

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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Placing concrete in mould-pipes, pile tubes, bore-holes or narrow shafts
E02D 15/06	<ul style="list-style-type: none"> Placing concrete under water {(for surfacing the bottom of bodies of water E02B 3/121)}
E02D 15/08	<ul style="list-style-type: none"> Sinking workpieces into water or soil {inasmuch as not provided for elsewhere}
E02D 15/10	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Foundation pits
E02D 17/04	<ul style="list-style-type: none"> Bordering {surfacing} or stiffening the sides of foundation pits
E02D 17/06	<ul style="list-style-type: none"> Foundation {trenches} ditches or narrow shafts
E02D 17/08	<ul style="list-style-type: none"> Bordering or stiffening the sides of ditches {trenches} or narrow shafts for foundations
E02D 17/083	<ul style="list-style-type: none"> {Shoring struts}
E02D 17/086	<ul style="list-style-type: none"> {Travelling trench shores}
E02D 17/10	<ul style="list-style-type: none"> Covering trenches for foundations
E02D 17/12	<ul style="list-style-type: none"> Back-filling of foundation trenches or ditches {(apparatus therefor E02F 5/12, E02F 5/22)}
E02D 17/13	<ul style="list-style-type: none"> Foundation slots {or slits}; Implements for making these slots {or slits}
E02D 17/16	<ul style="list-style-type: none"> Loosening of soil or rock, under water (for correcting streams E02B 3/02; by dredgers or excavators E02F)
E02D 17/18	<ul style="list-style-type: none"> Making embankments, {e.g. dikes, dams} (E02D 17/20 takes precedence; {foundations for dams E02D 27/40)}
E02D 17/20	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> {with flexible securing means}
E02D 17/205	<ul style="list-style-type: none"> {with modular blocks, e.g. pre-fabricated}
E02D 17/207	<ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> Restraining of open water
E02D 19/04	<ul style="list-style-type: none"> by coffer-dams {e.g. made of sheet piles (permanent sheet piling boxes E02D 27/30)}
E02D 19/06	<ul style="list-style-type: none"> Restraining of underground water
E02D 19/08	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> • {against entry of noxious gases, e.g. Radon}
E02D 31/02	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • • {Draining membranes, sheets or fabric specially adapted therefor, e.g. with dimples}
E02D 31/04	<ul style="list-style-type: none"> • • 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	<ul style="list-style-type: none"> • against corrosion by soil or water
E02D 31/08	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • against soil pressure or hydraulic pressure {(anchored foundations E02D 27/50; joint sealings for use under hydraulic pressure E02D 31/04)}
E02D 31/12	<ul style="list-style-type: none"> • • against upward hydraulic pressure
E02D 31/14	<ul style="list-style-type: none"> • • 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	<ul style="list-style-type: none"> • {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	<ul style="list-style-type: none"> • Height being adjustable
E02D 2200/115	<ul style="list-style-type: none"> • • with separate pieces
E02D 2200/12	<ul style="list-style-type: none"> • corrugated
E02D 2200/13	<ul style="list-style-type: none"> • having at least a mesh portion
E02D 2200/14	<ul style="list-style-type: none"> • resilient or elastic
E02D 2200/143	<ul style="list-style-type: none"> • • helically or spirally shaped
E02D 2200/146	<ul style="list-style-type: none"> • • Springs
E02D 2200/15	<ul style="list-style-type: none"> • including at least a hinge
E02D 2200/16	<ul style="list-style-type: none"> • Shapes
E02D 2200/1607	<ul style="list-style-type: none"> • • round, e.g. circle
E02D 2200/1614	<ul style="list-style-type: none"> • • • made from single element
E02D 2200/1621	<ul style="list-style-type: none"> • • • 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