

**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 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 <a href="#">E02D 3/12</a> )
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 ( <a href="#">E02D 5/50</a> , <a href="#">E02D 5/52</a> take precedence)}
E02D 5/50	.. Piles comprising both precast concrete portions and concrete portions cast in situ {( <a href="#">E02D 5/523</a> 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 {( <a href="#">E02D 5/44</a> takes precedence; ground anchors <a href="#">E02D 5/80</a> ; anchored foundations <a href="#">E02D 27/50</a> )}
E02D 5/56	.. Screw piles {(placing piles by screwing down <a href="#">E02D 7/22</a> )}
E02D 5/58	.. Prestressed concrete piles {(segmental piles <a href="#">E02D 5/523</a> )}
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 <a href="#">B28B</a> )}
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 <a href="#">E02D 5/54</a> ; anchored foundations <a href="#">E02D 27/50</a> )
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 <a href="#">E21D 21/00</a> )}
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}
<b>E02D 7/00</b>	<b>Methods or apparatus for placing sheet pile bulkheads, piles, mouldpipes, or other moulds (for both placing and removing <a href="#">E02D 11/00</a>; {accessories for coupling driver to piles or the like <a href="#">E02D 13/10</a>; for trees or other plants <a href="#">A01G 17/16</a>; placing posts <a href="#">E04H 17/26</a>})</b>

- 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 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 (pontoons 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
<b>E02D 2300/00</b>	<b>Materials</b>
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**

- 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