CHAPTER 162

GEOTHERMAL WELL STANDARDS

162.01 PURPOSE. It is the purpose of this ordinance to protect the health, safety and general welfare of the people of the City of Robins by ensuring that the ground waters will not be polluted or contaminated. Due to the serious potential of adverse environmental impacts, this ordinance will prohibit all open loop geothermal systems. It is also the intent of this ordinance to allow for closed loop systems with the requirements contained in this Ordinance for the construction, reconstruction, repair and destruction of geothermal wells.

162.02 DEFINITIONS.

1. Annular Space – The space between the casing or well screen and the wall of the borehole or between drilling pipe and casing or between two separate strings of casing.

2. Aquifer – A subsurface water-bearing layer of soil, sand, gravel or rock that will yield usable quantities of water to a well.

3. Borehole – A hole drilled or bored into the earth, usually for exploratory or economic purposes; a hole into which casing, screen and other materials may be installed to construct a well.

4. Casing – an impervious, durable pipe placed in a borehole to prevent the walls of the borehole from caving, and to seal off surface drainage or undesirable water, gas or other fluids and prevent entrance into a well.

5. Drinking Water – Water which is intended for human consumption and other domestic uses, and is considered to be free of harmful chemicals and disease-causing microorganisms.

6. Environmental Impact Analysis – A document prepared by a Licensed Professional Engineer in the State of Iowa, which assesses environmental and social risks of constructing a geothermal system, and determining mitigation measures to address those risks.

7. Geothermal Borehole – A hole drilled or bored into the earth into which piping is inserted for use in a geothermal system.

8. Geothermal System – A geothermal system uses the Earth's thermal properties in conjunction with electricity to provide greater efficiency in the heating and cooling of buildings.

9. Geothermal System – A mechanism for heat exchange, which consists of the following basic elements: Underground loops of piping; heat transfer fluid; a heat pump; an air distribution system. An opening is made in the Earth. A series of pipes are installed into the opening and connected to a heat exchange system in the building. The pipes form a "closed loop" and are filled with a heat transfer fluid. The fluid is circulated through the piping from the opening into the heat exchanger and back. The system functions in the same manner as the open loop system except there is no pumping of ground water.

10. Open Loop Geothermal System – Ground water is pumped from a water well into a heat exchanger located in a surface building. The water drawn from the Earth is then pumped back into the aquifer through a different well or in some cases the same well, otherwise known as re-injection. Alternatively, the ground water could be discharged to a surface water body also known as pump & dump. In the heating mode, cooler water is returned to the Earth, while in the cooling mode warmer water is returned to the surface water body.

11. Closed Vertical Loop or Horizontal Geothermal System – A borehole extends beneath the surface. Pipes are installed with U-bends at the bottom of the borehole. The pipes are connected to the heat exchanger and heat transfer fluid is circulated through the pipes.

12. Ground Water – Water beneath the Earth's surface, that occurs between saturated soil and rock that supplies wells and springs.

13. Grout – A low permeability material that is emplaced in the space between the wall of the borehole and the casing of a well and, or, emplaced on the wall of the borehole. The emplacement of grout is to prevent the migration of water or fluid contaminants into and through the borehole. Grout shall consist of neat cement, high solids bentonite slurry, or hydrated bentonite chips.

14. Heat Exchanger – A device usually made of coils of pipe that transfers heat from one medium to another; for example, from water to air or water to water.

15. Heat Transfer Fluid – Any liquid used specifically for the purpose of transferring thermal energy from the heat source to another location.

16. Low Permeability Material – A geological unit of unconsolidated material (usually clay or till) or bedrock (usually shale) that is all or partially saturated, and having permeability low enough (10-7 cm/sec) to give water in the aquifer artesian head.

17. Material Safety Data Sheet (MSDS) – A form containing data regarding the properties of a particular substance. It is intended to provide workers and emergency personal with procedures for handling or working with that substance in a safe manner, and includes

information such as physical data (melting point, boiling point, flash point etc.) toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill handling procedures. The exact format of an MSDS can vary from source to source.

18. Major Geothermal System – A horizontal or vertical closed loop system that is located more than 20 feet below the ground surface.

19. Minor Geothermal System – A horizontal closed loop system that is placed no more than 20 feet below the ground surface.

20. Permeability – The propensity of a material to allow fluid to move through its pores or interstices. Permeability is an important soil parameter when flow of water through soil or rock is a matter of concern.

21. Separation/Isolation Distances – The distance of a source of contamination from a surface drinking water source, a ground water source supply well, or any type of borehole.

22. Surface Water – Water located on the surface of the Earth in water bodies such as lakes, rivers, streams, ponds and reservoirs.

23. Tremie – A tubing string (typically about 2 to 3 inches in diameter) that is temporarily installed into the borehole during well construction. The tremie pipe is used for installing annular material such as filter pack sand and grout.

24. Water Supply Well – A well used by public water systems, or non-public use, for extracting ground water for human consumption.

25. Well – any excavation that is drilled, cored, driven, dug, bored, augured, jetted, washed or is otherwise construction for the purpose of exploring for ground water, monitoring ground water, utilizing the geothermal properties of the ground, or extracting water from or injecting water into the aquifer. "Well" does not include an open ditch, drain tiles, an excavation made for obtaining or prospecting for oil, natural gas, minerals, or products mined or quarried, lateral geothermal heat exchange systems nor temporary dewatering wells such as those used during the construction of subsurface facilities only for the duration of the construction.

162.03 PERMIT REQUIRED. No person shall dig, bore, drill, replace, modify, repair or destroy a geothermal well or any other excavation that may intersect ground water without first applying for and receiving a permit from the City of Robins, Iowa. A permit is required for all closed loop horizontal and closed loop vertical systems.

162.04 APPLICATION PROCEDURE. Applications for permits shall be made to the City of Robins on approved forms and shall contain all such information as required on the form. The application with accompanying filing fee and supporting documents shall be submitted by the property owner, owner's representative, or well driller. Supporting documents are as follows:

1. Site plan including:
    A. Property boundaries and easements of record.
    B. Location of wells and loops with retraceable dimensions to property boundaries.
    C. Location of test well, required with a Major Geothermal System.
    D. Erosion control and site restoration plan.
    E. Containment area for drilling effluent.
    F. Note stating the distance between proposed system and the nearest Water Supply Well.
2. Test Reports:
    A. Thermal Conductivity test.
    B. Geotechnical report with boring logs.
3. Environmental Impact Analysis required with a Major Geothermal System. Address risks including but not limited to:
    A. Atmospheric and noise emissions.
    B. Clearing of Vegetation.
    C. Ground subsidence.
    D. Surface water or groundwater pollution resulting from drilling effluents or heat transfer fluid.
    E. Disruption of existing in-ground contaminants.
    F. Fish or wildlife habitats on-site, if any.
    G. Floodplains or wetlands on-site, if any.
4. Product submittals:
    A. Material Safety Data Sheets.
    B. Manufacturers' shop drawings for piping, grout, pumps, and leak detector.
    C. Anticipated quantity of grout that will be used.
5. Certification of the well driller as required under Iowa Administrative Code 567-49 and 567-82.

162.05 MATERIAL REQUIREMENTS. All system materials and fluids shall meet or exceed requirements of Iowa Administrative Code 567.49. Geothermal piping shall have a 50-year warranty. Horizontal loops shall be installed with tracer wire. Heat transfer fluid used in exchanger lines must be a USP or food grade propylene glycol or calcium chloride solution. Ethylene Glycol will not be accepted. System shall include a pressure-based leak detector that will stop the system circulating pumps, should a leak occur.

162.06 REVIEW AND APPROVAL PROCESS.

1. Major and Minor Geothermal Systems can be authorized by the Building Official and/or City Engineer.

162.07 APPEAL PROCESS. For Minor Applications denied by the building official the applicant may appeal to the Robins City Council. Appeal for Major Geothermal systems denied by the City Council may be appealed to the Iowa district court.

162.08 WELL PERMITS. All proposed well drillers must obtain a permit from the Linn County Health Department and conform to Chapter 149 of the Iowa Administrative Code Section 567-49.29(455B).

162.09 PERMIT FEE. The fees for all geothermal work shall be set forth in Table 1-A as adopted by resolution of the Robins City Council. The permit fee must be submitted with the application.

162.10 PERMIT SUSPENSION AND REVOCATION. The City of Robins may suspend or revoke any permit issued pursuant to this Ordinance whenever it finds that the permitee has violated any of the provisions of this Chapter or has misrepresented any material fact in his/her/its application or, any supporting documents for such permit.

162.11 OPEN LOOP SYSTEMS PROHIBITED. Due to the serious potential adverse environmental impact with open loop systems, open loop systems are prohibited.

162.12 TESTING OF SYSTEM. Geothermal piping systems shall be tested hydrostatically at one and one half times the maximum system design pressure, but not less than 100 psi (689 kPa). The duration of each test shall be not less than 15 minutes. All geothermal systems must be checked by a licensed geothermal contractor, every year from the certification system date. Results shall be submitted to the Community Development Department on forms as adopted by resolution of the Robins City Council. A pressure monitoring system shall be installed on all geothermal systems which will cause the system to be shut down if there is a pressure drop of the geothermal system fluid which would indicate an external leak in the system.

162.13 LOCATION OF GEOTHERMAL SYSTEMS. Loops shall be located within the property boundaries and not encroach on any easements of record.

162.14 ABANDONMENT OF GEOTHERMAL SYSTEMS. The procedure used for abandonment of geothermal systems must be the same as currently described in Chapter 39 of the Iowa Administrative Code for Plugging Abandoned Wells. The heat transfer fluid must be removed by a displacement with grout. The top of the borehole must be uncovered and capped with grout.

162.15 REGULATION CONFLICT. In the event any of the provisions of this Ordinance conflict with any State or Federal regulation, the State or Federal regulations will control.

162.16 FAILURE TO COMPLY. Violations of this ordinance shall be punished as provided in Chapter 4 of The Code of Ordinances as a Municipal Infraction.