May 1, 2015

Regulatory Impact Analysis
and
Initial Regulatory Flexibility Act Analysis: Proposed Rule

Plastic Pipe Proposed Changes

PHMSA-2014-0098

Office of Pipeline Safety
Pipeline and Hazardous Materials Safety Administration (PHMSA)
U.S. Department of Transportation

May 1, 2015

1 Introduction

The Pipeline and Hazardous Materials Safety Administration (PHMSA) is proposing a package of nine provisions which will change portions of the plastic pipe regulations. The proposed changes to 49 CFR Part 192 are designed to update the pipeline safety regulations (PSR) as they relate to plastic pipe. The changes will impact all pipeline system types under Part 192, including new, repaired, and replaced pipes. The changes are designed to update the regulations with respect to the products and practices used in plastic pipe systems without compromising safety. Impacted areas include but are not limited to tracking and traceability, risers, fittings, and installation.

This report analyzes the benefits and costs of the regulatory changes as required by Section 1 of Executive Order 12866 (as amended by E.O.s 13258 (2002), 13422 (2007), and 13497 (2009)) and Section 1 of Executive Order 13563.[1] Executive Orders 12866 and 13563 require agencies to regulate in the "most cost-effective manner," make a "reasoned determination that the benefits of the intended regulation justify its costs," and develop regulations that "impose the least burden on society." Based on these requirements and the analysis detailed in the sections below, the following table summarizes the benefits and costs of the proposed rule, by provision. Figures are presented in annual terms using current dollars, as they are not expected to vary significantly in future years.

Table 1: Summary of Benefits and Costs by Provision

Provision:	Annual Costs	Annual Benefits	Annual Net Benefits
1. Tracking and Traceability	No incremental costs, except for some small costs for IT system changes and during transition period.	Non-quantifiable but expected to help avoid future incidents and excavation costs.	Not quantified but provision is expected to justify costs.
2. Design Factor for Polyethylene (PE) Pipe	No expected quantifiable cost.	$23.60 million	$23.60 million

[1] The text of E.O. 12866 can be found here: http://www.archives.gov/federal-register/executive-orders/pdf/12866.pdf and E. O. 13563 here: http://www.whitehouse.gov/sites/default/files/omb/inforeg/eo12866/eo13563_01182011.pdf

Provision:	Annual Costs	Annual Benefits	Annual Net Benefits
3. Expanded use of PA-11 Pipe	No expected quantifiable cost.	Not quantified but provision is expected to provide operator flexibility.	Not quantified, but presumed to be >= $0 since it provides optional, additional flexibility.
4. Incorporation of PA-12 Pipe	No expected quantifiable cost.	Not quantified but provision is expected to provide operator flexibility.	Not quantified, but presumed to be >= $0 since it provides optional, additional flexibility.
5. Risers	Not quantified but expected to be minimal; cost due to adhering to best practices.	Not quantified but provision is expected to improve safety at risers and provide operator flexibility.	Not quantified, but safety benefits and operator flexibility are expected to outweigh costs.
6. Fittings	Not quantified but expected to be minimal; cost due to requiring Category 1 seals only.	Not quantified but provision is expected to improve safety at fittings.	Not quantified, but safety benefits are expected to outweigh costs.
7. Plastic Pipe Installation	Not quantified but expected to be minimal; cost due to adhering to best practices.	$1.04 million	$1.04 million
8. Repairs	Not quantified but expected to be minimal; cost due to adhering to best practices.	Not quantified but provision is expected to improve safety of repairs and reduce leakage.	Not quantified, but safety benefits are expected to outweigh costs.
9. General Provisions	Not quantified but expected to be minimal; cost due to adhering to best practices.	Not quantified but provision is expected to improve safety.	Not quantified, but safety benefits are expected to outweigh costs.

Provision:	Annual Costs	Annual Benefits	Annual Net Benefits
TOTAL	Potential incidental and non-quantifiable costs.	$24.64 million plus non-quantifiable safety benefits.	$24.64 million plus non-quantifiable safety benefits, less small incidental costs.

Analysis of the potential impacts on small entities is also required by the Regulatory Flexibility Act. The Regulatory Flexibility Act analysis is also included in this document (see Section 8).

2 Background

The proposed rulemaking comprises nine sets of provisions which will improve safety, allow for expanded use of plastic pipe products, and allow or require the use of certain materials and practices.

Based on PHMSA Annual Report data, there are about 1,413 distribution, transmission, and/or gathering operators who have at least some plastic main mileage and/or plastic services. These operators would be affected by the proposed changes. In addition, there are approximately 5,200 master meter operators and 900 small LPG systems who could at least potentially be affected. However, these operators do not submit annual reports, so the extent of their use of plastic pipe is not known. (It is likely that any impacts on these operators will be limited due to the nature of their operations and limited use of plastic pipe, but this cannot be characterized further due to the lack of data.)

National totals for mileage and services by system type can be found in Table 2 below, along with the percentage of each that are plastic.

Table 2: Pipeline Mileage and Services by Type
Source: 2013 PHMSA Annual Report Data

	Total Mileage, All Materials	Total Plastic Mileage	Plastic Share of Total	5-Year Average, Annual New Plastic Mileage
Pipeline Mileage:				
Distribution (Main)	1,251,948	673,266	53.8%	12,094
Transmission	302,594	1,358	0.4%	60
Gathering	17,385	912	5.2%	-49

	Total Services, All Materials	Total Plastic Services	Plastic Share of Total	5-Year Average, Annual New Plastic Services
Services:	67,093,835	46,121,408	68.7%	819,858

The specific updates or issue areas are listed below and are described in greater detail in Section 3. These changes will specifically impact new, replaced, and repaired plastic pipe miles and services, rather than the system-wide totals described in Table 2 above.

- Creating a system of tracking and traceability (§ 192.63, § 192.321(k), and § 192.375(d))
- Design Factor for Polyethylene (PE) Pipe (§ 192.121)
- Expanded use of PA-11 Pipe (§ 192.121)
- Incorporation of PA-12 Pipe (§§ 192.121 and 192.123)
- Regulation addressing design installation and support considerations for risers (new section § 192.204 on riser design requirements)
- General incorporation of new and improved fitting standards (§§ 192.455 and 192.465(a))
- Revision of plastic pipe installation and joining requirements (§ 192.3, § 192.281, § 192.283, § 192.285, § 192.313, § 192.321, § 192.329, § 192.367, § 192.376, and § 192.756)
- Repair revisions including prohibition of leak-repair clamps as a means for permanent repair (§ 192.311 and new section § 192.720 on use of leak-repair clamps)
- General provisions for plastic pipe material, storage and handling, merging sections, and general design requirements (§ 192.7, § 192.9, § 192.59, § 192.67, § 192.121, § 192.123, § 192.143, § 192.145, § 192.149, § 192.513(c))

3 Identification of the Problem and the Need for the Rule

Under the Federal Pipeline Safety Laws, 49 U.S.C. 60101 *et seq.*, the Secretary of Transportation must prescribe minimum safety standards for pipeline transportation and for pipeline facilities. The Secretary has delegated this authority to the PHMSA Administrator (49 CFR 1.53(a)). The use and availability of plastic pipe have changed over the years with technological innovations, and the pipeline safety regulations have not stayed concurrent with the products and practices used in plastic pipe installations. This proposed rule would update the regulations to account for current applications of plastic pipe and allow for the expanded use of plastic pipe products.

Executive Order 12866 states that "Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people ... ." The mission of the

PHMSA is to ensure the safety of the natural gas and hazardous liquids pipeline system. The rule would create changes in the regulations consistent with the protection of persons and property while changing unduly burdensome requirements.

Pipeline operators do not always bear the full costs of an incident. Even in cases where they provide compensation for losses that can be monetized, those monetary penalties or settlements do not necessarily capture the full impact on affected parties, especially when a death or injury occurs. As a result, there is a negative externality present in which the company may not take the full societal cost of a possible incident into account in its decision-making. The negative externality alters the company's decision about safety precautions, leading to a need for government to set minimum levels of safety precautions. Pipeline safety regulations are designed to address this potential market failure. The rulemaking package analyzed here is more specifically intended to improve compliance with these regulations by updating references and technical standards, providing clarification, and removing conflicting language. Some of the provisions also promote improved pipeline integrity and safety by addressing small gaps in the current regulations, as discussed in more detail below.

Executive Order 12866 and 13563 direct all Federal agencies to consider the costs and benefits of "available regulatory alternatives, including the alternative of not regulating." Federal agencies are directed to develop a formal Regulatory Impact Analysis consistent with Office of Management and Budget (OMB) Circular A-4 for all "economically significant" rules, or those rules estimated to have an impact of $100 million in 1995 dollars or more in any one year. The Order also requires a determination as to whether a rule could adversely affect the economy in terms of productivity and employment, the environment, public health, safety, or State, local, or tribal governments. This requirement applies to rulemakings that rescind or modify existing rules as well as to those that establish new requirements. The goal of the analysis is to provide decision makers with a clear indication of the most efficient alternative – that is, the alternative that generates the largest net benefits to society ignoring distributional effects.

This rule falls below the $100 million per year in annual impact threshold. This regulatory analysis:

- Identifies the target problem, including a statement of the need for the action.
- Identifies available alternative approaches.
- Defines the baseline.
- Defines the scope and parameters of the analysis.
- Defines and evaluates the costs and benefits of the action and the main alternatives identified by the analysis.
- Compares the costs and benefits.
- Interprets the cost and benefit results.

Subsections 3.1 to 3.9 describe the regulatory changes in detail and the specific needs to which each regulatory change responds.

3.1 Tracking and Traceability

PHMSA is aware of several cases in which operators could not identify potential systemic issues related to plastic pipe. It is often difficult to determine whether a pattern of pipe or component failures is related to a certain type of material, vintage of material, specific product design, and/or whether the defective pipes or fittings were produced by a certain manufacturer at a certain time.

Further, once a pattern of problems is identified, many operators cannot locate the items of concern within their systems due to limited data on installation locations by type/date/manufacturer. This can lead to the inability to identify and remove the affected pipe or component. In some cases, operators perform improper or excessive excavations based on this incomplete information.

To address these issues, the proposed revisions would require operators to record and track plastic pipeline component details related to their manufacture and trace and locate where the material is installed. Tracking and traceability standards have been developed by industry groups and are in the process of being incorporated into other widely used standards, but are not currently reflected in the PSR. The proposed regulation, as will be defined in § 192.3 and outlined in ASTM F2897-11a, gives operators flexibility in terms of the specific practices that they would use for tracking and traceability, but these would most likely involve the use of barcode readers and 16-digit identification numbers (as ASTM F2897-11a specifies).

3.2 Design Factor for Polyethylene (PE) Pipe

These proposed changes respond to a petition from the American Gas Association to increase the design factor for PE pipe in § 192.121 from 0.32 to 0.4.[2] The petition is based on research and technical justification performed by the Gas Technology Institute (GTI), and includes certain limitations by type of material and wall thickness. This change would allow for the production and installation of PE pipe with thinner walls. Alternatively, the same pipe would be acceptable for operation at higher pressures, if made from higher quality material and meeting other limitations. For additional background and consideration, the current design factor of 0.32 was based on pipe used in the water industry with increased safety factors. The water industry has recently raised their design factors for plastic pipe from 0.5 to 0.63. If applying the same safety factors, that would result in a design factor of 0.4. Furthermore, a 0.4 design factor is currently allowed in the code for PA-11 pipe with certain limitations. This change can be viewed as a means to codify technical advances with no adverse impact on safety.

[2]Docket ID: PHMSA-2014-0006-0009. American Gas Association – Petition for Rulemaking Increase Design Factor for New Polyethylene Pipe, August 12, 2009. http://www.regulations.gov/#!documentDetail;D=PHMSA-2014-0006-0009

3.3 Expanded use of PA-11 Pipe

This proposed change would allow greater use of PA-11 plastic pipe. PA-11 is currently allowed in the PSR, but with certain limitations on pressure, diameter (up to 4"), and standard dimension ratio. This change would update the regulations to align with ASTM standards for PA-11 and would allow up to 6" diameter PA-11 pipe. These changes are designed to allow additional flexibility in choice of material with no adverse impact on safety.

3.4 Incorporation of PA-12 Pipe

Current PSR do not allow for the use of PA-12 pipe. PHMSA has been petitioned by PA-12 pipe manufacturers (Evonik and UBE) to allow for the use of this material using a 0.4 design factor with certain limitations for design pressure (maximum of 250 psig) and wall thickness (at least 0.090 inches).[3] PA-12 has already been put into use through various state waivers. As with the proposed provisions for PA-11, this change is designed to update the regulations, providing additional flexibility with respect to choice of pipeline material with no adverse impact on safety.

3.5 Risers

Part 192 PSR do not contain explicit requirements regarding design, installation, and support considerations with regard to risers, including risers used for service lines as well as risers for other installations near regulator stations and farm taps that are considered main by definition. Therefore this provision will create a new section in the regulations addressing these issues. Including such requirements in the regulations is intended to improve pipeline safety overall by addressing this gap in the regulations. It also offers regulatory relief by permitting the use of an encased plastic riser above ground, instead of steel, thus lowering materials costs and the costs of cathodic protection.

The specific installation requirements in this proposal include removal of burrs on metal components prior to insertion of plastic pipe, using risers manufactured in compliance with industry standard ASTM F1973-13, and having the service line risers located at the customer's building wall. These specific requirements are designed to increase pipeline safety by codifying best practices.

3.6 Fittings

This section includes the incorporation by reference of fitting-related standards for PE, PA11, and PA12 pipe, to accord with the broader use of these materials.

Another fitting-related provision designed to address issues that PHMSA has identified with mechanical fittings that become loose or with pipe being pulled out from the fittings. To prevent incidents related to this type of failure, PHMSA is proposing that all fittings used in plastic

[3] Docket ID: PHMSA-2014-0006-0002. Evonik-Degussa AG/UBE Industries – Petition to Amend Title 49 Code of Federal Regulations Section 192.123 to Permit Use of Polyamide 12 at Higher Pressures. April 27, 2007. http://www.regulations.gov/#!documentDetail;D=PHMSA-2014-0006-0002

pipeline service be designed and tested to provide a seal plus resistance, so that a force on the connection would cause the pipe being joined to yield before the joint does. More specifically, fittings would be required to provide a Category 1 joint under the ASTM standard D2513. This provision is detailed in the installation section of the NPRM.

Additionally, PHMSA proposes to revise a section of the regulation to allow an exception for metal alloy fittings in plastic pipelines. The fitting would not be required to have certain protections against external corrosion if it was monitored and tested within a particular frequency.

3.7 Plastic Pipe Installation

PHMSA is considering revision of the plastic pipe installation requirements (§ 192.321). These revisions include: requiring trenchless excavation best practices, specifying and qualifying joining procedures, qualifying joint makers, specifying bend requirements, specifying installation requirements for tracer wire and backfill, requiring seal plus resistance fittings, and joining equipment maintenance and documentation requirements.

Several of these changes are necessary to prevent abrasion and eventual leakage. The joining requirements are designed to create connections that withstand a force on the pipe equal to or greater than that which would cause permanent deformation of the pipe itself.

One specific major change is requiring the use of Category 1 joints only (item G.8 in the NPRM). PHMSA has observed issues with mechanical fittings becoming loose or pipe being pulled out from the fittings, leading to leaks and sometimes incidents. Therefore, PHMSA is considering the incorporation of a requirement to use only fittings that are designed and tested to provide a seal and resist pullout, so that the pipe being joined will yield before the joint does. More specifically, ASTM D2513-99, currently incorporated by reference in Part 192 (as well as newer versions of ASTM D2513), provide specifications for a number of different categories include seal plus resistance (Category 1), seal only (Category 2), and seal plus pipe restraint (Category 3). The regulation would require fittings to provide a Category 1 joint per ASTM D2513, or "A mechanical joint design that provides a seal plus a resistance to a force on the pipe end equal to or greater than that which will cause a permanent deformation of the pipe" which is generally considered the most stringent of the 3 categories.

3.8 Repairs

PHMSA proposes to require that all pipes or components with scratches or gouges exceeding 10% of wall thickness be replaced and that stainless steel leak-repair clamps be used as temporary repairs rather than permanent fixes. These requirements are preventative and enhance safety by ensuring that plastic pipes are properly maintained and appropriately repaired.

3.9 General Provisions

These changes would require that plastic pipe be manufactured to a listed standard developed for gas and liquid hydrocarbons, be free from defects, and contain no regrind or rework material.

Additionally, operators would be required to have written procedures related to storage and handling of plastic pipe; the procedures would also need to conform to a listed standard developed for gas and liquid hydrocarbons.

This section also includes a clarification that Type B regulated onshore gathering lines must comply with the requirements of Part 192 applicable to plastic pipe.

An additional change to the existing regulation entails merging two sections (192.121 and 192.123) into one new section (192.121). This section will outline the changes discussed in sections 3.2, 3.3, and 3.4 of this document. This change primarily represents a reorganization of the regulation but also incorporates certain exceptions that detail when it is permissible to exceed various limitations such as for pressure or temperature.

Finally, PHMSA proposes that certain general design requirements meet listed specifications. These design requirements are specifically for the ability of components to withstand certain operating pressures and anticipated loads and to ensure that valves and molded fittings are designed according to listed specifications.

4 Identification of Available Alternative Approaches

4.1 No Action

The “no action” alternative represents the current status quo under the Pipeline Safety Regulations. In this alternative, no changes to the PSR would be implemented, and no benefits or costs would accrue.

4.2 Proposed Revisions

This alternative comprises the set of revisions as described in Section 3. Expected benefits, costs, and other impacts of the proposed revisions are analyzed below.

5 Industry Information

The affected industry comprises owners and operators of regulated natural gas pipelines that use plastic pipe, defined here as having at least one mile of plastic distribution main or gathering lines, and/or at least one plastic service. These include a mix of large and small businesses, as well as publicly owned utilities, municipalities, and other organizations. No information is available on the roughly 5,000 master meter and 900 small LPG systems who do not file Annual Reports; these operators may be affected to the extent that they use plastic pipe. Among operators who file Annual Reports, PHMSA’s 2013 Annual Report data and the Dun and Bradstreet company database together indicate that there are approximately 1,413 entities utilizing plastic pipe when all corporate subsidiaries are separately counted. These entities consist of distribution, transmission, and gathering system operators, some of whom operate more than one system type. Of these, approximately 1,395 operators could be matched to Dun

and Bradstreet data on employee counts; these firms had a total of roughly 61,100 onsite employees. There are wide variations across entities with respect to the share of employees actually engaged in pipeline operations, especially for public agencies.

Among these entities, common industry (NAICS) codes are 221210, Natural Gas Distribution; 211111, Crude Petroleum and Natural Gas Extraction; and 486210, Pipeline Transportation of Natural Gas.

6 Definition and Evaluation of the Benefits and Costs

Costs and benefits of the proposed provisions are discussed below and, where possible, quantitatively estimated. For simplicity, these calculations generally assume that current trends continue with respect to the use of plastic pipe and that there are no other major changes to pipeline safety regulations.

Moreover, although benefit-cost analysis typically uses a multi-year period with appropriate discounting of future values, in this case benefits and costs are presented in annual terms or described qualitatively, because they are not expected to vary significantly across time.

6.1 Data Sources and Limitations

Cost is estimated using PHMSA databases and external datasets as detailed more specifically below. In many cases the changes either codify existing practices or provide regulatory flexibility, resulting in little to no quantifiable costs.

6.2 Costs

In the sub-sections below, each provision of the rulemaking is analyzed individually for potential cost implications.

6.2.1 Tracking and Traceability

The technology already exists to use barcoding and/or 16-digit identification numbers to track inventory and pipe material, and this practice is reflected in industry standard ASTM F28987-11a. According to the Plastic Pipe Institute, manufacturers have already started labelling their products with the 16-digit numbers and/or barcodes in compliance with this standard.[4] As such, no incremental costs for barcoding itself are anticipated.

Operators will need to maintain a recordkeeping system (typically electronic) to hold the tracking and traceability information. However, recording the barcode number and location of a pipe segment, fitting, or joint would ordinarily require no additional effort relative to current requirements, which entail recording descriptive information about the type, manufacturer, and

[4] Plastic Pipe Institute, http://plasticpipe.org/pdf/tracking-traceability.pdf

lot number of the pipe, fitting, or joint. Indeed, in many cases it is simpler to record the barcode information. Therefore, no incremental compliance costs are anticipated.

Recording the *name* of the person who made each joint, though not explicitly required by current regulations, is not expected to result in additional recordkeeping because it is already common practice and is an implied part of other current rules. Specifically, existing regulation §192.285(c) requires a joiner to be re-qualified if, among other things, he or she produces a certain number of unacceptable joints; in order to comply with this rule, operators must already have some means of tracking who made each joint.

In the near term, some operators may incur costs for making changes to their computer recordkeeping systems to accommodate the new standard. These costs should be minimal since the proposed rule does not prescribe a particular format, and most operators are prepared for this change. There will also be a transition period during which both the current descriptive information and the new barcode-based information will be recorded, creating the possibility of additional recordkeeping costs during this time. However, PMHSA believes that these impacts will be relatively minor and transitory.

6.2.2 **Design Factor for Polyethylene Pipe**

This provision would provide additional flexibility for operators with respect to choice of material by changing the allowable design factors for PE pipe used in gas service. As noted above, this would permit thinner pipe walls, with a resulting decrease in materials costs. (Alternatively, operators could operate at higher pressure at a given level of thickness, which increases the flow rate and allowing more product to be transported.) As this simply provides a new option for operators, there are no quantifiable cost impacts.

6.2.3 **Expanded use of PA-11 Pipe**

As with the changes for PE, this provision provides operators flexibility with new options for PA-11 pipe material. There are no quantifiable cost impacts.

6.2.4 **Incorporation of PA-12 Pipe**

There are no quantifiable cost impacts for this measure as the provision simply provides more flexibility for operators in choice of plastic pipe material.

6.2.5 **Risers**

This section addresses a gap in current regulations and codifies existing best practices and industry technical standards, notably ASTM F1973-13. Compliance costs are expected to be very minor, since most operators are already using these practices and standards. One implication of the requirement to use ASTM-compliant risers is that risers may no longer be hand-fabricated in the field. This could conceivably limit flexibility for operators in some settings where manufactured risers are for some reason not suitable, leading to additional installation costs. While no data on riser installation are available to support quantification of these potential costs, PHMSA believes that these impacts are likely to be very minor and would

be more than offset by the ability to use encased plastic, rather than steel, for above-ground portions of risers. Operators availing of this new option would be able to reduce their materials costs; maintenance costs would also be lower, since the plastic would not require cathodic protection.

6.2.6 **Fittings**

The incorporation by reference of existing industry standards for PE, PA11, and PA12 pipe is part of the additional flexibility granted to operators from expanded use of those materials (see above).

There is little to no cost for implementing the Category 1 joints for fittings. While the provision limits the range of permitted fittings, the allowable fitting is already widely in use. Additionally the Category 1 seal plus pullout resistance fitting is not recognizably different from the Category 2 and 3 fittings in terms of labor, material, and maintenance costs.

The limited exception from corrosion protection requirements would provide additional regulatory flexibility and does not entail additional costs.

6.2.7 **Plastic Pipe Installation**

Most of the proposed provisions in this section simply codify existing best practices from the industry, addressing gaps in the current regulations. Little to no incremental compliance costs are expected. These provisions address trenchless excavation, joining plastic pipe, qualifying joining procedures, qualifying persons to make joints, bends, installation of plastic pipe, and service lines.

More specifically, the provisions related to joints include a number of small technical changes, clarifications and corrections on topics such as use of heat, adhesive, and cements. No significant compliance costs are expected for these provisions.

Within the equipment maintenance provision, there is a proposed requirement for each operator to maintain records of the equipment used to maintain joining equipment and for this equipment to be used in accordance with manufacturer's specifications. Under the proposed provision, operators would need to maintain records of tests and calibrations, but not for daily verifications and adjustments. Although there appears to be some potential for additional recordkeeping costs, PHMSA believes that there will be little incremental cost in practice, since operators already must verify that equipment used meets the manufacturer's specifications.

Despite the little incremental costs for these changes and clarifications in practices, PHMSA believes that there are resulting safety benefits, as discussed in section 6.3.7.

6.2.8 **Repairs**

This provision would clarify that temporary clamps may not be used for permanent repair. While this may involve small additional compliance costs for the minority of operators who use this practice, the overall impact is expected to be minimal.

6.2.9 **General Provisions**

The proposed requirement related to plastic pipe standards is a clarification of an existing requirement (i.e., it clarifies that the standard to which the pipe was built must have been developed for gas or liquid hydrocarbons, rather than other products) and is not expected to have any cost impact. Similarly, the requirement to document storage and handling procedures that comply with a listed standard simply addresses a gap in the regulations, codifying existing industry practices that already occur; no new compliance costs are expected.

The provision related to gathering lines is a clarification of existing regulations and does not entail any costs.

The proposed provisions related to plastic pipe being free of defects and free of rework or regrind material would be expected, at the margin, to raise the supply cost of plastic pipe for operators. However, many operators already prohibit rework and regrind material in the pipe that they procure. PHMSA does not have the detailed industry data that would be required to estimate the overall cost impact of this proposed provision.

There are no costs associated with the merging of sections 192.121 and 192.123, which is purely a revision to reorganize this section for clarity.

There are no costs associated with requiring that certain components and valves meet listed specifications, as it is expected that this is already occurring.

6.2.10 **Cost Summary**

The proposed revisions have a variety of expected cost impacts, none of which can be quantified with available data. Several provisions are deregulatory in nature and allow additional flexibility to use new plastic pipe formats, creating the potential for cost savings in the industry. Others are merely clarifications or restatements of existing rules, or codifications of current industry practices and technical standards, and are not expected to have any significant cost impacts. While costs may come from proposed regulations on regrind and rework material, these could not be estimated with available data.

These costs also do not include costs to the master meter operators and small LPG systems, for whom no data are available to support estimation. However, impacts on these smaller operators are expected to be fairly minor.

6.3 Benefits

Pipeline incidents can result in death, injury, property damage, and environmental damage. The benefits of the proposed regulatory changes stem primarily from improvements to regulatory clarity and from upgraded safety requirements that are intended to reduce the number of pipeline incidents and their severity. Several provisions also provide benefits in the form of additional operational flexibility and lower costs for pipeline operators.

Estimates of avoided incident costs are calculated using information on fatalities, injuries, and property damage (including lost product). Fatalities and injuries are converted to dollar terms using values from departmental guidance documents, $9.3 million per fatality and $976,000 for an injury requiring hospitalization (2014$).[5] These figures are conservative to the extent that they do not include the costs of non-hospitalized injuries.

In the sub-sections below, the expected benefits of each provision of the rulemaking are analyzed individually.

6.3.1 Tracking and Traceability

While the benefits of increased tracking and traceability are difficult to quantify, qualitatively there are numerous advantages to instituting such a system. With the rapid pace of change in plastic pipe technology, it is important to be aware of which products are in use and where they are located. For example, if an incident or failure results in a recall of a particular batch or lot-number of plastic pipe, using a barcode-based or similar system will make it easier for operators to find and replace those products, reducing the safety risks from the defective products. . It is also expected to reduce the costs of excavation: operators could identify problem sections of pipe more quickly and avoid needless excavation when trying to located affected plastic pipe. This was one of the motivations behind the industry's adoption of the ASTM standard, and PHMSA is aware of several cases where extensive excavation was needed in order to locate affected sections of pipe. However, no data were available to estimate these savings.

Additionally, if the tracking and tracing system is implemented now, there is the potential to use this system to streamline maintenance in the future as the current "new" pipeline systems begin to age. This practice of proactive maintenance would ultimately result in cost savings for operators.

[5] Trottenberg, Polly and Robert Rivkin. "Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analyses." February 28, 2013. The fatality number was grown at the recommended rate of 1.07% per year from the 2012 base of $9.1 million. The injury number is equivalent to a "serious" injury on the Abbreviated Injury Scale and is 10.5% of the VSL.

6.3.2 **Design Factor for Polyethylene Pipe**

The benefit of this provision is that it will allow operators added flexibility and the ability to take advantage of newer PE technology. There is no expected degradation of safety as a result of these changes based on research and technical justification performed by the Gas Technology Institute. The provision is also in accordance with recent changes to the requirements for plastic pipe used in the water industry.

The change in design factor means that slightly thinner pipe can be used, resulting in savings on materials costs. Alternatively, operators could choose to operate at a slightly higher pressure for a given level of thickness, which means that more product (by volume) can be delivered, which is an operational advantage and may yield cost savings. Based on calculations provided by the American Gas Association, the proposed change would allow a 17% reduction in pipe material or an 11% increase in flow capacity.

The allowable change in material is expected to result in cost savings for operators. Over the last 5 years the average number of new plastic transmission miles, gathering miles, and distribution main miles was 12,105 and the average number of new services was 819,858.[6] Therefore, the total annual amount of new plastic pipe in transmission, gathering and distribution is approximately 64 million feet (12,105 new plastic miles x 5,280 feet per mile) and the total amount of new plastic services is equivalent to 41 million feet (819,858 new plastic services x an assumed 50 feet per new service). These figures sum to an annual total of approximately 105 million linear feet of new plastic miles, mains, and services. Of this approximately 90% or 94.4 million feet is assumed to be PE pipe, the most prevalent plastic. Based on public works costbooks and a review of price lists from plastic pipe vendors, the material cost per foot of PE pipe is approximately $2.50. This cost per foot results in a total annual industry material cost for PE pipe of approximately $236 million (94.4 million feet x $2.50 per foot). While it is estimated that the design factor change will result in a material reduction of 17% as noted above, we will conservatively estimate a 10% reduction in materials cost. This results in an annual material cost savings to transmission, gathering, and distribution operators of approximately $23.60 million, assuming that operators avail of the new design factor and do not make other changes in their choice of material.

6.3.3 **Expanded use of PA-11 Pipe**

As with the PE provision above, the inherent benefit of this provision is that it will allow operators added flexibility and the ability to take advantage of newer technology. There is no expected degradation of safety because these changes are in accordance with ASTM standards and testing. They have also already been applied in some cases through state waivers.

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[6] Figures calculated based on averaging year-over-year changes in plastic pipe miles of main and plastic pipe services respectively. Plastic pipe distribution miles of main and services totals were taken from PHMSA Annual Report data.

6.3.4 **Incorporation of PA-12 Pipe**

As for PA-11 above, this provision provides operators added flexibility in their choice of pipe material. There is no expected degradation of safety based on new standards developed for PA-12 and the fact that PA-12 is already in use through a select number of state waivers.

6.3.5 **Risers**

Risers have an inherent incident risk associated with them because they connect underground pipelines with above ground systems. However, it is unclear how many incidents could be avoided based on these changes because many of the proposed requirements are already standard in the industry, and because PHMSA's incident database does not readily allow identification of riser-related incidents. Overall, PHMSA believes that the requirements will increase the safety of risers and prevent incidents. Specifically, ensuring the use of best practices in riser installations and that risers conform to ASTM standards will help protect risers from above ground hazards and better protect maintenance crews while conducting repairs and replacements. These benefits could not be quantified for the reasons noted.

6.3.6 **Fittings**

These fitting standards represent the current best practices for the industry. If adopted by the entire industry, they are expected to improve safety and reduce incidents associated with fitting failure. Potential benefits are discussed below under the broader heading of installation.

6.3.7 **Plastic Pipe Installation**

From January 2010 to January 2014 there were a total of 11 reported plastic pipe incidents that could have been at least partially avoided based on the changes outlined in this provision. These incidents were selected by first identifying gas distribution, transmission and gathering incidents that involved plastic material. This filtering resulted in 122 gas distribution incidents which occurred from January 2010 to January 2014. Of these 122 incidents, 51 had listed causes that were potentially relevant to this provision (material failure of pipe or weld, natural force damage, or other outside force damage). Of the 51 incidents, 27 could be eliminated as not relevant based on the more detailed cause information, leaving a total of 24. These 24 incidents had cause details consisting of fusion joint, heavy rains/floods, high winds, mechanical fitting, other natural force damage, and other outside force damage. Of these 24 incidents, another 13 could be eliminated as not relevant based on information from the incident narrative, leaving a total of 11 relevant incidents. These incidents, and their corresponding details, are summarized in Table 3 below. All 11 incidents were associated with gas distribution pipes, as there were no relevant plastic pipe incidents associated with gas gathering and transmission pipes.

Table 3: Incidents Related to Plastic Pipe Installation

Report Number	Cause Details of Incident	Number Injured	Gas Released (mcf)	Cost of Gas Released	Cost of Property Damage (2014$)
20110369	MECHANICAL	0	120	$4,201	$633,389

Report Number	Cause Details of Incident	Number Injured	Gas Released (mcf)	Cost of Gas Released	Cost of Property Damage (2014$)
	FITTING				
20110016	MECHANICAL FITTING	0	6	$67	$731,305
20110062	MECHANICAL FITTING	0	158	$1,071	$93,017
20100084	FUSION JOINT	0	56	$289	$47,034
20130005	OTHER NATURAL FORCE DAMAGE	0	100	$1,000	$326,371
20120094	OTHER NATURAL FORCE DAMAGE	1	12	$36	$764,487
20110161	HIGH WINDS	0	-	$168	$414
20110059	HEAVY RAINS/FLOODS	0	90	$445	$40,394
20100095	HEAVY RAINS/FLOODS	0	70	$268	$26,387
20130038	OTHER OUTSIDE FORCE DAMAGE	1	15	$100	$40,100
20120001	OTHER OUTSIDE FORCE DAMAGE	0	26	$102	$565,156
Total:		2	653	$7,747	$3,268,054

The changes to the installation requirements, specifically those related to joining and fitting, could potentially reduce the likelihood of the incidents related to mechanical fitting and fusion joint. The changes to the installation requirements, specifically those related to backfill, could potentially reduce the likelihood of the incidents related to natural force damage, winds, and heavy rains/floods.

In order to calculate the total annual cost of these incidents, several steps are required. As noted above in section 6.3, the value of avoiding an injury is estimated at $976,000. Therefore the total cost for the two injuries noted in Table 3 above is $1.95 million. Therefore the total cost of the 11 incidents (including injury costs and the total estimated cost of property damage) was approximately $5.2 million over 4 years.

In addition to the direct incident costs, there are societal costs in the form of increased global warming potential (GWP) from the methane and carbon dioxide released as lost gas. As seen in Table 3 above, a total of 653 thousand cubic feet of gas was released as a result of these 11 incidents. Based on monetary values from the Interagency Working Group on Social Cost of

Carbon[7] and physical conversion factors[8], the GWP cost of the gas released in these incidents is approximately $12,500.

The $5.2 million in incident costs and social cost of carbon over the 4-year data period represent an average of approximately $1.3 million per year in incident costs that are potentially avoidable through the revisions in this section. For estimation purposes, because the relevant incidents may not be entirely prevented even with the proposed changes in place, we assume an 80% reduction in the relevant set of preventable incidents or a total of $1.04 million per year in safety benefits from incidents avoided.

6.3.8 **Repairs**

This provision will increase safety and result in a positive benefit because it effectively requires permanent repairs to pipes rather than allowing temporary fixes, which are more likely to result in leaks and incidents. The benefits of this provision are clear, but cannot be quantified due to a lack of data related specifically to incidents associated with temporary repair.

6.3.9 **General Provisions**

Prohibiting regrind or rework material and requiring documented procedures for storage and handling are expected to enhance safety by improving product quality and pipeline integrity. Because they are relatively common practices already, however, it is difficult to quantify the net impact of the proposed requirements.

There are no quantifiable benefits for the provision relating to gathering lines as the changes merely clarify the existing regulation.

There are no quantifiable benefits from the changes relating to merging sections 192.121 and 192.123. In terms of non-quantifiable benefits, these changes will consolidate the regulations and make them easier to read and understand. This is expected to improve compliance with the regulations.

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[7] The Working Group's estimate of $37 per metric ton of carbon dioxide in 2007 dollars was converted to 2013 dollars using the CPI-U; this yields an estimated $41.57 per ton of carbon dioxide emitted. (The Interagency Working Group's $37 value is based on a 3% discount rate and 2015 base year. This appears to be the most appropriate value available from the document, though it uses a 3% discount rate rather than the 7% rate typically used for regulatory impact analysis.) Methane is generally understood to be a more potent greenhouse gas than carbon dioxide, although with diminishing effects over time. While an official value for methane has not yet been established, other rulemaking efforts (see, e.g., the Corporate Average Fuel Economy (CAFE) rulemaking: http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FRIA_2017-2025.pdf) have used a multiple of 25 times the social cost of carbon dioxide emissions as an approximation. In this case, that is 25* $41.57, or $1039 per metric ton.

[8] For calculation purposes, gas was assumed to comprise 96% methane and 1% carbon dioxide based on industry averages. Volumes were converted to mass using physical conversion factors at typical tariff pressure and temperature (1 atmosphere, 60 degrees Fahrenheit).

There are no quantifiable benefits related to requiring certain components and valves meet listed specifications. However, these requirements lead to clear non-quantifiable benefits such as enhanced safety and ease of repair and replacing components and valves.

6.3.10 **Benefits Summary**

Three of the proposed provisions (related to PE, PA-11 and PA-12) allow additional flexibility to use new plastic pipe formats. The benefits of the PE provision for all operator types were estimated at roughly $23.60 million per year in reduced materials costs, and collectively these provisions will provide additional options for operators. These figures do not include the potential benefits to master meter and small LPG systems, for whom no data are available to support estimation.

Other proposed revisions are merely clarifications or restatements of existing rules, or codifications of current industry practices and technical standards, and are not expected to have significant quantifiable safety benefits. However, improving the clarity of the regulations is beneficial from the perspective of improving comprehension and compliance.

For the one set of provisions (installation) for which a discrete set of preventable incidents was identifiable, overall benefits in the form of incident costs avoided were estimated at $1.04 million per year for distribution operators. Safety benefits are also expected from other provisions that make small changes to allowable practices in pipeline repair and maintenance, but these changes could not be quantified due to limitations in the underlying incident data.

7 Summary and Conclusion

The proposed rulemaking includes 9 sets of changes to the Pipeline Safety Regulations (PSR, Part 192) as they relate to plastic pipe. The changes are designed to update the regulations with respect to the products and practices used in plastic pipe systems and to address gaps in the existing safety regulations.

One group of proposed changes provides significant additional flexibility to use new plastic pipe products, which is expected to yield cost savings for the affected industry, both in terms of material costs and in the ability to move product at higher pressures. These cost savings were estimated at roughly $23.60 million per year for all operator types.

Other provisions clarify or restate existing rules and/or incorporate existing best practices from industry. These provisions are expected to have very minor cost and benefit impacts.

For the proposed regulations involving additional stringency or recordkeeping, compliance costs were not quantifiable but are expected to be minimal based on existing practices and other requirements already in place. Benefits for distribution operators are estimated at $1.04 million

annually based on avoided incident costs. PHMSA believes that there are also significant un-quantified safety benefits.

8 Initial Regulatory Flexibility Act Analysis

8.1 Reasons for Agency Action

PHMSA works to ensure the safety of the nation's gas and hazardous liquid pipelines. Government regulation of pipeline safety standards addresses the market failure of negative externalities, namely the costs that pipeline incidents impose on other parties for which there may be no market compensation. PHMSA's safety regulations require periodic updating to update technical standards and acknowledge new products and technologies; address gaps in existing safety requirements. The rule comprises a set of changes to the Pipeline Safety Regulations (PSR) related to plastic pipe. The goals of the proposal are (1) to provide regulatory relief by granting additional flexibility to use new plastic pipe formats, and (2) to enhance safety by addressing gaps in current rules and making clarifications to existing rules.

8.2 Objectives of, and legal basis for, the proposed rule

The rule is designed to enhance pipeline safety through a set of revisions to the PSR. The ultimate objective is to lessen the frequency and societal consequences of pipeline incidents, including property damage, environmental degradation, personal injury, and loss of life. PHMSA's overall mandate to regulate pipeline safety is set by federal law under 49 USC 60102 et seq. Several provisions also address safety recommendations from the National Transportation Safety Board, an independent Federal agency charged with investigating serious transportation accidents and making safety recommendations.

8.3 Description and estimate of the number of small entities to which the proposed rule would apply; projected reporting, recordkeeping and other compliance requirements of the proposed rule and their impact on small entities

Based on 2013 Annual Report data, there are approximately 1,413 gas pipeline operators with at least some plastic pipe, i.e. at least one mile of transmission or gathering lines that are plastic pipe, and/or at least one service using plastic pipe. These entities consist of distribution, transmission, and gathering system operators, some of whom operate more than one system type. Of these, information was available on 1,395 operators through PHMSA's subscription to a Dun & Bradstreet database of company information, using a match by operator ID (OPID). (Eighteen operators could not be matched, apparently due to limitations of the Dun & Bradstreet coverage and/or time lags in the data.)

Of the 1,395 operators in the database, 341 (25%) were identified by Dun and Bradstreet's small business indicator variable as meeting government criteria for classification as a small businesses.

In addition, there are 5,200 master meter operators and about 900 small LPG systems who may be affected to the extent that they use plastic pipe. A precise count of affected operators in these groups, and the share that are small businesses, is not possible because these operators do not file Annual Reports with information on their plastic pipe inventory.

Based on these figures, a significant share of the affected entities can be classified as small business. While almost all of the changes would apply to these small business entities, the scope of impact is expected to be limited. The estimated compliance costs of the proposed rule were not quantifiable but included some changes to plastic pipeline installation, operations, recordkeeping, and maintenance. The proposed rule largely codifies best practices. Costs are expected to be minimal.

As always, the actual costs and savings per firm would vary according to factors such as the size of their plastic pipe network, their propensity to replace other materials with plastic over time, and their labor costs. However, the magnitude would be similar and would not represent a significant economic impact. Some small additional costs could also come from provisions requiring the use of best practices for risers, installation, and repair, although it is expected that most firms are already employing those practices.

Overall, much or all of the minimal, non-quantifiable incremental compliance costs of the proposed rule could be offset by the expanded ability to use new plastic pipe formats and technologies, which would lower material costs and provide greater operational flexibility. Improved safety from the installation, tracking and traceability, and other provisions would also limit operators' potential exposure to liability claims for third-party property damage and other incident costs.

8.4 Federal rules which may duplicate, overlap or conflict with the proposed rule

PHMSA believes that no other Federal rules duplicate, overlap, or conflict with the proposed rule. In fact, many of the provisions are designed to eliminate inconsistencies in the existing regulations.

8.5 Alternatives considered

In addition to the package of regulatory updates, PHMSA considered a no-action alternative in which no changes would be implemented. The no-action alternative was rejected because it would not respond to the identified safety issues with plastic pipe, and would needlessly delay the ability of operators to use new plastic pipe technologies.

Because the rule is focused on ensuring safety, is partially de-regulatory in nature, and does not have a significant economic impact on small entities, PHMSA did not consider establishing different compliance or reporting requirements or timetables for small entities.

8.6 Effect on the cost of credit

The proposed rule is not projected to increase the cost of credit for small entities in any way.

8.7 Summary and conclusion

The rule updates the pipeline safety regulations related to plastic pipe, improving safety and allowing significant new flexibility for the use of new plastic pipe formats and technologies.

The rule could affect a substantial number of small entities because of the market structure of the gas and pipeline industry, which includes many small entities. At least 341 small entities could be affected by at least one portion of the rulemaking, with smaller numbers affected by particular provisions. Estimated compliance costs indicate that these impacts would not be significant and would generally be offset by savings in materials costs for plastic pipe.