BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE No. 2695
Order No. R-333-F

THE APPLICATION OF THE OIL CONSERVATION COMMISSION UPON ITS OWN MOTION FOR AN ORDER REVISING, AMENDING, OR DELETING CERTAIN PORTIONS OF ORDER R-333-C & D AS AMENDED BY ORDER R-333-E PERTAINING TO GAS WELL TESTING PROCEDURE APPLICABLE TO GAS WELLS COMPLETED IN SAN JUAN, RIO ARRIBA, McKINLEY, AND SANDOVAL COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on November 8, 1962, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 30th day of November, 1962, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That there is need for a number of additions to and revisions of Order No. R-333-C & D as amended by Order No. R-333-E, heretofore entered by the Commission, said order outlining a testing procedure for gas wells completed in the Counties of San Juan, Rio Arriba, McKinley, and Sandoval, New Mexico.

(3) That the following rules and regulations should be adopted, and that said rules and regulations are in the interest of conservation.

IT IS THEREFORE ORDERED:

(1) That the following Special Rules and Regulations governing gas well testing in the San Juan Basin (Counties of San Juan, Rio Arriba, McKinley, and Sandoval, New Mexico), superseding the rules and regulations contained in Commission Order No. R-333-C & D, as amended by Order No. R-333-E, are hereby promulgated and adopted as an exception to Rules 401 and 402 of the general statewide rules and regulations of this Commission relating to gas well testing procedures.

GAS WELL TESTING RULES AND PROCEDURES
SAN JUAN BASIN, NEW MEXICO

CHAPTER I TYPE OF TESTS REQUIRED

Section 1: Initial Deliverability and Shut-In Pressure Tests for Newly Completed Wells

A. Immediately upon completion of each gas well in the San Juan Basin, a shut-in pressure test of at least seven days duration shall be made.

B. Within 60 days after a well is connected to a gas transportation facility, the well shall have been tested in accordance with Section 1 of Chapter II of these rules, "Initial Deliverability and Shut-In Pressure Test Procedures," and the results of the test filed with the Commission's Aztec office and with the gas transportation facility to which the well is connected. Failure to file said test within the above-prescribed 60-day period will subject the well to the loss of one day's allowable for each day the test is late.

C. The requirements for Initial Tests and Annual Deliverability and Shut-In Pressure Tests and the notification requirements and scheduling of such tests which apply to newly completed wells shall also apply to reworked or recompleted wells.

D. Any tests taken for informational purposes prior to pipeline connection shall not be recognized as official tests for the assignment of allowables.

Section 2: Annual Deliverability and Shut-In Pressure Tests

A. Annual Deliverability and Shut-In Pressure Tests shall be made on all gas wells during the period from January 1

through December 31 each year except as follows:

1. An Annual Deliverability and Shut-In Pressure Test will not be required during the current year for any well connected to a gas transportation facility after October 31. Such tests may be taken at the option of the operator of the well, however.

2. When the Initial Deliverability and Shut-In Pressure Test required by Section 1-B above has been taken in accordance with the annual testing procedure outlined in Section 2 of Chapter II of these rules, the initial test may be considered the annual test for the year in which the test was completed. Provided however, that if an operator intends to use such initial test as the first annual test, he must notify the Commission and the gas transportation facility to which the well is connected of his intent in writing prior to the conclusion of the 14-day conditioning period.

B. All Annual Deliverability and Shut-In Pressure Tests required by these rules must be filed with the Commission's Aztec office and with the appropriate gas transportation facility within 30 days after the end of the month during which the test is completed. Provided however, that any test completed between December 1 and December 31 must be filed not later than January 10. Failure to file any test within the above-prescribed times will subject the well to the loss of one day's allowable for each day the test is late. No extension of time for filing tests beyond January 10 will be granted except after notice and hearing.

Section 3: Scheduling of Tests

A. Annual Deliverability Tests

By December 1 of each year, each gas transportation facility shall, in cooperation with the operators involved, prepare and submit a schedule of the wells to which it is connected which are to be tested during the ensuing January and February. Said schedule shall be entitled, "Annual Deliverability and Shut-In Pressure Test Schedule," and shall be submitted in triplicate to the Commission's Aztec office. At least one copy shall also be furnished each operator concerned. The schedule shall indicate the date of tests, pool, operator, lease, well number, and location of each well. At least 30 days prior to the beginning of each succeeding 2-month testing interval, a similar schedule shall be prepared and filed in accordance with the above.

The gas transportation facility shall be notified immediately by any operator unable to conduct any test as scheduled. In the event a well is not tested in accordance with the test schedule, the well shall be re-scheduled by the gas transportation facility, and the Commission and the operator of the well so notified in writing. Notice to the Commission must be received prior to the conclusion of the 14-day conditioning period.

It shall be the responsibility of each operator to determine that all of its wells are properly scheduled for testing by the gas transportation facility to which they are connected, in order that all annual tests may be completed during the testing season.

B. Deliverability Re-Tests

An operator may, in cooperation with the gas transportation facility, schedule a well for a deliverability re-test upon notification to the Commission's Aztec office at least ten days before the test is to be commenced. Such re-test shall be for good and substantial reason and shall be subject to the approval of the Commission. Re-tests shall in all ways be conducted in conformance with the Annual Deliverability Test Procedures of these rules. The Commission, at its discretion, may require the re-testing of any well by notification to the operator to schedule such re-test.

Section 4: Witnessing of Tests

Any Initial or Annual Deliverability and Shut-In Pressure Test may be witnessed by any or all of the following: an agent of the Commission, an offset operator, a representative of the gas transportation facility connected to the well under test, or a representative of the gas transportation facility taking gas from an offset operator.

CHAPTER II PROCEDURE FOR TESTING

Section 1: Initial Deliverability and Shut-In Pressure Test Procedure

A. Within 60 days after a newly completed well is connected to a gas transportation facility, the operator shall complete a deliverability and shut-in pressure test of the well in conformance with the "Annual Deliverability and Shut-In Pressure Test Procedures" prescribed in Section 2 of this

chapter. Results of the test shall be filed as required by Section 1 of Chapter I of these rules.

B. In the event it is impractical to test a newly completed well in conformance with Paragraph A above, the operator may conduct the deliverability and shut-in pressure test in the following manner (provided, however, that any test so conducted will not be accepted as the first annual deliverability and shut-in pressure test as described in Paragraph A-2 of Section 2, Chapter I):

1. A 7- or 8-day production chart may be used as the basis for determining the well's deliverability, providing the chart so used is preceded by at least 14 days continuous production. The well shall produce through either the casing or tubing, but not both, into a pipeline during these periods. The production valve and the choke settings shall not be changed during either the conditioning or flow period with the exception of the first week of the conditioning period when maximum production would over-range the meter chart or location production equipment.

2. A shut-in pressure of at least seven days duration shall be taken. This shall be the shut-in test required in Paragraph A, Section 1 of Chapter I of these rules.

3. The average daily static meter pressure shall be determined in accordance with Section 2 of Chapter II of these rules. This pressure shall be used as P_t in calculating P_w for the Deliverability Calculation.

4. The daily average rate of flow shall be determined in accordance with Section 2 of Chapter II.

5. The static wellhead working pressure (P_w) shall be determined in accordance with Section 2 of Chapter II.

6. The deliverability of the well shall be determined by using the data determined in Paragraphs 1 through 5 above, in the deliverability formula in accordance with Section 2 of Chapter II.

7. The data and calculations for Paragraphs 1 through 6 above shall be reported as required in Section 1 of Chapter I of these rules, upon the blue-colored Form C-122-A.

Section 2: Annual Deliverability and Shut-In Pressure Test Procedure

This test shall be taken by producing a well into the pipeline through either the casing or tubing, but not both. The production valve and choke settings shall not be changed during either the conditioning or flow periods except during the first seven days of the conditioning period when maximum production would over-range the meter chart or the location production equipment. The daily flowing rate shall be determined from an average of seven consecutive producing days, following a minimum conditioning period of 14 consecutive days production. The first seven days of said conditioning period shall have not more than one interruption, which interruption shall be no more than 36 continuous hours in duration. The eighth to fourteenth days, inclusive, of said conditioning period shall have no interruptions whatsoever. All production during the 14-day conditioning period plus the 7-day deliverability test period shall be at static wellhead working pressures not in excess of 75 percent of the previous annual 7-day shut-in pressure of the well if such previous annual shut-in pressure information is available; otherwise, the 7-day initial deliverability shut-in pressure of the well shall be used.

In the event that the existing line pressure does not permit a drawdown as specified above with the well producing unrestrictedly into the pipeline, the operator shall request an exception to this requirement on Form C-122-A. The request shall state the reasons for the necessity for the exception.

Instantaneous pressures shall be measured by deadweight gauge during the 7-day flow period at the casinghead, tubinghead, and orifice meter, and shall be recorded along with instantaneous meter-chart static pressure reading.

When it is necessary to restrict the flow of gas between the wellhead and orifice meter, the ratio of the downstream pressure to the upstream pressure shall be determined. When this ratio is 0.57, or less, critical flow conditions shall be considered to exist across the restriction.

When more than one restriction between the wellhead and orifice meter causes the pressures to reflect critical flow between the wellhead and orifice meter, the pressures across each of these restrictions shall be measured to determine whether critical flow exists at any restriction. When critical flow does not exist at any restriction, the pressures taken to disprove critical flow shall be reported to the Commission on Form C-122-A in the "Remarks" section of the form. When critical flow conditions exist, the instantaneous flowing pressures required hereinabove shall be measured during the last 48 hours of the 7-day flow period.

When critical flow exists between the wellhead and orifice meter, the measured wellhead flowing pressure of the string through which the well flowed during test shall be used as P_t when calculating the static wellhead working pressure (P_w) using the method established below.

When critical flow does not exist at any restriction, P_t shall be the corrected average static pressure from the meter chart plus friction loss from the wellhead to the orifice meter.

The static wellhead working pressure (P_w) of any well under test shall be the calculated 7-day average static tubing pressure if the well is flowing through the casing; it shall be the calculated 7-day average static casing pressure if the well is flowing through the tubing. The static wellhead working pressure (P_w) shall be calculated by applying the tables and procedures set out in the New Mexico Oil Conservation Commission Manual entitled "Method of Calculating Pressure Loss Due to Friction in Gas Well Flow Strings for San Juan Basin."

To obtain the shut-in pressure of a well under test, the well shall be shut in immediately after the 7-day deliverability flow test for the full period of seven consecutive days. Such shut-in pressure shall be measured within the next succeeding twenty-four hours following the 7-day shut-in period. The 7-day shut-in pressure shall be measured on both the tubing and the casing when communication exists between the two strings. The higher of such pressures shall be used as P_c in the deliverability calculation. When any such shut-in pressure is determined by the Commission to be abnormally low, the shut-in pressure to be used shall be determined by one of the following methods:

1. A Commission-designated value.

2. An average shut-in pressure of all offset wells completed in the same zone.

3. A calculated surface pressure based on a measured bottom-hole pressure. Such calculation shall be made in accordance with the New Mexico Oil Conservation Commission "Back Pressure Mannual," Example No. 7.

All wellhead pressures as well as the flowing meter pressure tests which are to be taken during the 7-day deliverability test period as required hereinabove shall be taken with a deadweight gauge. The deadweight reading and the date and time according to the chart shall be recorded and maintained in the operator's records with the test information.

Orifice meter charts shall be changed and so arranged as to reflect upon a single chart the flow data for the gas from each well

for the full 7-day deliverability test period; however, no tests shall be voided if satisfactory explanation is made as to the necessity for using test volumes through two chart periods. Corrections shall be made for pressure base, measured flowing temperature, specific gravity, and supercompressibility; provided however, if the specific gravity of the gas from any well under test is not available, an estimated specific gravity may be assumed therefor, based upon that of gas from near-by wells, the specific gravity of which has been actually determined by measurement.

The 7-day average flowing meter pressure shall be calculated by taking the average of all consecutive 2-hour flowing meter pressure readings as recorded on the 7-day flow period chart. The pressure so calculated shall be used in calculating the wellhead working pressure, determining supercompressibility factors, and calculating flow volumes.

The 7-day flow period volume shall be calculated from the integrated readings as determined from the flow period orifice meter chart. The volume so calculated shall be divided by the number of testing days on the chart to determine the average daily rate of flow during said flow period. The flow chart shall have a minimum of seven and a maximum of eight legibly recorded flowing days to be acceptable for test purposes. The volume used in this calculation shall be corrected to New Mexico Oil Conservation Commission standard conditions.

The average flowing meter pressure for the 7-day or 8-day flow period and the corrected integrated volume shall be determined by the purchasing company that integrates the flow charts and furnished to the operator or testing agency when such operator or testing agency requests such information.

The daily volume of flow as determined from the flow period chart integrator readings shall be calculated by applying the Basic Orific Meter Formula:

$$Q = C' \sqrt{h_w P_f}$$

Where:

Q = Metered volume of flow Mcfd @ 15.025, 60° F., and 0.60 specific gravity.

C' = The 24-hour basic orifice meter flow factor corrected for flowing temperature, gravity, and supercompressibility.

h_w = Daily average differential meter pressure from flow period chart.

P_f = Daily average flowing meter pressure from flow period chart.

The basic orifice meter flow factors, flowing temperature factor, and specific gravity factor shall be determined from the New Mexico Oil Conservation Commission "Back Pressure Test Manual."

The daily flow period average corrected flowing meter pressure, psig, shall be used to determine the supercompressibility factor. Supercompressibility Tables may be obtained from the New Mexico Oil Conservation Commission.

When supercompressibility correction is made for a gas containing either nitrogen or carbon dioxide in excess of two percent, the supercompressibility factors of such gas shall be determined by the use of Table V of the C.N.G.A. Bulletin TS-402 for pressures 100-500 psig, or Table II, TS-461 for pressures in excess of 500 psig.

The use of tables for calculating rates of flow from integrator readings which do not specifically conform to the New Mexico Oil Conservation Commission "Back Pressure Test Manual" may be approved for determining the daily flow period rates of flow upon a showing that such tables are appropriate and necessary.

The daily average integrated rate of flow for the 7-day flow period shall be corrected for meter error by multiplication by a correction factor. Said correction factor shall be determined by dividing the square root of the chart flowing meter pressure, psia, into the square root of the deadweight flowing meter pressure, psia.

Deliverability pressure, as used herein, is a defined pressure applied to each well and used in the process of comparing the abilities of wells in a pool to produce at static wellhead working pressures equal to a percentage of the 7-day shut-in pressure of the respective individual wells. Such percentage shall be determined and announced periodically by the Commission based on the relationship of the average static wellhead working pressures (P_w) divided by the average 7-day shut-in pressure (P_c) of the pool.

The deliverability of gas at the "deliverability pressure" of any well under test shall be calculated from the test data derived from the tests hereinabove required by use of the following deliverability formula:

$$D = Q \left[\frac{\left(P_c^{\,2} - P_d^{\,2} \right)}{\left(P_c^{\,2} - P_w^{\,2} \right)} \right]^n$$

Where:

D = Deliverability Mcfd at the deliverability pressure, (P_d), (at Standard Conditions of 15.025 psia and 60°F).

Q = Daily flow rate in Mcfd, at wellhead pressure (P_w).

P_c = 7-day shut-in wellhead pressure, psia, determined in accordance with Section 2 of Chapter II.

P_d = Deliverability pressure, psia, as defined above.

P_w = Average static wellhead working pressure, as determined from 7-day flow period, psia, and calculated from New Mexico Oil Conservation Commission "Pressure Loss Due to Friction" Tables for San Juan Basin.

n = Average pool slope of back pressure curves as follows:

Mesaverde Formation	0.75
Dakota Producing Interval	0.75
Fruitland Formation	0.85
Farmington Formation	0.85
Pictured Cliffs Formation	0.85
Other Formations	0.75

(Note: Special Rules for Any Specific Pool or Formation May Supersede The Above Values. Check Special Rules If In Doubt.)

The value of the multiplier in the above formula (ratio factor after the application of the pool slope) by which Q is multiplied shall not exceed a limiting value to be determined and announced periodically by the Commission. Such determination shall be made after a study of the test data of the pool obtained during the previous testing season. The limiting value of the multiplier may be exceeded only after the operator has conclusively shown to the Commission that the shut-in pressure (P_c) is accurate or that

the static wellhead pressure (P_w) cannot be lowered due to existing producing conditions.

Any test prescribed herein will be considered unacceptable if the average flow rate for the final 7-day deliverability test is more than ten percent in excess of any consecutive 7-day average of the preceding two weeks. A deliverability test not meeting this requirement shall be invalid and the well shall be re-tested.

All charts relative to initial or annual deliverability tests or photostats thereof shall be made available to the Commission upon its request.

All testing agencies, whether individuals, companies, pipeline companies, or operators, shall maintain a log of all tests accomplished by them, including all field test data.

All forms heretofore mentioned are hereby adopted for use in the San Juan Basin Area in open form subject to such modification as experience may indicate desirable or necessary.

Initial and Annual Deliverability and Shut-In Pressure Tests for gas wells in all formations shall be conducted and reported in accordance with these rules and procedures. Provided however, these rules shall be subject to any specific modification or change contained in Special Pool Rules adopted for any pool after notice and hearing.

CHAPTER III INFORMATIONAL TESTS

A. A one-point back pressure test may be taken on newly completed wells before their connection or reconnection to a gas transportation facility. This test shall not be a required official test but may be taken for informational purposes at the option of the operator. When taken, this test must be taken and reported as prescribed below:

ONE-POINT BACK PRESSURE POTENTIAL TEST PROCEDURE

1. This test shall be accomplished after a minimum shut-in of seven days. The shut-in pressure shall be measured with a deadweight gauge.

2. The flow rate shall be measured by flowing the well three hours through a positive choke, which has a 3/4-inch orifice.

3. A 2-inch nipple which provides a mechanical means of accurately measuring the pressure and temperature

of the flowing gas shall be installed immediately upstream from the positive choke.

4. The absolute open flow shall be calculated using the conventional back pressure formula as shown in the New Mexico Oil Conservation Commission "Back Pressure Test Manual."

5. The observed data and flow calculations shall be reported in duplicate on Form C-122, "Multi-Point Back Pressure Test for Gas Wells."

6. Non-critical flow shall be considered to exist when the choke pressure is 13 psig or less. When this condition exists the flow rate shall be measured with a pitot tube and nipple as specified in the Commission's Manual of "Tables and Procedure for Pitot Tests." The pitot test nipple shall be installed immediately downstream from the 3/4-inch positive choke.

7. Any well completed with 2-inch nominal size tubing (1.995-inch ID) or larger shall be tested through the tubing.

B. Other tests for informational purposes may be conducted prior to obtaining a pipeline connection for a newly completed well upon receiving specific approval therefor from the Commission's Aztec office. Approval of these tests shall be based primarily upon the volume of gas to be vented.

(2) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

A. L. PORTER, Jr., Member & Secretary

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