NATURAL GAS UNDERGROUND STORAGE WELL/CAVERN
PERMIT APPLICATION

In conformity with the provision of K.S.A. 55-1,117 through K.S.A. 55-1,119, and K.A.R. 28-45a-1 through K.A.R. 28-45a-19, the undersigned, representing

_____

(Name of company, corporation or person applying)

hereby makes application to the Kansas Department of Health and Environment for a permit to operate underground natural gas storage wells described below in Part II. This application shall be submitted and signed by both the facility owner and the facility operator. This application shall be signed by an Executive Officer equivalent to or higher than a Vice-President. Signature statements are attached.

The permit application for each new natural gas underground storage well/cavern is to be submitted at least 180 days before the proposed commencement date for the construction of the new storage well. Construction shall not begin until the Secretary has approved the permit application.

Part I must be completed for each facility and referenced by Part II.

Part II must be completed for each well/cavern.

Submit the application to:

Kansas Department of Health and Environment
Bureau of Water, Geology Section
Underground Hydrocarbon Storage Unit
1000 SW Jackson St., Suite 420
Topeka, KS 66612-1267.

PERMIT APPLICATION
UNDERGROUND NATURAL GAS STORAGE WELLS

Name of Facility:
_____

Location of Facility:

Street: _____

City: _____ **Zip Code:** _____

Facility Mailing Address:
Street:
_____

City: _____ **Zip Code:** _____

Facility Contact Person:
Name: _____ **JobTitle:** _____

Telephone: _____ **Fax:** _____

E-mail: _____

Address:_____

City: _____ **State:** _____ **Zip:**_____

Facility Operator:

Company Name: _____

Street: __

City:_____ State:_____ Zip:_____

Telephone:_____ Fax: _____

E-mail: _____

Facility Owner: (if different than operator)

Name:_____

Street: _____

City:_____ State:_____ Zip:_____

Telephone:_____ Fax: _____

Email: _____

PART I – FACILITY

A. Permits Required

1. The applicant shall contact the following agencies for approval of construction and operation of the facility, if applicable.
    a. Department of Transportation (DOT)
    b. Federal Energy Regulatory Commission (FERC)
    c. Kansas Corporation Commission (KCC)
    d. Occupational Safety and Health Association (OSHA)

2. The applicant shall contact the Kansas Department of Agriculture, Division of Water Resources (DWR), to confirm the availability of water rights for the project.

3. The applicant is responsible for contacting other regulatory agencies that may have jurisdiction over different phases of the construction and operation of the natural gas facility including:
    a. Bureau of Air (BAR) – KDHE Clean Air program;
    b. Bureau of Water (BOW) – KDHE Industrial programs;
    c. Bureau of Waste Management (BWM) – KDHE Hazardous Waste Management program.

4. The applicant is responsible for verifying that site location meets all city, county, and state zoning requirements.

B. Maps

The maps should be drawn to scale. All text and map symbols should be legible.

1. Submit a map that shows that the boundaries of the facility with respect to:
    a. the boundaries of municipal population centers (at least three miles);
    b. any active or abandoned conventional shaft mining operation (at least five miles);
    c. any solution mining operation (at least two miles);
    d. any existing underground porosity gas storage facility (at least one mile).

2. Submit a map of the following features or structures located within one mile of the storage facility's perimeter:
    a. existing and proposed underground hydrocarbon storage wells;
    b. water supply wells, oil wells, gas wells, brine production wells, disposal wells, monitoring wells, injection wells, abandoned wells, dry holes, and core holes;
    c. surface water bodies, brine retention ponds, and springs;
    d. existing and proposed pipelines, mines, quarries, man-made structures, and construction activities.

3. Submit a map showing all utility right-of-ways, including pipeline, railway, roadway, and electrical lines. In addition, assess the potential effects of the identified utilities on the location or operation of the storage facility.

4. Submit a map indicating the boundaries and ownership of tracts of land adjacent to the facility.

a. Include with the map a list, keyed to a map, containing the names and mailing addresses of property owners adjacent to the facility boundaries.
b. Show that each cavern's outer boundary is at least 100 ft from:
    i. the property boundary of owners who have not consented to underground storage beneath their property;
    ii. any existing surface structure not owned by the applicant;
    iii. any transportation artery.

5. Submit a scaled aerial photo for the facility and area within one mile of the facility's perimeter.

C. Well Information

1. Submit a tabulation of data on all wells penetrating the salt section within one mile of the storage facility. These wells should be keyed to a map. Provide the following information:

a. the type of well;
b. well's current status;
c. construction details;
d. construction date;
e. location;
f. total depth.

2. Submit plugging or completion records that indicate wells were properly constructed and/or plugged.

a. Provide a schematic for wells that penetrate the salt formation.
b. Describe the protocol used to identify, locate, and ascertain the condition of the wells. At a minimum the records of the following agencies shall be reviewed:
    i. Kansas Department of Health and Environment;
    ii. Kansas Geological Society;
    iii. Kansas Geological Survey;
    iv. Kansas Corporation Commission.

D. Geology/Hydrogeology

1. Submit a regional and site-specific evaluation of the geology and hydrogeology including a discussion for the following supporting data:

a. Maps - Submit contoured maps. Plot the well locations and the data points used for contouring. Plot the data values for the well locations and the data points. Provide a legible legend, north arrow and scale. Provide the following maps:
    i. isopach and structure of the salt formation;
    ii. regional stratigraphy;
    iii. site-specific stratigraphy;
    iv. water-level or potentiometric maps.
b. Cross-sections - Submit cross-sections and logs with legible text and a scale that is suitable for showing detail. Key the well locations to a map. Show aquifers, stratigraphy, and structure.
c. A discussion of potential adverse impact on the storage cavern from dissolution zones or salt thinning due to any change in stratigraphy,

d. A structural analysis, including past and recent tectonic activity, supported with geophysical data,
e. An assessment of the potential for ground subsidence supported with maps, cross-sections and available geophysical data,
f. A description of potential risks to the storage operation from activities conducted at adjacent facilities.

2. Submit a core analysis for the facility. Submit a plan describing the coring interval, coring procedure and core testing at least 60 days prior to the coring event.
   a. Follow the core procedure in UICLPG#16 (KDHE/BOW website).
   b. Submit an evaluation of the integrity for the roof thickness, web thickness, and cavern shape as indicated by the geomechanical properties from the core test.

3. Submit a flood assessment for the site including:
   a. the potential for flooding, supported with Federal Emergency Management Agency (FEMA) maps;
   b. flood response procedures;
   c. design criteria for the well and facility equipment.

E. Operations and Maintenance Plan

1. Submit a long-term operations and maintenance plan for the facility. K.A.R. 28-45a-10 lists sensitive data to be maintained at the facility for security reasons. The plan should include the following:
   a. a facility location map showing boundaries, location of proposed underground storage wells, existing and proposed pipelines for each cavern, surface structures, shallow and deep groundwater observation wells, water supply wells, corrosion control wells, and disposal wells;
   b. a schematic of the gathering line system that connects all wells;
   c. a schematic of product lines for each cavern;
   d. a description of methods to be used to prevent over-pressuring of wells and caverns;
   e. design information and plans for holding tanks, separators, lines, pumps, filters, and other equipment used in the storage operation at the facility;
   f. a quality assurance/quality control (QA/QC) plan outlining the steps to be taken (such as calibrating and certifying gauges, pressure sensors, and flow meters) to assure readings are accurate and reliable for:
      i. continuous pressure monitoring equipment,
      ii. supervisory control and data acquisition (SCADA) system(s) including a description of parameters to be tracked, the maintenance of historical data, the sampling interval, any operational controls, and a description of backup power systems,
      iii. an inventory balance plan for system(s) used to measure the volume of natural gas injected into or withdrawn from an underground storage well.

2. Submit plans and diagrams for emergency control used to prevent surface and subsurface releases in emergency situations during installation and operation of the well.

F. Emergency Response Plan

K.A.R. 28-45a-11 requires an emergency response plan to be prepared and maintained at the facility. All coordinating emergency response agencies and committees should be provided with a copy of the plan. The plan shall be updated annually or when new information becomes available.

1. Describe the facility's response to the following events:
    a. product releases
    b. fires or explosions
    c. cavern subsidence or collapse
    d. any other activity that endangers public health, safety, or constitutes a threat to the environment

2. Submit the following:
    a. a description of the warning system for the facility
    b. a description of emergency response procedures
    c. a description of the communication system for emergency response
    d. a description of employee training for emergency response

3. Submit a description of the facility's protection against accidental damage from hazards such as vehicular traffic, railroads, electrical power lines, aircraft, or shipping traffic.

4. Submit a description of security measures to prevent unauthorized entry and to secure the facility.

5. Submit a description of safety and awareness measures for public education.

G. Groundwater Monitoring Plan

1. Submit a groundwater monitoring plan
    a. a description of the proposed monitoring wells
        i. a map, to scale, showing proposed monitoring well locations
        ii. a tabulation showing each well's total depth and screened interval
        iii. the geologic formation at total depth and at the screened interval
    b. a quality assurance plan with a description of sampling and analysis techniques
    c. a monitoring plan for obtaining quarterly chloride samples, monthly combustible gas readings, and quarterly static water level measurements

2. Submit a plan for collecting, describing, and logging well cuttings from any new monitoring well or stratigraphic test hole as specified in KDHE's "Procedures for Sample Logging" (UICLPG-9)

H. Ground Subsidence Monitoring Plan

Submit a plan for monitoring ground subsidence at the storage wells. Identify the permanent benchmark and describe the criteria used to establish this point as a permanent benchmark

I. Financial assurance

1. Submit proof that financial assurance has been established for the closure of the facility and the plugging of any underground natural gas storage well pursuant to the requirements of KAR 28-45a-9 and KDHE procedure UICLPG#7.

2. Submit proof of financial assurance for closure of the storage facility and the plugging of any underground natural gas storage well.

3. Submit a plugging and abandonment plan for the well including:
   a. Three cost estimates for plugging the well.
   b. A schematic of the well construction
   c. A description of the type, grade, quality and estimated quantity of cement to be used in the plugging
   d. A description of the method of cement placement.

J. Fees

Each applicant for a permit for a new underground natural gas storage well shall submit a fee of $700 with the permit application. Fees shall be made payable to the "Kansas Department of Health and Environment – Subsurface hydrocarbon storage fund".

K. Licensure

All sections of the application shall be stamped and signed by either a Kansas licensed geologist or a Kansas licensed engineer.

PART II – UNDERGROUND NATURAL GAS STORAGE WELL/CAVERN INFORMATION

Submit a title page listing the owner's name, the operator's name, the facility name, the well's identification, and the well's location (both GPS and USPLSS).

Include a statement certifying that the information submitted in Part I of this application is true and applicable as it pertains to this well.

A. Submit a drilling prognosis for each well including:

1. A schematic for the well construction.
2. The procedures for:
    a. setting the casing,
    b. cementing, including:
        i. type, grade, additives, slurry weight and expected compressive strength
        ii. cementing techniques and equipment including guide shoe, float collar, plugs, baskets, DV tools and location, centralizers, wall scratchers
        iii. a description of procedures to ensure satisfactory cementing of various casings
3. Certification for the compatibility of the stored product, ground water, blanket material, brine, formation fluids, drilling fluids, and any test materials.
4. Open-hole logs
    a. Gamma-ray log
    b. Neutron or sonic log
    c. Density log
    d. Caliper log
5. Cased-hole logs
    a. Cement bond log
    b. Casing inspection log
    c. Gamma-ray log
    d. Density log
6. Sonar survey for cavern
7. Mechanical Integrity Testing
    a. Nitrogen interface test for well and cavern
    b. Procedures pursuant to KAR 28-45a-14
8. A description of the testing method to demonstrate the mechanical integrity of the tubing-and-packer system.
9. A description of the corrosion control system for the facility.
10. A description of the method for containing drilling fluids and formation cuttings:
    a. A description of the dimensions of the drilling tank and reserve tank
    b. A description of the disposal method for the liquid and solid contents of the drilling tank and the reserve tank.
11. The procedures for collecting and logging sample cuttings from the wells pursuant to KAR 28-45a-4 (h).

B. Solutioning Plan

Submit a description of and procedure for solutioning or washing the cavern.

1. The plan shall include a list of acceptable blanket pad materials, the methods for monitoring the solutioning or washing process, and a monitoring schedule.
2. Provide a schematic of the well, piping, tanks and equipment associated with the washing process.
3. Describe the process for removing brine from the well, disconnecting brine lines and other equipment unnecessary for natural gas storage operations, and the injection of natural gas into the cavern.

C. Wellhead

1. Submit a schematic for the wellhead.
2. Submit a description of the emergency shutdown valves, the pressure transducers, manual isolation valves, gas detectors, and other safety and warning features. Discuss the parameters that activate each safety/warning device and the setting criteria.

D. Well Information

Submit well information for the proposed natural gas storage well

1. Submit a schematic for the well construction.
2. Provide a description of the type of casing that will be used for the prevention of collar leaks (premium grade, welded, etc)
3. Submit the performance standards for the collapse resistance, internal yield pressure, and pipe body yield strength for the well's setting depths using criteria specified in the American Petroleum Institute Bulletin 5C2.
4. Submit calculations for the casing pressure for the wellhead, the surface casing, the production casing, and the tubing-and-packer assembly that demonstrate casing design for maximum pressures and differential pressures have been met.
5. Submit a description and a schematic for the instrumentation necessary to monitor and record annular pressure and fluid levels associated with the tubing-and-packer assembly.
6. Submit a description and a schematic for the monitoring system required for the annular space. Include a description of the test method that will be used to demonstrate the mechanical integrity of the system.

E. Cavern Information

Submit a description of the salt cavern, including estimates for the top of salt, the top of cavern, the maximum diameter and height of the cavern, cavern volume (base gas and working gas), and the web thickness with adjacent caverns.

F. Inventory-Balance Plan

Submit an inventory and balance plan that includes calculations and estimates for the total volume, the base gas and the working gas.

G. Operations Plan

Submit an operations plan for the well. Include the reference formula and the calculations for the maximum allowable operating pressure, the minimum operating pressure, differential

pressures, and the normal operating pressures. Include a discussion regarding the pressure settings to activate alarms or warning systems.

H. Compliance Schedule

Submit a compliance schedule with tentative dates for required monitoring, logging and testing after installation of the storage well.

- Gamma-density log to check roof thickness every five years
- Pressure test for well and cavern every five years
- A casing evaluation every ten years
- Visually inspect the wellhead monthly
- A biennial elevation survey

SIGNATORY CERTIFICATION

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Company _____

Name (Printed)_____

Signature _____

Title _____

Date _____