

GUIDE SPECIFICATION FOR CONSTRUCTION

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DIVISION 15 - MECHANICAL

SECTION 15051

PANTOGRAPHS

04/99

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DEPARTMENT OF THE ARMY CEGS-15051 (04/99)
U.S. ARMY CORPS OF ENGINEERS -----
Superseding
CEGS-15051 (MM/YY)

GUIDE SPECIFICATION FOR CONSTRUCTION

SECTION 15051

PANTOGRAPHS

04/99

NOTE: This guide specification covers the requirements for Pantographs used in aircraft refueling systems or at truck fill stands for trucks used to refuel aircrafts as part of the Air Force Type III Standard (78-24-28-88). This guide specification is to be used in the preparation of project specifications in accordance with ER 1110-345-700 for military construction and in accordance with ER 1110-2-1201 for Civil Works construction.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest change (Notice) to this guide specification. During the reference reconciliation process, SPECSINTACT will automatically remove references from this paragraph that have been removed from the text.

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.

MILITARY SPECIFICATIONS (MS)

- | | |
|----------------|---|
| MS MIL-N-5877 | (Rev D) Nozzle, Pressure Fueling Servicing, Locking, Type D-2, Nominal 2-1/2 Inch Diameter. |
| MS MIL-R-83232 | (Rev B; Am 2) Reel, Static Discharge, Grounding RMU-20/E, 50-Foot with Clip |

MS MIL-C-83260 (Rev A) Coupler, Hydrant Valve GRU-16/e

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.5 (1988; Errata Oct 88; B16.5a) Pipe Flanges and Flanged Fittings

ASME B40.1 (1991) Gauges - Pressure Indicating, Dial Type, Elastic Element

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36 (1994) Carbon Structural Steel

ASTM A312 (1991) Seamless and Welded Austenitic Stainless Steel Pipe

AMERICAN PETROLEUM INSTITUTE (API)

API 1584 (1994) Four-Inch Hydrant System Components and Arrangements

AIR FORCE INSTRUCTION (AFI)

AFI 91-202 United States Air Force Mishap Prevention Program

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J517 (1987) Hydraulic Hose

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.

Indicate submittal classification in the blank space using "GA" when the submittal requires Government approval or "FIO" when the submittal is for information only.

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Manufacturer's Data

Complete technical literature shall be submitted on specific function equipment. Submittals shall include but not necessarily be limited to the following:

Flow meter; GA.

Hydrant coupler; GA.

Shut-off valve with 60 mesh strainer; GA.

Automatic pressure equalizing system; GA.

Pressure fueling nozzle; GA.

Venturi; GA.

Swivel joints - flanged and compact types; GA.

Sampling and drain assembly; GA.

Pressure gage assembly; GA.

Venting assembly; GA.

SD-04 Shop Drawings

Scaled assembly drawings; GA

Scaled assembly drawings identifying components and showing dimensions and tolerances.

SD-09 Certificates of Compliance

Materials of construction; GA.

AFSSEA Approval; GA.

SD-19 OMSI Submittals

OMSI information shall be submitted for the equipment items or systems listed below. Refer to Section entitled "Operating and Maintenance Support Information (OMSI)" for the information to be submitted for various types of equipment and systems.

Flow meter; GA.

Hydrant coupler; GA.

Shut-off valve with 60 mesh strainer; GA.

Automatic pressure equalizing system; GA.

Pressure fueling nozzle; GA.

Venturi; GA.

Swivel joints - flanged and compact type; GA.

Sampling and drain assembly; GA.

Pressure gage assembly; GA.

Venting; GA.

Aircraft pantograph submitted under this specification shall have been approved by the Air Force System Safety Engineer Analysis (AFSSEA) Team in accordance with AFI 91-202.

PART 2 PRODUCTS

2.1 DESIGN CONDITIONS

Shall be as specified in section entitled "Mechanical Equipment, Fueling". Components to be ASME B16.5 Class 150 (275 psig at 100 degrees F, except swivel joints and pressure fueling nozzles shall be 125 psig at 100 degrees F).

2.2 CONSTRUCTION FOR AIRCRAFT PANTOGRAPHS

a. The pantograph shall be designed in such a way that all wheel supports rest upon the apron regardless of the different terrain conditions.

b. 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 [____] feet.

**NOTE: INSERT REQUIRED PANTOGRAPH LENGTH OBTAINED
FROM COMMAND FUEL FACILITIES ENGINEER.**

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 balance or hydraulically actuated cylinders which balances the weight of the hydrant coupler, flanged swivel joints and pipe connecting section.

e. The dispensing end shall be designed to be coupled to the aircraft at heights of 12 inches to 8 feet above the apron.

**NOTE: THIS REQUIREMENT MUST BE REVISED FOR KC-10
AND E-4 AIRCRAFT TO HEIGHTS OF 7 FEET TO 16 FEET
ABOVE THE APRON.**

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, 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.

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

h. The pantograph 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 arrester. 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. The flow meter shall be provided with additional supports.

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 miles per hour. 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.

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

o. The overall electrical resistance between the hydrant coupler and the pressure fueling nozzle shall not exceed 1 Kilo Ohm. Grounding straps across the 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 MS MIL-R-83232.

q. The pantograph shall be equipped with a permanent sampling and drain assembly, pressure gage assembly and venting assembly.

r. All pantograph swivel joints (flanged and compact type) shall be stainless steel single plane swivels capable of 360 degree rotation.

s. Pantograph 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 ENGIHEER.

t. The whole unit consists of a steel frame with spring loaded casters and a lifting platform. The pipe sections are interconnected by swivel joints.

u. The dispensing end is mounted on the platform and consists of a combination of pipes, swivel joints and elbows without the necessity of using hoses.

v. The platform with the dispensing end shall be easily extended up to a connection height of 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.

w. The platform must be secured with railing and automatically closing door.

x. The pantograph shall be equipped with devices for draining, pressure gauging and venting.

y. Support structures, counter balance system 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. All repair work at the construction site on the pantograph shall be possible by the LFM personnel.

**NOTE: THESE REQUIREMENTS SHALL BE ADDED FOR KC-10
AND E-4 AIRCRAFT.**

2.3 CONSTRUCTION FOR TRUCK FILL STAND PANTOGRAPHES

a. 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.

b. The dispensing end shall be designed to coupled to the tank truck at heights of 12 inches 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, 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.

d. Hoses shall not be permitted as a part of the pantograph.

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

f. The overall electrical resistance between the hydrant coupler 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 and drain assembly, pressure gage assembly and venting assembly.

h. All pantograph swivel joints (flange and compact type) shall be stainless steel single plane swivels capable of 360 degree rotation.

2.4 CONSTRUCTION FOR TRUCK FILL STAND PANTOGRAPHES (RECESSABLE)

a. The pantograph shall be designed for bottom loading of tank 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 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 tank truck at heights of 12 inches 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, 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 pantograph.

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

i. The overall electrical resistance between the hydrant coupler 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 and drain assembly, pressure gage assembly and venting assembly.

k. All pantograph swivel joints (flange and compact type) shall be stainless steel single plane swivels capable of 360 degree rotation.

2.5 SIZE CRITERIA

Nominal diameters shall be as follows:

Hydrant coupler	4 inch
Piping sections	3 inch and 4 inch
Flanged connection	ASME B16.5 125 LB.
Flow meter	4 inch, ANSI B16.5 150 LB.
Shut-off valve with 40 mesh strainer	2-1/2 or 3 inch
Compact swivel joint	2-1/2 or 3 inch
Flanged swivel joints	3 inch and 4 inch
Pressure fueling nozzle	2-1/2 inch outlet

2.6 DESIGN REQUIREMENTS

2.6.1 Flanged Swivel Joints

a. Flanged swivel joints shall be 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 type with non-lubricated bearings.

b. 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 6-bolt flange connector is permitted. The swivel joints shall be warranted for two years against leakage.

c. There shall be electrical continuity from one flange to the other without the use of ground straps.

2.6.2 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. The unit of measurement shall be gallons and the increment of measurement shall be one gallon.

2.6.3 Spring-loaded Casters

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 non-abrasive polyurethane, 90 shore or 40 Series.

a. Two of the casters shall be equipped with brakes which positively lock the unit in place once at rest.

b. Two casters shall be equipped with an additional device which can be adjusted to lock automatically for towing the pantograph.

2.6.4 Sampling and Drain Assembly

Assembly shall provide for both sampling and draining of fuel. Materials shall be Type 316 stainless steel. Assembly shall consist of a 1/2-inch ball valve and 1/2-inch quick disconnect coupling with aluminum dust cap. Material for ball valve, quick disconnect coupling shall be Type 316 stainless steel. Structural steel shall conform to ASTM A36, hot dipped galvanized after fabrication and painted a factory standard color. A 3-foot, fuel resistant sampling hose with mating quick disconnect fitting shall be provided.

2.6.5 Pressure gage assembly

Assembly shall consist of 4-inch ASME B40.1 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.

2.6.6 Venting Assembly

Assembly shall consist of a 1/2 inch ball valve and shall terminate with a 180 degree pipe gooseneck and screwed cap.

2.6.7 Hydrant Coupler

The hydrant coupler is the connection between the hydrant system and the pantograph. It shall comply with [MS MIL-C-83260] [API 1584]. The coupler shall be provided with suitable, non-lubricated 360 degree rotation swivel joint and shall be suitable for mounting to flanged connection.

**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.**

2.6.8 Shut-Off Valve With Strainer

[Two and one-half inch] [3-inch] shutoff valve with 40 mesh strainer. It shall be mounted upstream of the pressure fueling nozzle and shall provide safe shutoff of the pantograph for inspection of the strainer.

**NOTE: PER COMMAND FUELS FACILITY ENGINEER
DIRECTION.**

2.6.9 Compact Swivel Joint

A [2-1/2 inch] [3-inch] compact swivel joint shall be mounted between the shut-off valve with strainer and the pressure fueling nozzle. The compact swivel shall be non-lubricated, maintenance free type. 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 two years against leakage. There must be electrical continuity from one flange to the other without the use of ground straps.

2.6.10 Pressure Fueling Nozzle

MS MIL-N-5877, 2-1/2-inch straight nozzle (D-2), non-swivel, with dry-break 60 mesh strainer shall be provided for the connection between pantograph and aircraft. Design shall be for single point fueling of air crafts at a flow rate of 600 gpm with maximum pressure drop of 30 psig. Nozzle shall be provided with a permanently installed quick disconnect coupler, aluminum dust plug with chain. Gammon GTP-235-3/8 Jet Test QD meets this specification. Provide pressure gage with 0-100 psig indicating range mounted on actuator for use with quick disconnect coupler.

2.6.11 Venturi

Provide for compensated pressure regulation 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. Venturi control lines shall be provided 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.

2.6.11.1 Fuel Sensing Line and Hose

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 shall be provided with quick disconnect suitable for connection to hydrant control valve's pilot system. Fuel sensing hose tube and cover shall be resistant to the effects of hydrocarbon fuels and shall conform to SAE J517-100R7.

2.16.12 Nitrogen Powered Deadman Control System

NOTE: INCLUDE IF SELECTED IN PARAGRAPH 2.2.19.

Pantographs shall be provided with a 39 cubic foot nitrogen cylinder, adjustable pressure regulator, quick release shuttle for the nitrogen, interconnecting control tubing 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.

2.7 MATERIALS

NOTE: SELECT SECTION ENTITLED "MECHANICAL GENERAL REQUIREMENTS" FOR NAVFACENCOM PROJECTS OR SECTION ENTITLED "GENERAL REQUIREMENTS" FOR COE PROJECTS

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:

2.7.1 Stainless Steel Piping

Schedule 10S, conforming to ASTM A312, seamless only.

2.7.2 Fitting and Bends

Same thickness as adjoining pipe.

2.7.3 Components

Aluminum alloy or stainless steel.

2.7.4 Structural Steel

Structural steel shall conform to ASTM A36, hot dipped galvanized after fabrication and painted a factory standard color.

2.8 ASSEMBLY

The pantograph shall be delivered completely assembled.

PART 3 EXECUTION

3.1 INSTALLATION

The pantograph shall be tested as described in Section 15899 SYSTEM START-UP, FUELING.

-- End of Section --