UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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08/18

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-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA	**UFGS-33 52 43.12 (August 2018)**

Preparing Activity: USACE	**Superseding**
	UFGS-33 52 43.12 (February 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 33 52 43.12

AVIATION FUEL PANTOGRAPHS
08/18

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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 and Cover Hydrant Refueling System Standards.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

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

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
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PART 1 GENERAL

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NOTE: DoD Type III systems must conform to Standard Design AW 078-24-28 PRESSURIZED HYDRANT FUELING SYSTEM TYPE III. DoD Type IV/V systems must conform to Standard Design AW 078-24-29 PRESSURIZED HYDRANT DIRECT FUELING SYSTEM TYPE IV/V. Cut and Cover systems must conform to Standard Design AW 078-24-33 UNDERGROUND VERTICAL STORAGE TANKS CUT AND COVER. Field fabricated ASTs must conform to AW 078-24-27 ABOVEGROUND VERTICAL STEEL TANKS WITH FIXED ROOFS.Standards can be found on the Whole Building Design Guide at the following location https://www.wbdg.org/ffc/dod/non-cos-standards.

Subject Matter Expert (SME) is defined as Service Headquarters Subject Matter Experts: Air Force - The Air Force Fuels Facilities Subject Matter Expert (HQ AFCEC/COS), Army - Headquarters, U.S. Army Corps of Engineers, POL-MCX Facilities Proponent (CECW-EC) through the Army Petroleum Center (APC), Navy/Marine Corps - NAVFAC POL Facility Subject Matter Expert (NAVFAC EXWC, CI11).
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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 Reference Identifier (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 SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.5	(2017) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A312/A312M	(2019) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

ENERGY INSTITUTE (EI)

EI 1529	(2014; 7th Ed) Aviation Fueling Hose and Hose Assemblies

EI 1584	(2017; 4th Ed) Four-Inch Hydrant System Components and Arrangements

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AS5877	(2016; Rev B) Detailed Specification for Aircraft Pressure Refueling Nozzle
SAE J517	(2020) Hydraulic Hose

U.S. AIR FORCE (USAF)

AFI 91-202	(2020) US Air Force Mishap Prevention Program

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-C-83260	(1972; Rev A; Notice 1 1996) Coupler, Hydrant Valve GRU-16/e
MIL-DTL-24788	(2017; Rev B) Coupling Assembly, Semi-Dry-Break, Quick-Disconnect Fuel With or Without Continuity Switch

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50696	(2016; Rev D) 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 must be submitted on specific function equipment. OMSI information must be submitted for the equipment items or systems specified. 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. Emergency dry breakaway coupler (EDBC) is required for USN/USMC projects.

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification 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[, [_____]]

SD-03 Product Data

Flow Meter; G[, [_____]]

Hydrant Coupler; G[, [_____]]

Shut-Off Valve; G[, [_____]]

Automatic Pressure Equalizing System; G[, [_____]]

Pressure Fueling Nozzle; G[, [_____]]

Venturi; G[, [_____]]

Flanged Swivel Joints; G[, [_____]]

Pressure Gage Assembly[; G][; G, [_____]]

[Emergency Dry Breakaway Coupler (EDBC); G[, [_____]]
]

SD-07 Certificates

Materials; G[, [_____]]

SD-10 Operation and Maintenance Data

Flow Meter; G[, [_____]]

Hydrant Coupler; G[, [_____]]

Shut-Off Valve; G[, [_____]]

Automatic Pressure Equalizing System; G[, [_____]]

Pressure Fueling Nozzle; G[, [_____]]

Venturi; G[, [_____]]

Flanged Swivel Joints; G[, [_____]]

Pressure Gage Assembly; G[, [_____]]

[Emergency Dry Breakaway Coupler (EDBC); G[, [_____]]
]

1.4 QUALITY ASSURANCE

1.4.1 Design Conditions

Design must be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT. Components must be ASME B16.5 Class 150 (9 MPa 275 psig at 38 degrees C 100 degrees F, except that swivel joints and pressure fueling nozzles must be 824 kPa 125 psig at 58 degrees C 100 degrees F). Nominal diameters must be as follows:

Hydrant coupler	100 mm4 inch
Piping sections	75 and 100 mm3 and 4 inch
Flanged connection	ASME B16.5 60 kg125 LB
Flow meter	100 mm4 inch ASME B16.5 70 kg150 LB
Shut-off valve/40 mesh strainer	62 or 75 mm2-1/2 or 3 inch
Dry break quick disconnects	62 or 75 mm2-1/2 or 3 inch
Flanged pantograph swivel joints	75 and 100 mm3 and 4 inch
Pressure fueling nozzle	62 mm2-1/2 inch outlet

PART 2 PRODUCTS

2.1 MATERIALS

The type of materials which come in contact with the fuel must be noncorrosive. No zinc coated metals, brass, bronze or other copper bearing alloys must 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 A312/A312M. Only seamless pipe must 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 must conform to ASTM A36/A36M, 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 must 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 SME.

****

b. Provide detachable pantographs consisting of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections must be [_____] mm feet.

c. The connecting section must consist of a hydrant coupler and flanged swivel joints, which allow the coupler to be connected to the hydrant control valve at levels of +/- 150 mm 6 inches from the level of the apron.

d. The connecting section must 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 0.305 to 2.4 m 12 inches to 8 feet above the apron.

f. The dispensing end must 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 must be able to operate the dispensing end.

g. Hoses (except fuel sensing hose) must not be permitted as a part of the detachable pantographs.

h. Detachable pantographs must be equipped with an adjustable automatic pressure equalizing system, relieving at 824 kPa 125 psig to an equalizing reservoir, to compensate for thermal expansion and contraction.

i. The equalizing reservoir's vent must be equipped with a flame arrestor. The reservoir must be sized for a maximum temperature differential of 62 degrees C 144 degrees F.

j. The pantograph must be equipped with supporting structures each mounted on two spring-loaded casters.

k. To avoid sagging, reinforcing must be welded to the underside of the pipe sections.

l. A tow bar must be attached to the front support of the pantograph. Maximum tow speed is 8 km/h 5 mph. Tow bar to be suitable for mounting to pintle hook.

m. The connecting section and the dispensing end must be locked to the main sections of the pantograph when in the stored or towing mode. Pantograph must be provided with a nozzle hanging support.

n. The three main sections of the pantograph must be locked together when in the stored or towing mode.

o. The overall electrical resistance between the hydrant coupler and the pressure fueling nozzle must not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

p. The pantograph must be equipped with two self winding grounding cable reels. The cable must be at least 15 m 50 feet long. Each cable reel, the grounding cable and the connection clamp must be in accordance with CID A-A-50696.

q. The pantograph must be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

r. Detachable pantographs must be provided with 7.5 m 25 feet of [hydraulic] [nitrogen powered] deadman control hose. Hose must be provided with stainless steel fittings, nylon stop ball and aluminum deadman control handle. Hose must be dual type with Buna-N tube, vertically braided textile body with fuel resistant neoprene cover.

****
NOTE: Per SME.
****

s. Detachable pantographs must be equipped with a flow meter, pantograph control valve,[fuel filter separator,][filter,][control valve,][additive injector,] and a venturi. The flow meter must be provided with additional support.

****
NOTE: Per SME.
****

t. The pantograph must 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 must be equipped with two lubricated ball bearings with grease nipples. The wheels must have an overall diameter of at least 305 mm 12 inches and must be equipped with two lubricated grooved ball bearings with grease nipples. The wheels must be coated with rubber. Two of the casters must be equipped with brakes which positively lock the unit in place once at rest. Two casters must 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 must be easily extended up to a connection height of 2.1 to 4.8 m 7 to 16 feet above ground level operated by hand. No electric energy must 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 must be equipped with devices for draining, pressure gauging and venting.

e. Support structures, counter balance systems and all other equipment made of steel must not be welded to the stainless steel pipe. It must be only bolted by clamps to the pipe and must be easily replaceable by common tools in case of repair or maintenance.

f. A tow bar must be attached to the front support of the pantograph. Maximum tow speed is 8 km/h 5 mph. Tow bar to be suitable for mounting to pintle hook.

g. The connecting section and the dispensing end must be locked to the main sections of the pantograph when in the stored or towing mode. Pantograph must be provided with a nozzle hanging support.

h. The overall electrical resistance between the hydrant coupler and the pressure fueling nozzle must not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

i. The pantograph must be equipped with two self winding grounding cable reels. The cable must be at least 15 m 50 feet long. Each cable reel, the grounding cable and the connection clamp must be in accordance with CID A-A-50696.

j. The pantograph must be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

k. The pantograph must 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 must 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 must be equipped with two lubricated ball bearings with grease nipples. The wheels must have an

overall diameter of at least 305 mm 12 inches and must be equipped with two lubricated grooved ball bearings with grease nipples. The wheels must be coated with rubber. Two of the casters must be equipped with brakes which positively lock the unit in place once at rest. Two casters must 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

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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 SME.

****

a. The permanent pantograph must 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 SME

****

b. The permanent pantograph must consist of [two] [three] main sections, plus one connecting section and one dispensing end. Total length of the main sections must be [_____] mm feet.

****

NOTE: Insert required height reach of Pantograph obtained from SME

****

c. The dispensing end must be designed to be coupled to the aircraft at heights of 305 mm 12 inches to [_____] mm feet above the apron.

d. The dispensing end must 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 must be able to operate the dispensing end.

e. Hoses (except fuel sensing hose) must not be permitted as a part of the pantograph.

f. The dispensing end must consist of a 3 m 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 must not be provided.

g. A suitable trough for storing the fueling hose must 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 must be welded to the underside of the pipe sections.

j. The main sections of the pantograph must 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 must not exceed 1 kilo Ohm. Grounding straps across the flanged swivel joints are not permitted.

l. The pantograph must be equipped with a permanent sampling, pressure gage, drain and vent assemblies.

m. The fixed portion of the pantograph must include a pantograph control valve, venturi, and flow meter.

n. A refueling adapter meeting the requirements of MIL-DTL-24788 must be mounted to the return piping for the purpose of flushing the permanent pantograph. The refueling adapter must have a 100 mm 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 must have 200 mm 8 inch diameter solid oil resistant tires and must be equipped with two lubricated grooved ball bearings with grease nipples. The wheels must 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 must consist of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections must be 3 m 10 feet.

b. The dispensing end must be designed to be coupled to the refueling truck at heights of 395 to 1400 mm 12 to 55 inches above the road.

c. The dispensing end must 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 must be able to operate the dispensing end. Pantograph must be provided with a nozzle hanging support.

d. Hoses must not be permitted as a part of the truck fill stand pantograph.

e. The three main sections of the pantograph must be locked together when stored.

f. The overall electrical resistance between the flanged end and the pressure fueling nozzle must not exceed 1 kilo Ohm. Grounding straps across the swivel joints are not permitted.

g. The connecting section and the dispensing end must 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 must be designed for bottom loading of refueling trucks and must be designed in such a way that it can be completely lowered into the pit. Pantograph construction and pit configuration must be coordinated such that interferences and restrictions in operation of the pantograph are eliminated.

b. A combination of flanged swivel joints and pipe sections must permit the required vertical and horizontal adjustments. The pantograph must automatically lock in the up position.

c. The guiding unit for vertical adjustment must be maintenance free.

d. The pantograph must consist of three main sections, plus one connecting section and one dispensing end. Total length of the three main sections must be 3 m 10 feet.

e. The dispensing end must be designed to be coupled to the refueling truck at heights of 305 to 1380 mm 12 to 55 inches above the road.

f. The dispensing end must 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 must be able to operate the dispensing end.

g. Hoses must not be permitted as a part of the truck fill stand pantograph.

h. The three main sections of the pantograph must be locked together when stored.

i. The overall electrical resistance between the flanged end and the pressure fueling nozzle must not exceed 1 kilo Ohm. Grounding straps across the swivel joints are not permitted.

j. The pantograph must 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 must 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 must be of the non-lubricated, maintenance free type with sealed bearings and no lubricating fittings[, and must be arctic-grade].

b. No leakage must be permitted under positive or negative pressure conditions. No leakage must be permitted under high or low temperature conditions. The swivel joints must 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) must be less than 1000 ohms. Each swivel joint must 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) must be used.

2.2.7 Flow Meter

The flow meter must be stainless steel or aluminum, positive displacement, rotor type, bi-directional, temperature compensating. Provide an adjustor for calibrating the meter. Meter must have large visible 5-digit reset totalizer and small visible 8-digit non-reset totalizer. [Meter readout must be mounted on a swivel.] The unit of measurement must be L gal and the increment of measurement must be one L gal.

[2.2.8 Emergency Dry Breakaway Coupler (EDBC)

****

NOTE: EDBC required for NAVY/MARINE CORPS Projects.

****

The EDBC unit must operate independently of internal pressure and separate at a nominal +/- 18 kg 50 pound tensile pull. The EDBC must 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, Cla-Val 346GF, and the Carter Ground Fueling 64227.

]2.2.9 Sampling Connection

Sampling connection must be provided when indicated. Materials must be Type 316 stainless steel. Material for ball valve, quick disconnect coupling must be Type 316 stainless steel. Each sampling connection must consist of a 6 mm 1/4-inch sampling probe where the probe faces upstream, ball valve, a quick disconnect coupling and aluminum dust cap. The sampling connections must be capable of accepting a sampling kit for drawing the samples required to assure fuel quality. Provide a 1 m 3-foot, fuel resistant sampling hose with mating quick disconnect fitting.

2.2.10 Pressure gage assembly

Assembly must consist of 100 mm 4-inch ASME B40.100 pressure gage and pressure gage stop cock. Pressure gage must be liquid filled type with an indicating range 0-1.8 MPa 0-275 psig. Material must be Type 316

stainless steel.

2.2.11 Drain and Vent Assemblies

Assemblies must consist of a 13 mm 1/2 inch ball valve and must terminate with a 180 degree pipe gooseneck and screwed cap for the vent, and the drain must have a 13mm 1/2 inch ball valve and must 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 SME. For new designs use the Commercial Specification. Some installations and countries use the Military Specification couplers and adaptors even though the specification is inactive. Some companies make couplers and adaptors to this specification. Hydrant Control Valve Adapter must 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 must comply with [MIL-C-83260] [EI 1584]. The coupler must be provided with suitable, non-lubricated 360 degree rotation swivel joint and must be suitable for mounting to flanged connection. In addition to the bicycle handle grips, the nozzle must 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 SME if only hose end Pantographs are to be used.
****

A [64 mm 2-1/2 inch] [75 mm 3-inch] shutoff valve must be mounted upstream of the pressure fueling nozzle and must provide safe shutoff of the pantograph for inspection of the dry break quick disconnect strainer.

2.2.14 Dry Break Quick Disconnect

A [64 mm 2-1/2 inch] [75 mm 3-inch] semi-dry break quick disconnect (MIL-DTL-24788, Class 1 or equivalent) must be mounted between the [shut-off valve] [hose end] and the pressure fueling nozzle. The semi-dry break quick disconnect must be capable of swiveling through 360 degrees and must 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. Provide the type of nozzle directed by the SME 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. Secondary control must be provided on all aircraft fueling connections, typical configurations are: (hydrant control valve primary & HHT secondary, HCV & pantograph control valve, Pantograph control valve and hose end regulator).

****

SAE AS5877, 64 mm 2-1/2-inch nozzle [D-1][D-2][D-1R (D-1 with [0.38][0.31]MPa [55][45]psig hose end pressure regulator)][D-2R (D-2 with [0.38][0.31]MPa [55][45]psig hose end pressure regulator)][D-3R (D-3 with [0.38][0.31]MPa [55][45]psig hose end regulator)]must be provided for the connection between pantograph and aircraft. Design must be for single point fueling of [aircraft][and][truck]at a flow rate of 36 L/s 600 gpm with maximum pressure drop of 2 kPa 30 psig. Nozzle must 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 0-7 MPa 0-100 psig indicating range mounted on actuator for use with quick disconnect sampling coupler.

[2.2.16 Aviation Fuel Hose

Fueling hose must conform to EI 1529, Grade 2, Type C, semi-hardwall, [75] [62] mm [3] [2.5]-inch nominal hose designed for use with specified fuel for a working pressure of 2 MPa 300 PSIG over a working temperature range of0 to 55 degrees C -22 to 131 degrees F. Hose must 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 must be constructed of stainless steel. The venturi must be sized to compensate for pressure drop of entire pantograph assembly at minimum through maximum design flow rate. The amount of recovery must be adjustable and the maximum unrecoverable pressure drop at 36 L/s 600 gpm must be less than 69 kPa 10 psi.

b. Provide venturi control lines with needle valve to be used during final adjustment of pantograph. Venturi control lines must be provided with pressure gauge and pressure gauge stop cock. Indicating range must be 0-667 kPa 0-100 psig. Material must be Type 316 stainless steel.

c. Detachable pantograph venturi must be provided with a 10 mm 3/8 inch stainless steel fuel sensing line and 2.4 m 8 feet of 8 mm 5/16-inch fuel sensing hose. Fuel sensing line and hose must 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 must be resistant to the effects of

hydrocarbon fuels and must conform to SAE J517-100R7.

2.2.18 Pantograph Control Valve

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NOTE: Per SME.
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Refer to Section 33 52 43.14 AVIATION FUEL CONTROL VALVES.

[2.2.19 Fuel Separator

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NOTE: Per SME.
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Refer to Section 33 52 43.28 FILTER SEPARATOR, AVIATION FUELING SYSTEM.

][2.2.20 Additive Injector

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NOTE: Per SME.
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Refer to Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT.

]2.2.21 Nitrogen Powered Deadman Control System

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NOTE: Include only if selected in paragraph DETACHABLE AIRCRAFT PANTOGRAPH, in PART 1.
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Provide pantographs with a 1.09 cubic m 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 must be mounted to the pantograph. Provide 3 m 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 must be delivered completely assembled.

3.2 TESTING

The pantograph must be tested as described in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START-UP.

-- End of Section --