A Publication for AGA Members

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AGA White Paper:

Leading Practices for Damage Prevention to Meter Sets

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1 Purpose and Scope

The purpose of this paper is to inform AGA members of several common methods used to help prevent damage to meter sets and reduce the associated risks. This document is intended to provide an overview of when meter set protection may be appropriate, as well as potential methods that may be used. Each property and building may present unique challenges, therefore, the need for meter set protection should be considered on a case-by-case basis. Considerations should also be given to applicable state and local laws and regulations when evaluating specific protection needs or the methods of protection to be used. The need to implement every practice and the timing of any implementation of the practices described in this document will vary with each natural gas utility and their specific operations. The actions within this document should be evaluated in light of each operator's system, geographic variables, the operator's independent integrity assessment, risk analysis and mitigation strategy and what has been deemed reasonable and prudent by their regulators. As used herein, the term "should" is not mandatory, but is to be acted upon as appropriate.

For the purpose of this paper, the term "vehicle" refers to any equipment that could damage a meter set including but not limited to an automobile, forklift, snowmobile or other industrial equipment.

2 General Definitions

Bollard (aka Guard Post or Protection Post): A sturdy, vertical post used as a form of physical protection to prevent vehicles from driving into an area or object, such as gas facilities. See Figure 1- Meter Bollard.

Figure 1- Meter Bollard Provided by Southern Gas Co.

Breakaway Fitting: Natural Gas Safety Breakaway (NGSB) is an integrated shutoff safety breakaway device that stops the flow of natural gas when a gas line is broken or breached at the meter as the result of an outside event (vehicular, snow load, etc.). See Figure 2- Breakaway Fitting.

Excess Flow Valve (EFV): An excess flow valve, or EFV, is a device designed to shut off or substantially reduce gas flow when it exceeds the normal flow. This may occur if the service line or meter becomes damaged, resulting in a sudden and significant leak or pressure drop. The New Jersey Bureau of Public Utilities (NJBPU) is the only known state regulator to date that allows EFVs to be used as a primary method of meter set protection from vehicular damages.

Figure 2 - Breakaway Fitting Provided By GTI

Guard Rail: Vertical posts connected to horizontal bars, used as a form of physical protection to prevent vehicles from driving into an area or object, such as gas facilities. See Figure 3 - Guard Rail.

Meter Set: A natural gas meter and any associated piping and appurtenances, including, but not limited to, a service regulator, valve, or other piping equipment located above ground and within the immediate vicinity of the gas meter. At times the regulator is located apart from the meter (i.e. inside meters with outside regulators). For these purposes, the regulator is still considered part of the "meter set." Risers are also considered to be part of a meter set for purposes of this paper.

Figure 3 - Guard Rail
Provided by Southern Gas Co.

Other Devices/Methods: A custom form of physical protection created to protect meter sets from vehicular damage in complex cases where adequate space is not available to install bollards or guard rails.

Service Riser: A gas riser without a meter/meter set assembly. For purposes of this paper, these will be treated the same as Meter Sets.

Vehicle Zone: A street, parking space, driveway, loading dock, garage entrance, indoor warehouse or other area where vehicle use is likely to occur. This can include both outside and inside locations where meter sets are located. Also, may include informal or unpaved areas such as mobile home parks or other areas where indicators of vehicular activity are present.

3 Regulatory Requirements for Meter Set Protection

Sections 192.353 and 192.355 of Title 49, C.F.R., Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*, provide the federal regulatory requirements for natural gas customer meter and regulator protection. These regulations are performance based, allowing gas operator's flexibility to provide suitable protective measures that will likely vary depending on the specific circumstances and conditions around the meter set. The gas utility's operating procedures should include the utility's protective measures that meet the intent behind the regulation. The operating procedures may also include methods to achieve protection, such as detailed material and construction criteria, distances, and other protective measures.

ANSI GPTC Z380.1, *Guide for Gas Transmission, Distribution, and Gathering Piping Systems (Guide*) is a resource that may help operators develop protective measures in order to comply

with the regulatory requirements of Part 192. The *Guide's* general recommendations specific to meter and regulator protection can be found in §192.353 2(b), and like PHMSA's regulations, are performance based.

While the utility's facilities are subject to federal regulations, locally adopted fire codes may also apply. Depending upon applicable state or local law or regulation, a utility may also be required to comply with the provisions of the adopted fire code (i.e., NFPA 1 Fire Code or the International Fire Code (IFC)) that apply to utility meter set protection. NFPA 1 and the IFC both require protection from possible vehicle damage for above ground gas meters, regulators, and its piping. NFPA 1 and the IFC specify the use of guard posts and specific installation criteria. However, both codes allow alternate means where approved by the local judication. Alternate means of protection may come from the utility's operating procedures when approved by company management.

4 Meter Set Placement

It is important to anticipate potential issues when installing new meter sets and plan accordingly. Choosing a proper location for a meter set can help reduce the possibility of the meter set being damaged and reduce the chance of a gas related incident while still allowing for easy access for maintenance and meter reading.

Two factors that operators should consider when determining meter set location, the venting of the meter set regulator and potential for damage to the meter set, are discussed below in detail. Meter shelters, breakaway fittings or vent limited regulators may expand the number of options of where a meter may be placed when looking for a sheltered spot for the meter set, but a safe location away from potential damage should be the priority. Below are leading practices for meter set locations.

4.1 Venting Accommodations

To reduce risk of gas migration and accidental ignition, venting considerations need to be taken prior to installing a meter set regulator. Per PHMSA:

> "Service regulator vents and relief vents must terminate outdoors, and…be located at a place where gas from the vent can escape freely into the atmosphere and away from any opening into the building; [PHMSA 49 CFR Part 192.355]

Meter set regulators should not be installed near an opening into a building such as operating windows, doors, air intake vents, and others. If the meter set regulator cannot be installed with proper clearance from building openings, external vent piping may be installed to relocate the vent termination to a safe location. Regulator vents should terminate at least 3

feet away from an opening into a building or any source of ignition or source of heat that might damage the meter to comply with 49 CFR 192.353, and be protected from damage to comply with 49 CFR 192.355.

Vent piping should be properly sized to ensure that the pressure relieving capability of the regulator is not reduced. Consider adding a screen to prevent the entry of bugs and debris in a regulator vent.

External vent piping termination for meter sets is increasingly a challenge due to municipal and customer requirements. Additionally, there are cases where installing a vent line is not practical or finding a compliant location for a vent terminus is a challenge due to the location of windows, doors, air intake vents, etc. To address these challenges, regulator manufacturers developed designs of limited venting of gas during overpressure conditions which enables more flexibility with vent terminations. Overpressure Shut-Off (OPSO) regulators provide even more protection by automatically shutting off the flow of gas downstream of the regulator when an overpressure condition is encountered, without the need of a vent terminus.

At times the meter set regulator is physically separated from the actual meter. There are no concerns about placing the actual meter (without a regulator component) near a building opening.

4.2 Damage Avoidance

In addition to the above venting considerations, risk of anticipated outside force damage to the meter set, including snow, ice and flooding, also needs to be explored prior to meter set installation. It is important to note that every situation is inherently different, and each utility should decide whether protection is necessary and what kind of protection to use on a case-by-case basis. In cases where the meter is separate from the regulator, both parts need to be considered for protection if they are at risk of vehicular, snow, ice or other outside force damage.

Operators should consider evaluating the placement of existing meter sets during maintenance activities to ensure the meter set is not in a hazardous location or to determine if additional protection measures are appropriate due to an inability to relocate the meter set.

4.2.1 Vehicular Damage Avoidance

Where feasible, avoid placing meter sets and associated piping in walkways, driveways, garages, material loading or storage areas, where they are susceptible to damage. When meter set placement must be in the vicinity of a vehicular zone, it is recommended it be installed at least 3 feet from the edge of a zone where anticipated traffic runs. See Section 5.1.1 below.

Special consideration should be given for meter set locations for mobile homes where driving patterns are typically non-traditional and informal. Meter set placement should be

out of the travel path of the mobile home, so the meter set is not damaged when a mobile home is moved. Use of suitable, gas-approved flexible line between the meter and the mobile home is an added measure of protection against structure movement; flexible lines for mobile homes may even be mandated by the local permitting agency.

4.2.2 Corrosion and Snow/Ice Avoidance

To prevent corrosion and allow for easy access for maintenance activities, meter sets should be installed such that the bottom of the gas meter does not contact the grade (soil/mulch/ground). Alkali in concrete and other corrosive elements in soil may accelerate corrosion to the meter casing causing future maintenance and repair work. Install meters upright, level and adequately supported with a recommended minimum of 1-inch clearance on all sides of the meter casing so that there is no direct contact with exterior structures.

Companies located in geographical areas prone to high amounts of snow accumulation may opt to install meter sets with adequate protection such as from a roof overhang, a meter set enclosure, ice shield/cover or install the meter set on the gable end of the building. Covers should be constructed for ease of removal in emergency and non-emergency situations. Metal and membrane roofing are prone to sheets of ice sliding off.

Additional consideration should be given to the installation height of the meter assembly; in particular, the height of the shut off valve above grade level. These distances should be increased in locations prone to ice and excessive snow level accumulations.

5 Meter Set Protection Criteria

5.1 Protecting from Vehicles, Snow, Ice and Other Outside Force Damage

While the preferred place for a meter set is a location with minimal threat of damage from vehicles, snow or ice, there are cases where this may not be possible or practical. In these situations, physical means may be required to protect from vehicular damage for both outdoor and indoor sets. If an existing meter set location is not acceptable and installing protective devices is not possible or practical, the utility may consider other options such as moving the meter to a safe location.

5.1.1 General Guidelines

The gas utility should provide adequate protection to meter sets susceptible to damage from vehicular and snow/ice damage. The following factors, at minimum, should be taken into consideration:

- Proximity of meter set to the vehicular zone (see section 5.1.2)

- Anticipated speed of nearby traffic
- Type of vehicles anticipated in vehicle zone (may also consider snow mobiles, farming equipment, fork lifts, etc.)
- Attributes of the meter set location (i.e. width and length of vehicle zone)
- Operating pressure of the service line supplying the meter set
- Volume of anticipated traffic in vehicle zone
- Configuration of vehicle zone and anticipated vehicle movement/approach (parallel, perpendicular, etc.)
- Existing physical features that provide adequate protection (fencing etc.)
- Driving surface type (alley, driveway, highway, loading dock, etc.)
- Non-traditional or informal driving paths (mobile homes)
- Meter set protection from the impact of falling ice or snow
- Proximity of meter set to hose bibs, irrigation lines, and sprinkler stubs

5.1.2 Footage Guidelines

Guidelines vary from gas utility to gas utility; some do not have a quantifiable distance specified while others specify distances based upon the flow of traffic or vehicular zone type. Therefore, the measurements below are general guidelines and are not to be prescriptive in nature. They are based upon the most common footages used across utilities that have set distances specified.

Protection is recommended when no devices or methods are currently in place protecting the meter and a driving surface is within 3 feet of the meter set.

5.1.3 Snow and Ice Protection

The gas utility should provide adequate protection to meter sets susceptible to damage from snow and ice damage. The following factors, at minimum, should be taken into consideration:

- Roof material
- Roof slope
- Overhang

6 Meter Set Protection Types

6.1 Protection from Vehicles

6.1.1 Physical Protection

6.1.1.1 Types

6.1.1.1.1 Standard Bollards

Bollards are a type of post designed to protect against incidental damage during typical low-speed maneuvering (i.e. turning, backing, etc.). The following are suggestions, based on the International Fire Code, regarding bollards used for meter set protection:

- Constructed of steel at least 4 inches in diameter where feasible, though 2-inch diameter bollards can also be used in residential applications
- Concrete filled
- Spaced a maximum of 3 feet apart (when more than one bollard is used)
- Where feasible set at least 3 feet deep into the ground
- Set in a concrete footing of 15 inches in diameter
- Height at least 3 feet above ground level
- Set a minimum of 3 feet from the protected object

At times the above requirements are not practical or possible. For example, setting bollards 3 feet out from the face of a meter on a narrow driveway could render the driveway unusable. In these circumstances it is recommended to adhere to the above requirements as much as is practicable.

Alternatively, sometimes the above requirements may not be sufficient. Consider cases where construction vehicles or farm equipment with bumpers higher than 3 feet frequent the driving surface. In these cases, it may be advantageous to use longer bollards such that they rise more than 3 feet above ground level.

Bollard Covers: As an alternative for repainting scuffed, aging bollards, applying high density polyethylene (HDPE) bollard covers is a quick and easy way to improve the long-term appearance. The install process is quicker than painting, and the result is a nicer looking bollard. Bollard covers contain ultraviolet and antistatic additives that withstand extreme temperatures and resist fading.

6.1.1.1.2 Guard Rails

Guard rails can sometimes better meet protection needs as they may offer a slimmer footprint than bollards (end posts are often smaller in diameter) and have horizontal bars to supplement protection from vehicles slipping through the end-posts.

6.1.1.1.3 Bolt-down Bollards

Bolt-down bollards may be an alternative when traditional bollards are not feasible. They are easy to install since they do not require excavation or installation of a footer. Bolt down bollards only work on concrete surfaces of adequate thickness for the type of anchors used. They are made of steel pipes in varying diameters welded to a steel base plate that can be anchored to a concrete surface with screw anchors. Bolt-down bollards are not as secure as regular bollards and will not provide the same level of protection as regular bollards.

6.1.1.1.4 Natural Barriers

Natural barriers rarely provide adequate protection of meter sets from vehicular damage. Bushes and small trees are sometimes thought to be protection but may not qualify under utility standards or locally adopted fuel codes requirements.

6.1.1.1.5 Custom Protective Methods

At times, custom protective methods may be needed to fit the requirements of the application. These methods should be designed to the gas utility standards or locally adopted fuel codes requirements.

6.1.1.2 Physical Protection Placement

Each meter set needs to be reviewed for ideal protection placement as there is no single common configuration that can be used for every case. The end goal is not just protecting the meter itself from damage, but most importantly to protect the customer and their property from the potential damage that could occur if a leak is caused by the meter being struck. Below are some recommendations that can be considered by the Utility.

- Consider all angles the meter set may be subjected to vehicular strikes (from the front, back, side etc.).
- Meter sets in a corner may need only one bollard at a 45-degree angle in front of the meter set to adequately protect.
- Meter sets along a straight building wall are usually protected by at least 2 bollards or guard rail(s).
- If a bollard or guard rail is to be installed directly in front of the meter face, allow room for meter set maintenance.

- Bollards and guard rails should not be placed in contact with the meter set as this could create a "domino effect" if the bollard is struck by a vehicle, pushing the bollard itself into the meter.
- When bollards are placed on either side of the meter set, they should be placed further out from the building wall than the face of the meter – bollards that are installed flush with the meter face do not protect from vehicular side-swipes.
- When multiple bollards are used to protect a meter, they should be placed close enough that a vehicle cannot drive in between them.
- Avoid obstructing sidewalks, walkways and ramps. Consider the Americans with Disabilities Act, ADA (i.e. wheelchairs should be able to continue to use the path of travel).
- Where required, obtain local village/municipality permits and get proper approvals before installing physical protection methods on public property.

6.1.1.3 Benefits

- Physical protection methods reduce risk of meter set damage from vehicles, as well as off road traffic such as snow mobiles, and tractors. Physical protection methods may also offer protection during snow and ice removal during heavy accumulations (Section 6.2.2).
- Relatively inexpensive, especially when compared to the cost of repairing damaged meter sets.

6.1.1.4 Challenges and Issues

- Customers sometimes devise and install their own form of protection. This protection is often inadequate as it would not meet the utilities or locally adopted fuel code requirements. Items such as landscape walls, bushes and safety cones are examples of customer devised methods.
- Customers may not be happy with the installation of physical protection methods on their property (i.e. aesthetics, lack of space, unwanted holes in new driveways, etc.).
- Historic neighborhood or building ordinances.
- City zoning restrictions.
- May not stop vehicle operating at higher speeds.
- Congested underground utilities may limit the location, number and type of physical protection methods to be installed.
- Physical protection methods may not be practical if they would impede pedestrian or street traffic or limit the ability of a vehicle to maneuver in a vehicular area, such as when the gas meter set is in a small or narrow driveway or alley.

- People with physical disabilities (ADA) should be considered.
- Although physical protection methods themselves are inexpensive, the installation requires workers to excavate an opening in order to set them to the required depth, pour concrete to create a footing, and in the case of bollards, fill with concrete.
- Physical protection methods may rust and fade over time or require periodic maintenance or replacement due to collision or corrosion.
- Since physical protection methods are fixed, they do not absorb impact upon collision.

6.1.2 Valves and Fittings

6.1.2.1 Excess Flow Valves (EFV)

In general, these devices can be used with physical protection methods to reduce the risk of gas leaks, fire, property damage and possible injury caused by vehicles or other outside forces impacting and damaging the meter set. The state of New Jersey is the only known state that has approval of their state commission to use EFVs as a primary form of vehicular protection. For all other states, EFVs may be considered a form of secondary meter set protection (in addition to physical protection methods).

6.1.2.2 Breakaway Fittings

This fitting is an engineered "weak link" that is designed to break upon impact and shut off the flow of gas immediately. The Natural Gas Safety Breakaway (NGSB) is designed to add a level of safety and protection for meters and other above ground natural gas lines that are located in high-traffic areas or those with an elevated risk of impact. See Figure 4 – Breakaway Fitting

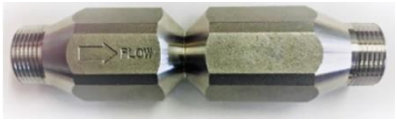

Figure 4 - Breakaway Fitting
Picture Provided by GTI

6.1.2.3 Gas Shutoff Valves

Other devices which may serve to protect meters are remote and automatic gas meter shutoff valves which are available as standalone devices installed between the regulator and meter (low pressure shut-offs) or between the riser and regulator (high pressure shut-offs), or as meters with built-in remote shutoff capability. Remote and automatic shutoff valves can be actuated to shut off the flow of gas during an incident. Additional features such as remote reading, pressure alarm and shutoff, and tilt tamper shut-off make them versatile. Functionality varies with each manufacturer and model, but the available capabilities are summarized below.

6.1.2.4 Installation and Operation

Excess Flow Valves	EFVs are spring operated mechanical valves that automatically shut off the flow of gas when the flow rate exceeds a certain threshold. Technology now exists whereby an EFV can be inserted into a service line without excavation or disruption to gas service. This method is generally referred to as “in-line insertion” or “trenchless” EFV. This

	technology is only currently available for certain sizes of PE gas services operating between 10 and 60 psig.
Breakaway Fittings	Installed above ground by replacing an existing pipe nipple in the meter set. The breakaway fitting is designed for pressures up to 1000 psig.
Gas Shutoff Valves	Can be installed between the regulator and meter (low pressure shut-offs) or between the riser and regulator (high pressure shut-offs), or as meters with built-in remote or automatic shutoff capability.

6.1.2.5 Benefits

Excess Flow Valves	EFVs may provide secondary protection in the event of escaping gas due to a damaged meter set upstream of the regulator. EFVs may not detect excess flow downstream of the meter in the event the damage is after regulator. Invisible to our customers (as opposed to physical protection methods). Easier to maintain (i.e. no corrosion concerns, etc.). Can be used in conjunction with physical protection methods to reduce risk of escaping gas if meter set is impacted.
Breakaway Fittings	Preventing gas from leaking to the surroundings reducing the risk of fire, property damage, and possible injury. Invisible to our customers (as opposed to physical protection methods). Completely mechanical device – no power required. Easier to maintain (i.e. no corrosion concerns, etc.). No excavation required to install the breakaway fitting. Can be used in conjunction with physical protection methods to reduce risk of escaping gas if meter set is impacted.
Gas Shutoff Valves	Remote gas shutoff valves may provide secondary protection in the event of escaping gas due to a damaged meter set downstream of the shutoff valve. Currently these valves are not designed to shut off automatically if the meter set is impacted. These devices may only provide a means to remotely shut off the flow of gas. Automatic shutoff valves may provide secondary protection in the event of escaping gas due to a damaged meter set downstream of

	the shutoff valve by automatically shutting off the gas flow when the pressure is above or below a set value. Invisible to our customers (as opposed to physical protection methods). Easier to maintain (i.e. no corrosion concerns, etc.). May provide other business value (not just for meter set protection). Can be used in conjunction with physical protection methods to reduce risk of escaping gas if meter set is impacted.

6.1.2.6 Challenges and Issues

Excess Flow Valves	EFV installation requires excavation (unless in-line/ insertion/trenchless technology is used) and related activities (permitting, restoration, traffic control, etc.). EFVs sized for larger non-residential services may not be readily/commercially available. EFVs are not recommended for pressure below 10 psig because they may "false trip" due to high gas velocity through the service line. Disruption in gas service (unless in-line insertion/trenchless technology is used). Installation may be costlier than installation costs of physical protection methods. Except for New Jersey, currently not recognized by State pipeline safety regulators as an acceptable form of vehicular protection for meter sets. May not trip if leak or damage are not significant enough to activate the EFV.
Breakaway Fittings	The meter set needs to be retrofitted with the fitting – typically by installing the breakaway fitting just downstream of the meter valve. Not currently recognized by all State pipeline safety regulators as a primary form of vehicular protection for meter sets. The breakaway fitting has an inherent flow restriction which may limit its use to residential and small commercial size loads.
Gas Shutoff Valves	Meter sets need to be retrofitted with the valve. May require Information Technology support.

	May not currently be recognized by your State pipeline safety regulators as a primary form of vehicular protection for meter sets. Some of the devices may only provide a means to remotely shut off the flow of gas. Batteries need to be replaced at various intervals, depending on use, as pertinent. Only protects portions of the meter set downstream of the valve.

6.2 Protecting Regulator from Snow and Ice

Accumulation of ice or snow may interfere with the proper operation of an outdoor meter set. Previous incidents on natural gas distribution system facilities have been tied to either stress caused by snow and ice or the malfunction of pressure regulators due to vent blockages. It is important to take precautionary actions to prevent such damage to meter sets from occurring. For utilities in areas prone to high amounts of snow accumulation, the following solutions should be considered.

6.2.1 Customer Communication

Periodically communicate with customers to remove snow and debris from around the meter set and not to deposit snow from snowplows onto or near the meter set. This communication should inform the customer to be careful when removing snow from around the gas meter set, as damage could potentially create a leak hazard. Use a broom to keep the meter set, including the regulator and vent piping, clear of snow and ice during the winter. Be sure to locate the meter set before snow plowing. Remind customers not to remove utility markings, call before excavating, and not to put mulch, soil, or rocks in contact with the meter set.

Periodically remind customers to use care when driving near meters as bumps or damages to the meter can create leak hazards. It may be beneficial to have a bright-colored, long-duration, all-weather label applied to the gas meter identifying it as a gas meter.

6.2.2 Snow and Ice Protection

6.2.2.1 Gas Meter Enclosure

Figure 5 - Gas Meter Enclosure
Provided by GTI

Gas meter enclosures, which can be easily placed over gas meter sets, may be installed in areas prone to high amounts of snow and ice accumulation. The covers fit over the meter and regulator and have a window to allow for easy meter reading. These covers also help prevent corrosion to the meter set and reduce tampering. See Figure 5 - Gas Meter Enclosure.

6.2.2.2 Ice Shields

Figure 6- Ice Shield
Provided by GTI

Some northern utilities install protective metal ice shields over meter sets to prevent damage from falling ice or snow. They are available simply as shields or with reinforcing steel bars that provide additional protection from impact. See Figure 6 – Ice Shield.

6.2.2.3 Vent Skirts / Expanders

A gas regulator is designed to safely release pressurized gas in the event of a malfunction. Blocking a regulator vent could create an unsafe condition where gas is not able to escape from internal piping. Ice accumulation over the vent can also block the regulator's atmospheric pressure reference, which can lead to regulator performance issues. A vent skirt prevents icicles from forming over the end of the vent tube by enclosing the space around the vent tube and providing an expanded passage. In addition, since the skirt is flared out, rain or freezing rain is deflected away from an area where it could splash upward back into the vent tube.

Consider adding protection such as regulator skirt vents and protective meter enclosures to meter sets that are not adequately protected from anticipated weather by a roof overhang.

6.2.2.4 Extend Piping

Regulator vent piping may be extended to ensure that the vent terminus will not be exposed to snow or ice.

6.3 Additional Meter Protection Devices and Considerations

6.3.1 Schedule 80 Anodeless Risers

Meter sets often break at the threads of the pipe nipple. Utilities may want to consider changing from a schedule 40 anodeless riser to a schedule 80 anodeless riser in areas where additional protection is desired. While this may not prevent damage to the meter set if impacted, it may reduce the chance that a break occurs below the meter shut off valve (on the threads of the

anodeless riser) to instead occur at a place above the meter shut off valve. This would maintain the ability to manually shut off the gas at the existing meter shut off valve if a post-impact leak occurs.

6.3.2 Flashback Arrestor Check Valve

During hot work applications in which fuel gas is used with oxygen , the International Fuel Gas Code, Section 410.5 *Flashback Arrestor Check Valve* states, "Where fuel gas is used with oxygen in any hot work operation, a listed protection device that serves as a combination flashback arrestor and backflow check valve shall be installed at an approved location on both the fuel gas and oxygen supply lines."

6.3.3 Riser Brackets and Trench Compaction

Damage to meter sets may also result from improperly secured riser brackets or service line trench compaction. If not properly secured and compacted, the gas riser can settle over time causing undue stress on the meter loop that may result in gas leakage or other damages.