

**TEXAS NATURAL RESOURCE CONSERVATION COMMISSION  
TECHNICAL PEER REVIEW DOCUMENT**

<i><b>This Section to be Completed by Issue Initiator</b></i>	
<b>TITLE OR ISSUE</b>	
Physical location requirements for "wellhead" pressure gauges.	
<b>DOCUMENT INITIATED BY</b> (Name/Office/Phone Number)	<b>DATE</b>
Pam Brown, TNRCC Region 14 (First Draft) Mark Cheesman, Merichem Company (Final Revised Version)	11/7/96
<b>ISSUE DESCRIPTION</b>	
30 TAC §331.64(b) states that "Pressure gauges shall be installed and maintained, at the wellhead, in proper operating conditions at all times on the injection tubing and on the annulus between the tubing and long-string casing, and/or annulus between the tubing and liner;" Not all facilities have their pressure gauges physically located at the wellhead. Is this a violation of the aforementioned rule that should be noted as such during an inspection and if not what are the guidelines for determining an acceptable location for the required pressure gauges?	
<b>WHO'S AFFECTED?</b>	
Class I Well Owners and Operators, TNRCC and Regional Inspectors	
<i><b>This Section to be Completed by Peer Review Team</b></i>	
<b>FACTORS CONSIDERED</b>	
<p>Annulus pressure is the most important continuously monitored parameter for indicating that mechanical integrity of the injection well is being maintained thus preventing contamination of a USDW. Injection pressure is the most important continuously monitored parameter for preventing damage to the injection zone due to over pressure. Thus the regulations require redundant devices for measuring annulus pressure and injection pressure. Specifically, pressure gauges as well as continuous recording pressure devices which include automatic alarms are required for annulus pressure and injection pressure. The pressure gauges serve as (1) a manual backup for the continuous recording pressure sensing devices in case of an instrument malfunction and (2) a means to check the calibration of the continuous recording pressure sensing devices. Thus, the pressure gauges must be installed in a location which provides a conservative indication of annulus pressure and injection pressure while being close enough to the continuous pressure recording devices sensing points to be within 4% of the recorded pressure during normal operations. The 4% differential is discussed in detail in the Issue 1 Peer Review Document. Therefore, the requirement for locating the required pressure gauges at the "wellhead" is not a specific location standard but a general location standard where the above mentioned constraints are satisfied.</p> <p>The factors which can vary pressure gauge readings based on different gauge locations are friction losses from flowing fluids and the pressure associated with the liquid head. The potential impact of these factors must be considered when determining whether a pressure gauge is properly located.</p>	

## **FINDING(S) AND RECOMMENDATION(S)**

The critical nature of the annulus pressure and injection pressure indications is a major reason why the regulations require installation and maintenance of locally mounted pressure gauges. The pressure gauges installed for measuring annulus pressure and injection pressure serve as manual backups for the continuous recording pressure sensing devices and are used to verify the readings of the continuous recording pressure sensing devices. Thus, the gauges must be installed in a location which provides a conservative indication of pressure while being close enough to the primary pressure devices sensing points to be within 4% of the recorded pressures during normal operations. The redundant nature of the pressure gauges does not require the same level of accuracy as the primary pressure recording devices as discussed in detail in the Issue 1 Peer Review Document.

The location of a pressure gauge which will provide the most accurate injection pressure indication is on the injection tubing at ground level (at the wellhead). Locating the gauge on the well feed line upstream of the wellhead could give a different pressure reading based on a lower liquid head contribution of 1 psi for every 27.7 inches of water (if located above ground level) and lower pressure loss due to friction. Generally, these impacts are negligible given the accuracy and range for pressure gauges installed on injection well feed lines. The highest, and thus most conservative pressure indication would be on the final injection pump discharge. The injection tubing pressure gauge also should be in communication with the injection pressure recording device sensing point in order to satisfy the verification requirement.

The location of the pressure gauge which will provide the most accurate annulus pressure indication is between the long string casing and the injection tubing at ground level (at the wellhead). The annulus pressure system generally consists of an annulus pressure pot filled with a corrosion inhibited fluid with a line to the well annulus. Pressure is maintained on the pot and thus the annulus itself via nitrogen or a differential pressure pump. Pressure can be measured from the pressure pot to the wellhead. This is because the annulus fluid systems are generally static thus there is negligible friction loss and there is again minimum impact from difference in the liquid head contribution to pressure. The most conservative, in this case lowest pressure would be measured at the annulus pressure pot. The annulus pressure gauge also should be in communication with the annulus pressure recording device sensing point in order to satisfy the verification requirement.

Based on the above findings, the following are the Team's recommendations:

1. The injection tubing pressure gauge can be located anywhere on the disposal well feed line downstream of the last injection pump up to the injection tubing at ground level (wellhead).
2. The annulus pressure gauge can be located anywhere on the annulus pressure system from the annulus pot to the space between the long string casing and the injection tubing at ground level (wellhead).
3. Inspectors shall verify that each locally mounted pressure gauge is in communication with the corresponding recording pressure device sensing point. An open line must connect the two devices (injection line or annulus system).

## **COMMENTS**

REVIEW COMPLETED BY	NAMES	INITIALS	DATE
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