American Gas Association

April 2011

AGA White Paper on Verification of MAOPs for Existing Steel Transmission Pipelines[1]

On January 10, 2011, PHMSA issued an advisory bulletin (ADB-11-01) to natural gas pipeline operators in which it instructed operators to take appropriate actions to ensure its records for transmission pipeline MAOPs are "*traceable, verifiable and complete*." AGA and its members submitted detailed comments in response to the advisory, expressing their concerns that the advisory was confusing and even exceeded existing code requirements. AGA members also worked on developing this paper, which serves two primary purposes:

1) Enlightening all parties so that there is a better understanding of how MAOPs were originally determined by pipeline operators and what type of records are useful in verifying this determination; and

2) Providing guidance for what documentation is reasonable to expect a natural gas pipeline operator to have in responding to concerns identified in the PHMSA advisory bulletin.

Overview:

- This paper will discuss the four primary criteria that must be considered under Title 49 Code of Federal Regulation (49 CFR) Section 192.619(a) for establishing MAOP - - design records, pressure testing, the highest actual operating pressure in the five years preceding the creation of the federal pipeline safety code in 1970, and the maximum safe pressure considering the operating history. Section 192.619 is included as Attachment A.

- This paper reviews the range of records an operator might reasonably be expected to have in support of pipeline MAOPs.[2]

- This paper discusses the standards for determining MAOP prior to the adoption of the Federal Minimum Safety Regulations.

The federal pipeline safety code became effective in November of 1970. Approximately 61% of natural gas transmission pipelines in service today were installed prior to this date. Although there was no federal code in place, these pipelines were generally installed and had their MAOP established under the ASA B31.1 standard (1935-51), the ASME B31.8 standard (1952 and after) or individual company standards, which were largely based upon the foundation of the ASA/ASME standards. These earlier standards provide valuable guidance on the safety margin in such pipelines at the time of their construction. Even with the implementation of part 192 regulations, specificity regarding records was not imposed. While 192.603(b) requires operators to keep records necessary to administer the procedures established under 192.605, there are no

[1] Please see final page for notices, copyright and permissible uses.

[2] AGA members recognize that any MAOP determination must ultimately take into consideration the strength rating of pipe components such as valves, flanges, tees, and elbows. The following discussion on pipeline records is applicable to pipe components.

explicit MAOP records requirements. Only 192.517 requires detailed information on test records.

There was recognition at the time Part 192 was implemented that the testing practices of the predecessor standards were different than what was being proposed in the new federal pipeline safety regulations. It was for this reason that 192.619(a)(3) and (c) [the 5-year window clause] were included as part of the original Part 192 rule implemented in 1970.

The natural gas industry is no different from other industries that face a challenge in maintaining its records of assets that are over 40 years old. One can imagine the challenges of keeping detailed physical paper records on every pipeline segment, some of which date back in excess of forty years. Pipelines in operation have **already** gone through the process of establishing a technically-based MAOP in compliance with the pipeline safety regulations. Some of the original installation records used to establish the MAOP may now be missing or judged as incomplete. That said, it is also critical to recognize the MAOPs of these pipelines have always been subject to regulatory review since the promulgation of federal or state pipeline safety regulations, and certainly from the pipeline's commissioning after November 1970. Pipelines in operation today have MAOPs previously accepted by state regulators as being compliant with Section 192.619. These MAOPs were established through logical, technical, and sound engineering methods identified in the regulations.

Discussion:

There are four primary criteria used by pipeline operators in establishing MAOP of a natural gas transmission pipeline under the existing code: Design Pressure, Pressure Test, Historic Operating Pressure and the Maximum Safe Pressure. Federal and state regulators have always expected operators to have a technical justification for how they arrived at any pipeline's MAOP. We will describe examples of what types of documentation are useful for an operator to have under each criteria.

(i) Design Pressure 192.619(a)(1)

The pipeline safety regulations contain requirements to design a pipeline to withstand internal pressures that may be imposed on the pipe. The formula used to design steel pipe includes factors such as the pipe's material strength, wall thickness, longitudinal joint factor, and diameter which determine the design pressure the pipe can safely withstand. This calculated pipe design pressure is multiplied by a "Design Factor" which provides a substantial margin of safety that establishes the maximum allowable MAOP and provides a substantially increased margin of safety. This Design Factor ranges from 0.72 (in rural locations) to 0.40 (in downtown locations). The ultimate result of the design pressure calculation is an MAOP with a safety factor ranging from 138% to 250% of the pipe strength.

For pipelines installed after the November 1970 effective date of the current regulations, any one of the following would be examples of documentation sufficient for verifying the design pressure calculation:

1. As-built documentation indicating pipe's attributes, such as minimum pipe yield strength, wall thickness and diameter
2. Documentation from the pipe mill which confirms the specifications of the pipe manufactured and delivered to the operator
3. A bill of material, purchasing requisition, or other documentation which contains the operator's specifications of the pipe ordered from the pipe supplier

If companies are missing any pipe attribute information, then AGA generally agrees that for purposes of establishing MAOP, the most conservative, applicable value must be used. As an example, a company may have specific knowledge on its legacy practices which give it a sound basis to make educated decisions. In this case, if the company's demonstrable policy has been that it only used Grade B or higher pipe, then it should be able to use Grade B pipe specifications as the most conservative pipe yield strength for the purposes of calculating the design pressure. However, if no such documentation exists and no records of the grade of said pipe exists, it must be assumed the pipe is 24,000 psi yield strength for the purposes of calculating the design pressure. The most conservative assumptions must always be made when completing these assessments. This methodology is consistent with ASME's guidelines found in B31.8S-2004, Appendix A1.2.

Pipelines constructed, replaced, relocated or otherwise changed prior to November 1970, or designed and constructed prior to March 1971[3] were largely designed, constructed and installed under the applicable industry standard at the time of construction or a company standard, based upon the applicable industry standard. Between 1955 and 1970, the most common applicable industry standard was ASME B31.8; prior to 1955, the applicable standard was ASA B31.1. It is also worth noting that some states incorporated standards' requirements prior to 1970. For these pipelines, documented use of any of the aforementioned standards' requirements would be appropriate to verify design pressure calculations. In addition, there may be other types of operator-specific documentation that may help the operator verify the design pressure calculation.

(ii) Pressure Test - 192.619(a)(2)

Another method of establishing a pipeline's MAOP is to conduct a pressure test. Such a test involves isolating a pipeline, filling it with a testing medium such as water or an inert gas, pressuring the pipeline to a test pressure for a specific time period, and monitoring the pipeline for ruptures or leaks. If there is a rupture or leak, the pressure test is repeated after repairs with the process repeated until the test pressure can be maintained for the entire test period. All pipelines constructed after November 1970 are required to pass a post-construction pressure test, as prescribed in Subpart J of the Federal Minimum Safety Regulations.

For pipelines installed after November 1970, section 192.517 is explicit in what records are initially required for operators to have:

[3] There was a gap to allow for transmission pipelines that were already designed prior to November 1970, yet constructed and placed into service after this date (but prior to March 1971).

(1) The operator's name, the name of the operator's employee responsible for making the test, and the name of any test company used.

(2) Test medium used.

(3) Test pressure.

(4) Test duration.

(5) Pressure recording charts, or other record of pressure readings.

(6) Elevation variations, whenever significant for the particular test.

(7) Leaks and failures noted and their disposition.

Operators may have other corroborating information that a pressure test was conducted for its pre- November 1970 pipelines. Examples of this type of information are listed below. Any one of these records should be sufficient documentation to address the concerns outlined in PHMSA advisory bulletin ADB-11-01.

1. Test pressure charts
2. Job-specific pressure test plan or procedure
3. Notation of completion of pressure test requirements on as-built
4. Field notes or log books with details of testing
5. A company form with some of the test details signed and dated by employee or contractor who oversaw pressure test
6. Signed statement from employee or contractor who oversaw pressure test, verifying successful completion of the tests and the pressure that the pipeline was subject to during the test.
7. A corporate standard from pre-November 1970 that stipulates the basis for test pressures on newly constructed transmission pipelines or other engineering records or documents that indicate the accepted MAOP
8. Company correspondence with regulatory agencies
9. Pre-1970 documentation attesting to pressure tests on other parts of a pipeline that was installed on the same job requisition

Additionally, there may be other types of operator-specific documentation that may support the operator in verifying that a pressure test was conducted. It should also be acceptable for an operator to use some combination of these types of records to validate the existing MAOP.

(iii) Historic Operating Pressure 192.619(a)(3)

In recognition of the many miles of transmission pipeline constructed and in operation prior to the initial adoption of the Federal Minimum Pipeline Safety Regulations, the pipeline safety regulations contain a provision that requires the MAOP to be defined as the highest actual operating pressure that the pipeline segment had been subjected to during the five years

preceding July 1, 1970. The use of this provision in establishing the MAOP under 192.619(a) may be a limiting factor, as it will often result in an MAOP that is equal to or lower than the other three primary criteria.

A PHMSA document "*Determination of Maximum Allowable Operating Pressure in Natural Gas Pipelines*" was initially issued in the 1990s to pipeline operators and regulators, for clarifying what records would be acceptable for documenting the historic operating pressure. Significantly, it has been used by OPS training personnel. It is included as Attachment B in the appendix of this document. In part, it states:

> **"For onshore pipelines, review records for the highest operating pressure between July 1,1965 and July 1,1970, such as pressure charts, regulator station inspection reports showing inlet or outlet pressures, etc. (If no records are available, a notarized statement by a person in charge of pipeline operations during that time period, attesting to the operating pressure during that period, may be acceptable at the discretion of regulatory agencies).**
>
> **The historic operating pressure limit can be overridden in two ways: by a pressure test under 192.619(a)(2) conducted after July 1, 1965, or by an uprating in compliance with Part 192, Subpart K. The most recent test or uprating would control."**

As noted by the PHMSA document, pressure charts, regulator station inspection reports documenting inlet/outlet pressures, and a signed statement by a responsible person are all acceptable ways to validate the highest actual operating pressure in the five-year period prior to July 1, 1970.

The historic operating pressure is generally the most conservative method used in determining a pipeline's MAOP. It is almost always lower than or equal to the figures derived from using design records or pressure test. Simply removing this option from Section 192.619 will require operators to take pipelines out of service to conduct a pressure test. This is not advisable because a new pressure test at a pressure of 1.5 times the MAOP may grow an existing, sub-critical and otherwise stable defect closer to its failure point. In addition, if a hydrotest is used to accomplish the newly required pressure test, it may have unintended consequences to the integrity of the pipeline by introducing the threat of internal corrosion to the pipeline as a result of the inability to completely remove the water from the line after the completion of the test. In many cases, a pressure test cannot even be conducted without complete interruption of service for extended periods of time to many residential, commercial, and industrial customers, including electric generation facilities, emergency care facilities, and other public institutions. Finally, it is important to note that the pipeline system resiliency can be reduced if a transmission line is taken out of service and alternate transmission lines are required to take up the gas supply.

(iv) Maximum Safe Pressure 192.619(a)(4)

Finally, the code requires the operator to determine the maximums safe pressure the pipeline can be operated given the operating experience of that line. Particularly, the code requires that

known corrosion and the actual operating pressure be considered as a final limited factor. It is up to the operator to determine whether the maximum allowable operating pressure determined by the criteria above is adequate, or whether a further reduction is warranted given the condition of the pipe.

Summary

Pipeline MAOPs have always been subject to regulatory inspections from federal and state regulators. Past inspections have resulted in acceptance of these types of documentation substantiating pipeline MAOPs, particularly for vintage pipelines. When states adopted supplementary requirements, operators reviewed the procedures in place to establish MAOP and, when necessary, implemented process changes to ensure compliance.

The fundamental methods prescribed in CFR 49 Part 192 in establishing a pipeline's MAOP have not changed since the inception of the federal pipeline safety code in 1970. Establishing proper MAOP has always been a fundamental part of operating a pipeline safely, even before the existence of part 192.

Attachment A

§ 192.619 Maximum allowable operating pressure: Steel or plastic pipelines.

(a) No person may operate a segment of steel or plastic pipeline at a pressure that exceeds a maximum allowable operating pressure determined under paragraph (c) or (d) of this section, or the lowest of the following:

(1) The design pressure of the weakest element in the segment, determined in accordance with subparts C and D of this part. However, for steel pipe in pipelines being converted under §192.14 or uprated under subpart K of this part, if any variable necessary to determine the design pressure under the design formula (§192.105) is unknown, one of the following pressures is to be used as design pressure:

(i) Eighty percent of the first test pressure that produces yield under section N5 of Appendix N of ASME B31.8 (incorporated by reference, *see* §192.7), reduced by the appropriate factor in paragraph (a)(2)(ii) of this section; or

(ii) If the pipe is 123/4inches (324 mm) or less in outside diameter and is not tested to yield under this paragraph, 200 p.s.i. (1379 kPa).

(2) The pressure obtained by dividing the pressure to which the segment was tested after construction as follows:

(i) For plastic pipe in all locations, the test pressure is divided by a factor of 1.5.

(ii) For steel pipe operated at 100 p.s.i. (689 kPa) gage or more, the test pressure is divided by a factor determined in accordance with the following table:

Class location	Factors[1], segment—		
	Installed before (Nov. 12, 1970)	Installed after (Nov. 11, 1970)	Converted under §192.14
1	1.1	1.1	1.25
2	1.25	1.25	1.25
3	1.4	1.5	1.5
4	1.4	1.5	1.5

[1]For offshore segments installed, uprated or converted after July 31, 1977, that are not located on an offshore platform, the factor is 1.25. For segments installed, uprated or converted after July 31, 1977, that are located on an offshore platform or on a platform in inland navigable waters, including a pipe riser, the factor is 1.5.

(3) The highest actual operating pressure to which the segment was subjected during the 5 years preceding the applicable date in the second column. This pressure restriction applies unless the segment was tested according to the requirements in paragraph (a)(2) of this section after the applicable date in the third column or the segment was uprated according to the requirements in subpart K of this part:

Pipeline segment	Pressure date	Test date
—Onshore gathering line that first became subject to this part (other than §192.612) after April 13, 2006	March 15, 2006, or date line becomes subject to this part, whichever is later	5 years preceding applicable date in second column.
—Onshore transmission line that was a gathering line not subject to this part before March 15, 2006		
Offshore gathering lines	July 1, 1976	July 1, 1971.
All other pipelines	July 1, 1970	July 1, 1965.

(4) The pressure determined by the operator to be the maximum safe pressure after considering the history of the segment, particularly known corrosion and the actual operating pressure.

(b) No person may operate a segment to which paragraph (a)(4) of this section is applicable, unless over-pressure protective devices are installed on the segment in a manner that will prevent the maximum allowable operating pressure from being exceeded, in accordance with §192.195.

(c) The requirements on pressure restrictions in this section do not apply in the following instance. An operator may operate a segment of pipeline found to be in satisfactory condition, considering its operating and maintenance history, at the highest actual operating pressure to which the segment was subjected during the 5 years preceding the applicable date in the second column of the table in paragraph (a)(3) of this section. An operator must still comply with §192.611.

(d) The operator of a pipeline segment of steel pipeline meeting the conditions prescribed in §192.620(b) may elect to operate the segment at a maximum allowable operating pressure determined under §192.620(a).

[35 FR 13257, Aug. 19, 1970]

Attachment B
Released by PHMSA April 22, 1998

DETERMINATION OF MAXIMUM ALLOWABLE OPERATING PRESSURE IN NATURAL GAS PIPELINES

INSTRUCTIONS

The minimum federal pipeline safety standards of 49 CFR Part 192 require that each section of pipeline or each segment of a distribution system have a maximum allowable operating pressure (MAOP) established. A separate MAOP must be established for each distinct segment of a gas pipeline system. The transmission line transporting gas to the town border station, the feeder line supplying district regulator stations, and each separately operated portion of a distribution system, must each have a designated MAOP. The federal standards of Part 192.619, Part 192.621, and Part 192.623 list the factors to review in determining the MAOP, and the lowest pressure thus determined is the MAOP. Records must be available to substantiate any value determined.

The attached form can be used to determine MAOP. It should be kept on permanent file, along with any support documents or records, and periodically reviewed to determine if anything has occurred which would change the MAOP.

The form can be used for both transmission pipelines and distribution systems. Part 192.619 applies to both transmission lines and distribution systems, but only for steel and plastic pipe; this regulation does not apply to other types of pipe, such as cast iron. Part 192.621 applies to high pressure distribution systems but not to transmission lines. Part 192.623 covers low pressure distribution systems.

A. Part 192.619: Transmission Lines and High Pressure Distribution Systems, and Part 192.621: High Pressure Distribution Systems.

Part 192.619(a)(1), Part 192.621(a)(1) Design Pressure.

The design pressure for steel pipe can be determined from Part 192.105, and for plastic pipe from Part 192.121. The design pressure for other pipeline system components will presumably come from the manufacturer's literature. Copies of this literature should be retained for every type of component installed.

Special attention should be paid to pressure regulators. The body pressure rating is not the value to use, but rather the inlet pressure rating which will vary with orifice size. For example, one common service regulator has a body pressure rating of 125 psig, but with a large orifice an inlet pressure rating of only 5 psig. Also, some district regulators may have outlet pressure ratings as low as 5 psig above set point.

If the design pressure rating for system components cannot be determined due to lack of information, setting the MAOP based on Part 192.619(a)(4) or Part 192.621(a)(5) may be considered. This decision should be cleared through the appropriate regulatory authority. It is

suggested that any approval received from an appropriate regulatory authority be obtained in writing to confirm action in the future.

For transmission pipelines, under certain circumstances a design pressure limit (or lack of information on which to set a design pressure limit) may be overridden by Part 192.619(c). This regulation allows systems components installed prior to July 1, 1970, to remain in service at the same pressure they were subjected to between July 1, 1965, and June 30, 1970, even if that pressure exceeds the pressure rating for the component. If that is the case, the historic operating pressure may be used to set the MAOP in lieu of the design pressure. Note that if the component is replaced, it must meet current design pressure requirements.

Part 192.619(a)(2): Pressure Test.

A pressure test means raising the pressure in the pipeline (using water, gas, or air) to a level well in excess of the intended operating pressure to check pipeline tightness and integrity. Leak tests conducted at or near operating pressure are not pressure tests within the context of this regulation.

This regulation applies not only to tests made after initial construction of the pipeline or system, but also to tests of pipe used for extensions, laterals, or services connected to the original pipe, and to any replacement pipe. Any single piece of pipe tested to a lower pressure than the rest of the system will set the MAOP for the entire system.

Note that the regulation makes no provision for using a pressure test to set the MAOP for steel pipe operating at less than 100 psig.

If more than one pressure test has been conducted, the most recent test controls.

A record of the pressure test, or for distribution systems the test procedure in use at the time, must be available.

Part 192.619(a)(3): Historic Operating Pressure.

For onshore pipelines, review records for the highest operating pressure between July 1, 1965, and July 1, 1970, such as pressure charts, regulator station inspection reports showing inlet or outlet pressures, etc. (If no records are available, a notarized statement by a person in charge of pipeline operations during that time period, attesting to the operating pressure during that period, may be acceptable at the discretion of regulatory agencies).

The historic operating pressure limit can be overridden in two ways: by a pressure test under Part 192.619(a)(2) conducted after July 1, 1965, or by an uprating in compliance with Part 192, Subpart K. The most recent test or uprating would control.

B. Part 192.621: High Pressure Distribution Systems.

Part 192.621(a)(2): The federal standards limit distribution system MAOP to 60 psig **unless** overpressure protection in accordance with Part 192.197(c) is provided at the point of delivery to customers.

If, as permitted by Part 192.197(c)(3), service regulators with internal relief are selected to permit operation at over 60 psig, the inlet pressure rating for adequate relief capacity must be carefully checked. The amount of inlet pressure the internal relief can safely vent depends on the size of the regulator orifice, with the relievable inlet pressure rating decreasing as orifice size increases.

Part 192.621(a)(3) The MAOP of a distribution systems containing cast iron pipe with unreinforced bell and spigot joints is limited to 25 psig. Reinforcement can be any of several methods of clamping or encapsulating joints to prevent pullout and/or leakage.

Part 192.621(a)(4) Any pressure limit on joints.

C. Additional Consideration.

If the operator has adequate data to thoroughly check all other MAOP criteria, but believes that a lesser pressure should be specified due to safety considerations not addressed in the other criteria, then the operator can set the MAOP at whatever value is considered the maximum safe pressure. Obviously, this pressure must be less than that determined from Part 192.619(a)(1)-(3) or Part 192.621(a)(1)-(4). Leak histories, corrosion problems, equipment problems, or other safety-related operational problems may require a lower MAOP be specified. However, operation of a system at a pressure below the MAOP for operational, not safety, reasons would not affect the MAOP.

There is also another way these regulations can be used. If pipeline and/or distribution system records are missing or incomplete, it may be impossible to conclusively determine what the MAOP should be under the other criteria. In that case, the operator ***must consult with the Regulatory Agency***, and should look at the normal operating pressures over the last 5 years, and select the highest pressure which did not cause unusual safety or operational problems. This pressure must have applied for a long enough period of time for any problems to become evident. The operator could then conclude that this pressure represents the maximum known safe operating pressure, and determine that it should be the MAOP.

Use of these regulations to determine the MAOP would not preclude a future raising of the MAOP through pressure test or uprating, except that any known limits based on other regulations could not be exceeded.

Use of either of Part 192.619(a)(4) or Part 192.621(a)(5) to establish the MAOP will require that the pipeline or system have overpressure protection to prevent the MAOP from being exceeded should a regulator failure occur. (See Part 192.619(b) and Part 192.621(b).) Any previous "grandfather" exemption from overpressure protection requirements is overruled. The concept is that if higher than normal pressures could cause a safety problem, or if the safety risk of a higher pressure cannot be determined because of lack of information, then measures must be taken to prevent that higher pressure from occurring.

D. Part 192.619(c) The Grandfather Clause.

Onshore transmission pipelines installed prior to March 12, 1971, can have an MAOP established based on the highest actual operating pressure that the pipeline was subjected to during the 5 year period preceding July 1, 1970, even though the design or testing under Part 192.619(a) are not satisfied. However if a segment of pipeline or component is replaced, the replacement is subject to the Part 192.619(a) requirements.

E. Part 192.623: Low Pressure Distribution System.

On distribution systems where the gas is delivered to the customer at system pressure with no service regulator, the MAOP is determined by the operator based on the maximum pressure which can safety be delivered to the customer. There is no universal consensus on what that pressure should be, but it must obviously be compatible with the customer piping and appliances. An MAOP established under this regulation should be periodically reviewed to determine if operating experience, local building code changes, new appliances or appliances regulators, etc., warrant revising the MAOP.

F. Determination of MAOP.

After determining the appropriate pressure limit in each category which applies to the pipeline or pipeline system involved, select the lowest value as the MAOP. Date the document to aid in future decision-making on whether the MAOP should be reevaluated, and attach all support documents. These support documents should be for all categories reviewed, not just the one which controlled. This file should be maintained for the life of the pipeline or system involved.

Identity of Pipeline/Distribution Area

A. Maximum Allowable Operating Pressure: Steel or Plastic Pipelines (Part 192.619): and High-Pressure Distribution Systems (Part 192.621).

Part 192.619(a)(1) Design Pressure: Lowest design pressure
Part 192.621(a)(1) for any of the following system elements

Pipe (including service lines)	_____
Valves	_____
Flanges	_____
Fittings	_____
Mechanical Couplings	_____
Leak Clamps	_____
Instruments	_____
Odorizers	_____
Overpressure Protection Devices	_____
Upstream Regulator(s)–Outlet	_____
Pressure Rating	_____
Downstream Regulators–Inlet	_____
Pressure Rating	_____
Other (list)	_____

Part 192.619(a)(2) Pressure Test

Plastic Pipe: Test Pressure divided by 1.5 _____

Steel Pipe operated at or over100 psi: Test Pressure divided by Class Location Factor _____

Part 192.619(a)(3) Historic Operations

Highest operating pressure between 7/1/65 and 7/1/70 unless the pressure test in (a)(2) was after 7/1/65 or an uprating in accordance with Subpart K has been conducted. _____

B. Part 192.621: High Pressure Distribution Systems Only.

Part 192.621(a)(2) 60 psig unless all services have overpressure protection _____

Part 192.621(a)(3) 25 psig for any cast iron pipe with unreinforced joints _____

Part 192.621(a)(4) Pressure limit on joints _____

C. Part 192.619(a)(3) and Part 192.621(a)(5): Additional Consideration for Transmission or High Pressure Distribution Lines.

Highest operating pressure considered safe based on operating history _____

D. Part 192.623: Low Pressure Distribution Systems.

Highest delivery pressure which can be safely applied to customer piping and properly adjusted gas appliances. _____

E. Part 192.619(c): Alternate consideration for transmission lines. Highest operating pressure between 7/1/65 and 7/1/70 (7/1/71 and 7/1/76 for offshore gathering lines.)

F. Determination of MAOP.

Either item E, where applicable, or the lowest pressure on any of the above lines is the MAOP.

MAOP _____
By _____
Date _____

The American Gas Association (AGA) coordinated the creation and maintenance of this document. While AGA provides administrative services, it does not independently test, evaluate, or verify the accuracy or soundness of any statements contained in this document.

This document is based on information that has not been verified or audited. The AGA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document. The AGA also makes no representation, warranty or guarantee in connection with this document, including, the accuracy or completeness of the information therein. Nothing contained in this document should be viewed as an endorsement or disapproval of any particular service provider, product or methodology.

In issuing and making this document available, the AGA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the AGA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

Users of this document should consult applicable federal, state and local laws and regulations. The AGA does not, by the publication of this document, intend to urge action that is not in compliance with applicable laws, and this document may not be construed as doing so.

The information contained in this document is not intended as legal advice or as an opinion on specific facts. For information about these issues, the User should consult the User's employer or seek the advice of a competent professional.

All questions, requests for revisions, or other communications relating to this document should be sent to: American Gas Association, Attention: AGA Operating Section, 400 N. Capitol St., N.W., Suite 450, Washington, D.C. 20001