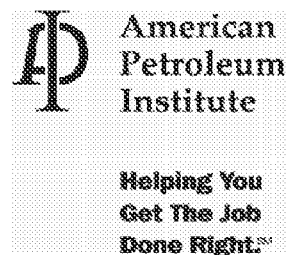
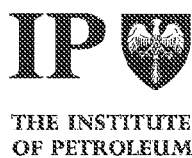


FOUR-INCH HYDRANT SYSTEM
COMPONENTS AND ARRANGEMENTS

API/IP SPECIFICATION 1584

Third edition
April 2001



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Published jointly by
American Petroleum Institute
and
The Institute of Petroleum, London
A charitable company limited by guarantee

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ISBN 0 85293 280 4

Published by The Institute of Petroleum

Further copies can be obtained from Portland Press Ltd. Commerce Way,
Whitehall Industrial Estate, Colchester CO2 8HP, UK. Tel: 44 (0) 1206 796 351
email: sales@portlandpress.com

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FOREWORD

This joint Institute of Petroleum and American Petroleum Institute publication provides recommended minimum performance and mechanical specifications for the design of aviation fuel hydrant system pit valves and associated couplers.

This publication also specifies requirements that need to be met to achieve full interchangeability between components of various manufacturers and requirements for optional features which component manufacturers may be requested by users to provide.

This publication has been produced jointly by the API Aviation Technical Services Subcommittee and the IP Aviation Committee. It replaces *API Standard 1584* second edition, December 1994, *IP Aviation hydrant pit systems recommended arrangements*, August 1990 and *IP The inspection and testing of airport hydrant pit valves*, July 1993.

It is possible that this joint publication will have a wider scope of usage and will encompass differing operating practices and safety and environmental legislation. Therefore, this publication should be read in conjunction with appropriate national and local statutory operating requirements. It is recommended that, if procedures defined in this publication are more stringent than those at the point of use are they should be followed.

Whilst the use of hydrant pit valve assemblies designed for use with 150 mm (6 in.) hydrant riser flanges is preferred, requirements for valves that are able to mate with other flanges are also included.

The requirements of this publication are not retroactive. Users of existing equipment should decide what action to take if equipment in current use does not conform to the requirements of this edition. Due consideration should be taken of the safety implications of non-conformance.

Within six months of the publication of this edition, manufacturers will be expected to be able to supply modification kits, where necessary, for any existing equipment that does not conform to the requirements of this edition.

The Institute of Petroleum and American Petroleum Institute are not undertaking to meet duties of employers, manufacturers or suppliers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations under local and regional laws and regulations.

Nothing contained in any Institute of Petroleum or American Petroleum Institute joint publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

Although it is hoped and anticipated that this publication will assist both the manufacturers and purchasers of aviation fuel hydrant system pit valves and couplers, the Institute of Petroleum and the American Petroleum Institute cannot accept any responsibility, of whatever kind, for damage or loss, or alleged damage or loss, arising or otherwise occurring as a result of the application of the specifications or qualification procedures contained herein.

Suggested revisions are invited and should be submitted to the Manager of Standardization, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005, USA or to the Technical Department, Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK.

Note for users of equipment covered by this publication. This publication includes a requirement for couplers to break away cleanly from the pit valve adapter if struck with a force as defined herein. It is recommended that, if a pit valve/coupler assembly is struck with sufficient force to remove the coupler during refuelling operations, the pit valve should be removed from service for inspection and tested to prove its suitability for further use. Users are referred to the recommended post-impact action in Annex C.

ACKNOWLEDGEMENTS

This edition of API/IP 1584 has been prepared by the IP Equipment Sub-Committee on behalf of the Institute of Petroleum and the American Petroleum Institute Aviation Technical Services Sub-Committee. Much of the redrafting was undertaken by Bob Simpson (Consultant) and Adrian Hamra (ExxonMobil).

Draft versions of this third edition were reviewed by representatives of the following companies:

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INTRODUCTION, SCOPE AND REFERENCED PUBLICATIONS

1.1 INTRODUCTION

The performance requirements and optional recommendations included in this publication are intended to achieve the following:

- (a) Establish the acceptable structural and operating integrity of the components involved.
- (b) Provide a compatible coupling configuration and arrangement at the hydrant pit that will permit interchangeability between the components of different manufacturers.
- (c) Assist component manufacturers in their design efforts by detailing operational, maintenance and ergonomic features of components that are considered desirable based upon experience in aircraft fuelling.
- (d) Describe the alternative arrangements of hydrant pit components that are typical for API and IP 4 inch hydrant systems and thereby assist component manufacturers and aircraft fuelling system designers and operators in their efforts.
- (e) Provide mechanical strength criteria for normal handling loads and failure modes for excess mechanical loadings and impact damage.

1.2 SCOPE

1.2.1 General

This publication specifies dimensions, coupling action, activation, and other requirements to achieve the necessary operational requirements and full interchangeability between components from manufacturers of hydrant pit valve assemblies and couplers. It also includes requirements for other optional features which component manufacturers may be requested to provide by purchasers. The performance specifications are for equipment intended for systems in aviation turbine fuel service. They do not apply to aviation gasoline (Avgas).

1.2.2 Organization

If complete interchangeability is to be attained, certain features of the mating components shall be standardised. Other features, although desirable, are not so critical, but are pointed out to assist manufacturers in the design of these components.

The pit valve and coupler, along with any other features attached, are considered to be as a whole for the purposes of this publication.

Section 3 covers general arrangement and features, specifying those features of the hydrant components that are mandatory, as well as those that are optional.

They are listed as "Mandatory" and "Optional" respectively. Section 4 describes performance criteria and test requirements for the hydrant pit valve assembly and hydrant coupler. Section 5 contains the quality assurance and information requirements. Five annexes are included for information only.

1.3 REFERENCED PUBLICATIONS

The following publications are cited in this publication. The latest available edition of each referenced publication applies.

API

RP 1004 *Bottom loading and vapour recovery for MC-306 tank motor vehicles.*

Specification Q1 *Specification for quality programs for the petroleum and natural gas industry.*

ASME ¹

B.16.5 *Pipe flanges and flanged fittings.*

IP ²

Fuel hydrant riser pipe stress analysis due to accidental impact loads.

The closure behaviour of aviation hydrant pit valves (Delft Hydraulics).

Sanderson, T.A., and Simpson, R.A. 1990, *Excess flow testing of hydrant pit valves*, Petroleum Review, May 1990.

ISO ³

9000:2000 *Quality management systems.*

10012-1 *Quality assurance requirements for measuring equipment: Metrological confirmation system for measuring equipment.*

SAE ⁴

ARP 868A *Method pressure drop test for fuel system components.*

1. American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10016-5990, USA. www.asme.org

2. Available from the Institute of Petroleum library, 61 New Cavendish Street, London W1G 7AR, UK

3. International Organization for Standardization, Case Postale 56, CH-1211 Geneva, Switzerland. www.iso.ch

4. Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA. www.sae.org

TERMS, DEFINITIONS AND ABBREVIATIONS

2.1 TERMS AND DEFINITIONS

For the purposes of this publication the following terms and definitions apply:

clean breakaway: when used in describing the breakaway of the hydrant coupler from the hydrant pit valve adapter, means that the coupler breaks away completely to allow the pit valve outlet adapter poppet to close. In practice, complete seating of the poppet cannot be guaranteed as coupler debris that may be left could prevent full poppet closing.

hydrant coupler: a unit that is attached to the inlet end of the hydrant dispenser inlet hose or boom assembly to provide for quick coupling to the outlet adapter of the hydrant pit valve assembly. The coupler may be one of four types, any of which can be equipped for product selectivity:

- *standard coupler:* a quick coupling device that allows for manually opening and closing the poppet on the hydrant pit valve assembly and provides a flow path from the hydrant pit valve assembly to the dispenser.
- *direct acting digital control coupler:* a coupler that incorporates the same features as a standard coupler, but uses a digital module to control pressure and flow for each hose combination. A

timer deadman may be included with this system as an option.

- *direct acting pressure control coupler:* a coupler that incorporates the same features as the standard unit, but also includes air-operated deadman and spring biased pressure regulation at a remote sensing point. This coupler also has optional excess flow control.
- *pilot-operated pressure control coupler:* a coupler that has the same features as the standard unit, plus the air deadman feature, but controls pressure by means of a pilot mechanism. This coupler also has optional excess flow control (with either single or dual flow rate settings).

hydrant coupler carriage assembly: a device fitted to the hydrant coupler to assist in moving the coupler to and from the pit valve whilst keeping the coupler from dragging on the ground.

Note: It generally takes the form of two small wheels on a structure that may be folded up beneath the inlet hose when not in use.

hydrant dispenser: (also known as 'hydrant servicer', 'aircraft fuel servicer' or 'hydrant cart') a fuelling unit used to receive fuel from a hydrant fuel supply system and deliver it to aircraft. It may be self-propelled, trailer mounted or skid mounted.

Note: It is normally fitted with filtration, pressure control, deadman control and metering equipment and is connected to the hydrant pit valve by a hydrant coupler and an inlet hose or metal boom assembly. The hydrant dispenser is used to deliver fuel into aircraft via a delivery hose and nozzle.

hydrant pit valve assembly: a valve that is vertically mounted on the flanged riser of an airport fuel piping system.

Note: The valve is composed of three components: the flanged inlet pilot-operated valve, the pilot device and the outlet adapter that mates with the hydrant coupler. Optional features may be included.

- *intermediate strainer:* an optional fine mesh screen that is mounted internal to the hydrant pit valve assembly, normally between the pilot-operated valve and the outlet adapter.

Note: The use of such a strainer is not recommended.

- *outlet adapter:* the outlet portion of the hydrant pit valve assembly to which the hydrant coupler mates. The outlet adapter has a poppet that is opened and closed by the coupler poppet. The outlet adapter provides a seating for the poppet and for optional product selectivity.

- *pilot device:* a mechanism which diverts pressure to and from the actuating element of the pilot-operated valve to enable it to either open or close in a controlled manner.

Note: The required methods for operating the pilot device are defined in 3.2.8.

- *pilot device override:* (also known as a 'servicing valve') a manually operated valve or device that overrides the action of the pilot valve thus preventing opening of the pilot-operated valve.
- *pilot-operated valve:* located at the inlet, it forms an integral part of the hydrant pit valve assembly and isolates downstream components from the fuel hydrant supply pressure. It is operated by the pilot device and controls the flow of fuel out of the hydrant pit valve assembly.
- *pressure equalisation valve:* a small valve located in the centre of the outlet adapter poppet that is actuated by the hydrant coupler poppet. This valve allows equalisation of the pressure contained

within the hydrant pit valve assembly with the pressure within the hydrant coupler.

- *stoneguard:* a mandatory coarse mesh screen (e.g. 5 mm or ¼ in. or equivalent) perforated metal strainer that is mounted upstream of the hydrant pit valve assembly to impede the flow of large debris normally foreign to fuel systems.

flow:

- *automatic excess flow control:* a device installed on or within the hydrant pit valve assembly and/or coupler to prevent excess flow.

Note: Upon the flow rate increasing to a predetermined level, the device will actuate the hydrant pit valve assembly and/or coupler to close and remain closed until the excess flow control device is reset.

- *catastrophic excess flow:* the maximum flow rate required to be stopped by the hydrant pit valve.
- *excess flow:* a flow rate in excess of rated flow.
- *rated flow:* the maximum flow rate for which the components of the pit valve assembly and coupler are designed.

in-line pressure control (or regulating) valve: a valve installed on board the hydrant dispenser forming a part of the fuel pressure control (or regulating) system. It may also provide a deadman operation, being opened and closed remotely by the fuelling operator. This valve is outside of the scope of this publication and may be fitted at the discretion of the user.

opening and closing times:

- *closing time:* the time required, after the operating device is actuated to close, for flow to cease from rated flow.
- *deadman control:* a hand-held control to actuate the opening and closing of the hydrant pit valve assembly and/or hydrant coupler.
- *opening time:* the time taken to achieve 90 % of rated flow measured from the time that the operating device is actuated.
- *overshoot:* the volume of liquid passing through the valve during the closing time period.

pressure:

- *burst pressure*: the pressure causing structural failure of the external casing of the hydrant pit components covered by this publication.

Note: For the purposes of this publication, the pressure defined in 4.4.2 is the minimum pressure above which structural failure may occur.

- *design pressure*: the maximum pressure to which the hydrant pit components will be subjected in service.

Note: This pressure equates to operating pressure plus surge pressure to which the equipment may be exposed. The performance criteria of this document do not apply at design pressure.

- *operating pressure*: the maximum steady state pump pressure that can be experienced in the system. At this maximum pressure, the hydrant pit valve assembly and coupler are required to conform to the performance criteria of this publication.

- *pressure loss*: the difference in static pressures measured in the test set-up defined in Figure 6 from point A to point B.

- *proof pressure*: the maximum pressure required of the hydrant pit components without external leakage or damage after which the components will meet all other performance requirements.

pressure control valve: a control valve that may be located either in the hydrant pit valve assembly or in the hydrant coupler assembly. This valve forms part of the pressure and flow control system delivering fuel to the aircraft. May also be known as a pressure-regulating valve.

vacuum test: a negative pressure applied to the hydrant pit valve assembly under which the poppet shall remain closed and not allow leakage of air in the reverse direction.

2.2 ABBREVIATIONS

The following abbreviations are used within this publication:

ft	feet
in.	inch
kg	kilogram
kPa	kiloPascal
kph	kilometres per hour
lbs	pounds mass
lbf	pounds force
lpm	litres per minute
m	metre
mm	millimetre
mph	miles per hour
N	Newton
psi	pounds per square in.
USG	US gallon
USGPM	US gallons per minute
°F	degrees Fahrenheit
°C	degrees Celsius
°	degree of angle

2.3 UNITS USED

This publication uses the *Système International d'Unités* (International System of Units or SI). In this system, the decimal point is a comma (,). In writing numbers of greater than 3 digits, e.g. thousands, tens of thousands etc. a comma may not be used to demarcate the thousands. Thousands are demarcated by the use of a space.

Within this publication SI Units are used with US Customary Units following in parentheses. Internationally agreed conversions have been applied to these values.