



**Design Guidelines for Installation of  
Automatic Shut-off Valve (ASV) and  
Remote Control Valve (RCV) Systems  
In Natural Gas Transmission Pipelines**







# **Design Guidelines for Installation of Automatic Shut-off Valve (ASV) and Remote Control Valve (RCV) Systems In Natural Gas Transmission Pipelines**

**October 2012**  
**AGA Distribution and Transmission Engineering Committee**  
*Copyright © 2012 American Gas Association, All Rights Reserved*



## DISCLAIMER AND COPYRIGHT

The American Gas Association's (AGA) Operations and Engineering Section provides a forum for industry experts to bring collective knowledge together to improve the state of the art in the areas of operating, engineering and technological aspects of producing, gathering, transporting, storing, distributing, measuring and utilizing natural gas.

Through its publications, of which this is one, AGA provides for the exchange of information within the gas industry and scientific, trade and governmental organizations. Each publication is prepared or sponsored by an AGA Operations and Engineering Section technical committee. While AGA may administer the process, neither AGA nor the technical committee independently tests, evaluates or verifies the accuracy of any information or the soundness of any judgments contained therein.

The purpose of this paper is to provide guidance to natural gas service companies with transmission pipelines in evaluating, implementing and installing ASVs and RCVs. 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, and use of or reliance on AGA publications. AGA makes no guaranty or warranty as to the accuracy and completeness of any information published therein. The information contained therein is provided on an "as is" basis and AGA makes no representations or warranties including any expressed or implied warranty of merchantability or fitness for a particular purpose.

In issuing and making this document available, AGA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is 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.

AGA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does AGA list, certify, test or inspect products, designs or installations for compliance with this document. Any certification or other statement of compliance is solely the responsibility of the certifier or maker of the statement.

AGA does not take any position with respect to the validity of any patent rights asserted in connection with any items that are mentioned in or are the subject of AGA publications, and AGA disclaims liability for the infringement of any patent resulting from the use of or reliance on its publications. Users of these publications are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

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

Changes to these guidelines may become necessary from time to time. Suggested changes to this document should be communicated to AGA by completing the last page of this report titled, **“Form for Proposal to Change Design Guidelines for Installation of ASV & RCV in**

**Natural Gas Transmission Pipelines” and sending it to Operations & Engineering Section, American Gas Association, 400 North Capitol Street, NW, 4th Floor, Washington, DC 20001, U.S.A.**

*Copyright © 2012, American Gas Association, All Rights Reserved.*

## ACKNOWLEDGEMENT

*Design Guidelines for Installation of Automatic Shut-off Valve (ASV) and Remote Control Valve (RCV) Systems in Natural Gas Transmission Pipelines* was developed by an ad hoc task group under the sponsorship of Distribution and Transmission Engineering committee. **Individuals who worked hard and made substantial contributions to the development of this document are:**

**Dan Menegus (Chairman) – Pacific Gas & Electric**  
**Bruce Paskett – NW Natural**  
**Mike Bermel – Sempra Utilities**  
**Bill Hamilton – DTE Energy/MichCon**  
**Dan Scarberry – Dominion East Ohio**  
**Deborah Sus – EN Engineering**

Other individuals who also contributed to the development of the document are:

Joe Ryan – Louisville Gas & Electric  
Chris Castronova – South Jersey Gas  
John Wyckoff – New Jersey Natural Gas  
Jim Finnerty – National Grid  
Dave Klimas – EN Engineering  
Cheryl Payne – Consolidated Edison  
Maria Allison – Louisville Gas & Electric  
Andrew Lu – American Gas Association

AGA acknowledges the contributions of the above individuals and thanks them for their time and effort in getting this document developed.

Christina Sames  
Vice President  
Operations & Engineering

Ali Quraishi, Staff Executive  
Engineering Services Director  
Operations & Engineering

# TABLE OF CONTENTS

<b>DISCLAIMER AND COPYRIGHT .....</b>	<b>iii</b>
<b>ACKNOWLEDGEMENT .....</b>	<b>v</b>
<b>TABLE OF CONTENTS .....</b>	<b>vi</b>
<b>1. Introduction.....</b>	<b>1</b>
<b>2. Background .....</b>	<b>2</b>
2.1. Definitions.....	2
2.2. Regulations.....	4
2.2.1. <i>Title 49 Code of Federal Regulations (49 CFR), Part 192, Subpart O</i> .....	4
2.2.2. <i>Potential Future Regulations Mandated by the 2011 Pipeline Safety Reauthorization Legislation</i> .....	5
2.3. Benefits of Using ASVs/RCVs .....	5
2.4. Potential Concerns with the Usage of ASVs/RCVs.....	6
<b>3. System Design and Installation Considerations.....</b>	<b>8</b>
3.1. System Design Philosophy and Objectives.....	8
3.2. Pipeline Sectionalization Design Considerations.....	9
3.2.1. <i>Limitations imposed by pipeline network configuration</i> .....	9
3.2.2. <i>Common Types of Piping Configurations:</i> .....	10
3.2.3. <i>Preventing Backflow to a Pipe Section</i> .....	14
3.2.4. <i>Hydraulic modeling</i> .....	15
3.2.5. <i>Pipeline Line Pack:</i> .....	16
3.3. Overall Valve Operational Considerations .....	17
3.3.1. <i>Valve Isolation Alternatives - ASVs, RCVs and Manual Operation:</i> .....	17
3.4. Cost Considerations .....	21
3.5. ASV/RCV Citing and Spacing Considerations.....	24
3.6. Site Related Design Considerations .....	26
3.6.1. <i>Specific Location Considerations:</i> .....	26
3.6.2. <i>Above vs. Below Ground Installation Determination:</i> .....	27
3.7. Automated Valve System Design Considerations .....	29
3.7.1. <i>Typical Components of an ASV/RCV:</i> .....	29
3.8. Pipeline Isolation Valves.....	30
3.8.1. <i>Typical Types of Valves:</i> .....	30
3.8.2. <i>New vs. Existing Valves:</i> .....	32

3.8.3.	<i>Valve Actuators:</i> .....	35
3.8.4.	<i>Pneumatic Piston:</i> .....	35
3.8.5.	<i>Electric Motor:</i> .....	36
3.8.6.	<i>Gas/Hydraulic:</i> .....	37
3.9.	Control Systems .....	38
3.9.1.	<i>Control System Packages:</i> .....	38
3.9.2.	<i>ASV Control:</i> .....	40
3.9.3.	<i>RCV Control:</i> .....	43
3.9.4.	<i>Failure Modes:</i> .....	46
3.9.5.	<i>Valve Closure and Open Time:</i> .....	46
3.10.	Power and Communication .....	48
3.10.1.	<i>Electrical Service:</i> .....	48
3.10.2.	<i>Power Gas (Drive Gas):</i> .....	49
3.10.3.	<i>Telecommunication:</i> .....	50
<b>4.</b>	<b>Operational Considerations.....</b>	<b>51</b>
4.1.	SCADA/Gas Control.....	51
4.1.1.	<i>Change Management:</i> .....	51
4.1.2.	<i>Point-to-Point Testing:</i> .....	52
4.1.3.	<i>Alarm Management:</i> .....	52
4.1.4.	<i>Gas Control Tools and Training:</i> .....	52
4.2.	General Operational Guidelines for Use of ASVs/RCVs .....	53
4.3.	Enhanced Liaison with Emergency Responders .....	54
<b>5.</b>	<b>Maintenance Considerations.....</b>	<b>56</b>
<b>6.</b>	<b>Appendix.....</b>	<b>58</b>
6.1.	Valve Actuators.....	58
6.1.1.	<i>Electric Motor Actuators:</i> .....	59
6.1.2.	<i>Pneumatic Piston Actuators:</i> .....	60
6.1.3.	<i>Gas/Hydraulic Actuators:</i> .....	61
<b>7.</b>	<b>References.....</b>	<b>63</b>
	<b>Form for Proposals to Change Design Guidelines for Installation .....</b>	<b>65</b>



# 1. Introduction

---

The purpose of this document is to provide information and guidance on the installation design of automatic shut-off valves (ASVs) or remote control valves (RCVs) in existing and new natural gas transmission pipelines. ASVs and RCVs are automated valves that can be utilized for a number of gas control purposes, but this guidance document is focused on their installation in transmission pipeline systems for the specific purpose of providing isolation of pipeline sections upon a pipeline event and subsequent unplanned gas release. ASVs/RCVs are not simply valves but are engineered systems that vary greatly in complexity, autonomy, reliability, cost, etc. The paper provides guidance on the design, installation, operational and maintenance considerations that an operator should take into account to provide for successful utilization. This guideline is intended for use as a reference document by natural gas pipeline operators, federal and state regulators, public interest groups and the general public.

Each operator serves a unique and defined geographic area and its system infrastructures vary widely based on a multitude of factors, including facility condition, past engineering practices and materials. Each operator will need to evaluate the guidance covered in this document in light of system variables, the operator's independent integrity assessment, risk analysis and mitigation strategy. It is recognized that not all of these guidelines will be applicable to all operators due to the unique set of circumstances that are attendant to their specific systems.

Consult the manufacturer(s) or other resources as necessary when considering a particular ASV, RSV or other system component to confirm its performance characteristics will accommodate your particular system's unique characteristics and variables.