

TR 21-06 – Removal of Mechanical Fittings Failures

2022 – Nov 2 – Editorial Section

Approved additions and revisions to guide material under §§ 191.12, 192.617, 192.1009, GMAs G-191-2, G-192-1, G-192-8, G-192-17 and the GPTC Index. **Ready to Recirculate for 3rd LB.**

TR Number	2021-06
Primary	191.12, 192.1009
Secondary	GMA G-191-2, GMA G-192-8
Purpose	Review and revise in light of Amdt 191-29 and 192-128
Origin/Rationale	Amendments 191-29 and 192-128. 191.12 This eliminates the need for mechanical fitting failure reports to be included in the Annual Reports. 192.1009 Reflects elimination of the requirement by operators to submit a mechanical fitting failure report.
Assigned to	O&M/OQ Task Group

1st Letter Ballot in LB4-2021 Results: 25 approved, 2 approved with comment, 3 disapproved. Disapproved votes by Bennett, Miller and Trombley.

2nd Letter Ballot Note: Changes made to address the disapproved votes from LB4-2021.

2nd Letter Ballot in LB6-2022 Results (revised): 27 approved, 1 disapproved. Disapproved vote by Trombley shown at end of this TR. {Previous disapproved voters in LB4-2021: Bennett and Miller voted Approved, Trombley voted Disapproved.}

Recirculation for 3^d Letter Ballot Note: Changes to address disapproved vote from LB6-2022 are shown in **yellow highlight**. Disapproved vote from LB6-2022 is copied at the end of this document.

Section 191.12

{Removed and Reserved}

[Editorial/LB note: Guide Material below has already been removed in Addendum 1 to the 2022 Edition.]

GUIDE MATERIAL

1 GENERAL

~~See Guide Material Appendix G-191-2 for an index of PHMSA reporting forms. Report forms and instructions can be downloaded from the PHMSA OPS website at www.phmsa.dot.gov/forms/pipelineforms. Section 191.7 requires operators to submit mechanical fitting failure reports electronically to PHMSA unless an alternative reporting method is authorized. For additional information about reporting mechanical fitting failures, see OPS Advisory Bulletin ADB-2012-07 (77 FR 34457, June 11, 2012; see Guide Material Appendix G-192-1, Section 2). For the definition of mechanical fitting, see §192.1001. Additional state requirements may exist for intrastate facilities.~~

2 REPORT FORM ENTRIES

~~Section 192.1009 requires distribution system operators to submit a report on Form PHMSA F 7100.1-2 for each mechanical fitting failure that causes a hazardous leak. The operator is required to enter the "apparent cause" of the failure. To ensure capturing the necessary information, some operators develop and use a checklist based on Form PHMSA F 7100.1-2.~~

3 FAILURE EVALUATION METHODOLOGIES

~~If the cause of a mechanical fitting failure is not readily apparent in the field and the operator chooses to conduct further evaluation off-site, the following outline is provided as guidance for evaluating either a nut-follower or a stab-type fitting. Other compression fittings, if investigated for failure, can follow the same basic principles as covered below. Participation by the manufacturer or referencing the manufacturer's literature (if available) early in the investigation can provide more accurate information.~~
~~3.1 Mechanical fitting failure evaluation for nut-follower fittings.~~

~~(a) Before disassembly, the operator should:~~

- ~~— (1) Use a checklist derived from Form PHMSA F 7100.1-2 to capture as much information as practicable.~~
- ~~— (2) Mark the 12 o'clock position of fitting with the pipe component while the unit is still in place.~~
- ~~— (3) Photograph and document external observations, both at the failure site before cutting out and then at the evaluation facility.~~
- ~~— (4) After proper shutdown and purge of gas, cut out the fitting without disturbing the pipe connection, and transport the unit to the evaluation location. Do not attempt to disassemble in the field.~~
- ~~— (5) Document whether any external blocking or restraint devices were found in the field.~~
- ~~— (6) Classify and document the surrounding soil.~~
- ~~— (7) Contact the manufacturer if the problem appears to be with the integrity of the fitting.~~
- ~~— (8) Document whether any wrench marks or other surface damages are on the fitting body.~~
- ~~— (9) Document whether nuts on bolted type fittings appear to be evenly tightened.~~
- ~~— (10) Document pipe and fitting characteristics, such as nominal size, SDR, schedule, and wall thickness.~~
- ~~— (11) Document the "printline" marking on pipe and fitting.~~
- ~~— (12) Document observations, such as cracking, delamination, and sand holes.~~
- ~~— (13) Document leak path location.
 - ~~— (i) Leak through fitting body — Fitting failure.~~
 - ~~— (ii) Leak through sealing area — Joint failure.~~~~
- ~~— (14) Determine an unknown leak path with a method such as the following.
 - ~~— (i) Cap the unit using test fittings.~~
 - ~~— (ii) Inject a fluorescein solution into the assembly and gradually pressurize.~~
 - ~~— (iii) Illuminate with UV light and identify specific leak path.~~
 - ~~— (iv) Drain fluorescein and allow time to dry before disassembling. Dry fluorescein in the leak path may be visible after disassembly. This is particularly important in cases where scratches on pipe create a leak path.~~~~
- ~~— (15) Mark pipe and fitting for stab depth and apparent leak location.~~
- ~~— (16) Mark the position of nuts or followers.~~
- ~~— (17) Photograph again.~~
- ~~— (18) Test the torque on nuts or followers, if appropriate.~~
- ~~— (19) For a pullout failure:
 - ~~— (i) Examine pipe surface for marks or indentations indicating excavation damage.~~
 - ~~— (ii) Record position of stiffener relative to pipe end.~~~~

~~(b) During disassembly, the operator should:~~

- ~~— (1) Maintain relative position of pipe, fitting, and components as practicable.~~
- ~~— (2) Not saw or cut into fitting or pipe unless absolutely necessary. If necessary, do so in a manner that allows position of components to be accurately determined after disassembly.~~
- ~~— (3) Count turns required to remove nuts or bolts. Precision down to 1/16th turn or better is helpful.~~
- ~~— (4) Ask the manufacturer how many turns are needed to achieve minimum recommended torque for the specific design and size fitting. Compare the actual turns found to those recommended by manufacturer.~~

~~(c) After disassembly, the operator should:~~

- ~~— (1) As soon as practicable, take high-resolution, close-up photographs of external and internal surfaces of pipe and components to record indentations and other evidence.~~
- ~~— (2) Document any damaged, cut, or distorted components.~~
- ~~— (3) Verify the leak path, such as looking for fluorescein traces on pipe and sealing member under UV light.~~
- ~~— (4) Record the condition of the internal retainer ring since, in some metal mechanical fitting designs, deformation of the internal retainer ring is evidence that the fitting was improperly torqued at installation. In many cases, the retainer ring might be difficult to remove from the nut if improper torque was applied.~~
- ~~— (5) Document whether the gasket or O-ring appears to be distorted and photograph the condition.~~
- ~~— (6) Document and photograph any scratches on the pipe under the gasket.~~
- ~~— (7) Document whether there is dirt or other debris between the gasket and pipe.~~
- ~~— (8) Document whether scratches, dirt, or debris line up with the fluorescein traces.~~
- ~~— (9) For a pullout failure:~~

- ~~— (i) Report any indicators on pipe surface of gradual or sudden movement of pipe relative to fitting.~~
 - ~~— (ii) Determine whether the joining procedure used was qualified by testing identical exemplars in accordance with §192.283(b).~~
 - ~~— (10) Document whether all components are present and in correct orientation.~~
 - ~~— (11) Document whether the correctly sized stiffener was used for the plastic piping being connected.~~
 - ~~(12) Document whether the joining procedure was qualified per §192.283(b).~~
 - ~~(13) Use the documented findings to help identify the apparent cause of mechanical joint failure.~~
- ~~3.2 Mechanical fitting failure evaluation for boltless stab fittings (2-inch and smaller):~~

The operator should:

- ~~(a) Use a checklist derived from Form PHMSA F 7100.1-2 to capture as much information as practicable.~~
- ~~(b) Mark the 12 o'clock position of fitting with the pipe component while the unit is still in place.~~
- ~~(c) Photograph and document external observations, both at the failure site before cutting out and then at the evaluation facility.~~
- ~~(d) After proper shutdown and purge of gas, cut out the fitting without disturbing the pipe connection, and transport the unit to the evaluation location. The operator should not attempt to disassemble in the field.~~
- ~~(e) Document whether any external blocking or restraint devices were found in the field.~~
- ~~(f) Classify and document the surrounding soil.~~
- ~~(g) Contact the manufacturer if the problem appears to be with the integrity of the fitting.~~
- ~~(h) Document whether any wrench marks are on the fitting body.~~
- ~~(i) Cut fitting in half.~~
- ~~(j) Determine whether the chamfer was proper for the installed fitting: internal for internal O-ring seal and external for external seal.~~
- ~~(k) Document whether the pipe was cut square.~~
- ~~(l) Document the condition of O-rings, checking for possibly being torn or pinched.~~
- ~~(m) Document the condition of pipe external wall surface and quantify the presence of scratches or gouges.~~

Section 192.617

1 GENERAL

- (a) Data on all failures and leaks should be compiled to support compliance with §192.613. A failure investigation should be performed to determine the cause of the failure and minimize the possibility of a recurrence.
- (b) For information on failures of PE pipe, see 3 of the guide material under §192.613.
- (c) For information on reporting failures of mechanical fittings, see ~~guide material under §191.12~~ Guide Material Appendix G-192-8, Section 10.
- ~~(c) For information on failures of mechanical fittings or joints, see 9 below.~~

2 TYPES AND NATURE OF FAILURES THAT SHOULD BE ANALYZED

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3 FAILURE INVESTIGATION

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- (c) For failures of mechanical fittings or joints, consider following the evaluation steps in ~~3 of the~~ ~~guide material under §191.12~~ 9 below.

{Editorial note: TR 18-04 proposes to re-letter above item from (c) to (e).}

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[LB Comment: The material below came from the original guide material removed from 3 under 191.12.]

9 CONSIDERATIONS FOR MECHANICAL FITTINGS

If the cause of a mechanical fitting failure is not readily apparent in the field and the operator chooses to conduct further evaluation off-site, the following is provided for evaluating either a nut-follower or a stab-type fitting. Other compression fittings, if investigated for failure, can follow the same basic principles as covered below. Participation by the manufacturer or referencing the manufacturer's literature (if available) early in the investigation can provide more accurate information.

9.1 Mechanical fitting failure evaluation for nut-follower fittings.

(a) Before disassembly, the operator should:

- (1) Use a checklist to capture as much information as practicable.
- (2) Mark the 12 o'clock position of fitting with the pipe component while the unit is still in place.
- (3) Photograph and document external observations, both at the failure site before cutting out and then at the evaluation facility.
- (4) After proper shutdown and purge of gas, cut out the fitting without disturbing the pipe connection and transport the unit to the evaluation location. Do not attempt to disassemble in the field.
- (5) Document whether any external blocking or restraint devices were found in the field.
- (6) Classify and document the surrounding soil.
- (7) Contact the manufacturer if the problem appears to be with the integrity of the fitting.
- (8) Document whether any wrench marks or other surface damages are on the fitting body.
- (9) Document whether nuts on bolted-type fittings appear to be evenly tightened.
- (10) Document pipe and fitting characteristics, such as nominal size, SDR, schedule, and wall thickness.
- (11) Document the "printline" marking on pipe and fitting.
- (12) Document observations, such as cracking, delamination, and sand holes.
- (13) Document leak path location.
 - (i) Leak through fitting body – Fitting failure.
 - (ii) Leak through sealing area – Joint Failure.
- (14) Determine an unknown leak path with a method such as the following.
 - (i) Cap the unit using test fittings.
 - (ii) Inject a fluorescein solution into the assembly and gradually pressurize.
 - (iii) Illuminate with UV light and identify specific leak path.
 - (iv) Drain fluorescein and allow time to dry before disassembling. Dry fluorescein in the leak path may be visible after disassembly. This is particularly important in cases where scratches on pipe create a leak path.
- (15) Mark pipe and fitting for stab depth and apparent leak location.
- (16) Mark the position of nuts or followers.
- (17) Photograph again.
- (18) Test the torque on nuts or followers, if appropriate.
- (19) For a pullout failure:
 - (i) Examine pipe surface for marks or indentations indicating excavation damage.
 - (ii) Record position of stiffener relative to pipe end.

(b) During assembly, the operator should:

- (1) Maintain relative position of pipe, fitting, and components as practicable.
- (2) Not saw or cut into fitting or pipe unless necessary. If necessary, do so in a manner that allows position of components to be accurately determined after disassembly.
- (3) Count turns required to remove nuts or bolts. Precision down to 1/16th turn or better is helpful.
- (4) Compare the actual turns found to those recommended by manufacturer. If uncertain, contact the manufacturer.

(c) After assembly, the operator should:

- (1) As soon as practicable, take high-resolution, close-up photographs of external and internal surfaces of pipe and components to record indentations and other evidence.
- (2) Document any damaged, cut, or distorted components.
- (3) Verify the leak path, such as looking for fluorescein traces on pipe and sealing member under UV light.
- (4) Record the condition of the internal retainer ring since, in some metal mechanical fitting designs, deformation of the internal retainer ring is evidence that the fitting was improperly torqued at installation. In many cases, the retainer ring might be difficult to remove from the nut if improper torque was applied.
- (5) Document whether the gasket or O-ring appears to be distorted and photograph the condition.
- (6) Document and photograph any scratches on the pipe under the gasket.
- (7) Document whether there is dirt or other debris between the gasket and pipe.

- (8) Document whether scratches, dirt, or debris line up with the fluorescein traces.
- (9) For a pullout failure:
 - (i) Take note of any indicators on pipe surface of gradual or sudden movement of pipe relative to fitting.
 - (ii) Determine whether the joining procedure used was qualified in accordance with §192.283(b).
- (10) Document whether all components are present and in correct orientation.
- (11) Document whether the correctly sized stiffener was used for the plastic piping being connected.
- (12) Document whether the joining procedure was qualified per §192.283(b).
- (13) Use the documented findings to help identify the apparent cause of mechanical joint failure.

9.2 Mechanical fitting failure evaluation for boltless stab fittings (2-inch and smaller).

The operator should:

- (a) Use a checklist to capture as much information as practicable.
- (b) Mark the 12 o'clock position of fitting with the pipe component while the unit is still in place.
- (c) Photograph and document external observations, both at the failure site before cutting out and then at the evaluation facility.
- (d) After proper shutdown and purge of gas, cut out the fitting without disturbing the pipe connection and transport the unit to the evaluation location. The operator should not attempt to disassemble in the field.
- (e) Document whether any external blocking or restraint devices were found in the field.
- (f) Classify and document the surrounding soil.
- (g) Contact the manufacturer if the problem appears to be with the integrity of the fitting.
- (h) Document whether any wrench marks are on the fitting body.
- (i) Cut fitting in half.
- (j) Determine whether the chamfer was proper for the installed fitting: internal for internal O-ring seal and external for external seal.
- (k) Document whether the pipe was cut square.
- (l) Document the condition of O-rings (e.g., torn, pinched).
- (m) Document the condition of pipe external wall surface and quantify the presence of scratches or gouges.

9 10 REFERENCE

- (a) NFPA 921, "Guide for Fire and Explosion Investigations."

Section 192.1009

{Removed and Reserved}

GUIDE MATERIAL

~~See §191.12 and Guide Material Appendix G-192-8.~~

~~Note: Hazardous leak and mechanical fitting are defined in §192.1001.~~

GMA G-191-2

GUIDE MATERIAL APPENDIX G-191-2

(See guide material under §§191.9, 191.11, ~~191.12~~, 191.15, and 191.17)

INDEX OF PHMSA REPORT FORMS

This appendix an index of PHMSA forms and the code sections in which they are referenced.

F 7100.1-2	Mechanical Fitting Failure Report Form	191.12, 192.1009
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GMA G-192-1

2 GOVERNMENTAL DOCUMENTS

OPS-ADB-2012-07	Advisory Bulletin—Completion of Mechanical Fitting Failure Report Form, Leak Causes (77 FR 34457, June 11, 2012)	§191.12
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6 SUMMARY OF PRIMARY WEBSITES

PHMSA-OPS Report Forms and Instructions	https://www.phmsa.dot.gov/forms/pipeline-forms	§191.9 §191.11 §191.12 §191.15 §191.17 §192.945 GMA G-191-2 GMA G-192-8
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GMA G-192-8

GUIDE MATERIAL APPENDIX G-192-8

(See §§192.1001, 192.1003, 192.1005, 192.1007, ~~192.1009~~, 192.1011, 192.1015, and Guide Material Appendix G-192-8A)

DISTRIBUTION INTEGRITY MANAGEMENT PROGRAM (DIMP)

CONTENTS

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1 INTRODUCTION

1.1 Scope.

(a) This guide material is intended to assist operators with development of a Distribution Integrity Management Program (DIMP), including the written plan, and compliance with Federal Regulations §192.1001, 192.1003, 192.1005, 192.1007, ~~192.1009~~, 192.1011, and 192.1015 on DIMP. It provides operators with practices that may be considered as they develop and maintain a DIMP specific to their gas distribution systems.

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1.3 How to use this guide material.

The guide material is organized to coincide with the seven required elements of a DIMP. The order in which the guidance is presented does not imply the order in which it should be applied. However, the operator needs to address each element in some way. Once an operator determines how it can best accomplish distribution system integrity, the guide material may be used to support or direct the operator’s approach. The operator is cautioned that the guide material may not anticipate all conditions that may be encountered, and the operator is not restricted from using other methods to comply with the Regulations.

Two sample DIMP approaches are given in Section **11**.

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10 REPORT FITTING FAILURES

~~(a) Except for master meter or small LPG operators, operators are required by §192.1009 to submit a report on each mechanical fitting failure, excluding any failure that results only in a nonhazardous leak, in accordance with §191.12.~~

~~Except for master meter or small LPG operators, operators are required to report the total number of hazardous leaks caused by mechanical fitting failures on the distribution annual report Form F7100.1-1.~~

~~Note: Hazardous leak and mechanical fitting are defined in §192.1001.~~

~~(b) — See §191.12.~~

11 SAMPLE DIMP APPROACHES

11.1 SME approach.

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11.2 Mathematical approach.

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GMA G-192-17

GUIDE MATERIAL APPENDIX G-192-17

(See Part 191 and guide material under §§192.13, 192.603, 192.605, 192.941, and 192.947)

EXPLICIT REQUIREMENTS FOR REPORTS, INSPECTIONS, TESTS, WRITTEN PROCEDURES, RECORDS, OR SIMILAR ACTIONS

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P	192.1009	Reporting mechanical fitting failures	Report

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End of GM portion of TR; see LB6-2022 results and comments shaded in gray below for review.

LB6-2022	31 approved, 0 approved with comment, 1 disapproved
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Erich Trombley

Section 192.617, 1 General – (a) Suggest retaining existing 1(c) with a redirect to GM Appendix G-192-8 for reporting of mechanical fitting failures. (b) Suggest striking the proposed 1(c) as the proposed Section 9 doesn’t need to be specifically called out in the General section.

Section 3 Failure Investigation – Suggest retaining 3(c) with a redirect to the new proposed Section 9.

DIMP Section 10 – The proposed language is incorrect. The Annual Report only requires reporting the number of hazardous leaks involving a mechanical joint failure.

Erich Trombley 10/5/2022 email:

The proposed revisions address my Disapproval to TR 21-06. I do have one editorial suggestion in Section 3. Include the word “Section” so that the sentence reads, “For failures of mechanical fittings consider following the evaluation steps in Section 9 below.” Otherwise, the revisions look good to me.