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 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)
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 orwick 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)
5/28 . . . made of steel {or other metals (E02D 8/52 takes precedence)}

5/285 . . . . [tubular, e.g. prefabricated from sheet pile elements (sheet pile boxes E02D 27/30; concrete piles with metal casings E02D 5/30)]

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)}

5/32 . . . with arrangements for setting (or assisting in setting) in position by fluid jets {(placing piers by using fluid jets in general E02D 3/24)}

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 - E02D 11/00; placing the concrete E02D 15/04)}

5/36 . . . 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

5/38 . . . making by use of mould-pipes or other moulds

5/385 . . . . [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)]

5/40 . . . . in open water

5/42 . . . . by making use of pressure liquid or pressure gas for compacting the concrete

5/44 . . . . with enlarged footing or enlargements at the bottom of the pile

5/445 . . . . . [by application of pyrotechniques]

5/46 . . . making in situ by forcing bonding agents into gravel fillings or the soil (consolidating soil in general E02D 3/12)

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)}

5/50 . . . Piles comprising both precast concrete portions and concrete portions cast in situ {(E02D 5/523 takes precedence)}

5/52 . . . Piles composed of separable parts, e.g. telescopic tubes {Piles composed of segments}

5/523 . . . . . [composed of segments]

5/526 . . . . . [Connection means between pile segments]

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)}

5/56 . . . Screw piles {(placing piles by screwing down E02D 7/22)}

5/58 . . . Prestressed concrete piles {(segmental piles E02D 5/523)}

5/60 . . . Piles with protecting cases

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

5/68 . . . 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
7/00 Methods or apparatus for placing sheet pile bulkheads, piles, mould-pipes, or other moulds (for both placing and removing E02D 13/10; for trees or other plants A01G 17/10)

7/02 ... Placing by driving (E02D 7/12 - E02D 7/24 take precedence)

7/04 ... Hand [(actuated) pile-drivers]

7/06 ... Power-driven drivers ([tampers E02D 3/04])

7/08 ... Drop drivers with free-falling hammer (E02D 7/10 takes precedence)

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)

7/12 ... Drivers with explosion chambers

7/15 ... Diesel drivers

7/14 ... Components for drivers [inasmuch as not specially for a specific driver construction]

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]

7/165 ... (if variable length, e.g. foldable or telescopic)

7/18 ... Placing by vibrating ((vibrators for soil compacting E02D 3/04))

7/20 ... Placing by pressure or pulling power

7/22 ... Placing by screwing down ([screw piles per E02D 5/56])

7/24 ... Placing by using fluid jets ([prefabricated concrete piles with arrangements therefor E02D 5/52])

7/26 ... Placing by using several means simultaneously

7/28 ... Placing of hollow pipes or mould pipes by means arranged inside the piles or pipes ((E02D 13/08 takes precedence)

7/30 ... by driving cores

9/00 Removing sheet piles bulkheads, piles, mould-pipes or other moulds [or parts thereof] (for both placing and removing E02D 11/00)

9/005 ... [removing the top of placed piles of sheet piles (E02D 9/04 takes precedence)]

9/02 ... by withdrawing

9/04 ... by cutting-off under water

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)

13/00 Accessories for placing or removing piles or bulkheads {e.g. noise attenuating chambers}

13/005 ... [Sound absorbing accessories in piling]

13/02 ... specially adapted for placing or removing bulkheads

13/04 ... Guide devices; Guide frames [as parts of the driver scaffold E02D 7/16]

13/06 ... for observation while placing

13/08 ... Removing obstacles

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

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)

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 3/12])

15/04 ... Placing concrete in mould-pipes, pile tubes, bore-holes or narrow shafts

15/06 ... Placing concrete under water ([for surfacing the bottom of bodies of water E02B 3/12])

15/08 ... Sinking workpieces into water or soil [inasmuch as not provided for elsewhere]

15/10 ... Placing gravel or light material under water [inasmuch as not provided for elsewhere]

17/00 Excavations; Bordering of excavations; Making embankments (soil-shifting apparatus E02F; earth drilling E02)

17/02 ... Foundation pits

17/04 ... Bordering [surfacing] or stiffening the sides of foundation pits

17/06 ... Foundation [trenches] ditches or narrow shafts

17/08 ... Bordering or stiffening the sides of ditches (trenches) or narrow shafts for foundations

17/083 ... (Shoring struts)

17/086 ... (Travelling trench shores)

17/10 ... Covering trenches for foundations

17/12 ... Back-filling of foundation trenches or ditches ([apparatus therefor E02F 5/12, E02F 5/22])

17/13 ... Foundation slots (or slits); Implements for making these slots (or slits)
17/16  . Loosening of soil or rock, under water (for correcting streams \textit{E02B 5/02}; by dredgers or excavators \textit{E02D})
17/18  . Making embankments, [e.g. dikes, dams] (\textit{E02D 17/20} takes precedence; [foundations for dams \textit{E02D 27/40}])
17/20  . Securing of slopes or inclines ([by soil \textit{E02D 3/12}; protection against snowslides or avalanches \textit{E01F 7/04}, \textit{E01F 15/00}; securing banks or like surfaces facing on bodies of water \textit{E02B 3/12}])

17/202  . (with flexible securing means)
17/205  . (with modular blocks, e.g. pre-fabricated)
17/207  . (means incorporating sheet piles or piles)

19/00  \textbf{Keeping dry foundation sites or other areas in the ground (sheet piles or bulkheads \textit{E02D 5/02})}
19/02  . Restraining of open water
19/04  . by coffer-dams, e.g. made of sheet piles (\textit{permanent sheet piling boxes \textit{E02D 27/30}})
19/06  , Restraining of underwater 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 \textit{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 \textit{E21D 1/12})
19/16  . by placing or applying sealing substances ([\textit{E02D 19/18} takes precedence]; consolidating by placing solidifying or pore-filling pore-filling substances in the soil \textit{E02D 3/12} ([improving soil by chemical substances \textit{C09K 17/00}]))
19/18  . by making use of sealing aprons, e.g. diaphragms made from bituminous or clay material ([\textit{concrete diaphragms \textit{E02D 5/18}}]; sealing or joints for \textit{hydraulic} engineering work \textit{E02B 3/16})
19/185  . [Joints between sheets constituting the sealing aprons]
19/20  . by displacing the water, e.g. by compressed air ([\textit{pneumatic caissons \textit{E02D 23/04}}])
19/22  . Lining sumps in trenches [or other foundation pits]

23/00  \textbf{Caissons; Construction or placing of caissons (tunnels submerged into or built in open water \textit{E02D 29/063}; \textit{mores, piers, quays, breakwaters incorporating caissons \textit{E02B 3/06}; foundation formed by caissons \textit{E02D 27/18 - E02D 27/22}; caisson-like artificial islands \textit{E02B 17/00})]
23/02  . Caissons able to be floated on water and to be lowered into water in situ ([\textit{floating caisson foundations \textit{E02D 27/06}}])
23/04  . Pneumatic caissons ([\textit{sinking of same \textit{E02D 23/10}}])
23/06  . [Bringing persons or material into or out of compressed air caissons ([\textit{air locks in mines \textit{E21F 1/14}}])]
23/08  . Lowering or sinking caissons ([\textit{sinking mine shaft \textit{E21D 1/00}}])
23/10  . Caissons filled with compressed air ([\textit{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  \textbf{Joining caissons, sinkers, or other units to each other under water}

27/00  \textbf{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 (\textit{E02D 27/04}, \textit{E02D 27/08} take precedence)
27/04  . in water or on quicksand
27/06  . Floating caisson foundations
27/08  . Reinforcements for flat foundations ([\textit{E02D 27/48 takes precedence}])
27/10  . Deep foundations
27/12  . Pile foundations
27/14  . [Pile framings, \textit{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 \textit{B63C 11/00})
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 ([\textit{for paving of roads \textit{E01C 3/00}}])
27/34  . Foundations for sinking or earthquake territories (building constructions with protection arrangements against earthquakes \textit{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 ([\textit{dams per se \textit{E02B 3/10, E02B 7/04}}])
27/42  . Foundations for poles, masts or chimneys ([\textit{sockets or holders for poles or masts per se \textit{E04H 12/22}}])
27/425  . [specially adapted for wind motors masts (\textit{wind motors per se \textit{F03D 1/00}})]
27/44  . Foundations for machines, engines or ordnance (special layout of foundations with respect to machinery to be supported \textit{F16M 9/00})
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)

27/48 Foundations inserted underneath existing buildings or constructions (making a new substructure subsequent to lifting or moving of buildings E04G 23/06)

27/50 Anchored foundations

27/52 Submerged foundations, i.e. submerged in open water (E02D 27/12 - E02D 27/24 take precedence)

27/525 [using elements penetrating the underwater ground (sinking work pieces E02D 15/08; sinking caissons E02D 23/02)]

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

29/02 Retaining or protecting walls (piers or quay walls E02B 3/06)

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 [characterised by constructional features]

29/0266 [made up of prefurred 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)

29/067 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)

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 11/222; 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)]

29/12 Manhole shafts; Other inspection or access chambers; Accessories therefor (for underground tanks B65D 90/10; for sewerage E03F 5/02; [climbing iron or ladders E06C 5/00])

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]
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 landfills, 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; 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 for use under hydraulic pressure (sealings for hydraulic engineering in general E02B 3/16; for building structures in general E04B 1/66)

31/06 . against corrosion by soil or water

31/08 . against transmission of vibrations or movements in the foundation soil (E02D 27/54 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
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
PVC
PE
made from carbon
made from metal
made from textile
made from cellulose
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