

## SECTION E — FIXED CONSTRUCTIONS

### E21 EARTH OR ROCK DRILLING; MINING

**E21D SHAFTS; TUNNELS; GALLERIES; LARGE UNDERGROUND CHAMBERS** (soil-conditioning or soil-stabilising materials C09K 17/00; cutting machines for mining or quarrying E21C; safety devices, transport, rescue, ventilation or drainage E21F) **[2, 6]**

#### Note(s)

1. This subclass covers methods or apparatus for making or lining tunnels, galleries or large underground chambers, using underground mining methods only, i.e. not involving disturbance of the ground surface.
2. This subclass does not cover underground spaces made by foundation engineering, i.e. involving disturbance of the ground surface, which are covered by subclass E02D.

#### Subclass index

MAKING SHAFTS; LININGS THEREFOR.....	1/00, 3/00, 7/00, 8/00, 5/00
MAKING TUNNELS OR GALLERIES; LININGS THEREFOR.....	9/00, 11/00
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#### Shafts

##### 1/00 Sinking shafts

- 1/02 • by hand
- 1/03 • mechanically (E21D 1/08 takes precedence)
- 1/04 • • with grabs
- 1/06 • • with shaft-boring cutters (drilling machines E21B)
- 1/08 • while moving the lining downwards
- 1/10 • Preparation of the ground
- 1/12 • • by freezing
- 1/14 • • • Freezing apparatus
- 1/16 • • by petrification (grouting anchoring-bolts E21D 20/02)

##### 3/00 Raising shafts, i.e. working upwards from the bottom

##### 5/00 Lining shafts; Linings therefor (E21D 11/00 takes precedence) [3]

- 5/01 • using prefabricated lining lowered into a hole filled with liquid or viscous mass
- 5/012 • Use of fluid-tight or anti-friction material on outside of, or between, lining layers
- 5/016 • Bearer curbs
- 5/02 • with wood (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
- 5/04 • with brick, concrete, stone, or similar building materials (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
- 5/06 • with iron or steel (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
- 5/08 • • in the form of profiled parts
- 5/10 • • in the form of tubing

- 5/11 • with combinations of different materials, e.g. wood, metal, concrete (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)

- 5/12 • Accessories for making shaft linings, e.g. suspended cradles, shutterings

##### 7/00 Shaft equipment, e.g. timbering within the shaft

- 7/02 • Arrangement of guides for cages in shafts; Connection of guides for cages to shaft walls (guideways or guides for elevators B66B 7/02)

##### 8/00 Shafts not provided for in groups E21D 1/00-E21D 7/00 [2006.01]

#### Tunnels; Galleries; Large underground chambers; Linings therefor [3, 6]

##### 9/00 Tunnels or galleries, with or without linings; Methods or apparatus for making thereof (linings per se E21D 11/00; galleries protecting against falling rocks or avalanches E01F 7/04); Layout of tunnels or galleries [3]

- 9/01 • Methods or apparatus for enlarging or restoring the cross-section of tunnels, e.g. by restoring the floor to its original level [7]
- 9/02 • Driving inclined tunnels or galleries [3]
- 9/04 • Driving tunnels or galleries through loose materials; Apparatus therefor not otherwise provided for
- 9/06 • Making by using a driving shield [2]
- 9/08 • • with additional boring or cutting means [2]
- 9/087 • • • with a rotary drilling-head cutting simultaneously the whole cross-section, i.e. full-face machines [7]
- 9/093 • • Control of the driving shield [7]

## E21D

- 9/10 • Making by using boring or cutting machines (E21D 9/08 takes precedence; similar machines for mining E21C 27/20; mining picks E21C 35/18) [3]
- 9/11 • • with a rotary drilling-head cutting simultaneously the whole cross-section, i.e. full-face machines [7]
- 9/12 • Devices for removing or hauling away excavated material or spoil; Working or loading platforms (underground transport E21F 13/00) [2]
- 9/13 • • using hydraulic or pneumatic conveying means [7]
- 9/14 • Layout of tunnels or galleries; Constructional features of tunnels or galleries, not otherwise provided for, e.g. portals, day-light attenuation at tunnel openings [3]

### 11/00 Lining tunnels, galleries or other underground cavities, e.g. large underground chambers; Linings therefor; Making such linings *in situ*, e.g. by assembling (E21D 15/00-E21D 23/00 take precedence; specially for shafts E21D 5/00; lining pressure water galleries, linings therefor E02B 9/06) [2]

- 11/02 • Lining predominantly with wood [2]
- 11/03 • • using timber-setting machines
- 11/04 • Lining with building materials (E21D 11/02, E21D 11/14 take precedence) [2]
- 11/05 • • using compressible insertions
- 11/06 • • with bricks
- 11/07 • • • using brick-laying machines
- 11/08 • • with preformed concrete slabs
- 11/10 • • with concrete cast *in situ*; Shuttering or other equipment adapted therefor
- 11/12 • • Temporary supports for use during building; Accessories
- 11/14 • Lining predominantly with metal [2]
- 11/15 • • Plate linings; Laggings, i.e. linings designed for holding back formation material or for transmitting the load to main supporting members (insulation E21D 11/38) [2]
- 11/18 • • Arch members
- 11/20 • • • Special cross-sections, e.g. corrugated
- 11/22 • • • Clamps or other yieldable means for interconnecting adjacent arch members either rigidly, or allowing arch member parts to slide when subjected to excessive pressure
- 11/24 • • • Knuckle joints or links between arch members
- 11/26 • • • Shoes for connecting arch members to longitudinal struts
- 11/28 • • Longitudinal struts
- 11/30 • • Bases for lower arch members (for props E21D 15/54)
- 11/34 • • Joints between vertical props and horizontal top bars (end caps forming part of the props E21D 15/54)
- 11/36 • • Linings or supports specially shaped for tunnels or galleries of irregular cross-section [2, 3]
- 11/38 • Waterproofing (in general E02D 31/00); Heat insulating; Soundproofing; Electric insulating (for building constructions in general E04B 1/62) [2]
- 11/40 • Devices or apparatus specially adapted for handling or placing units of linings for tunnels or galleries [2]

### 13/00 Large underground chambers; Methods or apparatus for making them (lining E21D 11/00) [6]

- 13/02 • Methods
- 13/04 • Special equipment; Accessories

## Working-face supports

### 15/00 Props (in the building art E04G 25/00); Chocks

- 15/02 • Non-telescopic props
- 15/04 • • with wooden prop parts joined by double conical connectors
- 15/06 • • with parts joined by a lock, with or without slight axial adjustability
- 15/08 • • • with toggle joint connection
- 15/10 • • • with dog-clutch or pin-and-hole connection
- 15/12 • • • with locking devices located near head or foot
- 15/14 • Telescopic props (general means for fixing telescopic parts together F16B)
- 15/15 • • Means counteracting entry of dirt; Built-in cleaning devices
- 15/16 • • with parts held together by positive means, with or without relative sliding movement when the prop is subject to excessive pressure
- 15/18 • • • with one part resting on a supporting medium, e.g. rubber, sand, bitumen, lead, located in the other part, with or without expulsion or displacement of the medium upon excessive pressure
- 15/20 • • • with pawl, pin, cross-piece, or the like engaging with ratchet teeth, notches, holes, or the like spaced apart at intervals
- 15/22 • • • with member, pin, cross-piece, or the like ruptured, sheared through, or permanently deformed upon excessive pressure
- 15/24 • • • with axial screw-and-nut, rack-and-worm, or like mechanism
- 15/26 • • • with screw, worm, or the like not self-locking but normally prevented from rotation by friction members which slip upon excessive pressure
- 15/28 • • with parts held relatively to each other by friction or gripping, e.g. using wedges
- 15/30 • • • by means expanded or contracted by pressure applied through the medium of a fluid or quasi-fluid, e.g. rubber
- 15/32 • • • by a deformable collar
- 15/34 • • • by axially-moving balls, rollers, or the like
- 15/36 • • • by a tiltable collar surrounding one or both parts
- 15/38 • • • with longitudinally-divided upper or lower prop parts, e.g. interfitting laminations
- 15/40 • • • Collar or other support gripped to one or both parts by toggle-action, cam, or other member pivoted or similarly mounted
- 15/42 • • • with special parts to influence the friction
- 15/43 • • • Details of wedges (friction linings or pads E21D 15/42)
- 15/44 • Hydraulic, pneumatic, or hydraulic-pneumatic props
- 15/45 • • • having closed fluid system, e.g. with built-in pumps or accumulators
- 15/46 • • with load-measuring devices; with alarm devices
- 15/48 • Chocks or the like
- 15/50 • Component parts or details of props (E21D 15/43, E21D 15/58, E21D 15/60 take precedence)
- 15/502 • • Prop bodies characterised by their shape, e.g. of specified cross-section
- 15/51 • • specially adapted to hydraulic, pneumatic, or hydraulic-pneumatic props, e.g. arrangements of relief valves
- 15/52 • • Extensible units located above or below standard props

- 15/54 • • Details of the ends of props (for permitting step-by-step movement E21D 23/06)
- 15/55 • • • of prop heads
- 15/56 • • Details of locks of telescopic props
- 15/58 • Devices for setting props
- 15/582 • • for mechanical props
- 15/59 • • for hydraulic, pneumatic, or hydraulic-pneumatic props
- 15/60 • Devices for withdrawing props or chocks
- 17/00 Caps for supporting mine roofs**
- 17/01 • characterised by the shape of the cap, e.g. of specified cross-section
- 17/02 • Cantilever extension or similar protecting devices
- 17/022 • • Auxiliary devices for temporary support of roof-supporting beams whilst assembling
- 17/03 • • Brackets for roof-supporting bars
- 17/04 • • for use in longwall working
- 17/05 • • • hydraulically extensible
- 17/054 • • • hydraulically pivotable
- 17/06 • • for use in drifting galleries
- 17/08 • • Cap joints for obtaining a coal-face free of pit-props
- 17/082 • • • of sliding type
- 17/086 • • • of articulated type
- 17/10 • Details of mine caps for engaging the tops of pit-props, with or without retaining-plates; Retaining-plates
- 19/00 Provisional protective covers for working space (E21D 9/06, E21D 23/00 take precedence) [3]**
- 19/02 • for use in longwall working
- 19/04 • for use in drifting galleries
- 19/06 • Arrangements for applying the covers [6]
- 20/00 Setting anchoring-bolts (anchoring bolts for shafts, tunnels or galleries E21D 21/00; means for anchoring structural elements or bulkheads specially adapted to foundation engineering E02D 5/74; dowels or other devices fastened in walls or the like by inserting them in holes made therein for that purpose F16B 13/00) [5]**
- 20/02 • with provisions for grouting
- 21/00 Anchoring-bolts for roof, floor, or shaft-lining protection (dowels or other devices fastened in walls or the like by inserting them in holes made therein for that purpose F16B 13/00) [5]**
- 21/02 • having means for indicating tension (screwed connections specially modified for indicating tensile load F16B 31/02)
- 23/00 Mine roof supports for step-by-step movement, e.g. in combination with provisions for shifting of conveyers, mining machines, or guides therefor (shifting of mine conveyers at the working face, per se E21F 13/08)**
- 23/03 • having protective means, e.g. shields, for preventing or impeding entry of loose material into the working space or support [4]
- 23/04 • Structural features of the supporting construction, e.g. linking members between adjacent frames or sets of props; Means for counteracting lateral sliding on inclined floor (E21D 23/14 takes precedence)
- 23/06 • • Special mine caps or special tops of pit-props for permitting step-by-step movement
- 23/08 • Advancing mechanisms (E21D 23/16 takes precedence)
- 23/10 • • with advancing devices separate from the supporting construction
- 23/12 • Control, e.g. using remote control (E21D 23/16 takes precedence)
- 23/14 • • Effecting automatic sequential movement of supports, e.g. one behind the other
- 23/16 • Hydraulic or pneumatic features, e.g. circuits, arrangement or adaptation of valves, setting or retracting devices
- 23/18 • • of advancing mechanisms
- 23/20 • • • for sequential movement, e.g. one behind the other
- 23/22 • • • incorporated in mine caps
- 23/24 • • • the advancing mechanisms being separate from the supporting construction
- 23/26 • • Hydraulic or pneumatic control