BRITISH STANDARDS (BS), CODE OF PRACTICE (CP) AND AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

The British Standards, Code of Practice and some other international standards have hundred years foundation in construction industry and are still being currently quoted for worldwide engineering projects. These standards list out the comprehensive requirements, testing procedure and acceptance criteria for each kind of work. The young engineers and site supervisors should be well aware of these standards in relation to their trade of work by studying the requirements from time to time when they meet the terms in the drawings and specifications. A set of the commonly used Standards should be kept in project office library for reference.

Afterall, "everyone is on the same boat". To achieve a construction contract successfully with profits, necessary running costs are unavoidable and the staff’s overhead is one of the main issues. As the rule "the right man on the right job" applies, the range of work found in today’s projects is however so wide that the employment of experienced expertise, professional staff and qualified workers is often essential for the running of a successful project.

The following international engineering and testing standards are commonly quoted in engineering specifications for both civil engineering and building contracts. The young engineers should be well aware of these standards in relation to their trade of work by studying the requirements from time to time when they meet the terms in the drawings and specifications.

Notes: In general, the acceptance criteria of these international standards are quite conservative and with high factor of safety. Some contractor staff even say that if every site activity is going to comply with the requirements, they have no chance to complete the work on time. But more interesting is, some experienced engineers or supervisors can make cross reference of these standards for substantiation to overcome the immediate problems on site.

1. British Standards (BS)

BS 4 Structural steel sections
BS 12 : 1978 Specification for ordinary and rapid-hardening Portland cement
BS 12 : 1989 Specification for Portland cements
BS 21 : 1985 Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)
BS 65 : 1988 Specification for vitrified clay pipes, fittings, joints and ducts
BS 144 : 1990 Wood preservation using coal tar creosotes
BS 373 : 1957(1986) Methods of testing small clear specimens of timber
BS 381C : 1988 Specification for colours for identification, coding and special purposes
BS 416 : 1990 Discharge and ventilating pipes and fittings, sand-cast or spun in cast iron
BS 417 : Part 2 : 1987 Specification for galvanized low carbon steel cisterns, cistern lids, tanks and cylinders - metric units
BS 427 : 1990 Method for Vickers hardness test and for verification of Vickers hardness testing machines
BS 434 : 1984 Bitumen road emulsions (anionic and cationic)
BS 443 : 1982(1990) Specification for testing zinc coatings on steel wire and for quality requirements
BS 449 : Part 2 : 1969 Specification for the use of structural steel in building - metric units
BS 534 : 1990 Specification for steel pipes, joints and specials for water and sewage
BS 544 : 1969 Specification for linseed oil putty for use in wooden frames
BS 729 : 1971(1986) Specification for hot dip galvanized coatings on iron and steel articles
BS 743 : 1970 Specification for materials for damp-proof courses
BS 812 Testing aggregates
BS 812 : Part 1 : 1975 Methods for determination of particle size and shape
BS 812 : Part 2 : 1975 Methods for determination of physical properties
BS 812 : Part 4 : 1976 Chemical properties
BS 812 : Part 101 : 1984 Guide to sampling and testing aggregates
BS 812 : Part 102 : 1989 Methods for sampling
BS 812 : Part 103 Methods for determination of particle size distribution
BS 812 : Section 103.1 : 1985 Sieve tests
BS 812 : Section 103.2 : 1989 Sedimentation test
BS 812 : Part 105 Methods for determination of particle shape
BS 812 : Section 105.1 : 1989 Flakiness index
BS 812 : Section 105.2 : 1990 Elongation index of coarse aggregate
BS 812 : Part 110 : 1990 Methods for determination of aggregate crushing value (ACV)
BS 812 : Part 111 : 1990 Methods for determination of ten per cent fines value (TFV)
BS 812 : Part 112 : 1990 Methods for determination of aggregate impact value (AIV)
BS 812 : Part 113 : 1990 Methods for determination of aggregate abrasion value (AAV)
BS 864 : Part 2 : 1983 Specification for capillary and compression fittings for copper tubes
BS 873 Road traffic signs and internally illuminated bollards
BS 873 : Part 1 : 1983 Methods of test
BS 873 : Part 5 : 1983 Specification for internally illuminated signs and external lighting luminaries
BS 873 : Part 6 : 1983 Specification for retroreflective and non-retroreflective signs
BS 873 : Part 7 : 1984 Specification for posts and fittings
BS 882 : 1983 Specification for aggregates from natural sources for concrete
BS 890 : 1972 Specification for building limes
BS 903 Physical testing of rubber
BS 903 : Part A2 : 1989 Determination of tensile stress-strain properties
BS 903 : Part A3 : 1982 Determination of tear strength (trouser, angle and crescent test pieces)
BS 903 : Part A4 : 1990 Determination of compression stress-strain properties
BS 903 : Part A5 : 1974 Determination of tension set
BS 903 : Part A6 : 1969 Determination of compression set after constant strain
BS 903 : Part A9 : 1988 Determination of abrasion resistance
BS 903 : Part A16 : 1987 Determination of the effect of liquids
BS 903 : Part A19 : 1986 Heat resistance and accelerated ageing tests
BS 903 : Part A26 : 1969 Determination of hardness
BS 903 : Part A43 : 1990 Method for determination of resistance to ozone cracking (static strain test)
BS 903 : Part C2 : 1982 Determination of volume resistivity
BS 952 Glass for glazing
BS 952 : Part 1 : 1978 Classification
BS 952 : Part 2 : 1980 Terminology for work on glass
BS 970 : Part 1 : 1983 General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels
BS 1004 : 1972(1985) Specification for zinc alloys for die casting and zinc alloy die casting
BS 1010 : Part 2 : 1973 Draw-off taps and above-ground stopvalves
BS 1070 : 1973(1979) Specification for black paint (tar-based)
BS 1155 : 1986 Specification for natural rubber compounds for extrusion
BS 1181 : 1989 Specification for clay flue linings and flue terminals
BS 1191 Specification for gypsum building plasters
BS 1191 : Part 1 : 1973 Excluding premixed lightweight plasters
BS 1194 : 1969 Specification for concrete porous pipes for under-drainage
BS 1199 and 1200 : 1976 Specification for building sands from natural sources
BS 1203 : 1979 Specification for synthetic resin adhesives (phenolic and aminoplast) for plywood
BS 1204 Synthetic resin adhesives (phenolic and aminoplast) for wood
BS 1212 Float operated valves
BS 1212 : Part 1 : 1990 Specification for piston type float operated valves (copper alloy body) (excluding floats)
BS 1212 : Part 2 : 1990 Specification for diaphragm type float operated valves (copper alloy body) (excluding floats)
BS 1212 : Part 3 : 1990 Specification for diaphragm type float operated valves (plastic bodied) for cold water services only (excluding floats)
BS 1247 : 1990 Manhole steps
BS 1369 Steel lathing for internal plastering and external rendering
BS 1377 : 1975 Methods of test for soils for civil engineering purposes
BS 1387 : 1985(1990) Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads
BS 1400 : 1985 Specification for copper alloy ingots and copper alloy and high conductivity copper castings
BS 1452 : 1990 Specification for flake graphite cast iron
BS 1470 : 1987 Specification for wrought aluminium and aluminium alloys for general engineering purposes: plate, sheet and strip
BS 1471 : 1972 Specification for wrought aluminium and aluminium alloys for general engineering purposes – drawn tube
BS 1473 : 1972 Specification for wrought aluminium and aluminium alloys for general engineering purposes – rivet, bolt and screw stock
BS 1474 : 1987 Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections
BS 1494 : Part 2 : 1967 Sundry fixings
BS 1610 : 1985 Materials testing machines and force verification equipment
BS 1615 : 1987 Method for specifying anodic oxidation coatings on aluminium and its alloys
BS 1722 : Part 1 : 1986 Specification for chain link fences
BS 1924 : 1990 Stabilized materials for civil engineering purposes
BS 2000 Methods of test for petroleum and its products
BS 2015 : 1965(1985) Glossary of paint terms
BS 2456 : 1990 Specification for floats (plastics) for float operated valves for cold water services
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BS 2494 : 1990 Specification for elastomeric seals for joints in pipework and pipelines
BS 2499 : 1973 Specification for hot applied joint sealants for concrete pavements
BS 2600 Radiographic examination of fusion welded butt joints in steel
BS 2600 : Part 1 : 1983 Methods for steel 2 mm up to and including 50 mm thick
BS 2600 : Part 2 : 1973 Methods for steel over 50 mm up to and including 200 mm thick
BS 2633 : 1987 Specification for Class I arc welding for ferritic steel pipework for carrying fluids
BS 2648 : 1955 Performance requirements for electrically- heated laboratory drying ovens
BS 2760 : 1973 Specification for pitch-impregnated fibre pipes and fittings for below and above ground drainage
BS 2782 Methods of testing plastics
BS 2782 : Part 3 :
Methods 320A to 320F : 1976 Tensile strength, elongation and elastic modulus
BS 2782 : Part 3 :
BS 2782 : Part 3 :
BS 2782 : Part 4 :
Methods 430A to 430D : 1983 Determination of water absorption at 23 °C.
Determination of water absorption at 23 °C with allowance for water-soluble matter.
Determination of boiling water absorption.
Determination of boiling water absorption with allowance for water-soluble matter.
BS 2782 : Part 6 :
Determination of density of solid plastics excluding cellular plastics (pyknometer method).
Determination of plastics (sink-float method).
Determination of density of solid plastics excluding cellular plastics (density gradient column method)
BS 2789 : 1985 Specification for spheroidal graphite or nodular graphite cast iron
BS 2869 : Part 2 : 1988 Specification for fuel oil for agricultural and industrial engines and burners (classes A2, C1, C2, D, E, F, G and H)
BS 2871 : Part 1 : 1971 Copper tubes for water, gas and sanitation
BS 2874 : 1986 Specification for copper and copper alloy rods and sections (other than forging stock)
BS 2910 : 1986 Methods for radiographic examination of fusion welded circumferential butt joints in steel pipes
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BS 3049 : 1976 Specification – Pedestrian guard rails (metal)
BS 3148 : 1980 Methods of test for water for making concrete (including notes on the suitability of the water)
BS 3262 : Part 3 : 1989 Specification for application of material to road surfaces
BS 3382 : Part 1 & 2 : 1961 Cadmium on steel components Zinc on steel components
BS 3410 : 1961 Specification for metal washers for general engineering purposes
BS 3416 : 1988 Specification for bitumen-based coatings for cold application , suitable for use in contact with potable water
BS 3468 : 1986 Specification for austenitic cast iron
BS 3505 : 1986 Specification for unplasticized polyvinyl chloride (PVC-U) pressure pipes for cold potable water
BS 3506 : 1969 Specification for unplasticized PVC pipe for industrial uses
BS 3571 : Part 1 : 1985 Specification for MIG welding of aluminium and aluminium alloys
BS 3600 : 1976(1988) Specification for dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes
BS 3601 : 1987 Specification for carbon steel pipes and tubes with specified room temperature properties for pressure purposes
BS 3690 : Part 1 : 1989 Specification for bitumens for roads and other paved areas
BS 3690 : Part 2 : 1989 Specification for bitumens for industrial purposes
BS 3692 : 1967 Specification for ISO metric precision hexagon bolts , screws and nuts. Metric units
BS 3698 : 1964(1979) Specification for calcium plumbate priming paints
BS 3923 : Part 1 : 1986 Methods for manual examination of fusion welds in ferritic steels
BS 3923 : Part 2 : 1972 Automatic examination of fusion welded butt joints in ferritic steels
BS 3987 : 1974 Specification for anodic oxide coatings on wrought aluminum for external architectural applications
BS 3998 : 1989 Recommendations for tree work
BS 4072 : 1987 Wood preservation by means of copper / chromium / arsenic compositions
BS 4102 : 1990 Specification for steel wire and wire products for fences
BS 4190 : 1967 Specification for ISO metric black hexagon bolts, screws and nuts
BS 4211 : 1987 Specification for ladders for permanent access to chimneys, other high structures, silos and bins
BS 4232 : 1967 Specification for surface finish of blast-cleaned steel for painting
BS 4254 : 1983 Specification for two-part polysulphide-based sealants
BS 4320 : 1968 Specification for metal washers for general engineering purposes. Metric series
BS 4346 : Part 1 : 1969 Injection moulded unplasticized PVC fittings for solvent welding for use with pressure pipes, including potable water supply
BS 4346 : Part 2 : 1970 Mechanical joints and fittings, principally of unplasticized PVC
BS 4360 : 1990 Specification for weldable structural steels
BS 4393 : 1969(1985) Specification for tin or tin-lead coated copper wire
BS 4395 Specification for high strength friction grip bolts and associated nuts and washers for structural engineering
BS 4395 : Part 1 : 1969 General grade
BS 4395 : Part 2 : 1969 Higher grade bolts and nuts and general grade washers
BS 4395 : Part 3 : 1973 Higher grade bolts (waisted shank), nuts and general grade washers
( excluding AMD 4337 and AMD 4540 and clauses 12.2.1 and 12.2.2 ) Specification for hot rolled steel bars for the reinforcement of concrete
BS 4461 : 1978 Specification for cold worked steel bars for the reinforcement of concrete
BS 4466 : 1989 Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete
BS 4482 : 1985 Specification for cold reduced steel wire for the reinforcement of concrete
BS 4483 : 1985 Specification for steel fabric for the reinforcement of concrete
BS 4486 : 1980 Specification for hot rolled and hot rolled and processed high tensile alloy steel bars for the prestressing of concrete
BS 4504 : Section 3.1 : 1989 Circular flanges for pipes, valves and fittings (PN designated) – Specification for steel flanges
BS 4514 : 1983 Specification for unplasticized PVC soil and ventilating pipes, fittings and accessories
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BS 4515 : 1984 Specification for welding of steel pipelines on land and offshore
BS 4550 : Part 1 : 1978 Methods of testing cement – Sampling
BS 4550 : Part 2 : 1970 Methods of testing cement – Chemical tests
BS 4550 : Part 3 : 1978 Methods of testing cement – Physical tests
BS 4551 : 1980 Methods of testing mortars, screeds and plasters
BS 4568 Specification for steel conduit and fittings with metric threads of ISO form electrical installations
BS 4568 : Part 1 : 1970 Steel conduit, bends and couplers
BS 4570 : 1985 Specification for fusion welding of steel castings
BS 4604 Specification for the use of high strength friction grip bolts in structural steelwork
BS 4604 : Part 1 : 1970 General grade
BS 4604 : Part 2 : 1970 Higher grade (parallel shank)
BS 4660 : 1989 Specification for unplasticized polyvinyl chloride (PVC-U) pipes and plastic fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage
BS 4677 : 1984 Specification for arc welding of austenitic stainless steel pipework for carrying fluids
BS 4772 : 1988 Specification for ductile iron pipes and fittings
BS 4848 Specification for hot-rolled structural steel sections
BS 4848 : Part 2 : 1975 Hollow sections
BS 4848 : Part 5 : 1980 Bulb flats
BS 4865 : Part 1 : 1989 Specification for non-metallic flat gaskets (including gaskets for flanges to BS 4772)
BS 4871 : Part 1 : 1982 Specification for approval testing of welders working to approved welding procedures – Fusion welding of steel
BS 4872 : Part 1 : 1982 Specification for approval testing of welders when welding procedure approval is not required – Fusion welding of steel
BS 4873 : 1986 Specification for aluminium alloy windows
BS 4921 : 1988 Specification for sheradized coatings on iron or steel
BS 4933 : 1973 Specification for ISO metric black cup and countersunk head bolts and screws with hexagon nuts
BS 4942 : 1981 Short link chain for lifting purposes
BS 5075 : Part 1 : 1982 Specification for accelerating admixtures, retarding admixtures and water reducing admixtures
BS 5075 : Part 3 : 1985 Specification for superplasticizing admixtures
BS 5135 : 1984 Specification for arc welding or carbon and carbon manganese steels
BS 5150 : 1990 Specification for cast iron gate valves
BS 5154 : 1989 Specification for copper alloy globe, globe stop and check, check and gate valves
BS 5163 : 1986 Specification for predominantly key-operated cast iron gate valves for waterworks purposes
BS 5212 : 1990 Cold applied joint sealant systems for concrete pavements
BS 5215 : 1986 Specification for one-part gun grade polysulphide-based sealants
BS 5255 : 1989 Specification for thermoplastics waste pipe and fittings
BS 5284 : 1976 Methods, sampling and testing mastic asphalt and pitchmastic used in building
BS 5400 Steel, concrete and composite bridges
BS 5400 : Part 2 : 1978 Specification for loads
BS 5400 : Part 6 : 1980 Specification for materials and workmanship, steel
BS 5400 : Part 9 : 1983 Bridge bearings
BS 5400 : Section 9.2 : 1983 Specification for materials, manufacture and installation of bridge bearings
BS 5493 : 1977 Code of practice for protective coating of iron and steel structures against corrosion
BS 5573 : 1978 Code of practice for safety precautions in the construction of large diameter boreholes for piling and other purposes
BS 5589 : 1989 Code of practice for preservation of timber
BS 5896 : 1980 Specification for high tensile steel wire and strand for the prestressing of concrete
BS 5911 Precast concrete pipes, fittings and ancillary products
BS 5911 : Part 2 : 1982 Specification for inspection chambers and street gullies
BS 5911 : Part 3 : 1982 Specification for pipes and fittings with ogee joints
BS 5911 : Part 100 : 1988 Specification for unreinforced and reinforced pipes and fittings with flexible joints
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BS 5930 : 1981 Code of practice for site investigations
BS 5931 : 1980 Code of practice for machine laid in situ edge details for paved area
BS 5950 : Part 2 : 1985 Specification for materials, fabrication and erection: hot rolled sections
BS 5996 : 1980 Methods for ultrasonic testing and specifying quality grades of ferritic steel plate
BS 6044 : 1987 Specification for pavement marking paints
BS 6088 : 1981(1985) Specification for solid glass beads for use with road marking compounds and for other industrial uses
BS 6089 : 1981 Guide to assessment of concrete strength in existing structures
BS 6105 : 1981 Specification for corrosion-resistant stainless steel fasteners
BS 6150 : 1982 Code of practice for painting of buildings
BS 6262 : 1982 Code of practice for glazing for buildings
BS 6323 : 1982(1990) Specification for seamless and welded steel tubes for automobile, mechanical and general engineering purposes
BS 6323 : Part 8 : 1982(1990) Specific requirements for longitudinally welded stainless steel tubes
BS 6362 : 1990 Specification for stainless steel tubes suitable for screwing in accordance with BS 21 “Pipe threads for tubes and fittings where pressure-tight joint are made on the threads”
BS 6405 : 1984 Specification for non-calibrated short link steel chain (grade 30) for general engineering purposes: class 1 and 2
BS 6431 Ceramic floor and wall tiles
BS 6431 : Part 1 : 1983 Specification for classification and marking, including definitions and characteristics
BS 6431 : Part 2 : 1984 Specification for extruded ceramic tiles with a low water absorption (E ≤ 3%). Group A1
BS 6431 : Part 3 Extruded ceramic tiles with a water absorption of 3% < E ≤ 6%. Group A11a
BS 6431 : Part 3 : Section 3.1 : 1986 Specification for general products
BS 6431 : Part 3 : Section 3.2 : 1986 Specification for products (terre cuite, cotto, baldosin catalan)
BS 6431 : Part 4 Extruded ceramic tiles with a water absorption of 6% < E ≤ 10%. Group A11b
BS 6431 : Part 4 : Section 4.1 : 1986 Specification for general products
BS 6431 : Part 4 : Section 4.2 : 1986 Specification for specific products (terre cuite, cotto, baldosin catalan)
BS 6443 : 1984 Method for penetrant flaw detection
BS 6463 Quicklime, hydrated lime and natural calcium carbonate
BS 6463 : Part 1 : 1984 Methods of sampling
BS 6463 : Part 2 : 1984 Methods of chemical analysis
BS 6463 : Part 4 : 1987 Methods of test for physical properties of hydrated lime and lime putty
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BS 6510 : 1984 Specification for steel windows, sills, window boards and doors
BS 6558 : 1985 Optical fibres and cables
BS 6566 Plywood
BS 6577 : 1985 Specification for mastic asphalt for building (natural rock asphalt aggregate)
BS 6588 : 1985 Specification for Portland pulverized-fuel ash cement
BS 6657 : 1986 Guide for prevention of inadvertent initiation of electro-explosive devices by radio-frequency radiation
BS 6681 : 1986 Specification for malleable cast iron
BS 6700 : 1987 Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their cartilages
BS 6925 : 1988 Specification for mastic asphalt for building and civil engineering (limestone aggregate)
BS 6949 : 1988 Specification for bitumen-based coatings for cold application, excluding use in contact with potable water
BS 7263 : 1990 Precast concrete flags, kerbs, channels, edgings and quadrants
BS 7263 : Part 1 : 1990 Specification
BS 8004 : 1986 Code of practice for foundations
BS 8005 : Part 1 : 1987 Guide to new sewerage construction

2. Code of Practice (CP)

CP 144 Roof coverings
CP 144 : Part 4 : 1970 Mastic asphalt. Metric units

3. American Society for Testing and Materials (ASTM) Standards

ASTM A 775M-86 Specification for epoxy-coated reinforcing steel bars
ASTM C 127-88 Test method for specific gravity and absorption of coarse aggregate
ASTM C 128-88 Test method for specific gravity and absorption of fine aggregate
ASTM C 136-84a Method for sieve analysis of fine and coarse aggregates
ASTM C 188-84 Test method for density of hydraulic cement
ASTM C 939-87 Test method of flow of grout for preplaced aggregate concrete
ASTM D 5-86 Test method for penetration of bituminous materials
ASTM D 113-86 Test method for ductility of bituminous materials
ASTM D 140-88 Method for sampling bituminous materials
ASTM D 242-85 Specification for mineral filler for bituminous paving mixtures
ASTM D 546-88 Method for sieve analysis of mineral filler for road and paving materials
ASTM D 854-83 Test method for specific gravity of soils
ASTM D 946-82 Specification for penetration-graded asphalt cement for use in pavement construction
ASTM D 979-87 Method for sampling bituminous paving mixtures
ASTM D 1559-82 Test method for resistance to plastic flow of bituminous mixtures using Marshall apparatus
ASTM D 1754-87 Test method for effect of heat and air on asphaltic materials (thin-film over test)
ASTM D 2000-86 Classification system for rubber products in automobile applications
ASTM D 2027-76(1986) Specification for cutback asphalt (medium-curing type)
ASTM D 2041-78 Test method for theoretical maximum specific gravity of bituminous paving mixtures
ASTM D 2042-81(1985) Test method for solubility of asphalt materials in trichloroethylene
ASTM D 2171-88 Test method for viscosity of asphalts by vacuum capillary
ASTM D 2172-88 Test method for quantitative extraction of bitumen from bituminous paving mixtures
ASTM D 2726-88 Test method for bulk specific gravity of compacted bituminous mixtures using saturated surface-dry specimens
ASTM D 3203-88 Test method for percent air voids in compacted dense and open bituminous paving mixtures
ASTM D 3289-85 Test method for specific gravity or density of semi-solid and solid bituminous materials by nickel crucible