

Amd adopted 10-13

Establishing Casing Guidance Document

A new section to the bill is inserted, to read as follows:

§22-6A-24. Casing Standards.

No later than thirty days after the effective date of this article, the Secretary shall prepare a written guidance document for casing standards which contains at a minimum the following standards:

(1) General requirements for protective devices, general casing and cementing requirements.

(A) Any person engaged in drilling any horizontal gas well should equip the well with casings of sufficient strength and with other safety devices as may be necessary and should use every effort and endeavor effectively to prevent blowouts, explosions and fires.

(B) The operator should conduct casing and cementing activities in accordance with this document and should case and cement the well to accomplish the following:

(i) Allow effective control of the well at all times;

(ii) Prevent migration of gas or other fluids into sources of fresh groundwater;

(iii) Prevent pollution of diminution of fresh groundwater;
and

(iv) Prevent the migration of gas or other fluids into coal seams.

(C) To aid in the protection of fresh groundwater, the well

operator should control and dispose of brines and discharges from the drilling, alteration or operation of an oil and gas in a manner which is consistent with the requirements of article six and six-a of Chapter twenty-two of the West Virginia Code, as amended, and the requirements of the Water Pollution Control Act (article eleven of chapter twenty-two of the West Virginia Code), the Groundwater Protection Act (article twelve of chapter twenty-two of the West Virginia Code), or regulations promulgated thereunder.

(D) To prevent the migration of gas or fluids into sources of fresh groundwater and to prevent pollution or diminution of fresh groundwaters, there should be run and permanent cemented a string or strings of casing in each well drilled through the fresh water bearing strata to a depth and in a manner as prescribed this article and by regulation of the Secretary.

(E) When the well is drilled a location where the coal seam has not been removed, the well should be drilled to such a depth and of size as will permit the placing of casing, packers in, and vents on, throughout the borehole at such points and in such manner as prescribed by the Secretary by regulation as will exclude all gas or fluids from the coal seam, except such as may be found naturally in the coal seam itself and will enable the monitoring by the integrity of the production casing.

(2) Casing and cementing plan; filing requirements, approval and revision.

(A) The operator should prepare and maintain a casing and cementing plan showing how the well will be drilled and completed.

The plan should demonstrate compliance with the requirements of this document, and include the following minimum information:

(i) The anticipated depth and thickness of any producing formation, expected pressures, anticipated fresh groundwater zones and the method or information by which the depth of the deepest fresh groundwater was determined;

(ii) The diameter of the borehole;

(iii) Casing type, whether the casing to be utilized is new or used, and the depth, diameter, wall thickness and burst pressure rating for the casing;

(iv) Cement type, yield, additives and estimated amount of cement to be used;

(v) The estimated location of centralizers;

(vi) The proposed borehole conditioning procedures; and

(vii) Any alternative methods or materials required by the Secretary as a condition of the well permit.

(B) The well-specific casing and cementing plan should be submitted to the Secretary for review and approval, and a copy of the plan should be kept at the well site for review by the Secretary.

(C) Any revisions to the casing and cementing plan made as a result of onsite modification should be documented in the plan and be available for review by the Secretary. The person making any revisions to the plan should initial and date the revisions.

(3) Conductor pipe.

If the operator installs conductor pipe in the well, the following provisions apply:

(A) The operator may not remove the pipe.

(B) Conductor pipe should be installed in a manner that prevents the subsurface infiltration of surface water or fluids by either driving the pipe into place or cementing the pipe from the seat to the surface.

(C) Conductor pipe must be made of steel unless a different material is approved for use by the Secretary.

(4) Surface and coal protective casing and cementing procedures.

(A) For horizontal wells drilled, altered, reconditioned or recompleted after the effective date of this article, surface casing or any casing functioning as a water protection casing may not be utilized as production casing unless one of the following applies:

(i) In oil wells where the operator does not produce any gas generated by the well and the annulus between the surface casing and the production pipe is left open.

(ii) The operator demonstrates that the pressure in the well is no greater than the pressure permitted does not exceed the parameters established by the Secretary for well construction and operation, demonstrates through a pressure test or other method approved by the Secretary that all gas and fluids will be contained within the well, and installs a working pressure gauge that can be

inspected by the Secretary.

(B) If the well is to be equipped with threaded and coupled casing, the operator should drill a hole so that the diameter is at least 1 inch greater than the outside diameter of the casing collar to be installed. If the well is to be equipped with plain-end welded casing, the operator should drill a hole so that the diameter is at least 1 inch greater than the outside diameter of the casing coupling.

(C) The operator should drill to approximately 50 feet below the deepest known fresh groundwater or at least 50 feet into consolidated rock, whichever is deeper, and immediately set and permanently cement a string of surface casing to that depth. Except as provided in subsection six of this section, the surface casing may not be set more than 200 feet below the deepest fresh groundwater except if necessary to set the casing in consolidated rock. The surface hole should be drilled using air, freshwater, or freshwater-based drilling fluid. Prior to cementing, the wellbore should be conditioned to ensure an adequate cement bond between the casing and the formation. The surface casing seat should be set in consolidated rock. When drilling a new well or redrilling an existing well, the operator should install at least one centralizer within 50 feet of the casing seat and then install a centralizer in intervals no greater than every 150 feet above the first centralizer.

(D) The operator should permanently cement the surface casing

by placing the cement in the casing and displacing it into the annular space between the wall of the hole and the outside of the casing.

(E) Where potential oil or gas zones are anticipated to be found at depths within 50 feet below the deepest fresh groundwater, the operator should set and permanently cement surface casing prior to drilling into a stratum known to contain, or likely containing, oil or gas.

(F) If additional fresh groundwater is encountered in drilling below the permanently cemented surface casing, the operator should document the depth of the fresh ground water zone in the well record and protect the additional fresh groundwater by installing and cementing a subsequent string of casing or other procedures approved by the Secretary to completely isolate and protect fresh groundwater. The string of casing may also penetrate zones bearing salty or brackish water with cement in the annular space being used to segregate the various zones. Sufficient cement should be used to cement the casing to the surface. The operator should install at least one centralizer within 50 feet of the casing seat and then install a centralizer in intervals no greater than, if possible, every 150 feet above the first centralizer.

(H) The operator should set and cement a coal protective string of casing through workable coal seams, in accordance with the provisions of section eighteen, article six of chapter twenty-two of the West Virginia Code.

(I) When a well is drilled through a coal seam at a location where the coal has been removed or when a well is drilled through a coal pillar, the operator should install coal protective strings and devices, in accordance with the provisions of section twenty, article six of chapter twenty-two of the West Virginia Code.

(J) If the operator sets and cements casing pursuant to subsection seven or eight of this section and subsequently encounters additional fresh groundwater zones below the deepest cemented casing string installed, the operator should protect the fresh groundwater by installing and cementing another string of casing or other method approved by the Secretary. Sufficient cement should be used to cement the casing to the surface. The additional casing string may also penetrate zones bearing brackish or salt water, but should be run and cemented prior to penetrating a zone known to or likely to contain oil or gas. The operator should install at least one centralizer within 50 feet of the casing seat and then, if possible, install a centralizer in intervals no greater than every 150 feet above the first centralizer.

(K) If it is anticipated that cement used to permanently cement the surface casing cannot be circulated to the surface, a cement basket may be installed immediately above the depth of the anticipated lost circulation zone. The casing should be permanently cemented by the displacement method. Additional cement may be added above the cement basket, if necessary, by pumping through a pour string from the surface to fill the annular space. Filling the

annular space by this method does not constitute permanently cementing the surface or coal protective casing under section ten of this rule (relating to casing and cementing-lost circulation).

(5) Casing and cementing-lost circulation.

(A) If cement used to permanently cement the surface or coal protective casing is not circulated to the surface despite pumping a volume of cement equal to or greater than 120% of the calculated annular space, the operator should determine the top of the cement, notify the Secretary, and meet one of the following requirements as approved by the Secretary:

(i) Run an additional string of casing at least 50 feet deeper than the string where circulation was lost and cement the additional string of casing back to the seat of the string where circulation was lost and vent the annulus of the additional casing string to the atmosphere at all times unless closed for well testing or maintenance. Shut-in pressure on the casing seat of the additional string of casing may not exceed the requirements of section 11 of this rule. (relating to intermediate and production casing).

(ii) Run production casing and set the production casing on a packer in a competent formation below the string where circulation was lost and vent the annulus of the production casing to the atmosphere at all times unless closed for well testing or maintenance.

(iii) Run production casing at least to the top of the formation that is being produced and cement the production casing

to the surface.

(iv) Run intermediate and production casing and cement both strings of casing to the surface.

(v) Produce oil but not gas and leave the annulus between the surface casing and the production pipe open.

(vi) In addition to meeting the requirements of subsection one of this section, the operator may also pump additional cement through a pour string from the surface to fill the annular space.

(6) Intermediate and production casing.

(A) Prior to cementing the intermediate and production casing, the borehole, mud and cement should be conditioned to ensure an adequate cement bond between the casing and the formation.

(B) If the well is to be equipped with an intermediate casing, centralizers should be used and the casing should be cemented to the surface by the displacement method. Gas may be produced off the intermediate casing if a shoe test demonstrates that all gas will be contained within the well and a relief valve is installed at the surface that is set less than the shoe test pressure. The shoe test pressure should be recorded in the completion report.

(C) Except as provided in section nine of this rule (relating to surface and coal protective casing and cementing procedures), each well must be equipped with production casing. The production string may be set on a packer or cemented in place. If the production casing is cemented in place, centralizers should be used and cement should be placed by the displacement method with

sufficient cement to fill the annular space to a point at least 500 feet above true vertical depth or at least 200 feet above the uppermost perforations, whichever is greater.

(7) Minimum casing standards for horizontal wells.

(A) The operator should install casing that can withstand the effects of tension, and prevent leaks, burst and collapse during its installation, cementing and subsequent drilling and producing operations.

(B) All casing must be a string of new pipe with an internal pressure rating that is at least 20% greater than the anticipated maximum pressure to which the casing will be exposed. No used casing along any segment of a horizontal well.

(C) Any plain end casing, except when being used as conductor pipe, which is welded together for use must meet the following requirements:

(i) The casing must pass a pressure test by holding the anticipated maximum pressure to which the casing will be exposed for 30 minutes with not more than a 10% decrease in pressure. The operator should notify the Secretary at least 24 hours before conducting the test. The test results should be entered on the drilling log.

(ii) The casing should be welded using at least three passes with the joint cleaned between each pass.

(iii) The casing should be welded by a person trained and certified in the applicable American Petroleum Institute, American

Society of Mechanical Engineers, American Welding Society or equivalent standard for welding casing and pipe or an equivalent training and certification program as approved by the Secretary. The certification requirements of this paragraph should take effect on the effective date of this article. A person with 10 or more years of experience welding casing as of the effective date of this article, who registers with the Secretary by December 1, 2011, is deemed to be certified.

(iv) When casing through a workable coal seam, the operator should install coal protective casing that has a minimum wall thickness of 0.23 inch.

(v) Casing which is attached to a blow-out preventer with a pressure rating of greater than 3,000 psi should be pressure tested after cementing. A passing pressure test must be holding the anticipated maximum pressure to which the casing will be exposed for 30 minutes with not more than a 10% decrease. Certification of the pressure test should be confirmed by entry and signature of the person

(8) Cement standards.

(A) When cementing surface casing or coal protective casing, the operator should use cement that meets or exceeds the ASTM International C 150, Type I, II or III Standard or API Specification 10. The cement must also:

(i) Secure the casing in the wellbore.

(ii) Isolate the wellbore from fresh groundwater.

(iii) Contain any pressure from drilling, completion and production.

(iv) Protect the casing from corrosion from, and degradation by, the geochemical, lithologic and physical conditions of the surrounding wellbore. For wells employing coal protective casing, this includes, but is not limited to, formulating cement to withstand elevated sulfate concentrations and other geochemical constituents of coal and associated strata which have the potential to adversely affect the integrity of the cement.

(v) Prevent gas flow in the annulus. In areas of known shallow gas producing zones, gas block additives and low fluid loss slurries should be used.

(B) After the casing cement is placed behind surface casing, the operator should permit the cement to set to a minimum designed compressive strength of 500 pounds per square inch (psi) at the casing seat. The cement placed at the bottom 300 feet of the surface casing must constitute a zone of critical cement and achieve a 72-hour compressive strength of 1,200 psi and the free water separation may be no more than 6 milliliters per 250 milliliters of cement. If the surface casing is less than 300 feet, the entire cemented string constitutes a zone of critical cement.

(C) After any casing cement is placed and cementing operations are complete, the casing may not be disturbed for a minimum of 8 hours by doing any of the following:

(i) Releasing pressure on the cement head within 4 hours of

cementing if casing equipment check valves did not hold or casing equipment was not equipped with check valves. After 4 hours, the pressure may be released at a continuous, gradual rate over the next four hours provided the floats are secure;

(ii) Nippling up on or in conjunction to the casing;

(iii) Slacking off by the rig supporting the casing in the cement sheath; or,

(iv) Running drill pipe or other mechanical devices into or out of the wellbore with the exception of a wireline used to determine the top of cement.

(D) Where special cement or additives are used, the operator may request approval from the Secretary to reduce the cement setting time specified in this subsection three, above.

(E) The operator should notify the Secretary a minimum of 1 day before cementing of the surface casing begins, unless the cementing operation begins within 72 hours of commencement of drilling.

(F) A copy of the cement job log should be available at the well site for inspection by the Secretary during drilling operations. The cement job log must include the mix water temperature and pH, type of cement with listing and quantity of additive types, the volume, yield and density in pounds per gallon of the cement and the amount of cement returned to the surface, if any. Cementing procedural information must include a description of the pumping rates in barrels per minute, pressures in pounds per

square inch, time in minutes and sequence of events during the cementing operation.

(G) The cement job log should be maintained by the operator after drilling operations for at least 5 years, and made available to the Secretary for inspection upon request at any time during and after well drilling and completion. Within 60 days of well completion, a copy of the full cement log for the well should be filed with the Secretary.

(9) Defective casing or cementing.

In a well that has defective, insufficient or improperly cemented casing, the operator should report the defect to the Secretary within 24 hours of discovery by the operator and should correct the defect. The operator should correct the defect or submit a plan to correct the defect for approval by the Secretary within 30 days. If the defect cannot be corrected or an alternate method is not approved by the Secretary, the well should be plugged.

(10) Gas storage reservoir protective casing and cementing procedures.

(A) In addition to the other provisions of sections nine, ten and eleven of this rule, a well drilled through a gas storage reservoir or a gas storage reservoir protective area should be drilled, cased and cemented as follows:

(i) An operator should use drilling procedures capable of controlling anticipated gas flows and pressures when drilling from the surface to 200 feet above a gas storage reservoir or gas storage horizon.

(ii) An operator should use drilling procedures capable of controlling anticipated gas storage reservoir pressures and flows at all times when drilling from 200 feet above a gas storage reservoir horizon to the depth at which the gas storage protective casing will be installed. Operators should use blow-out prevention equipment with a pressure rating in excess of the allowable maximum storage pressure for the gas storage reservoir.

(iii) To protect the gas storage reservoir, an operator should run intermediate or production casing from a point located at least 100 feet below the gas storage horizon to the surface. The operator should cement this casing by circulating cement to a point at least 200 feet above the gas storage reservoir or gas storage horizon.

(iv) When cementing casing in a well drilled through a gas storage reservoir, the operator should insure that no gas is present in the drilling fluids in an amount that could interfere with the integrity of the cement.

(B) A request by an operator for approval from the Secretary to use an alternative method or material for the casing, plugging or equipping of a well drilled through a gas storage reservoir must satisfy the requirements of subsection six, section six of this rule.

(11) Inspection of well and casing integrity.

(A) After a well has been completed, recompleted, reconditioned or altered, the operator should prevent surface shut-in pressure and surface producing back pressure inside the surface

casing or coal protective casing from exceeding the following pressure: 80% multiplied by 0.433 psi per foot multiplied by the casing length (in feet) of the applicable casing.

(B) The operator should inspect each operating well at least quarterly to ensure it is in compliance with the well construction and operating requirements of this article and associated rules promulgated by the Secretary. The results of the inspections should be recorded and retained by the operator for at least 5 years and be available for review by the Secretary and the coal owner or operator.

(C) At a minimum, inspections must determine:

(i) The well-head pressure or water level measurement;

(ii) The open flow on the annulus of the production casing or the annulus pressure if the annulus is shut in;

(iii) If there is evidence of gas escaping from the well and the amount escaping, using measurement or best estimate of quantity; and,

(iv) If there is evidence of progressive corrosion, rusting or other signs of equipment deterioration.

(D) For structurally sound wells in compliance with section nine this rule (relating to surface and coal protective casing and cementing procedure), the operator should follow the reporting schedule outlined in subsection five and subsection six of this section, below.

(E) For wells exhibiting progressive corrosion, rusting or

other signs of equipment deterioration that compromise the integrity of the well, or for wells which are not in compliance with the requirements of subsection one of this section:

(i) The operator should immediately notify the Secretary and take corrective actions to repair or replace defective equipment or casing or mitigate the excess pressure on the surface casing seat or coal protective casing seat. If the remedial or corrective measures requires the installation of replacement production casing or retrofitted production casing, the operator should notify the Secretary at least 7 days prior to initiating the corrective measure.

(ii) Additional mechanical integrity tests, including, but not limited to, pressure tests, may be required by the Secretary to demonstrate the integrity of the well.

(F) The operator should submit an annual report to the Secretary identifying the compliance status of each well with the mechanical integrity requirements of this section. The report should be submitted on forms prescribed by, and available from, the Secretary or in a similar manner approved by the Secretary.

(12) Gas migration response.

(A) When an operator or owner is notified of or otherwise made aware of a potential natural gas migration incident, the operator should immediately conduct an investigation of the incident. The purpose of the investigation is to determine the nature of the incident, assess the potential for hazards to public health and

safety, and mitigate any hazard posed by the concentrations of stray natural gas.

(B) The investigation undertaken by the operator under Rule 17.1. must include, but not be limited to, the following:

(i) A site visit and interview with the complainant to obtain information about the complaint and to assess the reported natural gas migration incident;

(ii) A field survey to assess the presence and concentrations of natural gas and aerial extent of the stray natural gas; and,

(iii) If necessary, establishment of monitoring locations at potential sources, in potentially impacted structures, and the subsurface.

(C) If combustible gas is detected inside a building or structure at concentrations equal to or greater than 10% of the Lower Explosive Limit (L.E.L.) the operator should do the following:

(i) Immediately notify the Secretary, local emergency response agency, gas and electric utility companies, police and fire departments and, in conjunction with the Secretary and local emergency response agencies, take measures necessary to ensure public health and safety;

(ii) Initiate mitigation measures necessary to control and prevent further migration; and,

(iii) Implement the additional investigation and mitigation measures as provided in subsection five of this section, below.

(D) The operator should notify the Secretary and, in

conjunction with the Secretary, take measures necessary to ensure public health and safety, if sustained detectable concentrations of combustible gas satisfy any of the following:

(i) Greater than 1% and less than 10% of the lower explosive Limit (L.E.L.), in a building or structure;

(ii) Equal to or greater than 25% of the lower explosive limit (L.E.L.) in a water well head space;

(iii) Detectable in the soils; or,

(iv) Equal to or greater than 7 mg/l dissolved methane in water.

(E) The Secretary may require the operator to take one or more of the following additional actions:

(i) Conduct a field survey to assess the presence and concentrations of combustible gas and the areal extent of the combustible gas in the soils, surface water bodies, water wells, and other potential migration pathways;

(ii) Collect gas or water, or both, samples at a minimum for molecular and stable carbon and hydrogen isotope analyses from the impacted locations such as water wells, and from potential sources of the migration such as gas wells;

(iii) Conduct an immediate evaluation of the operator's adjacent oil or gas wells to determine well cement and casing integrity and to evaluate the potential mechanism of migration. This evaluation may include assessing pressures for all casing intervals, reviewing records for indications of defective casing or cement,

application of cement bond logs, ultrasonic imaging tools, geophysical logs, and other mechanical integrity tests as required. The initial area of assessment must include wells within a radius of 2,500 feet and may be expanded if required by the Secretary;

(iv) Take action to correct any defect in the oil and gas wells to mitigate the stray gas incident.

(v) Establish monitoring locations and monitoring frequency in consultation with the Secretary at potential sources, in potentially impacted structures, and the subsurface.

(F) If concentrations of stray natural gas are detected at less which are less than the levels set forth in subsections three or four of this section, the operator should notify the Secretary, and do the following if requested by the Secretary:

- (i) Conduct additional monitoring;
- (ii) Document findings; and,
- (iii) Submit a closure report.

(G) If concentrations of stray natural gas are detected inside a building or structure at concentrations equal to or greater than 10% of the lower explosive limit (L.E.L.), the operator and owner should file a report with the Secretary by phone and email within 24 hours after the interview with the complainant and field survey of the extent of stray natural gas. Additional daily or weekly reports should be submitted if requested by the Secretary.

(H) For all stray natural gas migration incidents, a final written report documenting the results of the investigation should

be submitted to the Secretary for approval within 30 days of the close of the incident, or in a time frame otherwise approved by the Secretary. The final report must include the following:

(i) Documentation of all results of the investigation, including analytical data and monitoring results;

(ii) Operational changes established at the operator's oil and gas wells in this State; and,

(iii) Measures taken by the operator to repair any defects at any of the investigated oil and gas wells;

(I) Reports submitted in accordance with this section that contain an analysis of geological or engineering data should be prepared and sealed by a geologist or engineer licensed in this State.