DoD Fuel Facilities Criteria

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NAVFAC
Naval Facilities Engineering Command
ENGINEERING & EXPEDITIONARY WARFARE CENTER

Overview

- Unified Facility Criteria (UFC)
- Standard Designs
- Pipeline Pressure Testing Guidelines
- Specifications

- Questions

DoD Fuels Facilities Documents

- **Unified Facility Criteria (UFCs)**
  - **3-460-01 Design: Petroleum Fuels Facilities**
  - **3-460-03 O&M: Maintenance of Petroleum Systems***

- **Standard Designs**
  - **ASTs (Vertical)**
  - **Type III, IV, V Pressurized Hydrant Systems**
  - **Cut and Cover Tanks**
  - **USAFE/ NATO Standard ***
  - **Military Service Stations ***
  - **Rotary Wing Hydrant Systems ***
  - **Fuel Laboratory ***

***Under Development**

DoD Fuels Facilities Documents

- **Pipeline Pressure Testing Guidelines**
  - **Will be incorporated into UFC 3-460-03**
- **Unified Facilities Guide Specifications (UFGS)**
  - **Most in the 33 nn nn series**
  - **Associated with Standard Designs**
  - **Available on WBDG site**
- **Coating Systems**

DoD Fuels Facilities Documents

- **Unified Facility Criteria (UFCs)**
  - **Authoritative, mandatory unless waivered by Service HQ**
- **Standard Designs**
  - **Starting Point For Design, Edited For Site Adapt**
    - **Engineering design is still needed**
  - **Identifies preferences and design choices**
    - **Includes designer notes**
    - **Lists which UFGS to be used**
  - **Major deviations require Service HQ approval**
- **Unified Facilities Guide Specifications (UFGS)**
  - **Edited for the job**
  - **Designer choices in brackets**

UFC 3-460-01 Design: Petroleum Fuels Facilities

- Guidance for all new design and construction
- Guidance for Major Rehabilitation
- 340 pages

- Chapters:
  - 1 Introduction
  - 2 General Design Information
  - 3 Bulk Fuel Storage Facilities
  - 4 Aircraft Fueling Facilities
  - 5 Marine Receiving And Dispensing Facilities
  - 6 Interterminal and Installation Pipelines
  - 7 Ground Products Fueling Facilities
  - 8 Atmospheric Storage Tanks

UFC 3-460-01 (cont)

9 Piping Systems
10 Alternate POL Facilities
11 Support Facilities
12 Major Rehabilitation
13 Fueling Facility Temporary Deactivation
14 Fueling Facility Closure

APPENDICES

A References
B Manual Surge Calculations For Simple Piping Systems
C Charter Of DoD Fuels Facility Engineering Panel
D Glossary
E Plates

UFC 3-460-03: Maintenance of Fuel Facilities

- Currently Under Development
- Will Replace The Current UFC 3-460-03F
- Will Replace The Current MO-230
- Will Be Tri-service

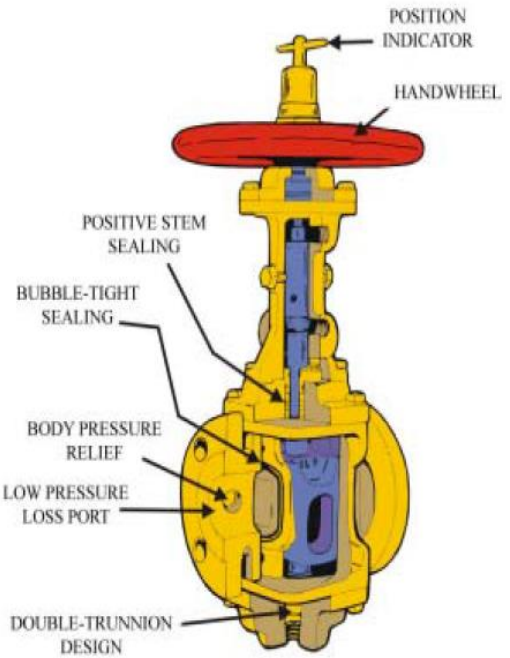
- Anticipate Publishing in December 2015

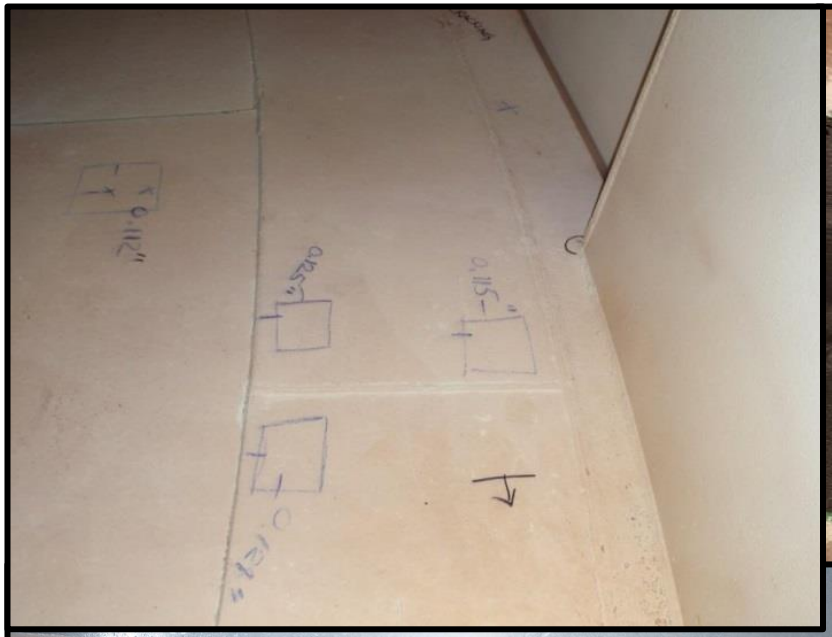
UFC 3-460-03 (cont.)

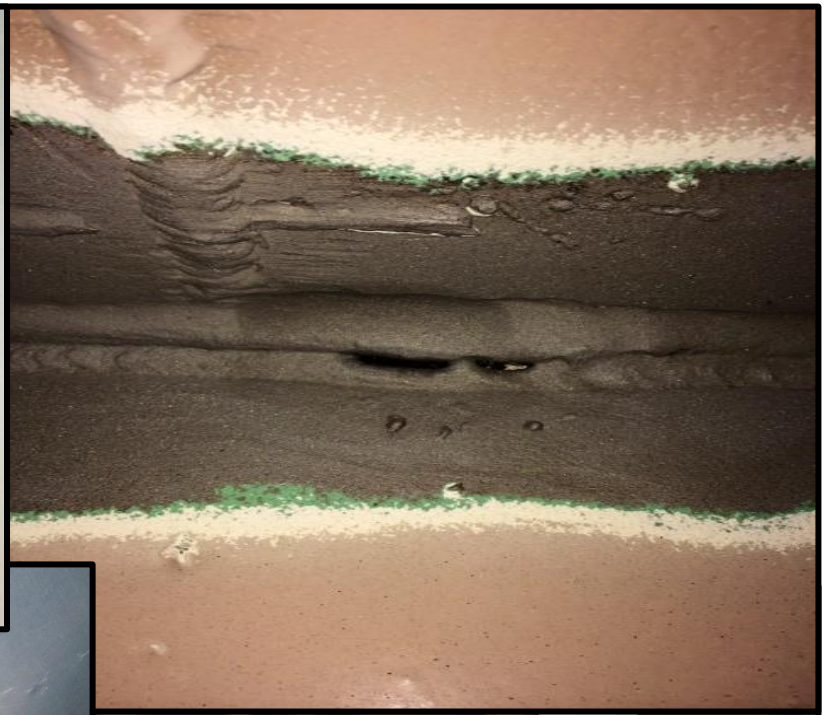
- Will Follow The Outline Of UFC 3-460-01
  - For example – Chapter 3 will cover the maintenance requirements for bulk storage facilities.
- Will Provide Additional/Consistent Guidance For Cleaning & Inspecting Fuel Storage Tanks
- Will Provide Pipeline Pressure Testing Guidance (Following The Pipeline Integrity Management System Procedures)

UFC 3-460-03 (cont.)

- Will Provide Appendix With List Of Equipment & Maintenance Schedule
- Will Include Facility Plates Detailing Equipment
- Will Include List Of Inspection Items In Addition To API 653 & STI SP001 lists.

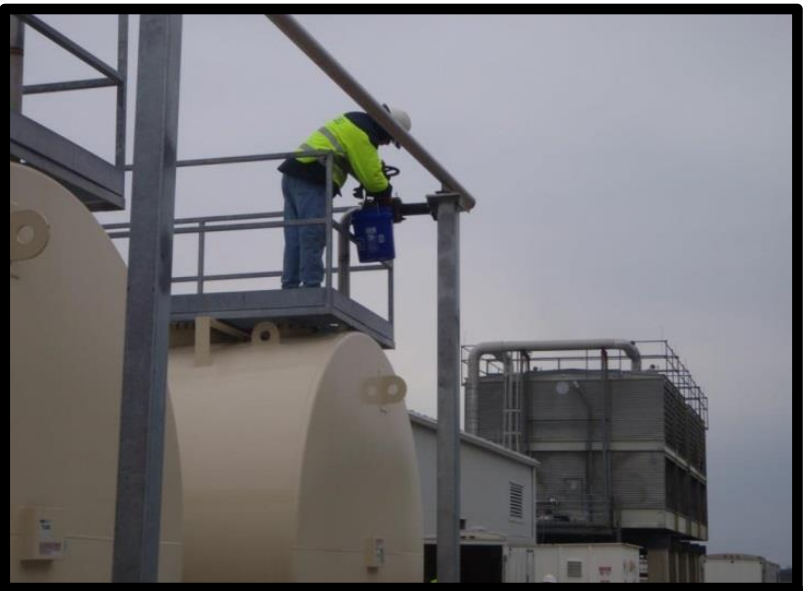


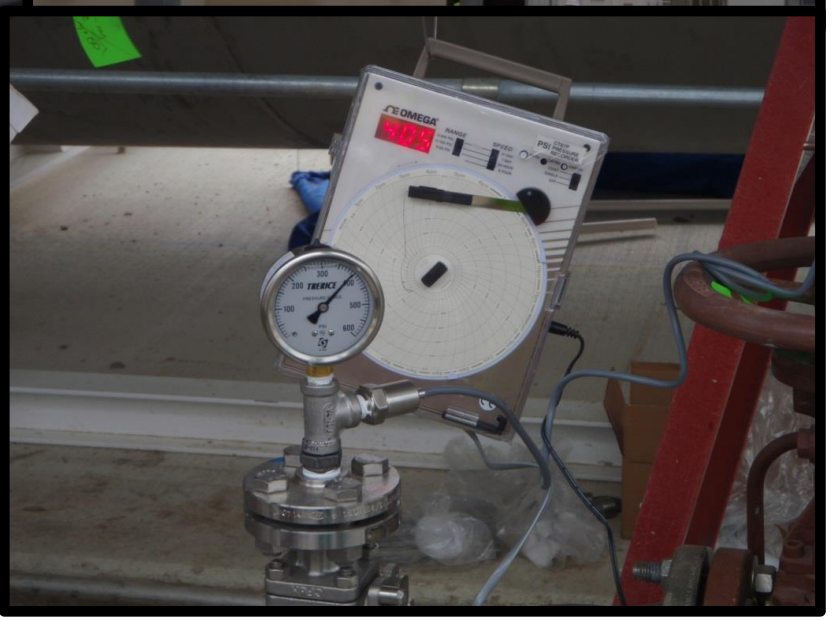




Pipeline Pressure Testing Guidelines

- Finalized in December 2013
- Approved By FFEP - June 2014
- Will Be Incorporated Into UFC 3-460-03?
- Provides Guidelines For Pressure & Frequency For Integrity Testing
- Not To Be Used For New Construction
- Not Published But Available If Requested




OMEGA

AST Standard Design

- Vertical Steel Tanks in JP-5 or JP-8/F-24 Service
  - Can be used for other products
- For >5K, <100K BBL Vertical ASTs
- Fixed Roof, Floating Pan
  - Considerations given for tanks w/o pans
- For New Construction, But Can Be Used For Renovations
- Elevated And Non-elevated Foundations
  - Areas with/without high water tables
- Requires Design In Accordance With API 650
- For CONUS And OCONUS

History & Current Status

- **Original Design in mid 80's**

- **Update in Feb 1993**
  - **Shop drawing detailed**
  - **Only included Tank, not site layout**
- **Last Update Published in 2012**
  - **Rely more on API 650, prescribe government preferences**
- **Current Update 2015**
  - **Includes piping/dike details**
- **Will Post to USACOE Std Dsn website**

AST Standard Design

- Useable volumes clarified
- High/low level control & shutoff logic
- Roof structure, compression ring
  - Single column for diameters 126 ft > D >91 ft
  - No columns for diameters < 91 ft
- Three UFGS Specifications
- UFC 3-460-01 was updated to resolve conflicts.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Pressurized Hydrant Fueling System (Type III)

- AW 078-24-28
- Published In July 2010
- It is comprised of two operating storage tanks, a pump house, a hydrant loop, and hydrants at each parking position.
- Any Number Of Aircraft Parked Along The Fueling Loop Can Receive Fuel Simultaneously Up To The Flow Capacity Of The System.
- Aircraft Can Be Defueled While Others Are Refueling.

Type III Hydrant Fueling System

Pressurized Hydrant Direct Fueling System (Type IV & V)

- AW 078-24-29
- Published July 2010
- Used To Fuel Aircraft With Engines Or Support Equipment Running.
- Installed Where The Mission Dictates A Continuing Need For Rapid Turnaround Without Shutting Engines Down And Are Located To Permit Quick Return To The Runway.
- Type V Systems Are For In-shelter Fueling.

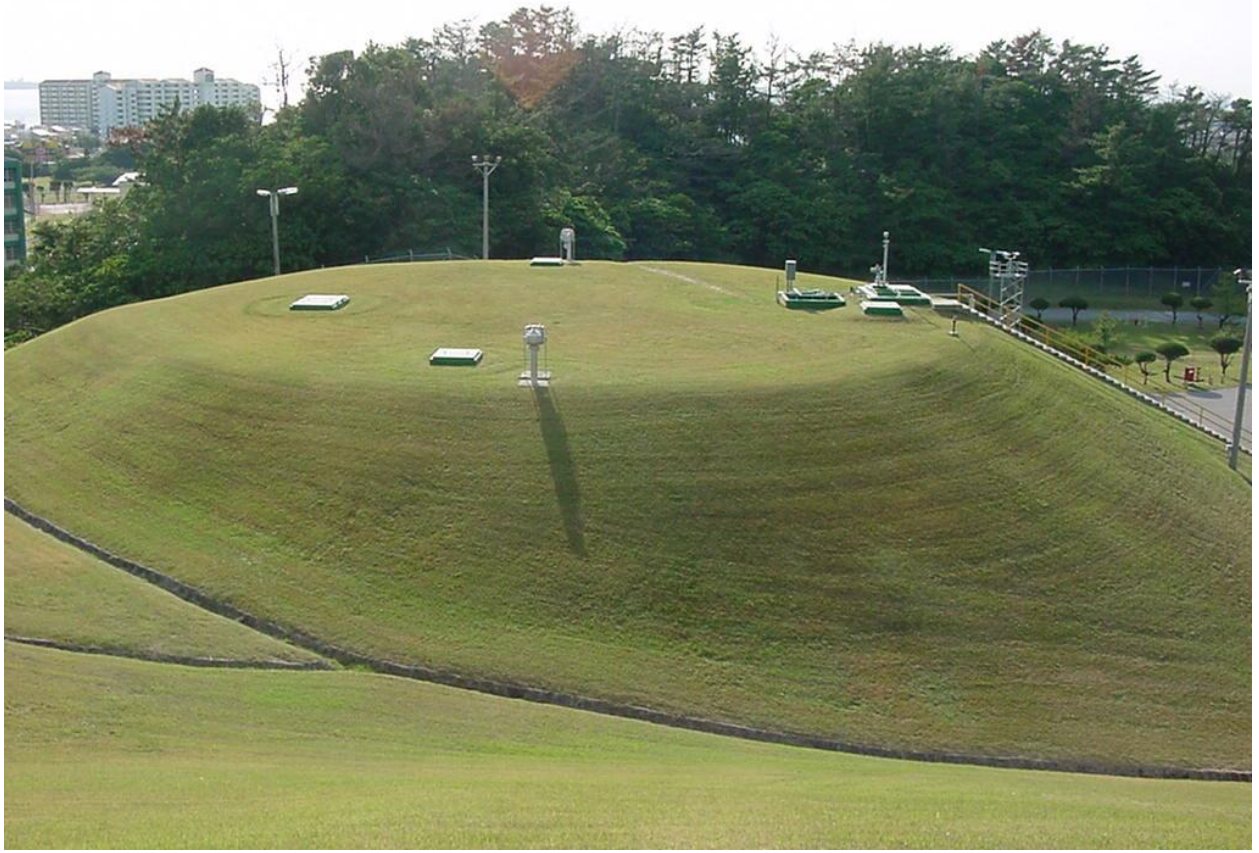
Type IV Hydrant Fueling System

Type V Hydrant Fueling System

Aircraft Fueling System with Underground Vertical Storage Tanks (Cut and Cover)

- AW 078-24-33
- Published in July 2010
- Cut and Cover storage tanks are steel-lined reinforced concrete with leak monitoring capability.
- They are not used within CONUS except when tanks are required to be constructed within the explosive cordon area.
- They are to be used in OCONUS Pacific in high threat areas or when tanks are required to be constructed within the explosive cordon area or clear zone.

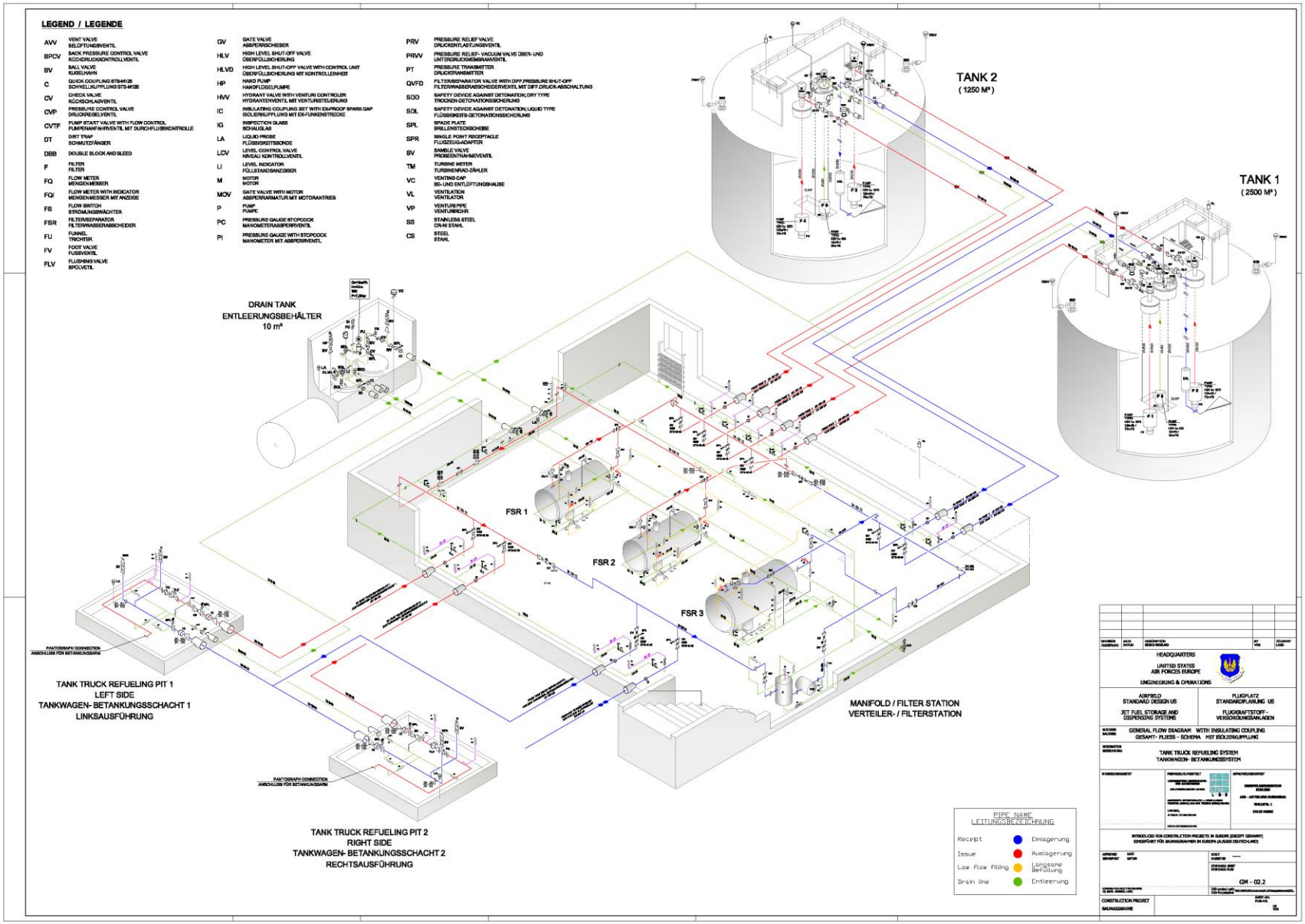
Cut and Cover Tank



Cut and Cover Tank Farm

USAFE/NATO Standard Design

- Similar to the Type III system
- Includes Cut & Cover Tanks
- Incorporates European Codes (UL vs CENELEC (ATEX))
- Updates Standard Specifications (STS)
- Digitizes 1987 version
- Anticipate Publishing in Dec 2015


LEGEND / LEGENDE
AVV VENT VALVE / BELÜFTUNGSVENTIL
BPCV BACK PRESSURE CONTROL VALVE / RÜCKDRUCKKONTROLLVENTIL
BV BALL VALVE / KUGELHAHN
C QUICK COUPLING STS-M125 / SCHNELLKUPPLUNG STS-M125
CV CHECK VALVE / RÜCKSCHLAGVENTIL
CVP PRESSURE CONTROL VALVE / DRUCKREGELVENTIL
CVTF PUMP START VALVE WITH FLOW CONTROL / PUMPENANFAHRVENTIL MIT DURCHFLUSSKONTROLLE
DT DIRT TRAP / SCHMUTZFÄNGER
DBB DOUBLE BLOCK AND BLEED
F FILTER / FILTER
FQ FLOW METER / MENGENMESSER
FQI FLOW METER WITH INDICATOR / MENGENMESSER MIT ANZEIGE
FS FLOW SWITCH / STRÖMUNGSWÄCHTER
FSR FILTER/SEPARATOR / FILTER/WASSERABSCHEIDER
FU FUNNEL / TRICHTER
FV FOOT VALVE / FUSSVENTIL
FLV FLUSHING VALVE / SPÜLVENTIL
GV GATE VALVE / ABSPERRSCHIEBER
HLV HIGH LEVEL SHUT-OFF VALVE / ÜBERFÜLLSICHERUNG
HLVD HIGH LEVEL SHUT-OFF VALVE WITH CONTROL UNIT / ÜBERFÜLLSICHERUNG MIT KONTROLLEINHEIT
HP HAND PUMP / HANDFLÜGELPUMPE
HVV HYDRANT VALVE WITH VENTURI CONTROLER / HYDRANTENVENTIL MIT VENTURISTEUERUNG
IC INSULATING COUPLING SET WITH EX-PROOF SPARK GAP / ISOLIERKUPPLUNG MIT EX-FUNKENSTRECKE
IG INSPECTION GLASS / SCHAUGLAS
LA LIQUID PROBE / FLÜSSIGKEITSSONDE
LCV LEVEL CONTROL VALVE / NIVEAU KONTROLLVENTIL
LI LEVEL INDICATOR / FÜLLSTANDSANZEIGER
M MOTOR / MOTOR
MOV GATE VALVE WITH MOTOR / ABSPERRARMATUR MIT MOTORANTRIEB
P PUMP / PUMPE
PC PRESSURE GAUGE STOPCOCK / MANOMETERABSPERRVENTIL
PI PRESSURE GAUGE WITH STOPCOCK / MANOMETER MIT ABSPERRVENTIL
PRV PRESSURE RELIEF VALVE / DRUCKENTLASTUNGSVENTIL
PRVV PRESSURE RELIEF- VACUUM VALVE / ÜBER- UND UNTERDRUCKMEMBRANVENTIL
PT PRESSURE TRANSMITTER / DRUCKTRANSMITTER
QVFD FILTER/SEPARATOR VALVE WITH DIFF.PRESSURE SHUT-OFF / FILTER/WASSERABSCHEIDERVENTIL MIT DIFF.DRUCK-ABSCHALTUNG
SDD SAFETY DEVICE AGAINST DETONATION; DRY TYPE / TROCKEN-DETONATIONSSICHERUNG
SDL SAFETY DEVICE AGAINST DETONATION; LIQUID TYPE / FLÜSSIGKEITS-DETONATIONSSICHERUNG
SPL SPADE PLATE / BRILLENSTECKSCHEIBE
SPR SINGLE POINT RECEPTACLE / FLUGZEUG-ADAPTER
SV SAMBLE VALVE / PROBENTNAHMEVENTIL
TM TURBINE METER / TURBINENRAD-ZÄHLER
VC VENTING CAP / BE- UND ENTLÜFTUNGSHAUBE
VL VENTILATION / VENTILATOR
VP VENTURI PIPE / VENTURIROHR
SS STAINLESS STEEL / CR-NI STAHL
CS STEEL / STAHL
TANK 2
(1250 M³)
TANK 1
(2500 M³)
DRAIN TANK
ENTLEERUNGSBEHÄLTER
10 m³
FSR 1
FSR 2
FSR 3
TANK TRUCK REFUELING PIT 1
LEFT SIDE
TANKWAGEN- BETANKUNGSSCHACHT 1
LINKSAUSFÜHRUNG
TANK TRUCK REFUELING PIT 2
RIGHT SIDE
TANKWAGEN- BETANKUNGSSCHACHT 2
RECHTSAUSFÜHRUNG
MANIFOLD / FILTER STATION
VERTEILER- / FILTERSTATION
PIPE NAME
LEITUNGSBEZEICHNUNG
Receipt Einlagerung
Issue Auslagerung
Low Flow Filling Langsame Befüllung
Drain line Entleerung
HEADQUARTERS
UNITED STATES AIR FORCES EUROPE
ENGINEERING & OPERATIONS
AIRFIELD STANDARD DESIGN US
JET FUEL STORAGE AND DISPENSING SYSTEMS
FLUGPLATZ STANDARDPLANUNG US
FLUGKRAFTSTOFF-VERSORGUNGSANLAGEN
GENERAL FLOW DIAGRAM WITH INSULATING COUPLING
GESAMT- FLUSS - SCHEMA MIT ISOLIERKUPPLUNG
TANK TRUCK REFUELING SYSTEM
TANKWAGEN- BETANKUNGSSYSTEM
GM - 02.2

Military Service Stations

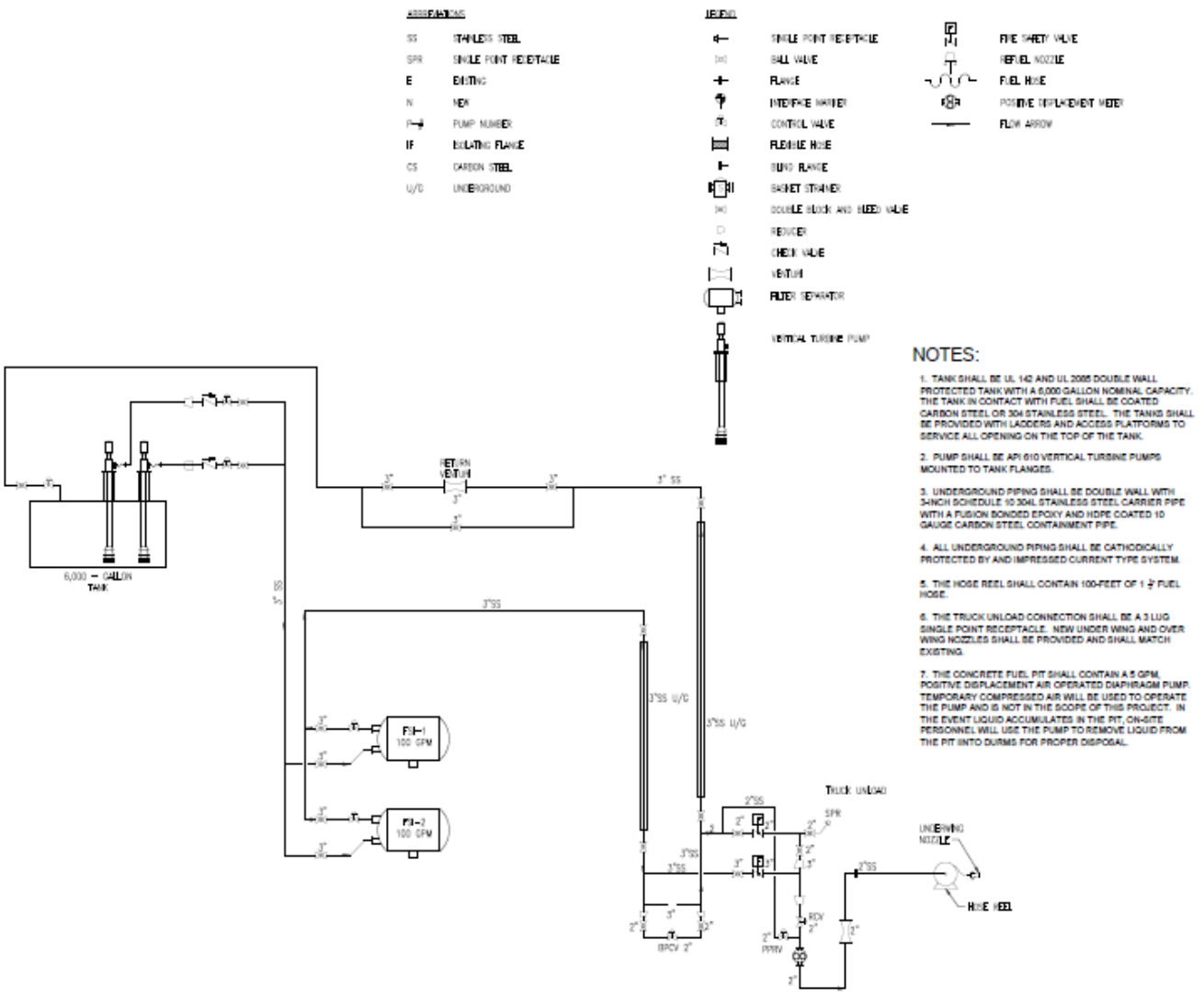
- **Phase I (completed)**
  - Conduct an industry wide review of best practices
  - Review, list and summarize all related DoD and government requirements
- **Phase II (completed)**
  - Conduct life cycle cost (LCC) analysis
  - Develop a decision matrix
- **Phase III**
  - System layout (65% design) drawings and specifications for recommended tank configurations including alternate options
- **Phase IV**
  - System layout (FINAL design) drawings and specifications for recommended tank configurations including alternate options

Military Service Stations

Rotary Wing Hydrant System

- Small Type III system
- Primarily for Rotary Wings
- Remote Locations

- Planning Phase


ABBREVIATIONS
SS STAINLESS STEEL
SPR SINGLE POINT RECEPTACLE
E EXISTING
N NEW
P PUMP NUMBER
IF ISOLATING FLANGE
CS CARBON STEEL
U/G UNDERGROUND
LEGEND
SINGLE POINT RECEPTACLE
BALL VALVE
FLANGE
INTERFACE MANIFOLD
CONTROL VALVE
FLEXIBLE HOSE
BLIND FLANGE
BASKET STRAINER
DOUBLE BLOCK AND BLEED VALVE
REDUCER
CHECK VALVE
VENTURI
FILTER SEPARATOR
VERTICAL TURBINE PUMP
FIRE SAFETY VALVE
REFUEL NOZZLE
FUEL HOSE
POSITIVE DISPLACEMENT METER
FLOW ARROW
NOTES:
1. TANK SHALL BE UL 142 AND UL 2085 DOUBLE WALL PROTECTED TANK WITH A 6,000 GALLON NOMINAL CAPACITY. THE TANK IN CONTACT WITH FUEL SHALL BE COATED CARBON STEEL OR 304 STAINLESS STEEL. THE TANKS SHALL BE PROVIDED WITH LADDERS AND ACCESS PLATFORMS TO SERVICE ALL OPENING ON THE TOP OF THE TANK.
2. PUMP SHALL BE API 610 VERTICAL TURBINE PUMPS MOUNTED TO TANK FLANGES.
3. UNDERGROUND PIPING SHALL BE DOUBLE WALL WITH 3-INCH SCHEDULE 10 304L STAINLESS STEEL CARRIER PIPE WITH A FUSION BONDED EPOXY AND HDPE COATED 10 GAUGE CARBON STEEL CONTAINMENT PIPE.
4. ALL UNDERGROUND PIPING SHALL BE CATHODICALLY PROTECTED BY AND IMPRESSED CURRENT TYPE SYSTEM.
5. THE HOSE REEL SHALL CONTAIN 100-FEET OF 1 ¼" FUEL HOSE.
6. THE TRUCK UNLOAD CONNECTION SHALL BE A 3 LUG SINGLE POINT RECEPTACLE. NEW UNDER WING AND OVER WING NOZZLES SHALL BE PROVIDED AND SHALL MATCH EXISTING.
7. THE CONCRETE FUEL PIT SHALL CONTAIN A 5 GPM, POSITIVE DISPLACEMENT AIR OPERATED DIAPHRAGM PUMP. TEMPORARY COMPRESSED AIR WILL BE USED TO OPERATE THE PUMP AND IS NOT IN THE SCOPE OF THIS PROJECT. IN THE EVENT LIQUID ACCUMULATES IN THE PIT, ON-SITE PERSONNEL WILL USE THE PUMP TO REMOVE LIQUID FROM THE PIT INTO DURMS FOR PROPER DISPOSAL.
6,000 – GALLON TANK
RETURN VENTURI
3" SS
3"SS U/G
FP-1 100 GPM
FP-2 100 GPM
TRUCK UNLOAD
2"SS
SPR
UNDERWING NOZZLE
HOSE REEL
RDV
PRRV
BPCV 2"

Fuel Laboratory

- Initiative Based On Recent Work At POL Labs In New Cumberland, Wainwright And Cabana.
- Design Goals:
  - Conceptual level of design for application across all Services
  - Provide consistent interpretation of relevant codes and criteria
  - Controlling factors of Fuels laboratories
    - Volume (storage, throughput)
    - Product (handling and disposal requirements)
    - Functionality (type of tests performed)
- UFC Format
- Completion - TBD

Fuel Laboratory

Current Coating Systems

- ****NEW***SECTION 09 97 13.15 LOW VOC POLYSULFIDE INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS
  - Modified epoxy novolac polysulfide coating
  - The first and finish coat materials are identical except that the coats shall be in contrasting colors to allow identification
  - Note that the qualification testing requires immersion testing for six months
  - Published February 2015

- SECTION 09 97 13.27 EXTERIOR COATING OF STEEL STRUCTURES
  - 2 - Epoxy coats 350 g/l 2.8 lbs/gal max. VOC
  - 1 - Polyurethane Topcoat 350 g/l 2.8 lbs/gal max. VOC

Coating Systems (cont.)

- **PLANNED COATING SYSTEM**
  - **EXTERIOR COATING:**
    - 1 - zinc rich coating
    - 1 - inorganic topcoat

- **Coating Specification that will be CANCELLED ASAP:**
  - **SECTION 09 97 13.17 THREE COAT EPOXY INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS**
    - 3 - Epoxy Coats 350 g/l 2.8 lbs/gal max. VOC

DoD Fuel Facilities Specifications

SPECIFICATION	DATE PUB		SPECIFICATION	DATE PUB
UFGS 01 33 23.33 Aviation Fuel System Submittal Requirements	Feb-2010		UFGS 33 52 43.28 Filter Separator, Aviation Fueling System	Nov-2010
UFGS 32 13 15.20 Concrete Pavement for Containment Dikes	Nov-2010		UFGS 33 52 43 Aviation Fuel Distribution (Non-Hydrant)	May-2011
UFGS 33 08 53 Aviation Fuel Distribution System Start-Up	Feb-2010		UFGS 33 52 80 Liquid Fuels Pipeline Coating Systems	Feb-2010
UFGS 33 08 55 Commissioning of Fuel Facility Systems	Jul-2007		UFGS 33 52 90.00 20 Welding for POL Service Piping	Feb-2010
UFGS 33 09 53 Aviation Fuel Pump Control and Annunciation System	Feb-2010		UFGS 33 56 10 Factory-Fabricated Fuel Storage Tanks	Jan-2008
UFGS 33 09 54 Aviation Fuel Pump Control and Annunciation System (Type [IV][V])	Feb-2010		UFGS 33 56 13.13 Steel Tanks With Fixed Roofs	May-2012
UFGS 33 09 55 Aviation Fuel Pump Control and Annunciation System (Cut-N-Cover Tanks)	Feb-2010		UFGS 33 56 13.15 Undertank Interstitial Space	May-2012
UFGS 33 52 10 Service Piping, Fuel Systems	Apr-2008		UFGS 33 56 63 Fuel Impermeable Liner System	Apr-2006
UFGS 33 52 43.11 Aviation Fuel Mechanical Equipment	Feb-2010		UFGS 33 57 00 Bulk Fuel Receiving / Dispensing Equipment	Aug-2011
UFGS 33 52 43.12 Aviation Fuel Pantograph	Feb-2010		UFGS 33 58 00 Leak Detection for Fueling Systems	Apr-2008
UFGS 33 52 43.13 Aviation Fuel Piping	Feb-2010		UFGS 33 59 00 Tightness of Existing Underground Fuel Systems	Apr-2007
UFGS 33 52 43.14 Aviation Fuel Control Valves	Feb-2010		UFGS 33 65 00 Cleaning Petroleum Storage Tanks	Aug-2011
UFGS 33 52 43.23 Aviation Fuel Pumps	Feb-2010			

DoD Fuel Facilities Specifications

- FFEP is planning to Revisit Specifications that are older than 5 years old in FY16.

Criteria Libraries

- **UFCs and Specifications (UFGSs) available at:**
  The Whole Building Design Guide
  http://www.wbdg.org

- **Standard Designs available at:**
  http://www.hnd.usace.army.mil/stddgn/

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