Background

The purpose of this document is to explain key aspects of the rules, regulations, practices, procedures, and policies pertaining to mechanical integrity tests (MITs) for both idle oil and gas wells and Class II underground injection control (UIC) wells within the State of Colorado. An **IDLE WELL** shall mean a well which is shut-in longer than two years, temporarily abandoned longer than 30 days, suspended operations longer than two years, waiting-on-completion longer than two years, or monitor wells not used for hydrocarbon production. Definitions for shut-in, temporarily abandoned, suspended operations, and waiting-on-completion wells are available in COGCC’s 100-series rules.

MIT of Idle Wells and Alternate Production Methods

There are a number of wells that produce under production packers or are produced intermittently through swabbing of the well. Usually these methods are used for lower producing or lower pressure wells. Because of these alternate production methods it is difficult to determine casing integrity based on production reporting alone.

Wells that are produced with a production packer or alternate method of isolation of the production perforations shall require an MIT within two years of the date the well was configured with the production packer, then every five years after the initial test.

Wells that are produced by swabbing shall require an MIT within two years of the date swabbing for production began, then every five years after the initial test.
Tubing-casing annulus packers used for gas lift may or may not seal the casing above the top perforation. These packers may be used to isolate individual stages of a producing zone (placement below the top perforation), rather than the entire producing zone (placement above the top perforation). MITs are not required for producing wells in this configuration, provided that the operator has monitoring in place to detect tubing leaks, casing leaks, and/or packer leaks. At a minimum, this would involve monitoring tubing, casing, and all annulus pressures and monitoring production efficiency. Upon request by COGCC staff, the operator may be required to provide monitoring records to demonstrate compliance for this exception. Gas lift wells must remain on production for this exception. If a gas lift well becomes an Idle Well, as defined above, then the Idle Well must pass an MIT.

Test for Idle Wells

Idle Wells must pass an MIT within two (2) years of the initial date when the well status becomes Shut-In, Waiting-on-Completion, or Suspended Operations. An Idle Well MIT is required for Temporarily Abandoned wells within thirty (30) days of temporary abandonment. An MIT is required for wells using alternate production methods within two (2) years from the last Swab date or the date of Production Packer installation (excluding gas lift wells, as described above). Subsequent MITs shall be performed at five (5) year intervals from the date of the initial MIT. MITs shall also be performed on monitoring wells at five (5) year intervals.

Wells that are considered Idle Wells for two (2) years or more and remediated wells (e.g., cement squeeze of a casing leak) must pass a pressure test to conditions anticipated during completion and/or production operations, consistent with Rule 317.k. (Production and Intermediate Casing Pressure Testing) prior to resuming injection or production. Depending on the expected conditions during injection, stimulation, or production operations, this test pressure may exceed routine MIT pressures for Idle Wells, but the test pressure should not be less than 300 psi.

5-Year UIC Test

UIC wells require a minimum of one MIT every five (5) years (Rule 326.a.(4)A) and that test must be witnessed by COGCC staff.

Test Notification

Operators must provide COGCC staff ten (10) days notice prior to an MIT (Rule 316B, Rule 316C.f. and Rule 326.e.) through submission of a Form 42. Operators shall consult the “General Instructions for Corrections to Submitted Notices” section of “COGCC Operator Guidance, Rule 316C/Form 42: Field Operations Notice,” available in COGCC’s Operator Guidance section of our website, to determine if schedule changes necessitate submittal of a Corrected Form 42.
Witnessed MITs

If COGCC staff witnesses an MIT, the operator is required to provide a copy of the Form 21 Mechanical Integrity Test in the field. The header panel, “reasons” panel, and pre-test well configuration information (Injection/Producing Zone(s), Perforated Interval, etc.) shall be completed by the operator prior to the test. The Test Data will be filled in by the COGCC field inspector. The copy of the Form 21 shall be signed by both parties. For witnessed MITs, pressure recordings are not required, but are recommended. All UIC tests are to be witnessed.

Non-Witnessed MITs

If an MIT is not witnessed by COGCC, the operator is required to file a Form 21 and an original pressure chart (Rule 316B) within thirty (30) days of the test. The chart may be a circular recording set with an appropriate rotation rate (e.g., clock rate one (1) revolution per hour is appropriate) and pressure range. For example, a zero to ten thousand (0-10,000) psi pressure range is not appropriate for a three hundred (300) psi pressure test. The chart should include the pressure run up from zero (0) psi, the test itself, and pressure run down to zero (0) psi. Alternatively, the operator may record test results with a data logger and provide the following to COGCC: 1) Pressure versus Time plot of the test including the pressure run up, the test, and the pressure run down, and 2) A data table containing pressure values at intervals of no more than one (1) minute and no less than fifteen (15) seconds. The Pressure versus Time plot shall have legible axes with scales appropriate for the test pressure and duration of the test.

Test for Idle Wells with Open Hole Completions

MITs are not required for Shut In or Temporarily Abandoned oil wells that are configured with fully-cemented, shallow surface casing (setting depth less than or equal to 500 feet) with no intermediate or production casing and an open hole completion below surface casing, provided that the well does not have an open wellbore penetrating other geologic formations underlying the producing zone. Wells with this configuration shall be produced or evaluated for plugging and abandonment within 2 years of commencing SI or TA status.

General - Mechanical Integrity Test Procedures

To minimize the chance of masking the discovery of a leak due to rapid temperature changes causing fluid expansion or contraction within a constant volume space, operators should:
Completely fill the casing-tubing annulus with liquid(s) at least twenty-four (24) hours before the test. When possible, pre-test the well before the COGCC staff member arrives on location to avoid unnecessary trips to the field.

To stabilize the well prior to the MIT operators should:

Load Idle Wells with fluid, and conduct the test only after the wellbore fluid has reached an equilibrium temperature (i.e., the well should be pre-loaded a minimum of eight (8) hours before testing to allow the fluid temperatures to balance); allow active injection wells (i.e. UIC wells) to inject continuously for over eight (8) hours prior to conducting the test.

The test must be at least fifteen (15) minutes long. To pass, the well must not lose or gain more than ten percent (10%) of the initial test pressure (Rule 326.g.), and the pressure must stabilize without an apparent increasing or decreasing trend for at least the last five (5) minutes of the test. The test may be repeated if the pressure loss or gain is determined to be the result of compression related to gas dissolution from the fluid column or temperature effects related to the fluid used to load the column. Rising pressures greater than ten percent (10%) in the casing-tubing annulus or casing during a test will invalidate the test. The well will have to be re-tested in this case.

A zero (0) psi initial test pressure is not acceptable. The initial test pressure shall be a minimum of three hundred (300) psi. The well must maintain at least three hundred (300) psi after pressure run up. It is suggested that the initial test pressure be one hundred ten percent (110%) of the desired approved pressure rating, this would include an allowed ten percent (10%) pressure decline. For example, if the required pressure for well operations is one thousand two hundred (1200) psi, the test should be run at one thousand three hundred twenty (1320) psi.

Packers or bridge plugs must be set one hundred (100) feet or less above the highest production perforation or open hole interval (Rule 326.a.(1)A., Rule 326.b.(3), Rule 326.c.(3), and Form 21 instructions). Any instance where a packer or bridge plug is set greater than one hundred (100) feet above the highest production perforation or open hole interval, must be approved by the COGCC Area Engineer BEFORE scheduling an MIT. In these instances, the operator must contact the Area Engineer for From 4 Sundry Notice approval before submitting a Form 42 Notice for the MIT. Depending on the circumstances, a formal Rule 502.b. Variance may be required.

Perforations used for casing repair/cement squeezes are meant to be closed by cement, therefore the repaired casing is to be fully included in the MIT (i.e., repair perforations do not count as production perforations and should be included in the tested interval). If the well is plugged back to a depth above previous perforations, a Form 5A shall be submitted (if not already on file with COGCC) to revise the open perforation interval and/or abandon a formation.
UIC Wells - Mechanical Integrity Test Procedures

UIC MITs shall be performed in the same manner as described in the previous section for General Requirements, except that the following, additional considerations are required for UIC wells noted below.

The initial MIT test performed to fulfill permitting requirements MUST be at the maximum approved injection pressure.

The subsequent MIT shall be performed at a minimum of the average operating injection pressure. At their discretion, prior to or during the test, COGCC staff may require the casing/tubing annulus to be pressured up to the maximum approved injection pressure as defined by the approved UIC permit (Figure 1) or the maximum annual injection pressure as defined by a review of the monthly reported pressure data, which can be found on the injection well’s scout card (Figure 2). Generally, tests will not be run more than three hundred (300) psi above maximum annual injection pressure.

![Figure 1: Maximum approved injection pressure as defined by the approved UIC permit.](image-url)
Figure 2: Maximum annual injection pressure from a review of the monthly reported pressure data found on the injection wells scout card.

The test pressure must have at least three hundred (300) psi differential pressure between the tubing pressure and the casing-tubing annulus pressure during the test, and the differential pressure must not drop below three hundred (300) psi during the test.

If the average operating injection pressure is less than three hundred (300) psi, then the test pressure must be three hundred (300) psi plus 10% to allow for pressure decline.

Testing at the average operating pressure will not result in the test pressure becoming the new approved maximum injection pressure.

Repairing or replacing the tubing and/or packer in a UIC well does not require prior approval, but an MIT is required to test the new configuration. Any activities involving alteration of casing or cement configuration requires prior approval and will also require an MIT after the repairs are completed and prior to resuming injection. The repair or replacement should be described on Form 21 for Verification of Repairs.

**Failing Mechanical Integrity**

A leak in wellhead seals, casing, tubing, or packer indicates a loss of mechanical integrity, which is considered a violation of Rule 326.f.

A decrease or increase in test pressure of greater than ten percent (10%) during the fifteen (15) minutes of the MIT or the inability to stabilize the pressure within the last five (5) minutes of the MIT shall constitute a failure. Tubing and casing mechanical
integrity shall be maintained in all UIC wells and wells using Alternate Production Methods; casing integrity shall be maintained in all Idle Wells. Failure to maintain mechanical integrity shall be considered a violation of Rule 326.f. Potential enforcement associated with mechanical integrity is described in “COGCC Operator Guidance, Rules 319 and 326: Mechanical Integrity Guidance,” available in COGCC’s Operator Guidance section of our website.

All wells lacking integrity shall be repaired or plugged and abandoned. Timeframes and potential enforcement for repair, plugging and abandonment are discussed in “COGCC Operator Guidance, Rules 319 and 326: Mechanical Integrity Guidance.” Prior approval via a Sundry Notice (Form 4) for casing repair (Rule 317.e.) or a Well Abandonment Report (Form 6) Notice of Intent to Abandon (Rule 311) is required.

Upon discovery, all injection wells lacking mechanical integrity shall be shut in immediately (Rule 326.f.(2)). The operator shall notify COGCC staff of any leak as soon as practicable.

**Offset Well Safety Shut-In/Temporary Abandonment**

COGCC Staff acknowledges that operators may perform a safety Shut-In (SI) or Temporary Abandonment (TA) of offset wells in preparation for stimulation of other adjacent well(s). The safety SI or TA wells may be on the same well pad or on a pad in the area. An operator may choose to prepare an adjacent well for safety SI or TA for a variety of downhole or surface issues. Example, it may be due to equipment being placed above the well being SI or TA on the same pad. Further, COGCC Staff understands that some wellhead equipment may be temporarily removed for safety reasons. Many of these temporary conditions would be considered placing the well in a TA well status. Rule 319.b. requires wells to have a mechanical integrity test (MIT) performed when wells are TA’d. The following provides guidance for wells that are SI or TA for offset stimulation to: 1) keep operators in compliance with COGCC Rules, and 2) identify these wells in the field to assist COGCC Field Inspectors when determining the correct status of wells during their field inspections.

1) When the well is, or wells are, readied for safety shut-in, document a pressure test of the casing for the SI/TA well. A charted or COGCC-witnessed test is not necessary, unless Item #2 applies (see below).

2) If a well has been SI prior to being readied for safety SI/TA and the resulting time before returning to production will be greater than 2 years, perform a charted or COGCC-witnessed MIT and submit the appropriate Form 21 (10 day written notification required).

3) If a well will be temporarily abandoned for a period greater than 6 months (removal of surface equipment or setting a downhole plug to render the well incapable of
production), file a Sundry Notice, Form 4 with all details required by Rule 319.b.
Document that there was a pressure test in lieu of a formal MIT prior to temporarily
abandoning the well; include statements regarding future plans for the well and how
the well is shut to the atmosphere. If the well will be temporarily abandoned with
downhole plugs for longer than 60 days, a Completed Interval Report, Form 5A must
be filed so that the Operator’s Monthly Report of Operations, Form 7 is consistent
with the correct wellbore configuration.

4) Install signage on the SI/TA wellhead indicating the reason for equipment removal
(Figure 3). If an operator does not place signage on a well during a Safety SI/TA to
alert COGCC’s Field Inspectors, then issuance of Corrective Action Field Inspection
Reports may result, requiring formal MITs.

5) Failure to perform the requirements as set forth in #2 and #3 above may be
considered a violation of COGCC rules.

![Temporary Shut In Sign](image)

*Figure 3: Example Temporary Sign*

**References**

1. Form 21 instructions located on the COGCC website Forms section describe how to
complete the form.
2. COGCC Operator Guidance, Rules 319 and 326: Mechanical Integrity Guidance,
available in COGCC’s Operator Guidance section of our website.

**Guidance Disclaimer**

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does not contain rules or otherwise binding requirements. Nothing in this document
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## Document Change Log

<table>
<thead>
<tr>
<th>Change Date</th>
<th>Description of Changes</th>
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<tr>
<td>July 6, 2014</td>
<td>Added suspended operations and waiting-on-completions well narrative, pressure testing after repaired casing</td>
</tr>
<tr>
<td>September 15, 2015</td>
<td>Revised language related to January 2015 Rulemaking to add suspended operations and waiting-on-completions to definitions and Rule 326, plus added Offset Well Safety Shut-In/Temporary Abandonment section. Add the section for Test for Idle Wells with Open Hole Completions.</td>
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