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**Regional prediction methods for the danger of coal and gas
outburst**

煤与瓦斯突出危险性区域预测方法

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1 Scope

The document lays down the general requirements, the prediction basis, the prediction methods, the judgement of the prediction result, the drawing of the regional prediction map and the preparation of the regional prediction report for the regional prediction of outburst-prone coal seams.

It applies to the regional prediction of the danger of coal and gas outburst in outburst-prone coal seams.

2 Normative references

Dated references apply only in the edition bearing that date; undated references apply in their latest edition, including all amendment sheets.

The documents cited are GB/T 15259 Terminology of mine safety; GB/T 15663.3 Terms relating to coal mining - Part 3: Underground mining; GB/T 15663.8 Terms relating to coal mining - Part 8: Coal mine safety; GB/T 23250 Direct method of determining coalbed gas content in the mine; GB 40880 Specification for the identification of coal mine gas grades; AQ/T 1047 Direct method of determining gas pressure in underground coal seams; and MT/T 1174 Method for determining the coal seam gas weathering zone.

3 Terms and definitions

The terms and definitions of GB/T 15259, GB/T 15663.3, GB/T 15663.8, GB 40880, GB/T 23250, AQ/T 1047 and MT/T 1174 apply, together with the two that follow.

3.1 regional prediction - the work of determining the danger of coal and gas outburst in a delimited area of an outburst-prone coal seam.

3.2 regional prediction map - a drawing based on the mining engineering plan which carries the geological structure of the coal seam, burial depth contours, the positions of outbursts and of clear outburst warning signs, and relative gas pressure and gas content, and which characterizes the outburst danger of the predicted area.

4 General requirements

4.1 The area covered by a regional prediction is delimited according to the mine development, the roadway layout, the distribution of geological structures, the layout of measuring points and similar circumstances, but is not to exceed 1 mining district and is generally not smaller than 1 panel. Where a panel is predicted to be free of outburst danger, it may be divided into several blocks and each predicted in turn as required.

4.2 Gas data from geological exploration, from surface well drilling and from the underground production period are collected for the regional prediction.

4.3 The regional prediction may be carried out by the mine itself with its own technical staff, organized by the chief engineer of the mine, or entrusted to a coal and gas outburst identification body.

4.4 Where the regional prediction result is no outburst danger, it is to be approved by the technical head of the coal mine enterprise.

4.5 The regional prediction uses coal seam gas parameters combined with gas geological analysis.

4.6 A regional prediction report is prepared, with the regional prediction map attached to it.

5 Regional prediction

5.1 Basis of prediction. The basis for a regional prediction by the method of coal seam gas parameters combined with gas geological analysis is the coal seam gas weathering zone, the gas geological analysis, and the measured relative gas pressure and gas content.

5.2 Data collection. Geological data collected cover the features of the mine coal seams, burial depth, faults, folds, igneous intrusions, roof and floor lithology, and the position, character and scale of structural zones. Gas data collected cover mine geological exploration data; gas dynamic phenomena during surface well drilling, gas parameter measurements and gas drainage data; mine production data; gas geological data and gas dynamic phenomena data from the development and production periods, the record card of coal mine gas dynamic phenomena being in the format of Annex A; the depth of the gas weathering zone; the mass of coal ejected and the gas emission per tonne of coal, calculated under GB 40880; and the type and features of the outburst.

5.3.1 Determination of the gas weathering zone. Areas free of outburst danger are delimited from the coal seam gas weathering zone, which is determined under MT/T 1174.

5.3.2 Gas geological analysis. Outburst-prone areas are delimited by gas geological analysis, carried out on the basis of the coal seam occurrence features, geological structure and outburst distribution pattern definitely established in the already mined area, together with the exploration and prediction results for the geological structure of the coal seam in the area to be predicted.

5.3.3 Measurement of coal seam gas parameters. In the part of the predicted area whose outburst danger is not settled by 5.3.1 and 5.3.2, prediction rests on the underground measured relative gas pressure P and gas content W of the coal seam. The layout of measuring points is to reflect the outburst danger of the coal seam in the predicted area, and the position and number of points follow from the size of the area and the complexity of the geological structure. Within the same geological unit inside the predicted area there are at least 2 points along the strike and at least 3 points along the dip, and points are placed at the greatest burial depth, at the lowest elevation and at representative geological structures already proved. The relative gas pressure P is measured under AQ/T 1047 and the gas content W under GB/T 23250. During the drilling of the measurement boreholes, the time and position of the test point, the completed borehole trajectory and parameters, abnormal drilling phenomena, sampling and testing conditions, results and personnel are recorded. Test points and borehole trajectories are marked on the regional prediction map, and the drilling record sheet follows Annex B.

5.4 Judgement of the prediction result. The rules for the method of coal seam gas parameters combined with gas geological analysis are as follows. The coal seam gas weathering zone is an area free of outburst danger. Where the distribution of outburst points, or of positions showing clear outburst warning signs, is directly related to a structural zone, the extension of that structure and the coal seam within a certain range on either side of it form an outburst-prone area; otherwise, within the same geological unit, the range from 20 m above the outburst point or the position with clear warning signs, measured as vertical depth, down to below it forms an outburst-prone area, as shown in Figure 1. Figure 1, drawn in metres, is keyed 1 fault; 2 outburst point or position showing outburst warning signs; 3 boundary line of the outburst-prone areas on either side of the fault deduced from the outburst point or warning sign point; 4 deduced upper boundary line of the lower outburst-prone area; 5 outburst-prone area, shown shaded. Outside the areas so delimited, prediction rests on the relative gas pressure P and the gas content W of the coal seam. The critical values used are to be established by test and investigation by a coal and gas outburst identification body; until they are established, Table 1 may be used for prediction. Table 1 states that where the relative gas pressure P is below 0.74 MPa and the gas content W is below 8 m³/t, with W below 6 m³/t inside a structural zone, the area is classed as free of outburst danger; a footnote adds that the area is free of outburst danger only when P and W both meet those conditions, and is otherwise outburst-prone.

5.5 Drawing the regional prediction map. On the mining engineering plan used as the base drawing, the geological structures collected, the positions of outburst points, the positions of

clear outburst warning signs, the burial depth contours and the measured gas parameter points are drawn in, and the presence or absence of outburst danger in the predicted area is marked.

6 Preparation of the regional prediction report

The regional prediction report is made up of three parts: a basic information sheet, the main text and the attachments.

The basic information sheet carries the name of the coal mine and coal seam predicted; the prediction basis, the gas parameters measured and the regional prediction conclusion, including the extent of the area predicted; and the predicting body, the personnel who carried out the prediction, the person in charge of the prediction, the reviewer and the person approving the report, together with the seal of the predicting body and the date of prediction.

The main text carries an outline of the mine; the gas geological situation of the predicted area; the determination of the extent of the prediction; the determination of the gas weathering zone in the predicted area, the results of the gas geological analysis and the measurement of coal seam gas pressure and gas content, including the layout of measuring points, the gas pressure rise curves and the gas content desorption curves; an analysis of the reliability of the results; the prediction basis and the prediction conclusion; and the measures to be taken.

The attachments carry the regional prediction map; a copy of the document by which the coal mine enterprise proves that it is equipped to carry out regional prediction itself, or a copy of the qualification certificate of the identification body; copies of the calibration certificates of the instruments used; copies of the test reports for coal seam gas pressure, gas content and the like; and copies of other items such as key interview records and certificates.

A Annex A (normative) Record card for gas dynamic phenomena in coal mines

Table A.1 is the record card for gas dynamic phenomena in coal mines. It carries a card number and identifies the province, county, company, mine and shaft. The fields it provides for cover the time and place of the event, with year, month, day and hour, and the elevation and vertical depth below the surface in m and the roadway type; the coal seam features, with seam name, thickness in m, dip angle in degrees and coal quality; the roof and floor lithology, for roof and floor; the mining situation of adjacent seams, upper and lower; a description of the geological structure covering faults, folds and changes in thickness and dip; the support form, with prop spacing and roof control distance in m; the ventilation method, with effective air quantity in m³/min, absolute gas quantity in m³/min and normal