

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 [E01C 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 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 {(tamperers [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 (pontoon 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 F04F 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 hydraulic 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