CPC  COOPERATIVE PATENT CLASSIFICATION

E  FIXED CONSTRUCTIONS

BUILDING

E02  HYDRAULIC ENGINEERING; FOUNDATIONS; SOIL SHIFTING

E02D  FOUNDATIONS; EXCAVATIONS; EMBANKMENTS (specially adapted for hydraulic engineering E02B); UNDERGROUND OR UNDERWATER STRUCTURES { (tunnels, tunnelling, mining E21) }

WARNINGS

1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   E02D 29/09 covered by E02D 29/06

2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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)

1/02 . before construction work
1/022 . . [by investigating mechanical properties of the soil (E02D 1/027 takes precedence)]
1/025 . . [combined with sampling]
1/027 . . [by investigating properties relating to fluids in the soil, e.g. pore-water pressure, permeability (sampling of groundwater E02D 1/06)]
1/04 . . Sampling of soil (E02D 1/025 takes precedence)
1/06 . . Sampling of ground water
1/08 . after finishing the foundation structure (testing of piles E02D 33/00)

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)

3/005 . [Soil-conditioning by mixing with fibrous materials, filaments, open mesh or the like]
3/02 . Improving by compacting (E02D 3/11 takes precedence; compacting soil locally before or while forming foundations E02D 27/26, E02D 27/28)
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)
3/0265 . . . [Wheels specially adapted therefor; Cleats for said wheels]
3/032 . . . Trench rollers
3/039 . . . Slope rollers

3/046 . . by tamping or vibrating, e.g. with auxiliary watering of the soil (E02D 3/026, E02D 3/08 takes precedence; generating or transmitting mechanical vibrations for performing mechanical work in general B66R; 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)

3/054 . . . involving penetration of the soil, e.g. vibroflotation
3/061 . . . Tampers with directly acting explosion chambers (pile drivers with explosion chambers E02D 7/12)
3/068 . . . Vibrating apparatus operating with systems involving reciprocating masses (E02D 3/054, E02D 3/061 take precedence)
3/074 . . . Vibrating apparatus operating with systems involving rotary unbalanced masses (E02D 3/054 takes precedence)
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)
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)
3/103 . . . [by installing wick drains or sand bags]
3/106 . . . [by forming sand drains containing only loose aggregates (sand piles E02D 3/08)]
3/11 . . by thermal, electrical or electro-chemical means (freezing soil for interrupting passage of underground water E02D 19/14)
3/115 . . . by freezing
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)
5/00  **Bulkheads, piles, or other structural elements specially adapted to foundation engineering**

**Engineering elements in general**

- **5/02**  Sheet piles or sheet pile bulkheads (foundations made with sheet pile bulkheads E02D 27/30; cofferdams E02D 19/06)

- **5/03**  Prefabricated parts (e.g. composite sheet piles)

- **5/04**  Made of steel

- **5/05**  Fitted piles or other elements specially adapted for closing gaps between two sheet piles or between two walls of sheet piles

- **5/06**  Locking forms; Edge joints; Pile crossings; Branch pieces

- **5/07**  Made of concrete or reinforced concrete (moulds therefor E02D 5/70)

- **5/08**  [of prestressed concrete (E02D 5/12 takes precedence)]

- **5/09**  Locking forms; Edge joints; Pile crossings; Branch pieces

- **5/10**  Sealing joints between adjacent (sheet) piles (sealing joints not restricted to foundation piles E04B 1/68)

- **5/11**  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])

- **5/12**  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])

- **5/13**  [using formworks to separate sections]

- **5/14**  [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)]

- **5/15**  [the bulkheads or walls being made continuously, e.g. excavating and constructing bulkheads or walls in the same process, without joints]

- **5/16**  Bulkheads or similar walls made of precast concrete, including reinforced concrete, in situ

- **5/17**  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)]

- **5/18**  [Details of top sections of foundation piles (E02D 5/54 takes precedence)]

- **5/19**  Protecting piles (piles with protecting cases E02D 5/60)

- **5/20**  Prefabricated piles

**Note**

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

- **5/21**  Made of steel (or other metals (E02D 5/52 takes precedence))

- **5/22**  Tubular, e.g. prefabricated from sheet pile elements (sheet pile boxes E02D 27/30; concrete piles with metal casings E02D 5/30)

- **5/23**  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])

- **5/24**  With arrangements for setting (or assisting in setting) in position by fluid jets (placing piers by using fluid jets in general E02D 7/24)

- **5/25**  Concrete or concrete-like piles cast in position (Apparatus for making same E02D 5/50; taking precedence; moulds E02D 5/665; placing, removing moulds E02D 7/00 - E02D 11/00; placing the concrete E02D 15/04)

- **5/26**  Making without use of mouldpipes or other moulds

**Note**

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

- **5/27**  Making by use of mould-pipes or other moulds

- **5/28**  [with removal of the outer mould-pipes (documents also covered by one or several of the groups E02D 5/40, E02D 5/44 are classified in all the relevant groups)]

- **5/29**  In open water

- **5/30**  By making use of pressure liquid or pressure gas for compacting the concrete

- **5/31**  With enlarged footing or enlargements at the bottom of the pile

- **5/32**  By application of pyrotechniques

- **5/33**  Making in situ by forcing bonding agents into gravel fillings or the soil (consolidating soil in general E02D 3/12)

- **5/34**  Piles varying in construction along their length (e.g. along the body between head and shoe, e.g. made of different materials along their length (E02D 5/50, E02D 5/52 take precedence))

- **5/35**  Piles comprising both precast concrete portions and concrete portions cast in situ (E02D 5/523 takes precedence)

- **5/36**  Piles composed of separable parts, e.g. telescopic tubes (Piles composed of segments)

- **5/37**  [composed of segments]

- **5/38**  [Connection means between pile segments]

- **5/39**  Piles with prefabricated supports or anchoring parts; Anchoring piles ([E02D 5/44 takes precedence; ground anchors E02D 5/80; anchored foundations E02D 27/50])

- **5/40**  Screw piles ([placing piles by screwing down E02D 7/22])

- **5/41**  Prestressed concrete piles ([segmental piles E02D 5/523])

- **5/42**  Piles with protecting cases
Methods or apparatus \textbf{(specially adapted)} for both placing and removing sheet pile bulkheads, piles, or mould-pipes (features relating to placing only \textit{E02D 7/00}, to removing only \textit{E02D 9/00} \{ placing apparatus which without special provisions, can be operated to remove, e.g. vibrating drivers \textit{E02D 7/00} \})

\textbf{Accessories for placing or removing piles or bulkheads}, \textit{e.g. noise attenuating chambers}

\textbf{Handling building or like materials for hydraulic engineering or foundations} \{ (soil-shifting \textit{E02F}) conveying or working-up concrete or similar masses in general \textit{E04G 21/02} \}

\textbf{Excavations; Bordering of excavations; Making embankments} \{ (soil-shifting \textit{E02F}; earth drilling \textit{E21}) \}
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17/16 . Loosening of soil or rock, under water (for correcting streams E02B 3/02; by dredgers or excavators E02F)
17/18 . Making embankments, [e.g. dikes, dams] (E02D 17/20 takes precedence; [foundations for dams E02D 27/40])
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)]
17/202 . . . (with flexible securing means)
17/205 . . . (with modular blocks, e.g. pre-fabricated)
17/207 . . . (with means incorporating sheet piles or piles)
19/00 Keeping dry foundation sites or other areas in the ground (sheet piles or bulkheads E02D 5/02)
19/02 . Restraining of open water
19/04 . . . by coffer-dams [e.g. made of sheet piles (permanent sheet piling boxes E02D 27/30)]
19/06 . Restraining of underground water
19/08 . . . by employing open ditches arranged below the level of the water
19/10 . . . by lowering level of ground water (installation for obtaining or collecting drinking water E03B 3/00)
19/12 . . . by damming or interrupting the passage of underground water
19/14 . . . by freezing the soil (in connection with sinking shafts E21D 1/12)
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))
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)
19/185 . . . . . . [Joints between sheets constituting the sealing aprons]
19/20 . . . by displacing the water, e.g. by compressed air ([pneumatic caissons E02D 23/04])
19/22 . . Lining sumps in trenches [or other foundation pits]
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 - E02D 27/22; caisson-like artificial islands E02B 17/00])
23/02 . . Caissons able to be floated on water and to be lowered into water in situ ([floating caisson foundations E02D 27/06])
23/04 . . Pneumatic caissons ([sinking of same E02D 23/10])
23/06 . . . Bringing persons or material into or out of compressed air caissons ([air locks in mines E21F 1/14])
23/08 . . Lowering or sinking caissons ([sinking mine shaft E21D 1/00])
23/10 . . . Caissons filled with compressed air ([E02D 23/06 takes precedence])
23/12 . . . Inclined lowering
23/14 . . . Decreasing the skin friction while lowering
23/16 . . . Jointing caissons to the foundation soil, specially to uneven foundation soil
25/00 Joining caissons, sinkers, or other units to each other under water
27/00 Foundations as substructures
27/01 . . Flat foundations
27/013 . . . [Shuttering specially adapted therefor]
27/016 . . . [made mainly from prefabricated concrete elements]
27/02 . . Flat foundations without substantial excavation (E02D 27/04, E02D 27/08 take precedence)
27/04 . . . in water or on quicksands
27/06 . . . Floating caisson foundations
27/08 . . . Reinforcements for flat foundations (E02D 27/48 takes precedence)
27/10 . . Deep foundations
27/12 . . . Pile foundations
27/14 . . . . . Pile framings, [i.e. piles assembled to form the substructure]
27/16 . . . Foundations formed of separate piles
27/18 . . Foundations formed by making use of caissons
27/20 . . . Caisson foundations combined with pile foundations
27/22 . . . Caisson foundations made by starting from fixed or floating artificial islands by using protective bulkheads
27/24 . . Foundations constructed by making use of diving-bells (equipment for dwelling or working under water B63C 11/00)
27/26 . . Compressing soil locally before forming foundations; Construction of foundation structures by forcing binding substances into gravel fillings (consolidating foundation soil in general E02D 3/02 - E02D 3/12; [for piles E02D 5/02, E02D 5/46])
27/28 . . Stressing the soil or the foundation structure while forming foundations
27/30 . . Foundations made with permanent use of sheet pile bulkheads, walls of planks, or sheet piling boxes
27/32 . . Foundations for special purposes ([for paving of roads E01C 3/00])
27/34 . . . Foundations for sinking or earthquake territories (building constructions with protection arrangements against earthquakes E04H 9/02)
27/35 . . . Foundations formed in frozen ground, e.g. in permafrost soil
27/36 . . . Foundations formed in moors or bogs
27/38 . . . Foundations for large tanks, e.g. oil tanks
27/40 . . Foundations for dams across valleys or for dam constructions ([dams per se E02B 3/10, E02B 7/04])
27/42 . . . Foundations for poles, masts or chimneys ([sockets or holders for poles or masts per se E04H 12/22])
27/425 . . . [specially adapted for wind motors masts (wind motors per se F03D 1/00)]
27/44 . . . Foundations for machines, engines or ordnance (special layout of foundations with respect to machinery to be supported F16M 9/00)
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)

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

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)

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

29/08 . . . [Siphons (for sewerage E03F 5/20; siphon weirs E02B 7/18; siphons in general F04D 10/00)]

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 11/22); 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)]

29/12 . . . Manhole shafts; Other inspection or access chambers; Accessories therefor (for underground tanks B65D 90/00; for sewerage E03F 5/06 [climbing irons or ladders E06C 9/00])

29/121 . . . (characterised by the connection between shaft elements, e.g. of rings forming said shaft)

29/122 . . . (Steps or handrails for shafts)

29/124 . . . (Shaft entirely made of synthetic material)

29/125 . . . (characterised by the lining of the shaft)

29/127 . . . (with devices for impeding fall or injuries of persons)

29/128 . . . (Repairs of manhole shafts)

29/14 . . . Covers for manholes or the like; Frames for covers (gully gratings E03F 5/06)

29/1409 . . . (adjustable in height or inclination)

29/1418 . . . (with implements to assist in lifting, e.g. counterweights, springs (lifting devices for covers B66F 19/005)

29/1427 . . . (Locking devices (of bayonet type E02D 29/14))

29/1436 . . . (with overflow or explosion control means, e.g. check or relief valves)

29/1445 . . . (Tools for positioning or removing cover frames)

29/1454 . . . (Non-circular covers, e.g. hexagonal, elliptic)

29/1463 . . . (Hinged connection of cover to frame)

29/1472 . . . (Cover entirely made of synthetic material)

29/1481 . . . (Security devices, e.g. indicating unauthorised opening (E02D 29/1427 takes precedence))

29/149 . . . (Annular gaskets)

29/02 . . . Retaining walls

29/0208 . . . [Gabions]

29/0216 . . . [Cribbing walls]

29/0225 . . . [comprising retention means in the backfill]

29/0233 . . . [the retention means being anchors (details of anchors E02D 5/80)]

29/0241 . . . [the retention means being reinforced earth elements]

29/025 . . . [made up of similar modular elements stacked without mortar]

29/0258 . . . [not used, see subgroups (E02D 29/0208 - E02D 29/025 take precedence)]

29/0266 . . . [made up of preformed elements]

29/0275 . . . [cast in situ]

29/0283 . . . [of mixed type]

29/0291 . . . [made up of filled, bag-like elements]

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))

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

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]

29/055 . . . further excavation of the cross-section proceeding underneath an already installed part of the structure, e.g. the roof of a tunnel

29/06 . . . (Constructions, or methods of constructing, in water (E02D 15/00 takes precedence; submerged foundations E02D 27/52))

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)
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

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)

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))

31/004 . . (Sealing liners)

31/006 . . (Sealing of existing landfill, e.g. using mining techniques)

31/008 . (against entry of noxious gases, e.g. Radon)

31/02 . against ground humidity or ground water (E02D 31/00 takes precedence; arrangements other than according to E02D 31/04; against hydraulic pressure of groundwater E02D 31/10)

31/025 . . (Draining membranes, sheets or fabric specially adapted therefor, e.g. with dimples)

31/04 . . Watertight packings, sheets or fabric specially adapted therefor, e.g. with dimples

31/06 . against corrosion by soil or water

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)

31/10 . against soil pressure or hydraulic pressure (anchored foundations E02D 27/50; joint sealings for use under hydraulic pressure E02D 31/04)

31/12 . . against upward hydraulic pressure

31/14 . . against frost heaves in soil

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)

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)

35/005 . . (Lowering or lifting of foundation structures)

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)

2200/00 Geometrical or physical properties

2200/11 . Height being adjustable

2200/115 . . with separate pieces

2200/12 . corrugated

2200/13 . having at least a mesh portion

2200/14 . resilient or elastic

2200/143 . . helically or spirally shaped

2200/146 . . Springs

2200/15 . including at least a hinge

2200/16 . Shapes

2200/1607 . . round, e.g. circle

2200/1614 . . made from single element

2200/1621 . . made from multiple elements

2200/1628 . . rectangular

2200/1635 . . made from single element

2200/1642 . . made from multiple elements

2200/1645 . . polygonal

2200/1657 . . made from single element

2200/1664 . . made from multiple elements

2200/1671 . . helical or spiral

2200/1678 . . triangular

2200/1685 . . cylindrical

2200/1692 . . conical or convex

2200/17 . including an electric conductive element

2220/00 Temporary installations or constructions

2225/00 Production methods

2225/0007 . . using a mold

2225/0015 . . using extrusion

2225/0023 . . Cast, i.e. in situ or in a mold or other formwork

2225/003 . . Injection of material

2225/0038 . . using an auger, i.e. continuous flight type

2225/0046 . . using prestressing techniques

2225/0053 . . using suction or vacuum techniques

2225/0061 . . for working underwater

2225/0069 . . Welding

2225/0076 . . Drilling

2225/0084 . . using pneumatic means

2225/0092 . . using hydraulic means

2300/00 Materials

2300/0001 . . Rubbers

2300/0003 . . Car tires

2300/0004 . . Synthetics

2300/0006 . . Plastics

2300/0007 . . . PVC

2300/0009 . . . PE

2300/001 . . . PP

2300/0012 . . . recycled

2300/0014 . . . PU

2300/0015 . . . HDPE

2300/0017 . . . thermoplastic

2300/0018 . . . Cement used as binder

2300/002 . . . Concrete

2300/0021 . . . Mortar

2300/0023 . . . Slurry

2300/0025 . . . Adhesives, i.e. glues

2300/0026 . . . Metals

2300/0028 . . . Copper

2300/0029 . . . Steel; Iron

2300/0031 . . . in cast iron form

2300/0032 . . . in sheet form, i.e. bent or deformed plate-material

2300/0034 . . . in wire form

2300/0035 . . . Aluminium

2300/0037 . . . Clays

2300/0039 . . . mixed with additives

2300/004 . . . Bentonite or bentonite-like
being modified by adding substances
with other ingredients
Composites
Foams
PU
PE
Including fibers
made from glass
made from plastic
PVC
PE
made from plastic
made from carbon
Resins including glass fibers
made from metal
made from textile
made from cellulose
made from carbon
Shredded car tires
Explosives
Textiles
non-woven
woven
Granulates
Ceramics
Cellulose
Geogrids
Geotextiles
woven
non-woven
with multi-layer structure
including a liquid tight layer
including bentonite
including a plastic membrane
with external friction enhancement features
Bitumen
Gaskets
Membranes
permeable
for liquids
for gases
impermeable
for liquids
for gases
multi-layered
Miscellaneous
comprising sensor means
comprising details of connection between elements
comprising anchoring details
comprising stabilising elements