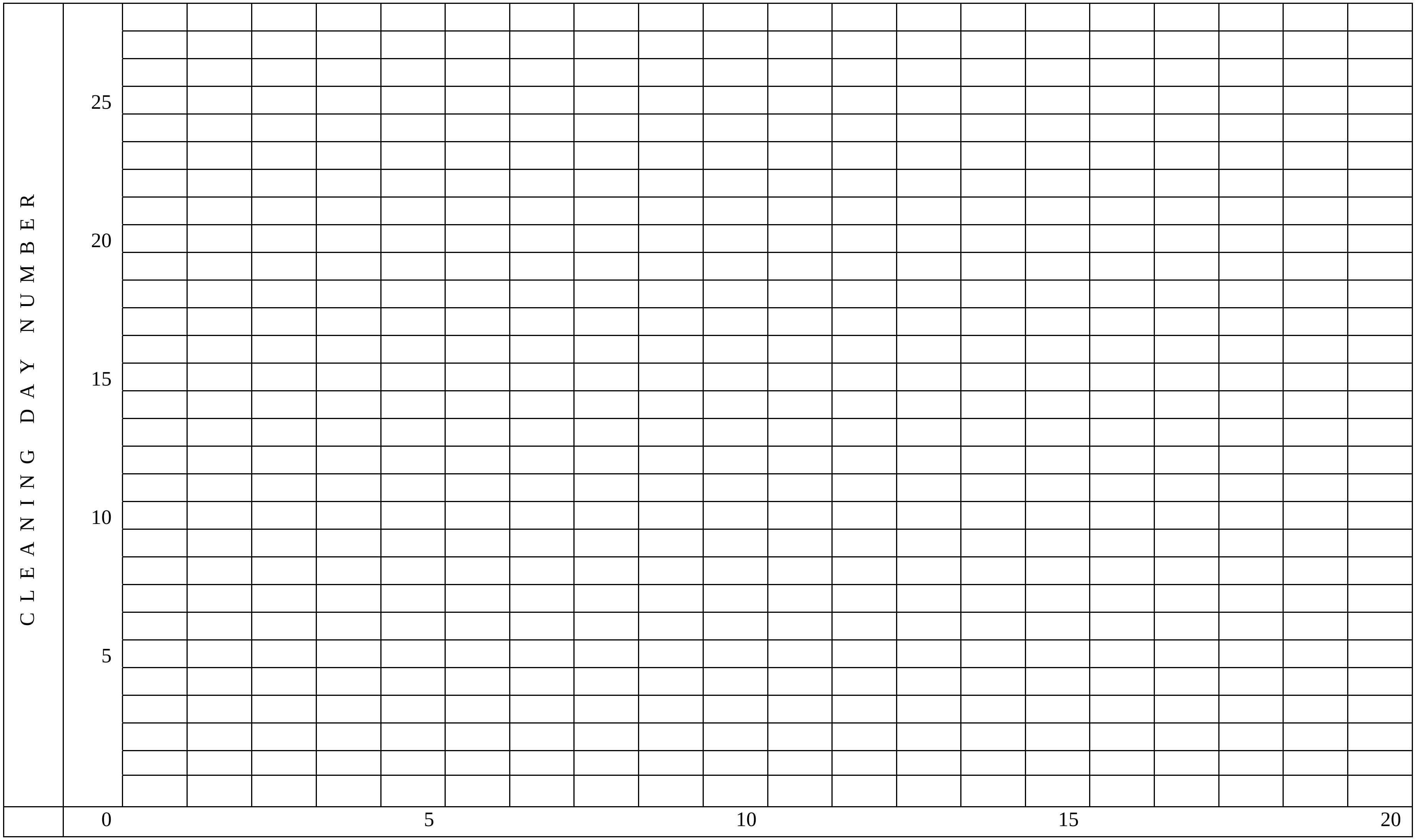


PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSI-3

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ______________________________ SIGNATURE: ______________________________



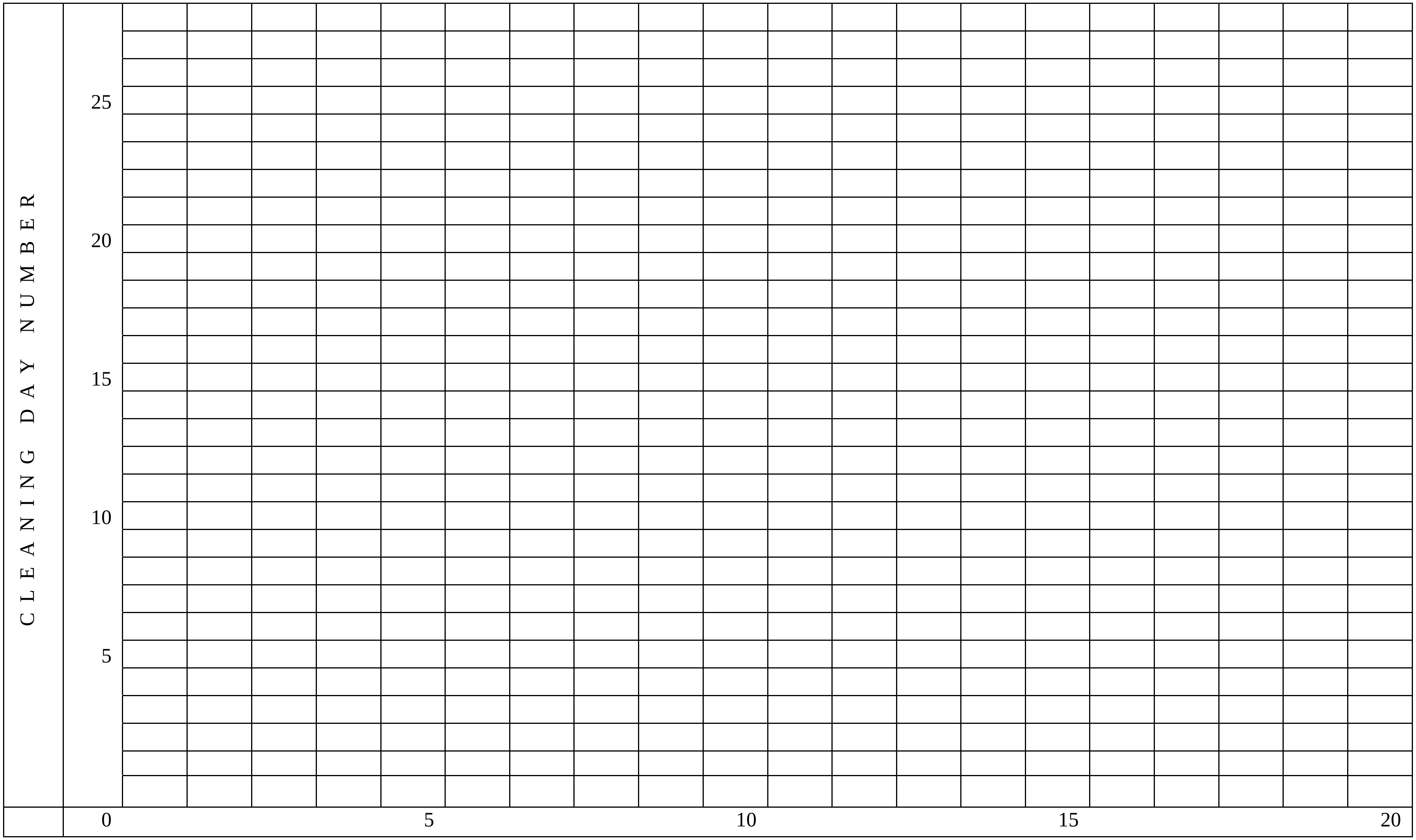
PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSI-4

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI

(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ______________________________ SIGNATURE: ______________________________

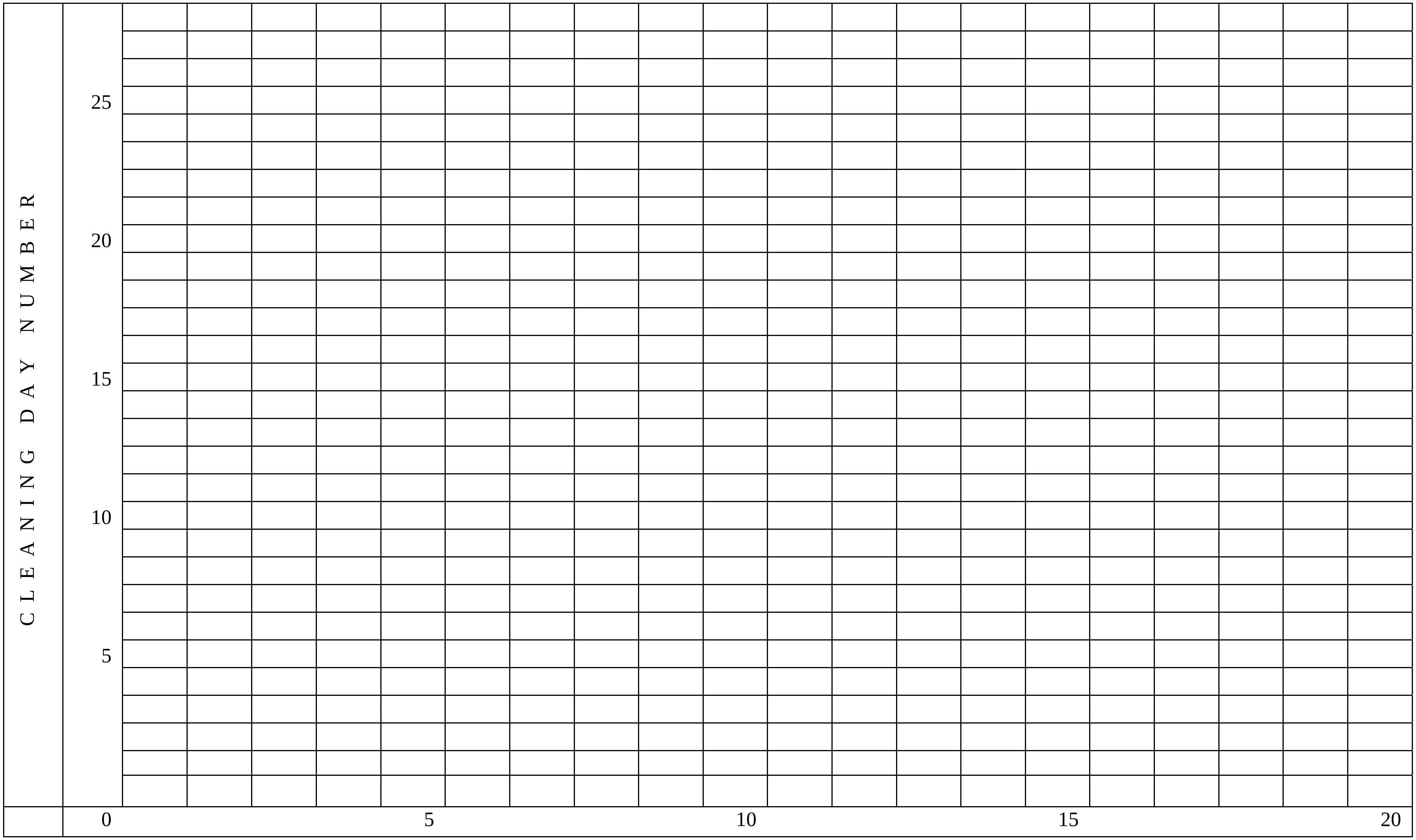


PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSI-5

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ______________________________ SIGNATURE: ______________________________

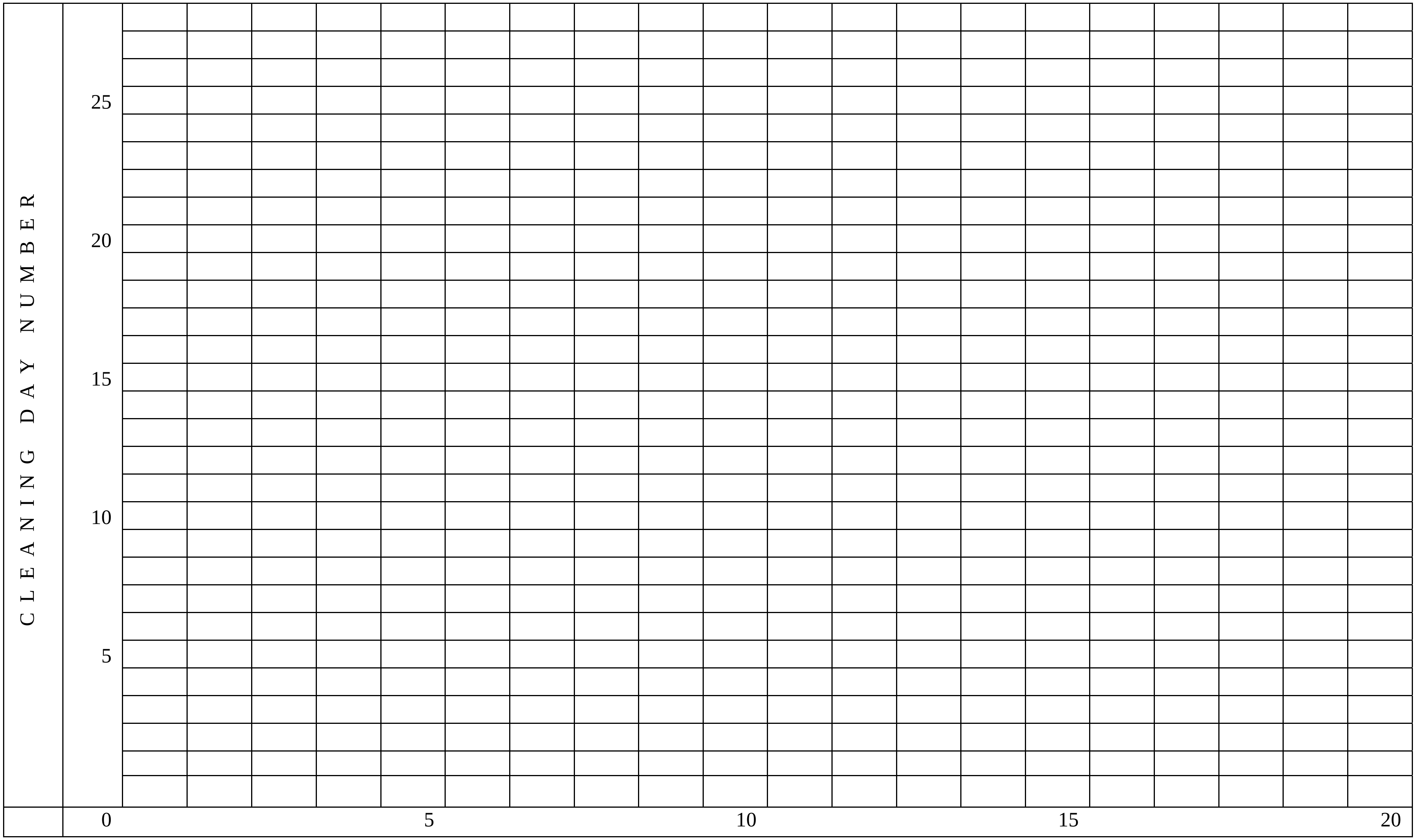


PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSR-1

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ____ SIGNATURE: ____



PRESSURE DROP IN POUNDS PER SQUARE IN (PSI)

CLEANING OPERATION DAILY FLOW VS. PRESSURE DROP GRAPH FOR FILTER SEPARATOR NO. FSR-2

* ELEMENT CHANGE CRITERIA: (1) When pressure drop across filter separator reaches 15 PSI
(2) When pressure drop is less than previous plot or fails to increase properly

STARTING DATE: ____________________ SIGNATURE: ____________________

****
USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 53 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 09 53

AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM

02/10

-- End of Section Table of Contents --

****
USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 53 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 09 53

AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM
02/10

****
NOTE: This guide specification covers the requirements for the Pump Control and Annunciation System for aircraft refueling systems constructed to the requirements of the DOD Type III Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90	(2005) Standard for Relays and Relay Systems Associated With Electric Power Apparatus
IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

ISA - INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ISA 18.1	(1979; R1992) Annunciator Sequences and Specifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA IA 2	(2005) Programmable Controllers - Parts 1 thru 8
NEMA ICS 1	(2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; Errata 2006; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2005) Terminal Blocks
NEMA ICS 6	(1993; R 2001; R 2006) Standard for Enclosures
NEMA LS 1	(1992; R 2000) Low Voltage Surge Protective Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 1012	(2005; R 2008 thru 2009) Standard for Power Units Other than Class 2
UL 1449	(2006; R 1998 thru 2009) Standard for Surge Protective Devices
UL 508	(1999; R 1999 thru 2008) Standard for Industrial Control Equipment

1.2 ADMINISTRATIVE REQUIREMENTS

a. Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM applies to this section, with the additions and modifications specified herein. The Hydrant Fueling System consists of fueling pumps that pump fuel to a Hydrant Hose Truck Check-out Pad, Truck Fill Stands, and fuel pits located on the airfield apron. Automatic pump starts and stops are based on system pressure and flow.

b. Programmable Logic Controllers (PLCs) receive information from pressure transmitters and other devices to control the pumps and control valves. There are two PLCs that are connected in a redundant configuration, to assure continued operation of the Hydrant fueling System even if either PLC (but not both) fails. The Hydrant Fueling System also includes above ground fuel storage tanks and a product recovery tank.

c. The pump control panel, personal computer, [graphic display panel,] and annunciator are located in the Control Room of the Pumphouse. The control system shall be furnished by a single supplier. See 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT for other required components of the control system. The control system supplier shall be responsible for providing a fully functional control system, in accordance with the drawings and specifications, including the field devices. Installation shall be in accordance with NFPA 70.

d. Submit six copies of Operation and Maintenance Manuals, within 7 calendar days following the completion of factory tests. Installation, Operation, and Maintenance manuals for all equipment supplied shall be furnished following the completion of shop tests and shall include:

1). Pump Control Panel including interior and exterior equipment layout. Complete guide outlining step-by-step procedures for system startup and operation.

2). All documents previously submitted and approved with all comments and field changes annotated. Complete description of the sequence of operation including that described in PART 3 and any subsystems not controlled by the PLC (e.g. annunciator panel, EPDS, etc.).

3). Complete listing of all programming of the PLCs, laptop computer, and Personal Computer.

4). Complete relay ladder logic diagrams, PLC input/output diagrams and control power distribution diagrams for the complete control system.

5). Complete troubleshooting guide, which lists possible operational problems and corrective action to be taken, including all as-built conditions.

e. Submit documents demonstrating the accuracy and completeness of the list of material and components, that items proposed comply fully with contract requirements, and are otherwise suitable for the application indicated. Documents shall consist of all data or drawings published by the manufacturer of individual items listed including manufacturer's descriptive and technical literature, performance data, catalog cuts, and installation instructions. Submit additional material if the listed items are not adequate to identify intent or conformance to technical requirements. Provide typed and electronic copies of these lists for approval. Any delays associated with resubmittals of incomplete or ambiguous initial submittals will be the Contractor's responsibility.

f. Documents shall be bound in a suitable binder adequately marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the

District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawing[; G][; G, [_____]].

SD-03 Product Data

Pump Control Panel (PCP) and Components[; G][; G, [_____]].

Programmable Logical Controller (PLC) Hardware and Software[; G][; G, [_____]].

Personal Computer (PC)[; G][; G, [_____]].

Laptop Computer[; G][; G, [_____]].

FCC Computer[; G][; G, [_____]].

Laser Printer[; G][; G, [_____]].

[Graphics Display Panel[; G][; G, [_____]].]

Graphics Display Screen[; G][; G, [_____]].

Control Wiring Data Lists[; G][; G, [_____]].

Tools and Spare Parts.

SD-06 Test Reports

Certified Pump Control Panel (PCP) Shop Test Report.

Record of Test.

SD-07 Certificates

Experience and Qualifications[; G][; G, [_____]].

Training Plan for Instructing Personnel[; G][; G, [_____]].

Testing Plan[; G][; G, [_____]].

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G][; G, [_____]].

1.4 TOOLS AND SPARE PARTS

The following shall be provided:

a. Any special tools necessary for operation and maintenance of the equipment providing supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked.

b. One spare set of fuses of each type and size

c. Recommended manufacturer list of spare parts, including part number, current unit price, and source of supply.

d. One spare power supply module

e. One spare I/O module for discrete devices and one for analog devices

f. Two PLC RAM back-up batteries

g. Two complete sets of ink cartridges for the laser printer

h. Minimum of 10 spare lamps for the Alarm Annunciator

i. Minimum of 10 spare lamps of each type of non-LED lamps used on the Pump Control Panel

1.5 EXPERIENCE AND QUALIFICATIONS

Submit the following data for approval:

a. Certification stating that the manufacturer has manufactured, installed, and successfully completed at least five PLC-based systems for automatic cycling of pumps based upon varying dispensing demands ranging from 0 to 2400 GPM utilizing multiple pumps. At least two of the five PLC-based systems shall be for dispensing jet fuel into a pressurized, constant pressure, flow demand aircraft hydrant system.

b. Certification that the control systems have successfully operated over the last 2 years and are currently in service.

c. Project names, locations, and system description of these installations. Include user point-of-contact and current telephone numbers.

1.6 WARRANTY

The Pump Control and Annunciation System including devices, hardware and software shall be warranted for a period of 1 year from the date of acceptance of the system by the Government. This warranty service shall include parts and labor service for equipment supplied under this specification. Upon notification by the Government of system or component failure, the Contractor shall respond at the site with necessary parts within 48 HOURS of notification.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Pump Control Panel (PCP) and Components

NEMA ICS 1, NEMA ICS 6, NEMA 250, and UL 508. The PCP enclosure shall be a freestanding NEMA Type 12, smooth, gasketed enclosure constructed of 12 gauge steel. All seams shall be continuously welded and there shall be no drilled holes or knockout prior to delivery to the job site. The pump control panel dimensions shall be a maximum of 90 inches high, maximum 72 inches wide, and a maximum of 24 inches deep and shall have removable lifting eyes. The interior surfaces of the panel shall be properly cleaned, primed, and spray painted with white high-gloss enamel. Exterior surfaces shall have standard factory finish. Access for the PCP shall be front only and shall consist of hinged doors having 3-point latching mechanisms. The doors shall open approximately 120 degrees. Rack mounting angles, swing-out panels and other component mounting hardware shall be installed such that servicing of one component shall not require removal or disconnection of other components. No clearance shall be required between the back of the panel and the room walls. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure.

2.1.2 Ventilation System

Two supply fans, single phase, 115 volt, shall be provided. Each fan shall supply a minimum of 100 CFM. The supply and exhaust grill shall contain a filter that is easily removed from the exterior of the enclosure. Three thermostats with an adjustable set point range of70 degrees F to 140 degrees F shall also be provided. The thermostats shall be located near the top in the interior of the PCP.

2.1.3 Ground Bar

The control panel shall have a tin plated copper equipment ground bar. The bar shall have a minimum of twenty grounding screws.

2.1.4 Standard Indicator Lights

NEMA ICS 1, NEMA ICS 2, and UL 508. Lights shall be heavy duty, NEMA 13, 1 inch mounting hole, round indicating lights operating at 120 volts ac/dc or 24 volts ac/dc. Long life bulbs shall be used. Indicator lights shall have a legend plate with words as shown on drawings. Lens color as indicated on the drawings. Lights shall be "push to test (lamp)" type. LED type lamps of comparable size and color may be substituted for standard indicator lights.

2.1.5 Selector Switches

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated lever operated selector switches shall be heavy duty, NEMA 13, round, and utilize a 7/8 inches mounting hole. They shall have the number of positions as indicated on the drawings. Switches shall be rated 600 volt, 10 amperes continuous. Legend plates shall be provided with each switch with words as indicated on the drawings.

2.1.6 Pushbuttons

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated pushbuttons shall be heavy duty, NEMA 13, round, utilize a 7/8 inch mounting hole, and have the number and type of contacts as indicated on the drawings or elsewhere in the specifications. The emergency stop switch shall be a red mushroom head, 1.5 inch diameter, momentary contact type. Pushbuttons shall be rated 600 volt, 10 amperes continuous. Legend plates shall be provided with each switch with words as indicated on the drawings.

2.1.7 Relays

IEEE C37.90, NEMA ICS 2, UL 508.

2.1.8 Nameplates

Nameplates shall be made of laminated plastic with black outer layers and a white core. Edges shall be chamfered. Nameplates shall be fastened with black-finished round-head drive screws or approved nonadhesive metal fasteners.

2.1.9 Transient Voltage Surge Suppression Devices

IEEE C62.41 for Category "B" transients, NEMA LS 1, UL 1449.

2.1.10 Terminal Blocks

NEMA ICS 4. Terminal blocks for conductors exiting the PCP shall be two-way type with double terminals, one for internal wiring connections and the other for external wiring connections. Terminal blocks shall be made of bakelite or other suitable insulating material with full deep barriers between each pair of terminals. A terminal identification strip shall form part of the terminal block and each terminal shall be identified by a number in accordance with the numbering scheme on the approved wiring diagrams.

2.1.11 Circuit Breakers

UL 508. Individual, appropriately sized, terminal block mounted, circuit breakers shall be provided for all 120 volt PCP mounted equipment and for the 120 volt terminal boards shown on the drawings.

2.1.12 Uninteruptable Power Supplies

UL 1012. Input voltage shall be 120 volts (nominal), 1 phase, 60 Hertz. Output voltage regulation shall be +/-5.0 percent for the following conditions:

a. 20 to 100 percent load on output.
b. Input voltage variation of -15 to +10 percent.
c. Constant load power factor between 80 and 100 percent.

Response time shall be 1.5 cycles or less. Battery capacity shall be such as to provide an orderly shut down of operating programs or as a minimum 10 minutes.

2.1.13 Miscellaneous Power Supplies

UL 1012. Certain field devices may require power other than 120 VAC (i.e.

24 VDC). The power supplies shall be convection cooled, have fully isolated independent outputs, have constant voltage, have short circuit and overvoltage protection, and have automatic current limiting.

2.1.14 Alarm Annunciator

UL 508 and ISA 18.1. The Alarm Annunciator shall provide visual annunciation, local and remote monitoring, constant or flashing visual and audible alarm as specified herein. The annunciator shall be completely solid state with no moving parts. The annunciator shall be furnished with cabinet and hardware appropriate for flush mounting on the control panel. A power supply either integral or separately mounted shall operate on 120 volts, 60 Hertz. The annunciator shall have windows arranged in a matrix configuration (rows and columns). Each window shall be at least 15/16 inch high by 1-5/8 inches wide and shall have rear illuminated translucent engraved nameplate. Lettering shall be at least5/32 inches high. System lamp voltage shall be 24 to 28 volts dc. The cells shall be individually addressable and not hardwired.

2.1.15 Alarm Horns

UL 508. The alarm horns shall consist of 3-vibrating horns and 2-resonating horns. One vibrating horn is to be mounted in the PCP, and two vibrating and two resonating horns shall be mounted outside of the pumphouse as shown on the drawings. The exterior horns shall each produce 100 db at 10 feet and shall be provided in a weather proof housing. The PCP horn shall produce 70 db at 10 feet.

2.1.16 Laptop Computer

2.1.16.1 Hardware

The following are the minimum hardware requirements for the laptop computer:

a. Latest Pentium CPU operating at 2 GHz or faster
b. 1 GB RAM
c. 100 GB hard drive
d. 16X Read Write DVD drive
e. Color XGA LCD screen14 inches
f. Keyboard
g. Pointing device (e.g. mouse, track ball)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC and Battery power supply
k. All cables and connectors for interfacing with PLC and personal computer
l. Modem compatible for remote troubleshooting of the system
m. Two USB 2.0 communications ports
n. Provide a carrying case for the Laptop Computer

2.1.16.2 Software

The following is the minimum software to be loaded on the laptop. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software needs to be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating system)
b. Software for programming the PLCs
c. Software for programming the personal computer

2.1.17 Personal Computer (PC)

2.1.17.1 Hardware

The following are the minimum hardware requirements for the personal computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM
c. 250 GB hard drive
d. 16X Read Write DVD drive
e. Color 17 inches flat screen monitor
f. Keyboard
g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120 VAC operating power
k. All cables and connectors interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System
m. Two USB 2.0 communications ports

2.1.17.2 Software

The following is the minimum software to be loaded on the personal computer. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software needs to be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)
b. Software for programming the PLCs
c. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points
d. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system on a real time basis
e. MS Ofice Professional with Excel shall be provided to allow the trending data described in "d". above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically

2.1.18 Laser Printer

The alarm/report printer shall be a color laser jet printer. The unit shall print in black at a minimum speed of twelve pages per minute. It shall print in color at a minimum speed of ten pages per minute. It shall as a minimum be capable of printing color graphs of various system pressures, issue flow, and return flow vs. time in seven colors. Provide one set of spare replacement ink cartridges.

2.1.19 FCC Computer

2.1.19.1 Hardware

The FCC computer shall be a copy of the personal computer so that upon failure of the personal computer it could be relocated to the pumphouse to assume the personal computers duties. The normal duties of the FCC computer shall be to serve as a remote monitor only of the screens that are available on the personal computer. The following are the minimum hardware requirements for the FCC computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM
c. 250 GB hard drive
d. 16X Read Write DVD drive
e. Color 17 inch flat screen monitor
f. Keyboard
g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120 VAC operating power
k. All cables and connectors interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System
m. Two USB 2.0 communications ports

2.1.19.2 Software

The following is the minimum software to be loaded on the FCC computer. The FCC computer shall be capable of replacing the Personal computer in the pumphouse if the personal compter fails. It will be set up initially to serve only as a remote monitor of the system while located at the FCC. Should the personal computer fail, the FCC computer will be relocated to the pumphouse and then assume the role of the personal computer. The computer software shall have a built in command to tell the computer whether it is serving as the personal computer or as the remote monitor only. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software needs to be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (the latest commercially available MS Operating System)
b. Software to tell the computer which mode it is to operate in, i.e. (personal computer or remote monitor)
c. Software to run as a remote monitor
d. Software for programming the PLCs
e. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points
f. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system, on a real time basis
g. MS Ofice Professional with Excel shall be provided to allow the trending data described in "e" above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically

2.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

2.2.1 General

a. NEMA IA 2. Each PLC shall be able to receive discrete and analog inputs and through its programming it shall control discrete and analog output functions, perform data handling operations and communicate with external devices and remote I/O racks. The PLCs shall be a modular, field expandable design allowing the system to be tailored to the process control application. The capability shall exist to allow for expansion to the system by the addition of hardware and/or user software. At a minimum the PLCs shall include mounting backplanes, power supply modules, CPU module, communication modules, and I/O modules.

b. Each PLC provided shall be designed and tested for use in the high electrical noise environment of an industrial plant. The PLC modules shall comply with the FCC Part 15 Part A for radio noise emissions. The programmable controller processor shall be able to withstand conducted susceptibility tests as outlined in NEMA ICS 2, IEEE C37.90.

c. The PLCs shall function properly at temperatures between 32 and 122 degrees F, at 5 to 95 percent relative humidity non-condensing and have storage temperatures between-40 and +140 degrees F at 5 to 95 percent relative humidity non-condensing.

d. The PLCs shall have manufacturer's standard system status indicators (e.g. power supply status, system fault, run mode status, back-up battery status).

2.2.2 Central Processing Unit Module

The CPU shall be a modular self-contained unit that will provide time of day, scanning, application (ladder rung logic) program execution, storage of the application program, storage of numerical values related to the application process and logic, I/O bus traffic control, peripheral and external device communications and self-diagnostics.

2.2.3 Power Supply Module

a. The power supply module shall be plugged into the backplane not separately mounted. The power supply shall be wired to utilize 120 VAC, 60 Hz power, the system shall function properly within the range of -10 to +15 percent of nominal voltage. The power supply shall provide an output to the backplane at a wattage and voltage necessary to support the attached modules. A single main power supply module shall have the capability of supplying power to the CPU module and local communication and I/O modules. Auxiliary power supplies shall provide power to remote racks.

b. Each power supply shall have an integral on/off disconnect switch to the module. If the manufacturers standard power supply does not have an on/off disconnect switch a miniature toggle type switch shall be installed near the PLC and clearly labeled as to its function.

c. The power supply shall monitor the incoming AC line voltage for proper levels and have provisions for both over current and over voltage protection. If the voltage level is detected as being out of range the system shall have adequate time to complete a safe and orderly shutdown.

2.2.4 Program Storage/Memory Requirements

a. The PLC shall have the manufacturers standard nonvolatile executive memory for the operating system. The PLC shall also have EEPROM (Electrically Erasable Programmable Read Only Memory) for storage of the user program and battery backup RAM for application memory. The EEPROM shall be loaded by use of the laptop computer or the personal computer.

b. Submit a calculation of the required amount of EEPROM and RAM (random access memory) needed for this application plus an extra 50 percent.

c. The number of times a normally open (N.O.) and/or normally closed (N.C.) contact of an internal output can be programmed shall be limited only by the memory capacity to store these instructions.

2.2.5 Input/Output (I/O) Modules

a. Provide all required I/O modules (analog input, analog output, discrete input, discrete output, and isolated discrete output) to manipulate the types of inputs and outputs as shown on the drawings and to comply with the sequence of operations. Also provide a minimum of 20 percent (round up for calculation) spare input and output points of each type provided, but not less than 2 of each type.

b. I/O modules shall be a self-contained unit housed within an enclosure to facilitate easy replacement. All user wiring to I/O modules shall be through a heavy-duty terminal strip. Pressure-type screw terminals shall be used to provide fast, secure wire connections. The terminal block shall be removable so it is possible to replace any input or output module without disturbing field wiring.

c. During normal operation, a malfunction in any remote input/output channel shall affect the operation of only that channel and not the operation of the CPU or any other channel.

d d. Isolation shall be used between all internal logic and external power circuits. This isolation shall meet the minimum specification of 1500 VRMS. Provide optically isolated I/O components which are compatible with field devices.

e. Each I/O module shall contain visual indicators to display ON/OFF status of individual input or output points.

f. Discrete output modules shall be provided with self-contained fuses for overload and short circuit protection of the module.

g. All input/output modules shall be color coded and titled with a distinctive label.

2.2.6 Interfacing

The PLC shall have communication ports and communication modules using the manufacturers standard communication architecture for connections of the Personal computer, Laptop Computer, remote I/O racks and interconnections between SYS 1 PLC and SYS 2 PLC for the redundant backup system of the PLCs.

2.2.7 Program Requirements

a. The programming format shall be ladder diagram type as defined by NEMA IA 2.

b. There shall be a means to indicate contact or output status of the contact or output on the CRT (of the personal computer) or LCD screen (of the laptop computer). Each element's status shall be shown independently, regardless of circuit configuration.

c. The program shall be full featured in its editing capabilities (e.g. change a contact from normally open to normally closed, add instructions, change addresses, etc.).

2.2.8 Diagnostics

The CPU shall continuously perform self-diagnostic routines that will provide information on the configuration and status of the CPU, memory, communications and I/O. The diagnostic routines shall be regularly performed during normal system operation. A portion of the scan time of the controller should be dedicated to perform these housekeeping functions. In addition, a more extensive diagnostic routine should be performed at power up and during normal system shutdown. The CPU shall log I/O and system faults in fault tables, which shall be accessible for display. When a fault shuts down a CPU, a sequence shall be initiated that will automatically switch over to the other CPU. When a fault affects I/O or communication modules the CPU shall shut down only the hardware affected and continue operation by utilizing healthy system components. All faults shall be annunciated on the alarm annunciator.

[2.3 GRAPHICS DISPLAY PANEL

2.3.1 Enclosure

The Graphics Display Panel (GDP) shall be a 42 inches LED Panel Display suitable for wall mounting and capable of accepting input from the Personal Computer. The Personal Computer shall be set up to normally display it's screen number four on the graphic Display Panel, but it shall be capable of sending any of its other screens to the display panel. Any combination of the screens shall be capable of being displayed on the Personal Computer Monitor and the Graphic Display Panel.

2.3.2 Display Presentation

The process schematic graphic representation shall be as shown on the drawings. Red, green, amber, etc. colors should display on the screen as indicated on the drawings. The indicated lights on the drawing shall display approx. a 1/2 inch in diameter.

2.3.3 Digital Flow and Pressure Indicators

Digital indicators as shown on the drawings shall also be displayed on the Graphics Display Panel to provide flows in GPM and pressures in psig. The digital indicators shall display the indicated number of digits as shown on the drawings. Each digit shall be approximately 0.6-inches high.

]PART 3 EXECUTION

3.1 PUMP CONTROL PANEL (PCP) AND COMPONENTS

3.1.1 General

a. Where two or more pieces of equipment performing the same function are required, they shall be exact duplicates produced by the same manufacturer. All display instruments of each type shall represent the same outward appearance, having the same physical size and shape, and the same size and style of numbers, characters, pointers, and lamp lenses.

b. The PCP shall include all required resident software programs and hardware to provide the specified sequence of operation. All software R/W CD-Rom disks, including programming manuals, shall be turned over to the Government at the completion of start-up so modification can be done in the field with no outside assistance.

c. It is intended that process controlling devices except field devices, and motor controllers be attached to or mounted within the PCP enclosure and all interconnecting wiring installed prior to shipment to the job site. This is to allow shop testing of the system and to decrease field labor requirements.

d. The PCP shall be shipped fully assembled in one piece after the completion of the shop tests and all defects corrected.

3.1.2 Wiring

Wiring methods and practices shall be in conformance with NEMA ICS 1, NEMA ICS 2, NEMA ICS 4, and NEMA ICS 6 recommendations as applicable. All wiring to instruments and control devices shall be made with stranded wire, and wiring shall be permanently labeled with conductor/wire numbers within 1 inch of termination points. Labels shall be tubular heat-shrinkable wire markers that remain legible after exposure to industrial fluids and abrasion. Position markers so that wire numbers can be read without disturbing or disconnecting wiring. Use of individual character-markers placed side-by-side is not acceptable. Numbers shall match approved shop drawings. All wiring shall be neatly laced from point of entry into enclosures to termination points with nylon lacing cord or plastic lacing ties. Lacing within wiring channels is not required. Provide typed Control Wiring Data Lists within each terminal cabinet and the PCP. The data lists shall include: conductor identification number, wire gauge, wire insulation type, "FROM" terminal identification, "TO" terminal identification, and remarks. The preliminary lists generated by the Contractor will be submitted for approval to the Contracting Officer and will be updated to As-Built conditions by the Contractor. The As-Built data lists shall be placed in a document holder within each enclosure.

3.1.3 Certified Pump Control Panel (PCP) Shop Test Report

The manufacturer shall shop test the PCP, Personal computer, and lap top computer. The procedure shall include simulation of field components and shall provide for fully testing the pump control and annunciator system as a unit before delivery to the project site. The test shall, reveal system defects, including, but not limited to, functional deficiencies, operating program deficiencies, algorithm errors, timing problems, wiring errors, loose connections, short circuits, failed components and misapplication of components. The test shall be performed prior to shipment to the site and problems detected shall be corrected. The final testing and correction sequence shall be repeated until no problems are revealed and then two additional successful tests shall be performed. Submit certified test report within 15 days after completion of the test. The report shall include a statement that the Pump Control Panel performs as specified. Notify the Contracting Officer and the Command Fuels Engineer 30 days prior to the final shop testing date. The Contracting Officer may require a Government witness at the final test before the PCP is shipped to the site.

3.1.4 Ventilation System

Thermostat T-1, shall control fan F-1 and thermostat T-2 shall control fan F-2. T-1 and T-2 shall be set at 80 degrees F to maintain interior air temperature to 20 degrees F above ambient. Thermostat T-3, set at 100 degrees F, shall provide a non-critical PCP HIGH TEMPERATURE alarm to the alarm annunciator.

3.1.5 Grounding

The PCP ground bar shall be connected to the building counterpoise via a #10 AWG conductor. Within the enclosure all I/O racks, processor racks, and power supplies, etc. shall be grounded to meet the manufacturer's specifications.

3.1.6 Indicator Lights, Switches, and Pushbuttons

Indicator lights, switches, and pushbuttons shall be mounted through the PCP enclosure and shall be arranged to allow easy vision and operation of each device. Each device shall have a nameplate and/or legend plate as indicated on the drawings. Nameplate wordings shall be as indicated on the drawings.

3.1.7 Transient Voltage Surge Suppression Devices

Transient voltage surge suppression (TVSS) devices shall be installed in the PCP to minimize effects of nearby lightning strikes, switching on and off of motors and other inductive loads. TVSS shall be provided for each control circuit ladder. Each ladder may contain any combination of the following devices: PLCs, power supplies (e.g., 24 volt), fans, relays, lights, switches etc. TVSS shall also be provided for PLC I/O originating outside of the building.

3.1.8 Terminal Blocks

As a minimum, any PCP device that connects to a field device (devices not located in the PCP) shall be connected to a terminal block. A connection diagram similar to the drawings shall be provided to the field Contractor for field connections to the PCP.

3.1.9 Circuit Breakers

As a minimum, any 120 volt PCP device i.e. (fans, lights, power receptacles, 24 VDC power supplies, PLC CPUs, PLC I/O racks) shall be provided with an individual circuit breaker. Additionally 120 volt terminal boards connecting to field devices (devices not located in the PCP) shall be protected by a 120 volt circuit breaker.

3.1.10 Uninteruptable Power supplies

The PCP shall contain three uninteruptable power supplies (UPS) each connected to a dedicated circuit. As shown on the drawings one UPS shall supply PLC System 1, one UPS shall supply PLC System 2, and the third UPS shall supply the miscellaneous device power. The UPSs output capacity shall be sufficient to drive all the equipment connected plus 25 percent. The UPSs shall be mounted on shelves near the bottom of the PCP but not rest on the floor of the PCP.

3.1.11 Power Supplies

Provide and install all 120 VAC and 24 VDC power supply. Interconnecting wiring between UPSs and PLC power supplies shall be completely installed prior to shipment to the job site.

3.1.12 Alarm Annunciator and Horns

Signals shall be initiated by hardwired field contacts or by PCP outputs as required. The annunciator shall energize alarm horns, both an integral panel mounted vibrating horn and remote horns, and flash the appropriate annunciator lamp. The minimum number of windows shall correspond to the number of alarm points, plus 15 percent spare. The drawings indicate panel layout and the alarms to be annunciated.

3.1.12.1 Non-critical Alarms

Non-critical alarm windows shall be white with black lettering and shall sound the PCP mounted vibrating horn and the exterior mounted vibrating horns.

3.1.12.2 Critical Alarms

Critical alarm windows shall be red with white lettering and shall sound the PCP mounted vibrating horn and the exterior mounted resonating horns. Critical alarms shall also cancel all automatic pump starts in the PLC.

3.1.12.3 Alarm Sequence

Alarm sequence for each alarm shall be as follows (ISA 18.1 sequence 'A').

a. For a normal condition, visual indicator and horns will be off.
b. For an alarm condition, visual indicator will flash and horns will sound (this condition will be locked in).
c. Upon acknowledgment of the alarm condition, visual indicator will be steady on and the horns will be off.
d. If, after acknowledgment of an alarm condition, another alarm condition is established, the new alarm will cause the appropriate window to flash and the horn to sound.
e. When condition returns to normal after acknowledgment, the visual indicator and the horn will be off.

3.1.13 Personal Computer

The personal computer shall be a stand alone, desk top mounted unit. The personal computer shall download system parameters from the PLCs for display. The personal computer shall also upload new set point values that the operator has changed using the personal computer keyboard, after a password has been entered.

3.1.13.1 Screen Number 1

This shall be a general opening screen. As a minimum it shall display the name and location of the installation (e.g. Seymour Johnson Air Force Base, North Carolina), name of the project (e.g., Type III Hydrant Fueling System) and screen navigation information.

3.1.13.2 Screen Number 2

At a minimum the following items shall be displayed. The values shall be continuously updated, a 2 second delay maximum between updates will be acceptable.

System Issue Rate	xxxx GPM
System Return Rate	xxxx GPM
System Net Flow	xxxx GPM
System Pressure	xxxx PSI
System Operation Mode	Auto/Off/Flush/Tightness test
Active System	Sys-1/Sys-2
Lead Pump	1/2/3/4/5
Fuel Pump #1	On/Off xxxxx.x HOURS
Fuel Pump #2	On/Off xxxxx.x HOURS
Fuel Pump #3	On/Off xxxxx.x HOURS
Fuel Pump #4	On/Off xxxxx.x HOURS
Fuel Pump #5	On/Off xxxxx.x HOURS
Backpressure Control Valve	Closed/Enabled
Pressure Control Valve	Closed/Enabled
Defuel/Flush Valve	Closed/Enabled
Tank 1 Outlet Valve	Open/Closed

Tank 2 Outlet Valve	Open/Closed
Tank 1 Receipt Valve	Open/Closed
Tank 2 Receipt Valve	Open/Closed
Receipt Bypass Valve	Open/Closed
Manifold Setup Valve I34	Open/Closed
Manifold Setup Valve I35	Open/Closed
Manifold Setup Valve R10	Open/Closed
Manifold Setup Valve R11	Open/Closed
Only one of the words separated by a slash (/) shall be displayed. The xxxxx.x HOURS is the fuel pumps elapsed run time and the value shall not be lost when the lead PLC is switched. The pump and valve status words shall be color coded to match the colors used on the graphic display screen.	

3.1.13.3 Screen Number 3

The following table shall be displayed. The table lists the set points that can be adjusted using the operator interface. A password shall be entered before the "current value" can be adjusted. The value entered can only be a number within the "set point range". The "default value" is the value held in the program that is loaded into EEPROM memory (This screen may require more than one display screen.).

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi	xxx psi
Issue flow to start second pump in the sequence	450 to 650 gpm	560 gpm	xxx gpm
Issue flow to start third pump in the sequence	1000 to 1300 gpm	1160 gpm	xxx gpm

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Issue flow to start fourth pump in the sequence	1600 to 1900 gpm	1760 gpm	xxx gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm	xxx gpm
Return flow to stop fourth third, and second pump in the sequence (lag pump)	500 to 800 gpm	700 gpm	xxx gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm	xxx gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds	xx seconds
Timer to enable second, third and fourth pumps to start	0 to 120 seconds	10 seconds	xx seconds
Timer to stop fourth, third, and second pumps	0 to 120 seconds	15 seconds	xx seconds
Timer to stop first pump	0 to 60 seconds	2 seconds	xx seconds
Timer to disable Back Pressure Control Valve	0 to 360 seconds	60 seconds	xx seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds	xx seconds
System pressure to stop lead pump	130 to 190 psig	140 psig	xxx psig

3.1.13.4 Screen Number 4

This screen shall be a duplicate of the Graphic Display Drawing showing a schematic of the process flow. This screen shall be referred to as the graphical display. Many operating parameters shall be displayed here as required in later paragraphs of this specification.

3.1.13.5 Screen Number 5

This screen shall be a duplicate of the Alarm Annunciator and it shall be superimposed over the current active screen on the personal computer monitor when an alarm is activated.

3.1.13.6 Screen Number 6

This screen shall be a screen designed solely for assisting the testing team during initial start up to watch all of the significant parameters of the systems operation simultaneously on one screen. This screen shall include the system parameters i.e. (flows, pressures, and status) from screen 2, the set points from screen 3, and timers for all of the actions that will take place following a delay function.

3.1.13.7 Screen Number 7

This screen shall be a screen designed solely for displaying the seven graphs as described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. The following values shall be displayed concurrently against time: Issue flow, Issue pressure, Return flow, Pump #1 discharge pressure, Pressure upstream of BPCV, Pressure downstream of BPCV, and Hydrant Pit Pressure. The personal computer shall be capable of storing up to 1 week of data corresponding to the above values. The system will be able to produce graphs on the screen of this data and be able to print the data in seven colors on the laser printer.

3.1.13.8 Screen Number 8

This screen shall be an alarm history screen. This screen shall be referred to as the Alarm History Display. This screen shall be capable of storing and displaying all alarms that have occured in the system for at least a period of 30 days.

3.1.13.9 Screen Number 9

This screen shall be a screen designed solely for displaying the parameters and process involved in the Tightness Test as described in this specification and on the drawings. The following values shall be displayed concurrently against time: Pressure (as sensed by PIT3). The system will be able to produce graphs on the screen of this data and be able to print the data in color on the laser printer.

3.1.14 Laptop Computer

The Laptop computer shall be used to create, edit, and load the ladder logic program into the PLCs and the operator interface graphics control program into the personal computer. The Laptop shall also be used to monitor the PLCs memory and ladder logic program. The computer shall be stored in a lockable cabinet located within the Pump Control Panel.

3.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

3.2.1 General

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NOTE: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures are defined in the following manners: When the pressure indicating transmitters differ with each other by more than 69 kPa (10 psig) after a 10 second delay, assume the lower reading

transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 2 L/s (30 gpm) after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 1.5 L/s (20 gpm) after a ten second delay, assume the lower reading transmitter has failed.

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The basic operation of the redundant PLC system is (Reference "Control System Block Diagram" on the drawings):

a. CPU-1 and it's associated I/O rack (I/O-1) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

b. CPU-2 and it's associated I/O rack (I/O-2) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

c. Within each rack (I/O-1 and I/O-2) System-1, System-2, and nonredundant inputs and outputs shall not be mixed on the same input/output module.

d. Under normal operation: The system input select switch is in the "SYS-1" position. CPU-1 is controlling the system using System-1 and nonredundant inputs from I/O-1 and any set point changes from the personal computer. CPU-2 is being updated by CPU-1 or concurrently monitoring System-1 inputs from I/O-2.

e. If under normal operation CPU-1 recognizes that a System-1 input has failed (see note below) it shall change over to the System-2 redundant input on I/O-1 and report the failure to the personal computer alarm screen.

Note: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures shall be defined in the following manners: When the prerssure indicating transmitters differ from each other by more than 10 psig after a ten second delay, assume the lower reading transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 30 gpm after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 20 gpm after a ten second delay, assume the lower reading transmitter has failed.

f. During normal operation there are two ways for CPU-2 to take control of the system: 1) CPU-1 identifies its own internal fault and hands over control to CPU-2. 2) CPU-2 identifies a fault in CPU-1 and takes control from CPU-1. When CPU-2 is in control of the system it shall annunciate the fault condition and shall be using any updated inputs from the personal computer and shall use System-1 inputs. If CPU-2 senses a fault on a System-1 input it shall then switch over to the appropriate System-2 input. If power is lost to System-1 inputs then CPU-2 shall use all of the System-2 inputs.

g. CPU-2 shall also report any of its internal faults to CPU-1 and CPU-1 shall report any faults it detects in CPU-2.

h. When the operators think the system is not working and the PLCs do not detect any faults the operator can move the system input select switch from the "SYS-1" position to the "SYS-2" position. With the switch in the "SYS-2" position the PLCs are using System-2 inputs.

3.2.2 Programs

a. Provide two copies of all working programs (i.e. PLC logic, personal computer) on read only CDs as well as a printed program listing.

b. Provide rung comments (documentation) in the ladder logic program. Each device, on the ladder, shall be identified as to the type of device, i.e. limit switch XX, flow indicator XX, motor starter XX, etc. Rung comments shall be provided for input and output rungs. The programmer shall also provide a comment describing the function of each rung or group of rungs that accomplish a specific function.

[3.3 GRAPHICS DISPLAY PANEL

The graphic display panel shall be shipped fully assembled in one piece after it has been shop tested as an integral part of the pump control panel and all defects corrected. The graphic display panel shall be able to depict the same screens as the personal computer displays. The default screen on the GDP shall be the graphic display screen. The other screens that the personal computer can display will also be able to be chosen from the personal computer to be displayed here.

]3.4 GRAPHICS DISPLAY SCREEN

3.4.1 General

The graphic display screen shall be capable of being displayed on the personal computer monitor[and the GRAPHICS DISPLAY PANEL].

3.4.2 Display Presentation

The Graphic Display shall depict the process fuel flow schematically as indicated on the drawings. Red, green, and amber symbols shall be integrated with the process schematic to provide current equipment status graphically. The symbols shall be located immediately adjacent to related equipment symbol.

3.4.3 Process Schematic

The process schematic graphic representation shall utilize conventional symbols when possible. Symbols and flow lines shall be sized and spaced so as to provide a clear representation of the system process. The Graphic Display shall be suitable for supervised field modification when future items are added. Minor changes may be incorporated to allow proper line width and spacing. Component arrangement, piping routing, and location of valves shall match the flow diagram. The Graphic Display layout shall be approved by the Government.

3.4.4 Digital Flow and Pressure Indicators

The graphics display screen shall have digital displays for the flows and pressures as indicated on the drawings.

3.5 INSTALLATION

Installation shall conform to the manufacturer's drawings, written recommendations and directions.

3.5.1 Shop Drawing

The shop drawing shall be clear and readable and preferably drawn using a computer aided drafting package. At the conclusion of the project the diagram drawings shall be redrafted to include all as-built conditions. These updated drawings shall be included in the O&M Manuals and appropriate section of the drawings placed in a data pocket located in each of the enclosures. The shop drawing at a minimum shall show:

a. Overall dimensions, front, side and interior elevation views of the PCP showing size, location and labeling of each device.

b. Overall dimensions, front elevation of the GDP showing graphical layout and size, location and labeling of each device.

c. Power ladder diagram indicating power connections between TVSS, power conditioners, PLCs, power supplies and field and panel devices. Any terminal block connection numbers used shall be indicated.

d. Control ladder diagram indicating control connections between field and devices and PLC I/O modules. Terminal block connection numbers and PLC terminal numbers shall be indicated.

e. Communication connections between PLCs and I/O racks. Communication channel numbers shall be indicated.

f. Bill of materials.

g. Written control sequence covering all inputs, outputs, and control scheme.

3.5.2 System Start-Up and Testing

a. At PCP start-up and testing provide personnel, onsite, to provide technical assistance, program fine tuning, and to start-up and test the system. Start-up and testing shall be coordinated with the overall fueling system start-up test specified in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Prior to this test, all connections shall have been made between the PCP, the personal computer, the motor control center, and all field devices. In addition, wiring shall have been checked for continuity and short circuits. Adjust set point values, timing values, and program logic as required to provide a functional hydrant fuel control system. Once the system has been fine tuned and passed the system test, the new system default values, shall be loaded into the PLC EEPROM and the personal computer screens adjusted to indicate the new values.

b. A step-by-step Testing Plan of the PCP shall be submitted. The test shall be designed to show that every device (lights, switches, personal computer display screens, alarms, etc.) on the PCP and personal computer is in working order and that the PLC program controls the system per specifications. The test shall be performed in conjunction with Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. The plan shall include a place for the Contractor and government representative to initial each step of the plan after satisfactory completion and acceptance of each step. The complete initialed Record of Test shall be certified by the Contractor and then submitted.

3.5.3 Training Plan for Instructing Personnel

a. Upon completion of the system start-up a competent technician regularly employed by the PCP manufacturer shall hold a training class for the instruction of Government personnel in the operation and maintenance of the system. Provide both classroom type theory instruction and hands-on instruction using operating equipment provided. The period of instruction shall be a minimum of three 8-hour working days. The training shall be designed to accommodate 8 operators, 4 maintenance personnel, and 2 programmers. The Contracting Officer shall receive written notice a minimum of 14 days prior to the date of the scheduled classes.

b. Furnish a written lesson plan and training schedule for Government approval at least 60 days prior to instructing operating, maintenance and programming personnel. Concurrently submit above to the MAJCOM for their input into the review process. Approval of lesson plan will be based on both Government and MAJCOM concurrence. This plan shall be tailored to suit the requirements of the Government. The training shall be divided into three separate classes. Each class shall be tailored to a specific group of personnel. The groups are: 1) Operators, those that will use the control system on a day to day basis; 2) Maintenance personnel, those that will perform routine and non-routine maintenance and trouble shooting of the control system; 3) Programmers, those that will make changes to and trouble shoot the PLC and personal computer programs. The training program shall provide:

(1) a detailed overview of the control system including the complete step-by-step procedures for start-up, operation and shut-down of the control system.

(2) a general overview of programmable logic controllers

(3) the maintenance of equipment installed

(4) the programming of the PLC and Personal Computer

(5) trouble shooting of the system

c. Complete approved Operation and Maintenance manuals for Specification 33 09 53AVIATION PUMP CONTROL AND ANNUNCIATION SYSTEM and 26 20 00 INTERIOR DISTRIBUTION SYSTEM (specifically pertaining to the motor control center and its relay ladder diagrams) shall be used for instructing operating personnel. Training shall include both classroom and hands-on field instruction. The class shall be recorded in DVD format.

d. Provide training courses in DVD format covering system overview, operation, maintenance, trouble shooting, and programming. These DVDs shall be produced offsite by the Contractor using the supplied Pump

Control Panel as the teaching aid, or commercially produced DVDs by the PLC manufacturer or third party who specializes in training on PLC systems. Along with the DVDs, provide workbooks, which follow along with the DVDs.

3.6 PLC CONTROL SYSTEM SEQUENCE OF OPERATION

The following describes general functions of the fueling system components.

3.6.1 Abbreviations

a. SYS-1: components of System #1 including UPS#1, power supplies, CPU-1, I/O-1, and system #1 input and outputs.

b. SYS-2: components of System #2 including UPS#2, power supplies, CPU-2, I/O-2, and system #2 input and outputs.

c. CPU-1: SYS-1 PLC CPU.

d. CPU-2: SYS-2 PLC CPU.

e. I/O-1: SYS-1 PLC input/output modules.

f. I/O-2: SYS-2 PLC input/output modules.

g. PCP: Pump Control Panel.

h. PC: Personal Computer.

i. UPS: Uninterruptible Power Supply.

[j. GDP: Graphic Display Panel]

3.6.2 Operating Tanks

[3.6.2.1 Level Control

Each operating tank has four level float switches to measure low-low, low, high and high-high levels. The switches are DPDT for the redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing.

a. Low-Low Level: When the low-low level float is activated the associated tank's graphic display low-low level light shall light up. If the tank's outlet valve is not fully closed the alarm annunciator's low-low level critical alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically. If all tanks are at low-low level, no fueling pumps shall start automatically.

b. Low Level: When the low level float is activated the associated tank's graphic display low level light shall light up and the alarm annunciator's non-critical low level alarm sequence activates.

c. High Level: When the high level float is activated the associated tank's graphic display high level light shall light up and the alarm annunciator's non-critical high level alarm sequence activates.

d. High-High Level: When the high-high level float is activated the associated tank's graphic display high-high level light shall light up, the alarm annunciator's critical high-high level alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically.

][3.6.2.2 Level Control

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NOTE: Use this and the following paragraphs if electronic level switches rather than float switches are used for determinig tank level alarms
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Each operating tank has level switches to monitor low-low, low, high, and high-high fuel levels. The switches shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The following alarms shall be reported.

a. Low-Low Level: When the low-low level elevation is attained the associated tank's GDP low-low level light shall light up. If the tank's outlet valve is not fully closed the alarm annunciator's low-low level critical alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically. If all tanks are at low-low level, no fueling pumps shall start automatically.

b. Low Level: When the low level elevation is attained the associated tank's GDP low level light shall light up and the alarm annunciator's non-critical low level alarm sequence activates.

c. High Level: When the high level elevation is attained the associated tank's GDP high level light shall light up and the alarm annunciator's non-critical high level alarm sequence activates.

d. High-High Level: When the high-high level elevation is attained the associated tank's GDP high-high level light shall light up, the alarm annunciator's critical high-high level alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically.

]3.6.2.3 Outlet Valve

Each operating tank's outlet valve has two limit switchs to indicate valve position. The closed limit switch is DPDT for redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The closed limit switch shall close when the valve is fully closed. When the closed limit switch is closed the associated tank's valve graphic display closed light shall activate. When the valve is fully open, the open limit switch is closed. At this time the associated tank's valve graphic display open light shall activate.

3.6.3 Product Recovery Tank

3.6.3.1 Fuel Transfer Pump (FTP)

The pump's motor controller has a status relay to indicate the on/off status of the pump. The status relay shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the pump's graphic display off light shall activate. When the status relay is closed the pump's graphic display on light shall light up. The status relay state shall also be used to start and stop the pumps elapsed run time timer.

3.6.3.2 Overfill Valve (OV)

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NOTE: The automatic starting and stopping of the fuel transfer pump is accomplished by the actuation of tank float switches connected to the control circuit in the motor control center. The PLC system does not control the starting and stopping.

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The tank's overfill valve has a limit switch to indicate valve position. The switch is SPST and shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The switch shall close when the valve is fully closed. When the limit switch is closed, the tank's graphic display valve closed light shall light up and the alarm annunciator's non-critical alarm sequence activates. When the limit switch is open the tank's graphic display valve open light shall light up.

3.6.3.3 High Level Alarm

The tank has a high level alarm float switch. The switch is SPST and shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the high level alarm float is activated the tank's graphic display high level light shall light up and the alarm annunciator's critical alarm sequence activates.

3.6.3.4 High-High Level Alarm

The tank has a high-high level alarm float switch. The switch is SPST and shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the high-high level alarm float is activated the tank's graphic display high-high level light shall light up and the alarm annunciator's critical alarm sequence activates.

3.6.3.5 Leak Detection

The tank has a leak detection system. The leak detection systems alarm relay shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the leak alarm is activated the alarm annunciator's non-critical alarm sequence activates.

3.6.4 Fueling Pumps (FP)

There are five fueling pumps with a maximum of four pumps running at one time. The lead pump selector switch shall select the pump starting sequence. Each pump's motor controller has a status relay to indicate the on/off status of the pump. The status relay shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the associated pump's graphic display off light shall activate and screen number 2 shall indicate on. When the status relay is closed the associated pump's graphic display on light shall activate and screen number 2 shall indicate off. The status relay state shall also be used to start and stop the pumps elapsed run time timer and shall be displayed on screen number 2.

3.6.5 Flow Switch, Fueling Pump

On the discharge side of each pump is a flow switch to indicate positive flow (fail safe feature). The flow switch is DPDT for redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. If the PLC has given a signal to start a pump and the flow switch has not closed before the set point timer expires or if the flow switch opens after the pump has been running then the pump shall be in a failure state and it shall be disabled (taken out of the starting sequence), the alarm annunciator's non-critical alarm sequence shall also be activated, and the next pump in the start sequence started. After the PLC has stopped all of the pumps, any failed pump shall be added back into the start sequence.

3.6.6 Transmitters

3.6.6.1 Pressure Indicating Transmitter (PIT)

The PIT's measure system pressure in psi. There are two PITs connected to the PCP for redundancy. PIT-1 and PIT-2 are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The system pressure is sent to personal computer display. PIT-3 is connected directly to the Tightness Test Panel.

3.6.6.2 Differential Pressure Transmitter (DPT)

The DPT's measure flow in gpm. There are two issue DPTs (DPT-1 and DPT-2) and two return DPTs (DPT-3 and DPT-4) for redundancy. The DPTs are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The net flow is sent to the personal computer display. The issue rate, return rate and net flow shall be displayed on the personal computer.

3.6.6.3 Pressure Sensors (PS)

The PS's measure system pressure in psi. There are three PSs installed on the system and there are PCP preparations made for a fourth PS to be temporarily wired in from a Hydrant Pit. PS-1, PS-2, PS-3, and PS-4 are connected to SYS-1 only as indicated on the Terminal Block Connection drawing. These sensors will report various system pressures to the personal computer to be used for the creation of the system graphs as required for screen 7 and described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP.

3.6.7 Control Valves

3.6.7.1 Defuel/Flush Valve (D/FV)

The D/FV shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. The graphical display open and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. The valve status shall be based on the table listed below.

Defuel/Flush Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Flush Mode	Open	De-energized	Energized	Open
Automatic Mode Pump(s) On	Closed	De-energized	De-energized	Closed
Automatic Mode Pumps Off	Enabled	Energized	De-energized	Closed
Off Mode Pump(s) On	Closed	De-energized	De-energized	Closed
Off Mode Pumps Off	Enabled	Energized	De-energized	Closed
Tightness Test	Closed	De-energized	De-energized	Closed

3.6.7.2 Pressure Control Valve (PCV)

The PCV shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. The graphical display enabled and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. The valve status shall be based on the table listed below.

Pressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Automatic Mode Pump(s) On	Closed	Energized	De-energized	Closed
Flush Mode Pumps On	Closed	Energized	De-energized	Closed
Flush Mode Pumps Off	Enabled	De-energized	De-energized	Closed
Off Mode Pump(s) On	Closed	Energized	De-energized	Closed
Off Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Tight. Test-Hi Pres	Closed	Energized	De-energized	Closed
Tight. Test-Static	Enabled	De-energized	De-energized	Enabled
Tight. Test-Low Pres	Enabled	Energized	Energized	Enabled

3.6.7.3 Backpressure Control Valve (BPCV)

The BPCV shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. The graphical display enabled and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. The valve status shall be based on the table listed below.

Backpressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pump Start-Up	Enabled	Energized	De-energized	Enabled
Automatic Mode Prior to Lead Pump Shutoff	Closed	De-energized	De-energized	Closed
Flush Mode	Closed	De-energized	De-energized	Closed
Off Mode Pump(s) On	Enabled	Energized	De-energized	Enabled
Off Mode Pumps Off	Closed	De-energized	De-energized	Closed
Tight. Test-Hi Pres	Enabled	De-energized	Energized	Enabled
Tight. Test-Low Pres	Closed	De-energized	De-energized	Closed

3.6.8 Safety Circuit

3.6.8.1 Emergency Stop Status

The emergency stop circuit status relay (ER1) N.O. contact shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the circuit is activated the alarm annunciator's critical alarm sequence is activated and any calls to start fueling pumps shall be canceled and no additional pump start signals shall be sent until the circuit has been reset. The fueling pumps will actually be stopped by a emergency stop circuit status relay (ER2) N.O. contact in the fuel pump motor control circuit located in the motor control center.

3.6.8.2 Emergency Shutoff Valves (ESO) Status

The ESO status relay (ER2) N.O. contact shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the GDP valve open lights shall light up. When the relay is open the GDP valve closed lights shall activate.

3.6.8.3 Circuit Power Status

The safety circuit power status relay (ER3) N.O. contact shall be connected to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the PCP emergency circuit power on light shall light up.

3.6.9 Pump Control Panel

3.6.9.1 CPU Faults

The PCP mounted CPU-1 and CPU-2 on lights are connected to both SYS-1 and SYS-2. The associated CPU light shall light when no system faults are detected. When a fault is detected by the CPU or it's redundant CPU the faulted CPU's on light shall be turned off and the alarm annunciator's non-critical alarm sequence shall be activated.

3.6.9.2 Input Select Switch

The 2-position input select switch shall control which inputs (System-1 or System-2) are being used. Each switch position shall be connected to both SYS-1 and SYS-2. The OI display shall indicate the active system.

3.6.9.3 Mode Select Switch

The 4-position switch selects what mode of fueling is active: automatic, flush, Tightness Test or off. Each switch position shall be connected to both SYS-1 and SYS-2. The screen number 2 status shall indicate the active mode.

3.6.9.4 Lead Pump Selector Switch

The 5-position switch selects which pump shall be the lead pump. The switch position shall fix the starting sequence for all pumps. The sequences shall be 1-2-3-4-5, 2-3-4-5-1, 3-4-5-1-2, 4-5-1-2-3, and 5-1-2-3-4. The off sequence shall be the reverse of the start sequence, therefore, first on will be last off. A maximum of four pumps will be allowed to run at one time. If a pump fails to start or fails during operation, that pump will be disabled and the next pump in the sequence started. The screen number 2 status display shall indicate the lead pump.

3.6.9.5 PCP Temperature Alarm

The alarm thermostat when activated shall activate the alarm annunciator's non-critical alarm sequence.

3.7 OPERATING PROGRAM REQUIREMENTS

The control system's logic program shall be stored on a EEPROM chip. Default values of operator adjustable parameters shall be permanently stored on the chip with the capability of resetting the values in RAM to the values with in the range specified below. The default values can be changed through the use of the personal computer (after the correct password has been entered). After loss of power and battery failure the adjustable settings shall revert back to the default values located on the chip. The default values shown here shall be reset to the values determined during the system start up and test.

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi
Issue flow to start second pump in sequence	450 to 650 gpm	560 gpm
Issue flow to start third pump in sequence	1000 to 1300 gpm	1160 gpm

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Issue flow to start fourth pump in sequence	1600 to 1900 gpm	1760 gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm
Return flow to stop fourth, third, and second pump in sequence (lag pump)	500 to 800 gpm	700 gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds
Timer to enable second, third, and fourth pumps to start	0 to 120 seconds	10 seconds
Timer to stop fourth, third, and second pumps	0 to 120 seconds	15 seconds
Timer to stop first pump	0 to 60 seconds	2 seconds
Timer to de-energize (close) Back Pressure Control Valve	0 to 360 seconds	300 seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
System pressure to stop lead pump	130 to 190 psig	140 psig
Should the operator enter a value not within the range for that parameter, the personal computer shall indicate "INVALID ENTRY" and revert back to the previous value.		
A number inside braces, {x}, in the following paragraphs indicates that the number may be changed by the operator via the operator interface within the Set Point Range listed above.		

3.8 AUTOMATIC MODE - IDLE CONDITION

The fueling system is intended to remain continuously pressurized while in the idle condition. This allows the system to respond immediately to aircraft refueling and defueling requirements. Periodically, in the idle condition, the system will lose minimal pressure. When this occurs, the control system will automatically repressurize in the following sequence:

a. The lead pump will start when the system pressure is less than {60} psig continuously for {0} seconds. If the pressure then rises above {60} psig before the timer expires, the timer shall reset.

b. After the timer expires:

(1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid 'A' shall be energized to close the valve.

(3) The D/FV solenoid 'A' shall be de-energized so the valve is closed and solenoid 'B' shall be de-energized.

c. With the lead pump running, 600 gpm will flow through the issue venturi. The system pressure upstream of the BPCV will increase to the BPCV set point of 130 psig. At this pressure the BPCV will start to open and the valve will modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With the lead pump running and no fueling demand the return venturi flow rate will equal the issue venturi flow rate. When the return venturi flow rate is greater than {560} gpm a {300} second timer shall start. If the flow rate drops below {560} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

e. After the timer expires:

(1) The BPCV solenoid 'A' shall be de-energized to close the valve.

(2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

(3) When system pressure rises to 140 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

(4) The Defuel/Flush valve solenoid "A" shall be energized 30 seconds after lead pump shut down to allow it to open at 80 psig for defuel operations.

f. The system has now returned to a pressurized and idle condition.

g. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

h. If a fueling pumps flow switch opens after the pump has successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

3.9 AUTOMATIC MODE - REFUELING CONDITION

To start an aircraft fueling operation, an operator connects fueling equipment such as a hydrant hose truck to an aircraft and to a hydrant control valve. When the operator opens the hydrant control valve by use of an hydraulic operated "Deadman", the following sequence occurs:

a. The lead pump will start when the PIT senses a pressure less than {60} psig continuously for {0} seconds. If the pressure then rises above {60} psig before the timer expires, the timer shall reset.

b. After the timer expires:

(1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid 'A' shall be energized to close the valve.

(3) The D/FV solenoid 'A' shall be de-energized so the valve is closed and solenoid 'B' shall be de-energized.

c. With the lead pump running, ± 600 gpm will flow through the issue venturi. The system pressure upstream of the BPCV will increase to the BPCV set point of 130 psig. At this pressure the BPCV will start to open and the valve will modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {40} gpm and less than {560} gpm the lead pump will continue to run and the BPCV will modulate to pass flow as necessary to maintain upstream system pressure.

e. With the lead pump running and a issue venturi flow rate greater than

{560} gpm and a return venturi flow rate greater than {560} gpm a {300} second timer shall start. If issue venturi flow rate falls below {560} gpm or the return venturi flow rate falls below {560} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

f. After the timer expires:

(1) The BPCV solenoid 'A' shall be de-energized to close the valve.

(2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

(3) When system pressure rises to 140 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

(4) The Defuel/Flush valve solenoid "A" shall be energized 30 seconds after lead pump shut-down to allow it to open at 80 psig for defuel operations.

g. With the lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {560} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

h. After the timer expires: The second pump shall start.

i. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead and second pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

j. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate greater than {700} gpm a (15) second timer shall start. If issue venturi flow rate falls below {1160} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

k. After the timer expires: The second pump shall be stopped.

l. With the lead and second pump running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {1160} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

m. After the timer expires: The third pump shall start.

n. With the lead, second and third pumps running and a issue venturi flow rate greater than {1760} gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead, second and third pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

o. With the lead, second and third pumps running and issue venturi flow rate greater than {1760} gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If the issue venturi flow rate falls below {1760} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

p. After the timer expires: The third pump shall be stopped.

q. With the lead, second and third pumps running and a issue venturi flow rate greater than {1760} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {1760} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

r. After the timer expires: The fourth pump shall start.

s. With the lead, second, third and fourth pumps running and a issue venturi flow rate greater than 2360 gpm and a return venturi flow rate of greater than {40} gpm and less than {700>} gpm the lead, second, third and fourth pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

t. With the lead, second, third and fourth pumps running and a issue venturi flow rate greater than 2368 gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If the issue venturi flow rate falls below 2360 gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

u. After the timer expires: The fourth pump shall be stopped.

v. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

w. If a fueling pumps flow switch opens after the pump successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

3.10 AUTOMATIC MODE - DEFUELING CONDITION

To start an aircraft defuel operation, an operator connects a hydrant hose truck to an aircraft and a fuel sense line and an air sense line to the hydrant control valve. The hydrant hose truck has an on-board defuel pump capable of delivering 300 gpm at 165 psig. When the operator starts the defuel operation one of the following occurs:

a. If the fueling pumps are running (D/FV closed) the fuel being removed from the aircraft will either go to the other aircraft(s) connected to the system or be returned to the pumphouse where the BPCV will modulate to control system pressure and the fuel will be returned to the operating tanks. The return venturi flow rate will control the number of pumps that are on as discussed in paragraph "AUTOMATIC MODE -

FUELING CONDITION".

b. If the fueling pumps are off (D/FV enabled) the fuel being removed from the aircraft will be returned to the pumphouse and both the D/FV and the PCV will modulate to return the fuel to the operating tanks.

3.11 FLUSH MODE

This mode shall be used when the system need to be flushed of water or sediment. The operators shall first place the manual valve in the desired position to select the appropriate flow path. Placing the selector switch in "flush" the following shall occur:

a. The BPCV solenoid 'A' shall be de-energized to force it closed.

b. The D/FV solenoid 'A' shall be de-energized to allow the valve to open and the D/FV solenoid 'B' shall be energized to force it open.

c. Start the fueling pump(s) manually using the Hand-Off-Auto or Hand-Auto switch to obtain the desired flow rate. The automatic pump starts shall be disabled in this mode.

d. The PCV solenoid 'A' shall be energized when pump(s) are on and de-energized when the pumps are off.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

3.12 TIGHTNESS TEST MODE

This mode shall be used in conjunction with the Tightness Monitoring Panel provided by Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENTto perform tightness tests. Placing the selector switch to "TIGHTNESS TEST" the PCP will send a signal to the Tightness Monitoring Panel telling it that it is ready to preform the tests. At this time it will also operate three MOV valves, closing I25 and I26 and opening I27. The PCP will then receive signals from the Tightness Monitoring Panel to prepare for High Pressure Test, run High Pressure Test, Prepare for Low Pressure Test, run Low Pressure Test, prepare for 2nd High Pressure Test, run 2nd High Pressure Test, and when the test is over. The following PCP actions will occur after the corresponding signal:

<u>Prepare for High Pressure Test</u>:

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The D/FV solenoid "A" shall be de-energized and the D/FV solenoid "B" shall be de-energized to force it closed.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be Energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 will be opened.

h. The pump will continue to run until such time as the run High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the High Pressure test.

Run High Pressure Test:

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be d-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a ten minute settling time to pass, then it will monitor the loop pressure for two minutes. Upon finishing this test it will instruct the PCP to Prepare for the Low Pressure Test.

Prepare for Low Pressure Test:

a. MOV I32 will be opened.

b. The PCV solenoid "A" will be energized and the PCV solenoid "B" will be energized to enable the valve at the 50 psi value.

c. The system will remain in this status until such time as the PCP receives a Run Low Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will monitor the loop pressure until it reaches the 50 psi value. It will then instruct the PCP to run the Low pressure test.

Run Low Pressure Test:

a. MOV I32 will be closed.

b. The system will remain in this status until such time as the PCP receives a Prepare for 2nd High Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will wait for a ten minute settling period to expire, then it will monitor the loop pressure for two minutes. Upon finishing this test it will instruct the PCP to prepare for 2nd High Pressure Test.

Prepare for 2nd High Pressure Test:

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The D/FV solenoid "A" shall be de-energized and the D/FV solenoid "B" shall be de-energized to force it closed.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be de-energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 will be opened.

h. The pump will continue to run until such time as the run 2nd High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the 2nd High Pressure test.

Run 2nd High Pressure Test:

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a ten minute settling time to pass, then it will monitor the loop pressure for two minutes. Upon finishing this test it will instruct the PCP that testing is finished.

e. The PCP will leave the system as is until such time as the PCP selector switch is placed into a different mode.

3.13 OFF MODE

a. Automatic starting of fueling pumps shall be disabled. All other functions (GDP, alarm annunciator, personal computer, control valve solenoids, etc.) shall be active to allow manual control of the fueling pumps using the Hand-Off-Auto or Hand-Auto switch.

b. When the first pump has been started:

(1) The BPCV solenoid "A" shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid "A" shall be energized to close the valve.

(3) The D/FV solenoid 'A' shall be de-energized so the valve is closed and solenoid 'B' shall be de-energized.

c. The second, third and fourth pumps maybe started or stopped manually as needed by the operator.

d. After the last pump has been stopped:

(1) The BPCV solenoid "A" shall be de-energized.

(2) The PCV solenoid "A" shall be de-energized.

(3) The D/FV solenoid 'A' shall be energized and D/FV solenoid 'B' shall be de-energized.

3.14 MANUAL OPERATION OF FUELING PUMPS

a. If the PLC system is still active see Paragraph "OFF MODE".

b. If the PLC system has no power or both CPUs have faulted (CPU lights on PCP off) the pumping system will be in a completely manual mode. The safety circuit will need power so that the ESO solenoids on the non-surge check valves will be open and fuel can flow. The solenoids on the other solenoid controlled valves will be de-energized so the valves will have to be manually opened or enabled for the system to run. Other valves may need to be opened or closed manually by the operators for the system to work properly.

3.15 4-VALVE MANIFOLD SUPERVISION

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NOTE: The drawing referenced below is from the DEPARTMENT OF DEFENSE PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III) Standard Drawings. Add the drawing to the design package if applicable.
****

a. Prior to initiating fueling operations in the automatic or in the test mode, the 4-valve manifold valves and the two tank outlet valves be in the proper positions for successful fueling operations. The PLC shall monitor valve positions of the 4-valve manifold (sensed by position limit switches for fully opened and fully closed status on valves I34, I35, R10, and R11) and by monitoring valve status on the tank outlet valves (sensed by position limit switches for fully opened and fully closed status on valves I1 and I2). Valve position must conform to the position table listed on drawing M-205 under "Storage Tank Selection".

b. If the system is placed in automatic or tightness test mode the valve selections must conform to the position table on sheet M-205. If the valve positions do not conform to this table the PCP will show a 4-Valve manifold error on the alarm annunicator. The alarm can be silenced, but will not reset until such time as the valve positions do conform to the table.

-- End of Section --

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 54 (February 2010)**
Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 54 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 09 54

AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (TYPE [IV][V])
02/10

****
NOTE: This guide specification covers the requirements for the Pump Control and Annunciation System for aircraft refueling systems constructed to the requirements of the DOD Type IV or V Direct Aircraft Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**
****

PART 1 GENERAL

1.1 SYSTEM OVERVIEW

The [Aircraft Direct Fueling System] [Aircraft In-Shelter Fueling System] consists of fueling pumps that pump fuel to pantagraph type fueling stations located [on the airfield apron.] [in Aircraft Shelters.] [Using Scheme A, the lead pump is started manually by the start/stop station located at the fueling station. The other pump is started and stopped automatically by the PCP.] [Using Scheme B, all pumps are started and stopped automatically by the PCP.] Automatic pump starts and stops are based on system pressure and flow. Programmable Logic Controllers (PLCs) receive information from pressure transmitters and other devices to control the pumps and control valves. There are two PLCs that are connected in a redundant configuration, to assure continued operation of the Aircraft Fueling System even if either PLC (but not both) fails. The [Aircraft Direct Fueling System][Aircraft In-Shelter Fueling System] also includes [above ground fuel storage tanks] [cut-n-cover type fuel storage tanks] and a product recovery tank. The pump control panel, personal computer[, graphic display panel] and annunciator are located in the Control Room of the [Pumphouse.][Filter Separator Building.]

1.2 GENERAL REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM applies to this section, with the additions and modifications specified herein. The control system shall be furnished by a single supplier. See specification 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT for other required components of the control system. The control system supplier shall be responsible for providing a fully functional control system, in accordance with the drawings and specifications, including the field devices. Installation shall be in accordance with NFPA 70.

1.3 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90 (2005) Standard for Relays and Relay Systems Associated With Electric Power Apparatus

IEEE C62.41 (1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

ISA - INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ISA 18.1 (1979; R1992) Annunciator Sequences and

Specifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA IA 2	(2005) Programmable Controllers - Parts 1 thru 8
NEMA ICS 1	(2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; Errata 2006; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2005) Terminal Blocks
NEMA ICS 6	(1993; R 2001; R 2006) Standard for Enclosures
NEMA LS 1	(1992; R 2000) Low Voltage Surge Protective Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 1012	(2005; R 2008 thru 2009) Standard for Power Units Other than Class 2
UL 1449	(2006; R 1998 thru 2009) Standard for Surge Protective Devices
UL 508	(1999; R 1999 thru 2008) Standard for Industrial Control Equipment

1.4 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's

Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawing[; G][; G, [_____]].

SD-03 Product Data

Pump Control Panel (PCP) and Components[; G][; G, [_____]].
Programmable Logical Controller (PLC) Hardware and Software[; G][; G, [_____]].
Personal Computer (PC)[; G][; G, [_____]].
Laptop Computer[; G][; G, [_____]].
FCC Computer[; G][; G, [_____]].
Printer[; G][; G, [_____]].
Graphics Display Panel[; G][; G, [_____]].
Graphics Display Screen[; G][; G, [_____]].
Control Wiring Data Lists[; G][; G, [_____]].

SD-06 Test Reports

Testing Plan[; G][; G, [_____]].
Certified Pump Control Panel (PCP.
Record of Test.

SD-07 Certificates

Experience and Qualifications[; G][; G, [_____]].

SD-10 Operation and Maintenance Data

Plan for Instructing Personnel[; G][; G, [_____]].

Operation and Maintenance Manuals[; G][; G, [_____]].
Tools and Spare Parts.

1.5 OPERATION AND MAINTENANCE MANUALS

1.5.1 Schedule and Content

Submit 6 copies of operational and maintenance manuals, within 7 calendar days following the completion of factory tests. As a minimum, include the following in the manuals:

a. Pump Control Panel including interior and exterior equipment layout.

b. All documents previously submitted and approved with all comments and field changes annotated.

c. Complete description of the sequence of operation including that described in PART 3 and any subsystems not controlled by the PLC (e.g. annunciator panel, EPDS, etc.)

d. Complete listing of all programming of the PLCs, laptop computer, and Personal Computer.

e. Complete relay ladder logic diagrams, PLC input/output diagrams and control power distribution diagrams for the complete control system.

f. Complete guide outlining step-by-step procedures for system startup and operation.

g. Complete troubleshooting guide, which lists possible operational problems and corrective action to be taken.

h. Complete maintenance and installation manual for all equipment supplied.

i. Spare parts data, which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked.

j. The above shall incorporate all as-built conditions.

1.5.2 Assembly

Bind documents in a suitable binder adequately marked or identified on the spine and front cover. Include a table of contents page and mark with pertinent contract information and contents of the manual. Provide tabs to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

1.6 TOOLS AND SPARE PARTS

Provide the following:

a. Any special tools necessary for maintenance of the equipment

b. One spare set of fuses of each type and size

c. Recommended manufacturer list of spare parts. Include part number, current unit price, and source of supply.

d. One spare power supply module

e. One spare I/O module (for discrete devices)

f. One spare I/O module (for analog devices)

g. Two PLC RAM back-up batteries

h. Two complete sets of ink cartrigages for the laser printer

i. Minimum of ten spare lamps for the Alarm Annunciator

j. Minimum of ten spare lamps of each type of non-LED lamps used on the Pump Control Panel

[k. [_____]
]

1.7 EXPERIENCE AND QUALIFICATIONS

Submit the following data for approval:

a. Certification stating that the manufacturer has manufactured, installed, and successfully completed at least three PLC-based systems for automatic cycling of pumps based upon varying dispensing demands ranging from 0 to 2400 gallons per minute utilizing multiple pumps. At least one of the three PLC-based systems shall be for dispensing jet fuel into a pressurized, constant pressure, flow demand aircraft hydrant system.

b. Certification that the proposed control systems have successfully operated over the last 2 years and are currently in service.

c. Project names, locations, and system description of these installations. Include user point-of-contact and current telephone numbers.

1.8 WARRANTY

Warrant the Pump Control and Annunciation System including devices, hardware and software for a period of 1 year from the date of acceptance of the system by the Government. This warranty service shall include parts and labor service for equipment supplied under this specification. Upon notification by the Government of system or component failure, the Contractor shall respond at the site with necessary parts within 48 hours of notification.

PART 2 PRODUCTS

2.1 PUMP CONTROL PANEL (PCP) AND COMPONENTS

2.1.1 Enclosure

NEMA ICS 1, NEMA ICS 6, NEMA 250, and UL 508. The PCP enclosure shall be a freestanding NEMA Type 12, smooth, gasketed enclosure constructed of 12 gauge steel. All seams shall be continuously welded and there shall be no drilled holes or knockout prior to delivery to the job site. The pump control panel dimensions shall be a maximum of 90 inches high, maximum 72 inches wide, and a maximum of 24 inches deep and shall have removable lifting eyes. The interior surfaces of the panel shall be properly cleaned, primed, and spray painted with white high-gloss enamel. Exterior surfaces shall have standard factory finish. Access for the PCP shall be front only and shall consist of hinged doors having 3-point latching mechanisms. The doors shall open approximately 120 degrees. Rack mounting angles, swing-out panels and other component mounting hardware shall be installed such that servicing of one component shall not require removal or disconnection of other components. No clearance shall be required between the back of the panel and the room walls. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure.

2.1.2 Ventilation System

Two supply fans, single phase, 115 volt, shall be provided. Each fan shall supply a minimum of 100 CFM. The supply and exhaust grill shall contain a filter that is easily removed from the exterior of the enclosure. Three thermostats with an adjustable set point range of 70 degrees F to 140 degrees F shall also be provided. The thermostats shall be located near the top in the interior of the PCP.

2.1.3 Ground Bar

The control panel shall have a tin plated copper equipment ground bar. The bar shall have a minimum of twenty grounding screws.

2.1.4 Standard Indicator Lights

NEMA ICS 1, NEMA ICS 2, and UL 508. Lights shall be heavy duty, NEMA 13, 22.5 mm mounting hole, round indicating lights operating at 120 volts ac/dc or 24 volts ac/dc. Long life bulbs shall be used. Indicator lights shall have a legend plate with words as shown on drawings. Lens color as indicated on the drawings. Lights shall be "push to test (lamp)" type. LED type lamps of comparable size and color may be substituted for standard indicator lights.

2.1.5 Selector Switches

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated lever operated selector switches shall be heavy duty, NEMA 13, round, and utilize a 7/8-inch mounting hole. They shall have the number of positions as indicated on the drawings. Switches shall be rated 600 volt, 10 amperes continuous. Legend plates shall be provided with each switch with words as indicated on the drawings.

2.1.6 Pushbuttons

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated pushbuttons shall be heavy duty, NEMA 13, round, utilize a7/8 inch mounting hole, and have the number and type of contacts as indicated on the drawings or elsewhere in the specifications. The emergency stop switch shall be a red mushroom head, 1.5 inch diameter, momentary contact type. Pushbuttons shall be rated 600 volt, 10 amperes continuous. Provide legend plates with each switch with words as indicated on the drawings.

2.1.7 Relays

IEEE C37.90, NEMA ICS 2, UL 508.

2.1.8 Nameplates

Provide laminated plastic nameplates with black outer layers and a white core. Edges shall be chamfered. Fasten the nameplates with black-finished round-head drive screws or approved nonadhesive metal fasteners.

2.1.9 Transient Voltage Surge Suppression Devices

IEEE C62.41 for Category "B" transients, NEMA LS 1, UL 1449.

2.1.10 Terminal Blocks

NEMA ICS 4. Terminal blocks for conductors exiting the PCP shall be two-way type with double terminals, one for internal wiring connections and the other for external wiring connections. Terminal blocks shall be made of bakelite or other suitable insulating material with full deep barriers between each pair of terminals. A terminal identification strip shall form part of the terminal block and each terminal shall be identified by a number in accordance with the numbering scheme on the approved wiring diagrams.

2.1.11 Circuit Breakers

UL 508. Provide individual, appropriately sized, terminal block mounted, circuit breakers for all 120 volt PCP mounted equipment and for the 120 volt terminal boards shown on the drawings.

2.1.12 Uninteruptable Power Supplies

UL 1012. Input voltage shall be 120 volts (nominal), 1 phase, 60 Hertz. Output voltage regulation shall be +/-5.0% for the following conditions:

a. 20% to 100% load on output.
b. Input voltage variation of -15% to +10%.
c. Constant load power factor between 80% and 100%.

Response time shall be 1.5 cycles or less. Battery capacity shall be such as to provide an orderly shut down of operating programs or as a minimum 10 minutes.

2.1.13 Miscellaneous Power Supplies

UL 1012. Certain field devices may require power other than 120VAC (i.e. 24VDC). The power supplies shall be convection cooled, have fully isolated independent outputs, have constant voltage, have short circuit and overvoltage protection, and have automatic current limiting.

2.1.14 Alarm Annunciator

UL 508 and ISA 18.1. The Alarm Annunciator shall provide visual annunciation, local and remote monitoring, constant or flashing visual and audible alarm as specified herein. The annunciator shall be completely solid state with no moving parts. Furnish the annunciator with cabinet and hardware appropriate for flush mounting on the control panel. A power supply either integral or separately mounted shall operate on 120 volts, 60 Hertz. The annunciator shall have windows arranged in a matrix configuration (rows and columns). Each window shall be at least 1 inch high by 1-5/8 inches wide and shall have rear illuminated translucent engraved nameplate. Lettering shall be at least 5/32 inches high. System lamp voltage shall be 24 to 28 volts dc.

2.1.15 Alarm Horns

UL 508. The alarm horns shall consist of 2-vibrating horns and 1-resonating horn. One vibrating horn is to be mounted in the PCP, and one vibrating and one resonating horn shall be mounted outside of the control room as shown on the drawings. The exterior horns shall each produce 100db at 10 feet and shall be provided in a weather proof housing. The PCP horn shall produce 70db at 10 feet.

2.1.16 Laptop Computer

2.1.16.1 Hardware

The following are the minimum hardware requirements for the laptop computer:

a. Latest Pentium CPU operating at 2 GHz or faster
b. 1 GB RAM
c. 100 GB hard drive
d. 16X Read-Write DVD drive
e. Color XGA LCD screen 14 inches
f. Keyboard
g. Pointing device (e.g. mouse, track ball)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC and Battery power supply
k. All cables and connectors for interfacing with PLC and personal computer
l. Modem compatible for remote troubleshooting of the system
m. Two USB 2.0 communications ports
n. Provide a carying case for the Laptop Computer

2.1.16.2 Software

The following is the minimum software to be loaded on the laptop. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software needs to be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)
b. Software for programming the PLC
c. Software for programming the personal computer

2.1.17 Personal Computer (PC)

2.1.17.1 Hardware

The following are the minimum hardware requirements for the personal computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM
c. 250 GB hard drive
d. 16X Read-Write DVD drive
e. Color 17 inches flat screen monitor
f. Keyboard

g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC operating power
k. All cables and connectors for interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System.
m. Two USB 2.0 communications ports

2.1.17.2 Software

The following is the minimum software to be loaded on the personal computer. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software shall be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)

b. Software for programming the PLCs

c. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points.

d. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system on a real time basis.

e. MS Ofice Professional with Excel shall be provided to allow the trending data described above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically.

2.1.18 Printer

The alarm/report printer shall be a color laser jet printer. The unit shall print in black at a minimum speed of twelve pages per minute. It shall print in color at a minimum speed of ten pages per minute. It shall as a minimum be capable of printing color graphs of various system pressures, issue flow, and return flow vs. time in seven colors. Provide one set of spare replacement ink cartridges.

2.1.19 FCC Computer

2.1.19.1 Hardware

The FCC computer shall be a copy of the personal computer so that upon failure of the personal computer it could be relocated to the pumphouse to assume the personal computers duties. The normal duties of the FCC computer shall be to serve as a remote monitor only of the screens that are available on the personal computer. The following are the minimum hardware requirements for the FCC computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM
c. 250 GB hard drive

d. 16X Read-Write DVD drive
e. Color 17 inches flat screen monitor
f. Keyboard
g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC operating power
k. All cables and connectors for interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System.
m. Two USB 2.0 communications ports

2.1.19.2 Software

The following is the minimum software to be loaded on the FCC computer. The FCC computer shall be capable of replacing the Personal computer in the pumphouse if the personal compter fails. It will be set up initially to serve only as a remote monitor of the system while located at the FCC. Should the personal computer fail, the FCC computer will be relocated to the pumphouse and then assume the role of the personal computer. The computer software shall have a built in command to tell the computer whether it is serving as the personal computer or as the remote monitor only. The software shall be the most current versions and compatible with each other to make a complete and usable system.

a. Operating system (e.g. the latest commercially available MS Operating System)

b. Software to tell the computer which mode it is to operate in, i.e. (personal computer or remote monitor)

c. Software to run as a remote monitor

d. Software for programming the PLCs

e. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points.

f. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system, on a real time basis.

g. MS Ofice Professional with Excel shall be provided to allow the trending data described in e. above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically.

2.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

2.2.1 General

a. NEMA IA 2. Each PLC shall be able to receive discrete and analog inputs and through its programming it shall control discrete and analog output functions, perform data handling operations and communicate with external devices and remote I/O racks. The PLCs shall be a modular, field expandable design allowing the system to be tailored to the process control application. The capability shall exist to allow for expansion to the system by the addition of hardware and/or user software. At a minimum the PLCs shall include mounting backplanes, power supply modules, CPU module, communication modules, and I/O modules.

b. Each PLC provided shall be designed and tested for use in the high electrical noise environment of an industrial plant. The PLC modules shall comply with the FCC Part 15 Part A for radio noise emissions. The programmable controller processor shall be able to withstand conducted susceptibility tests as outlined in NEMA ICS 2, IEEE C37.90.

c. The PLCs shall function properly at temperatures between 32 and 122 degrees F, at 5 to 95 percent relative humidity non-condensing and have storage temperatures between -40 and +140 degrees F at 5 to 95 percent relative humidity non-condensing.

d. The PLCs shall have manufacturer's standard system status indicators (e.g. power supply status, system fault, run mode status, back-up battery status).

2.2.2 Central Processing Unit Module

The CPU shall be a modular self-contained unit that provides time of day, scanning, application (ladder rung logic) program execution, storage of the application program, storage of numerical values related to the application process and logic, I/O bus traffic control, peripheral and external device communications and self-diagnostics.

2.2.3 Power Supply Module

a. The power supply module shall be plugged into the backplane not separately mounted. The power supply shall be wired to utilize 120 VAC, 60 Hz power, the system shall function properly within the range of -10% to +15% of nominal voltage. The power supply shall provide an output to the backplane at a wattage and voltage necessary to support the attached modules. A single main power supply module shall have the capability of supplying power to the CPU module and local communication and I/O modules. Auxiliary power supplies shall provide power to remote racks.

b. Each power supply shall have an integral on/off disconnect switch to the module. If the manufacturers standard power supply does not have an on/off disconnect switch a miniature toggle type switch shall be installed near the PLC and clearly labeled as to its function.

c. The power supply shall monitor the incoming AC line voltage for proper levels and have provisions for both over current and over voltage protection. If the voltage level is detected as being out of range the system shall have adequate time to complete a safe and orderly shutdown.

2.2.4 Program Storage/Memory Requirements

a. The PLC shall have the manufacturers standard nonvolatile executive memory for the operating system. The PLC shall also have EEPROM (Electrically Erasable Programmable Read Only Memory) for storage of the user program and battery backup RAM for application memory. The EEPROM shall be loaded by use of the laptop computer or the personal computer.

b. The contractor shall submit a calculation of the required amount of EEPROM and RAM (random access memory) needed for this application plus an extra 50 percent.

c. The number of times a normally open (N.O.) and/or normally closed (N.C.) contact of an internal output can be programmed shall be limited only by the memory capacity to store these instructions.

2.2.5 Input/Output (I/O) Modules

a. The Contractor shall provide all required I/O modules (analog input, analog output, discrete input, discrete output, and isolated discrete output) to manipulate the types of inputs and outputs as shown on the drawings and to comply with the sequence of operations. The Contractor shall also provide a minimum of 20% (round up for calculation) spare input and output points of each type provided, but not less than two of each type.

b. I/O modules shall be a self-contained unit housed within an enclosure to facilitate easy replacement. All user wiring to I/O modules shall be through a heavy-duty terminal strip. Pressure-type screw terminals shall be used to provide fast, secure wire connections. The terminal block shall be removable so it is possible to replace any input or output module without disturbing field wiring.

c. During normal operation, a malfunction in any remote input/output channel shall affect the operation of only that channel and not the operation of the CPU or any other channel.

d. Isolation shall be used between all internal logic and external power circuits. This isolation shall meet the minimum specification of 1500 VRMS. Provide optically isolated I/O components which are compatible with field devices.

e. Each I/O module shall contain visual indicators to display ON/OFF status of individual input or output points.

f. Discrete output modules shall be provided with self-contained fuses for overload and short circuit protection of the module.

g. All input/output modules shall be color coded and titled with a distinctive label.

2.2.6 Interfacing

The PLC shall have communication ports and communication modules using the manufacturers standard communication architecture for connections of the Personal computer, Laptop Computer, remote I/O racks and interconnections between SYS 1 PLC and SYS 2 PLC for the redundant backup system of the PLCs.

2.2.7 Program Requirements

a. The programming format shall be ladder diagram type as defined by NEMA IA 2.

b. There shall be a means to indicate contact or output status of the contact or output on the CRT (of the personal computer) or LCD screen (of the laptop computer). Each element's status shall be shown independently, regardless of circuit configuration.

c. The program shall be full featured in its editing capabilities (e.g. change a contact from normally open to normally closed, add instructions, change addresses, etc.).

2.2.8 Diagnostics

The CPU shall continuously perform self-diagnostic routines that will provide information on the configuration and status of the CPU, memory, communications and I/O. The diagnostic routines shall be regularly performed during normal system operation. A portion of the scan time of the controller should be dedicated to perform these housekeeping functions. In addition, a more extensive diagnostic routine should be performed at power up and during normal system shutdown. The CPU shall log I/O and system faults in fault tables, which shall be accessible for display. When a fault shuts down a CPU, a sequence shall be initiated that will automatically switch over to the other CPU. When a fault affects I/O or communication modules the CPU shall shut down only the hardware affected and continue operation by utilizing healthy system components. All faults shall be annunciated on the alarm annunciator.

[2.3 GRAPHICS DISPLAY PANEL

2.3.1 Enclosure

The Graphics Display Panel (GDP) shall be a minimum 42 inch LED Panel Display suitable for wall mounting and capable of accepting input from the Personal Computer. The Personal Computer shall be set up to normally display it's screen number four on the graphic Display Panel, but it shall be capable of sending any of its other screens to the display panel. Any combination of the screens shall be capabile of being displayed on the Personal Computer and the Graphic Display Panel.

2.3.2 Display Presentation

The process schematic graphic representation shall be as shown on the drawings. Display Red, green, amber, etc. colors on the screen as indicated on the drawings. The indicated lights on the drawing shall display approximately 1/2 inch in diameter.

2.3.3 Digital Flow and Pressure Indicators

Digital indicators as shown on the drawings shall also be displayed on the Graphics Display Panel to provide the net, issue, and return flow in GPM and pressure in psi of the system and the level in the operating tanks and product recovery tank. The digital indicators shall display the indicated number of digits as shown on the drawings. Each digit shall be approximately 5/8 inch high.

]PART 3 EXECUTION

3.1 PUMP CONTROL PANEL (PCP) AND COMPONENTS

3.1.1 General

a. Where two or more pieces of equipment performing the same function are required, they shall be exact duplicates produced by the same manufacturer. All display instruments of each type shall represent the same outward appearance, having the same physical size and shape, and the same size and style of numbers, characters, pointers, and lamp lenses.

b. The PCP shall include all required resident software programs and hardware to provide the specified sequence of operation. All software R/W CD-Rom disks including programming manuals shall be turned over to the Government at the completion of start-up so modification can be done in the field with no outside assistance.

c. It is intended that process controlling devices except field devices, and motor controllers be attached to or mounted within the PCP enclosure and all interconnecting wiring installed prior to shipment to the job site. This is to allow shop testing of the system and to decrease field labor requirements.

d. The PCP shall be shipped fully assembled in one piece after the completion of the shop tests and all defects corrected.

3.1.2 Wiring

3.1.2.1 Methods and Practices

Wiring methods and practices shall be in conformance with NEMA ICS 1, NEMA ICS 2, NEMA ICS 4 and NEMA ICS 6 recommendations as applicable. All wiring to instruments and control devices shall be made with stranded wire, and wiring shall be permanently labeled with conductor/wire numbers within 1 inch of termination points. Labels shall be tubular heat-shrinkable wire markers that remain legible after exposure to industrial fluids and abrasion. Position markers so that wire numbers can be read without disturbing or disconnecting wiring. Use of individual character-markers placed side-by-side is not acceptable. Numbers shall match approved shop drawings. All wiring shall be neatly laced from point of entry into enclosures to termination points with nylon lacing cord or plastic lacing ties. Lacing within wiring channels is not required.

3.1.2.2 Control Wiring Data Lists

Provide typed Control Wiring Data Lists within each terminal cabinet and the PCP. The data lists shall include: conductor identification number, wire gauge, wire insulation type, "FROM" terminal identification, "TO" terminal identification, and remarks. Submit the preliminary lists and update to As-Built conditions.

3.1.3 Shop Tests

The manufacturer shall shop test the Certified Pump Control Panel (PCP), Personal computer, and lap top computer. Include simulation of field components and provide for fully testing the pump control and annunciator system as a unit before delivery to the project site. The test shall, reveal system defects, including, but not limited to, functional deficiencies, operating program deficiencies, algorithm errors, timing problems, wiring errors, loose connections, short circuits, failed components and misapplication of components. Perform the test prior to shipment to the site and correct problems detected. Repeat the final testing and correction sequence until no problems are revealed and then perform two additional successful tests. Submit certified test report within 15 days after completion of the test. The report shall include a statement that the Pump Control Panel performs as specified. Notify the Governments Contracting Officer and the Command Fuels Engineer 30 days prior to the final shop testing date. The Contracting Officer may require a Government witness at the final test before the PCP is shipped to the site.

3.1.4 Ventilation System

Thermostat T-1, shall control fan F-1 and thermostat T-2 shall control fan F-2. T-1 and T-2 shall be set at 80 degrees F to maintain interior air temperature to 20 degrees F above ambient. Thermostat T-3, set at 100 degrees F, shall provide a non-critical PCP HIGH TEMPERATURE alarm to the alarm annunciator.

3.1.5 Grounding

Connect the PCP ground bar to the building counterpoise via a #10 AWG conductor. Within the enclosure all I/O racks, processor racks, and power supplies, etc. shall be grounded to meet the manufacturer's specifications.

3.1.6 Indicator Lights, Switches, and Pushbuttons

Mount indicator lights, switches, and pushbuttons through the PCP enclosure and arrange to allow easy vision and operation of each device. Provide each device with a nameplate and/or legend plate as indicated on the drawings. Nameplate wordings shall be as indicated on the drawings.

3.1.7 Transient Voltage Surge Suppression Devices

Transient voltage surge suppression (TVSS) devices shall be installed in the PCP to minimize effects of nearby lightning strikes, switching on and off of motors and other inductive loads. TVSS shall be provided for each control circuit ladder. Each ladder may contain any combination of the following devices: PLCs, power supplies (e.g., 24 volt), fans, relays, lights, switches etc. TVSS shall also be provided for PLC I/O originating outside of the building.

3.1.8 Terminal Blocks

As a minimum, any PCP device that connects to a field device (devices not located in the PCP) shall be connected to a terminal block. A connection diagram similar to the drawings shall be provided to the field contractor for field connections to the PCP.

3.1.9 Circuit Breakers

As a minimum, any 120 volt PCP device i.e. (fans, lights, power receptacles, 24 VDC power supplies, PLC CPUs, PLC I/O racks) shall be provided with an individual circuit breaker. Additionally 120 volt terminal boards connecting to field devices (devices not located in the PCP) shall be protected by a 120 volt circuit breaker.

3.1.10 Uninteruptable Power supplies

The Pump Control Panel (PCP) shall contain three uninteruptable power supplies (UPS) each connected to a dedicated circuit. As shown on the drawings one UPS shall supply PLC System 1, one UPS shall supply PLC System 2, and the third UPS shall supply the miscellaneous device power. The UPSs output capacity shall be sufficient to drive all the equipment connected plus 25%. The UPSs shall be mounted on shelves near the bottom of the PCP but not rest on the floor of the PCP.

3.1.11 Power Supplies

Provide and install all 120VAC and 24VDC power supplies as required. Size the power supplies for the load plus 25%. Supply all field devices, which require power and are controlled or monitored from the PCP, from power supplies in the pump control panel. Provide a 120V receptacle in the PCP for use by the Laptop computer. Completely install interconnecting wiring between UPSs and PLC power supplies prior to shipment to the job site.

3.1.12 Alarm Annunciator and Horns

Initiate signals by hardwired field contacts or by PCP outputs as required. The annunciator shall energize alarm horns, both an integral panel mounted vibrating horn and remote horns, and flash the appropriate annunciator lamp. The minimum number of windows shall correspond to the number of alarm points, plus 15 percent spare. The drawings indicate panel layout and the alarms to be annunciated.

3.1.12.1 Non-critical Alarms

Non-critical alarm windows shall be white with black lettering and shall sound the PCP mounted vibrating horn and the exterior mounted vibrating horns.

3.1.12.2 Critical Alarms

Critical alarm windows shall be red with white lettering and shall sound the PCP mounted vibrating horn and the exterior mounted resonating horns. Critical alarms shall also cancel all automatic pump starts in the PLC.

3.1.12.3 Alarm Sequence

Alarm sequence for each alarm shall be as follows (ISA 18.1 sequence 'A').

a. For a normal condition, visual indicator and horns will be off.

b. For an alarm condition, visual indicator will flash and horns will sound (this condition will be locked in).

c. Upon acknowledgment of the alarm condition, visual indicator will be steady on and the horns will be off.

d. If, after acknowledgment of an alarm condition, another alarm condition is established, the new alarm will cause the appropriate window to flash and the horn to sound.

e. When condition returns to normal after acknowledgment, the visual indicator and the horn will be off.

3.1.13 Personal Computer

The personal computer shall be a stand alone, desk top mounted unit. The personal computer shall download system parameters from the PLCs for display. The personal computer shall also upload new set point values that the operator has changed using the personal computer keyboard, after a password has been entered.

3.1.13.1 Screen Number 1

The general opening screen shall as a minimum display the name and location of the installation (e.g. Seymour Johnson Air Force Base, North Carolina), name of the project (e.g., Type III Hydrant Fueling System) and screen navigation information.

****
NOTE: Include items below that are appropriate to the operating scheme (A or B) chosen.
****

3.1.13.2 Screen Number 2

At a minimum display the following items. Continuously update the values; a 2 second delay maximum between updates is acceptable.

System Issue Rate	xxxx GPM
System Return Rate	xxxx GPM
System Net Flow	xxxx GPM
System Pressure	xxxx PSI
System Operation Mode	Auto/Off/Flush/Tightness test
Active System	Sys-1/Sys-2
Lead Pump	1/2/3
Fuel Pump #1	On/Off xxxxx.x HOURS
Fuel Pump #2	On/Off xxxxx.x HOURS
Fuel Pump #3	On/Off xxxxx.x HOURS
Backpressure Control Valve	[Closed/]Enabled/OPEN
[Pressure Control Valve	Closed/Enabled]
Flush Valve	Closed/Defuel

Tank 1 Outlet Valve	Open/Closed
Tank 2 Outlet Valve	Open/Closed
Tank 1 Receipt Valve	Open/Closed
Tank 2 Receipt Valve	Open/Closed
Receipt Bypass Valve	Open/Closed
Manifold Setup Valve I34	Open/Closed
Manifold Setup Valve I35	Open/Closed
Manifold Setup Valve R10	Open/Closed
Manifold Setup Valve R11	Open/Closed
Only one of the words separated by a slash (/) shall be displayed. The xxxxx.x HOURS is the fuel pumps elapsed run time and the value shall not be lost when the lead PLC is switched. The pump and valve status words shall be color coded to match the colors used on the graphic display screen.	

3.1.13.3 Screen Number 3

The following table shall be displayed. The table lists the set points that can be adjusted using the operator interface. A password shall be entered before the "current value" can be adjusted. The value entered can only be a number within the "set point range". The "default value" is the value held in the program that is loaded into EEPROM memory (This screen may require more than one display screen.).

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi	xxx psi
Issue flow to start second pump in the sequence	450 to 650 gpm	560 gpm	xxx gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm	xxx gpm

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Return flow to stop second pump in the sequence (lag pump)	500 to 800 gpm	700 gpm	xxx gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm	xxx gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds	xx seconds
Timer to enable second pump to start	0 to 120 seconds	10 seconds	xx seconds
Timer to stop second pump	0 to 120 seconds	15 seconds	xx seconds
Timer to stop first pump	0 to 60 seconds	2 seconds	xx seconds
Timer to disable Back Pressure Control Valve	0 to 360 seconds	60 seconds	xx seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds	xx seconds
System pressure to stop lead pump	130 to 190 psig	110 psig	xxx psig

3.1.13.4 Screen Number 4

Duplicate the Graphic Display Drawing showing a schematic of the process flow. Refer to this screen as the graphical display. Display many operating parameters here as required in later paragraphs of this specification.

3.1.13.5 Screen Number 5

This screen is a duplicate of the Alarm Annunciator and shall be superimposed over the current active screen on the personal computer monitor when an alarm is activated.

3.1.13.6 Screen Number 6

This screen is designed solely for assisting the testing team during initial start up to watch all of the significant parameters of the systems operation simultaneously on one screen. Include the system parameters (i.e. flows, pressures, and status) from screen 2, the set points from screen 3, and timers for all of the actions that will take place following a delay function.

3.1.13.7 Screen Number 7

This screen is designed solely for displaying the seven graphs as described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Display the following values concurrently against time: Issue flow, Issue pressure, Return flow, Pump #1 discharge pressure, Pressure upstream of BPCV, Pressure downstream of BPCV, and Hydrant Pit Pressure. The personal computer shall be capable of storing up to 1 week of data corresponding to the above values. The system shall be able to produce graphs on the screen of this data and print the data in seven colors on the laser printer.

3.1.13.8 Screen Number 8

This screen is an alarm history screen, referred to as the Alarm History Display. This screen shall be capable of storing and displaying all alarms that have occured in the system for at least a period of 30 days.

3.1.13.9 Screen Number 9

This screen is designed solely for displaying the parameters and process involved in the Tightness Test as described in this specification and on the drawings. Display the following values concurrently against time: Pressure (as sensed by PIT3) . The system shall be able to produce graphs on the screen of this data and be able to print the data in color on the laser printer.

3.1.14 Laptop Computer

The Laptop computer is used to create, edit, and load the ladder logic program into the PLCs and the operator interface graphics control program into the personal computer. The Laptop is also used to monitor the PLCs memory and ladder logic program. Store the computer in a lockable cabinet located within the Pump Control Panel.

3.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

3.2.1 General

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NOTE: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures shall be defined in the following manners: When the pressure indicating transmitters differ with each other by more than 70 kPa (10 psig) after a 10 second delay, assume the lower reading transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 2 L/s (30 gpm) after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 1.2 L/s (20 gpm) after a ten second delay, assume the lower reading transmitter has failed.

****

The basic operation of the redundant PLC system is (Reference "Control System Block Diagram" on the drawings):

a. CPU-1 and it's associated I/O rack (I/O-1) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

b. CPU-2 and it's associated I/O rack (I/O-2) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

c. Within each rack (I/O-1 and I/O-2) System-1, System-2, and nonredundant inputs and outputs shall not be mixed on the same input/output module.

d. Under normal operation: The system input select switch is in the "SYS-1" position. CPU-1 is controlling the system using System-1 and nonredundant inputs from I/O-1 and any set point changes from the personal computer. CPU-2 is being updated by CPU-1 or concurrently monitoring System-1 inputs from I/O-2.

e. If under normal operation CPU-1 recognizes that a System-1 input has failed (see note below) it shall change over to the System-2 redundant input on I/O-1 and report the failure to the personal computer alarm screen.

   Note: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures shall be defined in the following manners: When the prerssure indicating transmitters differ from each other by more than 10 psig after a ten second delay, assume the lower reading transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 30 gpm after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 20 gpm after a ten second delay, assume the lower reading transmitter has failed.

f. During normal operation there are two ways for CPU-2 to take control of the system: 1) CPU-1 identifies its own internal fault and hands over control to CPU-2. 2) CPU-2 identifies a fault in CPU-1 and takes control from CPU-1. When CPU-2 is in control of the system it shall annunciate the fault condition and shall be using any updated inputs from the personal computer and shall use System-1 inputs. If CPU-2 senses a fault on a System-1 input it shall then switch over to the appropriate System-2 input. If power is lost to System-1 inputs then CPU-2 shall use all of the System-2 inputs.

g. CPU-2 shall also report any of its internal faults to CPU-1 and CPU-1 shall report any faults it detects in CPU-2.

h. When the operators think the system is not working and the PLCs do not detect any faults the operator can move the system input select switch from the "SYS-1" position to the "SYS-2" position. With the switch in the "SYS-2" position the PLCs are using System-2 inputs.

3.2.2 Programs

a. The Contractor shall provide two copies of all working programs (i.e. PLC logic, personal computer) on read only CD or DVD as well as a printed program listing.

b. The Contractor (programmer) shall provide rung comments (documentation) in the ladder logic program. Each device, on the ladder, shall be identified as to the type of device, i.e. limit switch XX, flow indicator XX, motor starter XX, etc. Rung comments shall be provided for input and output rungs. The programmer shall also provide a comment describing the function of each rung or group of rungs that accomplish a specific function.

[3.3 GRAPHICS DISPLAY PANEL

Ship the graphic display panel fully assembled in one piece after it has been shop tested as an integral part of the pump control panel and all defects corrected. The graphic display panel shall be able to depict the same screens as the personal computer displays. The default screen on the GDP shall be the graphic display screen. The other screens that the personal computer can display shall also be able to be chosen from the personal computer to be displayed here.

]3.4 GRAPHICS DISPLAY SCREEN

3.4.1 General

The graphic display screen shall be capable of being displayed on the personal computer monitor[and the Graphics Display Panel].

3.4.2 Display Presentation

Depict the process fuel flow schematically as indicated on the drawings. Integrate red, green, and amber symbols integrated with the process schematic to provide current equipment status graphically. Locate the symbols immediately adjacent to related equipment symbol.

3.4.3 Process Schematic

The process schematic graphic representation shall utilize conventional symbols when possible. Size and space symbols and flow lines so as to provide a clear representation of the system process. The Graphic Display shall be suitable for supervised field modification when future items are added. Minor changes may be incorporated to allow proper line width and spacing. Component arrangement, piping routing, and location of valves shall match the flow diagram. The Graphic Display layout requires Government approval.

3.4.4 Digital Flow and PressureIndicators

Provide digital displays for the flows, pressures, and levels as indicated on the drawings.

3.5 INSTALLATION

Installation shall conform to the manufacturer's drawings, written recommendations and directions.

3.5.1 Shop Drawing

The shop drawing shall be clear and readable and preferably drawn using a computer aided drafting package. At the conclusion of the project the diagram drawings shall be redrafted to include all as-built conditions. These updated drawings shall be included in the O&M Manuals and appropriate section of the drawings placed in a data pocket located in each of the enclosures. The shop drawing at a minimum shall show:

a. Overall dimensions, front, side and interior elevation views of the PCP showing size, location and labeling of each device.

b. Overall dimensions, front elevation of the GDP showing graphical layout and size, location and labeling of each device.

c. Power ladder diagram indicating power connections between TVSS, power conditioners, PLCs, power supplies and field and panel devices. Any terminal block connection numbers used shall be indicated.

d. Control ladder diagram indicating control connections between field and devices and PLC I/O modules. Terminal block connection numbers and PLC terminal numbers shall be indicated.

e. Communication connections between PLCs and I/O racks. Communication channel numbers shall be indicated.

f. Bill of materials.

g. Written control sequence covering all inputs, outputs, and control scheme.

3.5.2 System Start-Up and Testing

a. At PCP start-up and testing the Contractor shall provide personnel, on site, to provide technical assistance, program fine tuning, and to start-up and test the system. Start-up and testing shall be coordinated with the overall fueling system start-up test specified in Section 33 08 53, AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Prior to this test, all connections shall have been made between the PCP, the personal computer, the motor control center, and all field devices. In addition, check wiring for continuity and short circuits. Adjust set point values, timing values, and program logic as required to provide a functional hydrant fuel control system. Once the system has been fine tuned and passed the system test, load the new system default values into the PLC EEPROM and adjust the personal computer screens to indicate the new values.

b. Submit a step-by-step testing procedure of the PCP, Testing Plan. Design the test to show that every device (lights, switches, personal computer display screens, alarms, etc.) on the PCP and personal computer is in working order and that the PLC program controls the system per specifications. Perform the test in conjunction with Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Include a place for the contractor and Government representative to initial each step of the plan after satisfactory completion and acceptance of each step. Certify and submit the complete initialed testing plan, Record of Test.

3.5.3 Training Plan for Instructing Personnel

Upon completion of the system start-up a competent technician regularly employed by the PCP manufacturer shall hold a training class for the instruction of Government personnel in the operation and maintenance of the system. Provide both classroom type theory instruction and hands-on instruction using operating equipment provided. The period of instruction shall be a minimum of three 8-hour working days. The training shall be designed to accommodate 8 operators, four maintenance personnel, and two programmers. The Government shall receive written notice (via Contracting Officer) a minimum of 14 days prior to the date of the scheduled classes.

a. Furnish a written lesson plan and training schedule for Government approval at least 60 days prior to instructing operating, maintenance and programming personnel. Concurrently submit above to the MAJCOM for their input into the review process. Approval of lesson plan will be based on both Government and MAJCOM concurrence. This plan shall be tailored to suit the requirements of the Government. The training shall be divided into three separate classes. Each class shall be tailored to a specific group of personnel. The groups are: 1) Operators, those that will use the control system on a day to day basis; 2) Maintenance personnel, those that will perform routine and non-routine maintenance and trouble shooting of the control system; 3) Programmers, those that will make changes to and trouble shoot the PLC and personal computer programs. The training program shall provide:

   (1) a detailed overview of the control system including the complete step-by-step procedures for start-up, operation and shut-down of the control system.
   (2) a general overview of programmable logic controllers
   (3) the maintenance of equipment installed
   (4) the programming of the PLC and Personal Computer
   (5) trouble shooting of the system

b. Use the complete approved Operation and Maintenance manuals for Section 33 09 54 PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS) and 26 20 00 INTERIOR DISTRIBUTION SYSTEM (specifically pertaining to the motor control center and its relay ladder diagrams) for instructing operating personnel. Include both classroom and hands-on field instruction. Record the class in DVD format.

c. Also provide training courses in DVD format covering system overview, operation, maintenance, trouble shooting, and programming. Produce these DVDs off-site using the supplied Pump Control Panel as the teaching aid, or commercially produced DVDs by the PLC manufacturer or third party who specializes in training on PLC systems. In conjunction with the DVDs, provide workbooks, which follow along with the DVDs.

3.6 PLC CONTROL SYSTEM SEQUENCE OF OPERATION

3.6.1 General

The following describes general functions of the fueling system components.

3.6.1.1 Abbreviations

a. SYS-1: components of System #1 including UPS#1, power supplies, CPU-1, I/O-1, and system #1 input and outputs.
b. SYS-2: components of System #2 including UPS#2, power supplies,

CPU-2, I/O-2, and system #2 input and outputs.

c. CPU-1: SYS-1 PLC CPU.
d. CPU-2: SYS-2 PLC CPU.
e. I/O-1: SYS-1 PLC input/output modules.
f. I/O-2: SYS-2 PLC input/output modules.
g. PCP: Pump Control Panel.
h. PC: Personal Computer.
i. UPS: Uninterruptible Power Supply.
[j. GDP: Graphic Display Panel

]3.6.2 Operating Tanks

3.6.2.1 Level Control

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NOTE: Use this paragraph if float switches rather than electronic level switches are used for determining tank level alarms
****

Each operating tank has four level float switches to measure low-low, low, high and high-high levels. The switches are DPDT for the redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing.

a. Low-Low Level: When the low-low level float is activated the associated tank's graphic display low-low level light shall light. If the tank's outlet valve is not fully closed the alarm annunciator's low-low level critical alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically. If all tanks are at low-low level, no fueling pumps shall start automatically.

b. Low Level: When the low level float is activated the associated tank's graphic display low level light shall light and the alarm annunciator's low level non-critical low level alarm sequence activates.

c. High Level: When the high level float is activated the associated tank's graphic display high level light shall light and the alarm annunciator's non-critical high level alarm sequence activates.

d. High-High Level: When the high-high level float is activated the associated tank's graphic display high-high level light shall light, the alarm annunciator's critical high-high level alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically.

3.6.2.2 Level Control

****
NOTE: Use this paragraph if electronic level switches rather than float switches are used for determining tank level alarms
****

Each operating tank has level sswitches to monitor low-low, low, high, and high-high fuel levels. Connect the switches to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The following alarms shall be reported.

a. Low-Low Level: When the low-low level elevation is attained the associated tank's GDP low-low level light shall light. The alarm annunciator's critical alarm sequence activates, the tank's fueling pumps running in automatic mode shall be disabled and these pumps shall not be allowed to start automatically. If both tanks are at low-low level, no fueling pumps shall start automatically.

b. Low Level: When the low level elevation is attained the associated tank's GDP low level light shall light. The alarm annunciator's non-critical alarm sequence activates.

c. High Level: When the high level elevation is attained the associated tank's GDP high level light shall light and the alarm annunciator's non-critical alarm sequence activates.

d. High-High Level: When the high-high level elevation is attained the associated tank's GDP high-high level light shall light, the alarm annunciator's critical alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically.

[3.6.2.3 Outlet Valve

Each operating tank's outlet valve has two limit switchs to indicate valve position. The closed limit switch is DPDT for redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The closed limit switch shall close when the valve is fully closed. When the closed limit switch is closed the associated tank's valve graphic display closed light shall activate. When the valve is fully open, the open limit switch is closed. At this time the associated tank's valve graphic display open light shall activate.

]3.6.3 Product Recovery Tank

3.6.3.1 Fuel Transfer Pump (FTP)

The pump's motor controller has a status relay to indicate the on/off status of the pump. Connect the status relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the pump's graphic display off light shall light. When the status relay is closed the pump's graphic display on light shall light. Also use the status relay state to start and stop the pumps elapsed run time timer.

3.6.3.2 Overfill Valve (OV)

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NOTE: The automatic starting and stopping of the fuel transfer pump is accomplished by the actuation of tank float switches connected to the control circuit in the motor control center. The PLC system does not control the starting and stopping.

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The tank's overfill valve has a limit switch to indicate valve position. The switch is SPST and shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The switch shall close when the valve is fully closed. When the limit switch is closed the tank's graphic display valve closed light shall light and the alarm annunciator's non-critical alarm sequence activates. When the limit switch is open the tank's graphic display valve open light shall light.

3.6.3.3 High Level Alarm

The tank has a high level alarm float switch. Connect the switch, SPST, to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the high level alarm float is activated the tank's graphic display high level light shall light and the alarm annunciator's critical alarm sequence activates.

3.6.3.4 High-High Level Alarm

The tank has a high-high level alarm float switch. Connect the switch, SPST, to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the high-high level alarm float is activated the tank's graphic display high-high level light shall light and the alarm annunciator's critical alarm sequence activates.

3.6.3.5 Leak Detection

The tank has a leak detection system. Connect the leak detection systems alarm relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the leak alarm is activated the alarm annunciator's non-critical alarm sequence activates.

3.6.4 Fueling Pumps (FP)

There are three fueling pumps with a maximum of two pumps running at one time in the automatic mode. The lead pump selector switch selects the pump starting sequence. Each pump's motor controller has a status relay to indicate the on/off status of the pump. Connect the status relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the associated pump's graphic displayoff light shall activate and screen number 2 shall indicate on. When the status relay is closed the associated pump's graphic display on light shall activate and screen number 2 shall indicate off. Also use the status relay state to start and stop the pumps elapsed run time timer and display on screen number 2.

3.6.5 Flow Switch, Fueling Pump

On the discharge side of each pump is a flow switch to indicate positive flow (fail safe feature). The flow switch is DPDT for redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. If the PLC has given a signal to start a pump and the flow switch has not closed before the set point timer expires or if the flow switch opens after the pump has been running then the pump shall be in a failure state and it shall be disabled (taken out of the starting sequence), the alarm annunciator's non-critical alarm sequence shall also be activated, and the next pump in the start sequence started. After the PLC has stopped all of the pumps, any failed pump shall be added back into the start sequence.

3.6.6 Transmitters

3.6.6.1 Pressure Indicating Transmitter (PIT)

The PIT's measure system pressure in pounds per square inch. There are two

PITs connected to the PCP for redundancy. PIT-1 and PIT-2 are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The system pressure is sent to personal computer display.[PIT-3 is connected directly to the Tightness Test Panel.]

3.6.6.2 Differential Pressure Transmitter (DPT)

he DPT's measure flow in gallons per minute. There are two issue DPTs (DPT-1 and DPT-2) and two return DPTs (DPT-3 and DPT-4) for redundancy. The DPTs are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The net flow is sent to the personal computer display. The issue rate, return rate and net flow shall be displayed on the personal computer.

3.6.6.3 Pressure Sensors (PS)

The PS measure system pressure in pounds per square inch. There are three PS installed on the system and there are PCP preparations made for a fourth PS to be temporarily wired in from a Hydrant Pit. PS-1, PS-2, PS-3, and PS-4 are connected to SYS-1 only as indicated on the Terminal Block Connection drawing. These sensors shall report various system pressures to the personal computer to be used for the creation of the system graphs as required for screen 7 and described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP.

3.6.7 Control Valves

3.6.7.1 Flushing Valve (FV)

Connect the FV to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. Activate the graphical display open and closed lights and screen number 2 status based on the PLC's output status for the valve. Base the valve status on the table listed below.

Flushing Valve Operation - One Solenoid			
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid	Graphical Display
Re-Fuel or Auto Mode	Open	De-energized	Open
Loop Flush	Open	De-energized	Open
Pantagraph Flush	Closed	Energized	Closed
Off Mode	Open	De-energized	Open
Tightness Test	Open	De-energized	Open

3.6.7.2 Pressure Control Valve (PCV)

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NOTE: Only include if Scheme B Control is utilized.

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Connect the PCV to I/O-1, I/O-2 and UPS #3 as indicated on the Terminal Block Connection drawing. Activate the graphical display enabled and closed lights and screen number 2 status based on the PLC's output status for the valve. Base the valve status on the table listed below.

Pressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Automatic Mode Pump(s) On	Closed	Energized	De-energized	Closed
Flush Mode Pumps On	Closed	Energized	De-energized	Closed
Flush Mode Pumps Off	Enabled	De-energized	De-energized	Closed
Off Mode Pump(s) On	Closed	Energized	De-energized	Closed
Off Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Tight. Test-Hi Pres	Closed	Energized	De-energized	Closed
Tight. Test-Static	Enabled	De-energized	De-energized	Enabled
Tight. Test-Low Pres	Enabled	Energized	Energized	Enabled

3.6.7.3 Backpressure Control Valve (BPCV)

The BPCV shall be connected to I/O-1, I/O-2 and UPS #3 as indicated on the Terminal Block Connection drawing. The graphical display enabled and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. The valve status shall be based on the table listed below.

Backpressure Control Valve Operation - Solenoid			
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Graphical Display
Re-Fuel / Pumps on	Enabled	Energized	Enabled
Re-Fuel / Pumps off	Open	Energized	Open
Both Flush Modes	Open	De-energized	Open
Off Mode	Open	De-energized	Open

Backpressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Both Flush Modes	Open	Energized	Energized	Open
Automatic Mode Pump(s) On	Enabled	Energized	De-energized	Enabled
Automatic Mode Pumps Off	Closed	De-energized	De-energized	Closed
Off Mode Pump(s) On	Enabled	Energized	De-energized	Enabled
Off Mode Pumps Off	Closed	De-energized	De-energized	Closed
Tightness Test	Enabled	De-energized	De-energized	Enabled

3.6.8 Safety Circuit

3.6.8.1 Emergency Stop Status

Connect the emergency stop circuit status relay (ER1) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the circuit is activated the alarm annunciator's critical alarm sequence is activated and any calls to start fueling pumps shall be canceled and no additional pump start signals shall be sent until the circuit has been reset. The fueling pumps will actually be stopped by a emergency stop circuit status relay (ER2) N.O. contact in the fuel pump motor control circuit located in the motor control center.

3.6.8.2 Emergency Shutoff Valves (ESO) Status

Connect the ESO status relay (ER2) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the GDP valve open lights shall light. When the relay is open the GDP valve closed lights shall light.

3.6.8.3 Circuit Power Status

Connect the safety circuit power status relay (ER3) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the PCP emergency circuit power on light shall light.

3.6.9 Pump Control Panel

3.6.9.1 CPU Faults

The PCP mounted CPU-1 and CPU-2 on lights are connected to both SYS-1 and SYS-2. The associated CPU light shall light when no system faults are detected. When a fault is detected by the CPU or it's redundant CPU the faulted CPU's on light shall be turned off and the alarm annunciator's non-critical alarm sequence shall be activated.

3.6.9.2 Input Select Switch

The 2-position input select switch controls which inputs (System-1 or System-2) are being used. Connect each switch position to both SYS-1 and SYS-2. The OI display indicates the active system.

3.6.9.3 Mode Select Switch

The [5][4]-position switch selects what mode of fueling is active: automatic Re-Fueling, loop flush,[pantagraph flush,] Tightness Test, or off. Each switch position shall be connected to both SYS-1 and SYS-2. The screen number 2 status shall indicate the active mode.

3.6.9.4 Lead Pump Selector Switch

The 3-position switch selects which pump is the lead pump. The switch position fixes the starting sequence for all pumps. The sequences shall be 1-2-3, 2-3-1, and 3-1-2. The off sequence shall be the reverse of the start sequence; therefore, first on will be last off. A maximum of two pumps are allowed to run at one time. If a pump fails to start or fails during operation, that pump shall be disabled and the next pump in the sequence started. The screen number 2 status display shall indicate the lead pump.

3.6.9.5 PCP Temperature Alarm

The alarm thermostat when activated shall activate the alarm annunciator's non-critical alarm sequence.

3.7 OPERATING PROGRAM REQUIREMENTS

Store the control system's logic program on an EEPROM chip. Permanently store default values of operator adjustable parameters on the chip with the capability of resetting the values in RAM to the values within the range specified below. The default values can be changed through the use of the personal computer (after the correct password has been entered). After loss of power and battery failure the adjustable settings shall revert back to the default values located on the chip. The default values shown here shall be reset to the values determined during the system start up and test.

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NOTE: Delete the addressable parameter accompanied by an asterisk(*) for control Scheme "A". Addressable parameters accompanied by two asterisks(**) apply to Scheme "A" only.

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SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Issue flow to start second pump in sequence	450 to 650 gpm	560 gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm
Return flow to stop second pump in sequence (lag pump)	500 to 800 gpm	700 gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds
Timer to enable second pump to start	0 to 120 seconds	10 seconds
Timer to stop second pump	0 to 120 seconds	15 seconds
Timer to stop first pump	0 to 60 seconds	2 seconds
Timer to stop first pump	0 to 15 minutes	10 minutes

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Timer to de-energize (close) Back Pressure Control Valve	0 to 360 seconds	60 seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds
System pressure to stop lead pump	130 to 190 psig	110 psig
Should the operator enter a value not within the range for that parameter, the personal computer shall indicate "INVALID ENTRY" and revert back to the previous value.		
A number inside braces, {x}, in the following paragraphs indicates that the number may be changed by the operator via the operator interface within the Set Point Range listed above.		

[3.8 AUTOMATIC MODE - IDLE CONDITION

The fueling system is intended to remain continuously pressurized while in the idle condition. This allows the system to respond immediately to aircraft refueling requirements. Periodically, in the idle condition, the system will lose minimal pressure. When this occurs, the control system will automatically repressurize in the following sequence:

a. Start the lead pump when the system pressure is less than {60} psig continuously for {0} seconds. Reset the timer if the pressure then rises above {60} psig before the timer expires.

b. After the timer expires:

(1) Energize the BPCV solenoid 'A' to enable the valve to modulate the system pressure at it's set point.

(2) Energize the PCV solenoid 'A' to close the valve.

c. With the lead pump running, 600 gpm flows through the issue venturi. The system pressure upstream of the BPCV shall increase to the BPCV set point of 80 psig. At this pressure the BPCV shall start to open and the valve modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With the lead pump running and no fueling demand the return venturi flow rate shall equal the issue venturi flow rate. When the return venturi flow rate is greater than {560} gpm a {60} second timer shall start. If the flow rate drops below {560} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

e. After the timer expires:

 (1) The BPCV solenoid 'A' shall be de-energized to close the valve.

 (2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

 (3) When system pressure rises to 110 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

f. The system has now returned to a pressurized and idle condition.

g. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

h. If a fueling pumps flow switch opens after the pump has successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

][3.9 AUTOMATIC MODE - REFUELING CONDITION

To start an aircraft fueling operation, an operator connects fueling equipment such as a pantagraph to an aircraft and to a hydrant control valve. When the operator opens the hydrant control valve by use of an hydraulic operated "Deadman", the following sequence occurs:

a. The lead pump will start when the PIT senses a pressure less than {60} psig continuously for {0} seconds. If the pressure then rises above {60} psig before the timer expires, the timer shall reset.

b. After the timer expires:

 (1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

 (2) The PCV solenoid 'A' shall be energized to close the valve.

c. With the lead pump running, $\pm$600 gpm will flow through the issue venturi. The system pressure upstream of the BPCV will increase to the BPCV set point of 80 psig. At this pressure the BPCV will start to open and the valve will modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {40} gpm and less than {560} gpm the lead pump will continue to run and the BPCV will modulate to pass flow as necessary to maintain upstream system pressure.

e. With the lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {560} gpm a {300} second timer shall start. If issue venturi flow rate falls below {560} gpm or the return venturi flow rate falls below {560} before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

f. After the timer expires:

(1) The BPCV solenoid 'A' shall be de-energized to close the valve.

(2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

(3) When system pressure rises to 110 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

g. With the lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {560} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

h. After the timer expires: The second pump shall start.

i. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead and second pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

j. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If issue venturi flow rate falls below {1160} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

k. After the timer expires: The second pump shall be stopped.

l. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

m. If a fueling pumps flow switch opens after the pump successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

]3.10 RE-FUELING MODE - REFUELING CONDITION

****
NOTE: Applicable to Scheme A operation
****

To start an aircraft fueling operation, an operator connects fueling equipment such as a pantagraph to an aircraft and to a hydrant control valve. The operator opens the hydrant control valve by use of an hydraulic operated "Deadman":

a. The lead pump will start when the local Start pushbutton is pushed.

b. The BPCV solenoid shall be energized to enable the valve to modulate the system pressure at it's set point.

c. With the lead pump running, $\pm$600 gpm will flow through the issue venturi. The system pressure upstream of the BPCV will increase to the BPCV set point of 130 psig. At this pressure the BPCV will start to open and the valve will modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With lead pump running and an issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {40} gpm the lead pump will continue to run and the BPCV will modulate to pass flow as necessary to maintain upstream system pressure.

e. With the lead pump running and an issue venturi flow rate greater than {560} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If issue venturi flow rate falls below {560} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

f. After the timer expires: The second pump shall start.

g. With the lead pump running and an issue venturi flow rate greater than {1160} gpm and a return venturi flow rate greater than {40} gpm and less that {700} gpm the lead and second pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

h. With the lead and second pumps running and an issue venturi flow rate greater than {1160} gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If issue venturi flow rate falls below {1160} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

i. After the timer expires: The second pump shall be stopped.

j. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

k. If a fueling pumps flow switch opens after the pump successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

l. When a fueling operation is complete the operators will depress the Stop button and the lead pump shall stop and the BPCV shall be de-energized.

m. If the operators forget to depress the stop button following completion of a fueling operation, a timer will be counting down at all times that the system is showing issue flow of greater than {560} gpm and a return flow of greater than {560} gpm. This timer will be 10 minutes and upon reaching 10 minutes the lead pump shall be shut down and the BPCV shall be de-energized.

3.11 LOOP FLUSH MODE

This mode shall be used when the system needs to be flushed of water or sediment. The operators will first place the manual valves in the desired position to select the appropriate flow path. Placing the selector switch in "loop flush" the following shall occur:

a. The BPCV solenoid shall be de-energized to force it open. Both BPCV solenoids shall be energized to force it open.

b. Start the fueling pump(s) manually using the Hand-Off-Auto or Hand-Auto switch to obtain the desired flow rate. The automatic pump starts shall be disabled in this mode.

c. The PCV solenoid "A" shall be energized when pump(s) are on and de-energized when the pumps are off. The PCV solenoid "B" is de-energized.

d. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

e. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

[3.12 PANTAGRAPH FLUSH MODE

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NOTE: This paragraph is not required if a separate flush line is provided for the system.

****

This mode shall be used when pantagraphs need to be flushed of water or sediment. The operators will first place the manual valves in the desired positions to select the appropriate flow path. Placing the selector switch in "pantagraph flush" the following shall occur:

a. The BPCV solenoid shall be de-energized to force it open.Both BPCV solenoids shall be energized to force it open.

b. The Flushing valve solenoid shall be energized to force it closed.

c. Start the fueling pump(s) manually using the Hand-Off-Auto or Hand-Auto switch to obtain the desired flow rate. The automatic pump starts shall be disabled in this mode.

d. The PCV solenoid "A" shall be energized when pump(s) are on and de-energized when the pumps are off. The PCV solenoid "B" is de-energized.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

]3.13 TIGHTNESS TEST MODE

This mode shall be used in conjunction with the Tightness Monitoring Panel provided by Spec. Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT to perform tightness tests. Placing the selector switch to "TIGHTNESS TEST" the PCP shall send a signal to the Tightness Monitoring Panel telling it that it is ready to preform the tests. At this time it shall also operate three MOV valves, closing I25 and I26 and opening I27. The PCP then receives signals from the Tightness Monitoring Panel to prepare for High Pressure Test, run High Pressure Test, Prepare for Low Pressure Test, run Low Pressure Test, prepare for Second High Pressure Test, run Second High Pressure Test, and when the test is over. The following PCP actions will occur after the corresponding signal:

3.13.1 High Pressure Test Preparation

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The Flush valve solenoid shall be de-energized to force it open.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be Energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 shall be opened.

h. The pump will continue to run until such time as the run High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the High Pressure test.

3.13.2 Run High Pressure Test

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be d-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a 10 minute settling time to pass, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP to Prepare for the Low Pressure Test.

3.13.3 Low Pressure Test Preparation

a. MOV I32 will be opened.

b. The PCV solenoid "A" will be energized and the PCV solenoid "B" will be energized to enable the valve at the 50 psi value.

c. The system will remain in this status until such time as the PCP receives a Run Low Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will monitor the loop pressure until it reaches the 50 psi value. It will then instruct the PCP to run the Low pressure test.

3.13.4 Run Low Pressure Test

a. MOV I32 will be closed.

b. The system will remain in this status until such time as the PCP receives a Prepare for Second High Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will wait for a 10 minute settling period to expire, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP to prepare for Second High Pressure Test.

3.13.5 Second High Pressure Test Preparation

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The Flush valve solenoid shall be de-energized to force it open.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be de-energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 will be opened.

h. The pump will continue to run until such time as the run Second High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the Second High Pressure test.

3.13.6 Run Second High Pressure Test

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a 10 minute settling time to pass, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP that testing is finished.

e. The PCP will leave the system as is until such time as the PCP selector switch is placed into a different mode.

3.14 OFF MODE

a. Automatic starting of fueling pumps shall be disabled. All other functions (GDP, alarm annunciator, operator interface, control valve solenoids, etc.) shall be active to allow manual control of the fueling pumps using the Hand-Off-Auto or Hand-Auto switch.

b. When the first pump has been started:

(1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid 'A' shall be energized to close the valve.

c. The second and third pumps maybe started or stopped manually as needed by the operator.

d. After the last pump has been stopped:

(1) The BPCV solenoid 'A' shall be de-energized.

(2) The PCV solenoid 'A' shall be de-energized.

3.15 MANUAL OPERATION OF FUELING PUMPS

a. If the PLC system is still active see paragraph OFF MODE.

b. If the PLC system has no power or both CPUs have faulted (CPU lights on PCP off) the pumping system will be in a completely manual mode. The safety circuit will need power so that the ESO solenoids on the non-surge check valves will be open and fuel can flow. The solenoids on the other solenoid controlled valves will be de-energized so the valves will have to be manually opened or enabled for the system to run. Other valves may need to be opened or closed manually by the operators for the system to work properly.

3.16 4-VALVE MANIFOLD SUPERVISION

****

NOTE: The drawing referenced below is from the DEPARTMENT OF DEFENSE PRESSURIZED HYDRANT DIRECT

FUELING SYSTEM Standard Drawings. Add the drawing to the design package if applicable.
****

a. Prior to initiating fueling operations in the automatic or in the test mode, the 4-valve manifold valves and the two tank outlet valves must be in the proper positions for successful fueling operations. The PLC shall monitor valve positions of the 4-valve manifold (sensed by position limit switches for fully opened and fully closed status on valves I34, I35, R10, and R11) and by monitoring valve status on the tank outlet valves (sensed by position limit switches for fully opened and fully closed status on valves I1 and I2). Valve position must conform to the position table listed on drawing M-204b under "Storage Tank Selection".

b. If the system is placed in automatic or test mode the valve selections must conform to the position table on sheet M-204b. If the valve positions do not conform to this table the PCP will show a 4-Valve manifold error on the alarm annunicator. The alarm can be silenced, but will not reset until such time as the valve positions do conform to the table.

-- End of Section --

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 55 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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DIVISION 33 - UTILITIES

SECTION 33 09 55

AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS)

02/10

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 09 55 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 09 55

AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS)
02/10

****
NOTE: This guide specification covers the requirements for the Pump Control and Annunciation System for aircraft refueling systems constructed to the requirements of the DOD Cut-N-Cover Hydrant Refueling System Standards. The Cut-N-Cover style of tanks are primarily used in OCONUS. Therefore this standard was prepared using metric units that would apply to most OCONUS projects. 120 volts at 60Hz is used for control power. Adjust all units to meet local requirements.

DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

****

PART 1 GENERAL

1.1 SYSTEM OVERVIEW

The Hydrant Fueling System consists of fueling pumps that pump fuel to a Hydrant Hose Truck Check-out Pad, Truck Fill Stands, and fuel pits located on the airfield apron. Automatic pump starts and stops are based on system pressure and flow. Programmable Logic Controllers (PLCs) receive information from pressure transmitters and other devices to control the pumps and control valves. There are two PLCs that are connected in a redundant configuration, to assure continued operation of the Hydrant Fueling System even if either PLC (but not both) fails. The Hydrant Fueling System also includes Cut-N-Cover fuel storage tanks and a product recovery tank. The pump control panel, personal computer,[graphic display panel,] and annunciator are located in the Control Room of the Filter Separator Building.

1.2 GENERAL REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM applies to this project, with the additions and modifications specified herein. The control system shall be furnished by a single supplier. See Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT for other required components of the control system. The control system supplier is responsible for providing a fully functional control system, in accordance with the drawings and specifications, including the field devices. Install in accordance with NFPA 70.

1.3 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90	(2005) Standard for Relays and Relay Systems Associated With Electric Power Apparatus
IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

ISA - INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ISA 18.1	(1979; R1992) Annunciator Sequences and Specifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA IA 2	(2005) Programmable Controllers - Parts 1 thru 8
NEMA ICS 1	(2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; Errata 2006; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2005) Terminal Blocks
NEMA ICS 6	(1993; R 2001; R 2006) Standard for Enclosures
NEMA LS 1	(1992; R 2000) Low Voltage Surge Protective Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 1012	(2005; R 2008 thru 2009) Standard for Power Units Other than Class 2
UL 1449	(2006; R 1998 thru 2009) Standard for Surge Protective Devices
UL 508	(1999; R 1999 thru 2008) Standard for Industrial Control Equipment

1.4 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some

submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawing[; G][; G, [_____]].

SD-03 Product Data

Pump Control Panel (PCP) and Components[; G][; G, [_____]].
Programmable Logical Controller (PLC) Hardware and Software[; G][; G, [_____]].
Personal Computer (PC)[; G][; G, [_____]].
Laptop Computer[; G][; G, [_____]].
FCC Computer[; G][; G, [_____]].
Printer[; G][; G, [_____]].
[Graphics Display Panel[; G][; G, [_____]].]
Graphics Display Screen[; G][; G, [_____]].
Control Wiring Data Lists[; G][; G, [_____]].

SD-06 Test Reports

Testing Plan[; G][; G, [_____]].
Certified Pump Control Panel (PCP).
Record of Test.

SD-07 Certificates

Experience and Qualifications[; G][; G, [_____]].

SD-10 Operation and Maintenance Data

Plan for Instructing Personnel[; G][; G, [_____]].
Operation and Maintenance Manuals[; G][; G, [_____]].
Tools and Spare Parts.

1.5 OPERATION AND MAINTENANCE MANUALS

1.5.1 Schedule and Content

Submit 6 copies of operational and maintenance manuals, within 7 calendar days following the completion of factory tests. As a minimum, include the following in the manuals:

a. Pump Control Panel including interior and exterior equipment layout.

b. All documents previously submitted and approved with all comments and field changes annotated.

c. Complete description of the sequence of operation including that described in Paragraphs 3.6 through 3.13 of this specification and any subsystems not controlled by the PLC (e.g. annunciator panel, EPDS, etc.)

d. Complete listing of all programming of the PLCs, laptop computer, and Personal Computer.

e. Complete relay ladder logic diagrams, PLC input/output diagrams and control power distribution diagrams for the complete control system.

f. Complete guide outlining step-by-step procedures for system startup and operation.

g. Complete troubleshooting guide, which lists possible operational problems and corrective action to be taken.

h. Complete maintenance and installation manual for all equipment supplied.

i. Spare parts data, which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked.

j. The above shall incorporate all as-built conditions.

1.5.2 Assembly

Bind documents in a suitable binder adequately marked or identified on the spine and front cover. Include a table of contents page and mark with pertinent contract information and contents of the manual. Provide tabs to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

1.6 TOOLS AND SPARE PARTS

Provide the following:

a. Any special tools necessary for maintenance of the equipment

b. One spare set of fuses of each type and size

c. Recommended manufacturer list of spare parts. Include part number, current unit price, and source of supply.

d. One spare power supply module

e. One spare I/O module (for discrete devices)

f. One spare I/O module (for analog devices)

g. Two PLC RAM back-up batteries

h. Two complete sets of ink cartrigages for the laser printer

i. Minimum of ten spare lamps for the Alarm Annunciator

j. Minimum of ten spare lamps of each type of non-LED lamps used on the Pump Control Panel

[k. [_____]
]

1.7 EXPERIENCE AND QUALIFICATIONS

Submit the following data demonstrating experience and qualifications:

a. Certification stating that the manufacturer has manufactured, installed, and successfully completed at least three PLC-based systems for automatic cycling of pumps based upon varying dispensing demands ranging from 0 to 2400 gallons per minute utilizing multiple pumps. At least one of the three PLC-based systems shall be for dispensing jet fuel into a pressurized, constant pressure, flow demand aircraft hydrant system.

b. Certification that the proposed control systems have successfully operated over the last 2 years and are currently in service.

c. Project names, locations, and system description of these installations. Include user point-of-contact and current telephone numbers.

1.8 WARRANTY

Warrant the Pump Control and Annunciation System including devices, hardware and software for a period of 1 year from the date of acceptance of the system by the Government. This warranty service shall include parts and labor service for equipment supplied under this specification. Upon notification by the Government of system or component failure, the Contractor shall respond at the site with necessary parts within 48 hours of notification.

PART 2 PRODUCTS

2.1 PUMP CONTROL PANEL (PCP) AND COMPONENTS

2.1.1 Enclosure

NEMA ICS 1, NEMA ICS 6, NEMA 250, and UL 508. The PCP enclosure shall be a freestanding NEMA Type 12, smooth, gasketed enclosure constructed of 12 gauge steel. All seams shall be continuously welded and there shall be no drilled holes or knockout prior to delivery to the job site. The pump control panel dimensions shall be a maximum of 90 inches high, maximum 72 inches wide, and a maximum of 24 inches deep and shall have removable lifting eyes. The interior surfaces of the panel shall be properly cleaned, primed, and spray painted with white high-gloss enamel. Exterior surfaces shall have standard factory finish. Access for the PCP shall be front only and shall consist of hinged doors having 3-point latching mechanisms. The doors shall open approximately 120 degrees. Rack mounting angles, swing-out panels and other component mounting hardware shall be installed such that servicing of one component shall not require removal or disconnection of other components. No clearance shall be required between the back of the panel and the room walls. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure.

2.1.2 Ventilation System

Two supply fans, single phase, 115 volt, shall be provided. Each fan shall supply a minimum of 100 CFM. The supply and exhaust grill shall contain a filter that is easily removed from the exterior of the enclosure. Three thermostats with an adjustable set point range of 70 degrees F to 140 degrees F shall also be provided. Locate the thermostats near the top in the interior of the PCP.

2.1.3 Ground Bar

The control panel shall have a tin plated copper equipment ground bar. The bar shall have a minimum of twenty grounding screws.

2.1.4 Standard Indicator Lights

NEMA ICS 1, NEMA ICS 2, and UL 508. Lights shall be heavy duty, NEMA 13, 22.5 mm mounting hole, round indicating lights operating at 120 volts ac/dc or 24 volts ac/dc. Long life bulbs shall be used. Indicator lights shall have a legend plate with words as shown on drawings. Lens color as indicated on the drawings. Lights shall be "push to test (lamp)" type. LED type lamps of comparable size and color may be substituded for standard indicator lights.

2.1.5 Selector Switches

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated lever operated selector switches shall be heavy duty, NEMA 13, round, and utilize a 7/8-inch mounting hole. They shall have the number of positions as indicated on the drawings. Switches shall be rated 600 volt, 10 amperes continuous. Provide legend plates with each switch with words as indicated on the drawings.

2.1.6 Pushbuttons

NEMA ICS 1, NEMA ICS 2, and UL 508. Non-illuminated pushbuttons shall be heavy duty, NEMA 13, round, utilize a7/8 inch mounting hole, and have the number and type of contacts as indicated on the drawings or elsewhere in the specifications. The emergency stop switch shall be a red mushroom head, 1.5 inch diameter, momentary contact type. Pushbuttons shall be rated 600 volt, 10 amperes continuous. Provide legend plates with each switch with words as indicated on the drawings.

2.1.7 Relays

IEEE C37.90, NEMA ICS 2, UL 508.

2.1.8 Nameplates

Provide laminated plastic nameplates with black outer layers and a white core. Edges shall be chamfered. Fasten the nameplates with black-finished round-head drive screws or approved nonadhesive metal fasteners.

2.1.9 Transient Voltage Surge Suppression Devices

IEEE C62.41 for Category "B" transients, NEMA LS 1, UL 1449.

2.1.10 Terminal Blocks

NEMA ICS 4. Terminal blocks for conductors exiting the PCP shall be two-way type with double terminals, one for internal wiring connections and the other for external wiring connections. Terminal blocks shall be made of bakelite or other suitable insulating material with full deep barriers between each pair of terminals. A terminal identification strip shall form part of the terminal block and each terminal shall be identified by a number in accordance with the numbering scheme on the approved wiring diagrams.

2.1.11 Circuit Breakers

UL 508. Provide individual, appropriately sized, terminal block mounted, circuit breakers for all 120 volt PCP mounted equipment and for the 120 volt terminal boards shown on the drawings.

2.1.12 Uninteruptable Power Supplies

UL 1012. Input voltage shall be 120 volts (nominal), 1 phase, 60 Hertz. Output voltage regulation shall be +/-5.0% for the following conditions:

a. 20% to 100% load on output.
b. Input voltage variation of -15% to +10%.
c. Constant load power factor between 80% and 100%.

Response time shall be 1.5 cycles or less. Battery capacity shall be such as to provide an orderly shut down of operating programs or as a minimum 10 minutes.

2.1.13 Miscellaneous Power Supplies

UL 1012. Certain field devices may require power other than 120VAC (i.e. 24VDC). The power supplies shall be convection cooled, have fully isolated independent outputs, have constant voltage, have short circuit and overvoltage protection, and have automatic current limiting.

2.1.14 Alarm Annunciator

UL 508 and ISA 18.1. The Alarm Annunciator shall provide visual annunciation, local and remote monitoring, constant or flashing visual and audible alarm as specified herein. The annunciator shall be completely solid state with no moving parts. Furnish the annunciator with cabinet and hardware appropriate for flush mounting on the control panel. A power supply either integral or separately mounted shall operate on 120 volts, 60

Hertz. The annunciator shall have windows arranged in a matrix configuration (rows and columns). Each window shall be at least 1 inch high by 1-5/8 inches wide and shall have rear illuminated translucent engraved nameplate. Lettering shall be at least 5/32 inches high. System lamp voltage shall be 24 to 28 volts dc.

2.1.15 Alarm Horns

UL 508. The alarm horns shall consist of 2-vibrating horns and 1-resonating horn. One vibrating horn is to be mounted in the PCP, and one vibrating and one resonating horn shall be mounted outside of the control room as shown on the drawings. The exterior horns shall each produce 100db at 10 feet and shall be provided in a weather proof housing. The PCP horn shall produce 70db at 10 feet.

2.1.16 Laptop Computer

2.1.16.1 Hardware

The following are the minimum hardware requirements for the laptop computer:

a. Latest Pentium CPU operating at 2 GHz or faster
b. 1 GB RAM
c. 100 GB hard drive
d. 16X Read-Write DVD drive
e. Color XGA LCD screen 14 inches
f. Keyboard
g. Pointing device (e.g. mouse, track ball)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC and Battery power supply
k. All cables and connectors for interfacing with PLC and personal computer
l. Modem compatible for remote troubleshooting of the system
m. Two USB 2.0 communications ports
n. Provide a carying case for the Laptop Computer

2.1.16.2 Software

The following is the minimum software to be loaded on the laptop. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software needs to be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a harddrive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)
b. Software for programming the PLC
c. Software for programming the personal computer

2.1.17 Personal Computer (PC)

2.1.17.1 Hardware

The following are the minimum hardware requirements for the personal computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM

c. 250 GB hard drive
d. 16X Read-Write DVD drive
e. Color 17 inches flat screen monitor
f. Keyboard
g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC operating power
k. All cables and connectors for interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System.
m. Two USB 2.0 communications ports

2.1.17.2 Software

The following is the minimum software to be loaded on the personal computer. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software shall be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)

b. Software for programming the PLCs

c. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points.

d. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system on a real time basis.

e. MS Ofice Professional with Excel shall be provided to allow the trending data described above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically.

2.1.18 Printer

The alarm/report printer shall be a color laser jet printer. The unit shall print in black at a minimum speed of twelve pages per minute. It shall print in color at a minimum speed of ten pages per minute. It shall as a minimum be capable of printing color graphs of various system pressures, issue flow, and return flow vs. time in seven colors. Provide one set of spare replacement ink cartridges.

2.1.19 FCC Computer

2.1.19.1 Hardware

The FCC computer shall be a copy of the personal computer so that upon failure of the personal computer it could be relocated to the pumphouse to assume the personal computers duties. The normal duties of the FCC computer shall be to serve as a remote monitor only of the screens that are available on the personal computer. The following are the minimum hardware requirements for the FCC computer:

a. Latest Pentium CPU operating at 2.4 GHZ or faster
b. 2 GB RAM
c. 250 GB hard drive
d. 16X Read-Write DVD drive
e. Color 17 inches flat screen monitor
f. Keyboard
g. Pointing device (e.g. mouse)
h. Parallel communication port
i. Serial communication port compatible with PLC (e.g. RS-232-C, RS-485)
j. 120VAC operating power
k. All cables and connectors for interfacing with PLC and Laser Printer
l. Provide a modem capable of remote troubleshooting of the system. The modem will not be permanetly connected to the System.
m. Two USB 2.0 communications ports

2.1.19.2 Software

The following is the minimum software to be loaded on the FCC computer. The FCC computer shall be capable of replacing the Personal computer in the pumphouse if the personal compter fails. It will be set up initially to serve only as a remote monitor of the system while located at the FCC. Should the personal computer fail, the FCC computer will be relocated to the pumphouse and then assume the role of the personal computer. The computer software shall have a built in command to tell the computer whether it is serving as the personal computer or as the remote monitor only. The software shall be the most current versions and compatible with each other to make a complete and usable system. All software shall be fully site licensed and come with all disks to allow a full restore or reload of software in the event of a hard drive crash.

a. Operating system (e.g. the latest commercially available MS Operating System)

b. Software to tell the computer which mode it is to operate in, i.e. (personal computer or remote monitor)

c. Software to run as a remote monitor

d. Software for programming the PLCs

e. The personal computer shall communicate with the PLCs to display system status and change system set points. The personal computer shall have run-time graphical software to display the graphical screens described later and to change set points.

f. Software for recording, tracking, trending, and printing out the pressures, flows, and operational status of all monitored components of the fueling system, on a real time basis.

g. MS Ofice Professional with Excel shall be provided to allow the trending data described in e. above to be imported to Excel where it can be studied, manipulated, graphed, and easily sent electronically.

2.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

2.2.1 General

a. NEMA IA 2. Each PLC shall be able to receive discrete and analog inputs and through its programming it shall control discrete and analog output functions, perform data handling operations and communicate with external devices and remote I/O racks. The PLCs shall be a modular, field expandable design allowing the system to be tailored to the process control application. The capability shall exist to allow for expansion to the system by the addition of hardware and/or user software. At a minimum the PLCs shall include mounting backplanes, power supply modules, CPU module, communication modules, and I/O modules.

b. Each PLC provided shall be designed and tested for use in the high electrical noise environment of an industrial plant. The PLC modules shall comply with the FCC Part 15 Part A for radio noise emissions. The programmable controller processor shall be able to withstand conducted susceptibility tests as outlined in NEMA ICS 2, IEEE C37.90.

c. The PLCs shall function properly at temperatures between 32 and 122 degrees F, at 5 to 95 percent relative humidity non-condensing and have storage temperatures between -40 and +140 degrees F at 5 to 95 percent relative humidity non-condensing.

d. The PLCs shall have manufacturer's standard system status indicators (e.g. power supply status, system fault, run mode status, back-up battery status).

2.2.2 Central Processing Unit Module

The CPU shall be a modular self-contained unit that provides time of day, scanning, application (ladder rung logic) program execution, storage of the application program, storage of numerical values related to the application process and logic, I/O bus traffic control, peripheral and external device communications and self-diagnostics.

2.2.3 Power Supply Module

a. The power supply module shall be plugged into the backplane not separately mounted. The power supply shall be wired to utilize 120 VAC, 60 Hz power, the system shall function properly within the range of -10% to +15% of nominal voltage. The power supply shall provide an output to the backplane at a wattage and voltage necessary to support the attached modules. A single main power supply module shall have the capability of supplying power to the CPU module and local communication and I/O modules. Auxiliary power supplies shall provide power to remote racks.

b. Each power supply shall have an integral on/off disconnect switch to the module. If the manufacturers standard power supply does not have an on/off disconnect switch a miniature toggle type switch shall be installed near the PLC and clearly labeled as to its function.

c. The power supply shall monitor the incoming AC line voltage for proper levels and have provisions for both over current and over voltage protection. If the voltage level is detected as being out of range the system shall have adequate time to complete a safe and orderly shutdown.

2.2.4 Program Storage/Memory Requirements

a. The PLC shall have the manufacturers standard nonvolatile executive memory for the operating system. The PLC shall also have EEPROM (Electrically Erasable Programmable Read Only Memory) for storage of the user program and battery backup RAM for application memory. The EEPROM shall be loaded by use of the laptop computer or the personal computer.

b. Submit a calculation of the required amount of EEPROM and RAM (random access memory) needed for this application plus an extra 50 percent.

c. The number of times a normally open (N.O.) and/or normally closed (N.C.) contact of an internal output can be programmed shall be limited only by the memory capacity to store these instructions.

2.2.5 Input/Output (I/O) Modules

a. Provide all required I/O modules (analog input, analog output, discrete input, discrete output, and isolated discrete output) to manipulate the types of inputs and outputs as shown on the drawings and to comply with the sequence of operations. Also provide a minimum of 20% (round up for calculation) spare input and output points of each type provided, but not less than two of each type.

b. I/O modules shall be a self-contained unit housed within an enclosure to facilitate easy replacement. All user wiring to I/O modules shall be through a heavy-duty terminal strip. Pressure-type screw terminals shall be used to provide fast, secure wire connections. The terminal block shall be removable so it is possible to replace any input or output module without disturbing field wiring.

c. During normal operation, a malfunction in any remote input/output channel shall affect the operation of only that channel and not the operation of the CPU or any other channel.

d. Isolation shall be used between all internal logic and external power circuits. This isolation shall meet the minimum specification of 1500 VRMS. Provide optically isolated I/O components which are compatible with field devices.

e. Each I/O module shall contain visual indicators to display ON/OFF status of individual input or output points.

f. Discrete output modules shall be provided with self-contained fuses for overload and short circuit protection of the module.

g. All input/output modules shall be color coded and titled with a distinctive label.

2.2.6 Interfacing

The PLC shall have communication ports and communication modules using the manufacturers standard communication architecture for connections of the Personal computer, Laptop Computer, remote I/O racks and interconnections between SYS 1 PLC and SYS 2 PLC for the redundant backup system of the PLCs.

2.2.7 Program Requirements

a. The programming format shall be ladder diagram type as defined by NEMA IA 2.

b. There shall be a means to indicate contact or output status of the contact or output on the CRT (of the personal computer) or LCD screen (of the laptop computer). Each element's status shall be shown independently, regardless of circuit configuration.

c. The program shall be full featured in its editing capabilities (e.g. change a contact from normally open to normally closed, add instructions, change addresses, etc.).

2.2.8 Diagnostics

The CPU shall continuously perform self-diagnostic routines that will provide information on the configuration and status of the CPU, memory, communications and I/O. The diagnostic routines shall be regularly performed during normal system operation. A portion of the scan time of the controller should be dedicated to perform these housekeeping functions. In addition, a more extensive diagnostic routine should be performed at power up and during normal system shutdown. The CPU shall log I/O and system faults in fault tables, which shall be accessible for display. When a fault shuts down a CPU, a sequence shall be initiated that will automatically switch over to the other CPU. When a fault affects I/O or communication modules the CPU shall shut down only the hardware affected and continue operation by utilizing healthy system components. All faults shall be annunciated on the alarm annunciator.

[2.3 GRAPHICS DISPLAY PANEL

2.3.1 Enclosure

The Graphics Display Panel (GDP) shall be a minimum 42 inch LED Panel Display suitable for wall mounting and capable of accepting input from the Personal Computer. The Personal Computer shall be set up to normally display it's screen number four on the graphic Display Panel, but it shall be capable of sending any of its other screens to the display panel. Any combination of the screens shall be capabile of being displayed on the Personal Computer and the Graphic Display Panel.

2.3.2 Display Presentation

The process schematic graphic representation shall be as shown on the drawings. Display Red, green, amber, etc. colors on the screen as indicated on the drawings. The indicated lights on the drawing shall display approximately 1/2 inch in diameter.

2.3.3 Digital Net Flow, Pressure and Level Indicators

Digital indicators as shown on the drawings shall also be displayed on the Graphics Display Panel to provide the net, issue, and return flow in GPM and pressure in psi of the system and the level in the operating tanks and product recovery tank. The digital indicators shall display the indicated number of digits as shown on the drawings. Each digit shall be approximately 5/8 inch high.

]PART 3 EXECUTION

3.1 PUMP CONTROL PANEL (PCP) AND COMPONENTS

3.1.1 General

a. Where two or more pieces of equipment performing the same function are required, they shall be exact duplicates produced by the same manufacturer. All display instruments of each type shall represent the same outward appearance, having the same physical size and shape, and the same size and style of numbers, characters, pointers, and lamp lenses.

b. The PCP shall include all required resident software programs and hardware to provide the specified sequence of operation. All software R/W CD-Rom disks including programming manuals shall be turned over to the Government at the completion of start-up so modification can be done in the field with no outside assistance.

c. It is intended that process controlling devices except field devices, and motor controllers be attached to or mounted within the PCP enclosure and all interconnecting wiring installed prior to shipment to the job site. This is to allow shop testing of the system and to decrease field labor requirements.

d. The PCP shall be shipped fully assembled in one piece after the completion of the shop tests and all defects corrected.

3.1.2 Wiring

3.1.2.1 Methods and Practices

Wiring methods and practices shall be in conformance with NEMA ICS 1, NEMA ICS 2, NEMA ICS 4 and NEMA ICS 6 recommendations as applicable. All wiring to instruments and control devices shall be made with stranded wire, and wiring shall be permanently labeled with conductor/wire numbers within 1 inch of termination points. Labels shall be tubular heat-shrinkable wire markers that remain legible after exposure to industrial fluids and abrasion. Position markers so that wire numbers can be read without disturbing or disconnecting wiring. Use of individual character-markers placed side-by-side is not acceptable. Numbers shall match approved shop drawings. All wiring shall be neatly laced from point of entry into enclosures to termination points with nylon lacing cord or plastic lacing ties. Lacing within wiring channels is not required.

3.1.2.2 Control Wiring Data Lists

Provide typed Control Wiring Data Lists within each terminal cabinet and the PCP. The data lists shall include: conductor identification number, wire gauge, wire insulation type, "FROM" terminal identification, "TO" terminal identification, and remarks. Submit the preliminary lists and update to As-Built conditions.

3.1.3 Shop Tests

The manufacturer shall shop test the Certified Pump Control Panel (PCP), Personal computer, and lap top computer. Include simulation of field components and provide for fully testing the pump control and annunciator system as a unit before delivery to the project site. The test shall, reveal system defects, including, but not limited to, functional deficiencies, operating program deficiencies, algorithm errors, timing problems, wiring errors, loose connections, short circuits, failed components and misapplication of components. Perform the test prior to shipment to the site and correct problems detected. Repeat the final testing and correction sequence until no problems are revealed and then perform two additional successful tests. Submit certified test report within 15 days after completion of the test. The report shall include a statement that the Pump Control Panel performs as specified. Notify the Governments Contracting Officer and the Command Fuels Engineer 30 days prior to the final shop testing date. The Contracting Officer may require a Government witness at the final test before the PCP is shipped to the site.

3.1.4 Ventilation System

Thermostat T-1, shall control fan F-1 and thermostat T-2 shall control fan F-2. T-1 and T-2 shall be set at 80 degrees F to maintain interior air temperature to 20 degrees F above ambient. Thermostat T-3, set at 100 degrees F, shall provide a non-critical PCP HIGH TEMPERATURE alarm to the alarm annunciator.

3.1.5 Grounding

The PCP ground bar shall be connected to the building counterpoise via a #10 AWG conductor. Within the enclosure all I/O racks, processor racks, and power supplies, etc. shall be grounded to meet the manufacturer's specifications.

3.1.6 Indicator Lights, Switches, and Pushbuttons

Mount indicator lights, switches, and pushbuttons through the PCP enclosure and arrange to allow easy vision and operation of each device. Provide each device with a nameplate and/or legend plate as indicated on the drawings. Nameplate wordings shall be as indicated on the drawings.

3.1.7 Transient Voltage Surge Suppression Devices

Transient voltage surge suppression (TVSS) devices shall be installed in the PCP to minimize effects of nearby lightning strikes, switching on and off of motors and other inductive loads. TVSS shall be provided for each control circuit ladder. Each ladder may contain any combination of the following devices: PLCs, power supplies (e.g., 24 volt), fans, relays, lights, switches etc. TVSS shall also be provided for PLC I/O originating outside of the building.

3.1.8 Terminal Blocks

As a minimum, any PCP device that connects to a field device (devices not located in the PCP) shall be connected to a terminal block. A connection diagram similar to the drawings shall be provided to the field contractor for field connections to the PCP.

3.1.9 Circuit Breakers

As a minimum, any 120 volt PCP device i.e. (fans, lights, power receptacles, 24 VDC power supplies, PLC CPUs, PLC I/O racks) shall be provided with an individual circuit breaker. Additionally 120 volt terminal boards connecting to field devices (devices not located in the

PCP) shall be protected by a 120 volt circuit breaker.

3.1.10 Uninteruptable Power supplies

The Pump Control Panel (PCP) shall contain three uninteruptable power supplies (UPS) each connected to a dedicated circuit. As shown on the drawings one UPS shall supply PLC System 1, one UPS shall supply PLC System 2, and the third UPS shall supply the miscellaneous device power. The UPSs output capacity shall be sufficient to drive all the equipment connected plus 25%. The UPSs shall be mounted on shelves near the bottom of the PCP but not rest on the floor of the PCP.

3.1.11 Power Supplies

Provide and install all 120VAC and 24VDC power supplies as required. Size the power supplies for the load plus 25%. Supply all field devices, which require power and are controlled or monitored from the PCP, from power supplies in the pump control panel. Provide a 120V receptacle in the PCP for use by the Laptop computer. Completely install interconnecting wiring between UPSs and PLC power supplies prior to shipment to the job site.

3.1.12 Alarm Annunciator and Horns

Initiate signals by hardwired field contacts or by PCP outputs as required. The annunciator shall energize alarm horns, both an integral panel mounted vibrating horn and remote horns, and flash the appropriate annunciator lamp. The minimum number of windows shall correspond to the number of alarm points, plus 15 percent spare. The drawings indicate panel layout and the alarms to be annunciated.

3.1.12.1 Non-critical Alarms

Non-critical alarm windows shall be white with black lettering and shall sound the PCP mounted vibrating horn and the exterior mounted vibrating horns.

3.1.12.2 Critical Alarms

Critical alarm windows shall be red with white lettering and shall sound the PCP mounted vibrating horn and the exterior mounted resonating horns. Critical alarms shall also cancel all automatic pump starts in the PLC.

3.1.12.3 Alarm Sequence

Alarm sequence for each alarm shall be as follows (ISA 18.1 sequence 'A').

a. For a normal condition, visual indicator and horns will be off.

b. For an alarm condition, visual indicator will flash and horns will sound (this condition will be locked in).

c. Upon acknowledgment of the alarm condition, visual indicator will be steady on and the horns will be off.

d. If, after acknowledgment of an alarm condition, another alarm condition is established, the new alarm will cause the appropriate window to flash and the horn to sound.

e. When condition returns to normal after acknowledgment, the visual indicator and the horn will be off.

3.1.13 Personal Computer

The personal computer shall be a stand alone, desk top mounted unit. The personal computer shall download system parameters from the PLCs for display. The personal computer shall also upload new set point values that the operator has changed using the personal computer keyboard, after a password has been entered.

3.1.13.1 Screen Number 1

The general opening screen shall as a minimum display the name and location of the installation (e.g. Seymour Johnson Air Force Base, North Carolina), name of the project (e.g., Type III Hydrant Fueling System) and screen navigation information.

3.1.13.2 Screen Number 2

At a minimum display the following items. Continuously update the values; a 2 second delay maximum between updates is acceptable.

System Issue Rate	xxxx GPM
System Return Rate	xxxx GPM
System Net Flow	xxxx GPM
System Pressure	xxxx PSI
System Operation Mode	Auto/Off/Flush/Tightness test
Active System	Sys-1/Sys-2
Lead Pump in Tank 1	1/2/3/4/5
Fuel Pump #1	On/Off xxxxx.x HOURS
Fuel Pump #2	On/Off xxxxx.x HOURS
Fuel Pump #3	On/Off xxxxx.x HOURS
Fuel Pump #4	On/Off xxxxx.x HOURS
Fuel Pump #5	On/Off xxxxx.x HOURS
Backpressure Control Valve	Closed/Enabled
Pressure Control Valve	Closed/Enabled
Defuel/Flush Valve	Closed/Enabled
Lead Pump in Tank 2	6/7/8/9/10

Tank 1 Outlet Valve I11	Open/Closed
Tank 2 Outlet Valve I12	Open/Closed
Receipt Bypass Valve	Open/Closed
Manifold Setup Valve I34	Open/Closed
Manifold Setup Valve I35	Open/Closed
Manifold Setup Valve R10	Open/Closed
Manifold Setup Valve R11	Open/Closed
Lead Tank	1/2
Fuel Pump #6	On/Off xxxxx.x HOURS
Fuel Pump #7	On/Off xxxxx.x HOURS
Fuel Pump #8	On/Off xxxxx.x HOURS
Fuel Pump #9	On/Off xxxxx.x HOURS
Fuel Pump #10	On/Off xxxxx.x HOURS
Only one of the words separated by a slash (/) shall be displayed. The xxxxx.x HOURS is the fuel pumps elapsed run time and the value shall not be lost when the lead PLC is switched. The pump and valve status words shall be color coded to match the colors used on the graphic display screen.	

3.1.13.3 Screen Number 3

Display the following table. The table lists the set points that can be adjusted using the operator interface. A password shall be entered before the "current value" can be adjusted. The value entered can only be a number within the "set point range". The "default value" is the value held in the program that is loaded into EEPROM memory (This screen may require more than one display screen.).

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi	xxx psi
Issue flow to start second pump in the sequence	450 to 650 gpm	560 gpm	xxx gpm

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Issue flow to start third pump in the sequence	1000 to 1300 gpm	1160 gpm	xxx gpm
Issue flow to start fourth pump in the sequence	1600 to 1900 gpm	1760 gpm	xxx gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm	xxx gpm
Return flow to stop fourth third, and second pump in the sequence (lag pump)	500 to 800 gpm	700 gpm	xxx gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm	xxx gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds	xx seconds
Timer to enable second, third and fourth pumps to start	0 to 120 seconds	10 seconds	xx seconds
Timer to stop fourth, third, and second pumps	0 to 120 seconds	15 seconds	xx seconds
Timer to stop first pump	0 to 60 seconds	2 seconds	xx seconds
Timer to disable Back Pressure Control Valve	0 to 360 seconds	60 seconds	xx seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds	xx seconds
System pressure to stop lead pump	130 to 190 psig	140 psig	xxx psig
Operating Tank No. 1 Low-Low Level Indication	0 to 6 feet	1 foot 8 inches	x.x feet

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE	CURRENT VALUE
Operating Tank No. 2 Low-Low Level Indication	0 to 6 feet	1 foot 8 inches	x.x feet
Operating Tank No. 1 Low Level Indication	0 to 6 feet	2 feet	x.x feet
Operating Tank No. 2 Low Level Indication	0 to 6 feet	2 feet	x.x feet
Operating Tank No. 1 High Level Indication	18 to 24 feet	21 feet 3 inches	x.x feet
Operating Tank No. 2 High Level Indication	18 to 24 feet	21 feet 3 inches	x.x feet
Operating Tank No. 1 High-High Level Indication	18 to 24 feet	22 feet	x.x feet
Operating Tank No. 2 High-High Level Indication	18 to 24 feet	22 feet	x.x feet

3.1.13.4 Screen Number 4

Duplicate the Graphic Display Drawing showing a schematic of the process flow. Refer to this screen as the graphical display. Display many operating parameters here as required in later paragraphs of this specification.

3.1.13.5 Screen Number 5

This screen is a duplicate of the Alarm Annunciator and shall be superimposed over the current active screen on the personal copmputer when an alarm is activated.

3.1.13.6 Screen Number 6

This screen is designed solely for assisting the testing team during initial start up to watch all of the significant parameters of the systems operation simultaneously on one screen. Include the system parameters i.e. (flows, pressures, and status) from screen 2, the set points from screen 3, and timers for all of the actions that will take place following a delay function.

3.1.13.7 Screen Number 7

This screen is designed solely for displaying the seven graphs as described in Section 33 08 53, AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Display the following values concurrently against time: Issue flow, Issue pressure, Return flow, Pump #1 discharge pressure, Pressure upstream of BPCV, Pressure downstream of BPCV, and Hydrant Pit Pressure. The personal computer shall be capable of storing up to 1 week of data corresponding to the above values. The system shall be able to produce graphs on the screen of this data and print the data in seven colors on the laser printer.

3.1.13.8 Screen Number 8

This screen is an alarm history screen, referred to as the Alarm History Display. This screen shall be capable of storing and displaying all alarms that have occured in the system for at least a period of 30 days.

3.1.13.9 Screen Number 9

This screen is designed solely for displaying the parameters and process involved in the Tightness Test as described in this specification and on the drawings. Display the following values concurrently against time: Pressure (as sensed by PIT3). The system shall be able to produce graphs on the screen of this data and be able to print the data in color on the laser printer.

3.1.14 Laptop Computer

The Laptop computer is used to create, edit, and load the ladder logic program into the PLCs and the operator interface graphics control program into the personal computer. The Laptop shall also be used to monitor the PLCs memory and ladder logic program. Store the computer in a lockable cabinet provided and located within the Pump Control Panel.

3.2 PROGRAMMABLE LOGICAL CONTROLLER (PLC) HARDWARE AND SOFTWARE

3.2.1 General

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NOTE: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures shall be defined in the following manners: When the pressure indicating transmitters differ with each other by more than 70 kPa (10 psig) after a 10 second delay, assume the lower reading transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 2 L/s (30 gpm) after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 1.2 L/s (20 gpm) after a ten second delay, assume the lower reading transmitter has failed.

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The basic operation of the redundant PLC system is (Reference "Control System Block Diagram" on the drawings):

a. CPU-1 and it's associated I/O rack (I/O-1) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

b. CPU-2 and it's associated I/O rack (I/O-2) sends system outputs to appropriate devices and receive input signals from System-1 redundant field devices (PIT-1, DPT-1, DPT-3, flow switches, valve limit switches), System-2 redundant field devices (PIT-2, DPT-2, DPT-4, flow switches, valve limit switches), and all nonredundant field devices as listed on the drawings.

c. Within each rack (I/O-1 and I/O-2) System-1, System-2, and nonredundant inputs and outputs shall not be mixed on the same input/output module.

d. Under normal operation: The system input select switch is in the "SYS-1" position. CPU-1 is controlling the system using System-1 and nonredundant inputs from I/O-1 and any set point changes from the personal computer. CPU-2 is being updated by CPU-1 or concurrently monitoring System-1 inputs from I/O-2.

e. If under normal operation CPU-1 recognizes that a System-1 input has failed (see note below) it shall change over to the System-2 redundant input on I/O-1 and report the failure to the personal computer alarm screen.

Note: The pressure indicating transmitters and the differential pressure transmitters are the only devices that the PLC can monitor for a possible failure. Failures shall be defined in the following manners: When the prerssure indicating transmitters differ from each other by more than 10 psig after a ten second delay, assume the lower reading transmitter has failed. When the issue differential pressure transmitters differ from each other by more than 30 gpm after a ten second delay, assume the lower reading transmitter has failed. When the return differential pressure transmitters differ from each other by more than 20 gpm after a ten second delay, assume the lower reading transmitter has failed.

f. During normal operation there are two ways for CPU-2 to take control of the system: 1) CPU-1 identifies its own internal fault and hands over control to CPU-2. 2) CPU-2 identifies a fault in CPU-1 and takes control from CPU-1. When CPU-2 is in control of the system it shall annunciate the fault condition and shall be using any updated inputs from the personal computer and shall use System-1 inputs. If CPU-2 senses a fault on a System-1 input it shall then switch over to the appropriate System-2 input. If power is lost to System-1 inputs then CPU-2 shall use all of the System-2 inputs.

g. CPU-2 shall also report any of its internal faults to CPU-1 and CPU-1 shall report any faults it detects in CPU-2.

h. When the operators think the system is not working and the PLCs do not detect any faults the operator can move the system input select switch from the "SYS-1" position to the "SYS-2" position. With the switch in the "SYS-2" position the PLCs are using System-2 inputs.

3.2.2 Programs

a. The Contractor shall provide two copies of all working programs (i.e. PLC logic, personal computer) on read only CD or DVD as well as a printed program listing.

b. The Contractor (programmer) shall provide rung comments (documentation) in the ladder logic program. Each device, on the ladder, shall be identified as to the type of device, i.e. limit switch XX, flow indicator XX, motor starter XX, etc. Rung comments shall be provided for input and output rungs. The programmer shall also provide a comment describing the function of each rung or group of rungs that accomplish a specific function.

[3.3 GRAPHICS DISPLAY PANEL (GDP)

The graphic display panel shall be shipped fully assembled in one piece after it has been shop tested as an integral part of the pump control panel and all defects corrected. The graphic display panel shall be able to depict the same screens as the personal computer displays. The default screen on the GDP shall be the graphic display screen. The other screens that the personal computer can display shall also be able to be chosen from the personal computer to be displayed here.

]3.4 GRAPHICS DISPLAY SCREEN

3.4.1 General

The graphic display screen shall be capable of being displayed on the personal computer and the GDP.

3.4.2 Display Presentation

Depict the process fuel flow schematically as indicated on the drawings. Integrate red, green, and amber symbols integrated with the process schematic to provide current equipment status graphically. Locate the symbols immediately adjacent to related equipment symbol.

3.4.3 Process Schematic

The process schematic graphic representation shall utilize conventional symbols when possible. Size and space symbols and flow lines so as to provide a clear representation of the system process. The Graphic Display shall be suitable for supervised field modification when future items are added. Minor changes may be incorporated to allow proper line width and spacing. Component arrangement, piping routing, and location of valves shall match the flow diagram.

3.4.4 Digital Flows, Pressures, and Level Indicators

Provide digital displays for the flows, pressures, and levels as indicated on the drawings.

3.5 INSTALLATION

Installation shall conform to the manufacturer's drawings, written recommendations and directions.

3.5.1 Shop Drawing

The shop drawing shall be clear and readable and preferably drawn using a computer aided drafting package. At the conclusion of the project the diagram drawings shall be redrafted to include all as-built conditions. These updated drawings shall be included in the O&M Manuals and appropriate section of the drawings placed in a data pocket located in each of the enclosures. The shop drawing at a minimum shall show:

a. Overall dimensions, front, side and interior elevation views of the PCP showing size, location and labeling of each device.

b. Overall dimensions, front elevation of the GDP showing graphical layout and size, location and labeling of each device.

c. Power ladder diagram indicating power connections between TVSS, power conditioners, PLCs, power supplies and field and panel devices. Any terminal block connection numbers used shall be indicated.

d. Control ladder diagram indicating control connections between field and devices and PLC I/O modules. Terminal block connection numbers and PLC terminal numbers shall be indicated.

e. Communication connections between PLCs and I/O racks. Communication channel numbers shall be indicated.

f. Bill of materials.

g. Written control sequence covering all inputs, outputs, and control scheme.

3.5.2 System Start-Up and Testing

a. At PCP start-up and testing the Contractor shall provide personnel, on site, to provide technical assistance, program fine tuning, and to start-up and test the system. Start-up and testing shall be coordinated with the overall fueling system start-up test specified in Section 33 08 53, AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Prior to this test, all connections shall have been made between the PCP, the personal computer, the motor control center, and all field devices. In addition, check wiring for continuity and short circuits. Adjust set point values, timing values, and program logic as required to provide a functional hydrant fuel control system. Once the system has been fine tuned and passed the system test, load the new system default values into the PLC EEPROM and adjust the personal computer screens to indicate the new values.

b. Submit a step-by-step testing procedure of the PCP, Testing Plan. Design the test to show that every device (lights, switches, personal computer display screens, alarms, etc.) on the PCP and personal computer is in working order and that the PLC program controls the system per specifications. Perform the test in conjunction with Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Include a place for the contractor and Government representative to initial each step of the plan after satisfactory completion and acceptance of each step. Certify and submit the complete initialed testing plan, Record of Test.

3.5.3 Training Plan for Instructing Personnel

Upon completion of the system start-up a competent technician regularly employed by the PCP manufacturer shall hold a training class for the instruction of Government personnel in the operation and maintenance of the system. Provide both classroom type theory instruction and hands-on instruction using operating equipment provided. The period of instruction shall be a minimum of three 8-hour working days. The training shall be designed to accommodate 8 operators, four maintenance personnel, and two programmers. The Government shall receive written notice (via Contracting Officer) a minimum of 14 days prior to the date of the scheduled classes.

a. Furnish a written lesson plan and training schedule for Government approval at least 60 days prior to instructing operating, maintenance and programming personnel. Concurrently submit above to the MAJCOM for their input into the review process. Approval of lesson plan will be based on both Government and MAJCOM concurrence. This plan shall be tailored to suit the requirements of the Government. The training shall be divided into three separate classes. Each class shall be tailored to a specific group of personnel. The groups are: 1) Operators, those that will use the control system on a day to day basis; 2) Maintenance personnel, those that will perform routine and non-routine maintenance and trouble shooting of the control system; 3) Programmers, those that will make changes to and trouble shoot the PLC and personal computer programs. The training program shall provide:

   (1) a detailed overview of the control system including the complete step-by-step procedures for start-up, operation and shut-down of the control system.
   (2) a general overview of programmable logic controllers
   (3) the maintenance of equipment installed
   (4) the programming of the PLC and Personal Computer
   (5) trouble shooting of the system

b. Use the complete approved Operation and Maintenance manuals for Section 33 09 54 PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS) and 26 20 00 INTERIOR DISTRIBUTION SYSTEM (specifically pertaining to the motor control center and its relay ladder diagrams) for instructing operating personnel. Include both classroom and hands-on field instruction. Record the class in DVD format.

c. Also provide training courses in DVD format covering system overview, operation, maintenance, trouble shooting, and programming. Produce these DVDs off-site using the supplied Pump Control Panel as the teaching aid, or commercially produced DVDs by the PLC manufacturer or third party who specializes in training on PLC systems. In conjunction with the DVDs, provide workbooks, which follow along with the DVDs.

3.6 PLC CONTROL SYSTEM SEQUENCE OF OPERATION

The following describes general functions of the fueling system components.

3.6.1 Abbreviations

a. SYS-1: components of System #1 including UPS#1, power supplies, CPU-1, I/O-1, and system #1 input and outputs.
b. SYS-2: components of System #2 including UPS#2, power supplies, CPU-2, I/O-2, and system #2 input and outputs.
c. CPU-1: SYS-1 PLC CPU.
d. CPU-2: SYS-2 PLC CPU.
e. I/O-1: SYS-1 PLC input/output modules.
f. I/O-2: SYS-2 PLC input/output modules.
g. PCP: Pump Control Panel.
h. PC: Personal Computer.
i. UPS: Uninterruptible Power Supply.
[j. GDP: Graphic Display Panel

]3.6.2 Operating Tanks

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NOTE: Use the following paragraphs for level alarms as electronic level switches are used for determining tank level alarms.
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3.6.2.1 Level Alarms

Each CUT-N-COVER tank has two level switches to monitor its fuel level. Connect the switches to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The following alarms shall be reported.

a. Low-Low Level: When the low-low level elevation is attained the associated tank's GDP low-low level light shall light. The alarm annunciator's critical alarm sequence activates, the tank's fueling pumps running in automatic mode shall be disabled and these pumps shall not be allowed to start automatically. If both tanks are at low-low level, no fueling pumps shall start automatically.

b. Low Level: When the low level elevation is attained the associated tank's GDP low level light shall light. The alarm annunciator's non-critical alarm sequence activates.

c. High Level: When the high level elevation is attained the associated tank's GDP high level light shall light and the alarm annunciator's non-critical alarm sequence activates.

d. High-High Level: When the high-high level elevation is attained the associated tank's GDP high-high level light shall light, the alarm annunciator's critical alarm sequence activates, fueling pumps running in automatic mode shall be disabled and no pump shall be allowed to start automatically.

3.6.2.2 Tank Outlet Valves

Each operating tank's outlet valve (I11 & I12) has two limit switchs to indicate valve position. The closed limit switch is connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. Close the closed limit switch when the valve is fully closed. When the closed limit switch is closed the associated tank's valve graphic display closed light shall activate. When the valve is fully open, the open limit switch is closed. At this time the associated tank's valve graphic display open light shall activate.

3.6.2.3 Level Annunciation

Each CUT-N-COVER tank has a level indicator/ATG (Automatic Tank Gauge) to measure its fuel level. Connect the ATG directly to the installation FAS System and additionally be connect to the PCP as shown on the drawings. Display the tank levels on the Graphic Screen.

3.6.3 Product Recovery Tank

3.6.3.1 Fuel Transfer Pump (FTP)

The pump's motor controller has a status relay to indicate the on/off status of the pump. Connect the status relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the pump's graphic display off light shall light. When the status relay is closed the pump's graphic display on light shall light. Also use the status relay state to start and stop the pumps elapsed run time timer.

3.6.3.2 Overfill Valve (OV)

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NOTE: The automatic starting and stopping of the fuel transfer pump is accomplished by the actuation of tank float switches connected to the control circuit in the motor control center. The PLC system does not control the starting and stopping.
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The tank's overfill valve has a limit switch to indicate valve position. Connect the switch, SPST, to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The switch shall close when the valve is fully closed. When the limit switch is closed the tank's graphic display valve closed light shall light and the alarm annunciator's non-critical alarm sequence activates. When the limit switch is open the tank's graphic display valve open light shall light.

3.6.3.3 High Level Alarm

The tank has a high level alarm float switch. Connect the switch, SPST, to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the high level alarm float is activated the tank's graphic display high level light shall light and the alarm annunciator's critical alarm sequence activates.

3.6.3.4 Leak Detection

The tank has a leak detection system. Connect the leak detection systems alarm relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When the leak alarm is activated the alarm annunciator's non-critical alarm sequence activates.

3.6.4 Fueling Pumps (FP)

There are ten fueling pumps with five being in each tank. A maximum of four fueling pumps could run concurrently from one tank. A lead tank selector switch determines which tanks pumps are active. The lead pump selector switchs shall select the pump starting sequence in each tank. Each pump's motor controller has a status relay to indicate the on/off status of the pump. Connect the status relay to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. When status relay is open the associated pump's graphic display off light shall activate and screen number 2 shall indicate on. When the status relay is closed the associated pump's graphic display on light shall activate and screen number 2 shall indicate off. The status relay state shall also be used to start and stop the pumps elapsed run time timer and shall be displayed on screen number 2.

3.6.5 Flow Switch, Fueling Pump

On the discharge side of each pump is a flow switch to indicate positive flow (fail safe feature). The flow switch is DPDT for redundancy and each pole shall be connected to both SYS-1 and SYS-2 as indicated on the

Terminal Block Connection drawing. If the PLC has given a signal to start a pump and the flow switch has not closed before the set point timer expires or if the flow switch opens after the pump has been running then the pump shall be in a failure state and it shall be disabled (taken out of the starting sequence), the alarm annunciator's non-critical alarm sequence shall also be activated, and the next pump in the start sequence started. After the PLC has stopped all of the pumps, any failed pump shall be added back into the start sequence.

3.6.6 Transmitters

3.6.6.1 Pressure Indicating Transmitter (PIT)

The PIT's measure system pressure in pounds per square inch. There are two PITs for redundancy. PIT-1 and PIT-2 are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The system pressure is sent to personal computer display. PIT-3 is connected directly to the Tightness Test Panel.

3.6.6.2 Differential Pressure Transmitter (DPT)

The DPT's measure flow in gallons per minute. There are two issue DPTs (DPT-1 and DPT-2) and two return DPTs (DPT-3 and DPT-4) for redundancy. The DPTs are connected to both SYS-1 and SYS-2 as indicated on the Terminal Block Connection drawing. The net flow is sent to the personal computer display. The issue rate, return rate and net flow shall be displayed on the personal computer.

3.6.6.3 Pressure Sensors (PS)

The PS measure system pressure in pounds per square inch. There are three PS installed on the system and there are PCP preparations made for a fourth PS to be temporarily wired in from a Hydrant Pit. PS-1, PS-2, PS-3, and PS-4 are connected to SYS-1 only as indicated on the Terminal Block Connection drawing. These sensors shall report various system pressures to the personal computer to be used for the system pressure test and for the creation of the system graphs as required for screen 7 and described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP.

3.6.7 Control Valves

3.6.7.1 Defuel/Flush Valve (D/FV)

Connect the D/FV to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. Activate the graphical display open and closed lights and screen number 2 status based on the PLC's output status for the valve. Base the valve status on the table listed below.

Defuel/Flush Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Flush Mode	Open	De-energized	Energized	Open

Defuel/Flush Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pump(s) On	Closed	De-energized	De-energized	Closed
Automatic Mode Pumps Off	Enabled	Energized	De-energized	Closed
Off Mode Pump(s) On	Closed	De-energized	De-energized	Closed
Off Mode Pumps Off	Enabled	Energized	De-energized	Closed
Tightness Test	Closed	De-energized	De-energized	Closed

3.6.7.2 Pressure Control Valve (PCV)

Connect the PCV to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. The graphical display enabled and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. Base the valve status on the table listed below.

Pressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Automatic Mode Pump(s) On	Closed	Energized	De-energized	Closed
Flush Mode Pumps On	Closed	Energized	De-energized	Closed
Flush Mode Pumps Off	Enabled	De-energized	De-energized	Closed
Off Mode Pump(s) On	Closed	Energized	De-energized	Closed
Off Mode Pumps Off	Enabled	De-energized	De-energized	Enabled
Tight. Test-Hi Pres	Closed	Energized	De-energized	Closed
Tight. Test-Static	Enabled	De-energized	De-energized	Enabled
Tight. Test-Low Pres	Enabled	Energized	Energized	Enabled

3.6.7.3 Backpressure Control Valve (BPCV)

Connect the BPCV to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. The graphical display enabled and closed lights and screen number 2 status shall activate based on the PLC's output status for the valve. Base the valve status on the table listed below.

Backpressure Control Valve Operation - Two Solenoids				
Fueling Mode per PCP Selector Switch	Valve Action	Solenoid A	Solenoid B	Graphical Display
Automatic Mode Pump Start-Up	Enabled	Energized	De-energized	Enabled
Automatic Mode Prior to Lead Pump Shutoff	Closed	De-energized	De-energized	Closed
Flush Mode	Closed	De-energized	De-energized	Closed
Off Mode Pump(s) On	Enabled	Energized	De-energized	Enabled
Off Mode Pumps Off	Closed	De-energized	De-energized	Closed
Tight. Test-Hi Pres	Enabled	De-energized	Energized	Enabled
Tight. Test-Low Pres	Closed	De-energized	De-energized	Closed

3.6.8 Safety Circuit

3.6.8.1 Emergency Stop Status

Connect the emergency stop circuit status relay (ER1) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the circuit is activated the alarm annunciator's critical alarm sequence is activated and any calls to start fueling pumps shall be canceled and no additional pump start signals shall be sent until the circuit has been reset. The fueling pumps shall actually be stopped by a emergency stop circuit status relay (ER2) N.O. contact in the fuel pump motor control circuit located in the motor control center.

3.6.8.2 Emergency Shutoff Valves (ESO) Status

Connect the ESO status relay (ER2) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the GDP valve open lights shall light. When the relay is open the GDP valve closed lights shall light.

3.6.8.3 Circuit Power Status

Connect the safety circuit power status relay (ER3) N.O. contact to I/O-1, I/O-2 and UPS#3 as indicated on the Terminal Block Connection drawing. When the relay is closed the PCP emergency circuit power on light shall light.

3.6.9 Pump Control Panel

3.6.9.1 CPU Faults

The PCP mounted CPU-1 and CPU-2 on lights are connected to both SYS-1 and SYS-2. The associated CPU light shall light when no system faults are detected. When a fault is detected by the CPU or it's redundant CPU the faulted CPU's on light shall be turned off and the alarm annunciator's non-critical alarm sequence shall be activated.

3.6.9.2 Input Select Switch

The 2-position input select switch shall control which inputs (System-1 or System-2) are being used. Connect each switch position to both SYS-1 and SYS-2. The OI display shall indicate the active system.

3.6.9.3 Mode Select Switch

The 4-position switch selects what mode of fueling is active: automatic, flush, Tightness Test or off. Connect each switch position to both SYS-1 and SYS-2. The screen number 2 status shall indicate the active mode.

3.6.9.4 Lead Tank Selector Switch

The 2-position switch selects which tank shall be the operating tank. The screen number 2 status display shall indicate the operating tank.

3.6.9.5 Lead Pump Selector Switchs

The two 5-position switchs select which pump shall be the lead pump in a given tank. The switch position shall fix the starting sequence for all pumps. The sequences for tank one shall be 1-2-3-4-5, 2-3-4-5-1, 3-4-5-1-2, 4-5-1-2-3, and 5-1-2-3-4. The sequences for tank two shall be 6-7-8-9-10, 7-8-9-10-6, 8-9-10-6-7, 9-10-6-7-8, and 10-6-7-8-9. The off sequence shall be the reverse of the start sequence; therefore, first on shall be last off. A maximum of four pumps are allowed to run at one time. If a pump fails to start or fails during operation, disable that pump and start the next pump in the sequence. The screen number 2 status display shall indicate the lead pump.

3.6.9.6 PCP Temperature Alarm

The alarm thermostat when activated shall activate the alarm annunciator's non-critical alarm sequence.

3.7 OPERATING PROGRAM REQUIREMENTS

Store the control system's logic program on an EEPROM chip. Permanently store default values of operator adjustable parameters on the chip with the capability of resetting the values in RAM to the values within the range specified below. The default values can be changed through the use of the personal computer (after the correct password has been entered). After loss of power and battery failure the adjustable settings shall revert back to the default values located on the chip. The default values shown here shall be reset to the values determined during the system start up and test.

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Lead pump starting pressure	30 to 150 psi	60 psi
Issue flow to start second pump in sequence	450 to 650 gpm	560 gpm
Issue flow to start third pump in sequence	1000 to 1300 gpm	1160 gpm

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Issue flow to start fourth pump in sequence	1600 to 1900 gpm	1760 gpm
Return flow to enable next pump in sequence to start	10 to 100 gpm	40 gpm
Return flow to stop fourth, third, and second pump in sequence (lag pump)	500 to 800 gpm	700 gpm
Return flow to initiate lead pump shutdown sequence	500 to 800 gpm	560 gpm
Timer to enable start-up of lead pump	0 to 120 seconds	0 seconds
Timer to enable second, third, and fourth pumps to start	0 to 120 seconds	10 seconds
Timer to stop fourth, third, and second pumps	0 to 120 seconds	15 seconds
Timer to stop first pump	0 to 60 seconds	2 seconds
Timer to de-energize (close) Back Pressure Control Valve	0 to 360 seconds	300 seconds
Timer to establish fueling pump failure	5 to 30 seconds	15 seconds
System pressure to stop lead pump	130 to 190 psig	140 psig
Operating Tank No. 1 Low-Low level indication	0 to 6 feet	1.6773 feet
Operating Tank No. 2 Low-Low level indication	0 to 6 feet	1.6773 feet
Operating Tank No. 1 Low level indication	0 to 6 feet	2.22 feet
Operating Tank No. 2 Low level indication	0 to 6 feet	2.22 feet
Operating Tank No. 1 High level indication	18 to 24 feet	21 feet 3 inches
Operating Tank No. 2 High level indication	18 to 24 feet	21 feet 3 inches

SET POINT DESCRIPTION	SET POINT RANGE	DEFAULT VALUE
Operating Tank No. 1 High-High level indication	18 to 24 feet	22 feet 5-1/2 inches
Operating Tank No. 2 High-High level indication	18 to 24 feet	22 feet 5-1/2 inches
Should the operator enter a value not within the range for that parameter, the personal computer shall indicate "INVALID ENTRY" and revert back to the previous value.		
A number inside braces, {x}, in the following paragraphs indicates that the number may be changed by the operator via the operator interface within the Set Point Range listed above.		

3.8 AUTOMATIC MODE - IDLE CONDITION

The fueling system is intended to remain continuously pressurized while in the idle condition. This allows the system to respond immediately to aircraft refueling and defueling requirements. Periodically, in the idle condition, the system will lose minimal pressure. When this occurs, the control system shall automatically repressurize in the following sequence:

a. Start the lead pump when the system pressure is less than 60 psig continuously for 0 seconds. Reset the timer if the pressure then rises above 60 psig before the timer expires.

b. After the timer expires:

   (1) Energize the BPCV solenoid 'A' to enable the valve to modulate the system pressure at it's set point.

   (2) Energize the PCV solenoid 'A' to close the valve.

   (3) De-energize the D/FV solenoid 'A' so the valve is closed and solenoid 'B' is de-energized.

c. With the lead pump running, 600 gpm flows through the issue venturi. The system pressure upstream of the BPCV shall increase to the BPCV set point of 130 psig. At this pressure the BPCV shall start to open and the valve modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With the lead pump running and no fueling demand the return venturi flow rate shall equal the issue venturi flow rate. When the return venturi flow rate is greater than 560 gpm a 300 second timer shall start. If the flow rate drops below 560 gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

e. After the timer expires:

(1) The BPCV solenoid 'A' shall be de-energized to close the valve.

(2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

(3) When system pressure rises to 140 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

(4) The Defuel/Flush valve solenoid "A" shall be energized 30 seconds after lead pump shut down to allow it to open at 80 psig for defuel operations.

f. The system has now returned to a pressurized and idle condition.

g. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

h. If a fueling pumps flow switch opens after the pump has successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

3.9 AUTOMATIC MODE - REFUELING CONDITION

To start an aircraft fueling operation, an operator connects fueling equipment such as a hydrant hose truck to an aircraft and to a hydrant control valve. When the operator opens the hydrant control valve by use of an hydraulic operated "Deadman", the following sequence occurs:

a. The lead pump will start when the PIT senses a pressure less than {60} psig continuously for {0} seconds. If the pressure then rises above {60} psig before the timer expires, the timer shall reset.

b. After the timer expires:

(1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid 'A' shall be energized to close the valve.

(3) The D/FV solenoid 'A' shall be de-energized so the valve is closed and solenoid 'B' shall be de-energized.

c. With the lead pump running, ±600 gpm will flow through the issue venturi. The system pressure upstream of the BPCV will increase to the BPCV set point of 130 psig. At this pressure the BPCV will start to open and the valve will modulate as required to pass sufficient flow through the return venturi to maintain pressure upstream of the valve.

d. With lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {40} gpm and less than {560} gpm the lead pump will continue to run and the BPCV will modulate to pass flow as necessary to maintain upstream system pressure.

e. With the lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate greater than {560} gpm a {300} second timer shall start. If issue venturi flow rate falls below {560} gpm or the return venturi flow rate falls below {560} before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

f. After the timer expires:

(1) The BPCV solenoid 'A' shall be de-energized to close the valve.

(2) The PCV solenoid 'A' shall be de-energized to bleed system pressure to 75 psig.

(3) When system pressure rises to 140 psig a {2} second timer shall start. After the timer has expired, the lead pump shall be stopped.

(4) The Defuel/Flush valve solenoid "A" shall be energized 30 seconds after lead pump shut-down to allow it to open at 80 psig for defuel operations.

g. With the lead pump running and a issue venturi flow rate greater than {560} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {560} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

h. After the timer expires: The second pump shall start.

i. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead and second pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

j. With the lead and second pumps running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If issue venturi flow rate falls below {1160} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

k. After the timer expires: The second pump shall be stopped.

l. With the lead and second pump running and a issue venturi flow rate greater than {1160} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {1160} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

m. After the timer expires: The third pump shall start.

n. With the lead, second and third pumps running and a issue venturi flow rate greater than {1760} gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead, second and third pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

o. With the lead, second and third pumps running and issue venturi flow rate greater than {1760} gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If the issue venturi flow rate falls below {1760} gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

p. After the timer expires: The third pump shall be stopped.

q. With the lead, second and third pumps running and a issue venturi flow rate greater than {1760} gpm and a return venturi flow rate less than {40} gpm a {10} second timer shall start. If the issue venturi flow rate falls below {1760} gpm or the return venturi flow rate rises above {40} gpm before the timer expires, the timer shall reset, and no changes shall be made to the pump and valve status.

r. After the timer expires: The fourth pump shall start.

s. With the lead, second, third and fourth pumps running and a issue venturi flow rate greater than 2360 gpm and a return venturi flow rate of greater than {40} gpm and less than {700} gpm the lead, second, third and fourth pumps shall continue to run and the BPCV shall modulate as necessary to maintain system pressure.

t. With the lead, second, third and fourth pumps running and a issue venturi flow rate greater than 2368 gpm and a return venturi flow rate greater than {700} gpm a {15} second timer shall start. If the issue venturi flow rate falls below 2360 gpm or the return venturi flow rate falls below {700} gpm before the timer expires, the timer shall reset and no changes shall be made to the pump and valve status.

u. After the timer expires: The fourth pump shall be stopped.

v. When a fueling pump is called to start, a 15 second timer shall start. If the timer expires before the flow switch closes the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

w. If a fueling pumps flow switch opens after the pump successfully started the pump shall be called off, the alarm annunciator's associated non-critical alarm sequence shall activate and the next pump in the sequence shall be called to start.

3.10 AUTOMATIC MODE - DEFUELING CONDITION

To start an aircraft defuel operation, an operator connects a hydrant hose truck to an aircraft and a fuel sense line and an air sense line to the hydrant control valve. The hydrant hose truck has an on-board defuel pump capable of delivering 300 gpm at 165 psig. When the operator starts the defuel operation one of the following occurs:

a. If the fueling pumps are running (D/FV closed) the fuel being removed from the aircraft will either go to the other aircraft(s) connected to the system or be returned to the pumphouse where the BPCV will modulate to control system pressure and the fuel will be returned to the operating tanks. The return venturi flow rate will control the number of pumps that are on as discussed in paragraph "AUTOMATIC MODE - FUELING CONDITION".

b. If the fueling pumps are off (D/FV enabled) the fuel being removed from the aircraft will be returned to the pumphouse and both the D/FV and the PCV will modulate to return the fuel to the operating tanks.

3.11 FLUSH MODE

This mode shall be used when the system need to be flushed of water or sediment. The operators will first place the manual valve in the desired position to select the appropriate flow path. Placing the selector switch in "flush" the following shall occur:

a. The BPCV solenoid 'A' shall be de-energized to force it closed.

b. The D/FV solenoid 'A' shall be de-energized to allow the valve to open and the D/FV solenoid 'B' shall be energized to force it open.

c. Start the fueling pump(s) manually using the Hand-Off-Auto or Hand-Auto switch to obtain the desired flow rate. The automatic pump starts shall be disabled in this mode.

d. The PCV solenoid 'A' shall be energized when pump(s) are on and de-energized when the pumps are off.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

3.12 TIGHTNESS TEST MODE

This mode shall be used in conjunction with the Tightness Monitoring Panel provided by Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENTto perform tightness tests. Placing the selector switch to "TIGHTNESS TEST" the PCP shall send a signal to the Tightness Monitoring Panel telling it that it is ready to preform the tests. At this time it also operates three MOV valves, closing I25 and I26 and opening I27. The PCP then receives signals from the Tightness Monitoring Panel to prepare for High Pressure Test, run High Pressure Test, Prepare for Low Pressure Test, run Low Pressure Test, prepare for Second High Pressure Test, run Second High Pressure Test, and when the test is over. The following PCP actions will occur after the corresponding signal:

3.12.1 High Pressure Test Preparation

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The D/FV solenoid "A" shall be de-energized and the D/FV solenoid "B" shall be de-energized to force it closed.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be Energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 shall be opened.

h. The pump will continue to run until such time as the run High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the High Pressure test.

3.12.2 Run High Pressure Test

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be d-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a 10 minute settling time to pass, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP to Prepare for the Low Pressure Test.

3.12.3 Low Pressure Test Preparation

a. MOV I32 will be opened.

b. The PCV solenoid "A" will be energized and the PCV solenoid "B" will be energized to enable the valve at the 50 psi value.

c. The system will remain in this status until such time as the PCP receives a Run Low Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will monitor the loop pressure until it reaches the 50 psi value. It will then instruct the PCP to run the Low pressure test.

3.12.4 Run Low Pressure Test

a. MOV I32 will be closed.

b. The system will remain in this status until such time as the PCP receives a Prepare for Second High Pressure test signal from the Tightness Monitoring Panel. Note: The Tightness Monitoring Panel will wait for a 10 minute settling period to expire, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP to prepare for Second High Pressure Test.

3.12.5 Second High Pressure Test Preparation

a. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be energized to enable the valve at the 160 psi value.

b. The D/FV solenoid "A" shall be de-energized and the D/FV solenoid "B" shall be de-energized to force it closed.

c. Automatically start the lead fueling pump to obtain pressure.

d. The PCV solenoid "A" shall be de-energized and PCV solenoid "B" shall be de-energized to close the valve.

e. When a fueling pump is started, a 15 second timer shall start. If the timer expires before the flow switch closes the alarm annunciator's associated non-critical alarm sequence shall activate.

f. If a fueling pumps flow switch opens after the pump successfully started the alarm annunciator's associated non-critical alarm sequence shall activate.

g. MOV I32 will be opened.

h. The pump will continue to run until such time as the run Second High Pressure test signal is received. Note: the Tightness Monitoring Panel is monitoring the Loop pressure and when it is satisfied that it is high enough it will instruct the PCP to Run the Second High Pressure test.

3.12.6 Run Second High Pressure Test

a. MOV I32 will be closed.

b. Fueling pump will be shut off.

c. The BPCV solenoid "A" shall be de-energized and the BPCV solenoid "B" shall be de-energized to close valve.

d. The PCV solenoid "A" will be de-energized and the PCV solenoid "B" will be de-energized to enable the valve at the 75 psi value. Note: the Tightness Monitoring Panel will wait for a 10 minute settling time to pass, then it will monitor the loop pressure for 2 minutes. Upon finishing this test it will instruct the PCP that testing is finished.

e. The PCP will leave the system as is until such time as the PCP selector switch is placed into a different mode.

3.13 OFF MODE

a. Automatic starting of fueling pumps shall be disabled. All other functions (GDP, alarm annunciator, operator interface, control valve solenoids, etc.) shall be active to allow manual control of the fueling pumps using the Hand-Off-Auto or Hand-Auto switch.

b. When the first pump has been started:

(1) The BPCV solenoid 'A' shall be energized to enable the valve to modulate the system pressure at it's set point.

(2) The PCV solenoid 'A' shall be energized to close the valve.

(3) The D/FV solenoid 'A' shall be de-energized so the valve is closed and solenoid 'B' shall be de-energized.

c. The second, third and fourth pumps maybe started or stopped manually as needed by the operator.

d. After the last pump has been stopped:

(1) The BPCV solenoid 'A' shall be de-energized.

(2) The PCV solenoid 'A' shall be de-energized.

(3) The D/FV solenoid 'A' shall be energized and D/FV solenoid 'B' shall be de-energized.

3.14 MANUAL OPERATION OF FUELING PUMPS

a. If the PLC system is still active see paragraph OFF MODE.

b. If the PLC system has no power or both CPUs have faulted (CPU lights on PCP off) the pumping system will be in a completely manual mode. The safety circuit will need power so that the ESO solenoids on the non-surge check valves will be open and fuel can flow. The solenoids on the other solenoid controlled valves will be de-energized so the valves will have to be manually opened or enabled for the system to run. Other valves may need to be opened or closed manually by the operators for the system to work properly.

3.15 4-VALVE MANIFOLD SUPERVISION

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NOTE: The drawing referenced below is from the DEPARTMENT OF DEFENSE CUT'N'COVER STANDARDS STORAGE TANK/PUMPHOUSE AND FILTER BUILDING Standard Drawings. Add the drawing to the design package if applicable.
****

a. Prior to initiating fueling operations in the automatic or in the test mode, the 4-valve manifold valves and the two tank outlet valves must be in the proper positions for successful fueling operations. The PLC shall monitor valve positions of the 4-valve manifold (sensed by position limit switches for fully opened and fully closed status on valves I34, I35, R10, and R11) and by monitoring valve status on the tank outlet valves (sensed by position limit switches for fully opened and fully closed status on valves I11 and I12). Valve position must conform to the valve position table listed on drawing M-204.

b. If the system is placed in automatic or test mode the valve selections must conform to the position table on sheet M-204. If the valve positions do not conform to this table the PCP will show a 4-Valve manifold error on the alarm annunicator. The alarm can be silenced, but will not reset until such time as the valve positions do conform to the table.

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA UFGS-33 52 43.11 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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DIVISION 33 - UTILITIES

SECTION 33 52 43.11

AVIATION FUEL MECHANICAL EQUIPMENT

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-- End of Section Table of Contents --

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 52 43.11 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 52 43.11

AVIATION FUEL MECHANICAL EQUIPMENT
02/10

****
NOTE: This guide specification covers the requirements for geneal equipment required for aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 1615	(1996; R 2001) Installation of Underground Petroleum Storage Systems

ASME INTERNATIONAL (ASME)

ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B40.100	(2005) Pressure Gauges and Gauge Attachments
ASME BPVC SEC VIII D1	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM C 827	(2001a; R 2005) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2008; Errata 08-1) Flammable and Combustible Liquids Code
NFPA 70	(2008; AMD 1 2008) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS3275	(2009; Rev C) Sheet, Acrylonitrile Butadiene (NBR) Rubber and Non-Asbestos Fiber Fuel and Oil Resistant

STEEL TANK INSTITUTE (STI)

STI P3	(2009) Specification and Manual for External Corrosion Protection of

Underground Steel Storage Tanks

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441	(2009; Rev D) Paint, Epoxy-Polyamide, General Specification for
MIL-DTL-38219	(2003; Rev D) Turbine Fuel, Low Volatility, JP-7
MIL-DTL-5624	(2008; Rev U; Notice 1) Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-DTL-83133	(2008; Rev F) Turbine Fuels, Aviation, Kerosene Types, JP-8 (NATO F-34), NATO F-35 and JP-8 + 100 (NATO F-37)
MIL-DTL-83413	(Rev B) Connectors and Assemblies, Electrical, Aircraft Grounding, General Specification for
MIL-DTL-83413/4	(Rev B) Connectors and Assemblies, Electrical, Aircraft Grounding: Plugs, for Types I and II Grounding Assemblies
MIL-DTL-83413/7	(Rev C) Connectors and Assemblies, Electrical, Aircraft Grounding Clamp Connector for Types I and III Grounding Assemblies, Clip, Electrical
MIL-PRF-370	(Rev J) Hose And Hose Assemblies, Nonmetallic: Elastomeric, Liquid Fuel
MIL-PRF-4556	(1999; Rev F; Am 1) Coating Kit, Epoxy, for Interior of Steel Fuel Tanks
MIL-STD-130	(Rev N) Identification Marking of U.S. Military Property
MIL-STD-161	(2005; Rev G) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50696	(Basic) Reels, Static Discharge, Grounding, 50 and 75 Foot Cable Lengths

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)

UNDERWRITERS LABORATORIES (UL)

UL 142	(2006; R 2007) Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids

UL 58	(1996; R 1997 thru 1998) Standard for Steel Underground Tanks for Flammable and Combustible Liquids

1.2 ADMINISTRATIVE REQUIREMENTS

Submit detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operation of the equipment and systems. Provide the drawings as one package with the design analysis. Shop fabrication drawings shall include type of material, configuration, thickness, and necessary details of construction of the steel tank and vault. Shop drawings shall also show the steel grating and supports. Submit Manufacturer's Catalog Data and Certificates of Compliance. Operation and maintenance information shall be submitted for the equipment items or systems listed in PART 2. Automatic pump controls shall include step-by-step procedures required for system startup, operation, and shutdown. Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted for various types of equipment and systems.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Meters[; G][; G, [_____]]
Venturi Tubes[; G][; G, [_____]]
Water Draw-off System[; G][; G, [_____]]
Truck Offload System[; G][; G, [_____]]
Operating Tank Vent[; G][; G, [_____]]
Hydrant Outlet Pits and Isolation Valve Pits[; G][; G, [_____]]
High Point Vent and Low Point Drain Pits[; G][; G, [_____]]
Product Recovery Tank and Accessories[; G][; G, [_____]]
Day Tank[; G][; G, [_____]]
Bowser Pumpoff Pump[; G][; G, [_____]]
Tightness Monitoring System[; G][; G, [_____]]

SD-03 Product Data

Pressure Gages[; G][; G, [_____]]
Automatic Pump Controls[; G][; G, [_____]]
Meters[; G][; G, [_____]].
Product Recovery Tank and Accessories[; G][; G, [_____]]
Day Tank[; G][; G, [_____]]
Truck Offload System[; G][; G, [_____]].
Operating Tank Vent[; G][; G, [_____]].
Hydrant Outlet Pits and Isolation Valve Pits[; G][; G, [_____]]
High Point Vent and Low Point Drain Pits[; G][; G, [_____]]
Operating Tank Level Indicator[; G][; G, [_____]]
Operating Tank Level Switches[; G][; G, [_____]]
Water Draw-Off System[; G][; G, [_____]]
Venturi Tubes[; G][; G, [_____]].
Bowser Pumpoff Pump[; G][; G, [_____]]
Tightness Monitoring System[; G][; G, [_____]]

SD-06 Test Reports

Leak Detection Monitor[; G][; G, [_____]]
Tightness Monitoring System[; G][; G, [_____]]
Coating Testing[; G][; G, [_____]]

SD-07 Certificates

System Supplier[; G][; G, [_____]]
Tightness Monitoring System[; G][; G, [_____]]

SD-10 Operation and Maintenance Data

Automatic Pump Controls[; G][; G, [_____]]
Product Recovery Tank and Accessories[; G][; G, [_____]]
Day Tank[; G][; G, [_____]]
Truck Offload System[; G][; G, [_____]]
Operating Tank Vent[; G][; G, [_____]].
Operating Tank Level Indicator[; G][; G, [_____]]
Water Draw-off System[; G][; G, [_____]].
Tightness Monitoring System[; G][; G, [_____]]

1.4 QUALITY ASSURANCE

Submit the following data for approval:

a. Certification stating that the system supplier has provided and installed at least five PLC-based pump control systems in the last five years, for automatic cycling of pumps based upon varying dispensing demands, utilizing multiple pumps. These systems shall be for dispensing jet fuel.

b. Certification that six systems have been successfully operated over the last three years and are currently in service.

c. Project names, locations, system description, and items provided at these installations. Include user point-of-contact and current telephone numbers.

PART 2 PRODUCTS

2.1 MATERIALS

Materials of construction shall be stainless steel, aluminum or nonferrous material except meter case may be steel with electrolyses nickel plated internals coated to 3 mil thickness. No ferrous or zinc-coated material bronze, brass or other copper bearing alloys shall be used in contact with the fuel.

2.1.1 Types of Fuel

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NOTE: Select type of fuel and insert expected temperature extremes.
****

Components shall be suitable for use with [JP-4 turbine fuel; specific gravity 0.76 at 60 degrees F; viscosity 0.92 CS at 60 degrees F; Reid vapor pressure 2 to 3 psi, MIL-DTL-5624] [JP-5 turbine fuel; specific gravity 0.82 at 60 degrees F; viscosity 1.62 CS at 60 degrees F; Reid Vapor pressure less than 0.05 psi, MIL-DTL-5624] [JP-7 turbine fuel; specific gravity 0.79 at 60 degrees F; viscosity 1.95 CS at 60 degrees F; Reid vapor pressure less than 0.05 psi, MIL-DTL-38219] [JP-8 turbine fuel; specific gravity 0.81 at 60 degrees F; viscosity 1.62 CS at 60 degrees F; Reid vapor pressure less than 0.05 psi, MIL-DTL-83133]. Components to be ANSI Class 150 (275 PSIG at 100 degrees F.) unless noted otherwise. Components to be suitable for outside, unsheltered location, and to function normally in ambient temperatures between [_____] degrees F and [_____] degrees F.

2.1.2 Composition of Materials

Materials in contact with the fuel shall be noncorrosive. No zinc-coated metals, brass, bronze, iron, lead or lead alloys, copper or copper alloys, or other light metal alloys containing more than 4 percent copper shall be used in contact with the fuel.

2.1.3 Gaskets

Gaskets shall be in accordance with Section 33 52 43.13 AVIATION FUELING PIPING.

2.1.4 Bolts and Nuts

Bolts and nuts shall be in accordance with Section 33 52 43.13 AVIATION FUELING PIPING.

2.2 EQUIPMENT AND MATERIAL

2.2.1 General

All items of equipment and material shall be new and of the best quality used for the purpose in commercial practice and shall be products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address and catalog number on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. The gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded. Equipment, assemblies and parts shall be marked for identification in accordance with MIL-STD-130 and MIL-STD-161. Pump and filter vessel numbers shall be as indicated on the drawings. In addition, filter vessels shall include element numbers and the date of the next element change. Identification tags made of brass, stainless steel, or engraved anodized aluminum, indicating valve number and normally open (NO) or normally closed (NC) shall be installed on valves. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No 12 AWG, copper wire, stainless or aluminum hanging wires, or chrome-plated beaded chain designed for that purpose.

2.2.2 Supplier

Since the pump control system, including but not limited to pump control panel, venturi tubes, transmitters, flow switches, fueling system pumps, all field instrumentation, tightness monitoring system, and control valves with all hardware and software, is an integrated system it shall be furnished by a single systems supplier regularly engaged in the supplying of this equipment. System Supplier shall be a company whose regular, normal, and primary business is representing manufacturers in the distribution and start-up of aviation fueling facilities, and have no affiliation with the Contractor other than as a seller to the Contractor. Supplier shall provide all equipment and appurtenances regardless of manufacture, be a factory authorized certified representative, and be responsible to the Contractor for satisfactory operation of the entire system, and shall oversee the installation of the equipment. Substitutions of functions specified will not be acceptable. The Contractor and the System Supplier shall be present at the system commissioning, and shall coordinate and schedule the work during construction, testing, calibration, and acceptance of the system. The System Supplier shall be responsible to the Contractor for scheduling all Contractor, Sub-contractor, and manufacturer's service personnel during system start-up and final commissioning.

2.3 ELECTRICAL EQUIPMENT

Motors, manual or automatic motor control equipment except where installed in motor control centers, and protective or signal devices required for the operation specified herein shall be provided under this section in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Any wiring required for the operation specified herein, but not shown on the electrical plans, shall be provided under this section in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.4 PRESSURE GAGES

Pressure gages shall conform to ASME B40.100 with metal cases and 4-inch diameter white dials. Gages shall be bottom connected, without back flanges. A pulsation dampener, adjustable to the degree of dampening required, shall be provided for each gage. Range of gages shall be as indicated. A ball valve shall be provided for each pressure gage. Gages shall have all parts immersed in silicone oil. Gages shall be labeled with the calibration date.

2.5 AUTOMATIC PUMP CONTROLS

The pressure and flow transmitters specified in this paragraph shall be obtained from a single supplier of such products. The same supplier shall also furnish the associated venturi tubes and GPM meter. The supplier shall be responsible for furnishing components that are compatible and that operate as a system to perform the required pump control functions. Control tubing between controls/instruments and fuel lines shall be installed to eliminate air entrapment. Control tubing shall be as specified in Section 33 52 43.13 AVIATION FUELING PIPING. Each item of equipment specified hereafter shall have manufacturer's authorized service personnel present to assist in PERFORMANCE TESTING as specified in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP. Items specified under this paragraph shall be submitted for approval concurrently with items specified in Section 33 09 53 AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM.

2.5.1 Pressure Indicating Transmitters

Pressure indicating transmitters shall consist of a capacitance sensor operating on a differential in pressure of fuel (one side being open to atmospheric pressure). The output shall be a 4 - 20 mA dc, linear signal between 0 - 100 %percent of the input. It simultaneously will produce a digital HART (Highway Addressable Remote Transducer) output signal. Loop power shall be provided from remote power supply located in the pump control panel (PCP).

a. Transmitter body shall be stainless steel with stainless steel diaphragm capsule process connecting to a 1/2 inch NPT. Drain and vent valves to be stainless steel. Accuracy shall be ± 0.20 percent of calibrated span including combined effects of linearity, hysteresis and repeatability.

[b. One pressure indicating dial shall be supplied with each pair of transmitters. Pressure indicating dials shall consist of a bellows type pressure sensing element operating on a differential in pressure of fuel (one side being open to atmospheric pressure) and a mechanical indicator (driven by the bellows unit). The bellows shall be dual opposed, liquid filled, rupture-proof type with bellows movement converted to rotation and transmitted by a torque tube. Bellows housing shall be stainless steel and shall have a rated working pressure of not less than 500 psi with a minimum differential pressure range of 0 to 250 psi. Liquid used to fill the bellows shall be suitable for the expected minimum ambient temperature. The indicating dial shall be at least 6 inches in diameter with a weatherproof glass cover. The case shall be finished with a weather resistant epoxy resin enamel. The indicating pointer shall traverse a 270 degrees arc. The scales shall be graduated over the selected pressure ranges so that the pressure can be read in psig. Indicator accuracy shall be 0.75 percent of full scale. Pressure indicating dial shall be provided with suitable over-range protection.]

[c. Display at the pressure transmitter shall be LCD, one per each transmitter. The digital scale shall be a 4 digit LCD capable of being read in low light/no light conditions. Indicator scale shall be in psig.]

****
NOTE: Select type of display per directions from COMMAND FUELS FACILITY Engineer.
****

d. Pressure transmitters shall be UL, FM, or CSA listed for Class 1, Division 1, Group D hazardous environment as defined by NFPA 70, with maximum temperature rating T2D (419 degrees F). Each transmitter and dial shall be supplied with a factory assembled two valve stainless steel manifold. Vent valves shall be furnished on upper ports of each transmitter and dial. Pressure transmitters and the indicating dial shall be suitable for mounting on a 2-inch pipe stand. Complete installation shall be in accordance with manufacturer's recommendations.

e. Provide a HART (Highway Addressable Remote Transducer) protocol interface handheld calibration device. Communicator to be intrinsically safe and have Class 1, Div 1, Group C and D approval. Device to include NIST traceable modules, one 0-500 psig range, one 0-2000 wc, and also one protection module for open sensor bay. Unit shall be furnished in hard carrying case and to include 250 ohm shunt for HART communicator, A900 HART test lead kit, 145 psig pressure pump with variator, low pressure fittings and tubing kit. Hand-held pump capable of producing a minimum of 300 psig pressure.

2.5.2 Flow Switches

Switches shall be actuating vane type flow switch with single adjustable set-point. Switches shall mount on ASME B16.5 Class 150 raised face flange. Flange material shall match the piping material at their connection to the system. Provide snap action switch mechanism U.L. listed for Class I, Division 1, Group D hazardous locations. Switches to be double pole double throw (DPDT). Switch power shall be 120 volts, single phase, 60 hertz, 10 amps minimum.

2.5.3 Venturi Tubes

a. The venturi tubes shall be provided in conjunction with Section 33 09 53 AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM.

b. Start-up, adjustments and calibration, and instruction of personnel in the operation and maintenance of the venturi tubes shall be considered as a required portion of the controls package.

****
NOTE: Select type of Fuel.
****

c. The venturi tubes shall be low loss differential pressure producers consisting of a short housing piece and a fully machined, contoured throat section providing a restriction at the center, with both inlet approach and exit having geometrically symmetrical curves. They shall be velocity head, impact, differential producing devices designed to measure differential pressure of [JP-4] [JP-5] [JP-7] [JP-8] fuel. They shall be constructed of 304L stainless steel with ANSI Class 150 flanges on each end and be suitable for operation of 275 psig at 100 degrees F. They shall be of sufficient thickness to with-stand the same stresses as the upstream and downstream piping. Each venturi tube shall have a minimum of four 1/2-inch connections. An individual head-capacity curve shall be furnished for each venturi tube.

d. Operating conditions for the venturi tubes shall be as follows:

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NOTE: Select based on System and PUMP capacity.

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(1) Issue Venturi Tube. Minimum inlet-to-throat differential pressure at [2,400] [_____] gpm: 200 in H2O.

(2) Return Venturi Tube. Minimum inlet-to-throat differential pressure at [600] [_____] gpm: 200 in H2O.

(3) Venturi tubes discharge coefficient "C" to be greater than or equal to 0.97 over pipe Reynolds number range between 200,000 and 1,000,000 and shall be independent of Beta over a Beta range of 0.4 to 0.75. Pressure loss shall be less than 24 percent of differential pressure generated by the venturi tube. Repeatability of the discharge coefficient "C" shall be 2 percent for Reynolds number range of 10,000 to 1,000,000.

(4) Provide two portable GPM Meters, one for each size of venturi. The meters shall be complete with valves, hoses and connecting disconnects, and carrying case. The meters shall have stainless steel bellows, mounting bracket, 500 psi swp, 6-inch dial with 270 degrees arc. Dial shall read GPM Jet Fuel. Range of scale shall match the flow transmitter for issue and return. The venturi manufacturer shall provide the portable meters with the venturi in order to be compatible. The venturi tubes shall also be provided with a suitable table to convert inches differential pressure to gallons per minute.

2.5.4 Differential Pressure Transmitter

Differential pressure transmitter shall consist of a capacitance sensor operating on a differential in pressure of fuel. The output shall be a 4 - 20mA dc, square root signal between a minimum of 4 - 100 percent of the input. It may be linear between 0 - 4 percent. It simultaneously will produce a digital HART (Highway Addressable Remote Transducer) output signal. Loop power shall be provided from remote power supply located in the pump control panel (PCP).

a. Transmitter body shall be stainless steel with stainless steel diaphragm capsule process connecting to a 1/2 inch NPT. Drain and vent valves to be stainless steel. Accuracy shall be ± 0.20 percent of calibrated span including combined effects of linearity, hysteresis and repeatability.

[b. One differential pressure dial shall be supplied with each pair of transmitters. Differential pressure dial shall consist of a bellows type pressure sensing element, operating on a differential in pressure of fuel, and a mechanical indicator, driven by the bellows unit. The bellows shall be dual opposed, liquid filled, rupture-proof type with bellows movement converted to rotation and transmitted by a torque tube. Displacement of bellows shall be 1.5 cubic inches for full scale travel. Bellows housing shall be stainless steel and shall have a rated working pressure of not less than 500 psi. Liquid used to fill the bellows shall be suitable for the expected minimum ambient temperature. The indicating dial shall be at least 6 inches in diameter with a weatherproof glass cover. The case shall be finished with a weather resistant epoxy resin enamel. The indicating pointer shall traverse a 270 degree arc. The scales shall be graduated over the selected pressure ranges so that the flow rate can be accurately read in gallons per minute. Indicator accuracy shall be 0.5 percent of full scale. Differential pressure indicating dial shall be provided with built-in pulsation damper and suitable over-range protection.]

****

NOTE: Select type of display per directions from COMMAND FUELS FACILITY Engineer.

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[c. Display at the transmitter shall be LCD, one per each differential pressure transmitter. The digital scale shall be a 4 digit LCD, capable of being read in low light/no light conditions. Indicator scale shall be in gallons per minute.]

****

NOTE: Select based on System and Pump capacity. Systems greater than 2400 gpm require issue Venturi Tube to have low range (0-1500 gpm) and high range (0- maximum system flow in gpm) transmitters versus one single full range transmitter.

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d. Each venturi tube shall have two transmitters and one indicating dial per function and shall be installed as indicated on the drawings. Differential pressure ranges shall be selected as necessary to operate in conjunction with associated venturi tube:

(1) Issue Venturi Tube - 0 to [2400] [_____] GPM (full range)

(2) Return Venturi Tube - 0 to [800] [_____] GPM (full range)

[e. Differential pressure transmitters shall be UL, FM, or CSA listed for Class 1, Division 1, Group D hazardous environment as defined by NFPA 70, with maximum temperature rating T2D (419 degrees F). Each transmitter and indicating dial shall be supplied with a factory assembled five valve stainless steel manifold. Vent valves shall be furnished on upper ports of each transmitter and indicating dial. Differential pressure transmitters and the indicating dial shall be suitable for mounting on a 2-inch pipe stand. Complete installation shall be in accordance with manufacturer's recommendations.]

2.5.5 Pressure Sensor

Sensor shall be UL, FM, or CSA listed for Class 1, Division 1, Group D hazardous environment as defined by NFPA 70, with maximum temperature rating T2D (419 degrees F). Excitation voltage shall be 12-28 VDC. Output signal shall be 4-20 mA. Unit shall have 0.25 percent accuracy and have built-in high pressure snubbers, minimum pressure range shall be 0-300 PSI. Wetted material shall be stainless steel.

2.6 METERS

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NOTE: Select type of fuel.
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Meter shall be a one-way flow, temperature compensating, positive displacement type meter designed for a continuous flow of 600 GPM at the truck fill stand. Meter shall have ANSI Class 150 flanges and body working pressure of not less than 275 psig and shall be suitable for hydrostatic testing of 275 psig. Meter shall be factory calibrated for [JP-4] [JP-5] [JP-7] [JP-8] jet fuel and capable of being calibrated in the field. The register shall have a non-setback total indicator and a setback type run indicator so that individual runs can be registered without affecting the total of all runs as shown on the indicator. The total indicator shall have a minimum of eight figures and the setback run indicator shall have a minimum of five figures. The register shall read in gallons and the smallest unit of indicated delivery shall be 1 gallon. Accuracy shall be within +0.3 percent between ten percent and maximum rated flow. Meters shall be provided with a suitable drain at the bottom, equipped with a ball valve. Pressure loss through the meter shall not exceed 3 psi at 600 gpm flow rate.

[2.7 RECEIPT FLOW METER

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NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
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Flow meter shall consist of corner tapped orfice flanges, orfice flange plate, differential pressure transducer and flow computer capable of square root extraction for calculating flow rate in gpm. The normal flow range for flow meter is 0 to 600 gpm. Orfice flanges shall be ANSI Class 150 and shall be constructed of Type 304 or 304L stainless steel. Beta value shall be 0.70. Maximum pressure loss shall be 3 psi at 600 gpm. Differential pressure transducer shall have a calibrated range of 0-300 inch w.c. with a 4-20mA output. Accuracy shall be 0.25 percent of the calibrated range or better. Flow computer shall calculate flow in gpm, from the differential pressure transducer output. Flow computer and pressure transducer shall be located in the pump room and shall be suitable for the installation in Class 1, Division 1, Group D hazardous locations. Flow computer shall have a digital display giving a local readout in gpm, minimum four figures, with a 4-20 mA output to the process control system.

]2.8 PRODUCT RECOVERY TANK AND ACCESSORIES

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NOTE: Use fiberglass TANK if directed by COMMAND FUELS FACILITY Engineer, reference Section 33 56 10 FACTORY-FABRICATED FUEL STORAGE TANKS.
****

2.8.1 Tank Construction

Product recovery tank shall be a U.L. labeled, double wall, steel tank, with interstitial monitor. Tank shall be provided with calibrated gage stick, strapping chart, and a steel vault attached to tank. Vault shall be provided with a rolling pit cover and removable access grating. Minimum inner and outer tank wall thickness shall be 0.167 inches.

2.8.1.1 Steel Tank With Vault

a. The design, fabrication, erection, testing, and inspection of the double wall tank shall conform to the requirements of UL 58, Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids, Type II. The exterior tank walls shall be separated from the interior walls by standoffs.

b. Material shall be carbon steel plate.

c. Lifting lugs shall be located at the balance points.

d. Provide anchor straps to attach tank to hold down slab. Straps shall be separated from the tank by a pad made of inert insulating material. Number and location of straps shall be as indicated on the drawings. Metal straps, turnbuckles, and anchors shall be coated to resist corrosion.

e. Tank capacity, connections and appurtenance shall be as shown on the drawings and as described under "Monitor."

f. Provide a complete system of cathodic protection for the tank and vault in accordance with Section [26 42 14.00 10 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)] [26 42 13.00 20 CATHODIC PROTECTION BY GALVANIC ANODES].

g. The interior and exterior surfaces of tank and vault shall be coated for corrosion protection. The interior surface shall be coated in accordance with MIL-DTL-24441, Formulas 150, 151, and 152. The exterior surface shall be coated in accordance with STI P3 and the tank shall bear the STI P3 label.

2.8.1.2 Leak Detection Monitor

a. Provide an annular space between the primary and secondary shells to allow for the free flow and containment of all leaked product from the primary tank.

b. Provide the tank with a leak monitoring system capable of sensing leaks in the secondary containment space and in the vault. The system shall detect a leak of fuel through the inner shell to the area between the inner and outer shells or a leak of ground water through the outer shell into the area between the inner and outer shells. The detector and any equipment in the area of the fuel tanks and valve pits shall be explosion proof. The system shall be a continuous surveillance type. The sensor shall be electronic or hydraulic type and shall be connected to a remote panel. Totally flooded containment space reservoir system shall not be permitted. The panel shall provide an audible and visible alarm if a leak is detected and shall indicate if the leak is fuel or water. The alarm shall be manually reset at the panel. Use an inert gas that is heavier than air in containment space of the tanks to prevent the forming of condensation. The tank monitoring system shall be compatible with the tank furnished and shall be as recommended by the tank manufacturer. Provide instructions and equipment required for calibration of the monitoring system and calibration maintenance schedule. Access shall be provided to the tank sensor for testing and maintenance. The control panel shall be located where shown on the plans. Remote alarm shall be provided at the pump control panel(PCP), see Section 33 09 55 AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS). This control panel shall have a sign located adjacent to it indicating that the alarm indicates a leak in the fuel tank or the vault. Provide system operating instructions inside of the control panel.

c. Monitoring shall be continuous and shall be remotely indicated. The control console shall generate a visual and audible alarm and shall provide one DPDT contact closure on alarm for remote alarm annunciation.

2.8.1.3 Tank Appurtenances and Fittings

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NOTE: Provide devices in accordance with the recommendation of NFPA 30, Federal, State and Local Codes as applicable in this and following paragraphs.
****

Provide tank appurtenances and fittings as indicated. Nozzles for appurtenances and steel vault shall be as indicated or per manufacturer's recommendations and installed plumb with all above grade flange faces level. Gravity fill line shall be provided with locking cap. The flange on the Fuel Transfer Pump pumpway shall be an ASME Class 150 flange.

2.8.1.4 Tank Vents

Tank vents shall be standard weight steel pipe with malleable iron fittings. Vent outlets shall be equipped with [flame arresters] [pressure-vacuum vents] [flame arresters and pressure-vacuum vents] [flare stacks].

2.8.1.5 Manway

A 36-inch round manway shall have U.L. listed gasket with bolted cover. A fiberglass or stainless steel ladder shall be provided inside the tank at the manway.

2.8.1.6 Sampling and Gauging hatch

A sampling and gauging hatch shall be provided and shall consist of a foot-operated, hinged cover with a flexible sealing ring and provision for padlocking. The hatch shall be non-sparking and shall have a flanged connection for installation on 4-inch steel pipe. Provide a datum plate beneath gauge opening, and stencil reference height on gauge/sampling hatch piping.

2.8.1.7 Liquid-level Indicator

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NOTE: Per COMMAND FUELS FACILITY Engineer.

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Liquid-level indicator shall be the mechanically or electronically actuated type that can continuously monitor a tank's usable liquid level storage capacity. The system shall provide a digital readout of a tank's liquid level in terms of inches and gallons. The system shall be accurate to plus or minus 1/16 inch. The system shall measure water accumulation in inches from 3/4 to 5 inches off the bottom of a storage tank. Construct system components to be chemically compatible with the fuel to be handled. For each tank monitored, provide a sending unit that transmits the digital readout from a tank to the same electronic monitoring/alarm panel used for the leak detection system. Panel shall be a standard industrial enclosure. Panel doors shall swing left or right. The panel shall display the digital readout of each monitored tank on an LCD mounted exterior to the panel. The panel shall also have external controls to allow operators to toggle between information on the LCD without having to open the panel. Unit shall be Veeder-Root ATG TLS.

2.8.1.8 Float Switch Assembly

The float switch assembly shall be the top mounted, float operated type with vertical float rod. The switch assembly shall be suitable for flange mounting and float and trim shall be stainless steel. The switch shall be magnetically latching reed or actuated mercury switch suitable for operation on 120 volt, 60 hertz AC power. Rating of the switch contacts shall be adequate for the indicated functions shown on the drawings. This float switch assembly shall be used to start and stop the Fuel Transfer Pump and to indicate a high level and activate an alarm in the PCP.

2.8.1.9 Fuel Transfer Pump (FTP-1)

Refer to Section 33 52 43.23 AVIATION FUEL PUMPS

2.8.1.10 Electric Pump

The electric pump shall be a sliding vane type rotary pump. The pump construction shall permit the removal of the rotor and sliding vanes without disconnecting the pump. Pump capacity shall be 5 gal per minute with a differential head of [_____] feet. The pump and motor shall be mounted on a cast iron or steel subbase. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for available electric service, shall be totally enclosed, fan cooled, TEFC, and shall conform to the requirements specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Pump shall be provided with stainless suction screen, foot valve, stainless steel pipe, and aluminum 1-1/2-inch cam type quick disconnect with dust cap.

2.8.1.11 Lockable Cap

Provide a lockable cap for the 2-inch gravity fill line.

2.8.1.12 Spill Containment Basin

Container shall be constructed of fiberglass reinforced plastic, be compatible with the type of fuel being handled, have a minimum 3 gal fuel storage capacity, and form a water-tight seal around the fuel piping to prevent spilled fuel from entering the soil. Container shall be provided with a drain and have an easily removable cover constructed of either cast aluminum or cast iron. Covers shall be weather-resistant and shall prevent the influx of water.

2.8.1.13 Overfill Valve (OV-1)

Refer to Section 33 52 43.14 AVIATION FUEL CONTROL VALVES

2.8.1.14 Tank Calibration

Provide a certified tank calibration chart in increments reading in gal. Tank certification shall be done onsite and stamped by a P.E.

[2.9 FUEL SYSTEM WASTE WATER TANK AND ACCESSORIES

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NOTE: Use fiberglass tank if directed by COMMAND FUELS FACILITY Engineer, reference Section 33 56 10 FACTORY-FABRICATED FUEL STORAGE TANKS. Use a fuel system waste water tank when designing a cut and cover system if directed by COMMAND FUELS FACILITY Engineer.

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2.9.1 Tank Construction

Waste water tank shall be a U.L. labeled, double wall, steel tank, with interstitial monitor. Tank shall be provided with calibrated gage stick, strapping chart and a steel vault attached to tank. Vault shall be provided with a rolling pit cover and removable access grating. Minimum inner and outer tank wall thickness shall be 0.167 inches.

2.9.1.1 Steel Tank With Vault

a. The design, fabrication, erection, testing, and inspection of the double wall tank shall conform to the requirements of UL 58, Standard for Safety, Steel Underground Tanks for Flammable and Combustible Liquids, Type II. The exterior tank walls shall be separated from the interior walls by standoffs.

b. Material shall be carbon steel plate.

c. Lifting lugs shall be located at the balance points.

d. Provide anchor straps to attach tank to hold down slab. Straps shall be separated from the tank by a pad made of inert insulating material. Number and location of straps shall be as indicated on the drawings. Metal straps, turnbuckles, and anchors shall be coated to resist corrosion.

e. Tank capacity, connections and appurtenance shall be as shown on the drawings and as described under "Monitor."

f. A complete system of cathodic protection shall be provided for the tank and vault in accordance with Section [26 42 14.00 10 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)] [26 42 13.00 20 CATHODIC PROTECTION BY GALVANIC ANODES].

g. The interior and exterior surfaces of tank and vault shall be coated for corrosion protection. The interior surface shall be coated in accordance with MIL-DTL-24441, Formulas 150, 151, and 152. The exterior surface shall be coated in accordance with STI P3 and the tank shall bear the STI P3 label.

2.9.1.2 Leak Detection Monitor

a. Provide an annular space between the primary and secondary shells to allow for the free flow and containment of all leaked product from the primary tank.

b. Provide the tank with a leak monitoring system capable of sensing leaks in the secondary containment space and in the vault. The system shall detect a leak of fuel through the inner shell to the area between the inner and outer shells or a leak of ground water through the outer shell into the area between the inner and outer shells. The detector and any equipment in the area of the fuel tanks and valve pits shall be explosion proof. The system shall be a continuous surveillance type. The sensor shall be electronic or hydraulic type and shall be connected to a remote panel. Totally flooded containment space reservoir system will not be permitted. The panel shall provide an audible and visible alarm if a leak is detected and shall indicate if the leak is fuel or water. The alarm shall be manually reset at the panel. Use an inert gas that is heavier than air in containment space of the tanks to prevent the forming of condensation. The tank monitoring system shall be compatible with the tank furnished and shall be as recommended by the tank manufacturer. Submit instructions and equipment required for calibration of the monitoring system, calibration maintenance schedule and access to the tank sensor for testing and maintenance. Locate the control panel where shown on the plans. Remote alarm shall be provided at the pump control panel (PCP), see Section 33 09 53 FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM (CUT-N-COVER TANKS). This control panel shall have a sign located adjacent to it indicating that the alarm indicates a leak in the fuelsystem waste water tank or the vault. Provide system operating instructions inside of the control panel.

c. Monitoring shall be continuous and shall be remotely indicated. The control console shall generate a visual and audible alarm and shall provide one DPDT contact closure on alarm for remote alarm annunciation.

2.9.1.3 Tank Appurtenances and Fittings

****

NOTE: Provide devices in accordance with the recommendation of NFPA 30, Federal, State and Local Codes as applicable in this and following paragraphs.

****

Provide tank appurtenances and fittings as indicated. Nozzles for appurtenances and steel vault shall be as indicated or per manufacturer's recommendations and installed plumb with all above grade flange faces level.

2.9.1.4 Tank Vents

Tank vents shall be standard weight steel pipe with malleable iron fittings. Vent outlets shall be equipped with pressure-vacuum vents.

2.9.1.5 Manway

A 36-inch round manway shall have U.L. listed gasket with bolted cover. A fiberglass or stainless steel ladder shall be provided inside the tank at the manway.

2.9.1.6 Sampling and Gauging hatch

Provide a sampling and gauging hatch consisting of a foot-operated, hinged cover with a flexible sealing ring and provision for padlocking. The hatch shall be non-sparking and shall have a flanged connection for installation on 4-inch steel pipe. Provide a datum plate beneath gauge opening, and stencil reference height on gauge/sampling hatch piping.

2.9.1.7 Float Switch Assembly

The float switch assembly shall be the top mounted, float operated type with vertical float rod. The switch assembly shall be suitable for flange mounting and float and trim shall be stainless steel. The switch shall be magnetically latching reed or actuated mercury switch suitable for operation on 120 volt, 60 hertz AC power. Rating of the switch contacts shall be adequate for the indicated functions shown on the drawings. This float switch assembly shall be used to start and stop the Fuel Transfer Pump and to indicate a high level and activate an alarm in the PCP.

2.9.1.8 Electric Pump

The electric pump shall be a sliding vane type rotary pump. The pump construction shall permit the removal of the rotor and sliding vanes without disconnecting the pump. Pump capacity shall be 50 gal per minute with a differential head of 57 feet. The pump and motor shall be mounted on a cast iron or steel subbase. The motor shall have sufficient power for the service required, be of a type approved by the manufacturer of the pump, be suitable for available electric service, be totally enclosed, fan cooled, TEFC, and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Pump shall be provided with stainless suction screen, stainless steel pipe, and aluminum 2-inch cam type quick disconnect with dust cap.

2.9.1.9 Overfill Valve (OV-1)

Refer to Section 33 52 43.14 AVIATION FUEL CONTROL VALVES.

2.9.1.10 Tank Calibration

Provide a certified tank calibration chart in 1/16 inch increments reading in gal. Tank certification shall be done onsite and stamped by a P.E.

]2.10 TRUCK OFFLOAD SYSTEM

The truck offload system shall be a factory fabricated and skid mounted unit.

2.10.1 Offload Pump (OP)

Refer to Section 33 52 43.23 AVIATION FUEL PUMPS

2.10.2 Air Eliminator Tank

2.10.2.1 Tank Housing

Each Tank housing shall be fabricated from carbon steel and shall be internally coated with an epoxy coating in accordance with MIL-PRF-4556.

Coat the exterior with alkalyal resin primer (universal metal primer). Each unit shall be constructed and labeled in accordance with ASME BPVC SEC VIII D1. The housing shall be designed for a working pressure of 90 psig. The inlet and outlet connections shall be provided with raised face flanges faced and drilled in compliance with ASME B16.5, Class 150. The configuration of the air eliminator tanks shall be as shown on the drawings.

2.10.2.2 Sight Gauge

Provide a 5-inch armored, clear pyrex liquid level gauge for observing fuel level in the tank. The gauge shall be equipped with stainless steel ball checks in both the upper and lower fittings, an upper and lower shutoff valve, and a bottom blowoff cock. The gauge will contain a colored density sensitive ball. Glass shall be protected by a minimum of four guard rods.

2.10.2.3 High Level Shutoff

The vent connection shall have a stainless steel high level shutoff mechanism to act as an overfill prevention device to keep fuel from going out the vent.

2.10.2.4 Level Sensors

The level sensors shall be ultrasonic tip sensitive level control switches, NEMA 7/9, weatherproof, explosion proof for Class I, Div I, Group D, temperature T2D (419 degrees F), 120-volt input power, SPST relay output, 1-inch flanged mounting.

2.10.2.5 Vent

Tank vent outlet shall be equipped with pressure-vacuum breather vent, aluminim construction with weather hood and with viton pallet seat inserts, high density screens, stainless steel internals, with pressure relief setting at 0.5 oz per square inch, and vacuum relief set at 32 oz per square inch. Pressure venting capacity shall be 5400 cubic feet per hour, vacuum capacity shall be 5000 cubic feet per hour.

2.10.3 Non-Surge Check/Air Block Valve

Refer to Section 33 52 43.14 AVIATION FUEL CONTROL VALVES

2.10.4 Offload Fuel Hose

The offload fuel hose shall be 4-inch, lightweight, flexible, minimum 8-inch bend radius, non-pressurized offloading hose constructed of nitrile rubber, rigid PVC helix, synthetic braiding, smooth bore, corrugated outer diameter, conforming to MIL-PRF-370 (formerly CID A-A-52554), non-collaspible, threaded, male NPT, both ends, and have UV protection.

2.10.5 Offload Sight Flow Indicator

The Truck Offload sight flow indicator shall be four inch wafer pattern sight glass, plane indicator aluminum construction.

2.10.6 Flood Lights

Three 100 Watt HPS floodlights shall be mounted on the off load skid, approx. 12 foot high, two on one pole, one on another pole to provide light in the off load area. Provide a manual switch for control. The floodlights shall be Holophane Predator, PD100HP27KN1B or approved equal. See Section 26 56 00 EXTERIOR LIGHTING for applicable requirements.

2.10.7 Flowmeter

Meter shall be a temperature compensating, turbine type meter designed for a continuous flow of [600] [300] GPM. Meter shall have ANSI Class 150 flanges and body working pressure of not less than 275 psig and shall be suitable for hydrostatic testing of 275 psig. Materials of construction shall be stainless steel. Meter shall be factory calibrated and capable of being calibrated for JP-8 jet fuel in the field. Pressure loss through the meter shall not exceed 4 psi at maximum flow rate for water. The register shall be explosion proof and have a total indicator and a rate indicator. The total indicator shall have a minimum of eight figures and the setback rate indicator shall have a minimum of five figures. The register shall read in gal and the smallest unit of indicated delivery shall be 1 gal. Accuracy shall be within +0.3 percent between ten percent and maximum rated flow.

[2.10.8 Grounding

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NOTE: Delete this paragraph if the tank trucks to be loaded/unloaded have a plug-in connection for such a system. Indicate on the drawings the type of connection required for a Grounding Verification Unit. Delete the second paragraph if a grounding cable and clamp connection will be sufficient.

****

The skid shall be equipped with a self winding grounding cable reel. The cable shall be at least 50 feet long. The cable reel, the grounding cable and the connection clamp shall be in accordance with CID A-A-50696.

][2.10.9 Grounding Verification Unit

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NOTE: System can connect to a tank truck by using either a grounding clamp or plug. For a grounding plug to work, the tank trucks must have an appropriate receptable. Coordinate with the Using Agency to determine if plugs are needed and if so what type.

The switch contact in the control module can be used to initate various interlock functions (e.g., stop pumps, close valves, initate alarms, etc.). Indicate the desire interlock control functions on the drawings.

****

System shall include grounding [clamp] [plug], grounding cable, and monitoring and control module. System shall automatically and continually monitor and verify a low-resistance static dissipation path (less than [10 Ohms] [_____]) between connecting tanker and the designated ground point. [Grounding clamp shall conform to MIL-DTL-83413 and MIL-DTL-83413/7.] [Grounding plug shall [conform to MIL-DTL-83413 and MIL-DTL-83413/4.]

[______].] Grounding cable shall be corrosion resistant steel strands sheathed in a Hytrel jacket. Cable shall be the spiral, self-retracting type. Cable shall be a minimum 30 feet in length. Monitoring and control module shall be rated for an explosion-proof environment in accordance with NFPA 70 for Class I, Division I, Group D locations. Module shall include status lights (red for no ground verification and green for positive ground verification) and a lockable bypass switch. Module shall include a switch contact to allow interlock functions.

]2.10.10 Other Offload Equipment

For other equipment shown on the drawings as part of the offload system, refer to this Section and refer to Section 33 52 43.13 AVIATION FUELING PIPING

2.11 HYDRANT OUTLET PITS AND ISOLATION VALVE PITS

Use this paragraph for On-shoulder and On-apron installation. Pantograph and hydrant hose truck hydrant outlet pits and isolation valve pits shall be prefabricated units that are the standard products of a firm regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least (3) years prior to bid opening. The basic pit shall consist of a 50-inch thick fiberglass walls and floor with main body dimensions as shown on the drawings. The pit shall contain twelve (minimum) integral concrete anchors or two integral anchors that run continuous on three sides of pit. The integral fiberglass top flange shall require no exposed corrosive material, weldments, or strongbacks within the pit to support the aluminum cover assembly. The manufacturer shall have had a minimum of three years successful experience in the production and usage of their fiberglass service pits and shall supply proof of experience at time of submittals. Pits shall be provided with a 2-inch pump-out line terminating with a male cam type bronze connector with female dustcap. Pits shall be provided with removable aluminum grating platform suitable for loading of 400 pounds per square foot. The grating shall cover the entire opening when the lid is in the open position. The grating platform shall have outside edges and cut-outs framed. The inside of the lid shall have a 14 by 10 inch permanently attached sign which says "DANGER CONFINED SPACE ENTER BY PERMIT ONLY". The sign shall be white with black letters, made of PVC, completely and permanently encapsulated 50-mil plastic.

2.11.1 Pit Cover

The pit cover assembly shall consist of a completely removable one-piece aluminum lid attached to a rigid frame which is an integral part of the fiberglass pit. The lid shall be attached to the frame with hinges which do not carry wheel loads applied to the top surface of the lid in its closed position. The lid shall be equipped with a device to hold the lid in its fully-opened position. This lid-staying device shall automatically engage when the lid is opened to its fully-opened position. The device shall also be provided with a quick-release mechanism designed to be operated with one hand. The lid shall be considered fully-open when it is rotated approximately 90 degrees from its closed position. Each cover lid shall move smoothly through its entire range of motion and shall be counterbalanced sufficiently to require an externally-applied opening force of 35 pounds (maximum) to be applied to the center of the long side of the cover (opposite the hinge side). Similarly, the maximum closing force required to be applied at the same point shall be approximately 50 pounds. In addition, the cover shall be counterbalanced in such a fashion that the cover will not close under its own weight if released when open to any angle greater than 70 degrees (from its closed position). Operation of the lid will not have spring assist. Lifting handles (two minimum) shall be provided for each lid. Each handle shall provide comfortable, secure grip for and average adult male's full (gloved) hand. All covers shall be provided with a latch, operable from the exterior of the vault, to securely hold the lid to the frame in the closed position. The latch will be capable of being released from either lifting handle. Tools shall not be required to engage (or disengage) the latch or the lid lifting handles. Latch and handle designs shall be weather-resistant with features to prelude freeze-up and the collection of dirt and precipitation. Projections of the lid's hinges, lifting handles, or latches above the plane of the lid, whether temporary or permanent, shall not be allowed. The weight bearing flange surfaces of both the fiberglass pit liner and the aluminum cover lid shall be machined flat to assure uniform weight distribution. The word FUEL shall be integrally cast in raised letters on the top surface of each lid. The lettering shall be a minimum of 1-inch high and 0.0625-inch deep. [The pantograph pit cover shall include an interior center 18-inch diameter (clear opening) twist and turn lid that fully opens and is attached with a stainless steel cable.] [Pit lid shall be designed for resisting debris and water accumulation at seals, load bearing surfaces, hinges, and handle pockets. Seal shall be an elastomeric perimeter seal, easy to replace, secured to lid by dovetail grooves, no adhesive. Push buttons are not allowed.]

2.11.2 Pit Cover Materials, Design, and Testing

****

NOTE: Provide center opening per Command Fuels Facility Engineer. Provide water resistant lid per Command Service Headquarter Engineer at nothern bases.

****

All cover lids and frames shall be designed using an appropriate cast aluminum alloy or rolled aluminum plate to support an aircraft wheel load simulated by a roving 200,000-pound test-load applied perpendicular to a 200-square-inch contact area(10 by 20 inches) of the cover's top surface. The aluminum alloy material selected for design shall be ductile, corrosion-resistant, impact-resistant, and suitable for the intended use. All covers shall be non-skid surface construction and free of injurious defects. Welding for the purpose of structural repair of casting defects shall not be allowed. Minor cosmetic welding is acceptable. The cover shall be capable of supporting the test-load without failure regardless of the location or orientation of the load. Localized yielding or cracking or excessive deformations shall be considered as failure. Actual load-tests shall be performed on a minimum of 10 percent of all the covers supplied. Load-tested units shall be randomly selected. Load-test conditions shall model field-installed conditions as nearly as practicable. The 200 Kip test-load shall be applied to the cover for a minimum duration of 5 minutes. Absolute maximum deflection of the cover lid under the test-load shall not exceed 1/180th of the minimum interior opening dimension of the fiberglass pit body. Maximum deflection of the cover lids, remaining after removal of the test load, shall be + 0.010-inches to assure that no permanent set has taken place. Upon removal of the test-load, the cover lid and frame shall be carefully examined for cracks or localized areas of permanent deformation. All results shall be submitted for review and approval. A single failure to meet any of the stated criteria shall be considered sufficient grounds for the testing of 50 percent of the units.

2.11.3 Pipe Seal

The pipe penetrations through the pit floor or wall shall be sealed by means of a Buna-N boot. The boot shall be secured to the pipe and to a steel sleeve bonded to the pit wall at the pit penetration by stainless steel clamps. Buna-N (Nitrile Butadiene) material shall be in accordance with SAE AMS3275.

2.11.4 Hydrant Outlet Pit Equipment

At the Contractor's option, hydrant pits may be furnished complete with hydrant control valves and shutoff valves assembled in a pipe riser. All valves and piping furnished by the pit manufacturer shall comply with the requirements specified herein. All control valves shall be of the same manufacturer.

2.12 HIGH POINT VENT AND LOW POINT DRAIN PITS

Use for On-Shoulder and On-Apron installations.

2.12.1 Pit Assembly

Each pit shall incorporate the following items built into a self-contained assembly.

2.12.2 Pit

The basic pit shall consist of 0.25-inch wall fiberglass liner with a main body approximately 23-inches in diameter and a minimum of 37-inches deep. The pit shall contain two integral concrete anchors. The fiberglass top flange shall require no exposed corrosive material, weldments, or strongbacks within the pit to support the cast aluminum ring and cover assembly. The pits shall be the standard products of a firm regularly engaged in the manufacture of such product and shall essentially duplicate items that have been in satisfactory use for at least three (3) years prior to bid opening. Proof of experience will be submitted.

2.12.3 Pit Cover, General Requirements

The pit cover shall include a removable outer ring frame and an interior 18-inch diameter (clear opening) hinged lid that opens 160 degrees. [The pit shall have a tamperproof cover. The removable outer ring shall have anchors to provide for means to secure the manhole and its moveable cover and lid to the "concrete" fiberglass containment. The inner hinged lid shall have a means of being locked.] Each cover lid shall move smoothly through its entire range of motion and shall require a maximum opening force of 35 pound-force to be applied at a single lifting handle. Each handle shall provide a comfortable, secure grip for an average adult male's full gloved hand. Tools shall not be required to engage the lifting handle. Projections of the lid's hinges or handles above the plane of the lid, whether temporary or permanent, shall not be allowed. The pit service shall be integrally cast in raised letters on the top surface of each lid. The lettering shall be a minimum of 1-inch high and 0.0625-inch deep. The weight bearing flanges of the fiberglass pit liner and the aluminum cover frame (and lid) shall be machined to assure uniform weight distribution.

2.12.4 Pit Cover Materials, Design, and Testing

****
NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
****

The cover frames and lids shall be designed and manufactured by a qualified company having a minimum of five years successful experience in the production of similar airport apron slab fixtures. All cover lids and frames shall be designed using an appropriate cast aluminum alloy or rolled aluminum plate to support an aircraft wheel load simulated by a roving 200,000-pound test-load applied perpendicular to a 200-square-inch contact area(10 by 20 inches) of the cover's top surface. The aluminum alloy material selected for design shall be ductile, corrosion-resistant, impact-resistant, and suitable for the intended use. All covers shall be non-skid surface construction and free of injurious defects. Welding for the purpose of structural repair of casting defects shall not be allowed. Minor cosmetic welding is acceptable. The cover shall be capable of supporting the test-load without failure regardless of the location or orientation of the load. Localized yielding or cracking or excessive deformations shall be considered as failure. Actual load-tests shall be performed on a minimum of 10 percent of all the covers supplied. Load-tested units shall be randomly selected. Load-test conditions shall model field-installed conditions as nearly as practicable. The 200 Kip test-load shall be applied to the cover for a minimum duration of 5 minutes. Absolute maximum deflection of the cover lid under the test-load shall not exceed 1/180th of the interior diameter of the fiberglass pit body. Maximum deflection of the cover lids, remaining after removal of the test load shall be + 0.010-inches to assure that no permanent set has taken place. Upon removal of the test-load, the cover lid and frame shall be carefully examined for cracks or localized areas of permanent deformation. All results shall be submitted for review and approval. A single failure to meet any of the stated criteria shall be considered sufficient grounds for the testing of 50 percent of the units.

2.12.5 Pipe Riser Seal

The riser pipe penetration through the pit floor shall be sealed by means of a Buna-N boot. The boot shall be secured to a metal collar welded to the pipe riser and to a flange at the floor opening by stainless steel clamps. Collar shall be fabricated from the same material as the pipe.

2.13 OPERATING TANK LEVEL INDICATOR

The level indicating system must perform tank gauging and have local tank readout. The level indicating system must use a servo to measure all the various locations required for the primary measurement. The level indicating system must be able to measure and compute fuel level, fuel density, fuel actual volume, fuel and water corrected volume, and fuel ambient temperature. The reference point for all level measurements must be from the tank's datum plate. The servo system must attach to the tank's [8] [10] [12] inch riser/[10-inch] stilling well to minimize the effects of turbulence on the measurements and still allow the government access to take quality control samples. The level indicating system must be able to measure in underground, aboveground and cut and cover tanks with all floor and roof types. The level indicating system must be able to measure multiple tanks with a single field interface unit. The level indicating system must be able to determine whether the tank is issuing or receiving fuel while in the transfer mode and also with the same unit be able to perform leak detection. The level indicating system must require no periodic calibration after installation is complete. The level indicating system must be approved for installation in a hazardous area and certified intrinsically safe by an approved agency and provide lightning protection. The level indicating system must be able to interface with government owned information systems. The level indicating system must provide five sets of alarm outputs; high intermediate high, low, intermediate low and static tank movement alarm.

****
NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
****

Level accuracy ± 0.05 inches
Corrected volume accuracy ± 0.1 percent
Density accuracy ± 1 percent
Temperature accuracy ± 1 degrees F
Detect water in the tank sump to a level equal to or slightly above the water draw-off pipe

It will be an ENRAF Servo Gauge Model 854 Automatic Tank Gauging System. The system shall include an ENDRESS+HAUSER RTU 8130 and a local display similar or equal to a CP/2500. The RTU shall transmit data to the Base FAS System located in the RCC via telephone lines as shown on the drawings. Base personnel shall coordinate reprogramming of the FAS System to accept this new data.

2.14 OPERATING TANK LEVEL SWITCHES

****
NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
****

The switches shall be an external mount liquid level switch with a stainless steel float chamber and stainless steel, type 304 or 316, float and trim. Switch contacts shall be two single pole double throw switches factory mutual approved or U.L. listed for use in Class I, Division 1, Group D hazardous location with a maximum temperature rating of T2D (419 degrees F). Units shall have provisions to check level switch operations without increasing the fuel level in the tanks as shown on the contract drawings.

2.15 OPERATING TANK LEVEL SWITCHES

****
NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
****

a. System shall be designed and installed in such a way that the system shall be continuously and automatically self-checking. Switches shall be an external mount with a stainless steel fluid chamber. Electronic level sensors shall be thermistors or optic type, and be intrinsically safe Class I, Division 1, Group D for hazardous environments, with recognized FM, CSA or UL approval. The sensor holder/junction box shall be accessible from the stairway. Units shall have provisions to check level switch operations without increasing the fuel level in the tanks as shown on the contract drawings.

b. Level alarms shall be mechanically and electrically independent and be totally isolated from the gauging system. The level switches shall receive power and send their signal to the Pump Control Panel. Circuitry and cables from the PCP to the electronic level sensors in the tank shall be intrinsically safe.

[2.16 OPERATING TANK LEVEL SWITCHES

****
NOTE: Select when using a cut and cover Tank.
****

a. System shall be designed and installed in such a way that the system shall be continuously and automatically self-checking. Switches shall be mounted on top of the tank, in the pump house, as indicated. Electronic level sensors shall be thermistors or optic type, and be intrinsically safe Class I, Division 1, Group D for hazardous environments, with recognized FM, CSA or UL approval. The sensor holder/junction box shall be accessible.

b. Level alarms shall be mechanically and electrically independent and be totally isolated from the gauging system. The level switches shall receive power and send their signal to the Pump Control Panel. Circuitry and cables from the PCP to the electronic level sensors in the tank shall be intrinsically safe.

]2.17 WATER DRAW-OFF SYSTEM

****
NOTE: Use a FUEL SYSTEM WASTE WATER TANK when designing a CUT AND COVER SYSTEM if directed by COMMAND FUELS FACILITY Engineer.
****

A water draw-off system shall be provided for each Operating Tank. Water draw-off system shall gravity drain. Each system shall include tank, product return pump and all necessary pipe, pressure relief system, valves, and fittings.

2.17.1 Tank

Water draw-off tank shall be a 55-gal fabricated stainless steel tank with supporting legs as shown. Tank and support legs shall be fabricated from Type 304 stainless steel.

2.17.2 Sight Glass

Sight glasses for tank shall be standard tubular gages with density ball and shut-off valves on each end. Wetted parts other than sight glass shall be stainless steel. If glass breakage should occur, a stainless steel ball in the valve shall close preventing product loss. Glass shall be protected by minimum of four guard rods.

2.17.3 Return Pump

****

NOTE: Insert site specific Pump requirements.
****

Product return pump (PRP-1 and PRP-2) shall have the capacity of not less than 5 gpm against a total head of [_____] feet when driven at [_____] rpm. The pump shall have flange connections and shall be constructed of stainless steel or aluminum so as to have no zinc, brass or other copper bearing alloys in contact with the fuel. The unit shall be explosion-proof, Class I, Division 1, Group D with maximum temperature rating of "T2D" (419 degrees F). The motor shall not be overloading at any point on the pump curve. Contractor has the option of selecting either centrifugal or positive displacement type pump with the restriction of the positive displacement type pump shall include a pressure relief between the discharge and suction protecting the pump from overloading.

2.17.4 Anchoring

All units of the water draw-off system shall be installed plumb and level and secured in place by anchor bolts.

2.18 BOWSER PUMPOFF PUMP

The pump shall be a sliding vane type rotary pump. The pump construction shall permit the removal of the rotor and sliding vanes without disconnecting the pump. Pump capacity shall be 10 gpm with a differential head of [_____] feet when driven at 1800 rpm. The pump and motor shall be mounted on a cast iron or steel subbase. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for available electric service, shall be totally enclosed, fan cooled, TEFC, and shall conform to the requirements specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Pump shall be provided with stainless suction side basket strainer.

2.19 TIGHTNESS MONITORING SYSTEM

The system shall be a permanent, fully automated, pressure step (no volume measurement)leak detection system, and will be used for tightness testing the hydrant loop pipeline. System shall have a guaranteed accuracy to detect a leak of less than 0.0004 gal/h per cubic foot at 150 PSI. The system shall be US EPA Third Party Certified to the above sensitivity with a Probability of Detection greater than or equal to 95 percent and a Probability of False Alarm of less than or equal to 5 percent. System will have performed satisfactorily on at least five (5) projects involving quantities and complexities at least equal to those required under this Contract. Equipment shall be compatible with equipment furnished and installed under Section 33 52 43.11 AVAIATION FUEL MECHANICAL EQUIPMENT, and Section 33 09 53 AVIATION FUEL PUMP CONTROL AND ANNUNCIATION SYSTEM, where the individual equipment components are common to both the Tightness Monitoring System functional operation, and the Hydrant Fuel Control System functional operation. Test results shall be unaffected by the temperature change of the fuel, and have a maximum test period of one hour. A local controller shall implement and analyze data, store data and be capable of printing results, and be located in the control room of the pumphouse building. Printer shall be provided. Controller shall utilize 120V, single phase power. Any additional utilities or equipment needed to be added to the fuel system in addition to what is shown on the drawings to allow the Tightness Monitoring System to meet the requirements, will be the requirement of the Tightness Monitoring System. Provide calculations, design, and proof of compliance. Upon completion of 72 hours of continuous system operation and before final acceptance of work, test the Tightness Monitoring System in service to demonstrate compliance with contract requirements. Performance verification shall be coordinated with overall fuel system start-up, and commissioning of fueling facilities. Perform performance verification in such a way as to obtain complete tightness information within the required accuracy stated herein and provided Tightness Certification on each pipe section tested.

2.20 TRUCK FILLSTAND OVERFILL PROTECTION AND GROUND VERIFICATION UNIT

****

NOTE: Delete this paragraph if the tank trucks to be loaded do not have an overfill system installed (e.g., liquid level sensors, wiring, and plug receptable). Indicate the type of plug required for the system.

The switch contact in the control module can be used to initate various interlock functions (e.g., stop pumps, close valves, initate alarms, etc.). Indicate the desire interlock control functions on the drawings.

****

System shall include connection plug, control cable, and monitoring and control module. System shall be the self-checking type that automatically and continually monitors the liquid-level within a tank truck's storage compartment during fueling. [Connection plug shall conform to [_______].] [The system shall be compatible with the Scully Duocept w/Truck Identification Module (T.I.M.) P/N 09061 to monitor truck liquid level, provide ground verification and provide a method to electronically prevent product commingling.] System shall be rated for an explosion-proof environment in accordance with NFPA 70 for Class I, Division I, Group D locations. Module shall include status lights and a switch contact to allow interlock functions. Control cable shall be the spiral, self-retracting type. Cable shall be a minimum 30 feet in length. The fillstand tank level sensor shall signal the fillstand control valves to shutdown and shall serve as the primary fill stand overfill system.

2.21 DAY TANK

A day tank shall be provided in the pumphouse.

2.21.1 Tank

The day tank shall be a 50-gal fabricated stainless steel tank with supporting legs. Tank and support legs shall be fabricated from Type 304 stainless steel.

2.21.2 Sight Glass

Sight glasses for tank shall be standard tubular gages with density ball and shut-off valves on each end. Wetted parts other than sight glass shall be stainless steel. If glass breakage should occur, a stainless steel ball in the valve shall close preventing product loss. Glass shall be protected by minimum of four guard rods.

2.21.3 Level Sensors

The level sensors shall be ultrasonic tip sensitive level control switches, NEMA 7/9, weatherproof, explosion proof for Class I, Div I, Group D, temperature T2D (419 degrees F), 120-volt input power, SPST relay output, 1-inch flanged mounting.

2.21.4 Anchoring

The tank shall be installed plumb and level and secured in place by anchor bolts.

[2.22 JP-8+100 INJECTION SYSTEM AND STORAGE TANK

****
NOTE: Select per COMMAND FUELS FACILITY Engineer direction.
****

The JP-8+100 Injection System shall incorporate and include all components necessary to mechanically inject the JP-8+100 additive into the fuel stream at an adjustable rate of 250 ppm.

2.22.1 Injector Assembly

The injector assembly shall be a completely self contained 4-inch flanged unit rated for 150 ANSI service and installed at each truck fill stand. Three units will be government furnished. The main housing shall be constructed of aluminum and contain a "swing vane" positive displacement fluid motor driven by teflon vanes. No externally driven pump shall be accepted. All components shall be compatible with JP-8 and the JP-8+100 additive. The unit shall be passive in operation in that the injection stops when the fuel flow stops. A minimum flow of 75 GPM shall be required to start the additive injection. The injector pump shall be adjustable from 0 to 1,000 ppm minimum. The assembly shall include a flow indicator/suction strainer, inlet valve, outlet valve and piping all manufactured from stainless steel materials.

2.22.2 Injector Storage Tanks

The injector storage tanks (two each) shall be horizontal double wall steel tanks with a 400 gal capacity and a horizontal cylindrical design. The tank shall met all requirements of NFPA 30 and UL 142 for flammable/combustible liquids and shall include a 30 year warranty against defects in material or workmanship. The tank and all components shall be suitable for JP-8+100 additive. The tank shall be equipped with standard accessories including mounting supports, a 24-inch manway, normal venting, mechanical level indication, a 2-inch NPT plugged drain fitting, primary and secondary containment emergency venting, manual interstitial space monitoring, two-inch product drop tube, a manual level sticking port, interior epoxy coating as per Section 09 97 13.17 THREE COAT EPOXY INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS and exterior epoxy coating as per Section 09 97 13.27 EXTERIOR COATING OF STEEL STRUCTURES. All materials mounted inside the tank shall be 304 SS minimum. The storage tanks shall be mounted on a 5-foot high steel structural stand. The injector storage tank gauge shall be a vertical direct read with an 8 inch minimum dial face calibrated in gal. The gauge assembly shall mount on a 2-inch NPT fitting. The float, float arm and all wetted parts are to be 304 SS minimum.

2.22.3 JP-8+100 Additive Tubing and Conduit

The additive supply header feeding the fuel injection stations shall be manufactured of one 1 inch nylon flexible tubing natural colored. The tubing shall have an inner diameter of 13/16-inches, a working pressure of 205 PSIG and a minimum bend radius of 7 inches. All tube fittings shall be of stainless steel ferrule compression design. Support aboveground tubing as required to mount securely.

2.22.4 JP-8+100 Additive Ball Valves and Strainer

The valves and strainer in the tanks supply line shall meet the requirements of Section 33 52 43.13 AVIATION FUELING PIPING plus be equipped with gaskets, seals, seats and packing that are compatible with the JP-8+100 additive. Teflon and Viton-Litharge are recommended by the additive manufacturer. The strainer shall include a stainless steel 50 mesh screen.

][2.23 OPERATING TANK VENT

****
NOTE: Select when using a cut and cover Tank.
****

a. System shall be designed and installed in such a way that the system shall be continuously and automatically self-checking. Switches shall be mounted on top of the tank, in the pump house, as indicated. Electronic level sensors shall be thermistors or optic type, and be intrinsically safe Class I, Division 1, Group D for hazardous environments, with recognized FM, CSA or UL approval. The sensor holder/junction box shall be accessible.

b. Tank vent outlet shall be equipped with pressure-vacuum breather vent, aluminim construction with weather hood and with viton pallet seat inserts, high density screens, stainless steel internals, with pressure relief setting at 0.5 oz psi, and vacuum relief set at 0.5 oz psi. Pressure venting capacity shall be 9700 cubic feet/hour, vacuum capacity shall be 14500 cubic feet/hour.

]PART 3 EXECUTION

3.1 GENERAL

3.1.1 Installation

Install equipment and components in position, true to line, level and plumb, and measured from established benchmarks or reference points. Follow manufacturer's recommended practices for equipment installation. Provide required clearances between equipment components. Equipment, apparatus, and accessories requiring normal servicing or maintenance to be accessible.

3.1.2 Anchoring

Anchor equipment in place. Check alignment of anchor bolts before installing equipment and clean-out associated sleeves. Do not cut bolts because of misalignment. Notify Contracting Officer of errors and obtain the Contracting Officer's acceptance before proceeding with corrections.

Cut anchor bolts of excess length to the appropriate length without damage to threads. Where anchor bolts or like devices have not been installed, provide appropriate self-drilling type anchors for construction condition.

3.1.3 Grouting

Equipment which is anchored to a pad is to be grouted in place. Before setting equipment in place and before placing grout, clean surfaces to be in contact with grout, including fasteners and sleeves. Remove standing water, debris, oil, rust, and coatings which impair bond. Clean contaminated concrete by grinding. Clean metal surfaces of mill scale and rust by hand or power tool methods. Provide necessary formwork for placing and retaining grout. Grout to be non-metallic, non-shrink, fluid precision grout of a hydraulic cementitious system with graded and processed silica aggregate, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents; free of aluminum powder agents, oxidizing agents and inorganic accelerators, including chlorides; proportioned, pre-mixed and packaged at factory with only the addition of water required at the project site. Grouting shall be in accordance with ASTM C 827. Perform all grouting in accordance with equipment manufacturer's and grout manufacturer's published specifications and recommendations.

3.1.4 Leveling and Aligning

Level and align equipment in accordance with respective manufacturer's published data. Do not use anchor bolt, jack-nuts or wedges to support, level or align equipment. Install only flat shims for leveling equipment. Place shims to fully support equipment. Wedging is not permitted. Shims to be fabricated flat carbon steel units of surface configuration and area not less than equipment bearing surface. Shims to provide for full equipment support. Shim to have smooth surfaces and edges, free from burrs and slivers. Flame or electrode cut edges not acceptable.

3.1.5 Direct Drives

Alignment procedure follows:

3.1.5.1 Rotation Direction and Speed

Check and correct drive shaft rotation direction and speed.

3.1.5.2 End Play

Run drive shafts at operational speed. Determine whether axial end play exists. Run drive shaft at operational speed and mark drive shaft axial position when end play exists. Block drive shaft in operating position when aligning drive shaft with driven shaft.

3.1.5.3 Shaft Leveling and Radial Alignment

Pump alignment shall be accomplished by the factory technician or a millwright trained in pump alignment, and with the use of dial gauges or laser alignment equipment.

3.1.5.4 Angular Alignment and End Clearance

Check angular alignment and end clearance by inserting a feeler gage at 4 points, 90 degrees apart around outer edges of coupling halves.

3.1.5.5 Final Recheck

Check adjustments with dial indicator after completing recheck. Align shafts within 0.001 inch tolerance, except as other-wise required by more stringent requirements of equipment manufacturer.

3.1.6 Precautions

Special care shall be taken to ensure that equipment and materials are stored properly to prevent damage and maintain cleanliness, and that the completed system is free of rocks, sand, dirt, and foreign objects. Take the following steps to insure these conditions.

a. Equipment brought to the site and not stored inside, shall be stored on blocks or horses at least 18 inches above ground.

b. Visual inspection shall be made of each piece of equipment to ensure that it is clean prior to installation.

c. The open ends of equipment shall be closed when work with that piece of equipment is not in progress.

3.2 INSTALLATION OF UNDERGROUND TANKS

Installation shall be per tank manufacturer's recommendations, API RP 1615, NFPA 30, 40 CFR 280, state and local codes and as specified herein. If recommendations require tank to be filled, only fuel will be allowed in tanks. Water filling is not acceptable. Before being placed in service, tank shall be tightness tested in accordance with NFPA 30.

3.2.1 Coating Testing

The coating shall be examined for flaws and tested for thickness. Provide the facilities, personnel, and equipment for testing for flaws and thickness. Thickness shall be measured electronically. Coating shall be tested directly before placement of the tank with an electric flaw detector, equipped with a bell, buzzer, or other type of audible signal that operates when a flaw is detected. The detector for the type of coating used shall have an operating voltage of 10,000 to 35,000 volts. Check of the holiday detector potential may be made by the Contracting Officer at any time to determine the suitability of the detector. Damaged areas shall be repaired with materials identical to those used originally, and after drying, shall be retested electrically. Submit test results.

3.2.2 Steel Tanks

a. Cover the concrete hold down slab with 6 inches of tank bedding backfill evenly graded and thoroughly compacted, prior to tank placement.

b. Each tank is to be unloaded and placed on the sand bed using cranes and the rigging procedures provided by the tank manufacturer. Use the tank lifting lugs for lifting the tank into place. The use of slings around the tank is not permitted, nor is the use of chock blocks of any sort. During handling, carefully inspect the tanks for coating damage and repair any damage whatsoever before proceeding. After placement, check each tank to ensure it is sloped as required. The elevation shall be confirmed.

c. Before proceeding with backfill, install the hold down straps and tighten the turnbuckles securely and evenly throughout the length of the tanks. The bottom and sides of the tanks to be fully and evenly supported by hand shoveling and tamping. Use tank bedding backfill up to 12 inches above the top of tank. Hand-guided power equipment can be used to place fill in 6-inch layers, compacted to a minimum of 95 percent maximum density, after the bottom quadrant is filled. A minimum of four density tests per tank to be performed. Clean, noncorrosive, well tamped gravel to be used for backfill from a point 12 inches above the tanks to finished grade.

d. Do not fill the tank, even partially, before the bottom quadrant is backfilled. The level of fuel product not to exceed the level of compacted backfill at any time.

e. Coordinate tank installation with the installation of cathodic protection.

3.3 INSTALLATION OF FIBERGLASS PITS

Submit recommended installation procedures and setting tolerances from the pit manufacturer/supplier for the fiberglass pit and the aluminum cover. These procedures shall indicate recommended methods of supporting the pit in its proper position in the open excavation prior to and during concrete placement operations. Also, required installation tolerances, especially for flatness/levelness of the fiberglass pit lip, shall be provided. Follow these recommendations and apply other procedures as required to ensure the integrity of the pit liner and cover assemblies in their installed positions. All penetrations through the fiberglass pit liner shall be tightly sealed by suitable means to preclude water infiltration, with consideration for potential relative movements between the penetrating objects and the pit liner. Reference the Contract drawings for additional installation requirements.

3.4 POSTED OPERATING INSTRUCTIONS

For each designated system or equipment item, provide instructions for guidance of operating and maintenance personnel. Following approval of content, prepare these instructions in a form and scale that will be readily legible when displayed in appropriate locations, to be designated by the Contracting Officer and meet the following requirements:

3.4.1 Each System

For each system, include diagrams of equipment, piping, wiring and control. Define control sequences.

3.4.2 Each Tank

For each tank provide a P.E. stamped certified tank calibration chart in 1/16-inch increments reading in gallons.

3.4.3 Each Item

For each equipment item, include starting, adjustment, operation, lubrication, safety precautions and shut-down procedures. Identify procedures to be performed in event of equipment failure. Provide other instructions recommended by the manufacturer.

3.4.4 Diagrams

Provide a professionally prepared isometric piping diagram of the fueling system apparatus. Diagram shall be 36 by 54 inches and shall be color coded to match PCP color diagrams. Diagram shall show the entire facility and shall include all equipment and the operational sequences of all equipment with equipment numbers displayed. Diagram shall show all valves along with the valve numbers shown on the drawings and listed as normally open/closed. It shall be wall mounted under glass.

3.4.5 Volume of Fuel

Provide a certified system inventory of fuel in the pipe, tank, pumphouse, etc. The piping will show length of pipe, size of pipe, gal/foot, and total gal. Verify during initial fill.

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA **UFGS-33 52 43.12 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 52 43.12

AVIATION FUEL PANTOGRAPHS

02/10

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USACE / NAVFAC / AFCESA / NASA UFGS-33 52 43.12 (February 2010)

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****

SECTION 33 52 43.12

AVIATION FUEL PANTOGRAPHS
02/10

****
NOTE: This guide specification covers the requirements for Pantographs used in aircraft refueling systems or at truck fill stands constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III). **DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API SPEC 1584	(2001; Addenda 2007) Four-Inch Hydrant System Components and Arrangements
API Std 1529	(2005) Aviation Fueling Hose and Hose Assemblies

ASME INTERNATIONAL (ASME)

ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B40.100	(2005) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

ASTM A 312/A 312M	(2009) Standard Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AS5877	(2007; Rev A) Aircraft Pressure Refueling Nozzle
SAE J517	(2008) Hydraulic Hose

U.S. AIR FORCE (USAF)

AFI 91-202	(1998) US Air Force Mishap Prevention Program

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-C-83260	(Rev A; Notice 1) Coupler, Hydrant Valve GRU-16/e

MIL-DTL-24788	(Rev A) Coupling Assembly, Semi-Dry-Break, Quick-Disconnect Fuel With or Without Continuity Switch

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50696	(Basic) Reels, Static Discharge, Grounding, 50 and 75 Foot Cable Lengths

1.2 ADMINISTRATIVE REQUIREMENTS

Provide aircraft pantograph approved by the [Air Force System Safety Engineer Analysis (AFSSEA) Team in accordance with AFI 91-202] [Navy (NAVAIR (AIR 4.4.5.1)] [APC]. Submit scaled assembly drawings identifying components and showing dimensions and tolerances. Complete technical literature shall be submitted on specific function equipment. OMSI information shall be submitted for the equipment items or systems specified. Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYTEMS for the information to be submitted for various types of equipment and systems. Emergency dry breakaway coupler (EDBC) is required for USN/USMC projects.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Scaled assembly drawings[; G][; G, [_____]]

SD-03 Product Data

Flow meter[; G][; G, [_____]]
Hydrant coupler[; G][; G, [_____]]
Shut-off valve[; G][; G, [_____]]
Automatic pressure equalizing system[; G][; G, [_____]]
Pressure fueling nozzle[; G][; G, [_____]]
Venturi[; G][; G, [_____]]
Flanged Swivel joints[; G][; G, [_____]]
Pressure gage assembly[; G][; G, [_____]]
[Emergency dry breakaway coupler (EDBC)[; G][; G, [_____]]]

SD-07 Certificates

Materials[; G][; G, [_____]]

SD-10 Operation and Maintenance Data

Flow meter[; G][; G, [_____]]
Hydrant coupler[; G][; G, [_____]]
Shut-off valve[; G][; G, [_____]]
Automatic pressure equalizing system[; G][; G, [_____]]
Pressure fueling nozzle[; G][; G, [_____]]
Venturi[; G][; G, [_____]]
Flanged Swivel joints[; G][; G, [_____]]
Pressure gage assembly[; G][; G, [_____]]
[Emergency dry breakaway coupler (EDBC)[; G][; G, [_____]]]

1.4 QUALITY ASSURANCE

1.4.1 Design Conditions

Design shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT. Components shall be ASME B16.5 Class 150 (275 psig at 100 degrees F, except that swivel joints and pressure fueling nozzles shall be 125 psig at 100 degrees F). Nominal diameters shall be as follows:

Hydrant coupler	4 inch
Piping sections	3 and 4 inch
Flanged connection	ASME B16.5 125 LB
Flow meter	4 inch ASME B16.5 150 LB
Shut-off valve/40 mesh strainer	2-1/2 or 3 nch
Dry break quick disconnects	2-1/2 or 3 inch
Flanged pantograph swivel joints	3 and 4 inch
Pressure fueling nozzle	2-1/2 inch outlet

PART 2 PRODUCTS

2.1 MATERIALS

The type of materials which come in contact with the fuel shall be noncorrosive. No zinc coated metals, brass, bronze or other copper bearing alloys shall be used in contact with the fuel. Additional requirements are as follows:

2.1.1 Piping

Construct all pipe and piping components of Schedule 10S, Grade TP304L, stainless steel conforming to ASTM A 312/A 312M. Only seamless pipe will be used.

2.1.2 Fitting and Bends

Same thickness as adjoining pipe.

2.1.3 Components

Aluminum alloy or stainless steel.

2.1.4 Structural Steel

Structural steel shall conform to ASTM A 36/A 36M, hot dipped galvanized after fabrication and painted a factory standard color.

2.2 EQUIPMENT AND MATERIAL

2.2.1 Detachable Aircraft Pantograph

a. Detachable pantographs shall be designed in such a way that all wheel supports rest upon the apron regardless of the different terrain conditions.

****
NOTE: Insert required Pantograph length obtained from COMMAND FUEL FACILITIES Engineer.
****

b. Provide detachable pantographs consisting of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections shall be [_____] feet.

c. The connecting section shall consist of a hydrant coupler and flanged swivel joints, which allow the coupler to be connected to the hydrant control valve at levels of +/- 6 inches from the level of the apron.

d. The connecting section shall be supported by an adjustable spring, counterweight or hydraulically actuated cylinders which balance the weight of the hydrant coupler, flanged swivel joints and pipe connecting section.

e. Design the dispensing end to be coupled to the aircraft at heights of 12 inches to 8 feet above the apron.

f. The dispensing end shall be supported by an adjustable spring, counterbalance or hydraulically actuated cylinder which balances the weight of the pressure fueling nozzle, shut-off valve, flanged swivel joints and connecting pipes to ensure that only minimum force occurs when connecting the detachable pantograph to the aircraft. One person shall be able to operate the dispensing end.

g. Hoses (except fuel sensing hose) shall not be permitted as a part of the detachable pantographs.

h. Detachable pantographs shall be equipped with an adjustable automatic pressure equalizing system, relieving at 125 psig to an equalizing reservoir, to compensate for thermal expansion and contraction.

i. The equalizing reservoir's vent shall be equipped with a flame arrestor. The reservoir shall be sized for a maximum temperature differential of 144 degrees F.

j. The pantograph shall be equipped with supporting structures each mounted on two spring-loaded casters.

k. To avoid sagging, reinforcing shall be welded to the underside of the pipe sections.

l. A tow bar shall be attached to the front support of the pantograph. Maximum tow speed is 5 mph. Tow bar to be suitable for mounting to pintle hook.

m. The connecting section and the dispensing end shall be locked to the main sections of the pantograph when in the stored or towing mode. Pantograph shall be provided with a nozzle hanging support.

n. The three main sections of the pantograph shall be locked together when in the stored or towing mode.

o. The overall electrical resistance between the hydrant coupler and the pressure fueling nozzle shall not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

p. The pantograph shall be equipped with two self winding grounding cable reels. The cable shall be at least 50 feet long. Each cable reel, the grounding cable and the connection clamp shall be in accordance with CID A-A-50696.

q. The pantograph shall be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

r. Detachable pantographs shall be provided with 25 feet of [hydraulic] [nitrogen powered] deadman control hose. Hose shall be provided with stainless steel fittings, nylon stop ball and aluminum deadman control handle. Hose shall be dual type with Buna-N tube, vertically braided textile body with fuel resistant neoprene cover.

****

NOTE: Per COMMAND FUELS FACILITY Engineer, or Service Headquarters.

****

s. Detachable pantographs shall be equipped with a flow meter, pantograph control valve,[fuel filter separator,] [control valve,] [additive injector,] and a venturi. The flow meter shall be provided with additional support.

****
NOTE: Per COMMAND FUELS FACILITY Engineer, or Service Headquarters.
****

t. The pantograph shall be equipped with a minimum of eight (8) terrain spring loaded casters made of steel or cast steel, galvanized or hot-dip galvanized. The caster swivel head shall be equipped with two lubricated ball bearings with grease nipples. The wheels shall have an overall diameter of at least 12 inches and shall be equipped with two lubricated grooved ball bearings with grease nipples. The wheels shall be coated with rubber. Two of the casters shall be equipped with brakes which positively lock the unit in place once at rest. Two casters shall be equipped with an additional device which can be adjusted to lock automatically for towing the pantograph.

2.2.2 High Reach Pantographs

a. The high reach pantograph unit consists of a steel frame with spring loaded casters and a lifting platform. The pipe sections are interconnected by swivel joints.

b. The platform with the dispensing end shall be easily extended up to a connection height of 7 to 16 feet above ground level operated by hand. No electric energy shall be used. An extensionable ladder fixed at the frame allows to reach the platform at any position.

c. The platform must be secured with a railing and automatically closing door.

d. The high reach pantograph shall be equipped with devices for draining, pressure gauging and venting.

e. Support structures, counter balance systems and all other equipment made of steel shall not be welded to the stainless steel pipe. It shall be only bolted by clamps to the pipe and shall be easily replaceable by common tools in case of repair or maintenance.

f. A tow bar shall be attached to the front support of the pantograph. Maximum tow speed is 5 mph. Tow bar to be suitable for mounting to pintle hook.

g. The connecting section and the dispensing end shall be locked to the main sections of the pantograph when in the stored or towing mode. Pantograph shall be provided with a nozzle hanging support.

h. The overall electrical resistance between the hydrant coupler and the pressure fueling nozzle shall not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

i. The pantograph shall be equipped with two self winding grounding cable reels. The cable shall be at least 50 feet long. Each cable reel, the grounding cable and the connection clamp shall be in accordance with CID A-A-50696.

j. The pantograph shall be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

k. The pantograph shall be equipped with labeling to provide safety warnings such as don't use around power lines, and use limits such as weight limitations.

l. The pantograph shall be equipped with a minimum of four (4) terrain spring loaded casters made of steel or cast steel, galvanized or hot-dip galvanized. The caster swivel head shall be equipped with two lubricated ball bearings with grease nipples. The wheels shall have an overall diameter of at least 12 inches and shall be equipped with two lubricated grooved ball bearings with grease nipples. The wheels shall be coated with rubber. Two of the casters shall be equipped with brakes which positively lock the unit in place once at rest. Two casters shall be equipped with an additional device which can be adjusted to lock automatically for towing the pantograph.

2.2.3 Permanent Pantograph Fabrication - [Hoseless][Hose End] Type

****

NOTE: The requirements of this paragraph should be added for KC-10, E-4, and other aircraft that incorporate fueling adapters located more than 2.4 m (8 feet) above the apron.

Per COMMAND FUELS FACILITY Engineer or Service Headquarters.

****

a. The permanent pantograph shall be designed in such a way that all wheel supports rest upon the apron regardless of the different terrain conditions.

****

NOTE: Insert required Pantograph number of sections and length obtained from COMMAND FUELS FACILITY Engineer.

****

b. The permanent pantograph shall consist of [two] [three] main sections, plus one connecting section and one dispensing end. Total length of the main sections shall be [_____] feet.

****

NOTE: Insert required height reach of Pantograph obtained from COMMAND FUELS FACILITY Engineer.

****

c. The dispensing end shall be designed to be coupled to the aircraft at heights of 12 inches to [_____] feet above the apron.

d. The dispensing end shall be supported by an adjustable spring, weight device or hydraulically actuated cylinder to counter balance the weight of the pressure fueling nozzle, shut-off valve, flanged swivel joints and connecting pipes to ensure that only minimum force occurs when connecting pantograph to aircraft. One person shall be able to operate the dispensing end.

e. Hoses (except fuel sensing hose) shall not be permitted as a part of the pantograph.

f. The dispensing end shall consist of a 10 foot section of aviation fueling hose, as specified herein after, a [D-1] [D-1R] [D-2] [D-2R] pressure refueling nozzle and a bonding wire wrapped a minimum of 10 coils around the exterior of the hose and connected to both hose-end NTP fittings. A shut-off valve between the hose end and the pressure refueling nozzle shall not be provided.

g. A suitable trough for storing the fueling hose shall be provided on top of the final pantograph leg.

h. Provide a draw bar or pull cable with handle for positioning the pantograph.

i. To avoid sagging, reinforcing shall be welded to the underside of the pipe sections.

j. The main sections of the pantograph shall be locked together and to the non-movable portion of the pantograph when in the stored mode.

k. The overall electrical resistance between the pantograph control valve and the pressure fueling nozzle shall not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

l. The pantograph shall be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

m. The fixed portion of the pantograph shall include a pantograph control valve, venturi, and flow meter.

n. A refueling adapter meeting the requirements of MIL-DTL-24788 shall be mounted to the return piping for the purpose of flushing the permanent pantograph. The refueling adapter shall have a 4-inch flange mounting and be equipped with a metal vacuum tight locking dust cap that mates with the lugs of the refueling adapter.

o. Intermediate and end swivel joints shall have 8 inch diameter solid oil resistant tires and shall be equipped with two lubricated grooved ball bearings with grease nipples. The wheels shall be coated with rubber.

****
NOTE: EDBC required for NAVY/MARINE CORPS projects.
****

p. Install an emergency dry breakaway coupler (EDBC) between the last swivel and the dispensing hose.

2.2.4 Truck Fill Stand Pantograph Fabrication - (Non-Recessable)

a. Truck fill stand pantographs shall consist of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections shall be 10 feet.

b. The dispensing end shall be designed to be coupled to the refueling truck at heights of 12 to 55 inches above the road.

c. The dispensing end shall be supported by an adjustable spring, weight device or hydraulically actuated cylinder to counter balance the weight of the pressure fueling nozzle, shut-off valve, flanged swivel joints and connecting pipes to ensure that only minimum force occurs when connecting pantograph to tank trucks. One person shall be able to operate the dispensing end. Pantograph shall be provided with a nozzle hanging support.

d. Hoses shall not be permitted as a part of the truck fill stand pantograph.

e. The three main sections of the pantograph shall be locked together when stored.

f. The overall electrical resistance between the flanged end and the pressure fueling nozzle shall not exceed 1 kilo Ohm. Grounding straps across the swivel joints are not permitted.

g. The pantograph shall be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

h. The connecting section and the dispensing end shall be locked to the main sections of the pantograph when in the stored mode.

2.2.5 Truck Fill Stand Pantograph Fabrication (Recessable)

a. The truck fill stand pantograph shall be designed for bottom loading of refueling trucks and shall be designed in such a way that it can be completely lowered into the pit. Pantograph construction and pit configuration shall be coordinated such that interferences and restrictions in operation of the pantograph are eliminated.

b. A combination of flanged swivel joints and pipe sections shall permit the required vertical and horizontal adjustments. The pantograph shall automatically lock in the up position.

c. The guiding unit for vertical adjustment shall be maintenance free.

d. The pantograph shall consist of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections shall be 10 feet.

e. The dispensing end shall be designed to be coupled to the refueling truck at heights of 12 to 55 inches above the road.

f. The dispensing end shall be supported by an adjustable spring, weight device or hydraulically actuated cylinder to counter balance the weight of the pressure fueling nozzle, shut-off valve, flanged swivel joints and connecting pipes to ensure that only minimum force occurs when connecting pantograph to tank trucks. One person shall be able to operate the dispensing end.

g. Hoses shall not be permitted as a part of the truck fill stand pantograph.

h. The three main sections of the pantograph shall be locked together when stored.

i. The overall electrical resistance between the flanged end and the pressure fueling nozzle shall not exceed 1 kilo Ohm. Grounding straps across the swivel joints are not permitted.

j. The pantograph shall be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

2.2.6 Flanged Swivel Joints

a. Anchor end, intermediate, and hose end pantograph swivel joints shall be stainless steel, [single plane,] flanged capable of rotating 360 degrees. Welded swivel joints and welding of swivel joints to the pipe and/or elbow is not permitted. Welding of swivel joints to flange joints is permitted. Swivel joints shall be of the non-lubricated, maintenance free type with non-lubricated bearings and no lubricating fittings[, and shall be arctic-grade].

b. No leakage shall be permitted under positive or negative pressure conditions. No leakage shall be permitted under high or low temperature conditions. The swivel joints shall be warranted for three years against leakage due to both positive and negative pressure conditions.

c. There must be electrical continuity from one flange to the other without the use of ground straps. The electrical continuity from one flange to another (without the use of ground straps) shall be less than 1000 ohms. Each swivel joint shall have at least two ball bearings and one roller bearing and two seals.

****

NOTE: Include Item 'd' for NAVY/MARINE CORPS projects and delete [SINGLE PLANE,] in Item 'a' above.

****

d. Only NAVAIR approved swivels (Aeroequip single plane; EMCO-Wheaton single plane; CLA-VAL 2-plane; and Carter Ground Fueling single and 2-plane) shall be used.

2.2.7 Flow Meter

The flow meter shall be stainless steel or aluminum, double case, positive displacement, rotor type, bi-directional, temperature compensating. Provide an adjustor for calibrating the meter. Meter shall have large visible 5-digit reset totalizer and small visible 8-digit non-reset totalizer. [Meter readout shall be mounted on a swivel.] The unit of measurement shall be gal and the increment of measurement shall be one gal.

[2.2.8 Emergency Dry Breakaway Coupler (EDBC)

****

NOTE: EDBC required for NAVY/MARINE CORPS Projects.

****

The EDBC unit shall operate independently of internal pressure and separate at a nominal +/- 50 pound tensile pull. The EDBC shall be capable of reinstallation without replacement parts or the use of special tools. The NAVAIR approved EDBCs for use on aircraft refueling pantographs are the Aeroquip AE1284U and the Carter Ground Fueling 64227.

]2.2.9 Sampling Connection

Sampling connection shall be provided. Materials shall be Type 316 stainless steel. Material for ball valve, quick disconnect coupling shall be Type 316 stainless steel. Each sampling connection shall consist of a 1/4-inch sampling probe where the probe faces upstream, ball valve, a quick disconnect coupling and aluminum dust cap. The sampling connections shall be capable of accepting a sampling kit for drawing the samples required to assure fuel quality. Provide a 3-foot, fuel resistant sampling hose with mating quick disconnect fitting.

2.2.10 Pressure gage assembly

Assembly shall consist of 4-inch ASME B40.100 pressure gage and pressure gage stop cock. Pressure gage shall be liquid filled type with an indicating range 0-275 psig. Material shall be Type 316 stainless steel.

2.2.11 Drain and Vent Assemblies

Assemblies shall consist of a 1/2 inch ball valve and shall terminate with a 180 degree pipe gooseneck and screwed cap for the vent, and the drain shall have a 1/2 inch ball valve and shall terminate with a cam type quick disconnect.

2.2.12 Hydrant Coupler

****

NOTE: Select either Military Specification Pantographs or Commercial Specification for use with hose trucks or as directed by COMMAND FUEL FACILITY Engineer. Hydrant Control Valve Adapter shall match selection. Delete this paragraph if only permanent Pantographs are to be used.

****

The hydrant coupler is the connection between the hydrant system and the pantograph. It shall comply with [MIL-C-83260] [API SPEC 1584]. The coupler shall be provided with suitable, non-lubricated 360 degree rotation swivel joint and shall be suitable for mounting to flanged connection. In addition to the bicycle handle grips, the nozzle shall be provided with a half circle ring handle.

2.2.13 Shut-Off Valve

****

NOTE: Delete this paragraph for NAVY/MARINE CORPS projects. For AIR FORCE projects this paragraph will be deleted at the direction of the COMMAND FUELS FACILITY Engineer if only hose end Pantographs are to be used.

****

A [2-1/2 inch] [3-inch] shutoff valve shall be mounted upstream of the pressure fueling nozzle and shall provide safe shutoff of the pantograph for inspection of the dry break quick disconnect strainer.

2.2.14 Dry Break Quick Disconnect

A [2-1/2 inch] [3-inch] semi-dry break quick disconnect (MIL-DTL-24788, Class 1 or equivalent) shall be mounted between the [shut-off valve] [hose end] and the pressure fueling nozzle. The semi-dry break quick disconnect shall be capable of swiveling through 360 degrees and shall incorporate a 60 mesh strainer in the portion attached to the pressure refueling nozzle (also known as the male half).

2.2.15 Pressure Fueling Nozzle

****
NOTE: D-1R, D-2R and D-3R Nozzles incorporate either a 380 kPa (55 psi) (NAVY/MARINE CORPS) or 311 kPa (45 psi) (ARMY) hose end pressure regulator. Pprovide the type of nozzle directed by the COMMAND FUELS FACILITY Engineer or Service Headquarters. For NAVY/MARINE CORPS projects provide D-1R Nozzles having 380 kPa (55 psig) hose end regulators unless specific approval for a different nozzle type is received from NAVAIR.
****

SAE AS5877, 2-1/2-inch nozzle [D-1] [D-2] [D-1R (D-1 with [55] [45] psig hose end pressure regulator)] [D-2R (D-2 with [55] [45] psig hose end pressure regulator)] [D-3R (D-3 with [55][45] psig hose end regulator)] shall be provided for the connection between pantograph and aircraft. Design shall be for single point fueling of [aircraft] [and] [truck] at a flow rate of 600 gpm with maximum pressure drop of 30 psig. Nozzle shall be provided with a permanently installed quick disconnect sampling coupler. (Gammon GTP-235-3/8 Jet Test QD meets this requirement.) Provide pressure gage with 0-100 psig indicating range mounted on actuator for use with quick disconnect sampling coupler.

[2.2.16 Aviation Fuel Hose

Fueling hose shall conform to API Std 1529, Grade 2, Type C, semi-hardwall, [3] [2.5]-inch nominal hose designed for use with specified fuel for a working pressure of 300 PSIG over a working temperature range of -22 to 131 degrees F. Hose shall be constructed of braided synthetic cord surrounded by an interior rubber tube and an exterior rubber cover. Provide permanent brass, threaded, male NPT, both ends.

]2.2.17 Venturi

a. The venturi provides for compensated pressure regulation to each permanent aircraft pantograph control valve and on each hydrant control valve. Venturi shall be constructed of stainless steel. The venturi shall be sized to compensate for pressure drop of entire pantograph assembly at minimum through maximum design flow rate. The amount of recovery shall be adjustable and the maximum unrecoverable pressure drop at 600 gpm shall be less than 10 psi.

b. Provide venturi control lines with needle valve to be used during final adjustment of pantograph. Venturi control lines shall be provided with pressure gauge and pressure gauge stop cock. Indicating range shall be 0-100 psig. Material shall be Type 316 stainless steel.

c. Detachable pantograph venturi shall be provided with a 3/8 inch stainless steel fuel sensing line and 8 feet of 5/16-inch fuel sensing hose. Fuel sensing line and hose shall be provided with a stainless steel plug and socket type quick disconnect for coupling together at the pantograph and opposite end of fuel sensing hose suitable for connection to hydrant control valve's pilot system.

d. Fuel sensing hose tube and cover shall be resistant to the effects of hydrocarbon fuels and shall conform to SAE J517-100R7.

2.2.18 Pantograph Control Valve

****
NOTE: Per COMMAND FUELS FACILITY Engineer or COMMAND Service Headquarter direction.
****

Refer to Section 33 52 43.14 AVIATION FUEL CONTROL VALVES.

[2.2.19 Fuel Separator

****
NOTE: Per COMMAND FUELS FACILITY Engineer or COMMAND Service Headquarter direction.
****

Refer to Section 33 52 43.28 FILTER SEPARATOR, AVIATION FUELING SYSTEM.

][2.2.20 Additive Injector

****
NOTE: Per COMMAND FUELS FACILITY Engineer or COMMAND Service Headquarter direction.
****

Refer to Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT.

]2.2.21 Nitrogen Powered Deadman Control System

****
NOTE: Include only if selected in paragraph DETACHABLE AIRCRAFT PANTOGRAPH, in PART 1.
****

Provide pantographs with a 39 cubic foot nitrogen cylinder, adjustable pressure regulator, quick release shuttle for the nitrogen, interconnecting control tubing, pressure gauge, and all necessary hardware to operate the pneumatic deadman pilot system on the hydrant control valve. The nitrogen bottle shall be mounted to the pantograph. Provide 10 feet of air/nitrogen control hose to connect the deadman control system to the hydrant control valve air deadman connection. Provide stainless steel plug and socket type quick disconnect for coupling together the air control hose at the pantograph and a quick disconnect suitable for connection to the hydrant control valve's pilot system at the other end.

PART 3 EXECUTION

3.1 ASSEMBLY

The pantograph shall be delivered completely assembled.

3.2 TESTING

The pantograph shall be tested as described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP.

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA   UFGS-33 52 43.13 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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****
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Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 52 43.13

AVIATION FUEL PIPING
02/10

****
NOTE: This guide specification covers the requirements for piping and valves for aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date,

and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 1110	(2007) Pressure Testing of Steel Pipelines for the Transportation of Gas, Highly Volatile Liquids or Carbon Dioxide
API RP 582	(2009) Welding Guidelines for the Chemical, Oil, and Gas Industries
API STD 600	(2009; Errata 2009) Steel Gate Valves-Flanged and Butt-welding Ends, Bolted Bonnets
API STD 608	(2008) Metal Ball Valves - Flanged, Threaded, And Welding End
API Spec 5L	(2007; Errata 2009) Specification for Line Pipe
API Spec 6D	(2008; Errata 2008; Errata 2008; Errata 2009; Addendum 2009) Specification for Pipeline Valves
API Spec 6FA	(1999; R 2006; Errata 2006; Errata 2008) Specification for Fire Test for Valves
API Std 1529	(2005) Aviation Fueling Hose and Hose Assemblies
API Std 594	(2004) Check Valves: Flanged, Lug, Wafer and Butt-Welding
API Std 607	(2005; Errata 2008) Testing of Valves: Fire Type-Testing Requirements

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2007) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A3.0	(2001; R 2001) Standard Welding Terms and Definitions
AWS A5.1/A5.1M	(2004; Errata 2004) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.5/A5.5M	(2006) Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding
AWS A5.9/A5.9M	(2006; Errata 2006) Specification for Bare Stainless Steel Welding Electrodes and Rods
AWS Z49.1	(2005) Safety in Welding, Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B1.1	(2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B16.11	(2009) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2005) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.34	(2009) Valves - Flanged, Threaded and Welding End
ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.1	(1996; R 2005) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 2005) Standard for Square and Hex Nuts
ASME B31.1	(2007; Addenda a-2008) Power Piping
ASME B31.3	(2008) Process Piping
ASME BPVC SEC IX	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M	(2009) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A 182/A 182M	(2009a) Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 193/A 193M	(2009) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(2009) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A 234/A 234M	(2007) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 269	(2008) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 312/A 312M	(2009) Standard Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes
ASTM A 358/A 358M	(2008a) Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service and General Applications
ASTM A 403/A 403M	(2009) Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 961/A 961M	(2008a) Standard Specification for Common Requirements for Steel Flanges, Forged Fittings, Valves, and Parts for Piping Applications
ASTM D 229	(2009b) Rigid Sheet and Plate Materials Used for Electrical Insulation
ASTM E 94	(2004) Radiographic Examination
ASTM F 436	(2009) Hardened Steel Washers

BRITISH STANDARDS INSTITUTE (BSI)

BS EN ISO 10497	(2004) Testing of Valves Fire Type-Testing Requirements

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-69	(2003) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2008; Errata 08-1) Flammable and Combustible Liquids Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AS5877	(2007; Rev A) Aircraft Pressure Refueling Nozzle
SAE J514	(2004) Hydraulic Tube Fittings

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 5	(2007) White Metal Blast Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-25896	(Rev E; Notices 1 & 3) Adapter, Pressure Fuel Servicing, Nominal 2.5 inch diameter
MIL-DTL-24441	(2009; Rev D) Paint, Epoxy-Polyamide, General Specification for
MIL-PRF-13789	(Rev E; Notice 1) Strainers, Sediment: Pipeline, Basket Type
MIL-PRF-4556	(1999; Rev F; Am 1) Coating Kit, Epoxy, for Interior of Steel Fuel Tanks
MIL-STD-161	(2005; Rev G) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS L-C-530	(Rev C) Coating, Pipe, Thermoplastic Resin

FS L-T-1512 (Rev A) Tape, Pressure Sensitive Adhesive, Pipe Wrapping

U.S. NAVAL SEA SYSTEMS COMMAND (NAVSEA)

NAVSEA T9074-AS-GIB-010/271 (1999; Notice 1) Requirements for Nondestructive Testing Methods

1.2 ADMINISTRATIVE REQUIREMENTS

Design conditions shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT. Submit a copy of welding qualified procedures, where the procedures will be used, and a list of names and identification symbols of qualified welders and welding operators. Submit Operation and Maintenance Manuals for the equipment items or systems listed below. Refer to Section 01 78 23.33OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted for various type of equipment and systems.

Manual Valves
Flexible Ball Joints
Surge Suppressor Tank and Valve
Strainers
Protective Coatings
Sample Connections
Isolating Gasket Kits
Gaskets
Flexible Hoses

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fittings[; G][; G, [_____]]
Surge Suppressor Tank and Valve[; G][; G, [_____]]
Flexible Ball Joints[; G][; G, [_____]]
Strainers[; G][; G, [_____]]
Flexible Hoses[; G][; G, [_____]]
Lightning Surge Arrester[; G][; G, [_____]]
Epoxy Lining[; G][; G, [_____]]
Protective Coatings[; G][; G, [_____]]
Sample Connections[; G][; G, [_____]]
Isolating Gasket Kits[; G][; G, [_____]]
Gaskets[; G][; G, [_____]].
Purge Blocks[; G][; G, [_____]]
Pigging Accessories[; G][; G, [_____]]

SD-06 Test Reports

Pneumatic Test
Hydrostatic Test
Geometry Tool Reports[; G][; G, [_____]]

SD-07 Certificates

Welding
Welding qualified Procedures[; G][; G, [_____]]
Qualifications of Welding Inspectors
Qualifications of Welders
Fittings
Surge Suppressor Tank and Valve[; G][; G, [_____]]
Isolating Gasket Kits
Survey final elevations
Pipeline Pigging Verification[; G][; G, [_____]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G][; G, [_____]]

1.4 QUALITY ASSURANCE

****
NOTE: Specify as directed by the COMMAND FUELS FACILITY Engineer.
****

1.4.1 Welding Qualifications

[Welding of fuel pipe joints shall comply with Section 33 52 90.00 20 WELDING FOR POL SERVICE PIPING.] [Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.]

[1.4.2 Qualifications of Welders

Welders and welding procedures shall be qualified in accordance with requirements of ASME B31.3. Submit for each pipe material and process a Welding Procedure Specification (WPS), its corresponding Procedure Qualification Record (PQR), and the welder Performance Qualification (WPQ) for each welder and each specification. Submit on the forms contained within Appendix A of ASME BPVC SEC IX. All welding is to be performed in accordance with applicable requirements of API RP 582 and AWS Welding Handbook Vol. 4, Chapter 5 as it applies to stainless steel piping.

1.4.2.1 Weld Identification

Each qualified welder shall be assigned an identification symbol. All welds shall be permanently marked with the symbol of the individual who made the weld.

1.4.2.2 Defective Work

Welders found making defective welds shall be removed from the work or shall be required to be requalified in accordance with ASME B31.3.

]PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

****
NOTE: Per COMMAND FUELS FACILITY Engineer.
****

Pipe and fittings in contact with fuel shall be stainless steel, interior epoxy coated carbon steel, or carbon steel as indicated on the drawings. No zinc coated metals, brass, bronze or other copper bearing alloys shall be used in contact with the fuel. All carbon steel and stainless steel underground piping shall have an exterior protective coating and shall be cathodically protected in accordance with Section [26 42 19.00 20 CATHODIC PROTECTION BY IMPRESSED CURRENT] [26 42 17.00 10 CATHODIC PROTECTION SYSTEM (IMPRESSED CURRENT)]. Identification of piping shall be in accordance with MIL-STD-161 unless specified otherwise. Material for manual valves shall be as specified hereinafter.

2.1.1 Carbon Steel Piping

Each length of pipe shall be subjected to factory hydrostatic testing and ultrasonic testing in accordance with their respective pipe specification.

a. Piping 12-Inches and Larger: Seamless, ASTM A 53/A 53M Grade B having a wall thickness of 0.375-inch.

b. Piping 2 1/2 through 10-Inches: Seamless, Schedule 40 API Spec 5L Grade B or ASTM A 53/A 53M Grade B.

c. Piping 2-Inches and Smaller: Seamless, Schedule 80 API Spec 5L Grade B or ASTM A 53/A 53M Grade B.

d. Welding Electrodes (Factory Fabrication): E70XX low hydrogen electrodes conforming to AWS A5.1/A5.1M or AWS A5.5/A5.5M.[Provide pipe with coating system Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM.] [Interior epoxy coating system shall be factory applied and in accordance with MIL-PRF-4556, 6 to 8 mils dry film thickness. Documentation of conditions during application shall be submitted to the Contracting Officer.]

2.1.1.1 Interior Epoxy Coated Carbon Steel Piping

****

NOTE: Pipe smaller than 75 mm (3-Inches) can not be Coated. Per COMMAND FUELS FACILITY Engineer.

****

Before applying the epoxy coating, the inside of the pipe shall be sandblasted to "white" metal conforming with SSPC SP 5. If the pipe is not internally epoxy lined immediately after cleaning, a rust preventative coating shall be applied. The rust preventative shall be approved by the epoxy manufacturer. The ends of the pipe shall be masked or wiped back a minimum of one inch but not more than 1-1/2 inches.

2.1.1.2 Coat Testing

After the top coat has cured, the internal epoxy lining shall be tested electrically using an approved holiday detector and shall be free of holidays. The ends of the pipe shall then be capped. The shop doing the application shall have a minimum of five years of experience at applying internal epoxy coating. The application and holiday testing at the shop shall be available for inspection at any time by the Contracting Officer. The shop shall notify the Contracting Officer at least one week before the pipe and fittings will be cleaned and epoxy coated. Provide a certified technical representative of the epoxy manufacturer to make at least three separate inspection trips with at least one day in the shop per trip. Each trip report shall be submitted to the Contracting Officer. Pipe 2-1/2-inches and smaller shall not be interior coated.

2.1.2 Stainless Steel Piping

****

NOTE: A cyclic fatigue analysis need not be made by the designer to determine wall thickness of welded pipe as long as the pipe meets the sizes listed in TABLE A. The minimum wall thickness that welded pipe can be is the Schedule 20 listed in TABLE A. Pressures found in the surge analysis will be used.

****

a. Piping 2-1/2-Inches and Larger:

(1) ASTM A 358/A 358M, Grade 304L, Class 1 or Class 3 with supplementary requirements of S1, S2 and S3, or ASTM A 312/A 312M Type 304L, seamless (only). Any agreements between the purchaser and the manufacturer or supplier as referenced in the applicable ASTM shall include the Contracting Officer as a party to the agreement. All piping welds will receive 100 percent radiographic inspection, 100 percent liquid penetrant inspection, 100 percent visual inspection and all tests as required by the applicable ASTM Standard. Piping shall be provided with a nominal wall thickness as shown in Table A for ASTM A 358/A 358M with the deviation from the nominal wall thickness less than 0.01-inch. ASTM A 312/A 312M seamless piping shall be provided with a minimum schedule 10S wall thickness.

(2) Pipe Ends: All Piping shall be provided with beveled ends per Chapter V, ASME B31.3, and shall be shipped with the ends capped.

(3) Seam and End Welds: All sections of the piping provided shall be accepted on the project site if the seam welds meet the requirements of the paragraph K341 of ASME B31.3 and Appendix 4 of ASME BPVC SEC VIII D1. One hundred spots may be reinspected at the project site prior to installation and backfilling at the request of the Contracting Officer. End welds shall be properly aligned prior to welding per Chapter V of the ASME B31.3; welds found to be defective shall be repaired at no additional cost to the government. Observation by the Contracting Officer of the manufacturing and field procedures shall be allowed under this contract.

(4) Welders Qualifications: Piping shall be welded in accordance with qualified procedures using performance qualified welders and welding operators. Welding procedures qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record.

(5) Factory Testing and Inspection Records: Per Table K341.3.2 of Chapter IX of ASME B31.3, visual, radiographic and liquid penetrant tests shall be performed for each section of piping provided as all sections are subjected to cyclic conditions. All testing and inspections records shall be submitted to the Contracting Officer and shall indicate the pipe mark and installed location of each piping section on the project site. Observation by the Contracting Officer of the manufacturers and the fields testing and inspection procedures shall be allowed under this contract. Pipe certification along with pipe markings shall be submitted before the pipe arrives on the job site.

(6) Qualifications of Welding Inspectors for Stainless Steel Piping: Submit the qualifications of all the testing personnel that will perform all field tests as requested by the Contracting Officer. The qualifications of all personnel on the job site that will perform welding inspection shall be submitted for approval. These inspectors shall meet the qualifications as defined in Chapter VI of the ASME B31.3, and use the methods as defined in Table K341.3.2 of the ASME B31.3.

(7) Provide a qualified inspector in accordance with Chapter VI of ASME B31.3. to act as the owner's inspector (for the Government) at the pipe manufacturer's facility in addition to the manufacturer's inspector.

(8) Submit Quality Assurance Plan for the welding, inspecting and testing of the welded seam pipe.

TABLE A		
Nominal Pipe Size	Nominal (Average) Pile O.D.	Wall Thickness(tn)
16 inches	16.000 inches	0.312 inch
14 inches	14.000 inches	0.312 inch
12 inches	12.750 inches	6.2 mm (0.250 in
10 inches	10.750 inches	0.250 inch
8 inches	8.625 inches	0.250 inch
6 inches	6.625 inches	0.219 inch
4 inches	4.500 inches	0.219 inch
2.5 inches	2.875 inches	0.156 inch

b. Piping 2-inches and Smaller: Schedule 80 ASTM A 312/A 312M seamless Type 304L for threaded piping and schedule 40 (unless otherwise indicated) ASTM A 312/A 312M seamless Type 304L for welded piping.

c. Stainless Steel Control Tubing: Seamless, fully annealed tubing conforming to ASTM A 269, Grade TP316, Rockwell hardness B80 or less. Wall thickness for 1/2-inch tubing to be 0.049-inch.

d. Welding Electrodes (Factory Fabrication): E308L conforming to AWS A5.9/A5.9M.

2.1.3 Protective Coatings for Aboveground Piping

****

NOTE: Per COMMAND SERVICE HEADQUARTERS Engineer for marine environment. Pipe cleaning for severe or marine environment for lenght of line; pipe mostly abovegradeand long lengths should consider using Section 09 97 13.27. pipe cleaning per SSPC SP 6/NACE No.3 will give good surface cleaning but will not get rust or paint from the bottom of the pits.

****

Provide coating of aboveground piping, piping in pits, pipe supports, filter separators, and miscellaneous metal and equipment in accordance with [MIL-DTL-24441, Type III, and the instructions that follow] [Section 09 97 13.27 EXTERIOR COATING OF STEEL STRUCTURES] [Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM]. Color of finish coat shall be [white] [biege]. Do not paint stainless steel or aluminum surfaces. [[Surfaces including those that have been shop coated, shall be solvent cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with power tools according to SSPC SP 3.] [Surfaces shall be blast cleaned according to SSPC SP 5.] [Surfaces shall be blast cleaned according to SSPC SP 6/NACE No.3.] Cleaning shall be performed in sections or blocks small enough to permit application of the epoxy-polyamide prime coat during the same work shift. Shop-coated surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.]

[2.1.3.1 Coating Description

Epoxy-polyamide coatings consist of a two component system that includes a pigmented polyamide resin portion (A component) and an epoxy resin portion (B component). Once they are mixed together and applied as a paint film, the coating cures to a hard film by chemical reaction between the epoxy and polyamide resins. Epoxy-polyamide coating (MIL-DTL-24441) consists of individual formulations, for example, Formula 150 is for green primer, and Formula 152 is for white topcoat.

2.1.3.2 Mixing Epoxy-Polyamide Coatings

Epoxy-polyamide coatings are supplied in measured amounts that must be mixed together in exact proportions to ensure the correct and complete chemical reaction. Mix no more paint than can be applied in the same day. The estimated pot life is 3-4 hours for 5 gal at 70-80 degrees F. Discard any mixed paint remaining at the end of the day.

****

NOTE: The individual A and B components of the various formulas are not interchangeable.

****

a. Mixing Ratio. The mixing ratio of the MIL-DTL-24441 coatings (except Formula 159) are all 1:1 by volume, for example, 5 gallons of component A to 5 gallons of component B. The mixing ratio of MIL-DTL-24441 for formula 159 is 1:4 by volume.

b. Mixing Procedures. Each component shall be thoroughly stirred prior to mixing the components together. After mixing equal volumes of the two components, this mixture shall again be thoroughly stirred until well blended. The induction time shall be adhered to, to ensure complete chemical reactions. Induction time is defined as the time immediately following the mixing together of components A and B during which the critical chemical reaction period of these components is initiated until the mixture is ready for application. This reaction period is essential to ensure the complete curing of the coating. Volumetric mixing spray equipment with in-line heaters set at 70 to 80 degrees F may be used without an induction period.

2.1.3.3 Induction Times

The temperature of the paint components in storage should be measured to determine induction time and pot life. Pot life is the usable life of the mixed paint. It is dependent upon the temperature and the volume of the mixed paint. The pot life of a 5 gal mixture of the MIL-DTL-24441 paints at 70-80 degrees F is approximately 4 hours. The job site application temperature will affect the time required for the paint to cure, and must be considered in estimating induction time, cure time, and the effect of batch size on these functions. At 40 to 60 degrees F a 1 hour induction time shall be used. Volumetric mixing spray equipment with in-line heaters set at 70 to 80 degrees F may be used without an induction period. To ensure that the reaction proceeds uniformly, the paint should be manually stirred periodically during its induction period. This prevents localized overheating or hot spots within the paint mixture.

2.1.3.4 Epoxy-Polyamide Coating Application

Epoxy-polyamide coatings, MIL-DTL-24441, may be applied by brushing or spraying. Three coats shall be applied, primer, intermediate, and top. Each coat shall be a different color.

a. Thinning Application. Ordinarily, MIL-DTL-24441 coatings are not thinned. If necessary, up to one pint of epoxy thinner for each gal of mixed paint may be added if paint has thickened appreciably during cold temperature application or if necessary to improve application characteristics. When applied at the proper thickness, without thinning, these paints will have no tendency to sag.

b. Application Thickness. Unless otherwise specified, apply three coats of paint to produce approximately 3 mils dry film thickness (DFT) each. Application which yields in excess of 4.0 mils DFT should be avoided to prevent sagging. Final coat shall be polyurethane on exterior paint.

c. Spray Application. MIL-DTL-24441 paints should be sprayed with conventional spray guns and normal spray-pot pressures. The spray gun should be equipped with a middle-size (D) needle, and nozzle setup. Both conventional and airless spray equipment are suitable for use with or without volumetric mixing capability.

2.1.3.5 Equipment Cleanup

The mixed paint should not be allowed to remain in spray equipment for an extended period, especially in the sun of a warm area. The paint cures more rapidly at higher temperatures. When components A and B are mixed together, the pot life of the mixture (including the induction time is 6 hours at 70 degrees F. Pot life is longer at lower temperatures and shorter at temperatures above 70 degrees F. Spray equipment should be cleaned after using by flushing and washing with epoxy thinner or aromatic hydrocarbon thinners (xylene or high flash aromatic naphtha). General cleanup is also done by using these solvents. Brushes and rollers should be given a final cleaning in warm soapy water, rinsed clean with warm fresh water and hung to dry.

]2.1.4 Protective Coatings for Buried Steel Piping

[Provide pipe with coating system Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM.] [Provide pipe with FS L-C-530 coating system of factory-applied adhesive undercoat and continuously extruded plastic resin coating; minimum thickness of plastic resin shall be 36 mils for pipe sizes 6 inches and larger. Fittings, couplings, irregular surfaces, damaged areas of pipe coating, and existing piping affected by the Contractor's operations shall be clean, dry, grease free, and primed before application of tape. Tape shall overlap the pipe coating not less than 3 inches. Waterproof shrink sleeves may be provided in lieu of tape and shall overlap the pipe coating not less than 6 inches. Pipe coating and adhesive undercoat surfaces to be wrapped with tape shall be primed with a compatible primer prior to application of tape. Primer shall be as recommended by tape manufacturer and approved by pipe coating manufacturer.

a. Damaged Areas of Pipe Coating: Provide FS L-T-1512, 20 mils nominal thickness of tape over damaged areas. Residual material from damaged areas of pipe coating shall be pressed into the break or trimmed off. Apply tape spirally with one-third overlap as tape is applied. A double wrap of one full width of tape shall be applied at right angles to the axis to seal each end of the spiral wrapping.

b. Fittings, Couplings, and Regular Surfaces: Provide FS L-T-1512, 10 mils nominal thickness tape overlapped not less than 1.0 inch over damaged areas. Initially stretch and apply first layer of tape to conform to component's surface. Then apply and press a second layer of tape over first layer of tape.

c. Testing of Protective Coatings: Perform tests with an approved silicone rubber electric wire brush or an approved electric spring coil flaw tester. Tester shall be equipped with an operating bell, buzzer, or other audible signal which will sound when a holiday is detected at minimum testing voltage equal to 1,000 times the square root of the average coating thickness in mils. Tester shall be a type so fixed that field adjustment cannot be made. Calibration by tester manufacturer shall be required at six-month intervals or at such time as crest voltage is questionable. Certify in writing the calibration date and crest voltage setting. Maintain the battery at ample charge to produce the crest voltage during tests. Areas where arcing occurs shall be repaired by using material identical to original coating or coating used for field joints. After installation, retest the exterior surfaces, including field joints, for holidays. Promptly repair holidays.]

2.1.5 Fittings

2.1.5.1 General

Welding ells, caps, tees, reducers, etc., shall be of materials compatible for welding to the pipe line in which they are installed, and wall thickness, pressure and temperature ratings of the fittings shall be not less than the adjoining pipe line. Unless otherwise required by the conditions of installation, all elbows shall be the long radius type. Miter joints are not acceptable. Make odd angle offsets with pipe bends or elbows cut to the proper angle. Butt weld fittings shall be factory-made wrought fittings manufactured by forging or shaping. Fabricated fittings will not be permitted. Welding branch fittings shall be insert type suitable for radiographic inspections specified herein.

2.1.5.2 Carbon Steel Fittings

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NOTE: Tees with branch lines 50 percent of the main line size or more should have guide bars in piggable systems.

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a. Fittings 2.5 Inches and Larger: Butt weld, conforming to ASTM A 234/A 234M, grade WPB and ASME B16.9 of the same wall thickness as the adjoining pipe. All welds shall be radiographically examined throughout the entire length of each weld. Each fitting shall be subjected to the Supplementary Requirements S3 and S4, Liquid Penetration examination and Magnetic-Particle Examination. Detectable flaws will not be accepted in the supplementary examinations. Fittings shall be identified to relate them to their respective radiograph. Elbows located between the pig launcher and the receiver, shall have a radius three times the pipe diameter. Tees with branches 6-inches and larger, shall have guide bars as detailed on the drawings.

b. Fittings 2 Inches and Smaller. Forged (socket welded or if indicated on drawings, threaded), 2,000-pound W.O.G., conforming to ASTM A 105/A 105M, Grade 2 and ASME B16.11. Threaded fittings shall only be used for above grade applications. Underground and in pits low point drain pipe and high point vent pipe shall be butt welded.

c. Flanges: 150 pound weld neck, forged flanges conforming to ASTM A 105/A 105M, and ASME B16.5. Flanges to be 1/16-inch raised face with phonographic finish, except where required otherwise to match equipment furnished. Match flange face to valves or equipment furnished. Flange face shall be machined to match valves or equipment furnished. Use of spacing rings or gaskets discs are not allowed. Flanges shall be subjected to the Supplementary Requirements S56, Liquid Penetrant Examination as outlined in ASTM A 961/A 961M. Detectable flaws will not be accepted.

d. Interior Epoxy Coating System shall be applied to the fittings as specified in paragraph "Carbon Steel Piping."

2.1.5.3 Stainless Steel Fittings

a. Fittings 2.5 Inches and Larger: Butt weld stainless steel conforming to ASTM A 403/A 403M, Class WP, Type 304L, seamless or welded, and ASME B16.9 of the same minimum wall thickness as the adjoining pipe. Welded fittings shall be tested and inspected the same as the welded seam pipe and meet the same requirements as for the pipe. Elbows located between the pig launcher and the receiver, shall have a radius three times the pipe diameter. Tees with branches 6-inches and larger, shall have guide bars as detailed on the drawings.

b. Fittings 2-Inches and Smaller: Forged Type 304 or 304L (socket welded or if indicated on drawings, threaded), 2,000-pound W.O.G. conforming to ASTM A 182/A 182M and ASME B16.11. Threaded fittings shall only be used for above grade applications. Underground and in pits low point drain pipe and high point vent pipe shall be butt welded.

c. Unions. Conforming to ASTM A 312/A 312M, Grade 304 or 316.

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NOTE: Check system pressures, as Type 304L stainless steel flanges have a pressure rating of 2 MPa (230 PSIG).

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d. Flanges. 150 pound weld neck, forged Type 304[or 304L] stainless steel flanges conforming to ASTM A 182/A 182M and ASME B16.5, except flanges that are to be connected to the fueling/defueling pumps shall be 300-pound. Flanges to be 1/16-inch raised-face with phonographic finish, except where required otherwise to match equipment furnished. Match flange face to valves or equipment furnished. Flanges shall be subjected to the Supplementary Requirements S56, Liquid Penetrant Examination as outlined in ASTM A 961/A 961M.

e. Stainless Steel Tube Fittings. Flareless, 316 stainless steel fittings conforming to SAE J514.

2.1.5.4 Isolating Gasket Kits (Insulating) for Flanges

Provide ASTM D 229 electrical insulating material of 1,000 ohms minimum resistance; material shall be resistant to the effects of aviation hydrocarbon fuels. Provide full face insulating gaskets between flanges. Provide full surface 0.03-inch thick wall thickness, spiral-wound mylar insulating sleeves between the bolts and the holes in flanges; bolts may have reduced shanks of a diameter not less than the diameter at the root of threads. Provide 0.125-inch thick high-strength phenolic insulating washers next to flanges and provide flat circular stainless steel washers over insulating washers and under bolt heads and nuts. Provide bolts 0.5-inch longer than standard length to compensate for the thicker insulating gaskets and the washers under bolt heads and nuts. Exterior above grade flanges separated by electrically isolating gasket kits shall be provided with weatherproof lightning surge arrester devices. The surge arrester shall bolt across flanges separated by insulating gasket kits per detail on contract drawings. The arrestor shall have the following features:

a. Weatherproof NEMA 4 enclosure.
b. Bidirectional and bipolar protection.
c. Constructed of solid state components, no lights, fuses or relays and used without required maintenance or replacement.
d. Withstand unlimited number of surges at 50,000 Amperes.
e. Maximum clamping voltage of 700 Volts based on a IEEE C62.41 8x20 microsecond wave form at 50,000 Amperes peak measured at the device terminals (zero lead length).
f. A UL listed arrester for installation in Class 1, Division 2, Group D, hazardous areas.

Install the mounting bracket and leads on the flange side of the bolt insulating sleeve and washer, and size in accordance with this schedule:

Line Size	Bolt Size
2 inch	5/8 inch
2.5 inch	5/8 inch
3 inch	5/8 inch
4 inch	5/8 inch
6 inch	3/4 inch
8 inch	3/4 inch
10 inch	7/8 inch
12 inch	7/8 inch
14 inch	1 inch
16 inch	1 inch

Line Size	Bolt Size
Note: Make allowance for the 1/32-inch thickness of the insulating sleeve around the bolts when sizing the mounting lugs.	

2.1.6 Bolts and Nuts

Bolts and nuts for pipe flanges, flanged fittings, valves and accessories shall conform to ASME B18.2.1 and ASME B18.2.2, except as otherwise specified. Bolts shall be of sufficient length to obtain full bearing on the nuts and shall project no more than three full threads beyond the nuts with the bolts tightened to the required torque. Bolts shall be regular hexagonal bolts conforming to ASME B18.2.1 with material conforming to ASTM A 193/A 193M, Class 2, Grade B8, stainless steel, when connections are made where a stainless steel flange is involved, and Grade B7 when only carbon steel flanges are involved. Bolts shall be threaded in accordance with ASME B1.1, Class 2A fit, Coarse Thread Series, for sizes one inch and smaller and Eight-Pitch Thread Series for sizes larger than one inch. Nuts shall conform to ASME B18.2.2, hexagonal, heavy series with material conforming to ASTM A 194/A 194M, Grade 8, stainless steel for stainless steel bolts, and Grade 7 for carbon steel bolts. Nuts shall be threaded in accordance with ASME B1.1, Class 2B fit, Coarse Thread Series for sizes one inch and smaller and Eight-Pitch Thread Series for sizes larger than one inch. Provide washers under bolt heads and nuts. Washers to be ASTM F 436, flat circular stainless steel for stainless steel bolts, and carbon steel for carbon steel bolts. Torque wrenches shall be used to tighten all flange bolts to the torque recommended by the gasket manufacturer. Tightening pattern shall be as recommended by the gasket manufacturer. Anti-seize compound shall be used on stainless steel bolts.

2.1.7 Gaskets

ASME B16.21, composition ring, using a Buna-N, Teflon, or a protein and glycerin binder, 0.1250-inch thick. Gaskets shall be resistant to the effects of aviation hydrocarbon fuels and manufactured of fire-resistant materials. Full-face gaskets shall be used for flat-face flanged joints. Ring gaskets shall be used for raised-face flanged joints. Gaskets shall be of one piece factory cut.

2.1.8 Relief and Drain System Piping

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NOTE: Per COMMAND FUELS FACILITY Engineer.
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Pressure relief valve discharge lines and drain lines to the product recovery tank shall be Schedule 40 [API Spec 5L Grade B or ASTM A 53/A 53M Grade B Carbon Steel] [ASTM A 312/A 312M seamless Type 304L Stainless Steel]. See Gaskets specified herein before.

2.1.9 Relief and Drain System Protective Coating

Pipe shall be factory coated as specified herein before for steel piping.

2.1.10 Field Applied Protective Coatings

The field joints and fittings of all underground piping shall be coated as herein specified.

2.1.10.1 Welded Joints

Heat shrinkable radiation-cross-linked polyolefin wraparound type sleeves shall be applied to all welded joints. Joints shall not be coated until pressure testing is complete. Apply sleeves consisting of 40 mil polyolefin backing and 40 mil thermoplastic mastic adhesive in accordance with the manufacturer's instructions.

2.1.10.2 Tape for Fittings

Fittings and other irregular surfaces shall be tape wrapped. The tape shall be a plastic mastic laminated tape having 6 mil plastic backing of either polyethylene or polyvinylchlorine and 29 to 44 mil of synthetic elastomer.

2.1.11 Threaded Joints

Threaded joints, if indicated on the drawings, shall be made tight with manufacturer recommended teflon tape or a mixture of graphite and oil, inert filler and oil, or with a graphite compound, applied with a brush to the male threads. Not more than three threads shall show on made up joints. Threaded joints, mechanical couplings and flanges will not be permitted in buried piping. Threaded joints shall not get welded.

2.1.12 Welded Joints

Welded joints in steel pipe shall be as specified in Part 3.

2.2 MANUAL VALVES

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NOTE: Per COMMAND SERVICE HEADQUARTERS Engineer for marine environment, provide stainless steel valves on exterior (aboveground and in pits) piping.

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All portions of a valve coming in contact with fuel in stainless steel pipe lines or epoxy lined carbon steel pipe lines shall be of noncorrosive material. Valves in stainless steel pipe lines or epoxy lined carbon steel pipe lines shall be Type 304 or Type 316 stainless steel or carbon steel internally plated with chromium or nickel or internally electroless nickel plated. Valves in unlined carbon steel pipelines shall have carbon steel body. Stem and trim shall be stainless steel for all valves. Manually operated valves 6 inches and larger shall be worm-gear operated and valves smaller than 6 inches shall be lever operated or handwheel operated. Valves smaller than 2 inches shall have lever-type handles. Valves installed more than 8 feet above finished floor shall have chain operators and a position indicators visible from ground level. Sprocket wheel for chain operator shall be aluminum. Valves in the isolation pits in fuel piping between the pig launchers and the pig receivers shall be full bore, piggable, double block and bleed type. The full bore piggable valves at the launcher and the receiver shall be ball type.

2.2.1 Ball Valves

Ball valves shall be fire tested and qualified in accordance with the requirements of API Std 607 and API STD 608. Ball valves shall be nonlubricated valves that operate from fully open to fully closed with 90 degree rotation of the ball. Valves 2 inches and larger shall conform to applicable construction and dimension requirements of API Spec 6D, ANSI Class 150 and shall have flanged ends. Valves smaller than 2 inches shall be ANSI class 150 valves with one piece bodies with flanged ends, unless noted otherwise. The balls in valves 10 inches full port and 12 inch regular port and larger shall have trunnion type support bearings. Except as otherwise specified, reduced port or full port valves may be provided at the Contractor's option. Balls shall be solid, not hollow cavity.

2.2.1.1 Materials

Ball shall be stainless steel. Ball valves shall have tetrafluoroethylene (TFE) or Viton seats, body seals and stem seals. Valves 4 inches and smaller shall have a locking mechanism.

2.2.1.2 Full Port Ball (DBBV) Valves for Piggable Lines

Ball valves shall be designed, manufactured, and tested to API Spec 6D, fire-safe and tested to API Spec 6FA, API Std 607, and BS EN ISO 10497 (BS 6755, Part 2). Valves shall be trunnion-mounted with independent spring and hydraulically actuated, floating, single piston effect, self-relieving seat rings, with bi-directional sealing. Ball shall be solid type with full through-conduit opening, suitable for passage of pipeline pigs. Stem shall be anti-static, blow-out-proof design with o-ring seals and provided with an emergency sealant injection fitting. Valves shall be 3-piece, bolted body design with raised-faced ANSI Class 150 flanged connections, equipped with body drain/bleed valve and vent fitting, and suitable for double block and bleed service in the closed and open positions. Valves shall be all stainless steel construction, or carbon steel with stainless steel stem, and all wetted parts electroless nickel-plated. Valves shall have nylon or teflon seat inserts, viton B body, stem, and seat o-rings, with stainless steel and graphite body gaskets and graphite secondary stem seals. Valves located in vaults or pits shall be equipped with actuator extensions.

2.2.1.3 Electric Valve Actuator

Electric valve actuator shall be as indicated for Plug (Double Block and Bleed) Valves, electric valve actuator.

2.2.2 Plug (Double Block and Bleed) Valves

API Spec 6D, Type III, ANSI Class 150, non-lubricated, resilient, double seated, trunnion mounted, tapered lift plug capable of two-way shutoff. Valve shall have tapered plug of steel or ductile iron with chrome or nickel plating and plug supported on upper and lower trunnions. Sealing slips shall be steel or ductile iron, with Viton seals which are held in place by dovetail connections. Valve design shall permit sealing slips to be replaced from the bottom with the valve mounted in the piping. Valves shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valves shall have weatherproof operators with mechanical position indicators. Indicator shaft shall be stainless steel. Minimum bore size shall be not less than 65 percent of the internal cross sectional area of a pipe of the same nominal diameter unless bore height of plug equals the nominal pipe diameter and manufacturer can show equal or better flow characteristics of the reduced bore size design. Full port plug valves in distribution piping shall be provided with a 1-inch flanged body drain.

2.2.2.1 General

Valves in the operating tank suction and fill lines and the valves at the four valve manifold in the pump room in the tank fill lines shall be provided with a factory-installed limit switch that is actuated by the valve closure. Each switch shall have one double pole double throw contacts or four single pole, double throw contracts, two for open, two for closed, and shall be watertight and U.L. listed for Class I, Division 1, Group D hazardous areas.

2.2.2.2 Valve Operation

Rotation of the handwheel toward open shall lift the plug without wiping the seals and retract the sealing slips so that during rotation of the plug clearance is maintained between the sealing slips and the valve body. Rotation of the handwheel toward closed shall lower the plug after the sealing slips are aligned with the valve body and force the sealing slips against the valve body for positive closure. When valve is closed, the slips shall form a secondary fire-safe metal-to-metal seat on both sides of the resilient seal. Plug valves located in Isolation Valve Pits or vaults shall be provided with handwheel extensions.

2.2.2.3 Relief Valves

ANSI Class 150. Provide plug valves with automatic thermal relief valves to relieve the pressure build up in the internal body cavity when the plug valve is closed. Relief valves shall open at 25 psi differential pressure and shall discharge to the throat of, and to the upstream side, of the plug valve.

2.2.2.4 Bleed Valves

ANSI Class 150, stainless steel body valve. Provide manually operated bleed valves that can be opened to verify that the plug valves are not leaking when in the closed position.

2.2.2.5 Electric Valve Actuator

The actuator, controls and accessories shall be the responsibility of the valve-actuator supplier for sizing, assembly, certification, field-testing and any adjustments necessary to operate the valve as specified. The electric valve actuator shall include as an integral unit the electric motor, actuator unit gearing, limit switch gearing, position limit switches, torque switches, drive bushing or stem nut, declutch lever, wiring terminals for power, remote control,indication connections and handwheel. The electrically actuated plug valve shall be set to open and close completely in 30 to 60 seconds against a differential pressure of 275 PSIG. The actuator settings of torque and limit contacts shall be adjustable. The valve actuator shall be suitable for mounting in a vertical or horizontal position and be rated for 30 starts per hour. The valve actuator shall be capable of functioning in an ambient environment temperature ranging from -32 to 158 degrees F.

a. The electrical enclosure shall be speciffically approved by UL or

Factory Mutual for installation in Class I, Division 1, Group D locations.

b. The electric motor shall be specifically designed for valve actuator service and shall be totally enclosed, non-ventilated construction. The motor shall be capable of complete operation at plus or minus 10 percent of specified voltage. Motor insulation shall be a minimum NEMA Class F. The motor shall be a removable subassembly to allow for motor or gear ratio changes as dictated by system operational requirements. The motor shall be equipped with an embedded thermostat to protect against motor overload and also be equipped with space heaters. It shall de-energize when encountering a jammed valve.

c. The reversing starter, control transformer and local controls shall be integral with the valve actuator and suitably housed to prevent breathing or condensation buildup. The electromechanical starter shall be suitable for 30 starts per hour. The windings shall have short circuit and overload protection. A transformer, if needed, shall be provided to supply all internal circuits with 24 VDC or 110 VAC may be used for remote controls.

d. The actuator gearing shall be totally enclosed in an oil-filled or grease-filled gearcase. Standard gear oil or grease shall be used to lubricate the gearcase.

e. The actuator shall integrally contain local controls for Open, Close and Stop and a local/remote three position selector switch: Local Control Only, Off, and Remote Control plus Local Stop Only. A metallic handwheel shall be provided for emergency operation. The handwheel drive must be mechanically independent of the motor drive. The remote control capablity shall be to open and close. Rim pull to operate valve manually shall not exceed 80 pounds.

f. Position limit switches shall be functional regardless of main power failure or manual operation. Four contacts shall be provided with each selectable as normallly open or normally closed. The contacts shall be rated at 5A, 120 VAC, 30 VDC.

g. Each valve actuator shall be connected to a PLC supplied by "others".

h. The actuator shall have a local display of position even when power has been lost.

i. The actuator shall be supplied with a start-up kit comprising installation instruction, electrical wiring diagram and spare cover screws and seals.

j. The actuator must be performance tested and a test certificate shall be supplied at no extra charge. The test should simulate a typical valve load with current, voltage, and speed measured.

2.2.3 Swing Check Valves

Swing check valves shall conform to applicable requirements of API Spec 6D, regular type, ANSI Class 150 with flanged end connections. Check valves shall conform to API STD 600 and be swing type with material as previously indicated herein. Discs and seating rings shall be renewable without removing the valve from the line. The disc shall be guided and controlled to contact the entire seating surface.

2.2.4 Silent Check Valves

Spring assisted, wafer/lug pattern, butterfly check with viton or teflon seat ring, designed to prevent flow reversal slamming of valve, dual plate, and shall conform to ASME B16.34, API Std 594, except face to face dimensions may deviate from standard. Valves shall be suitable for installation in any orientation. Valve body and trim material shall be as previously indicated herein.

2.3 RELIEF VALVES

Relief valves shall be the fully enclosed, spring loaded, angle pattern, single port, hydraulically operated type with plain caps, and shall be labeled in accordance with ASME BPVC SEC VIII D1. Valve stems shall be fully guided between the closed and fully opened positions. The valves shall be factory-set to open at 265 psi unless otherwise indicated on the drawings. Operating pressure shall be adjustable by means of an enclosed adjusting screw. The valves shall have a minimum capacity of 20 GPM at 10 percent overpressure. Valves shall have a replaceable seat. Relief valves that do not relieve to a zone of atmospheric pressure or tank must be a balanced type relief or regulator valve.

2.3.1 Valve Materials

Valves shall have carbon steel bodies and bonnets with stainless steel springs and trim. Valves shall be Class 150 flanged end connections.

2.3.2 Sight Flow Indicators

Sight flow indicators shall be ANSI Class 150 and shall have flanged end connections. Sight flow indicators shall consist of a housing containing a rotating propeller that is visible through a glass observation port. The housing shall be stainless steel when installed in stainless steel lines and carbon steel when installed in carbon steel lines. The glass in the indicator shall also meet the Class 150 rating.

2.4 PIPING ACCESSORIES

2.4.1 Flexible Ball Joints

Flexible ball joints shall be [stainless steel] [carbon steel with electroless nickel-plating to a minimum of 3 mils thickness], capable of 360-degree rotation plus 15-degree angular flex movement, ASME B16.5, Class 150 flanged end connections. Provide pressure molded composition gaskets designed for continuous operation temperature of 275 degrees F. Joints shall be designed for minimum working pressure of ANSI Class 150. Injectable packing will not be allowed.

2.4.2 Pipe Sleeves

Pipe sleeves shall be installed where indicated and at all points where the piping passes through concrete construction. Such sleeves shall be of sufficient inside diameter to provide a minimum clear distance between the pipe and the sleeve of 1/2-inch. Sleeves through concrete pits or slabs shall be standard weight carbon steel pipe with a protective coating. Each sleeve shall extend through the respective pit wall or slab and shall be provided with a Buna-N casing seal. Sleeves where piping passes under roads or piping indicated to be double walled shall be standard weight carbon steel pipe with a protective coating as previously specified. Alignment of the sleeve and piping shall be such that the pipe is accurately centered within the sleeve by a nonconductive centering element. The sleeve shall be securely anchored to prevent dislocation. Closure of space between the pipe and the pipe sleeve shall be by means of a mechanically adjustable segmented elastomeric seal. The seal shall be installed so as to be flush.

2.4.3 Strainers

2.4.3.1 Basket Type

Strainer shall be in compliance with MIL-PRF-13789, except as specified otherwise. Strainer end connections shall be designed in accordance with ASME B16.5, Class 150. Strainer body material shall be the same as the material specified for manual valves. Strainers shall have removable baskets of 60 mesh wire screen with larger wire mesh reinforcement; wire shall be stainless steel, Type 316. Pressure drop for clean strainer shall not exceed 3 psig at maximum design flow rate. The ratio of net effective strainer area to the area of the connecting pipe shall be not less than three to one. Each strainer shall be provided with a suitable drain at the bottom, equipped with a ball valve. The strainer shall be equipped with a direct-reading, piston type differential pressure gauge that measures the differential pressure across the basket. The gauge shall consist of a spring-supported, corrosion resistant piston moving inside a glass cylinder, with high pressure applied on top of the piston and low pressure applied below it. Under a differential pressure of 30 PSI, leakage past the piston shall not exceed 120 drops per minute. The cylinder shall have stainless steel and flanges with Viton O-ring seals. The high pressure inlet of the gauge shall have a 10-micron pleated paper filter and the low pressure connection shall have a fine mesh stainless steel strainer. The gauge shall have an operating pressure of 300 PSI. Differential pressure range of the gauge through approximately 3 inches of piston movement shall be 0-30 PSI with an accuracy of $\pm$ 0.5 PSI, calibrated linearly with one PSI scale graduations. High and low pressure connections shall be 1/4 inch NPT female with a stainless steel bar stock valve at each connection. Construction of the gauge shall be such that a 3-valve manifold is not necessary. If only one bar stock valve is closed, the gauge shall not be damaged by up to 300 PSI differential pressure in either direction. A pressure gauge shall be attached to the differential pressure gauge to indicate the high pressure and have a range of 300 psi.

2.4.3.2 Cone Type (Temporary)

Strainer shall be stainless steel type 304 or 316, 100 mesh screen with the ratio of net open area of strainer to the area of the connecting pipe shall be not less than three to one at the pump suction, and 5/32-inch perforations and suitable for bi-directional flow at the inlet to the hydrant pit control valves.

2.4.4 Pipe Hangers and Supports

2.4.4.1 General

Pipe hangers and supports shall conform to MSS SP-58 and MSS SP-69. Supports shall be provided at the indicated locations. Support channels for drain lines shall be epoxy coated on all surfaces or hot-dip galvanized after the channels are cut to length. Coated supports shall be coated with fusion bonded epoxy resin applied by the fluidized bed method. Thickness of the coating shall be not less than 10 mils. Surface preparation and coating application shall be in accordance with the epoxy manufacturer's instructions. The coating shall be pinhole free when tested with a low voltage holiday detector set at no more than 100 times the mil thickness of the coating. All pinholes shall be marked, repaired and retested to ensure a pinhole free film. The coating material shall be a 100 percent solids, thermosetting, fusion-bonded, dry powder epoxy resin. The manufacturer shall certify that the material is suitable for fluidized bed application and that it is approved by the Environmental Protection Agency. A teflon pad shall be installed between the pipe and the u-bolt.

2.4.4.2 Adjustable Pipe Supports

Adjustable pipe supports shall consist of a cast iron saddle and a threaded nipple connected to a carbon steel pipe by means of a special reducer conforming to MSS SP-69. The supports shall be provided with teflon insulation strips.

2.4.4.3 Low Friction Supports

Low friction supports shall be self-lubricating antifriction element composed of reinforced TFE. Units shall be factory designed and manufactured.

2.4.4.4 Concrete and Grout

Concrete and grout for anchors and supports shall comply with SECTION 03 31 00.00 10 CAST-IN-PLACE STRUCTURAL CONCRETE.

2.4.5 Sample Connections

a. Sample connections shall be factory assembled units specifically designed for obtaining representative samples from fuel pipelines. Each connection shall include a 1/4-inch sampling probe where the probe faces upstream, ball valve and 1/4-inch quick disconnect coupling with dust plug, all assembled into a unit that is suitable for installation in a pipe nipple. The sampling probe shall extend not less than one inch into the fuel pipe. All materials in the sample connections shall be stainless steel or aluminum.

b. Furnish two sampling hose assemblies to the Contracting Officer at the project site. Each assembly shall consist of a 6-foot length of 1/4-inch clear plastic tubing with internal bonding/grounding wire. One end of the tubing will contain a male connector that actuates flow when inserted into the quick disconnect coupler. Each end of the bonding/grounding wire shall be equipped with clips for attaching to the pipe and metal sample container.

2.4.6 Flanged Swivel Joints

Flanged swivel joints shall be stainless steel, single plane, capable of rotating 360 degrees. Welded swivel joints and welding of swivel joints to the pipe and/or elbow is not permitted. Swivel joints shall be of the non-lubricated, maintenance free type with nonlubricated bearings and no lubricating fitting. Swivel joint shall be flanged at the end connecting to the piping system and threaded (female NPT) at the end connecting to the fuel hose. No leakage shall be permitted under positive or negative pressure conditions. No leakage shall be permitted under high or low temperature conditions. Welding of swivel joint to six-bolt flange connector is permitted. The swivel joints shall be warranted for three years against leakage. There must be electrical continuity from one flange to the other without the use of ground straps. The electrical continuity from one flange to another (without the use of ground straps) shall be less than 1000 ohms. Each swivel joint shall have at least two ball bearings and one roller bearing and two seals.

2.4.7 Monitoring Points

At the following locations, provide half-inch pipe, flanged ball valve, and blind flange for future test equipment connections:

a. On the filter separator discharge header in the pumphouse.

b. At the Hydrant Hose Truck Checkout, inlet to Hydrant Valve.

c. At the inlet to the Back Pressure Control Valve in the Pumphouse.

d. At both sides of the isolation valve in all the isolation valve pits.

2.4.8 Fuel Hose

Fuel hose shall conform to API Std 1529, Grade 2, Type C, threaded, male NPT, both ends.

2.4.9 Pressure Fueling Nozzle

****
NOTE: Specify type of nozzle as directed by the COMMAND FUELS FACILITY Engineer.
****

Nozzles shall conform to SAE AS5877, Type [D-1] [D-2] [D-3]. Nozzles and nozzle components shall be compatible with the fuel to be handled. Nozzles shall be provided with an internal 60 mesh stainless steel strainer and a fuel sample connection tapping. Nozzle design shall be for single point fueling of aircraft. Nozzles shall be provided with a compatible dry break quick disconnect swivel. Coupler shall allow for quick disconnect and reconnect of fueling nozzles with corresponding adapters. Coupler and adapter shall provide a positive, leak proof connection under constant or surge flow. Coupler shall be designed to prevent blowout of internal poppet.

2.4.10 Nozzle Adapter (SPR)

Adapter shall be a nominal 2-1/2 inches with self-closing valve in accordance with MIL-A-25896. Adapter shall have a 4 inch flange mounting and vacuum tight, locking dust cap using the SPR lugs.

2.4.11 Pigging Accessories

2.4.11.1 Closure Door

The closure shall be hinged, swing bolted closure of the same material as the pipe and for a Class 150 system. Gasket shall be nitrile. Eye bolts shall be pinned to lugs on the hub.

2.4.11.2 Signaler

The pig signaler shall be mechanical flag type with manual reset, and be located on the pig launcher and the pig receiver. Material in contact with the fuel shall be stainless steel. Units shall be suitable for removal and installation under line pressure of 275 psig. Signaler shall be capable of withstanding line pressure of a Class 150 system.

2.5 FLEXIBLE HOSES

Flexible hoses for fueling pumps shall have ANSI Class 300 flanges to mate to the pump and Class 150 to connect to the system flanges of stainless steel construction conforming to ASME B16.5. Flexible hoses shall be of stainless steel flexible metal hose consisting of an inner corrugated stainless steel tube with stainless steel braid cover. All components to be suitable for not less than 275 psig. Length and application of flexible hoses shall be per manufacturer's written recommendations.

2.6 AUTOMATIC AIR VENT

Unit shall have one-inch connections and automatically vent air under pressure, and prevent a vacuum when pressure drops below a positive pressure. As fuel fills the vent, a float shall rise and form a drip-tight closure. The unit pressure rating shall be a minimum of 275 psi. The float shall be stainless steel. Body and cover be carbon steel or ductile iron and be internally epoxy coated.

2.7 SURGE SUPPRESSOR TANK AND VALVE

The unit shall be fabricated from carbon steel, internally coated pressure vessel with a rubber bladder or a stainless steel diaphram separating the fuel from the gas charge. The epoxy coating shall be in accordance with MIL-PRF-4556. The rubber bladder shall be molded synthetic nitrile rubber (Buna-N). The unit shall be constructed and labeled in accordance with ASME BPVC SEC VIII D1. The housing shall be designed for a working pressure of 275 PSIG. The gas precharge shall be dry nitrogen and shall have a pressure gauge, gas valve, and an adapter for field charging. Bladder precharge pressure shall be 80 PSIG. The connection to the piping system shall be Class 150 ANSI flange, size as indicated on the drawings. The connection shall have a check valve to provide unrestricted flow into the vessel and restricted flow from the vessel. The flange shall have a 1/2-inch NPT connection with a valve and adapter to relieve fluid pressure during gas recharging and to drain the vessel during removal. A charging assembly shall be provided. The surge control supplier shall furnish a service person trained to provide installation check-out assistance and to supervise operation and testing necessary to place the surge control system into service and to provide training on charging, recharging, and checking the surge suppressor.

PART 3 EXECUTION

****
NOTE: Specify as directed by the COMMAND FUELS FACILITY Engineer.
****

3.1 VERIFICATION OF DIMENSIONS

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 CLEANING OF PIPING

Keep the interior and ends of all new piping, affected by construction operations, thoroughly cleaned of foreign matter and water before and after being installed. Piping systems shall be kept clean during installation by means of plugs or other approved methods. When work is not in progress, open ends of piping and fittings shall be closed so that no water or other foreign substance will enter the pipes or fittings. Piping shall be inspected before placing into position. The interior of each length of pipe shall be cleaned after welding insuring that the interior of the piping is free of foreign matter when it is connected into the system.

3.3 TRENCHING AND BACKFILLING

Trenching and backfilling shall conform to Section 31 00 00 EARTHWORK, and the following bedding and backfill requirements. The pipe shall be laid in a bed of sand 6 inches deep, compacted in accordance with Section 31 00 00 EARTHWORK, paragraph "Backfilling and Compaction". Sand shall meet the requirements of Section 31 00 00 EARTHWORK, paragraph "Select Granular Material". The full length of each section of pipe without any protective covering shall be excavated to permit installation of the protective covering. Pipe that has the grade or joint disturbed after laying, shall be taken up and relaid. Pipe shall not be laid in water or when the trench or weather conditions are unsuitable for such work. After testing and application of protective covering to joints, sand backfill shall be placed and compacted around the pipe or protective coating to a depth of 1 foot above top of pipe. The remainder of the backfill shall be the same as for other types of pipe.

3.4 PIPING LAYOUT REQUIREMENTS

3.4.1 Pipe Fabrication

Fabricate piping to measurements established on the project site and position into place without springing or forcing. Make provisions for absorbing expansion and contraction without undue stress in any part of the system.

3.4.2 Interferences and Measurements

Provide offsets, fittings, and accessories required to eliminate interferences and to match actual equipment connection locations and arrangements. Verify measurements before commencing work. Submit discrepancies for clarification before proceeding with the installations to the Contracting Officer.

3.4.3 Space and Access

Keep piping, control tubing, which is not detailed close to structures and columns so as to take up a minimum amount of space. Ensure that access is provided for maintenance of equipment, valves and gauges.

3.4.4 Location

Do not place unions in locations that will be inaccessible after the completion of the work. Place unions on each side of equipment.

3.4.5 Piping and Equipment

Provide anchors where required to absorb or transmit thrust or eliminate vibration or pulsation. Provide hangers and supports near each change of direction. Select support components which do not restrict the movement of the pipe due to thermal expansion. Space hangers uniformly and arrange symmetrically.

3.4.6 Structural Support

Provide supplementary or intermediate steel or other structural members as required for transmission of loads to members forming part of the supporting structure.

3.4.7 Grade

Where profiles of piping lines are shown on the drawings, grade the line uniformly between changes in slope or direction. Maintain gradient to within $\pm$ 1/4-inch over the entire length of pipe. When backfilling has been completed to the top of the pipe, the pipe shall be surveyed at each joint, and logged by station number. Submit to the Contracting Officer for approval the survey final elevations before backfilling can continue.

3.4.8 Size Changes

Make changes in pipe size with reducing fittings. Do not use bushings. In lieu of welding reducing outlet tees for piping 2 inches and larger, welding branches suitable for 100 percent radiographic inspection may be used. Do not use weldolets unless specifically called out (labeled) on the drawings.

3.4.9 Direction Changes

Make changes in direction of pipes with long radius fittings. Provide special fittings when required. Do not make miter welds. Make odd-angle offsets with pipe bends or elbows cut to the proper angle.

3.5 WELDING

3.5.1 General

All joints, unless indicated otherwise, in carbon steel and stainless steel piping systems shall be welded. [Welding of fuel pipe joints shall comply with Section 33 52 90.00 20 WELDING FOR POL SERVICE PIPING.][Unless otherwise approved, all girth welds shall be complete penetration groove welds made in accordance with qualified welding procedures. Welding operations, qualifications of welders and welding procedures shall comply with the provisions of ASME B31.3 and the requirements specified herein. The root pass on stainless steel and carbon steel pipe shall be by the GMAW or GTAW process.]

****

NOTE: If Section 33 52 90.00 20 WELDING FOR POL SERVICE PIPING is chosen, delete the rest of the paragraph.

****

[a. Definitions shall be in accordance with AWS A3.0.

b. Symbols shall be in accordance with AWS A2.4 for welding and nondestructive testing, unless otherwise indicated.

c. Safety Precautions shall conform to AWS Z49.1.

d. Weld Preparation shall comply with the requirements of ASME B31.3 and the qualified Welding Procedure Specification. The use of "rice paper" as purge blocks is not permitted. Submit alternate method for approval. Back purge gas shall be used for the root pass and hot pass of all pipe welds. The use of flux-coated or cored welding rod is prohibited in making the root pass.

e. Backing Rings. The use of backing rings for making or repairing welds will not be permitted.]

3.5.2 Tests

a. All steel pipe welds, except factory seam welds, including high point vent pipe and low point drain pipe, shall be site examined by radiographic methods to determine conformance to the paragraph "Standards of Acceptance". Socket welds and branch connections which can not be radiographed shall be examined per ASME B31.3, paragraph 341.4.3. All of the socket welds shall be examined, except the socket welds on the non-pressurized drain lines in the [pumphouse] [filter building] to the product recovery tank in which a minimum of 10 percent shall be examined, and 10 percent of the socket welded pipe on the tanks, and to the conformance of the paragraph "Standards of Acceptance".

b. The services of a qualified commercial or testing laboratory approved by the Contracting Officer shall be employed for testing of piping welds. The weld inspector shall have a minimum of two years experence in inspection of stainless steel piping and two years in commercial or military aircraft hydrant fueling systems, petroleum refineries, power generating plants, or chemical process plants. Costs of testing, including retesting or repaired welds, shall be borne by the Contractor.

c. Procedures for radiographic inspection shall be in accordance with NAVSEA T9074-AS-GIB-010/271 or ASTM E 94. Weld ripples or surface irregularities that might mask or be confused with the radiographic image of any objectionable defect shall be removed by grinding or other suitable mechanical means. The weld surface shall be merged smoothly with the base metal surface.

3.5.3 Standards of Acceptance

Interpretation of test results and limitations on imperfections in welds shall comply with the requirements for 100 percent Radiography for the circumferential butt welds, and visual examination for the welds that cannot be radiographed, per ASME B31.3, Chapter IX, Table K341.3.2.

3.5.4 Corrections and Repairs

Defects shall be repaired in accordance with approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Whenever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners. After a defect is thought to have been removed, and prior to rewelding, the area shall be examined by suitable methods to insure that the defect has been eliminated. After repairs have been made, the repaired area shall be reinspected and shall meet the standards of acceptance for the original weld. Any indication of a defect shall be regarded as a defect unless reevaluation by nondestructive methods and/or by surface conditioning shows that no defect is present.

3.5.4.1 Defect Removal

Defective or unsound weld joints shall be corrected by removing and replacing the entire weld joint, or for the following defects corrections shall be made as follows:

a. Excessive Convexity and Overlap: Reduce by removal of excess metal.

b. Excessive Concavity of Weld, Undersized Welds, Undercutting: Clean and deposit additional weld metal.

c. Excessive Weld Porosity, Inclusions, Lack of Fusion, Incomplete Penetration: Remove defective portions and reweld.

d. Crack in Weld or Base Metal: Remove crack throughout its length, including sound weld metal for a distance of twice the thickness of the base metal or 2 inches, whichever is less, beyond each end of the crack, followed by the required rewelding. Complete removal shall be confirmed by magnetic particle inspection for carbon steel or liquid penetrant inspection for stainless steel. Inspection procedures shall comply with the requirements of ASME B31.3.

e. Poor Fit-Up: Cut apart improperly fitted parts, and reweld.

3.5.4.2 Methods of Defect Removal

The removal of weld metal or portions of the base metal shall be done preferably by chipping, grinding, sawing, machining, or other mechanical means. Defects also may be removed by thermal cutting techniques. If thermal cutting techniques are used, the cut surfaces shall be cleaned and smoothed by mechanical means. In addition, at least 1/8-inch of metal shall be removed by mechanical means from the cut surfaces of stainless steel.

3.5.4.3 Rewelding

Repair welds shall be made using an electrode or filler wire preferably smaller than that used in making the original weld. Rewelding shall be done using qualified welding procedures. The surface shall be cleaned before rewelding. Repair welds shall meet the requirements of this specification.

3.5.4.4 Peening or Caulking

The use of force (peening) or foreign materials to mask, fill in, seal, or disguise any welding defects shall not be permitted.

3.6 INSTALLATION

3.6.1 Precautions

Take special care to ensure that the protective coating on buried pipe is not damaged during installation and that the completed system is free of rocks, sand, dirt, water, weld slag, and foreign objects including construction debris. Take the following steps to ensure these conditions.

a. Coated pipe shall be handled only with canvas or nylon slings or padded clamps. Any coating damaged by improper handling or storage shall be repaired as specified.

b. Pipe brought to the site shall be stored on blocks or horses at least 18 inches above the ground and adequately supported to prevent sagging. Padded blocks or horses shall be used for coated pipe. The method and height of storing coated pipe shall be in accordance with the coating manufacturer's instructions. Pipe ends shall be protected and capped against weather at all times, except to accommodate immediate installation.

c. Visual inspection shall be made of the inside of each length of pipe to ensure that it is clear and clean prior to installation.

d. The open ends of the pipe system shall be closed at the end of each day's work or when work is not in progress by use of expansion plugs and shall not be opened until the work is resumed.

e. A swab, with a leather or canvas belt disc to fit the inside diameter of pipe, shall be pulled through each length of pipe after welding in place.

f. Obstruction remaining in the pipe after completion of the system shall be removed at the expense of the Contractor.

g. Plasma cutters and torches are not to be used to make penetrations in the pipe or to cut pipe.

h. After installation and backfill of the hydrant loop is complete and before fuel is put in the pipe, the pipe will be cleaned using foam swabs and poly coated wire brush pigs and compressed dry gas, residual humidity of not over 20 percent. Ten flights of a combination of swab and brush pigs shall be run. During this, low point drains and high point vents shall be blown clean.

3.6.2 Protective Coatings

3.6.2.1 Application of Tape Wrapping

Surfaces to receive tape shall be clean, dry, grease-free and dust-free. Extruded polyethylene coating and adhesive undercoat surfaces to be tape wrapped shall be primed with a compatible primer prior to application of the tape. The primer shall be as recommended by the tape manufacturer and approved by the extruded polyethylene coating manufacturer. Weld beads shall be wire brushed. Burrs and weld spatter shall be removed. Weld beads shall be covered with one wrap of tape prior to spiral wrapping. Fittings shall be wrapped spirally beginning with one complete wrap three inches back from each edge of the extruded polyethylene coating. For pipe less than four-inch size, one layer half-lapped shall be used. For pipe

4-inch size and larger, two layers half-lapped shall be used, with the second layer wrapped opposite hand to the first. On irregular surfaces one layer shall be applied half-lapped and stretched to conform to the surface, followed by a second layer half-lapped and applied with the tension as it comes off the roll.

3.6.2.2 Inspection and Testing

The condition of factory field coated and wrapped piping shall be the responsibility of the Contractor and all damage to the protective covering during transit and handling shall be repaired at no additional cost to the Government. All field coating and wrapping shall be subject to approval by the Contracting Officer. The entire pipe shall be inspected as specified in sub-paragraph "Testing of Protective Coatings" under paragraph "Protective Coatings for Buried Steel Piping." The inspection for holidays shall be performed just prior to lowering the pipe into the ditch and every precaution shall be taken during lowering and backfilling to prevent damage to the protective covering.

3.6.2.3 Damage Repair

Damaged areas of extruded polyethylene coating shall be repaired by tape wrapping as specified in the preceding paragraph for fittings. Residual material from the extruded polyethylene coating shall be pressed into the break or shall be trimmed off; all areas to be taped shall be primed, and the tape shall be applied half-lapped.

3.7 INTERIOR EPOXY COATING

When internally epoxy lined pipe is cut, the lining shall be ground back from the end a minimum of one inch but not more than 1-1/2 inches.

3.8 INSTALLATION OF UNDERGROUND PIPE

Underground fuel pipelines shall be pitched as shown on the drawings. Where not indicated they shall be pitched a minimum of 2 inches per 100 feet. Branch lines to the hydrant pits shall slope up to the pit. Two-inch pipe size valved drain connections shall be provided at all low points and 1-1/2-inch pipe size valved outlet vent connections shall be provided at all high points. Vent and drain lines shall terminate in male cam-type locking end connectors with matching female dust covers and installed in pits. The pipe shall have cover as shown on the drawings. Drain lines shall be installed at the slopes indicated.

3.8.1 Pipe Assembly

Pipe shall be strung parallel and adjacent to or above a trench. The pipe shall be supported on padded skids during welding and inspection of joints. Protective coating shall be inspected and repaired prior to lowering the pipe into the trench. The pipe shall be lowered using only canvas or nylon slings. The sling shall be dug from underneath the pipe after placements and shall not be pulled from underneath the pipe while in contact with it. Care shall be taken to prevent damage to the pipe, welded joints or coating and any such damage shall be repaired as directed by the Contracting Officer. Pressure testing of the pipe shall be done after it has been placed in final position in the trench.

3.8.2 Warning Tapes in Earth Trenches

For the purpose of early warning and identification of buried pipes outside of building walls during future trenching or other excavation, continuous identification tapes shall be provided in the trench. Provide metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured for the purpose of early warning and identification of utilities buried below the tape. Tape shall be at least 3 inches in width. Color of tape shall be as standard with the manufacturer with respect to the type of utility buried below the tape. Tape shall have lettering at least 1 inch high with warning and identification imprinted in bold black letters continuously over the entire tape length with not less than the following identification on the tape: BURIED JET FUEL PIPING BELOW. Tape shall be installed in accordance with the printed recommendations of the tape manufacturer, as modified herein. Tapes shall be buried at a depth of 6 inches from the top of the subgrade or 12 inches below the top surface of earth. Provide permanent color and printing, unaffected by moisture or soil.

3.8.3 Clearances

Install pipe to be clear of contact with other pipes, pipe sleeves, casings, reinforcing steel, conduits, cables, or other metallic structures. Where pipes cross other pipes or structures with a separation of less than 6 inches, install an insulating separator. Protect the pipe from contact with a 12-inch square by 1 inch thick bituminous-impregnated canefiber board.

3.8.4 Protective Coating

When the protective coating on pipe is damaged, the Contracting Officer shall be notified and shall inspect the pipe before the coating is patched. If the damage to the pipe is deeper than 0.050-inch, the damage shall be repaired by welding in accordance with paragraph "WELDING". If the pipe is dented, out of round or damaged to the point that welding will not make it good as new, the length of pipe shall be rejected.

3.9 TESTING

Piping shall be tested by pneumatic and hydrostatic pressure. Testing shall comply with applicable requirements of ASME B31.3, NFPA 30 and the requirements specified herein. Hydrostatic testing shall be performed using fuel as the liquid. Water shall not be introduced into the system for testing. Pressure and hydrostatic testing shall be performed only after welding inspection has been completed.

3.9.1 Pneumatic Test

Piping to be installed underground shall not receive field applied protective covering at the joints or be covered by backfill until the piping has passed the pneumatic test described herein. To facilitate the tests, isolate various sections of the piping system and test each one separately. Where such sections terminate at flanged valve points, the line shall be closed by means of blind flanges in lieu of relying on the valve. Furnish tapped flanges that can be attached to the end of the section of line being tested, and that will permit a direct connection between the piping and the air compressor and/or pressurizing pump. No taps in the permanent line will be permitted. Furnish all necessary equipment for testing; all gauges shall be subject to testing and approval of the Contracting Officer. The air used for pneumatic testing shall have a residual humidity of not over 20 percent. Provide dehumidifying equipment on the suction or discharge side of the air compressor used to provide air for testing. Pressurizing pump shall not exceed 10 cfm.

3.9.1.1 Pneumatic Test Procedure

Special safety measures, including the wearing of face mask, shall be taken during testing under pressure. Only authorized personnel shall be permitted in the area during testing. The pneumatic test pressure shall be applied in increments. A preliminary 25 psig test shall be applied. Examine joints with soap solution. Leaks revealed by this test shall be repaired. The full test pressure shall then be applied. Unless otherwise directed by the Contracting Officer, all piping shall be tested at a pressure of [50] [100] psig for not less than 2 hours, during which time there shall be no drop in pressure, only pressure rises with temperature. The pressure source shall be disconnected during the final test period. Any leaks revealed by the test shall be repaired and the test repeated.

3.9.1.2 Hydrostatic Test

Upon completion of pneumatic testing and after backfilling, hydrostatically test each piping system with fuel at [275] [_____] psig in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gauge pressure for four hours. Furnish electricity, instruments, connecting devices, and personnel for test. Fuel shall be furnished by the Government. Defects in work shall be corrected at the Contractor's expense, and the test repeated until the work is proven to be in compliance with the Contract requirements.

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NOTE: If the COMMAND FUELS FACILITY Engineer directs the Designer to hydrostatically test the system to 1.5 times the design pressure, exceeding the flange rating, the Designer will be required to write the commissioning hydrostatic testing procedures; removing all ball valves, control valves, and instructing the testing people what valves to close, where to connect the hydrostatic test pump, blind flange placements, and other safety requirements.

****

3.9.2 Performance Testing

The completed fuel system shall be cleaned and performance tested as specified in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START UP. All control valves, both manual and automatic, shall be checked for leaks (any area wetted with fuel) and proper operation and adjusted, repaired or replaced to correct any defects.

3.10 PIPELINE PIGGING VERIFICATION

3.10.1 Geometry Tool Reports

After the system is installed and prior to performance testing, a field/preliminary report shall be issued and a debrief given to Government personnel onsite on the condition of the fuel hydrant loop. This shall be comprised of raw data in the form of a PC download or equivalent which shows a continuous scan of each data unit output. Results of a preliminary interpretation of the data shall be reported. These shall include as a minimum all critical anomalies. A final report shall include a description of the principle of operation, explanation of raw data, presentation of raw data, data to be clearly marked with distance traveled scale with classified anomaly location and all identifiable pipeline features, and all anomalies to be classified with locations in summary tabular form.

3.10.2 Workmanship

Verify pipe bend radii at pipe locations between pig launchers and receivers. If a pipe bend is less than 3D, replace the bend.

3.10.3 Pipeline Internal Inspection Operations

3.10.3.1 General

The following pigs will be propelled through the pipeline with product in order to inspect the pipeline: 5 pound density foam swab, combination poly scraper-magnetic, stainless steel wire brush, aluminum plate gauge, and geometry tool. Tracking devices shall be used on all pigs. At a minimum, the sequence of pig runs shall be as follows: 1) foam swab for proving and cleaning, 2) wire brush for cleaning, 3) scraper-magnetic for cleaning, 4) aluminum plate gauge for gauging internal anomalies, 5) scraper-magnetic for cleaning, 6) wire brush for cleaning, 7) scraper-magnetic for cleaning, 8) foam swab for cleaning, (Note: the number of pig flights of each type of cleaning pigs shall be determined by the amount and type of debris removed. The conclusion of the cleaning process shall be when debris recovered is only that from the pigs themselves. This determination will be determined by the project's system supplier and the contracting officier), 9) geomety tool. The pipe wall shall be continuously monitored on a real-time basis during the geometry pig run. Anomalies such as patches, couplings, or flanges shall also be identified, and the wall thickness given. The geometry pig's technician will determine if additional runs are necessary. A permanent data set of internal inspection survey findings shall be generated.

3.10.3.2 Preparatory Work

The Government will bring to the attention of the Contractor all statutes, rules and regulations relevant to the performance of the work on the site (on Government property) and will also provide the Contractor with a copy of its own site regulations (if any). Provide the pigging vendors with all-available pipeline records and drawings.

3.10.3.3 Pig Load And Launch

****
NOTE: If pig a launcher and a receiver are not provided in the contract, portable ones will be by the Contractor during pigging operations.
****

The pig shall be loaded into the pig launcher by the Contractor. The method of loading and lodging the front pig cup into the launcher shall not involve the use of uncontrolled mechanical force applied to the rear of the pig.

3.10.3.4 Pipeline Operation During Pigging

All pig runs shall be made with the line packed with product. The system pumps will be used to propel the pig. The new pig traps will be used for pig launch and retrieval.

3.10.3.5 Brush and Gauging Survey

Run a brush pig at least as often as previously indicated. The brush pig shall be designed and provided by the geometry pig vendor. Additional runs may be required based upon the amount of debris found in the pipeline. The onsite geometry pig vendor's personnel shall determine if additional runs are required. Immediately following the brush pig run and immediately prior to the geometry survey, run, as a minimum, a single batching pig fitted with a gauge plate equal to 90 percent of the pipeline normal inside diameter. The plate is to be a segmented aluminum disk of 1/8 inch thickness. The plate gauge pig shall also include a tracker and tracking equipment. Track the pig assembly above ground during the operation.

3.10.3.6 Geometry Survey

After a satisfactory gauging pig run, the pipeline geometric defects shall be determined by a geometry tool. The geometry tool shall provide accuracy geometric anomaly detection, and bend radius measuring capability. The data obtained shall be presented in a PC software format to allow user friendly analysis and presentation. The geometry tool assembly shall be capable of:

a. Operating in hydrocarbon liquid environment, specifically jet fuel, at a pressure of up to ANSI 300 rating.

b. Traversing the pipeline with nominal wall thickness and possible bore restrictions down to 90 percent of nominal pipe inside diameter.

c. Traversing the pipeline length at a speed of between 3 and 5 ft/sec when propelled by pumped jet fuel. Pressure differential across pig not to exceed 50 psi.

d. Traversing through smooth pipe bends as small as 3D (3 pipe diameters) radius and single miter bends of up to 10 degrees change of direction.

e. Include a tracker and tracking equipment. Track the pig assembly above ground during the operation. The battery life of the tracker shall not be less than 72 hours.

f. Manual loading into the new horizontal pig trap.

The geometry tool assembly instrumentation performance shall be capable of:

a. Battery life to be minimum 18 hours at operating conditions.

b. Principle of operation to be electronically stored geometry system.

c. Geometry sensing to span full circumference and length of pipe, with associated distance measuring method.

d. Geometry system shall be capable of:

    (1) positive location and identification of each geometric anomaly.

(2) positive location and identification of each bend.

(3) positive location and identification of distance marker reference points of either magnetic or electronic type placed on or above the pipe.

e. Classification of geometric anomalies to be as minimum:

(1) discrimination between ovality and intrusion anomalies.

(2) mechanical damage such as mill defects, dents, internal gouges, and buckles.

(3) pipeline weld defects (such as excess weld penetration).

(4) geometric thickness anomalies. As a minimum, these shall be reported in the following categories within the listed accuracy.

(aa) magnitude of anomaly (+/- 1 inch)
(bb) span of anomaly (+/- 1 inch)
(cc) ovality (+/- 0.1 inch)
(dd) span of ovality (+/- 1 inch)
(ee) anomaly station (+/- 1:2,000)

3.10.3.7 Pipe Wall Thickness Survey

After a satisfactory cleaning, gauging, and geometry pig run, the pipeline wall thicknesses shall be determined. The tool shall provide accuracy measurement of pipe wall thickness (+/- 0.01 inch). The data obtained shall be presented in a PC software format to allow user friendly analysis and presentation.

3.10.3.8 Lost Pig

The Contractor is responsible for a lost pig, finding the pig, retrieval of the pig, and all repairs, radiographs to the pipeline system and the pig.

-- End of Section --

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 52 43.14 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010

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SECTION 33 52 43.14

AVIATION FUEL CONTROL VALVES
02/10

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NOTE: This guide specification covers the requirements for diaphragm type automatic control valves used in aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASME INTERNATIONAL (ASME)

ASME B16.24	(2006) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500
ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME BPVC SEC VIII D1	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A 194/A 194M	(2009) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A 216/A 216M	(2008) Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A 269	(2008) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 320/A 320M	(2008) Standard Specification for Alloy/Steel Bolting Materials for Low-Temperature Service
ASTM A 536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM A 743/A 743M	(2006) Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application

ASTM B 26/B 26M	(2009) Standard Specification for Aluminum-Alloy Sand Castings
ASTM D 2000	(2008) Standard Classification System for Rubber Products in Automotive Applications
ASTM D 751	(2006) Coated Fabrics

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS 3216	(2005; Rev G) Fluorocarbon (FKM) Rubber High-Temperature - Fluid Resistant Low Compression Set 70 To 80
SAE J200	(2008) Classification System for Rubber Materials
SAE J429	(1999) Mechanical and Material Requirements for Externally Threaded Fasteners

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-8625	(2003; Rev F; Am 1) Anodic Coatings, for Aluminum and Aluminum Alloys

1.2 ADMINISTRATIVE REQUIREMENTS

Design conditions shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT. Components shall be suitable for ANSI Class 150 (275 psig at 100 degrees F).

a. Control valves specified herein shall be of one manufacturer. The valve manufacturer shall also produce the hydraulically-operated pilots. For each type control valve required and specified, submit the following:

   (1). Flow diagrams.
   (2). Operational description of the control valve and pilot control system.
   (3). Complete valve assembly list of materials, along with material Certificates of Conformance, used in the manufacture of the control valves and pilot systems.
   (4). sectional drawings of main valve and control pilot systems.

b. Before shipment, each individual control valve shall be operationally tested and adjusted by manufacturer under actual flow conditions utilizing a hydrocarbon test fluid with a specific gravity comparable to [JP-4] [JP-5] [JP-7] [JP-8] fuel. Manufacturer shall submit certified records of test data.

c. Operation and maintenance information shall be submitted for each individual type control valve specified herein. Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted.

1.3 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Control Valves[; G][; G, [_____]].

SD-03 Product Data

Control Valves[; G][; G, [_____]].

SD-06 Test Reports

Control Valves; .

SD-07 Certificates

Previous Air Force/Military Projects[; G][; G, [_____]].

Qualified Engineers[; G][; G, [_____]].
Field Assistance[; G][; G, [_____]].

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G][; G, [_____]].

1.4 QUALITY ASSURANCE

1.4.1 Field Assistance

Provide the following:

a. Proof of experience on previous Air Force/Military projects.

b. Number of qualified engineers (factory trained)available to provide startup support.

c. Written assurance as to ability to respond to specified time for field assistance.

1.4.2 Training

The manufacturer shall conduct two eight hour training classes for Liquid Fuels Maintenance Technicians which include valve overhaul procedures, pilot overhaul procedures, valve adjustments, and valve diagnostics. The manufacturer shall provide a 4-inch valve mock-up with various trim components (i.e., rate of flow, solenoid control, and speed control features) to be used during training. Video taping of training shall be allowed or provided at the time of the class, and an attendance roster maintained by the Contractor. The 4-inch valve mock-up shall become the property of the Government and shall be turned over to the Contracting Officer. Submit copies of the Operation and Maintenance Manuals for approval.

1.5 WARRANTY

****
NOTE: Modify hours for projects outside the UNITED STATES.
****

If a problem attributable to the valve's manufacturer or installation arises after the initial system start-up has been accomplished, and after system final acceptance date, the Contractor shall have [48] [_____] hours from the time of notification that a problem exists to solve the problem. The problem shall be solved to the satisfaction of the [Contracting Officer, the Base Civil Engineer and/or the Command Fuel Facilities Engineer] [Contracting Officer]. If the Contractor cannot effectuate a proper resolution to the problem as outlined above in the [48] [_____] hour period, provide a factory trained engineer from the manufacturer of the valve within [48] [_____] hours after the expiration of the Contractor's initial [48] [_____] hour period to effectuate a resolution of the problem above. All services provided by the valve manufacturer shall be at no cost to the Government. When it has been determined by the Contractor, Contracting Officer, and the valve manufacturer's representative that the valve(s) cannot be repaired in its installed position in the fuel system, it shall be replaced with a new valve and pilot assembly within [48][_____] hours after the initial 96-hour period listed above expires and at no cost to the Government.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

The type of materials which come in contact with the fuel, if not specified herein before, shall be noncorrosive.

2.2 CONTROL VALVES

2.2.1 General

Control valves shall be single-seated globe type, diaphragm actuated, hydraulically operated valves. Valves shall consist of 3 major components: the valve body, valve cover, and diaphragm assembly. The diaphragm assembly shall be the only moving part. In the event of diaphragm failure, valve shall fail closed against flow, unless otherwise indicated. The main valve shall be drip-tight when closed. Each valve shall have an external indicator to show the position of the valve disc at all times. Control valves shall be shipped from the factory as a complete assembly with all pilot controls and pilot auxiliary piping properly installed on the main valve. Materials which come in contact with the fuel shall be resistant to the effects of and not harmful to aircraft engine fuel and shall be stainless steel, or electroless nickel plated ductile iron unless noted otherwise. [High level shut-off valve bodies shall be electroless nickel plated ductile iron.] [Valves at exterior locations shall be stainless steel. Open canopies are considered an exterior location.] Materials for control valves, and items to be mounted on the valves shall be as follows:

****
NOTE: Provide per COMMAND FUELS FACILITY Engineer's direction.
****

2.2.1.1 Bodies, Bonnets, and Covers

Shall be constructed of one of the following materials:

a. Cast steel conforming to ASTM A 216/A 216M, Grade WCB internally plated with chromium, nickel or internally electroless nickel plated.

b. Cast stainless steel conforming to ASTM A 743/A 743M.

c. Ductile iron conforming to ASTM A 536, electroless nickel plated.

d. Bodies shall have flanged inlet and outlet connections. Valve shall have a screwed bottom drain plug.

2.2.1.2 Valve Seats

****
NOTE: Provide per COMMAND FUELS FACILITY Engineer's direction.
****

Valve seats shall be stainless steel in accordance with ASTM A 743/A 743M. It shall be possible to remove the valve seat while the valve is connected in the line. Valve seat and upper stem bearing shall be removable and screwed in the body and/or cover. The lower stem bearing must be concentrically contained in the valve seat and shall be exposed to flow on all sides. The diameter of the valve seat shall be the same size as the inlet and/or outlet flanges of the main valve.

2.2.1.3 Valve Discs

Valve discs shall contain a resilient, viton disc conforming to SAE AMS 3216 having a rectangular cross section, contained on 3.5 sides by a disc retainer and a disc guide, forming a drip tight seal against the seat. The disc shall be usable on either side. The disc guide shall be the contoured type capable of holding disc firmly in place during high differential pressure conditions that may develop across the seating surface. The disc retainer shall be capable of withstanding rapid closing shocks.

2.2.1.4 Diaphragm Assembly

Diaphragm Assembly shall form a sealed chamber in the upper portion of the valve, separating the operating fluid from the line pressure. The diaphragm assembly shall contain a valve stem which is fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. Valve body and cover shall be sealed by the diaphragm. Valve stem shall be stainless steel. The bearing material shall be compatible with the fuel specified and shall not contain zinc coated metals, brass, bronze, or other copper bearing alloys. The diaphragm shall be of a nonwicking material or design, with a minimum of 2 layers of nylon fabric bonded with a minimum of 3 layers of synthetic rubber (valves 2-1/2 inches and smaller one layer of nylon fabric). The edge area of the center hole for the valve stem shall be sealed by vulcanization. Materials to be resistant to aromatics of up to 50 percent in accordance with ASTM D 2000 (SAE J200). The diaphragm must have a MULLINS-burst rating according to ASTM D 751 of a minimum of 600 psi per layer of nylon fabric. All diaphragm sizes must be cycle tested to a minimum of 100,000 cycles, by alternately applying pressure under the diaphragm (main valve pressure) and above the diaphragm (cover chamber pressure). That test shall be certified by the manufacturer. The diaphragm shall not be used as a seating surface. The diaphragm must be fully supported by the body and cover in either the open or closed position.

2.2.1.5 Bolts, Screws and Nuts

a. For Ductile Iron, and Cast Steel Body Valves.

    (1) Bolts and Screws, cadmium plated steel in accordance with SAE J429, Grade 5.

    (2) Nuts, cadmium plated steel in accordance with ASTM A 194/A 194M, Grade 2 H.

b. For Stainless Steel Body Valves. Bolts, Screws and Nuts, ASTM A 320/A 320M, Grade B8M C.1.1.

2.2.1.6 Pilot Control System and Auxiliary Piping

Pilot Control System and auxiliary piping shall be stainless steel, seamless, fully annealed tubing conforming to ASTM A 269, Grade TP316, Rockwell hardness B80 or less. Wall thickness for 1/2-inch tubing to be 0.049-inch. Threaded connections shall be used in pilot system piping and shall be o-ring type with viton o-rings. Tubing connections shall not be welded.

2.2.1.7 Pilot Valves

Pilot valves shall have [stainless steel bodies conforming to ASTM A 743/A 743M] [aluminum bodies conforming to ASTM B 26/B 26M Type 356-T6 anodized in accordance with MIL-A-8625] with stainless steel internal working parts. Disc and diaphragm assemblies shall be as specified herein before. The setting of adjustable type pressure operated pilot valves shall be easily adjusted by means of a single adjusting screw. The adjusting screw shall be protected by a threaded cap drilled to accommodate a lead-seal wire and a lock nut shall be provided on the adjusting screw to lock it in position at the desired setting. The lead seal wire shall be installed after final acceptance of the system. Spare wire seals and the "embossing" tool will be turned over to the Contracting Officier for the LFM shop.

****
NOTE: Per COMMAND FUELS FACILITY Engineer direction.
****

2.2.1.8 Solenoids

Solenoids for operation of pilot valves shall be housed in an explosion-proof case suitable for Class I, Division 1, Group D with maximum temperature rating of T2D (419 degrees F), hazardous locations as defined in NFPA 70. Solenoids shall operate on 120 volts, 60 cycle, single phase, alternating current. A manual type operator or needle valve to bypass the solenoid valve shall be provided for emergency manual operation.

2.2.2 Serviceability of Main Valve Internal Parts

Main valve movable parts including strainers, valve seat, stem bearings, and control system shall be replaceable without removing the main valve from the line. All nonmetallic parts shall be replaceable.

2.2.3 Total Lengths

The total valve length does not include the orifice plate flange (when used). If the control valve being supplied has the orifice plate built into its flange, the spacer provided shall bring the valve face-to-face dimension equal to those listed below plus 0.0875 inch. The lengths of the valves shall be equal for the following materials: cast stainless steel, cast steel, and ductile iron.

SIZE inches	VALVE LENGTH inches
1-1/2	8.5
2	9.375
3	12
4	15
6	20

SIZE inches	VALVE LENGTH inches
8	25.4
10	29.8
12	34
14	39
16	41.375
Note: Tolerance shall be +0.03 inch for size 1-1/2 inches through 8 inches and +0.06 inch for size 10 thru 16 inches.	

Control valves not meeting these face to face dimensions shall be supplied with spacers suitable for the proper installation of the valve.

2.2.4 Flanges

****
NOTE: Per Command Fuels Facility Engineer direction.
****

MATERIAL	SEALING SURFACE
Cast Steel, ASME B16.5 Class 150	Raised Face
Cast Stainless Steel, ASME B16.5	Raised Face Class 150
Ductile Iron, ASME B16.24 Class 150	Flat Face
Note: The mating flange shall be made the same as above.	

2.2.5 Identification

2.2.5.1 Main Valve Body

The following shall be cast into the main valve body:

a. Pressure Class
b. Size
c. Material
d. Foundry Heat Number and Identification
e. Manufacturer
f. Flow Pattern

2.2.5.2 Main Valve Cover

The following shall be cast into the main valve cover:

a. Size
b. Material
c. Foundry Heat Number and Identification

2.2.5.3 Brass Name Plates

Brass name plates shall be fastened to the valve. Body name plates shall list the following:

a. Size
b. Model Number
c. Stock Number
d. Manufacturer/Supplier
e. Manufacturer's Inspection Stamp

2.2.5.4 Inlet Name Plate

Inlet name plate shall list the following:

a. Size
b. "Inlet" Marking
c. Assembly Model Number
d. Part Number

2.2.5.5 Outlet Name Plate

Outlet name plate shall list the "Outlet" Marking.

2.2.5.6 Pilot Valves

Pilot valves shall be tag identified. The valve shall have the field adjusted start up setting engraved on a plastic tag, white with black lettering.

2.3 INDIVIDUAL CONTROL VALVE OPERATIONAL REQUIREMENTS

Operation, performance, and special features of the individual control valves shall be as specified herein.

2.3.1 High Liquid Level Shut-Off Valve (HLV-1 AND HLV-2)

2.3.1.1 Size

8-inch

2.3.1.2 Flow

1200 GPM

2.3.1.3 Operation

High liquid level shut-off valve shall be hydraulically operated and shall be provided with a tank exterior mounted float. Activation point of the float for opening and closing the high liquid level shut-off valve shall be as shown on the drawings. Upon a rise in fluid level to the float activation point, the float control system shall cause the main valve to close tightly. The main valve shall remain closed until a drop in tank fluid level occurs. Upon a drop in fluid level beneath the float activation point, the float control shall cause the main valve to open completely.

2.3.1.4 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

2.3.1.5 Manual Test Feature

Manual testing of high level shut-off valve and exterior mounted float's automatic opening and closing feature shall be possible.

2.3.1.6 Strainer

A 40-mesh stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.3.1.7 Pressure Sensitive Close Feature

If the upstream pressure rises to 150 psi or above while closing, the valve will stop closing or open slightly until the pressure is less than 150 psi.

****
NOTE: Provide per Command Fuels Facility Engineer direction.
****

[2.3.1.8 Minimum Differential Pressure Feature

The valve shall be equipped with a minimum differential pressure pilot to maintain a differential pressure across the valve. Pressure shall be adjustable with a range of 5 to 25 psi.

][2.3.1.9 Opening and Closing Feature

The valve shall be equipped with an adjustable differential pressure pilot and a quick cover exhaust system to allow the valve to open in 3-4 seconds when pressure is greater than [_____] [170] psig.

]2.3.2 Non-Surge Check Valve (CV-1 THRU CV-6)

2.3.2.1 Size

6-inch; 2-inch for FTP-1

2.3.2.2 Flow

[950] [650] GPM; 50 GPM for FTP-1.

2.3.2.3 Operation

Non-surge check valve shall open slowly. Opening speed shall be adjustable from two (2) to 30 seconds without affecting closing of valve. Factory set for 15 seconds. The nonsurge check vales shall fail closed against reverse flow in check condition.

2.3.2.4 Quick closure

Valve closure to be rapid, closing quickly when outlet pressure exceeds inlet pressure.

2.3.2.5 Flow Control

Valve to limit flow to [950] [650] GPM (CV-1 thru CV-5), 50 GPM (CV-6). Sensing shall be by orifice. Valve to modulate to limit flow without hunting. Rate of flow to be manually adjustable and utilize a downstream orifice plate holder.

2.3.2.6 Strainer

A 40-mesh, stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.3.3 Non-Surge Check/Air Block Valve (AB/CV-1 THRU AB/CV-[ ])

2.3.3.1 Size

4 inch

2.3.3.2 Flow

0-[340] [640] GPM.

2.3.3.3 Operation

Backpressure control pilots will cause main valve to modulate to maintain constant inlet pressure. There shall be 3 backpressure control pilots, A, B, and C. Pilot A shall be solenoid enabled and set at pressure which corresponds with unloading pump flow rate of 600 GPM. Pilot B shall be solenoid enable and set at pressure which corresponds with unloading pump flow rate of 300 GPM. Pilot C is not solenoid controlled and is set at pressure corresponding with unloading pump flow rate of 150 GPM. A 2 inch solenoid controlled control valve may be used at this flow instead. All pilots are to have 20-200 PSIG range.

2.3.3.4 Speed Control

Valve shall open slowly. Opening speed shall be adjustable from two (2) to 30 seconds without affecting closing of valve. Factory set for 15 seconds. The valves shall fail closed against reverse flow in check condition.

2.3.3.5 Check Feature

Valve closure to be rapid, closing quickly when outlet pressure exceeds inlet pressure.

2.3.3.6 Solenoid Control

Solenoid control of valve shall be as indicated on the drawings.

2.3.3.7 Strainer

A 40-mesh, stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.3.4 Filter Separator Control Valve (FSCV-1 Thru FSCV-7)

2.3.4.1 Size

6-inch

2.3.4.2 Flow

[900] [600] GPM

2.3.4.3 Operation

Filter Separator Control Valve shall limit flow to [900] [600] GPM. Controlling to be by orifice. Rate of flow to be manually adjustable and utilize a downstream orifice plate holder.

2.3.4.4 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

2.3.4.5 Water Slug Shut-Off

****
NOTE: Do a hydraulic analysis on the transfer line to see if the water slug shut-off should be deleted from the receipt filter separators.
****

Valve shall close rapidly when water is sensed at filter separator sump high level as indicated by Float Control Valve float position. Manual testing of operation shall be possible.

[2.3.4.6 Shut-Off Feature at Maximum Differential Pressure

****
NOTE: Coordinate selection of this feature with the COMMAND FUELS FACILITY Engineer and for use on long transfer lines.
****

Valve shall close rapidly when differential control pilot increases to preset point. Resetting of the differential control pilot shall be manually reset after each shutoff.

]2.3.4.7 Emergency Shut-off Operation

Open/closed valve, solenoid operated. Closure shall be accomplished within 10 seconds upon power failure or activation of an emergency-stop pushbutton.

2.3.4.8 Solenoid Control

****
NOTE: Per COMMAND FUELS FACILITY Engineer direction. Function can also be done via a manual valve.
****

Solenoid control shall be as indicated on the drawings.

2.3.5 Filter Separator Float Control Valve and Tester (FC-1 THRU FC-7)

2.3.5.1 Operation

Float shall ride on the fuel-water interface inside filter separator sump. Activation shall initiate water slug shutoff of filter separator valve.

2.3.5.2 Float Control Pilot and Tester

The filter separator housing sump shall be fitted with a float control pilot valve assembly made of stainless steel. The pilot valve is connected to the filter separator control valve. An integral float control tester shall provide a means to remove a portion of the float ball ballast allowing the float to rise, verifying operation of the water slug and flow control valve, and the integrity of the float ball.

2.3.6 Back Pressure Control Valve (BPCV-1)

2.3.6.1 Size

6-inch

2.3.6.2 Flow

0-[2400][2700] GPM

2.3.6.3 Operation

****

NOTE: To be determined by system hydraulics. For the Type IV System, pantograph is required, inlet pressure will vary based on manufacturer, size, and number of legs.

****

Back pressure control valve shall modulate to maintain constant inlet pressure. Set-point shall be adjustable with a range of 20 to 200 psig. Factory set at [130] [80] [_____] psig, and 160 psig.

2.3.6.4 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

2.3.6.5 Solenoid Control

The valve shall be provided with 2 solenoid controls and shall operate as indicated on the drawings.

2.3.6.6 Speed Control

Valve shall close slowly without affecting the opening speed and shall be factory set for 8 seconds. Closing time shall be adjustable with a range of 2 to 30 seconds. Valve opening time shall be 1.0 second maximum.

[2.3.6.7 Opening Feature

The valve shall be equipped with cover quick exhaust system to allow the valve to open in 3-4 seconds when pressure is greater than [_____] [170] psig.

]2.3.7 Pressure Control Valve (PCV-1)

2.3.7.1 Size

2-inch.

2.3.7.2 Flow

50 GPM under normal operating conditions.

2.3.7.3 Operation

Pressure control valve shall modulate to control inlet pressure and shall have adjustable set-point with a range[s] of 20 to 200 psig. Factory set at 75 psig[, and 50 psig].

2.3.7.4 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

2.3.7.5 Solenoid Control

The valve shall be provided with 2 solenoid controls and shall operate as indicated on drawings.

2.3.7.6 Speed Control

Provide separate opening and closing speed controls each adjustable between 1 and 30 seconds. Factory set at 3 seconds for opening speed and 1 second for closing speed.

2.3.8 Defuel/Flush Valve (D/FV-1)

2.3.8.1 Size

8-inch.

2.3.8.2 Flow

300 to [2400] [2700] GPM.

2.3.8.3 Operation

Valve shall modulate to control inlet pressure and shall have adjustable set-point with a range of 20 to 200 psig. Factory set at 80 psig.

2.3.8.4 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

2.3.8.5 Solenoid Control

The valve shall be provided with 2 solenoid controls and shall operate as indicated on drawings.

2.3.8.6 Speed Control

Valve shall open slowly without affecting the closing speed and shall be factory set for 3 seconds. Opening time to be adjustable with a range of 2 to 30 seconds.

2.3.9 Hydrant Control Valve (HCV)

2.3.9.1 Size

****
NOTE: Select 100 mm (4-inch) for use with pantograph and 100 or 150 mm (4 or 6-inch) for use with hydrant hose truck, per COMMAND FUEL FACILITIES Engineer direction.
****

[4] [6] inch

2.3.9.2 Flow

****
NOTE: Select 38 L/s (600 GPM) for 100 mm (4-inch) valve and 76 L/s (1200 GPM) for 150 mm (6-inch) valve.
****

[600] [1200] GPM.

2.3.9.3 Operation

Hydrant control valve shall modulate, by use of a liquid sensing line from [pantograph] [refueler] venturi, and regulate at a maximum pressure at the skin of the aircraft of 45 psig at any flow rate from 50 to [600] [1200] GPM. Pressure to be adjustable with a range of 15 to 75 psi. Valve, adapter and 90-degree hydrant coupler pressure drop shall not exceed [9 psi at 600 GPM] [28 psi at 1200 GPM] with the valve fully open.

2.3.9.4 Quick Closure

****
NOTE: Select 38 L/s (600 GPM) or 76 L/s (1200 GPM) based on hydrant control valve size selection.
****

Valve shall close rapidly when outlet pressure exceeds control set-point. Valve shall limit the surge pressure on the aircraft to a maximum of 120 psig when fueling at [600 GPM with an aircraft tank valve closure of 0.5 second] [1200 GPM with an aircraft tank valve closure of 0.8 second]. The valve shall reopen when the outlet pressure drops below the set-point of the pilot if the deadman control lever is still depressed.

2.3.9.5 Deadman Control

****
NOTE: Select deadman control option, hydraulic for pantograph, pneumatic for refueler trucks. Verify type of deadman control to select with the MAJCOM.
****

Deadman shall be [hydraulically] [pneumatically] connected to the pilot system of main valve. Valve shall open when deadman control lever is pressed and shall close valve when the lever is released to bleed air from the hydrant hose truck. On rupture of the deadman hose between outlet of deadman control and main valve pilot system, there shall be no fuel leakage. Main valve shall close in 5 seconds maximum when deadman is released or when one of the deadman hose couplers is disconnected.

2.3.9.6 Defuel

Valve shall be capable of reverse flow at the rate of 300 GPM at 165 psig. Valve shall be capable of defueling regardless of nozzle pressure created by the R-12.

2.3.9.7 Speed Control

Valve shall open slowly without affecting the closure rate. Provide adjustable speed control with a range of 2 to 30 seconds.

2.3.9.8 Thermal Relief

Valve to open for pressure equalization and return flow when downstream pressure exceeds upstream pressure.

2.3.9.9 Adapter

Valves shall be provided with type adapter as indicated on drawings. Adapter shall have pressure equalizing feature and have a vacuum tight dust cap.

2.3.9.10 Strainer

A 40-mesh stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

[2.3.9.11 Minimum Differential Pressure Feature

The valve shall be equiped with a minimum differential pressure pilot to maintain a differential pressure across the valve. Pressure shall be adjustable with a range of 5 psi to 25 psi (6-inch valve only)

]2.3.10 Overfill Valve for Product Recovery Tank (OV-1)

2.3.10.1 Size

2-inch.

2.3.10.2 Capacity

50 GPM.

2.3.10.3 Operation

Hydraulically operated overfill valve shall close automatically upon rising to Product Recovery Tank 80 percent fill level. Valve shall open automatically upon falling below Product Recovery Tank 80 percent fill level.

2.3.10.4 Control Float

Automatic opening and closing of the valve shall be initiated by a control float located within the Product Recovery Tank. Control float shall be provided with a manual tester, mounted external to the tank, for testing of overfill valve operation.

2.3.10.5 Pressure Reservoir

Valve shall be provided with a pressure reservoir to supply required hydraulic pressure for operation. Reservoir pressure to be supplied by Fuel Transfer Pump (FTP-1)using 0.5-inch tubing connected upstream of the pump non-surge check valve. Valve shall close upon loss of reservoir pressure. Reservoir shall be a 1 gal capacity bladder-type tank, carbon steel constructed, tested and stamped in accordance with ASME BPVC SEC VIII D1 for a working pressure of 125 psi and precharged with air of 13-15 psig. The tank will be epoxy lined. The tank will be fitted with an air charging valve and pressure gauge.

2.3.10.6 Thermal Relief

Overfill valve shall be provided with a pressure sustaining control valve that shall automatically, upon inlet pressure rising to 200 psig, open allowing thermal relief around overfill valve. Pressure sustaining valve shall automatically close upon inlet pressure dropping below 200 psig.

2.3.10.7 Limit Switch

Limit switch shall be single pole, single throw contract (SPST) and provided with valve for remote indication of valve open or closed position. Valve closed position will become an alarm condition the pump control panel (PCP).

2.3.10.8 Strainer

Pressure reservoir inlet line shall be provided with a shut-off valve, strainer and check valve.

2.3.11 Truck Fill Stand Control Valve (TFV)

2.3.11.1 Size

4-inch.

2.3.11.2 Flow

600 GPM.

2.3.11.3 Operation

Valve shall modulate to regulate downstream pressure to 35 psig at a flow rate of 50 to 600 GPM. Pressure shall be adjustable with a range of 15 TO 75 psi. Valve solenoid shall be connected to the overfill protection system.

2.3.11.4 Quick Closure

Valve shall close rapidly when outlet pressure exceeds control set-point. Valve shall limit the surge pressure on the bottom loader of a tank truck to a maximum of 85 psig when filling at 600 GPM with a tank truck valve closure of 0.5 second. The valve shall reopen when the outlet pressure drops below the set-point of the pilot if the deadman control lever is still depressed.

2.3.11.5 Opening Speed Control

Valve shall control the opening speed of the main valve. The control shall be adjustable with a range of 2 to 30 seconds. Factory set at 10 seconds.

2.3.11.6 Deadman Control

Deadman shall be hydraulically connected to the pilot system of the main valve. Valve shall open when deadman control lever is pressed and shall close the valve when the lever is released. On rupture of the deadman hose between outlet of deadman control and main valve pilot system, there shall be no fuel leakage. Main valve shall close in 2 seconds maximum when one of the deadman hose couplers is disconnected. Length of hose shall be 15 feet.

2.3.11.7 Thermal Relief

Valve to open for pressure equalization and return flow when downstream pressure exceeds upstream pressure.

2.3.11.8 Strainer

A 40-mesh stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.3.11.9 Solenoid Control

****

NOTE: For use with ground proving system.

****

Solenoid control of valve shall operate as indicated on drawings.

2.3.12 Pantograph Control Valve (PTCV)

****

NOTE: Select use of pantograph control valve per COMMAND SERVICE HEADQUARTERS direction.

****

2.3.12.1 Size

4-inch.

2.3.12.2 Flow

600 GPM.

2.3.12.3 Operation

Valve shall modulate, by use of a liquid sensing line from the pantograph venturi, and regulate downstream to 55 psig at a flow rate of 50 to 600 GPM. Pressure shall be adjustable with a range of 15 to 75 psi.

2.3.12.4 Closing Speed Control

Valve shall control the closing speed of the main valve. The control shall be adjustable with a range of 2 to 30 seconds. Factory set at 10 seconds.

[2.3.12.5 Thermal Relief

****
NOTE: For use Type IV Aircraft direct Fueling stations.
****

Valve to open for pressure equalization and return flow when downstream pressure exceeds upstream pressure.

]2.3.12.6 Strainer

A 40-mesh stainless steel wire, self-cleaning strainer shall be provided in the pilot valve supply piping.

2.3.13 Flushing Valve (FV-1)

2.3.13.1 Size

6-inch.

2.3.13.2 Flow

0-1200 GPM.

2.3.13.3 Operation

Valve shall open and close by means of hydraulic line pressure.

2.3.13.4 Solenoid Control

Solenoid control of valve shall operate as indicated on drawings.

2.3.14 Pantograph Pressure Control Valve (PPCV-1 thru PPCV-[ ])

****
NOTE: Quantity based on number of Aircraft direct Fueling stations. One per station.
****

2.3.14.1 Size

1-1/2-inch.

2.3.14.2 Operation

Valve shall open and close by means of hydraulic line pressure. Initial setting shall be 75 PSIG and shall be field adjustable between 50-100 PSIG. Final field pressure setting of valve shall be equal to 10 percent above recorded line pressure at 600 GPM flow rate.

2.3.14.3 Check Valve Feature

Valve shall close rapidly when outlet pressure exceeds inlet pressure.

PART 3 EXECUTION

3.1 VALVE TESTING AND START-UP SUPPORT

Provide the services of a factory trained and certified service engineer authorized/sanctioned/certified by the valve manufacturer to verify that each valve has been properly installed and to verify valves were factory operationally tested, adjusted and set per these specifications. The service engineer shall assist the Contractor in the valve start-up adjustment process and will remain on site until all control valves function as required by the contract documents.

-- End of Section --

****
USACE / NAVFAC / AFCESA / NASA UFGS-33 52 43.23 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

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****
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Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
****

SECTION 33 52 43.23

AVIATION FUEL PUMPS
02/10

****
NOTE: This guide specification covers the requirements for refueling pumps used in aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR)**.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 7	(1995; R 2008) Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plan

AMERICAN PETROLEUM INSTITUTE (API)

API STD 682	(2004; Errata 2006) Pumps Shaft Sealing Systems For Centrifugal and Rotary Pumps
API Std 610	(2004) Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries

ASME INTERNATIONAL (ASME)

ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME BPVC SEC IX	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A 182/A 182M	(2009a) Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 276	(2008a) Standard Specification for Stainless Steel Bars and Shapes
ASTM A 356/A 356M	(2007) Standard Specification for Steel Castings, Carbon, Low Alloy, and Stainless

	Steel, Heavy-Walled for Steam Turbines
ASTM A 487/A 487M	(1993; R 2007) Standard Specification for Steel Castings Suitable for Pressure Service
ASTM A 582/A 582M	(2005) Standard Specification for Free-Machining Stainless Steel Bars
ASTM A 743/A 743M	(2006) Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM C 827	(2001a; R 2005) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

HYDRAULIC INSTITUTE (HI)

HI M100	(2005) Complete Set of Centrifugal, Reciprocating, Rotary and Vertical Centrifugal/Vertical Pump Standards

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 112	(2004) Standard Test Procedure for Polyphase Induction Motors and Generators

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2007; Errata 2008) Standard for Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC SP 10	(2007) Near-White Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441	(2009; Rev D) Paint, Epoxy-Polyamide, General Specification for
MIL-PRF-4556	(1999; Rev F; Am 1) Coating Kit, Epoxy, for Interior of Steel Fuel Tanks

1.2 ADMINISTRATIVE REQUIREMENTS

****

NOTE: Add number of days below. For COE Projects, include in MOU specific AIR FORCE REPRESENTATIVES to be notified when factory test dates are submitted by

the CONTRACTING OFFICER.
****

Design conditions shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT.

a. Tests: Hydrostatic, performance, vibration, and NPSH tests shall be conducted at the factory on each pump in accord with API 610. Test each pump with the actual motor which will drive the pump in the field, unless the water test media will cause overload of the motor. If so, provide vibration test report for motor separately. Vertical turbine pump vibration test must be run with field driver. All tests will be observed by the Contracting Officer or the designated representative. Provide the Contracting Officer [_____] days notice prior to performance of factory tests in order to schedule observing such tests. Performance testing shall not occur prior to acceptance of shop drawing submittal.

b. Test reports shall bear the serial number of both pump and driver. Submit manufacturer's certified reports of hydrostatic, performance, and NPSH tests. Submit manufacturer's certified test curves..

c. Operation and Maintenance Manuals shall be submitted for the pumps and appurtenance specified herein. Refer to Section 01 78 23.33OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted.

d. Motors, manual or automatic motor control equipment, except where installed in motor control centers, and protective or signal devices required for the operation specified herein shall be provided under this section in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Any wiring required for the operation specified herein, but not shown on the electrical plans, shall be provided under this section in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Motors shall be high efficiency type and in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.3 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority.

Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fueling Pumps (FP-1 through FP-5)[; G][; G, [_____]].
Offload Pumps[; G][; G, [_____]].
Fuel Transfer Pump[; G][; G, [_____]].
Water Draw-off Pump[; G][; G, [_____]].

SD-03 Product Data

Fueling Pumps (FP-1 through FP-5)[; G][; G, [_____]].
Offload Pumps[; G][; G, [_____]].
Fuel Transfer Pump[; G][; G, [_____]].
Water Draw-off Pump[; G][; G, [_____]].

SD-06 Test Reports

Certified Test Curves

SD-07 Certificates

Fueling Pumps (FP-1 through FP-5)[; G][; G, [_____]].
Offload Pumps[; G][; G, [_____]].
Fuel Transfer Pump[; G][; G, [_____]].
Water Draw-off Pump[; G][; G, [_____]].

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G][; G, [_____]].

PART 2 PRODUCTS

2.1 FUELING PUMPS (FP-1 through FP-5)

2.1.1 Capacity

****
NOTE: Insert site specific pump requirements.
****

Capacity shall be 600 gpm against a total head of [_____] feet when driven at 3600 rpm. Overall efficiency at design conditions of pump and driver, connected, shall be minimum of [_____] percent. Pump head capacity shall be continually rising and shall be free of dips and valleys from design point to shut-off head. Pump shut-off head shall have a 10 to 20 percent head rise to shut off. Pump shall be capable of at least a 10 percent head increase at rated conditions by installing a new impeller. Pumps shall not overheat or be damaged in any way while operating continuously at a minimum flow condition of 150 gpm and continuously at a maximum flow condition of 125 percent required capacity. The unit will also be required to operate at a flow of 12.5 percent required capacity GPM without exceeding the vibration limits given in API Std 610 at that flowrate. These pumps are for parallel operation and shall have equal head at minimum continuous stable flow, plus or minus 2 percent.

2.1.2 General Requirements

a. The pumps shall meet the requirements of API Std 610, latest edition. Whenever the information contained herein conflicts with said standard, the information herein shall govern. The pumps shall run at a nominal 3600 rpm and shall be single stage centrifugals, horizontally mounted, vertical or radial split case, enclosed impeller, with end suction and top vertical discharge. Pumps shall be of the back pull-out design to permit removing case half from rear for access to internal parts without disturbing the suction or discharge piping or the driver. All parts shall be factory inspected so that parts are interchangeable. Pumps and motors shall be furnished as complete units as herein specified. Pump assembly shall be statically and dynamically balanced for all flow rates from minimum flow to 120 percent of design flow.

b. The pump shall require no more than 15-feet of net positive suction head (NPSHR) when it is operated with water at a capacity of 600 gpm at rated head and speed. A hydrocarbon reduction or correction factor shall not be used. Pump suction specific speed shall be less than 12,000.

c. The pump shall be horizontal, single stage, single suction with double volute construction to assure radial balance. It shall be designed to permit removal of the impeller, shaft, bearings and bearing housing as an assembly, without disconnecting the suction or discharge piping.

d. The pump case shall be end suction, centerline discharge type for ease of piping alignment. Flange ratings shall be class 300-pound per ASME B16.5. The case shall be designed for maximum discharge pressure at pumping temperature but not less than 550 psig, with a minimum corrosion allowance of 1/8-inch. The suction and discharge flanges as well as the cover bolting surfaces shall be backfaced or spotfaced for positive bolt seating. The radial case to cover split shall be a metal-to-metal fit with a confined, controlled compression gasket.

e. The pump cover shall contain a stuffing box designed to accept an unbalanced mechanical seal. The stuffing box shall have a minimum of 3-inch studs for seal gland bolting. The gasket fit for seal gland to stuffing box shall be of the controlled compression type with metal-to-metal joint contact.

f. Both case and cover are to be fitted with renewable wear rings.

g. The impeller shall be of the enclosed type, dynamically and hydraulically balanced. It shall be key driven, held in place by a positive lock, threaded against rotation. The running clearance between the impeller and case-cover wear rings shall be no less than 0.018-inches.

h. Mechanical Seal: A single unbalanced mechanical seal per API Std 610 code USTHN, unbalbaned single seal with throttle bushing seal gland, a nitrile seal-ring-to-sleeve gasket and carbon against silicon carbide faces, of multiple spring design shall be supplied. The seal gland shall be tapped for three connections and each shall be stamped for identification as follows: Q for quench; F for flush; and D for drain. A non-sparking throttle bushing pressed into the seal end plate against an outside shoulder shall be provided to minimize leakage on complete seal failure.

i. Bearing Housing: Oil lubricated anti-friction, radial and thrust bearings of standard design shall be supplied. The bearings shall be selected to give a minimum L-10 rating life of 25,000 hours in continuous operation. Bearings shall be retained on the shaft and fitted into housings in accordance with ABMA 7. Locking of the ball thrust bearing to the shaft shall be by series W tank type washer. Minimum spacing between bearing centerlines shall be 6.5-inches.

j. A sight glass for checking oil level with a permanent indication of proper oil level shall be supplied.

k. Bearing housings shall be equipped with labyrinth type end seals and deflectors where the shaft passes through the housing; lip-type seals shall not be used. Deflectors shall be made of non-sparking material. The deflector design shall effectively retain oil in the housing and prevent entry of foreign material into the housing.

l. Shafts shall be of ample size to transmit the maximum torque required under specified operating conditions, and to withstand continuously all stresses resulting from supported weights, thrusts and starting, including across-the-line motor starting. It shall be key seated to provide positive drive for the coupling, shaft sleeve and impeller. The shaft stiffness factor shall be under 70. The radial bearing centerline to impeller centerline, distance and the pump shaft diameter under the sleeve shall be provided to calculate the factor.

m. A spacer coupling shall be supplied. The spacer length shall permit the removal of the assembled pullout element without disturbing the driver or the suction and discharge piping. Couplings shall be properly keyed in place. Cylindrical fits shall be light enough to permit easy removal of the hub in the field without the need for heating. A service factor of at least 1.5 shall be used in selecting couplings based on manufacturer's ratings.

n. Removable coupling guards of the non-sparking type shall be supplied. They shall comply with the requirements of OSHA.

o. Total indicated shaft runout at coupling end shall be 0.001-inches or less. Total shaft deflection shall be no more than 0.002-inches at face of stuffing box.

p. Baseplate: The baseplate shall be of fabricated steel construction. It shall be of the drain pan style, sloping from back to front.

Connections for a drain shall be tapped (1-inch minimum) at the pump end and located to accomplish complete drainage. A grout hole of at least 8-inches minimum diameter shall be supplied and shall have 1/2-inch minimum raised lip edge. Pump pedestals shall be trapezoidal in design.

q. Materials: No zinc, brass, bronze or other copper bearing alloy shall come in contact with the fuel. Materials shall be material class C-6, unless otherwise noted.

r. The case and cover shall be constructed of stainless steel ASTM A 487/A 487M GR CF8M or ASTM A 487/A 487M GR CA6NM or aluminum ASTM A 356/A 356M GR T6.

s. Impeller material shall be stainless steel ASTM A 487/A 487M GR CF8M or ASTM A 743/A 743M CA 6NM or CA 15.

t. Wear rings shall be stainless steel ASTM A 182/A 182M GR F6 or ASTM A 276 TP410 or 416.

u. Shaft shall be stainless steel ASTM A 276 type 410 or 416 or ASTM A 582/A 582M Type 410 or 416.

v. Testing: All shop testing shall be performed in accordance with the API Std 610.

2.1.3 Service Nameplate

A pump service nameplate, of type 18-8 stainless steel or monel, attached by stainless steel pins at an accessible point on the pump, shall be furnished in addition to the identification nameplate. The pump service nameplate shall be stamped with the following information:

Manufacturer's name
Serial number of pump
Capacity, gpm
Pumping head, ft.
Maximum specific gravity of fluid to be pumped
Revolutions per minute
Horsepower of driver

2.1.4 Identification Nameplate

A pump identification nameplate of Type 18-8 stainless steel or monel shall be provided and securely attached by stainless steel pins to a conspicuous place on the pump head. Tagging in letters 1/4-inch high shall bear the equipment number as shown on the drawings.

2.1.5 Exterior Primer Coat

Exterior surfaces of the baseplate shall be primed by the manufacturer. Coating shall be applied meeting requirements of SSPC PA 1. Surface cleaning shall meet requirements of SSPC SP 10. Metal primer shall be zinc rich paint conforming to specification MIL-DTL-24441, Type 1, Class 3. Dry film thickness shall be 2 to 4 mils.

2.1.6 Exterior Topcoat

Manufacturer's standard exterior topcoat shall be applied at factory to the base plate.

2.1.7 Motors

a. Motor shall be furnished by the pump manufacturer and shall be non-overloading with 10 percent head increase, and suitable for the environment and operating conditions to which it will be subjected. Motors for vertical turbine pumps shall be provided with anti-reversing rachet. Provide space heaters suitable for operation on 460 or 120 volts as indicated on the drawings within the motor enclosure to prevent moisture condensation after shut-down. Motor shall be UL listed for use in Class I, Division 1, Group D hazardous areas, and shall have a maximum temperature rating of T2D (419 degrees F) as defined by NFPA 70. The motor nameplate shall include the temperature rating of the motor and locked-rotor indicating code letters in accordance with NFPA 70, Table 430-7(b).

b. Voltage rating shall be 460 volts, 3 phase, 60HZ. Motor nominal speed shall match pump. Motors shall be capable of delivering rated horsepower output successfully and continuously under conditions of voltage variations of 10 percent above or below rated voltage.

c. Pump manufacturer shall assure the specified output and proper operation of the pump without being overloaded at unity service factor when operating at any point on the pump performance curve. In addition to having sufficient horsepower-output rating at rated speed, motor shall have performance characteristics which will allow, without injurious overheating of the motor, accelerating the load from standstill to rated speed under conditions of 10 starts per hour. Attention is specifically directed to the fact that thermal characteristics of motors with regard to capability for accelerating the load may vary greatly from motor manufacturer to motor manufacturer, notwithstanding that the horsepower rating may be the same. It is the pump manufacturer's responsibility to provide motors with adequate thermal starting characteristics as well as adequate rated-speed operating characteristics. Service factors shall conform with NEMA standards; however, service factors are only applicable at rated nameplate voltage and frequency. Since all system voltages are subject to variation, service factors above unity shall not be applied in sizing motor.

d. Motor shall be squirrel-cage induction type. Motor shall be NEMA Design B (normal-torque, low starting current).

e. Motor insulation shall be non-hydroscopic, NEMA Class H, 82 degrees F for motors over 10 hp and NEMA Class F, 302 degrees F for 10 hp and smaller. Stator windings shall be epoxy impregnated. The impregnations shall be applied by the vacuum and pressure process.

f. Winding temperature rise, (based on a maximum ambient temperature of 4 degrees F at 3300-feet altitude) shall not exceed 176 degrees F.

g. Bearings shall be ABMA minimum L10 life of 60,000 hours or L50 life of 300,000 hours suitable for the size, type, and application when the pump is operating at the specified flow and head.

h. Motor enclosures shall be totally enclosed, weather sealed, fan cooled, explosion-proof and shall be listed and labeled for Class I, Group D areas. Provide bronze ground bolt on motor enclosure. All motor external electrical connections shall be terminated within a single terminal housing.

i. The dynamic balance, overspeed withstand capability, and sound power levels of the motor shall conform with NEMA standard requirements.

j. The pump manufacturer shall furnish the Contracting Officer with the recommended minimum run time for the motor.

k. Pump motor shall be provided with temperature limiting thermostats within the motor frame when required to meet Class I, Group D requirements.

l. Pump motor shall be furnished with lifting lugs on the motor casing.

m. Unless indicated otherwise, motors for conventional applications over 15 horsepower shall be the energy efficient type. This requirement is not applicable to hermetically sealed motors, integrally mounted motors, motors specified as part of energy efficient equipment, wound rotor motors, or any application involving special construction or performance. Guaranteed minimum full load efficiencies shall be (based on 1800 rpm, open drip proof):

20 hp	92.0%	75 hp	95.5%
25 hp	92.0%	100 hp	93.5%
30 hp	92.0%	125 hp	94.5%
40 hp	92.0%	150 hp	94.5%
50 hp	92.5%	200 hp	94.5%
60 hp	92.5%	600 hp	94.5%

n. Other motors of different speed or housing classification shall also be of the energy efficient type, as advertised by the motor manufacturer, with efficiency greater than the standard line. Motor efficiencies shall have been verified in accordance with NEMA MG 1, 12.53.a., and determined using the dynamometer method as described in IEEE 112, Method B. All shop drawing submittals on motor driven equipment shall include the motor efficiency.

2.2 FUELING PUMP (VERTICAL TURBINE) (FP)

2.2.1 Capacity

****
NOTE: Insert site specific pump requirements.
****

Capacity shall be [600][900] gpm against a total head of [____] feet for the Fueling Pump, when driven at 1800 rpm. Overall efficiency at design conditions of pump and driver, connected, shall be minimum [_____] percent. Pump head capacity shall be continually rising and shall be free of dips and valleys from design point to shut-off head. Pump shall be capable of at least 5 percent head increase at rated conditions by installing a new impeller.

2.2.2 Assembly

The pump for this service shall meet the requirements of API Std 610, latest edition, seventh edition for vibration. Wherever the information contained herein conflicts with said standard, the information herein shall govern. The pump for this service shall run at a nominal 1800 rpm and shall be a multi-stage, vertical turbine pump. Pump and motor shall be furnished as a complete unit as herein specified. Pump assembly shall be statically and dynamically balanced for all flow rates from minimum flow to 120 percent of design flow. Flanged column, shaft, and bearing spacing shall not exceed 5-foot sections to facilite pump disassembly within pump room.

2.2.3 Materials

The materials of construction for the pump shaft and the impellor shall be stainless steel. All other materials shall be material class S-1 with the wetted ferrous parts such as the bowl interiors enamel-lined, bowl exteriors, column interior and exterior, discharge head interior epoxy-coated per MIL-PRF-4556, and discharge head exterior epoxy-coated per MIL-DTL-24441.

2.2.3.1 Mechanical Seal

API STD 682, balanced type, API Class Code BSTHN.

2.2.4 Construction

Castings used for any part of pumps shall be sound and free of shrink or blow holes, scale, blisters, and other similar casting defects. The surfaces of casting shall be cleaned by sand or shot blasting, pickling, or other standard methods used by the manufacturer. All mold parting fins and remains of gates and risers shall be either chipped, filed, or ground flush with the surface of the casting. The repair of casting leaks and defects by peening or by the use of cement compounds is prohibited. All welding to be per ASME BPVC SEC IX.

2.2.4.1 Couplings

Couplings shall be flanged, rigid spacer type, CPAT or equal. The couplings shall be of the spacer-type with a spacer of sufficient length to permit replacement of the mechanical seal assembly without removing the motor. The pump half coupling shall be of such design that it can be removed without the use of heat. Coupling halves shall fit tightly to the shafts of the pump and the driver so as not to become loose during operation. The coupling shall be provided with an OSHA approved coupling guard.

2.2.4.2 Impeller

Impeller shall be enclosed and double keyed to the shaft for radial loads and fixed in the axial position by shaft sleeve nuts, or other positive positioning device. Impellers shall be held to the shaft so that the impeller will not become loose should the pump accidentally rotate in reverse direction. The impeller shall be statically and dynamically balanced to 8 W/N.

2.2.4.3 Wear Rings

Renewable stainless steel wearing rings shall be positively locked on the impeller. Wearing rings shall fit with close tolerances so as to permit a minimum of recirculation. Wear ring hardened surfaces differential shall be at least Brinell 50. Positive locking case wearing rings shall be provided so that the case wearing rings will not rotate or change position in the case. Clearances shall be established for hydrocarbon (Jet Fuel) service.

2.2.4.4 Shaft

Shaft shall be designed with a high safety factor to easily withstand the torsional loads and other stresses to which it may be subjected. It shall be so designed that there will be no detrimental vibration stresses. Surfaces shall be ground to accurate dimensions. Shaft deflection shall be limited to 0.0020-inch maximum when measured at the face of the mechanical seal under the operating condition of zero flow at shut off head. Seal piping from the discharge to the mechanical seal shall be provided. The pump shaft shall be in maximum 5 foot sections, and couplings shall be keyed and split ring type, not threaded.

2.2.4.5 Finishing

Passageways and impellers shall be finished to permit maximum efficiency and provide noise reduction. Overall sound levels shall not exceed OSHA limits.

2.2.4.6 Bearings

Bearings shall be product-lubricated. Sleeve type, carbon graphite shall be provided. Bearing spacing shall be per API Std 610, eight edition, but shall not exceed 5-foot in any case.

2.2.4.7 Drilling and Tapping

Casting shall be drilled and tapped for drain and seal recirculation lines. All connections shall be provided with plugs.

2.2.4.8 Mounting Flange

Mounting flange shall be coordinated with the tank's mounting flange, and shall be ANSI or API pattern, and contain a 1-inch tapping for air eliminator discharge.

2.2.4.9 Pump Discharge

Pump discharge head shall include a 1 inch tapping at the highest point with valve, 100 mesh strainer, and air eliminator valve, as specified in Section 33 52 43.13, AVIATION FUEL PIPING, with check valve on outlet.

2.2.4.10 Special Tools

Pumps shall be furnished with special tools necessary to dismantle and reassemble the unit.

2.2.4.11 Service Nameplate

A pump service nameplate, of type 18-8 stainless steel or monel, securely attached by stainless steel pins at an easily accessible point on the pump, shall be furnished in addition to the identification nameplate. The pump service nameplate shall be stamped with the following information:

Manufacturer's name
Serial number of pump
Capacity, gpm
Pumping head, ft.
Maximum specific gravity of fluid to be pumped
Revolutions per minute
Horsepower of driver

2.2.4.12 Identification Nameplate

A pump identification nameplate of Type 18-8 stainless steel or monel shall be provided and securely attached by stainless steel pins to a conspicuous place on the pump head. Tagging in letters 1/4-inch high shall be the equipment number as shown on the drawings.

2.2.4.13 Primer Coat

Surfaces of the pump and baseplate shall be primed by the manufacturer. Surface cleaning shall meet requirements of SSPC SP 10. Metal primer shall be zinc rich paint conforming to specification MIL-DTL-24441 Type 1, Class 3. Dry film thickness shall be 2 to 4 mils.

2.2.4.14 Topcoat

Topcoat shall be factory applied and shall be white and conforming to specification MIL-DTL-24441.

2.2.5 Motor

a. Motor shall be furnished by the pump manufacturer and shall be suitable for the environment and operating conditions to which it will be subjected and be provided with anti-reversing rachet. Provide space heaters suitable for operation on 460 or 120 volts as indicated on the drawings within the motor enclosure to prevent moisture condensation after shut-down. Motor shall be UL listed for use in Class I, Division 1, Group D hazardous areas, and shall have a maximum temperature rating of "T2D 419 degrees F " as defined by NFPA 70. The motor nameplate shall include the temperature rating of the motor and locked-rotor indicating code letters in accordance with NFPA 70, Table 430-7(b).

b. Voltage rating shall be 460 volts, 3 phase, 60HZ. Motor nominal speed shall match pump. Motors shall be capable of delivering rated horsepower output successfully and continuously under conditions of voltage variations of 10 percent above or below rated voltage.

c. Pump manufacturer shall assure the specified output and proper operation of the pump without being overloaded at unity service factor when operating at any point on the pump performance curve based on the future potential of a 5% head increase. In addition to having sufficient horsepower-output rating at rated speed, motor shall have performance characteristics which will allow, without injurious overheating of the motor, accelerating the load from standstill to rated speed under conditions of 10 starts per hour. Attention is specifically directed to the fact that thermal characteristics of motors with regard to capability for accelerating the load may vary greatly from motor manufacturer to motor manufacturer, notwithstanding that the horsepower rating may be the same. It is the pump manufacturer's responsibility to provide motors with adequate thermal starting characteristics as well as adequate rated-speed operating characteristics. Service factors shall conform with NEMA standards; however, service factors are only applicable at rated nameplate voltage and frequency. Since all system voltages are subject to variation, service factors above unity shall not be applied in sizing motor.

d. Motor shall be squirrel-cage induction type, high thrust vertical P base, unless bearing frame pump is utilized. Motor shall be NEMA Design B (normal-torque, low starting current).

e. Motor insulation shall be non-hydroscopic, NEMA Class F, 302 degrees F for motors. Motor windings shall be supplied with extra dips and bakes.

f. Winding temperature rise, (based on a maximum ambient temperature of 104 degrees F at 3300-feet altitude) shall not exceed 176 degrees F.

g. Bearings shall be ABMA minimum L10 life of 60,000 hours or L50 life of 300,000 hours suitable for the size, type, and application when the pump is operating at the specified flow and head.

h. Motor enclosures shall be totally enclosed, weather sealed, fan cooled, explosion-proof and shall be listed and labeled for Class I, Group D areas. Provide bronze ground bolt on motor enclosure. All motor external electrical connections shall be terminated within a single terminal housing.

i. The motors shall be dynamically balanced and vibration measured per NEMA MG 1, vibration and balance under category "precision". Motor overspeed withstand capability and sound power levels of the motor shall conform with NEMA standard requirements.

j. The pump manufacturer shall furnish the Contracting Officer with the recommended minimum run time for the motor.

k. Pump motor shall be provided with temperature limiting thermostats within the motor frame when required to meet Class I, Group D requirements.

l. Pump motor shall be furnished with lifting lugs on the motor casing.

m. Unless indicated otherwise, motors for conventional applications over 15 horsepower shall be the energy efficient type. This requirement is not applicable to hermetically sealed motors, integrally mounted motors, motors specified as part of energy efficient equipment, wound rotor motors, or any application involving special construction or performance. Guaranteed minimum full load efficiencies shall be (based on 1800 rpm, open drip proof):

20 hp	92.0%	75 hp	95.5%
25 hp	92.0%	100 hp	93.5%
30 hp	92.0%	125 hp	94.5%

40 hp	92.0%	150 hp	94.5%
50 hp	92.5%	200 hp	94.5%
60 hp	92.5%	600 hp	94.5%

n. Other motors of different speed or housing classification shall also be of the energy efficient type, as advertised by the motor manufacturer, with efficiency greater than the standard line. Motor efficiencies shall have been verified in accordance with NEMA MG 1, 12.53.a., and determined using the dynamometer method as described in IEEE 112, Method B. All shop drawing submittals on motor driven equipment shall include the motor efficiency.

2.3 OFFLOAD PUMPS

2.3.1 Capacity

****

NOTE: Insert site specific pump requirements. Pump capacity to be provided by MAJCOM.

****

Capacity shall be [600] [300] gpm against a total head of [_____] feet when driven at 3600 rpm. Overall efficiency at design conditions of pump and driver, connected, shall be minimum of 60 percent. Pump head capacity shall be continually rising and shall be free of dips and valleys from design point to shut-off head. Pump shut-off head shall have a 10 to 20 percent head rise to shut off. Pump shall be capable of at least a 10 percent head increase at rated conditions by installing a new impeller. Pumps shall not overheat or be damaged in any way while operating continuously at a minimum flow condition of 150 gpm and continuously at a maximum flow condition of 125 percent required capacity GPM. The unit will also be required to operate at a flow of 12.5 percent required capacity without exceeding the vibration limits given in API Std 610. These pumps are for parallel operation and shall have equal head at minimum continuous stable flow, plus or minus 2 percent.

2.3.2 General Requirements

a. The pumps for this service shall meet the requirements of API Std 610, latest edition. Whenever the information contained herein conflicts with said standard, the information here in shall govern. The pumps for this service shall run at a nominal 3600 rpm and shall be single stage centrifugals, horizontally mounted, vertical or radial split case, enclosed impeller, vertical-in-line with end suction and discharge. All parts shall be factory inspected so that parts are interchangeable. Pumps and motors shall be furnished as complete units as herein specified. Pump assembly shall be statically and dynamically balanced for all flow rates from no flow to 120 percent of design flow.

b. The pump shall require no more than 15.5-feet of net positive suction head (NPSHR) when it is operated with water at a capacity of [600] [300] gpm at rated head and speed. A hydrocarbon reduction or correction factor shall not be used. Pump suction specific speed shall be less than 12,000.

c. The pump shall be vertical in-line, single stage, single suction with double volute construction to assure radial balance. It shall be designed to permit removal of the impeller, shaft, bearings and bearing housing as an assembly, without disconnecting the suction or discharge piping.

d. The pump case shall be vertical in-line type for ease of piping alignment. Flange ratings shall be class 300-pound per ASME B16.5. The case shall be designed for maximum discharge pressure at pumping temperature but not less than 550 psig, with a minimum corrosion allowance of 1/8-inch. The suction and discharge flanges as well as the cover bolting surfaces shall be backfaced or spotfaced for positive bolt seating. The radial case to cover split shall be a metal-to-metal fit with a confined, controlled compression gasket.

e. The pump cover shall contain a stuffing box designed to accept an unbalanced mechanical seal. The stuffing box shall have a minimum of 3-inch studs for seal gland bolting. The gasket fit for seal gland to stuffing box shall be of the controlled compression type with metal-to-metal joint contact.

f. Both case and cover are to be fitted with renewable wear rings.

g. The impeller shall be of the enclosed type, dynamically and hydraulically balanced. It shall be key driven, held in place by a positive lock, threaded against rotation.

h. Mechanical Seal. A single unbalanced mechanical seal per API Std 610 code USTHN of multiple spring design shall be supplied. The seal gland shall be tapped for three connections and each shall be stamped for identification as follows: Q for quench; F for flush; and D for drain. A non-sparking throttle bushing pressed into the seal end plate against an outside shoulder shall be provided to minimize leakage on complete seal failure.

i. Bearing Housing. Grease lubricated anti-friction, radial and thrust bearings of standard design shall be supplied. The bearings shall be selected to give a minimum L-10 rating life of 25,000 hours in continuous operation. Pumps may be provided with or without bearing brackets.

j. Shafts shall be of ample size to transmit the maximum torque required under specified operating conditions, and to withstand continuously all stresses resulting from supported weights, thrusts and starting, including across-the-line motor starting. It shall be key seated to provide positive drive for the line motor starting. It shall be key seated to provide positive drive for the coupling, shaft sleeve and impeller. The shaft stiffness factor shall be under 70. The radial bearing centerline to impeller centerline, distance and the pump shaft diameter under the sleeve shall be provided to calculate the factor.

k. A rigid type spacer coupling shall be supplied. The spacer length shall permit the removal of the assembled pullout element without disturbing the driver or the suction and discharge piping. Couplings shall be properly keyed in place. Cylindrical fits shall be light enough to permit easy removal of the hub in the field without the need for heating. A service factor of at least 1.5 shall be used in selecting couplings based on manufacturer's ratings.

l. Removable coupling guards of the non-sparking type shall be supplied.

They shall comply with the requirements of OSHA.

m. Total indicated shaft runout at coupling end shall be 0.001-inches or less. Total shaft deflection shall be no more than 0.002-inches at face of stuffing box.

n. Materials. No zinc, brass, bronze or other copper bearing alloy shall come in contact with the fuel.

o. The case and cover shall be constructed of stainless steel ASTM A 487/A 487M GR CF8M or ASTM A 487/A 487M GR CA6NM or aluminum ASTM A 356/A 356M GR T6.

p. Impeller material shall be stainless steel ASTM A 487/A 487M GR CF8M or ASTM A 743/A 743M CA 6NM.

q. Wear rings shall be stainless steel ASTM A 182/A 182M GR F6 or ASTM A 276 TP410 or 416.

r. Shaft shall be stainless steel ASTM A 276 type 410 or 416 or ASTM A 582/A 582M Type 410 or 416 with renewable shaft sleeve of ASTM A 276 type 316L with hard facing under mechanical seal gasket.

s. Testing. All shop testing shall be performed in accordance with the HI M100.

2.3.3 Service Nameplate

A pump service nameplate, of type 18-8 stainless steel or monel, attached by stainless steel pins at an accessible point on the pump, shall be furnished in addition to the identification nameplate. The pump service nameplate shall be stamped with the following information:

Manufacturer's name
Serial number of pump
Capacity, gpm
Pumping head, ft.
Maximum specific gravity of fluid to be pumped
Revolutions per minute
Horsepower of driver

2.3.4 Identification Nameplate

A pump identification nameplate of Type 18-8 stainless steel or monel shall be provided and securely attached by stainless steel pins to a conspicuous place on the pump head. Tagging in letters 1/4-inch high shall bear the equipment number as shown on the drawings.

2.3.5 Exterior Primer Coat

Exterior surfaces of the baseplate shall be primed by the manufacturer. Coating shall be applied meeting requirements of SSPC PA 1. Surface cleaning shall meet requirements of SSPC SP 10. Metal primer shall be zinc rich paint conforming to specification MIL-DTL-24441, Type 1, Class 3. Dry film thickness shall be 2 to 4 mils.

2.3.6 Exterior Topcoat

Manufacturer's standard exterior topcoat shall be applied at factory to the base plate.

2.3.7 Motors

a. Motor shall be furnished by the pump manufacturer and shall be suitable for the environment and operating conditions to which it will be subjected. Provide space heaters suitable for operation on 460 or 120 volts as indicated on the drawings within the motor enclosure to prevent moisture condensation after shut-down. Motor shall be UL listed for use in Class I, Division 1, Group D hazardous areas, and shall have a maximum temperature rating of T2D (419 degrees F) as defined by NFPA 70. The motor nameplate shall include the temperature rating of the motor and locked-rotor indicating code letters in accordance with NFPA 70, Table 430-7(b).

b. Voltage rating shall be 460 volts, 3 phase, 60HZ. Motor nominal speed shall match pump. Motors shall be capable of delivering rated horsepower output successfully and continuously under conditions of voltage variations of 10 percent above or below rated voltage.

c. Pump manufacturer shall assure the specified output and proper operation of the pump without being overloaded at unity service factor when operating at any point on the pump performance curve. In addition to having sufficient horsepower-output rating at rated speed, motor shall have performance characteristics which will allow, without injurious overheating of the motor, accelerating the load from standstill to rated speed under conditions of 10 starts per hour. Attention is specifically directed to the fact that thermal characteristics of motors with regard to capability for accelerating the load may vary greatly from motor manufacturer to motor manufacturer, notwithstanding that the horsepower rating may be the same. It is the pump manufacturer's responsibility to provide motors with adequate thermal starting characteristics as well as adequate rated-speed operating characteristics. Service factors shall conform with NEMA standards; however, service factors are only applicable at rated nameplate voltage and frequency. Since all system voltages are subject to variation, service factors above unity shall not be applied in sizing motor.

d. Motor shall be squirrel-cage induction type. Motor shall be NEMA Design B (normal-torque, low starting current).

e. Motor insulation shall be non-hydroscopic, NEMA Class F, 300 degrees F for motors. Stator windings shall be epoxy impregnated. The impregnations shall be applied by the vacuum and pressure process.

f. Winding temperature rise, (based on a maximum ambient temperature of 104 degrees F at 3300-feet altitude) shall not exceed 176 degrees F.

g. Bearings shall be ABMA minimum L10 life of 60,000 hours or L50 life of 300,000 hours suitable for the size, type, and application when the pump is operating at the specified flow and head.

h. Motor enclosures shall be totally enclosed, weather sealed, fan cooled, explosion-proof and shall be listed and labeled for Class I, Group D areas. Provide bronze ground bolt on motor enclosure. All motor external electrical connections shall be terminated within a single terminal housing.

i. The dynamic balance, overspeed withstand capability, and sound power levels of the motor shall conform with NEMA standard requirements.

j. The pump manufacturer shall furnish the Contracting Officer with the recommended minimum run time for the motor.

k. Pump motor shall be provided with temperature limiting thermostats within the motor frame when required to meet Class I, Group D requirements.

l. Pump motor shall be furnished with lifting lugs on the motor casing.

m. Unless indicated otherwise, motors for conventional applications over 15 horsepower shall be the energy efficient type. This requirement is not applicable to hermetically sealed motors, integrally mounted motors, motors specified as part of energy efficient equipment, wound rotor motors, or any application involving special construction or performance. Guaranteed minimum full load efficiencies shall be (based on 1800 rpm, open drip proof):

20 hp	92.0%	75 hp	95.5%
25 hp	92.0%	100 hp	93.5%
30 hp	92.0%	125 hp	94.5%
40 hp	92.0%	150 hp	94.5%
50 hp	92.5%	200 hp	94.5%
60 hp	92.5%	600 hp	94.5%

n. Other motors of different speed or housing classification shall also be of the energy efficient type, as advertised by the motor manufacturer, with efficiency greater than the standard line. Motor efficiencies shall have been verified in accordance with NEMA MG 1, 12.53.a., and determined using the dynamometer method as described in IEEE 112, Method B. All shop drawing submittals on motor driven equipment shall include the motor efficiency.

2.4 FUEL TRANSFER PUMP (FTP-1) AND WATER DRAW-OFF PUMP (WSP-1 AND WSP-2)

2.4.1 Capacity

****
NOTE: Insert site specific pump requirements.
****

Capacity shall be 50 gpm against a total head of [_____] feet for the Fuel Transfer Pump, and 50 gpm against a total head of [_____] feet for the Water Draw-off Pump, when driven at 1800 rpm. Overall efficiency at design conditions of pump and driver, connected, shall be minimum [_____] percent. Pump head capacity shall be continually rising and shall be free of dips and valleys from design point to shut-off head. Pump shall be capable of at least 10 percent head increase at rated conditions by installing a new impeller.

2.4.2 Assembly

****
NOTE: Select pump stage requirements.
****

The pump for this service shall meet the requirements of API Std 610, latest edition, seventh edition for vibration. Wherever the information contained herein conflicts with said standard, the information herein shall govern. The pump for this service shall run at a nominal 1800 rpm and shall be a [single stage] [multi-stage], vertical turbine pump. Pump and motor shall be furnished as a complete unit as herein specified. Pump assembly shall be statically and dynamically balanced for all flow rates from minimum flow to 120 percent of design flow.

2.4.3 Materials

The materials of construction for the pump shaft and the impellor shall be stainless steel. All other materials shall be material class S-1 with the wetted ferrous parts such as the bowl interiors enamel-lined, bowl exteriors, column interior and exterior, discharge head interior epoxy-coated per MIL-PRF-4556, and discharge head exterior epoxy-coated per MIL-DTL-24441.

2.4.3.1 Mechanical Seal

API STD 682, balanced type, API Class Code BSTHN.

2.4.4 Construction

Castings used for any part of pumps shall be sound and free of shrink or blow holes, scale, blisters, and other similar casting defects. The surfaces of casting shall be cleaned by sand or shot blasting, pickling, or other standard methods used by the manufacturer. All mold parting fins and remains of gates and risers shall be either chipped, filed, or ground flush with the surface of the casting. The repair of casting leaks and defects by peening or by the use of cement compounds is prohibited.by ASME BPVC SEC VIII D1.

2.4.4.1 Couplings

Couplings shall be flanged, rigid spacer type, CPAT or equal. The couplings shall be of the spacer-type with a spacer of sufficient length to permit replacement of the mechanical seal assembly without removing the motor. The pump half coupling shall be of such design that it can be removed without the use of heat. Coupling halves shall fit tightly to the shafts of the pump and the driver so as not to become loose during operation. The coupling shall be provided with an OSHA approved coupling guard.

2.4.4.2 Impeller

Impeller shall be keyed to the shaft for radial loads and fixed in the axial position by shaft sleeve nuts, or other positive positioning device. Impellers shall be held to the shaft so that the impeller will not become loose should the pump accidentally rotate in reverse direction. The impeller shall be statically and dynamically balanced.

2.4.4.3 Wear Rings

Renewable wearing rings shall be positively locked on the impeller. Wearing rings shall fit with close tolerances so as to permit a minimum of recirculation. Positive locking case wearing rings shall be provided so that the case wearing rings will not rotate or change position in the case.

2.4.4.4 Shaft

Shaft shall be designed with a high safety factor to easily withstand the torsional loads and other stresses to which it may be subjected. It shall be so designed that there will be no detrimental vibration stresses. Surfaces shall be ground to accurate dimensions. Shaft deflection shall be limited to 0.0020-inch maximum when measured at the face of the mechanical seal under the operating condition of zero flow at shut off head. Shaft shall be protected through the mechanical seal by means of a shaft sleeve. Seal piping from the discharge to the mechanical seal shall be provided.

2.4.4.5 Finishing

Passageways and impellers shall be finished to permit maximum efficiency and provide noise reduction. Overall sound levels shall not exceed OSHA limits.

2.4.4.6 Bearings

Bearings shall be product-lubricated. Sleeve type, carbon graphite shall be provided. Bearing spacing shall be per API Std 610.

2.4.4.7 Drilling and Tapping

Casting shall be drilled and tapped for drain and seal recirculation lines. All connections shall be provided with plugs.

2.4.4.8 Mounting Flange

Mounting flange shall be coordinated with the tank's mounting flange, and shall be ANSI or API pattern.

2.4.4.9 Special Tools

Pumps shall be furnished with special tools necessary to dismantle and reassemble the unit.

2.4.4.10 Service Nameplate

A pump service nameplate, of type 18-8 stainless steel or monel, securely attached by stainless steel pins at an easily accessible point on the pump, shall be furnished in addition to the identification nameplate. The pump service nameplate shall be stamped with the following information:

Manufacturer's name
Serial number of pump
Capacity, gpm
Pumping head, ft
Maximum specific gravity of fluid to be pumped
Revolutions per minute
Horsepower of driver

2.4.4.11 Identification Nameplate

A pump identification nameplate of Type 18-8 stainless steel or monel shall be provided and securely attached by stainless steel pins to a conspicuous place on the pump head. Tagging in letters 1/4-inch high shall be the equipment number as shown on the drawings.

2.4.4.12 Exterior Primer Coat

Exterior surfaces of the pump and baseplate shall be primed by the manufacturer. Surface cleaning shall meet requirements of SSPC SP 10. Metal primer shall be zinc rich paint conforming to specification MIL-DTL-24441 Type 1, Class 3. Dry film thickness shall be 2 to 4 mils.

2.4.4.13 Exterior Topcoat

Manufacturer's standard exterior topcoat shall be factory applied and shall be white.

2.4.5 Motor

Refer to paragraph, Motors for the Fueling Pumps.

PART 3 EXECUTION

3.1 PREPARATION FOR SHIPMENT

3.1.1 Rust Preventative

Exterior machine surfaces shall be coated with a rust preventative. Pumps shall be disassembled after the shop running tests and inspected, and internal parts shall be coated with a rust preventative before reassembling.

3.1.2 Closure of Openings

Threaded openings shall be provided with metallic plugs or caps. Flanges shall be gasketed with rubber and closed with 3/16-inch thick plate of the same outside diameter as the match flange. A minimum of four full-diameter bolts shall hold closure in place.

3.1.3 Assembly

Pumps shall be shipped assembled or a field service engineer shall be furnished to supervise the field assembly at no additional cost to the Government.

3.1.4 Bracing

Each unit shall be suitably prepared for shipment, supported and braced, with auxiliary equipment secured to prevent damage during shipment.

3.1.5 Vapor Inhibiting Wraps

Exposed shafts and shaft couplings shall be wrapped with waterproof moldable waxed cloth or vapor inhibitor paper. The seams shall be sealed with adhesive tape.

3.1.6 Shipping Identification

Each pump shall be identified with a metal tag showing the item number. Material shipped separately shall be marked with a metal tag indicating the item number for which it is intended.

3.2 INSTALLATION

Install equipment and components true to line, level and plumb, and measured from established benchmarks or reference points. Follow manufacturer's recommended practices for equipment installation. Provide required clearances between equipment components. Equipment, apparatus, and accessories requiring normal servicing or maintenance shall be easily accessible.

3.2.1 Anchoring

Anchor equipment in place as indicated on the drawings or per manufacturer's recommendations. Minimum anchor bolt size is 5 inch. Check alignment of anchor bolts and/or bolt holes before installing equipment and clean-out associated sleeves. Do not cut bolts due to misalignment. Notify the Contracting Officer of errors and obtain the Contracting Officer's acceptance before proceeding with corrections. Cut anchor bolts of excess length to the appropriate length without damage to threads.

3.2.2 Grouting

Equipment which is anchored to a pad shall be grouted in place. Before setting equipment in place and before placing grout, clean surfaces to be in contact with grout, including fasteners and sleeves. Remove standing water, debris, oil, rust, coatings and other materials which impair bond. Clean contaminated concrete by grinding. Clean metal surfaces of mill scale and rust by hand or power tool methods. Provide formwork for placing and retaining grout. Grout to be non-metallic, non-shrink, fluid precision grout of a hydraulic cementitious system with graded and processed silica aggregate, portland cement, shrinkage compensating agents, plasticizing and water reducing agents; free of aluminum powder agents, oxidizing agents and inorganic accelerators, including chlorides; proportioned, pre-mixed and packaged at factory with only the addition of water required at the project site. Grouting to meet requirements of ASTM C 827. Perform all grouting in accord with equipment manufacturer's and grout manufacturer's published specifications and recommendations.

3.2.3 Leveling and Aligning

Level and align equipment in accord with respective manufacturer's published data. Do not use anchor bolt, jack-nuts or wedges to support, level or align equipment. Install only flat shims for leveling equipment. Place shims to fully support equipment. Wedging is not permitted. Shims to be fabricated flat carbon steel units of surface configuration and area not less than equipment bearing surface. Shims to provide for full equipment support. Shim to have smooth surfaces and edges, free from burrs and slivers. Flame or electrode cut edges not acceptable.

3.2.4 Direct Drives

Alignment procedure follows.

3.2.4.1 Rotation Direction and Speed

Check and correct drive shaft rotation direction and speed.

3.2.4.2 End Play

Run drive shafts at operational speed. Determine whether axial end play exists. Run drive shaft at operational speed and mark drive shaft axial position when end play exists. Block drive shaft in operating position when aligning drive shaft with driven shaft.

3.2.4.3 Shaft Leveling and Radial Alignment

Check shaft leveling by placing a straightedge across the two coupling half faces in both horizontal and vertical planes.

3.2.4.4 Angular Alignment and End Clearance

Pump alignment shall be accomplished by the factory technician or a millwright trained in pump alignment, and with the use of dial gauges or laser alignment equipment.

3.2.4.5 Final Recheck

Check adjustments with dial indicator after completing recheck. Align shafts within 0.002-inch tolerance, except as otherwise required by more stringent requirements of equipment manufacturer.

3.2.5 Start-up Representative

****
NOTE: Consult with COMMAND FUEL FACILITIES Engineer t0 determine if additional training is required.
****

A manufacturer's field service representative shall be provided at no additional cost to the Government to check the pumps for proper operation prior to start-up and also to witness, as a minimum, the first two days of operation. Any additional time required due to delays or corrections by the Contractor shall be provided at no additional cost to the Government. The manufacturer's field service representative shall also instruct the required personnel in the proper operation and maintenance of the pumps.

-- End of Section --

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USACE / NAVFAC / AFCESA / NASA UFGS-33 52 43.28 (February 2010)

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
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SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 52 43.28

FILTER SEPARATOR, AVIATION FUELING SYSTEM

02/10

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCESA / NASA **UFGS-33 52 43.28 (February 2010)**

Preparing Activity: USACE

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010
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SECTION 33 52 43.28

FILTER SEPARATOR, AVIATION FUELING SYSTEM
02/10

****
NOTE: This guide specification covers the requirements for filter separators and fuel quality monitors used in aircraft refueling systems constructed to the requirements of the DoD Type III/IV/V, and Cut'n Cover Hydrant Refueling System Standards. DoD Type III systems shall conform to Standard Design 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM (TYPE III)**. DoD Type IV/V systems shall conform to** Standard Design 078-24-29 AIRCRAFT DIRECT FUELING SYSTEM (TYPE IV) DESIGN**.**

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents**, including their organization designation and telephone number, is on the Internet.**
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's

Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 1581	(2002; Addenda 2006) Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separators

ASME INTERNATIONAL (ASME)

ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B31.3	(2008) Process Piping
ASME BPVC SEC VIII D1	(2007; Addenda 2008; Addenda 2009) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM C 827	(2001a; R 2005) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-P-5315	(2001, Rev A) Butadiene - Acrylonitrile (NBR) Rubber For Fuel-Resistant Seals 60 To 70

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-HDBK-831	(1999; Not 1) Preparation of Test Reports
MIL-PRF-4556	(1999; Rev F; Am 1) Coating Kit, Epoxy, for Interior of Steel Fuel Tanks
MIL-STD-130	(Rev N) Identification Marking of U.S. Military Property

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 1) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt

Anchors)

1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Filter Separator[; G][; G, [_____]].
Micronic Pre-filter[; G][; G, [_____]].

SD-03 Product Data

Filter Separator[; G][; G, [_____]].
Micronic Pre-filter[; G][; G, [_____]].

SD-07 Certificates

Filter Separator.
Micronic Pre-filter.

SD-10 Operation and Maintenance Data

Filter Separator[; G][; G, [_____]].
Micronic Pre-filter[; G][; G, [_____]].

1.3 PREPRODUCTION TESTING

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NOTE: Contact the Naval Facilities Engineering Command (NAVFACENGCOM) or the Coprs of Engineers (COE) for direction on selection. For COE projects, include in the MOU the specific Air Force representatives to be notified when factory filter separator test dates are submitted to the Contracting Officer.Er.
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Prior to construction of filter separators (FSI-1 THROUGH FSI-[_____], FSR-[_____], THROUGH FSR-[_____]) for the project, preproduction tests shall have been conducted in the presence of [Det 3, WR-ALC/AFTH Technical Assistance Team Air Force Petroleum Office Wright-Patterson AFB, OH] [NAVAIR/NAFAC] [Army Petroleum Center] representative. Notify the Contracting Officer [_____] days prior to conductance of factory tests in order to schedule witnessing by representative.

1.3.1 Inspection and Testing

The inspection and testing of the preproduction filter separator shall be conducted on a full-scale test system in accordance with API Spec 1581 and as specified herein. The test sample shall consist of a complete filter separator with elements installed. Elements shall be representative of a production lot. The filter separator, coalescers, and separator screens shall be identified with the manufacturer's part number.

1.3.2 Deviations from API Spec 1581

No deviations are allowed.

1.3.3 Data Required Prior to Tests

Submit installation data to enable Government representative to verify that the equipment has been installed and operated correctly. Submit certification from the manufacturer that the test vessel has passed a hydrostatic pressure test, and that the design conforms to API Spec 1581, Category [M] [M100], Type S. Submit two sets of assembly drawings of the test vessel and accessories for approval.

1.3.4 Submittal of Test Documents

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NOTE: Contact NAVFACENGCOM or COE for direction on selection. For NAVFACENGCOM Projects, the designer must consult with the engineer in charge (EIC) to determine the review input of the appopriate service. For COE projects, coordinate with appopriate service to determine which service agency will review test documents and ensure that mou and submittal register contain these requirements.

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The test report shall be submitted to the Command Fuel Facilities Engineer or [Det 3, WR-ALC/AFTH][NAVAIR/NAFAC] [Army Petroleum Center] for Government approval. Prepare report in accordance with MIL-HDBK-831. In addition to results, the report shall contain complete records of the tests including data sheets, performance curves, chronological test records, photographs, sample calculations, test procedures, and a description of the test apparatus. Submit color photographs of the sample elements before and after tests. Submit one new coalescer element and one new separator element.

1.3.5 Required Preproduction Tests

a. Examination. A visual examination of the filter separator housing and each element shall be performed to ensure compliance with the drawings and verify workmanship requirements.

b. Hydrostatic Pressure Tests. The filter separator shall be subjected to a hydrostatic pressure test in accordance with API Spec 1581, Section 3.2.2.11.1.

c. Full Scale Performance Test. API Spec 1581 The filter/separator with a full set of coalescer and separator elements shall be tested in accordance with API Spec 1581 section 4.4 at [600] [_____] gpm (FSI-1 through FSI-[_____] ; [FSR-1 and FSR-2]) [and [1200] [_____] gpm (FSR-1 and FSR-2)].

d. Coalescer Structural Test. A coaleser structural test shall be conducted in accordance with API Spec 1581 Section 4.5.

e. Disassembly Inspection. Upon completion of the tests specified above, the filter separator shall be disassembled and inspected to determine the condition of the coalescer and separator elements. Defects in the element such as swelling of the elements, or damaged gaskets shall be noted. Swelling of or damage to the elements or other parts shall be cause for rejection.

1.4 DESIGN CONDITIONS

Design conditions shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT and as modified herein.

1.5 WORKMANSHIP

Each filter separator, including all parts and accessories, shall be free from blemishes, defects, burrs and sharp edges. The vessel shall exhibit accuracy of dimensions, accurate radii of fillets and complete marking of parts and assemblies.

1.6 CLEANING

Components of the filter separators shall be cleaned to remove dirt; excess soldering; brazing, and welding flux; welding slag; loose, spattered, or excess solder; metal chips; and other foreign materials before, during and after assembly.

PART 2 PRODUCTS

2.1 WELDING

Welding shall be in accordance with ASME B31.3.

2.2 MATERIALS AND EQUIPMENT

2.2.1 Housing

a. [Carbon steel with internal epoxy coating][3003 or 6061 aluminum alloy][Type 304 or 316 stainless steel].

b. Float Assembly. Stainless steel.

c. Manual Drain Valve. Stainless steel.

d. Sight Glass. Armored clear pyrex with nickel-copper alloy ball checks.

e. Differential Gauge. Corrosion resistant piston with stainless steel valves.

f. Seperators. 200 mesh stainless steel wire cloth, Teflon coated on both sides, or synthetic mesh cloth.

2.3 FILTER SEPARATOR CONSTRUCTION

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NOTE: As required by the Command Fuels Facility Engineer or service headquarters. Coated carbon steel shall not be used for filter separator vessels on Navy/Marine Corps projects. Specify internally coated carbon steel vessel construction for Air Force projects.

Indicate the operating height of the unit on the drawings. Note that the unit's support system (legs) may have to be structurally designed to meet project requirements.

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2.3.1 Housing Vessel

Each filter separator housing shall be fabricated from [carbon steel and shall be internally coated with an epoxy coating in accord with MIL-PRF-4556][3003 or 6061 aluminum alloy][Type 304 or 316 stainless steel].[Coat the exterior with alkalyd resin primer (universal metal primer).] Each unit shall be constructed and labeled in accordance with ASME BPVC SEC VIII D1. The housing shall be designed for a working pressure of 275 psig. Each unit shall be [horizontal, end-opening type with coalescers and separators mounted side-by-side (coalescers at the bottom of the vessel and separators at the top)][vertical, top-opening type with coalescers and separators mounted side-by-side (coalescers at the inlet of the vessel and separators at the outlet)]. The head opening shall be equipped with a hinged or pivoting device to facilitate swinging the head to one side for servicing. The hinges or pivots shall support the head during servicing without distortion or misalignment. Swing-type bolts shall be used on all main closures. Unit shall be provided with 3-inch inside diameter lifting eyes spaced to support a weight of 2-1/2 times the gross weight of the filter separator. The configuration of the pressure vessel shall be as shown on the drawings. The housing shall be provided with a 3/4-inch inlet compartment fuel drain plug. A hand hole access plate shall be provided in the inlet compartment. The head shall be sealed to the body by means of an O-ring, meeting requirements of SAE AMS-P-5315, mounted in a circular groove at the point of closure. Threaded base mounting adapters shall be provided for the coalescers. The separators shall be mounted on adapters with blunted Vee-type knife edges. Height of Vee section to be 0.06 inches, plus or minus 10 percent. Weld ridges shall not prevent liquid from draining. The filter separator vessel shall be able to withstand a force of 2400 pounds and a moment of 2400 foot-pounds at the flanges.

2.3.2 Legs

Four 3 x 3 x 1/4 inch angle-shaped legs shall be welded to the housing. Each leg shall be fitted with a 4 x 4 x 1/2-inch base plate drilled through with a 3/4-inch hole.

2.3.3 Inlet and Outlet Connections

The inlet and outlet connections shall be 6 inch nominal pipe size and shall be located parallel to each other as shown on the drawings. Inlet connection shall be provided with raised face flanges, faced and drilled in compliance with ASME B16.5, Class 150. Outlet connection flange face shall match Filter Separator Control Valve (FSCV).

2.3.4 Manual Drain Valve

As specified in paragraph ACCESSORIES.

2.3.5 Sight Gauge

As specified in paragraph ACCESSORIES.

2.3.6 Differential Pressure Gauge

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NOTE: Coordinate selection of this feature with the Command Fuel Facilities Engineer.
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As specified in paragraph ACCESSORIES.

2.3.7 Automatic Air Eliminator and Pressure Relief Valves

As specified in paragraph ACCESSORIES.

2.3.8 Sampling Connections

As specified in paragraph ACCESSORIES.

2.3.9 Spider Assembly

Each filter separator shall contain a spider assembly to hold the coalescers and separators in position, to support them firmly against vibration. The method of stabilization shall assure an electrical bond between the spider and the vessel.

2.3.10 Coalescer and Separator Cartridges

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NOTE: Choose the appropriate filter separator size and identification (FSR or FSI). Filter separators other than standard sizes in 19 L/s (300 gpm) increments shall not be used.
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Each filter separator shall be provided with coalescers and separators that have been qualified to the performance requirements of API Spec 1581, Category [M] [M100], Type S. Filter separators shall use coalescers 6-inch in diameter and 22-inch long (300 gpm) or 38-inch long (600 gpm).

2.3.11 Control Valve Accessories

Provide each filter separator with a control valve (FSCV), manual water drain valve, and float control valve (FC) with manual tester as specified in Section33 52 43.14 AVIATION FUEL CONTROL VALVES and shall be of the same manufacturer.

2.3.11.1 Float Control Pilot and Tester

Each housing sump shall be fitted with a float control pilot and tester specified in Section 33 52 43.14 AVIATION FUEL CONTROL VALVES and shall be of the same manufacturer as the control valves. The drain port "D" shall be tubed to the drain piping to the product recovery tank.

2.3.12 Identification of Product

Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The main equipment nameplate shall be mounted on the housing, and in addition to the usual MIL-STD-130 requirements, shall include the following markings in letters 3/32 inch high or larger:

Filter Separator, Liquid Fuel			
Design Flow-Rate			
Design Pressure			
Elements			
First Stage		Mfg. Part No. *	
Second Stage		Mfg. Part No. *	
Contract No. *			
Manufacturer *			
Specification*			
*Applicable information shall be entered by the Contractor.			
*Applicable information shall be stenciled by LFM personnel.			

2.3.13 Assembly

Each filter separator shall come assembled with all accessories and shall be ready for use. The functions of all components shall be tested prior to shipment and no assembly or field adjustment of valves or components shall be required.

2.4 MICRONIC PRE-FILTER CONSTRUCTION

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NOTE: As required by the Command Fuels Facility Engineer or Service Headquarters.
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2.4.1 Product Submittals

a. If product has been previously tested and approved by the Government, submit certification of qualification under API Spec 1581, Category [M] [M100], Type S (Filter Separator). Include the description of qualification, which contains element types and quantities, and provide details of the configurations of vessels tested. Also, include the name of the Government Agency and the date of approval.

b. Submit scaled drawings showing dimensions, tolerances, connection sizes of the vessel and accessories. Submit shop drawings for elements. Shop drawings shall include number and arrangement of elements. Submit technical literature on the vessel, elements, and accessories, which is the manufacturer's published literature.

c. Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for specifics on the required operation and maintenance information.

2.4.2 Housing Vessel

Each pre-filter housing shall be fabricated from carbon steel and shall be internally coated with an epoxy coating in accord with MIL-PRF-4556. Coat the exterior with alkalyd resin primer (universal metal primer). Each unit shall be constructed and labeled in accordance with ASME BPVC SEC VIII D1. The housing shall be designed for a working pressure of 275 psig. Each unit shall be horizontal, end-opening type with filters mounted side-by-side. The head opening shall be equipped with a hinged or pivoting device to facilitate swinging the head to one side for servicing. The hinges or pivots shall support the head during servicing without distortion or misalignment. Swing-type bolts shall be used on all main closures. Unit shall be provided with 3-inch inside diameter lifting eyes spaced to support a weight of 2-1/2 times the gross weight of the filter separator. The configuration of the pressure vessel shall be as shown on the drawings. The housing shall be provided with a 3/4-inch inlet compartment fuel drain plug. A hand hole access plate shall be provided in the inlet compartment. The head shall be sealed to the body by means of an O-ring, meeting requirements of SAE AMS-P-5315, mounted in a circular groove at the point of closure. The filter cartridges shall be mounted on adapters with blunted Vee-type knife edges. Height of Vee section to be 0.06 inches, plus or minus 10 percent.

2.4.3 Legs

Four 3 x 3 x 1/4 inch angle-shaped legs shall be welded to the housing.

Each leg shall be fitted with a 4 x 4 x 1/2-inch base plate drilled through with a 3/4-inch hole.

2.4.4 Inlet and Outlet Connections

The inlet and outlet connections shall be 8 inch nominal pipe size and shall be located parallel to each other as shown on the drawings. Connections shall be provided with raised face flanges, faced and drilled in compliance with ASME B16.5, Class 150.

2.4.5 Manual Drain Valve

As specified in paragraph ACCESSORIES.

2.4.6 Sight Gauge

As specified in paragraph ACCESSORIES.

2.4.7 Differential Pressure Gauge

As specified in paragraph ACCESSORIES.

2.4.8 Automatic Air Eliminator and Pressure Relief Valves

As specified in paragraph ACCESSORIES.

2.4.9 Sampling Connections

As specified in paragraph ACCESSORIES.

2.4.10 Spider Assembly

The prefilter shall contain a spider assembly to hold the filter cartridges in position, to support them firmly against vibration. The method of stabilization shall assure an electrical bond between the spider and the vessel.

2.4.11 Filter Cartridges

The prefilter shall be provided with 5 micron pleated media filter cartridges. Filter cartridges shall have a minimum efficiency of 98% and a minimum collapse strength 75 psig.

2.4.12 Identification of Product

Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The main equipment nameplate shall be mounted on the housing, and in addition to the usual MIL-STD-130 requirements, shall include the following markings in letters 3/32 inch high or larger:

Micronic Prefilter, Liquid Fuel	
Design Flow-Rate	
Design Pressure	
Elements	

First Stage		Mfg. Part No. *	
Second Stage		Mfg. Part No. *	
Contract No. *			
Manufacturer *			
Specification*			
*Applicable information shall be entered by the Contractor.			
*Applicable information shall be stenciled by LFM personnel.			

2.4.13 Assembly

The prefilter shall come assembled with all accessories and shall be ready for use. The functions of all components shall be tested prior to shipment and no assembly or field adjustment of valves or components shall be required.

2.5 ACCESSORIES

2.5.1 Manual Drain Valve

Each filter separator shall be equipped with a 1-inch stainless steel manual ball valve water and fuel drain. The valve shall be capable of draining all water, fuel and sediment from the filter separator by gravity. The valve shall be installed below the sump of the housing as shown on the drawings.

2.5.2 Sight Gauge

A [1/2-inch armored, clear pyrex][or][magnetis level type] liquid level gauge shall be provided for observing the water accumulation in the sump. The gauge shall be equipped with stainless steel ball checks in both the upper and lower fittings, an upper and lower shutoff valve, and a bottom blowoff cock.[The gauge will contain a colored density sensitive ball.] Liquid level gauges shall be rated for a maximum pressure of 150 psi.

2.5.3 Differential Pressure Gauge

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NOTE: Coordinate selection of this feature with the command fuel facilities engineer or service headquarters.

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The housing shall be equipped with a direct-reading, piston type differential pressure gauge that measures the differential pressure across both coalescers and separators. The gauge shall consist of a spring-supported, corrosion resistant piston moving inside a glass cylinder, with high pressure applied on top of the piston and low pressure applied below it. The gauge shall have a peak-hold reading that locks the piston to indicate the maximum differential pressure that is measured until the pistion is released by turning a knob, a push button test valve to relieve pressure under the piston, and a pressure relief feature set at 300 psi to protect the gauge if isolation valves have been left closed. Under a differential pressure of 30 psi, leakage past the piston shall not exceed 120 drops per minute. The cylinder shall have stainless steel and flanges with Viton O-ring seals. The high pressure inlet of the gauge shall have a 10-micron pleated paper filter and the low pressure connection shall have a fine mesh stainless steel strainer. The gauge shall have an operating pressure of 300 psi. Differential pressure range of the gauge through approximately 3 inches of piston movement shall be 0-30 psi with an accuracy of ± 0.5 psi, calibrated linearly with one PSI scale graduations. High and low pressure connections shall be 1/4 inch NPT female with a stainless steel bar stock valve at each connection. Construction of the gauge shall be such that a 3-valve manifold is not necessary. If only one bar stock valve is closed, the gauge shall not be damaged by up to 300 psi differential pressure in either direction. The differential pressure gauge shall be attached to the filter separator by a gauge panel.[Differential pressure gauge shall control the filter separator control valve (FSCV) to automatically shut down flow when 20 psi differential pressure is exceeded.] A pressure gauge shall be attached to the differential pressure gauge to indicate the high pressure and have a range of 300 psi.

2.5.4 Automatic Air Eliminator and Pressure Relief Valves

A 1-inch angle pattern pressure relief valve shall be provided on top of each vessel. An automatic air eliminator shall be installed on the highest point of the vessel and shall have check valve feature. The air eliminator shall release at pressures up to 150 psi with no fuel leakage allowed.

2.5.5 Sampling Connections

Sampling connections shall be provided at the inlet and outlet connections to the housing. Each sampling connection shall consist of a 1/4-inch sampling probe where the probe faces upstream, ball valve, a quick disconnect coupling and aluminum dust cap. The sampling connections shall be capable of accepting a sampling kit for drawing the samples required to assure fuel quality.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment and components in position, true to line, level and plumb and measured from established benchmarks or reference points. Follow manufacturer's recommended practices for equipment installation. Provide required clearance between equipment components. Equipment apparatus, and accessories requiring normal servicing or maintenance to be accessible.

3.1.1 Anchoring

Anchor equipment in place. Check alignment of anchor bolts before installing equipment and cleanout associated sleeves. Do not cut bolts because of misalignment. Notify Contracting Officer of errors and obtain the Contracting Officer's acceptance before proceeding with corrections. Cut anchor bolts of excess length to the appropriate length without damage to threads. Where anchor bolts or like devices have not been installed, provide appropriate self-drilling type anchors for construction condition. Expansion bolt anchors provided shall be in accordance with CID A-A-1923, Type 4, Class One, half-inch size.

3.1.2 Grouting

Equipment, which is anchored to a pad, shall be grouted in place where applicable. Before setting equipment in place and before placing grout, clean surfaces to be in contact with grout, including fasteners and sleeves. Remove standing water, debris, oil, rust, coatings and other materials which impair bond. Clean contaminated concrete by grinding or other acceptable means. Provide necessary formwork for placing and retaining grout. Grout to be nonmetallic, nonshrink, fluid precision grout of a hydraulic cementitious system with graded and processed silica aggregate, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents; free of aluminum power agents, oxidizing agents and inorganic accelerators, including chlorides; proportioned, premixed and packaged at factory with only the addition of water required at the project site. Grouting to meeting requirements of ASTM C 827. Perform grouting in accord with ACI, equipment manufacturer's, and grout manufacturer's published specifications and recommendations.

3.1.3 Leveling and Aligning

Level and align equipment in accordance with respective manufacturer's published data. Do not use anchor bolts, jack-nuts or wedges to support, level or align equipment. Install only flat shims for leveling equipment. Place shims to fully support equipment. Wedging is not permitted. Shims to be fabricated flat carbon steel units of surface configuration and area not less than equipment bearing surface. Shims to provide for full equipment support. Shims to have smooth surfaces and edges, free from burrs and slivers. Flame or electrode cut edges not acceptable.

3.1.4 Painting

Equipment painting shall be as specified in Section 33 52 43.13 AVIATION FUEL PIPING. Equipment labeling shall be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT.

-- End of Section --