

CPC**COOPERATIVE PATENT CLASSIFICATION****E02D**

FOUNDATIONS; EXCAVATIONS, EMBANKMENTS (specially adapted for hydraulic engineering [E02B](#)); **UNDERGROUND OR UNDERWATER STRUCTURE** (tunnels, tunnelling, mining [E21](#))

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[E02D 29/09](#) covered by [E02D 29/06](#)

E02D 1/00

Investigation of foundation soil in situ (investigation involving boring or specially adapted to earth drilling [E21B 25/00](#), [E21B 49/00](#); investigating or analysing materials by determining their chemical or physical properties, in general [G01N](#), e.g. sampling [G01N 1/00](#))

E02D 1/02

. before construction work

E02D 1/022

.. { by investigating mechanical properties of the soil ([E02D 1/027](#) takes precedence) }

E02D 1/025

... { combined with sampling }

E02D 1/027

.. { by investigating properties relating to fluids in the soil, e.g. pore-water pressure, permeability (sampling of groundwater [E02D 1/06](#)) }

E02D 1/04

.. Sampling of soil { ([E02D 1/025](#) takes precedence) }

E02D 1/06

.. Sampling of ground water

E02D 1/08

. after finishing the foundation structure { (testing of piles [E02D 33/00](#)) }

E02D 3/00

Improving or preserving soil or rock, e.g. preserving permafrost soil (securing of slopes or inclines [E02D 17/20](#); damming or interrupting passage of underground water [E02D 19/12](#); improving soil for agricultural purposes [A01](#); soil stabilisation for road building or like purposes [E01C 21/00](#), [E01C 23/10](#); setting rock anchoring bolts [E21D](#))

E02D 3/005

. { Soil-conditioning by mixing with fibrous materials, filaments, open mesh or the like }

E02D 3/02

. Improving by compacting ([E02D 3/11](#) takes precedence; compacting soil locally before or while forming foundations [E02D 27/26](#), [E02D 27/28](#))

E02D 3/026

.. by rolling with rollers usable only for or specially adapted for soil compaction, e.g. sheepfoot rollers (rollers for soil working in agriculture [A01B 29/00](#); rollers for road paving, such rollers usable also for compacting soil [E01C 19/23](#))

E02D 3/0265

... { Wheels specially adapted therefor; Cleats for said wheels }

E02D 3/032

... Trench rollers

E02D 3/039

... Slope rollers

E02D 3/046

.. by tamping or vibrating, e.g. with auxiliary watering of the soil ([E02D 3/026](#), [E02D 3/08](#) take precedence; generating or transmitting mechanical vibrations for performing mechanical work in general [B06B](#); tamping or vibrating apparatus for working ballast or railways [E01B 27/00](#), for consolidating paving materials

- [19/30](#), for consolidating concrete in general [E04G 21/06](#))
- E02D 3/054 . . . involving penetration of the soil, e.g. vibroflotation
- E02D 3/061 . . . Tampers with directly acting explosion chambers ([pile drivers with explosion chambers E02D 7/12](#))
- E02D 3/068 . . . Vibrating apparatus operating with systems involving reciprocating masses ([E02D 3/054](#), [E02D 3/061](#) take precedence)
- E02D 3/074 . . . Vibrating apparatus operating with systems involving rotary unbalanced masses ([E02D 3/054](#) takes precedence)
- E02D 3/08 . . by inserting stones or lost bodies, e.g. compaction piles ([sand drains for soil compaction E02D 3/10](#); [stressing soil while forming foundations E02D 27/28](#))
- E02D 3/10 . . by watering, draining, de-aerating or blasting, e.g. by installing sand or wick drains ([E02D 3/11](#) takes precedence; [soil-penetrating vibrators with auxiliary watering E02D 3/054](#); [drainage of soil in general E02B 11/00](#))
- E02D 3/103 . . . { [by installing wick drains or sand bags](#) }
- E02D 3/106 . . . { [by forming sand drains containing only loose aggregates \(sand piles E02D 3/08 \)](#) }
- E02D 3/11 . . by thermal, electrical or electro-chemical means ([freezing soil for interrupting passage of underground water E02D 19/14](#))
- E02D 3/115 . . by freezing
- E02D 3/12 . . Consolidating by placing solidifying or pore-filling substances in the soil ([making piles E02D 5/46](#); [soil-conditioning or soil-stabilising materials C09K 17/00](#); [consolidation of ground around boreholes or wells E21B 33/138B](#), [E21B 43/025](#))
- E02D 3/123 . . { [and compacting the soil \(E02D 3/126](#) takes precedence) }
- E02D 3/126 . . { [and mixing by rotating blades](#) }
- E02D 5/00 Bulkheads, piles, or other structural elements specially adapted to foundation engineering ([engineering elements in general F16](#))**
- E02D 5/02 . . Sheet piles or sheet pile bulkheads { ([foundations made with sheet pile bulkheads E02D 27/30](#); [cofferdams E02D 19/04](#)) }
- E02D 5/03 . . Prefabricated parts { [e.g. composite sheet piles](#) }
- E02D 5/04 . . . made of steel
- E02D 5/06 Fitted piles or other elements specially adapted for closing gaps between two sheet piles or between two walls of sheet piles
- E02D 5/08 Locking forms; Edge joints; Pile crossings; Branch pieces
- E02D 5/10 . . . made of concrete or reinforced concrete { ([moulds therefor E02D 5/70](#)) }
- E02D 5/105 { [of prestressed concrete \(E02D 5/12](#) takes precedence) }
- E02D 5/12 Locking forms; Edge joints; Pile crossings; Branch pieces
- E02D 5/14 . . Sealing joints between adjacent { [sheet](#) } piles ([sealing joints not restricted to foundation piles E04B 1/68](#))
- E02D 5/16 . . Auxiliary devices rigidly or detachably arranged on sheet piles for facilitating assembly { ([as parts of driving or pulling apparatus E02D 7/00](#), [E02D 13/00](#)) }
- E02D 5/18 . . Bulkheads or similar walls made solely of concrete in situ { ([moulds therefor E02D 5/68](#); [making foundation slots E02D 17/13](#); [sealing diaphragms other than those made of concrete E02D 19/18](#)) }
- E02D 5/182 . . { [using formworks to separate sections](#) }

- E02D 5/185 .. { with flexible joint members between sections (joints in foundation structures [E02D 29/16](#); flexible joints in hydraulic engineering [E02B 3/16](#), in building [E04B 1/68](#)) }
- E02D 5/187 .. { the bulkheads or walls being made continuously, e.g. excavating and constructing bulkheads or walls in the same process, without joints }
- E02D 5/20 . Bulkheads or similar walls made of prefabricated parts and concrete, including reinforced concrete, in situ
- E02D 5/22 . Piles (sheet piles, { i.e. elements shaped to mutually lock or mate } [E02D 5/02](#); { pile shoes [E02D 5/72](#); foundations on piles [E02D 27/12](#), [E02D 27/20](#) })
- E02D 5/223 .. { Details of top sections of foundation piles ([E02D 5/54](#) takes precedence) }
- E02D 5/226 .. { Protecting piles (piles with protecting cases [E02D 5/60](#)) }
- E02D 5/24 .. Prefabricated piles

NOTE

Documents covered both by [E02D 5/26](#) to [E02D 5/32](#) and by one or several of the groups [E02D 5/48](#) to [E02D 5/64](#) are classified in all relevant groups unless specific priority rules to the contrary are given

- E02D 5/26 ... made of timber with or without reinforcement; Means affording protection against spoiling of the wood (cases [E02D 5/60](#); impregnating agents [B27K 3/16](#)); Self-cleaning of piles placed in water
- E02D 5/28 ... made of steel { or other metals ([E02D 5/52](#) takes precedence) }
- E02D 5/285 { tubular, e.g. prefabricated from sheet pile elements (sheet pile boxes [E02D 27/30](#); concrete piles with metal casings [E02D 5/30](#)) }
- E02D 5/30 ... made of concrete or reinforced concrete or made of steel and concrete { ([E02D 5/50](#) takes precedence; assembled from segments [E02D 5/523](#); prestressed concrete [E02D 5/58](#)) }
- E02D 5/32 ... with arrangements for setting { or assisting in setting } in position by fluid jets { (placing piers by using fluid jets in general [E02D 7/24](#)) }
- E02D 5/34 .. Concrete or concrete-like piles cast in position; { Apparatus for making same ([E02D 5/50](#) takes precedence; moulds [E02D 5/665](#); placing, removing moulds [E02D 7/00](#) to [E02D 11/00](#); placing the concrete [E02D 15/04](#)) }
- E02D 5/36 ... making without use of mouldpipes or other moulds

NOTE

Documents covered both by [E02D 5/34](#) to [E02D 5/46](#) and by one or several of the groups [E02D 5/48](#) to [E02D 5/64](#) are classified in all relevant groups unless specific priority rules to the contrary are given

- E02D 5/38 ... making by use of mould-pipes or other moulds
- E02D 5/385 { with removal of the outer mould-pipes (documents also covered by one or several of the groups [E02D 5/40](#) to [E02D 5/44](#) are classified in all the relevant groups) }
- E02D 5/40 in open water
- E02D 5/42 by making use of pressure liquid or pressure gas for compacting the concrete
- E02D 5/44 with enlarged footing or enlargements at the bottom of the pile
- E02D 5/445 { by application of pyrotechniques }

- E02D 5/46 . . . making in situ by forcing bonding agents into gravel fillings or the soil
([consolidating soil in general E02D 3/12](#))
- E02D 5/48 . . Piles varying in construction along their length, { [i.e. along the body between head and shoe, e.g. made of different materials along their length \(E02D 5/50, E02D 5/52 take precedence \)](#) }
- E02D 5/50 . . Piles comprising both precast concrete portions and concrete portions cast in situ
{ ([E02D 5/523 takes precedence](#)) }
- E02D 5/52 . . Piles composed of separable parts, e.g. telescopic tubes { [Piles composed of segments](#) }
- E02D 5/523 . . . { [composed of segments](#) }
- E02D 5/526 { [Connection means between pile segments](#) }
- E02D 5/54 . . Piles with prefabricated supports or anchoring parts; Anchoring piles {([E02D 5/44 takes precedence](#); [ground anchors E02D 5/80](#); [anchored foundations E02D 27/50](#)) }
- E02D 5/56 . . Screw piles {([placing piles by screwing down E02D 7/22](#)) }
- E02D 5/58 . . Prestressed concrete piles {([segmental piles E02D 5/523](#)) }
- E02D 5/60 . . Piles with protecting cases
- E02D 5/62 . . Compacting the soil at the footing or in { [or along](#) } a casing by forcing cement or like material through tubes
- E02D 5/64 . . Repairing piles

- E02D 5/66 . Mould-pipes or other moulds {([for plant use B28B](#)) }
- E02D 5/665 . . { [for making piles](#) }
- E02D 5/68 . . for making bulkheads or elements thereof
- E02D 5/70 . . for making sheet piles { [not used](#) }

- E02D 5/72 . Pile shoes

- E02D 5/74 . Means for anchoring structural elements or bulkheads ([anchoring piles E02D 5/54](#); [anchored foundations E02D 27/50](#)) }
- E02D 5/76 . . Anchoring for bulkheads or sections thereof { [in as much as specially adapted therefor](#) }
- E02D 5/765 . . . { [removable](#) }
- E02D 5/80 . . Ground anchors {([for galleries, tunnels or shafts E21D 21/00](#)) }
- E02D 5/801 . . . { [driven by screwing](#) }
- E02D 5/803 . . . { [with pivotable anchoring members](#) }
- E02D 5/805 . . . { [with deformable anchoring members](#) }
- E02D 5/806 . . . { [involving use of explosives](#) }
- E02D 5/808 . . . { [anchored by using exclusively a bonding material](#) }

- E02D 7/00** **Methods or apparatus for placing sheet pile bulkheads, piles, mouldpipes, or other moulds** ([for both placing and removing E02D 11/00](#); { [accessories for coupling driver to piles or the like E02D 13/10](#); [for trees or other plants A01G 17/16](#); [placing posts E04H 17/26](#) })

- E02D 7/02 . Placing by driving {([E02D 7/18 to E02D 7/24 take precedence](#)) }
- E02D 7/04 . . Hand { [\(-actuated\)](#) } pile-drivers

- E02D 7/06 . . . Power-driven drivers {(tampers [E02D 3/061](#))}
- E02D 7/08 . . . Drop drivers with free-falling hammer {([E02D 7/10](#) takes precedence)}
- E02D 7/10 . . . with pressure-actuated hammer, { i.e. the pressure fluid acting directly on the hammer structure ([E02D 7/12](#) takes precedence; vibrating drivers [E02D 7/18](#))}
- E02D 7/12 . . . Drivers with explosion chambers
- E02D 7/125 { Diesel drivers }
- E02D 7/14 . . . Components for drivers { inasmuch as not specially for a specific driver construction }
- E02D 7/16 Scaffolds { or supports } for drivers {(guide frames for the elements to be driven per se [E02D 13/04](#); supports of the artificial island type [E02B 17/00](#))}
- E02D 7/165 { of variable length, e.g. foldable or telescopic }
- E02D 7/18 . Placing by vibrating {(vibrators for soil compacting [E02D 3/046](#))}
- E02D 7/20 . Placing by pressure or pulling power
- E02D 7/22 . Placing by screwing down {(screw piles per se [E02D 5/56](#))}
- E02D 7/24 . Placing by using fluid jets {(prefabricated concrete piles with arrangements therefor [E02D 5/32](#))}
- E02D 7/26 . Placing by using several means simultaneously
- E02D 7/28 . Placing of hollow pipes or mould pipes by means arranged inside the piles or pipes {([E02D 13/08](#) takes precedence)}
- E02D 7/30 . . by driving cores
- E02D 9/00** **Removing sheet piles bulkheads, piles, mould-pipes or other moulds { or parts thereof } (for both placing and removing [E02D 11/00](#))**
- E02D 9/005 . { removing the top of placed piles of sheet piles ([E02D 9/04](#) takes precedence)}
- E02D 9/02 . by withdrawing
- E02D 9/04 . by cutting-off under water
- E02D 11/00** **Methods or apparatus { specially adapted } for both placing and removing sheet pile bulkheads, piles, or mould-pipes (features relating to placing only [E02D 7/00](#), to removing only [E02D 9/00](#); { placing apparatus which without special provisions, can be operated to remove, e.g. vibrating drivers [E02D 7/00](#))}**
- E02D 13/00** **Accessories for placing or removing piles or bulkheads, { e.g. noise attenuating chambers }**
- E02D 13/005 . { Sound absorbing accessories in piling }
- E02D 13/02 . specially adapted for placing or removing bulkheads
- E02D 13/04 . Guide devices; Guide frames {(as parts of the driver scaffold [E02D 7/16](#))}

- E02D 13/06 . for observation while placing
- E02D 13/08 . Removing obstacles
- E02D 13/10 . Follow-blocks of pile-drivers or like devices

NOTE

The IPC wording is replaced by the following wording: Devices adapted to, e.g. interposed on, the top of the pile to be driven, e.g. follow-blocks or the like caps, rings

E02D 15/00 Handling building or like materials for hydraulic engineering or foundations ({ soil-shifting [E02F](#); } conveying or working-up concrete or similar masses in general [E04G 21/02](#))

- E02D 15/02 . Handling of bulk concrete specially for foundation { or hydraulic engineering } purposes { (lining canals [E02B 5/02](#); banks of the bodies of water [E02B 3/121](#)) }
- E02D 15/04 . . Placing concrete in mould-pipes, pile tubes, bore-holes or narrow shafts
- E02D 15/06 . . Placing concrete under water { (for surfacing the bottom of bodies of water [E02B 3/121](#)) }
- E02D 15/08 . Sinking workpieces into water or soil { inasmuch as not provided for elsewhere }
- E02D 15/10 . Placing gravel or light material under water { inasmuch as not provided for elsewhere }

E02D 17/00 Excavations; Bordering of excavations; Making embankments (soil-shifting apparatus [E02F](#); earth drilling [E21](#))

- E02D 17/02 . Foundation pits
- E02D 17/04 . . Bordering { surfacing } or stiffening the sides of foundation pits
- E02D 17/06 . Foundation { trenches } ditches or narrow shafts
- E02D 17/08 . . Bordering or stiffening the sides of ditches { trenches } or narrow shafts for foundations
- E02D 17/083 . . . { Shoring struts }
- E02D 17/086 . . . { Travelling trench shores }
- E02D 17/10 . . Covering trenches for foundations
- E02D 17/12 . . Back-filling of foundation trenches or ditches { (apparatus therefor [E02F 5/12](#), [E02F 5/22](#)) }
- E02D 17/13 . Foundation slots { or slits }; Implements for making these slots { or slits }
- E02D 17/16 . Loosening of soil or rock, under water (for correcting streams [E02B 3/02](#); by dredgers or excavators [E02F](#))
- E02D 17/18 . Making embankments, { e.g. dikes, dams } ([E02D 17/20](#) takes precedence; { foundations for dams [E02D 27/40](#) })
- E02D 17/20 . Securing of slopes or inclines { (by soil [E02D 3/12](#); protection against snowslides or

- avalanches [E01F 7/04](#), [E01F 15/00](#); securing banks or like surfaces facing on bodies of water [E02B 3/12](#))}
- E02D 17/202 . . { with flexible securing means }
- E02D 17/205 . . { with modular blocks, e.g. pre-fabricated }
- E02D 17/207 . . { with means incorporating sheet piles or piles }
- E02D 19/00** **Keeping dry foundation sites or other areas in the ground (sheet piles or bulkheads [E02D 5/02](#))**
- E02D 19/02 . Restraining of open water
- E02D 19/04 . . by coffer-dams { ,e.g. made of sheet piles (permanent sheet piling boxes [E02D 27/30](#)) }
- E02D 19/06 . Restraining of underground water
- E02D 19/08 . . by employing open ditches arranged below the level of the water
- E02D 19/10 . . by lowering level of ground water {(installation for obtaining or collecting drinking water [E03B 3/00](#)) }
- E02D 19/12 . . by damming or interrupting the passage of underground water
- E02D 19/14 . . . by freezing the soil (in connection with sinking shafts [E21D 1/12](#))
- E02D 19/16 . . . by placing or applying sealing substances {([E02D 19/18](#) takes precedence }; consolidating by placing solidifying or pore-filling pore-filling substances in the soil [E02D 3/12](#); { improving soil by chemical substances [C09K 17/00](#)) }
- E02D 19/18 . . . by making use of sealing aprons, { e.g. diaphragms made from bituminous or clay material } {(concrete diaphragms [E02D 5/18](#)); sealing or joints for { hydraulic } engineering work [E02B 3/16](#))
- E02D 19/185 . . . { Joints between sheets constituting the sealing aprons }
- E02D 19/20 . . . by displacing the water, e.g. by compressed air {(pneumatic caissons [E02D 23/04](#)) }
- E02D 19/22 . Lining sumps in trenches { or other foundation pits }
- E02D 23/00** **Caissons; Construction or placing of caissons (tunnels submerged into or built in open water [E02D 29/063](#); { moles, piers, quays, breakwaters incorporating caissons [E02B 3/06](#); foundation formed by caissons [E02D 27/18](#) to [E02D 27/22](#); caisson-like artificial islands [E02B 17/00](#)) }**
- E02D 23/02 . Caissons able to be floated on water and to be lowered into water in situ {(floating caisson foundations [E02D 27/06](#)) }
- E02D 23/04 . Pneumatic caissons {(sinking of same [E02D 23/10](#)) }
- E02D 23/06 . . bringing persons or material into or out of compressed air caissons {(air locks in mines [E21F 1/14](#)) }
- E02D 23/08 . Lowering or sinking caissons {(sinking mine shaft [E21D 1/00](#)) }
- E02D 23/10 . . Caisson filled with compressed air {([E02D 23/06](#) takes precedence) }
- E02D 23/12 . . inclined lowering
- E02D 23/14 . . Decreasing the skin friction while lowering
- E02D 23/16 . Jointing caissons to the foundation soil, specially to uneven foundation soil

E02D 25/00 Joining caissons, sinkers, or other units to each other under water

E02D 27/00 Foundations as substructures

- E02D 27/01 . Flat foundations
- E02D 27/013 .. { **Shuttering specially adapted therefor** }
- E02D 27/016 .. { **made mainly from prefabricated concrete elements** }
- E02D 27/02 .. Flat foundations without substantial excavation ([E02D 27/04](#), [E02D 27/08](#) take precedence)
- E02D 27/04 .. in water or on quicksand
- E02D 27/06 ... Floating caisson foundations
- E02D 27/08 .. Reinforcements for flat foundations { [E02D 27/48](#) takes precedence }

- E02D 27/10 . Deep foundations
- E02D 27/12 .. Pile foundations
- E02D 27/14 ... Pile framings, { **i.e. piles assembled to form the substructure** }
- E02D 27/16 ... Foundations formed of separate piles
- E02D 27/18 .. Foundations formed by making use of caissons
- E02D 27/20 .. Caisson foundations combined with pile foundations
- E02D 27/22 .. Caisson foundations made by starting from fixed or floating artificial islands by using protective bulkheads

- E02D 27/24 . Foundations constructed by making use of diving-bells ([equipment for dwelling or working under water B63C 11/00](#))

- E02D 27/26 . Compacting soil locally before forming foundations; Construction of foundation structures by forcing binding substances into gravel fillings ([consolidating foundation soil in general E02D 3/02 to E02D 3/12](#); { **for piles E02D 5/02, E02D 5/46** })

- E02D 27/28 . Stressing the soil or the foundation structure while forming foundations

- E02D 27/30 . Foundations made with permanent use of sheet pile bulkheads, walls of planks, or sheet piling boxes

- E02D 27/32 . Foundations for special purposes { ([for paving of roads E01C 3/00](#)) }
- E02D 27/34 .. Foundations for sinking or earthquake territories ([building constructions with protection arrangements against earthquakes E04H 9/02](#))
- E02D 27/35 .. Foundations formed in frozen ground, e.g. in permafrost soil
- E02D 27/36 .. Foundations formed in moors or bogs
- E02D 27/38 .. Foundations for large tanks, e.g. oil tanks
- E02D 27/40 .. Foundations for dams across valleys or for dam constructions { ([dams per se E02B 3/10, E02B 7/04](#)) }
- E02D 27/42 .. Foundations for poles, masts or chimneys { ([sockets or holders for poles or masts per se E04H 12/22](#)) }
- E02D 27/425 ... { **specially adapted for wind motors masts** ([wind motors per se F03D 1/00](#)) }
- E02D 27/44 .. Foundations for machines, engines or ordnance ([special lay-out of foundations](#))

- with respect to machinery to be supported [F16M 9/00](#))
- E02D 27/46 . . Foundations for supply conduits or other canals {(bridges for supporting conduits [E01D 18/00](#); elevated canals [E02B 5/005](#); penstocks [E02B 9/06](#))}
- E02D 27/48 . . Foundations inserted underneath existing buildings or constructions {(making a new substructure subsequent to lifting or moving of buildings [E04G 23/06](#))}
- E02D 27/50 . . Anchored foundations
- E02D 27/52 . . Submerged foundations, { i.e. submerged in open water ([E02D 27/12](#) to [E02D 27/24](#) take precedence)}
- E02D 27/525 . . . { using elements penetrating the underwater ground (sinking work pieces [E02D 15/08](#), sinking caissons [E02D 23/02](#))}
- E02D 29/00** { Independent } **underground or underwater structures** (underground tanks [B65D 88/76](#); hydraulic engineering, e.g. sealings or joints, [E02B](#); underground garages [E04H 6/00](#); underground air-raid shelters [E04H 9/12](#); burial vaults [E04H 13/00](#));
- Retaining walls**
- E02D 29/02 . Retaining or protecting walls (piers or quay walls [E02B 3/06](#))
- E02D 29/0208 . . { Gabions }
- E02D 29/0216 . . { Cribbing walls }
- E02D 29/0225 . . { comprising retention means in the backfill }
- E02D 29/0233 . . . { the retention means being anchors (details of anchors [E02D 5/80](#))}
- E02D 29/0241 . . . { the retention means being reinforced earth elements }
- E02D 29/025 . . { made up of similar modular elements stacked without mortar }
- E02D 29/0258 . . { not used, see subgroups ([E02D 29/0208](#) to [E02D 29/025](#) take precedence)}
- E02D 29/0266 . . . { made up of preformed elements }
- E02D 29/0275 . . . { cast in situ }
- E02D 29/0283 . . . { of mixed type }
- E02D 29/0291 . . . { made up of filled, bag-like elements }
- E02D 29/04 . Making large underground spaces, e.g. for underground plants, { e.g. stations of underground railways }; Construction or layout thereof ([E02D 29/10](#) takes precedence; { water-supply or sewerage plants [E03](#) }; layout of water power plants [E02B 9/00](#); making large underground chambers by underground methods only [E21D 13/00](#))
- E02D 29/045 . Underground structures, e.g. tunnels or galleries, built in the open air or by methods involving disturbance of the ground surface all along the location line; Methods of making them
- E02D 29/05 . . at least part of the cross-section being constructed in an open excavation or from the ground surface, e.g. assembled in a trench
- E02D 29/055 . . . further excavation of the cross-section proceeding underneath an already installed part of the structure, e.g. the roof of a tunnel
- E02D 29/06 . Constructions, or methods of constructing, in water {([E02D 15/00](#) takes precedence; submerged foundations [E02D 27/52](#))}
- E02D 29/063 . Tunnels submerged into, or built in, open water (construction or placing of caissons in general [E02D 23/00](#); joining caissons to each other under water, in general [E02D 25/00](#))

- E02D 29/067 . . Floating tunnels; Submerged bridge-like tunnels, i.e. tunnels supported by piers or the like above the water-bed ([pontons or floating bridges E01D 15/14](#))
- E02D 29/07 . . Tunnels or shuttering therefor preconstructed as a whole or continuously made, and moved into place on the water-bed, e.g. into a preformed trench
- E02D 29/073 . . Tunnels or shuttering therefor assembled from sections individually sunk onto, or laid on, the water-bed, e.g. in a preformed trench ([caisson-type sections lowered onto the water-bed E02D 29/077](#))
- E02D 29/077 . . Tunnels at least partially built beneath the water-bed characterised by being made by methods involving disturbance thereof all along the location line, e.g. by cut-and-cover or caisson methods
- E02D 29/08 . Siphons ([for sewerage E03F 5/20](#); [siphon weirs E02B 7/18](#); { [siphons in general E04F 10/00](#) })
- E02D 29/10 . Tunnels or galleries specially adapted to house conduits, e.g. oil pipe-lines, sewer pipes ([for pressure water conduits E02B 9/06](#); { [for cables H02G 9/02](#); [layout of tunnels or galleries in general E21D 9/14](#); [road kerbs with housings for pipes or the like E01C 11/222](#) }); Making conduits in situ, e.g. of concrete ([combined with digging of trenches or ditches E02F 5/10](#); { [making or lining tunnels or galleries E21D](#); [constructing tunnels or galleries in open excavations E02D 29/045](#); [in open water E02D 29/063](#) }); Casings, { i.e. manhole shafts, access or inspection chambers } or coverings of boreholes or narrow wells ([wells for drinking water E03B 3/08](#); [boreholes or wells formed by deep drilling E21B](#); [shafts E21D](#))
- E02D 29/12 . Manhole shafts; Other inspection or access chambers; Accessories therefor ([for underground tanks B65D 90/10](#); [for sewerage E03F 5/02](#); { [climbing irons or ladders E06C 9/00](#) })
- E02D 29/121 . . { characterised by the connection between shaft elements, e.g. of rings forming said shaft }
- E02D 29/122 . . { [Steps or handrails for shafts](#) }
- E02D 29/124 . . { [Shaft entirely made of synthetic material](#) }
- E02D 29/125 . . { characterised by the lining of the shaft }
- E02D 29/127 . . { [with devices for impeding fall or injuries of persons](#) }
- E02D 29/128 . . { [Repairs of manhole shafts](#) }
- E02D 29/14 . . Covers for manholes or the like; Frames for covers { ([gully gratings E03F 5/06](#)) }
- E02D 29/1409 . . . { [adjustable in height or inclination](#) }
- E02D 29/1418 . . . { [with implements to assist in lifting, e.g. counterweights, springs \(lifting devices for covers B66F 19/005 \)](#) }
- E02D 29/1427 . . . { [Locking devices \(of bayonet type E02D 29/14 \)](#) }
- E02D 29/1436 . . . { [with overflow or explosion control means, e.g. check or relief valves](#) }
- E02D 29/1445 . . . { [Tools for positioning or removing cover frames](#) }
- E02D 29/1454 . . . { [Non-circular covers, e.g. hexagonal, elliptic](#) }
- E02D 29/1463 . . . { [Hinged connection of cover to frame](#) }
- E02D 29/1472 . . . { [Cover entirely made of synthetic material](#) }
- E02D 29/1481 . . . { [Security devices, e.g. indicating unauthorised opening \(\[E02D 29/1427\]\(#\) takes precedence \)](#) }
- E02D 29/149 . . . { [Annular gaskets](#) }
- E02D 29/16 . Arrangement or construction of joints in foundation structures { ([for hydraulic engineering E02B 3/16](#)); [sealing joints not restricted to foundation structures E04B 1/68](#)) }

E02D 31/00	Protective arrangements for foundations or foundation structures {(protective casings for piles E02D 5/60)}; Ground foundation measures for protecting the soil or the subsoil water, e.g. preventing or counteracting oil pollution (spillage retaining means for tanks B65D 90/24)
E02D 31/002	. { Ground foundation measures for protecting the soil or subsoil water, e.g. preventing or counteracting oil pollution (not used, see subgroups and E02D 31/00)}
E02D 31/004	. . { Sealing liners }
E02D 31/006	. . { Sealing of existing landfills, e.g. using mining techniques }
E02D 31/008	. { against entry of noxious gases, e.g. Radon }
E02D 31/02	. against ground humidity or ground water {(E02D 31/06 takes precedence; arrangements other than according to E02D 31/04 ; against hydraulic pressure of groundwater E02D 31/10)}
E02D 31/025	. . { Draining membranes, sheets or fabric specially adapted therefor, e.g. with dimples }
E02D 31/04	. . Watertight packings for use under hydraulic pressure {(sealings for hydraulic engineering in general E02B 3/16 ; for building structures in general E04B 1/66)}
E02D 31/06	. against corrosion by soil or water
E02D 31/08	. against transmission of vibrations or movements in the foundation soil {(E02D 27/34 takes precedence; foundations for machines, engines or ordnance E02D 27/44 ; for road foundations E01C 3/06)}
E02D 31/10	. against soil pressure or hydraulic pressure {(anchored foundations E02D 27/50 ; joint sealings for use under hydraulic pressure E02D 31/04)}
E02D 31/12	. . against upward hydraulic pressure
E02D 31/14	. . against frost heaves in soil
E02D 33/00	Testing foundations or foundation structures (testing methods and apparatus, see the relevant subclasses of class G01 ; testing structures or apparatus as regards function, in general, G01M ; testing or determining chemical or physical properties, in general G01N)
E02D 35/00	Straightening, lifting, or lowering of foundation structures or of constructions erected on foundations {(foundations for sinking territories with incorporated means for remedying settlement E02D 27/34 ; lifting or moving buildings E04G 23/06)}
E02D 35/005	. { Lowering or lifting of foundation structures }
E02D 37/00	Repair of damaged foundations or foundation structures {(renewing piles E02D 5/64 ; roads E01C 11/005 ; bridges E01D 22/00 ; repairing buildings E04G 23/02)}
E02D 2200/00	Geometrical or physical properties
E02D 2200/11	. Height being adjustable

- E02D 2200/115 . . with separate pieces
- E02D 2200/12 . corrugated
- E02D 2200/13 . having at least a mesh portion
- E02D 2200/14 . resilient or elastic
- E02D 2200/143 . . helically or spirally shaped
- E02D 2200/146 . . Springs
- E02D 2200/15 . including at least a hinge
- E02D 2200/16 . Shapes
 - E02D 2200/1607 . . round, e.g. circle
 - E02D 2200/1614 . . . made from single element
 - E02D 2200/1621 . . . made from multiple elements
 - E02D 2200/1628 . . rectangular
 - E02D 2200/1635 . . . made from single element
 - E02D 2200/1642 . . . made from multiple elements
 - E02D 2200/165 . . polygonal
 - E02D 2200/1657 . . . made from single element
 - E02D 2200/1664 . . . made from multiple elements
 - E02D 2200/1671 . . helical or spiral
 - E02D 2200/1678 . . triangular
 - E02D 2200/1685 . . cylindrical
 - E02D 2200/1692 . . conical or convex
- E02D 2200/17 . including an electric conductive element
- E02D 2220/00 Temporary installations or constructions**
- E02D 2250/00 Production methods**
 - E02D 2250/0007 . using a mold
 - E02D 2250/0015 . using extrusion
 - E02D 2250/0023 . Cast, i.e. in situ or in a mold or other formwork
 - E02D 2250/003 . Injection of material
 - E02D 2250/0038 . using an auger, i.e. continuous flight type
 - E02D 2250/0046 . using prestressing techniques
 - E02D 2250/0053 . using suction or vacuum techniques
 - E02D 2250/0061 . for working underwater

E02D 2250/0069 .. Welding
 E02D 2250/0076 .. Drilling
 E02D 2250/0084 .. using pneumatical means
 E02D 2250/0092 .. using hydraulical means

E02D 2300/00 Materials

E02D 2300/0001 . Rubbers
 E02D 2300/0003 .. Car tires

E02D 2300/0004 . Synthetics
 E02D 2300/0006 .. Plastics
 E02D 2300/0007 ... PVC
 E02D 2300/0009 ... PE
 E02D 2300/001 ... PP
 E02D 2300/0012 ... recycled
 E02D 2300/0014 ... PU
 E02D 2300/0015 ... HDPE
 E02D 2300/0017 ... thermoplastic
 E02D 2300/0018 .. Cement used as binder
 E02D 2300/002 ... Concrete
 E02D 2300/0021 ... Mortar
 E02D 2300/0023 ... Slurry
 E02D 2300/0025 .. Adhesives, i.e. glues

E02D 2300/0026 . Metals
 E02D 2300/0028 .. Copper
 E02D 2300/0029 .. Steel; Iron
 E02D 2300/0031 ... in cast iron form
 E02D 2300/0032 ... in sheet form, i.e. bent or deformed plate-material
 E02D 2300/0034 ... in wire form
 E02D 2300/0035 .. Aluminium

E02D 2300/0037 . Clays
 E02D 2300/0039 .. mixed with additives
 E02D 2300/004 .. Bentonite or bentonite-like
 E02D 2300/0042 ... being modified by adding substances
 E02D 2300/0043 ... with other ingredients

E02D 2300/0045 . Composites

E02D 2300/0046 . Foams
 E02D 2300/0048 .. PU
 E02D 2300/005 .. PE

E02D 2300/0051	. Including fibers
E02D 2300/0053	.. made from glass
E02D 2300/0054	.. made from plastic
E02D 2300/0056	... PVC
E02D 2300/0057	... PE
E02D 2300/0059	... PP
E02D 2300/006	... being recycled
E02D 2300/0062 Shredded car tires
E02D 2300/0064	.. made from metal
E02D 2300/0065	.. made from textile
E02D 2300/0067	.. made from cellulose
E02D 2300/0068	.. made from carbon
E02D 2300/007	. Resins including glasfibers
E02D 2300/0071	. Wood
E02D 2300/0073	. Explosives
E02D 2300/0075	. Textiles
E02D 2300/0076	.. non-woven
E02D 2300/0078	.. woven
E02D 2300/0079	. Granulates
E02D 2300/0081	. Ceramics
E02D 2300/0082	. Cellulose
E02D 2300/0084	. Geogrids
E02D 2300/0085	. Geotextiles
E02D 2300/0087	.. woven
E02D 2300/0089	.. non-woven
E02D 2300/009	.. with multi-layer structure
E02D 2300/0092	... including a liquid tight layer
E02D 2300/0093 including bentonite
E02D 2300/0095 including a plastic membrane
E02D 2300/0096	.. with external friction enhancement features
E02D 2300/0098	. Bitumen
E02D 2450/00	{ Gaskets }
E02D 2450/10	. Membranes

E02D 2450/101	..	permeable
E02D 2450/102	...	for liquids
E02D 2450/103	...	for gases
E02D 2450/105	..	impermeable
E02D 2450/106	...	for liquids
E02D 2450/107	...	for gases
E02D 2450/108	..	multi-layered

E02D 2600/00 **Miscellaneous**

E02D 2600/10	.	comprising sensor means
E02D 2600/20	.	comprising details of connection between elements
E02D 2600/30	.	comprising anchoring details
E02D 2600/40	.	comprising stabilising elements