WorldSkills Standards Specification

Concrete Construction Work

Construction and Building Technology

worldskills

 WSC2019_WSSS46

THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

GENERAL NOTES ON THE WSSS

The WSSS specifies the knowledge, understanding and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSSS).

The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standards Specification is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. This is often referred to as the "weighting". The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	**Work organization and management**	**5**
	The individual needs to know and understand: • Health and safety legislation, obligations, and documentation • The situations when personal protective equipment must be used • The purposes, uses, care, maintenance, and storage of all tools and equipment together with their safety implications • The purposes, uses, care and storage of materials • Sustainability measures applying to the use of 'green' materials and recycling • The ways in which working practices can minimize wastage and help to manage costs • The principles of work flow and measurement • The significance of planning, accuracy, checking, and attention to detail in all working practices	
	The individual shall be able to: • Follow health and safety standards, rules, and regulations • Identify and use the appropriate personal protective equipment including safety footwear, ear, and eye protection • Select, use, clean, maintain, and store all tools and equipment safely • Select, use and store all materials safely • Safely working at heights • Plan the work area to maximize efficiency and maintain the discipline of regular tidying • Measure accurately • Work efficiently and check progress and outcomes regularly • Establish and consistently maintain high quality standards and working processes • Set up and make secure construction sites by means of locks and signage and implement anti-theft measures • Proactively engage in continuous professional development to maintain current knowledge of technology and working practices	

2	**Communication and interpersonal skills**	**10**
	The individual needs to know and understand: • The significance of establishing and maintaining confidence with colleagues and clients • The roles and requirements of architects and other related professions • The value of building and maintaining productive working relationships • The importance of swiftly resolving misunderstandings and conflicting demands • The criteria for being understandable within teams and to non-specialists • The principles of self-awareness and awareness of others • The basic rules of communication	
	The individual shall be able to: • Interpret customer requirements and manage customer expectations positively • Recognize the needs of architects and other related professions • Introduce architects and related trades and professions to support customer requirements • Use comments and questions to help solve problems • Formulate technical questions and expound problems • Offer suggestions for solving technical problems • React to colleagues' ideas and suggestions constructively and help make decisions on them • Describe complex technical matters to non-specialists	
3	**Interpretation of drawings**	**5**
	The individual needs to know and understand: • The essential information that must be included in construction drawings • Principles, symbols, and protocols used in construction drawings • The importance of checking for missing information or errors, anticipating problems and resolving in advance of the 'setting out' process and construction • The role and use of geometry in construction processes • Mathematical principles, processes and problem solving • The standardized representation of structural components in outline and in section and dimensioning (determination of heights from set measuring points)	

	The individual shall be able to: • Prepare simple site measurement drawings • Prepare the materials requirements, taking into account increased requirement due to compression, wastage, breakage, etc. • Calculate formwork surfaces and materials requirement • Calculate formwork surfaces and materials requirement for face concrete formwork • Interpret, analyse, and understand construction plans (e.g. design plans, formwork plans, reinforcement plans, detail drawings, etc.), and material and parts lists • Relay information in plans to other professionals, work colleagues, and clients • Prepare sketches from the necessary perspectives, sections, and other representation formats	
4	**Setting out and measurement**	**15**
	The individual needs to know and understand: • The importance of thinking 'top down' to ensure all features can be set out at the start of the project • The implications for the business/organization of not setting out correctly • The templates/building aids which may be helpful for construction • Calculations to assist in measurement and checking of project • Geometry principles and techniques to assist with the project	
	The individual shall be able to: • Visualize and think through the project identifying potential challenges early and taking the necessary preventative action • Set out the locations, starting points and lines of projects according to plans and specifications • Accurately interpret the dimensions from the drawing and ensure the design is set out within a one mm standard tolerance • Check all horizontal and vertical angles • Produce any templates/building aids that may be helpful when constructing • Set out datum points of reference for the project • Carry out setting out work using the necessary surveying equipment (pocket rule, tape measure, distance meter, set square, level, etc.) • Set out and check angles • Create horizontal levels and measure heights using a spirit level, water level gauge, and optical devices • Set out and measure up formwork manually from plans • Measure predetermined structures, joints and materials for the subsequent face concrete surface (anchor holes, shuttering frames, board inserts, distribution, and alignment of formwork boards, etc.)	

5	Construction of formworks and reinforcement	40
	The individual needs to know and understand: • The impact of Health, Safety, and Environment requirements and legislation on a project • How to use and apply tools, equipment, construction machinery, and working aids (e.g. instruments, measuring devices, etc.) in accordance with operating and handling instructions • How to use and handle manual tools such as hammers, saws, planes, etc., to work with materials such as wood, metal, and plastic • How to use and handle machinery such as drills, saws, sanders, etc., to work with materials such as wood, metal, and plastic, in compliance with safety guidelines • Scaffolding requirements • The individual formwork components such as form lining (plywood, frame elements, screed protection cover), formwork girders, formwork supports, bolts, formwork clamps, and bracing • The components (formwork girders, tubular steel props, supports, bracings, reinforcements, formwork anchors) and materials (wood, steel) for scaffolding • How to make formwork, including erection, bracing, forming recesses, and stripping formwork • Types of formwork, areas of use and usage methods for foundation formwork, wall formwork, column formwork, beam formwork, slab formwork, staircase moulds, formwork for face concrete, climbing formwork, sliding formwork, recesses, etc. • Strengthening steel and reinforcement, categories and types of strengthening steel plus their designations, categorizations, and delivery forms • Cutting steel and bending steel bars according to standard specifications • Concrete coverings • The various types of joint (expansion joints, settling joints, construction joints, and dummy joints), what they do and how they are made • Face concrete surface, in terms of porosity, colour consistency, smoothness, creation of construction joints, formwork element joints, formation of edges, impressions due to the attachment of formwork lining, anchor points, anchor hole separation, frame impression, formwork lining joints, formwork lining as a smooth or rough concrete surface (texture)	

	The individual shall be able to:
	• Work manually with materials such as wood, metal, and plastic (for separating, reshaping, connecting)
	• Measure, lay out and cut wood and work with it manually and using machinery
	• Make simple trestles, working platforms plus auxiliary equipment, set up protective nets and use them in compliance with the relevant regulations
	• Make and put together every type of formwork
	• Make supports and reinforcements (concrete pressure)
	• Make face concrete formwork
	• Make slits, apertures, openings, and recesses
	• Move anchors as directed
	• Make various joints in combination with the appropriate joint sealants (profiles, sealing strips, expansion joint tapes)
	• Cut to length, bend, interweave, lay, and anchor structural steel according to bending and reinforcement diagrams and in compliance with reinforcement directives (specifically those concerning bending, radius of curvature, end hooks, brackets, distributors, separators, joints, and connection reinforcements)
	• Prevent the following problems through correct construction:
	  • Build-up of rust stains on vertical components and of traces of rust caused by reinforcement residues being left on the undersides of horizontal components
	  • Mortar residues running down through unsealed construction joints on vertical components
	  • Unclean edge formation due to damaged, misaligned, and unsuitable triangular or trapezoidal profiles
	  • Offset of over 10 mm between formwork element joints and component connections
	  • Heavy bleeding at formwork board and element joints and on component connections and anchor holes (e.g. core structure exposed as a result of cement paste leakage)
	  • Very noticeable entrainment water effects
	  • Differing surface qualities (colour/texture) due to inappropriately stored formwork
	• Use scaffolding appropriately and safely and apply health and safety requirements and legislation	

6	Filling of formworks and treatment	20
	The individual needs to know and understand: • The impact of health and safety requirements on a project • Concrete technology and concrete processing on the construction site (ordering, transporting to formwork, application and compression, after-treatment) • Concrete additives such as concrete liquefiers, plasticisers, sealants, anti-freeze, hardening accelerators, etc.), how to use them and their effect on the concrete • How to prevent problems • Additional measures to take when concreting in summer and winter • Pre-requisites for concrete application, such as the removal of contaminants from the formwork, pre-wetting, checking for stability, using sufficient separators, smoothing gauges, etc.) • The compression process according to the consistency of the concrete • The possibilities of processing the concrete surface by smoothing/removing/levelling and the tools required to do this • The need for after-treatment of the concrete (to counter drying-out, temperature differential, frost, leaching, vibrations) using covers, spray, humidification, use of after-treatment aids or by leaving fresh concrete in the formwork beyond the stripping times • Face concrete surfaces in terms of porosity, colour consistency, etc.	
	The individual shall be able to: • Produce unreinforced and reinforced concrete (mix and transport formula concrete = site-mixed concrete) • Order ready-mixed concrete for the site and transport it using concrete pumps, crane buckets or conveyors • Apply means of separation before concreting depending on the formwork lining, using high pressure sprays, brushes, cloths, or mechanically • Apply concrete in the prepared formwork • Compress concrete using various compressors • Process concrete surfaces by smoothing/removing/levelling, using the tools required to do this • Carry out after-treatment of concrete using covers, spray, humidification, use of after-treatment aids or by leaving fresh concrete in the formwork beyond the stripping times • Prevent the following problems through correct construction: • Incorrect application and compression of concrete (“honeycombing”, highly visible layers, etc.)	

7	**Removal of formworks and reprocessing**	**5**
	The individual needs to know and understand: • The stripping times • The cleaning options depending on the formwork material, such as pressurized water, manual formwork cleaning • Health and safety issues and procedures relating hazardous cleaning material • Care and maintenance of system formwork (cleaning, maintenance, repairing damaged sections, working with separating agents)	
	The individual shall be able to: • Strip formwork using tools (e.g. formwork bars) • Clean formwork using e.g. water, manual formwork cleaners • Use hazardous cleaners correctly and safely • Care for and maintain system formwork and replace damaged sections • Sort and store all required formwork parts ready for transportation	
	Total	**100**

REFERENCES FOR INDUSTRY CONSULTATION

WorldSkills is committed to ensuring that the WorldSkills Standards Specifications fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Standards Specification on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (http://www.ilo.org/public/english/bureau/stat/isco/isco08/)
- ESCO: (https://ec.europa.eu/esco/portal/home)
- O*NET OnLine (www.**oneto**nline.org/)

This WSSS (Section 2) appears to most closely relate to *Cement Masons and Concrete Finishers*: https://www.onetonline.org/link/summary/47-2051.00

and *Concrete Placers, Concrete Finishers and Related Workers*: http://data.europa.eu/esco/isco/C7114.

These links also enable adjacent occupations to be explored.