STRUCTURAL REQUIREMENTS

MINING

LABC Warranty's Surveyors and Engineers are required to assess the design of structures over, or in the vicinity of, mine-workings, entries and features, as part of the audit process on behalf of the Underwriter. The following guidance outlines recognised good practice in relation to this. Foundation design and construction should be in accordance with the LABC Warranty Technical Manual and recognised publications from British Standards, Eurocodes, CIRIA, BRE, ICE and the Coal Authority.

KEY REQUIREMENTS

The foundations shall be designed to clearly demonstrate that the design loads are safely transferred to known soil strata that are, in turn, capable of supporting the loads. Foundations should be designed to ensure that long-term settlement does not exceed 25mm (or 10mm for piles) or 1:500 (differential), unless more stringent criteria are required by the Project Structural Engineer.

TECHNICAL DOCUMENTATION REQUIRED

The following documentation will be required by LABC Warranty's Structural Engineer to facilitate the assessment. In the absence of approval, works are proceeding at the Developer's own risk.

1. Structural drawings and calculations for foundations
2. Site Investigation Reports including site-specific recommendations for foundations
3. Coal Authority Report
4. Shallow mine workings:

a) Coal Mining Risk Assessment Report including details of site investigation carried out to confirm the presence or otherwise of shallow mine workings, entries and features

b) If it is proposed to found over untreated mine-workings, we require an appropriately qualified and experienced Geotechnical Engineer to:

- Demonstrate appropriate competent rock cover of at least 10 times the seam thicknesses. Note that the 10 times rock cover guidance outline in CIRIA SP32 is only a 'rule of thumb' for crown-hole collapses. Other subsidence mechanisms can occur, such as pillar failure, for which the 10 times rock cover 'rule of thumb' is not an appropriate guide. It should be demonstrated that the untreated workings are stable in terms of other collapse mechanisms (e.g. pillar failure, floor failure or other global effects)
- Provide written confirmation that they are satisfied that the extent and depth of intrusive investigation is adequate, having considered CIRIA guidance (including CIRIA SP32 and C758D) and the Coal Authority's Technical Guidance Notes (including TGN01/2019)

c) Details of stabilisation of shallow mine workings (including specification, grout-hole layouts, validation report and testing)

5. Mine entries:

a) Dimensioned drawing (including sections) indicating the location of the entry in relation to foundations
b) Report confirming size, depth and condition of entry and depth to competent rock-head
c) Validation report with regard to the stabilisation of the entry
d) Shaft cap drawing and design calculation
e) Drawings and calculations demonstrating how foundations have been designed to accommodate a potential shaft failure (with reference to CIRIA guidance (including CIRIA SP32 and C758D)

Refer to separate guidance documents in relation to specific foundation types e.g. piling, rafts, vibro treatment, building on fill (e.g. in opencast mines) etc.

If there are queries with regard to anything not covered within this document and/or it is intended to deviate from the above guidance, then please contact LABC Warranty for agreement prior to commencement. Following acceptance of the proposals, please contact us if anything is subsequently discovered on site, which affects the design and/or construction.

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REFERENCE DOCUMENTS

Building Regulations – Part A
BS EN 1990 to BS EN 1997 including all parts and National Annexes.
CIRIA SP32 Construction over abandoned mine workings, 2002.
CIRIA C758D Abandoned mine workings manual, 2019
TGN1/2019 - Coal Authority Technical Guidance Note – Findings from a large subsidence event on a residential estate.
https://www.gov.uk/government/organisations/the-coal-authority

GUIDANCE

The Coal Authority must be consulted in relation to all works over or near coal, workings, entries etc.

SITE INVESTIGATION

A Coal Authority Report should be obtained to determine the risk and any records or otherwise of mine-workings, mine entries/features or previous subsidence events etc. Records should be viewed with caution, as historical mining plans do not always give a true representation of the coal workings that have actually been undertaken. Furthermore, there may be unrecorded workings, entries and features etc.

A detailed, site specific, interpretative, Phase 1 and 2 Geotechnical Site Investigation should take place and be in accordance with BS5930/BSEN1997-2, CIRIA SP32, CIRIA C758D, TGN01/2019 and the Coal Authority's requirements. Both desk-based research and ground investigations should be undertaken to confirm the:

- Coal workings, recorded and probable
- Workable seam outcrops
- Accuracy of the coal mining plans that could affect the development
- Competence and current condition of the geology overlaying the coal workings
- Potential effects of groundwater, including assessment of recovering levels post mining, which may still be taking place today
- Mine entries
- Mine gas
- Geological features, including fissures and break lines
- Former surface mining sites including delineation of high-walls
- Risk of spontaneous combustion

The site investigation should be to an appropriate scope, extent and depth to enable consideration of all potentially affected areas. Borings to 30m depth may not be deep enough (dependent on the particular geology and mining in the area).

STABILISATION OF MINE-WORKINGS

If there is evidence of mine-workings or lack of conclusive evidence to rule out the presence of mine-workings, the Geotechnical Engineer should assess the impact on the foundations. The particular foundation type and loading regime should be considered in the assessment. Note that piles transfer loads to a greater depth and often as a series of point loads.

If mine-workings are considered to potentially affect the foundations, they should be stabilised in accordance with CIRIA SP32 and CIRIA C758D. The injection of grout should take place at appropriate centres and to the required depths to ensure that the mine-workings are stabilised. The Geotechnical Engineer should prepare a validation report, which should include:

- The location, thickness and depth of all workings to be stabilised
- Detailed specification for stabilisation including the grout-hole layout overlaid on the site layout plan
- Grouting records (including bore reference, depth, grout take, soils description)
- Testing records (including test bores, cube tests)
- A clear validation statement confirming that all mine-workings have been adequately stabilised and recommendations for foundation design and construction

If mine-workings are considered not to affect the foundations, the Geotechnical Engineer should:

- Demonstrate appropriate competent rock cover of at least 10 times the seam thicknesses between the top of the seam and underside of the founding strata. Note that the 10 times rock cover guidance outlined in CIRIA SP32 is only a 'rule of thumb' for crown-hole collapses. Other subsidence mechanisms can occur, such as pillar failure, for which the 10 times rock cover 'rule of thumb' is not an appropriate guide. These mechanisms need to be considered
- Provide written confirmation that they are satisfied that the extent and depth of intrusive investigation is adequate, having considered CIRIA guidance (including SP32 and C758D) and the Coal Authority's Technical Guidance Notes (including TGN01/2019)

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MINE ENTRIES / FEATURES

It is strongly recommended that proposed development be relocated away from the influence of mine entries and features, even when such features are treated. The sterilisation zone should be agreed with the Coal Authority. Structures should be sited a minimum distance from shafts/features equal to the depth of superficial deposits. A safety zone should be maintained around the shaft, the dimensions of which may be subtended by an angle of 45° to the surface from the point where the sides of the shaft intersect competent rock-head. Note that angle of 45 degrees may need to be more conservative depending on the particular ground conditions

Suspected mine entries/features should be located in accordance with guidelines from CIRIA SP32 and C758D and the Coal Authority. This can often take the form of trenching or probing to a suitable distance around the suspected or recorded location (to the Coal Authority's satisfaction). If the search area extends into a neighbouring site with no access, it should be assumed that the entry/feature lies at the boundary.

If safe to do so, the depth, condition of the shaft and the depth to rock-head should be established to enable an assessment of the potential impact on foundations.

If it is necessary to locate structures near to mine entries/features, it needs to be demonstrated that the foundations will not be affected by a future failure of the entry/feature. This is commonly achieved by:

- Ensuring that the foundations lie outside the potential collapse zone (the dimensions of which may be subtended by an angle of 45° to the surface from the point where the sides of the shaft intersect competent rock-head refer to figure 33 of CIRIA SP32). Note that angle of 45 degrees may need to be more conservative depending on the particular ground conditions. Deepening the foundations may be an option

  and

- Stabilising the entry/feature (e.g. by grouting) to its full footprint and depth

  and

- Capping the entry/feature at rock-head

FOUNDATIONS IN MINING AFFECTED AREAS

Common foundation types used over stabilised mine workings are:

- Shallow spread foundations (strips and rafts) suitably reinforced to span soft spots (3m span and 1.5m cantilever). It is desirable to maintain bearing pressures below 160kN/m2 at the grouted horizons
- Piles are not generally suitable unless founded below the grouted horizons (typically, this cannot be achieved with driven piles). There is also a potential for pile installation to disturb workings or shafts

Refer to CIRIA SP32 and C758D for details.

All formation levels should be inspected by an Engineer. Local Authorities can also have their own specific requirements.

Foundations, which encounter coal, should be brought below the coal. The sides of foundations should be protected when they are in contact with coal.

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