

The preparation of maps and plans in terms of engineering geology

Report by the Geological Society Engineering
Group Working Party

CONTENTS

	<i>page</i>		<i>page</i>
1. Introduction	297	3. Recommendations on engineering geology maps	306
1.1. Terms of reference	297	3.1. Introduction	306
1.2. General	297	3.2. Recommendations	306
1.3. Engineering geology maps	299	3.3. Geological aspects	306
1.4. Engineering geology plans	299	3.3.1. Mappable units	307
1.4.1. The pre-construction or site investigation plan	299	3.3.2. Geological boundaries	307
1.4.2. The construction or foundation plan	300	3.3.3. Description of rocks and soils	307
2. Supplementation of existing geological maps	300	3.3.4. Description of exposures	307
2.1. Introduction	301	3.3.5. Description of weathering and alteration	307
2.2. Geological aspects	301	3.3.6. Description of joints and other structural planes	307
2.2.1. Description of rocks and soils	301	3.3.7. Sub-surface information	307
2.2.2. Weathering and alteration	301	3.4. Hydrogeological aspects	307
2.2.3. Geological boundaries	301	3.4.1. Availability of information	307
2.2.4. Intraformational shears	301	3.4.2. General hydrogeological conditions	308
2.2.5. Joints and other structural discontinuities	301	3.4.3. Hydrogeological properties of rocks and soils	308
2.2.6. Faults	301	3.4.4. Springs and seepages	308
2.3. Geomorphological aspects	301	3.5. Geomorphological aspects	308
2.3.1. General	301	3.5.1. General	308
2.3.2. Landslides	301	3.5.2. Mass movements	308
2.3.3. Cambering	302	3.6. Seismicity	308
2.3.4. Natural underground openings	302	3.7. Boreholes	308
2.4. Hydrogeology	302	3.8. Site investigations and tests	308
2.4.1. Availability of information	302	3.9. Mines and quarries	309
2.4.2. General hydrogeological conditions	302	4. Recommendations on engineering geology plans	309
2.4.3. Hydrogeological properties of deposits	302	4.1. Introduction	309
2.4.4. Springs and seepages	302	4.2. Recommendations	309
2.5. Seismicity	302	4.3. Geological aspects	309
2.6. Boreholes	302	4.3.1. Mappable units	309
2.7. Site investigations and tests	303	4.3.2. Geological boundaries	309
2.7.1. Site investigations	303	4.3.3. Description of rocks and soils	309
2.7.2. Sites of engineering tests	303	4.3.4. Description of exposures	310
2.8. Mines and quarries	303	4.3.5. Description of weathering and alteration	310
2.8.1. Open workings	303	4.3.6. Description of discontinuities	310
2.8.2. Filled-in workings and made ground	303	4.3.7. Sub-surface information	310
2.8.3. Mining subsidence	303	4.4. Hydrogeological aspects	310
2.8.4. Disturbed ground	303	4.5. Geomorphological aspects	310
2.8.5. Other information	304	4.5.1. General	310
2.9. Example	304	4.5.2. Mass movement	310

Contents

	<i>page</i>		<i>page</i>
4.6. Site investigations and tests	310	6.3. Symbols for hydrogeological properties of rocks and soils	328
4.6.1. Direct methods	310	6.4. Symbols for general, geomorphological, glacial, mass movement and fossil periglacial features	328
4.6.2. Indirect methods	311	6.4.1. General requirements	328
4.6.3. <i>In situ</i> testing and sampling	311	6.4.2. General features	329
4.6.4. Laboratory test results	311	6.4.3. Shafts, tunnels, boreholes and wells	331
4.7. Layout of engineering geological plans	311	6.4.4. Geomorphological features	332
4.7.1. Suggested layout for large drawings	311	6.4.5. Glacial features	334
4.7.2. Suggested layout for report sized drawings	312	6.4.6. Mass movement and fossil periglacial features	334
5. Description of soils and rocks	313	6.5. Symbols for structural features	338
5.1. Introduction	313	6.5.1. Planar structures	338
5.2. Rocks	313	6.5.2. Linear structures	340
5.2.1. Colour	314	6.5.3. Combinations of structural symbols	341
5.2.2. Grain size	314	6.5.4. Traces of geological structures and geological boundaries	341
5.2.3. Texture and structure	315	6.5.5. Structural features determined by photogeological means	342
5.2.4. Discontinuities within the mass	316	6.6. Site investigation symbols	343
5.2.5. Weathered state	316	6.6.1. Symbols for use on engineering geological maps	343
5.2.6. Alteration state	317	6.6.2. Symbols for use on engineering geological plans	343
5.2.7. Minor lithological characteristics	317	6.6.3. Trace symbols for use on engineering geology plans or sections	346
5.2.8. Rock name	317	6.6.4. Trace symbols for features interpreted by geophysical means	346
5.2.9. Estimated mechanical strength of the rock material	317	6.7. Colour scheme	347
5.2.10. Estimate of mass permeability	318	6.7.1. The recommended colour scheme for linework and symbols	347
5.2.11. Other terms indicating special engineering characteristics	319	6.7.2. Symbols for rocks	347
5.3. Soils	319	6.7.3. Symbols for soils	347
5.3.1. Colour	320	6.7.4. Symbols for glacial, mass movement, geomorphological and general features	347
5.3.2. <i>In situ</i> strength and structure, including discontinuities	320	6.7.5. Symbols for structural features	348
5.3.3. Weathered state	322	6.7.6. Symbols for site investigations	348
5.3.4. Alteration state	322	7. Notes on the preparation of cross-sections for engineering geology plans	348
5.3.5. Minor lithological characteristics	322	7.1. Symbols for use on cross-sections for engineering geology plans	349
5.3.6. Soil name	323	8. Membership of the working party	349
5.3.7. Estimated mass behaviour to groundwater flow	324	9. References	350
5.3.8. Other terms indicating special engineering characteristics	324		
6. Legend for engineering geology maps and plans	324		
6.1. Symbols for rocks	324		
6.1.1. Examples of sedimentary rock types	325		
6.1.2. Examples of igneous rock types	326		
6.1.3. Examples of metamorphic rock types	326		
6.2. Symbols for soils	327		
6.2.1. Examples of soil types	327		

Contents

	<i>page</i>		<i>page</i>
APPENDIX I			
10. Preparation of maps and plans	351	11.1.6. Drawings showing the results of a geophysical survey	357
10.1. Introduction	351	11.2. Photogeology	359
10.2. Methods	352	11.2.1. General requirements	359
10.2.1. The pace and compass method	352	11.2.2. Copies of R.A.F. air photo- graphs	361
10.2.2. The hand level method	352	11.2.3. Companies undertaking air photography	361
10.2.3. The altimeter method	352	11.2.4. Selected references	361
10.2.4. The plane table method	352	11.2.5. Illustrations	362
10.2.5. Terrestrial photogrammetry	352	11.3. Groundwater	365
10.3. Selected references	353	11.3.1. General requirements	365
11. Special Techniques and aids	354	11.3.2. Published hydrogeological maps	366
11.1. Geophysical techniques	354	12. Sources of existing information	366
11.1.1. Introduction	354		
11.1.2. Methods	354	APPENDIX II	
11.1.3. Applications and limitations of geophysical techniques	355	13. Examples of engineering geology plans	367
11.1.4. Presentation of geophysical information	356		
11.1.5. Selected references	356		

1. Introduction

1.1. TERMS OF REFERENCE

THE WORKING PARTY on the preparation of geological maps in terms of engineering geology was set up by the Engineering Group of the Geological Society. The following terms of reference were adopted by the working party:

- (a) to consider the need for engineering geology maps,
- (b) to make proposals for the presentation of relevant information on such maps,
and
- (c) to study methods of obtaining the basic data required for their preparation.

1.2. GENERAL

The working party met on several occasions during the period 1968–71; it was agreed at an early meeting of the working party that two sub-committees should be formed to consider:

- (a) Regional engineering geological maps on a scale of 1 : 10 000 or smaller.
- (b) Engineering geological plans on a scale larger than 1 : 10 000.