



National Competency Standards Level-5 for “Civil Technology”



National Competency Standards Level-5 for “Civil Technology”



Competency Standards

National Vocational and Technical Training Commission (NAVTTC),
Government of Pakistan



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NAVTTTC team under the leadership of Dr. Muqem ul Islam initiated development of CBT & A based qualifications of diploma level-5 as a reform project of TVET sector in November 2018 and completed 27 NVQF diplomas of Level-5 in September, 2019. It seems worth highlighting that during this endeavor apart from developing competency standards/curricula in conventional trades new dimensions containing high-tech trades in TVET sector in the context of generation IR 4.0 trades have also been developed which inter alia includes Robotics, Mechatronics, artificial intelligence, industrial automation, instrumentation and process control. Moreover, trades like entrepreneurship, green/environmental skills and variety of soft/digital skill have also been developed to equip the Pakistani youth with skills set as per requirement of the global trends. These skills have been made integral part of all the 27 diplomas.

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Contents

1. Introduction	10
2. Purpose of the Qualification	10
3. Core competencies of the Qualification	10
4. Date of Validation	27
5. Codes of Qualifications	27
6. Members of Qualifications Development Committee	28
7. Entry Requirements	29
8. Proposed Scheme of Studies	29
10. A- Occupation Packaging of Civil Technology	31
10. B- Qualification Packaging of Civil Technology	32
11. Detail of Qualifications and its Competency Standards Level Wise	32
11. A. National Qualification Certificate in Civil Technology Level 2	32
11.1. Basic Civil Surveying	32
0732B&CE-1 . Perform Chain Survey	32
0732B&CE-2 . Perform Compass Traversing	34
0732B&CE-3 . Carry out Plane Table Survey	36
0732B&CE-4 . Perform Levelling	38
0732B&CE-5 . Perform Reciprocal Levelling	40
0732B&CE-6 . Perform Long & Cross Sectioning	42
0732B&CE-7 . Perform Tacheometry	45
0732B&CE-8 . Perform Contouring	47
0732B&CE-9 . Perform Hydrographic Survey	49
0732B&CE-10 . Compute Volume by Contouring	51
11.2. Civil Engineering. Drawing	53
0732B&CE-11 . Produce Templates, Title Block/ Strip & Draw Lines	53
0732B&CE-12 . Perform Lettering and Printing On Sheet.	56
0732B&CE-13 . Construct Scales for Drawing	58
0732B&CE-14 . Construct Geometrical Figures	60
0732B&CE-15 . Produce Orthographic Projections	63
0732B&CE-16 . Perform Sectioning	65
0732B&CE-17 . Perform Dimensioning On Drawings	67
0732B&CE-18 . Produce Pictorial Drawings	70
0732B&CE-19 . Develop Symbols of Engineering Drawings	73
0732B&CE-20 . Produce Cross Section of Wall.	76
0732B&CE-21 . Develop Building Drawings	79
0732B&CE-22 . Perform House Planning	83
0732B&CE-23 . Produce Layout Plans for Building Services.	85
0732B&CE-24 . Produce Drawings of Sanitary Structures	88
11.3. Building Materials	90
0732B&CE-25 . Identify bricks	90
0732B&CE-26 . Dress stone for masonry	93
0732B&CE-27 . Prepare slaked lime	95
0732B&CE-28 . Identify and store cement for construction	97
0732B&CE-29 . Select sand for construction	99
0732B&CE-30 . Identify ferrous and non-ferrous metals	101
0732B&CE-31 . Identify advanced construction materials	103
0732B&CE-32 . Work Safely in Construction Industry	105
0732B&CE-33 . Interpret Simple Building Plans	107
0732B&CE-34 . Read and Interpret plans and Specifications	109
0732B&CE-35 . Apply power and hand tools in construction	111
11.4. Workshop Practice-I (wood working)	113
0732B&CE-36 . Carry out OH & S requirement in workshop	113



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-37	. Determine properties and types of locally manufactured timber	115
0732B&CE-38	. Sharpen carpentry tools	117
0732B&CE-39	. Apply hand tools	119
0732B&CE-40	. Perform wooden joinery work	121
0732B&CE-41	. Apply fastenings	123
0732B&CE-42	. Apply traditional spirits polishing techniques	124
0732B&CE-43	. Apply portable power tools	126
0732B&CE-44	. Make simple calculations of timber	128
0732B&CE-45	. Construct a basic timber product	129
11.5. Workshop Practice-II (Electrical wiring)		131
0732B&CE-46	. Carry out OH & S requirement in workshop	131
0732B&CE-47	. Maintain safety	133
0732B&CE-48	. Perform electrical wiring	135
0732B&CE-49	. Install electrical system	138
0732B&CE-50	. Construct circuits	141
0732B&CE-51	. Measure properties of electricity	144
0732B&CE-52	. Perform electrical wiring of a single room	146
11. B- Certificate in Civil Technology Level 3		149
11.6. Advanced Surveying		149
0732B&CE-53	. Measure Angles by Theodolite	149
0732B&CE-54	. Perform Trigonometric Levelling by Theodolite	152
0732B&CE-55	. Perform Traversing by Theodolite	154
0732B&CE-56	. Set Out Horizontal Curves by Theodolite	156
0732B&CE-57	. Set out Vertical Curves by Theodolite	159
0732B&CE-58	. Carry out Triangulation by Theodolite	161
0732B&CE-59	. Perform Temporary Adjustment of Total Station	163
0732B&CE-60	. Measure Distance by Total Station	165
0732B&CE-61	. Measure Angles by Total Station	167
0732B&CE-62	. Measure Area by Total Station	169
0732B&CE-63	. Set out Curves by Total Station	171
0732B&CE-64	. Perform Integration of GPS	173
0732B&CE-65	. Measure Co-ordinates by GPS	175
0732B&CE-66	. Set out Civil Engineering Structures by GPS	176
11.7. Auto CAD		179
0732B&CE-67	. Perform Basic Computer Operations	179
0732B&CE-68	. Perform Drafting Settings and Formatting	182
0732B&CE-69	. Perform Dimensioning, Lettering and Plotting	184
0732B&CE-70	. Develop 2d Drawings of Structures	185
0732B&CE-71	. Produce Drawing of Framed Structure Building	188
0732B&CE-72	. Develop Sectional Drawing for foundations	190
0732B&CE-73	. Develop Drawings for Doors & Windows	192
0732B&CE-74	. Produce Drawings of Stairs and Stair Cases	194
0732B&CE-75	. Produce Drawings of Water Tanks	195
0732B&CE-76	. Produce Drawings of Cross Drainage Works	197
0732B&CE-77	. Develop 3d Drawings	200
0732B&CE-78	. Produce Civil Technology Drawings	202
11.8. Construction I		205
0732B&CE-79	. Perform Simple Levelling	205
0732B&CE-80	. Lay out Building plans	207
0732B&CE-81	. Carryout excavation and install supports	210
0732B&CE-82	. Place Concrete in Foundations	213
0732B&CE-83	. Prepare for construction Process (Brick/ block laying)	215
0732B&CE-84	. Mix Cementitious materials (Mortar & Concrete)	218
0732B&CE-85	. Install flashing and damp proof course	221
0732B&CE-86	. Carry out brick work	224
0732B&CE-87	. Construct Cavity Wall	228



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-88	Construct Curved Wall	234
0732B&CE-89	Construct Masonry arches (semi-circular and segmental)	236
0732B&CE-90	Construct Scaffolding	241
0732B&CE-91	Install doors and window frames	244
0732B&CE-92	Prepare Surface and fix tiles	248
0732B&CE-93	Prepare Surface for Painting	254
0732B&CE-94	Paint by spray, brush and roller	257
0732B&CE-95	Apply stains and clear timber finishes	260
0732B&CE-96	Prepare site layout of civil engineering projects	265
0732B&CE-97	Construct masonry steps and stairs	268
0732B&CE-98	Install stairs	271
0732B&CE-99	Prepare for solid dry wall plastering	274
0732B&CE-100	Apply plaster	277
11.9. Plumbing		280
0732B&CE-101	Identify plumbing tools & equipment	280
0732B&CE-102	Perform cutting, threading & reaming	282
0732B&CE-103	Join pipes & fittings	283
0732B&CE-104	Layout for domestic water supply	287
0732B&CE-105	Make water connection	289
0732B&CE-106	Install plumbing fixtures	291
0732B&CE-107	Install & repair water pumps	295
0732B&CE-108	Install turbine pumps	297
11.10. Digital Skills		299
0732B&CE-109	Install computer operating systems and hardware	299
0732B&CE-110	Operate digital media technology	302
0732B&CE-111	Perform computer operations	304
0732B&CE-112	Use computer applications	306
0732B&CE-113	Create user documentation	309
0732B&CE-114	Create technical documentation	310
0732B&CE-115	Create basic databases	312
0732B&CE-116	Use social media tools for collaboration and engagement	314
0732B&CE-117	E-Commerce- SEO (Search Engine Optimization)	316
0732B&CE-118	E-Commerce- SCM (Supply Chain Management)	317
0732B&CE-119	E-Commerce- Social Media Marketing	318
0732B&CE-120	Use digital devices	319
0732B&CE-121	Operate word-processing applications	321
0732B&CE-122	Operate spreadsheet applications	323
0732B&CE-123	Operate presentation packages	325
0732B&CE-124	Perform writing and editing tasks	327
0732B&CE-125	Write and Edit Copy	329
0732B&CE-126	Build Java applets	331
0732B&CE-127	Manipulate Images (Illustrator)	333
0732B&CE-128	Manipulate Images (Photoshop)	335
0732B&CE-129	Design simple web page layouts	337
0732B&CE-130	Apply introductory programming techniques	339
11c Certificate in Civil Technology Level 4		341
11.11. Construction II		341
0732B&CE-131	Prepare subgrade, base, and bedding course for paving	341
0732B&CE-132	Lay paving	344
0732B&CE-133	Perform concrete, tiles and mosaic flooring	347
0732B&CE-134	Perform marble/granite flooring	350
0732B&CE-135	Apply water proofing remedial processes	352
0732B&CE-136	Apply and install sealants	355
0732B&CE-137	Perform water proofing works	357
0732B&CE-138	Apply water proofing tools and equipment	361
0732B&CE-139	Perform water proofing of basements	365
0732B&CE-140	Apply water proofing to internal wet areas	370



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-141	Install Physical termite barriers.....	375
0732B&CE-142	Erect and dismantle slip formwork	379
0732B&CE-143	Install trench support	382
0732B&CE-144	Construct underpinning	384
0732B&CE-145	Carry out reinforced concrete work	387
0732B&CE-146	Work safely on roofs.....	390
0732B&CE-147	Install roof components	392
0732B&CE-148	Install roof drainage.....	395
0732B&CE-149	Lay roof tiles.....	397
0732B&CE-150	Erect roof trusses	400
11.12. Basic Quantity Surveying		403
0732B&CE-151	Produce rough cost estimates of buildings	403
0732B&CE-152	Evaluate items of work for straight wall, T, L, H, U shaped and circular walls.	405
0732B&CE-153	Produce detailed estimate of a single storey building.....	407
0732B&CE-154	Produce Annual/Special repair estimates-Building and Road.....	408
0732B&CE-155	Evaluate Earth work for Civil Engineering structures.....	409
0732B&CE-156	Produce detailed estimate of Arterial roads	411
0732B&CE-157	Produce material statements	413
0732B&CE-158	Analyse Rates of different items of work for building	415
0732B&CE-159	Produce of rough cost estimate of water supply scheme.....	418
0732B&CE-160	Produce of rough cost estimate of Sewerage scheme.....	420
0732B&CE-161	Evaluate value & standard rent of an existing building	422
0732B&CE-162	Produce Detailed Estimate of Culverts.....	424
0732B&CE-163	Produce Detailed Estimate of Bridge.....	426
11.13. Water Supply		428
0732B&CE-164	Layout for domestic water supply.....	428
0732B&CE-165	Prepare sketches of aqueducts & water pipes	429
0732B&CE-166	Draw sketches of intakes	431
0732B&CE-167	Estimate demand for Water Supply	433
0732B&CE-168	Plan water treatment (Clarification)	435
0732B&CE-169	Plan water treatment (Filtration).....	438
0732B&CE-170	Plan water distribution system.....	440
11.14. Strength of Materials.....		442
0732B&CE-171	Locate centroid of different sections	442
0732B&CE-172	Find out moment of inertia of different sections	444
0732B&CE-173	Produce Shear Force and Bending Moment Diagrams.....	446
0732B&CE-174	Find hardness of metals.....	449
0732B&CE-175	Conduct Tensile Strength Test.....	451
11.15. Soft Skills.....		453
0732B&CE-176	Manage meetings	453
0732B&CE-177	Manage recruitment selection and induction processes.....	455
0732B&CE-178	Manage personal work priorities and professional development	457
0732B&CE-179	Manage workforce planning	459
0732B&CE-180	Undertake project work	461
0732B&CE-181	Identify and communicate trends in career development	464
0732B&CE-182	Apply specialist interpersonal and counseling interview skills	466
0732B&CE-183	Work safely in an office environment	470
0732B&CE-184	Develop workplace documents	472
0732B&CE-185	Prepare and implement negotiation.....	475
0732B&CE-186	Maintain professionalism in the workplace	478
0732B&CE-187	Maintain professional development and career professionalism.....	480
0732B&CE-188	Organize schedules	482
11.16. Construction III		485
0732B&CE-189	Erect and dismantle formwork to suspended slabs, columns, beams and walls	485
0732B&CE-190	Operate elevated platforms.....	488



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-191	Construct, erect and dismantle formwork for stairs and ramps	491
0732B&CE-192	Evaluate materials for multi-storey buildings	496
0732B&CE-193	Apply structural principles to the construction of large, high rise and complex buildings	499
0732B&CE-194	Install fire and smoke containment systems	503
0732B&CE-195	Inform clients about thermal performance of residential buildings	508
0732B&CE-196	Design air conditioning and ventilation system	512
0732B&CE-197	Design acoustic of an auditorium	516
0732B&CE-198	Insulate sound insulation products in building	518
0732B&CE-199	Install ceiling insulation	520
0732B&CE-200	Design an earthquake resistant building	525
0732B&CE-201	Coordinate maintenance and repair of buildings	528
0732B&CE-202	Assess construction faults in buildings	531
0732B&CE-203	Repair and rectify concrete	534
0732B&CE-204	Repair wall and floor tiles	538
0732B&CE-205	Apply building codes and standards to building projects	542
11.17. Concrete Technology		545
0732B&CE-206	Test the Properties of Cement	545
0732B&CE-207	Find out Strength of Cement	547
0732B&CE-208	Test the Properties of Aggregate	549
0732B&CE-209	Test the Properties of Fresh Concrete	551
0732B&CE-210	Perform Destructive Tests on Hardened Concrete	553
0732B&CE-211	Perform Non-Destructive Tests on Hardened Concrete	555
11.18. Advanced Quantity Surveying		556
0732B&CE-212	Produce Detailed Estimate of Water Tanks	556
0732B&CE-213	Produce Detailed Estimate of Wells	560
0732B&CE-214	Produce Detailed Estimate of Steel Structures	562
0732B&CE-215	Produce Detailed Estimate of RCC Framed Structure	564
0732B&CE-216	Produce Detailed Estimate of Building Services	566
0732B&CE-217	Produce Detailed Estimates Using Computer Software -Excel	568
0732B&CE-218	Produce Project of Road in AutoCAD Civil 3D software	573
11.19. Contract Management		576
0732B&CE-219	Produce Pre-Qualification Documents & collect expression of interest	576
0732B&CE-220	Perform Evaluation Criteria for the assessment	579
0732B&CE-221	Produce Tender Documents & Collect Proposals	581
0732B&CE-222	Perform Tender Evaluation & Award of Contract	585
0732B&CE-223	Perform Post-Award Legal/Contract Requirements and Finance	587
0732B&CE-224	Maintain record of Stores	590
0732B&CE-225	Perform Variation Orders, Claims and Dispute Adjudication Board	593
11.20. Sanitary Engineering		595
0732B&CE-226	Design sanitary sewers	595
0732B&CE-227	Design storm water sewers	597
0732B&CE-228	Layout of sewers	599
0732B&CE-229	Prepare sketches of sewer appurtenance	601
0732B&CE-230	Construct Sewers	604
0732B&CE-231	Maintain Sewers	606
0732B&CE-232	Install Sewage Pumps	608
0732B&CE-233	Produce sketches of sewage treatment plant	610
0732B&CE-234	Dispose sewage	612
11.21. Engineering Mechanics		614
0732B&CE-235	Design Homogeneous Beam	614
0732B&CE-236	Determine Deflection of Beams	617
0732B&CE-237	Determine load carrying capacity of columns	619
0732B&CE-238	Evaluate Efficiency of Joints-riveted and welded	621
0732B&CE-239	Analyze forces in truss members	623



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-240	Determine stability of retaining wall	625
11d Certificate in Civil Technology Level 5		627
11.22. Transportation Engineering-II		627
0732B&CE-241	Develop construction plan of Tunnels.....	627
0732B&CE-242	Produce sketches of an airport	628
0732B&CE-243	Produce sketches of permanent Way	630
0732B&CE-244	Produce sketches of points and crossings	632
0732B&CE-245	Produce sketches of station yards and signals	634
0732B&CE-246	Produce sketches of harbour	636
11.23. Hydraulics Engineering		638
0732B&CE-247	Determine Hydrostatic pressure	638
0732B&CE-248	Apply Hydro kinematic Principles.....	640
11.24. Soil Mechanics		643
0732B&CE-249	Determine moisture content and specific gravity of soil.....	643
0732B&CE-250	Determine Atterberg's Limits.....	645
0732B&CE-251	Identify Type of Soil	647
0732B&CE-252	Conduct soil compaction tests.....	649
0732B&CE-253	Determine permeability of soil.....	652
0732B&CE-254	Investigate shear strength of soil.....	654
0732B&CE-255	Find out bearing capacity of soil.....	657
11.25. Bridge Engineering.		659
0732B&CE-256	Produce sketches of bridges w.r.t. functions	659
0732B&CE-257	Produce sketches of bridges w.r.t. material of construction	661
0732B&CE-258	Produce sketches of bridges w.r.t. type of super structure	663
0732B&CE-259	Produce sketches of bridges w.r.t. floor type	665
0732B&CE-260	Produce sketches of culverts, low level and high level causeway.....	667
11.26. Environmental Technology.....		669
0732B&CE-261	Determine Water Pollution	669
0732B&CE-262	Evaluate Air Pollution	672
0732B&CE-263	Determine Noise Pollution	674
0732B&CE-264	Evaluate Solid Waste Pollution	676
0732B&CE-265	Adopt occupational health and safety	678
0732B&CE-266	Respond to Natural Disaster.....	681
11.27. Construction Project Planning and Management		683
0732B&CE-267	Develop Project Management Life Cycle.....	683
0732B&CE-268	Develop Preliminary Project Plan.....	686
0732B&CE-269	Develop Construction Project Plan.....	688
0732B&CE-270	Conduct on-site supervision of construction projects.....	691
0732B&CE-271	Perform Basic operation in Primavera P6	694
0732B&CE-272	Perform road Project Activities Scheduling in Primavera P6	696
0732B&CE-273	Perform road Project Resources Costing &Planning in Primavera P6	699
0732B&CE-274	Manage construction Project in Primavera P6	702
0732B&CE-275	Identify Project Risk and Consequences on Project life cycle	705
0732B&CE-276	Perform Evaluation to assess the severity of Risk and formulate the strategy to manage the risk	707
11.28. Transportation Engineering-II		709
0732B&CE-277	Plan Route Alignment of Highway	709
0732B&CE-278	Design Highway Geometrics	710
0732B&CE-279	Perform tests on stone metal for pavement construction.....	712
0732B&CE-280	Perform tests on bitumen	713
0732B&CE-281	Prepare drawings of flexible/rigid pavement	716
0732B&CE-282	Plan highway drainage	718
0732B&CE-283	Develop maintenance plan for roads	718



National Competency Standards Level-5 for “Civil Technology”



11.29. Irrigation Engineering	720
0732B&CE-284 Produce sketches of canals and head works	720
0732B&CE-285 Design Canals	724
0732B&CE-286 Produce sketches of Hydraulic structures.....	727
11.30. R.C.C. Design.....	729
0732B&CE-287 Design and Draw Reinforcement for Beams	729
0732B&CE-288 Design and Draw Reinforcement for Slabs	732
0732B&CE-289 Design and Draw Reinforcement for Columns	734
0732B&CE-290 Design and Draw Reinforcement for Footings	736
0732B&CE-291 Design and Draw Reinforcement for Stairs.....	738
11.31. Civil Engineering Project	740
0732B&CE-292 Develop Project for construction of RCC framed Structure Class Room.....	740
0732B&CE-293 Develop Project plan for construction of RCC OHR of 10000 gal (UK) capacity	743
0732B&CE-294 Develop Project plan for construction of Water Supply Scheme.	746
0732B&CE-295 Develop Project plan for construction of sewerage scheme	749
0732B&CE-296 Develop Project plan for construction of Highway.....	752
0732B&CE-297 Develop Project plan for construction of Irrigation Canal	755
11.32. Entrepreneurial Skills.....	758
0732B&CE-298 Investigate micro business opportunities	758
0732B&CE-299 Develop a micro business proposal	761
0732B&CE-300 Develop a marketing plan	763
0732B&CE-301 Develop and review a business plan.	765
0732B&CE-302 Organise finances for the micro business	767
0732B&CE-303 Manage human resources.....	769
0732B&CE-304 Market products and services	772
0732B&CE-305 Monitor and review business performance.....	776
0732B&CE-306 Negotiate for resolving business issues	778
List of Tools, Equipment and Consumable	780



1. Introduction

Civil engineering is considered as the first discipline of the various branches of engineering after military engineering, and includes the designing, planning, construction, and maintenance of the infrastructure. The works include roads, bridges, buildings, dams, canals, water supply and numerous other facilities that affect the life of human beings. Civil engineering is intimately associated with the private and public sectors, including the individual homeowners and international enterprises. It is one of the oldest engineering professions, and ancient engineering achievements due to civil engineering include the pyramids of Egypt and road systems developed by the Romans.

Civil engineering has a significant role in the life of every human being, though one may not truly sense its importance in our daily routine. The function of civil engineering commences with the start of the day when we take a shower, since the water is delivered through a water supply system including a well-designed network of pipes, water treatment plant and other numerous associated services. The network of roads on which we drive while proceeding to school or work, the huge structural bridges we come across and the tall buildings where we work, all have been designed and constructed by civil engineers. Even the benefits of electricity we use are available to us through the contribution of civil engineers who constructed the towers for the transmission lines. In fact, no sphere of life may be identified that does not include the contribution of civil engineering. Thus, the importance of civil engineering may be determined according to its usefulness in our daily life. Therefore, industry expectations for skilled workforce are also dynamic which can only be managed through setting relevant competency standards in collaboration with the leading industries. Being cognizant of this fact, National Vocational & Technical Training Commission (NAVTC) developed competency standards for Civil Technology under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading Construction, Real States & Builder industry of the country.

2. Purpose of the Qualification

The purpose of this qualifications is to set high professional standards for civil technology sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of the trainees
- Provide opportunities for recognition of skills attained through non-formal or informal pathways
- Improve the quality and effectiveness of training and assessment for civil technology industry
- Enable the existing workforce to capacitate themselves in new technologies and methods

3. Core competencies of the Qualification



National Competency Standards Level-5 for “Civil Technology”



The proposed curriculum is composed of **306 competencies** that will be covered in **3600 Learning hours**. Duration of the course is proposed to be Three years. The total weightage for technical competencies is 3600 hours. A total of 1200 hours have been reserved for allied subjects i.e. Islamic studies, English, Mathematics, Physics and Chemistry.

The details of technical modules are given as under:

Level - 2 = 6 months. (Single Semester)

Level - 3 = 6 months. (Single Semester)

Level - 4 = 1 Year. (Two Semesters)

Level - 5 = 1 Year. (Two Semesters)

The overall distribution of contact hours and Credit Hours is given below:

Total.	3600 hours. & 360 Credits
Theory.	976 hours (27.11 %)
Practical.	2624 hours (72.89 %)

The distribution of contact hours and credit hours in each level is given below:

Level - 2 = 6 months (16 weeks)

Total.	592 hours. & 59.2 Credits
Theory.	128 hours (22 %)
Practical.	464 hours (78 %)

Level - 3 = 6 months (16 weeks)

Total.	608 hours. & 60.8 Credits
Theory.	128 hours (21 %)
Practical.	480 hours (79 %)

Level - 4 = 1 Year (16 weeks + 16 Weeks)

Total.	1200 hours. & 120 Credits
Theory.	240 hours (20 %)
Practical.	960 hours (80 %)

Level - 5 = 1 Year (16 weeks + 16 Weeks)

Total.	1200 hours. & 120 Credits
Theory.	480 hours (40 %)
Practical.	720 hours (60 %)



National Competency Standards Level-5 for “Civil Technology”



First Semester-National Qualification Certificate in Civil Technology Level 2

S#	Competency Standard	Category	Level	Theory	Practical	Total	Credit Hour
11.01 Basic Engineering Surveying				32	160	192	19.2
0732B&CE001	Perform Chain Survey	Core	2	4	9	13	1.3
0732B&CE002	Perform Compass Traversing	Core	2	4	15	19	1.9
0732B&CE003	Carry out Plane Table Survey	Core	2	4	12	16	1.6
0732B&CE004	Perform Levelling	Core	2	4	27	31	3.1
0732B&CE005	Perform Reciprocal Levelling	Core	2	2	21	23	2.3
0732B&CE006	Perform Long & Cross Sectioning	Core	2	2	22	24	2.4
0732B&CE007	Perform Tacheometry	Core	2	2	9	11	1.1
0732B&CE008	Perform Contouring	Core	2	2	18	20	2
0732B&CE009	Perform Hydrographic Survey	Core	2	6	15	21	2.1
0732B&CE010	Compute Volume by Contouring	Core	2	2	12	14	1.4
11.02 Civil Engineering Drawing				32	160	192	19.2
0732B&CE011	Produce Templates, Title Block/ Strip & Draw Lines	Core	2	2	9	11	1.1
0732B&CE012	Perform Lettering and Printing on Sheet.	Core	2	2	9	11	1.1
0732B&CE013	Construct Scales for Drawing	Core	2	2	9	11	1.1
0732B&CE014	Construct Geometrical Figures	Core	2	2	9	11	1.1
0732B&CE015	Produce Orthographic Projections	Core	2	2	9	11	1.1
0732B&CE016	Perform Sectioning	Core	2	2	9	11	1.1
0732B&CE017	Perform Dimensioning On Drawings	Core	2	2	9	11	1.1
0732B&CE018	Produce Pictorial Drawings	Core	2	2	9	11	1.1
0732B&CE019	Develop Symbols of Engineering Drawings	Core	2	2	9	11	1.1
0732B&CE020	Produce Cross Section of Wall.	Core	2	2	9	11	1.1
0732B&CE021	Develop Building Drawings	Core	2	6	34	40	4
0732B&CE022	Perform House Planning	Core	2	2	9	11	1.1
0732B&CE023	Produce Layout Plans for Building Services.	Core	2	2	18	20	2
0732B&CE024	Produce Drawings of Sanitary Structures	Core	2	2	9	11	1.1



National Competency Standards Level-5 for “Civil Technology”



	11.03 Building Materials			32	48	80	8
0732B&CE025	Identify bricks	Core	2	4	6	10	1
0732B&CE026	Dress stone for masonry	Core	2	4	6	10	1
0732B&CE027	Prepare slaked lime	Core	2	2	2	4	0.5
0732B&CE028	Identify and store cement for construction	Core	2	4	6	10	1
0732B&CE029	Select sand for construction	Core	2	2	3	5	0.5
0732B&CE030	Identify ferrous and non-ferrous metals	Core	2	2	6	8	1
0732B&CE031	Identify advanced construction materials	Core	2	4	9	13	1
0732B&CE032	Work Safely in Construction Industry	Generic	2	4	1	5	0.5
0732B&CE033	Interpret Simple Building Plans	Core	2	2	3	5	0.5
0732B&CE034	Read and Interpret plans and Specifications	Core	2	2	3	5	0.5
0732B&CE035	Apply power and hand tools in construction.	Core	2	2	3	5	0.5
	11.04 Workshop Practice (Wood Work)			16	48	64	6.4
0732B&CE036	Carry out OH & S requirement in workshop	Generic	2	2	3	5	0.5
0732B&CE037	Determine properties and types of locally manufactured timber	Generic	2	2	6	8	0.8
0732B&CE038	Sharpen carpentry tools	Core	2	1	6	7	0.7
0732B&CE039	Apply hand tools	Core	2	1	6	7	0.7
0732B&CE040	Perform wooden joinery work	Core	2	2	6	8	0.8
0732B&CE041	Apply fastenings	Core	2	1	3	4	0.4
0732B&CE042	Apply traditional spirits polishing techniques	Core	2	2	3	5	0.5
0732B&CE043	Apply portable power tools	Core	2	1	3	4	0.4
0732B&CE044	Make simple calculations of timber	Core	2	2	6	8	0.8
0732B&CE045	Construct a basic timber product	Core	2	2	6	8	0.8
	11.05 Workshop Practice (Electrical Wiring)			16	48	64	6.4
0732B&CE046	Carry out OH & S requirement in workshop	Generic	2	2	6	8	0.8



National Competency Standards Level-5 for “Civil Technology”



0732B&CE047	Maintain safety	Generic	2	2	6	8	0.8
0732B&CE048	Perform electrical wiring	Core	2	3	9	12	1.2
0732B&CE049	Install electrical system	Core	2	3	9	12	1.2
0732B&CE050	Construct Circuits	Core	2	2	6	8	0.8
0732B&CE051	Measure properties of electricity	Core	2	2	6	8	0.8
0732B&CE052	Perform electrical wiring of a single room	Core	2	2	6	8	0.8

Second Semester-National Qualification Certificate in Civil Technology Level 3

S#	Competency Standard	Category	Level	Theory	Practical	Total	Credit Hour
	11.06 Advanced Surveying			48	192	240	24
0732B&CE053	Measure Angles by Theodolite	Core	3	4	18	22	2.2
0732B&CE054	Perform Trigonometric Levelling by Theodolite	Core	3	3	9	12	1.2
0732B&CE055	Perform Traversing by Theodolite	Core	3	4	15	19	1.9
0732B&CE056	Set Out Horizontal Curves by Theodolite	Core	3	4	18	22	2.2
0732B&CE057	Set out Vertical Curves by Theodolite	Core	3	3	9	12	1.2
0732B&CE058	Carry out Triangulation by Theodolite	Core	3	3	21	24	2.4
0732B&CE059	Perform Temporary Adjustment of Total Station	Core	3	4	9	13	1.3
0732B&CE060	Measure Distance by Total Station	Core	3	4	12	16	1.6
0732B&CE061	Measure Angles by Total Station	Core	3	4	18	22	2.2
0732B&CE062	Measure Area by Total Station	Core	3	3	18	21	2.1
0732B&CE063	Set out Curves by Total Station	Core	3	4	9	13	1.3
0732B&CE064	Perform Integration of GPS	Core	3	2	6	8	0.8
0732B&CE065	Measure Co-ordinates by GPS	Core	3	2	6	8	0.8
0732B&CE066	Set out Civil Engineering Structures by GPS	Core	3	4	24	28	2.8
	11.07 AutoCAD			32	128	160	16
0732B&CE067	Perform Basic Computer Operations	Core	3	3	6	9	0.9



National Competency Standards Level-5 for “Civil Technology”



0732B&CE068	Perform Drafting Settings and Formatting	Core	3	2	6	8	0.8
0732B&CE069	Perform Dimensioning, Lettering & Plotting	Core	3	2	6	8	0.8
0732B&CE070	Develop 2d Drawings of Structures	Core	3	3	15	18	1.8
0732B&CE071	Produce Drawing of Framed Structure Building	Core	3	3	18	21	2.1
0732B&CE072	Develop Sectioning Drawing for foundations	Core	3	3	18	21	2.1
0732B&CE073	Develop Drawings for Doors & Windows	Core	3	2	9	11	1.1
0732B&CE074	Produce Drawings of Stairs and Stair Cases	Core	3	2	9	11	1.1
0732B&CE075	Produce Drawings of Water Tanks	Core	3	3	18	21	2.1
0732B&CE076	Produce Drawings Of Cross Drainage Works	Core	3	2	6	8	0.8
0732B&CE077	Develop 3d Drawings	Core	3	4	6	10	1
0732B&CE078	Produce Civil Technology Drawings	Core	3	3	11	14	1.4
	11.08 Construction I			16	112	128	12.8
0732B&CE079	Perform Simple Levelling	Core	2	0.5	3	3.5	0.35
0732B&CE080	Lay out Building plans	Core	2	0.5	5	5.5	0.55
0732B&CE081	Carryout excavation and install supports	Core	2	1	5	6	0.6
0732B&CE082	Place Concrete in Foundations	Core	2	0.5	3	3.5	0.35
0732B&CE083	Prepare for construction Process (Brick/ block laying)	Core	3	0.5	6	6.5	0.65
0732B&CE084	Mix Cementitious materials (Mortar & Concrete)	Core	3	1	3	4	0.4
0732B&CE085	Install flashing and damp proof course	Core	3	1	3	4	0.4
0732B&CE086	Carry out brick work	Core	3	0.5	6	6.5	0.65
0732B&CE087	Construct Cavity Wall	Core	3	0.5	6	6.5	0.65
0732B&CE088	Construct Curved Wall	Core	3	1	6	7	0.7
0732B&CE089	Construct Masonry arches (semi-circular and segmental)	Core	3	1	6	7	0.7
0732B&CE090	Construct Scaffolding	Core	3	0.5	6	6.5	0.65



National Competency Standards Level-5 for “Civil Technology”



0732B&CE091	Install doors and window frames	Core	3	0.5	6	6.5	0.65
0732B&CE092	Prepare Surface and fix tiles	Core	3	1	3	4	0.4
0732B&CE093	Prepare Surface for Painting	Core	3	0.5	6	6.5	0.65
0732B&CE094	Paint by spray, brush and roller	Core	3	0.5	6	6.5	0.65
0732B&CE095	Apply stains and clear timber finishes	Core	3	0.5	6	6.5	0.65
0732B&CE096	Prepare site layout of civil engineering projects	Core	3	0.5	6	6.5	0.65
0732B&CE097	Construct masonry steps and stairs	Core	3	1	6	7	0.7
0732B&CE098	Install stairs	Core	3	1	9	10	1
0732B&CE099	Prepare for solid dry wall plastering	Core	3	1	3	4	0.4
0732B&CE100	Apply plaster	Core	3	1	3	4	0.4
	11.09 Plumbing			16	32	48	4.8
0732B&CE101	Identify plumbing tools & equipment	Core	3	4	2	6	0.6
0732B&CE102	Perform cutting, threading & reaming	Core	3	2	4	6	0.6
0732B&CE103	Make water connection	Core	3	1	4	5	0.5
0732B&CE104	Layout for domestic water supply	Core	3	1	4	5	0.5
0732B&CE105	Join pipes & fittings	Core	3	3	5	8	0.8
0732B&CE106	Install plumbing fixtures	Core	3	2	4	6	0.6
0732B&CE107	Install & repair water pumps	Core	3	1	4	5	0.5
0732B&CE108	Install turbine pumps	Core	3	2	5	7	0.7
	11.10 Digital Skills	32		16	16	32	3.2
0732B&CE109	Install computer operating systems and hardware	Generic	3	1	1	2	0.2
0732B&CE110	Operate digital media technology	Generic	3	0.5	0.5	1	0.1
0732B&CE111	Perform computer operations	Generic	3	1	1	2	0.2
0732B&CE112	Use computer applications	Generic	3	0.5	0.5	1	0.1
0732B&CE113	Create user documentation	Generic	3	0.5	0.5	1	0.1
0732B&CE114	Create technical documentation	Generic	3	0.5	0.5	1	0.1
0732B&CE115	Create basic databases	Generic	3	0.5	0.5	1	0.1
0732B&CE116	Use social media tools for collaboration and engagement	Generic	3	1	1	2	0.2
0732B&CE117	E-Commerce- SEO (Search Engine Optimization)	Generic	3	0.5	0.5	1	0.1
0732B&CE118	E-Commerce- SCM (Supply Chain Management)	Generic	3	0.5	0.5	1	0.1



National Competency Standards Level-5 for “Civil Technology”



0732B&CE119	E-Commerce- Social Media Marketing	Generic	3	0.5	0.5	1	0.1
0732B&CE120	Use digital devices	Generic	3	1	1	2	0.2
0732B&CE121	Operate word-processing applications	Generic	3	1	1	2	0.2
0732B&CE122	Operate spreadsheet applications	Generic	3	1	1	2	0.2
0732B&CE123	Operate presentation packages	Generic	3	1	1	2	0.2
0732B&CE124	Perform writing and editing tasks	Generic	3	1	1	2	0.2
0732B&CE125	Write and Edit Copy	Generic	3	0.5	0.5	1	0.1
0732B&CE126	Build Java applets	Generic	3	0.5	0.5	1	0.1
0732B&CE127	Manipulate Images (Illustrator)	Generic	3	0.5	0.5	1	0.1
0732B&CE128	Manipulate Images (Photoshop)	Generic	3	0.5	0.5	1	0.1
0732B&CE129	Design simple web page layouts	Generic	3	1	1	2	0.2
0732B&CE130	Apply introductory programming techniques	Generic	3	1	1	2	0.2

3rd Semester, National Qualification Certificate in Civil Technology Level 4 Part-1

S#	Competency Standard	Category	Level	Theory	Practical	Total	Credit Hour
	11.11 Construction Techniques II			32	128	160	16
0732B&CE131	Prepare subgrade, base, and bedding course for paving	Core	4	3	10	13	1.3
0732B&CE132	Lay paving	Core	4	1	5	6	0.6
0732B&CE133	Perform concrete, tiles and mosaic flooring	Core	4	2	10	12	1.2
0732B&CE134	Perform marble/granite flooring	Core	4	1	4	5	0.5
0732B&CE135	Apply water proofing remedial processes	Core	4	2	5	7	0.7
0732B&CE136	Apply and install sealants	Core	4	1	5	6	0.6
0732B&CE137	Perform water proofing works	Core	4	2	5	7	0.7
0732B&CE138	Apply water proofing tools and equipment	Core	4	3	5	8	0.8
0732B&CE139	Perform water proofing of basements	Core	4	2	5	7	0.7



National Competency Standards Level-5 for “Civil Technology”



0732B&CE140	Apply water proofing to internal wet areas	Core	4	2	10	12	1.2
0732B&CE141	Install Physical termite barriers	Core	4	2	10	12	1.2
0732B&CE142	Erect and dismantle slip formwork	Core	4	2	10	12	1.2
0732B&CE143	Install trench support	Core	4	1	7	8	0.8
0732B&CE144	Construct underpinning	Core	4	1	4	5	0.5
0732B&CE145	Carry out reinforced concrete work	Core	4	1	4	5	0.5
0732B&CE146	Work safely on roofs	Generic	4	1	4	5	0.5
0732B&CE147	Install roof components	Core	4	1	4	5	0.5
0732B&CE148	Install roof drainage	Core	4	2	7	9	0.9
0732B&CE149	Lay roof tiles	Core	4	1	7	8	0.8
0732B&CE150	Erect roof trusses	Core	4	1	7	8	0.8
	11.12 Basic Quantity Surveying			16	176	192	19.2
0732B&CE151	Produce rough cost estimates of buildings	Core	4	1	15	16	1.6
0732B&CE152	Evaluate items of work for straight wall, T, L, H, U shaped and circular walls.	Core	4	1	12	13	1.3
0732B&CE153	Produce detailed estimate of a single storey building.	Core	4	1	15	16	1.6
0732B&CE154	Produce Annual/special repair estimates-Building and Road.	Core	4	1	12	13	1.3
0732B&CE155	Evaluate Earth work for Civil Engineering structures	Core	4	1	18	19	1.9
0732B&CE156	Produce detailed estimate of Arterial roads	Core	4	1	12	13	1.3
0732B&CE157	Produce material statements	Core	4	1	12	13	1.3
0732B&CE158	Analyze Rates of different items of work for building	Core	4	2	16	18	1.8
0732B&CE159	Produce of rough cost estimate of water supply scheme.	Core	4	2	12	14	1.4
0732B&CE160	Produce of rough cost estimate of Sewerage scheme.	Core	4	2	15	17	1.7
0732B&CE161	Evaluate Value & Standard Rent of Buildings	Core	4	1	12	13	1.3



National Competency Standards Level-5 for “Civil Technology”



0732B&CE162	Produce Detailed Estimate of Culverts	Core	4	1	13	14	1.4
0732B&CE163	Produce Detailed Estimate of Bridges.	Core	4	1	12	13	1.3
	11.13 Water Supply			16	64	80	8
0732B&CE164	Estimate demand for Water Supply	Core	4	2	12	14	1.4
0732B&CE165	Prepare sketches of aqueducts & water pipes	Core	4	2	12	14	1.4
0732B&CE166	Draw sketches of intakes	Core	4	2	7	9	0.9
0732B&CE167	Plan water treatment (Clarification)	Core	4	4	12	16	1.6
0732B&CE168	Plan water treatment (Filtration)	Core	4	4	9	13	1.3
0732B&CE169	Plan water distribution system	Core	4	2	12	14	1.4
	11.14 Strength of Materials			16	64	80	8
0732B&CE170	Locate centroid of different sections	Core	4	3	12	15	1.5
0732B&CE171	Find out moment of inertia of different sections	Core	4	3	12	15	1.5
0732B&CE172	Produce Shear Force and Bending Moment Diagrams	Core	4	4	16	20	2
0732B&CE173	Find hardness of metals	Core	4	3	12	15	1.5
0732B&CE174	Conduct Tensile Strength Test	Core	4	3	12	15	1.5
	11.15. Soft Skills			32	64	96	9.6
0732B&CE175	Develop workplace policy and procedures for sustainability	Generic	4	2	4	6	0.6
0732B&CE176	Manage meetings	Generic	4	2	4	6	0.6
0732B&CE177	Manage recruitment selection and induction processes	Generic	4	2	4	6	0.6
0732B&CE178	Manage personal work priorities and professional development	Generic	4	2	4	6	0.6
0732B&CE179	Manage workforce planning	Generic	4	2	4	6	0.6
0732B&CE180	Undertake project work	Generic	4	3	6	9	0.9
0732B&CE181	Identify and communicate trends in career development	Generic	4	2	4	6	0.6
0732B&CE182	Apply specialist interpersonal and counselling interview skills	Generic	4	2	4	6	0.6
0732B&CE183	Work safely in an office environment	Generic	4	2	4	6	0.6
0732B&CE184	Develop workplace documents	Generic	4	2	4	6	0.6



National Competency Standards Level-5 for “Civil Technology”



0732B&CE185	Prepare and implement negotiation	Generic	4	2	4	6	0.6
0732B&CE186	Maintain professionalism in the workplace	Generic	4	2	4	6	0.6
0732B&CE187	Maintain professional development and career professionalism	Generic	4	4	8	12	1.2
0732B&CE188	Organize schedules	Generic	4	3	6	9	0.9

4th Semester, National Qualification Certificate in Civil Technology Level 4 Part-2

S#	Competency Standard	Category	Level	Theory	Practical	Total	Credit Hour
	11.16 Construction Techniques III			16	64	80	8
0732B&CE189	Erect and dismantle formwork to suspended slabs, columns, beams and walls	Core	4	1	4	5	0.5
0732B&CE190	Operate elevated platforms	Core	4	1	7	8	0.8
0732B&CE191	Construct, erect and dismantle formwork for stairs and ramps	Core	4	1	4	5	0.5
0732B&CE192	Evaluate materials for multi-storey buildings	Core	4	1	4	5	0.5
0732B&CE193	Apply structural principles to the construction of large, high rise and complex buildings	Core	4	1	4	5	0.5
0732B&CE194	Install fire and smoke containment systems	Core	4	1	4	5	0.5
0732B&CE195	Inform clients about thermal performance of residential buildings	Core	4	1	4	5	0.5
0732B&CE196	Design air conditioning and ventilation system	Core	4	1	4	5	0.5
0732B&CE197	Design acoustic of an auditorium	Core	4	0.5	4	4.5	0.45
0732B&CE198	Insulate sound insulation products in building	Core	4	1	4	5	0.5
0732B&CE199	Install ceiling insulation	Core	4	1	3	4	0.4



National Competency Standards Level-5 for “Civil Technology”



0732B&CE200	Design an earthquake resistant building	Core	4	1	3	4	0.4
0732B&CE201	Coordinate maintenance and repair of buildings	Core	4	1	3	4	0.4
0732B&CE202	Assess construction faults in buildings	Core	4	1	3	4	0.4
0732B&CE203	Repair and rectify concrete	Core	4	1	3	4	0.4
0732B&CE204	Repair wall and floor tiles	Core	4	0.5	3	3.5	0.35
0732B&CE205	Apply building codes and standards to building projects	Core	4	1	3	4	0.4
	11.17 Concrete Technology			32	64	96	9.6
0732B&CE206	Test the Properties of Cement	Core	4	6	12	18	1.8
0732B&CE207	Find Out Strength of Cement	Core	4	4	9	13	1.3
0732B&CE208	Test the Properties of Aggregate	Core	4	6	12	18	1.8
0732B&CE209	Test the Properties of Fresh Concrete	Core	4	6	10	16	1.6
0732B&CE210	Destructive Tests on Hardened Concrete	Core	4	6	9	15	1.5
0732B&CE211	Perform Non-Destructive Tests on Hardened Concrete	Core	4	4	12	16	1.6
	11.18 Advanced Quantity Surveying			16	144	160	16
0732B&CE212	Produce Detailed Estimate of Water Tanks.	Core	4	2	18	20	2
0732B&CE213	Produce Detailed Estimate of Wells.	Core	4	2	18	20	2
0732B&CE214	Produce Detailed Estimate of Steel Structures	Core	4	2	18	20	2
0732B&CE215	Produce Detailed Estimate of RCC Framed Structure	Core	4	2	21	23	2.3
0732B&CE216	Produce Detailed Estimate of Building Services.	Core	4	2	12	14	1.4
0732B&CE217	Produce Detailed Estimates Using Computer Software -Excel.	Core	4	3	27	30	3
0732B&CE218	Produce Project of Road in AutoCAD Civil 3D software	Core	4	3	30	33	3.3



National Competency Standards Level-5 for “Civil Technology”



	11.19 Contract Management			32	64	96	9.6
0732B&CE219	Produce Prequalification documents and collect EOI	Core	4	6	8	14	1.4
0732B&CE220	Set Evaluation Criteria for Assessment	Core	4	3	3	6	0.6
0732B&CE221	Produce Tender Documents & Collect Proposals	Core	4	6	18	24	2.4
0732B&CE222	Perform Tender Evaluation & Award of Contract	Core	4	5	17	22	2.2
0732B&CE223	Perform Post Award Legal/ Contract Requirements and Finance	Core	4	5	5	10	1
0732B&CE224	Maintain record of Stores.	Core	4	3	4	7	0.7
0732B&CE225	Perform Variation orders, claims and Dispute Adjudication Board	Core	4	4	9	13	1.3
	11.20 Sanitary Engineering			16	64	80	8
0732B&CE226	Design sanitary sewers	Core	4	2	9	11	1.1
0732B&CE227	Design storm water sewers	Core	4	1.5	7	8.5	0.85
0732B&CE228	Layout of sewers	Core	4	2	6	8	0.8
0732B&CE229	Prepare sketches of sewer appurtenance	Core	4	2	6	8	0.8
0732B&CE230	Construct Sewers	Core	4	1.5	9	10.5	1.05
0732B&CE231	Maintain Sewers	Core	4	1.5	6	7.5	0.75
0732B&CE232	Install Sewage Pumps	Core	4	2	6	8	0.8
0732B&CE233	Produce sketches of sewage treatment plant	Core	4	1.5	9	10.5	1.05
0732B&CE234	Dispose sewage	Core	4	2	6	8	0.8
	11.21 Engineering Mechanics			16	64	80	8
0732B&CE235	Design Homogeneous Beam	Core	4	3	12	15	1.5
0732B&CE236	Determine Deflection of Beams	Core	4	2	9	11	1.1
0732B&CE237	Determine load carrying capacity of columns	Core	4	3	12	15	1.5
0732B&CE238	Evaluate Efficiency of Joints-riveted and welded	Core	4	2	9	11	1.1
0732B&CE239	Analyse forces in truss members	Core	4	3	12	15	1.5
0732B&CE240	Determine stability of retaining wall	Core	4	3	10	13	1.3



5th Semester, National Qualification Certificate in Civil Technology Level 5 Part-1

S#	Competency Standard	Category	Level	Th	Practical	Total	Credit Hour
	11.22 Transportation Engineering I			64	48	112	11.2
0732B&CE241	Develop construction plan of Tunnels	Core	5	8	3	11	1.1
0732B&CE242	Produce sketches of an airport	Core	5	8	3	11	1.1
0732B&CE243	Produce sketches of permanent Way	Core	5	12	12	24	2.4
0732B&CE244	Produce sketches of points and crossings	Core	5	12	9	21	2.1
0732B&CE245	Produce sketches of station yards and signals	Core	5	12	9	21	2.1
0732B&CE246	Produce sketches of harbour	Core	5	12	12	24	2.4
	11.23 Hydraulics Engineering			32	48	80	8
0732B&CE247	Determine Hydrostatic pressure	Core	5	16	21	37	3.7
0732B&CE248	Apply Hydro kinematic Principles	Core	5	16	27	43	4.3
	11.24 Soil Mechanics			32	48	80	8
0732B&CE249	Determine moisture content and specific gravity of soil	Core	5	4	6	10	1
0732B&CE250	Determine Atterberg's Limits	Core	5	4	6	10	1
0732B&CE251	Identify type of soil	Core	5	6	9	15	1.5
0732B&CE252	Conduct soil compaction tests	Core	5	6	9	15	1.5
0732B&CE253	Determine permeability of soil	Core	5	4	6	10	1
0732B&CE254	Investigate shear strength of soil	Core	5	4	6	10	1
0732B&CE255	Find out bearing capacity of soil	Core	5	4	6	10	1
	11.25 Bridge Engineering			32	48	80	8
0732B&CE256	Produce sketches of bridges w.r.t. functions	Core	5	6	9	15	1.5
0732B&CE257	Produce sketches of bridges w.r.t. material of construction	Core	5	6	9	15	1.5
0732B&CE258	Produce sketches of bridges w.r.t. type of super structure	Core	5	8	12	20	2
0732B&CE259	Produce sketches of bridges w.r.t. floor type	Core	5	6	9	15	1.5
0732B&CE260	Produce sketches of culverts, low level and high level causeway	Core	5	6	9	15	1.5



National Competency Standards Level-5 for “Civil Technology”



	11.26 Environmental Technology			32	48	80	8
0732B&CE261	Determine Water Pollution	Core	5	6	12	18	1.8
0732B&CE262	Evaluate Air Pollution	Core	5	6	12	18	1.8
0732B&CE263	Determine Noise Pollution	Core	5	3	5	8	0.8
0732B&CE264	Evaluate Solid Waste Pollution	Core	5	4	3	7	0.7
0732B&CE265	Adopt occupational health and safety	Generic	5	9	9	18	1.8
0732B&CE266	Respond to Natural Disaster	Core	5	4	7	11	1.1
	11.27. Construction Project Planning & Management			64	96	160	16
0732B&CE267	Develop Project Management Life Cycle	Core	5	4	6	10	1
0732B&CE268	Develop Preliminary Project Plan	Core	5	6	9	15	1.5
0732B&CE269	Develop Construction Project Plan	Core	5	6	9	15	1.5
0732B&CE270	Conduct on-site supervision of construction projects	Core	5	5	12	17	1.7
0732B&CE271	Perform Basic operation in Primavera P6	Core	5	8	12	20	2
0732B&CE272	Perform road Project Activities Scheduling in Primavera P6	Core	5	8	12	20	2
0732B&CE273	Perform road Project Resources Costing & Planning in Primavera P6	Core	5	8	12	20	2
0732B&CE274	Manage construction Project in Primavera P6	Core	5	8	12	20	2
0732B&CE275	Identify Project Risk and Consequences on Project life cycle	Core	5	5	6	11	1.1
0732B&CE276	Perform Evaluation to assess the severity of Risk and formulate the strategy to manage the risk	Core	5	6	6	12	1.2

6th Semester, National Qualification Certificate in Civil Technology Level 5 Part-2

S#	Competency Standard	Category	Level	Th	Practical	Total	Credit Hour
	11.28 Transportation Engineering I			48	48	96	9.6
0732B&CE277	Plan Route Alignment of Highway	Core	5	6	6	12	1.2
0732B&CE278	Design Highway Geometrics	Core	5	6	6	12	1.2



National Competency Standards Level-5 for “Civil Technology”



0732B&CE279	Perform tests on stone metal for pavement construction	Core	5	6	6	12	1.2
0732B&CE280	Perform tests on bitumen	Core	5	12	21	33	3.3
0732B&CE281	Prepare drawings of flexible/rigid pavement	Core	5	6	3	9	0.9
0732B&CE282	Plan highway drainage	Core	5	6	3	9	0.9
0732B&CE283	Develop maintenance plan for roads	Core	5	6	3	9	0.9
	11.29. Irrigation Engineering			64	48	112	11
0732B&CE284	Produce sketches of canals and head works	Core	5	21	18	39	3.9
0732B&CE285	Design Canals	Core	5	22	15	37	3.7
0732B&CE286	Produce sketches of Hydraulic structures	Core	5	21	15	36	3.6
	11.30. RCC Design			80	64	144	14
0732B&CE287	Design and Draw Reinforcement for Beams	Core	5	14	12	26	2.6
0732B&CE288	Design and Draw Reinforcement for Slabs	Core	5	24	16	40	4
0732B&CE289	Design and Draw Reinforcement for Columns	Core	5	19	11	30	3
0732B&CE290	Design and Draw Reinforcement for Footings	Core	5	8	10	18	1.8
0732B&CE291	Design and Draw Reinforcement for Stairs	Core	5	15	15	30	3
	11.31. Civil Engineering Project (Any one project to a group of 8 students)			0	160	160	16
0732B&CE292	Develop Project for construction of RCC framed Structure Class Room.	Core	5	0	160	160	16
0732B&CE293	Develop Project plan for construction of RCC OHR of 10000 gal (UK) capacity.	Core	5	0	160	160	16
0732B&CE294	Develop Project plan for construction of Water Supply Scheme.	Core	5	0	160	160	16
0732B&CE295	Develop Project plan for construction of sewerage scheme	Core	5	0	160	160	16



National Competency Standards Level-5 for “Civil Technology”



0732B&CE296	Develop Project plan for construction of Highway	Core	5	0	160	160	16
0732B&CE297	Develop Project plan for construction of Irrigation Canal	Core	5	0	160	160	16
	11.32. Entrepreneurial Skills			32	64	96	9.6
0732B&CE298	Investigate micro business opportunities	Generic	5	3	6	9	0.9
0732B&CE299	Develop a micro business proposal	Generic	5	4	8	12	1.2
0732B&CE300	Develop a marketing plan	Generic	5	3	8	11	1.1
0732B&CE301	Develop and review a business plan.	Generic	5	4	8	12	1.2
0732B&CE302	Organize finances for the micro business	Generic	5	4	8	12	1.2
0732B&CE303	Manage human resources	Generic	5	3	6	9	0.9
0732B&CE304	Market products and services	Generic	5	4	8	12	1.2
0732B&CE305	Monitor and review business performance	Generic	5	4	8	12	1.2
0732B&CE306	Negotiate for resolving business issues	Generic	5	3	4	7	0.7



National Competency Standards Level-5 for “Civil Technology”



4. Date of Validation

The level 5 of National DAE qualification on Civil Technology has been validated by the Qualifications Development Committee (QDC) members on 27-29 May 2019 and will remain in currency until May, 2022

5. Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCED codes for these qualifications are assigned as follows:

ISCED Classification for Civil Technology level-5	
Code	Description
000000000	1 st Semester National Qualification Certificate of level-2, in “Civil Technology”
000000000	2 nd Semester National Qualification Certificate of level-3, in “Civil Technology”
000000000	3 rd Semester National Qualification Certificate of level-4 Part-I, in “Civil Technology”
000000000	4 th Semester National Qualification Certificate of level-4 Part-II, in “Civil Technology”
000000000	5 th Semester National Qualification Certificate of level-5 Part-I, in “Civil Technology”
000000000	6 th Semester National Qualification Certificate of level-5 Part-II, in “Civil Technology”



National Competency Standards Level-5 for “Civil Technology”



6. Members of Qualifications Development Committee

The following members participated in the qualification's development and validation of these qualifications:

S#	Name	Designation	Organization
1	Engr. Azhar Iqbal Shad	Chief Instructor (Civil)	GCT Raiwind Road, LHR
2	Engr. Mazhar Abbas Naqvi	Principal	GSTC, Faisalabad
3	Engr. Naveed Ahmad Ajmal	Sr. Instructor (Civil)	GCT Bahalpur
4	Imtiaz Ahmad Awan	Sr. Instructor (Civil)	GCT Rasul (M.B.Din)
5	Muhammad Amjad Rafique	Sr. Instructor (Civil)	GCT Rasul (M.B.Din)
6	Engr. Zuneera Ashfaq	Asstt Director	PITAC Lahore
7	Engr. Rehan Younis	Asstt Director	FWO- Rawalpindi
8	Engr. Mohsin Jahanzeb	Instructor (Civil)	GSTC, Faisalabad
9	Muhammad Asad Mahmood	Contractor	G.Five Construction Co. Faisal Abad
10	Engr. Norheen Amina	Consultant	Allied Engg. Services Lahore
11	Hira Ishtiaq	Coordinator Engr.	Allied Engg. Services Lahore
12	Engr. Hafsa Khalid	Project Manager	ANS Associates Lahore
13	Engr. Habiba Mohsin	Project Manager	Jers Engg. Co. Lahore
14	Mian Muhammad Naeem	Consultant Engr.	Mian Associates Lahore
15	Engr. Rana Haroon Mujahid	SDO, Bridges & Roads	C&W Faisalabad
16	Bushra Asghar	Instructor	GCT (w) Lahore
17	Engr. Inayat ur Rehman	DACUM, Facilitator	Peshawar
18	Muhammad Ishaq	QDC Coordinator	NAVTTC, Islamabad

7. Members of Qualifications Validation Committee

The following members participated in the qualification development and validation of these qualifications:

S#	Name	Designation	Organization
1	Engr. Azhar Iqbal Shad	Chief Instructor (Civil)	GCT Raiwind Road, LHR
2	Engr. Mazhar Abbas Naqvi	Principal	GSTC, Faisalabad
3	Mr. Imtiaz Ahmad Awan	Sr. Instructor (Civil)	GCT Rasul (M.B.Din)
4	Mr. Tariq Ali	A / Professor (Civil)	GPI Batkhela KP-TEVTA
5	Mr. Fida Hussain Mirjat	Principal	GMI Matli Hyderabad
5	Mr. Muhammad Khurram Murad	DCE PBTE	Lahore
6	Engr. Inayat ur Rehman	DACUM Facilitator	Ex. KP-TEVTA
7	Mr. Sikander Masood	Director SS & C.	NAVTTC Islamabad



National Competency Standards Level-5 for “Civil Technology”



8. Entry Requirements

The entry for D.A. E National Certificate level 5, in Civil Technology are

1. A person having National Vocational Certificate level 4, in Civil Technology.
2. A person having Matric certificate with Science subjects

9. Proposed Scheme of Studies

1st Semester (000000000) National Qualification Certificate in “Civil Technology” level-2,

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Basic Engineering Surveying	Technical	32	160	192	19.2	2	10	12
000000000	Civil Engineering Drawing	Technical	32	160	192	19.2	2	10	12
000000000	Building Materials	Technical	32	48	80	8	2	3	05
000000000	Workshop Practice-I (Wood Working)	Technical	16	48	64	6.4	1	3	4
000000000	Workshop Practice-II (Electrical Wiring)	Technical	16	48	64	6.4	1	3	4
000000000		Allied							
000000000		Allied							
Total			128	464	592	59.2	8	29	37

2nd Semester (000000000) National Qualification Certificate in “Civil Technology” level-3

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Advanced Surveying	Technical	48	192	240	24	3	12	15
000000000	AutoCAD	Technical	32	128	160	16	2	8	10
000000000	Construction Techniques I	Technical	16	112	128	12.8	1	7	8
000000000	Plumbing	Technical	16	32	48	4.8	1	2	3
000000000	Digital Skills	Technical	16	16	32	3.2	1	1	2
000000000		Allied							
000000000		Allied							
Total			128	480	608	60.8	8	30	38

3rd Semester (000000000) National Qualification Certificate in “Civil Technology” level-4, Part-1

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Construction Techniques II	Technical	32	128	160	16	2	8	10
000000000	Basic Quantity Surveying	Technical	16	176	192	19.2	1	11	12



National Competency Standards Level-5 for “Civil Technology”



000000000	Water Supply	Technical	16	64	80	8	1	4	5
000000000	Strength of Materials	Technical	16	64	80	8	1	4	5
000000000	Soft Skills	Technical	32	64	96	9.6	2	4	6
000000000		Allied							
000000000		Allied							
Total			112	496	608	60.8	7	31	38

4th Semester (000000000) National Qualification Certificate in “Civil Technology” level-4, Part-2

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Construction Techniques III	Technical	16	64	80	8	1	4	5
000000000	Concrete Technology	Technical	32	64	96	9.6	2	4	6
000000000	Advanced Quantity Surveying	Technical	16	144	160	16	1	9	10
000000000	Contract Management	Technical	32	64	96	9.6	2	4	6
000000000	Sanitary Engineering	Technical	16	64	80	8	1	4	5
000000000	Engineering Mechanics	Technical	16	64	80	8	1	4	5
000000000		Allied							
000000000		Allied							
Total			128	464	592	59.2	8	29	37

5th Semester (000000000) National Qualification Certificate in “Civil Technology” level-5, Part-1

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Transportation Engineering-I	Technical	64	48	112	11.2	4	3	7
000000000	Hydraulics Engineering	Technical	32	48	80	8	2	3	5
000000000	Soil Mechanics	Technical	32	48	80	8	2	3	5
000000000	Bridge Engineering	Technical	32	48	80	8	2	3	5
000000000	Environmental Technology	Technical	32	48	80	8	2	3	5
000000000	Construction Project Planning and Management	Technical	64	96	160	16	4	6	10
000000000		Allied							
000000000		Allied							
Total			256	336	592	59.2	16	21	37

6th Semester (000000000) National Qualification Certificate in “Civil Technology” level-5, Part-2

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
000000000	Transportation Engineering-II	Technical	48	48	96	9.6	3	3	6



National Competency Standards Level-5 for “Civil Technology”



000000000	Irrigation Engineering	Technical	64	48	112	11.2	4	3	7
000000000	R.C.C. Design	Technical	80	64	144	14.4	5	4	9
000000000	Civil Engineering Project	Technical	0	160	160	16	0	10	10
000000000	Entrepreneurial Skill	Technical	32	64	96	9.6	2	4	6
000000000		Allied							
000000000		Allied							
Total			224	384	608	60.8	14	24	38

9. A- Occupation Packaging of Civil Technology

S.#	Name of Occupation	Level	Digital Skills	Soft Skills	Technical Skills
1.	Civil Surveyor	3	0732B&CE- 109 to 130	0732B&C E-175 to 188	0732B&CE-1 to 21, 53 to 66
2.	Draftsman	3	0732B&CE-109 to 130	0732B&C E-175 to 188	0732B&CE-11 to 24, 67 to 78
3.	Quantity Surveyor	5	0732B&CE- 109 to 130	0732B&C E-175 to 188	0732B&CE-6, 8, 10, 11 to 25, 67 to 78, 151 to 169, 206 to 218, 219 to 234, 241 to 246, 256 to 260, 277 to 286
4.	Quantity Surveyor after Draftsman	5	-----	-----	0732B&CE-6, 8, 10, 25 to 35, 151 to 169, 206 to 218, 219 to 234, 241 to 246, 256 to 260, 277 to 286
5.	Materials Technician	5	0732B&CE- 109 to 130	0732B&C E-175 to 188	0732B&CE-25, 173, 174, 206 to 211, 249 to 255, 261 to 265, 279, 280.
6.	Construction Quality control Supervisor	5	0732B&CE-109 to 130	0732B&C E-175 to 188	0732B&CE-1 to 21, 25 to 35, 53 to 66, 173, 174, 206 to 211, 249 to 255, 261 to 265, 267 to 274, 279, 280
7.	Mason	2	-----	-----	0732B&CE-25 to 35, 79 to 100, 131 to 150, 189 to 194, 199, 203, 204.
8.	Plumber	2	-----	---	0732B&CE-101 to 108, 164, 228, 230, 231
9.	Domestic Electrician	2	-----	-----	0732B&CE-46 to 52



9. B- Qualification Packaging of Civil Technology

S.#	Name of Qualification	Level	Digital Skills	Soft Skills	Technical Skills
1	Site supervisor	4	0732B &CE- 109 to 130	0732B &CE- 175 to 188	0732B&CE-1 to 24, 25 to 35, 36 to 45, 46 to 52, 53 to 66, 67 to 78, 79 to 100, 101 to 108, 131 to 150, 164 to 169, 189 to 205, 206 to 209, 226 to 234, 241 to 246, 256 to 260, 277 to 286

10. Detail of Qualifications and its Competency Standards Level Wise

10. A. National Qualification Certificate in Civil Technology Level 2

10.1. Basic Civil Surveying

0732B&CE-1 . Perform Chain Survey

Overview: This competency standard covers the skills and knowledge required to perform chainage offset and perform chain traversing survey by using the Engineer, meter chain and other different type of chains.

Competency Units	Performance Criteria
CU1. Measure a Line	P1. Identify appropriate chain to be used for chainage P2. Perform ranging of line by using ranging rods P3. Unfold chain to record chainage by identifying talley P4. Fold chain properly according to standard procedure
CU2. Perform Chain survey	P1. Select appropriate chain and ranging rods for chain survey P2. Mark station points which would cover area to be surveyed P3. Perform ranging of every line to be chainaged P4. Record chainage of every line of traverse. P5. Identify cross staff to take normal offsets P6. Record offsets of required points P7. Prepare map of area

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



- K1. Explain Chain Survey, their specifications and its measurement.
- K2. Explain cross staff with its types.
- K3. Explain Compass, its parts, measure bearing
- K4. Prepare Traverse sheet and calculate areas.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout by chain survey
- Taking offsets by cross staff
- Calculate area by chain survey
- Fold and unfold the chain.
- Run a traverse and calculate its area

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Measuring scale,
6. Drawing sheet,
7. Measuring Tape,
8. Compass,
9. Chain (Engineering, Gunter & Metric)
10. Cross Staff
11. Tripod
12. Ranging Rods
13. Pegs
14. Arrows
15. White Chalk/powder
16. Scotch Tape



0732B&CE-2 . Perform Compass Traversing

Overview: This competency standard covers the skills and knowledge required to perform chainage offset and perform compass traversing survey by using the magnetic compass and different type of chains.

Competency Units	Performance Criteria
CU-1. Read Bearing by Compass	P1. Identify compass and tripod stand to read bearing of line P2. Adjust compass on initial point of line by fixing and levelling of compass on tripod P3. Record bearing of line by sighting final point of line P4. Repeat procedure for back bearing by shifting compass at final point
CU-2 Perform Traversing by Compass	P1. Identify compass and tripod stand to read bearing of line P2. Mark station points which would cover area to be surveyed P3. Record bearing of each line of traverse in terms of fore bearing and back bearing P4. Measure distance of each line by chain or tape P5. Compile data of traverse in tabular form P6. Check for local attraction in readings of bearings P7. Apply correction for any error in readings of bearings P8. Plot traverse on drawing sheet

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain Chain Surrey, their specifications and its measurement.
- K2. Explain Compass, its parts, measure bearing
- K3. Explain traversing and types of traverse
- K4. Prepare Traverse sheet and calculate areas.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Measure distances between stations with Chain
- Prepare traverse by compass
- Focus the prism of compass
- Take and measure the bearings
- Plot the traverse and calculate area



TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Measuring scale,
6. Drawing sheet,
7. Measuring Tape,
8. Compass,
9. Chain (Engineering, Gunter & Metric)
10. Cross Staff
11. Tripod
12. Ranging Rods
13. Pegs
14. Arrows
15. White Chalk
16. Scotch Tape



0732B&CE-3 . Carry out Plane Table Survey

Overview: This competency standard covers the skills and knowledge required to perform plane Table Survey by Orientation, Radiation and intersection Method by using the plane table u-frame, plumb bob, Alidade, telescopic Alidade and Trough compass

Competency Units	Performance Criteria
CU1. Carry out Plane Table Survey	P1. Identify the instruments used in plane table surveying P2. Fix the table on tripod at given station point by using instrument P3. Check leveling & centering of the table with the help of plumb bob P4. Fix Drawing Sheet & mark North by trough compass P5. Sight the objects by sight vane and measure distance P6. Show the conventional symbols of objects on map
CU2. Carry out Plane Table Survey (By Radiation)	P1. Identify the instruments used in plane table surveying P2. Adjust the table on tripod at suitable point from where all objects could be covered P3. Fix Drawing Sheet & Mark North by trough compass P4. Sight the objects by sight vane and measure distance P5. Draw traverse by scale with Radiation P6. Show conventional symbols of objects on map
CU3. Carry out Plane Table Survey (By Intersection)	P1. Identify the instruments used in plane table surveying P2. Mark base line which can be used for sighting the points from initial and final point of line P3. Adjust the table on initial point of base line P4. Fix Drawing Sheet & Mark North by trough compass P5. Sight the objects by sight vane and measure distance P6. Adjust the table on final point of base line P7. Sight the objects by sight vane and measure distance P8. Draw traverse by scale with Intersection P9. Show conventional symbols of objects on map

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

K1. Explain Plane Table Survey with its different methods.



National Competency Standards Level-5 for “Civil Technology”



- K2. Explain base and check line in the Traverse.
- K3. Explain trough Compass, alidade, u-frame and plumb bob functions.
- K4. Explain Traverse Method and calculate areas.
- K5. Explain different conventional symbols with its importance.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan the work station
- Take centering by u-frame
- Draw the rays with Alidade
- Check base line.
- Fold and unfold the tripod and u-frame.
- Prepare traverse by radiation, orientation and intersection method.
- Fix the plumb bob with tripod.
- Sighting by sight vane.
- Plot the traverse and calculate area

TOOLS AND EQUIPMENT'S

1. Calculator,
2. Measuring scale,
3. Drawing sheet,
4. Measuring Tape,
5. Trough Compass,
6. Tripod
7. Ranging Rods
8. Pegs
9. Arrows
10. Pencil
11. Eraser
12. White chalk
13. Plane Table with clamp
14. Plubing Fork (U-Frame)
15. Scotch Tape
16. Telescopic Alidade
17. Laser level



0732B&CE-4 . Perform Levelling

Overview: This competency standard covers the skills and knowledge required to perform Levelling, by using the different type of leveling instruments, Staff and chains.

Competency Units	Performance Criteria
CU1. Determine height of instrument in Levelling	P1. Identify leveling instrument and leveling staffs P2. Select appropriate level and staff for leveling P3. Identify temporary Bench Mark P4. Take B.S on Bench mark P5. Determine height of instrument
CU2. Perform Simple Levelling	P1. Select appropriate level and staff P2. Perform temporary adjustment of level P3. Observe staff reading on given Bench Mark P4. Record BS & FS in field book P5. Calculate Reduced Level
CU3. Perform Differential Levelling	P1. Select appropriate level and staff P2. Perform temporary Adjustment of level P3. Take readings on given Bench Mark with staff P4. Record BS, IS & FS in Field Book P5. Calculate Reduced Levels P6. Apply arithmetic check
CU4. Carry out Fly Leveling	P1. Select appropriate level and staff P2. Perform temporary Adjustment of level P3. Take readings on given Bench Mark with staff P4. Record BS,& FS in Field Book P5. Calculate Reduced Levels P6. Apply arithmetic check

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Define leveling and describe the purpose of leveling.
- K2 Define technical terms, level line, level surface, datum, datum line, horizontal plane, vertical plane, Horizontal line, vertical line, level line, line of collimation, Axis of telescope, bubble tube axes, back sight, foresight, Intermediate sight, change point, station point.
- K3 Describe bench mark and its types Identify the parts and function of various types of tilting levels and Auto set level
- K4 Explain with sketches leveling staves and their uses.
- K5 List the steps involved in performing temporary adjustment of a level.



National Competency Standards Level-5 for “Civil Technology”



- K6 Compute the reduced levels by rise & fall method and height of instrument method and recording the same on level book.
- K7 Solve numerical problem on reciprocal leveling
- K8 Describe the procedures for taking readings to reciprocal leveling precise leveling etc.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Set out Leveling points Level from existing control stations.
- Carry out Arithmetic checks by formula
- Undertake setting out in the field using level,
- Taking offsets by cross staff
- Fold and unfold the tripod
- Focus the level
- Took and measure the readings BS, IS & FS

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Field Book
4. Sharpner,
5. Calculator,
6. Measuring scale,
7. Measuring steelTape,
8. Level (Auto Set, Dumpy or Tilting)
9. Tripod
10. Ranging Rods
11. Pegs
12. Levelling staff (Metric or FPS)
13. Thermometer
14. Ball pein hammer



0732B&CE-5 . Perform Reciprocal Levelling

Overview: This competency standard covers the skills and knowledge required to determining the elevations, leveling between two widely separated points in which observations are made in both directions to eliminate the effects of atmospheric refraction and the curvature of the earth.

Competency Units	Performance Criteria
CU1. Carry out Reciprocal leveling	P1. Select appropriate level and staff P2. Mark two reciprocal points P3. Perform temporary Adjustment near X point. P4. Observe staff readings on both points X and Y P5. Perform temporary Adjustment near Y points P6. Calculate difference of both pair of staves readings. P7. Compare RL's of both points P8. Compute elevations
CU2. Carry out Reciprocal Ranging	P1. Mark any two reciprocal points P2. Range the points on line P3. Mark intermediate point on survey line P4. Observe ranging

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Define fly leveling,
- K2 Explain Profile Leveling
- K3 Determine the missing data of a level book page.
- K4 Define fly leveling.
- K5 State precautions in leveling operation.
- K6 Describe the procedures for taking readings to plot L-section x-section
- K7 Plot Long section
- K8 Describe parts and functions of Laser Level
- K9 Explain the procedure of leveling by use of Laser Level. With their specifications and its measurement.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Find out BM & RLs.
- Focus the eye piece



National Competency Standards Level-5 for “Civil Technology”



- Took and measure the staff readings
- Make temporary adjustment of leveling instrument
- Compute different levels at different R.Ds
- Calculate height of Instrument

TOOLS AND EQUIPMENT'S

- 1 Pencil,
- 2 Eraser,
- 3 Sharpner,
- 4 Calculator,
- 5 Measuring scale,
- 6 Measuring Steel Tape,
- 7 Tripod
- 8 Pegs
- 9 Arrows
- 10 Level
- 11 Levelling Staff
- 12 White Chalk
- 13 Thermometer
- 14 Ball pein hammer



0732B&CE-6 . Perform Long & Cross Sectioning

Overview: This competency standard covers the skills and knowledge required to draw Cross sections, lines of levels or short profiles made perpendicular to the center line of the project. (For example, taking a cross section profile of a stream bed while doing a profile survey of the stream.) Cross sections are usually taken at regular intervals and at sudden changes in the center-line profile. long sectioning and cross sectioning are required to calculate earthwork for roads, Railway track and earthen embankment.

Competency Units	Performance Criteria
CU1. Perform Cross Sectioning	P1. Adjust Level & Locate temporary bench mark. P2. Take readings every 25 feet interval of existing track (Transversely) P3. Observe first reading on BM and the center line P4. Observe staff reading on specific interval starting from center line to right & left sides and record in the field book P5. Continue staff readings on every RD of 25 ft with same pattern (Left & Right) of given line P6. Calculate Reduced Levels & Re-check by formula
CU2. Draw Cross Sections	P1. Compile the data obtained from cross sectioning to plot the cross section P2. Fix drawing sheet on drawing table P3. Draw cross section
CU3. Perform Long Sectioning	P1. Locate temporary bench mark. P2. Establish stations every 30m /100 ft. interval of existing track (Longitudinally) P3. Observe first reading on temporary bench mark. P4. Observe reading on specific interval (30m /100 ft) and record in the field book P5. Calculate Reduced Levels at the centre line readings to plot the Longitudinal section
CU4. Draw Long Sections	P1. Compile the data obtained from long sectioning to plot the long section P2. Fix drawing sheet on drawing table P3. Draw long section

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1 Explain cross hair and line of collimation for the level.
- K2 Define cross-sectioning & Long Sectioning
- K3 State precautions in leveling operation.
- K4 Describe the procedures for taking readings to plot x-section
- K5 Plot X-sections and Long Sections
- K6 Describe Road chain age, cross fall, and road edge details
- K7 Compute and tabulate of setting out data for the road alignment and Curves.
- K8 Explain the purpose of the specialized surveying technique

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout survey for Road & Railway
- Take offsets by Theodolite
- Apply survey techniques
- Compute road alignment data
- Carry out appropriate checks
- Cross sections
- Pin and unpin the Leveling Instrument from the box.
- Prepare Cross section diagram.
- Focus the Eyepiece of the instrument.
- Take readings and measure the angles.
- Apply formula to calculate earthwork for site.
- Differentiate between long section and cross sections
- Draw long and cross sections

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Measuring scale,
6. Levelling Instrument
7. Field Book,
8. Steel Tape,
9. Tripod



National Competency Standards Level-5 for “Civil Technology”



10. Ranging Rods
11. Pegs
12. Arrows
13. Staff
14. White Chalk
15. Thermometer
16. Ball pein hammer / Mallet
17. Umbrella with stand



0732B&CE-7 . Perform Tacheometry

Overview: This competency standard covers the skills and knowledge required to perform Levelling for the land survey i.e making angles, workout vertical and horizontal distances by stadia cross hair using stadia constant.

Competency Units	Performance Criteria
CU-1 Find out Horizontal distance	P1. Adjust the level on station point from where distance is to be measured P2. Place staff on the point to where distance is to be measured P3. Record upper stadia lower stadia and cross hair readings. P4. Calculate horizontal distance by stadia tachometry
CU-2 Find out Vertical distance	P1. Adjust the level on station point from where distance is to be measured P2. Place staff on the point to where distance is to be measured P3. Record upper stadia lower stadia and cross hair readings. P4. Calculate elevation by stadia tachometry

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain Tachometry with its methods.
- K2. Explain Stadia lines.
- K3. Explain stadia constant.
- K4. Describe rule to find out distances.
- K5. Describe the method to take the readings by theodolite and levels.
- K6. Explain to apply the formula.
- K7. Describe to locate the Bench Mark.
- K8. Calculate vertical and horizontal distance

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare level or Theodolite on its tripod
- Take readings BS, IS, FS.
- Apply survey techniques
- Compute BM & RLs.
- Carry out appropriate checks
- Calculate Distances by using Theodolites



National Competency Standards Level-5 for “Civil Technology”



- Indicate Level, Staff and Tripod.
- Calculate difference between cross hair
- Locate stadia line

➤ **TOOLS AND EQUIPMENT'S**

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Tee scale,
6. Set square
7. Drawing Sheet
8. Level (with stadia hairs), tripod and staff
9. Theodolite with tripod and staff
10. Ranging Rods
11. Pegs
12. Chain / Measuring tape
13. Theodolite (Digital) with tripod
14. White Chalk
15. Thermometer
16. Ball pein hammer
17. Mallet
18. Umbrella with stand



0732B&CE-8 . Perform Contouring

Overview: This competency standard covers the skills and knowledge required to perform Contouring for the land survey i-e an imaginary line passing through points of equal reduced levels by using the level and Theodolite with its components. A contour line may also be defined “as the intersection of a level surface with the surface of the earth”. Thus, contour lines on a plan illustrates the topography of the area

Competency Units	Performance Criteria
CU1. Carry out Contouring (Direct Mthod)	P1. Identify instruments P2. Perform temporary adjustment P3. Locate points P4. Draw radial Lines P5. Set contour interval P6. Draw contour lines on drawing sheet as per drawn on earth and put their levels according to given scale
CU2. Carry out Contouring (In-Direct Mthod)	P1. Identify instruments P2. Perform temporary adjustment P3. Locate points P4. Draw squares on the ground P5. Set contour interval P6. Draw contour lines on drawing sheet as per drawn on earth and put their levels according to given or assumed scale P7. Recheck the calculations
CU3. Draw Contour plan	P1. Take Terrain levels or arbitrary level P2. Take Contours intervals (as required) P3. Check Datum level on site P4. Building footprint and floor levels P5. Draw Utility services (drainage, gas, power line, sewer line, Telephone line, water etc.)

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain Countering and its methods.
- K2. Explain Radial line and base line.



- K3. Explain contour interval.
- K4. Describe rule to draw the contour lines.
- K5. Explain contour for ponds and filling areas
- K6. Explain square in contours.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare contour map on drawing sheet
- Take contour for hill and pond.
- Apply survey techniques
- Compute contour for sewer alignment.
- Carry out appropriate checks
- Draw contour for hill and valley

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Tee scale,
6. Set square
7. Drawing Sheet
8. Plane table board with tripod
9. Compass
10. Ranging Rods
11. Pegs
12. Chain / Measuring tape
13. Theodolite,(Digital) with tripod
14. Staff
15. White Chalk
16. Thermometer
17. Ball pein hammer / Mallet



0732B&CE-9 . Perform Hydrographic Survey

Overview: This competency standard covers the skills and knowledge required to perform in water with its components. It also covers the skills and knowledge required to perform **Hydrographic survey** for measurement and description of features which affect maritime navigation, marine construction, dredging, offshore oil exploration / offshore oil drilling and related activities.

Competency Units	Performance Criteria
CU1. Measure depth of a channel (by sounding rod)	P1. Perform Reconnaissance survey P2. Identify equipment for Hydrographic Survey P3. Locate Horizontal & vertical Control P4. Use stationery boat P5. Use sounding rod P6. Observe bed level of channel by sounding rod
CU2. Measure depth of a channel (by lead line)	P1. Perform Reconnaissance survey P2. Identify equipment for Hydrographic Survey P3. Locate Horizontal & vertical Control P4. Use stationery boat P5. Use sounding chain P6. Observe chain reading P7. Determine bed level of channel
CU3. Determine velocity of flowing water by current meter	P1. Identify current meter to determine velocity of water P2. Assemble current meter P3. Use stationery boat P4. Place current meter at two specified depths P5. Observe reading
CU4. Determine velocity of flowing water by float	P1. Select area where turbulence is minimum P2. Mark section at least 3 times of x-section P3. Place float and observe time crossed by float in marked section P4. Determine velocity by float

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe rule for hydrographic survey.
- K2. Describe Hydrographic Survey.



- K3. Explain Hydrographic Survey Instruments.
- K4. Describe the method to find out depth of channel.
- K5. Explain sounding Rods
- K6. Explain sounding boats
- K7. Explain reconnaissance survey

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Drive sounding boat
- Compute depth for bed at water level.
- Carry out appropriate checks
- Calculate depth of channel
- Indicate sounding rods.

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Tee scale,
6. Set square
7. Drawing Sheet
8. Compass
9. Sounding Rods
10. Sounding Boat
11. White Chalk
12. Velocity Rod
13. Umbrella with stand
14. Sounding chain
15. Sounding meter



0732B&CE-10 . Compute Volume by Contouring

Overview: This competency standard covers the skills and knowledge required to calculate Volume by a contour map, but the volume calculated by this method is approximate. It cannot be compared with the volume calculated by the cross-section method.

Competency Units	Performance Criteria
CU1. Compute volume by contouring (By Average End Area Method)	P1. Interpolate required contours for calculation P2. Find out the area of each contour with relevant instrument. P3. Apply Average End Area (trapezoidal) Method formula to find out volume between two contours P4. Sum up the volume in tabular forms for all contours
CU2. Compute volume by contouring (By Prismoidal Method)	P1. Interpolate required contours for calculation P2. Find out the area of each contour with relevant instrument. P3. Apply prismoidal formula to find out volume between two contours P4. Sum up the volume in tabular forms for all contours

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Explain the uses of contour map.
- K2 Explain the methods of performing contour survey.
- K3 Interpolate contours on a plan.
- K4 Explain the procedure to lay down alignment of road, railway and channel on contour map and describe procedure for measuring gradient.
- K5 Compute the capacity of reservoirs and volume of earth from the contour map.
- K6 Explain Countering and its methods.
- K7 Explain Radial line and base line.
- K8 Explain contour interval.
- K9 Describe rule to draw the contour lines.
- K10 Explain contour for ponds and filling areas
- K11 Explain average area method
- K12 Explain prismoidal formula

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare contour map on drawing sheet
- Take contour for hill and pond.
- Apply survey techniques



National Competency Standards Level-5 for “Civil Technology”



- Compute contour interval for different alignment.
- Carry out appropriate checks
- Apply prismoidal formula
- Apply average area formula
- Calculate volume for ground / earth work

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Calculator,
5. Chain / Measuring tape
6. Level (Digital) with tripod
7. Staff
8. White Chalk
9. Thermometer
10. Umbrella



10.2. Civil Engineering. Drawing

0732B&CE-11 . Produce Templates, Title Block/ Strip & Draw Lines

Overview: This competency standard covers the skills and knowledge required to prepare report interpreting health & safety considerations as per national standards, Select, Identify, uses of drawing instruments, draw title strip, draw title block on sheets, and draw different lines used in drawings.

Competency Units	Performance Criteria
CU-1: Investigate and prepare a short report on the health and safety considerations in construction of drawings.	P1. Observe Considerations: light (natural, artificial), P2. CAD (computer screens, electrical protection devices) P3. Observe neatness for drawing place. P4. Check cleanliness of drawing instruments.
CU-2: Select Instruments for drawings	P1. Identify instruments (adjustable drawing board, tee square, set square, scale rule, compasses, drawing pens/pencils, flexible curves, French curve and templates) P2. Select instruments in correct orientation for drawings P3. Select Instruments for horizontal, vertical & inclined lines.
CU-3: Set out a drawing sheet	P1. Identify drawing sheets (British, American and ISO standards). P2. Draw margins as per local standard. P3. Draw title strip as per standards on imperial & half imperial size sheet. P4. Draw title block as per standards on imperial & half imperial size sheet.
CU-4: Draw different types of lines.	P1. Draw lines used in construction drawings. (basic construction line, main object outline, broken line, chain line, section line, grid line, cutting plane line, short break line, long break line.) P2. Use correct grades of pencils. P3. Draw lines of correct weight. P4. Draw lines with standard measurements. P5. Observe principles of drawing lines, cleanliness.
CU-5: Store prepared drawings.	P1. Fold A0, A1, A2, A3, A4, drawing sheets as per requirements. P2. Fold Double elephant, Imperial- full, half, quarter, antiquarian, drawing sheets as per requirements. P3. Store the drawing sheet as per requirements



Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** State the importance of civil drafting as an engineering communication medium.
- K-2.** Understand necessity of civil drafting in different engineering fields.
- K-3.** Indicate the link between drafting and other subjects of study in diploma course.
- K-4.** Describe the health and safety considerations involved in the production of construction drawings. **Considerations:** light (natural, artificial), CAD (computer screens, electrical protection devices), cleanliness.
- K-5.** Identify the various types of drawing medium available and describe their use. **Drawing medium:** cartridge paper, tracing paper.
- K-6.** Identify standard drawing sheet sizes. **Sizes:** A0, A1, A2, A3, A4, Double elephant, Imperial-full, half, quarter, antiquarian, A, B, C, D, E.
- K-7.** Identify and state the use of the various types of drawing equipment along with sizes. **Drawing Instruments:** adjustable drawing board, tee, square, set square, scale rule, compasses, drawing pens/pencils, flexible curves, French curve, templates.
- K-8.** Explain the different types of lines and arrowheads used in drawings. **Line types:** basic construction line, main object outline, broken line, chain line, section line, grid line
- K-9.** Explain the weight of lines, grades of pencils.
- K-10.** State the components of Title Block and Title Strip.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Report on health & safety considerations as per national standards.
- Drawing sheet of different types of lines.
- Drawing of Title Block, Title Strip
- Describe half imperial and Quarter imperial sheets.

Instruments & Consumables



National Competency Standards Level-5 for “Civil Technology”



S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Graph sheets
6	Handkerchief	6	Thumb pins
7	French Curves		
8	Set of Card board scales		



0732B&CE-12 . Perform Lettering and Printing On Sheet.

Overview: This competency standard covers the skills and knowledge required to draw letters on graph sheet, in 4:5 & 4:7 ratio, double stroke, single stroke, upper case and lower case lettering and printing on drawing sheet.

Competency Units	Performance Criteria
CU-1. Draw Single Stroke letters in ratio 4:5 and 4:7 taking 1.5” letter height on graph sheet.	P1. Observes standards for basics of drawing. P2. Distribute space on sheet P3. Draw single stroke letters as per ratio. P4. Draw tile strip on drawing sheet. P5. Draw tile block on drawing sheet.
CU-2. Distribute space of half imperial drawing sheet for lettering.	P1. Observes standards for basics of drawing. P2. Use of correct grades of pencils. P3. Provide horizontal & vertical spaces P4. Distribution Sheet as per required standards.
CU-3. Prepare graph for drawing 1.5” letters in ratio 4:5 and 4:7 on half imperial sheet.	P1. Observes standards for basics of drawing. P2. Use of parallel lines principle for division of line into required number of segments vertically. P3. Use of requisite set square for horizontal division. P4. Draw graph lines.
CU-4. Draw Single Stroke letters in ratio 4:5 and 4:7 taking 1.5” letter height on half imperial drawing sheet.	P1. Observes standards for basics of drawing. P2. Distribute space with given ratio on drawing sheet. P3. Draw single stroke letters as per ratio. P4. Draw tile strip OR title block for drawing sheet.
CU-5. Draw Double Stroke letters in ratio 4:5 and 4:7 taking 1.5” letter height on half imperial drawing sheet.	P1. Observes standards for basics of drawing. P2. Distribute space and draw both graphs on drawing sheet. P3. Draw double stroke letters as per ratio. P4. Draw tile strip OR title block for drawing sheet.
CU-6. Draw Single Stroke upper case letters 1 cm high and ¼” high in ratio 4:5 and 4:7.	P1. Observes standards for basics of drawing. P2. Distribute space and draw both graphs on drawing sheet. P3. Draw single stroke upper case letters as per ratio. P4. Draw single stroke upper case free hand italic letters.
CU-7. Draw Free hand Single Stroke lower	P1. Observes standards for basics of drawing. P2. Distribute space and draw both graphs on drawing sheet.



National Competency Standards Level-5 for “Civil Technology”



case letters 1 cm high and ¼” high printing in ratio 4:5 and 4:7.	P3. Draw single stroke lower case free hand lettering & printing as per ratio. P4. Draw single stroke upper case free hand italic letters.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Explain the procedure of division of lines, space distribution of sheet.
- K-2.** Explain principle of parallel lines and preparation of graph.
- K-3.** State importance of lettering.
- K-4.** State the need and different types of lettering.
- K-5.** Describe different uses of lettering stencils for a given application.
- K-6.** State the principles of lettering.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of letters on graph sheet in 4:5 & 4:7 ratio, double stroke, single stroke, upper case.
- Drawing of letters on half imperial sheet in 4:5 ratio, double stroke, single stroke, upper case and lower case lettering and printing.
- Drawing of letters on half imperial sheet in 4:7 ratio, double stroke, single stroke, upper case and lower case lettering and printing.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Graph sheets
6	Handkerchief	6	Thumb pins
7	French Curves		
8	Set of Card board scales		



0732B&CE-13 . Construct Scales for Drawing

Overview: This competency standard covers the skills and knowledge required to draw reducing scales in MKS and FPS Units.

Competency Units	Performance Criteria
CU-1. Construct a plain scale of RF 1: 5& 1:20 showing metres & decimetres on half imperial drawing sheet.	P1. Observes local standards for basics of drawing. P2. Distribute space in required part of drawing sheet P3. Draw tile strip OR title block for drawing sheet. P4. Draw scale of RF = 1:5 & 1:20 using principle of parallel lines.
CU-2. Construct a plain scale of RF 1:6 & 1: 48 showing feet & inches on half imperial drawing sheet.	P1. Observes local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw tile strip for drawing sheet. P4. Draw scale of RF = 1:6 & 1:48 using principle of parallel lines.
CU-3. Construct a Diagonal scale of RF 1: 50 showing metres, decimetres & centimetres, of RF1:500 showing km, hectometres & decametres on A3 drawing sheet.	P1. Observes standards for basics of drawing. P2. Distribute space in relevant part of sheet. P3. Draw tile strip OR title block for drawing sheet. P4. Draw scale of RF = 1:50 using principle of parallel lines and diagonals. P5. Draw scale of RF = 1:500 using principle of parallel lines and diagonals.
CU-4. Construct a Diagonal scale of RF 1:36 showing yards, feet & inches, & of RF 1: 96 showing mile & furlong & 1/8 furlong on A3 drawing sheet.	P1. Observes standards for basics of drawing. P2. Distribute space in required parts. P3. Draw tile strip OR title block for drawing sheet. P4. Draw scale of RF = 1:36 using principle of parallel lines and diagonals. P5. Draw scale of RF = 1:96 using principle of parallel lines and diagonals.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the



National Competency Standards Level-5 for “Civil Technology”



knowledge of:

- K-1.** Define scale, Scale Factor and R.F.
- K-2.** State the types of scales- Reducing scales, enlarging scales, full scale.
- K-3.** Describe plane scales and diagonal scales.
- K-4.** Describe the open-ended scale and full divided scales
- K-5.** Explain the procedure of constructing plane scales.
- K-6.** Explain the procedure of constructing diagonal scales.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of letters on graph sheet in 4:5 & 4:7 ratio, double stroke, single stroke, upper case.
- Drawing of letters on half imperial sheet in 4:5 ratio, double stroke, single stroke, upper case and lower case lettering and printing.
- Drawing of letters on half imperial sheet in 4:7 ratio, double stroke, single stroke, upper case and lower case lettering and printing.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-14 . Construct Geometrical Figures

Overview: This competency standard covers the skills and knowledge required to draw triangles, quadrilaterals, polygons- inscribed & circumscribed, draw prisms, draw pyramids, conic sections, circle, ellipse, parabola hyperbola and solid figures.

Competency Units	Performance Criteria
CU-1. Draw sketches of different types of triangles according to side length and angles free hand and to scale.	P1. Observes standards for basics of drawing. P2. Distribute space on drawing sheet P3. Draw title strip OR title block for drawing sheet P4. Draw equilateral triangle of side length 2”. P5. Draw isosceles triangle with base 5 cm and height= 6cm P6. Draw scalene triangle of lengths 2”, 1.5”, 1”. P7. Draw acute angled triangle. P8. Draw right angles triangle. P9. Draw obtuse angled triangle.
CU-2. Draw sketches of polygons, circle, semi-circle, segment of circle, sector of circle & zone of circle free hand and to a scale.	P1. Observe local standards for basics of drawing. P2. Distribute space on drawing sheet P3. Draw title strip OR title block for drawing sheet P4. Draw a regular pentagon of side length = 4 cm. P5. Draw hexagon inscribes in a circle and circumscribed about a circle of 3 inches diameter. P6. Draw circle, semi-circle, segment of circle, sector of circle & zone of circle of diameter 1.5 inch and 3.5 inch.
CU-3. Draw sketches of all quadrilaterals	P1. Observes standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title strip for drawing sheet P4. Draw square of side length 2”and 4.5 “ P5. Draw rectangle with length 5 cm and width= 3cm P6. Draw rhombus of side length=2 cm & internal angle= 45° P7. Draw parallelogram of length6 cm, width= 3 cm having internal angle= 45° P8. Draw trapezoid of parallel sides’ length4 cm & 6cm spaced at a distance of 3 cm. P9. Draw trapezium of side lengths 5 cm, 4 cm, 6 cm & 3 cm.
CU-4. Draw conic sections with cutting plane at different angles	P1. Draw conic section resulting in a circle. P2. Draw conic section resulting in an ellipse. P3. Draw conic section resulting in a parabola.



National Competency Standards Level-5 for “Civil Technology”



	P4. Draw conic section resulting in a hyperbola. P5. Draw title strip on sheet
CU-5. Draw full scale ellipses major axis = 10 cm and minor axis = 8 cm with four methods.	P1. Draw ellipse by four centers method. P2. Draw ellipse by basic method. P3. Draw ellipse by parallelogram method. P4. Draw ellipse by off-set method in concentric circles. P5. Draw title block on sheet
CU-6. Draw full scale parabola major axis = 10 cm and minor axis = 8 cm with four methods.	P1. Draw parabola by basic method. P2. Draw parabola by tangent method. P3. Draw parabola by rectangle method P4. Draw title block on sheet
CU-7. Draw sketched of prisms, cylinders, pyramids, cones in isometric views free hand and to a scale.	P1. Draw right & oblique rectangular prism. P2. Draw right and oblique cylinders. P3. Draw right & oblique hexagonal pyramids. P4. Draw right & oblique cones. P5. Draw title block on sheet

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** State plane and solid figures.
- K-2.** Freehand sketching of plane figures and solid figures.
- K-3.** State the difference between plane and solid figure.
- K-4.** Draw free hand sketches of different plane and solid figures.
- K-5.** Describe the procedure for the construction of angles.
- K-6.** Describe different types of triangles, quadrilaterals and polygons.
- K-7.** State difference between inscribed and circumscribed figures.
- K-8.** State the terms used in a circle.
- K-9.** Sketch and label different lines and arcs in a circle.
- K-10.** Define ellipse and parabola
- K-11.** State cone, conical sections, (circle, parabola, ellipse and hyperbola).
- K-12.** Explain conical sections in civil engineering drawings.
- K-13.** Explain the procedure of drawing plane and solid geometrical figures.
- K-14.** Explain the procedure of drawing ellipses & parabolas by different methods.



National Competency Standards Level-5 for “Civil Technology”



Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construction of triangles, quadrilaterals, polygons- inscribed & circumscribed
- Drawings for prism Cylinders, pyramids, Cones, & different conical sections
- Drawings for circle, ellipse, parabola hyperbola and solid figures.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-15 . Produce Orthographic Projections

Overview: This competency standard covers the skills and knowledge required to draw orthographic projections, First angle projections, third angle projections of vee block, hollow concrete block, wooden cut blocks and draw missing view.

Competency Units	Performance Criteria
CU-1. Draw orthographic projections of Vee Block in first angle projection system.	P1. Apply basic operations on A3 size sheet. P2. Distribute space on sheet by calculations. P3. Draw title strip on sheet P4. Draw front, top and side views by use of projector and drawing instruments.
CU-2. Draw orthographic projections of hollow concrete Block in first angle projection system.	P1. Apply basic operations on A3 size sheet P2. Distribute space by calculations. P3. Draw title strip on sheet P4. Draw front, top and side views by use of projector and drawing instruments.
CU-3. Draw orthographic projections of wooden cut block in first angle projection system.	P1. Apply basic operations on A3 size sheet. P2. Distribute space by calculations. P3. Draw title strip on sheet P4. Draw front, top and side views by use of projector and drawing instruments.
CU-4. Complete missing views when two views are given.	P1. Apply basic operations on A3 size sheet. P2. Distribute space by calculations. P3. Draw title strip on block P4. Draw front, top and side views by use of projector and drawing instruments.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define plane, principal plane.
- K-2.** Explain the principle of orthographic projection with simple sketches.
- K-3.** State the definition of projector and projection lines and their use.
- K-4.** State and differentiate between dihedral and trihedral angles.
- K-5.** State the types of orthographic projection.
- K-6.** Sketch the orthographic views of a simple engineering part of given pictorial drawing.
- K-7.** Identify the object from a number of orthographic views of the object.
- K-8.** Select the minimum number of views needed to fully represent a given object



National Competency Standards Level-5 for “Civil Technology”



K-9. Differentiate between First & third angle projections for different 3-D objects

K-10. Define 3-D objects

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of First angle projections of V-Block
- Drawing of third angle projections of hollow concrete block.
- Drawing of first angle & third angle projections of wooden cut blocks.
- Drawing of third angle projections of missing view.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-16 . Perform Sectioning

Overview: This competency standard covers the skills and knowledge required to draw full sectional views & offset sectional views of hollow concrete block, hollow hexagonal prism and rectangular pyramid.

Competency Units	Performance Criteria
CU-1. Draw full sectional front view and outside top view of the hollow concrete block.	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of hollow concrete block. P5. Draw materials symbols P6. Hatch the section portion in views.
CU-2. Drawing of full sectional front view, side view and top view of the prisms, pyramids of different types.	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of hollow hexagonal prism. P5. Draw front, top and side views of rectangular pyramid. P6. Hatch the section portion in views.
CU-3. Draw offset sectional front view and outside top view of the hollow concrete block.	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of hollow concrete block. P5. Hatch the section portion in views.
CU-4. Drawing of offset sectional front view, side view and top view of the prisms, pyramids of different types.	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of hollow hexagonal prism. P5. Draw front, top and side views of rectangular pyramid. P6. Hatch the section portion in views.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** State the definition of section and sectioning.
- K-2.** Explain purpose of sectional views.
- K-3.** State cutting plane and cutting plane line.
- K-4.** State the purpose of cutting plane line.



National Competency Standards Level-5 for “Civil Technology”



- K-5.** State conventional representation of engineering materials.
- K-6.** Know rule of putting arrowhead on cutting plane line.
- K-7.** State types of sectional views.
- K-8.** Select the position of cutting plane line to give maximum details of object.
- K-9.** Define Hatching
- K-10.** Explain the principles of hatching.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of full sectional views & offset sectional views of hollow concrete block
- Drawing of full sectional views & offset sectional views of hollow hexagonal prism nad rectangular pyramid.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-17 . Perform Dimensioning On Drawings

Overview: This competency standard covers the skills and knowledge required to dimension a drawing by adopting Uni-directional and bi-directional dimensioning, Base line dimensioning system, continuous dimensioning system, location dimensioning.

Competency Units	Performance Criteria
CU-1: Prepare a Dimensioned drawing by adopting Uni-directional and bi-directional dimensioning.	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of Vee block. P5. Dimension the drawing Uni-directionally. P6. Dimension the drawing bi-directionally.
CU-2: Prepare a Dimensioned drawing by adopting Base line dimensioning system,	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of Vee block with holes. P5. Dimension the drawing as per base line dimensioning system. P6. Draw system of dimensioning P7. Draw dimensioning of holes P8. Draw dimensioning of arc P9. Draw dimensioning circles P10. Draw dimensioning of angles
CU-3: Prepare a Dimensioned drawing by adopting continuous dimensioning system	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations. P4. Draw front, top and side views of Vee block with holes. P5. Dimension the drawing as per continuous dimensioning system. P6. Draw system of dimensioning P7. Draw dimensioning of holes P8. Draw dimensioning of arc P9. Draw dimensioning circles P10. Draw dimensioning of angles
CU-4: Prepare a Dimensioned drawing by adopting	P1. Apply basic operations on A3 size sheet. P2. Draw title strip on sheet P3. Distribute space by calculations.



National Competency Standards Level-5 for “Civil Technology”



location dimensioning system	P4. Draw front, top and side views of Vee block with holes. P5. Dimension the drawing location of center of holes P6. Draw system of dimensioning P7. Draw dimensioning of holes P8. Draw dimensioning of arc P9. Draw dimensioning circles P10. Draw dimensioning of angles

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define Dimensioning.
- K-2.** State the need of dimensioning drawings according to accepted standards
- K-3.** State the dimension and extension line, arrow head, dimension, leader.
- K-4.** State the types of arrow head, length of arrowhead.
- K-5.** Identify the system of placement of dimensions of a given dimensioned drawing.
- K-6.** Describe Uni-directional and bi-directional dimensioning.
- K-7.** Define Base line dimensioning system, continuous dimensioning system, location dimensioning.
- K-8.** Draw dimension for location and size of holes, arcs, circles.
- K-9.** Dimension a given drawing using standard notations and desired system of dimensioning.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Dimensioned drawing by adopting Uni-directional and bi-directional dimensioning,
- Dimensioned drawing by Base line dimensioning system, continuous dimensioning system, location dimensioning.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape



National Competency Standards Level-5 for “Civil Technology”



5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-18 . Produce Pictorial Drawings

Overview: This competency standard covers the skills and knowledge required to draw isometric views, oblique views, and perspective views of objects. Draw isometric, oblique and perspective views from principal views.

Competency Units	Performance Criteria
CU-1. Draw isometric views of a cube having circular hole in its focus and R.C.C. stairs (First three steps).	P1. Apply basic operations on different size sheet. P2. Draw title strip on sheet P3. Divide space on drawing sheet. P4. Select base line on sheet P5. Draw isometric view observing OHSE requirements. P6. Draw holes (ellipses in three isometric planes.)
CU-2. Draw isometric views of R.C.C. stairs-First three steps.	P1. Select base line on sheet P2. Draw title strip on sheet P3. Draw isometric view observing OHSE requirements. P4. Perform lettering & Dimensioning.
CU-3. Create an oblique drawing of different prisms and pyramids from its given principal views.	P1. Select base line. P2. Draw title strip on sheet P3. Draw oblique view with the help of given principal views. P4. Perform lettering & Dimensioning.
CU-4. Perspective drawing of slotted block and different wooden blocks from there given principal views.	P1. Select base line. P2. Draw the principal views. P3. Select the vanishing points, mirror line P4. Draw Perspective view. P5. Perform lettering & Dimensioning. P6. Draw title strip on sheet
CU-5. Draw Isometric view with the help of orthographic projections of hollow concrete block	P1. Select base line. P2. Draw title strip on sheet P3. Draw isometric view with the help of given principal views. P4. Perform lettering & Dimensioning.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K-1. Define pictorial drawing.
- K-2. State the types of pictorial drawings and their general uses.
- K-3. Sketch isometric axis, angles, scales, arcs and circles.
- K-4. Differentiate between the isometric and non-isometric lines.
- K-5. Sketch isometric drawing and isometric projection.
- K-6. Sketch the isometric projection from the given orthographic drawings.
- K-7. Explain the angle of receding axis.
- K-8. State the oblique drawing and its uses.
- K-9. Sketch and letter the oblique cavalier and cabinet views.
- K-10. Define perspective drawing.
- K-11. Explain the purpose of perspective drawing.
- K-12. State the vanishing point.
- K-13. State the principles of making perspective views.
- K-14. State the parallel and angular (diametric and trimetric) perspective

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of isometric views of a cube having circular hole in its focus and R.C.C. stairs (First three steps).
- Drawing of an oblique view of different prisms and pyramids from its given principal views.
- Perspective drawing of slotted block and different wooden blocks from there given principal views.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils



National Competency Standards Level-5 for “Civil Technology”



4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-19 . Develop Symbols of Engineering Drawings

Overview: This competency standard covers the skills and knowledge required to prepare report on the health and safety considerations while preparing drawings, draw different symbols of Engineering materials, components of building in plan, elevation & section, draw symbols of electrical installations, water supply installation, gas installations and sanitary installations.

Competency Units	Performance Criteria
CU-1. Investigate and prepare a short report on the health and safety considerations in preparing drawings.	P1. Observe Considerations: light (natural, artificial), P2. CAD (computer screens, electrical protection devices) P3. Observe neatness & cleanliness of drawing
CU-2. Draw symbols of engineering materials.	P1. Select the suitable instruments to draw symbols. P2. Draw title strip on sheet P3. Distribute space of drawing sheet. P4. Draw symbols duly hatched as per local standards of- Sand, ballasts, metals, timbers, soil-natural, cutting, filling, fabrics, rock, glass, ceramics, plastics, asbestos.
CU-3. Draw symbols of building components in plan, section, & section.	P1. Select the suitable instruments to draw symbols. P2. Draw title strip on sheet P3. Distribute space of drawing sheet. P4. Draw symbols in plan, section, & section duly hatched as per local standards of- brick work, stone work, block work, doors, windows, ventilators, RCC work, R.B. work, PCC, DPC, Lintels, stairs
CU-4. Draw symbols of electrical installations for ceiling and walls.	P1. Select the suitable instruments to draw symbols. P2. Draw title strip on sheet P3. Distribute space of drawing sheet. P4. Draw symbols duly hatched as per local standards of- energy meter, main switches, sub-main switches, circuit breakers, kit kat, panel box, DFB, tube lights, holders, fans, bulbs, switches, socket, boards, circuit diagram
CU-5. Draw symbols of water supply and gas installations.	P1. Select the suitable instruments to draw symbols. P2. Draw title strip on sheet P3. Distribute space of drawing sheet.



National Competency Standards Level-5 for “Civil Technology”



	P4. Draw symbols duly hatched as per local standards of- water pipe lines, mixers, valves, cocks, taps, showers, pump, meter, cooler. Gas pipe line, Gas meter, gas heater, gas light, gas geezer, gas burner.
CU-6. Draw symbols of sanitary installations.	P1. Select the suitable instruments to draw symbols. P2. Draw title strip on sheet P3. Distribute space of drawing sheet. P4. Draw symbols duly hatched as per local standards of- sewer lines, wash hand basins, water closets, bath tubs, urinals, sinks, dish washers, looking mirror, toilet paper holder, soap dish, shelf, towel rail, vent pipe, manhole, intercepting chambers, traps, and grating.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define conventional symbols and give its importance.
- K-2.** Enlist and sketch symbols of Engineering materials- Sand, ballasts, metals, timbers, soil- natural, cutting, filling, fabrics, rock, glass, ceramics, plastics, asbestos.
- K-3.** Enlist and sketch components of building in plan, elevation & section- brick work, stone work, block work, doors, windows, ventilators, RCC work, R.B. work, PCC, DPC, Lintels, stairs.
- K-4.** Enlist and sketch symbols of electrical installations- energy meter, main switches, sub-main switches, circuit breakers, kit kat, panel box, DFB, tube lights, holders, fans, bulbs, switches, socket, boards, circuit diagram.
- K-5.** Enlist and sketch water supply installation, gas installations- water pipe lines, mixers, valves, cocks, taps, showers, pump, meter, cooler. Gas pipe line, Gas meter, gas heater, gas light, gas geezer, gas burner.
- K-6.** Enlist and sketch sanitary installations- sewer lines, wash hand basins, water closets, bath tubs, urinals, sinks, dish washers, looking mirror, toilet paper holder, soap dish, shelf, towel rail, vent pipe, manhole, intercepting chambers, traps, grating.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing symbols of Engineering materials.
- Drawing symbols of components of building in plan, elevation & section



National Competency Standards Level-5 for “Civil Technology”



- Drawing symbols of symbols of electrical installations
- Drawing symbols of water supply installation
- Drawing symbols of gas installations
- Drawing symbols of sanitary installations.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-20 . Produce Cross Section of Wall.

Overview: This competency standard covers the skills and knowledge required to draw 2 dimensional & 3 dimensional cross section of wall along with flooring, roofing & finishing details.

Competency Units	Performance Criteria
CU-1. Draw Cross section of 9” thick wall, 13.5” Thick wall.	P1. Observes standards for basics of drawing. P2. Draw title block on sheet P3. Distribute space and draw both graphs on graph sheet. P4. Draw parts of wall- foundation concrete, brick work, GL. FL., DPC, Super structure, plastering, lintel, sunshade, doors, windows, ventilator, almirah. P5. Label drawing parts.
CU-2. Draw Cross section of 20 cm thick wall, 30 cm Thick wall.	P1. Observes standards for basics of drawing. P2. Draw title block on sheet P3. Distribute space of sheet. P4. Draw parts of wall- foundation concrete, brick work, GL. FL., DPC, Super structure, plastering, lintel, sunshade, doors, windows, ventilator and almirah. P5. Label drawing parts.
CU-3. Draw parts of flooring	P1. Observes standards for basics of drawing. P2. Draw title strip on sheet P3. Draw parts of flooring- earth filling, sand filling, base concrete, topping floor. P4. Label drawing parts.
CU-4. Draw parts of flooring.	P1. Observes standards for basics of drawing. P2. Draw title strip on sheet P3. Parts of roofing- roof slab, slab projection, parapet, drip course, cornice, bitumen coating, polythene sheet, earth filling over plaster, tile flooring. P4. Label drawing parts.



National Competency Standards Level-5 for “Civil Technology”



CU-5. Draw cross section of 13.5” thick wall in isometric view.	P1. Draw substructure of 13.5” thick walls. P2. Draw title strip on sheet P3. Draw super structure components of wall. P4. Draw roofing components along with parapet- roof slab, slab projection, parapet, drip course, cornice, bitumen coating, polythene sheet, earth filling over plaster, tile flooring. P5. Draw flooring components- earth filling, sand, base concrete and topping floor. P6. Draw window, lintel and sunshade. P7. Label drawing parts.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Enlist & sketch parts of wall- foundation concrete, brick work, GL. FL., DPC, Super structure, plastering, lintel, sunshade, doors, windows, ventilator, almirah.
- K2. Enlist & sketch parts of flooring- earth filling, sand filling, base concrete, topping floor.
- K3. Enlist & sketch parts of roofing- roof slab, slab projection, parapet, drip course, cornice, bitumen coating, polythene sheet, earth filling over plaster, tile flooring.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of cross section of wall along with flooring, roofing & finishing detail.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape



National Competency Standards Level-5 for “Civil Technology”



5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-21 . Develop Building Drawings

Overview: This competency standard covers the skills and knowledge required to read, draw plans, elevations, sections, schedules of single room, two roomed quarter, c-type building and submission drawing.

Competency Units	Performance Criteria
CU-1. Prepare report on various features after reading the drawing of an existing building.	P1. Observe feature like rooms and its sizes. P2. Investigate inter-relation of rooms. P3. Check openings in building. P4. Observe building services.
CU-2. Prepare drawings for single room 14' x 12' having wall thickness 9".	P1. Observes local standards for basics of drawing. P2. Draw title block for drawing sheet. P3. Distribute space in required parts on drawing sheet P4. Draw line plan of room as per given data. P5. Draw detailed plan of room. P6. Draw Elevation of single room. P7. Draw Section of room passing through opening. P8. Perform dimensioning and lettering P9. Indicate North direction.
CU-3. Prepare drawings for two roomed quarter along with bath, kitchen, verandah, courtyard.	P1. Observes local standards for basics of drawing. P2. Draw title strip for drawing sheet. P3. Distribute space for drawing sheet. P4. Draw line plan of two roomed quarter as per given data. P5. Draw detailed plan of two roomed quarter. P6. Draw Elevation of two roomed quarter. P7. Draw Section of two roomed quarter passing through opening. P8. Perform dimensioning, lettering P9. Indicate North direction.
CU-4. Prepare drawings for C-type residence.	P1. Observes local standards for basics of drawing. P2. Draw title strip on drawing sheet. P3. Distribute space of drawing sheet. P4. Draw line plan of C-type residence as per given data. P5. Draw detailed plan of C-type residence. P6. Draw Elevation of C-type residence.



National Competency Standards Level-5 for “Civil Technology”



	P7. Draw Section of C-type residence passing through opening. P8. Perform dimensioning, lettering P9. Indicate North direction.
CU-5. Prepare Submission drawing for a double storey residence of plot size 50'x78'.	P1. Observes local standards for basics of drawing. P2. Draw title block on drawing sheet. P3. Distribute space for drawing sheet. P4. Draw detailed plans of double storey residence as per given data. P5. Draw front, side & rear elevations of double storey residence. P6. Draw two sections of double storey residence passing through opening. P7. Draw site plan, landscape plan of double storey residence. P8. Perform dimensioning, lettering P9. Prepare schedule of area, openings, iron fittings. P10. Indicate North direction.
CU-6. Prepare foundation plan for a double storey residence of plot size 50'x78'.	P1. Observes local standards for basics of drawing. P2. Draw title block on drawing sheet. P3. Distribute space for drawing sheet. P4. Draw foundation plan of double storey residence. P5. Draw front, side & rear elevations of double storey residence. P6. Draw two sections of double storey residence passing through opening. P7. Draw site plan, landscape plan of double storey residence. P8. Perform dimensioning, lettering P9. Prepare schedule of area, openings, iron fittings. P10. Indicate North direction.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Describe the elements of report on residential building.
- K2. State the different types of building drawings.
- K3. Describe the different rooms in residential and educational building of different classes.
- K4. Describe the different rooms in hospital and industrial building of different classes.
- K5. Describe the different rooms in public & commercial building of different classes.
- K6. State the sizes of rooms for different classes of residences and other buildings.
- K7. Follow measurements from a given plan.
- K8. Describe the plot area and covered area of public residential buildings
- K9. Define site plan, line plan, detailed plan, layout plan, index plan, foundation plan, elevations & sections.
- K10. Sketch plans, elevations, and sections of buildings from given line diagrams.
- K11. Label the parts of given plan.
- K12. Explain the procedure for preparing plans, elevations and sections for single storey and double storey buildings.
- K13. Prepare schedule of openings in building.
- K14. Prepare schedule of area, and iron fittings for doors, windows, almirah etc.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Report on various features after reading the drawing of an existing building.
- Drawings for single room 14' x 12' having wall thickness 9".
- Drawings for two roomed quarter along with bath, kitchen, verandah, courtyard.
- Drawings for C-type residence.
- Drawings Submission drawing for a double storey residence of plot size 50'x78'.
- Define “C” type building
- State Importance for north direction on drawing sheet

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins



National Competency Standards Level-5 for “Civil Technology”



6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-22 . Perform House Planning

Overview: This competency standard covers the skills and knowledge required to prepare report on orientation & ventilation of an existing building and plan & prepare drawing of c-type residence as per local regulations.

Competency Units	Performance Criteria
CU-1. Prepare report on orientation & ventilation of an existing building.	P1. Observe orientation of rooms. P2. Compare opening sizes as per local regulations. P3. Indicate ventilation for a building P4. Draft the report on ventilation.
CU-2. Plan & prepare drawing of c-type residence as per local regulations for ventilation	P1. Observes local standards for basics of drawing. P2. Prepare title block on sheet P3. Distribute space in required parts. P4. Calculate area of floors, volume of rooms as per ventilation aspects. P5. Draw detailed plan of residence as per regulations. P6. Draw Elevation of residence. P7. Draw Section of room passing through opening. P8. Prepare schedule of area, openings. P9. Perform dimensioning, lettering of drawings. P10. Indicate North direction.
CU-3. Plan & prepare drawing of c-type residence as per local regulations for seismic aspects.	P1. Observes local standards for basics of drawing. P2. Distribute space in required parts. P3. Prepare title block on sheet P4. Calculate area of floors, volume of rooms as per seismic aspects. P5. Draw detailed plan of residence as per regulations. P6. Draw Elevation of residence. P7. Draw Section of room passing through opening. P8. Prepare schedule of area, openings. P9. Perform dimensioning, lettering for drawings. P10. Indicate North direction.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K-1. Define House planning
- K-2. State the necessity of house planning
- K-3. State the factors, which govern the selection of site for building
- K-4. Define orientation and ventilation.
- K-5. State the factors affecting the planning of a house
- K-6. State the inter-relationship of different rooms
- K-7. State the minimum area of the building openings for ventilation.
- K-8. Describe the positions of openings in building
- K-9. Describe materials for building structures
- K-10. State principles of providing building services
- K-11. Draw sketches of different sizes of plots along with location of commercial area
- K-12. State building bye laws of different national agencies i.e., CDA, LDA

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Report on orientation & ventilation of an existing building.
- Drawing of c-type residence planned as per local regulations.
- State Importance and process of Ventilation
- Importance of Seismic aspects

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-23 . Produce Layout Plans for Building Services.

Overview: This competency standard covers the skills and knowledge required to produce detailed plan for water supply, gas, sanitary, electricity installations in residence & circuit diagram.

Competency Units	Performance Criteria
CU-1. Prepare detailed plan of water supply installations for “A” class bath on A4 sheet.	P1. Observe local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title block for drawing sheet. P4. Draw detailed plan of A class bath. P5. Draw water supply installations. P6. Draw sanitary installations. P7. Perform dimensioning, lettering for drawings.
CU-2. Prepare detailed plan of sanitary installations for “A” class bath on A4 sheet.	P1. Observe local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title block for drawing sheet. P4. Draw detailed plan of A class bath. P5. Draw water supply installations. P6. Draw sanitary installations. P7. Perform dimensioning, lettering
CU-3. Prepare detailed plan of water supply, gas & sanitary installations for A class kitchen on A4 sheet.	P1. Observe local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title block for drawing sheet. P4. Draw detailed plan of A class kitchen. P5. Draw water supply installations. P6. Draw gas installations. P7. Draw sanitary installations. P8. Perform dimensioning and lettering
CU-4. Prepare detailed plan of water supply gas & sanitary installations for C type residence on A3 sheet.	P1. Observe local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title block for drawing sheet. P4. Draw detailed plan of C type residence. P5. Draw water supply installations. P6. Draw gas installations. P7. Draw sanitary installations. P8. Prepare schedule of installations. P9. Perform dimensioning and lettering P10. Indicate North direction on sheet.



National Competency Standards Level-5 for “Civil Technology”



CU-5. Prepare detailed plan of electrical installations & Circuit diagram for C type residence on A3 sheet.	P1. Observe local standards for basics of drawing. P2. Draw title strip for drawing sheet. P3. Distribute space in required parts. P4. Draw detailed plan of C type residence. P5. Draw electrical installations. P6. Draw Circuit diagram P7. Prepare schedule of installations. P8. Perform dimensioning and lettering P9. Indicate North direction on sheet.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Define building services.
- K2. Enlist water supply, gas, sanitary & electricity installations for residential building.
- K3. Prepare schedule of different fixtures required for bath, kitchen, dining and courtyards.
- K4. Sketch the different fixtures in kitchen and bathrooms at their proper places.
- K5. Sketch the building services in C class residence at their proper places.
- K6. Importance for dimensioning and lettering
- K7. Explain schedule for installation
- K8. Sketch for different sanitary fixtures.
- K9. Free hand sketch for bath room fittings
- K10. Free hand sketching for kitchen accessories

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of detailed plan for water supply, & sanitary installations of A class bath.
- Drawing of detailed plan for water supply, gas, & sanitary installations of A class kitchen.
- Drawing of detailed plan for water supply, gas & sanitary installations of C class residence.
- Drawing of detailed plan for electricity installations & circuit diagram in C class residence.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet



National Competency Standards Level-5 for “Civil Technology”



2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



0732B&CE-24 . Produce Drawings of Sanitary Structures

Overview: This competency standard covers the skills and knowledge required to produce drawings of soakage pit, septic tank, manhole and sewer line.

Competency Units	Performance Criteria
CU-1. Prepare drawing of Soakage Pit for 25 users on A3 sheet.	P1. Observe local standards for basics of drawing. P2. Draw title strip for drawing sheet. P3. Distribute space in required parts. P4. Draw plan & section of soakage pit. P5. Perform dimensioning and lettering
CU-2. Prepare drawing of rectangular Septic Tank for 25 users on A3 sheet.	P1. Observe local standards for basics of drawing. P2. Draw title strip for drawing sheet. P3. Distribute space in required parts. P4. Draw plan & sections of Septic Tank. P5. Perform dimensioning and lettering
CU-3. Prepare drawing of rectangular Manhole on A3 sheet.	P1. Observe local standards for basics of drawing. P2. Draw title strip for drawing sheet P3. Distribute space in required parts. P4. Draw plan, long section & cross section of manhole. P5. Perform dimensioning and lettering.
CU-4. Prepare drawing of Sewer line on A4 sheet.	P1. Observe local standards for basics of drawing. P2. Distribute space in required parts. P3. Draw title strip for drawing sheet. P4. Draw cross section of sewer line. P5. Perform dimensioning and lettering

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define sanitary structures.
- K-2.** Enlist sanitary structures- soakage pit, soak pit, septic tank, manhole and sewer line.
- K-3.** Sketch & label sanitary structures- soakage pit, soak pit, septic tank, manhole & sewer line.
- K-4.** State the purpose of sanitary structures.
- K-5.** Differentiate between manhole and drop manhole
- K-6.** Importance of sanitary structure



National Competency Standards Level-5 for “Civil Technology”



Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of Soakage pit & Soakage pit for 25 users.
- Drawing of rectangular Septic Tank for 25 users
- Drawing of rectangular and circular manhole.
- Drawing of cross section of sewer line.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
5	Sharpener/ Sand paper	5	Thumb Pins
6	Handkerchief	6	Duster
7	French Curves		
8	Set of Card board scales		



10.3. Building Materials

0732B&CE-25 . Identify bricks

Overview: This competency standard covers the skills and knowledge required to interpret brick is a man-made building material used to make walls and make places to walk. It is a single unit of a kneaded clay-bearing soil, sand and lime, or concrete material, fire-hardened or air-dried, used in masonry construction. Bricks are made mostly of clay. Bricks used outdoors on the ground are called "pavers".

Competency Unit	Performance Criteria
CU-1. Inspect Brick Kiln.	P1. Identify constituents' materials P2. Ensure mixing proportions P3. Inspect brick making method P4. Prepare Report.
CU-2. Inspect Pre-Cast block unit factory.	P1. Identify manufacturing items P2. Identify constituents' materials P3. Ensure mixing proportions P4. Record making process
CU-3. Inspect a quarry / crusher.	P1. Inspect raw material. P2. Separate aggregate types P3. Record the crushing procedure. P4. Prepare Report
CU-4. Interpret brick manufacturing process.	P1. Identify raw materials P2. Mix raw material P3. Check ingredients. P4. Clean & fill mould P5. Remove bricks from mould P6. Dry bricks P7. Burn bricks in kiln P8. Use PPEs
CU-5. Test bricks.	P1. Select bricks P2. Find compressive strength of selected bricks P3. Find water absorption of selected bricks Check ingredients. P4. Check dimensional tolerance of selected bricks P5. Find efflorescence of selected bricks P6. Perform hardness test on selected bricks



	P7. Perform abrasion test on selected bricks P8. Check structure of selected bricks

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

- K1. Explain Uses of different building materials.
- K2. Describe and explain the Method to prepare brick kiln
- K3. Describe essential need for aggregate
- K4. Explain the quarry and its working
- K5. Explain demand of water for different building materials
- K6. Explain variation in size of bricks
- K7. Describe optimizing quality of crush
- K8. Explain network for different building materials
- K9. Explain safety precautions for laying, preparing brick & aggregate
- K10. Explain types of quarry.
- K11. Explain blasting method
- K12. Explain manufacturing of bricks

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout of brick kiln
 - Preparation plan to laying of brick at construction site as per standards
 - Apply method to prepare a kiln
 - Identify Method to carry out quarry process
 - Check construction specification for bricks and aggregates.
 - Apply variation for brick manufacturing
 - Apply brick manufacturing process
 - Apply safety precautions
 - Apply sieving process at quarry
 - Be able to
 - Find compressive strength of selected bricks
 - Find water absorption of selected bricks
- Check ingredients.



National Competency Standards Level-5 for “Civil Technology”



- Check dimensional tolerance of selected bricks
- Find efflorescence of selected bricks
- Perform hardness test on selected bricks
- Perform abrasion test on selected bricks
- Check structure of selected bricks

TOOLS AND EQUIPMENT'S

- ❖ Brick Making Machine
- ❖ Brick Molds
- ❖ Hand roller
- ❖ Thermometer
- ❖ Umbrella with stand
- ❖ Spirit level
- ❖ PPEs



0732B&CE-26 . Dress stone for masonry

Overview: This competency standard covers the skills and knowledge required to perform roughly dressed stones are laid in a mortar the result is a stone rubble masonry and Ashlar Masonry. Stone masonry using dressed (cut) stones is known as ashlar masonry. Stone Veneer. Stone veneer is used as a protective and decorative covering for interior or exterior walls and surfaces.

Competency Units	Performance Criteria
CU-1. Inspect dressing of natural stone	P1. Identify materials P2. Observe dressing process P3. Record the process
CU-2. Interpret Stone masonry (Rubble)	P1. Identify Materials P2. Pick Rough stones P3. Prepare cement sand mortar P4. Perform alignment P5. Place stones in layers P6. Carry out Joints filling with mortar P7. Perform safety precautions
CU-3. Interpret Stone masonry (Ashlar)	P1. Identify Materials P2. Sharpen edge of Rough stones P3. Prepare cement sand mortar P4. Perform alignment P5. Place stones with proper bond P6. Perform safety precautions

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Comprehend the purpose and application of stone masonry
- K2 Knowledge for method to apply rough stone masonry
- K3. Explain method to apply ashlar stone masonry
- K4- Describe working of stone masonry precautions.
- K5. Explain different type of stones used in masonry
- K6. Describe different jointing methods of stones
- K7. Describe safety procedure for joining of stones
- K8. Explain hole filling method in rough stone masonry

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Define Joints in stone masonry.
- Draw sketch of different stone masonry work.
- Interpret different stone masonry procedures
- Calculate quantity for stone masonry
- Plan safety procedure during construction of stone masonry
- Plan the steps to joining of stones in layers as Rubble

TOOLS AND EQUIPMENT'S

1. Calculator
2. Thermometer
3. Stone masonry instruments
4. Scissor
5. trowel
6. Umbrella with stand
7. Spirit level
8. PPEs
9. Hammer
10. Chisels



0732B&CE-27 . Prepare slaked lime

Overview: This competency standard covers the skills and knowledge required apply white alkaline substance consisting of calcium hydroxide, made by adding water to quicklime and used in traditional building methods to make plaster, mortar, and lime wash it Quicklime reacts with water to form slaked lime (**calcium hydroxide**). Slaked lime is used to reduce the acidity of lakes and soils. Lakes and soils can become acidic because of acid rain.

Competency Units	Performance Criteria
CU-1. Prepare slaked lime	P1. Identify requisite material P2. Spread lime at ponds P3. Add water P4. Observe change in lime P5. Check strength
CU-2. Store quick lime	P1. Classify lime as per use P2. Identify process for storing lime P3. Prepare lime putty to store lime

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

- K1-Describe lime with its properties
- K2- Explain Method to convert quick lime into slaked lime.
- K3- Explain procedure to get lime from quarry.
- K4. Describe design procedure for maintaining a quarry
- K5. Explain safety precaution to get lime from quarry
- K6. Explain PPEs

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Maintain safety precautions at quarry
- Maintain safety precautions to convert lime property
- Handling the quarry process
- Design the lime properties
- Execute and plan to change lime property



National Competency Standards Level-5 for “Civil Technology”



TOOLS AND EQUIPMENT'S

1. Spirit level
2. PPEs
3. Kassie
4. Thermometer
5. Lime beds
6. Umbrella with stand



0732B&CE-28 . Identify and store cement for construction

Overview: This competency standard covers the skills and knowledge required for basics as construction material powdery substance made by calcining lime and clay, mixed with water to form mortar or mixed with sand, gravel, and water to make concrete. **Store cement** in a building which is dry, leak proof and as moisture proof as possible. There **should** be minimum number of windows in the storage building. Stack the **cement** bags off the floor on wooden planks in such a way, so that it is about 150 mm to 200 mm above the floor.

Competency Units	Performance Criteria
CU-1. Develop Flow diagram for manufacturing of cement	P1. Identify drawing instruments P2. Fix Drawing sheet on board P3. Select scale P4. Use safety precautions for drawing P5. Draw flow diagram
CU-2. Manage storage process for cement	P1. Identify material P2. Locate moisture proof place P3. Stacked cement bags P4. Cover with plastic sheet P5. Use PPEs

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

K1-Describe cement storage process

K2- Explain Method to cover the cement in moisture proof place.

K3- Explain procedure to get cement from moisture proof room.

K4. Describe design procedure for maintaining a moisture proof room

K5. Explain safety precaution to get and use of cement from moisture proof room

K6. Explain PPEs

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Maintain safety precautions for cement storage
- Handling the storage process
- Design cement storage process at different sites



- Execute and plan to change cement into different categories

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Measuring scale,
5. Drawing sheet,
6. PPEs
7. Thermometer
8. Umbrella with stand
9. Plastic sheets



0732B&CE-29 . Select sand for construction

Overview: This competency standard covers the skills and knowledge required for basics as construction granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Desert sand, although plentiful, is not suitable for concrete, and 50 billion tons of beach sand and fossil sand is needed each year for construction.

Competency Units	Performance Criteria
CU-1. Test sand for use	P1. Select sand from heap P2. Find salts in sand P3. Determine bulking of sand P4. Find clay content in selected sand P5. Find size of sand grains.
CU-2. Manage storage process of sand at site	P1. Locate safe place for storage of sand P2. Dump sand at located place P3. Cover sand with plastic sheets P4. Use PPEs

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

K1-Describe sand storage process

K2- Explain Method to cover the sand and water sprinkling on sand.

K3- Explain procedure to get sand from quarry

K4. Describe design procedure for maintaining quarry for sand

K5. Explain safety precaution to get and use of sand at construction site

K6. Explain PPEs

K7. Describe type of sand ingredients.

K8. Explain sieving of sand

K9. Explain working of sand in concrete

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Maintain safety precautions at sand quarrying site
- Design the sand ingredients size
- Execute and plan to change concrete ratio with sand
- Manage and Plan different type of sand at site



National Competency Standards Level-5 for “Civil Technology”



- Handling storage of sand at different sites

TOOLS AND EQUIPMENT'S

- Weighing Balance
- Measuring Cylinders
- Plastic Sheets
- Sieve Analysis
- PPE's



0732B&CE-30 . Identify ferrous and non-ferrous metals

Overview: This competency standard covers the skills and knowledge required for Non-Ferrous Metals do not contain Iron, are not magnetic and are usually more resistant to corrosion than ferrous metals. Some examples of Non-Ferrous Metals we deal which are Aluminum, Aluminum Alloys and Copper.

Competency Units	Performance Criteria
CU-1. Identify ferrous metals	P1. Identify materials P2. Select ferrous metals P3. Check iron particles P4. Perform magnetic operation P5. Use PPEs P6. Perform results
CU-2. Identify Non-ferrous metals	P1. Identify materials P2. Select nonferrous metals P3. Check iron particles P4. Perform magnetic operation P5. Use PPEs P6. Perform results

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1-Describe ferrous and nonferrous metals

K2- Explain Method to perform strength for metals.

K3- Explain different alloys

K4. Explain PPEs

K5. Explain types of nonferrous metal

K6. Explain types of ferrous metal

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Maintain safety precautions for ferrous metal
- Maintain safety precautions for non-ferrous metal
- Handling of ferrous and non-ferrous metals

TOOLS AND EQUIPMENT'S



National Competency Standards Level-5 for “Civil Technology”



1. Ferrous Metal
2. Non-ferrous Metal
3. Magnets
4. PPEs
5. Thermometer



0732B&CE-31 . Identify advanced construction materials

Overview: This competency standard covers the skills and knowledge required Traditional construction materials, such as timber, steel, asphalt and Portland cement concrete are often used in many construction projects. Modern materials, such as. Polymers and composites are making headway into the construction industry.

Competency Units	Performance Criteria
CU-1. Identify Timber	P1. Identify materials P2. Select color for wood P3. Count annual rings P4. Check pith & rays P5. Select bark & sap wood P6. Perform results
CU-2. Identify steel	P1. Identify materials P2. Perform Tensile Strength. P3. Perform Ductility. P4. Check Malleability. P5. Monitor Durability. P6. Identify Conductivity. P7. Check Luster P8. Use PPEs
CU-3. Identify asphalt	P1. Identify materials P2. Perform Brittleness P3. Perform Ductility P4. Check Hardening P5. Monitor Viscosity P6. Identify Conductivity P7. Check Luster P8. Use PPEs
CU-4. Identify cement	P1. Indicate material P2. Check Fineness P3. Administer Soundness. P4. Monitor Consistency. P5. Check Strength. P6. Supervise Setting time. P7. Check Heat of hydration. P8. Study Loss of ignition.



National Competency Standards Level-5 for “Civil Technology”



	P9. Perform Bulk density. P10. Use PPES
CU-5. Identify glass	P1. Identify material P2. Check transparency, P3. Perform heat resistance, P4. Check pressure P5. Indicate breakage resistance P6. Check chemical resistance. P7. Use PPEs

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1-Describe different construction material
- K2- Explain Method to perform strength for different materials
- K3- Explain different material properties
- K4. Describe design procedure for manufacturing different materials
- K5. Explain safety precaution to manufacturing and finishing of materials
- K6. Explain PPEs
- K7. Explain type of nonferrous metals
- K9. Explain safe working process to cut the metals and timber
- K10. Explain temperature zone for cutting different materials
- K11. Explain Annealing process for metals

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Maintain safety precautions for cutting of metals
- Maintain safety precautions while alloys process
- Handling the alloy process at plant
- Design the alloy for better performance
- Execute and plan to change the heat while alloying
- Manage and Plan different type alloy processing at plant
- Manage to cut the timber
- Plan Designing in timber process



0732B&CE-32 . Work Safely in Construction Industry

Overview: This competency standard covers the skills and knowledge required to identify OHS legislative requirements, identify construction hazards and control measures, identify OHS communication and reporting processes and identify OHS incident response procedures.

Competency Unit	Performance Criteria
CU-1. Identify OHS legislative requirements.	P1. Identify and explain applicable OHS legislative requirements relevant to own work, role and responsibilities. P2. Identify duty of care requirements. P3. Identify and explain own responsibilities to comply with safe work practices
CU-2. Identify construction hazards and control measures.	P1. Identify basic principles of risk management. P2. Identify & discuss Common construction hazards. P3. Identify measures for controlling hazards and risks.
CU-3. Identify OHS communication and reporting processes.	P1. Identify & discuss OHS communication processes, information and documentation. P2. Identify & explain role of designated OHS personnel. P3. Identify & explain Safety signs and symbols. P4. Identify & discuss Procedures and relevant authorities for reporting hazards, incidents and injuries are identified.
CU-4. Identify OHS incident response procedures.	P1. Identify & explain General procedures for responding to incidents and emergencies. P2. Identify procedures for accessing first aid. P3. Identify & demonstrate requirements for the selection and use of relevant personal protective equipment. P4. Identify & discuss Fire safety equipment.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe applicable Commonwealth, State or Territory OHS legislation, regulations, standards, codes of practice and industry standards/guidance notes relevant to own work, role and responsibilities
- K2.** Describe basic principles of risk management and assessment for construction work.
- K3.** Describe common construction hazards, common construction safety signage and its meanings
- K4.** Describe general construction emergency response and evacuation procedures.



National Competency Standards Level-5 for “Civil Technology”



- K5.** Describe general construction work activities that require licenses, tickets or certificates of competency.
- K6.** Describe general first aid response requirements and general procedures for raising OHS issues.
- K7.** Explain general procedures for reporting OHS hazards, accidents, incidents, emergencies, injuries, near misses and dangerous occurrences.
- K8.** Describe general procedures for responding to hazards, incidents and injuries.
- K9.** Describe general workers' compensation and injury management requirements.
- K10.** Describe OHS hierarchy of controls, OHS responsibilities and rights of duty holders.
- K11.** Describe persons in control of construction work/projects- employers and self-employed persons, supervisors, employees, designers, inspectors and manufacturers and suppliers
- K12.** Describe own responsibilities to comply with safe work practices relating to:
housekeeping, identification of hazards, preventing bullying or harassment, smoking, use of amenities, use of drugs and alcohol
- K13.** Describe role of OHS committees and representatives
- K14.** Describe types of common personal protective equipment and fire safety equipment
- K15.** Explain types of OHS information and documentation.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Applicable OHS legislative and safety requirements for construction work including duty of care
- The range of common construction hazards and procedures for the assessment of risk and application of the hierarchy of control
- OHS communication processes, information and documentation including the role of OHS committees and representatives, the meaning of common safety signs and symbols, and procedures for reporting hazards, incidents and injuries
- General procedures for responding to incidents and emergencies including evacuation, first aid, fire safety equipment and PPE.

TOOLS AND EQUIPMENT'S

Personal protective equipment for construction industry.



0732B&CE-33 . Interpret Simple Building Plans

Overview: This competency standard covers the skills and knowledge required to locate, interpret and apply relevant information standards of simple building plans,

Competency Unit	Performance Criteria
CU-1. Identify types of drawings and their functions.	P1. Identify the Main types of plans and drawings used in the construction sector of the industry. P2. Identify Key features and functions of each type of drawing. P3. Recognize the Quality requirements of company operations. P4. Identify Environmental requirements and controls from job plans, specifications and environmental plan.
CU-2. Recognize amendments.	P1. Check the Title panel of project documentation to verify latest amendments to drawing. P2. Check the amendments to specifications to ensure currency of information and convey to others where appropriate.
CU-3. Recognize commonly used symbols and abbreviations.	P1. Recognize the Construction symbols and abbreviations. P2. Locate legend on project drawings, and interpret correctly symbols & abbreviations

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Basic calculations of heights, areas, volumes and grades
- K2.** Knowledge of Commonly used construction symbols and abbreviations
- K3.** Define different Construction terminology
- K4.** Knowledge of Drawing conventions
- K5.** Knowledge for features of plans and elevations, including direction, scale, key, contours, symbols and abbreviations

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations
- Communicate and work effectively and safely with others

Instruments & Consumables



National Competency Standards Level-5 for “Civil Technology”



S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-34 . Read and Interpret plans and Specifications

Overview: This competency standard covers the skills and knowledge required to read, interpret plans and specifications.

Competency Unit	Performance Criteria
CU-1. Identify types of drawings and their functions.	P1. Identify main types of plans and drawings used in the construction sector P2. Identify key features and functions of each type of drawing P3. Recognize quality requirements of company operations P4. Identify environmental requirements and controls from job plans, specifications and environmental plan.
CU-2. Recognize amendments.	P1. Check title panel of project documentation P2. Check to ensure amendments to specifications.
CU-3. Recognize commonly used symbols and abbreviations.	P1. Recognize construction symbols and abbreviations. P2. Interpret legend located on project drawings, symbols and abbreviations
CU-4. Locate and identify key features on a site plan.	P1. Position plan according to site. P2. Identify key features of the site. P3. Access to site and identify services, main features, contours and datum
CU-5. Identify project requirements.	P1. Identify dimensions of project on locations. P2. Identify construction types and dimensions for nominated locations. P3. Check Environmental control. P4. Identify location, dimensions and tolerances for ancillary works.
CU-6. Read and interpret job specifications.	P1. Identify job specifications from drawings, notes and descriptions. P2. Identify standards of work, finishes and tolerances from project specifications. P3. Identify material attributes from specifications.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1.** Basic calculations of heights, areas, volumes and grades
- K2.** Knowledge of commonly used construction symbols and abbreviations
- K3.** Describe different Construction terminology
- K4.** Knowledge of drawing conventions
- K5.** Knowledge for features of plans and elevations, including direction, scale, key, contours, symbols and abbreviations
- K6.** Develop job safety analysis (JSA) and safe work method statements
- K7.** Knowledge for key features of formal job specifications
- K8.** Describe processes for application of scales in plan preparation and interpretation
- K9.** Define project quality requirements
- K10.** Explain site and equipment safety (OHS) requirements
- K11.** Describe techniques for orienting/confirming the orientation of a plan.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations
- Communicate and work effectively and safely with others for a minimum of two different projects, read and interpret the project plans, including:
- Confirmation of amendment status and drawings confirmed 'for construction'
- Orientation of plans to the ground
- Six key features on both the plan and the site
- Confirmation of six items of information from the title block of the project plans
- Six construction dimensions, levels and locations from the project plans
- Six ancillary works dimensions, levels and locations from the project plans for a minimum of two formal specifications, identify the dimensions, material requirements and processes to be followed.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-35 . Apply power and hand tools in construction.

Overview: This competency standard covers the skills and knowledge required to identify and select hand, power and pneumatic tools for given tasks and safely use and maintain a minimum of rule, tape, square, hammer, hand saw, hand plane, chisel, shovel, wheelbarrow, sledge hammer, pick, mattock and crow bar and pinch bar for given tasks.

Competency Unit	Performance Criteria
CU-1. Plan and prepare	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work.
CU-2. Identify and select hand, power and pneumatic tools	P1. Identify and select hand tools, power and pneumatic tools. P2. Apply safety requirements when using hand, power and pneumatic tools. P3. Observe pre-operational checks, including lubricants, hydraulic fluid and water.
CU-3. Use tools safely and effectively	P1. Use hand tools appropriate to the task P2. Use power and pneumatic tools are safely and effectively in accordance with manufacturer recommendations. P3. Sharpen and maintain tools.
CU-4. Identify, select and use plant and equipment	P1. Select and use plant and equipment consistent with OHS requirements respective to job. P2. Observe pre-operational checks, including lubricants, hydraulic fluid and water.
CU-5. Clean up work place.	P1. Clean work area and dispose of waste in accordance with work specifications. P2. Clean, maintain and store tools plant and equipment in accordance with workplace practices.

Knowledge and understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain need for store in a project
- K2.** State the classification of stores- stock, tools and plants, Road metal and materials charged direct to the work.
- K3.** Knowledge of Construction terminology, particularly names of tools and equipment
- K4.** Describe Manual handling and correct posture for tool and equipment use
- K5.** Define use of Personal protective equipment
- K6.** Explain Safety techniques for tool and equipment use
- K7.** Describe safety requirements for workplace and equipment

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Identify and select hand, power and pneumatic tools for given tasks.
- Safely use and maintain a minimum of rule, tape, square, hammer, hand saw, hand plane, chisel, shovel, wheelbarrow, sledge hammer, pick, mattock and crow bar and pinch bar for given tasks.

Instruments & Consumables

S No.	Description (Instruments)
1	Hand tools
2	Power tools
3	Pneumatic tools
4	PPE's



10.4. Workshop Practice-I (wood working)

0732B&CE-36 . Carry out OH & S requirement in workshop

Overview: This competency standard covers the skills and knowledge required to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area.

Competency Units	Performance Criteria
CU1. Assess risks	P1. Identify hazards in the work area P2. Identify OHS issues and risks in the work area P3. Prepare reports on OHS, hazard, accident or incident
CU2. Plan and prepare for safe work practices	P1. Select personal protective equipment (PPE) P2. Select tools and equipment consistent with safe work practice requirements P3. Determine and erect Required barricades, hoardings and signage P4. Identify and apply Material Safety Data Sheets (MSDS)
CU3. Maintain safety of self and others	P1. Identify safety signs in terms of color and shape, symbols and alarms P2. Identify, handle and store hazardous chemicals and materials maintaining the safety to self, others and the environment P3. Identify common causes of accidents in the industry P4. Implement prevention measures for accidents
CU4. Apply emergency response	P1. Identify area requiring emergencies P2. Provide emergency response in accordance to requirements P3. Prepare report detail of actions taken
CU5. Clean up work site area	P1. Clear workplace by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Define work shop orientation
- K2. Enlist safety precautions
- K3. Enlist PPE's

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain uses of PPE's
- Knowledge of workshop cleanliness
- Knowledge of proper storage of tools and equipment
- Observe causes of accidents in industries

Tools and Equipment

1. Ear Muff, Ear Plug
2. Safety shoes
3. Gloves
4. Safety Goggles
5. Safety Helmet
6. Respiratory protective equipment i.e. Masks
7. Life Jacket
8. High visibility jacket
9. Safety harness
10. Face shield
11. Rubber shoes/ long shoes



0732B&CE-37 . Determine properties and types of locally manufactured timber

Overview: This competency standard covers the skills and knowledge required to identify type of timber, determine specific gravity of timber, find out moisture content of timber and determine compressive strength of timber

Competency Units	Performance Criteria
CU1. Identify type of timber	P1. Recognize color and odor of locally produced timber P2. Prepare a list of locally produced timber in accordance with color and odor P3. Identify type of given timber sample
CU2. Determine specific gravity of timber	P1. Identify tools and equipment P2. Measure dimensions of sample P3. Weigh the sample P4. Calculate specific gravity of timber by computing density
CU3. Find out moisture content of timber	P1. Identify tools and equipment P2. Weigh sample before oven drying P3. Weigh sample after drying sample P4. Calculate moisture content
CU4. Determine compressive strength of timber	P1. Identify tools and equipment P2. Assemble sample in equipment by placing sample perpendicular to grain P3. Find out compressive strength according to specification P4. Repeat process by placing sample parallel to grain P5. Interpret compressive strength

Knowledge & Understanding

The candidate must be able to develop skills and understanding identify type of timber, determine specific gravity of timber, find out moisture content of timber and determine compressive strength of timber required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Define wood
- K2. Explain Constructional wood (timber) with sketch
- K3. Explain structure and growth of timber.
- K4. Explain wood types and uses of various wooden products
- K5. Perform felling and conversion of timber.
- K6. Enlist the defects and decay of timber.



National Competency Standards Level-5 for “Civil Technology”



K7. Explain characteristics of timber

K8. Draw section of timber

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare report on specific gravity of timber
- Prepare report on moisture content of timber
- Prepare report on compressive strength of timber

Tools and Equipment

1. Compression testing machine
2. Digital weighing balance
3. Laboratory oven



0732B&CE-38 . Sharpen carpentry tools

Overview: This competency standard covers the skills and knowledge required to identify tools used in carpentry and perform sharpening of carpentry tools

Competency Units	Performance Criteria
CU1. Identify tools used in carpentry	P1. Recognize tools used in carpentry P2. Identify tools needed to be sharpen
CU2. Perform sharpening of carpentry tools	P1. Identify tools and equipment P2. Perform plane iron sharpening P3. Perform chisel sharpening P4. Perform scraper sharpening P5. Perform router bit sharpening P6. Perform carving tool sharpening

Knowledge & Understanding

The candidate must be able to develop skills and understanding to identify tools used in carpentry and perform sharpening of carpentry tools required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Enlist wood tools
- K2. Enlist wood measuring tools
- K3. Enlist wood marking tools
- K4. Enlist wood holding tool
- K5. Enlist cutting tool
- K6. Explain the working of different tools

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain sharpening of tools
- Explain OHS requirement for tools sharpening

Tools and Equipment

1. Files
2. Diamond stones
3. Water stones
4. Oil stones



National Competency Standards Level-5 for “Civil Technology”



5. Ceramic stones



0732B&CE-39 . Apply hand tools

Overview: This competency standard covers the skills and knowledge required to identify and select hand tools, Identify the tools and cleanup work site area.

Competency Units	Performance Criteria
CU1. Identify and select hand tools	P1. Identify and select hand , power and pneumatic tools , their functions, operations and limitations P2. Recognize OHS requirements for using hand tools
CU2. Identify the tools	P1. Use appropriate hand tools to the task and materials in accordance with OHS requirements P2. Sharpen and maintain tools
CU3. Clean up the work site area	P1. Clear work area and dispose materials (reused or recycled) in accordance with legislation, regulations and codes of practice and job specification. P2. Clean, check, maintain and store tools according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Enlist wood tools
- K2. Enlist wood measuring tools
- K3. Explain wood marking tools
- K4. Enlist wood holding tool
- K5. Enlist cutting tool

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



- Explain use of tools
- Check compliance to OHS requirement

Tools and Equipment

1. Wood tool
2. Measuring tool
3. Marking tools
4. Holding tool
5. Cutting tool
6. Planning tool



0732B&CE-40 . Perform wooden joinery work

Overview: This competency standard covers the skills and knowledge required to make butt, biscuit, miter, edge, dovetail, mortise and tenon and dado joint.

Competency Units	Performance Criteria
CU1. Make butt joints	P1. Identify butt joint P2. Cut timber according to requirement of butt joint P3. Join cut pieces according to requirement
CU2. Perform Biscuit joinery	P1. Identify biscuit joint P2. Cut timber according to requirement of biscuit joint P3. Join cut pieces according to requirement
CU3. Make Miter joints	P1. Identify Miter joints P2. Cut timber according to requirement of Miter joints P3. Join cut pieces according to requirement
CU4. Make Edge joint	P1. Identify Edge joint P2. Cut timber according to requirement of Edge joint P3. Join cut pieces according to requirement
CU5. Make Dovetail joint	P1. Identify Dovetail joint P2. Cut timber according to requirement of Dovetail joint P3. Join cut pieces according to requirement
CU6. Make Mortise and tenon joint	P1. Identify Mortise and tenon joint P2. Cut timber according to requirement of Mortise and tenon joint P3. Join cut pieces according to requirement
CU7. Make Dado joint	P1. Identify Dado joint P2. Cut timber according to requirement of Dado joint P3. Join cut pieces according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding make butt, biscuit, miter, edge, dovetail, mortise and tenon and dado joint required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain types of wood joints
- K2. Describe the uses of wood joints
- K3. Define Butt joint
- K4. Define Biscuit joint



National Competency Standards Level-5 for “Civil Technology”



- K5. Define Miter joint
- K6. Define Edge joint
- K7. Define Dovetail joint
- K8. Define Mortise and tenon joint
- K9. Define Dado joint

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify joint types
- Knowledge of cutting of wood
- Explain procedure for joining of wood

Tools and Equipment

- ❖ Wood tool
- ❖ Measuring tool
- ❖ Marking tools
- ❖ Holding tool
- ❖ Cutting tool
- ❖ Planning tool



0732B&CE-41 . Apply fastenings

Overview: This competency standard covers the skills and knowledge required to prepare hole, identify and apply fastenings.

Competency Units	Performance Criteria
CU1. Prepare hole	P1. Identify and select power and pneumatic tools for making hole P2. Perform boring to make hole in accordance with OHS requirement
CU2. Identify fastenings	P1. Identify and select appropriate fastening P2. Identify and select tools for fastenings
CU3. Apply fastenings	P1. Insert fastening in hole prepared before P2. Use tools for fastenings

Knowledge & Understanding

The candidate must be able to develop skills and understanding to prepare hole, Identify fastenings and apply fastenings required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Define types of fastenings
- K2. Enlist fastening tools
- K3. Explain the standard procedures for fastening

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain use of tools for fastening
- Selection of appropriate fastening
- Compliance to OHS requirement

Tools and Equipment

1. Fastening tools
2. Boring machine
3. Fastenings



0732B&CE-42 . Apply traditional spirits polishing techniques

Overview: This competency standard covers the skills and knowledge required to plan and prepare for work, prepare for application of polish, perform skin in job surface, perform body up on skinned in surface, apply spirit on surface and clean up.

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Identify work requirements correctly from drawings/specifications/instructions P2. Recognize quality assurance requirements P3. Observe OHS requirements, including personal protection needs throughout the work P4. Select tools and equipment consistent with job requirements and work instructions P5. Prepare skinning in, bodying up and spiriting out/stiffening up rubbers consistent with the requirements of the work
CU2. Prepare for application of polish	P1. Check surfaces for contamination and correct preparation according to workplace procedures and standards P2. Identify products with surface or other faults P3. Identify techniques for hand application of polish using traditional methods P4. Prepare materials and equipment suitable for skinning in, bodying up and spiriting out/stiffening up operations are P5. Stain, fill in and seal surfaces with polish using a mop brush and blender.
CU3. Perform skin in job surface	P1. Perform sand surface lightly P2. Perform skinning in rubber and apply polish for job color and clarity P3. Perform skin in surface covering small areas at a time, using correct amount of pressure and suitable rubber movements P4. Apply pumice powder as necessary in accordance with workplace procedure. P5. Inspect skinned in surface



National Competency Standards Level-5 for “Civil Technology”



CU4. Perform body up on skinned in surface	P1. Use polish, lubricating oil and pumice powder is used to body up the skinned in surface, using correct amount of pressure and suitable rubber movements P2. Monitor and evaluate rubber and job surface continuously P3. Recharge body up rubber and lubricating oil P4. Apply pumice as necessary to ensure surface faults and blemishes do not develop
CU5. Apply spirit on surface	P1. Apply spirit on surface using correct amount of pressure and suitable rubber movements P2. Observe blemishes or rubber marks
CU6. Clean up	P1. Clear workplace of debris and unused materials P2. Store rubbers separately in airtight glass or plastic containers in accordance with workplace procedures P3. Clean, maintain and store tools and equipment

Knowledge & Understanding

The candidate must be able to develop skills and understanding to Plan and prepare for work, prepare for application of polish, Skin in job surface, Body up a skinned in surface, Spirit off/stiffen up surface and clean up required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain uses of glue
- K2. Enlist types of fastener
- K3. Explain procedure for sprit polish
- K4. Explain use of polish, lubricating oil and pumice powder

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain uses of tools
- Procedure to apply polish on object
- Compliance to OHS requirement

Tools and Equipment

- ❖ Lac
- ❖ Polishes
- ❖ Paraffin and linseed oils
- ❖ Methylated spirits
- ❖ Rubbers
- ❖ Sprayer
- ❖ Glass
- ❖ Mop brush
- ❖ Blender



0732B&CE-43 . Apply portable power tools

Overview: This competency standard covers the skills and knowledge required to identify and select power and pneumatic tools, use of tools and cleanup work site area.

Competency Units	Performance Criteria
CU1. Identify and select power and pneumatic tools	P1. Identify and select power and pneumatic tools, their functions, operations and limitations P2. Recognize OHS requirements for using power and pneumatic tools P3. Check lubricants, hydraulic fluid and water according to manufacturer recommendations
CU2. Use of tools	P1. Use hand tools appropriate to the task and materials in accordance with OHS requirements P2. Use of power and pneumatic tools safely and effectively in accordance with manufacturer recommendations and state or territory OHS requirements P3. Sharpen and maintain tools
CU3. Clean up work site area.	P1. Clear work area and dispose materials (reused or recycled) in accordance with legislation, regulations and codes of practice and job specification. P2. Clean, check, maintain and store plant, tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Introduction of tools
- K2.** Define Circular SAW
- K3.** Explain Wood Work Planer
- K4.** Explain Wood Turning lathe, Spindle, Boring, Sander

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



- Procedure for use of tools
- Explain use of power and pneumatic tools
- Compliance to OHS requirement

Tools and Equipment

- ❖ Circular SAW
- ❖ Wood Planer
- ❖ Wood Turning lathe
- ❖ Spindle
- ❖ Boring machine
- ❖ Sander



0732B&CE-44 . Make simple calculations of timber

Overview: This competency standard covers the skills and knowledge required to prepare a drawing of product and estimate timber quantity.

Competency Units	Performance Criteria
CU1. Prepare drawing of given specimen	P1. Identify drawing tools P2. Perform basics of drawing P3. Draw plan, cross section and elevation of specimen
CU2. Estimate timber quantity	P1. Identify components of specimen P2. Recognize timber requirement for specific components of timber P3. Calculate quantities of timber

Knowledge & Understanding

The candidate must be able to develop skills and understanding to prepare a drawing of product and estimate timber quantity required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain measurement of wood square and board
- K2. Draw plan, cross section and elevation of specimen
- K3. Explain measurement of Log

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of tools
- Calculate quantities of timber
- Compliance to OHS requirement

Tools and Equipment

1. Drafting table
2. Drafting tools
3. Drawing sheet
4. Pencils
5. Eraser
6. Drawing board
7. Sharpener



0732B&CE-45 . Construct a basic timber product

Overview: This competency standard covers the skills and knowledge required to estimate timber quantity, prepare timber for joinery work, apply fastenings and apply polish.

Competency Units	Performance Criteria
CU1. Estimate timber quantity	P1. Prepare a drawing of product P2. Identify components of product P3. Recognize timber requirement for specific components of product P4. Calculate quantities of timber
CU2. Prepare timber for joinery work	P1. Cut timber according to drawing/specifications P2. Perform necessary work for joints
CU3. Apply fastenings	P1. Prepare holes on required product P2. Apply fastenings
CU4. Apply polish	P1. Prepare surface for polishing P2. Apply polish on job surface P3. Apply Spirit on surface

Knowledge & Understanding

The candidate must be able to develop skills and understanding to construct a basic timber product required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain planning for product construction
- K2. Describe procedure of selection of timber
- K3. Describe procedure for cutting of timber
- K4. Define joinery work
- K5. Explain fastenings
- K6. Explain procedure for polishing

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain use of tools
- Calculate quantities of timber
- Identify components of given product
- Compliance to OHS requirement



Tools and Equipment

1. Drafting table
2. Drafting tools
3. Drawing sheet
4. Pencils
5. Eraser
6. Drawing board



10.5. Workshop Practice-II (Electrical wiring)

0732B&CE-46 . Carry out OH & S requirement in workshop

Overview: This competency standard covers the skills and knowledge required to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area.

Competency Units	Performance Criteria
CU1. Assess risks	P1. Identify hazards in the work area P2. Identify OHS issues and risks in the work area P3. Complete reports on OHS, hazard, accident or incident
CU2. Plan and prepare for safe work practices	P1. Select personal protective equipment (PPE) P2. Select tools and equipment consistent with safe work practice requirements P3. Determine and erect Required barricades, hoardings and signage P4. Identify and apply Material safety data sheets (MSDS)
CU3. Maintain safety of self and others	P1. Identify safety signs in terms of colour and shape, symbols and alarms P2. Identify, handle and store hazardous chemicals and materials maintaining the safety to self, others and the environment P3. Identify common causes of accidents in the industry P4. Implement prevention measures for accidents
CU4. Apply emergency response	P1. Identify emergencies P2. Provide emergency response in accordance to requirements P3. Report detail of actions taken
CU5. Clean up work site area	P1. Clear work are by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to assess risks, plan and prepare for safe work practices, maintain safety of self and others, apply emergency response and cleanup work site area required to carry out tasks covered in this competency standard. This includes the



National Competency Standards Level-5 for “Civil Technology”



knowledge of:

K1. Define work shop orientation

K2. Enlist safety precautions

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Workshop cleanliness
- Proper storage of tools and equipment

Tools and Equipment

1. Ear Muff, Ear Plug
2. Safety shoes
3. Gloves
4. Safety Goggles
5. Safety Helmet
6. Respiratory protective equipment i.e. Masks
7. Life Jacket
8. High visibility jacket
9. Safety harness
10. Face shield
11. Rubber shoes/ long shoes



0732B&CE-47 . Maintain safety

Overview: This competency standard covers the skills and knowledge required to use electricity safely and treat against electric shock

Competency Units	Performance Criteria
CU1. Use electricity safely	P1. Determine safest supply and route for electrical supply P2. Support and place leads in accordance with regulations. P3. Conduct check on power board visually P4. Check leads and equipment for tags and visual damage P5. identify and report electrical hazards
CU2. Treat against electric shock	P1. Turn off the source of electricity, if possible. If not, move the source away from you and the person, using a dry, non-conducting object made of cardboard, plastic or wood P2. Begin CPR if the person shows no signs of circulation, such as breathing, coughing or movement P3. Try to prevent the injured person from becoming chilled P4. Apply a bandage. Cover any burned areas with a sterile gauze bandage, if available, or a clean cloth. Don't use a blanket or towel, because loose fibers can stick to the burns.

Knowledge & Understanding

The candidate must be able to develop skills and understanding to use electricity safely and treat against electric shock required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Safety precautions for electricity
- K2.** Treatment against electric shock

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Workshop cleanliness
- Proper storage of tools and equipment



Tools and Equipment

1. Ear Muff, Ear Plug
2. Safety shoes
3. Gloves
4. Safety Goggles
5. Safety Helmet
6. Respiratory protective equipment i.e. Masks
7. Life Jacket
8. High visibility jacket
9. Safety harness
10. Face shield
11. Rubber shoes/ long shoes



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-48 . Perform electrical wiring

Overview: This competency standard covers the skills and knowledge required to Interpret Drawing, Arrange Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging, Perform Wire Dressing, and Perform Checking & Testing of electrical wiring.

Competency Units	Performance Criteria
CU1. Interpret Drawing	P1. Differentiate between control and power wiring as per job requirement P2. Perform preliminary marking before termination of cables P3. Follow drawing to perform wiring and for reporting/record purpose
CU2. Arrange Resources for electrical wiring	P1. Enlist and arrange tools and material as per job P2. Arrange work permit for the wiring task P3. Arrange backup resources for lighting, power and safety purposes as per job requirement
CU3. Perform Wiring (Domestic & Industrial), termination and tagging	P1. Perform Wiring using following methods: • Concealed • Conduit • Busway • Open • Duct P2. Follow procedure to remove insulation and to attach thimbles P3. Perform different types of terminations including • High tension (HT) • Low tension (LT) • Control shrouding • Sleeves P4. Perform different types of joints • High tension • Low tension • Water proof/underground • Open P5. Attach tags or numbers to wires for identification P6. Use personal protective equipment as per job requirement
CU4. Perform Wire Dressing	P1. Maintain distance between power, communication and control wires according to job requirements P2. perform alignment of cables as per job requirement
CU5. Perform Checking & Testing of electrical wiring	P1. Check continuity using line of terminal P2. Perform test to identify open/close circuits P3. Perform live test for verification of wiring P4. Verify proper grounding / Panel Earthing (PE) on designated locations

Knowledge & Understanding

The candidate must be able to develop skills and understanding o Interpret Drawing, Arrange



National Competency Standards Level-5 for “Civil Technology”



Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging, Perform Wire Dressing, Perform Checking & Testing of electrical wiring required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain electrical symbols
- K2. Describe different types of drawings (e.g. power, control, single line etc.)
- K3. Describe how to prepare drawing if not available
- K4. Describe types of breakers, contactors, relays etc.
- K5. Describe standard tools used in wiring
- K6. Describe usage of back up resources including Emergency lights, ladder, safety belts etc
- K7. Explain different types of wiring techniques including: • Concealed • Conduit • Busway • Open • Duct
- K8. Describe purpose of color coding and tagging during wiring K4. Describe types and size of thimbles and use of thimble puncher
- K9. Explain Termination techniques for HT, LT, Control shrouding, sleeves K6.describe Jointing techniques for HT, LT
- K10. Describe purpose of distancing
- K11. Describe purpose of cable alignment
- K12. Describe Importance of terminals
- K13. Describe open, close circuits and testing procedures
- K14. Describe Importance of controlled live test
- K15. Describe Importance of grounding

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Use of tools
- Proper storage of tools and equipment

Tools and Equipment

1. Electrical drawing
2. Computer
3. Emergency light
4. Ladder
5. drill machine tool kit
6. Thimble puncher



National Competency Standards Level-5 for “Civil Technology”



7. Shroud
8. PVC tape
9. HT tape
10. Thimbles
11. cable knife
12. wire stripper
13. drill machine
14. PPE
15. Cable tie
16. Clamps
17. Plier
18. Cutter
19. spiral/ flexible pipes
20. tie base
21. ravel bolt
22. ravel plug
23. hilty bolt
24. wooden screw
25. AVO meter
26. test lamp
27. earth tester
28. line tester
29. megger



0732B&CE-49 . Install electrical system

Overview: This competency standard covers the skills and knowledge required to Interpret Drawing, Arrange Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging, Perform Wire Dressing, and Perform Checking & Testing of electrical wiring.

Competency Units	Performance Criteria
CU1. Interpret Electrical layout	P1. Interpret layout of the job for installations P2. Read/interpret electrical drawing for electrical wirings P3. Follow drawing to connect components of equipment
CU2. Arrange Resources (e.g. Power Supply, Tools & Equipment) for electrical equipment installation/dismantling	P1. Enlist and arrange tools and material as per job P2. Arrange work permit for the wiring task P3. Arrange backup resources for lighting, power and safety purposes as per job requirement
CU3. Perform Electrical Panel Installation	P1. Extract information from layout regarding panel installations P2. Place the panel according to layout P3. Connect input and output of cables in relevant panels as per electrical layouts
CU4. Perform Cable Installation	P1. Interpret layouts for cable route P2. Handle cable for laying with the help of stacker P3. Tag both ends of cables for cable tracing P4. Lay cables in cable trays according to route plan P5. Perform testing of cables e.g. insulation, continuity etc
CU5. Perform Cable Dismantling	P1. Interpret layouts for cable route P2. Disconnect electric supply from the job P3. Handle cable for laying with the help of stacker P4. Tag both ends of cables for cable tracing P5. Remove cables in cable trays according to route plan
CU6. Perform Electrical Appliances Installation	P1. Interpret vendor's user manual for electrical installations P2. Coordinate with concerned departments before installations for feedback P3. Connect cables with machines as per operation manual P4. Verify the connections with respect to color coding/tagging/numbering



National Competency Standards Level-5 for “Civil Technology”



CU7. Perform Electrical equipment Dismantling	P1. Extract information from layouts regarding electrical equipment dismantling P2. Disconnect input/output cables of relevant equipment P3. Remove equipment from location as per SOPs P4. Handle removed equipment as per manufacturers' instructions P5. Place tags on dismantled items as per SOPs P6. Store the dismantled equipment at designated place
CU8. Perform Earthing	P1. Perform earthing of cables according to calculated load P2. Perform earthing of electrical appliances according to calculated load P3. Perform earth resistance test as per standards
CU9. Provide Power Supply to machine	P1. Interpret electrical drawings for power supply distribution P2. Perform power distribution according to drawings P3. Perform verification of electrical supply as per operations manual P4. Perform communication with all concerned persons for electrical appliance dry-run

Knowledge & Understanding

The candidate must be able to develop skills and understanding o Interpret Drawing, Arrange Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging, Perform Wire Dressing, Perform Checking & Testing of electrical wiring required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define electrical symbols to be used in drawings
- K2.** Describe types of drawings (civil, electrical and communication) for the job
- K3.** Explain connection scheme of the job
- K4.** Explain all types of drawings (civil, electrical and communication)
- K5.** Explain the hierarchy of the organization to rectify the issues (if occurred)
- K6.** Describe the quality standards of original products
- K7.** Describe the quantity of products against purchase requisition
- K8.** Define electrical symbols to be used in drawings
- K9.** Describe types of drawings (civil, electrical) for machine
- K10.** Explain handling techniques for placement
- K11.** Describe all the types of drawings (civil and electrical)
- K12.** Describe the safe handling techniques of cable routing



National Competency Standards Level-5 for “Civil Technology”



- K13.** Explain the different methods of cable testing
- K14.** Describe different the types of drawings e.g. civil and electrical etc.
- K15.** Describe the safe handling techniques of cable routing
- K16.** Describe methods of installing the electrical appliances
- K17.** Describe basic knowledge of electrical appliances (A/C, water dispensers, microwave oven etc)
- K18.** Describe the different types of coding procedures (e.g. colour coding/tagging/numbering)
- K19.** Describe different the types of drawings e.g. civil and electrical etc.
- K20.** Enlist appropriate positions of tags for visual controls
- K21.** Explain earthing and testing procedures
- K22.** Describe working principle of earth tester
- K23.** Explain Describe different the types of drawings e.g. civil and electrical etc.
- K24.** Explain verification parameters according to standards
- K25.** Explain the importance of communication with relevant persons

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Use of tools
- Proper storage of tools and equipment

Tools and Equipment

Drawings, operations manuals

Layouts, ICT, measuring tools (calipers, cable chart, hand hacksaw, measuring tape, laser gun for length), quality standards, vendor certificate, grinding cutter, drill machines, hammer
Layouts, lifters, chain-pulley, jacks, spirit level

Layouts, measuring tools, cutting tools like wire cutter, side cutter, cable cutter, thimble presser, megger, stacker, tags, glands, shrouds, conduits, cable tray etc
Layouts, cutting tools e.g. wire cutter, side cutter, cable cutter, stacker, tags etc.

Drawing, layout, manual, fork lifter, drill machine, PPE

Layouts, lifters, chain-pulley, jacks, tags

Soldering, earth tester, thimble presser,

Drawings, multi meters,



0732B&CE-50 . Construct circuits

Overview: This competency standard covers the skills and knowledge required to construct parallel circuit, series circuit and tunnel circuit.

Competency Units	Performance Criteria
C1. Construct parallel circuit for two lamps	P1. Observe OHS requirements P2. Identify tools and equipment P3. Draw diagram of parallel circuits for two lamps. P4. Perform preliminary marking before termination of cables. P5. Follow drawing to perform wiring and for reporting/ record purpose.
C2. Construct series circuit for two lamps.	P1. Observe OHS requirements P2. Identify tools and equipment P3. Draw diagram of series circuits for two lamps. P4. Perform preliminary marking before termination of cables. P5. Follow drawing to perform wiring and for reporting/ record purpose.
C3. Construct tunnel circuit for multi storey building stair case.	P1. Observe OHS requirements P2. Identify tools and equipment P3. Draw diagram of tunnel circuit for multi storey staircase. P4. Perform preliminary marking before termination of cables. P5. Follow drawing to perform wiring and for reporting/ record purpose.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain electrical symbols
- K2. Describe different types of drawings parallel circuits, series circuit and tunnel circuit.
- K3. Describe how to prepare drawing if not available
- K4. Describe types of breakers, contactors, relays etc.
- K5. Describe standard tools used in wiring
- K6. Explain different types of wiring techniques including: • Concealed • Conduit • Busway• Open • Duct
- K7. Describe purpose of color coding and tagging during wiring



National Competency Standards Level-5 for “Civil Technology”



- K8. Describe purpose of cable alignment
- K9. Describe open, close circuits and testing procedures
- K10. Describe Importance of controlled live test

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Use of tools
- Proper storage of tools and equipment
- Wiring of

Tools and Equipment

1. Electrical drawing
2. Computer
3. Emergency light
4. Ladder
5. drill machine tool kit
6. Thimble puncher
7. Shroud
8. PVC tape
9. cable knife
10. wire stripper
11. drill machine
12. PPE
13. Cable tie
14. Clamps
15. Plier
16. Cutter
17. spiral/ flexible pipes
18. tie base
19. ravel bolt
20. ravel plug
21. hilty bolt
22. wooden screw
23. AVO meter



National Competency Standards Level-5 for “Civil Technology”



- 24. test lamp
- 25. earth tester
- 26. line tester
- 27. megger



0732B&CE-51 . Measure properties of electricity

Overview: This competency standard covers the skills and knowledge required to measure voltage, current, find out resistance and power.

Competency Units	Performance Criteria
CU1. Measure voltage	P1. Identify tools and equipment P2. Measure value of voltage according to specification P3. Observe OHS requirement
CU2. Measure current	P1. Identify tools and equipment P2. Measure value of current according to specification P3. Observe OHS requirement
CU3. Find out resistance	P1. Record values of voltage and current P2. Calculate resistance by ohm's law
CU4. Find out power	P1. Record values of voltage and current P2. Calculate power

Knowledge & Understanding

The candidate must be able to develop skills and understanding to measure voltage, current, find out resistance and power required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe Conductor, Insulator, Semi-Conductor current, Ampere voltage, Resistance and ohm
- K2. Define ohms law specific resistance laws up Resistance make calculation using
- K3. Define these laws resistance in series and parallels solve series and parallel circuits

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Use of tools
- Proper storage of tools and equipment

Tools and Equipment

1. Voltmeter
2. Ammeter
3. Multi meter



National Competency Standards Level-5 for “Civil Technology”



4. Ohmmeter



0732B&CE-52 . Perform electrical wiring of a single room

Overview: This competency standard covers the skills and knowledge required to Interpret Drawing, Arrange Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging, Perform Wire Dressing, and Perform Checking & Testing of electrical wiring.

Competency Units	Performance Criteria
CU1. Interpret Drawing	P1. Differentiate between control and power wiring as per job requirement P2. Perform preliminary marking before termination of cables P3. Follow drawing to perform wiring and for reporting/record purpose
CU2. Arrange Resources for electrical wiring	P1. Enlist and arrange tools and material as per job P2. Arrange work permit for the wiring task P3. Arrange backup resources for lighting, power and safety purposes as per job requirement
CU3. Perform Wiring (Domestic & Industrial), termination and tagging	P1. Perform Wiring using following methods: • Concealed • Conduit • Busway • Open • Duct P2. Follow procedure to remove insulation and to attach thimbles P3. Perform different types of terminations including • High tension (HT) • Low tension (LT) • Control shrouding • Sleeves P4. Perform different types of joints • High tension • Low tension • Water proof/underground • Open P5. Attach tags or numbers to wires for identification P6. Use personal protective equipment as per job requirement
CU4. Perform Wire Dressing	P1. Maintain distance between power, communication and control wires according to job requirements P2. perform alignment of cables as per job requirement
CU5. Perform Checking & Testing of electrical wiring	P1. Check continuity using line of terminal P2. Perform test to identify open/close circuits P3. Perform live test for verification of wiring P4. Verify proper grounding / Panel Earthing (PE) on designated locations

Knowledge & Understanding

The candidate must be able to develop skills and understanding o Interpret Drawing, Arrange Resources for electrical wiring, Perform Wiring (Domestic & Industrial), termination and tagging,



National Competency Standards Level-5 for “Civil Technology”



Perform Wire Dressing, Perform Checking & Testing of electrical wiring required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain electrical symbols
- K2.** Describe different types of drawings (e.g. power, control, single line etc.)
- K3.** Describe how to prepare drawing if not available
- K4.** Describe types of breakers, contactors, relays etc.
- K5.** Describe standard tools used in wiring
- K6.** Describe usage of back up resources including Emergency lights, ladder, safety belts etc
- K7.** Explain different types of wiring techniques including: • Concealed • Conduit • Busway • Open • Duct
- K8.** Describe purpose of color coding and tagging during wiring K4. Describe types and size of thimbles and use of thimble puncher
- K9.** Explain Termination techniques for HT, LT, Control shrouding, sleeves K6.describe Jointing techniques for HT, LT
- K10.** Describe purpose of distancing
- K11.** Describe purpose of cable alignment
- K12.** Describe Importance of terminals
- K13.** Describe open, close circuits and testing procedures
- K14.** Describe Importance of controlled live test
- K15.** Describe Importance of grounding

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE
- Use of tools
- Proper storage of tools and equipment

Tools and Equipment

1. Electrical drawing
2. Computer
3. Emergency light
4. Ladder
5. drill machine tool kit
6. Thimble puncher
7. Shroud



National Competency Standards Level-5 for “Civil Technology”



8. PVC tape
9. HT tape
10. Thimbles
11. cable knife
12. wire stripper
13. drill machine
14. PPE
15. Cable tie
16. Clamps
17. Plier
18. Cutter
19. spiral/ flexible pipes
20. tie base
21. ravel bolt
22. ravel plug
23. hilty bolt
24. wooden screw
25. AVO meter
26. test lamp
27. earth tester
28. line tester
29. megger



11. B- Certificate in Civil Technology Level 3

10.6. Advanced Surveying

0732B&CE-53 . Measure Angles by Theodolite

Overview: This competency standard covers the skills and knowledge required to perform angle measurement of different angles by Theodolite with its basic components. It also covers the knowledge by using Theodolite Surveying.

Competency Units	Performance Criteria
CU-1. Perform Temporary adjustment of theodolite.	P1. Identify the Equipment P2. Set Theodolite on tripod at station point P3. Perform centering and levelling on station point
CU-2. Measure Horizontal Angle by Repetition Method	P1. Adjust theodolite on station point O P2. Set angle to $0^{\circ}-0'-0''$ at given point A P3. Record reading of angle at point B as angle AOB P4. Repeat angle measurement three times for each face P5. Calculate mean of the readings
CU-3. Measure Horizontal Angle by Reiteration Method	P1. Adjust theodolite on station point O P2. Set angle to $0^{\circ}-0'-0''$ at given point A P3. Bisect the second point B, C and D to record angle readings between AOB, BOC and COD P4. Close the horizon by bisecting the D to A to check if angle is 360° P5. Adjust error according to standard procedure P6. Repeat the procedure by changing face of the theodolite.
CU-4. Measure Vertical Angle measurement	P1. Adjust theodolite on station P2. Set theodolite for vertical angle measurement P3. Record vertical angle by sighting the object P4. Take 2 more readings for mean

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Define theodolite, sketch & label theodolite and list the types of theodolites
- K2 Define the terms; centering, transiting, face left, Face right, swinging the telescope,



National Competency Standards Level-5 for “Civil Technology”



axis of level tube, horizontal & vertical axis

- K3 Explain the procedure of temporary adjustment of a theodolites
- K4 Explain the procedure of measuring horizontal & vertical angles.
- K5 Explain the procedure of setting out an angle and prolonging a line
- K6 Explain the procedure of fixing inter-mediate points between two given points
- K7 Explain various methods of traversing and enlist steps involved in traversing
- K8 State the standards of accuracy in linear and angular measurement.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout by theodolite taking angles
- Calculate area by theodolite survey
- Fold and unfold the tripod
- Take temporary adjustment for Theodolite
- Focus eye piece for Theodolite
- Take and measure the angles
- calculate vertical & horizontal angles
- Carry out appropriate checks
- Undertake setting out in the field using Theodolites, tapes,
- Know Horizontal control and Vertical control

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Theodolite with tripod
5. Measuring scale,
6. Measuring Tape,
7. Ranging Rods
8. Pegs
9. White Chalk
10. Mallet
11. Umbrella with stand
12. Arrows
13. Thread (Dori)
14. Scientific Calculator
15. Rough Copy



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-54 Perform Trigonometric Levelling by Theodolite

Overview: This competency standard covers the skills and knowledge required to perform process of determining the differences of elevations of stations from observed vertical angles and known distances. The vertical angles are measured by means of theodolite. Measurements are to be carried out in two or sometimes three stages. The said leveling is to be done by Theodolite.

Competency Units	Performance Criteria
CU-1. Carry out Trigonometric Leveling (base of point is accessible)	P1. Adjust theodolite on a station point from where altitude point is accessible P2. Set theodolite for vertical angle measurement P3. Take reading on bench mark P4. Record vertical angle of point to whom elevation is to be determined P5. Measure horizontal distance from the station to the point P6. Calculate elevation of point by trigonometry.
CU-2. Carry out Trigonometric Levelling (base of point is inaccessible)	P1. Mark two station points in a line P2. Adjust theodolite on a station point closer to point of observation P3. Set theodolite for vertical angle measurement P4. Record vertical angle from closer station point P5. Adjust theodolite on second station point which is farther from point but in line of first station point P6. Record vertical angle from second station point P7. Measure distance between station points P8. Calculate elevation of point by trigonometry.
CU-3. Carryout Trigonometric Leveling (base of point is inaccessible and no plane surface is available nearby)	P1. Adjust theodolite on a station point in depression and record height of trunion axis. P2. Hold the levelling staff at higher level and read vertical angle. P3. Record stadia hairs readings and line of collimation reading. P4. Calculate the horizontal and inclined distances. P5. Calculate elevation of point by trigonometry.

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1 Describe tacheometry and trigonometry



National Competency Standards Level-5 for “Civil Technology”



- K2 Explain the principles of tachometry and enlist the method of tacheometry
- K3 Describe the instruments used in stadia survey and state tacheometric constants
- K4 Lists the steps involved in taking stadia observations in field to find elevations and distances of stations and compute the elevation and horizontal distances.
- K5 Solve examples for finding horizontal and vertical distances by tachometry Checks on open and closed traverse
- K6 Explain the method of plotting traverse and adjustment of closing error.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan the work station
- Check base line.
- Fold and unfold the tripod
- Prepare plan for triangulation with both method.
- Fix the tripod with plumb bob.
- Understand sighting by sight vane.
- Plot the traverse and calculate area
- Measure horizontal distance

TOOLS AND EQUIPMENT'S

1. Calculator,
2. Measuring scale,
3. Drawing sheet,
4. Measuring Tape,
5. Tripod
6. Ranging Rods
7. Pegs
8. Pencil
9. Eraser
10. Field Book
11. Thread (Dori)
12. Umbrella with stand
13. White chalk
14. Vernier / Digital Theodolite



0732B&CE-55 Perform Traversing by Theodolite

Overview: This competency standard covers the skills and knowledge required to perform **Traverse** in the field of surveying to establish control networks. It is also used in geodesy. **Traverse** networks involve placing survey stations along a line or path of travel, and then using the previously surveyed points as a base for observing the next point.

Competency Units	Performance Criteria
CU-1. Carry out area of traversing (by digital theodolite)	P1. Mark station points which would cover area P2. Record bearing of first line by prismatic compass P3. Adjust theodolite on first station point P4. Record horizontal internal or external angle between lines originating from first station point P5. Shift theodolite to the next stations P6. Record horizontal internal or external angles between lines P7. Measure the distances between the station points P8. Compile the data
CU-2. Carry out calculations in Gale's Traverse Table	P1. Compile the data in Gale's Table P2. Apply necessary corrections P3. Calculate co-ordinates P4. Convert the dependent co-ordinates into independent co-ordinates P5. Calculate the area by coordinates method
CU-3. Plot traverse of the area	P1. Fix the sheet on drawing board with relevant orientation. P2. Use drawing instruments to plot the control points by use of coordinate with appropriate scale. P3. Draw the survey lines. P4. Perform relevant lettering.

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Explain traverse & its types, methods of traversing
- K2 Explain the objects and standard of accuracy of traversing
- K3 Check of open & closed traverse
- K4 Know plotting & graphical adjustment of closing error
- K5 Calculate angles from given bearings and vice versa



National Competency Standards Level-5 for “Civil Technology”



- K6 Explain coordinates its types and technical terms.
- K7 Compute co-ordinates and computation of missing data associated with theodolites traversing
- K8 Understand the balancing a traverse by different methods
- K9 Explain a range of specialized surveying techniques.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Set the temporary adjustment of theodolite.
- Set out coordinated points from existing control stations.
- Calculate distance from coordinates
- Carry out appropriate checks by formula
- Undertake setting out in the field using theodolite, tapes and Ranging Rods.
- Fold and unfold the tripod
- Prepare traverse by theodolite
- Focus the eyepiece of the theodolite
- Take and measure readings

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Field Book
4. Sharpner,
5. Calculator,
6. Measuring scale,
7. Measuring steelTape,
8. Digital / vernier Theodolite
9. Tripod
10. Ranging Rods
11. Pegs
12. Arrows
13. Thermometer
14. Ball pein hammer
15. Umbrella with stand



0732B&CE-56 Set Out Horizontal Curves by Theodolite

Overview: This competency standard covers the skills and knowledge required to set Horizontal Curves of the two important transition elements in geometric design for highways. A horizontal curve provides a transition between two tangent strips of roadway, allowing a vehicle to negotiate a turn at a gradual rate rather than a sharp cut.

Competency Units	Performance Criteria
CU-1. Set out Horizontal Curve by Taking offsets from Long Chord	P1. Compute and compile data for setting out curve by taking offsets from long chord. P2. Mark Tangent points T1 & T2 and Intersection point for setting out curve with the help of theodolite P3. Mark tangent lines and long chord with string and lime. P4. Locate points of curve by taking normal offsets from long chord at specified points. P5. Lay curve by joining points with lime.
CU-2. Set out Horizontal Curve by Taking offsets from Tangent	P1. Compute and compile data for setting out curve by Taking offsets (radial and square) from Tangent P2. Mark Tangent points T1 & T2 and Intersection point for setting out curve with help of theodolite P3. Mark tangent lines and long chord with string and lime. P4. Locate points of curve by taking normal offsets from tangent P5. Locate points of curve by taking radial offsets from tangent P6. Lay curve by joining points with lime
CU-3. Set out Horizontal Curve by deflection angle method (Rankine's method)	P1. Compute and compile data for setting out curve by deflection angle method P2. Mark Tangent points T1 & T2 and Intersection point for setting out curve with the help of theodolite P3. Mark tangent lines and long chord with string and lime. P4. Locate points of curve by relevant deflection angle and sub-chord with the help of theodolite and tape. P5. Lay curve by joining points with lime.



CU-4. Set out transition curve in the field	P1. Compute and compile data for setting out transition curve P2. Set two points T1, T2 at shift of curve P3. Erect pole in direction of intersection point from T1 and T2. P4. Mark the shift points for both tangents. P5. Start setting out from first tangent point T1 P6. Start setting out from second tangent point T2 P7. Set out circular curve P8. Lay curve by lime

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Define a curve and differentiate its types. Describe necessity of providing curves.
- K2 Define designation of curves
- K3 Describe elements and notation of simple circular curves & their relationship
- K4 Calculate the data & apply the methods of setting out simple circular curves
- K5 Setting out simple curve beyond obstacles
- K6 Define transition curves and explain its necessity. State Characteristics, elements & notation of transition curve and their inter relationship
- K7 Explain super elevation and methods of calculation the length of transition curve with numerical problems
- K8 Calculate the data and apply the methods of setting out of transition curve

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Calculate deflection angles for curves
- Set out curves by theodolite
- Fold and unfold the tripod
- Find out Tangent length
- Focus the eyepiece
- Take and measure the chord length
- Adjust temporarily of the theodolite
- Compute Reduced Levels
- Find out radial / perpendicular off sets

TOOLS AND EQUIPMENT'S

1. Pencil,



National Competency Standards Level-5 for “Civil Technology”



2. Eraser,
3. Sharpner,
4. Scientific Calculator,
5. Measuring scale,
6. Measuring Steel Tape,
7. Tripod
8. Ranging Rods
9. Pegs
10. Arrows
11. Umbrella with stand
12. Theodolite
13. Staff
14. White Chalk
15. Thermometer
16. Ball pein hammer
17. Field Book



0732B&CE-57 Set out Vertical Curves by Theodolite

Overview: This competency standard covers the skills and knowledge required to perform Vertical Curves of the two important transition elements in geometric design for highways. A vertical curve provides a transition between two sloped roadways, allowing a vehicle to negotiate the elevation rate change at a gradual rate rather than a sharp cut.

Competency Units	Performance Criteria
CU-1. Interpret to set out vertical curve	P1. Compute and compile data for setting out curve P2. Identify gradients and rate of change of gradient P3. Locate point of intersection P4. Calculate length of vertical curve P5. Calculate tangent corrections P6. Find out levels of curve P7. Draw vertical curve
CU-2. Set out Vertical Curve in the field	P1. Set the theodolite on first tangent point T_1 P2. Locate second tangent point T_2 P3. Fix the poles at intermediate points P4. Perform leveling to find NSL P5. Mark the point on pole by using the difference in NSL

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Explain vertical curves
- K2 Explain the types of vertical curves, elements, terms and their inter relationship.
- K3 Calculate the data and apply Setting out vertical curves
- K4 Apply various steps in setting out of combined curves
- K6. Explain Theodolite with its parts.
- K5 Compute, tabulate and set out data for the road alignment and Curves.
- K6 Explain the purpose of the specialized surveying technique

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Take RL's by leveling instrument



National Competency Standards Level-5 for “Civil Technology”



- Apply survey techniques
- Compute road alignment data
- Carry out appropriate check
- Pin and unpin survey instrument from the box.
 - Prepare long section diagram.
 - Apply formula to calculate earthwork for site.

TOOLS AND EQUIPMENT'S

1. Pencil,
2. Eraser,
3. Sharpner,
4. Scientific Calculator,
5. Measuring scale,
6. Field Book,
7. Steel Tape,
8. Level (Digital)
9. Tripod
10. Ranging Rods
11. Pegs
12. Arrows
13. Staff
14. White Chalk
15. Thermometer
16. Ball pein hammer / Mallet
17. Umbrella with stand



0732B&CE-58 Carry out Triangulation by Theodolite

Overview: This competency standard covers the skills and knowledge required to perform series or network of triangles in order to determine the distances and relative positions of points spread over an area, especially by measuring the length of one side of each triangle and deducing its angles and the length of the other two sides by observation from this baseline.

Competency Units	Performance Criteria
CU-1. Mark station points by dividing the area by triangles	P1. Carry out reconnaissance of area P2. Mark stations covering the area P2. Divide the area in triangles P3. Fix a base line
CU-2. Measure the base line	P1. Identify equipment P2. Measure the base line P3. Apply corrections
CU-3. Measure the angles for triangulation	P1. Identify equipment P2. Fix theodolite on a station point P3. Measure the angles P4. Shift the instrument on next station point P5. Measure all the required angles
CU-4. Calculate the area	P1. Compile data obtained from survey P2. Calculate missing data P3. Apply formula P4. Calculate the area

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1 Explain triangulation and describe the types of triangulation.
- K2 Explain the methods to solve Triangles
- K3 Understand the Sine rule and its application in triangulation
- K4 Define well condition and ill condition in Triangulation
- K5 Understand the selection of station points
- K6 Know measurement of base line
- K7 Apply correction of base line measurement in triangulation
- K8 Explain the purpose of the specialized surveying technique



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout of survey for calculation of area
- Take base line
- Apply survey techniques
- Compute data for entire area
- Carry out appropriate checks
- Pin and unpin the theodolite from the box.
 - Calculate angles.
 - Focus the eyepiece of Theodolite.
 - Take readings and measure the angles by Theodolite.

TOOLS AND EQUIPMENT'S

- 1) Pencil,
- 2) Eraser,
- 3) Sharpner,
- 4) Scientific Calculator,
- 5) Measuring scale,
- 6) Field Book,
- 7) Steel Tape,
- 8) Theodolite,(Digital)
- 9) Tripod
- 10) Ranging Rods
- 11) Pegs
- 12) Arrows
- 13) Staff
- 14) White Chalk
- 15) Thermometer
- 16) Ball pein hammer / Mallet
- 17) Umbrella with stand



0732B&CE-59 Perform Temporary Adjustment of Total Station

Overview: This competency standard covers the skills and knowledge required to Temporary adjustment of total station on a station point. It is set of operations which are performed on a total station to make it ready for taking observations. These include its initial setting up on a tripod or other stand, centering, leveling up and focusing of eyepiece.

Competency Units	Performance Criteria
CU-1. Adjust temporarily total station on a given point	P1. Identify the equipment P2. Unfold tripod P3. Perform centering of total station at station point P4. Perform leveling of total station P5. Adjust foot screws & center the bubble P6. Focus the telescope
CU-2. Set the Total station Electronically	P1. Set instrument on station point P2. Fix battery P3. Turn on instrument P4. Show opening screen as “MEAS” screen. P5. Adjust foot screw P6. Rotate instrument 90 degree P7. Repeat method and check
CU-3. Set co-ordinates of occupied station	P1. Set instrument on station point P2. Turn on instrument P3. Select co-ordinate menu P4. Input co-ordinates. P5. Check Result

Knowledge & Understanding

The candidate must be able to develop skills in carrying out setting of total station and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Identify the total station, its parts, functions and modes
- K2. Identify and describe the accessories of total station and their operation
- K3. Describe the parameters, setting of total station and its operation.
- K4. Explain the methods of co-ordinates entry in the total station.
- K5. Explain to connect and disconnect its battery
- K6. Explain to change of “Face”

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Draw sketch of total station with labels



National Competency Standards Level-5 for “Civil Technology”



- Explain detailed procedure of setting up total station
- Explain detailed parts of total station

Prepare calculation sheet for traversing

- Observe the required traverse data to an acceptable level of accuracy
- Calculate the co-ordinates (3D) of the traverse stations
- Plot a scale drawing of the traverse plan
- Change the “face” of total station

Tools and Equipment

1. Ranging rods
2. Prism with Prism Pole
3. Total station
4. Measuring tapes
5. Pegs
6. Mallet
7. Battery Charger
8. Tripod
9. Scientific Calculator
10. Field Book



0732B&CE-60 Measure Distance by Total Station

Overview: This competency standard covers the skills and knowledge required to identify the horizontal, vertical and inclined measurements taken by Total Station with its components.

Competency Units	Performance Criteria
CU-1 Measure distance by Total Station (Horizontal & Vertical)	P1. Set up total station on station point & install battery P2. Show opening screen at measuring mode P3. Input the co-ordinates of the station point P4. Set the prism on the required point P5. Record readings P6. Recheck distance by steel tape
CU-2 Measure distance by Total Station (Inclined Distance)	P1. Set up total station on station point & install battery P2. Show opening screen at inclined measurement P3. Set the prism on the required point P4. Adjust Total station toward Prism P5. Record readings on screen P5. Recheck distance by invar tape
CU-3 Stack out different point at various distances on a line	P1. Set up total station on station point P2. Select stack out menu P3. Select the method to stake out the point P4. Select "XY" to stake out by coordinates P5. Use the keypad to enter the coordinates or distances

Knowledge & Understanding

The candidate must be able to develop skills in carrying out survey by Total station and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Identify the Total station, its Parts and describe its types
- K2. Describe the functions and modes of Total station
- K3. Explain the methods to set the Total Station at station point
- K4. Describe the parameters, setting of total station and its operation.
- K5. Explain the methods of measurement of distances, angles, bearings and co-ordinates by total station.
- K6. Explain the procedure to measure the height of an object with total station by using REM
- K7. Setting and calculation co-ordinate value of occupied station, setting height of instrument & height of reflector

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of Total Station and label its parts
- Understand detailed procedure of setting up instrument for measurements
- Apply detailed procedure of measuring techniques
- Explain detail procedure to set the prism
- Explain detail procedure of use of hand held distometer

Tools and Equipment

1. Total Station (single frequency and hand held)
2. Thermometer
3. Ranging rods
4. Prism with Prism Pole
5. Total station
6. Measuring tapes
7. Pegs
8. Mallet
9. Umbrella with stand
10. Lime Powder
11. Thread (Dori)
12. Arrows
13. Battery Charger



0732B&CE-61 Measure Angles by Total Station

Overview: This competency standard covers the skills and knowledge required to identify the Total station with its components and function. It also cover the Kinematics of techniques for using Total Station in the field along with its safety precautions.

Competency Units	Performance Criteria
CU-1. Measure horizontal angles by Total Station	P1. Identify station points P2. Set total station on intermediate station point P3. Fix ranging rod on the first point P4. Fix ranging rod on the other point P5. Sight first point P6. Set 0°-0'-0" on total station for horizontal angle P7. Sight the other point P8. Record the measurement P9. Repeat by changing face
CU-2. Measure vertival angles by Total Station	P1. Select the station point P2. Set total station on station point P3. Sight the first point P4. Set 0°-0'-0" on total station for vertical angle P5. Sight the prism P6. Record measurement for vertical angle P7. Set percentage for Angle
CU-3 Measure the height of an object with total station by using REM	P1. Set up total station on station point P2. Place the mirror target on the ground at the corner of the building P3. Record the mirror target height from the range pole scale P4. Set target height by setting target height P5. Lock position with horizontal and vertical clamps P6. Take observation using REM menu P7. Unlock the vertical clamp and sight in the top of the building corner P8. Re-lock vertical clamp P9. Record height by using REM
CU-4. Measure the distance between different station points with the help of occupied point (MLM) by using measure data or by using coordinate data	P1. Set up total station on station point P2. Place the mirror on reference point P3. Measure the reference point P4. Aim at the first target point P5. Measure the target point P6. Aim at the second target point P7. Measure the second target point P8. Record results



Knowledge & Understanding

The candidate must be able to develop skills in carrying out and evaluating angles by Total station (vertical, Horizontal and Inclined). It also give the knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Identify the setting of Total Station
- K2. Describe the functions and modes of Total station
- K3. Explain the different parameters of Total Station.
- K3. Explain the methods of observations for Total Station.
- K4. Explain the methods for Safety Precaution while using Total Station along with its components.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Know detailed procedure of setting up instrument for measurements of angles
- Understand detailed procedure of measuring techniques
- Know fixing the scale of Total Station at 00.00
- Understand fixing of Prism
- Calculate angles
- Apply formula on Total Station

Tools and Equipment

1. Ranging rods
2. Prism with Prism Pole
3. Total station
4. Measuring tapes
5. Pegs
6. Mallet
7. Umbrella with stand



0732B&CE-62 Measure Area by Total Station

Overview: This competency standard covers the skills and knowledge required to adjust total station on a station point temporarily and to find out the area of plots and transfer data into computer by networking method.

Competency Units	Performance Criteria
CU-1. Measure the area of a traverse by direct field observations	P1. Set up total station on station point P2. Create a file name using file management P3. Enter instrument height and prism code after setting zero against point number or name P4. Measure first point and save it P5. Turn the total station to second point P6. Repeat the steps to the rest of the stations P7. Calculate area by using functions of total station
CU-2. Measure area for rectangular Plot	P1. Set up the total station P2. Turn on total station P3. Position the horizontal circle. P4. Select boundary points P5. Apply area command P6. Show Area P7. Recheck Mathematically

Knowledge & Understanding

The candidate must be able to develop skills in carrying out and evaluating angles by Total station (vertical, Horizontal and Inclined) It also give the knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Identify the setting of Total Station
- K2. Describe the functions and modes of Total station
- K3. Explain the different parameters of Total Station.
- K3. Explain the methods of observations for Total Station.
- K4. Explain the methods for Safety Precaution while using Total Station along with its components.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain detailed procedure of setting up instrument for measurements of angles
- explain detailed procedure of measuring techniques
- Fix the scale of Total Station at 00.00



National Competency Standards Level-5 for “Civil Technology”



- Understand the fixing of Prism
- Measure area for plots

Tools and Equipment

1. Ranging rods
2. Prism with Prism Pole
3. Total station
4. Measuring tapes
5. Pegs
6. Mallet
7. Umbrella with stand
8. Scientific Calculator



0732B&CE-63 Set out Curves by Total Station

Overview: This competency standard covers the skills and knowledge required to adjust total station on a station point temporarily and to lay the curves with its different methods in Railway and Roads. It also helps to transfer data into PC.

Competency Units	Performance Criteria
CU-1. Set horizontal curve by Total Station (by Coordinates)	P1. Compute and compile data for setting out curve P2. Locate station points by total station P3. Adjust total station on a station point P4. Adjust total station to the S-O Arc function. P5. Select the type of curve. P6. Enter coordinates of Total Station, Point of Curvature, Point of Tangency, direction of arc, Radius of arc etc. P7. Give the distance of first point on arc and mark the point on earth. P8. Give the distances of other points on arc and mark the point on earth. P9. Lay out the curve by joining point with lime.
CU-2. Set Vertical curve by Total Station	P1. Compute and compile data for setting out curve P2. Locate station points by total station P3. Adjust total station on a station point P4. Adjust total station to the S-O Arc function. P5. Select the type of curve. P6. Enter coordinates of Total Station, Point of Curvature, Point of Tangency, sag or hog of arc, gradient of arc etc. P7. Give the distance of first point on arc and mark the point on earth with long pegs/ poles etc. P8. Give the distances of other points on arc and mark the point on earth with long pegs/ poles etc.

Knowledge & Understanding:

The candidate must be able to develop skills in carrying out and evaluating curves by Total station (vertical and horizontal curves). It also gives the knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain curves with its types
- K2. Draw the curves by Total station
- K3. Explain the different parameters of Total Station performing curves.
- K4. Explain the methods of observations for Total Station at curves setting



National Competency Standards Level-5 for “Civil Technology”



- K5. Explain the methods for Safety Precaution while using Total Station along with its components.
- K6. Explain Chords and Tangents
- K7. Explain the method to transfer data into PC

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Apply detailed procedure of setting up instrument for laying of curves in field
- Apply detailed procedure for laying different type of curves with its techniques
- Fix the scale of Total Station at $00^0.00^0$
- Undertake fixing of Prism at relevant places
- Adjust chord for Laying curves
- Perform Tangent offset for curves
- Understand the importance of curves and set Total Station on Tangent and Chord Mode
- Perform data transfer into PC

Tools and Equipment

1. Ranging rods
2. Prism with Prism Pole
3. Total station
4. Measuring tapes
5. Pegs
6. Mallet
7. Umbrella with stand
8. Personal Computer
9. Battery charger
10. Lime Powder
11. Dori (Thread)



0732B&CE-64 Perform Integration of GPS

Overview: This competency standard covers the skills and knowledge required to Identify the parts of GPS, Identify modes/functions of GPS, traverse the area by static techniques, traverse the area by Stop & Go techniques and traverse the area by Real Time Kinematics techniques. Its also covers a unique position of a specific feature. With this information, one can navigate back to it. However, one cannot relate this “feature position” to any other “feature position” unless one is standing at the site and other features are visible.

Competency Units	Performance Criteria
CU-1. Identify parts of GPS	P1. Identify GPS P2. Identify type of GPS P3. Identify parts of GPS P4. Install battery to GPS
CU-2. Identify modes / functions of GPS	P1. Identify modes of GPS P2. Indicate functions of GPS P3. Identify parameters of GPS P4. Identify sources of Errors in GPS

Knowledge & Understanding

The candidate must be able to develop skills in carrying out the working of GPS to evaluate and draw curves, calculate areas, traversing by Global Positioning System through internet. It also gives the knowledge and understanding to carry out tasks and concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise.

Each GPS satellite continuously transmits a radio signal containing the current time and data about its position. The time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities. This includes the knowledge of:

- K1. Explain GPS with its types
- K2. Draw the Sketches of GPS
- K3. Explain the different parameters of GPS Performing surveying and leveling.
- K4. Explain the methods of observations for GPS at Different task setting



- K5. Explain the methods for Safety Precaution while using GPS along with its components.
- K5. Explain Working process to GPS
- K6. Explain different mode for GPS

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Undertake detailed procedure of setting up GPS
- Undertake detailed procedure for Performing different task on GPS
- Fixing of GPS at work station
- Undertake Fixing of Prism at relevant places
- Adjust GPS with PC
- Perform Data transfer in to PC
- Explain the importance of GPS in field
- Install & Transfer data for GPS into PC
- Use frequently GPS for different functions
- Convert mode easily
- Compile task properly
- Installed battery

Tools and Equipment

1. G.P.S
2. Data cables
3. Wi fi
4. Battery charger



0732B&CE-65 Measure Co-ordinates by GPS

Overview: This competency standard covers the skills and knowledge required to draw co. Ordinates by GPS on given station point. It also helps to transfer data into PC.

Competency Units	Performance Criteria
CU-1. Set out co-ordinates by GPS	P1. Set out GPS P2. Turn on GPS P3. Open google map P4. Finding your co-ordinates P5. Tap cross hair icon P6. Hold the blue dot P7. Note co-ordinate location
CU-2. Set coordinates within REFLEXW by GPS	P1. Set out GPS P2. Turn ON GPS P3. Use REFLEXW mode P4. view profile by google map P5. Use Processing options P6. Take 3-D, topography P7. Generate Data P8. Check Result

Knowledge & Understanding

The candidate must be able to develop skills in carrying out and evaluating GPS along with its type and working. It also give the knowledge and understanding required to carry out tasks and recovered the coordinates by your choice OR already prescribed. This includes the knowledge of:

- K1. Explain GPS with its types
- K2. Explain the working of GPS
- K3. Explain the basis of GPS is "co-ordinates" from satellites.
- K4. Explain "co-ordinates," a GPS receiver measures distance using the travel time of radio signals.
- K5. Explain to measure travel time,
- K6. Describe GPS needs very accurate timing which it achieves with some tricks.
- K7. Explain the different parameters of GPS for single frequency type.
- K8. Explain the different parameters of GPS for Double frequency type.
- K9. Explain the methods to observe co-ordinates and its setting.
- K10. Explain the methods for transfer the data in PC / android.
- K11. Describe Safety Precaution while using GPS along with its components.
- K12. Explain wi-fi signals with its working
- K13. Explain to generate data



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Undertake detailed procedure of Working of GPS setting up
- Carry out detailed procedure to draw co-ordinates with its techniques
- Fix co-ordinates of a station point
- Know the method of turn on and turn off the GPS
- Understand to the use of different parameters of GPS
- Explain the importance of working at GPS
- Ensure wi-fi signals
- Transfer data into PC
- Work efficiently on system
- Save data into requisite place into PC
- Generate and transfer data
- Transfer data from one PC to another PC
- Process e-mail

Tools and Equipment:

1. G.P.S
2. Data cables
3. Wi fi
4. Umbrella with stand
5. Lime Powder
6. Battery with charger

0732B&CE-66 Set out Civil Engineering Structures by GPS

Overview: This competency standard covers the skills and knowledge required to use the Global Positioning System (GPS) as a tool for Civil Engineering on monitoring the vibrations of large road structures, notably the bridges. To be characterized as a structural tool it was developed and tested a method which is based on the interferometry principle. The method uses the L1 carrier phase that needs to be collected from only two satellites.

Competency Units

Performance Criteria



National Competency Standards Level-5 for “Civil Technology”



CU-1. Set out Civil Engineering Structures by GPS (by using the classic RTK technique)	P1. Set GPS at station point P2. Install battery P3. Select “RTK” Network Approach P4. Apply (R.T) Real Time Positioning by GPS P5. Use GPS Derived “COORDINATES” P6. Use Laser Pointing System P7. Evaluate “RTK” Accuracy Results
CU-2. Use 3-D data interpretation By GPS	P1. Set GPS at station point P2. Install battery P3. Import data P4. Process Data P5. Check Results.

Knowledge & Understanding

The candidate must be able to Surveying work needed on construction sites is usually dependent on the determination of accurate plane coordinates and heights. With current developments in the Global Navigation Satellite Systems (GNSS), real-time 3D positioning can be generally achieved at the cm level of accuracy. Such accuracy helps to expand the use of Real Time Kinematic (RTK) GPS positioning techniques for construction surveying work, particularly for large sites when rapid survey is needed.

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- K1. Explain GPS with its working
- K2. Draw the sketch for GPS and its parts.
- K3. Explain the different parameters of GPS performing different task.
- K3. Explain the methods of observations for GPS.
- K4. Explain the methods for Safety Precaution while using GPS along with its components.
- K5. Explain Data transfer method into PC
- K6. Explain Global Navigation Satellite Systems
- K7. Explain Real Time Kinematic (RTK) GPS positioning techniques
- K8. Explain Universal Traverse Mercator Coordinate System (UTM) Conversion
- K9. Describe space segment
- K10. Explain satellite geometry
- K11. Explain carrier phase tracking system



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Detailed procedure of setting up instrument for construction survey work
- Detailed procedure for survey techniques while using GPS
- Fix GPS at 00.00
- Fix Prism at relevant places
- Adjust its modulator
- Perform Transfer data
- Import data from google
- Perform UTM Conversion
- Use Satellite Geometry
- Control Space Segment
- Work on carrier phase tracking system
- Work on different modulation system
- Indicate & locate wi-fi signals

Tools and Equipment

1. Double Frequency GPS
2. Measuring tapes
3. Peg
4. Umbrella with stand
5. Lime Powder
6. Wi-Fi signals
7. GPS Battery with Charger



10.7. Auto CAD

0732B&CE-67 Perform Basic Computer Operations

Overview: This competency standard covers the skills and knowledge required to prepare report on the health and safety considerations while working on computer, recognize basic computer hardware, software, applications and perform general troubleshooting, demonstrate your skills of MS Word, MS PowerPoint, MS Excel as well as installation and troubleshooting of Operating System and software.

Competency Units	Performance Criteria
CU-1. Investigate and prepare a short report on the health and safety considerations while working on IT equipment.	P1. Observe Considerations: light (natural, artificial), P2. Identify any hazard risk P3. Perform CAD (computer screens, electrical protection devices) P4. Repetitive work, working postures, Incorrect screen settings, working without break
CU-2. Configure Computer System	P1. Connect computer components and peripherals as per requirements P2. Install System software and applications software according to the Instruction Manual P3. Troubleshoot Applications to trace and fix faults (if any) to bring it in a running condition P4. Follow health, safety and security procedures to ensure safe working environment
CU-3. Create a document Using MS Word	P1. Compose a document as per requirements P2. Assign name and location to save a file in word file format P3. Format Word Document according to given requirements P4. Generate hard copy according to job requirements
CU-4. Prepare a Worksheet Using MS Excel	P1. Develop a worksheet as per given data P2. Format the worksheet according to given job requirements P3. Apply Formulas according to given criteria P4. Generate Charts/Graphs according to the given data
CU-5. Prepare presentation in power point software.	P1. Insert Slides with different Layouts according to requirements of presentation



National Competency Standards Level-5 for “Civil Technology”



	P2. Insert text, tables, images, etc. according to the requirements P3. Apply a set of effects to animate the slide according to requirements P4. Apply Slide Transitions on Slides according to requirement P5. Apply Sound Effects on Objects/text/images according to job requirements

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- P1. Understand Operating systems-** Describe procedure of Installation of software applications.
- P2.** Describe how to Locate, Open, close files and manage files.
- P3. Describe Hardware and Software-** Access a CD/DVD-ROM, Data traveler, Troubleshoot hardware and software problems.
- P4. Explain use of Internet and E-mailing-** send an e-mail message, Receive an e-mail message, Attach a file to an e-mail, Basic search in search engine, download and view file from webpage, upload files to cloud location and print web page.
- P5.** Describe basic formatting in MS Office- bold, italic & center.
- P6.** Save a file and print a file
- P7.** Describe Hyperlinking and referencing
- P8.** Describe how to apply Formulas
- P9.** Describe Short Keys use in MS Office
- P10.** Explain how to assign Animations and transitions to different slides
- P11.** Communication skills

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Report on Health & Safety considerations.
- Install MS Office Application correctly
- Prepare a formatted document using MS Word
- Enter data into the respective columns and rows as per given instructions
- Set page layouts and margins



National Competency Standards Level-5 for “Civil Technology”



- Apply any slide transition on entire presentation

Instruments & Consumables

Sr. No.	Description (Instruments)	Sr. No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation



0732B&CE-68 Perform Drafting Settings and Formatting

Overview: This competency standard covers the skills and knowledge required to create two dimensional drawings by using various tools and commands, create & modify objects and drawings in AutoCAD to meet specific targets according to civil technology requirements.

Competency Units	Performance Criteria
CU-1. Set up user interface for required specifications	P1. Load the AutoCAD software. P2. Set the units, Limits, coordinate system, Workspace, P3. Set Object Snap Settings. P4. Set up the grid, snap, ortho, tracking settings. P5. Save AutoCAD drawing files in different file formats (DWG, DWT).
CU-2. Perform formation of entities- line, line type, text, layers, points, dimensioning.	P1. Setup user interface settings for required specifications P2. Load centre line, dashed line, border, dot. P3. Create layer with lines, colours, weight. P4. Format text styles & multiline styles. P5. Format dimension styles. P6. Format point styles.
CU-3. Create templates of sheets sizes A2, A3 & A4 having geometrical figures in 2D.	P1. Setup user interface settings for required specifications P2. Format the line, line type, text, layers, points. P3. Draw rectangle with line command by adopting coordinates- rectangular (absolute & relative). P4. Draw, polygons, ellipse & circle. P5. Create title block layout for sheets sizes A2, A3 & A4. P6. Use Design centre for inserting styles in new file. P7. Save the files in DWT format.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1. Describe and use of Basic Drawing Settings-** Unit setting, Limits setting, User coordinate system, Workspace setting, and Object Snap Settings
- K-2.** Use Direct distance entry system for drawing lines
- K-3.** Set U.C.S for different situations
- K-4. Basic Commands and Concepts-** Angles and lines in AutoCAD



National Competency Standards Level-5 for “Civil Technology”



- a. Differentiate between absolute, relative and polar system
- b. Explain DIMSTYLE and MTEXT commands
- K-5. Describe the procedure for Navigation in AutoCAD for AutoCAD classic, 2D
- K-6. Drafting and Annotation, 3D Modelling and Initial Setup Workspace.
- K-7. Describe the options in File, Edit, View, Insert, Format, Tools, Draw, modify, Parametric, Windows, help, and Express in AutoCAD classic.
- K-8. Describe the use of ribbons of “2D drafting and annotation” i.e. Home, Insert, Annotate, Parametric, View, Manage, output and express tools.
- K-9. Describe the use of various categories in ribbons of Home, Insert, Annotate, Parametric, View, Manage, output and express tools in 2D drafting and annotation menus.
- K-10. Understand the use of osnap, inquiry, standard, formatting & other Tool Bars
- K-11. Understand the use of different ribbons-home, solid, surface, mesh, render, parametric, insert, annotate, view, manage, output, plug-in, Express Tools.
- K-12. Describe the use of tool bars of AutoCAD classic i.e. Draw, Modify, Standards, properties, Layers, Osnap, Dimension and their practical application.
- K-13. Explain the procedure for creation of user tool bars.
- K-14. Describe Design center feature- Scale and paper sizes
- K-15. Modify dimension style and text size according to paper size
- K-16. Apply drafting settings (Units, Limits, Snap, Auto On & Off) and their application

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Template of sheets sizes A2, A3 & A4.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books



National Competency Standards Level-5 for “Civil Technology”



7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation

0732B&CE-69 Perform Dimensioning, Lettering and Plotting

Overview: This competency standard covers the skills and knowledge required to create 3-Dimensional Models by using various tools and commands in AutoCAD software, demonstrate skills to modify 3D objects and models to ensure civil technology requirements and present a rendered 3D Model final outcome.

Competency Units	Performance Criteria
CU-1. Perform dimensioning of drawing.	P1. Select dimension styles as per scale. P2. Applying dimension styles as per scale. P3. Set Dimension location of object. P4. Check Dimension drawing P5. Aligned dimension, continuous dimension, base line dimension, leader.
CU-2. Perform lettering (Text) of styles.	P1. Select & Insert multi-line text style lettering for drawing type. P2. Select & Insert single-line text style lettering for notes on drawing. P3. Select & Insert single-line text style lettering for schedule on drawing. P4. Select & Insert single-line text style lettering for schedule on drawing.
CU-3. Create Layouts for printing for Printing.	P1. Perform setting in layouts as per required scale P2. Perform setting in layouts as per required orientation. P3. Plot drawing on scale according to required size.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Describe Design center feature- Scale and paper sizes
- K-2.** Modify dimension style and text size according to paper size
- K-3.** Apply drafting settings (Unites, Limits, Snap, Auto On & Off) and their application
- K-4.** describe layer options, dimensioning & text and their application
- K-5.** Explain layout settings & printing of CAD drawings and their application
- K-6.** Describe the purpose and use of the use of blocks and symbols.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of Render 3D prototype Model including materials, lights, scene and different camera views

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation

0732B&CE-70 Develop 2d Drawings of Structures

Overview: This competency standard covers the skills and knowledge required to create two dimensional drawings by using various tools and commands, create & modify objects and drawings in AutoCAD to meet specific targets according to civil technology requirements.

Competency Units	Performance Criteria
CU-1. Perform basic settings for AutoCAD.	P1. Setup drawing interface for required specifications P2. Create formation of entities- line, line type, layers. P3. Create styles- text, points, P4. Create lines and multi-lines
CU-2. Execute draw commands objects.	P1. Draw construction lines. P2. Draw lines with precision as per standards. P3. Draw curves with precision as per standards.



National Competency Standards Level-5 for “Civil Technology”



	P4. Hide the construction lines layer.
CU-3. Perform application of Modify tools / commands to delete whole or part of surplus entities.	P1. Apply FILLET & TRIM, ERASE, BREAK commands to delete whole or part of surplus entities in given scenario. P2. Apply CHAMFER, EXTEND & FILLET to modify corners. P3. Apply SCALE, LENGTHEN, STRETCH for multiple purposes.
CU-4. Change properties of objects to meet set standards.	P1. Apply ROTATE to rotate & MOVE to move objects. P2. Use OFFSET, MIRROR, ARRAY & copy to create multiple objects. P3. Modify properties by SCALE, EXPLODE, PEDIT, JOIN for multiple purposes.
CU-5. Assign symbols to specified materials	P1. Set the scale factors for hatching patterns. P2. Select specified area/ object on drawing. P3. Apply the hatch to the area. P4. Calculate hatched area by Auto CAD command
CU-6. Modify drawing objects using properties option.	P1. Perform inquiry commands to get area & distance of object. P2. observe the objects properties- location, linear & angular measurements, and other drafting formations. P3. Modify the objects properties- location, P4. Apply linear measurements with other drafting formations P5. Apply angular measurements with other drafting formations

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Apply draw commands and tools.
- K-2.** Describe and use modify commands and tools.
- K-3.** Describe HATCHING concepts in AutoCAD.
- K-4.** Describe zooming options
- K-5.** Describe features of Tools palettes window and their application
- K-6.** Describe Design center feature- Scale and paper sizes
- K-7.** Apply drafting settings (Unites, Limits, Snap, Auto On & Off) and their application
- K-8.** Explain layout settings & printing of CAD drawings and their application
- K-9.** Explain integration of total station with AutoCAD & MS Excel and their application
- K-10.** Explain how to extend, trim, stretch, break and scale drawn items.
- K-11.** Explain how to edit properties of objects.
- K-12.** Describe the purpose and use of the use of blocks and symbols.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Create 2D Drawings of C-type residence including Plan,
- Draw working plan, section, elevation, legend, schedule, areas & measurements according to civil technology.
- Create X-section for 2D Drawings of C-type residence.

Instruments & Consumables

Sr. No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation



0732B&CE-71 Produce Drawing of Framed Structure Building

Overview: This competency standard covers the skills and knowledge required to draw architectural & structural drawing for a double storey “RCC” framed structure building (key plan, layout plan, detailed plan, elevations, sections, structural drawing of building components), detailed drawing of steel trussed roof shed (60’ x 40’) and sketches of arches, floors & roofs.

Competency Units	Performance Criteria
CU-1. Prepare architectural drawings of a Small two storey RCC framed Structure Building.	P1. Select the suitable instruments to draw frame. P2. Draw title strip on sheet. P3. Distribute space of drawing sheet. P4. Draw key plan, layout plan, detailed plan of building, roof drainage plan & Floor plan of building. P5. Draw Elevation, and sections of building. P6. Perform lettering and dimensioning. P7. Prepare schedule of area, openings, fittings. P8. Indicate North direction P9. Perform printing for drawing
CU-2. Prepare structural drawings of a Small two storey RCC framed Structure Building.	P1. Draw structural detail of roof, floor, lintels on half imperial sheet. P2. Draw title strip on sheet. P3. Distribute space of drawing sheet. P4. Draw Reinforcement details of RCC column with base, beams, slabs, and stairs. P5. Perform lettering and dimensioning. P6. Indicate North direction P7. Perform printing for drawing
CU-3. Prepare detailed drawing of steel trussed roof shed (60’ x 40’)	P1. Select the suitable instruments to draw sheet. Draw title strip on sheet OR block. P2. Distribute space of drawing sheet. P3. Draw plan of roof shed. P4. Draw frame of truss with roofing detail- sheets, purlin, gutter, ridging and wind ties. P5. Draw detail of joints and fixing at support. P6. Perform lettering and dimensioning. P7. Indicate North direction P8. Perform printing for drawing
CU-4. Draw sketches of arches	P1. Select the suitable instruments to draw sketches. P2. Draw title strip on sheet OR block. P3. Distribute space of drawing sheet.



National Competency Standards Level-5 for “Civil Technology”



	P4. Sketch semi-circular, circular, segmental, two cusp, three cusp, elliptical, & flat arches. P5. Perform lettering and dimensioning. P6. Indicate North direction P7. Perform printing for drawing
CU-5. Draw sketches of roofs	P1. Select the suitable instruments to draw sketches. P2. Draw title strip on sheet OR block. P3. Distribute space of drawing sheet. P4. Sketch first class mud roof, 2nd Class mud roof, R.C.C, R.B slabs, Pre-cast, roof. Jack arch and sloping roofs. P5. Perform lettering and dimensioning. P6. Indicate North direction P7. Perform printing for drawing
CU-6. Draw sketches of floors	P1. Select the suitable instruments to draw sketches. P2. Draw title strip on sheet OR block. P3. Distribute space of drawing sheet. P4. Sketch conglomerate, mosaic, terrazzo, glazed tile, brick tile, wooden, vinyl, rubber, cork, & tuff tile floors. P5. Perform lettering and dimensioning. P6. Indicate North direction P7. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Sketch out the x-section of lintels and arches.
- K-2.** State the various parts of lintels and arches.
- K-3.** Define different types of floors.
- K-4.** Draw the sketches of different parts of floors.
- K-5.** Explain the standard proportions for the different layers of floors.
- K-6.** State different types of roofs i.e. first-class mud roofing, 2nd Class mud roofing, R.C.C and R.B roof and Pre-cast roof slabs.
- K-7.** State different types of sloping roof.
- K-8.** Draw the sketches of steel trusses up to 40' span from the given data.
- K-9.** Label the sketches of different parts of trusses.
- K-10.** Distribute the space for different views evenly on drawing sheet.
- K-11.** Define columns.
- K-12.** Sketch & show steel reinforcement at appropriate place in the column sections of different shapes.



National Competency Standards Level-5 for “Civil Technology”



- K-13.** State the position of over laps and its length.
- K-14.** Sketch different types of hooks and bends with their standard dimensions.
- K-15.** Define beam & types of beam
- K-16.** Sketch the x-section and L-section of a singly reinforced beam & show steel reinforcement (simply supported, cantilever, over hanging, continuums beam)
- K-17.** Differentiate between the Primary and Secondary beam.
- K-18.** Sketch and label the details of Reinforcement of T-and L-Beam.
- K-19.** Sketch and label the details of Reinforcement of two-way continuous slab over Tee-Beam.
- K-20.** State the purpose of stirrups and bent up bars
- K-21.** Types of mild steel bars (plain, deformed, cold twisted, presented)

Critical Evidence(S) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of a small two storey RCC framed Structure building.
- Drawing of steel trussed roof shed (60' x 40')
- Sketches of Arches, Roofs & Floors.

Instruments & Consumables

Sr. No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation

0732B&CE-72 Develop Sectional Drawing for foundations

Overview: This competency standard covers the skills and knowledge required to draw structural drawing of raft foundation, grillage foundation, Pile Foundation, well foundation, spread footing, column base & pillar.



National Competency Standards Level-5 for “Civil Technology”



Competency Units	Performance Criteria
CU-1. Prepare structural detail of Raft foundation.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw structural steel drawings of raft foundation. P4. Perform printing for drawing
CU-2. Prepare structural detail of Grillage foundation.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw structural drawings of grillage foundation. P4. Perform printing for drawing
CU-3. Prepare structural detail of Pile foundation.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw structural steel drawings of Pile foundation. P4. Perform printing for drawing
CU-4. Prepare structural detail of Well foundation.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw structural drawings of well foundation. P4. Perform printing for drawing
CU-5. Prepare structural detail of spread footing, pillar, foundations & column base.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw structural drawings of spread footing, pillar, & column footing. P4. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define and sketch the spread footing.
- K-2.** Define and sketch the raft foundations.
- K-3.** Define and sketch the grillage foundation.
- K-4.** Define and sketch the well and pile foundation.
- K-5.** Define and sketch the caisson foundations.
- K-6.** Label different parts of spread footing i.e. base concrete, sub grade, steps offsets, and plinth.
- K-7.** Calculate the depth and breadth required for spread footings.
- K-8.** Sketch and label the raft foundations with steel reinforcement.
- K-9.** Sketch and label the pile foundations with steel reinforcement.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of structural detail of Raft foundation.
- Drawing of structural detail of Grillage foundation.
- Drawing of structural detail of Pile foundation.
- Drawing of structural detail of Well foundation.
- Drawing of structural detail of spread footing, pillar, foundations & column base.

Instruments & Consumables

Sr. No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation

0732B&CE-73 Develop Drawings for Doors & Windows

Overview: This competency standard covers the skills and knowledge required to draw sketches of ledged, ledged & batten, louvers, collapsible, sliding, rolling, revolving doors, sketches glazed, louvers windows and detailed drawings of panelled & glazed, flush and wire gauzed doors & windows.

Competency Units	Performance Criteria
CU1. Prepare sketches of doors	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Sketch the ledged, ledged & batten, louvers, collapsible, sliding, rolling, revolving doors. P4. Sketch glazed, louvers windows. P5. Perform lettering & dimensioning. P6. Perform printing for drawing



National Competency Standards Level-5 for “Civil Technology”



CU2. Prepare structural drawing of Panelled & Glazed Doors & Windows	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan, sections & elevation panelled & glazed door & window. P4. Perform lettering & dimensioning. P5. Perform printing for drawing
CU3. Prepare structural drawing of Flush and Wire Gauzed Doors & Windows	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan, sections & elevation flush door& window. P4. Draw detailed plan, sections & elevation wire gauzed door& window. P5. Perform lettering & dimensioning. P6. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** State need of doors and windows.
- K-2.** Define clerestory windows and ventilators.
- K-3.** State the different types of doors and windows.
- K-4.** Explain the various parts of doors and windows.
- K-5.** State the different materials used for doors, windows and ventilators
- K-6.** Sketch the elevations, sectional plans and vertical sections of doors, windows and ventilators.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing sketches of ledged, ledged & batten, louvers, collapsible, sliding, rolling, revolving doors, sketches glazed, louvers windows
- Structural drawings of panelled & glazed, flush and wire gauzed doors & windows.

Instruments & Consumables

Sr. No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD



National Competency Standards Level-5 for “Civil Technology”



3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation

0732B&CE-74 Produce Drawings of Stairs and Stair Cases

Overview: This competency standard covers the skills and knowledge required to draw sketches of open newel, straight, bifurcated, geometrical, circular, spiral, & dog-legged stair & Structural drawings of Dog-legged and Spiral Stair cases.

Competency Units	Performance Criteria
CU-1. Prepare sketches of stairs	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Sketch open newel, straight, bifurcated, geometrical, circular, spiral, & dog-legged stair. P4. Perform lettering & dimensioning. P5. Perform printing for drawing
CU-2. Prepare structural drawing of Dog-legged Stair.	P-1. Select the suitable instruments to draw foundation. P-2. Distribute space of drawing sheet. P-3. Draw detailed plan & sections of dog legged stair. P-4. Draw detailed plan & sections spiral stair case P-5. Perform lettering & dimensioning. P-6. Perform printing for drawing
CU-3. Prepare structural drawing of Spiral Stair Case.	P-1. Select the suitable instruments to draw foundation. P-2. Distribute space of drawing sheet. P-3. Draw detailed plan & sections of dog legged stair. P-4. Draw detailed plan & sections spiral stair case P-5. Perform lettering & dimensioning. P-6. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define stair and stair case
- K-2.** Define the terms and parts used in different types of stairs.
- K-3.** Explain the stairs according to their layout.
- K-4.** State the suitability of each type of stair.



National Competency Standards Level-5 for “Civil Technology”



K-5. Sketch the plans and sections of different types of stairs according to their layout.

K-6. Define different type of Stairs

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing sketches of open newel, straight, bifurcated, geometrical, circular, spiral, & dog-legged stair.
- Structural drawings of Dog-legged and Spiral Stair cases.

• Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, Power Point and Excel)
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	Printer Paper
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	NVQF/Policy Documentation
8	Internet Connection		

0732B&CE-75 Produce Drawings of Water Tanks

Overview: This competency standard covers the skills and knowledge required to draw masonry underground masonry water tank, RCC Circular Surface Water tank and Square RCC over head water Tank.

Competency Units	Performance Criteria
CU-1. Prepare structural drawing of RCC surface circular / square water tank.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of masonry underground water tank. P4. Draw reinforcement detailed drawing.



National Competency Standards Level-5 for “Civil Technology”



	P5. Perform lettering & dimensioning. P6. Perform printing for drawing
CU-2. Prepare structural drawing of RCC square overhead water tank.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan of RCC surface water tank. P4. Draw detailed cross sections of RCC surface water tank. P5. Draw reinforcement detailed drawing. P6. Perform lettering and dimensioning. P7. Perform printing for drawing
CU-3. Prepare structural drawing of RCC Circular overhead water tank.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of RCC overhead water tank. P4. Draw reinforcement detailed drawing. P5. Perform lettering and dimensioning. P6. Perform printing for drawing
CU-4. Prepare structural drawing of RCC Rectangular overhead water tank.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of RCC overhead water tank. P4. Draw reinforcement detailed drawing. P5. Perform lettering and dimensioning. P6. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Define water tank.
- K-2.** Define the terms and parts used in different types of water tanks.
- K-3.** Explain the tanks according to their material, & level.
- K-4.** State the suitability of each type of water tank.
- K-5.** Sketch the plans and sections of different types of water tanks.
- K-6.** Differentiate between surface and overhead water tank
- K-7.** Describe reinforcement for overhead water tank
- K-8.** Explain reinforcement overlapping, binding and cutting

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of masonry underground rectangular water tank,
- Drawing of RCC Circular Surface Water tank
- Drawing of Square RCC over head water Tank.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, Power Point and Excel)
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	Printer Paper
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	NVQF/Policy Documentation
8	Internet Connection		

0732B&CE-76 Produce Drawings of Cross Drainage Works

Overview: This competency standard covers the skills and knowledge required to draw detailed drawing of RCC Deck high level 2 spans bridge, prepare detailed drawing of masonry segmental arched single span bridge and Prepare detailed drawing of steel plate girder single span bridge.

Competency Units	Performance Criteria
CU-1. Prepare detailed drawing of RCC Deck high level 2 spans bridge	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan, elevation & sections of RCC deck 2 span high level bridge. P4. Draw reinforcement detailed drawing. P5. Perform lettering & dimensioning. P6. Perform printing for drawing
CU-2. Prepare detailed drawing of masonry segmental arched single span bridge.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of Segmental Arch single span bridge.



National Competency Standards Level-5 for “Civil Technology”



	P4. Perform lettering & dimensioning. P5. Perform printing for drawing
CU-3. Prepare detailed drawing of masonry segmental arched triple span bridge.	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of Segmental Arch triple span bridge. P4. Perform lettering & dimensioning. P5. Perform printing for drawing
CU-4. Prepare detailed drawing of steel plate girder bridge for single span	P1. Select the suitable instruments to draw foundation. P2. Distribute space of drawing sheet. P3. Draw detailed plan & sections of steel plate girder bridge for single span. P4. Draw reinforcement detailed drawing. P5. Perform lettering & dimensioning. P6. Perform printing for drawing

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Sketch the X-section of concrete Road structure.
- K-2.** State various parts of culverts i.e. abutment, wing wall, toe wall parapet, base plate.
- K-3.** Sketch the Plan, Foundation Plan, Long Section and X-Section of Culvert.
- K-4.** Explain the various terms used in Bridge.
- K-5.** State the difference between culvert and Bridge.
- K-6.** Explain the various types of bridges.
- K-7.** Sketch the Plan, Foundation Plan, Long section and X-Section of two Span Bridge.
- K-8.** Sketch the detailed drawing of 25' span plate girder steel bridge.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Prepare detailed drawing of RCC Deck high level 2 spans bridge
- Prepare detailed drawing of masonry segmental arched single span bridge.
- Prepare detailed drawing of steel plate Girder Bridge 1 span

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable



National Competency Standards Level-5 for “Civil Technology”



1	PCs/Laptops	1	Microsoft Office (Word, Power Point and Excel)
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	Printer Paper
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	NVQF/Policy Documentation
8	Internet Connection		



0732B&CE-77 Develop 3d Drawings

Overview: This competency standard covers the skills and knowledge required to create 3-Dimensional Models by using various tools and commands in AutoCAD software, demonstrate skills to modify 3D objects and models to ensure civil technology requirements and present a rendered 3D Model final outcome.

Competency Units	Performance Criteria
CU-1. Develop 3D Objects	P1. Setup & save 3D Drawing Interface for required specifications P2. Setup 3D User Interface settings for required specifications P3. Create 3D Objects with given data P4. Perform printing for drawing
CU-2. Manipulate 3D Objects Using 3D Editing Tools	P1. Modify 3D Objects in line with the requirements P2. Make customized 3D Models according to the requirements of the given job P3. Convert 3D Face Objects into Single Mesh Objects P4. Perform printing for drawing
CU-3. Render 3D Model	P1. P1. Apply material to required 3D Model as per given specifications P2. Apply lights to get the requisite scene of required 3D model P3. Assign cameras to execute different views of required 3D Model P4. Render and print the 3D model according to required size and orientation P5. Perform printing for rendered model

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- P1.** Describe 3D Modeling in AutoCAD- 3D solids, Surfaces, Meshes, Wireframe Objects
- P2.** Differentiate between Surface Modeling and Solid Modeling
- P3.** Explain 3D Face and Edges
- P4.** Explain Boolean Operation Concepts- Subtraction, Intersection, Union
- P5.** Describe 3D Navigate Control- functions of different camera settings, importance of scene creation, PRESET views such as isometric, top, bottom, front, left, etc.
- P6.** Describe Perspective projection and parallel projection
- P7.** Describe walk and Constrained Orbit.



National Competency Standards Level-5 for “Civil Technology”



- P8.** Describe how to assign Material and Light Control- planner mapping, texture map, opacity control, render context and render sampling.
- P9.** Explain rendering requirements
- P10.** Explain modelling procedure

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Drawing of Render 3D prototype Model including materials, lights, scene and different camera views

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, PowerPoint and Excel) Drawing sheet
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	3D Studio Max
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	Printer Paper
8	Internet Connection	8	NVQF/Policy Documentation



0732B&CE-78 Produce Civil Technology Drawings

Overview: This competency standard covers the skills and knowledge required to Printout on A4 paper drawings of c-type residential building, Printout on A2 paper submission drawings of a small two storey R.C.C. framed structure building, Printout on A4 paper x-sections of canals, drains and roads and Printout on A4 paper drawings of masonry 10 ft segmental arched culvert.

Competency Units	Performance Criteria
CU-1. Prepare & printout on A4 paper drawings of c-type residential building.	P1. Setup drawing interface for required specifications P2. Setup user interface settings for required specifications P3. Draw detailed plan of C type building. P4. Draw front & side elevation of C type building. P5. Draw x-section of C type building. P6. Adjust layouts in viewports for printing C type building. P7. Perform lettering & dimensioning P8. Print the drawings
CU-2. Prepare & printout on A2 paper submission drawings of a small two storey R.C.C. framed structure building	P1. Setup drawing interface for required specifications P2. Setup user interface settings for required specifications P3. Draw detailed plans of framed structure building. P4. Draw front & side elevation of framed structure building. P5. Draw site plan, layout plan of framed structure. P6. Draw x-sections of framed structure building. P7. Draw reinforcement detail of RCC structures. P8. Adjust layouts in viewports for printing frame structure building. P9. Perform lettering & dimensioning P10. Print the drawings
CU-3. Prepare & printout on A4 paper x-sections of canals and drains	P1. Setup drawing interface for required specifications P2. Setup user interface settings for required specifications P3. Draw cross section of canal fully in cutting, fully in filling and partly in cutting & partly in filling. P4. Draw x-sections of type-I. type-II & type 8 drains P5. Adjust layouts in viewports for printing cross section of canals and drains. P6. Perform lettering & dimensioning P7. Print the drawings
CU-4. Prepare & printout on A4 paper x-sections of roads.	P1. Setup drawing interface for required specifications P2. Setup user interface settings for required specifications P3. Draw cross section of canal fully in cutting, fully in filling and partly in cutting & partly in filling.



National Competency Standards Level-5 for “Civil Technology”



	P4. Draw cross section of national highway dual carriage in rural and built up area. P5. Draw cross section of district highway double lane in rural and built up area. P6. Draw x-sections of type-I. type-II & type 8 drains P7. Adjust layouts in viewports for printing cross section of road. P8. Perform lettering & dimensioning P9. Print the drawings
CU-5. Prepare & printout on A4 paper drawings of masonry 10 ft segmental arched culvert.	P1. Setup drawing interface for required specifications P2. Setup user interface settings for required specifications P3. Draw detailed plan, & layout plan of culvert. P4. Draw long section & cross section of culvert. P5. Draw elevation of culvert. P6. Adjust layouts in viewports for printing segmental arch culvert. P7. Perform lettering & dimensioning P8. Print the drawings

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Modify dimension style and text size according to paper size
- K-2.** Apply drafting settings (Unites, Limits, Snap, Auto On & Off) and their application
- K-3.** describe layer options, dimensioning & text and their application
- K-4.** Explain features of dimensioning & text options and their application
- K-5.** Explain layout settings & printing of CAD drawings and their application
- K-6.** Explain integration of total station with AutoCAD & MS Excel and their application
- K-7.** Explain how to extend, trim, stretch, break and scale drawn items.
- K-8.** Explain how to edit properties of objects.
- K-9.** Describe the purpose and use of the use of blocks and symbols.
- K-10.** Describe adjustment of layouts along with viewports for printing.
- K-11.** Describe the procedure of printing drawings.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Printout on A4 paper drawings of c-type residential building.
- Printout on A2 paper submission drawings of a small two storey R.C.C. framed structure building
- Printout on A4 paper x-sections of canals, drains and roads.



National Competency Standards Level-5 for “Civil Technology”



- Printout on A4 paper drawings of masonry 10 ft segmental arched culvert.

Instruments & Consumables

S No.	Description (Instruments)	S No.	Software& Consumable
1	PCs/Laptops	1	Microsoft Office (Word, Power Point and Excel)
2	Multimedia Projector	2	AutoCAD
3	Scanner	3	Printer Paper
4	Printer/ Plotter	4	Windows OS
5	USB Sticks	5	White Board & Markers
6	Tracing Sheet	6	Note Books
7	Scissor/ Paper Cutter	7	NVQF/Policy Documentation
8	Internet Connection		



10.8. Construction I

0732B&CE-79 Perform Simple Levelling

Overview: This competency standard covers the skills and knowledge required to Prepare for work, Perform manual leveling and Cleanup work area.

Competency Unit	Performance Criteria
CU-1. Prepare for work.	P1. Determine requirements of the job and obtain various levels. P2. Observe work health and safety (WHS) requirements associated with levelling activities. P3. Identify quality assurance requirements according to workplace requirements. P4. Select and check serviceability of tools and equipment, including personal protective equipment.
CU-2. Perform manual leveling.	P1. Identify height to be transferred drawings, plans or instructions. P2. Carryout hand levelling and operate according to manufacturer instructions. P3. Record levels and mark according to job requirements.
CU-3. Clean up work area.	P1. Clean work area, and waste disposed of reused or recycled in accordance with work specifications. P2. Clean, maintain and store tool, plant and equipment in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1.** Describe different types of levelling equipment, their applications and their method of operation
- K2.** Explain process for how to access relevant information, including codes and technical standards
- K3.** Develop job safety analysis (JSA) and safe work method statements (SWMS)
- K4.** Describe process of establishing, and checking levels and alignment
- K5.** Explain procedure for the calculations to carry out leveling
- K6.** Describe workplace and equipment safety requirements

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Locating, interpreting and applying relevant information, standards and specifications for the establishment, and checking of levels
- Applying safety requirements throughout the work sequence, including electrical safety requirements and the use of personal protective clothing and equipment

Instruments & Consumables

S No.	Description (Instruments)
1	Spirit level
2	Staff rod
3	Auto level



0732B&CE-80 Lay out Building plans

Overview: This competency standard covers the skills and knowledge required to Plan and prepare, Identify and indicate site boundaries, Set out first line for building alignment, Set out right angled corners, Install other building lines, Check building lines for square, Clean-up work place

Competency Unit	Performance Criteria
CU-1. Plan and prepare	P1. Obtain work instructions, including plans, specifications, quality requirements and operational details, and apply relevant information for planning and preparation. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select tools and equipment to carry out tasks consistent with job requirements, and check serviceability, and any faults. P5. Calculate material quantity requirements in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare and handle safely materials appropriate to the work application. P7. Identify applied environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Identify and indicate site boundaries.	P1. Identify and locate survey pegs at corners of site in accordance with job drawings, specifications and site topography. P2. Set string lines accurately into position to identify site boundary markings in accordance with site plan and survey pegs.



National Competency Standards Level-5 for “Civil Technology”



CU-3. Set out first line for building alignment.	P1. Determine measurements of building line from boundary or existing building from site drawings for setting out. P2. Determine approximate position and length of line, plus building clearance measurement at each end for hurdle location in accordance with site plan and survey pegs. P3. Install pegs and hurdles/profiles approximately level across and between one another with adequate provision to mark footing width on hurdle/profile in accordance with job drawings and specifications. P4. Mark location for line accurately with nails on hurdles/profiles and line set taut into position to true alignment with boundary in accordance with job drawings and specifications without error.
CU-4. Set out right angled corners.	P1. Determine corner of building on set building line to true measurement from adjacent boundary and mark with peg in accordance with job drawings and specifications. P2. Set up right angle to line from corner peg using triangulation principles. P3. Install hurdles/ profiles to approximate level of other hurdles and set taut line to right angled alignment.
CU-5. Install other building lines.	P1. Install hurdles for remaining building lines to appropriate locations, approximately level with established hurdles in accordance with job drawings and specifications. P2. Mark measurements for remaining building lines accurately and nail on hurdles to dimensions from site drawings. P3. Set taut string lines into position to nailed locations on hurdles in accordance with job drawings and specifications.
CU-6. Check building lines for square.	P1. Inspect diagonal measurements for square and adjust lines to provide square relationship within 5mm tolerance over minimum diagonal length of 15m. P2. Check measurements for accuracy.
CU-7. Clean up work place	P1. Clean work area and dispose of waste in accordance with work specifications.



National Competency Standards Level-5 for “Civil Technology”



	P2. Clean, maintain and store tools plant and equipment in accordance with workplace practices.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Knowledge of application and requirements for line, level and plumb in construction projects
- K2.** Explain basic construction processes
- K3.** Describe construction plan, symbols and construction terminology
- K4.** Define different construction terminology
- K5.** Enlist job safety analysis (JSA) and safe work method statements
- K6.** Describe processes for interpreting engineering drawings and sketches
- K7.** Explain processes for setting out
- K8.** Describe project quality requirements
- K9.** Explain site and equipment safety (OHS) requirements
- K10.** Describe site isolation and traffic control responsibilities and authorities
- K11.** Define Types, characteristics, technical capabilities and limitations of setting out devices.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations
- Comply with organizational policies and procedures, including quality requirements
- Safely and effectively use tools and equipment
- Communicate and work effectively and safely with others
- Set out a full size L shape building on a relatively level site to specifications.

Instruments & Consumables

S No.	Description (Instruments)
1	Signage & Barricade equipment's



National Competency Standards Level-5 for “Civil Technology”



2	Surveying pegs
3	Measuring Tape
4	Nails
5	PPE's

0732B&CE-81 Carryout excavation and install supports

Overview: This competency standard covers the skills and knowledge required to excavate and install trench and excavation support on a new or existing site, in order to make provisions for footings/slabs or to provide/repair/divert services.

Competency Unit	Performance Criteria
CU-1. Plan and prepare	P1. Confirm work instructions with supervisor. P2. Calculate material quantity requirements in accordance with specifications. P3. Obtain materials needed and check & prepare for compliance.
CU-2. Locate excavation site and erect safety equipment	P1. Locate excavation site and establish line & depth from site plans and instructions. P2. Set and mark service points and the excavation limits. P3. Establish temporary drainage system to divert surface and sub-surface water. P4. Identify service markers and avoid interference with underground services.
CU-3. Dig Excavations	P1. Dig safely excavations with hand tools to ensure correct route, line and depth. P2. Assist machine operator to ensure correct route, line and depth of excavation. P3. Install trench or excavation support if required.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Plan and prepare for installing trench support	P1. Access, interpret and apply trench support documentation, and ensure the work activity is compliant P2. Obtain, read, interpret, clarify and confirm work requirements P3. Identify and address potential risks, hazards and environmental issues, and implement control measures P4. Select and wear personal protective equipment appropriate for work activities P5. Identify, obtain and implement traffic signage requirements. P6. Select, and check for faults, equipment and/or attachments for work activities P7. Obtain and interpret emergency procedures, and be prepared for fire/accident/emergency
CU-5. Install trench shoring	P1. Communicate with plant operator and ensure the excavation of trenches complies with site plan, line and depth P2. Determine and prepare shoring method P3. Set out positioning of shoring P4. Position/erect shoring within the trench P5. Secure shoring in position and ensure structural conformity with regulations P6. Clean out excavation P7. Locate ladders for safe access and egress
CU-6. Remove trench shoring	P1. Release jacking mechanisms and remove ladders P2. Check shoring and prepare it for lifting from the trench P3. Remove shoring from trench and store it



National Competency Standards Level-5 for “Civil Technology”



CU-7. Conduct housekeeping activities	P1. Clear work area and dispose of or recycle materials P2. Clean and maintain condition of equipment, ensure suitability for use, and address/report issues P3. Manage/report hazards and maintain a safe working environment P4. Process written records

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Apply common skills and knowledge specified in the introduction to these RMCS
Commonly used in-ground services
- K2.** Describe excavation materials
- K3.** Describe excavation techniques
- K4.** Interpret Plans, specifications and drawings
- K5.** Define Shoring
- K6.** Describe types & components of shoring

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Effectively use tools, plant and equipment
- Mark out and excavate site as to without damaging services.

Instruments & Consumables

S No.	Description (Instruments)
1	Shovels
2	Battens, props, planks for shoring
3	Jacks
4	Ladder



0732B&CE-82 Place Concrete in Foundations

Overview: This competency standard covers the skills and knowledge required to identify and select hand, power and pneumatic tools for given tasks and safely use and maintain a minimum of rule, tape, square, hammer, hand saw, hand plane, chisel, shovel, wheelbarrow, sledge hammer, pick, mattock and crow bar and pinch bar for given tasks.

Competency Unit	Performance Criteria
CU-1. Plan and prepare	P1. Confirm work instructions with supervisor. P2. Select Tools and equipment as required, check serviceability and report any faults. P3. Calculate material quantities in accordance with specifications. P4. Obtain materials needed, checked for compliance and prepare.
CU-2. Define and prepare work area.	P1. Receive concrete, check for debris and discharge into wheelbarrow, kibble, pump or hopper. P2. Determine location of concrete placement from plans and specifications and check for free of debris and waste.
CU-3. Place, screed and level concrete	P1. Place concrete in horizontal layers into location to marked out levels. P2. Minimize height of vertical drop of concrete to avoid segregation of concrete materials. P3. Consolidate poured concrete during process using compaction or vibration method. P4. Check finished levels using appropriate levelling device. P5. Perform screed on concrete to correct levels and grades using appropriate straight edged tool/ formwork-mounted screed.
CU-4. Clean up	P1. Clean work area and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check faults and maintain and store in accordance with workplace practices



Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain concrete ingredients ratio
- K2.** Describe batching and finishing techniques
- K3.** Enlist concrete materials
- K4.** Describe procedure for placement of concrete
- K5.** Explain curing times
- K6.** Explain levelling techniques
- K7.** Explain types, characteristics, uses and limitations of plant, tools and equipment

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Use a hand trowel and power trowel to finish a minimum of 10 square meters of concrete in foundation.
- Consolidation methods

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Chutes • Line pumps • Measuring tapes and rules, mechanized dumpers • Rakes • Screed boards • Shovels • Stipple devices • Trowels troweling machines • Vibrators • Wheelbarrows



0732B&CE-83 Prepare for construction Process (Brick/ block laying)

Overview: This competency standard covers the skills and knowledge required to Plan work, Set out brickwork/ blockwork, and Lay bricks/blocks forming steps and wing walls and Clean up

Competency Unit	Performance Criteria
CU-1. Plan work	P1. Confirm work instructions with supervisor. P2. Select tools and equipment as required, check for serviceability and report faults. P3. Calculate material quantity requirements in accordance with specifications. P4. Obtain materials needed, check for compliance and prepare.
CU-2. Set out brickwork/ blockwork	P1. Erect work platform in accordance with workplace requirements. P2. Check location and relative level of footing from job drawings and specifications. P3. Calculate rise and going of flight and individual steps to codes and workplace requirements. P4. Set out flight and individual steps from calculations and job drawings.
CU-3. Lay bricks/blocks forming steps and wing walls	P1. Prepare mortar mix to required conformity and set out bricks/blocks laid to according to specifications. P2. Construct base brickwork to specifications. P3. Lay & form steps square, level, plumb, true and specified bond. P4. Construct profile of steps to bond, design, aligned and plumb to specifications. P5. Form parallel wing walls to step alignment in accordance with specifications. P6. Carry out jointing to work specifications. P7. Lay brickwork/blockwork to line, set out with gauge and completed to work specifications. P8. Clean brick/block faces free of mortar.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Clean up	P1. Clean work area, and waste disposed of, reused or recycled in accordance with work specifications. P2. Clean, maintain and store tool, plant and equipment in accordance with workplace practices.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Describe brick bond patterns
- K3.** Describe characteristics and applications of materials for masonry steps and stairs construction
- K4.** Draw plans, specifications and drawings
- K5.** Enlist techniques of masonry steps and stairs construction

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct a flight of stairs with a minimum of three pre-cast treads, to specifications; and
- Construct a flight of three solid masonry treads with a parallel wing wall on one side to specifications.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters, • Brick buggies and brick grabs, • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch)



National Competency Standards Level-5 for “Civil Technology”



	• Hoses • Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • mortar boards • Pallet trolleys, plumb rules, profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows



0732B&CE-84 Mix Cementitious materials (Mortar & Concrete)

Overview: This competency standard covers the skills and knowledge required to Plan work, Set out brickwork/ blockwork, and Lay bricks/blocks forming steps, wing walls and Clean up

Competency Unit	Performance Criteria
CU1. Plan work	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work.
CU2. Set out brickwork/ blockwork	P1. Calculate materials quantity in accordance with ratio/ specifications. P2. Obtain materials needed, check for compliance and prepare. P3. Mix the materials uniformly. P4. Pour the water and mix thoroughly for uniform color.
CU3. Lay bricks/blocks forming steps and wing walls	P1. Calculate materials quantity in accordance with ratio/ specifications. P2. Obtain materials needed, check for compliance and prepare. P3. Mix the materials uniformly. P4. Pour the water and mix thoroughly for uniform colour.
CU4. Clean up	P1. Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications. P2. Clean plant tools and equipment, check for faults and maintained and stored in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Describe brick bond patterns
- K3.** Describe characteristics and applications of materials for masonry steps and stairs construction
- K4.** Draw plans, specifications and drawings
- K5.** Explain techniques of masonry steps and stairs construction

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct a flight of stairs with a minimum of three pre-cast treads, to specifications; and
- Construct a flight of three solid masonry treads with a parallel wing wall on one side to specifications.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses • Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • Masonry saws



National Competency Standards Level-5 for “Civil Technology”



	• Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • plumb rules • profiles • Scaffolds • Shovels • Small petrol or diesel engines • Compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows



0732B&CE-85 Install flashing and damp proof course

Overview: This competency standard covers the skills and knowledge required install flashings and damp proofing products to different types and styles of buildings.

Competency Unit	Performance Criteria
CU-1. Plan work	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Prepare for work	P1. Identify type of flashing and damp proofing material in accordance with and state of structure. P2. Identify area of structure for damp proofing from or site inspection and inspected for defects. P3. Correct the defects and carryout surface preparation of structure requiring damp proofing to manufacturer specifications
CU-3. Install damp proof course	P1. Install damp proof in accordance with work specifications. P2. Lay flashing or damp proof course and lap in accordance with specifications. P3. Apply damp proof material with a consistent mortar bed on top and bottom. P4. Fold damp proof course to follow shape of surrounding structures.
CU-4. Install moisture proof barrier or flashings	P1. Prepare flashing materials for application to surrounding structures in accordance with requirements. P2. Lay, lap, and join flashing material to follow shape of surrounding structure.



National Competency Standards Level-5 for “Civil Technology”



	P3. Form flashings or moisture barrier material and seal around openings. P4. Install flashing and damp proof course to project outside of mortar joint on external surface, and outside of brickwork in accordance with specifications.
CU-5. Clean up	P1. Clean work area, dispose waste and reuse or recycle material in accordance with work specifications. P2. Clean plant tools and equipment, checked for faults and maintained and stored in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Explain characteristics and applications of materials to install flashings and DPC
- Describe techniques for installing flashings and DPC
- Explain waterproofing methods

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Install according to specifications, flashings of suitable materials for cavity brickwork including internal and external corners, window and door heads and vertical flashings; and stepped and tray flashings to gables and/or parapets.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets



National Competency Standards Level-5 for “Civil Technology”



	• Builders’ lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses • Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows



0732B&CE-86 Carry out brick work

Overview: This competency standard covers the skills and knowledge required to lay and construct brick and masonry buildings.

Competency Unit	Performance Criteria
CU-1. Plan work	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Set out brickwork/ blockwork	P1. Identify, select and check bricks/blocks for conformity with specifications. P2. Develop work platform in accordance with workplace requirements. P3. Identify location and structural details of brickwork/ blockwork from plans. P4. Set out base brickwork construction, below and above floor to location, dimensions and specifications.
CU-3. Install damp proof course	P1. Prepare and check Mortar mix for conformity and bricks/blocks laid to set out to specification. P2. Determine brickwork/ blockwork gauge and prepare set out rod. P3. Construct base brickwork/blockwork for veneer construction to requirements of regulations and specifications. P4. Install sub-floor ventilation in accordance with specifications.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Construct Veneer Walls	P1. Check structural frame to ensure it is ready for brick or block veneer construction maintaining minimum cavity. P2. Install damp proof courses to specifications. P3. Build ventilation for veneer construction to specifications. P4. Position and correctly fix wall ties to framework as per specifications. P5. Construct openings and install flashings. P6. Keep cavities clear of mortar droppings and bridging. P7. Install lintels as per requirement. P8. Construct top brickwork/blockwork to eaves/gable/ceiling level in accordance with standards. P9. Construct veneer gable as required by plans and specifications. P10. Build walls to gauge straight and true in plumb, line and level within standards tolerance. P11. Form control joints in accordance with locations on job drawings and specifications. P12. Locate and build weep holes, brick/block reinforcing and wall flashing. P13. Cut sill bricks where required and lay to line in accordance with work specifications.
CU-5. Apply rake/ rule joints and clean face.	P1. Apply rake or rule joints of laid brickwork/blockwork to correct depth and profile in accordance with work specifications. P2. Brush down brickwork/blockwork prior to drying to remove unwanted mortar and face is cleaned. P3. Remove excess mortar from brick/blockwork surfaces and clean cavities free of mortar and debris.
CU-6. Clean up	P1. Clean work area, and waste disposed of, reused or recycled in accordance with work specifications. P2. Clean, maintain and store tool, plant and equipment in accordance with workplace practices



Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Describe brick bond patterns
- K3.** Explain the characteristics and applications of materials for masonry veneer construction
- K4.** Explain techniques of masonry veneer construction

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct a section of a brick veneer building, including set out and gauge brickwork to a base; damp proof course (DPC) if applicable, weep holes, air vents, control joints and veneer ties; lintels and flashings; brick gables; and brick sills and flashings, completing all to specifications.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses



National Competency Standards Level-5 for “Civil Technology”



	• Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows



0732B&CE-87 Construct Cavity Wall

Overview: This competency standard covers the skills and knowledge required to prepare for work, set out brickwork/ blockwork, construct base of brickwork/ blockwork, position door and window frames, construct brick walls, apply rake or rule joints, and clean up.

Competency Unit	Performance Criteria
CU-1. Prepare for work	P1. Obtain work instructions, including plans, specifications, quality requirements and operational details from relevant information, confirm and apply to determine bricklaying and block laying tasks. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify signage and barricade requirements & implemented. P4. Select plant, tools and equipment to carry out tasks in consistent with job requirements, check for serviceability, and rectify or report any faults prior to commencement. P5. Calculate material quantity in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, and safely handle materials appropriate to the work application, including required fire resistance rating, ready for use. P7. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.



National Competency Standards Level-5 for “Civil Technology”



CU-2. Set out brickwork/ blockwork	P1. Identify bricks and/or blocks, select and check for conformity with specifications and compliance with standards. P2. Erect work platform in accordance with regulatory and workplace requirements. P3. Identify location and structural details of brickwork/ blockwork from job drawings and job specifications. P4. Set out base brickwork below floor construction to location, dimensions and specifications in compliance with standards. P5. Set out load bearing brickwork, including engaged piers, dwarf walls, isolated piers and corbelling to job drawings and specifications. P6. Set out cavity brick wall to requirements of job drawings.
CU-3. Construct Base of brickwork/ blockwork.	P1. Prepare mortar mix and check for conformity and lay bricks/ blocks to set out according to specifications and standards. P2. Determine brickwork/blockwork gauge and prepare set out rod. P3. Construct base brickwork/blockwork for cavity construction to requirements of regulations and specifications.
CU-4. Position door and window frames.	P1. Locate window frames and build in to cavity walls to specification and protect frames from mortar droppings during construction. P2. Locate door jambs, built in and fix to cavity walls and single leaf walls according to job drawings and specifications.



National Competency Standards Level-5 for “Civil Technology”



CU-5. Construct brick walls.	P1. Construct brick or block cavity construction walls to job specifications and standards. P2. Lay/ build damp proof courses and flashings to job specifications. P3. Construct ventilation for solid brick construction to requirements of job specification and regulations. P4. Check straightness, plumb, line and level of walls within standard tolerances. P5. Position wall ties to comply with standards. P6. Construct openings and install flashing to job specifications. P7. Install lintels to job specifications. P8. Form control joints in accordance with locations on job drawings and standards. P9. Locate weep holes, brick reinforcing, vermin proofing and wall flashings and build in to job specifications. P10. Construct gables and parapets by plans and specifications. P11. Cut and lay sill bricks to line in accordance with job specifications. P12. Install tie down and lateral support systems for ceiling/roof structures to walls in accordance with plans, specifications and standards.
CU-6. Apply rake or rule joints.	P1. Apply rake or rule joints of laid brickwork/blockwork to correct depth and profile in accordance with work specifications. P2. Brush down brickwork/blockwork prior to drying to remove unwanted mortar and face is cleaned. P3. Remove excess mortar from brick/blockwork surfaces and clean cavities free of mortar and debris.
CU-7. Clean up	P1. Clean work area, and waste disposed of, reused or recycled in accordance with work specifications. P2. Clean, maintain and store tool, plant and equipment in accordance with workplace practices



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Explain brick bond patterns
- K3.** Explain characteristics and applications of materials for cavity brick construction, including fire control and separation required by the Building Code of Australia (BCA) and other legislation
- K4.** Describe construction terminology
- K5.** Describe job safety analysis (JSA) and safe work method statements
- K6.** Explain material safety data sheets (MSDS)
- K7.** Explain materials storage and environmentally friendly waste management
- K8.** Draw plans, specifications and drawings
- K9.** Explain processes for the calculation of material requirements, quality requirements
- K10.** Explain techniques of cavity brick construction, including:- anti-termite measures, closing of cavities and capping systems, damp proofing, floor, wall and roof members, gable and eaves construction, lintels and load bearing components, stepped and level flashing for parapets and gables, sub-floor construction, tying components, ventilation, vermin control
- K11.** Explain types, characteristics, uses and limitations of plant, tools and equipment
- K12.** Describe workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard. locate, interpret and apply relevant information, standards and specifications

- Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations
- Comply with organizational policies and procedures, including quality requirements
- Safely and effectively use tools, plant and equipment
- Communicate and work effectively and safely with others
- Construct a section of a cavity brick building, including sub-floor walling; damp proof course (DPC) and ventilation; attached and isolated piers; openings (window and door) and lintels; brick cavity ties and roof tie-downs; and parapets (stepped flashing)
- Correct identification of requirement and finishing of the task
- Correct selection and use of appropriate processes, tools and equipment
- Completing all work to specification ensuring correct selection and use of fire-rated materials and methods of construction

Instruments & Consumables



National Competency Standards Level-5 for “Civil Technology”



S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses • Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels



National Competency Standards Level-5 for “Civil Technology”



	• Wheelbarrows



0732B&CE-88 Construct Curved Wall

Overview: This competency standard covers the skills and knowledge required to plan work, set out curve for construction of curved masonry wall, lay curved wall, finish joints and clean up

Competency Unit	Performance Criteria
CU-1. Plan work	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Set out curve for construction of curved masonry wall	P1. Plot planned curve points from job drawings and establish all trammel centers on footing slab. P2. Plan curve of wall to specified location from trammel or plotted points and mark on the footing slab.
CU-3. Lay curved wall.	P1. Mix mortar to specifications. P2. Lay bricks/blocks for first course to planned set out for line and specify bond according to specifications. P3. Maintain gauge within standard tolerance at every course level. P4. Maintain vertical face alignment. P5. Lay bricks/blocks level over the length of the wall to the established plan profile. P6. Lay bricks/blocks to specified bond with perpendicular joints (perpend) maintained in a vertical line P7. Complete construction to requirements of job drawings and specifications.
CU-4. Finish Joints	P1. Remove excess mortar from brick/blockwork surfaces in accordance with work specifications. P2. Rake or rule joints of laid brickwork/blockwork are to correct profile and depth to. P3. Brush down brickwork/blockwork prior to drying.



National Competency Standards Level-5 for “Civil Technology”



CU-5. Clean up	P1. Clean work area and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean, check tools plant and equipment are for faults and maintain & store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Explain brick bond patterns, types of joints and finishing
- K3.** Explain characteristics and applications of materials for masonry arch construction
- K4.** Explain construction and arch terminology
- K5.** Perform geometric calculations and drawing
- K6.** Draw plans, specifications and drawings
- K7.** Explain types of masonry arches and techniques of construction

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct a curved wall using an arc center and trammel
- Construct a serpentine curved wall using the plotted points and template technique

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers



National Competency Standards Level-5 for “Civil Technology”



	• Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses • Jig saws • Jointing tools • Line blocks and line pins • Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows

0732B&CE-89 Construct Masonry arches (semi-circular and segmental)

Overview: This competency standard covers the skills and knowledge required to Plan work, Set out first course for masonry arch, Prepare for arch construction, Construct arch center, Set up arch center, Cut and lay brick/ block to arch, Finish Joints and Clean up



National Competency Standards Level-5 for “Civil Technology”



Competency Unit	Performance Criteria
CU-1. Plan work	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Set out first course for masonry arch	P1. Set out location and line of brickwork/blockwork wall on concrete footing/slab to job drawings. P2. Determine pan of arch from prepared allotted arch center plus 4mm. P3. Set out arch spans to location for first course.
CU-3. Prepare for arch construction.	P1. Prepare mortar mix and lay bricks/blocks to form wall to set out. P2. Maintain gauge of abutting walls within standard tolerance at each course level. P3. Maintain plumb and alignment of vertical wall face. P4. Cut bricks and lay in level and to line over length of wall. P5. Lay abutment jambs/piers vertical up to springing line. P6. Lay bricks/blocks in stretcher bond to springing line of arch with perpendicular joints maintained in vertical line.
CU-4. Construct arch center.	P1. Set out arch center and draw curve in accordance with specifications and plan. P2. Transfer plan to material and cut to shape.
CU-5. Set up arch center.	P1. Determine height to springing line and confirm height to crown of arch to be within standard tolerance. P2. Determine height of toms and wedges or adjustable metal props to set up and support timber arch center. P3. Adjust supports to ensure arch center is level at right angles to wall face and level across springing line.



National Competency Standards Level-5 for “Civil Technology”



	P4. Locate props, toms, packers and wedges are located for easy removal. P5. Establish position of central key brick/block for gauged arch and tape used to mark gauge.
CU-6. Cut and lay brick/block to arch.	P1. Cut and lay bricks and blocks on center to form arch to specifications. P2. Maintain joints to equal size and parallel on the extrados of an arch. P3. Maintain same size wedge shape on face. P4. Maintain centerline of key brick/block wedge through vertical center line of arch. P5. Maintain even joint thickness around extrados for cut brickwork and blockwork. P6. Cut all bricks and lay to maintain even joints. P7. Apply all joints evenly to depth and shape to specifications.
CU-7. Finish Joints.	P1. Remove excess mortar from brick/blockwork surfaces in accordance with work specifications. P2. Apply rake and rule joints of laid brickwork/blockwork to correct profile and depth. P3. Brush down brickwork/blockwork prior to drying.
CU-8. Clean up	P1. Clean work area, and waste disposed of, reused or recycled in accordance with work specifications. P2. Clean, maintain and store tool, plant and equipment in accordance with workplace practices



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain brick and block expansion and growth, control and articulation joints
- K2.** Explain brick bond patterns, types of joints and finishing
- K3.** Explain characteristics and applications of materials for masonry arch construction
- K4.** Explain construction and arch terminology
- K5.** Perform geometric calculations and drawing
- K6.** Draw plans, specifications and drawings
- K7.** Explain types of masonry arches and techniques of construction

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct five arches - three are in brick and two in block, including bull's eye, segmental and Gothic with the construction of the arch center for one of the arches

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scotch) • Hoses • Jig saws • Jointing tools • Line blocks and line pins



National Competency Standards Level-5 for “Civil Technology”



	• Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rulers • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows



0732B&CE-90 Construct Scaffolding

Overview: This competency standard covers the skills and knowledge required to erect and dismantle a range of modular scaffolding systems to provide work platforms for construction purposes.

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Whip, tie, splice and inspect ropes	P1. Inspect ropes and cords for damage and wear. P2. Whip and splice designated rope ends in accordance with regulations and project specifications. P3. Apply and inspect bends and hitches in accordance with project specifications.
CU-3. Erect scaffolding	P1. Confirm purpose for scaffolding and identify associated work tasks. P2. Determine expected loading on scaffold and supporting structure using load tables and manufacturer specifications. P3. Select and inspect scaffolding and components and label & reject damaged components. P4. Select sole board/base plate in accordance with regulations, legislation, codes of practice and manufacturer specifications. P5. Set out and erect scaffolding in accordance with regulatory and manufacturer requirements. P6. Erect and install static lines where specified in accordance with regulatory requirements. P7. Assemble and erect lifting device where specified.



CU-4. Inspect, repair and alter erected scaffolding	P1. Inspect erected modular scaffolding for damage, corrosion, wear and compatibility. P2. Check current use of scaffolding against original design and in accordance with regulations and specifications P3. Inspect and confirm scaffolding stability. P4. Carry out alteration or repair where specified. P5. Complete and date inspection log and handover ready for signing by a certified scaffolder.
CU-5. Dismantle scaffolding	P1. Isolate scaffolding and appropriately sign and barricade to ensure safe dismantling. P2. Dismantle scaffolding using reverse procedure as for erection.
CU-6. Clean up	P1. Clean work area and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean, check, and tools plant and equipment for faults and maintain and store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Enlist scaffolding equipment
- K2.** Explain scaffolding techniques
- K3.** Explain procedure for scaffolding

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Complete erect and dismantle a modular scaffolding system, in accordance with specifications, including a minimum of:
 - Three bays with an internal and external return
 - Three lifts, including ties
 - Ladder and stair access
 - Fall and edge protection



National Competency Standards Level-5 for “Civil Technology”



- Complete whipping, splicing, tying and inspecting of five fiber ropes in accordance with regulations.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Adjustable base plates • Bends and hitches, box spanners, braces, bracket scaffolds (tank and formwork) • Cantilevered hoists (materials only with maximum capacity of 500kg) • Couplers and accessories • Fiber ropes • Gin wheels, guard rails • Hammers • Ledgers • Mesh guards • Mid rails • Modular and prefabricated scaffolds • Hammers, prefabricated components • Safety nets, scaffold belts, scaffolding planks shovels, spanners, spirit levels • Stairs or ladders, standards, static lines, steel and aluminum tubes • Tape measures, torpedo levels, transoms • Wire nips, wrenches. • Pallet trolleys, plumb rules, profiles • Scaffolds, shovels, small petrol or diesel engines and compressors, spirit levels, straight edges, string lines • Trowels • Wheelbarrows



0732B&CE-91 Install doors and window frames

Overview: This competency standard covers the skills and knowledge required set out and install timber and metal window and door units of different types, with appropriate weather proofing, smooth access and good security.

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment. P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Install window units to frame	P1. Check window opening size to be greater than overall window frame. P2. Join reveals and fix securely to frames where specified. P3. Locate window unit to suit brickwork and eaves finish for veneer construction, whichever is applicable. P4. Position window unit in place so that head/sill is level and stiles are plumb and in wind, ensuring reveals or frame are finished flush with face of inside wall lining. P5. Pack and fix window to wall frame through/to studs, in accordance with specified fixing and fastening methods.
CU-3. Replace window units/door frames	P1. Remove architraves and nosing. P2. Remove sill bricks or cladding where specified. P3. Cut fasteners, remove packing and detach flashing from frame. P4. Remove window unit/ doorframe. P5. Install window unit/door frame and window components to plumb, level and wind.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Architraves and moldings are replaced	P1. Prepare door opening, and construct and fix jamb. P2. Check doorframe opening size to be greater than the overall door jamb width and height, allowing for plumbing of stiles, thickness of floor covering, levelling of door head and level of floor. P3. Mark jamb stiles and cut to length allowing for clearances according to specifications. P4. Accommodate trench head to jamb stiles allowing for clearance according to specification. P5. Assemble jamb frame, square and brace with rebates flush. P6. Clean and finish joints and rebates.
CU-5. Install door and door unit	P1. Position door unit in place so that the head/sill is level and stiles are plumb and in wind, ensuring reveals or frame finished flush with face of inside wall lining. P2. Fit door to jamb allowing for clearances according to specifications with lock stile door backed off to facilitate correct operation. P3. Mark out hinges on door and jamb. P4. Fit hinges to door and jamb. P5. Make final adjustments of door. P6. Fit door furniture components and fix to manufacturer specifications
CU-6. Perform clean up	P1. Clean work area, and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check for faults and maintain & store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain flashing requirements and installation techniques



- K2.** Explain processes for setting out
- K3.** Explain window and door installation and replacement techniques
- K4.** Enlist window and door materials

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct and fit one standard external rebated door jamb/frame to specifications;
- Fit and hang one standard door, including the door furniture and a pair of doors with door jambs to specifications;
- Install one standard window or glazed sliding door unit to specifications; and
- Replace one standard window or glazed sliding door unit to specifications.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Air compressors and hoses • Bevels • Chisels • Drills • Hammers, hand/power saws • Marking equipment, measuring tapes and rules • Nail guns • Protractors • Spirit levels, squares (combination/tri), steel squares and fences, string lines Materials may include: • Barrel bolts • Cabin hooks closers • Dead bolts • Flash bolts, flashings • Handles hinges (butt and parliament) • Latches, locks



National Competency Standards Level-5 for “Civil Technology”



- Metal
- Night latches
- Passage sets
- Timber

Windows may include:

- All size windows
- Casement
- Double hung
- Glazed sliding doors, curved and bay
- Hopper
- Straight and sliding



0732B&CE-92 Prepare Surface and fix tiles

Overview: This competency standard covers the skills and knowledge required set out and install timber and metal window and door units of different types, with appropriate weather proofing, smooth access and good security, and fix wall tiles

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Prepare materials for tiling application	P1. Check floor and wall tiling materials to ensure they are suitable and meet specifications. P2. Carry out material preparation to satisfy the requirements of the specified application process.
CU-3. Prepare underlay and sheeting substrate	P1. Provide assistance with underlay preparation under supervision. P2. Finish substrate surface to specification, with joints flush and sealed.
CU-4. Prepare render substrate surface	P1. Detach safely surface-mounted construction units and attachments. P2. Clean surfaces of substrate structure to remove all loose material. P3. Mix proportion of materials for splash coat as per instructions ready for application to wet surface. P4. Prepare horizontal and vertical surrounds for tiling process in accordance with type of tile and specified finish. P5. Mix proportion of materials for render coat as per instructions ready for application.



National Competency Standards Level-5 for “Civil Technology”



	P6. Scratch, render, cure and dry Surface in accordance with specifications for tile application.
CU-5. Cut tiles as required.	P1. Cut tiles without jagged or damage to tile surfaces or finish, in accordance with workplace procedures and manufacturer recommendations. P2. Cut by hand or machine recess hole or curve to shape and size and to specified tolerance. P3. Form a miter by edging tile jolly so that biscuit is not exposed at the joint in accordance with workplace procedures and manufacturer recommendations.
CU-6. Fix wall tiles	P1. Prepare and apply mortar and/or adhesive to tile surface in accordance with manufacturer recommendations. P2. Prepare and fix tiles with pad tiles set to level alignment. P3. Check horizontal joint for straightness, and check tile edges and surface alignment for conformity. P4. Fix tiles to alignment maintaining designed pattern to specification. P5. Cut bottom course and fix to create a rake or square corner in accordance with drawings and specification. P6. Fix splayed, manufactured, formed coves in accordance with drawings and specifications. P7. Finish vertical tiles plumb and true to square corners. P8. Maintain Joints straight and uniform in width with due allowance for tolerance of tile sizes. P9. Build in control joints, in accordance with specifications and manufacturer recommendations. P10. Make miter joints, maintaining glazing on miter without damage to tile surfaces or finish and maintaining uniformity of miter in accordance with company procedures and manufacturer recommendations
CU-7. Apply tiles on external corners.	P1. Check setting out for plumb, level and check square be within specified tolerance. P2. Check external corners to ensure surface intersections are straight.



National Competency Standards Level-5 for “Civil Technology”



	P3. Fix curved bead angle trim or tiles so that external return and bead are square and measurements are accurate to junction with tiles and set out, where applicable. P4. Fix tiles with minimum voids in tile bed while maintaining fully bedded alignment to specifications. P5. Keep corner square within specified tolerance and finish to specifications.
CU-8. Apply tiles on internal corners	P1. Check internal corner to ensure surfaces are flat and intersection is straight. P2. Cut tiles where required and fix one wall to maintain alignment in accordance with set out and specifications. P3. Cut tiles where required and fixed abutting adjacent wall tiles to line, set out and specifications. P4. Make joints for abutting tiles are made in accordance with designed margin for grouting or for expansion joint, where applicable, to specifications. P5. Install coved tile or trim to coved internal wall or wall and floor junctions. P6. Install coved tile or trim so that line is straight and, where applicable, aligned with set out. P7. Fix tiles to cove tile or trim and finish to alignment and specifications.
CU-9. Perform grout wall tile face	P1. Clean and prepare joints to receive grout according to manufacturer specifications. P2. Mix and apply grout in accordance with workplace and manufacturer specifications and to meet job requirements. P3. Clean and polish tiles with dry cloth to specifications, removing all dust from surface and joints.
CU-10. Perform clean up	P1. Clean work area, and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check for faults and maintain & store in accordance with workplace practices



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain surface preparation materials and techniques.
- K2.** Enlist control joints
- K3.** Explain techniques in fixing tiles to walls and corners, including preparation of substrates
- K4.** Describe tiling materials, including tiles, adhesives, mortar, grouting and substrates, their qualities, characteristics, preparation, techniques, applications, limitations and finishing.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Prepare a concrete bathroom floor and pointed fiber cement sheet wall for tiling
- Prepare a timber bathroom floor and pointed fiber cement sheet wall for tiling
- Tile the front and return of a standard framed or bricked bath, including a straight hob between the bath and wall, using adhesive or mortar to fix the tiles; tiles are not to be proud of the bath and coving to floor is to allow for control joints as required.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Brooms • Brushes • Buckets • Caulking guns • Cement sheet cutters • Concrete mixers • Electrical leads • Hammers • Hose • Water spray • Ladders • Levelling equipment



National Competency Standards Level-5 for “Civil Technology”



- Lump hammers
- Measuring tapes and rules
- Mortar boards
- Nippers
- Pointed grouters
- Power drills
- Power screwdrivers
- Power grinders
- Power sanders and sanders
- Rags, rubber mallets
- Sanding blocks
- Saws
- Scrapers
- Shovels
- Spacers and wedges
- Spatulas
- Sponges
- Squares
- Squeegees
- Straight edges
- String lines
- Trowels
- Wet and dry diamond saws
- Wheelbarrows
- Wire brushes
- Wooden floats
- Work platforms

Materials may include:

- Acoustic underlay material
- Caulking compound
- Cement mortar (with and without additives)



National Competency Standards Level-5 for “Civil Technology”



	• Clouts • Cornice adhesive • Crack suppression membrane • Fixings and fasteners • Patching materials • Plasterboard nails • Pre-mixed and Mixed fillers • Sand and Cement • Self-tapping screws • Soft sheet nails • Wall board adhesive



0732B&CE-93 Prepare Surface for Painting

Overview: This competency standard covers the skills and knowledge required to prepare new or uncoated surfaces for painting or clear finish, prepare previously coated surfaces for painting or clear finish, remove wallpaper and prepare surface for painting and perform clean up.

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Prepare new or uncoated surfaces for painting or clear finish	P1. Determine suitability of surface for painting or clear finish application in accordance with manufacturer recommendations. P2. Select surface preparation method in accordance with the environment, finish and substrate requirements. P3. Prepare surface according to manufacturer specifications in compliance with substrate requirements. P4. Stop, fill and sand the surface to a smooth finish, ready for painting.
CU-3. Prepare previously coated surfaces for painting or clear finish	P1. Determine and test condition and nature of existing substrate and surface material. P2. Select surface preparation in accordance with the environment, finish and substrate requirements. P3. Prepare surfaces by removing unwanted coatings and loose debris. P4. Repair, fill and sand surface defects to smooth finish ready for painting in accordance with specifications.



CU-4. Remove wallpaper and prepare surface for painting	P1. Determine type, condition and nature of existing type of wallpaper prior to removal. P2. Select surface preparation method in accordance with the environment, finish and substrate requirements. P3. Remove wallpaper using the most appropriate method. P4. Prepare surfaces for paint application by removing loose debris. P5. Repair surface defects and stop imperfections to smooth finish ready for painting in accordance with specifications.
CU-5. Perform clean up	P1. Clean work area, and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check for faults and maintain & store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain paint application testing procedures
- K2.** Explain prevention and/or rectification procedures for surface coating defects
- K3.** Procedures, products and techniques associated with preparation of surfaces and wallpaper removal
- K4.** Explain properties and surface preparation requirements of new substrates
- K5.** Explain required protection for application of clear or stained finishes
- K6.** Explain the term surface coating technology

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Remove wallpaper from a room, cubicle or equivalent and prepare the surface for painting
- Identify repair of surface defects
- Determine type and condition of wallpaper

Instruments & Consumables



National Competency Standards Level-5 for “Civil Technology”



S No.	Description (Instruments)
1	Construction Lab Tools
2	• Drop sheets • Duster brushes • Filling knives and blades • Hammers • Hand sanders • Heat removal equipment • Mechanical sanders • Nail punches • Putty knives • Scrapers • Water blasters • Wire brushes



0732B&CE-94 Paint by spray, brush and roller

Overview: This competency standard covers the skills and knowledge required to apply brushed, rolled or sprayed paint coatings to different materials to form a protective and decorative finish.

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Prepare work area	P1. Prepare materials and substrate surfaces in accordance with manufacturer recommendations. P2. Protect surfaces not to be painted by drop sheets, masking or removal of objects. P3. Provide adequate ventilation to maintain a safe environment.
CU-3. Mix paint color	P1. Identify base color by sample analysis or specification, and correct tint base, paint type and determine sheen level. P2. Select colorants suitable for the color match, mixed with the base, allowed to dry and match against the sample/specification for accuracy. P3. Mix materials for specified paint finish in accordance with manufacturer recommendations. P4. Prepare correct amounts of paint material to specified ratio and note drying time in accordance with manufacturer specification.
CU-4. Apply paint with brush or roller	P1. Select brush and/or roller to suit specified surface profile, size of area, type of paint and finish specified. P2. Apply sealant, undercoat, intermediate coat and finish coat by brush/roller to achieve the required level of



National Competency Standards Level-5 for “Civil Technology”



	opacity, finish, texture and sheen, in accordance with specifications.
CU-5. Apply paint by spray	P1. Select appropriate spray equipment, accessories and lines and set up for operation in accordance with the manufacturer's recommendations. P2. Mix paint and adjust viscosity to allow for spray painting. P3. Apply paint to achieve correct finish specifications.
CU-6. Finish the application	P1. Cure and test finished paint surface using curing method in accordance with manufacturer recommendations. P2. Reinstall doors, windows and furniture removed for painting application correctly and without damage to finished
CU-7. Perform clean up	P1. Clean work area, and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check for faults and maintain & store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe compatibility factors of preparatory materials and paint systems
- K2.** Explain hazards associated with solvents, chemicals and dust
- K3.** Explain surface coating technology, including specification of paint systems for interior and exterior painting projects to maximize durability, protection and aesthetic considerations
- K4.** Explain testing techniques and support materials
- K5.** Enlist theoretical principles relating to adhesion and cohesion of paint
- K6.** Explain theoretical principles relating to pigmentation and coloring agents, drying and curing processes and the role of solvents

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Explain minimum application of six square meters brushed or rolled
- Characteristics of timber panel door
- Explain timber window, including architrave and frame with moving parts



National Competency Standards Level-5 for “Civil Technology”



- Enlist four different surface type.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
2	• Brush ware • Compressor • Conventional spray unit • Diaphragm • Drop sheets • Filling knives and blades filters • Hand sanders • Heat and flame paint removal equipment • High-volume low-pressure (hvlp) spray • Hose • Masking equipment • Mechanical sanders • Nail punches • Paint pots and buckets • Paint stirrers • Piston airless spray unit (electrical, pneumatic and petrol) • Putty knives • Regulator • Roller frames • Scrapers • Spray equipment • Spray guns



0732B&CE-95 Apply stains and clear timber finishes

Overview: This competency standard covers the skills and knowledge required to apply stains and clear timber finishes to different material surfaces, to form a protective and decorative finish.

Competency Unit	Performance Criteria
CU-1. Plan and prepare.	P1. Confirm work instructions from supervisor. P2. Check serviceability of tools and equipment P3. Observe safety requirements, and warnings, including use of personal protective equipment, throughout the work. P4. Calculate material quantity in accordance with specifications. P5. Obtain materials needed, check for compliance and prepare.
CU-2. Prepare materials and application area	P1. Protect adjoining surfaces by masking off or covering. P2. Provide adequate ventilation to maintain a safe environment. P3. Take measures to ensure application area remains free of dust and foreign matter. P4. Apply strips on existing stained or finished surfaces using appropriate techniques.
CU-3. Apply stain to bare timber surface.	P1. Select stain for type of timber in accordance with manufacturer recommendations. P2. Prepare stain to proportions and consistency in accordance with manufacturer recommendations. P3. Select application method for the specified surface, area size and type of finish. P4. Apply stain to bare timber surface according to specifications. P5. Select wood filler and putty, mixed, color-matched and applied to timber in accordance with specifications.
CU-4. Apply finish surface	P1. Apply coats of selected clear finish to achieve required level of opacity, finish and polish in accordance with specifications.



National Competency Standards Level-5 for “Civil Technology”



	P2. Allow drying time between coats and cure clear finish surfaces in accordance with manufacturer recommendations.
CU-5. Perform clean up	P1. Clean work area, and dispose of, reuse or recycle waste in accordance with work specifications. P2. Clean tools plant and equipment, check for faults and maintain & store in accordance with workplace practices

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain hazards associated with solvents, chemicals and dust
- K2.** Explain surface preparation techniques for clear wood finishing
- K3.** Explain testing techniques and support materials
- K4.** Explain theoretical principles relating to pigmentation and coloring agents, drying and curing processes and the role of solvents
- K5.** Explain types, properties, uses and limitations of clear timber finishes and timber stains
- K6.** Explain types, uses and limitations of commonly used brushes, rollers and other applicators

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Prepare and or strip surfaces; and
- Select and apply stains and finishes to timber in accordance with specifications and to suit the timber type, condition and finish required.

Instruments & Consumables

S No.	Description (Instruments)
1	Construction Lab Tools
	• Brush ware and accessories, buckets • Drop sheets, duster brushes • Filling knives and blades



National Competency Standards Level-5 for “Civil Technology”



	• Hammers • Heat guns • Nail punches • Paint pots and buckets • Paint stirrers • putty knives • Roller frames and accessories • Sanders – hand and mechanical • Scrapers • Spray equipment

Tools and Equipment

Sr. #	Description
1	Calculator
2	Ruler
3	Pencil
4	Construction Lab Tools
	• Adjustable metal props • Bolsters • Brick buggies and brick grabs • Brooms • Buckets • Builders' lines • Concrete mixers • Dumpy levels • Elevators • Forklifts • Hammers (bricks, club and scutch), hoses • Jig saws • Jointing tools • Line blocks and line pins



National Competency Standards Level-5 for “Civil Technology”



Sr. #	Description
	• Margin or raking tools • Masonry saws • Masonry squares • Materials hoists • Measuring tapes and rules • Mortar boards • Pallet trolleys • Plumb rules • Profiles • Scaffolds • Shovels • Small petrol or diesel engines and compressors • Spirit levels • Straight edges • String lines • Trowels • Wheelbarrows • Brush ware and accessories • Buckets • Drop sheets • Duster brushes • Filling knives and blades • Hammers, heat guns • Nail punches • Paint pots and bucket • Paint stirrers • Putty knives • Roller frames and accessories • Sanders – hand and mechanical • Scrapers • Spray equipment



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-96 Prepare site layout of civil engineering projects

. **Overview:** This competency standard covers the skills and knowledge required to prepare for work, prepare site for temporary fencing and structures, and prepare the erection of site security fencing/hoarding, interpret construction of temporary site structures and organize storage of tools and machine accessories

Competency Units	Performance Criteria
CU1. Prepare for work	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details. P2. Follow Safety (OHS) requirements in Accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks consistent with job requirements, check for serviceability, and any faults P5. Calculate material quantity requirements in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, and safely handle materials appropriate to the work application
CU2. Prepare site for temporary fencing and structures	P1. Identify services, location and work areas are accurately P2. Place adequate warning signs and safeguards to support and protect services and substructures identified in work area. P3. Set up and secure temporary signs, control systems and protective barriers in accordance with job and safety instructions.
CU3. Prepare the erection of site security fencing/hoarding	P1, Select appropriate type fencing materials in adequate quantities. P2. Confirm dimensions of installed fence components to job specifications and/or work instructions. P3. Check erected fence as meeting security and enclosure requirements.
CU4. Interpret construction of temporary site structures	P1. Interpret instruction/specification for temporary site structures accurately to the relevant persons. P2. Lay out temporary site structures to facilitate ease of access and to prevent obstruction of other site activities.



National Competency Standards Level-5 for “Civil Technology”



	P3. Check erected temporary site structures as conforming to job specification/ instruction given.
CU5. Organize storage of tools and machine accessories	P1. Lay out storage facilities correctly and built to specifications. P2. Correctly demonstrate working knowledge of the type of items to be stored P3. Organize store for proper delivery, checking and control of materials, tools and equipment.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain types and purpose of job information/instructions
- Explain OH&S requirements for preparing construction sites
- Demonstrate physical conditions of site
- Enlist use of tools, machines and equipment
- Describe site fencing and hoarding
- Explain relevant statutory requirements relating to site boundaries
- Demonstrate traffic access and routes
- Explain area for storage and control of tools and materials
- Procedure for convenient, visible and safe storage
- Explain quality standards and specifications

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Compliance with occupational health and safety regulations applicable to workplace operations
- Application of organizational management policies and procedures including quality assurance requirements where applicable
- Demonstrate ability to read and interpret job related documentations
- Demonstrate ability to co-ordinate the clearing of construction sites
- Demonstrate ability to co-ordinate the preparation of access route, and the construction of temporary fencing/hoarding and structures



National Competency Standards Level-5 for “Civil Technology”



- Demonstrate ability to organize the storage of tools, equipment and materials on site
- Relate to people from varied social, cultural and ethnic background
- Evidence is best gathered through a holistic assessment activity, which integrates the elements of competency

Tools and Equipment

Sr. #	Description
1	Calculator
2	Ruler
3	Pencil
4	Fencing
5	Hoarding
6	Barriers

If workplace based, the resources should relate specifically to organization policies, guidelines, requirements, resources and equipment.

Resources may include:

- A real or simulated environment
- Project resources
- Organization policies and guidelines
- Access to relevant resource personnel
- Relevant legal and statutory documentation



0732B&CE-97 Construct masonry steps and stairs

Overview: This competency standard covers the skills and knowledge required to construct masonry steps, stairs and wing walls for different types and styles of buildings. It includes planning, types and styles of stairs and set out and installation of the masonry.

Competency Units	Performance Criteria
CU1. Prepare for work.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details, from relevant information <i>to</i> determine bricklaying and block laying tasks. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks consistent with job requirements, check for serviceability, and any faults P5. Calculate material quantity requirements in accordance with plans, specifications and quality requirements. P6. Identify, obtain prepare, and safely handle Materials appropriate to the work application are and located ready for use.
CU2.Set out brickwork/ block work.	P1. Check work platform in accordance with regulatory and workplace requirements and brick and block stair construction requirements. P2. Check location and relative level of prepared footing from job drawings and specifications. P3. Calculate rise and fall of flight and individual steps as per codes and workplace requirements.
CU3.Lay bricks/blocks forming steps and wing walls.	P1. Prepare mortar mix to required conformity and specifications. P2. Construct base brickwork to specifications and requirements of standards and codes. P3. Construct square steps, level, and plumb and lay to specified bond.



National Competency Standards Level-5 for “Civil Technology”



	P4. Develop design and profile of steps and aligned to bond and plumb to specifications. P5. Carry out joints according to work specifications. P6. Set out brickwork/block work laid to line, with gauge and complete to work specifications. P7. Clean brick/block faces free of mortar

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain brick bond patterns characteristics and applications of materials for masonry steps and stairs construction
- Explain brick and block expansion and growth, control and articulation joints
- Define construction terminology
- Explain materials storage and environmentally friendly waste management
- Draw plans, specifications and drawings
- Explain processes for the calculation of material requirements
- Demonstrate quality requirements
- Explain techniques of masonry steps and stairs construction
- Explain types, characteristics, uses and limitations of plant, tools and equipment
- Demonstrate workplace and equipment safety requirements

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- Locate, interpret and apply relevant information, standards and specifications
- Safely and effectively use tools, plant and equipment
- Communicate and work effectively and safely with others
- As a minimum, construct a flight of stairs with a minimum of three pre-cast treads, and
- Construct a flight of three solid masonry treads with a parallel wing wall on one side, ensuring:
 - correct identification of requirement and finishing of the tasks
 - correct selection and use of appropriate processes, tools and equipment
 - Completing all work to specification.

Tools and equipment:

- Bolsters
- Brick grabs
- Brooms



National Competency Standards Level-5 for “Civil Technology”



- Buckets
- Builders' lines
- Concrete mixers
- Dumpy levels
- Elevators
- Hammers (bricks, club and scotch)
- Hoses
- Jig saws
- Jointing tools
- Line blocks
- Line pins
- Mason's squares
- Masonry saws
- Measuring tapes and rules
- Mortar boards
- Plumb rules
- Margin or raking tools
- Profiles
- Shovels
- Spirit levels
- Straight edges
- String lines
- Trowels
- Wheelbarrows



0732B&CE-98

Install stairs

Overview: This competency standard covers the skills and knowledge required to construct masonry steps, stairs and wing walls for different types and styles of buildings. It includes planning, preparation, set out and installation of the stairs.

Competency Units	Performance Criteria
CU1. Plan and prepare materials	P1. Confirm work instructions in accordance supervisor. P2. Select required tools and equipment, serviceability and any faults. P3. Calculate materials quantity requirements accordance with specifications. P4. Obtain materials needed for compliance, prepared quality requirements.
CU2. Select and prepare materials and components	P1. Identify methods of assembling erected for stairs P2. Check components for appropriate locations in stair structure. P3. Determine method of assembling and fixing in accordance with stair design and location
CU3. Assemble strings and newels	P1. Identify Specific position for stairs P2. Check measurements and adjustments if applicable. P3. Assemble Strings and newels to design and specification. P4. Fix strings to walls temporarily supported or directly fixed in position /specification.
CU4. Install treads and risers	P1. Assemble strings and newels temporarily braced in vertical position. P2. Fix treads and risers about newels to assembly P3. Check flight is true and square. P4. Fit intermediate treads and risers.
CU5. Assemble and install landings	P1. Fix bearers, joists and level according to specification. P2. Fix nosing and floor landing according to finish specification
CU6. Install handrail and balustrade	P1. Fix balusters/intermediate railing and handrails to form stair balustrade according to specification, P2. Check and ensure plumb fit of Newels prior to final fixing P3. Fix hand railings fitted to wall in accordance with specifications



CU7. Install spiral stair and curved strings	P1. Mark location of stair and first step on floor and erect central post is into true position, fixed at floor and temporarily braced at top. P2. Support initial string section temporarily supported in place for assembly, and fit treads and risers into position to specification. P3. Develop stair progressively with the extending, supporting and fixing of curved string, and complete with head secured to floor/landing, balustrade installed and central post fixed to specifications.
CU8. Secure stair to structure and line spandrel area	P1. Carry out securing of stair to building during/on completion of assembly. P2. Frame, line and fix spandrel, where applicable, to specified finish.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Enlist adhesives, fixings and fasteners related to stair construction
- Explain assembling procedures for stairs
- Explain leveling techniques
- Explain procedure for marking of components
- Explain materials and their characteristics, relevant to stair construction
- Explain procedure for measuring and setting out related to assembling and installing stairs
- Explain stair construction and joining methods
- Enlist types of stairs
- Explain selection criteria and use of safe and efficient procedures in installing treads, risers, flooring and nosing

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Accurately set out stair location and check levels for adjustments on newels;
- Adopt and use appropriate techniques to fit and fix balustrades;
- Complete installation with stair true to plumb and level, and fixed securely to structure with
- Surfaces finished free of marks;



National Competency Standards Level-5 for “Civil Technology”



- Demonstrate safe and effective procedures in assembling strings and newels and installing
- Landing bearers and joists;
- Select and use appropriate processes, tools and equipment to assemble stair components;

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Mason hammer • Pointing towels • Measuring tape • Mason thread • Plumb bob • Leveling tools (water level, spirit level) • Bucket • Mortar pan • Wooden float • Steel float • Shovel • Spade • Wire brush • Screeds (wooden/steel)



0732B&CE-99 Prepare for solid dry wall plastering

Overview: This competency standard covers the skills and knowledge required to effectively carry out the preparation process of dry wall plastering, and applies to effectively prepare the process for carrying out solid plastering work, and applies to individuals working in masonry in the construction industry.

Competency Units	Performance Criteria
CUI. Plan for construction process	P1. Assure quality requirements of company’s construction operations P2. Identify preparation and planning requirements from drawings/work location and/or supervisor’s instructions. P3. Observe OH&S requirements and accordance with application tasks and workplace environment. P4. Identify safety hazards and correct procedures in order to minimize risk to self and others. P5. Select materials to supervisor’s instructions, P6. Select appropriate personal protective equipment, correctly. P6. Select tools and equipment consistent with the job requirements. P7. Select fixtures/fasteners consistent with job requirements and check for specifications, quality requirements and operational details, P8. Calculate materials quantity requirements in accordance with plans, specifications and quality requirements. P9. Identify materials appropriate to the work application are, obtained, prepared, safely handled and located ready for use.
CU2. Prepare work area suitable for construction process	P1. Identify activities to be carried out in work area from surfaces to be lined and height to be accessed. P2. Prepare work area for construction process to supervisor’s instructions
CU3. Use tools, plant and equipment appropriate for construction process	P1. Use regular hand and power tools suitable for application process identified to job requirements. P2. Carry out hand and power tools used safely and effectively processes



National Competency Standards Level-5 for “Civil Technology”



CU4. Use tools, plant and equipment appropriate for construction process	P1. Identified Regular hand and power tools suitable for application process to job requirements. P2. Use Hand and power tools safely and effectively to carry out processes.
CU5. Prepare background of brick, concrete or blockwork for solid plastering	P1. Identify Structure and surface prepared. Depressions patched with suitable material to supervisor's instructions. P2. Apply adhesive Concrete surface where appropriate rough. P3. Mix materials for scratch coat to instructions ready for application to wet surface.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain workplace and equipment safety requirements
- Explain drawings and specifications portable power tools and tools and equipment materials relative to dry wall plastering materials handling
- Explain measurement relative to dry wall plastering
- Explain fixing and fasteners consistent with dry wall plastering requirements
- Demonstrate workplace communication sand and cement
- Define plaster
- Define cornice adhesive
- Enlist caulking compounds

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with occupational health and safety regulations applicable to work operations at all times.
- Mix materials as per the job requirement following standard procedures.
- Plaster to required alignments and thickness following standard practices.

Instruments & Consumables

S No.	Description (Instruments)



National Competency Standards Level-5 for “Civil Technology”



1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Mason hammer • Pointing towels • Measuring tape • Mason thread • Plumb bob • Leveling tools (water level, spirit level) • Bucket • Mortar pan • Wooden float • Steel float • Shovel • Spade • Wire brush • Screeds (wooden/steel)



0732B&CE-100 Apply plaster

Overview: This competency standard covers the skills and knowledge required to prepare for work, mortar mix, and scaffolding and perform plastering work.

Competency Units	Performance Criteria
CU1. Prepare for work	P1. Work according to instructions, plans, specifications, quality requirements and operational details, from relevant information to determine bricklaying and block laying tasks. P2. Safety (OHS) requirements are followed in Accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select tools and equipment to carry out tasks are consistent with job requirements, check for serviceability and any faults are rectified or reported prior to commencement. P5. Calculate material quantity requirements in accordance with plans, specifications and quality requirements. P6. Identify materials appropriate to the work application.
CU2.Prepare mortar mix	P1. Select PPE, tools and equipment in accordance with the job requirements. P2. Estimate materials required as per job specifications. P3. Prepare the surface/mixing machines for mixing of mortar as per the job requirement. P4. Mix materials as per the job requirement following standard procedures. P5. Transport mortar mix as per the job requirement following standard procedures.
CU3. Prepare scaffolding	P1. Select and use PPE according to the job requirements. P2. Select and use tools and equipment as per the job requirement following standard procedures. P3. Prepare estimate of materials required based on the job requirements. P4. Prepare scaffolds components as per the job requirement following standard procedures



National Competency Standards Level-5 for “Civil Technology”



	P5. Erect and assemble scaffolds components as per the job requirements following standard procedures. P6. Dismantle scaffolding as per the job requirement following standard procedures. P7. Store or stockpile components according to standard procedures.
CU4. Perform plastering work	P1. Prepare the surface to be plastered as per the job requirement following standard. P2. Prepare and apply cement slurry as per the job requirement following standard practices. P3. Apply mortar mix as per the job requirement to the required specifications following standard procedures. P4. Cure the plastered surfaces as per the job requirement following standard practices.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain occupational Health and Safety (OHS) Regulations
- Explain composition, properties and specifications of plastering materials
- Describe economic use of materials
- Explain procedure for estimation of materials
- Describe purpose of plastering/pointing
- Enlist types of plaster/pointing
- Explain methods of plastering/pointing
- Explain defects in plastering/pointing
- Define curing
- Demonstrate repair and maintenance work

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with occupational health and safety regulations applicable to work operations at all times.



National Competency Standards Level-5 for “Civil Technology”



- Mix materials as per the job requirement following standard procedures.
- Plaster to required alignments and thickness following standard practices.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Mason hammer • Pointing towels • Measuring tape • Mason thread • Plumb bob • Leveling tools (water level, spirit level) • Bucket • Mortar pan • Wooden float • Steel float • Shovel • Spade • Wire brush • Screeds (wooden/steel)



10.9. Plumbing

0732B&CE-101 Identify plumbing tools & equipment

Overview: This competency standard covers the skills and knowledge required to interpret layout drawing for Plumbing Lab its specifications, its Requirement for tools and equipment.

Competency Units	Performance Criteria
CU-1. Draw Layout drawing for Plumbing Lab	P1. Mark North Point. P2. Measure the Lab dimension. P3. Develop layout drawing P4. Analyse Signs, Symbols and data P5. Identify location for Doors and windows. P6. Identify instruments places. P7. Identify sitting plan.
CU-2. Identify Plumbing Tools & Equipment	P1. Identify Tools & equipment P2. Check for safety hazards P3. Conduct operational testing P4. Maintain professional proficiency

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain safety requirements, for the required tools for task.
- K2. Explain lay out drawings with its type
- K3. Explain different specification for tools and equipment
- K4. Explain use of different plumbing tools
- K5. Describe different symbols for plumbing
- K6. Describe Plumbing History and Plumbing importance
- K7. Explain Safety measures while performing Plumbing tasks
- K8. Explain different drawing instruments

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout drawing of lab
- Create sketches and drawing



National Competency Standards Level-5 for “Civil Technology”



- Preparation is done according to area and standards
- Prepare space for entire work
- Plan for relevant job
- Adopt safety measures

TOOLS AND EQUIPMENT'S

1. Pencil
2. Eraser
3. Sharpner
4. Calculator
5. Measuring scale
6. Drawing sheet
7. Drawing board
8. Tee Square
9. Set Square
10. Measuring Tape
11. Plumbing lab tools.



0732B&CE-102 Perform cutting, threading & reaming

Overview: This competency standard covers the skills and knowledge required to perform pipe cutting, its threading and reaming.

Competency Units	Performance Criteria
CU-1. Perform Pipe Cutting.	P1. Identify tools for cutting. P2. Secure work piece firmly P3. Measure required Length P3. Use cutter OR Use Hacksaw P4. Loose the cutting Piece P6. Check length for cutting piece P7. Observe OHSA
CU-2. Perform Pipe Threading.	P1. Identify tools for threading. P2. Adopt safety measures P3. Fix work piece firmly P4. Clamp Threading die P5. Prepare threading P6. Unclamp the threading die P7. Observe OHSA
CU-3. Perform Pipe Reaming.	P1. Identify tools for Reaming. P2. Adopt safety measures P3. Fix work piece firmly P4. Clamp Threading pipe piece P5. Use reamer P6. Unclamp pipe piece P7. Observe OHSA

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Comprehend the purpose and application of plumbing tools
- K2. Knowledge of plumbing tools (pipe wrench, spanner, screw drivers, pipe cutters etc.)
- K3. Knowledge of Plumbing equipment (Threading die, Hack Saw, Bench Vice, Leg Vice and reamer)
- K4- Describe calibration of tools.
- K5. Explain safety precaution for using tools
- K6. Explain different type of Dies
- K7. Explain the procedure to use of threading die
- K8. Explain the procedure to use of Hack saw
- K9. Explain the procedure to use of Reamer



K10. Enlist clear work place procedure

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Define tools with it usage
- Define safety measures
- Fix and Change blade for the die
- Preparation is done according to area and standards
- Prepare space for entire work
- Plan for relevant job

TOOLS AND EQUIPMENT'S

1. Pipe Cutting Tools,
2. Plumbing pliers,
3. Plumbing wrenches,
4. Plumbing spanners,
5. PPEs
6. Threading Tools
7. Reaming Tools

0732B&CE-103 Join pipes & fittings

Overview: This competency standard covers the skills and knowledge required to prepare for different type of pipe joints and it's fitting on residential and commercial plumbing works.

Competency Units	Performance Criteria
CU-1. Undertake pipe fitting and Installation	P1. Observe basic principles for pipe fittings P2. Identify and select materials for task P3. Identify tools and equipment for task P4. Attach Pipe with fittings P5. Locate fixtures properly



National Competency Standards Level-5 for “Civil Technology”



	P6. Undertake pipe leakage test P7. Use PPEs
CU-2. Install Hot and Cold Water Supply Pipes	P1. Observe basic principles for pipe fitting P2. Identify and select materials for task P3. Identify tools and equipment for task P4. Attach cold Pipe with fittings P5. Attach Hot Pipe with Geyser and fittings P6. Locate cross over properly P7. Locate drainage pipes P8. Undertake pipe leakage test P9. Use PPEs
CU-3. Join Copper Pipes	P1. Observe basic principles for Joining pipes P2. Select materials for task P3. Identify tools and equipment for task P4. Melt Lead P5. Fill lead in collar of pipe with proper tool P6. Undertake pipe leakage test P7. Use PPEs
CU-4. Join G.I Pipes	P1. Observe basic principles for G.I. pipes P2. Select materials for task P3. Identify tools and equipment for task P4. Perform threading & cutting on pipes P5. Tight pipe with socket P6. Undertake pipe leakage test P9. Use PPEs
CU-5. Join PPRC Pipes	P1. Observe basic principles for PPRC pipes P2. Adopt safety measures P3. Identify and select materials for task P4. Select tools and equipment for task P5. Switch on heater P6. Join Heated pipe to required point P7. Undertake pipe leakage test P8. Use PPEs

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1- Knowledge of Safety requirements for installing cold and hot water pipes in residential buildings.

K2. Knowledge of Fittings attach with hot water



National Competency Standards Level-5 for “Civil Technology”



- K3. Explain signs and symbols for Water supply system
- K4. Explain specifications for cold and hot water connections
- K5- Knowledge of faults in hot water pipes
- K6- Explain use of safety valves in geysers
- K7. Explain the equipment for installing and fittings of pipes
- K8. Explain drain Pipes
- K9. Explain method for different type of pipe joints

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain safety requirements at work place
- Prepare plan for installation/replacement
- Performing installation/replacement
- Perform fittings for installation of geyser
- Perform different pipe fittings methods.
- Perform safety measures
- Perform different pipe jointing techniques

TOOLS AND EQUIPMENT'S

1. Pipe Benders,
2. Pipe Cutting Tools,
3. Deburrers,
4. Plumbing pliers,
5. Plumbing wrenches,
6. Plumbing spanners,
7. Pressure testing kits,
8. PPEs
9. Hot water fittings
10. Hot water accessories
11. G.I. & Cost Iron Pipes according to specifications
12. Pipe Vice
13. Hack Saw with blade
14. Different Fittings
15. Geyser
16. Safety Valve
17. Cost Iron Pipe
18. Lead
19. PPRC Pipe with fittings



National Competency Standards Level-5 for “Civil Technology”



20.

Cocking Tools



0732B&CE-104 Layout for domestic water supply

Overview: This competency standard covers the skills and knowledge required for layout domestic water supply in residence and residential schemes.

Competency Units	Performance Criteria
CS-1. Prepare for works	P1. Interpret work instructions P2. Plan according to job requirements P3. Organise duties P4. Select appropriate tools & equipment P5. Select piping materials and plumbing fixtures P6. Select PPEs
CS-2. Lay out for water supply scheme	P1. Mark North Point on drawing sheet P2. Measure the Scheme area. P3. Interpret layout plan by scale P4. Identify sources of water supply P5. Indicate Water Conveyance System. P6. Show storage Reservoirs P7. Locate Main, sub main and branches

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Define water Layout system.
- K2- Define fundamentals of water reservoirs
- K3- Explain Types of water sources
- K4- Describe applications of water connections with main to branches
- K5- Knowledge to prepare work OR Task.
- K6- Knowledge of safety measures.
- K7. Explain gravity and pressure supply of water

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Study of different water supply system
- Installation of water supply scheme layout
- Indicate water reservoir
- Indicate gravity and pumping system
- Clarity to organise duties to perform task

TOOLS AND EQUIPMENT'S



National Competency Standards Level-5 for “Civil Technology”



1. Pencil
2. Eraser
3. Sharpner
4. Calculator
5. Measuring scale
6. Drawing sheet
7. Drawing board
8. Tee Square
9. Set Square
10. Measuring Tape
11. Computer
12. AutoCAD
13. PPEs



0732B&CE-105 Make water connection

Overview: This competency standard covers the skills and knowledge required to make the new connection for house from the main water.

Competency Units	Performance Criteria
CU-1: Make water connection	P1- Identify work place P2. Select tools and equipment P3- Measure pipe P4- Prepare pipe as per length P5- Join Clamp on main pipe P6. Fix the valve P7. Adjust branch pipe with fitting P8. Perform final testing of pipes
CU-2: Clean up Work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1-Describe different tools and equipment for making new connection for water supply

K2- Explain taking connection procedure

K3- Explain cutting and threading procedures

K4. Explain PPEs

K5. Explain use of different plumbing tools

K6. Explain clamps with its type

K7. Explain use of valve while taking connection

K8. Explain branch and main pipe

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Mount pipe connection perfectly
- Use of cutting, threading and connections without leakage
- Use Safety measure at place
- Use effective tools for taking connection



National Competency Standards Level-5 for “Civil Technology”



- Fixing of clamp on main pipe
- Preparation is done according to area and standards
- Prepare work area for performance
- Plan for relevant job

TOOLS AND EQUIPMENT'S

1. Pipe Cutting Tools,
2. Deburrers OR Reamers
3. Plumbing pliers,
4. Plumbing wrenches,
5. Plumbing spanners,
6. Plungers,
7. Pressure testing kits,
8. PPEs
9. Clamps for pipe
10. Pipe (G.I OR PPRC)



0732B&CE-106 Install plumbing fixtures

Overview: This competency standard covers the skills and knowledge required to install plumbing fixtures at work place i-e installation of water closet, flushing cistern, Wash hand Basin, English WC and Urinal

Competency Units	Performance Criteria
CU-1. Install Wash Hand Basin	P1. Identify safety requirements for installation P2. Identify tools for work P3. Identify Fixtures P4. Perform measurements P5. Mark out Installation point P6. Fix Pedestal by Drilling P7. Install Wash hand Basin P8. Fix Pillar cock, Rubber connection, waste pipes with coupling P9. Connect to drain pipe
CU-2. Install English water closet	P1. Mark out Installation point P2. Install the closet flange P3. Secure it to the subfloor P4. Connect outlet pipes with water supply P5. Perform final quality inspection P6. Check Level
CU-3. Install English water closet	P1. Mark out Installation point P2. Fix floor trap P3. Set WC at Level P4. Connect outlet pipes with water supply P5. Perform final quality inspection P6. Check Level P7. Use PPEs
CU-4. Install Flushing Cistern	P1. Mark out Installation point P2. Measure height for flushing cistern P3. Fix flushing pipe P4. Connect inlet pipe with water supply P5. Perform final quality inspection P6. Check Level



National Competency Standards Level-5 for “Civil Technology”



	P7. Use PPEs
CU-5. Install Urinal	P1. Mark out Installation point P2. Measure Height for flushing cistern P3. Fix Urinal with flushing pipe P4. Connect inlet pipe with water supply P5. Perform final quality inspection P6. Check Level P7. Use PPEs
CU-6. Install Sink	P1. Mark out Installation point P2. Measure height for sink P3. Fix sink fat trap with drain pipe P4. Connect inlet pipe with water supply P5. Perform final quality inspection P6. Check Level P7. Conduct Operational Testing P8. Use PPEs
CU-7. Install Bath Tub	P1. Mark out Installation point P2. Measure Height for bath tub P3. Fix Bath Tub with drain pipe P4. Connect inlet pipe with water supply P5. Perform leakage test P6. Perform Safety Precaution P7. Use PPEs

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of water closet, Flushing Cistern with its types
- K2- Use of tools and equipment's
- K3- Knowledge of joining techniques and with fixtures
- K4- Knowledge of levelling and fixing WC
- K5. Define WC with its types
- K6. Describe various trap fittings
- K7. Explain wash hand basin Pedestal type
- K8. Explain fitting procedure to install wash hand basin

Critical Evidence(s)



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Fixing and use of water closet and flushing cistern
- Demonstrate the installation of water closet and flushing cistern
- Install wash hand basin and shower
- Install geyser with its fitting and valve
- Fix trap and measure the size
- Installation of urinal

TOOLS AND EQUIPMENT'S

1. Pipe Benders,
2. Pipe Cutting Tools,
3. Pipe vice with stand,
4. Deburrers,
5. Plumbing pliers,
6. Plumbing wrenches,
7. Plumbing spanners,
8. Plungers,
9. Pressure testing kits,
10. PPEs
11. P-Trap
12. W.C (Indian & English)
13. Wash hand basin
14. Shower
15. Geyser
16. Bolt Kit
17. Screws
18. Clamps
19. Nails
20. Hammer
21. Bath Tub with accessories
22. Mallet
23. Urinal with fitting
24. Urinal Cistern
25. Tee cock
26. Pillar cock
27. Sink with mixer



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-107 Install & repair water pumps

Overview: This competency standard covers the skills and knowledge required to install drinking water pumps and its repair work.

Competency Units	Performance Criteria
CU-1: Install Air ejector Pump	P1. Mark out Installation point P2. Perform Safety Precaution P3. Measure Pipes with fittings P4. Fix pump with suction & delivery pump P5. Connect with electricity P6. Perform leakage test P7. Use PPEs
CU-2: Install Centrifugal Pump	P1. Mark out Installation point P2. Perform Safety Precaution P3. Measure Pipes with fittings P4. Fix flanges with suction & delivery pipes P5. Connect with electricity P6. Perform leakage test P7. Use PPEs
CU-3: Install Rotary Pump	P1. Mark out Installation point P2. Perform Safety Precaution P3. Measure Pipes with fittings P4. Fix flanges with suction & delivery pipes P5. Connect with electricity P6. Perform leakage test P7. Use PPEs
CU-4: Carry out repair of Pump	P1. Perform Safety Precaution P2. Disconnect electricity and pump P3. Use PPEs P4. Check for Fault P5. Repair fault using proper tools P6. Refit with suction & delivery pipes P7. Connect with electricity P8. Perform leakage test

Knowledge & Understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Use of tools and equipment's
- K2. Knowledge of joining techniques and pipe fittings
- K3- Knowledge of leakage in pipes and pumps
- K4. Explain working of different pumps
- K5. Explain repairing of different pumps.
- K6. Explain safety measures while performing repair of works
- K7. Explain leakage checking with its methods

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Fit and refit the pump
- Install different pumps with its fittings
- Install flanges with pumps and pipes
- Check for leakage

TOOLS AND EQUIPMENT'S

1. Pipe Benders,
2. Pipe Cutting Tools,
3. Chain Pipe Wrench
4. Deburrers,
5. Plumbing pliers,
6. Plumbing wrenches,
7. Plumbing spanners,
8. Plungers,
9. Pressure testing kits,
10. Radiator tools
11. PPEs
12. Different Pumps with fittings
13. Electricity



0732B&CE-108 Install turbine pumps

Overview: This competency standard covers the skills and knowledge required to Install turbine

Competency Units	Performance Criteria
CU-1: Install turbine	P1. Mark out Installation point P2. Use PPEs P3. Check depth of bore P4. Adopt Safety Measures P5. Measure length of turbine Pipes with fittings P6. Fix Turbine with flange & Pipes P7. Insert turbine into bore with tripod & chain pulley P8. Connect Motor with shaft fittings P9. Connect electricity and start



National Competency Standards Level-5 for “Civil Technology”



	P10. Remove tripod P11. Check discharge
CU-2: Clean-up work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of turbine with its working
- K2- Explain Use of tools and equipment's for turbine fitting
- K3- Explain different joining techniques and pipe fittings
- K4- Knowledge of leakage testing
- K5. Explain turbine impellers with its fittings
- K6. Explain installation method into bore.
- K7. Explain tripod and chain pulley function

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of turbine
- Installation of Turbine
- Discharge finding
- Install tripod with chain pulley
- Function of Chain pulley

TOOLS AND EQUIPMENT'S

1. Pipe Cutting Tools,
2. Chain Pipe Wrench
3. Deburrers,
4. Plumbing pliers,
5. Plumbing wrenches,
6. Plumbing spanners,
7. Pressure testing kits,
8. Radiator tools



9. PPEs
10. Turbine with impellers & Motor
11. Electricity motor
12. Turbine pipe with fittings
13. Pipe wooden / steel clamps

10.10. Digital Skills

0732B&CE-109 Install computer operating systems and hardware

Overview: This unit describes the performance outcomes, skills and knowledge required to select, configure and use computer operating systems and basic computer hardware.

Unit of Competency	Performance Criteria
1. Identify operating system and hardware components	1.1 Determine ICT organizational requirements and specifications 1.2 Identify and select operating system 1.3 Identify appropriate external hardware components 1.4 Identify internal hardware components
2. Install and configure operating system and application software with hardware components	2.1 Install and configure operating system to meet organizational requirements 2.2 Identify the functions associated with the operating system and associated boot process 2.3 Configure power-management settings to minimize power consumption as an environmentally sustainable measure 2.4 Use both the graphical user interface and the command line interface to perform basic tasks 2.5 Install or upgrade application software onto the operating system and hardware configuration 2.6 Determine the relationship between an application program, the operating system and hardware



National Competency Standards Level-5 for “Civil Technology”



	2.7 Identify general differences between the different computer platforms and their respective operating systems
3. Optimize operating system and hardware components	3.1 Optimize operating system using included tools or third-party utilities 3.2 Customize the graphical user interface 3.3 Use techniques unique to the command line interface 3.4 Set up and configure external hardware components and check functionality 3.5 Install drivers as appropriate and check functionality

Knowledge & Understanding

- K1: Basic knowledge of current industry-accepted operating system, hardware and software products
- K2: Compatibility of an operating system, in respect to other versions
- K3: Function of single-user and multi-user operating systems
- K4: Interoperability between operating systems
- K5: OHS principles and responsibilities, including ergonomic principles to avoid injury associated with using computer systems.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to select, configure and use computer operating systems and basic computer hardware. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Use an operating system in a variety of scenarios and across functions, including:
 - scheduling, loading, initiating, and supervising the execution of programs
 - allocating storage
 - initiating and controlling input and output operations
 - handling errors
- Identify and install suitable hardware components
- Install and upgrade application software.



National Competency Standards Level-5 for “Civil Technology”





National Competency Standards Level-5 for “Civil Technology”



0732B&CE-110 Operate digital media technology

Overview: This unit describes the performance outcomes, skills and knowledge required to identify, select and use a digital media package and supporting technologies.

Unit of Competency	Performance Criteria
1. Use appropriate OHS office work practices	1.1 Use safe work practices to ensure ergonomic, work organization, energy and resource conservation requirements are addressed 1.2 Use wrist rests and document holders where appropriate 1.3 Use monitor anti-glare and radiation reduction screens where appropriate
2. Identify and select appropriate digital media package	2.1 Identify the basic requirements of a design brief, including user environment 2.2 Research and review suitable available digital media packages 2.3 Select an appropriate digital media package to meet design brief requirements
3. Use digital media package	3.1 Procure or create suitable data to meet requirements of the brief 3.2 Manipulate data using digital media package tools 3.3 Ensure naming and storing of documents in appropriate file format in directories or folders
4. Review digital media design	4.1 Evaluate design for creative, dramatic and technical quality, file size, and suitability to meet the brief 4.2 Test and run any incorporated graphics, video or sound as part of a digital media presentation and present designs in the appropriate format 4.3 Review final product against design brief

Knowledge & Understanding

K1: Basic principles of visual design

K2: Functions and features of digital media packages and technologies

K3: Graphic design and stylistic language conventions

K4: OHS principles and responsibilities for ergonomics, such as work periods and breaks

K5: Principles of digital imaging and file formats, video and sound file formats, file management and transfer systems

K6: Vendor product directions in digital media hardware and software



K7: Visualization and interpreting creative information, scripts (text) and images

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to identify, select and use a digital media package and supporting technologies. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints. Demonstrated evidence of the ability to:

- Identify basic requirements of a design brief
- Use digital media package to meet organizational requirements
- Use OHS principles and responsibilities for ergonomics, such as work periods and breaks
- Use help manuals and online help when appropriate
- Use digital media technologies to support design brief requirements.



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-111 Perform computer operations

Overview: This unit covers the knowledge, skills and attitudes and values needed to perform computer operations which include inputting, accessing, producing and transferring data using the appropriate hardware and software.

Unit of Competency	Performance Criteria
1. Plan and prepare for task to be undertaken	1.1 Requirements of task are determined as per standard operating procedures 1.2 Appropriate hardware and software is selected according to task assigned and required outcome 1.3 Task is planned to ensure
2. Input data into computer	2.1 Data are entered into the computer using appropriate program/application in accordance with company procedures 2.2 Accuracy of information is checked and information is saved in accordance with standard operating procedures 2.3 Inputted data are stored in storage media according to requirements 2.4 Work is performed within ergonomic guidelines
3. Access information using computer	3.1 Correct program/application is selected based on job requirements 3.2 Program/application containing the information required is accessed according to company procedures 3.3 Desktop icons are correctly selected, opened and closed for navigation purposes 3.4 Keyboard techniques are carried out in line with OH & S requirements for safe use of keyboards
4. Produce/output data using computer system	4.1 Entered data are processed using appropriate software commands 4.2 Data are printed out as required using computer hardware/peripheral devices in accordance with standard operating procedures 4.3 Files and data are transferred between compatible systems using computer software, hardware/ peripheral devices in accordance with standard operating procedures
5. Maintain computer equipment and	5.1 Systems for cleaning, minor maintenance and replacement of consumables are implemented



National Competency Standards Level-5 for “Civil Technology”



systems	5.2 Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures 5.3 Basic file maintenance procedures are implemented in line with the standard operating procedures

Knowledge & Understanding

K1: Basic ergonomics of keyboard and computer use

K2: Main types of computers and basic features of different operating systems

K3: Main parts of a computer

K4: Storage devices and basic categories of memory

K5: Relevant types of software

K6: General security

K7: Viruses

K8: OH & S principles and responsibilities

K9: Calculating computer capacity

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Selected and used hardware components correctly and according to the task requirement
- Identified and explain the functions of both hardware and software used, their general features and capabilities
- Produced accurate and complete data in accordance with the requirements
- Used appropriate devices and procedures to transfer files/data accurately
- Maintained computer system



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-112 Use computer applications

Overview: This unit describes the performance outcomes, skills and knowledge required to identify, select and operate three commercial software packages, including a word-processing, a spreadsheet and presentation application package.

Unit of Competency	Performance Criteria
1. Use appropriate OHS office work practices	1.1 Use safe work practices to ensure ergonomic, work organization, energy and resource conservation requirements are addressed 1.2 Use wrist rests and document holders where appropriate 1.3 Use monitor anti-glare and radiation reduction screens where appropriate
2. Install and remove software	2.1 Select software to be installed 2.2 Follow installation instructions 2.3 Delete unrequired software
3. Use appropriate word-processing software	3.1 Select word-processing software appropriate to perform activity 3.2 Identify document purpose, audience and presentation requirements, and clarify with personnel as required 3.3 Identify organizational requirements for text-based business documents and design document structure and layout to ensure consistency of style and image 3.4 Match document requirements with software functions to provide efficient production of documents 3.5 Use technical functions, other data and formatting to finalize documents 3.6 Ensure the naming and storing of documents in appropriate directories or folders and the printing of documents to the required specifications
4. Use appropriate spreadsheet software	4.1 Select spreadsheet software appropriate to perform activity 4.2 Identify document purpose, audience and presentation requirements, and clarify with personnel as required 4.3 Enter simple formulas and functions using cell referencing where required 4.4 Customize spreadsheet settings and format documents to meet requirements



National Competency Standards Level-5 for “Civil Technology”



	4.5 Ensure the naming and storing of documents in appropriate directories or folders and the printing of documents to the required specifications
5. Use appropriate presentation software	5.1 Select software application package appropriate to perform activity 5.2 Identify purpose, audience and presentation requirements, and clarify with personnel as required 5.3 Use technical functions, other data and formatting to finalize documents 5.4 Ensure documents are named and stored in appropriate directories or folders and printed to required specifications 5.5 Make a presentation

Knowledge & Understanding

K1: Application software packages used by the organization

K2: Basic technical terminology related to reading help files and responding to system help prompts

K3: Basic knowledge of system usage

K4: Current business practices related to using software to prepare reports

K5: Features and functions of commercial computing packages

K6: Import and export software functions

K7: Linking documents

K8: OHS principles and responsibilities for ergonomics, such as work periods and breaks

K9: Purpose, use and functions of applications

K10: Use of input and output devices

K11: Functions and uses of word processing, spreadsheet and presentation software

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to identify, select and operate three commercial software packages, including a word-processing and a spreadsheet application package. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the ability to:



National Competency Standards Level-5 for “Civil Technology”



- Produce workplace documents using a minimum of three different software application packages
- Open, amend and save files and documents according to organizational requirements
- Use OHS principles and responsibilities for ergonomics, such as work periods and breaks
- Use help manuals and online help.

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Use an operating system in a variety of scenarios and across functions, including:
 - scheduling, loading, initiating, and supervising the execution of programs
 - allocating storage
 - initiating and controlling input and output operations
 - handling errors
- Identify and install suitable hardware components
- Install and upgrade application software.



0732B&CE-113 Create user documentation

Overview: This unit describes the performance outcomes, skills and knowledge required to create user documentation that is clear to the target audience and easy to navigate.

Unit of Competency	Performance Criteria
1. Determine documentation standards and requirements	1.1 Determine documentation requirements 1.2 Investigate documentation and industry standards for requirements and determine appropriate application to user documentation 1.3 Design documentation templates using appropriate software and obtain approval from appropriate person
2. Produce user documentation	2.1 Conduct a review of the subject system, program, network or application in order to understand its functionality 2.2 Gather existing technical, design or user specifications and supporting documentation 2.3 Create user documentation based on template to record the operation of the subject system, program, network or application
3. Review and obtain sign-off	3.1 Submit user documentation to target audience for review 3.2 Gather and analyze feedback 3.3 Make changes to user documentation 3.4 Submit user documentation to appropriate person for approval

Knowledge & Understanding

- K1: Content features, including clarity and readability
- K2: Document design, web design and usability
- K3: Functions and features of templates and style guides
- K4: Instructional design principles

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create user documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to create user documentation that:



National Competency Standards Level-5 for “Civil Technology”



- Meets business requirements
- Caters for a diverse readership
- Is clear to the target audience
- Is easy to navigate.

0732B&CE-114 Create technical documentation

Overview: This unit describes the performance outcomes, skills and knowledge required to create technical documentation that is clear to the target audience and easy to navigate.

Unit of Competency	Performance Criteria
1. Identify and analyze documentation requirements and client needs	1.1 Consult with client to identify documentation requirements 1.2 Interpret and evaluate documentation requirements and confirm details with client 1.3 Investigate industry and documentation standards for requirements 1.4 Define and document the scope of work to be produced 1.5 Consult with client to validate and confirm the scope of work
2. Design documentation	2.1 Identify information requirements with reference to layout and document structure 2.2 Create document templates and style guides consistent with information requirements 2.3 Conduct a review of the system in order to understand its functionality 2.4 Extract content that meets information requirements according to copyright restrictions 2.5 Develop the structure of the technical documentation giving focus to the flow of information, style, tone and content format 2.6 Validate the technical documentation structure with the client
3. Develop documentation	3.1 Write technical documentation based on the template and scope of work using the information gathered 3.2 Translate technical terminology into plain English where appropriate 3.3 Apply content format and style according to documentation standards and templates
4. Evaluate and edit documentation	4.1 Submit technical documentation to appropriate person for review 4.2 Gather and analyze feedback 4.3 Incorporate alterations into the technical documentation



National Competency Standards Level-5 for “Civil Technology”



	4.4 Edit the technical documentation for technical and grammatical accuracy
5. Prepare documentation for publication	5.1 Check that the completed technical documentation meets client requirements and scope of work 5.2 Submit the technical documentation to appropriate person for approval 5.3 Prepare the technical documentation for publication and distribution using appropriate channels

Knowledge & Understanding

K1: Content features, such as clarity and readability

K2: Document design, web design and usability

K3: Functions and features of templates and style guides

K4: Instructional design principles

K5: Organizational policies, procedures and standards that cover document design.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Establish customer needs
- Design and develop technical documentation, such as system, procedures, training material and user guides, incorporating appropriate standards
- Update document with client feedback
- Prepare documentation for publication.



0732B&CE-115 Create basic databases

Overview: This unit describes the skills and knowledge required to design, develop and test a database in order to meet a specification. It applies to individuals who may be either database, or web designers, required to create a simple database to store information for an online application, using a simple entity relational database.

Unit of Competency	Performance Criteria
1. Analyze the requirements for the database	1.1 Determine the information that the database is required to hold 1.2 Develop a written requirement report for the functionality of the database 1.3 Complete the documentation, and submit it to the appropriate person for approval
2. Use data modeling to design the database to suit requirements	2.1 Design an entity-relationship (ER) diagram to model the relationships between the entities and the attributes that the database will hold 2.2 Develop primary and foreign keys to link the entities 2.3 Develop a data dictionary 2.4 Complete the documentation, and submit it to the appropriate person for approval
3. Create a database on a web or database server	3.1 Use the appropriate language on a web or database server to create one or more databases 3.2 Use the appropriate language on a web or database server to create tables 3.3 Populate the database fields
4. Test the database and debug	4.1 Test the database on the web or database server 4.2 Ensure that the information represented matches the requirements

Knowledge & Understanding

- K1: outline the principles of open platforms, including browsers and databases
- K2: list the processes associated with the creation of entities, attributes, and I populating fields, using both software solutions and script- based input
- K3: describe data-modeling techniques to design a database
- K4: outline the steps in database design, modeling and implementation
- K5: describe the internet operation related to web servers and clients
- K6: identify the naming conventions appropriate to database design
- K7: identify security restrictions on servers, incorporating some theoretical concepts
- K8: describe best practice communication, and accessibility, for audiences with special needs.



Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- research client requirements for a database solution
- design a database that meets client requirements
- create a database on a web hosting service or server to meet client requirements by a due date
- Test and debug the database.



0732B&CE-116 Use social media tools for collaboration and engagement

Overview: This unit describes the performance outcomes, skills and knowledge required to establish a social networking presence using social media tools and applications. The unit specifically identifies the requirement to review, compare and use different types of social networking tools and applications.

Unit of Competency	Performance Criteria
1. Describe different types of social media tools and applications	1.1 Explain characteristics of the term social media 1.2 Identify different types of social-media tools and applications 1.3 Illustrate some of the issues associated with the use of social media tools and applications
2. Compare different types of social media tools and applications	2.1 Select one social media type for review 2.2 Review most popular tools and applications within that social media type 2.3 Itemize benefits across a range of the most popular tools and applications 2.4 Select most appropriate social media tool or application
3. Set up and use popular social media tools and applications	3.1 Identify social media tools and applications for possible implementation 3.2 Initiate preferred social media tools and applications for use 3.3 Establish social media interface using text and file content 3.4 Initiate social networking interaction 3.5 Test and evaluate tools and applications for ease of use 3.6 Present findings

Knowledge & Understanding

- K1: Basic technical terminology in relation to social networking and social media applications and tools
- K2: Basic knowledge of uploading images, text files, pdf files, audio files, video files and link associated files
- K3: Features and functions of social media applications
- K4: Import and export software functions
- K5: Linking documents
- K6: OHS principles and responsibilities for ergonomics, including work periods and breaks
- K7: Tagging to facilitate collaborative folksonomy
- K8: Social media applications and procedures for connecting to social networking sites



National Competency Standards Level-5 for “Civil Technology”



K9: Use of input and output devices

K10: Use of RSS feeds to connect a social network.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Establish customer needs
- Design and develop technical documentation, such as system, procedures, training material and user guides, incorporating appropriate standards
- Update document with client feedback
- Prepare documentation for publication.



0732B&CE-117 E-Commerce- SEO (Search Engine Optimization)

Overview: The aim of this module is to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. Identify SOE Techniques	P1. Apply SEO techniques P2. Employ SEO key words
CU-2. Indicate SEO (Search Engine Optimization)	P1. Demonstrate SEO techniques to priorities their site or web application using automated tools P2. Develop efficient E-marketing strategies

Knowledge & Understanding

- K1: Explain different SEO Methods including but not limited to Getting Indexed, Preventing Crawling, and Increasing Prominence.
- K2: Elaborate White-hat, Black-hat SEO techniques for web application
- K3: Knowledge of SEO key words for web pages translation.
- K4: Application of SEO tools usage

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to write and edit copy that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:



0732B&CE-118 E-Commerce- SCM (Supply Chain Management)

Overview: The aim of this module is to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. Identify SCM (Supply Chain Management)	P1. Identity potential Suppliers P2. Select the appropriate supplier P3. Place order as per requirement/inventory P4. Inspect received order
CU-2. Prepare updated inventory detail	P1. Maintain Inventory as per Inventory Control / store keeping techniques P2. Identity different available transportation mode P3. Identify steps of reverse SCM i-e from consumer to organization

Knowledge & Understanding

- K1: Elaborate knowledge of procurement Cycle (Launch of RFP/RFQ, Tender, Bidding, Comparative Statement, Award of Contract, Maintenance)
- K2: Explain different techniques to manage
- K3: Explain product delivery and their traceability
- K4: Knowledge of Incorporation of Outsourcing in logistics.
- K5: Information about electronic Data Interchange methodologies and format

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to write and edit copy that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:



0732B&CE-119 E-Commerce- Social Media Marketing

Overview: The aim of this module is to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. Social Media Marketing	P1. Identify different Social media marketing techniques P2. Apply suitable Classified Advertisement techniques on social media
CU-2. Develop Marketing Techniques	P1. Perform Electronic Mail Marketing P2. Creation of Blogs

Knowledge & Understanding

- K1: Describe Knowledge of different social media sites that is Facebook, Twitter, LinkedIn, Google+ etc., Comparative Statement, Award of Contract, Maintenance)
- K2 Explain Brand pages creation on social media sites.
- K3: Evaluate familiarity of banner ads integration on different web sites like newspaper site in any demographic region.
- K4: Mention skills to regularly update brand/product/service blogs.K5: Information about electronic Data Interchange methodologies and format
- K5: Elaborate direct marketing techniques e.g. Email, SMS (Mobile- Commerce) for the projection of company newsletters

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to implement e-marketing strategies that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-120 Use digital devices

Overview: This unit describes the skills and knowledge required to use a range of digital devices, such as a digital camera, video camera, or personal digital assistant (PDA) device. It applies to individuals who require entry level information and communications technology (ICT) knowledge and literacy skills to support their work in a home office or small office environment.

Unit of Competency	Performance Criteria
CU-1. Prepare to use the digital device	P1. Review the instruction manual and ensure identified components are available P2. Identify the physical components of the digital device P3. Turn on and follow access procedures to activate the digital device P4. Alter the digital device settings to best suit intended use P5. Configure power management settings where appropriate to minimize power consumption, as an environmentally sustainable measure
CU-2. Set up and use the digital device	P1. Identify and set the basic operating, security and menu settings P2. Navigate and manipulate the screen environment P3. Customize screen icons and access to applications where applicable P4. Use the digital device, and save and edit output where applicable P5. Identify more advanced features available and use as required
CU-3. Access and use basic connectivity devices	P1. Connect to external digital devices, such as computer devices or storage devices, to retrieve, copy, move and save information P2. Check physical connectivity of computer devices or storage devices to ensure operation and performance P3. Connect to a printer either through a computer device or directly, and use printer settings and print data P4. Access audio-visual devices to view and play a multimedia file
CU-4. Shut down digital device	P1. Save current work and back up important data P2. Close open programs on the digital device and any computer device or storage device P3. Shut down digital devices, according to manufacturer instructions

Knowledge & Understanding

K1: outline the capabilities and connectivity requirements of relevant:

- audio-visual devices
- peripheral devices



National Competency Standards Level-5 for “Civil Technology”



- storage devices

K2: list basic security functions

K3: explain basic software operation and associated applications

K4: explain digital device functions

K5: explain digital device settings.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to use digital devices that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- turn on a digital device
- use the menu features and navigate a graphical user interface
- use device features to perform tasks
- Save the results of work.



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-121 Operate word-processing applications

Overview: This unit describes the skills and knowledge required to operate word- processing applications and perform basic operations, including creating and formatting documents, creating tables and printing labels. It applies to individuals in the workplace using fundamental knowledge of word-processing under direct supervision or with limited responsibility.

Unit of Competency	Performance Criteria
1. Apply workplace health and safety (WHS) practices	1.1 Use workplace ergonomic work practices and strategies 1.2 Organize work area to ensure an ergonomic work environment
2. Create documents	2.1 Open word-processing application, create document and add data according to information requirements 2.2 Use document templates as required 2.3 Use simple formatting tools when creating the document 2.4 Save document to directory
3. Customize basic settings to meet page layout conventions	3.1 Adjust page layout to meet information requirements 3.2 Open and view different toolbars 3.3 Change font format to suit document purpose 3.4 Change alignment and line spacing according to document information requirements 3.5 Modify margins to suit the document purpose 3.6 Open and switch between several documents
4. Format documents	4.1 Use formatting features and styles as required 4.2 Highlight and copy text from another area in the document or from another active document 4.3 Insert headers and footers to incorporate necessary data 4.4 Save document in another file format 4.5 Save and close document to a storage device
5. Create tables	5.1 Insert standard table into document 5.2 Change cells to meet information requirements 5.3 Insert and delete columns and rows as necessary 5.4 Use formatting tools according to style requirements
6. Add images	6.1 Insert appropriate images into document and customize as necessary 6.2 Position and resize images to meet document formatting needs
7. Print documents	7.1 Preview document in print preview mode 7.2 Select basic print settings 7.3 Print document or part of document from printer



Knowledge & Understanding

- K1: describe formatting styles and their effect on formatting, readability and appearance of documents
- K2: identify organizational requirements for ergonomics, including work periods and breaks
- K3: select organizational style guide to use
- K4: outline purpose, use and function of word-processing software.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create word documents that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- follow organizational ergonomic work health and safety (WHS) requirements and practices
- create, open and retrieve documents using customized basic settings
- format documents by creating tables and adding text, objects and images
- Save and prints documents.



0732B&CE-122 Operate spreadsheet applications

Overview: This unit describes the skills and knowledge required to operate word- processing applications and perform basic operations, including creating and formatting documents, creating tables and printing labels. It applies to individuals in the workplace using fundamental knowledge of word-processing under direct supervision or with limited responsibility.

Unit of Competency	Performance Criteria
1. Create presentations	1.1 Open presentation package and create a simple design for a presentation according to organizational requirements 1.2 Open blank presentation and add text and graphics 1.3 Apply existing styles within a presentation 1.4 Use presentation template and slides to create a presentation 1.5 Use various tools to improve the look of the presentation 1.6 Save presentation to the appropriate storage device and folder
2. Customize basic settings	2.1 Adjust display to meet user requirements 2.2 Open and view different toolbars to view options 2.3 Ensure font settings are appropriate for the presentation purpose 2.4 View multiple slides at once
3. Format presentations	3.1 Use and incorporate organizational charts and bulleted lists, and modify as required 3.2 Add objects and manipulate to meet presentation purposes 3.3 Import objects and modify for presentation purposes 3.4 Modify slide layout, including text and colors, to meet presentation requirements 3.5 Use formatting tools as required within the presentation 3.6 Duplicate slides within and across a presentation 3.7 Reorder sequence of slides and delete slides for presentation purposes 3.8 Save presentation in another format 3.9 Save to storage device and close presentation
4. Add slide show effects	4.1 Incorporate pre-set animation and multimedia effects into presentation as required to enhance the presentation 4.2 Add slide transition effects to presentation to ensure smooth progression through the presentation 4.3 Test presentation for overall effect 4.4 Use onscreen navigation tools to start and stop slide show or move between different slides as required



National Competency Standards Level-5 for “Civil Technology”



5. Print presentation and notes	5.1 Select appropriate print format for presentation 5.2 Select preferred slide orientation 5.3 Add notes and slide numbers 5.4 Preview slides and run spell check before presentation 5.5 Print selected slides and submit presentation to appropriate person for feedback

Knowledge & Understanding

K1: list basic technical terminology to read help files and prompts

K2: outline the different types of:

- formal and informal presentations
- audience

K3: explain the effect of design and formatting on the readability and usability of presentations

K4: outline presentation pitfalls

K5: identify suitable presentation effects for different audiences.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to presentations that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- create, format and prepare presentations for distribution and display
- customize basic settings
- Add slide show effects.



0732B&CE-123 Operate presentation packages

Overview: This unit describes the skills and knowledge required to operate word- processing applications and perform basic operations, including creating and formatting documents, creating tables and printing labels. It applies to individuals in the workplace using fundamental knowledge of word-processing under direct supervision or with limited responsibility.

Unit of Competency	Performance Criteria
1. Create spreadsheets	1.1 Open the spreadsheet application, create spreadsheet files and enter numbers, text and symbols into cells according to information requirements 1.2 Enter simple formulas and functions using cell referencing when required 1.3 Correct formulas when error messages occur 1.4 Use a range of common tools during spreadsheet development 1.5 Edit columns and rows within the spreadsheet 1.6 Use the auto-fill function to increment data where required 1.7 Save the spreadsheet to a folder on a storage device
2. Customize basic settings	2.1 Adjust page layout to meet user requirements or special needs 2.2 Open and view different toolbars 2.3 Change font settings so they are appropriate for the document purpose 2.4 Change alignment options and line spacing according to spreadsheet formatting features 2.5 Format cell to display different styles as required 2.6 Modify margin sizes to suit the purpose of the spreadsheets 2.7 View multiple spreadsheets concurrently
3. Format spreadsheet	3.1 Use formatting features as required 3.2 Copy selected formatting features from another cell in the spreadsheet or from another active spreadsheet 3.3 Use formatting tools as required within the spreadsheet 3.4 Align information in a selected cell as required 3.5 Insert headers and footers using formatting features 3.6 Save spreadsheet as another file type 3.7 Save to storage device and close spreadsheet
4. Incorporate object and chart in spreadsheet	4.1 Import an object into an active spreadsheet 4.2 Manipulate imported object by using formatting features 4.3 Create a chart using selected data in the spreadsheet



National Competency Standards Level-5 for “Civil Technology”



	4.4 Display selected data in a different chart 4.5 Modify chart using formatting features
5. Print spreadsheet	5.1 Preview spreadsheet in print preview mode 5.2 Select basic printer options 5.3 Print spreadsheet or selected part of spreadsheet 5.4 Submit the spreadsheet to appropriate person for approval or feedback

Knowledge & Understanding

K1: list basic technical terminology related to reading help files and prompts

K2: explain the effect of formatting and appearance on the readability and usability of spreadsheets

K3: outline log-in procedures relating to accessing a personal computer (PC)

K4: describe the purpose, use and function of spreadsheet applications

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- create spreadsheets
- customize basic settings
- format spreadsheets
- create basic formulas
- insert objects and charts in spreadsheets
- Save and print spreadsheets.



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-124 Perform writing and editing tasks

Overview: This unit describes the skills and knowledge required to apply the conventions of plain English to writing and editing tasks of different forms. It also includes editing and proofreading techniques. It applies to individuals in various writing contexts who write and edit texts using appropriate language, style, grammar, spelling, and standard conventions for editing and proofreading.

Unit of Competency	Performance Criteria
1. Apply clear and appropriate language and style to writing and editing tasks	1.1 Use safe work practices including addressing ergonomic requirements when undertaking writing tasks 1.2 Use clear, concise and plain English in writing and editing tasks 1.3 Apply appropriate paragraph structure to written material to ensure clarity of meaning and ease of reading 1.4 Make clear and logical connections between sentences, paragraphs and sections 1.5 Determine and incorporate the language and style of the audience
2. Apply the appropriate voice, tone and tense	2.1 Determine appropriate voice, tone and tense of the written materials according to audience requirements 2.2 Maintain consistent voice, tone and tense throughout written material
3. Apply appropriate grammar, spelling and punctuation	3.1 Apply appropriate grammar conventions to a range of written contexts including use of numbers, quotations, and tables 3.2 Apply appropriate spelling and punctuation conventions in writing and editing tasks.
4. Perform editing and proofreading tasks to meet requirements	4.1 Edit written material to ensure clear meaning through language and paragraphs, consistent voice, tone and tense 4.2 Copyedit written material by checking grammar, spelling and punctuation using standard editing conventions 4.3 Proofreading using style guides and by monitoring written material for errors

Knowledge & Understanding

K1: main features of clear, concise and plain English language for written material

K2: grammar, punctuation and spelling conventions that meet the task requirements

K3: editing conventions used in substantive editing and copyediting of written material

K4: basic software used to write and collect feedback

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



A person who demonstrates competency in this unit must be able to provide evidence of the ability to perform writing and editing tasks that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- write and edit at least one written material (2500-4000 words) and edit another material written by another author (2500-4000 words), of different forms (e.g. blog, journal, book) that demonstrate use of:
 - clear and concise language
 - clear and logical paragraph structures
 - appropriate voice, tone, tense and language
 - plain English grammar, spelling and punctuation
 - accepted grammar conventions for a range of written contexts including use of numbers, quotation and tables
 - standard editing conventions
- complete editing and proofreading tasks using handwritten and digital methods
- Accurately follow a style guide where required.
- follow relevant health and safety practices for writing tasks



0732B&CE-125

Write and Edit Copy

Overview: This unit is about writing and editing copy (i.e. final version of text) for a range of formats in different media

Unit of Competency	Performance Criteria
CU1. Undertaking copy-writing for different media	P1. Present the facts and information in a manner that is coherent, comprehensible and appropriate for the target audience P2. Write and edit items P3. Craft an engaging narrative, conceptualize and clarify ideas P4. Display strong command of the language including correct grammar, spelling, sentence construction, diction and pronunciation skills P5. Ensure that finished scripts meet legal and regulatory norms, and do not pose any risks to the individual and/ or organization
CU2. Undertaking script-writing for various media and types of stories	P1. Edit a story or script based on the brief and prescribed word/ time limits P2. Write and edit items such as: headlines, captions, intros, outros, cues and other types of links P3. Craft an engaging narrative, conceptualize and clarify ideas and develop stories that meet the broader creative/editorial objectives of the organization, if appropriate to the role P4. Display strong command of the language including correct grammar, spelling, sentence construction, diction and pronunciation skills P5. Ensure that finished scripts meet legal and regulatory norms

Knowledge & Understanding

- K1: State editorial standards followed by the organization/ individual that is commissioning the content (including applicable local, national or international laws)
- K2: Elaborate the resource limitations including any constraints on budget, resources and time availability (i.e. deadlines)
- K3: Explain how to structure one’s thoughts and ideas and write clearly and coherently
- K4: Explain how to use a wide range of vocabulary and writing techniques to minimize repetition and create interesting pieces of work
- K5: Explain the difference between facts and opinion/ point of view – and write in a manner that makes this distinction evident to the reader/ viewer



K6: Describe the applicable legal and regulatory framework for different types of stories and scripts (e.g. disclosure, consent, intellectual property/ ownership and possible litigation) and writing/ editing in a manner that minimizes these risks

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to perform writing and editing tasks that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Edit stories and scripts as per the brief, or own editorial vision if appropriate
- Undertake background research, gather references and collect information
- Read and analyze various sources of news including wire services and other publications/ channels/ websites/ media
- Plan own work and work for additional staff (e.g. copy desk, art editors, video editors) according to deadlines, as per role



0732B&CE-126 Build Java applets

Overview: This unit describes the skills and knowledge required to compile and run an applet that executes in Java-enabled browsers, and interacts with users. It applies to individuals involved in software, web or games development and who are required to build applets, using Java that interacts with users via a browser.

Unit of Competency	Performance Criteria
1. Create Java source file	1.1 Create a file with a text editor 1.2 Create a sub-class of the class Java. Applet. 1.3 Ensure that applet sub-class implements at least one of the following methods: init and paint 1.4 Define classes that contain instance variables, methods and local variables 1.5 Ensure that the init method initializes instance variables, and constructs any graphical interface used in the applet sub-class 1.6 Implement the paint and update methods to manage output that is drawn in the applet window 1.7 Incorporate event handling methods 1.8 Implement the code that allows a user to enter values, and assigns these values to variables 1.9 Use available graphical user interface (GUI) components to allow user interaction with the applet 1.10 Specify and load images and sounds 1.11 Include comments to describe the behavior of the applet
2. Compile a source file	2.1 Use a Java compiler to compile the file 2.2 Correct errors detected by the compiler 2.3 Confirm basic correctness of the file, to ensure that all variables have been initialized 2.4 Ensure the compiler creates a class file, and that the class is interpreted correctly
3. Run applet	3.1 Create and name a hypertext markup language (HTML) file, and add APPLET tag 3.2 Write the applet class file to match the HTML document that contains an APPLET tag 3.3 Confirm that the applet loads and executes correctly 3.4 Identify and correct run-time errors 3.5 Identify and correct logic errors



National Competency Standards Level-5 for “Civil Technology”



	3.6 Ensure that the appearance of the applet window renders it accessible and intuitive for the user, and that its design complies with organizational standards 3.7 Ensure that user interaction is implemented efficiently and effectively

Knowledge & Understanding

- K1: explain object-oriented programming concepts
- K2: outline the theoretical concepts of Java programming
- K3: recognize, and describe, the Australian Computer Society Code of Ethics
- K4: identify the sources of browser security restrictions.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to build Java applets that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- review the requirements to provide an applet that executes in Java-enabled browsers, and allows users to customize the applet's operation
- write, compile and run an applet that accepts user input, and generates a response based on the input



0732B&CE-127 Manipulate Images (Illustrator)

Overview: This unit describes the skills and knowledge required to compile and manipulate images. It applies to individuals involved in software, image editing and who are required to manipulate images, using Illustrator.

Unit of Competency	Performance Criteria
1. Familiarize with illustrator interface	1.1 Able to describe differences between raster and vector imaging and uses for both 1.2 Understand the capabilities of Illustrator and alternative programs 1.3 able to comfortably navigate Illustrator
2. create and edit basic vector paths	2.1 Able to use path creation and editing tools 2.2 Use the terminology associated with vector paths 2.3 Able to save an illustrator file 2.4 Export a drawing to various other file types
3. Apply and edit colors in their drawings	3.1 Use variety of basic color tools and settings 3.2 Create a cohesive color theme 3.3 create and edit gradients
4. Use specific tools to modify the appearance of paths	4.1 Apply advanced stroke and width settings to a path 4.2 Understand the basic function and process of using brushes
5. Create, edit, and combine shapes in a variety of ways	5.1 Use the shape tools effectively 5.2 Rotate, reflect, scale, skew, and free transform a shape 5.3 Utilize various ways to copy and paste a shape 5.4 Use the knife and scissors tools to split paths and shapes 5.5 Create a complex shape by combining simple ones 5.6 Create and edit clipping paths
6. Apply and edit the appearance of images	6.1 Able to victories and paint a raster image 6.2 Use text effectively 6.3 Able to effectively live trace an image 6.4 Able to add, edit, and warp text 6.5 Apply and edit object effects



Knowledge & Understanding

- K1: Explain the usage of pen tool
- K2: Describe the benefits of clipping masks
- K3: Explain the ways to create the perfect shape using path finder panel
- K4: Elaborate the ways to make brushes
- K5: Explain the usage of layering

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to use illustrator that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Learning the Interface
- Creating shapes
- Ways to create complex shapes with the Shape Builder tool.
- Stokes and fills
- Practical use of effects and the appearance panel.
- Creating cool 3D effects for texts and logos.



0732B&CE-128 Manipulate Images (Photoshop)

Overview: This unit describes the skills and knowledge required to compile and manipulate images. It applies to individuals involved in software, image editing and who are required to manipulate images, using Illustrator.

Unit of Competency	Performance Criteria
1. Performs basic image edits using Photoshop	1.1 Able to describe differences between raster and vector imaging and uses for both 1.2 Edit Photos non-destructively 1.3 Able to comfortably navigate Photoshop 1.4 Crop picture effectively 1.5 Straighten the picture 1.6 Use the layering process in Photoshop
2. Use masks and combine images	2.1 Make and edit masks 2.2 Make selection 2.3 Make adjustment layers with masks 2.4 Use masks and layers to combine photos
3. Merge and heal photos	3.1 Use Photo merge 3.2 Fill selections with content aware fill 3.3 Use healing tools correctly 3.4 Apply Filters to photos
4. Use non-photo elements in Photoshop designs	4.1 Use text tool 4.2 Use brushes 4.3 Create shapes 4.4 Apply colors and gradients 4.5 Apply Layer Effects 4.6 Combine elements in pleasing ways

Knowledge & Understanding

- K1: State the names of the basic tools
- K2: Explain the organization of layer method
- K3: Elaborate the effects of masking, brush, cropping, and adjusting layers
- K4: Describe the short keys for tools
- K5: Explain the process of opening and saving image
- K6: Describe the ways to add effects on an image

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



A person who demonstrates competency in this unit must be able to provide evidence of the ability to use Photoshop that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- get familiarize with Photoshop interface
- master all the tools in depth
- blend Images seamlessly
- decorate an Image
- create reflection effect
- create awesome text effect
- create rain effect , cloud effect
- create pixel perfect designs
- create blur backgrounds , polygon backgrounds
- Create whirlpool Effect, Bokeh Effect



0732B&CE-129

Design simple web page layouts

Overview: This unit is about writing and editing copy (i.e. final version of text) for a range of formats in different media

Unit of Competency	Performance Criteria
1. Identify main layout sections from design specification	1.1 Identify the required sections of the web page 1.2 Create the web page structure
2. Layout the web page to match design specification	2.1 Position document elements 2.2 Style web page elements to match the design specifications
3. Test and validate the layout	3.1 Test the website in various browsers 3.2 Validate the web pages against industry standards

Knowledge & Understanding

K1: Summaries standard web and web scripting design principles

K2: define and explain the application of the following for website development:

- cascading style sheets (CSS)
- the hypertext transfer protocol (HTTP)
- a markup language, such as hypertext markup language (HTML), or extensible hypertext markup language (XHTML)
- World Wide Web Consortium (W3C) standards.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to Design simple web page layouts that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements



National Competency Standards Level-5 for “Civil Technology”



This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- develop a website according to design specifications
- lay out page elements
- test the web pages in a variety of browsers
- Validate the web pages, against industry standards.



0732B&CE-130 Apply introductory programming techniques

Overview: This unit describes the performance outcomes, skills and knowledge required to undertake introductory programming tasks in the development of a game or application. This unit addresses the knowledge, processes and techniques necessary to develop skills to create simple applications or games.

Unit of Competency	Performance Criteria
1. Apply language syntax and layout	1.1 Apply basic language syntax rules 1.2 Use language data types, operators and expressions to create clear and concise code 1.3 Apply variables and variable scope 1.4 Use library functions in a program 1.5 Use commenting to create clear meaning to code
2. Apply control structures	2.1 Apply language syntax for sequence, selection and iteration constructs 2.2 Use logical operators to create expressions for use in selection and iteration constructs
3. Code using standard algorithms	3.1 Develop algorithms that use the sequence, selection and iteration constructs 3.2 Create and use arrays 3.3 Code standard sequential access algorithms for reading and writing text files, including end-of-file detection loops 3.4 Apply string manipulation
4. Test code	4.1 Use debugging techniques to trace code execution and examine variable contents to detect and correct errors 4.2 Create and conduct simple tests to confirm code meets design specification 4.3 Document the tests performed and results achieved
5. Create an application or game	5.1 Design an algorithm in response to basic program specifications 5.2 Develop the application or game to meet the program specification 5.3 Test and confirm that application or game meets the initial specifications

Knowledge & Understanding

K1: Programming language syntax and command structure

K3: Small-sized application or game development.



Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to undertake introductory programming tasks in the development of a game or application. This unit addresses the knowledge, processes and techniques necessary to develop skills to create simple applications or games. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Apply programming language syntax, sequence, selection and iteration control structures to the development of an application or game
- Produce an application or game that is designed and built from a provided program specification
- Confirm that the created application or game meets the original program specifications and obtain user sign-off for completed program.



11c Certificate in Civil Technology Level 4

10.11. Construction II

0732B&CE-131 Prepare subgrade, base, and bedding course for paving

Overview: This competency standard covers the skills and knowledge required to prepare subgrade, base and bedding course in preparation for laying paving.

Competency Units	Performance Criteria
CU1. Prepare for work	P1 Confirm work instructions with supervisor. P2. Select required tools and equipment, check for serviceability and any faults. P3. Calculate materials quantity requirements in accordance with specifications. P4. Obtain materials needed and check for compliance
CU2. Identify soil	P1 Identify class of soil used as per soil classification charts. P2. Determine properties of soil assessed to its class. P3. Determine subgrade requirements of penetration tests.
CU3. Prepare subgrade	P1. Identify drainage and other features are within the area to be paved. P2. Identify drains put in place where required P3. Identify services in work area P4. Identify damp proof courses and paving is constructed so that it does not compromise them. P5. Components are cleaned, stacked and stored for reuse or bundled for removal.
CU4. Install base course materials	P1. Calculate quantity of base course materials is based upon the subgrade type and purpose of the paved area. P2. Distribute material over area, allowing for compaction. P3. Perform compaction on area taking care not to over-compact base materials.
CU5. Install bedding course materials	P1. Select bedding course material P2. Calculate quantity of layer course materials P3. Distribute material over the area to be paved within tolerances stipulated by relevant standards. P4. Handle compacting machinery correctly. P5. Screed base materials to levels as determined, and set out by string lines or other mechanisms. P6. Clean the work area.

Knowledge & Understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain principles of California bearing ratio (CBR)
- Explain properties of bedding course materials
- Explain properties of geotextile materials
- Explain relevant Australian standards
- Explain stabilizing bedding sand

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations
- Comply with organizational policies and procedures including quality requirements
- Safely and effectively operate and use tools, plant and equipment
- Communicate and work effectively and safely with others.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Tools and equipment: compactors concrete mixer levelling devices rakes screed shovels string lines Wheelbarrows.
	Materials required: aggregates



National Competency Standards Level-5 for “Civil Technology”



	bedding sand cement concrete crushed rock road base sand.



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-132 Lay paving

Overview: This competency standard covers the skills and knowledge required to plan for work, set out work area and lay paving.

Competency Units	Performance Criteria
CU1. Plan for work	P1. Confirm work instructions with supervisor. P2. Select tools and equipment are selected as required, check for serviceability and any faults P3. Calculate material quantity requirements in accordance with specifications. P4. Obtain and prepare materials needed for compliance
CU2 Set out work area	P1. Identify location and area of paved area from plans and specifications. P2. Identify sub-soil and footing types according to standards. P3. Locate underground services P4. Set out location and shape of paving area to dimensions from plans and specifications.
CU3. Lay paving	P1. Excavate area is to required depth, allowing for base and thickness of unit and specified finish level. P2. Position drainage pipes in sub soil in accordance with plans and specifications. P3. Mix mortar for masonry paving to specifications and standards. P4. Spread substrate base material and compact to specifications. P5. Spread and screed bedding material is spread to designed level and alignment. P6. Position edge boards to set out and specifications. P7. Grade paving surface to fall evenly, without ponding, to outlets or surface run-off system. P8. Determine initial starting line is and lay pavers to line conforming to specified pattern. P9. Cut paving units and segments and lay to designed pattern and specifications, with joints to specifications and surface finish aligned. P10. Maintain finished level is across junctions between different finishes. P11. Complete paving installation with joints finished to specifications. P12. Clean paving surface according to specifications.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Explain characteristics and applications of materials for laying pavers



National Competency Standards Level-5 for “Civil Technology”



- Define corner geometry
- Explain paving bonds and patterns, joints and finishing
- Draw plans, specifications and drawings
- Explain techniques for laying pavers

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Pave a level area of 3m x 5m with clay pavers, using sand as a bedding material on compacted crushed rock (closed finish with sand brushed in); and
- Pave an area of 3m x 5m over a fall with clay bricks, incorporating control joints and using mortar as a bedding material on concrete (mortar joints finish).

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Bolsters • Brick buggies • Buckets • Builders' lines • Builders squares • Concrete mixers • Forklifts • Hammers • Hoses • Line blocks • Line pins • Masonry saws • Mason's squares measuring tapes and rules • Mortar boards • Pallet trolleys • Rakes and brooms • Rubber mallets



National Competency Standards Level-5 for “Civil Technology”



	• Screed boards • Shovels • Small petrol or diesel engines • Compressors or mixers • Spirit levels • Straight edges • String lines • Trowels • Vibrating plates • Wheelbarrows



0732B&CE-133 Perform concrete, tiles and mosaic flooring

Overview: This competency standard covers the skills and knowledge required to supervising construction works using concrete. It requires candidates to be able to prepare concrete mixture, perform concrete flooring, perform tiles flooring and perform mosaic flooring.

Competency Units	Performance Criteria
CU1 Prepare concrete mixture	P1. Read, and interpret drawing / layout and specification according to the job requirements. P2. Select materials according to job requirements. P3. Select and use PPE as per the job requirements. P4. Select and use required tools and equipment as per the job requirements P5. Prepare materials as per the job requirement following standard procedures. P6. Mix materials as per the job requirement following standard procedures. Transport concrete mix as per the job requirement following standard procedures.
CU2 Perform concrete flooring	P1. Prepare surfaces as per the job requirement following standard procedure P2. Lay the concrete mixtures as per the job requirement following standard procedure P3. Compact the concrete mixtures/surfaces following standard procedures. P4. Plaster the floor surfaces following standard practices P5. Prepare and apply cement slurry to the surfaces as per the job requirement following standard procedures. P6. Cure the floor surfaces following standard practices.
CU3 Perform tiles flooring	P1. Prepare surfaces as per the job requirement following standard procedures. P2. Prepare tiles as per the job requirement following standard procedures. P3. Plaster the floor surfaces as per the job requirement following standard procedures. P4. Prepare and apply cement slurry as per the job requirement following standard procedures. P5. Lay floor tiles as per the job requirement following standard procedures. P6. Cure the floor surfaces following standard practices.



National Competency Standards Level-5 for “Civil Technology”



	P7. Finish the floor surfaces as per the job requirement following standard procedures.
CU4 Perform mosaic flooring	P1. Prepare surfaces as per the job requirement following standard procedure. P2. Place the stripes as per the job requirement following standard practices. P3. Pour the concrete mixtures as per the job requirement following standard procedure. P4. Compact the concrete mixtures/surfaces of following standard procedures. P5. Prepare mosaic mix as per the job requirement following standard practices. P6. Pour and compact mosaic mix as per the job requirement following standard procedures. P7. Finish the floor surfaces as per the job requirement following standard procedures.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Demonstrate occupational Health and Safety (OHS) Regulations
- Explain composition, properties and specifications of flooring mixtures
- Explain economic use of materials
- Describe the procedure for estimation of materials
- Explain repair and maintenance work
- Explain tiles design and decorations

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with hygiene and safety regulations applicable to work operations at all times.
- Prepare the flooring materials as per the job requirements.
- Finish the floor surfaces as per the job requirement following standard procedures



Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Mason hammer • Trowel • Chisel • Measuring tape • Try square • Mason thread • Sprite level • Bucket • Mortar pan Sponge/form • Wooden/steel float • Shovel • Spade • Wire brush • Screeds(wooden/steel) • Grinder • Wooden/steel edge



0732B&CE-134 Perform marble/granite flooring

Overview: This competency standard covers the skills and knowledge required to prepare concrete, mixture and lay marbles/granite

Competency Units	Performance Criteria
CU1 Prepare concrete mixture	P1 Read, and interpret drawing / layout and Specification according to the job requirements. P2 Select materials according to job requirements. P3 Select and use PPE as per the job requirements. P4 Select and use required tools and equipment as per job requirements P5 Prepare materials as per the job requirement following standard procedures. P6 Mix materials as per the job requirement P7 Transport concrete mix as per the job requirement following standard procedures.
CU2. Lay marbles/granite	P1. Prepare surfaces as per the job requirement following standard procedure P2. Prepare marble/granite slabs as per the Standard procedure. P3 Plaster the floor surfaces as per the standard P4. Prepare and apply cement slurry as per the job requirement standard procedure. P5. Lay marble/granite tiles as per the job requirement following standard procedure. P6. Finish the floor surfaces as per the job requirement following standard procedures.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of: Fundamentals of masonry.

- Enlist types of flooring
- Enlist types of bondage
- Explain safe use of tools and equipment
- Estimation and costing.
- Curing procedures
- Explain economic use of materials
- Describe grinding and molding procedures

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with hygiene and safety regulations applicable to work operations at all times.
- Demonstrate compliance with occupational health and safety regulations applicable to work operations at all times.
- Interpret drawings and layouts.
- Lay marble/granite tiles as per the job requirement following standard procedure.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Straight edge • Plumb bob • Sprite level • Grinding tools • Trowel • Pans shovels • Molding tools • Cutter • Float



0732B&CE-135 Apply water proofing remedial processes

Overview: This competency standard covers the skills and knowledge required to apply remedial waterproofing processes to external and below ground level wet areas, using injection epoxy, cement crystallisation or hydrostatic coating methods. It includes identification of the waterproofing system to be used, its preparation and its application.

Competency Units	Performance Criteria
CU1. Plan and prepare	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Calculate material quantity in accordance with plans, specifications and quality requirements. P5. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU2. Identify waterproofing system.	P1. Identify area to be waterproofed from a technical report or diagnosed damp fault area and inspected for defects and soundness in accordance with job and manufacturer specifications. P2. Inspect area of structure for waterproofing surface application for defects and soundness in accordance with job and manufacturer specifications. P3. Identify, analyze and select appropriate remedial waterproofing systems and products in accordance with job and manufacturer specifications P4. Check range of waterproofing materials for product suitability, conformity to specification and compatibility with surface material, preparation and waterproofing installation technique. P5. Select type of waterproofing material is identified in accordance with type of substrate, job specification, state of structure and job safety requirements.
CU3. Prepare for waterproofing process.	P1. Confirm site to be repaired in accordance with drawings, specifications and manufacturers' specification. P2. Set out construction/installation site to specified location, structure and dimensions in accordance with drawings and specifications.



National Competency Standards Level-5 for “Civil Technology”



CU4. Apply waterproofing using injection.	P1. Determine and measure Injection hole set-out spacing and in accordance with manufacturer recommendations. P2. Apply materials prepared for injection method application in accordance with manufacturer recommendations. P3. Prepare and set up Injection equipment for injection process in accordance with manufacturer recommendations. P4. Test and flush injection system in accordance with manufacturer specifications. P5. Make damp course water resistant and capped using injection method in accordance with manufacturer recommendations and to specifications.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of: characteristics and applications of remedial waterproofing materials

- Explain construction systems and waterproofing considerations
- Explain general construction terminology
- Explain job safety analysis (JSA) and safe work method statements
- Explain materials storage and environmentally friendly waste management
- Draw plans, drawings and specifications
- Explain plant, tools and equipment types, characteristics, uses and limitations
- Explain principles and considerations of water exclusion
- Explain processes for the calculation of material requirements
- Explain quality requirements
- Describe remedial waterproofing materials, processes and testing techniques
- Explain workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs must be able to provide evidence of the ability to:

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations
- Comply with organizational policies and procedures including quality requirements
- Safely and effectively operate and use tools, plant and equipment
- Communicate and work effectively and safely with others as a minimum:



National Competency Standards Level-5 for “Civil Technology”



- Repair a crack in a concrete basement wall or a suspended car park slab, identifying remedial waterproofing method to be used, determining the type of material to be used and the repair requirement (e.g. spacing of injection ports/packers if using an injection method), and testing the application

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: • Angle grinders • Chisels • Electric drills and screwdrivers • Hammers • Impact drills • Measuring tapes and rules • Mixing equipment • Pressure injection equipment, including: • Cartridge applications • Compressors • Hoses • Pumps • Vacuum pumps • Spirit levels • Straight edges.



0732B&CE-136 Apply and install sealants

Overview: This competency standard covers the skills and knowledge required to apply and install sealants.

Competency Units	Performance Criteria
CU1. Prepare for work	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details, for planning and preparation purposes P2. Follow safety (OHS) requirements in Accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks consistent with job requirements, check for serviceability, and any faults P5. Calculate sealant material quantity in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, safely handle and locate materials appropriate to the work application
CU2. Prepare surface to receive sealants.	P1. Clean surface free of contaminants such as oil, grease, dust or moisture. P2. Surface is prepared by sanding and/or cleaning in accordance with preparation specifications.
CU3. Apply sealant.	P1. Apply sealant materials to manufacturer recommendations and specifications. P2. Take care to ensure no air is trapped within applied sealant

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain safe materials handling techniques and requirements, including hazardous materials relevant to sealant application work
- K2.** Explain safe use of scaffolding and working platforms
- K3.** Enlist types and performance of sealants used in buildings
- K4.** Explain types and use of hand tools and equipment relevant to sealant application and installation work
- K5.** Explain workplace and equipment safety requirements.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate who demonstrates competency in this unit must be able to handle and use all the sealant materials and application devices listed in the range statement, providing evidence of the ability to:

- Comply with OHS regulations and state and territory legislation applicable to workplace operations
- Comply with organizational policies and procedures, including quality assurance requirements
- Select and use appropriate processes, tools and equipment to carry out tasks
- Adopt and carry out correct procedures prior to and during handling and application of materials
- Demonstrate safe and effective operational use of tools and equipment
- Demonstrate safe application in the process of cleaning up application area and cleaning equipment

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment: Brooms Brushes Cartridge applicators Putty knives and paring knives Rollers Sanders Spray equipment.



0732B&CE-137 Perform water proofing works

Overview: This competency standard covers the skills and knowledge required to safely and effectively use tools and equipment used in waterproofing. It includes identification, selection and use of hand and power tools, plant and equipment used in masonry work.

Competency Units	Performance Criteria
CU-1. Prepare for work.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Calculate material quantity in accordance with plans, specifications and quality requirements. P5. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Identify waterproofing system.	P1. Identify basement, water tank area to be waterproofed from job drawings and specifications. P2. Inspect area of structure to be waterproofed for defects and soundness in accordance with job and manufacturer specifications. P3. Identify, analyses and select appropriate waterproofing systems and products for water exclusion in accordance with job and manufacturer specifications, and with material safety data sheet (MSDS) directions. P4. Check range of waterproofing materials for product suitability; conformity to specification; and compatibility with surface material, preparation and waterproofing installation technique. P5. Determine termination detailing. P6. Identify type of waterproofing material in accordance with job specification, state of structure, and job safety requirements
CU-3. Prepare water proofing installation.	P1. Check basement, tank and wet area fitment or fixtures for specific measurements and set out in accordance with drawings and specifications.



National Competency Standards Level-5 for “Civil Technology”



	P2. Check substrate for soundness of fit, curing compounds, moisture content and other contaminants, and reported or remedied as required. P3. Check flooring installation levels and falls to waste outlets for conformity to specification. P4. Install corner flashing in accordance with manufacturer recommendations. P5. Check points of connection, termination detailing and over flashings as required to be in place and secure. P6. Check rebates for baths and basins for compliance with standards.
CU-4. Prepare substrate	P1. Correct defects and make good in accordance with manufacturer specifications, to bring substrate to a smooth and uniform finish. P2. Prepare surface of structure to be waterproofed to manufacturers' specification, including fixings and belling out around taps. P3. Install water stops and hobs in required location in compliance with standards and good building practice. P4. Perform priming coat on prepared surface of structure to manufacturers' specification, where applicable.
CU-5. Identify and select plant and equipment	P1. Apply waterproofing membrane to primed surface of structure to correct thickness and in accordance with manufacturers' job specification. P2. Apply appropriate bond breakers and fillets as required in accordance with manufacturer specifications. P3. Cure waterproofing membrane in accordance with manufacturers' specification and workplace requirements. P4. Conduct flood testing of installation if required. P5. Protect waterproofing system and materials using methods and materials consistent with manufacturers' specification, workplace requirements and good building practice. P6. Under take final inspection of site in accordance with certifying authority's requirements and sign-off and handover of work is carried out in accordance with workplace requirements.



National Competency Standards Level-5 for “Civil Technology”



CU-6. Clean up.	P1. Clear work area and dispose of, reuse or recycle materials in accordance with legislation, regulations, and codes of practice and job specification. P2. Clean, check, maintain and store plant, tools and equipment in accordance with manufacturer recommendations and standard work practices.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe applications, limitations and method of operation and maintenance of hand and power tools, plant and equipment applicable to waterproofing tasks
- K2.** State communication processes - verbal and signaling
- K3.** State general construction terminology
- K4.** Recognize and observe job safety analysis (JSA) and safe work method statements

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- Water proofing of water tank
- Curing of waterproofing membrane
- Installation of corner flashing
- Application of bond breakers and fillets.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment Angle grinders Brooms, brushes Buckets Caulking guns Chisels, including cold chisels Cutting blades



National Competency Standards Level-5 for “Civil Technology”



	Electric drills and screwdrivers
	Fans
	Floor scrapers
	Hammers
	Heat welders, hot air welders, lights
	Measuring tapes and rules
	Moisture meters
	Nylon rollers
	Pressure rollers
	Fusion rollers
	Scissors
	Seam probes
	Solvent applicators
	Spirit levels
	Straight edges
	Vacuum cleaners.



0732B&CE-138 Apply water proofing tools and equipment

Overview: This competency standard covers the skills and knowledge required to safely and effectively use tools and equipment used in waterproofing. It includes identification, selection and use of hand and power tools, plant and equipment used in masonry work.

Competency Units	Performance Criteria
CU-1. Prepare for work.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Calculate material quantity in accordance with plans, specifications and quality requirements. P5. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Identify hand and power tools.	P1. Identify type and function of hand and power tools to be used in the waterproofing work. P2. Identify methods of operation of hand and power tools from specifications, standards and manufacturers' instructions. P3. Identify specific OHS requirements for specific hand and power tools. P4. Identify personal protective equipment (PPE) required for operation of the tools in accordance with regulatory and workplace requirements.
CU-3. Select Tools for work	P1. Select tools and equipment consistent with job requirements. P2. Check tools, including leads and hoses, for tags, serviceability and report safety and any faults to supervisor. P3. Check power tools guards, guides and controls and maintained in accordance with manufacturer recommendations. P4. Check equipment to hold or support material during operation and inspect for faults. P5. Complete pre-operational checks, including lubricants, hydraulic fluid and water, in accordance with manufacturer recommendations.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Use Tools	P1. Connect power and compressed air supply to work area to the area of work in accordance with regulatory and workplace requirements and codes of practice. P2. Observe start-up and shut-down procedures. P3. Use tools safely and effectively according to manufacturer recommendations and regulatory requirements. P4. Switch off tools safely and locate when not in use.
CU-5. Identify and select plant and equipment	P1. Identify function and limitations of waterproofing hand and power tools, plant and equipment used for waterproofing systems and waterproofing tasks. P2. Identify method of operation of plant and equipment from specifications, standards and manufacturers' instructions. P3. Identify and apply OHS requirements for specific plant and equipment, including requirements for guarding, guiding and controls. P4. Identify PPE required for the operation of plant and equipment in accordance with regulatory and workplace requirements. P5. Select items of plant and equipment consistent with hazard minimization and needs of the job. P6. Check plant and equipment for safety, and report faults to supervisor in accordance with workplace procedures. P7. Recognize and adhere to OHS requirements for operating and using plant and equipment
CU-6. Use plant and equipment	P1. Observe start-up and shut-down procedures P2. Use plant and equipment safely and effectively according to manufacturer recommendations and regulatory requirements. P3. Switch off plant and equipment safely and locate when not in use.
CU-7. Clean up.	P1. Clear work area and dispose of, reuse or recycle materials in accordance with legislation, regulations, and codes of practice and job specification. P2. Clean, check, maintain and store plant, tools and equipment in accordance with manufacturer recommendations and standard work practices.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1** Describe applications, limitations and method of operation and maintenance of hand and power tools, plant and equipment applicable to waterproofing tasks
- K2** State communication processes - verbal and signaling
- K3** State general construction terminology
- K4** Recognize and observe job safety analysis (JSA) and safe work method statements

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard. A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

Locate, interpret and apply relevant information, standards and specifications

Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations

Comply with organizational policies and procedures including quality requirements

Safely and effectively operate and use tools, plant and equipment

Communicate and work effectively and safely with others as a minimum, follow work instructions and operating procedures to safely and effectively use appropriate tools, plant and equipment for the preparation of the substrate for waterproofing and the application of at least one of the following applications:- an internal wet area, an external wet area, a below ground level wet area, a remedial waterproofing project ensuring:

Correct selection- and use of appropriate processes, tools and equipment

No damage to tools, plant and equipment, completing all work to specification

- Compliance with regulations, standards and organizational quality procedures and processes.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment Angle grinders Brooms, brushes Buckets Caulking guns Chisels, including cold chisels Cutting blades Electric drills and screwdrivers



National Competency Standards Level-5 for “Civil Technology”



	Fans Floor scrapers Hammers Heat welders, hot air welders, lights Measuring tapes and rules Moisture meters Nylon rollers Pressure rollers Fusion rollers Scissors Seam probes Solvent applicators Spirit levels Straight edges Vacuum cleaners.



0732B&CE-139 Perform water proofing of basements

Overview: This competency standard covers the skills and knowledge required to identify of the waterproofing system to be used, prepare water proofing system and perform water proofing system in basements.

Competency Units	Performance Criteria
CU-1. Plan and prepare.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks in consistent with job requirements, check for serviceability, and rectify or report any faults prior to commencement. P5. Calculate material quantity in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, and safely handle materials appropriate to the work application, including required fire resistance rating, ready for use. P7. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Identify water proofing system.	P1. Identify basement area to be waterproofed from job drawings and specifications. P2. Inspect area of structure to be waterproofed for defects and soundness in accordance with job and manufacturer specifications. P3. Identify, analyze and select appropriate waterproofing systems and products for water exclusion in accordance with job and manufacturer specifications, and with material safety data sheet (MSDS) directions. P4. Check range of waterproofing materials for product suitability; conformity to specification; and compatibility with surface material, preparation and waterproofing installation technique. P5. Determine termination detailing. P6. Identify type of waterproofing material in accordance with job specification, state of structure, and job safety requirements with MSDS directions



National Competency Standards Level-5 for “Civil Technology”



CU-3. Prepare for water proofing installation	P1. Check basement area and wet area fitment or fixtures for specific measurements and set out in accordance with drawings and specifications. P2. Check substrate for soundness of fit, curing compounds, moisture content and other contaminants, and reported or remedied as required. P3. Check flooring installation levels and falls to waste outlets for conformity to specification. P4. Install corner flashing in accordance with manufacturer recommendations. P5. Check points of connection, termination detailing and over flashings as required to be in place and secure. P6. Check rebates for baths and basins for compliance with standards.
CU-4. Apply water proofing to basement.	P1. Correct defects and make good in accordance with manufacturer specifications, to bring substrate to a smooth and uniform finish. P2. Prepare surface of structure to be waterproofed to manufacturers' specification, including fixings and belling out around taps. P3. Install water stops and hobs in required location in compliance with standards and good building practice. P4. Perform priming coat on prepared surface of structure to manufacturers' specification, where applicable. P5. Apply waterproofing membrane to primed surface of structure to correct thickness and in accordance with manufacturers' job specification. P6. Apply appropriate bond breakers and fillets as required in accordance with manufacturer specifications. P7. Cure waterproofing membrane in accordance with manufacturers' specification and workplace requirements. P8. Conduct flood testing of installation if required. P9. Protect waterproofing system and materials using methods and materials consistent with manufacturers' specification, workplace requirements and good building practice. P10. Under take final inspection of site in accordance with certifying authority's requirements and sign-off and handover of work is carried out in accordance with workplace requirements.



National Competency Standards Level-5 for “Civil Technology”



CU-5. Clean up.	P1. Clear work area and dispose of, reuse or recycle materials in accordance with legislation, regulations, and codes of practice and job specification. P2. Clean, check, maintain and store plant, tools and equipment in accordance with manufacturer recommendations and standard work practices.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe assessment and appreciation of moisture content in substrate materials
- K2.** State characteristics and applications of waterproofing materials and adhesives
- K3.** Describe construction systems and waterproofing considerations
- K4.** Define general construction terminology
- K5.** Describe internal waterproofing materials, processes and techniques
- K6.** Describe job safety analysis (JSA) and safe work method statements
- K7.** State materials storage and environmentally friendly waste management
- K8.** Describe MSDS
- K9.** Read and interpret plans, drawings and specifications
- K10.** Describe plant, tools and equipment types, characteristics, uses and limitations
- K11.** Describe principles and considerations of water exclusion
- K12.** State processes for the calculation of material requirements
- K13.** Describe quality requirements
- K14.** Explain termination and flashing principals
- K15.** Describe workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.



National Competency Standards Level-5 for “Civil Technology”



Locate, interpret and apply relevant information, standards and specifications

Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations

Comply with organizational policies and procedures including quality requirements

Safely and effectively operate and use tools, plant and equipment

Communicate and work effectively and safely with others as a minimum:

Waterproof a bathroom incorporating: lap up a wall, appropriate penetrations, wastes and hobs

Install and detail a hob less frame shower enclosure and a bath that abuts a masonry connection wall, ensuring: correct identification of requirement and installation of the waterproofing

Correct selection and use of appropriate processes, tools and equipment

- Completing all work to specification, correct termination and over flashing.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab equipment Angle grinders Brooms, brushes Buckets Caulking guns Chisels, including cold chisels Cutting blades Electric drills and screwdrivers Fans Floor scrapers Hammers Heat welders, hot air welders, lights Measuring tapes and rules Moisture meters Nylon rollers Pressure rollers Fusion rollers Scissors Seam probes



National Competency Standards Level-5 for “Civil Technology”



	Solvent applicators Spirit levels Straight edges Vacuum cleaners.



0732B&CE-140 Apply water proofing to internal wet areas

Overview: This competency standard covers the skills and knowledge required to identify of the waterproofing system to be used, prepare water proofing system and apply water proofing system.

Competency Units	Performance Criteria
CU-1. Plan and prepare.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks in consistent with job requirements, check for serviceability, and rectify or report any faults prior to commencement. P5. Calculate material quantity in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, and safely handle materials appropriate to the work application, including required fire resistance rating, ready for use. P7. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Identify water proofing system.	P1. Identify internal area to be waterproofed from job drawings and specifications. P2. Inspect area of structure to be waterproofed for defects and soundness in accordance with job and manufacturer specifications. P3. Identify, analyze and select appropriate waterproofing systems and products for water exclusion in accordance with job and manufacturer specifications, and with material safety data sheet (MSDS) directions. P4. Check range of waterproofing materials for product suitability; conformity to specification; and compatibility with surface material, preparation and waterproofing installation technique. P5. Determine termination detailing. P6. Identify type of waterproofing material in accordance with job specification, state of structure, and job safety requirements with MSDS directions
CU-3. Prepare water proofing installation	P1. Check internal wet area and wet area fitment or fixtures for specific measurements and set out in accordance with drawings and specifications.



National Competency Standards Level-5 for “Civil Technology”



	P2. Check substrate for soundness of fit, curing compounds, moisture content and other contaminants, and reported or remedied as required. P3. Check flooring installation levels and falls to waste outlets for conformity to specification. P4. Install corner flashing in accordance with manufacturer recommendations. P5. Check points of connection, termination detailing and over flashings as required to be in place and secure. P6. Check rebates for baths and basins for compliance with standards.
CU-4. Prepare substrate	P1. Correct defects and make good in accordance with manufacturer specifications, to bring substrate to a smooth and uniform finish. P2. Prepare surface of structure to be waterproofed to manufacturers' specification, including fixings and belling out around taps. P3. Install water stops and hobs in required location in compliance with standards and good building practice. P4. Perform priming coat on prepared surface of structure to manufacturers' specification, where applicable.
CU-5. Apply water proofing.	P1. Apply waterproofing membrane to primed surface of structure to correct thickness and in accordance with manufacturers' job specification. P2. Apply appropriate bond breakers and fillets as required in accordance with manufacturer specifications. P3. Cure waterproofing membrane in accordance with manufacturers' specification and workplace requirements. P4. Conduct flood testing of installation if required. P5. Protect waterproofing system and materials using methods and materials consistent with manufacturers' specification, workplace requirements and good building practice. P6. Under take final inspection of site in accordance with certifying authority's requirements and sign-off and handover of work is carried out in accordance with workplace requirements.



National Competency Standards Level-5 for “Civil Technology”



CU-6. Clean up.	P1. Clear work area and dispose of, reuse or recycle materials in accordance with legislation, regulations, and codes of practice and job specification. P2. Clean, check, maintain and store plant, tools and equipment in accordance with manufacturer recommendations and standard work practices.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1** Describe assessment and appreciation of moisture content in substrate materials
- K2** State characteristics and applications of waterproofing materials and adhesives
- K3** Describe construction systems and waterproofing considerations
- K4** Define general construction terminology
- K5** Describe internal waterproofing materials, processes and techniques
- K6** Describe job safety analysis (JSA) and safe work method statements
- K7** State materials storage and environmentally friendly waste management
- K8** Describe MSDS
- K9** Read and interpret plans, drawings and specifications
- K10** Describe plant, tools and equipment types, characteristics, uses and limitations
- K11** Describe principles and considerations of water exclusion
- K12** State processes for the calculation of material requirements
- K13** Describe quality requirements
- K14** Explain termination and flashing principals
- K15** Describe workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.



National Competency Standards Level-5 for “Civil Technology”



Locate, interpret and apply relevant information, standards and specifications

Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations

Comply with organizational policies and procedures including quality requirements

Safely and effectively operate and use tools, plant and equipment

Communicate and work effectively and safely with others as a minimum:

Waterproof a bathroom incorporating: lap up a wall, appropriate penetrations, wastes and hobs

Install and detail a hob less frame shower enclosure and a bath that abuts a masonry connection wall, ensuring: correct identification of requirement and installation of the waterproofing

Correct selection and use of appropriate processes, tools and equipment

- Completing all work to specification, correct termination and over flashing.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab Equipment Angle grinders Brooms, brushes Buckets Caulking guns Chisels, including cold chisels Cutting blades Electric drills and screwdrivers Fans Floor scrapers Hammers Heat welders, hot air welders, lights Measuring tapes and rules Moisture meters Nylon rollers Pressure rollers Fusion rollers Scissors



National Competency Standards Level-5 for “Civil Technology”



	Seam probes Solvent applicators Spirit levels Straight edges



0732B&CE-141 Install Physical termite barriers

Overview: This competency standard covers the skills and knowledge required to install physical termite barriers, including barriers that combine physical and chemical characteristics. The unit requires the ability to assess techniques and methods of construction, as well as techniques required to prevent termites gaining concealed access to a completed construction. It requires a thorough understanding of client requirements, and the application of company information in order to perform the task. The selection of appropriate equipment, materials and methods is essential for performing the task safely and efficiently.

Competency Units	Performance Criteria
CU-1. Plan for construction process	P1. Identify installation requirements for termite barrier from work order, drawings and supervisor’s instructions. P2. Review work site plan and select installation specification to prevent concealed termite access according to work order and legislative, occupational health and safety (OHS) and company requirements. P3. Advise client of installation procedure according to work order and company requirements. P4. Recognise and adhere to quality assurance requirements according to company requirements. P5. Select and locate materials in readiness for installation according to manufacturer specifications and OHS and company requirements. P6. Select equipment and tools consistent with installation requirements, check serviceability, and report faults to appropriate persons according to manufacturer specifications and OHS and company requirements.
CU-2. Access and assess site.	P1. Access work site according to client and company requirements. P2. Review installation method according to work order and company requirements, and clarify issues with appropriate persons. P3. Check previous trades work for possible effect on proposed installation of termite barrier according to company requirements. P4. Check previous trades work for possible effect on proposed installation of termite barrier according to company requirements. P5. Assess work site for access and safety issues according to legislative, OHS and company requirements.



National Competency Standards Level-5 for “Civil Technology”



CU-3. Prepare site for installation	P1. Identify hazards and control risks at the work site according to company, legislative, OHS and public health and safety requirements. P2. Determine usage pattern of work site to ensure safety of personnel and efficient use of equipment and tools. P3. Identify factors affecting completion of work order and advise appropriate persons promptly.
CU-4. Prepare equipment	P1. Select suitable personal protective equipment (PPE) and use according to manufacturer specifications and legislative, OHS and company requirements. P2. Select equipment and tools and check operational effectiveness according to manufacturer specifications and legislative, OHS and company requirements. P3. Set up equipment and tools according to manufacturer specifications and legislative, OHS and company requirements. P4. Adjust equipment and tools according to manufacturer specifications to suit operator's requirements.
CU-5. Install physical barrier	P1. Install termite barrier to concealed termite access points according to work order, manufacturer specifications and company requirements. P2. Check installation of termite barrier according to company requirements. P3. Conduct work using safe operating practices according to manufacturer specifications and environmental, legislative, OHS and company requirements.
CU-6. Restore work site and complete documentation	P1. Clean equipment, tools and PPE according to manufacturer specifications and environmental, OHS and company requirements. P2. Check equipment, tools and PPE safely and record required maintenance according to manufacturer specifications and OHS and company requirements. P3. Store cleaned equipment, tools and PPE according to company requirements. P4. Dispose of collected waste according to work order, manufacturer specifications and environmental, legislative, OHS and company requirements. P5. Update client records regulatory and complete company documentation and distribute according to legislative and company requirements.



Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1** Describe legislation, regulations, codes of practice and industry advisory standards that apply to the installation of physical termite barriers, including: -OHS legislation, relevant Australian standards and relevant license requirements
- K2** State company management structure and procedures, including: - emergency response procedures, manual-handling techniques, OHS procedures, and reporting channels
- K3** Describe construction methods and materials, such as:- concrete slabs, footings and wall frame materials
- K4** State hazardous substances in the workplace
- K5** State installation equipment
- K6** Describe product knowledge, including manufacturer specifications for equipment and products being used
- K7** Describe subterranean termite ecology as related to termite barrier installation
- K8** Explain work order specifications

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

Carry out correct procedures prior to and during installation of physical termite barrier

Communicate to support team and ensure safe and effective workplace operations

Comply with:- company policies and procedures, including quality assurance, legislative and regulatory requirements, product installation specifications

Identify hazards and risks associated with the installation

Safely and effectively use hand and power tools, plant and equipment

Achieve outcomes in relation to work order.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab equipment • Adhesive applicators



National Competency Standards Level-5 for “Civil Technology”



	• Angle grinders • Bolsters • Brushes and brooms • Drills • Power • Rechargeable • Generators • Hammers • Hoses • Knives • Measuring tapes or rules • Power leads • Rollers • Safety switch equipment • Screwdrivers • Sheet metal or utility cutters or snips • Shovels.



0732B&CE-142 Erect and dismantle slip formwork

Overview: This competency standard covers the skills and knowledge required to plan and prepare, set out formwork, assemble core form system, locate and install penetrations conduct slip system and clean up.

Competency Units	Performance Criteria
CU-1. Plan and prepare.	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements. P4. Select plant, tools and equipment to carry out tasks in consistent with job requirements, check for serviceability, and rectify or report any faults prior to commencement. P5. Calculate material quantity in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, and safely handle materials appropriate to the work application, including required fire resistance rating, ready for use. P7. Identify environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations.
CU-2. Set out formwork.	P1. Locate set out points and lines according to engineer's drawings, survey datum points and site plan for formwork erection. P2. Locate slip form formwork positioning to predetermine set out.
CU-3. Assemble core form system.	P1. Erect and fix internal prefabricated system wall form shutters into location according to engineer's drawings. P2. Fit system to concrete nib walls to heights consistent with engineer's requirements. P3. Install shear key feet to manufacturer specifications. P4. Fit platforms and assembly into core to manufacturer specifications. P5. Fit structural steel system grid work and hydraulic hose lines to manufacturer specifications.



National Competency Standards Level-5 for “Civil Technology”



	P6. Suspend wall form shutters and fit & complete system cladding and platforms to manufacturer specifications and engineer's requirements.
CU-4. Locate and install penetrations.	P1. Set out locations and dimensions of penetrations in accordance with designated tolerance from engineering drawings. P2. Construct penetrations, block-outs and cast-in services where required to engineering drawings. P3. Install penetrations to requirements of engineering drawings.
CU-5. Conduct slip system.	P1. Erect and fix external prefabricated system wall shutters to engineers and manufacturer specifications. P2. Loose and strip shutters according to manufacturer's and OHS requirements. P3. Communicate with rigger to activate electrical/ hydraulic jacking of the system to the new position. P4. Install trailing platforms to engineer's specifications. P5. Dismantle formwork in accordance with manufacturer and engineer's specifications.
CU-6. Clean up	P1. Clear work area and dispose of or recycle materials in accordance with project environmental management plan P2. Clean, check, maintain and store plant, tools and equipment

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of: common formwork faults, problems and suitable rectifications

- K1.** Describe common formwork faults, problems and suitable rectifications
- K2.** State concrete properties
- K3.** Define construction terminology
- K4.** Describe electrical/hydraulic jacking systems
- K5.** Describe formwork materials and techniques
- K6.** Describe hydraulic pressures applied to formwork
- K7.** Explain job safety analysis (JSA) and safe work method statements
- K8.** State material safety data sheets (MSDS)
- K9.** Describe materials storage and environmentally friendly waste management
- K10.** Read, Interpret plans, specifications and drawings
- K11.** Describe plant, tools and equipment types, characteristics, uses and limitation
- K12.** Describe processes for the calculation of material requirements



National Competency Standards Level-5 for “Civil Technology”



K13. State quality requirements for slip form formwork

K14. Describe workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations
- Comply with organizational policies and procedures, including quality requirements
- Safely and effectively use tools, plant and equipment
- Communicate and work effectively and safely with others
- Complete, as part of a team, the erection and dismantling of the slip form formwork for one operation.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab equipment • Air compressors and hoses • Chisels • Hammers • Levelling equipment • Measuring tapes and rules • Nail bags • Pneumatic wrenches • Power drills • Power leads • Proprietary slip form formwork • Spanners • Spirit levels.



0732B&CE-143 Install trench support

Competency Units	Performance Criteria
CU-1. Plan and prepare for installing trench support	P1. Access, interpret and apply trench support documentation, and ensure the work activity is compliant P2. Obtain, read, interpret, clarify and confirm work requirements P3. Identify and address potential risks, hazards and environmental issues, and implement control measures P4. Select and wear personal protective equipment appropriate for work activities P5. Identify, obtain and implement traffic signage requirements P6. Select, and check for faults, equipment and/or attachments for work activities P7. Obtain and interpret emergency procedures, and be prepared for fire/accident/emergency
CU-2. Install trench shoring	P1. Communicate with plant operator and ensure the excavation of trenches complies with site plan, line and depth P2. Determine and prepare shoring method P3. Set out positioning of shoring P4. Position/erect shoring within the trench P5. Secure shoring in position and ensure structural conformity with regulations P6. Clean out excavation P7. Locate ladders for safe access and egress
CU-3. Remove trench shoring	P1. Release jacking mechanisms and remove ladders P2. Check shoring and prepare it for lifting from the trench P3. Remove shoring from trench and store it
CU-4. Conduct housekeeping activities	P1. Clear work area and dispose of or recycle materials P2. Clean and maintain condition of equipment, ensure suitability for use, and address/report issues P3. Manage/report hazards, and maintain a safe working environment P4. Process written records

Overview: This competency standard covers the skills and knowledge required to install trench and excavation support on a new or existing site



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe excavation techniques
- K2.** Interpret Plans, specifications and drawings
- K3.** Define Shoring
- K4.** Describe types & components of shoring
- K5.** Workplace and equipment safety requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Effectively use tools, plant and equipment; and
- Mark out and excavate site as to without damaging services.
- Support trench – timbering in trenches.

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab equipment Battens, props, planks for shoring Sheet piling Trench shields Timber sets



0732B&CE-144 Construct underpinning

Overview: This competency standard covers the skills and knowledge required to It includes planning and preparing, setting out and preparing sections, excavating sections, constructing underpinnings, and cleaning up. Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and industry sectors. Relevant information must be sourced prior to application of the unit.

Competency Units	Performance Criteria
CU-1. Plan and prepare	P1. Access, interpret and apply compliance documentation relevant to the work activity P2. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details to the allotted task P3. Obtain and confirm safety requirements from the site safety plan and organizational policies and procedures, and apply to the allotted task P4. Identify, obtain and implement signage requirements from the project traffic management plan P5. Select tools and equipment to carry out tasks consistent with the requirements of the job, check for serviceability and rectify or report any faults P6. Identify environmental protection requirements from the project environmental management plan, and confirm and apply to the allotted task



National Competency Standards Level-5 for “Civil Technology”



CU-2. Set out and prepare sections	P1. Identify and record underpinning requirements for adjoining properties and roadways from site drawings and surveys of the surrounding construction P2. Identify and implement sections and sequence of excavations from the planned schedule for underpinning P3. Check existing shoring system for soundness and conformation to specifications and design requirements P4. Set out sections for excavation to underpinning specifications and schedule P5. Identify and protect areas for excavation and surrounding working space requirements to provide a safe working area P6. Erect barricades and signage, where required, in accordance with the site safety plan P7. Position plant and equipment for excavations
CU-3. Excavate sections	P1. Excavate designated sections to the designed depth of footings P2. Install trench and excavation support in accordance with soil characteristics, safety considerations and the job safety analysis
CU-4. Construct underpinning	P1. Construct underpinning in accordance with job specifications P2. Backfill excavated sections P3. Underpin alternate sections in sequence according to underpinning schedule
CU-5. Clean up	P1. Clear work area and disposed of or recycled materials in accordance with project environmental management plan P2. Clean, check, maintain and store plant, tools and equipment

Knowledge & Understanding

- K1.** Demonstrate site and equipment safety requirements
- K2.** Explain foundation work
- K3.** Explain civil construction terminology
- K4.** Enlist underpinning techniques
- K5.** Explain construction principles
- K6.** Explain processes for interpreting engineering drawings
- K7.** Explain soil, sand, rock, clay, shale, gravel and silt types and characteristics
- K8.** Define water erosion
- K9.** Explain equipment types, characteristics, technical capabilities and limitations
- K10.** Explain operational, maintenance and basic diagnostic procedures



National Competency Standards Level-5 for “Civil Technology”



K11. Explain site isolation and traffic control responsibilities and authorities

K12. Explain materials safety data sheets and materials handling methods

K13. Describe project quality requirements

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Knowledge of the requirements, procedures and instructions for constructing underpinnings
- Implementation of requirements, procedures and techniques for the safe, effective and efficient completion of underpinning construction
- Working with others to undertake and complete the construction of underpinnings that meets all of the required outcomes
- Consistent timely completion of underpinning construction that safely, effectively and efficiently meets the required outcomes
- Construction of underpinning for a minimum of two projects, one using drilling techniques and one using excavation techniques to the required job specifications

Instruments & Consumables

S No.	Description (Instruments)
1	Personal protective equipment for construction industry.
2	Construction Lab equipment Compressors Fittings and hoses Pneumatic picks and jack hammers Pumps Winches Sheet piling Trench shields Timber sets



0732B&CE-145 Carry out reinforced concrete work

Overview: This competency standard covers the skills and knowledge required to plan and prepare work, place and fix reinforcement, carry out concrete placement and clean-up work site area.

Competency Units	Performance Criteria
CU1. Plan and prepare work	P1. Recognize quality assurance requirements of construction operations and adhered to. P2. Recognize OH&S requirements for application tasks and workplace environment adhered to. P3. Identify reinforcement, type of fixing and locations from instructions/reinforcement schedule, job drawings and specifications. P4. Check formwork/excavation for completion and conformity to receive reinforcement. P5. Select, fit and use appropriate personal protective equipment correctly. P6. Select tools and equipment consistent with job requirements P7. Check delivered reinforcement for correct size type and quantities against reinforcement schedule/details shown in job detail drawings
CU2. Place and fix reinforcement	P1. Cut and bend reinforcement bars to required set -out and drawing details. P2. Tie bars to designed configuration from drawings. P3. Cut reinforcement sheets to required sizes, where applicable. P4. Attach stiffening rods to panels to instructions as required to facilitate handling processes P5. Locate bar chairs/spacers to requirements of reinforcement schedule and job drawings.



National Competency Standards Level-5 for “Civil Technology”



CU3. Carry out concrete placement	P1. Provide assistance provide with the undertaking of relevant concrete tests. P2. Transport concrete correctly and safely with wheelbarrow and discharge into formwork using correct manual handling techniques. P3. Place concrete to instruction, minimizing spillage. P4. Compact concrete to specification and instruction using immersion vibrator or other specified method. P5. Screed concrete to specified levels/grades as per instructions. P6. Finish concrete to instruction to specified surface finish. P7. Identify and apply curing process. P8. Cover concrete surface adequately with appropriate material to support curing process and protect it from damage.
CU4. Clean-up work site area	P1. Clear work are by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to plan and prepare work, place and fix reinforcement, carry out concrete placement and clean-up work site area required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain workplace and equipment safety requirements
- K2. Describe formwork for concrete
- K3. Enlist portable power tools, hand tools
- K4. Define plant and equipment
- K5. Enlist materials relevant to steel-fixing
- K6. Describe materials handling
- K7. Knowledge of drawings and specifications
- K8. Describe reinforcement schedule
- K9. Describe appropriate steel-fixing procedures and legislative requirements

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with Occupational Health and Safety regulations applicable to workplace operations



National Competency Standards Level-5 for “Civil Technology”



- Select and use appropriate processes, tools and equipment
- Apply quality procedures and processes within the context of fixing steel reinforcing
- Check materials for conformity with specifications and job requirements
- Identify and follow assembly location and placement sequence
- Demonstrate safe and effective use of tools and equipment and handling of materials
- Place and tie/weld reinforcement to specification
- Interactively communicate with others to ensure safe and effective operations in fixing the reinforcing

Tools and Equipment

1. Shovels and rakes
2. Wooden floats
3. Steel floats
4. Bull floats
5. Immersion vibrator or vibrating table
6. Tarpaulins/covers
7. Curing agent applicator
8. Steam generator
9. Wheelbarrow
10. Tamping rods
11. Screed boards
12. Edging tool
13. Brooms
14. Bolt cutters
15. Hacksaw
16. Wire nippers
17. Tie wire spool
18. Measuring tape/rule
19. Reinforcement bender



0732B&CE-146 Work safely on roofs

Overview: This competency standard covers the skills and knowledge required to plan and prepare, prepare for work, perform work on roof and clean-up work site area

Competency Units	Performance Criteria
CU1. Plan and prepare	P1. Select tools and equipment as required, P2. Check for serviceability and fix/report any faults P3. Calculate material quantity requirements in accordance with specifications P4. Obtain needed materials needed and check for compliance
CU2. Prepare for work	P1. Verify suitability of the roof structure to support the roof safety system. P2. Inspect and install fall protection and perimeter protection equipment for conformance
CU3. Perform work on roof	P1. Check access from ground to the roofing work area to ensure it is safe and clear of obstructions and hazards P2. Secure roof materials and equipment safely on roof and distribute to eliminate risk of distorting or collapsing the building framework. P3. Check roof safety system is checked periodically for optimum performance, and correct/report faults
CU4. Clean-up work site area	P1. Clear work are by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding to plan and prepare, prepare for work, perform work on roof and clean-up work site area required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain the safe working on roofs
- K2. Explain procedure of installation of fall protection

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Erect, maintain and dismantle, for a roof corner area, fall and perimeter protection, incorporating handrails and foot walk or harnesses and harness fixing points for safe access to the roof, stores and equipment locations

Tools and Equipment

1. Fall protection
2. Ladders
3. Chain blocks, cranes
4. Elevated work platforms
5. Forklifts
6. Hand trolleys, hoists and jacks
7. Rollers
8. Scaffolds
9. Perimeter protection



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-147 Install roof components

Overview: This competency standard covers the skills and knowledge required to install roof components. Site location for work application may be either domestic or commercial and may be a new work site or an existing structure being renovated, extended, restored or maintained.

Competency Units	Performance Criteria
CU1. Prepare for work	P1. Obtain plans and specifications P2. Select and install industrial roof components according to Work health and safety (WHS) and environmental P3. requirements P4. Identified and adhere quality assurance requirements to according to workplace requirements. P5. Plan and sequence tasks in conjunction with others involved in or work. P6. Select and check tools and equipment, including personal protective equipment for serviceability. P7. Prepare work area to support efficient selection and installation of industrial roof components.
CU2. Identify Installation requirements.	P1. Identify Industrial roof components from plans and specifications and are compatible with adjacent materials and other relevant information. P2. Select and check proposed sealant, fixing materials, and roofing and flashing materials for compliance with plans, specifications and relevant standards. P3. Identify, order and collect Materials according to workplace procedures. P4. Check materials and equipment for compliance with docket and order form and for acceptable condition, and report faults P5. Observe sustainability principles and concepts when preparing for and undertaking work process. P6. Identify location of installation and opening size from plans and manufacturer specifications. P7. Check location for obstructions that may affect installation.
CU3. Install roof components.	P1. Erect industrial component to comply with manufacturer recommendations. P2. Set out industrial roof component to comply with plans, specifications and site measurements P3. Install structural supports to comply with plans and specifications. P4. Prepare openings to comply with plans.



National Competency Standards Level-5 for “Civil Technology”



	P5. Locate and fix Mullions, frames, baffles, sheeting and louver blades to comply with manufacturer recommendations. P6. Install flashing and waterproofing to comply with relevant standards, plans, specifications, manufacturer recommendations and regulatory authorities' requirements. P7. Test installation performance.
CU4. Clean-up work site area	P1. Clear work are by disposing of materials. P2. Clean, check, maintain and store tools and equipment's according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain capillary action, thermal expansion and fabrication techniques to prevent leaking
- K2. Explain corrosion prevention treatment requirements of cut sheets
- K3. Explain job safety analysis (JSA) and safe work method statements (SWMS)
- K4. Describe processes of erecting and installing industrial roof components
- K5. Describe relevant WHS regulations and fall protection codes and requirements
- K6. Explain relevant statutory requirements related to installing roof components
- K7. Define SI system of measurement
- K8. Explain types of fasteners, fixings and sealants and their application to the installation of roof components.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locating interpreting and applying relevant information, relevant standards and specifications to determine requirements, plan and install industrial components in roofs
- Applying safety requirements throughout the work sequence, including electrical safety requirements and the use of personal protective clothing and equipment
- Given the plans and specifications of an industrial roof, determine the material requirements, selecting and installing two of the following components in a roof (one on a ridge line and another in roof sheeting, which may include insulation):
 - Thermal vent or a skylight
 - Non-mechanised ventilator unit
 - Manual box-type louvre unit



National Competency Standards Level-5 for “Civil Technology”



- Continuous roof ventilator (ridge or slope mounted), ensuring:
- Application of sustainability principles and concepts
- Correct identification of requirements and details of proposed installations
- Completed installation must fit
- Correct selection and use of appropriate processes, tools and equipment
- Completing all work to specification
- Compliance with regulations, relevant standards and organizational quality procedures and processes
- Communicating and working effectively and safely with others

Tools and Equipment

1. Cranes
2. Fall protection equipment
3. Hand and power tools
4. Ladders
5. Levelling equipment
6. Lifting and load shifting equipment, including:
7. Chain blocks
8. Elevated work platforms
9. Forklifts
10. Hand trolleys
11. Hoists and jacks
12. Restricted height scaffolds
13. Rollers
14. Measuring equipment
15. Perimeter guard rails.



0732B&CE-148 Install roof drainage

Overview: This competency standard covers the skills and knowledge required to install roof drainage components and rainwater goods for commercial and residential roof systems

Competency Units	Performance Criteria
CU1. Plan and prepare	P1. Select tools and equipment as per specifications, P2. Check for serviceability and any faults P3. Calculate material quantity requirements in accordance with specifications P4. Obtain needed materials and check for compliance
CU2. Identify installation requirements	P1. Identify roof drainage components required for installation from drawings and specifications. P2. Draw fabrication patterns based on design and drawing of roof drainage. P3. Calculate quantity, type and sizing of drainage components, rain water materials and accessories required from drawings and specifications. P4. Install gutter support system to comply with engineering advice for the building. P5. Mark out materials for fabricating drainage components, as specified in drawings
CU3. Fabricate roof drainage components	P1. Determine methods of fabrication, tools and materials requirements based on drawings and job requirement P2. Fabricate roof drainage components in compliance with drawings and specifications
CU4. Set out and install roof drainage components	P1. Arrange roof drainage components in order of installation and to comply with and site measurements. P2. Install structural supports and join roof drainage components securely and watertight. P3. Install flashing and waterproofing to comply with the plans P4. Test the performance of the roof-drainage system to determine satisfactory installation and remedy any faults or leaks
CU5. Clean-up work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Explain capillary action, thermal expansion and fabrication techniques to prevent leaking installations
- K2. Explain characteristics of various metals and finishes
- K3. Describe corrosion prevention treatment requirements of cut sheets
- K4. Explain procedure of joining of materials
- K5. Describe processes of fabricating, jointing and fixing roof drainage components
- K6. Explain types of fasteners, fixings and sealants and their application to the fabrication and installation of roof coverings

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- For a roofed area of at least 4 square metres, determine requirements, select, fabricate and install valley gutter, box gutter, eaves gutter and downpipe system, with gutter supports, expansion joints and caps.

Tools and Equipment

1. Drawing equipment
2. Fall protection equipment
3. Hand and power tools
4. Ladders
5. Lifting and load shifting equipment, including:
6. Chain blocks
7. Cranes
8. Elevated work platforms
9. Forklifts
10. Hand trolleys
11. Hoists and jacks
12. Restricted height scaffolds
13. Rollers



0732B&CE-149 Lay roof tiles

Overview: This competency standard covers the skills and knowledge required to Plan and prepare for work, prepare roof face, Cut and fix battens, Install tiles and Clean-up work site area.

Competency Units	Performance Criteria
CU1. Plan and prepare for work.	P1. Select tools and equipment as per requirement. P2. Check for serviceability and any faults P3. Calculate material quantity requirements in accordance with specifications P4. Obtain needed materials and check for compliance
CU2. Prepare roof face	P1. Install fall arrest system to roof perimeter and roof surface and structure and check for stability and safe access P2. Assemble tile elevator and operate in accordance with site conditions and the manufacturer's instructions. P3. Remove existing roofing material without damage to the roof frame P4. Clean areas already tiled with high-pressure water cleaners to the new installation's condition. P5. Obtain required materials and calculate required tiles minimizing quantity by planning efficient cuts at the hip and valley joints. P6. Set out roof surface to manufacturer recommendations for specified tile.
CU3. Cut and fix battens	P1. Measure battens, cut and fix using selected fasteners at specified centres. P2. Check completed sarking and batten work for correct alignment and fixing



CU4. Install tiles	P1. Load tiles onto roof, support and distribute evenly. P2. Spread, cut, secure and install roof tiles to manufacturer specifications. P3. Install flashing and waterproofing to comply with the plans and manufacturers’ recommendations. P4. Bed roof tiles using correct mortar mix, maintaining alignment. P5. Point roof tiles with mortar to a flush, smooth finish and install to manufacturer specifications
CU4. Clean-up work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Describe characteristics and applications of roof tiling materials
K2.	Explain roof construction systems and structures and tiling considerations
K3.	Explain roof tiling techniques and procedures

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of sarking, battens, tile cutting, bedding and pointing in roof tiling
- Prepare space for entire work
- Installation of different tiles for roof system
- Adopt safety measures for entire job

Tools and Equipment

1. Air compressors and hoses



National Competency Standards Level-5 for “Civil Technology”



2. Bedding frames, brooms, buckets
3. Calculators, chalk lines, chisels, concrete mixers
4. Elevators
5. Fall safety devices
6. Gutter protectors
7. Hammers, hand saws, high pressure water cleaners
8. Ladders
9. Measuring tapes and rules
10. Nail guns
11. Pinchers, power drills, power saws
12. Shovels, squares, string lines
13. Tile cutters, trowels



0732B&CE-150 Erect roof trusses

Overview: This competency standard covers the skills and knowledge required to Plan and prepare for work, Locate roof trusses and Clean-up work site area.

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Select tools and equipment as per requirement. P2. Check for serviceability and any faults P3. Calculate material quantity requirements in accordance with specifications P4. Obtain needed materials and check for compliance
CU2. Locate roof trusses	P1. Set out location of roof trusses for hip and valley roofs on wall top plates to plan layout and specifications. P2. Perform earthing of steel frames temporarily during erection and connect to permanent earthing system upon completion. P3. Erect and fix roof trusses including temporary bracing, to set out positions in correct sequence to line at apex and plumb. P4. Install top chord above wall plate to be constant height above wall plate. P5. Fix ceiling trimming and creeper rafter member to specifications. P6. Use bottom chord of truss to provide lateral support for internal walls. P7. Provide roof bracing through construction, valley construction, diagonal metal tension or timber bracing or a combination of these, and fixed to specification. P8. Fix lateral restraints to truss chords in position to manufacturer specifications.
CU3. Clean-up work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement



Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Knowledge of plans, specifications and drawings for roof trusses and roof bevels
- K2. Knowledge of roof calculations for lengths, quantities and pitch
- K3. Explain roof load transfer
- K4. Describe roof shape and geometry
- K5. Explain roof truss erection and construction techniques
- K6. Describe roof truss materials and installation, including fire control and separation materials
- K7. Define roof types and truss components
- K8. Describe techniques for lifting and positioning of trusses
- K9. Define Temporary and permanent bracing
- K10. Explain Truss set out

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare standard trusses to incorporate bracing for a full size roof in timber and metal.
- Prepare space for entire work
- Plan for relevant job
- Adopt safety measures

Tools and Equipment

1. Air compressors and hoses
2. Clamps
3. Hammers
4. Marking equipment, measuring tapes and rules
5. Nail bags, nail guns
6. Power drills Power leads Power saws



National Competency Standards Level-5 for “Civil Technology”



7. Saw stools, scaffolding, screwdrivers, spanners, spirit levels
8. Squares (combination/tri), string lines
9. Welding equipment.



10.12. Basic Quantity Surveying

0732B&CE-151 Produce rough cost estimates of buildings

Overview: This competency standard covers the skills and knowledge required to Prepare Rough Cost by unit rate method, Prepare rough cost by plinth area method, Specify items of work for according to categories of Buildings and Specify items of work in detail for Buildings

Competency Unit	Performance Criteria
CU-1. Prepare rough cost estimate by unit rate method.	P1. Read line plan. P2. Calculate number of units. P3. Calculate unit rate from existing building. P4. Compile results of estimate.
CU-2. Prepare Rough Cost estimate by plinth area method.	P1. Calculate covered area of building P2. Calculate cost per square foot from existing buildings P3. Calculate cost estimate
CU-3. Identify items of work in accordance with categories of Building.	P1. Prepare General specifications for first class building. P2. Prepare General specifications for second class building. P3. Prepare General specifications for third class building. P4. Prepare General specifications for fourth class building.
CU-4. Identify items of work to draft specifications.	P1. Identify material, product (size of crush, type of sand,) P2. Draft standards of materials P3. Draft execution of item of work. P4. Draft units of measurement and rate.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** State formulae for area, perimeters and volumes of various plane and solid geometrical figures.
- K2.** State the units of measurements in FPS, MKS and SI.
- K3.** Convert the units.
- K4.** Describe the importance of estimates.
- K5.** State the data required for preparation of estimates.



National Competency Standards Level-5 for “Civil Technology”



- K6. State the types of estimate.
- K7. Define specifications.
- K8. Explain the purpose and types of specification.
- K9. State general specifications of buildings & Road.
- K10. Describe the detailed specifications of important items of works.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Rough cost Estimate of building.
2. Draft of General and Detailed Specification.

Instruments & Consumables

- Calculator
- Ruler
- Pencil



0732B&CE-152 Evaluate items of work for straight wall, T, L, H, U shaped and circular walls.

Overview: This competency standard covers the skills and knowledge required to calculate quantities for walls by long & short wall method and calculate quantities for walls by center line method

Competency Unit	Performance Criteria
CU-1. Calculate quantities of walls by long & short wall method	P1. Identify the types of wall technical i.e. I-wall, H-Wall, Tee Wall. P2. Implement the principles of I-wall, H-Wall, Tee Wall. P3. Calculate the quantities of items of work for straight wall. P4. Calculate the quantities of items of work for T walls P5. Calculate the quantities of items of work for L walls P6. Calculate the quantities of items of work for H walls.
CU-2. Calculate quantities for walls by center line method	P1. Identify the types of wall technical i.e. I-wall, H-Wall, Tee Wall. P2. Mark the center line in the wall and calculate length of center line. P3. Calculate quantities of items of work for circular walls. P4. Calculate quantities of items of work for U walls.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Terms used in quantity surveying (provisional sum, prime cost, input rates, MRS, CSR, SMM, CESMM, Premium, rebate, contingencies, petty establishment charges, cost, value, bill, FIDIC and Bo Qs).
- K2.** Prepare rough cost estimate of a building from given line plan or covered area.
- K3.** Distinguish between P.W.D and English method of recording measurements.
- K4.** List the all items of works for walls.
- K5.** Determine quantities of all items of works for straight; D, F, H, T shaped walls by long and short wall method.
- K6.** Explain center line method and determine quantities for U shaped walls and circular walls.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 1- Measurement sheets for all the above walls.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-153 Produce detailed estimate of a single storey building.

Overview: This competency standard covers the skills and knowledge required to calculate quantities for single storey building, prepare Abstract of Cost for single

Competency Unit	Performance Criteria
CU-1. Work out quantities for a single room, two roomed quarter and C-type building by Centre Line method	P1. Draw the center lines in plan. P2. Sum up the lengths of center lines. P3. Implement the principle of center line method. P4. Calculate the quantities of items of work for building P5. Implement the principles of deduction for surface rendering.
CU-2. Prepare Abstract of Cost for a single room, two roomed quarter and C-type building	P1. Draw Abstract of Cost table. P2. Incorporate quantities of all items of work and relevant rates. P3. Calculate the amount of each items of work. P4. Sum up the amounts. P5. Add premium/ contractor's profit on amounts of relevant rates. P6. Sum up the amounts and add contingencies. P7. Add building Services charges for the building. P8. Add other centage charges for the building.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** List the all items of works for a residential building (only building position except public health and electrification installation).
- K2.** Workout quantities of all items of works for a single storey building (building portion only) from given drawings.
- K3.** Prepare bill of quantities and abstract of cost with the help of composite schedule of rates.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

1. Detailed estimate of a single storey buildings.

Instruments & Consumables

- 1 Calculator, 2 Ruler, 3 Pencil



0732B&CE-154 Produce Annual/Special repair estimates-Building and Road.

Overview: This competency standard covers the skills and knowledge required to prepare of annual repair and special repair estimates for building, prepare of annual repair/ special repair estimates of roads.

Competency Unit	Performance Criteria
CU-1. Prepare Annual repair estimate for Building	P1. Identify the items of work for Annual Repair of building. P2. Calculate quantities of items of work for Annual Repair. P3. Prepare Abstract of Cost for Annual Repair for building
CU-2. Prepare Special repair estimate for Building	P1. Identify the items of work for special repair of building. P2. Calculate quantities items of work for special Repair. P3. Prepare Abstract of Cost for Special Repair for building
CU-3. Prepare Annual Repair estimate of Roads.	P4. Identify the items of work for Annual Repair of road. P5. Calculate quantities of items of work for Annual Repair. P6. Prepare Abstract of Cost for Annual Repair for road.
CU-4. Prepare Special Repair estimate of Roads.	P4. Identify the items of work for special repair of road. P5. Calculate quantities items of work for special Repair. P6. Prepare Abstract of Cost for Special Repair for road.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.**Enlist items of work for annual and special repair estimate for a given building.
- K2.**Prepare annual repair estimate for a given building.
- K3.**Prepare special repair estimate for a given building.
- K4.**Prepare special repair for bituminous road.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

1. Annual Repair Estimate of Building.
2. Special Repair Estimate of Building.
3. Annual and Special Repair Estimate of Bituminous Road.

Instruments & Consumables

- 1 Calculator, 2 Ruler, 3 Pencil



0732B&CE-155 Evaluate Earth work for Civil Engineering structures

Overview: This competency standard covers the skills and knowledge required to calculate earth work of earthen embankment by given design and data using mean area method, using mid sectional area method, Prismoidal formula Method for road in plane areas, in hilly areas and for irrigation channel

Competency Unit	Performance Criteria
CU-1. Calculate earth work of earthen embankment by given design and data using mean area method.	P1. Draw table for calculation by mean area method. P2. Incorporate the data of NSL, FL and calculate depth of filling. P3. Calculate the x-sectional area at each RD. P4. Calculate mean area and length for this mean area. P5. Calculate the volume of earth work for filling.
CU-2. Calculate earth work of earthen embankment by given design and data using mid sectional area method.	P1. Draw table for calculation by Mid Sectional area method. P2. Incorporate the data of NSL, FL, and calculate mean depth of filling. P3. Calculate the mid x-sectional area for consecutive RDs. and length for this mid x-sectional area. P4. Calculate the volume of earth work for filling.
CU-3. Calculate earth work of earthen embankment by given design and data using Prismoidal formula Method.	P1. Draw table for calculation by Prismoidal Formula method. P2. Calculate the x-sectional area at each RD. P3. Calculate the mid x-sectional area for consecutive RDs. and length for this mid x-sectional area. P4. Calculate volume by Prismoidal Formula
CU-4. Calculate earth work of road in plane areas	P1. Draw table for calculation for the specified method. P2. Incorporate the data of NSL, FL, and calculate depth of filling or and cutting as the case. P3. Calculate the areas and length. P5. Calculate the volume of earth work.
CU-5. Calculate earth work for road in hilly areas.	P1. Draw table for calculation for the specified method. P2. Incorporate the data of NSL, FL, and calculate depth of filling or and cutting as the case. P3. Calculate the areas and length. P5. Calculate the volume of earth work.
CU-6. Calculate earth work for irrigation channel.	P1. Draw table for calculation as per section of channel. P2. Incorporate the data of NSL, FL, and calculate depth of filling or and cutting as the case.



	P3. Calculate the areas and length. P5. Calculate the volume of earth work.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define various terms used for earthwork.
- K2.** State data required for computation of earth works. (Intermediate point-IMP)
- K3.** Explain method to determine quantity of earthwork and their respective proforma (mid area, mean area, coordinates Prismoidal & Graphical).
- K4.** Workout (determine) quantity of earthwork for embankments, roads and irrigation channels.
- K5.** Explain remodeling of irrigations channels.
- K6.** Workout quantity of earthwork for remodeling of a channel from given x-sections of channels.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Earth work of calculations by mean area method.
2. Earth work of calculations by mid sectional area method.
3. Earth work of calculations by Prismoidal formula Method.
4. Earth work of calculations for road in plane area.
5. Earth work of calculations for road in hilly area.
6. Earth work of calculations for irrigation channels.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-156 Produce detailed estimate of Arterial roads

Overview: This competency standard covers the skills and knowledge required to prepare estimate of arterial bituminous road, prepare estimate of concrete road and Plan estimate for special repair of bituminous road

Competency Unit	Performance Criteria
CU-1. Prepare estimate of arterial bituminous road.	P1. Calculate the quantities of Jungle clearance, clearing & Grubbing and Uprooting of trees as per requirement of site. P2. Calculate area of site for surveying and levelling. P3. Calculate area of permanent land. P4. Calculate the volume of earth work. P5. Calculate area of temporary land. P6. Calculate volume of sub-base and base course of road. P7. Calculate area of surfacing (TST or carpet). P8. Measure items of boundary pillar, km post, $\frac{1}{4}$ km posts, sign boards.
CU-2. Prepare estimate of concrete road.	P1. Calculate the quantities of Jungle clearance, clearing & Grubbing and Uprooting of trees as per requirement of site. P2. Calculate area of site for surveying and levelling. P3. Calculate area of permanent land. P4. Calculate the volume of earth work. P5. Calculate area of temporary land. P6. Calculate volume of sub-base and concrete of road. P7. Measure quantity of expansion joints. P8. Measure quantity of dowel bars. P9. Measure items of boundary pillar, km post, $\frac{1}{4}$ km posts, sign boards.
CU-3. Prepare estimate of Crete road.	P1. Calculate the quantities of Jungle clearance, clearing & Grubbing and Uprooting of trees as per requirement of site. P2. Calculate area of site for surveying and levelling. P3. Calculate area of permanent land. P4. Calculate the volume of earth work. P5. Calculate area of temporary land. P6. Calculate volume of sub-base and concrete of road.



National Competency Standards Level-5 for “Civil Technology”



	P7. Measure items of boundary pillar, km post, ¼ km posts, sign boards.
CU-4. Prepare estimate for special repair of bituminous road.	P1. Take the manual measurements from site. P2. Calculate the volume of dismantling base & sub-base. P3. Calculate volume of sub-base and base course of road. P4. Calculate area of surfacing (TST or carpet). P5. Prepare abstract of cost

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

1. Describe parts of road structure and their specifications.
2. State the units and method of measurement of all items of works for a road.
3. Prepare detailed & repair estimate for bitumen and cement concrete road.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed estimate of bituminous arterial road.
2. Detailed estimate of concrete road.
3. Detailed estimate of Crete road.
4. Detailed special repair estimate of bituminous road.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-157 Produce material statements

Overview: This competency standard covers the skills and knowledge required to Prepare material statements for Brick work in C/S (1:6), Prepare material statements for foundation concrete (1:6:12). Prepare material statements for RCC work of CC (1:2:4), Prepare material statements for Cement plaster in C/S 1:6), Prepare material statements for DPC 1.5” thick of CC (1:2:4), Prepare material statements for Cement pointing with C/S (1:3), Prepare material statements for whitewashing 3 coats.

Competency Unit	Performance Criteria
CU-1. Prepare material statements for Brick work in C/S (1:6)	P1. Identify materials required for work P2. Evaluate the proportion required for mortar P3. Calculate the number of bricks P4. Calculate proportional quantity of cement and sand P5. Fill the quantities in schedule of materials table.
CU-2. Prepare material statements for foundation concrete (1:6:12)	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work
CU-3. Prepare material statements for RCC work of CC (1:2:4).	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work
CU-4. Prepare material statements for Cement plaster in C/S 1:6).	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work
CU-5. Prepare material statements for DPC 1.5” thick of CC (1:2:4)	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work
CU-6. Prepare material statements for Cement pointing with C/S (1:3).	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work



National Competency Standards Level-5 for “Civil Technology”



CU-7. Prepare material statements for whitewashing 3 coats.	P1. Identify materials required for work P2. Evaluate the proportion required for work P3. Evaluate the setting time required for work P4. Evaluate the curing time required for work

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

1. Define Materials Statement.
2. Know the dry materials required for different items of buildings.
3. Determine quantity of materials required for various items of building works.
4. Prepare material statement for various items of building works.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Material statements for Brick work in C/S (1:6)
2. Material statements for foundation concrete (1:6:12).
3. Material statements for RCC work of CC (1:2:4).
4. Material statements for Cement plaster in C/S 1:6).
5. Material statements for DPC 1.5” thick of CC (1:2:4).
6. Material statements for Cement pointing with C/S (1:3).
7. Material statements for whitewashing 3 coats.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-158 Analyse Rates of different items of work for building

Overview: This competency standard covers the skills and knowledge required to evaluate rates cement concrete of different ratios, Brick work in cement mortar in foundation and plinth and superstructure, dry brick paving, cement plaster of ratios, cement pointing, white washing.

Competency Unit	Performance Criteria
CU1. Prepare Rate analysis of Cement concrete (1:2:4)	P1. Identify materials, their ratio and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for the concrete (1:2:4). P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.
CU2. Prepare Rate analysis of Cement concrete (1:6:12)	P1. Identify materials, their ratio and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for the concrete (1:6:12). P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.
CU3. Prepare Rate analysis of Brick work in cement mortar (1:6) in foundation and plinth	P1. Identify materials, their ratio and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for the brick work in foundations & plinth. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.



National Competency Standards Level-5 for “Civil Technology”



CU4. Prepare Rate analysis of Brick work in cement mortar (1:6) in superstructure.	P1. Identify materials, their ratio and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for the brick work in superstructure. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.
CU5. Prepare Rate analysis of dry brick paving sand grouted on edge.	P1. Identify materials and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for the brick paving on edge. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.
CU6. Prepare Rate analysis of cement plaster with Cement sand (1:6) up to 20 ft height on brick walls.	P1. Identify materials, thickness of plaster and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for cement plaster. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.
CU7. Prepare Rate analysis of cement pointing with Cement sand (1:2) upto 20 ft height on brick walls.	P1. Identify materials, type of pointing and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for cement pointing. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.



National Competency Standards Level-5 for “Civil Technology”



CU8. Prepare Rate analysis of white washing 3 coats on new plane surface of plaster.	P1. Identify materials, number of coats and unit of rate. P2. Calculate materials and their cost by input rates (MRS). P3. Calculate the labour charges for white washing. P4. Calculate the carriage charges for the ingredients. P5. Add sundries lump sum charges (tools plant, overheads, taxes etc.). P6. Sum up the amounts and add contractor's profit. P7. Add water charges.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe the purpose of rate analysis.
- K2. Explain prerequisites for analysis of rate of items of works, i.e. market rates of materials and labour, carriage, out-turn of labour, specifications, overhead costs etc labour required for different constructional works output of machinery.
- K3. Prepare analysis of rates for important items of work- concrete, RCC, brick work, DPC, brick paving, cement plaster, and cement pointing.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Analysis of rate for cement concrete (1:6:12).
2. Analysis of rate for cement concrete (1:2:4).
3. Analysis of rate for Brick work in cement mortar (1:6) in foundation and plinth.
4. Analysis of rate for Brick work in cement mortar (1:6) in superstructure.
5. Analysis of rate for dry brick paving on edge.
6. Analysis of rate for cement plaster in C/S (1:6) on walls.
7. Analysis of rate for cement pointing in C/S (1:6) on walls.
8. Analysis of rate for white washing 3 coats on new surface.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-159 Produce of rough cost estimate of water supply scheme.

Overview: This competency standard covers the skills and knowledge required to prepare rough cost estimate and hydraulic statement for water supply scheme.

Competency Unit	Performance Criteria
CU-1. Prepare Rough cost Estimate of pipe lines	P1. Take out lengths of each diameter pipe. P2. Prepare analysis of rate for pipe line. P3. Calculate amount of pipe line.
CU-2. Prepare Rough cost Estimate of water tank	P1. Collect population of area. P2. Calculate capacity of tank in gallons. P3. Calculate cost of construction of tank.
CU-3. Prepare Rough cost Estimate of tube well	P1. Calculate the cost for investigation of source. P2. Calculate the cost for Boring & lowering of pipe. P3. Calculate the cost for pump and pumping machinery. P4. Calculate the cost for pump room. P5. Calculate the cost for external electrification
CU-4. Prepare hydraulic statement for pipe lines.	P1. Calculate population based on Area to be served for each pipe line. P2. Calculate the discharge required for each pipe line during peak hours (starting from source of water). P3. Calculate head losses in each pipe line. P4. Calculate Ground level & Hydraulic levels in each pipe line. P5. Calculate Terminal Level Difference

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define Hydraulic Statement.
- K2. Enlist components of water supply scheme.
- K3. List all item of works for pipe line and their measurement units.
- K4. Draw table of hydraulic Statement.
- K5. Describe the elements of hydraulic statement.
- K6. Explain the procedure for the preparation of hydraulic statement.



National Competency Standards Level-5 for “Civil Technology”



- K7. Explain the procedure for the preparation of rough cost estimate of water supply.
- K8. Describe working out quantities of each item of work for pipe line and pump room,
- K9. Prepare bill of quantities and abstract of cost.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed estimate of pipe line.
2. Detailed estimate of pump room.
3. Detailed estimate of tube well.
4. Hydraulic statement of Water Supply Scheme.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-160 Produce of rough cost estimate of Sewerage scheme.

Overview: This competency standard covers the skills and knowledge required to prepare rough cost estimate and hydraulic statement for sewerage scheme.

Competency Unit	Performance Criteria
CU-1. Prepare Rough cost Estimate of sewer lines	P1. Take out lengths of each dia pipe. P2. Prepare analysis of rate for sewer line. P3. Calculate amount of sewer line.
CU-2. Prepare Rough cost Estimate of manhole	P1. Calculate quantities of excavation & foundation concrete. P2. Calculate the quantities of brick work & RCC work. P3. Calculate the quantities of flooring concrete & plaster. P4. Calculate the quantities of iron steps, manhole cover. P5. Prepare abstract of cost.
CU-3. Prepare Rough cost Estimate of Septic Tank.	P1. Calculate quantities of excavation & foundation concrete. P2. Calculate the quantities of brick work & RCC work. P3. Calculate the quantities of flooring concrete & plaster. P4. Calculate the quantities of iron steps, manhole cover vent pipe, inlet and outlet pipes. P5. Prepare abstract of cost.
CU-4. Prepare hydraulic statement for pipe lines.	P1. Calculate population based on Area to be served for each pipe line. P2. Calculate the discharge required for each pipe line during peak hours (starting from source of water). P3. Calculate head losses in each pipe line. P4. Calculate Ground level & Hydraulic levels in each pipe line. P5. Calculate Terminal Level Difference

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define Hydraulic Statement.
- K2. Enlist components of sewerage scheme.
- K3. Draw table of hydraulic Statement.



National Competency Standards Level-5 for “Civil Technology”



- K4. Describe the elements of hydraulic statement.
- K5. Explain the procedure for the preparation of hydraulic statement.
- K6. List all item of works for a manhole, septic tank & sewer line and their measurement units.
- K7. Explain the procedure for the preparation of rough cost estimate of water supply and sewerage schemes.
- K8. Work out quantities of each item of work for sewer line and manhole from given drawing.
- K9. Prepare bill of quantities and abstract of cost.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 1. Detailed estimate of Manhole.
- 2. Detailed estimate of Sewer line.
- 3. Detailed estimate of septic Tank.
- 4. Hydraulic statement of Sewerage Scheme.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-161 Evaluate value & standard rent of an existing building

Overview: This competency standard covers the skills and knowledge required to evaluate value & standard rent of an existing building.

Competency Unit	Performance Criteria
CU-1. Calculate present market value of an existing building by standard rent method	P1. Calculate the gross rent from monthly rent. P2. Calculate the gross out goings (taxes, loss, running expenditures, maintenance charge, sinking fund, Insurance). P3. Calculate the net rent. P4. Calculate the capitalised value (Present value).
CU-2. Find out standard rent of government buildings.	P1. Calculate the plinth area of building. P2. Calculate plinth area rate considering all factors. P3. Calculate value of building. P4. Calculate the annual rent on construction cost. P5. Calculate the monthly rent.
CU-3. Find out standard rent of private buildings.	P1. Calculate the plinth area of building. P2. Calculate plinth area rate considering all factors. P3. Calculate value of building. P4. Calculate the annual rent on construction cost and for cost of land. P5. Calculate the monthly rent.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. State the purpose of valuation.
- K2. Explain terms, book value, market value, salvage value, scrap value, sinking fund, year's purchase, annuity, capitalized value, depreciation and price variation.
- K3. Determine the depreciation of a building by straight line method, constant percentage method and sinking fund method.
- K4. Determine the depreciation of machinery.
- K5. Determine the value of a building by rental method, valuation based on profit and depreciation method.
- K6. Determine rent for government and private building

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Calculation sheet for valuation by standard rent method.
2. Calculation sheet for valuation by Depreciation method.
3. Calculation sheet for rent of Government buildings.
4. Calculation sheet for rent of private buildings.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-162 Produce Detailed Estimate of Culverts.

Overview: This competency standard covers the skills and knowledge required to Prepare Estimate of slab and arched Culverts.

Competency Unit	Performance Criteria
CU-1. Undertake the measurement based on SMM /CSR for single span RCC slab road culvert.	P1. Calculate the quantities of all items of work for substructure for RCC Slab culvert. P2. Calculate the quantities of all items of work for superstructure RCC Slab culvert. P3. Calculate the quantities of all items of work for road structure RCC Slab culvert.
CU-2. Prepare abstract of cost using MRS/ CSR for single span RCC slab culvert	P1. Incorporate quantities of all items of work and relevant rates Abstract of Quantities table. P2. Calculate the amount of each items of work and Sum up the amounts. P3. Add premium/ contractor's profit on amounts of relevant rates.
CU-3. Undertake the measurement based on SMM /CSR two span segmental arch culvert	P1. Calculate the quantities of all items of work for substructure. P2. Calculate the quantities of all items of work for superstructure. P3. Calculate the quantities of all items of work for road structure.
CU-4. Prepare abstract of cost using MRS/ CSR for two span segmental arch culvert	P1. Incorporate quantities of all items of work and relevant rates in Abstract of Quantities table. P2. Calculate the amount of each items of work and Sum up the amounts. P3. Add premium/ contractor's profit on amounts of relevant rates.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required:

- K1. Define culvert.
- K2. State the different parts of RCC Slab culvert and segmental arch culvert.
- K3. Enlist the items of work for estimation of RCC Slab culvert and segmental arch culvert.
- K4. Enlist the items unit of measurement and units of rate for both culverts.
- K5. Apply principles of geometry and mensuration to calculate quantities.
- K6. Apply the procedure for preparation of abstract of cost.



National Competency Standards Level-5 for “Civil Technology”



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed Estimate for single Span RCC Slab Culvert.
2. Detailed Estimate for two Span Segmental arched Culvert

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-163 Produce Detailed Estimate of Bridge.

Overview: This competency standard covers the skills and knowledge required to prepare detailed estimate of R.C. C. Bridge.

Competency Unit	Performance Criteria
CU-1. Measure quantities of R. C. C. Deck of Bridge with masonry supports, 2 spans, 25 ft each, based on SMM /CSR/MRS.	P1. Draw abstract of quantities table. P2. Calculate quantities of items of for work below bed level of bridge. P3. Calculate quantities of items of work for above bed level of abutments, wing walls & pier of bridge. P4. Calculate quantities of super structure of bridge. P5. Calculate the quantities for TST Surfacing. P6. Prepare Bill of Quantities.
CU-2. Prepare bar bending schedule for RCC structures of Bridge.	P1. Calculate number of bars for each structure. P2. Calculate length of bars for each structure. P3. Calculate unit length weight for each dia. of bar. P4. Draw table of bar bending schedule. P5. Insert calculations in the table of schedule of bar. P6. Perform calculations to calculate weight for each type of bar and total weight.
CU-3. Prepare Abstract of cost of R. C. C. Bridge	P1. Draw Abstract of cost table. P2. Put quantities of all items of work and relevant rates. P3. Calculate amount of each item of work by incorporation of rates from MRS. P4. Sum up the amounts. P5. Add premium/ contractor's profit on amounts of relevant rates. P6. Sum up the amounts and add contingencies. P7. Add petty establishment charges.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K1. Describe technical terms used in bridges.



National Competency Standards Level-5 for “Civil Technology”



K2. Enlist & describe parts of Bridge (substructure and superstructure)

K3. Enlist different items of work for RCC Over Head Deck Bridge.

K4. Instructions on calculation of quantities of different items of work.

K5. Instructions on preparation of Abstract of Cost.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed estimate of R. C. C. Bridge.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



10.13. Water Supply

0732B&CE-164 Layout for domestic water supply

Overview: This competency standard covers the skills and knowledge required for layout domestic water supply in residence and residential schemes.

Competency Units	Performance Criteria
CS-1. Prepare for works	P1. Interpret work instructions P2. Plan according to job requirements P3. Organise duties P4. Select appropriate tools & equipment P5. Select PPEs
CS-2. Lay out for water supply scheme	P1. Mark North Point on drawing sheet P2. Measure the Scheme area. P3. Interpret layout plan by scale P4. Identify sources of water supply P5. Indicate Water Conveyance System. P6. Show storage Reservoirs P7. Locate Main, sub main and branches

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Define water Layout system.
- K2- Define fundamentals of water reservoirs
- K3- Explain Types of water sources
- K4- Describe applications of water connections with main to branches
- K5- Knowledge to prepare work or task.
- K6- Knowledge of safety measures.
- K7. Explain gravity and pressure supply of water

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Study of different water supply system
- Installation of water supply scheme layout
- Indicate water reservoir
- Indicate gravity and pumping system
- Clarity to organise duties to perform task



TOOLS AND EQUIPMENT'S

14. Pencil
15. Eraser
16. Sharpner
17. Calculator
18. Measuring scale
19. Drawing sheet
20. Drawing board
21. Tee Square
22. Set Square
23. Measuring Tape
24. Computer
25. AutoCAD
26. PPEs

0732B&CE-165 Prepare sketches of aqueducts & water pipes

Overview: This competency standard covers the skills and knowledge required to prepare an aqueduct / watercourse constructed to carry water from a source to a distribution point far away. In modern engineering, the term aqueduct is used for any system of pipes, ditches, canals, tunnels, and other structures used for this purpose.

Competency Units	Performance Criteria
CU-1. Prepare Sketch for aqueduct	P1. Identify aqueduct. P2. Spread & fix sheet



National Competency Standards Level-5 for “Civil Technology”



	P3. Apply scale P4. Draw aqueduct according to scale
CU-2. Prepare Sketch for water pipes	P1. Identify pipes (G.I, concrete pipes, PPRC pipes) P2. Calculate pipe length and height for adequate fall P3. Identify pipe diameter P4. Spread and fix sheet P5. Select scale P6. Label the calculated dimension on sheet

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Comprehend the purpose and application of aqueduct
- K2 Knowledge of aqueduct parts
- K3. Explain design procedure for aqueduct
- K4- Describe working of Aqueduct.
- K5. Explain different type of pipes use in water supply system

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Define Pipes and Aqueduct.
- Draw sketch of aqueduct for different sizes.
- Plan safety procedure during design and drawing

TOOLS AND EQUIPMENT'S

- Calculator
- Spirit level
- PPEs
- Drawing sheet
- Drawing board
- Tee Square
- Set Square
- Measuring Tape
- Computer
- AutoCAD
- Pencil
- Eraser



- Sharpner

0732B&CE-166 Draw sketches of intakes

Overview: This competency standard covers the skills and knowledge required to Collection and Distribution of Water By providing a structure on the bank of River and Canals. The basic function of intake structure is to help in safely withdrawing water from the source and then to discharge this water in to the withdrawal conduit, through which it reaches the water treatment plant.

Competency Units	Performance Criteria
CU-1. Draw Intake	P1. Identify source of water P2. Identify type of intake structure P3. Measure the Scheme area. P4. Fix sheet P5. Select scale P6. Mark North Point on drawing sheet P7. Draw proposed sketch P8. Use proper PPE's

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1-Describe intakes and its type.
- K2- Explain Marking out intakes.
- K3- Explain procedure to take out water from intakes.



K4. Explain safety precaution for task

K5. Explain PPEs

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Study of intake and its types
- Draw sketch for different intakes

TOOLS AND EQUIPMENT'S

- Drawing sheet
- Drawing board
- Tee Square
- Set Square
- Measuring Tape
- Pencil
- Eraser
- Sharpner
- Calculator
- Measuring scale
- Computer
- AutoCAD
- PPE's



0732B&CE-167 Estimate demand for Water Supply

Overview: This competency standard covers the skills and knowledge required to interpret Demand estimation in a water distribution network provides crucial data for monitoring and controlling systems. There is a need to estimate water demand from a limited number of sensor measurements. The demand estimation problem is underdetermined because of the limited sensor data and the implicit relationships between Demands and pressure heads.

Competency Units	Performance Criteria
CU-1. Evaluate demand of water supply	P1. Identify amount of water. P2. Calculate number of people P3. Identify people habits. P4. Calculate per capita consumption. P5. Check temperature. P6. Identify Losses P7. Identify quality & quantity of water P8. Identify rate of water supply
CU-2. Identify Water Layout Standards	P1. Calculate quantity of water P2. Identify number of hydrants P3. Suggest Spacing between Hydrants P4. Select supply of water by (gravity / pumping) P5. Suggest spacing between main line valves P6. Check flushing and maintenance procedures P7. Identify Standard Construction Specification P8. Install treatment plant (if necessary)
CU-3. Identify Rate of Demand for water	P1. Identify Seasonal variation P2. Calculate daily variation P3. Identify hourly variation
CU-4. Optimizing water supply network	P1. Identify Single-objective optimization P2. Identify Multi-objective optimization P3. Identify Sensitivity analysis P4. Check Operational constraints

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Describe use of graphical methods to solve hydrological problems such as hydrographs, flood prediction and extreme events.
- K2. Describe and explain the essential features of installations for the abstraction of water for Public consumption.
- K3. Describe and explain the essential features of installations for the treatment of water for public Consumption.
- K4. Describe and explain the essential features of installations for the distribution of water for Public consumption.
- K5. Explain demand of water per capita rate
- K6. Explain variation in demand of water
- K7. Describe optimization of water supply network
- K8. Explain safety precautions
- K9. Explain demand of water for hilly & plain area

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout of water standards
- Preparation is done according to area and standards
- Supply water procedures continuations
- Apply water maintenance procedures.
- Check construction specification for residential and commercial areas.
- Apply variation in demand of water supply
- Apply safety precautions

TOOLS AND EQUIPMENT'S

1. Pipes
2. Calculator
3. Thermometer
4. Valves
5. Pipe repairs,
6. Plungers,
7. Pressure testing kits,
8. Radiator tools
9. Spirit level
10. Previous population data



11. PPEs

0732B&CE-168 Plan water treatment (Clarification)

Overview: This competency standard covers the skills and knowledge required for basics of water **Clarifiers** and settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. A clarifier is generally used to remove solid particulates or suspended solids from liquid.

Competency Units	Performance Criteria
CU-1. Draw water treatment Plan	P1. Identify quantity of water P2. Show Grits removal chamber P3. Indicate Screens P4. Show pumping P5. Identify settling tank P6. Identify filtration stage



National Competency Standards Level-5 for “Civil Technology”



CU-2. Plan Screening for water treatment	P1. Identify quantity of water P2. Identify quality of water. P3. Identify screens and grit removal
CU-3. Plan Clarifier for water treatment	P1. Identify quantity of water P2. Identify Primary Clarifier. P3. Identify secondary Clarifier P4. Indicate filtration and disinfection

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Define water treatment process
- K2- Define fundamentals steps for water treatment
- K3- Explain sources of water
- K4- Describe applications stages for water treatment
- K6- Knowledge of Market requirements of domestic and commercial water supply
- K7. Explain filtration process in water treatment
- K8. Explain different type of screens used for treatment of water

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Study of different stages of water treatment
- Knowledge for the Installation of water treatment plant
- Plan a water treatment plant
- Plan stages for treatment plant
- Study of screens in treatment plant
- Identify clarifier in water treatment plant

TOOLS AND EQUIPMENT'S

1. Drawing sheet
2. Drawing instruments
3. Pencils
4. Eraser
5. Compass
6. Sprit level
7. Calculator
8. Umbrella (Optional)
9. PPEs



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-169 Plan water treatment (Filtration)

Overview: This competency standard covers the skills and knowledge required to prepare for water flows through a filter designed to remove particles in the water. The filters are made of layers of sand and gravel, and in some cases, crushed anthracite. Filtration collects the suspended impurities from water and enhances the effectiveness of disinfection work.

Competency Units	Performance Criteria
CU-1. Draw Plan water filtration process	P1. Identify source of water P2. Calculate quantity of water P3. Identify sand beds P4. Check filtration Rate P5. Select reducing Factor P6. Identify inlet & outlet
CU-2. Interpret Plan (Slow Sand Filter) at water treatment plant	P1. Identify water treatment plant P2. Indicate sand beds P3. Identify slow sand filters P4. Identify filter media P5. Identify sand removal need
CU-3. Interpret Plan (Pressure Sand Filter) at water treatment plant	P1. Identify source of water P2. Indicate sand beds P3. Identify Rapid / Pressure filters P4. Identify filter media P5. Identify back wash results P6. Check associated symptoms

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of Safety requirements for drinking water after treatment
- K2- Knowledge of water treatment process
- K3- Explain different stages for water treatment process
- K4- Explain filter media and it types
- K5. Explain change of filter media at water treatment plant
- K6. Describe slow and rapid sand filters at water treatment plant

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Perform safety requirements at water treatment plant
- Prepare plan for installation of filtration pumps at water treatment plant
- Performing repair and maintenance at plant
- Preform media replacement at water treatment plant
- Identify rapid & slow sand filters
- Identify working of sand filters
- Use of PPEs

TOOLS AND EQUIPMENT'S

1. Drawing sheet
2. Drawing instruments
3. Pencils
4. Eraser
5. Compass
6. Sprit level
7. Calculator
8. Umbrella (Optional)
9. PPEs



0732B&CE-170 Plan water distribution system

Overview: This competency standard covers the skills and knowledge required to prepare for work of water supply system or water supply network. It consist of engineered [hydrologic](#) and [hydraulic](#) components which provide [water supply](#) and install water closet OR flushing cistern.

Competency Units	Performance Criteria
CU-1. Interpret water distribution system	P1. Identify safety requirements for installation P2. Identify Gravity system P3. Identify Pumping system P4. Identify partly gravity & pumping system
CU-2. Interpret layout for water distribution network	P1. Mark out distribution network points P2. Identify dead end system P3. Identify Radial system P4. Identify Ring System P5. Identify Grid Iron System
CU-3. Interpret layout for water Storage Reservoir	P1. Identify reservoir P2. Identify surface reservoir P3. Identify elevated reservoir P4. Monitor difference in working both reservoir
CU-4. Interpret storage capacity of Reservoir	P1. Identify quantity of water for reservoir P2. Identify balancing storage P3. Identify breakdown storage P4. Calculate Fire demand storage P5. Identify dead storage
CU-5. Accumulate Hydraulic model	P1. Evaluate methodology of distribution system P2. Develop pipe networks into sub networks P3. Recognize Data P4. Prepare hydraulic model P5. Analyze Results

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of water storage reservoir
- K2- Explain Uses of tools and equipment to clean and repair of water reservoir
- K3. Explain different system for water supply in housing scheme
- K4. Explain different system for water supply Pipe laying network in housing scheme
- K5- Knowledge of joining techniques and pipe fittings to reservoir
- K6- Knowledge of levelling and leakage repairing in water supply system



K7. Explain type of reservoir according to shapes, material and design

K8. Explain reservoir storage parts frequently

K9. Explain hydraulic model

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan a storage reservoir
- Plan site selection for reservoir
- Demonstrate the installation of reservoir pipes
- Demonstrate pipe laying & distribution system
- Plan storage capacity for water reservoir
- Plan distribution of pipe in residential scheme
- Plan hydraulic model with its working

TOOLS AND EQUIPMENT'S

1. Drawing sheet
2. Drawing instruments
3. Pencils
4. Eraser
5. Compass
6. Sprit level
7. Calculator
8. Umbrella (Optional)
9. Computer
10. PPEs



10.14. Strength of Materials

0732B&CE-171 Locate centroid of different sections

Overview: This competency standard covers the skills and knowledge required to locate centeroid of regular and irregular shape

Competency Units	Performance Criteria
CU1. Locate centeroid of a regular shape	P1. Fix the graph paper on the given object of any shape P2. Hang the figure through its hole P3. Hang plumb bob with nail P4. Draw lines of action of the plumb bob P5. Locate centeroid
CU2. Locate centeriod of symmtrical I section 2x6cm	P1. Draw figure according to given dimensions P2. Join diagonally P3. Mark centroid on the figure
CU3. Locate centeriod of un- Symmittercal L (6x4x1cm)	P1. Segment the section in to simple geometrical shape rectangles P2. Draw reference axis P3. Calculate area of each section P4. Segment the section in to simple geometrical shape P5. Draw reference axis P6. Find Area of each re rectangles P7. Find centeriodal distances P8. Apply formula to calculate distance (X' & Y') from reference axis. P9. Mark centeroid in section.
CU4. Locate centeroid of hollow sections cosisting of 6x10cm solid And a hollow circle 2cm dia at $x'=3\text{cm}$, $y'=6\text{cm}$	P1. Segment the section in to simple geometrical shape P2. Draw reference axis P3. Calculate area of each section P4. Draw reference axis P5. Find Area of each geometrical shape P6. Find centeriodal distances P7. Apply formula to calculate distance (X' & Y') from reference axis. P8. Mark centroid in section.
CU5. Locate centeroid of a irregular shape	P1. Fix the graph paper on the given object of any shape



National Competency Standards Level-5 for “Civil Technology”



	P2. Hang the figure through its hole P3. plumb bob with nail P4. Draw lines of action of the plumb bob. P5. Locate centroid

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Define and explain the terms: Center of gravity, Centroid, first moment of area, reference axes, centeriodal axes and symmetrical axes.
- K2. Describe the methods of finding center of gravity.
 - a. By geometrical consideration
 - b. By the method of moments
- K3. Explain the steps for the calculation of centroid of composite sections
- K4. Determine position of C. G. for various structural sections i.e. I-section, H-section, T-section, channel section, angle section, Z-section and composite sections by method of moments

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locate centroid of triangles, square, rectangle, circular and semicircular sections
- Locate centroid of irregular shapes
- Locate centroid of composite sections I ,H,T, channel section , angle section, Z-section and composite sections by method of moments

Tools and Equipment

Calculator

Graph Paper

Lead Pencil

Rubber



0732B&CE-172 Find out moment of inertia of different sections

Overview: This competency standard covers the skills and knowledge required to regular and irregular shapes calculate moment of inertia of regular shapes, moment of inertia for composite section and calculate polar moment of inertia for circular section.

Competency Units	Performance Criteria
CU1. Find moment of Inertia of given T section 8x4x2cm	P1. Draw figure according to dimensions P2. Segment section into simple rectangles P3. Find centroid of figure P4. Calculate centeriodal distances of areas P5. Apply formula of parallel axis theorem P6. Calculate moment of inertia
CU2. Find moment of Inertia of given I section 8x4x2cm	P1. Draw figure according to dimensions P2. Segment the section into simple rectangles P3. Find centroid of figure P4. Calculate centeriodal distances of areas P5. Apply formula of parallel axis theorem P6. Calculate moment of inertia.
CU3. Find Polar moment of Inertia of given Circular section of 5cm diameter	P1. Draw figure according to dimensions P2. Draw reference axis P3. Apply formula to find I_{xx} . And I_{yy} . P4. Calculate Polar Moment of Inertia.
CU4. Find moment of Inertia of given Hollow section Comprising of I section 8x4x2cm & a hollow circle 2cm dia at $x'=3\text{cm}$, $y'=5\text{cm}$	P1. Draw correct figure according to given dimensions and mark reference axis P2. Calculate area of each section P3. Find Area of each geometrical shape P4. Find centeriodal distances P5. Apply formula to calculate distance (X' & Y') from reference axis. P6. Mark centroid in section. P7. Apply parallel axis theorem to find I_{xx} . , I_{yy} . by deducting circular section.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Define moment of inertia, second moment of area, polar moment of inertia, radius of gyration and their units
- K2. State moment of inertia of simple geometrical shapes; rectangle, triangle and circle etc. (their formulae).
- K3. State perpendicular and parallel axes theorems.
- K4. Determine moment of inertia of simple and composite sections by applying parallel axes theorem with sketches
- K5. Determine polar moment of inertia for circular section applying perpendicular axes theorem Define and explain the terms: Center of gravity, Centroid, first moment of area, reference axes, centeroidal axes and symmetrical axes.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Find out second moment of Area of triangles, square, rectangle, circular and semicircular sections
- Find out second moment of Area of composite sections I ,H,T, channel section , angle section, Z-section and composite sections by method of moments
- Find out second moment of Area of hollow composite sections section , comprising of different shapes

Tools and Equipment

- I. Calculator
- II. Paper
- III. pencil



0732B&CE-173 Produce Shear Force and Bending Moment Diagrams

Overview: This competency standard covers the skills and knowledge required to Produce Shear Force and Bending Moment Diagrams in case of simply supported, cantilever and over hanging beam under point load, uniformly distributed loads and Uniformly Varying loads.

Competency Units	Performance Criteria
CU1. Draw Shear Force and Bending Moment Diagrams of simply supported beam having 3m span and two point loads at 1 and 1.5 m from right support	P1. Draw load diagram according to given Data P2. Compute reactions P3. Compute shear force at different sections of beam P4. Compute bending moment at different sections of beam P5. Draw Shear Force and Bending Moment Diagrams
CU2. Draw Shear Force and Bending Moment Diagrams of simply supported beam having 2m span with of uniformly distributed loads 100kg/m on half span	P1. Draw load diagram according to given Data P2. Compute reactions by taking moments P3. Compute shear force at different sections of beam P4. Compute bending moment at different sections of beam P5. Draw Shear Force and Bending Moment Diagrams
CU3. Draw Shear Force and Bending Moment Diagrams of simply supported beam under uniformly varying load	P1. Draw load diagram according to given Data P2. Compute reactions by taking moments P3. Compute shear force at different sections of beam P4. Compute bending moment at different sections of beam P5. Compute point of maximum Bending moment P6. Draw Shear Force and Bending Moment Diagrams
CU4. Draw Shear Force and Bending Moment Diagrams cantilever beam Having 2.5m span and two point loads 50Kg and 75Kg 1m and 2m from fixed respectively	P1. Draw load diagram according to given Data P2. Calculate shear force at different sections of beam P3. Compute bending moment at different sections of beam P4. Draw Shear Force and Bending Moment Diagram.
CU5. Draw Shear Force and Bending Moment Draw	P1. Identify cantilever beam P2. Compute shear force at different sections of beam



National Competency Standards Level-5 for “Civil Technology”



cantilever beam having combined loading	P3. Compute bending moment at different sections of beam P4. Draw S.F.D and B.M.D
CU6. Draw Shear Force and Bending Moment Diagrams in for overhanging beam under point load and uniformly distributed load and also find point of contra flexure if any	P5. Identify over hanging beam P6. Draw load diagram P7. Compute reactions P8. Compute shear force at different sections of beam P9. Draw shear force diagram P10. Locate the point of Zero shear force P11. Compute bending moment at different sections of beam P12. Locate point of maximum Bending moment at zero Shear force P13. Draw bending moment diagram and locate zero bending moment (point of contra flexure)
CU7. Draw Shear Force and Bending Moment in case of overhanging beam under uniformly varying load	P1. Identify over hanging beam P2. Compute reactions P3. Compute shear force at different sections of beam P4. Compute bending moment at different sections of beam P5. Draw S.F.D and B.M.D

Knowledge & Understanding

The candidate must be able to develop understanding to draw shear force and bending moment diagram in case of simply supported beam, over hanging beam and cantilever beam under point load, uniformly distributed load and uniformly varying load, Define beam, support and load.

- K1.** State difference between statically determinate and indeterminate structures
- K2.** Calculate reactions for simply supported, overhanging and cantilever beams under various loading conditions (Point loads-U.D.L & Combined loading).
- K3.** Explain shear force & Bending Moment in beams and their significance.
- K4.** Shear force and Bending Moment diagrams of beams (simply supported beam, over hanging beam & cantilever beam).
- K5.** Calculate maximum and minimum shear force and bending moment and determine their positions.
- K6.** Explain Point of zero shears, point of contra flexure and their significance and calculations.
- K7.** State standard formulas for shear force and bending moments for:



National Competency Standards Level-5 for “Civil Technology”



- K8.** Simply supported beam subjected to a central point load and U.D.L on a whole span.
- K9.** Cantilever beam subjected to a point load at free end and U.D.L on whole span
- K10.** Shear forces and Bending Moments at various sections of different types of beam, under different loading conditions (Point loads-U.D.L & Combined loadings).

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Calculate shear force of simply supported beam for different spans and loads, including point, uniformly distributed load, uniformly varying load and mix loading.
- Draw shear force diagram of simply supported beam for different spans and loads, including point, uniformly distributed load and mix loading.
- Calculate bending moment of cantilever beams for different spans and loads, including point, uniformly distributed, uniformly varying and mix loading.
- Draw shear force diagram of cantilever beam for different spans and loads, including point, uniformly distributed load and mix loading.
- Calculate shear force of overhanging beam for different spans and loads, including point, uniformly distributed load and mix loading.
- Draw shear force diagram of overhanging beam for different spans and loads, including point, uniformly distributed load and mix loading.

Tools and Equipment

- ❖ Paper
- ❖ Pencil
- ❖ Eraser



0732B&CE-174 Find hardness of metals

Overview: This competency standard covers the skills and knowledge required find hardness of different metals i.e. Aluminium, copper, mild steel by using (a) Brunel’s Hardness test (b) Rockwell Hardness test , comparison of Brunel & Rockwell hardness tests and limitations of Brunel’s hardness test

Competency Units	Performance Criteria
CU1. Perform hardness test of aluminum by using Rockwell Hardness Testers	P1. Identify the Brunel’s Hardness test apparatus P2. Select specimen P3. Fix suitable indenter P4. Place specimen on the platform. P5. Raise the platform P6. Set position against the indenter P7. Apply the load by loading lever and wait for specified time P8. Remove the load from the specimen with help of loading lever P9. Note reading of pointer on the corresponding scale of the dial gauge. P10. Repeat the test and tabulate the readings. P11. Lower the platform and remove the indenter. P12. Tabulate the result in desired format
CU2 Perform hardness test of aluminum by using Brinell’s Hardness Test to find its hardness.	P1. Identify the Brinell’s Hardness test apparatus P2. Fix suitable indenter P3. Place specimen on the anvil plate. P4. Set position against the indenter and apply the load by loading lever P5. Note reading of pointer on the corresponding scale of the dial gauge. P6. Remove the load from the specimen with help of loading lever P7. Tabulate the result in desired format

Knowledge & Understanding

The candidate must be able to develop understanding to and strain of mild steel and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Define Hardness Tension, compression, hardness, Toughness, Brittleness, ductility, Resilience, Flexural
- K2. Explain Brinell’s hardness test, limitations of Brinell’s hardness test
- K3. Explain Rockwell Hardness test;
- K4. Define and explain the terms stress, and its types (tensile, compressive and shear)
- K5. Define and explain strain, its types (tensile, compressive, shear, linear, lateral and volumetric) and poisson’s ratio
- K6. Define Hardness Tension, compression, hardness, Toughness, Brittleness, ductility, Resilience, Flexural
 - a. Explain Hardness tests;
- K7. Explain mechanical properties of materials like elasticity, plasticity, ductility, brittleness and hardness, etc

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform hardness test Brunel’s Hardness test
-

Tools and Equipment

- ❖ Rockwell hardness testing machine with accessories,
- ❖ Brinell’s hardness testing machine with accessories,
- ❖ Specimen,
- ❖ Allen key,
- ❖ Indenter.



0732B&CE-175 Conduct Tensile Strength Test

Overview: This competency standard covers the skills and knowledge required to evaluate relation between stress and strain of a copper wire, evaluate Young's modulus of the material of the wire, determine tensile strength of mild steel and plot a graph between stress and strain of mild steel

Competency Units	Performance Criteria
CU1. Evaluate relation between stress and strain of a copper wire	P1. Identify the Young's modulus apparatus P2. Measure the diameter d of the piece of wire P3. Set up the apparatus P4. Measure the un-stretched length P5. Add a mass to the end of the wire P6. Continue to increase the load P7. Record the extension P8. Calculate the cross-sectional area P9. Compile the results of stress and strain in tabular form
CU2. Evaluate Young's modulus of the material of copper wire	P1. Plot a graph of stress (y-axis) against strain (x-axis) P2. Calculate the gradient of your graph. P3. Calculate the Young's modulus
CU3. Determine tensile strength of mild steel	P1. Identify testing machine P2. Measure original length and diameter of specimen. P3. Fix metal piece into machine. P4. Apply load on work piece P5. Record load on Load against elongation. P6. Take readings till yield point. P7. Measure elongation values P8. Repeat test till fracture occurs. P9 Compile results.
CU4. Plot a graph between stress and strain of mild steel	P1. Compile the data in tabular form P2. Plot a graph of stress (y-axis) against strain (x-axis)

Knowledge & Understanding

The candidate must be able to develop understanding to evaluate relation between stress and strain of a copper wire, evaluate Young's modulus of the material of the wire, determine tensile strength of mild steel and plot a graph between stress and strain of mild steel and



National Competency Standards Level-5 for “Civil Technology”



understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define Tension, compression, hardness, Toughness, Brittleness, ductility, Resilience, Flexural
- K2.** Explain Hardness tests; (a) Brinell's Hardness test (b) Rockwell Hardness test (c) limitations of Brinell's hardness test (d) comparison of Brinell & Rockwall hardness tests
- K3.** Define and explain the terms stress, and its types (tensile, compressive and shear)
- K4.** Define and explain strain, its types (linear, lateral and volumetric) and poisson's ratio.
- K5.** Define and explain Hook's Law.
- K6.** State Young's modulus of elasticity, modulus of rigidity and bulk modulus.
- K7.** Explain mechanical properties of materials like elasticity, plasticity, ductility, brittleness and hardness, etc.
- K8.** Identify parts and attachments of U.T.M for tensile and compression tests. Also explain the salient points in stress strain curve for ductile material
- K9.** Numerical problems relating to simple stress, strain, Poisson's ratio and Hook's Law

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Observations and calculations statement showing relation between stress and strain of a copper wire
- Calculation sheet for Young's modulus of copper wire
- Observations and calculations statement showing tensile strength of mild steel
- graph sheet for stress and strain of mild steel

Tools and Equipment

1. Universal testing machine,
2. Vernier calipers,
3. Mild Steel Rod of given dimension
4. Steel rule.
5. Strain gauge
6. Young Modulus apparatus along with accessories



10.15. Soft Skills

0732B&CE-176 Manage meetings

Overview: This unit describes the skills and knowledge required to manage a range of meetings including overseeing the meeting preparation processes, chairing meetings, organizing the minutes and reporting meeting outcomes. It applies to individuals employed in a range of work environments who are required to organize and manage meetings within their workplace, including conducting or managing administrative tasks in providing agendas and meeting material. They may work as senior administrative staff or may be individuals with responsibility for conducting and chairing meetings in the workplace.

Unit of Competency	Performance Criteria
1. Prepare for meetings	P1 Develop agenda in line with stated meeting purpose P2 Ensure style and structure of meeting are appropriate to its purpose P3 Identify meeting participants and notify them in accordance with organizational procedures P4 Confirm meeting arrangements in accordance with requirements of meeting P5 Dispatch meeting papers to participants within designated timelines
2. Conduct meetings	P1 Chair meetings in accordance with organizational requirements, agreed conventions for type of meeting and legal and ethical requirements P2 Conduct meetings to ensure they are focused, time efficient and achieve the required outcomes P3 Ensure meeting facilitation enables participation, discussion, problem-solving and resolution of issues P4 Brief minute-taker on method for recording meeting notes in accordance with organizational requirements and conventions for type of meeting
3. Follow up meetings	P1 Check transcribed meeting notes to ensure they reflect a true and accurate record of the meeting and are formatted in accordance with organizational procedures and meeting conventions P2 Distribute and store minutes and other follow-up documentation within designated timelines, and according to organizational requirements P3 Report outcomes of meetings as required, within designated timelines

Knowledge & Understanding

K1: outline meeting terminology, structures, arrangements



National Competency Standards Level-5 for “Civil Technology”



- K2: outline responsibilities of the chairperson and explain group dynamics in relation to managing meetings
- K3: describe options for meetings including face-to-face, teleconferencing, web-conferencing and using webcams
- K4: identify the relevant organizational procedures and policies regarding meetings, chairing and minutes including identifying organizational formats for minutes and agendas.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage meetings. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- apply conventions and procedures for formal and informal meetings including:
 - developing and distributing agendas and papers
 - identifying and inviting meeting participants
 - organizing and confirming meeting arrangements
 - running the meeting and following up
- organize, take part in and chair a meeting
- record and store meeting documentation
- Follow organizational policies and procedures.



0732B&CE-177 Manage recruitment selection and induction processes

Overview: This unit describes the skills and knowledge required to manage all aspects of recruitment selection and induction processes in accordance with organizational policies and procedures. It applies to individuals or human resource personnel who take responsibility for managing aspects of selecting new staff and orientating those staff in their new positions. It is not assumed that the individual will be directly involved in the selection processes themselves, although this may well be the case.

Unit of Competency	Performance Criteria
1. Develop recruitment, selection and induction policies and procedures	P1 Analyze strategic and operational plans and policies to identify relevant policies and objectives P2 Develop recruitment, selection and induction policies and procedures and supporting documents P3 Review options for technology to improve efficiency and effectiveness of recruitment and selection process P4 Obtain support for policies and procedures from senior managers P5 Trial forms and documents supporting policies and procedures and make necessary adjustments P6 Communicate policies and procedures to relevant staff and provide training if required
2. Recruit and select staff	P1 Determine future human resource needs in collaboration with relevant managers and sections P2 Ensure current position descriptors and person specifications for vacancies are used by managers and others involved in recruitment, selection and induction processes P3 Provide access to training and other forms of support to all persons involved in recruitment and selection process P4 Ensure advertising of vacant positions complies with organizational policy and legal requirements P5 Utilize specialists where necessary P6 Ensure selection procedures are in accordance with organizational policy and legal requirements P7 Ensure processes for advising applicants of selection outcome are followed P8 Ensure job offers and contracts of employment are executed promptly, and new appointments are provided with advice about salary, terms and conditions



National Competency Standards Level-5 for “Civil Technology”



3. Manage staff induction	P1 Provide access to training and ongoing support for all persons engaged in staff induction P2 Check induction processes are followed across the organization P3 Oversee management of probationary employees and provide them with feedback until their employment is confirmed or terminated P4 Obtain feedback from participants and relevant managers on extent induction process is meeting its objectives P5 Make refinements to induction policies and procedures

Knowledge & Understanding

K1: describe recruitment and selection methods, including assessment centers

K2: explain the concept of outsourcing

K3: describe the purpose of employee contracts and industrial relations

K4: summarize relevant legislation, regulations, standards and codes of practice that may affect recruitment, selection and induction

K5: explain why terms and conditions of employment are an important aspect of recruitment

K6: explain the relevance of psychometric and skills testing programs to recruitment.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage recruitment selection and induction processes. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- develop or critically analyze a policy and procedures framework for recruitment, selection and induction
- identify the need for recruitment
- prepare and oversee appropriate documentation required for recruitment
- select and advise job applicants appropriately
- manage the induction process
- Comply with relevant legislation and organizational requirements.



0732B&CE-178 Manage personal work priorities and professional development

Overview: This unit describes the skills and knowledge required to create systems and process to organize information and prioritize tasks. It applies to individuals working in managerial positions who have excellent organizational skills. The work ethic of individuals in this role has a significant impact on the work culture and patterns of behavior of others as managers at this level are role models in their work environment.

Unit of Competency	Performance Criteria
1. Establish personal work goals	P1 Serve as a positive role model in the workplace through personal work planning P2 Ensure personal work goals, plans and activities reflect the organization s plans, and own responsibilities and accountabilities P3 Measure and maintain personal performance in varying work conditions, work contexts and when contingencies occur
2. Set and meet own work priorities	P1 Take initiative to prioritize and facilitate competing demands to achieve personal, team and organizational goals and objectives P2 Use technology efficiently and effectively to manage work priorities and commitments P3 Maintain appropriate work-life balance, and ensure stress is effectively managed and health is attended to
3. Develop and maintain professional competence	P1 Assess personal knowledge and skills against competency standards to determine development needs, priorities and plans P2 Seek feedback from employees, clients and colleagues and use this feedback to identify and develop ways to improve competence P3 Identify, evaluate, select and use development opportunities suitable to personal learning style/s to develop competence P4 Participate in networks to enhance personal knowledge, skills and work relationships P5 Identify and develop new skills to achieve and maintain a competitive edge

Knowledge & Understanding

K1: explain principles and techniques involved in the management and organization of:

- performance measurement
- personal behavior, self-awareness and personality traits identification



National Competency Standards Level-5 for “Civil Technology”



- a personal development plan
- personal goal setting
- time

K2: discuss management development opportunities and options for self

K3: describe methods for achieving a healthy work-life balance

K4: outline organization s policies, plans and procedures

K5: explain types of learning style/s and how they relate to the individual

K6: describe types of work methods and practices that can improve personal performance.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage personal work priorities and professional development. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- use business technology to create and use systems and processes to organize and priorities tasks and commitments
- measure and maintain personal work performance including assessing competency against competency standards and seeking feedback
- maintain an appropriate work-life balance to manage personal health and stress
- participate in networks
- develop a personal development plan which includes career objectives and an action plan
- Develop new skills.



0732B&CE-179 Manage workforce planning

Overview: This unit describes the skills and knowledge required to manage planning in relation to an organization’s workforce including researching requirements, developing objectives and strategies, implementing initiatives and monitoring and evaluating trends. It applies to individuals who are human resource managers or staff members with a role in a policy or planning unit that focuses on workforce planning.

Unit of Competency	Performance Criteria
1. Research workforce requirements	P1 Review current data on staff turnover and demographics P2 Assess factors that may affect workforce supply P3 Establish the organization’s requirements for a skilled and diverse workforce
2. Develop workforce objectives and strategies	P1 Review organizational strategy and establish aligned objectives for modification or retention of the workforce P2 Consider strategies to address unacceptable staff turnover, if required P3 Define objectives to retain required skilled labor P4 Define objectives for workforce diversity and cross-cultural management P5 Define strategies to source skilled labor P6 Communicate objectives and rationale to relevant stakeholders P7 Obtain agreement and endorsement for objectives and establish targets P8 Develop contingency plans to cope with extreme situations
3. Implement initiatives to support workforce planning objectives	P1 Implement action to support agreed objectives for recruitment, training, redeployment and redundancy P2 Develop and implement strategies to assist workforce to deal with organizational change P3 Develop and implement strategies to assist in meeting the organization’s workforce diversity goals



National Competency Standards Level-5 for “Civil Technology”



	P4 Implement succession planning system to ensure desirable workers are developed and retained P5 Implement programs to ensure workplace is an employer of choice
4. Monitor and evaluate workforce trends	P1 Review workforce plan against patterns in exiting employee and workforce changes P2 Monitor labor supply trends for areas of over- or under-supply in the external environment P3 Monitor effects of labor trends on demand for labor P4 Survey organizational climate to gauge worker satisfaction P5 Refine objectives and strategies in response to internal and external changes and make recommendations in response to global trends and incidents P6 Regularly review government policy on labor demand and supply P7 Evaluate effectiveness of change processes against agreed objectives

Knowledge & Understanding

- K1: explain current information about external labor supply relevant to the specific industry or skill requirements of the organization
- K2: outline industrial relations relevant to the specific industry
- K3: describe labor force analysis and forecasting techniques

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage workforce planning. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- review and interpret information from a range of internal and external sources to identify:
 - current staff turnover and demographics
 - labor supply trends factors that may affect workforce supply



National Competency Standards Level-5 for “Civil Technology”



- organization’s workforce requirements objectives and strategies
- manage workforce planning including developing, implementing, monitoring and reviewing strategies to meet workforce needs
- review relevant trends and supply and demand factors that will impact on an organization’s workforce
- Develop a workforce plan that includes relevant research and specific strategies to ensure access to a skilled and diverse workforce.

0732B&CE-180 Undertake project work

Overview: This unit describes the skills and knowledge required to undertake a straightforward project or a section of a larger project. It covers developing a project plan, administering and monitoring the project, finalizing the project and reviewing the project to identify lessons learned for application to future projects. This unit applies to individuals who play a significant role in ensuring a project meets timelines, quality standards, budgetary limits and other requirements set for the project.

Unit of Competency	Performance Criteria
1. Define project	P1 Access project scope and other relevant documentation P2 Define project stakeholders P3 Seek clarification from delegating authority of issues related to project and project parameters P4 Identify limits of own responsibility and reporting requirements P5 Clarify relationship of project to other projects and to the organization’s objectives P6 Determine and access available resources to undertake project
2. Develop project plan	P1 Develop project plan in line with the project parameters P2 Identify and access appropriate project management tools P3 Formulate risk management plan for project, including Work Health and Safety (WHS) P4 Develop and approve project budget P5 Consult team members and take their views into account in planning the project P6 Finalize project plan and gain necessary approvals to commence project according to documented plan
3. Administer and monitor project	P1 Take action to ensure project team members are clear about their responsibilities and the project requirements P2 Provide support for project team members, especially with regard to specific needs, to ensure that the quality of the expected outcomes of the project and documented time lines are met



National Competency Standards Level-5 for “Civil Technology”



	P3 Establish and maintain required recordkeeping systems throughout the project P4 Implement and monitor plans for managing project finances, resources and quality P5 Complete and forward project reports as required to stakeholders P6 Undertake risk management as required to ensure project outcomes are met P7 Achieve project deliverables
4. Finalize project	P1 Complete financial recordkeeping associated with project and check for accuracy P2 Ensure transition of staff involved in project to new roles or reassignment to previous roles P3 Complete project documentation and obtain necessary sign-offs for concluding project

Knowledge & Understanding

K1: give examples of project management tools and how they contribute to a project

K2: outline types of documents and other sources of information commonly used in defining the parameters of a project

K3: explain processes for identifying and managing risk in a project

K4: outline the organization's mission, goals, objectives and operations and how the project relates to them

K5: explain the organization's procedures and processes that are relevant to managing a project including:

- lines of authority and approvals
- quality assurance
- human resources
- budgets and finance
- recordkeeping
- reporting

Outline the legislative and regulatory context of the organization in relation to project work, including work health and safety (WHS) requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



A person who demonstrates competency in this unit must be able to provide evidence of the ability to undertake project work. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- define the parameters of the project including:
 - project scope
 - project stakeholders, including own responsibilities
 - relationship of project to organizational objectives and other projects
 - reporting requirements
 - resource requirements
- use project management tools to develop and implement a project plan including:
 - deliverables
 - work breakdown
 - budget and allocation of resources
 - timelines
 - risk management
 - recordkeeping and reporting
- consult and communicate with relevant stakeholders to generate input and engagement in planning, implementing and reviewing the project
- provide support to team members to enable them to achieve deliverables and to transition them as appropriate at completion of the project
- finalize the project including documentation, sign-offs and reporting Review and document the project outcomes.



0732B&CE-181 Identify and communicate trends in career development

Overview: This unit describes the skills and knowledge required to conduct research to identify and communicate career trends. It establishes the need to interact professionally with others in assessing career needs, to effectively assist clients identify competencies they require for a career and employability in a given context. It also examines how to maintain quality of career development services and professional practice. It applies to individuals seeking to identify and communicate trends in career development.

Unit of Competency	Performance Criteria
1. Research and confirm career trends	P1 Apply knowledge of changing organizational structures, lifespan of careers and methods of conducting work search, recruitment and selection processes P2 Analyze changing worker and employer issues, rights and responsibilities in context of changing work practices P3 Examine importance of quality careers development services P4 Maintain all research, documentation, sources and references (electronic or physical) to a high degree of currency and relevance P5 Analyze implications of relevant policy, legislation, professional codes of practice and national standards relating to worker and employer issues P6 Research changes and trends in theory of career development counseling and practice P7 Confirm clusters, levels and combinations of transferable employability skills and preferences that may open employment options spanning more than one occupation or career pathway
2. Assess and confirm ongoing career development needs of target group	P1 Analyze history and records in assessing needs of target group P2 Assess success of previous career development services and techniques used for individual or target group P3 Deploy other means to investigate appropriate care and counseling approaches as required P4 Maintain privacy and security of all data, research and personal records according to relevant policy, legislation, professional codes of practice and national standards P5 Establish existing work-life balance requirements, issues and needs
3. Maintain quality of career development	P1 Analyze and review relevance of career theories, models, frameworks and research for target group



National Competency Standards Level-5 for “Civil Technology”



services and professional practice	P2 Incorporate into career development services and professional practice, major changes and trends influencing workplace and career-related options and choices P3 Comply with all relevant policy, legislation, professional codes of practice and national standards that influence delivery of career development services

Knowledge & Understanding

- K1: explain client care and counseling techniques and processes in the context of career development services
- K2: describe diversity and its potential effects on career choices
- K3: outline human psychological development and needs in relation to careers development
- K4: outline relevant policy, legislation, codes of practice and standards relevant to career development
- K5: explain recruitment and selection processes in the context of career development services
- K6: describe a range of data gathering and research techniques
- K7: explain techniques used to analyze trends.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to identify and communicate trends in career development. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- research and analyze current economic, labor market, employment, career and vocational, educational and training trends
- identify choices and career development needs for individuals and target groups within a given context
- report and document management of research and career development materials
- Comply with all relevant local, state/territory and national legislation, policies and practices.



0732B&CE-182 Apply specialist interpersonal and counseling interview skills

Overview: This unit describes the skills and knowledge required to use advanced and specialized communication skills in the client-counselor relationship. This unit applies to individuals whose job role involves working with clients on personal and psychological issues within established policies, procedures and guidelines.

Unit of Competency	Performance Criteria
1. Communicate effectively	P1 Identify communication barriers and use strategies to overcome these barriers in the client-counselor relationship P2 Facilitate the client-counselor relationship through selection and use of micro skills P3 Integrate the principles of effective communication into work practices P4 Observe and respond to non-verbal communication cues P5 Consider and respond to the impacts of different communication techniques on the client-counselor relationship in the context of individual clients P6 Integrate case note taking with minimum distraction
2. Use specialized counseling interviewing skills	P1 Select and use communication skills according to the sequence of a counseling interview P2 Identify points at which specialized counseling interviewing skills are appropriate for inclusion P3 Use specialized counseling communication techniques based on their impacts and potential to enhance client development and growth P4 Identify and respond appropriately to strong client emotional reactions
3. Evaluate own communication	P1 Reflect on and evaluate own communication with clients P2 Recognize the effect of own values and beliefs on communication with clients P3 Identify and respond to the need for development of own skills and knowledge

Knowledge & Understanding

K1: legal and ethical considerations for communication in counseling practice, and how these are applied in individual practice:

- codes of conduct/practice
- discrimination
- duty of care



National Competency Standards Level-5 for “Civil Technology”



- human rights
- practitioner/client boundaries
- privacy, confidentiality and disclosure
- rights and responsibilities of workers, employers and clients
- work role boundaries responsibilities and limitations of the counselor role
- work health and safety

K2: principles of person-centered practice

K3: key objectives of counseling interviewing

K4: stages of a counseling interview

K5: potential impacts of using different communication skills and techniques in counseling contexts

K6: communication techniques and micro-skills including:

- attending behaviors active listening, reflection of content feeling, summarizing
- questioning skills open, closed, simple and compound questions
- client observation skills
- noting and reflecting skills
- providing client feedback

K7: specialized counseling communication techniques, and how they are used, including:

- challenging
- reframing
- focusing

K8: components of the communication process including:

- encoder
- decoder

K9: primary factors that impact on the communication process including:

- context
- participants
- rules
- messages
- channels
- noise
- feedback

K10: communication barriers and resolution strategies, including:

- environmental
- physical
- individual perceptions
- cultural issues



National Competency Standards Level-5 for “Civil Technology”



- language
- age issues
- disability

K11: observational techniques including:

- facial expressions
- non-verbal behavior
- posture
- silence

K12: ways in which different people absorb information, including:

- visual
- auditory
- kinesthetic

K13: obstacles to the counseling process

K14: impacts of trauma and stress on the communication process, including on:

- concentration and attention
- memory
- use of verbal and written language
- use of body language
- challenging within the counseling session

K15: self-evaluation practices, including:

- how to recognize own biases
- Impact of own values on the counseling relationship.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to apply specialist interpersonal and counseling interview skills. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:



National Competency Standards Level-5 for “Civil Technology”



- interviewed at least 3 different clients using specialized interpersonal communication and counseling interviewing skills, including:
- micro-skills and communication techniques, including:
 - attending behaviors active listening,
 - reflection of content, summarizing
 - questioning skills open, closed, simple and compound questions
 - client observation skills
 - noting and reflecting skills
 - providing client feedback
- specialized counseling interviewing skills, including:
 - challenging
 - reframing
 - focusing
- integrated clear case note taking into the interview process
- Completed a structured process of self-reflection and evaluation of own communication used during the 3 interviews.



0732B&CE-183 Work safely in an office environment

Overview: This unit describes the performance outcomes, skills and knowledge required to participate in workplace occupational health and safety (OHS) processes to protect workers own health and safety, and that of others.

Unit of Competency	Performance Criteria
1. Work safely	P1 Follow established safety procedures when conducting work P2 Carry out pre-start systems and equipment checks in accordance with workplace procedures
2. Implement workplace safety requirements	P1 Identify designated persons for reporting queries and concerns about safety in the workplace P2 Identify existing and potential hazards in the workplace, report them to designated persons and record them in accordance with workplace procedures P3 Identify and implement workplace procedures and work instructions for controlling risks P4 Report emergency incidents and injuries to designated persons
3. Participate in OHS consultative processes	P1 Contribute to workplace meetings, inspections or other consultative activities P2 Raise OHS issues with designated persons in accordance with organizational procedures P3 Take actions to eliminate workplace hazards or to reduce risks
4. Follow safety procedures	P1 Identify and report emergency incidents P2 Follow organizational procedures for responding to emergency incidents

Knowledge & Understanding

- K1: Explain responsibilities of employers and employees under relevant health and safety regulation
K2: describe emergency procedures including procedures for fires, accidents and evacuation
K3: outline commonly used hazard signs and safety symbols

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to participate in workplace OHS processes. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.



National Competency Standards Level-5 for “Civil Technology”



Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. The unit assessment must ensure the safety processes; hazards and risk are relevant to the area of work. Evidence of the following is essential:

- Accurately following all relevant safety procedures
- Identifying and reporting hazards to designated personnel
- Knowledge of relevant health and safety regulations
- Knowledge of relevant materials, equipment and work processes.



0732B&CE-184 Develop workplace documents

Overview: This unit covers interpreting and composing a range of workplace documents from a number of sources. It includes interpreting written information for workplace purposes as well as planning, drafting and reviewing a basic document before writing the final version. The focus is on the content and structure of written materials and not on the use of computer technology

Unit of Competency	Performance Criteria
1. Interpret written information	P1 Read workplace materials to identify the subject and key information for using or reporting to others. P2 Read procedural manuals and codes of practice to locate specific information to carry out work functions in accordance with policy and standards. P3 Read a range of written materials to locate and select required information for summaries, short reports and responses to requests. P4 Identify the cultural context and prior knowledge required to interpret workplace information and obtain assistance when required. P5. Determine audience and purpose for the document P6 Seek assistance with interpretation of complex materials in accordance with organizational procedures.
2. Develop written materials	P1 Identify and comply with established requirements for a range of written materials in accordance with organizational procedures and standard templates. P2. Determine format and structure P3. Establish key points for inclusion P4. Identify organizational requirements P5. Establish method of communication P6. Establish means of communication
3. Draft document	P1 Develop draft document to communicate key points P2. Obtain and include any required additional information P3 Prepare written information in an accurate, concise and unambiguous manner that meets intended audience and organizational requirements.
4. Review document	P1 Check draft for suitability of tone for audience, purpose, format and communication style P2. Check draft for readability, grammar, spelling, sentence and paragraph construction and correct any inaccuracies or gaps in content.



National Competency Standards Level-5 for “Civil Technology”



	P3. Check draft for sequencing and structure P4. Check draft to ensure it meets organizational requirements P5. Ensure draft is proofread, where appropriate, by supervisor or colleague
5. Write final document	P1 Make and proofread necessary changes P2. Ensure document is sent to intended recipient within required time frames P3. File copy of document in accordance with organizational policies and procedures

Knowledge & Understanding

- K1: Explain the reading and writing procedures at a level to cope with a range of workplace materials
- K2: Explain the integration of information from a number of sources in order to generate meaning
- K3: Describe the ways to write and sequence paragraphs according to the required purpose of written material
- K4: Outline the linking ideas in written material through selection and use of words, grammatical structures, headings and punctuation appropriate to the purpose
- K5: Elaborate spelling, punctuation and grammar for workplace documents at an experienced level
- K6: Explain the response to diversity, including gender and disability
- K7: Explain the implementation of ergonomic requirements for office work
- K8: Explain the environmental policies such as those relating to paper use/wastage/recycling
- K9: Describe the preparation of general information and papers according to target audience
- K10: Elaborate the ways of proofreading and editing documents to ensure clarity of meaning and conformity to organizational requirements
- K11: Describe the problem-solving skills to determine document design and production processes
- K12: Explain the usage of resources to assist in document production, such as dictionary, thesaurus, templates, style sheets
- K13: Describe the ways to produce business letters, memos, job applications, resumes, meeting agendas and minutes
- K14: Explain the ways to fold and insert letters into a standard and window faced envelope.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



A person who demonstrates competency in this unit must be able to provide evidence of the ability to interpret written information for workplace purposes and plan, draft and review a basic document before writing the final version. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the following is essential:

- Producing a range of documents that accurately convey required information including single and multipage business letters, memos, job applications, resumes, meeting agendas and minutes.
- Using formatting suitable for intended audience
- Knowledge of organizational policies and procedures for document production



0732B&CE-185 Prepare and implement negotiation

Overview: This unit covers the skills, knowledge and attitudes required to prepare for and participate in a process of negotiation.

Unit of Competency	Performance Criteria
1. Prepare for the negotiation	P1 Identify objectives and preferred outcome of the negotiation and determine minimum acceptable outcome P2 Understand in relation to what can be offered and what is needed from the other party P3 Gather information regarding the other party – objectives, needs, preferences, resources, what they want to achieve - in order to determine best negotiating points P4 List and rank the issues to consider concessions that may be made. P5 Find examples and refine negotiation argument. P6 Check information to ensure it is correct and up-to-date. P7 Develop a negotiation plan that includes information about the other party and its interests and a set of responses and strategies to the anticipated tactics. P8 Prepare an agenda in advance, which includes discussion topics, participants, location and schedule
2. Participate in negotiations	P1 Analyze all aspects of the incident for degree of hazard, priorities, optional outcomes and appropriate strategies P2 Analyze and determine strategies and priorities on the incident sought from a range of sources P3 Assess long term objectives against resources and priorities P4 Apply a range of communication techniques to make and maintain contact with the key people P5 Provide clear and factual information to enable an honest and realistic assessment of the interests of the key people and their positions P6 Resolve the conflict and express their likely consequences clearly and do an analysis of the benefits P7 Reassess points of disagreements for common positive positions
3. Coordinate support services	P1 Assess the need for support services in terms of the determined strategies and priorities



National Competency Standards Level-5 for “Civil Technology”



	P2 Negotiate the resources of support services according to established procedures and availability P3 Provide information on strategies to support services and maintain the communication P4 Delegate roles and responsibilities according to expertise and resources
4. Restore order	P1 Assess the incidents for degree of risk and take appropriate action to reduce and remove the impact of the incident and restore order P2 Take action designed to minimize risk and the preserve the safety and security of all involved P3 Take action to prevent the escalation of the incident appropriate to the circumstances and agreed procedures. P4 Carry out the use of force for the restoration of control and the maintenance of security in the least restrictive manner. P5 Complete reports accurately and clearly provided to the appropriate authority promptly P6 Review, evaluate and analyze the incident and the organizational response to it and report it promptly and accurately.
5. Provide leadership. direction and guidance to the work group	P1 Link between the function of the group and the goals of the organization P2 Participate in decision making routinely to develop, implement and review work of the group and to allocate responsibilities where appropriate P3 Give opportunities and encouragement to others to develop new and innovative work practices and strategies P4 Identify conflict and resolve with minimum disruption to work group function P5 Provide staff with the support and supervision necessary to perform work safely and without risk to health P6 Allocate tasks within the competence of staff and support with appropriate authority, autonomy and training P7 Supervise appropriately the changing priorities and situations and takes into account the different needs of individuals and the requirements of the task

Knowledge & Understanding



National Competency Standards Level-5 for “Civil Technology”



- K1: Explain organization’s policies, guidelines and procedures related to control and surveillance, safety and preventing and responding to incidents and breaches of orders covered in the range of variables.
- K2: Explain organization’s management and accountability systems
- K3: Describe teamwork principles and strategies
- K4: Outline the principles of effective communication
- K5: Outline the guidelines for use of equipment and technology
- K6: Explain code of conduct

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to solve problems which jeopardize safety and security. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the following is essential:

- evidence of effective communication strategies including negotiation, counseling, mediation, advocacy demonstrated under pressure working effectively in a team environment
- evidence of knowledge and application of organizations policies, procedures and guidelines for critical incidents
- evidence of accurate and safe use of all emergency equipment
- evidence of managing effective outcomes using strategic planning, team Leadership and situational analysis



0732B&CE-186 Maintain professionalism in the workplace

Overview: This unit of competency describes the outcomes required maintain a professional image in the workplace, including behaving ethically, demonstrating motivation, respecting timeframes and maintaining personal appearance.

Unit of Competency	Performance Criteria
1. Respect work timeframes	P1 Demonstrate punctuality in meeting, set working hours and times. P2 Utilize working hours only for working and follow company regulations. P3 Complete work tasks within deadlines according to order of priority P4 Supervisors are informed of any potential delays in work times or projects.
2. Maintain personal appearance and hygiene	P1 Clean hair, body and nails regularly. P2 Wear suitable cloths for the workplace, and respect local and cultural contexts P3 Meet specific company dress code requirements
3. Maintain adequate distance with colleagues and clients	P1 Respect personal space of colleagues and clients with reference to local customs and cultural contexts. P2 Keep sufficient distance from others P3 Avoid cross transmission of infections (especially through respiration).
4. Work in an ethical manner	P1 Follow company values/ethics codes of ethics and/or conduct, policies and guidelines. P2 Use company resources in accordance with company ethical standards. P3 Conduct personal behavior and relationships in accord with ethical standards and company policies. P4 Undertake work practices in compliance with company ethical standards, organizational policy and guidelines. P5 Instruct co-workers on ethical, lawful and reasonable directives. P6 Share company values/practices with co-workers using appropriate behavior and language. P7 Report work incidents/situations and/or resolved in accordance with company protocol/guidelines.

Knowledge & Understanding

K1: Explain application of good manners and right conduct

K2: Explain basic practices for oral and personal hygiene

K3: Describe common products used for oral and personal hygiene



National Competency Standards Level-5 for “Civil Technology”



K4: Outline the company code of conduct/values

K5: Outline the Company regulations, performance and ethical standards

K6: Explain work responsibilities/job functions

K7: Describe communication skills

K8: State workplace hygiene standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to maintain professionalism in the workplace .The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the following is essential:

- clarify and affirm work values/ethics/concepts consistently in the workplace;
- comply with required working times;
- conduct work practices satisfactorily and consistently, in compliance with work ethical standards, organizational policy and guidelines;
- Develop suitable hygiene

Keep adequate distance while interacting with colleagues and clients.



0732B&CE-187 Maintain professional development and career professionalism

Overview: This unit describes the outcomes required to promote own learning career growth and advancement.

Unit of Competency	Performance Criteria
1. Identify own learning needs	P1 Identify learning needs through evaluation of existing skills and knowledge against job and career progression requirements. P2 Gather feedback and appraisal is gathered from supervisors, colleagues and clients and used to identify learning needs and skill gaps. P3 Give advice to relevant personnel regarding identified professional needs.
2. Motivate and build the team	P1 Sought opportunities are sought for undertaking skill-development activities and are planned in liaison with work group and relevant personnel. P2 Follow and apply advice on the job coaching/mentoring P3 Undertake formal training programs where available. P4 Utilize knowledge and skills gained through professional development activities in the workplace and for career development. P5 Collect constructive assessment and feedback on work performance from colleagues and supervisor to identify ongoing learning needs and opportunities.
3. Maintain professional growth and development	P1 Sought recognitions as evidence of career advancement. P2 Obtain licenses and/or certifications relevant to job and career P3 Lay down professional goals and strategies to develop the required skills and knowledge through professional development

Knowledge & Understanding

- K1: Explain all possible learning and development tools: training, mentoring, coaching, networking, seminars, project assignments
- K2: Explain education, qualification and certification systems in the country
- K3: Describe fundamental rights at work including gender sensitivity
- K4: Outline methodology to identify own learning needs and preferred learning style
- K5: Elaborate methods of obtaining feedback
- K6: Explain Range of options for undertaking personal skill development



National Competency Standards Level-5 for “Civil Technology”



K7: Describe Workplace policies and procedures

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to lead small teams. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the following is essential:

- determine areas for skills and knowledge improvement;
- identify job skill and knowledge requirements; and

Seek and implement feedback on own learning needs



0732B&CE-188 Organize schedules

Overview: This unit describes the skills and knowledge required to manage appointments and diaries for personnel within an organization, using manual and electronic diaries, schedules and other appointment systems. It applies to individuals employed in a range of work environments who provide administrative support to teams and individuals.

Unit of Competency	Performance Criteria
1. Establish schedule requirements	P1 Identify organizational requirements and protocols for diaries and staff planning tools P2 Identify organizational procedures for different types of appointments P3 Determine personal requirements for diary and schedule items for individual personnel P4 Establish appointment priorities and clarify in discussion with individual personnel
2. Manage schedules	P1 Identify recurring appointments and deadlines, and schedule these in accordance with individual and organizational requirements P2 Establish availability of attendees, and schedule new appointments in accordance with required timelines and diary commitments P3 Negotiate alternative arrangements and confirm when established appointments are changed P4 Record appointments and manage schedules in accordance with organizational policy and procedures

Knowledge & Understanding

K1: identify the key provisions of relevant legislation, standards and codes that affect aspects of business operations or the achievement of team goals

K2: describe organizational requirements for managing appointments for personnel within the organization

K3: summarize the range of appointment systems that could be used

K4: outline important considerations when managing the schedules of others.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to organize schedules. The evidence should integrate employability skills with workplace



National Competency Standards Level-5 for “Civil Technology”



tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Appropriately manage the schedules of various individuals through a process of careful planning and negotiation.



National Competency Standards Level-5 for “Civil Technology”





10.16. Construction III

0732B&CE-189 Erect and dismantle formwork to suspended slabs, columns, beams and walls

Overview: This competency standard covers the skills and knowledge required to Plan and prepare for work, erect formwork, dismantle formwork and Clean-up work site area

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Select tools and equipment as per requirement. P2. Check for serviceability and any faults P3. Calculate material quantity requirements in accordance with specifications P4. Obtain needed materials and check for compliance
CU2. Erect formwork	P1. Clear work area and prepare surface for safe erection of form work for suspended slabs, piers and shutters. P2. Set out formwork to requirements of plans and specifications. P3. Assemble formwork according to plans, specifications and class of surface finish, with support system set to correct height level and line. P4. Place bracing of formwork according to support plans and specifications to maintain rigidity and stability. P5. Erect formwork support system sequentially according to initial set out. P6. Construct formwork shutters form requirements and specified dimensions. P7. Install Block-outs and cast-in services to specified locations. P8. Remove debris, sawdust and other waste materials from completed formwork in accordance with waste management policy for the site. P9. Apply release agent to formwork face to manufacturer specifications where specified.



CU3. Dismantle formwork	P1. Remove formwork and bracing/strutting support sequentially and safely. P2. De-nail, clean and store or stack timber components safely for reuse or removal from site. P3. Clean, oil and store or stack steel components to manufacturers' maintenance recommendations. P4. Discard damaged formwork components safely after stripping.
CU4. Clean-up work site area	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Describe formwork materials and techniques
K2.	Explain hydraulic pressures applied to formwork
K3.	Describe Plans, specifications and drawings for relevant job
K4.	Explain purpose, application and properties of commonly used release agents
K5.	Describe dismantling of formwork

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Set out and erect suspended slab formwork (slab size a minimum of 30 square metres), incorporating a beam and two different types of columns with a specified formwork system at a minimum height of 2.4 metres.
- Prepare space for entire work



- Plan for relevant job
- Adopt safety measures
- Installation and removal of formwork

Tools and Equipment

1. Air compressors and hoses, automatic levels
2. Chisels
3. Formwork equipment
4. Hammers, hand saws
5. Ladders and scaffolding
6. Marking equipment, measuring tapes and rules
7. Nail bags, nail guns
8. Pinch bars, power drills power grinders, power leads, power saws
9. Saw stools, shovels, spanners spirit levels, squares (combination/tri)
10. Steel squares, string lines



0732B&CE-190 Operate elevated platforms

Overview: This competency standard covers the skills and knowledge required to Plan and prepare for work, Conduct routine checks of Platform, Locate equipment in place for work application, Elevate platform to work location, Lower platform and shut down and Clean-up work site area

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Recognize OH&S requirements associated with operating elevating work platforms and workplace environment P2. Identify workplace operations plan in accordance with job requirements and surrounding activities and environment P3. Select appropriate personal protective equipment. P4. Select equipment consistent with job requirements and check for serviceability P5. Identify safety hazards and use procedures correctly to minimize risks to self and others. P6. Select materials in accordance with job drawings and/or from specifications/supervisor's instructions
CU2. Conduct routine checks of Platform	P1. Determine power source where applicable and connect platform equipment to manufacturer's specifications. P2. Carry out routine pre-operational equipment checks in accordance with checklist from operator's manual. P3. Switch equipment on, in accordance with start-up procedures and check controls for correct operation and ease of movement. P4. Check emergency safety devices to instructions from operator's manual. P5. Check work location for level ground and floor surface to determine stabilizing and safe working area requirements.



National Competency Standards Level-5 for “Civil Technology”



CU3. Locate equipment in place for work application	P1. Locate platform in position for work application and engage stabilizers to set equipment base level into place. P2. Erect barricades and signage to isolate safe working area where applicable. P3. Place tools, equipment and materials into bucket/platform to job application requirements
CU4. Elevate platform to work location	P1. Operate controls to manufacturer's recommendations and elevate platform to work position. P2. Switch power off and engage locking devices to operator's manual. P3. Carry out work to job specification and safety requirements of operator's manual.
CU5. Lower platform and shut down	P1. Operate controls to manufacturer's recommendations and lower platform to down position. P2. Carry out shut down procedures to operator's manual and switch off equipment
CU6. Clean-up work site area	P1. Remove and dispose of waste material safely P2. Seal and store/stack unused materials P3. Remove, clean, maintain and store tools and equipment P4. Disengage stabilizers, store and secure equipment and remove unit from location P5. Carry out routine post-operational checks in accordance with checklist from operator's manual and report any faults

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe workplace and equipment safety



National Competency Standards Level-5 for “Civil Technology”



K2.	Explain requirements relative to
EWP's	
K3.	Explain operation and maintenance of
equipment	
K4.	Describe use of hand and power tools
K5.	Knowledge of communication
processes – verbal and signalling	
K6.	Knowledge of materials and material
fixing	
K7.	Describe OHS for elevated platforms

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate compliance with Occupational Health and Safety regulations applicable to workplace operations
- Show compliance with organizational policies and procedures including Quality Assurance requirements
- Carry out correct procedures prior to, during and after use of elevating work platform
- Demonstrate safe and effective operational use of plant, tools and equipment
- Demonstrate safe and effective work application while in set elevated position
- Interactively communicate with others to ensure safe and effective workplace operations

Tools and Equipment

1. Elevated Platforms (scissor type extending arm [cherry picker])
2. Personal protective equipment (coveralls, safety boots, hard hat/cap, gloves, safety glasses/goggles, ear plugs/muffs, dust masks/respirator)



0732B&CE-191 Construct, erect and dismantle formwork for stairs and ramps

Overview: This competency standard covers the skills and knowledge required to Plan and prepare for work, set out formwork, Assemble and erect formwork, dismantle formwork and Clean up

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational details, from relevant information for planning and preparation purposes. P2. Follow safety (OHS) requirements in accordance with safety plans and policies. P3. Identify and implement signage and barricade requirements P4. Select plant, tools and equipment to carry out tasks consistent with job requirements, check for serviceability, and rectify any faults or report prior to commencement. P5. Calculate material quantity requirements in accordance with plans, specifications and quality requirements. P6. Identify, obtain, prepare, handle safely and locate materials appropriate to the work application ready for use. P7. Identify and apply environmental requirements for project in accordance with environmental plans and statutory and regulatory authority obligations
CU2. Set out formwork	P1. Identify design of stairs and/or ramps and method of joining formwork from job drawings and specifications, and check to be in accordance with legislation, regulations and codes of practice. P2. Determine exit and ground finish levels from plans, specifications and site inspection.



	P3. Determine rise, going and pitch of stairs and ramp from plans, specifications, site inspection, rise measurements and requirements of Building Code. P4. Calculate full size set out of stairs and ramp and make to determine rise, going and pitch of stairs to provide location of landings, stringers, treads and posts where specified. P5. Determine location of stair, ramp and newels from plans, specifications and pitch of stairs. P6. Set out location of footings to layout of designed stairs and ramp from plans, specifications P7. Select and set out materials for formwork, including stringers, to pitch of stairs with rises not exceeding specified space between treads
CU3. Assemble and erect formwork	P1. Place, fix and brace landing bearers and joists according to plans and specifications, where specified. P2. Check footings for accuracy to requirements of plans and specifications. P3. Erect and brace stairs and/or ramp formwork soffit is in accordance with plans and specifications. P4. Cut square formwork stringers to length and shape in accordance with set out and junction with newel posts, and install and brace. P5. Screw/bolt metal angle brackets to formwork strings to set out locations of tread support. P6. Locate and fix formwork strings for stairs and ramps according to plans and specifications. P7. Set out, cut square material for face of treads length and fix to metal angle bracket according to plans and specifications. P8. Brace risers at mid-span to prevent deflection under the load of wet concrete. P9. Erect and brace newels temporarily to plumb position, where specified.



National Competency Standards Level-5 for “Civil Technology”



	P10. Locate and Secure formwork tie bolts to plans and specifications to maintain stair width where specified
CU4. Dismantle formwork.	P1. Remove formwork and bracing/strutting support sequentially and safely. P2. De-nail, clean and store or stack timber components safely for reuse or removal from site. P3. Clean, oil and store or stack steel components to manufacturers' maintenance recommendations. P4. Discard damaged formwork components safely after stripping.
CU5. Clean up	P1. Clear work area by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain application and requirements for line, level and plumb in construction projects
- K2. Define various construction terminology
- K3. Describe formwork materials and techniques
- K4. Describe job safety analysis (JSA) and safe work method statements
- K5. Explain material safety data sheets (MSDS)
- K6. Describe material storage and environmental friendly waste management
- K7. Knowledge of plans, specifications and drawings for relevant job.
- K8. Explain use and limitation of plant, tools and equipment and their types
- K9. Explain processes for setting out and measuring
- K10. Explain processes for calculating material requirements
- K11. Describe quality requirements for formwork for stairs and ramps

Critical Evidence(s) Required



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations
- Comply with organizational policies and procedures, including quality requirements
- Safely and effectively use tools, plant and equipment
- Communicate and work effectively and safely with others
- Complete a site assessment to determine levels and stair dimensions
- Apply the height and going of stairs to construct, erect and dismantle the form work for a flight of stairs (free standing or against a wall), including a landing, with a minimum rise of flight of 1800mm
- Complete the construction, erection and dismantling of a ramp with a rise of 400mm.

Tools and Equipment

1. Air Compressors And Hoses
2. Automatic Levels
3. Chisels
4. Explosive Power Tools
5. Grinders
6. Hammers
7. Hand Saws
8. Laser Levels
9. Marking Equipment
10. Measuring Tapes And Rules
11. Nail Bags
12. Nail Guns
13. Optical Levelling Equipment
14. Pinch Bars
15. Power Drills
16. Power Leads
17. Power Saws
18. Props



National Competency Standards Level-5 for “Civil Technology”



19. Saw Stools
20. Scaffolding
21. Shovels
22. Spanners
23. Spirit Levels
24. Squares (Combination/Tri)
25. Steel Squares And Bevels
26. String Lines



0732B&CE-192 Evaluate materials for multi-storey buildings

Overview: This competency standard covers the skills and knowledge required to assess the nature and performance of concrete for use in Multi-storey buildings, Assess application of concrete used in multi-storey buildings, Evaluate methods undertaken to repair concrete, Evaluate effects of fire and heat on concrete used in multi-storey buildings and Monitor Environmental impacts of building materials used

Competency Units	Performance Criteria
CU1. Assess the nature and performance of concrete for use in Multi-storey buildings.	P1. Identify and record plastic and hardened concrete properties for building types. P2. Indicate sources of aggregate and properties of each described. P3. Identify effects of impurities P4. Conduct manufacture and testing of concrete in accordance with relevant standards.
CU2. Assess application of concrete used in Multi-storey buildings.	P1. Determine selection and distribution methods of concrete following analysis of site access. P2. Maintain correct distribution and placement methods of concrete P3. Identify reasons and effects of compaction on both plastic and hardened concrete P4. Compare immersion, surface and form vibration P5. Maintain accurate records relating to the application of concrete P6. Identify and record types of curing methods and detrimental effects of poor or no curing
CU3. Evaluate methods undertaken to repair concrete	P1. Identify live and dormant cracks P2. Identify and record repair methods and causes of cracked concrete and concrete cancer in accordance with organizational procedures. P3. Record faults in concrete in accordance with organizational procedures.



National Competency Standards Level-5 for “Civil Technology”



CU4. Evaluate effects of fire and heat on concrete used in multi-storey buildings.	P1. Test reinforced concrete for effects of fire and heat. P2. Identify and apply methods of fire protection for concrete elements
CU5. Monitor environmental impacts of building materials used	P1. Monitor and apply new technologies in concrete for construction of multi-storey buildings in accordance with organizational policies and guidelines. P2. Identify and apply performance requirements of concrete in fire resistance construction in accordance with acceptable standard construction practices. P3. Identify cost-effectiveness of using recycled materials in accordance with acceptable standard construction practices.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Explain application of Building Code and standards
K2.	Describe applications of structural principles in buildings
K3.	Define design principles and behaviour of structural members undergoing stress, strain, compression, bending or combined actions
K4.	Explain OHS requirements, legislative codes and practices
K5.	Describe types and nature of materials and effect of their performance, including properties and uses of cement and types of hydraulic cement
K6.	Knowledge of work drawings and specifications.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Documentation, including design brief drawings, specifications, codes, design concepts, construction schedules and other necessary supporting documents
- Research resources, including timber product information and samples
- Access to relevant legislation, regulations and codes of practice
- Relevant computer software package and suitable hardware.



0732B&CE-193 Apply structural principles to the construction of large, high rise and complex buildings

Overview: This competency standard covers the skills and knowledge required to apply structural principles to the construction of large, high rise and complex buildings

Competency Units	Performance Criteria
CU1. Apply structural principles to the planning of the erection or demolition of a structure.	P1. Identify main structural principles that apply to the erection of large, high rise and complex structures P2. Identify, analyse and apply performance characteristics of the structural elements, including materials identified in the building plan, to the planning of the construction work. P3. Undertake demolition of existing structures in accordance with legislative and planning requirements and safe work practices.
CU2. Coordinate and manage the site assessment and job set-up	P1. Put processes in place to analyse stability of soils and capacity of the site to support the construction loads. P2. Identify requirements for retaining walls in conjunction with related industry professionals and apply to the planning process. P3. Analyse and apply structural function and requirements for temporary structural elements to the planning process.
CU3. Coordinate and manage construction of footing systems	P1. Undertake coordination of the set-out of the building in accordance with documented building plans, following the full assessment of the site. P2. Assess structural performance of the footings specified in the building plan for compliance with relevant codes and accepted industry construction principles. P3. Lay and check footings, as specified in the building plan, are for compliance with standards and accepted industry construction principles.



National Competency Standards Level-5 for “Civil Technology”



	P4. Plan, implement and check damp coursing and the provision of termite barriers and other relevant techniques in accordance with codes, standards and industry practice
CU4. Coordinate and manage structural elements of the construction process.	P1. Identify and analyse technical construction principles and performance characteristics of construction materials in the planning of project. P2. Identify, implement and check processes for construction of all structural elements for compliance with manufacturer specifications and relevant standards and codes. P3. Identify and implement building plans and relevant standards and codes to ensure appropriate allowances have been made for plumbing, electrical conduits and other services to be installed.



CU5. Analyse and plan for Structural integrity of buildings.	P1. Consult relevant industry professional to provide advice regarding the structural integrity of proposed building. P2. Assess structural requirements and loads of the building design. P3. Conduct analysis of the effects of force and movements on structural elements. P4. Conduct analysis of properties and behaviours of structural materials is conducted. P5. Conduct analysis of section properties of structural elements using standard industry formulas and performance comparisons. P6. Evaluate performance characteristics of columns using standard industry techniques. P7. Assess methods used for stress distribution in connections between structural elements P8. Assess impact of various loads on the building structure P9. Identify design impact of high performance structural elements

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Describe applications of structural principles in buildings
K2.	Knowledge on Building Code and standards
K3.	Explain design principles and behaviour of structural members undergoing stress, strain, compression, bending or combined actions
K4.	Describe interpretation and analysis of work drawings and specifications
K5.	Explain Nature of materials and effect



of performance.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Coordinate professional input to evaluate structural integrity of large and complex buildings
- Clearly analyse structural impact of design decisions
- Comply with OHS and organisational quality procedures and processes
- Apply and interpret relevant documentation and codes
- Apply design principles relating to performance
- Identify typical faults and problems and the action required to rectify such faults.



0732B&CE-194 Install fire and smoke containment systems

Overview: This competency standard covers the skills and knowledge required to install fire and smoke containment systems

Competency Units	Performance Criteria
CU1. Apply rules and regulations to installation operations	P1. Confirm and apply requirements of relevant rules and regulations to work procedures. P2. Check compliance requirements and take action according to organisational policies and procedures.
CU2. Prepare for system installation	P1. Obtain work permits prior to entering customer premises. P2. Discuss customer requirements and select a suitable fire and smoke containment system according to organisational and customer requirements. P3. Apply relevant measurement processes to installation site and passive fire and smoke containment system components. P4. Identify and assemble components, tools, equipment and materials required for installation P5. Identify and assemble fireproofing or fire-stopping materials required for installation of system
CU3. Prepare fire proofing substrate or fire stopping opening for the system	P1. Check structural or penetrated elements for compliance with required smoke resistance or fire resistance level. P2. Prepare fire proofing substrate or fire stopping opening P3. Measure and prepare Materials for installation of fireproofing or fire stopping system



National Competency Standards Level-5 for “Civil Technology”



CU4. Install passive fire and smoke containment system	P1. Install fireproofing material or fire stopping system according to manufacturers' installation instructions. P2. Inspect and test passive fire and smoke containment system for defects and check to ensure that installation is sound and aesthetically pleasing, according to standard testing procedures and acceptable workmanship P3. Rectify and report impediments according to organisational requirements.
CU5. Label and certify passive fire and smoke containment system	P1. Assess and label or mark installation according to provisions of relevant standard and manufacturer, Building Code and organisational requirements. P2. Complete relevant schedule of evidence of compliance set out in relevant standard or logbook is completed according to relevant standard, and organisational and customer requirements.
CU6. Complete installation.	P1. Clean customer premises on completion of installation functions. P2. Complete and distribute documentation according to organisational and customer requirements.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe action to take when a breach of health, safety or other policy occurs
- K2. Define common technical terminology used in the installation of passive fire and smoke containment systems, including: plumb, level, mix ratio, density, wet film thickness, dry film thickness, section factor (H_p/A), exposed surface to mass (ESM) ratio and critical temperature



National Competency Standards Level-5 for “Civil Technology”



- K3. Define fire-rated walls, masonry, concrete, plasterboard and shaft wall
- K4. Explain fire-rated floors and floor ceiling systems
- K5. Describe penetration dimensions, i.e. width, height, depth and orientation
- K6. Define ambient and cold smoke, medium smoke and elevated and hot smoke
- K7. Define intumescent products and ablative products, fire resistance levels, incipient spread of fire, spread of flame indices, fire test report, assessments and letters of opinion.
- K8. Describe dangers of incorrect installation of passive fire and smoke containment systems
- K9. Explain key features of legislation, and building code requirements relating to:
- K10. Describe installation of passive fire and smoke containment systems
- K11. Define passive fire and smoke containment
- K12. Describe implications of not applying legislative requirements to job functions
- K13. Explain methods of converting imperial units of measurement to metric
- K14. Describe organisational requirements for labelling and certifying passive fire and smoke containment system installations
- K15. Define passive fire and smoke containment labelling types
- K16. Explain principles of passive fire protection related to overall fire safety and containment systems specific to passive fire and smoke containment systems
- K17. Describe procedures for determining fire resistance levels and smoke resistance levels
- K18. Explain purpose and interpretation of standards and technical documentation relating to passive fire and smoke containment systems
- K19. Knowledge of technical terms relating to passive fire and smoke containment system installation
- K20. Describe fireproofing and fire stopping variables, including types, components and fire barrier types.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Install different types of fireproofing to structural steel and ductwork:
 - spray,



- intumescent paint
- board
- Install fire stopping systems comply with the requirements of:
- Standards identified as relevant to work procedures
- Building Acts, regulations and codes
- Environmental regulations
- Manufacturers’ specifications
- OHS legislation, codes and regulations
- Organisational requirements, including OHS policies and procedures

Tools and Equipment

Fire and smoke containment products, including:

1. Fabric and timber protection, impregnated or sprayed
2. Fire-rated air transfer grilles fire-rated sealants, caulks and putties:
3. Acrylic
4. Polyurethane
5. Silicone
6. Fire resistant boards:
7. Calcium silicate
8. Vermiculite fire resistant mortars and grouts:
9. Load bearing
10. Non-load bearing fire resistant pillows:
11. Non-intumescent fire stop collars:
12. Intumescent paints and coatings (other than those used for fireproofing structural steel) linear gaps seals:
13. Impregnated foams
14. Tapes
15. Intumescent gaskets
16. Sealants materials into or onto which passive fire and smoke containment products are installed, including:
17. Concrete
18. Fire resistant board
19. Masonry
20. Plasterboard



National Competency Standards Level-5 for “Civil Technology”



21. Steel
22. Timber
23. UPVC
24. Mechanical and intumescent fire dampers
25. Smoke dampers passive fire and smoke containment solutions, including:
26. Access panels and hatches
27. Ceiling and partition systems
28. Control joints and expansion joints
29. Duct fireproofing and protection
30. Duct and damper penetration protection
31. Fire-rated sealants
32. Industrial fire protection
33. Structural steel fireproofing and protection
34. UPVC and plumbing penetrations



0732B&CE-195 Inform clients about thermal performance of residential buildings

Overview: This competency standard covers the skills and knowledge required to inform clients about thermal performance of residential buildings

Competency Units	Performance Criteria
CU1. Explain thermal performance to clients	P1. Explain building thermal performance to clients in line with organisational procedures. P2. Identify impact of building design and materials on thermal performance of building and communicate to clients in line with organisational procedures. P3. Explain relationship between building thermal performance, heating and cooling, and energy consumption to clients in line with organisational procedures. P4. Explain main uses of energy in buildings and the proportion attributed to heating and cooling to clients in line with organisational procedures. P5. Apply correct industry terminology for energy use when communicating with clients. P6. Apply correct units of measurement when describing power and energy. P7. Explain environmental and social impacts of energy use to clients in line with organisational procedures.
CU2. Explain the process of heat transfer in residential buildings to clients	P1. Explain heat transfer to clients in line with organisational procedures. P2. Explain meanings of key terms used to describe heat transfer to clients in line with organisational procedures. P3. Explain ways in which residential buildings lose and gain heat to clients in line with organizational procedures



National Competency Standards Level-5 for “Civil Technology”



CU3. Explain factors that impact on thermal comfort to clients.	P1. Explain thermal comfort and its use in building thermal performance assessments to clients in line with organisational procedures. P2. Explain physical factors that influence thermal comfort to clients in line with organisational procedures. P3. Establish requirements for thermal comfort based on occupant needs and explain to clients in line with organisational requirements
CU4. Explain how climatic conditions influence thermal Performance of residential buildings to clients.	P1. Identify major climatic zones and explain their key characteristics relevant to thermal performance assessments P2. Explain types and uses of climate data used in carrying out thermal performance assessments to clients in line with organisational procedures P3. Explain impact of local climatic conditions on building thermal performance to clients in line with organisational procedures P4. Explain ways of improving thermal performance appropriate to the relevant climatic zone to clients in line with organisational procedures
CU5. Explain principles of passive design to clients.	P1. Explain principles of passive design to clients in line with organisational requirements. P2. Explain application of principles of passive design to plan and existing residential buildings to clients in line with client and organisational requirements. P3. Explain factors that diminish the thermal performance of buildings to clients in line with organisational procedures

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain different climatic zones and characteristics of climatic zones



National Competency Standards Level-5 for “Civil Technology”



- K2. Describe climate data used in thermal performance assessment: diurnal temperature range, humidity, irradiance, maximum and minimum temperature, solar geometry, wind speed and direction and impact of climate on thermal performance of residential buildings
- K3. Explain environmental and social impacts of energy use: climate change, energy cost, energy security, global warming, greenhouse gas emissions, operational costs and resource depletion
- K4. Explain heat transfer in residential buildings: impact on heating and cooling mechanisms: radiation, convection, conduction, modelling
- K5. Describe U and R-values of building materials
- K6. Describe R-values of wall constructions
- K7. Knowledge on passive building design principles: building envelope, construction materials, construction methods, glazing, house plan ratio, insulation, orientation, thermal mass, ventilation, zoning, sources of information on climate
- K8. Define thermal comfort and its importance
- K9. Explain influences on thermal comfort: air movement, humidity, radiation, temperature, models of thermal comfort, requirements for thermal comfort, role of thermal comfort in building thermal performance assessments, thermal sensitivity of individuals
- K10. Knowledge on thermal performance: factors that diminish and enhance the thermal performance of buildings, impact of local climatic conditions on building thermal performance principles, relationship between building thermal performance, heating and cooling and energy consumption

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Explain Thermal Performance To Clients Using Correct Terminology
- Explain The Process Of Heat Transfer In Residential Buildings To Clients, Including The Ways In Which Residential Buildings Lose And Gain Heat
- Explain Factors That Impact On Thermal Comfort To Clients



National Competency Standards Level-5 for “Civil Technology”



- Explain How Climatic Conditions Influence Thermal Performance Of Residential Buildings To Clients, Including The Ways Of Improving Thermal Performance Appropriate To Particular Climatic Zones
- Explain Principles Of Passive Design To Clients, Their Application In Planned And Existing Residences, And The Factors That Diminish Thermal Performance.



0732B&CE-196 Design air conditioning and ventilation system

Overview: This competency standard covers the skills and knowledge required to design air conditioning and ventilation system

Competency Units	Performance Criteria
CU1. Evaluate design parameters.	P1. Determine client requirements from plans, specifications and client briefs to determine work scope. P2. Evaluate user comfort conditions and specific use conditions and calculate psychometric evaluation and heat loads P3. Evaluate building heat losses. P4. Specify distribution requirements for air conditioning and ventilation system applications P5. Evaluate range of air conditioning and ventilation systems in accordance with given applications. P6. Evaluate mechanical services drawings and interpret. P7. Evaluate health risks that may arise due to poor maintenance of air conditioning and ventilation systems P8. Specify minimum performance requirements for several different air conditioning and ventilation systems. P9. Evaluate manufacturer specifications and technical manuals for suitability for a range of design applications.
CU2. Plan system components	P1. Plan appropriate zoning of air conditioning and ventilation systems to comply with given specific performance objectives. P2. Specify air conditioning units for optimum performance with reference to legislation, standards and other relevant documentation.



National Competency Standards Level-5 for “Civil Technology”



	P3. Specify fan types for a range of applications with reference to legislation, standards and other relevant documentation. P4. Plan air diversion systems, including registers, to ensure a balanced system with reference to legislation, standards and other relevant documentation. P5. Plan required ventilation and duct work components and specify locations with reference to legislation, standards and other relevant documentation. P6. Specify approved materials for air conditioning and ventilation systems are specified. P7. Complete plans and drawings using standard drawing symbols related to air conditioning and ventilation in accordance with legislation, standards and other relevant documentation.
CU3. Design and size systems	P1. Calculate volume air changes per hour from given floor plans and details. P2. Specify methods for eliminating health risks from existing or proposed systems with reference to legislation, standards and other relevant documentation. P3. Design and size range of air conditioning and ventilation systems for given applications.
CU4. Test systems.	P1. Evaluate test procedures for air conditioning and ventilation systems are evaluated. P2. Conduct tests using appropriate testing equipment, record results and prepare report. P3. Plan, design and specify adjustments required as a result of testing.



CU5. Prepare documentation.	P1. Develop appropriate checklist, including formulas required to carry out an air balance to a given specification. P2. Prepare plans for a range of air conditioning and ventilation systems. P3. Prepare specification for an air conditioning and ventilation system. P4. Prepare testing and commissioning schedule. P5. Produce operation and maintenance manual.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe air psychometrics and the use of psychometric charts
- K2. Explain standards, manufacturer specifications, Building Code and other applicable codes or standard operating procedures relevant to the sector
- K3. Describe OHS and organisational quality procedures and processes
- K4. Explain hazards associated with devices and systems used in the hydraulic sector
- K5. Calculate heat load
- K6. Describe installation methods used in hydraulic systems
- K7. Define various terminology and definitions used in hydraulic design
- K8. Knowledge on work drawings and specifications.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Establishing And Evaluating Design Parameters For A Range Of Air Conditioning And Ventilation Systems
- Planning System Components For A Range Of Air-Conditioning And Ventilation Systems, Including:
 - Air Conditioning Units
 - Ducting Systems
 - Fans



National Competency Standards Level-5 for “Civil Technology”



- Designing And Sizing A Range Of Air Conditioning And Ventilation Systems For Given Applications
 - Developing An Appropriate Checklist For Tests Tube Carried Out On The System, Including Formulas Required To Carry Out An Air Balance
 - Conducting Tests, Recording And Evaluating Test Results And Preparing A Report
 - Preparing Plans For A Range Of Air Conditioning And Ventilation Systems
 - Preparing Specifications For Air Conditioning And Ventilation Systems
 - Preparing Testing And Commissioning Schedules For Air Conditioning And Ventilation Systems
 - Preparing Operation And Maintenance Manuals For Air Conditioning And Ventilation Systems

Tools and Equipment

1. Air Pressure Gauge
2. Air Velocity Gauge
3. Air Volume Gauge
4. Humidity Gauge
5. Pitot Tubes
6. Sound Power Levels
7. Temperature.



0732B&CE-197 Design acoustic of an auditorium

Overview: This competency standard covers the skills and knowledge required to design acoustic of an auditorium

Competency Units	Performance Criteria
CU1. Identify dimensions of hall for acoustic design	P1. Identify site of hall. P2. Make orientation, layout and structural design to keep noise within specification. P3. Set floor area and height to get volume of hall as per specification. P4. Set the floor plan as per use of hall
CU2. Design the seating plan	P1. Identify the distance of first line as per specified angle. P2. Set the width of seat and distance between two seats P3. Set the distance of last line from curtain line. P4. Set the height of adjacent seats.
CU2. Design surfaces of hall	P1. Design internal surface of roof false ceiling as per specification. P2. Design internal surfaces of walls as per specifications. P3. Set the reverberation as per use of hall according to specifications.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Define terms: sound, pitch, loudness, tone, intensity of sound, reflection of sound, reverberation, line of reverberation, transmission of sound, and absorption of sound.
- Describe factors to be considered in acoustics of building
- Describe characteristics of various types of sound absorbing materials
- Describe design requirements of an auditorium
- Describe principles to be observed in the acoustics design of an auditorium

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Drawing of acoustically designed hall

Tools and Equipment:

- Drawing tools
- Drawing sheets



0732B&CE-198 Insulate sound insulation products in building

Overview: This competency standard covers the skills and knowledge required to insulate sound insulation products in building

Competency Units	Performance Criteria
CU1. Plan and prepare for installing insulation material	P1. Obtain and confirm work instructions and relevant information for planning and preparation purposes. P2. Undertake risk assessment to identify existing risks and hazards in the work area, including electrical risks and hazards. P3. Document identified risks and undertake appropriate response according to safety requirements. P4. Confirm insulating material and insulation requirements in accordance with work specifications. P5. Identify appropriate personal protective equipment (PPE) and clothing according to organisational policies and procedures. P6. Select tools and equipment appropriate to the requirements of the work, confirm for serviceability, and report for repair or replacement where not serviceable. P7. Determine associated material and organise ready for use according to quality requirements and work plans and specifications
CU2. Install insulation	P1. Measure insulation material accurately P2. Install insulation using approved processes and handling techniques P3. Install insulation safely without damage or distortion of the surrounding environment, electrical and other services and in a manner that maximises safety of self and others.



National Competency Standards Level-5 for “Civil Technology”



CU3. Complete installation	P1. Conduct final inspections to ensure installed ceiling insulation conforms to job and manufacturer specifications. P2. Clean work area and disposed of materials, reused or recycled according to organisational, safety and environmental requirements. P3. Clean, check, maintain and store tools and equipment according to manufacturer specifications and organisational procedures.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Define sound insulation
- Explain physical measurement of sound
- Define reverberation of echo
- Describe use of ray diagram and echo
- Explain common acoustical defects and remedies of conference hall
- Define acoustic materials
- Explain methods of sound insulation of buildings
- Recommend different types of buildings for good acoustics

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sound insulated building designed as per specifications

Tools and Equipment

- Sound insulation material according to job
- PPE's



0732B&CE-199 Install ceiling insulation

Overview: This competency standard covers the skills and knowledge required to install ceiling insulation

Competency Units	Performance Criteria
CU1. Identify legislative, regulatory, and organisational requirements.	P1. Identify and comply with safety and applicable legislative requirements P2. Identify and comply with organisational environmental and safety plans and policies according to organisational requirements. P3. Identify and apply safe work methods and practices according to organisational safety plans and policies. P4. Identify and apply environmental requirements are according to organisational environmental plans and regulatory requirements. P5. Identify and carry out emergency response and evacuation procedures when required.
CU2. Plan and prepare for installing insulation	P1. Obtain and confirm work instructions and relevant information for planning and preparation purposes. P2. Undertake risk assessment to identify existing risks and hazards in the work area, including electrical risks and hazards. P3. Document identified risks and undertake appropriate response according to safety requirements. P4. Confirm ceiling insulating material and insulation requirements in accordance with work specifications. P5. Identify, fit correctly and use appropriate personal protective equipment (PPE) and clothing according to organisational policies and procedures. P6. Select tools and equipment appropriate to the requirements of the work, confirm for serviceability, and report for repair or replacement where not serviceable.



National Competency Standards Level-5 for “Civil Technology”



	P7. Determine associated material and organise ready for use according to quality requirements and work plans and specifications
CU3. Install ceiling insulation	P4. Measure insulation material accurately to minimise waste. P5. Install insulation using approved processes and handling techniques according to manufacturer specifications and relevant electrical and building regulations P6. Use dust-suppression procedures to minimise health risk in work area to self and others. P7. Install insulation safely without damage or distortion of the surrounding environment, electrical and other services and in a manner that maximises safety of self and others. P8. Identify and report variations and difficulties affecting performance or quality requirements of own work.
CU4. Complete installation.	P4. Conduct final inspections to ensure installed ceiling insulation conforms to job and manufacturer specifications. P5. Make notification of work completion to designated personnel according to organisational procedures. P6. Clean work area and disposed of materials, reused or recycled according to organisational, safety and environmental requirements. P7. Clean, check, maintain and store tools and equipment according to manufacturer specifications and organisational procedures. P8. Document and report malfunctions, faults, wear or damage to tools, equipment and site accurately for repair or replacement according to organisational procedures



Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe appropriate PPE and their use to reduce injury and electric shock
- K2. Explain ceiling insulation material types and quality requirements
- K3. Define common health and safety risks associated with handling ceiling insulation
- K4. Explain common workplace safety hazards and risks, and procedures for reporting these to designated personnel
- K5. Describe emergency response and evacuation procedures
- K6. Define hierarchy of hazard control legislation, regulation and building codes related to ceiling insulation and safe work method statements
- K7. Explain methods for calculating insulation material quantities
- K8. Describe organisational requirements and procedures relating to ceiling insulation installation, including requirements for a systematic approach to planning own work
- K9. Explain procedures to safely use equipment, shift and handle products and materials, and work at heights and in enclosed areas
- K10. Describe tools and equipment prohibited for use near identified asbestos-containing materials (ACM)
- K11. Define type and purpose of tags and logs of use for equipment
- K12. Describe reason for the operating temperature limit of electrical cables
- K13. Explain effect on cables partially surrounded by thermal insulation and fully surrounded by thermal insulation
- K14. Describe common wiring systems used in domestic premises indicating the age of the installation

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Apply knowledge of industry products to identify:

- Common Faults And Problems
- Manufacturer Specifications In Relation To Insulation
- Properties Of The Available Product
- Manufacturer Components And Materials



Apply Knowledge for the Safe Installation of Thermal Insulation In Relation To Electrical Equipment, Including:

- Effects Of Thermal Insulation On Cables
- Wiring Likely To Be Adversely Affected By The
- Retrospective Installation Of Thermal Insulation
- Clearance Of Thermal Insulation From Recessed Own Lights And Ancillary Equipment

Complete A Risk Assessment Sheet For Each Installation Which Documents:

- Whether The Wiring System Is Compatible With Thermal Insulation
- Number Of Recess Luminaires In Ceiling And How The Clearances Are To Be Met
- Electrical Hazards, And Measures Taken To Eliminate Them
- Relevant Work Instructions
- Communicate And Work Effectively And Safely With Others
- Comply With Organisational Policies And Procedures, Including Quality Requirements
- Comply With Site Safety Plan And Ohs Legislation, Regulations And Codes Of Practice Applicable To Workplace Operations
- Follow Work Instructions, Operating Procedures And Inspection Practices To:
- Maintain Workplace Records In Relation To Materials, Plant And Equipment Use
- Modify Work Activities To Cater For Variations In Workplace Procedures, Personnel, Contexts And Environment Prevent Damage To The Environment, Equipment, Products, Or Site Select And Use Appropriate Ppe
- Work Effectively Alone Or With Others And Operate With Minimal Supervision
- Select And Use Non-Conductive And Insulated Tools And Materials To Minimise Electrical Hazards
- Locate, Interpret And Apply Relevant Information, Standards And Specifications
- Select And Install Ceiling Insulation On At Least Two Occasions Within Agreed Timeframes And Standards Using Safe Handling Methods For Materials And Equipment.

Tools and Equipment

1. Broad Knives



National Competency Standards Level-5 for “Civil Technology”



2. Brooms
3. Caulking Guns
4. Electric Screw Guns
5. Hammers
6. Hand Saws
7. Keyhole Saws
8. Ladders
9. Manual Levelling Devices
10. Measuring Tapes And Rules
11. Nail Bags
12. Power Drills
13. Power Leads
14. Power Saws
15. Spanners
16. Spirit Levels
17. T Squares
18. Taping Knives
19. Tin Snips
20. Trestles
21. Trowels

Non-Conductive And Insulated Tools May Include:

22. Air Compressors And Hoses
23. Clamps
24. Docking Saw And Drop Saws
25. Laser Levelling Devices
26. Masonry Drills
27. Nail Guns
28. Pop Riveters
29. Scaffolding & Planks.



0732B&CE-200 Design an earthquake resistant building

Overview: This competency standard covers the skills and knowledge required to design of earthquake resistant building

Competency Units	Performance Criteria
CU1. Identify principles of earthquake resistant buildings	P1. Obtain plans and specifications P2. Identify building configuration like lightness standards, symmetry, projections and size of building P3. Identify enclosed area P4. Design slopes, foundation and ductility
CU2. Identify seismic strengthening arrangements in building	P1. Obtain plans and specifications P2. Identify building material as per specifications P3. Identify horizontal reinforcement at lintel, plinth, gable and roof level P4. Identify vertical reinforcement as per specification P5. Prepare drawing

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- State Reid’s elastic theory, theory of plate tectonics, seismic waves, earthquake size local site effects, internal structure of earth, classification of earth quake tsunami



National Competency Standards Level-5 for “Civil Technology”



- Describe different seismic zones.
- Explain seismic design parameters.
- Explain seism resistant building architecture.
- State ductility consideration in earthquake resistant design of building.
- Explain construction of project in different seismic zones
- Describe methods and materials of construction.
- Describe principles to be observed while planning, designing and construction of earthquake resisting buildings.
- Describe precautions to be taken in planning, designing and construction of buildings in seismic zones.

Critical Evidence(s) Required

- The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:
 - Drawing of seismic resistant building designed as per specifications

Tools and Equipment

- Drawing tools
- Drawing sheets



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-201 Coordinate maintenance and repair of buildings

Overview: This competency standard covers the skills and knowledge required to coordinate maintenance and repair of buildings

Competency Units	Performance Criteria
CU1. Plan repair or maintenance operation	P1. Review and confirm repair or maintenance requirements with relevant people according to organisational requirements. P2. Determine and arrange repair or maintenance resource requirements according to work order and budgetary requirements. P3. Identify site access and specific site requirements are identified and make appropriate arrangements according to client, organisational and legislative requirements. P4. Prepare work order and plan contingencies to ensure client and organisational requirements are met in an efficient and effective manner. P5. Recognise and satisfy client and tenant safety and security requirements in provision of services. P6. Establish communication channels and processes and agree with relevant people according to organisational requirements.



National Competency Standards Level-5 for “Civil Technology”



CU2. Coordinate repair or maintenance operation.	P1. Repair or maintenance operation is monitored against work schedules to ensure completion occurs within designated timeframes. P2. Identify factors affecting achievement of scheduled work are identified and required variations to schedules are negotiated and agreed with relevant people. P3. Establish communication channels and processes are used to ensure accurate exchange of information throughout operation. P4. Identify situations requiring specialist advice are identified and assistance is sought as required according to organisational requirements.
CU3. Check and record completed operation.	P1. Receive notification of completed repair or maintenance and check against client and organisational requirements. P2. Arrange inspection to confirm repair or maintenance is fully operational and meets performance specifications and industry standards. P3. Verify faults, errors or omissions and determine and arrange prompt remedial action with relevant people according to organisational requirements. P4. Use business equipment and technology to maintain relevant documentation according to applicable OHS, legislative and organisational requirements.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Basic knowledge of property contracts and administrative requirements
- K2. Describe building codes and relevant standards



- K3. Explain building control legislation
- K4. Describe common hazards to personal and public safety associated with particular types of maintenance work in buildings
- K5. Explain limitations of work role, responsibility and professional abilities
- K6. Explain OHS issues and requirements
- K7. Describe organisational and professional procedures, ethical practices and business standards
- K8. Define points of contact with emergency service agencies

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- K1. Inspecting completed work against work order and ensuring remedial action for faults, errors or omissions
- K2. Monitoring maintenance and repair work ensuring effective communication exchange and identification of factors requiring variations to work schedules
- K3. Knowledge of organisation's practices, ethical standards and legislative requirements associated with planning and coordinating the repair, maintenance and modification of properties and facilities
- K4. Planning maintenance and repair work ensuring client and tenant safety and security, and resource requirements are according to budgetary parameters
- K5. Responding appropriately to requests for maintenance and repair work and maintaining adequate records and reports.



0732B&CE-202 Assess construction faults in buildings

Overview: This competency standard covers the skills and knowledge required to assess construction faults in buildings

Competency Units	Performance Criteria
CU1. Identify and analyse construction faults on building sites up to three storeys	P1. Collect information relating to the specific building construction problem. P2. Identify construction problem for the type of construction relative to original specifications and building material. P3. Communicate construction faults to appropriate personnel and document in accordance with standard work practices. P4. Use problem solving techniques, identify typical faults and problems and action to rectify is deemed to be in accordance with the Building codes.



National Competency Standards Level-5 for “Civil Technology”



CU2. Identify construction techniques, methods and materials nominated in relevant legislation in the Building codes and standard	P1. Use building terminology accurately in the communication of issues. P2. Examine working drawings and specifications and identify and evaluate existing or designed construction problems P3. Prepare alternative methods and materials to meet construction aims and objectives to the specification nominated in relevant legislation in the Building codes and standards. P4. Prepare detailed sketches of available alternative methods and materials available to meet the construction aims and objectives to specification.
CU3. Resolve construction faults in construction techniques and methods	P1. Evaluate project working drawings and specifications identifying existing or designed construction problems. P2. Prepare report identifying available alternative methods and materials to meet the construction aims and objectives to specification. P3. Prepare detailed sketches of available alternative methods and materials available to meet the construction aims and objectives to specification.
CU4. Resolve construction faults using alternative construction methods.	P1. Evaluate suitable methods from available alternative solutions and recommend to resolve the problem in accordance with project aims and objectives. P2. Integrate selected methods into the project in order to resolve the construction problems in accordance with project aims. P3. Carry out evaluation of available alternative forms of construction is carried out in accordance with project aims.



CU5. Resolve common on-site faults with building materials.	P1. Evaluate commonly occurring on-site problems with building materials and their causes. P2. Identify and implement corrective and preventative measures.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Enlist authorities and powers of a building surveyor
K2.	Describe design and construction principles of buildings
K3.	Explain nature of materials and effect on performance
K4.	Describe processes for the administration and preparation of documentation
K5.	Describe processes for the interpretation of reports, working drawings and specifications
K6.	Explain relevant federal, state or territory legislation and local government policy and procedures

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Comply with OHS regulations applicable to workplace operations
- Apply organisational management policies and procedures, including quality assurance requirements where appropriate
- Assess construction faults in buildings, determine a rectification strategy and consider alternative construction methods; and the associated reporting of data, findings, recommendations and strategies for at least one residential building project and one commercial building project or equivalent in compliance with relevant legislation
- Provide reports to appropriate body/individual as determined by the project brief.



0732B&CE-203 Repair and rectify concrete

Overview: This competency standard covers the skills and knowledge required to repair and rectify concrete

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Identify, confirm and apply work instructions, work health and safety (WHS) requirements and other information relevant to the work for planning and preparation purposes. P2. Select plant, tools and equipment consistent with job P3. Requirements check for serviceability, and rectify faults and report before work begins. P4. Identify and calculate material quantity requirements according to plans, specifications and quality requirements. P5. Obtain, prepare, handle safely and locate materials appropriate to the work application ready for use. P6. Identify environmental requirements for the project according to environmental plans and regulatory requirements.



National Competency Standards Level-5 for “Civil Technology”



CU2. Carry out minor repairs.	P1. Identify Types of surfaces that may require repair and categorise repair work as major repairs or minor repairs. P2. Repair colour variations by applying a concrete staining agent. P3. Repair effects of dusting by applying an appropriate surface hardener/dust inhibiting agent or removing the weak top layer. P4. Repair damaged or blistered concrete either by grinding or topping. P5. Apply repair mortars and self-levelling floor compounds according to manufacturer specifications. P6. Apply sealers and coloured paints to concrete surfaces according to manufacturer specifications.
CU3. Repair cracks and other major defects.	P1. Determine and rectify root cause of defect. P2. Prepare concrete and apply flexible epoxy resins to manufacturer specification. P3. Apply toppings to concrete using correct materials and techniques. P4. Apply acid etching and cleaning safely according to manufacturer requirements
CU4. Clean-up work site area	P1. Clear work are by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe types, location and use of relevant safety resources and information:
- K2. Explain job safety analyses (JSA) and safe work method statements (SWMS)
- K3. Describe safety data sheets (SDS)
- K4. Define signage and barricades
- K5. Describe principles and processes for general concreting work:



- K6. Describe materials and techniques for repairing concrete
- K7. Explain preparation and placement of formwork and reinforcement
- K8. Describe use of control joints
- K9. Explain levelling techniques
- K10. Define mortar mix composition and additives
- K11. Describe placing and finishing of concrete to ensure timely completion of job within quality requirements and specifications
- K12. Define general construction terminology
- K13. Explain processes for material storage and environmentally friendly waste management
- K14. Describe processes for calculating material requirements
- K15. Explain quality requirements relevant to the repair and rectification of concrete
- K16. Describe operational, maintenance and basic diagnostic procedures
- K17. Knowledge on workplace and equipment safety requirements

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify and apply the correct repair method and top coat to a minimum of one square metre of affected area for three minor repairs and one major repair listed in the range statement
- Remove a section or whole defective area of concrete, cleaning and preparing the affected area and applying the necessary bonding
- Locate, interpret and apply relevant information, standards and specifications relating to repairing and rectifying concrete
- Comply with site safety plans and procedures
- Comply with organisational policies and procedures relating to repairing and rectifying concrete while maintaining quality requirements
- Safely and effectively operate and use plant, tools and equipment required to repair and rectify concrete
- Communicate and work effectively and safely with others at each stage of the process to repair concrete.

Tools and Equipment



National Competency Standards Level-5 for “Civil Technology”



1. Brooms
2. Concrete Mixers
3. Floats
4. Grinders
5. Hoses
6. Polishers
7. Rollers
8. Screeds
9. Shovels
10. Trowels, Including Power Trowels
11. Water Blasters
12. Wheel Barrows.



0732B&CE-204 Repair wall and floor tiles

Overview: This competency standard covers the skills and knowledge required to repair wall and floor tiles

Competency Units	Performance Criteria
CU1. Plan and prepare for work	P1. Identify, confirm and apply work instructions, work health and safety (WHS) requirements and other information relevant to the work for planning and preparation purposes. P2. Select plant, tools and equipment consistent with job P3. Requirements check for serviceability, and rectify faults and report before work begins. P4. Identify and calculate material quantity requirements according to plans, specifications and quality requirements. P5. Obtain, prepare, handle safely and locate materials appropriate to the work application ready for use. P6. Identify environmental requirements for the project according to environmental plans and regulatory requirements.
CU2. Repair damaged Tile work	P1. Remove damaged or defective tiles avoiding damage to surrounding tiles. P2. Clean old bedding and clear to allow placement of replacement tile. P3. Select replacement tiles and cut where applicable to match existing face, size, colour and pattern. P4. Fit tiles are fit and fix to maintain alignment with joints to uniform spacing. P5. Carry out grouting and clean tile face to specified finish.
CU4. Clean-up work site area	P1. Clear work are by disposing of materials (reused or recycled) in accordance to legislation and regulations P2. Clean, check, maintain and store tools and equipment according to requirement



Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1.	Explain job safety analysis (JSA) and safe work method statements
K2.	Describe material safety data sheets (MSDS) and hazards associated with solvents, adhesives and cement or epoxy-based grouts
K3.	Describe materials storage and environmentally friendly waste management

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Locate, interpret and apply relevant information, standards and specifications
- Comply with site safety plan and OHS legislation, regulations and codes of practice applicable to workplace operations
- Comply with organisational policies and procedures including quality requirements
- Safely and effectively operate and use tools, plant and equipment
- Communicate and work effectively and safely with others
- As a minimum remove and replace a quantity of damaged wall tiles, which are fixed with adhesive bedding; and remove and replace a quantity of damaged floor tiles, which are fixed with mortar bedding, ensuring:
 - Correct identification of requirement and replacement of the tiles
 - Correct selection and use of appropriate processes, tools and equipment
 - Completing all work to specification
 - Compliance with regulations, standards and organisational quality procedures and processes.

Tools and Equipment

1. Broom
2. Brushes
3. Buckets



National Competency Standards Level-5 for “Civil Technology”



4. Caulking Guns
5. Cement Sheet Cutters
6. Hammers
7. Hose And Water Sprays
8. Ladders
9. Levelling Equipment
10. Lump Hammers
11. Measuring Tapes And Rules
12. Mortar Boards
13. Nippers
14. Pointed Grouters
15. Power Drills
16. Power Leads
17. Rags
18. Rubber Mallets
19. Sanding Blocks
20. Saws
21. Scrapers
22. Shovels
23. Spacers And Wedges
24. Spatulas
25. Sponges
26. Squares
27. Squeegees
28. Straight Edges
29. String Lines
30. Tile Cutters And Scribes
31. Trowels
32. Wet And Dry Diamond Saws
33. Wheelbarrows
34. Wire Brushes
35. Wooden Floats May Include:
36. Concrete Mixers
37. Masonry Drill Bits



National Competency Standards Level-5 for “Civil Technology”



38. Power Grinders

39. Power Sander



0732B&CE-205 Apply building codes and standards to building projects

Overview: This competency standard covers the skills and knowledge required to apply building codes and standards to building projects

Competency Units	Performance Criteria
CU1. Access and interpret relevant codes and standard requirements	P1. Identify relevant performance requirements from the Building codes that apply to individual projects (described as low rise). P2. Determine requirements of relevant Building codes deemed-to-satisfy (DTS) provisions. P3. Assess and interpret requirements of relevant standards referenced in the Building codes accordingly.
CU2.2. Classify buildings	P1. Determine nature of a building according to its use and arrangement. P2. Apply building codes criteria to determine the defined classification P3. Identify and interpret building codes requirements for multiple classification



CU3. Analyse and apply a Range of solutions to a construction problem for compliance with the building codes.	P1. Determine range of criteria that will ensure that construction methods comply with building codes performance requirements. P2. Discuss and propose alternative solutions to a design or construction problem that will comply with building codes requirements in accordance with company policies and procedures. P3. Identify performance-based solutions and document in accordance with Building codes requirements. P4. Analyse and apply assessment methods referenced in the building codes to determine whether a building solution complies with performance requirements or DTS provision of the building codes P5. Identify and complete relevant documentation in accordance with building codes requirements.
CU4. Apply fire protection Requirements.	P1. Identify and apply passive and active fire control elements for low rise building required by the building codes and other legislation P2. Determine level of fire resistance required for the construction of various low rise buildings. P3. Carry out check of existing buildings for compliance with passive and active fire protection requirements in accordance with building codes requirements.

Knowledge & Understanding

The candidate must be able to develop skills and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Describe basic design principles and the behaviour of structures under stress, strain, compression, bending or combined actions
- K2. Knowledge on Building codes performance hierarchy
- K3. Define technical terms specified under general provisions of building codes
- K4. Explain general nature of materials and the effects of performance
- K5. Knowledge on relevant LDA and other development authorities standards
- K6. Explain relevant legislative and OHS requirements, codes and practices



K7. Knowledge on working drawings and specifications

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Comply with organisational quality procedures and processes
- Apply and interpret relevant documentation and codes
- Accurately apply building codes performance requirements relating to the design and construction of a building
- Understand assessment methods available to determine compliance with the BCA
- Identify faults and problems and proposed action to rectify.

Tools and Equipment

Different building codes like LDA, and other development authorities standards.



10.17. Concrete Technology

0732B&CE-206 Test the Properties of Cement

Overview: This competency standard covers the skills and knowledge required to check fineness of cement, prepare cement paste of standard consistence, find out Initial setting time, final setting time, and soundness of cement,

Competency Units	Performance Criteria
CU-1. Check fineness of cement	P1. Take standard weigh of cement sample P2. Sieve the sample on standard sieve. P3. Weigh residue retained P4. Find fineness by formula
CU-2. Prepare cement paste of standard consistence	P1. Identify the apparatus P2. Clean the tools P3. Weigh cement sample P4. Prepare cement paste and fill moulds. P5. Place the mould under Vicat apparatus. P6. Adjust zero reading P7. Drop the plunger and note reading till final value P8. Record the value of consistence
CU-3. Find out Initial setting time	P1. Weigh cement sample P2. Prepare paste of cement. P3. Start the stop watch. P4. Fill the moulds P5. Put the mould under vicat apparatus. P6. Drop the needle and note reading till final value is attained. P7. Record initial setting time.
CU-4. Find out final setting time	P1. Replace the needle with the needle having circular attachment P2. Note the time when needle leave the impression only. Record final setting time
CU-5. Find soundness of cement	P1. Take sample. P2. Make paste with standard %age of water. P3. Fill the split cylinder in specified manner. P4. Measure distance between legs of apparatus after 24 hrs.



National Competency Standards Level-5 for “Civil Technology”



	P5. Put the sample in water and boil it for 3 hrs. P6. Find soundness by formula

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to,

- K1.** Explain the properties of Cement
- K2.** Explain the role of chemicals in setting process and effects on strength due to variance in quantity in cement
- K3.** Explain the various properties (i.e. initial and final setting time. Soundness of cement, Compression strength of cement and Tensile strength of cement etc.

Critical Evidence(s) required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Observation and calculation sheet to determine fineness of cement.
- Capable to check the consistence of cement sample.
- Capable to check soundness of cement.
- Capable to check initial and final setting time.

List of Tools and Equipment

- BS-170 Sieve
- Sieve shaker
- Vicat Apparatus
- Le-chatlier Apparatus.
- Briquet Apparatus.
- Briquet Mould
- Digital Balance
- GI Tray
- Spatula
- Knife edge
- Digital Stop Watch



0732B&CE-207 Find out Strength of Cement

Overview: This competency standard covers the skills and knowledge required to check compressive strength of cement and tensile strength of cement with Briquette apparatus

Competency Units	Performance Criteria
CU1. Find compressive strength of cement	P1. Measure the cement and sand by weight. P2. Mix the material thoroughly. P3. Add specified %age of water P4. Mix it for specific time. P5. Fill cube mould in specific manner. P6. Place the sample in atmosphere for specific time and then dip in fresh water. P7. Test the samples after 3,7, and 28 days P8. Record readings. P9. Plot the graph.
CU2. Find tensile strength of cement with Briquette test	P1. Prepare cement paste with standard quantities. P2. Fill the moulds for 3 and 7 days. P3. Perform test on samples. P4. Record readings. P5. Plot the graph.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to,

- K1.** Explain the properties of Cement
- K2.** Explain the role of chemicals in setting process and effects on strength due to variance in quantity in cement
- K3.** Explain the various properties (i.e. initial and final setting time. Soundness of cement, compression strength of cement and tensile strength of cement etc.

Critical Evidence(s) required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Capable to determine fineness of cement.
- Capable to check the consistence of cement sample.



National Competency Standards Level-5 for “Civil Technology”



- Capable to check soundness of cement.
- Capable to check initial and final setting time.
- Capable to check compressive and tensile strength.

List of Tools and Equipment

- BS-170 Sieve
- Sieve shaker
- Vicat Apparatus
- Le-chatlier Apparatus.
- Briquet Apparatus.
- Briquet Mould
- Digital Balance
- GI Tray
- Spatula
- Knife edge
- Digital Stop Watch



0732B&CE-208 Test the Properties of Aggregate

Overview: This competency standard covers the skills and knowledge required to find clay percentage in sand, particle size distribution of fine and coarse aggregates with sieve analysis, bulk density of aggregates, flakiness index of coarse aggregates, Elongation index of coarse aggregates and specific gravity of aggregates

Competency Units	Performance Criteria
CU1. Find out clay percentage in sand.	P1. Collect sample of sand. P2. Prepare the solution in cylinder and add sand. P3. Take the reading and tabulate the percentage
CU2. Find out particle size distribution of fine and coarse aggregates with sieve analysis	P1. Arrange the sieve. P2. Put sample on sieve and shake it. P3. Weigh material retained on each sieve. P4. Draw grading curve with cumulative percentage retained.
CU3. Find out bulk density of aggregates	P1. Take the appropriate cylinder. P2. Put material in cylinder and weigh it. P3. Apply formula.
CU 4. Find out flakiness index of coarse aggregates	P1. Identify the apparatus. P2. Collect sample and sieve it. P3. Collect the retained material from two consecutive sieves. P4. Calculate the index.
CU5. Find out elongation index of coarse aggregates	P1. Identify the apparatus P2. Arrange the apparatus. P3. Collect sample and sieve it. P4. Collect the retained material from two consecutive sieves. P5. Calculate the index.
CU6. Find out of specific gravity of aggregates	P1. Collect the required sample and pour it in pycnometer. P2. Remove the entrapped air. P3. Perform the weighing procedure. P4. Oven dry the sample. P5. Use formula to calculate specific gravity

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to:



National Competency Standards Level-5 for “Civil Technology”



- K1.** State classification of aggregates according to nature of formation, size and shape
- K2.** State the characteristics of good fine and coarse aggregates
- K3.** Explain the fine aggregates (Fineness, impurities) and on coarse aggregates (sieve analysis, Flakiness, elongation and Specific gravity).
- K4** Explain the effects of bulking of sand.
- K5** Define importance of gradation of aggregated.

Critical Evidence(s) required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Capable to determine clay percentage in sand.
- Capable to determine particle size distribution of fine and coarse aggregates with sieve analysis.
- Capable to check flakiness and elongation index of fine and coarse aggregates
- Capable to check out bulk density of aggregates
- Capable to check out of specific gravity of aggregates.

List of Tools and Equipment

- Flakiness index gauge.
- Elongation index gauge.
- Specific gravity bottle.
- Moulds.
- Rod
- Sieves set



0732B&CE-209 Test the Properties of Fresh Concrete

Overview: This competency standard covers the skills and knowledge required to check workability by slump cone, Check workability by compacting factor apparatus, prepare concrete cubes and cylinders vibrated and hand compacted hand mixed and machine mixed and with different water cement ratio.

Competency Units	Performance Criteria
CU-1. Check workability by slump cone apparatus.	P1. Identify the apparatus P2. Weigh cement, sand, and aggregate according to ratio. P3. Mix the material properly P4. Add water for W/C. ratio P5. 0.4, 0.5, 0.55 and 0.6. P6. Oil the inner surface of cone P7. Fill it in 4 layers. P8. Remove the cone and measured the slump.
CU-2. Check workability by compacting factor apparatus	P1. Identify the apparatus. P2. Pour the concrete mix in Hooper's in proper sequence. P3. Weigh the concrete. P4. Fill the cylinder in specified layers P5. Weigh compacted concrete. P6. Calculate the compacting factor by using formula.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain Ingredients of Concrete
- K2.** Explain difference between good and bad concrete.
- K3.** Explain the factor influencing concrete properties
- K4.** State different factors affecting the workability of concrete.
- K5.** State the different recommended values of slumps for various conditions of placements.
- K6.** Explain different methods of mix design, transportation of fresh concrete it's placing and compaction.

_Tool and equipment

- Concrete Drum Mixer



National Competency Standards Level-5 for “Civil Technology”



- Platform scale
- Slump Test Apparatus
- Compacting Factor Apparatus
- Mechanical Sieve Shaker
- Wheel Barrow
- Bucket
- Straight Edge
- Shovels with handle
- Spirit Level
- Mortar Pan
- Mixing Spoon Set
- Weigh balance
- Straight Edge
- Metallic Tape



0732B&CE-210 Perform Destructive Tests on Hardened Concrete

Overview: This competency standard covers the skills and knowledge required to check find out compression strength of concrete using cubes and cylinders, Perform modules of rupture test on standard size beams, Perform Split cylinder test,

Competency Units	Performance Criteria
CU-1. Calculate compressive strength of concrete (1:2:4) using cubes and cylinders	P1. Measure the cement and sand by weight. P2. Mix the material thoroughly. P3. Add specified %age of water P4. Fill mould in specific manner. P5. Place the sample in atmosphere for specific time, then dip in fresh water. P6. Test the samples after 3,7,14, and 28 days P7. Record readings. P8. Plot the graph.
CU-2. Perform modules of rupture test on standard size beams.	P1. Prepare the sample of concrete beam as per specification P2. Place the specimen on loading points. P3. Apply load at a constant rate. P4. Measure the cross section of the tested specimen at each end and at center to calculate average depth and height. P5. Calculate Flexural strength by using formula.
CU-3. Perform Split cylinder test	P1. Prepare the sample of concrete cylinder as per specifications. P2. Record the weight and dimensions of sample. P3. Place the specimen on compression testing machine With ply wood strips above and below. P4. Apply the continuous load within the range of 0.72 to 1.4 Mpa / Min. P5. Observed the failure pattern P6. Record the Flexural strength.



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain Ingredients of Concrete
- K2.** Explain difference between good and bad concrete.
- K3.** Explain the factor influencing concrete properties
- K4.** State different factors affecting the workability of concrete.
- K5.** State the different recommended values of slumps for various conditions of placements.
- K6.** Describe the compressive strength of cube and Cylinder ,
- K7.** Explain the Tensile strength (split cylinder test), and Flexural strength (Beam test),
- K8.** Describe non-destructive tests
- K9.** Explain different methods of mix design, transportation of fresh concrete its placing and compaction.

Tool and equipment

- Concrete Drum Mixer
- Platform scale
- Moulds 4", 6"
- Concrete cylinder 6" dia
- Vibrating Table
- Wheel Barrow
- Bucket
- Straight Edge
- Shovels with handle
- Spirit Level
- Mortar Pan
- Mixing Spoon Set
- Weigh balance
- Straight Edge
- Metallic Tape
- Compression testing machine



0732B&CE-211 Perform Non-Destructive Tests on Hardened Concrete

Overview: This competency standard covers the skills and knowledge required to perform non-destructive test by rebound hammer and Perform Rebar Detector test (NDT) for steel reinforcement

Competency Units	Performance Criteria
CU1. Perform non-destructive test by rebound hammer	P1. Calibrate rebound hammer. P2. Set Rebound Hammer vertical to the surface. P3. Push hammer on surface. P4. Release the hammer and record the rebound number. P5. Find the compressive strength from graph.
CU 2. Perform Rebar Detector test (NDT) for steel reinforcement	P1. Identify the apparatus. P2. Operate the instrument on required surface. P3. Detect the steel its spacing and position.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the factor influencing concrete properties
- K2.** Describe non-destructive tests
- K3.** Explain different methods of mix design, transportation of fresh concrete it's placing and compaction.

Tool and equipment

- Rebound hammer.
- Rebar locator



10.18. Advanced Quantity Surveying

0732B&CE-212 Produce Detailed Estimate of Water Tanks.

Overview: This competency standard covers the skills and knowledge required to prepare rough cost estimate and hydraulic statement for sewerage scheme. Detailed estimate of Rectangular masonry underground & surface tank, Detailed estimate of hexagonal masonry underground & surface tank, Detailed estimate of circular masonry & RCC underground tank and Detailed estimate of Rectangular RCC Over Head Water Reservoir.

Competency Unit	Performance Criteria
CU1. Prepare detailed estimate of masonry rectangular 8' x 6' underground water tank.	P1. Calculate quantities of excavation & foundation concrete for rectangular underground masonry tank. P2. Calculate the quantities of brick work & RCC work for rectangular underground masonry tank.. P3. Calculate the quantities of flooring concrete & plaster for rectangular underground masonry tank.. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes for rectangular underground masonry tank.. P5. Prepare abstract of cost for rectangular underground masonry tank..
CU2. Prepare detailed estimate of masonry hexagonal underground water tank internal side length=5 ft.	P1. Calculate quantities of excavation & foundation concrete masonry hexagonal underground water tank. P2. Calculate the quantities of brick work & RCC work masonry hexagonal underground water tank. P3. Calculate the quantities of flooring concrete & plaster masonry hexagonal underground water tank. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes masonry hexagonal underground water tank. P5. Prepare abstract of cost masonry hexagonal underground water tank.
CU3. Prepare detailed estimate of masonry circular underground water tank 8 ft dia.	P1. Calculate quantities of excavation & foundation concrete masonry circular underground water tank. P2. Calculate the quantities of brick work & RCC work masonry circular underground water tank. P3. Calculate the quantities of flooring concrete & plaster masonry circular underground water tank.



National Competency Standards Level-5 for “Civil Technology”



	P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes masonry circular underground water tank. P5. Prepare abstract of cost masonry circular underground water tank.
CU4. Prepare detailed estimate of masonry rectangular surface water tank 4m X 2 m.	P1. Calculate quantities of excavation & foundation concrete masonry rectangular surface water tank. P2. Calculate the quantities of brick work & RCC work masonry rectangular surface water tank. P3. Calculate the quantities of flooring concrete & plaster masonry rectangular surface water tank. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes masonry rectangular surface water tank. P5. Prepare abstract of cost masonry rectangular surface water tank.
CU5. Prepare detailed Estimate of masonry hexagonal surface water tank internal side length=1.7 m..	P1. Calculate quantities of excavation & foundation concrete masonry hexagonal surface water tank. P2. Calculate the quantities of brick work & RCC work masonry hexagonal surface water tank. P3. Calculate the quantities of flooring concrete & plaster masonry hexagonal surface water tank. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes masonry hexagonal surface water tank. P5. Prepare abstract of cost masonry hexagonal surface water tank.
CU6. Prepare detailed estimate of masonry circular surface water tank 2 m i/d.	P1. Calculate quantities of excavation & foundation concrete masonry circular surface water tank. P2. Calculate the quantities of brick work & RCC work masonry circular surface water tank. P3. Calculate the quantities of flooring concrete & plaster masonry circular surface water tank. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes masonry circular surface water tank. P5. Prepare abstract of cost masonry circular surface water tank.
CU7. Prepare detailed estimate of RCC	P1. Calculate quantities of excavation & foundation concrete RCC circular water tank.



National Competency Standards Level-5 for “Civil Technology”



circular water tank 4m i/d.	P2. Calculate the quantities of RCC work RCC circular water tank. P3. Calculate the quantities of flooring concrete & plaster RCC circular water tank. P4. Calculate the quantities of iron steps, manhole cover inlet and outlet pipes RCC circular water tank. P5. Prepare abstract of cost RCC circular water tank.
CU8. Prepare detailed Estimate of RCC square Overhead water tank 14' x 14' x 9' elevated at 40 ft height.	P1. Calculate quantities of excavation & foundation concrete of RCC square Overhead water tank. P2. Calculate the quantities of RCC work for footing of RCC square Overhead water tank. P3. Calculate the quantities of RCC work for columns, ring beams, landing slabs, base slab, top slab based on MRS of RCC square Overhead water tank. P4. Calculate the quantities of steel reinforcement & plaster of RCC square Overhead water tank. P5. Calculate the quantities inlet pipe, wash out pipe, over flow pipe, outlet pipes and valves of RCC square Overhead water tank. P6. Calculate the quantities of iron steps/ ladder, manhole cover of RCC square Overhead water tank P7. Prepare abstract of cost of RCC square Overhead water tank.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Technical terms used in water tanks.
- K2. Parts of tanks (Underground, surface, overhead water reservoir)
- K3. Enlist different items of work for RCC & masonry Underground water tank.
- K4. Enlist different items of work for masonry surface water tank.
- K5. Enlist different items of work for RCC Over Head Reservoir.
- K6. Instructions on calculation of quantities of different items of work.
- K7. Instructions on preparation of Abstract of Cost.



National Competency Standards Level-5 for “Civil Technology”



K8. Enlist different works for RCC Over Head and Under Ground Water (polygonal with flat slab and Circular with segmental top slabs)

K9. Prepare bill of quantities and abstract of cost.

Critical evidence required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Detailed estimate of Rectangular masonry underground & surface tank.

Detailed estimate of hexagonal masonry underground & surface tank.

Detailed estimate of circular masonry & RCC underground tank.

Detailed estimate of Rectangular RCC Over Head Water Reservoir.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-213 Produce Detailed Estimate of Wells.

Overview: This competency standard covers the skills and knowledge required to prepare detailed estimates of Persian well and tube well.

Competency Unit	Performance Criteria
CU1. Calculate the quantities based on SMM /CSR for persian well.	P1. Calculate the quantities of excavation, cutting edge, well curb. P2. Calculate the quantities of masonry in steining of well, flooring surrounding of well and PCC on top of well. P3. Calculate the quantities of all items of sinking of well and surcharge weight.
CU2. Prepare abstract of cost using rates from MRS/ CSR for persian well	P1. Put quantities of all items of work for Persian well in Abstract of Cost table and relevant rates. P2. Calculate the amount of each items of work and Sum up the amounts for Persian well. P3. Add premium/ contractor's profit on amounts of relevant rates for Persian well.
CU3. Calculate the quantities based on SMM /CSR for subhead No. 1 investigation of source.	P1. Calculate the quantities of Electric Resistivity Survey. P2. Calculate the quantities of Boring, Collection of samples, Built Box and Testing of samples for investigation of source. P3. Prepare Abstract of cost for investigation of source.
CU4. Calculate the quantities based on SMM /CSR for subhead No. 2 Boring & lowering of pipe for tube well.	P1. Calculate the quantities of Boring, Collection of samples, Built Box and Testing of samples. P2. Calculate the quantities of bail plug, strainer, blind pipe, shrouding. P3. Prepare Abstract of cost for lowering of pipe.
CU5. Calculate the quantities based on SMM /CSR for subhead No. 3 pump and pumping machinery for tube well.	P1. Calculate the quantities of pump/ turbine with gear & motor, chlorination chamber, discharge gauge, chain pulley block. P2. Calculate the quantities of tool kit, steel tool cabinet, testing & development of tube well. P3. Prepare Abstract of cost for pump.
CU6. Calculate the quantities based on SMM /CSR for subhead No. 4 pump room for tube well.	P1. Draw the centre lines in plan for pump room. P2. Sum up the lengths of centre lines. P3. Apply the principle of centre line method. P4. Calculate the quantities of items of work for building P5. Apply the principles of deduction for surface rendering. P6. Prepare Abstract of cost for pump.



National Competency Standards Level-5 for “Civil Technology”



CU7. Calculate the quantities for subhead No. 5 external electrification for tube well.	P1. Calculate the quantities of electric poles, bared twisted cables, and transformer. P2. Calculate the quantities of electric energy meter, main switch, starter and internal electrification. P3. Prepare Abstract of cost for external electrification.
CU8. Prepare Summary for abstract of costs for Tube well.	P1. Put all costs for five sub-heads of tube well. P2. Sum up the amounts of tube well.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required:

- K1. Define well, Persian well and tube well.
- K2. State the different parts of Persian well.
- K3. Enlist the items of work for estimation of Persian well.
- K4. Enlist the items unit of measurement and units of rate for Persian well.
- K5. Apply principles of geometry and mensuration to calculate quantities.
- K6. Apply the procedure for preparation of abstract of cost Persian well.
- K7. State the different subheads wise parts of tube well.
- K8. Enlist the items of work with measuring for estimation of tube well- investigation of source, Boring & lowering of pipe, pump and pumping machinery, pump room and external electrification
- K9. Apply principles of geometry and mensuration to calculate quantities.
- K10. Apply the procedure for preparation of abstract of cost for all subheads and summary of abstract of cost for tube well.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 1. Detailed estimate of Persian well.
- 2. Detailed estimate of tube well.

Instruments & Consumables 1 Calculator, 2 Ruler, 3 Pencil.



0732B&CE-214 Produce Detailed Estimate of Steel Structures

Overview: This competency standard covers the skills and knowledge required to prepare detailed estimate of Steel Trussed Shed and steel plate Girder Bridge.

Competency Unit	Performance Criteria
CU1. Measure quantities for construction of Steel Trussed Shed 60 ft x 40’.	P1. Draw the abstract of quantities table for shed. P2. Calculate quantities of Structural Steel. P3. Calculate the quantities for painting. P4. Calculate the quantities for Roofing. P5. Calculate the quantities for Ridging & Gutter. P6. Calculate the quantities for Rain water down pipes & Bottom khurra. P7. Prepare Bill of Quantities for shed.
CU2. Prepare Abstract of Cost of Steel Trussed Shed 60 ft x 40ft.	P1. Put quantities of all items of work and relevant rates in abstract of cost table for shed. P2. Calculate the amount of each items of work and sum up the amounts for shed. P3. Add premium/ contractor’s profit on amounts of relevant rates for shed. P4. Sum up the amounts and add contingencies for shed. P5. Add building Services charges for the building for shed.
CU3. Measure quantities for construction of 16 ft Steel Plate Girder Bridge.	P1. Draw the abstract of quantities table for steel plate girder. P2. Calculate unit length weights of iron sections. P3. Calculate quantities of Structural Steel and plates. P4. Calculate the quantities for painting to bridge. P5. Calculate quantities of, plates, sheets, spout. P6. Prepare Bill of Quantities for bridge.
CU4. Measure quantities for construction of 16 ft Steel Plate Girder Bridge.	P1. Put quantities of all items of work and relevant rates in abstract of cost table for bridge. P2. Calculate the amount of each items of work and sum up the amounts for shed. P3. Add premium/ contractor’s profit on amounts of relevant rates for bridge. P4. Sum up the amounts and add contingencies for bridge.



Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define Truss and parts of Truss.
- K2. Enlist and define parts of shed (roofing only).
- K3. Describe the procedure of calculating unit weight of iron sections and plates.
- K4. Describe the procedure of calculating of items of work of steel trussed shed.
- K5. Workout quantities and cost of steel roof trussed shed of size 60ft x 100 ft.
- K6. Define steel plate girder and steel plate Girder Bridge.
- K7. Enlist and define parts of steel plate Girder Bridge.
- K8. Estimation of single span plate girder steel bridge 16' span
- K9. Describe the procedure of calculating of items of work of steel plate Girder Bridge.
- K10. Working out of quantities of different items of work for steel plate Girder Bridge.
- K11. Detailed Estimate of Steel plate girder bridge

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed estimate of a small two storeyed R. C. C. frame structure building.
2. Detailed estimate of Steel Trussed Shed.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-215 Produce Detailed Estimate of RCC Framed Structure

Overview: This competency standard covers the skills and knowledge required to prepare estimate of a small two storeyed R. C. C. frame structure building.

Competency Unit	Performance Criteria
CU-1. Measure quantities of a small two storeyed R. C. C. frame structure building having 2 rooms, 1 kitchen and 1 bath at each floor.	P1. Draw the abstract of quantities table. P2. Calculate quantities of RCC concrete for the frame. P3. Calculate the quantities for Brick work and DPC. P4. Calculate the quantities for Roofing. P5. Calculate the quantities for Surface Rendering. P6. Calculate the quantities for flooring. P7. Calculate the quantities for Doors & Windows. P8. Prepare Bill of Quantities.
CU-2. Prepare bar bending schedule for RCC structures of small two storeyed R. C. C. frame structure building.	P1. Calculate number of bars for each structure. P2. Calculate length of bars for each structure. P3. Calculate unit length weight for each dia. of bar. P4. Draw table of bar bending schedule. P5. Put the calculations in the table of schedule of bar. P6. Perform calculations to calculate weight for each type of bar and total weight.
CU-3. Prepare Abstract of cost of small two storeyed R. C. C. frame structure building	P1. Put quantities of all items of work and relevant rates in Abstract of cost table. P2. Calculate the amount of each items of work and sum up the amounts. P3. Add premium/ contractor's profit on amounts of relevant rates. P4. Sum up the amounts and add contingencies. P5. Add building Services charges for the building. P6. Add other centage charges for the building.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K-1. Define Framed Structure building.



National Competency Standards Level-5 for “Civil Technology”



- K-2. Describe components of framed structure.
- K-3. Enlist different items of work for RCC Framed Structure Buildings along with unit of measurement and unit of rate.
- K-4. Know procedure on Calculation of quantities of different items of work. including steel reinforcement
- K-5. Prepare schedule of bars for RCC column bases, columns, beams, slabs, lintels and stairs.
- K-6. Prepare of Abstract of Cost & Bar schedule.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Detailed estimate of a small two storeyed R. C. C. frame structure building.
2. Schedule of bars for RCC column bases, columns, beams, slabs, lintels and stairs.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-216 Produce Detailed Estimate of Building Services.

Overview: This competency standard covers the skills and knowledge required to prepare detailed estimate of Water supply installations, sanitary installation, Electrification, Telephone and cable and Gas installations.

Competency Unit	Performance Criteria
CU1. Prepare detailed estimate of water supply installations in C class building.	P1. Calculate quantities of pipes for water supply. P2. Calculate the quantities of valves, cocks & showers. P3. Calculate the quantities of mixers, taps, water filter system. P4. Calculate the quantities of tank & taps. P5. Prepare abstract of cost for water supply.
CU2. Prepare detailed estimate of sanitary installations in C class building.	P1. Calculate quantities of sewer pipes for sanitary installations. P2. Calculate the quantities of W.C., Basin, Urinal, Tub. P3. Calculate the quantities of Sink, Toilet paper holder, towel rail, soap dish, shelf, gulley trap & vent pipe. P4. Calculate the quantities of tooth brush stand. P5. Prepare abstract of cost for sanitary installations.
CU3. Prepare detailed estimate of internal electrification installations in C class building.	P1. Calculate quantities of cables & wires, conduits, duct. P2. Calculate the quantities of switches, sockets, plugs, bulb holders, ceiling rose, boards, & main switch. P3. Calculate the quantities of Circuit breaker, voltmeter, hooks, fans, fancy lights, water tight set, energy meter. P4. Calculate the quantities of panel box, indicator. P5. Prepare abstract of cost for electric installations.
CU4. Prepare detailed estimate of gas installations in C class building.	P1. Calculate quantities of pipes for gas. P2. Calculate the quantities of valves, gas meter. P3. Calculate the quantities of burner, geezer, heater P4. Prepare abstract of cost for gas.
CU5. Prepare detailed estimate of	P1. Calculate quantities of cables & wires, conduits, duct for telephone and cable.



National Competency Standards Level-5 for “Civil Technology”



telephone & cable installations in C class building.	P2. Calculate the quantities of socket, boards, & connectors. P3. Prepare abstract of cost for phone and cable.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define building services.
- K2. State different types of building services- Water supply installations, Sanitary installation, Electrification, Telephone and cable and Gas installations.
- K3. Enlist items of work with measuring unit for Water supply installations, Sanitary installation, Electrification, Telephone and cable and Gas installations.
- K4. Instruction regarding preparation of detailed estimate for Water supply installations, Sanitary installation, Electrification, Telephone and cable and Gas installations.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 1. Detailed Estimate of Water supply installations for C class building.
- 2. Detailed Estimate of Sanitary installation for C class building.
- 3. Detailed Estimate of Electrification for C class building.
- 4. Detailed Estimate of Telephone and cable for C class building.
- 5. Detailed Estimate of Gas installations for C class building.

Instruments & Consumables

- 1 Calculator
- 2 Ruler
- 3 Pencil



0732B&CE-217 Produce Detailed Estimates Using Computer Software -Excel.

Overview: This competency standard covers the skills and knowledge required to Prepare Estimate of framed structure building, detailed estimate for rectangular masonry underground water tank, detailed estimate for Segmental arch masonry bridge, detailed estimate for Building Services, detailed estimate for Tube well and Persian well, hydraulic statement of water supply and sewerage schemes, Earthwork calculations, Bituminous Road, materials statement and Rate analysis of brick work.

Competency Unit	Performance Criteria
CU1. Prepare detailed estimate for framed structure class room in MS EXCEL	P1. Load the EXCEL and prepare abstract of quantities table. P2. Type the measurements in number, length, breadth & height for each item of work for framed structure class room. P3. Type relevant formula for area, volume and other elements. P4. Type the formula for quantities and format the measurements & quantities. P5. Take out totals and net totals of quantities. P6. Prepare schedule of bars for columns, beams, slabs and lintels for framed structure class room. P7. Put quantity of each item of work and type relevant rates from the MRS/ CSR in abstract of cost table. P8. Calculate the amount by formula, sum up amounts and add premium, contractor profit. P9. Add contingencies and Work charges.
CU2. Prepare detailed estimate for rectangular masonry underground water tank in MS EXCEL.	P1. Load the EXCEL and prepare abstract of quantities table. P2. Type the measurements in number, length, breadth & height for each item of work for rectangular masonry underground water tank. P3. Type relevant formula for area, volume and other elements. P4. Type the formula for quantities and format the measurements & quantities. P5. Take out totals and net totals of quantities. P6. Prepare schedule of bars for slab of rectangular masonry underground water tank. P7. Put quantity of each item of work and type relevant rates from the MRS/ CSR in abstract of cost table. P8. Calculate the amount by formula, sum up amounts and add premium, contractor profit.



National Competency Standards Level-5 for “Civil Technology”



	P9. Add contingencies and Work charges.
CU3. Prepare detailed estimate for Segmental arch masonry bridge in MS EXCEL.	P1. Load the EXCEL and prepare abstract of quantities table. P2. Type the measurements in number, length, breadth & height for each item of work for Segmental arch masonry bridge. P3. Type relevant formula for area, volume and other elements. P4. Type the formula for quantities and format the measurements & quantities. P5. Take out totals and net totals of quantities. P6. Put quantity of each item of work and type relevant rates from the MRS/ CSR in abstract of cost table. P7. Calculate the amount by formula, sum up amounts and add premium, contractor profit. P8. Add contingencies and Work charges.
CU4. Prepare detailed estimate for Building Services in MS EXCEL.	P1. Prepare Detailed Estimate of Water supply installations for C class building. P2. Prepare Detailed Estimate of Sanitary installation for C class building. P3. Prepare Detailed Estimate of Electrification for C class building. P4. Prepare Detailed Estimate of Telephone and cable for C class building. P5. Prepare Detailed Estimate of Gas installations for C class building.
CU5. Prepare detailed estimate for Tube well and Persian well in MS EXCEL.	P1. Type the measurements of subheads 1 to 5 for tube well and Persian well and type formula for quantities. P2. Put quantity of each item of work and type relevant rates from the MRS/ CSR in abstract of cost. P3. Calculate the amount by formula, sum up amounts and add premium, contractor profit. P4. Add contingencies and Work charges.
CU6. Prepare hydraulic statement of water supply and sewerage schemes in MS EXCEL	P1. Draw the table and prepare Hydraulic statement of water supply in MS EXCEL having column headings Sr.#. Name of line (1-2), Length of Line (Rft), Area to be served(Own Area, Other Area, Total Area), Density of Population @34 persons, Discharge @ 8 gal/head/ hour for 9 hours, Peak Demand @ 2.25 times, Proposed dia of Pipe,



National Competency Standards Level-5 for "Civil Technology"



	Velocity ft'/sec, Loss of head (1000 ft), Total loss of head in line, Ground Level (<i>Upper Lower</i>), Hydraulic Level (<i>Upper, Lower</i>), Terminal P2. Draw the table and prepare Hydraulic statement of sewerage schemes in MS EXCEL having column headings Sr.#, Name of line (1-2), Length of Line (Rft), Area (Own, Acre, Other Area, Total Area), Density of Population, Total Line at line(6*7), Domestic Sewage Flow, Peak Factor, Peak Flow=9*10, Storm Water Flow= 50% of peak flow (11/2), Total Discharge =(11+12), Proposed size of Pipe, Capacity of Sewage pipe 9" =1.1 cusec, 12"=1.96 cusec, Slope as per size of pipe + natural slope available at site, Velocity when running full 2.5'/sec, Q max. or Q full (13/15), V max. or V full =(18/x-area of pipe or Q max/ x-area of pipe, Velocity at max (17*19), Fall due to gradient (length/ slope), Fall due to change of size 9"/12", Total fall (21+22), Ground Level upper, Ground Level lower, Invert Level upper, Invert Level lower, Thickness of wall bedding, Bed Level upper, Bed Level lower, Depth of cutting upper, Depth of cutting lower, Mean depth, No. of Manholes (size of pipe), Name of Line, Length of pipe, Size of Pipe, Remarks.
CU7. Earthwork calculations, Bituminous Road, materials statement and Rate analysis of brick work in MS EXCEL.	P1. Type the heading of table for earthwork, enter values and type formula for quantities. P2. Prepare abstract of quantities for bituminous road, enter values and type formula for quantities. P3. Type the heading of table for materials statement, calculate materials by typing formula for amounts. P4. Type the heading of table for rate analysis, calculate materials charges, labour charges, carriage charges and sundries for brick work. Sum up and add contractor's profit by typing formula for amounts.



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required:

MS EXCEL

- K1.** Instructions regarding use of MS EXCEL software.
- K2.** State the operators & functions along with their purpose.
- K3.** Describe syntax of formula in geometry and mensuration.
- K4.** Explain how to give formation to the measurements and quantities.
- K5.** State how to give references of cells in the same sheet, amongst sheets and amongst files.
- K6.** Prepare detailed estimate for framed structure building in MS EXCEL.
- K7.** Prepare detailed estimate for water tanks in MS EXCEL.
- K8.** Prepare detailed estimate for Bridge in MS EXCEL.
- K9.** Prepare detailed estimate for Building Services in MS EXCEL.
- K10.** Prepare detailed estimate for Tube well and Persian well in MS EXCEL.
- K11.** Prepare hydraulic statement of water supply and sewerage schemes in MS EXCEL.
- K12.** Earthwork calculations, Bituminous Road, materials statement and Rate analysis, in MS EXCEL.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 1. Detailed estimate for framed structure building in MS EXCEL.
- 2. Detailed estimate for water tanks in MS EXCEL.
- 3. Detailed estimate for Bridge in MS EXCEL.
- 4. Detailed estimate for Building Services in MS EXCEL.
- 5. Detailed estimate for Tube well and Persian well in MS EXCEL.
- 6. Hydraulic statement of water supply and sewerage schemes in MS EXCEL.
- 7. Earthwork calculations, Bituminous Road, Rate analysis, materials statement in MS EXCEL.

Instruments & Consumables

- Computer latest model with Server
- Computer latest model work stations
- Laptop computer
- Net working
- UPS 2000 Watt with batteries
- Multimedia Projector
- Scanner for A-3 paper



National Competency Standards Level-5 for “Civil Technology”



- Printer LaserJet
- USB Sticks
- Computer Chair (will be added in furniture portion) without arm rest – 5 legs base
- Computer Table (will be added in furniture portion) $2\frac{1}{2} \times 2 \times 2\frac{1}{2}$
- License software for education Latest Versions: Auto CAD Civil 3D M.S Office Antivirus
Microsoft windows



0732B&CE-218 Produce Project of Road in AutoCAD Civil 3D software

Overview: This competency standard covers the skills and knowledge required to Prepare Estimate of slab and arched Culverts.

Competency Unit	Performance Criteria
CU1. Import Survey data from excel file *.csv	P1. Create new dwg file in desired units-feet or meters for road project. P2. Save excel file in *.csv file format P3. Create formats for data import. P4. Import *.csv file in CAD file.
CU2. Perform Surface modeling	P1. Create parcels for project. P2. Edit parcels for project. P3. Print parcel reports for project. P4. Create points and point groups and work with survey figures for project. P5. Create surfaces for project. P6. Edit surfaces of project. P7. View surfaces for project. P8. Analyze surfaces for project.
CU3. Mark horizontal & vertical Alignment	P1. Create horizontal and vertical alignments for project. P2. Edit horizontal and vertical alignments for project. P3. Create data shortcuts for project.
CU4. Create sites, profiles, and cross-sections	P1. Create sites for project. P2. Create profiles for project. P3. Create cross-sections for project.
CU5. Create assemblies, corridors, intersections and Grading solutions	P1. Create assemblies for project. P2. Create corridors for project. P3. Create intersections for project. P4. Create Grading solutions for project.
CU6. Create gravity fed and pressure pipe networks	P1. Create gravity fed pipe networks for project. P2. Create pressure pipe networks for project.
CU7. Perform quantity takeoff and volume calculations	P1. Perform quantity takeoff for project. P2. Perform volume calculations for project.
CU8. Use plan production tools to create plan and profile sheets	P1. Create plan and profile sheets by use of plan production tools for project.



National Competency Standards Level-5 for “Civil Technology”



	P2. Create plan and profile sheets by use of plan production tools for project.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required:

AutoCAD Civil 3D

- K1. Describe Loading and unloading of AutoCAD Civil 3D.
- K2. State Interface and Workspaces of AutoCAD Civil 3D,
- K3. Describe Toolspace, panorama, Templates, Settings, and Styles
- K4. Describe AutoCAD Civil 3D Projects, Sharing Data, Using Data Shortcuts for Project Management
- K5. Describe how to Create and edit parcels and print parcel reports
- K6. Describe how to Create points and point groups and work with survey figures
- K7. Describe how to Create, edit, view, and analyze surfaces
- K8. Describe how to Create and edit alignments
- K9. Describe how to Create data shortcuts
- K10. Describe how to Create sites, profiles, and cross-sections
- K11. Describe how to Create assemblies, corridors, and intersections
- K12. Describe how to Create grading solutions
- K13. Describe how to Create gravity fed and pressure pipe networks
- K14. Describe how to Perform quantity takeoff and volume calculations
- K15. Describe how to Use plan production tools to create plan and profile sheets
- K16. State Steps in designing a project in AutoCAD Civil 3D.
- K17. Describe how to design a road project for 1 km length as per data collected from the civil engineering project.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- 9.19.18.** Complete Design and Bill of Quantities of a road project for 1 km length as per data collected from the civil engineering project.

Tools and Equipment



National Competency Standards Level-5 for “Civil Technology”



- Computer latest model with Server
- Computer latest model work stations
- Laptop computer
- Net working
- UPS 2000 Watt with batteries
- Multimedia Projector
- Scanner for A-3 paper
- Printer LaserJet
- USB Sticks
- Computer Chair (will be added in furniture portion) without arm rest – 5 legs base
- Computer Table (will be added in furniture portion) $2\frac{1}{2} \times 2 \times 2\frac{1}{2}$
- License software for education Latest Versions: Auto CAD Civil 3D M.S Office
Antivirus Microsoft windows



10.19. Contract Management

0732B&CE-219 Produce Pre-Qualification Documents & collect expression of interest

Overview: This competency standard covers the skills and knowledge required to prepare flow chart for pre-qualification process, prepare pre-qualification documents, notice for expression of interest and evaluation criteria to pre-qualify the Contractor/Consultant/Vendor.

Competency Unit	Performance Criteria
CU-1. Prepare flow chart for Prequalification process as per PEC specifications.	P1. Identify Qualification criteria to comply with the specific requirements. P2. Get Sanction from the authorities pertaining to Qualification criteria. P3. Identify Prequalification process for Civil works. P4. Prepare Flow chart- Form Procurement Team, Develop Evaluation Criteria to qualify, Issue Notice for the EOI, Evaluation of applicants, Data attachments, Applicant short list, Selection, Completion of the process and record keeping.
CU-2. Preparation of Pre-Qualification Document as per PEC Specification.	P1. Process for sanction of administrative approval- Budget provision P2. Process for technical sanction- allocation of funds. P3. Identify & get formed procurement team. P4. Download latest Pre-Qualification documents from PEC web site. P5. Identify & Prepare Pre-qualification document observing PEC directions. Instructions to applicant, Qualification Criteria, Annexures.
CU-3. Prepare Standard procedure and Features of Pre-qualification Document.	P1. Identify the standard procedure and features of Pre-Qualification document as per PEC directions. P2. Draft features of Instructions to Applicant. P3. Draft features of technical and financial capability assessment of applicants. P4. Draft features to assess the capability of joint venture P5. Draft features of evaluation criteria



CU-4. Prepare Pre-Qualification document for works & invite to applicants.	P1. Prepare Draft of Qualification Criteria. P1.1. Prepare Draft of General information of applicant P1.2. Prepare Draft to assess General experience of the Applicant. P1.3. Prepare Draft to assess Personnel Capabilities of the Applicant. P1.4. Prepare Draft to assess Equipment Capabilities of the Applicant. P1.5. Prepare Draft to assess financial position of the Applicant. P2. Prepare the Features and draft to assess the Joint venture. P3. Prepare (EOI) notice as per PEC & PPRA rules. P4. Get published in the print and digital media as per PPRA rules.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define Contractor, Consultant and Vendor, Procurement, Contract, types of Contract.
- K2.** Establish type of Contract.
- K3.** Define Prequalification, Types of prequalification.
- K4.** Enlist steps of pre-qualification process and Documents, forms, evaluation forms.
- K5.** Define Notice of invitation (EOI).
- K6.** Describe Pre-requisite for prequalification administrative approval, technical sanction, Budget provision and allocation of funds to carry out the whole process.
- K7.** State the Procurement Team formation.
- K8.** Define financial capabilities and technical capabilities.
- K9.** Define instruction to applicant.
- K10.** Understanding the forms of Technical and Financial capability as per the PCE/PPRA.
- K11.** Define the Technical features in the forms of prequalification.
- K12.** Define the assessment criteria and procedure of assessment.
- K13.** Define Joint venture and the features to assess the capabilities of Joint venture.



National Competency Standards Level-5 for “Civil Technology”



K14. Define the procedure to advertise the notice of invitation of prequalification.

K15. Enlist the pre-requisite attachments, along with Notice of EOI

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepared flow chart for Pre-Qualification process
- Prepared Pre-Qualification documents.
- Prepared Evaluation Criteria Scoring procedure.
- Prepared Notice of EOI and advertisement

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing Lab equipment



0732B&CE-220 Perform Evaluation Criteria for the assessment

Overview: This competency standard covers the skills and knowledge required to Collect (EOI) for civil works, Opening and initial evaluation of Applicants, prepare comparative statement, Shortlisting of applicants to meet the requirements.

Competency Unit	Performance Criteria
CU-3. Collect Expression of Interest for civil works.	P1. Issue Pre-Qualification documents to the applicants. P2. Conduct Meeting to understand scope of work. P3. Collect the EOI of the applicants with duly coding formalities and entered on register.
CU-4. Opening and Perform evaluation	P1. Open the Applications as per PPRA rules. P2. Perform the evaluation assessment as per the approved criteria for the particular works. P3. Prepare evaluation report. P4. Short list Applicants as per PEC/ PPRA rules. P5. Prepare List of Qualified Applicants. P6. Prepare report to get approval by authorities.
CU-5. Shortlisting and declaration successful Applicants.	P1. Short list Applicants as per PEC/PPRA rules. P2. Prepare List of Qualified Applicants. P3. Prepare report for authorities. P4. Prepare and notice to successful applicants.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** State to keep the records and codifying the responses for the future activity reference.
- K2.** Explain Knowledge of PEC & PPRA rules- standard procedure for evaluation of technical and Financial aspects.
- K3.** Describe Background Factors influenced on evaluation process and conflict of interest.
- K4.** Describe annexures and principles for evaluation.
- K5.** Define the Capability assessment of Joint venture.
- K6.** Prepare comparative statement and selection of successful applicants
- K7.** Explain the procedure to declare the successful applicants.



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepared the record register to enter the record of responses and Coding.
- Prepared the marking/evaluation pertaining to technical and financial capabilities and comparison report of the applicants.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-221 Produce Tender Documents & Collect Proposals

Overview: This competency standard covers the skills and knowledge required to prepare flow chart for tendering process, prepare tender documents, tender notice and collect proposals.

Competency Unit	Performance Criteria
CU-1. Prepare flow chart for tendering process as per PEC specifications.	P1. Identify tendering pre-requisites for works. P2. Identify tender processing for works. P3. Prepare Flow chart- Form Procurement Team, Develop Tender & Evaluation Criteria, Pre-qualified tenderer's List, Issue Tender, Tender Briefing meeting, Presentations visits, Submission of Tenders, opening of Tenders, Initial evaluation, Bidder short list, Selection, Officially declaration of Lowest bidders, Letter of acceptance, Contract agreement Award of Contract.
CU-2. Preparation of tendering Pre-requisites for works.	P1. Identify and select the Type of Contact. P2. Prepare the Engineers Estimate. P3. Process for sanction of administrative approval- Budget provision. P4. Process for sanction of technical sanction- allocation of funds. P5. Identify & get formed procurement team. P6. Download latest bidding documents from PEC web site. P7. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-3. Prepare Report on Main Features of Tender Documents.	P1. Identify the features of tender documents as per PEC directions. P2. Draft features of Instructions to Bidders & Bidding Data. P3. Draft features of General Conditions of Contract Part-I (GCC) & Particular Conditions of Contract Part-II (PCC).



National Competency Standards Level-5 for “Civil Technology”



	P4. Draft features of Specifications - Special Provisions & Specifications - Technical Provisions. P5. Draft features of Form of Bid & Appendices to Bid- Appendix A (special Stipulation clause conditions of contract, Appendix B (Foreign Currency requirements), Appendix C (Price Adjustment clause 70) Appendix D (Bill of Quantities, Day work schedule, Labour, Day work Material & rates, day work machinery plants), Appendix E (proposed construction schedule), Appendix F (Method of performing work), Appendix G List of equipment, Appendix H (Construction camp & housing facilities), Appendix I (List of Subcontractors), Appendix J (Estimated Progress payment), App K (organisation chart), Appen L (Integrity pact), Insurance requirement. P6. Draft features of Form of Bid Security, Form of Agreement, and Form of Performance Security/Bond & Mobilization Advance. P7. Draft features of Guarantee/Bond, and Drawings.
CU-4. Prepare tender documents for civil works & invitation for tender.	P1. Prepare draft of Particular Conditions of Contract (PEC) P2. Prepare draft of Specifications - Special Provisions. P3. Prepare draft of Specifications - Technical Provisions. P4. Prepare draft of detailed estimate & Bill of Quantities. P5. Prepare working drawings. P6. Attach All Forms of Securities. P7. Prepare tender notice as per PEC & PPRA rules. P8. Get published in the print and digital media as per PPRA rules.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define the duration required to submit the performance bond and procedure.
- K2.** Enlist the financial institution for the issuance of the performance bond.



National Competency Standards Level-5 for “Civil Technology”



- K3.** Define insurance and types of insurances required for Construction contracts.
- K4.** Define the Program.
- K5.** Define tender, contract, tender notice, tender documents, agreement.
- K6.** Enlist tender documents- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
- K7.** Describe Pre-requisite for tendering-administrative approval, technical sanction, Budget provision and allocation of funds
- K8.** Describe main features of Tender documents and tender notice.
- K9.** Describe methods of Invitation of tenders- by negotiation, selective tenders and public notice.
- K10.** Describe Prequalification of Bid, Tender notices - Characteristics, instruction on calling tender.
- K11.** Describe Submission of tenders/ bids-instruction to bidders.
- K12.** State Earnest money, security deposit. Mobilization advance, secured advance, retention money.
- K13.** State methods of departmental execution of works i.e. daily Labour, piece work and day work
- K14.** Explain the various contracting systems for construction works i.e. Lump sum contract, item rate contract, Construction Contract, Plant-Design Build Contract, cost plus fee contract, cost plus percentage contract, labour contract, negotiated rate contract, EPC/turn-key contract, Design Build operate transfer Contract (BOT,BOOT) and package contract etc.
- K15.** List the merits and limitations of each contracting system
- K16.** Distinguish between work order and contract
- K17.** Define terms budget provision, administrative approval, Technical sanction and Allocation of funds
- K18.** State the pre-requisites for tendering
- K19.** State the methods of invitation of tender
- K20.** Draft a tender notice
- K21.** Prepare tender documents
- K22.** Explain the need of earnest money and security deposit
- K23.** Lists the steps involved in fixing up the agency through tender system
- K24.** Discuss the instruction to bidders/contractor for filling tenders/bids
- K25.** Describe the handing over and defect liability period.
- K26.** Explain the conditions of contract such as penalty, Arbitration, Time of completions and Extension of time.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepared Program to submit as contractual requirement.
- Prepared flow chart for tendering process
- Prepared tender documents and tender notice.
- Prepared Engineering Cost Estimate.
- Evaluation of Tenders.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment



0732B&CE-222

Perform Tender Evaluation & Award of Contract

Overview: This competency standard covers the skills and knowledge required to Collect Tender for civil works, Opening and initial evaluation of tenders, prepare comparative statement, drafts of agreement deeds and procurement order.

Competency Unit	Performance Criteria
CU-1. Collect Tender for civil works.	P1. Issue tender documents to Qualified bidders. P2. Conduct tender briefing meeting. P3. Collect tenders with coding formalities duly entered on register.
CU-2. Opening and initial evaluation of tenders.	P1. Open the tender as per PPRA rules. P2. Implement Background Factors on opening of tenders- accord weightage to elements of bid eligibility for evaluation tenders. P3. Implement Steps/ Stages of Bid Evaluation in consistence to Evaluation Guide as per PEC/PPRA rules. P4. Inspect Annexures & Appendices with the bid. P5. Short list bidders as per PEC/ PPRA rules in initial evaluation. P6. Bidder short list, Selection, Award Contract.
CU-3. Award contract to successful bidder.	P1. Check the amounts of items of work. P2. Prepare comparative statement. P3. Reconciliate bank sureties, and data of appendices. P4. Pay visit for confirmation of accuracy of bid appendices and forms. P5. Select the qualified bidder as per criteria defined by PEC. P6. Issue letter of acceptance, and sign agreement deeds. P7. Award the contract to the successful bidder.



Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** State Knowledge of PEC & PPRA rules- standard procedure for evaluation of bids civil works.
- K2.** Describe Background Factors on opening of tenders
- K3.** Prepare comparative statement and selection of contractor from tenders
- K4.** Explain steps and stages of bid evaluation.
- K5.** Describe annexures for bid evaluation.
- K6.** Define bid opening record and bid validity, scrutiny of tenders, comparative statement, acceptance of tenders, award and commencement of work, possession of site.
- K7.** Describe principles of bid evaluation.
- K8.** Describe Preliminary examination of bid.
- K9.** Describe detailed examination of bid.
- K10.** Explain bid evaluation procedure.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepared Comparative statement.
- Prepared evidence Lowest bidder's declaration.
- Draft of Letter of Acceptance.
- Formation of Contract agreement.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-223 Perform Post-Award Legal/Contract Requirements and Finance.

Overview: This competency standard covers the skills and knowledge required to post award legal/Contract requirements and Cash flow. Record of measurements and payment on MB of building work, Record of attendance roll, material consumed, acquaintance roll on muster roll, Daily labour report and casual labour report.

Competency Unit	Performance Criteria
CU-1. Performance bond, Insurance requirements and Program	P1. Submit Performance bond prior to possession of Site. P2. Submit the insurance requirements. P3. Prepare and Submit the program
CU-2. Prepare record of measurements and payments for execution on contract basis of a building	P1. Get issued measurement book (MB). P2. Record project detailed information in MB. P3. Record bill number in MB. P4. Record measurements for items of work in the MB. P5. Record costing of items of work as per agreement in MB. P6. Make deductions as per agreement. P7. Incorporate the costing results in bill form. P8. Submit for auditing passing, and payment.
CU-3. Prepare record of measurements and payments for execution on daily labor basis for repair works.	P1. Get issued muster roll (MR). P2. Record work detailed information in muster roll. P3. Record category wise name of laborer's employed. P4. Record measurements of work performed by labor in the MR. P5. Record quantity of materials issued & consumed. P6. Record actual wages of labour fortnightly in MR. P7. Add arrears if applicable in current acquaintance roll. P8. Submit for auditing passing, and payment.
CU-4. Prepare record of permanent advances for works.	P1. Submit requisition for imprest/ permanent advance. P2. Record entries on Imprest cash account. P3. Submit the bills/ vouchers of expenditures. P4. Get cleared imprest amount.
CU-5. Prepare record of temporary advances for works.	P1. Receive the cash on receipt-STR-3A. P2. Enter on cash book. P3. Adjust in cash book on disbursement. P4. Attach the voucher/ acquaintance role.

Knowledge and understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define & describe measurement book (MB), SMB, CMB, muster roll, bill, acquaintance roll.
- K2.** State the importance of measurement book
- K3.** List the rules to be followed in recording measurements in MB.
- K4.** Record measurements in M.B and prepare abstract of payment in M.B
- K5.** Explain the mode of payment to contractors
- K6.** State the types of bills to be used.
- K7.** Describe & prepare of bills, running bills, final bills, first & final bill, deductions to be made from bills checking of bills, value engineering, cost accounting (interim payment certificate)
- K8.** Define daily labour report, casual labour report,
- K9.** Prepare muster roll. daily labour report etc
- K10.** Explain terms, Hand receipt, imprest, recoverable payment, competent authority, controlling officer, Disbursing officer, Divisional officer, cogence of work, deposit work, supervision charges, suspense account, market rates, storage rate and charges.
- K11.** Describe Mode of payment-bills, vouchers, first and final bill, interim payment, final payment, advance payment, secured advance payment, bill forms, imprest cash account,
- K12.** Major expenditure heads-major head, minor head, sub head and detailed head.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Record of measurements and payment on MB of building work.
- Record of attendance roll, material consumed, acquaintance roll on muster roll.
- Daily labour report and casual labour report.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Computer lab



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-224 Maintain record of Stores.

Overview: This competency standard covers the skills and knowledge required to prepare record of store (stock) debited to suspense account, prepare record of store directly charged to work, prepare record for transfer of store & prepare receipt record of tools & plants- supplies.

Competency Unit	Performance Criteria
CU-1. Prepare record of store (stock) debited to suspense account	P1. Identify stores debited to suspense account-stock. P2. Record stock account in stock register of stock-Small Stores, building Materials, timber, metal, fuel, paint stores, and house fittings. P3. Record stock account in stock register of stock-miscellaneous, land and kiln, manufacture, and storage. P4. Enter receiving of stock on prescribed format- Form PWA-4. P5. Record entries on cash book of suspense account.
CU-2. Prepare record of store directly charged to work.	P1. Identify stores debited to debit to final head of account-Tools & plants, road metals, materials charged to work. P2. Identify stock articles requiring no prior sanction- materials charged to work. P3. Identify stock articles requiring prior sanction- tools & plants. P4. Record sales Account on Form DFR DW-10
CU-3. Prepare record for transfer of store.	P5. Get issued indent book (Form PFR-26). P6. Record items required for consumption on indent book. P7. Get approval of authority. P8. Receive store and record on consumable Stock registers. P9. Receive tools & plants and record on durable goods Stock register.
CU-4. Prepare receipt record of tools & plants- supplies	P1. Record delivery of items-Inward gate pass, Goods Delivery challan P2. Get inspected store items-Technical Evaluation committee, Goods Inspection Report P3. Record accepted store items in register-Goods receiving Note, Stock Register. P4. Get prepared Stock Entry Certificate for store items

Knowledge and understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain need for store in a project
- K2.** State the classification of stores- stock, tools and plants, Road metal and materials charged direct to the work.
- K3.** State the classification of the items held in general stock- Sub-Heads: - (i) Small Stores; (ii) Building Materials; (iii) timber (iv) Metal (v) Fuel (vi) Paint Stores (vii) House Fittings (viii) Miscellaneous. (ix) Land and kiln; (x) Manufacture; and (xi) Storage.
- K4.** Explain the principles of storing materials and T&P in store
- K5.** Prepare the register of store issue and receipt,
- K6.** State the need for materials at site account & Road metal account.
- K7.** Describe Stock-sub-heads of stock receipts and issue of stock, stock account, Register of stock receipts and issues, shortages and surpluses of stock, monthly stock account.
- K8.** Explain the verification procedures of stores
- K9.** Explain the procedure of taking delivery for stores
- K10.** Explain the principles of storing materials, Location of T & P protection of stores, store room record, bin card, ordering procedure of store.
- K11.** Explain procedure for Indenting of materials-instruction for preparation of indents, specifications, and supply procedures in works departments.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Record of store (stock) debited to suspense account
- Record of store directly charged to work.
- Record documents prepared for transfer of store.
- Record documents receipt record of tools & plants- supplies

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



National Competency Standards Level-5 for “Civil Technology”





**0732B&CE-225 Perform Variation Orders, Claims and Dispute
Adjudication Board**

Overview: This competency standard covers the skills and knowledge required to prepare Variation order, prepare Claim document, hiring of Dispute adjudication board, formation of Dispute adjudication board agreements.

Competency Unit	Performance Criteria
CU-1. Preparation of Variation order	P1. Identify the Need of Change in Scope of work P2. Notify in time to Contractor about the change and extent. P3. Maintain the record and approval of Change order.
CU-2. Preparation of Claims	P1. Identify the entitlement of Claims. P2. Notify for Claim within approved time. P3. Submit the claim with supporting
CU-3. Payment of Claims.	P1. Validate the claim within specified time. P2. Assessment for the prolongation of the time P3. Assessment for Payment.
CU-4. Dispute Adjudication board	P1. Identify the need of Dispute Adjudication board P2. Prepare the hiring Procedure of DAB as the PEC/PPRA Rules. P3. Prepare the Draft of Dispute adjudication agreement

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define the Scope of work, variation, change order, State the need of change order.
- K2.** State the process of Change order as per PEC/PPRA preparation and approval.
- K3.** State the prolongation of Time and Cost.
- K4.** Define the Claim.
- K5.** State the process of Claim preparation as per PEC/PPRA
- K6.** Enlist the support document of Claim
- K7.** Define the Prolongation of time
- K8.** Define the prolongation of cost
- K9.** State the assessment procedure of claim as per PEC/PPRA rules.



National Competency Standards Level-5 for “Civil Technology”



- K10.** State Cost weightage of labour, equipment and Material
- K11.** State the Price adjustment formula to validate the variation in prices as per PEC/PPRA rules.
- K12.** Define the Dispute.
- K13.** State the dispute avoidance techniques.
- K14.** Define the Adjudication board
- K15.** Define amicable settlements and arbitration.
- K16.** State the process to hire the DAB as per PEC/PPRA rules.
- K17.** State the Dispute adjudication board agreement, term and Conditions.
- K18.** State the procedure of dispute resolution by the DAB.
- K19.** State the expiry of DAB.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Prepared process flow chart of variation order.
- Prepared process flow chart of Claim preparation.
- Prepared process flow chart of Claim Substantiation.
- Prepared flow diagram of Dispute adjudication board process techniques as per PEC/PPRA rules.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing Lab equipment



10.20. Sanitary Engineering

0732B&CE-226 Design sanitary sewers

Overview: This competency standard covers the skills and knowledge required to interpret Separate sanitary sewer systems are designed to transport sewage alone. Sanitary sewers are distinguished from combined sewers, which combine sewage with storm water runoff in one pipe. Sanitary sewer systems are beneficial because they avoid combined sewer overflows.

Competency Units	Performance Criteria
CU-1. Evaluate sanitary sewer	P1. Identify sanitary sewer P2. Calculate quantity of sewage P3. Identify population P4. Identify rate of water supply P5. Check temperature. P6. Apply and compare by different formulas P7. Decide pumping station (If required) P8. Check results
CU-2. Perform Preliminary Investigations to design sanitary sewer	P1. Identify Area P2. Obtain pertinent maps P3. Identify structures and utilities P4. Determine groundwater conditions P5. Show Gradient for sewer P6. Determine characteristics/subsurface of soil in which sewers are to be constructed
CU-3. Design Hydraulic Equation for sewer	P1. Identify Manning equation P2. Identify Manning “n” value (not less than 0.013) P3. Suggest type of construction P4. Suggest length of sewer pipe P5. Suggest Gradient for sewer P6. Identify Manholes distances or connections from buildings

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

K1. Use graphical methods to solve hydrological problems to design for sewer.



National Competency Standards Level-5 for “Civil Technology”



- K2. Describe and explain the essential features for sewerage system.
- K3. Describe essential features of installations for the sanitary sewers.
- K4. Explain the “SELF CLEANING VELOCITY” for sewage
- K5. Explain demand of water per capita rate and calculate quantity of sewage
- K6. Explain variation in swage flow
- K7. Describe optimizing quality of sewage
- K8. Explain network for sewers
- K9. Explain safety precautions for laying sewers in plain & hilly area
- K10. Explain manholes c/c distance for different sewers.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare layout of sewers scheme
- Preparation plan to laying of sewers according to area and standards
- Apply formula to design sewers
- Identify Manning value for sewers.
- Check construction specification for sewers for residential and commercial areas.
- Apply variation for sewage flow
- Apply safety precautions
- Apply man hole distance and provide gradient in sewers

TOOLS AND EQUIPMENT'S

- ❖ Drawing sheet
- ❖ Calculator
- ❖ Thermometer
- ❖ Drawing instruments
- ❖ Pressure testing kits
- ❖ Umbrella with stand
- ❖ Spirit level
- ❖ PPEs



0732B&CE-227 Design storm water sewers

Overview: This competency standard covers the skills and knowledge required to storm sewer system and its design to carry rainfall runoff and other drainage. It is not designed to carry sewage or accept hazardous wastes. The runoff is carried in underground pipes or open ditches and discharges untreated into local streams, rivers and other surface water bodies.

Competency Units	Performance Criteria
CU-1. Perform Basic Design Considerations for Storm sewer	P1. Identify run off / quantity of flow P2. Check catchment Area with characteristics P3. Suggest Sewer pipe materials P4. Find out Minimum pipe sizes P5. Apply Minimum and maximum velocities for sewage P6. Identify gradient for sewer P7. Evaluation of alternative alignments or designs P8. Select appropriate sewer appurtenances
CU-2. Interpret Sewer Construction	P1. Identify Sewers Material (Rigid or Flexible) P2. Check soil condition P3. Check load for sewer P4. Perform alignment P6. Carry out Joints of sewers P7. Perform Back filling

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- k1.Explain the purpose and application of storm sewer
- K2 Knowledge of catchment area with its characteristics
- K3. Explain design procedure for storm sewers
- K4- Describe working of storm sewers and manhole.
- K5. Explain different type of pipes used as sewers
- K6. Describe different pipe jointing methods.
- K7. Describe safety procedure for joining pipes
- K8. Explain concrete & Cast iron difference

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Define Joints, Pipes and its types.
- Draw sketch of different pipe joints.



National Competency Standards Level-5 for “Civil Technology”



- Design a sewers scheme
- Calculate Run off
- Plan safety procedure during construction of sewers
- Plan the steps to joining of sewers for different materials
- Adopt safety precautions while construction of sewers.
- Apply formulas to design of sewers

TOOLS AND EQUIPMENT'S

- ❖ Drawing sheet
- ❖ Calculator
- ❖ Thermometer
- ❖ Drawing instruments
- ❖ Pressure testing kits,
- ❖ Umbrella with stand
- ❖ Spirit level
- ❖ PPEs
- ❖ Sewers for different materials



0732B&CE-228 Layout of sewers

Overview: his competency standard covers the skills and knowledge required to design the layout for sewers and open drains. Surface **drainage** involves the removal of excess water from the surface of the soil. This is done by removing low spots where water accumulates by land forming. Sewers layout is to be done by excavating ditches, laying and joining of pipes on an entire designed area.

Competency Units	Performance Criteria
CU-1. Interpret Layout of Sewers	P1. Identify Sewerage scheme P2. Spread & fix sheet P3. Apply scale P4. Draw sewer scheme showing components P5. Suggest gradient P6. Suggest specifications for sewers
CU-2. Perform Layout for storm water sewers	P1. Identify storm sewer P2. Check catchment area with characteristics P3. Calculate run off P4. Check temperature. P5. Fix drawing sheet and select scale P6. Show pumping station (If required) P7. Draw sewer scheme showing components

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1-Describe Layout plans
- K2- Explain Marking out of sewers.
- K3- Explain procedure to draw layout plans.
- K4. Describe design procedure for sewerage system
- K5. Explain safety precaution for task
- K6. Describe fixing of pump during installation of sewers
- K7. Explain PPEs

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Mount pipe for sewers
- Install pump for sewerage system properly
- Design the sewers scheme



National Competency Standards Level-5 for “Civil Technology”



- Execute sewers scheme plan
- Maintain connection from house to manholes
- Maintain self-cleaning velocity of sewage

TOOLS AND EQUIPMENT'S

- ❖ Spirit level
- ❖ PPEs
- ❖ Drawing sheet
- ❖ Drawing instruments
- ❖ Thermometer
- ❖ Drawing Board
- ❖ Compass
- ❖ Measuring Tape
- ❖ Pegs
- ❖ Arrows
- ❖ Pump for pumping station (if Required)



0732B&CE-229 Prepare sketches of sewer appurtenance

Overview: This competency standard covers the skills and knowledge required for basics of water **Clarifiers** and settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. A **clarifier** is generally used to remove solid particulates or suspended solids from liquid.

Competency Units	Performance Criteria
CU-1. Develop sketches for sewer appurtenances	P1. Identify sewer appurtenances P2. Fix Drawing sheet on board P3. Select scale P4. Use safety precautions for drawing P5. Draw sewer appurtenances P6. Identify Specifications for sewer appurtenances P7. Recognize material used in construction
CU-2. develop sketch for Man Hole	P1. Identify man hole P2. Fix Drawing sheet & select scale P3. Select material, size & shape for manhole P4. Locate position & c/c distance for manhole P5. Suggest specification for Manhole
CU-3. Plan sketch for clean out	P1. Identify clean out P2. Fix Drawing sheet & select scale P3. Select material, size & shape for clean out P4. Locate position for clean out P5. Suggest specification
CU-4. Plan sketch for inlet	P1. Identify inlet P2. Fix Drawing sheet & select scale P3. Select material, size & shape for clean out P4. Locate position for inlet P5. Suggest specification
CU-5. Plan sketch for catch basin	P1. Identify catch basin P2. Fix Drawing sheet & select scale P3. Select material, size & shape for catch basin P4. Locate position for catch basin P5. Suggest specification
CU-6. Plan sketch for Flushing Tanks	P1. Identify flushing tank P2. Fix Drawing sheet & select scale P3. Select material, size & shape for flushing tank P4. Locate position for flushing tank



National Competency Standards Level-5 for “Civil Technology”



	P5. Suggest specification
CU-7. Plan sketch for Grease & oil Traps	P1. Identify Grease & Oil Traps P2. Fix Drawing sheet & select scale P3. Select material, size & shape for traps P4. Locate position for traps P5. Suggest specification
CU-8. Plan sketch for storm regulator	P1. Identify storm regulator P2. Fix Drawing sheet & select scale P3. Select material, size & shape for storm regulator P4. Locate position for storm water regulator P5. Suggest specification
CU-9. Plan sketch for Inverted syphon	P1. Identify Inverted syphon P2. Fix Drawing sheet & select scale P3. Select material, size & shape for inverted syphon P4. Locate position for traps P5. Suggest specification

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1- Define sewer appurtenances and its process

K2- Describe the working of different sewer appurtenances

K3- Explain Types of regulators.

K4- Describe applications stages for different sewer appurtenances

K5- Knowledge of repair and maintenance for sewer appurtenances

K6- Knowledge of Market requirements of domestic and commercial sewer appurtenances

K7. Explain working of lamp holes

K8. Explain working of drop man holes.

K9. Differentiate between manhole & drop manholes.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Differentiate lamp hole & drop manhole
- Installation for different sewer appurtenances
- Plan sewer appurtenances
- Plan stages for sewer appurtenances
- Plan different method used for plan sewer appurtenances



National Competency Standards Level-5 for “Civil Technology”



- Indicate different sewer appurtenances
- Identify components for different sewer appurtenances

TOOLS AND EQUIPMENT'S

- Drawing sheet
- Drawing instruments
- Pencils
- Eraser
- Compass
- Sprit level
- Calculator
- Umbrella (Optional)
- PPEs
- Protector



0732B&CE-230 Construct Sewers

Overview: This competency standard covers the skills and knowledge required to prepare and developed sewers pipes from buildings to one or more levels of larger underground trunk mains, which transport the sewage to sewage treatment Plant. Vertical pipes, usually made of precast concrete and cast iron called soil stack / vent pipes which are connect the mains to the sewers system.

Competency Units	Performance Criteria
CU-1. Plan and prepare for work	P1. Identify work place P2. Measure safety and other regulatory requirements P3. Interpret and confirm layout plan P4. Mark out excavation P5. Select tools and equipment P6. Use PPEs P7. Perform final quality inspection
CU-2. Interpret Plan for sewer construction	P1. Check for Safety Hazards P2. Perform excavation P3. Install trench support P4. Select material for construction P5. Perform bedding P6. Lay pipes and joints P7. Check hydraulic load P8. Perform Hydraulic test P9. Back filling and compaction
CU-3 Interpret Plan for soil stack pipe	P1. Check for Safety Hazards P2. Perform aligning and clamping P3. Select material P4. Perform joining and fixing P5. Check hydraulic load P6. Perform hydraulic test

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of Safety requirements for installation of sewers
- K2- Knowledge of sewer joints with manholes
- K3- Explain different stages for sewer construction
- K4- Explain method to lay the sewer



- K5. Explain change of sewer line in case of breakage
- K6. Describe safety measures to lay sewer pipes
- K7. Explain PPEs with its importance
- K8. Explain soil stack pipes with its working

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform safety requirements while laying of sewers
- Prepare plan for installation of sewers with its components
- Performing repair and maintenance for sewers
- Perform back filling of earth on sewer
- Identify sewer and sewage
- Identify working of sewer lines
- Use of PPEs
- Set soil stack pipes

TOOLS AND EQUIPMENT'S

- ❖ Compass
- ❖ Spirit level
- ❖ Calculator
- ❖ Umbrella (Optional)
- ❖ PPEs
- ❖ Trench digging tools
- ❖ Trench sides
- ❖ Chain pulley
- ❖ Small crane
- ❖ Excavator
- ❖ Clamps
- ❖ Joints for pipes



0732B&CE-231 Maintain Sewers

Overview: This competency standard covers the skills and knowledge required to prepare for maintenance of sewers and manholes for long running its working.

Competency Units	Performance Criteria
CU-1. Interpret plan for maintain sewer	P1. Identify sewer to maintain P2. Investigate problem P3. Clean out clogged drain P4. Perform remedy P5. Perform water pressure
CU-2. Interpret plan to maintain man hole	P1. Identify man hole to maintain P2. Investigate problem P3. Clean out clogged or suction sewage P4. Perform flushing P5. Perform test to working performance

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of maintenance of sewers or soil stack pipes
- K2- Explain Uses of tools and equipment to clean and repair sewer pipes
- K3. Explain different system for cleaning of sewers
- K4. Explain drain opener using procedure.
- K5- Knowledge of joining techniques the pipe to manholes
- K6- knowledge of levelling and leakage repairing of sewers in system
- K7. Explain type of drain openers and their precautions while using
- K8. Explain PPEs
- K9. Explain hydraulic pressure and self-cleaning velocity

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan to maintain a sewer pipes
- Plan site selection for sewer scheme
- Demonstrate the installation of maintenance machinery
- Demonstrate pipe maintenance system requirements
- Plan to maintain sewer appurtenances
- Plan distribution of pipe in residential scheme
- Plan hydraulic model with its working



TOOLS AND EQUIPMENT'S

- ❖ Drain opener
- ❖ Drawing / lay out for sewers
- ❖ Compass
- ❖ Sprit level
- ❖ Calculator
- ❖ Umbrella (Optional)
- ❖ PPEs
- ❖ Drain suction machine
- ❖ Flushing machine with water
- ❖ Flushing pipes
- ❖ Pipe joints
- ❖ Nut & bolts
- ❖ Flanges



0732B&CE-232 Install Sewage Pumps

Overview: This competency standard covers the skills and knowledge required to prepare for Installation of sewage / Sump pumps. They are automatic pumps designed basically to clean water. They are used for sump basin drainage or in emergency situations. The most common application is for basement drainage to prevent residential flooding. Sewage pumps are used when the water being pumped may contain solids up to 2” in diameter.

Competency Units	Performance Criteria
CU-1. Interpret plan sewage pump (Existing scheme)	P1. Identify sewage to pumping P2. Investigate problem P3. Install pump (Fixed or Mobile) P4. Switch on with power P5. Perform pumping
CU-2. Interpret plan sewage pump (New scheme)	P1. Identify pump P2. Prepare Drawing with dimension P3. Construct dry & wet well P4. Install pump P5. Switched with power P6. Perform test for lines P7. Perform pumping

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of maintenance of sewage pumping
- K2- Explain Uses of tools and equipment to pumping the sewage
- K3. Explain different type of pumps use for sewage pumping
- K4. Explain working of centrifugal pump for sewage pumping
- K5- Knowledge of joining techniques the pipe to pump
- K6- Explain wet well and dry well
- K7. Explain construction procedure for dry well and wet well
- K8. Explain PPEs
- K9. Explain hydraulic pressure and self-cleaning velocity

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan to maintain a sewage pumps



National Competency Standards Level-5 for “Civil Technology”



- Plan site selection for sewage pumping
- Demonstrate the installation of sewage pumps
- Demonstrate pump maintenance system requirements
- Plan to maintain sewage pumps
- Plan well pipes measurements and directions
- Plan hydraulic model with its working

TOOLS AND EQUIPMENT'S

1. lay out plan for pumps
2. Compass
3. Sprit level
4. Calculator
5. Umbrella (Optional)
6. PPEs
7. Drawing Sheets
8. Drawings equipment



0732B&CE-233 Produce sketches of sewage treatment plant

Overview: This competency standard covers the skills and knowledge required to prepare for Sewage treatment process of removing contaminants from municipal wastewater, containing mainly household sewage and industrial wastewater. Physical, chemical, and biological processes are used to remove contaminants and produce treated wastewater (or treated effluent) that is safe enough for release into the environment. A by-product of sewage treatment is a semi-solid waste or slurry, called sewage sludge. The sludge has to undergo further treatment before being suitable for disposal or application to land.

Competency Units	Performance Criteria
CU-1. Interpret plan sewage treatment plan	P1. Identify sewage treatment plant P2. Draw parts for treatment plant P3. Identify Screens in chamber P4. Identify grit chamber P5. Identify settling tank P6. Identify sludge digestion tank P7. Identify trickling filters P8. Identify sludge drying beds P9. Apply chlorination
CU-2. Interpret plan sewage treatment procedure	P1. Identify treatment plant P2. Prepare Drawing with dimension P3. Draw parts of treatment plant P4. Identify Influent passage P5. Identify primary treatment P6. Identify secondary treatment P7. Identify tertiary treatment P8. Check effluent
CU-3. Interpret plan sewage treatment process	P1. Identify treatment plant P2. Indicate Biological treatment P3. Identify Chemical treatment P4. Indicate Physical treatment P5. Check effluent

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of sewage treatment plant with its working
- K2- Explain Uses of tools and equipment at treatment plant



- K3. Explain different type of pumps use for sewage treatment plant
- K4. Explain working of centrifugal pump for sewage pumping
- K5- Knowledge of drying beds and its design techniques at plant
- K6- Explain different parts of plant
- K7. Explain construction procedure for sewage treatment plant
- K8. Explain PPEs
- K9. Explain hydraulic pressure and self-cleaning velocity

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan to maintain a sewage treatment plant
- Plan site selection for sewage treatment plant
- Demonstrate the installation of sewage treatment plant components
- Demonstrate pump maintenance system requirements at plant
- Plan to maintain sewage treatment plant
- Plan well pipes measurements and directions from plant and toward plant
- Plan hydraulic model with its working

TOOLS AND EQUIPMENT'S

1. Spirit level
2. PPEs
3. Drawing sheet
4. Drawing instruments
5. Thermometer
6. Drawing Board
7. Compass
8. Measuring Tape
9. Pegs
10. Arrows
11. Pumping station plan (if required)
12. Scissor



0732B&CE-234 Dispose sewage

Overview: This competency standard covers the skills and knowledge required to prepare for Sewage disposal system in which sewage is transported through cities and inhabited areas to sewage treatment plants, where it is then treated to remove contaminants to produce environmentally-safe and waste disposed into river OR used for agriculture purposes.

Competency Units	Performance Criteria
CU-1. Interpret plan for sewage disposal into river	P1. Identify sewage for disposal P2. Investigate quantity of sewage P3. Identify influent P4. Identify effluent P5. Perform pumping into drains P6. Dispose into river
CU-2. Interpret plan for sewage disposal into ground	P1. Identify sewage for disposal P2. Investigate quantity of sewage P3. Identify influent P4. Calculate quantity of effluent P5. Perform pumping into drains or conduits P6. Excavate well P7. Dispose into ground

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1- Knowledge of dispose of sewage into river, canals and dump into ground
- K2- Explain Uses of tools and equipment to dispose of sewage at plant
- K3. Explain different system for dispose of sewage
- K4. Explain the reason to disposal of sewage
- K5- Knowledge for influent and effluent
- K6- knowledge of levelling the effluent in accordance physically fit to remove of sewage
- K7. Explain type of drains constructed for effluent
- K8. Explain PPEs

Critical Evidence(s)

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan to maintain sewage disposal
- Plan site selection for sewage disposal



National Competency Standards Level-5 for “Civil Technology”



- Demonstrate the installation of disposal point for effluent
- Demonstrate pipe and drain maintenance for effluent
- Plan to maintain disposal works

TOOLS AND EQUIPMENT'S

1. Spirit level
2. PPEs
3. Drawing sheet
4. Drawing instruments
5. Thermometer
6. Drawing Board
7. Compass
8. Measuring Tape
9. Pegs
10. Arrows
11. Pumping station plan (if required)
12. Scissor



10.21. Engineering Mechanics

0732B&CE-235 Design Homogeneous Beam

Overview: This competency standard covers the skills and knowledge required to design the homogeneous beam by simple bending equation and draw the bending and shear stress distribution for symmetrical sections of beams.

Competency Units	Performance Criteria
CU1. Design the homogeneous beam by simple bending equation	P1. Extract the given data P2. Evaluate maximum bending moment P3. Compute moment of inertia about N.A P4. Compute distance of extreme fiber from N.A P5. Apply bending equation P6. Evaluate cross section of beam
CU2. Draw the bending and shear stress distribution for symmetrical sections of beams	P1. Extract the given data P2. Evaluate maximum bending moment P3. Compute distance between base of section to the Compute moment of inertia about N.A P4. Compute distance of extreme fiber from N.A P5. Evaluate bending stresses by bending equation
CU3. Draw Mohr's circle and find principal stresses	P1. Draw major and minor principal stresses find mid-point P2. From mid-point draw Mohr's circle

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain the types of stresses in beams (Bending & Shear stresses).
- K2. State the assumptions made in theory of simple bending.
- K3. State and explain bending equation.
- K4. Explain Bending stress distribution across rectangular section.
- K5. Solve problems on theory of simple bending.
- K6. State formula for shear stress and shear stress distribution across rectangular, circular & I-sections of beam.
- K7. Solve problems on shear stress.



National Competency Standards Level-5 for “Civil Technology”



- K8. Define Bi-axial stresses
- K9. Define principal stresses
- K10. Equation of normal and tangential stresses
- K11. Preparation of Mohr's circle graphically

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design of homogeneous beam by simple bending equation
- Draw bending and shear stress distribution for symmetrical sections of beams

Tools and Equipment

1. Calculator
2. Paper
3. Pencil
4. Eraser



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-236 Determine Deflection of Beams

Overview: This competency standard covers the skills and knowledge required to solve the problem of deflection of beams, To verify that the deflection is proportional to the cube of span and verify that the deflection is proportional to the load by drawing a graph and solve problems on deflection of beams.

Competency Units	Performance Criteria
CU1. Verify that deflection is proportional to the cube of span	P1. Identify equipment P2. Set apparatus P3. Apply load on the midpoint of beam P4. Record initial reading of vernier scale P5. Increase load P6. Record reading of vernier scale P7. Repeat the procedure for 6 readings P8. Compute deflection P9. Repeat the procedure by changing the span P10. Verify that the deflection is proportional to the cube of span
CU2. Verify that the deflection is proportional to the load by drawing a graph	P1. Plot a graph between load and deflection P2. Verify that the deflection is proportional to the load by drawing a graph
CU3. Solve problems on deflection of beams	P1. Enlist the given data P2. Identify the type of beam P3. Identify the loading conditions P4. Compute maximum slope and deflection

Knowledge & Understanding

The candidate must be able to develop skills and understanding to solve the problem on principal stresses and maximum shear stress, draw Mohr's circle for principal stresses, verify that the deflection is proportional to the cube of span and verify that the deflection is proportional to the load by drawing a graph and solve problems on deflection of beams and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1. Define deflection of beam and state its significance.

K2. Name various methods of deflection calculation i.e. moment area method,



National Competency Standards Level-5 for “Civil Technology”



K3. Double integration method, Machauly’s method and unit load method.

K4. State maximum deflection in different types of beams.

K5. State formulae for calculation of maximum deflection in cantilever & simply supported beam or following loading conditions.

a) For cantilever beam

- I. Point load at free end
- II. Uniformly distributed loads on full span
- III. Uniformly distributed loads on part of span from fixed end.
- IV. Combination of above loading.

b) For simply supported beam

- I. Point load on mid span
- II. Uniformly distributed loads on full span
- III. Combination of above loading.

K6 Solve problem of beam deflection of moment area method for above beams a load conditions

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Determine deflection of cantilever beams.
- Determine deflection of simply supported beams.
- Calculate stiffness of beams



0732B&CE-237 Determine load carrying capacity of columns

Overview: This competency standard covers the skills and knowledge required to evaluate buckling load for column by Euler's formula and evaluate buckling load for column by Rankin's formula.

Competency Units	Performance Criteria
CU1. Evaluate buckling load for column by Euler's formula	P1. Enlist the given data P2. Identify the end conditions P3. Compute moment of inertia P4. Compute effective length P5. Evaluate critical load P6. Evaluate safe load
CU2. Evaluate buckling load for column by Rankin's formula	P1. Enlist the given data P2. Identify the end conditions P3. Compute moment of inertia P4. Compute cross sectional area P5. Evaluate critical load P6. Evaluate safe load

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define the terms: column, strut, long column, short column, axial and eccentric loading
- K2. State failure patterns of short and long columns.
- K3. Define the terms: buckling load, crushing load, safe load, F.O.S, slenderness ratio, radius of gyration, fatigue, effective length, etc.
- K4. State four end conditions for the calculation of effective length of column.
- K5. State Euler's formula & Rankin's formula for calculating ultimate load.
- K6. Practice of numerical problems based on Euler's and Rankin's formulae.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design the column for a given ultimate load by using Euler's formula & Rankin's formula.
- Calculate the load carrying capacity of column under given end condition.



National Competency Standards Level-5 for “Civil Technology”



- Calculate crushing strength of different steel sections

Tools and Equipment

1. Calculator
2. Paper
3. Pencil
4. Eraser Tools and Equipment



0732B&CE-238 Evaluate Efficiency of Joints-riveted and welded

Overview: This competency standard covers the skills and knowledge required to explain different types of riveted joint, failure methods, strength and efficiency of riveted lap and butt joints, welded joints and its types, calculate strength and dimensions of fillet welds, compression of riveted and welded joints.

Competency Units	Performance Criteria
CU1. Analyze and sketch single riveted lap joint	P1. Calculate shearing strength of rivet P2. Calculate bearing strength of rivet. P3. Calculate tearing strength of plate. P4. Determine the strength of plate. P5. Calculate efficiency. P6. Draw the sketch and label it.
CU2. Design double riveted double cover butt-joint for 100 KN Load	P1. Calculate pitch of rivets P2. Calculate bearing strength of rivet. P3. Determine the strength of plate. P4. Calculate No of rivets required P5. Draw the sketch and label it
CU3. Analyze and sketch single riveted single cover butt-joint	P1. Calculate shearing strength of rivet P2. Calculate bearing strength of rivet. P3. Calculate tearing strength of plate. P4. Determine the strength of plate. P5. Calculate efficiency. P6. Draw the sketch and label it.
CU4. Calculate the load carrying capacity of welded lap joint.	P1. Check for the limitations on the weld geometry P2. Design strength of the weld P3. Tension strength of the member
CU5. Design welded lap joint for 100 KN Load	P1. Assume material properties P2. Design the tension member P3. Design the welded connection P4. Layout of Connection P5. Fracture strength of the member P6. Design the gusset plate

Knowledge & Understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define terms: Pitch, back pitch, margin, edge distance, nominal diameter of rivets, and gross diameter of rivets.
- K2.** Explain the different types of riveted joints.
- K3.** Explain failure strength and efficiency of riveted joints.
- K4.** Calculate the strength, efficiency, pitch etc., of riveted joints.
- K5.** Define welded joint and compare riveted joints and welded joints
- K6.** State different types of welded joints
- K7.** Calculate strength & dimensions of fillet welded joints only

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design single riveted lap joint.
- Design double riveted double cover butt joint.
- Calculate efficiency of riveted joint.
- Calculate the strength of fillet welded joint.

Tools and Equipment

1. Calculator
2. Paper
3. Pencil
4. Eraser Tools



0732B&CE-239 Analyze forces in truss members

Overview: This competency standard covers the skills and knowledge required to calculate forces in members of statically determinate truss by method of joint and method of sections different members of trusses.

Competency Units	Performance Criteria
CU1. Evaluate Forces in members of a given truss by method of joints	P1. Draw the diagram of truss. P2. Calculate reactions. P3. Consider the joint. P4. Calculate forces of unknown members P5. Tabulate result P6. Draw force diagram.
CU2. Evaluate Forces in members of a given truss by method of sections	P1. Draw the diagram of truss. P2. Calculate reactions P3. Draw section line P4. Apply condition of Equilibrium to determine forces P5. Tabulate result P6. Draw force diagram.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. State the types of steel structures
- K2. Describe the merits of steel construction
- K3. Describe the demerits of steel construction
- K4. State the types of structural steels
- K5. Describe and sketch the hot rolled structural shapes
- K6. Describe and sketch the cold formed shapes
- K7. Describe and sketch the built-up sections
- K8. Define cladding
- K9. Define truss, state types and parts of steel trusses.
- K10. State methods of truss analysis.
- K11. Determine forces in members of statically determinate truss by method of joints & method of sections.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Calculate forces in statically determinate truss.
- Prepare table of forces.
- Identify nature of forces tension, compression.



0732B&CE-240 Determine stability of retaining wall

Overview: This competency standard covers the skills and knowledge required to calculate active and passive earth pressure, stresses at base (toe and heel), application of Rankin’s formula, stress distribution diagram, Apply Checks against stability of retaining walls, solve numerical problems

Competency Units	Performance Criteria
CU1. Examine the stability of given retaining wall.	P1. Draw the section of wall. P2. Calculate weight of wall and its point of action. P3. Evaluate pressure of retained material P4. Draw pressure diagram. P5. Locate point of action of resultant force. P6. Calculate stresses developed at base. P7. Apply the check of stability.
CU2. Calculate stresses in base of given retaining wall and stress distribution diagram.	P1. Draw the section of wall. P2. Calculate weight of wall and its point of action. P3. Evaluate pressure of retained material P4. Draw pressure diagram. P5. Locate point of action of resultant force. P6. Calculate stresses developed at base. P7. Draw stress distribution diagram at base.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. State the terms: retaining wall, classification of retaining wall, angle of repose, level & surcharge backing, active and passive earth pressure.
- K2. Explain the pressures on retaining wall and stresses at base (toe and heel) Rankin’s formula and its applications.
- K3. Describe the stress distribution diagram at base of the retaining wall.
- K4. Describe conditions of stability of retaining walls.
- K5. Check and compare the results of stability of retaining walls with standards.
- K6. Numerical problems relating to stresses at base of retaining wall.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”





11d Certificate in Civil Technology Level 5

10.22. Transportation Engineering-II

0732B&CE-241 Develop construction plan of Tunnels

Overview: This competency standard covers the skills and knowledge required for the Demarcation of the alignment of tunnel and draft a construction plan of tunnel.

Competency Units	Performance Criteria
CU1. Demarcation of the alignment of tunnel	P1. Collect contour map of a hilly area P2. Identify considerations for demarcation of alignment P3. Place contour map on drafting table P4. Mark possible routes considering influencing factors
CU2. Draft a construction plan of tunnel	P1. Analyze activities to be performed to construct tunnel P2. Identify machinery required to execute activities planned before P3. Draft hierarchy of construction team P4. Define roles according to positions for construction P5. Identify hazards and precautionary measures

Knowledge & Understanding

The candidate must be able to develop understanding for the demarcation of the alignment of tunnel and draft a construction plan of tunnel maintenance and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** State necessity of tunnels
- K2.** State importance of tunnel engineering
- K3.** Demonstrate alignment of tunnels and their construction
- K4.** Enumerate tunnels as per their length

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demarcation of alignment of tunnel
- Construction plan of tunnel

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-242 Produce sketches of an airport

Overview: This competency standard covers the skills and knowledge required to prepare a general layout plan of an airport, draw cross section of a runway, draw sketches of airport patterns and draw cross section of drainage for sub surface

Competency Units	Performance Criteria
CU1. Prepare a general layout plan of an airport	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw layout plan of an airport
CU2. Draw cross section of a runway	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw cross section of a runway
CU3. Draw sketches of airport patterns	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of airport patterns
CU4. Draw cross section of drainage for sub surface	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw cross section of drainage for sub surface

Knowledge & Understanding

The candidate must be able to develop understanding to prepare a general layout plan of an airport, draw cross section of a runway, draw sketches of airport patterns and draw cross section of drainage for sub surface and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the technical terms, explain factors effecting site selection of airports and sketch the general layout of various types of airport
- K2.** Describe the run way pavements, its types draw typical cross section.
- K3.** Sketch different patterns of run way.
- K4.** Explain the drainage systems of an airport.
- K5.** Describe the routine and special repairs of run way.
- K6.** Describe the lighting of an airport.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- A general layout plan of an airport
- Drawing of cross section of a runway
- Sketches of airport patterns
- Drawing of cross section of drainage for sub surface

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-243 Produce sketches of permanent Way

Overview: This competency standard covers the skills and knowledge required to draw rails sections (double headed, bull headed and flat footed), sketches of rail fastenings, sleeper fastenings, cross section of broad gauge rail track.

Competency Units	Performance Criteria
CU1. Draw rails sections (double headed, bull headed and flat footed)	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw rails sections (double headed, bull headed and flat footed) P4. Perform labeling and dimensioning
CU2. Draw sketches of rail fastenings	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketches of rail fastenings P4. Label parts of rail fastenings
CU3. Draw sketches of sleeper fastenings	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketches of sleeper fastenings P4. Label parts of sleeper fastenings
CU4. Draw cross section of broad gauge rail track	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw cross section of broad gauge rail track of in filling P4. Draw cross section of broad gauge rail track in cutting P5. Label components of rail tracks

Knowledge & Understanding

The candidate must be able to develop understanding to draw rails sections (double headed, bull headed and flat footed), sketches of rail fastenings, sleeper fastenings, cross section of broad gauge rail track and understanding required to carry out tasks covered in this competency standard.

This includes the knowledge of:

- K1. Define permanent way
- K2. State the requirements of permanent way
- K3. Explain the components of permanent way, their functions and types (formation, ballast and sleepers).
- K4. Explain gauge and its types
- K5. Explain factors governing adoption of a particular gauge
- K6. Explain the different types of rails, rail joints, rail fittings and accessories.
- K7. Explain carriage wheel and conning of wheels.
- K8. State the requirement of good rail joint and ballast.
- K9. Explain modern methods of laying railway track.



National Competency Standards Level-5 for “Civil Technology”



- K10. Definition of creep
- K11. Explain the causes of creep.
- K12. Explain with sketch magnitude of creep.
- K13. State the results of creep.
- K14. State the methods of correction of creep.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Drawing of rails sections (double headed, bull headed and flat footed)
- Sketches of rail fastenings
- Sketches of sleeper fastenings
- Drawing of cross section of broad gauge rail track of in filling
- Drawing of cross section of broad gauge rail track in cutting

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-244 Produce sketches of points and crossings

Overview: This competency standard covers the skills and knowledge required to draw sketches of switches, crossings, right hand turnout and left hand turnout.

Competency Units	Performance Criteria
CU1. Draw sketches of switches	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketch of stub switch P4. Draw sketch of split switch P5. Label components of switches
CU2. Draw sketches of crossings	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketches of crossings (acute angle, obtuse angle, right angle, spring, cross over, diamond, scissors) P4. Label components of crossings
CU3. Draw sketch of right hand turnout	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketch of right hand turnout P4. Label components of right hand turnout
CU4. Draw sketch of left hand turnout	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw sketch of left hand turnout P4. Label components of left hand turnout

Knowledge & Understanding

The candidate must be able to develop understanding to draw sketches of switches, crossings, right hand turnout and left hand turnout and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** State the purpose of points and crossing.
- K2.** Describe with sketches the sleepers for point and crossing (through and interlaced sleepers).
- K3.** Explain the terms switches, shapes, length of stock and tongue rails, heel clearance, switch angle, through switches.
- K4.** State the types of crossing.
- K5.** Explain theoretical and actual nose of crossing.
- K6.** Explain the terms crossing angle and number.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketchs of switches
- Sketches of crossings
- Sketch of right hand turnout
- Sketch of left hand turnout

Tools and Equipment

- ❖ Drafting Table,
- ❖ Drawing Tools
- ❖ Drawing Sheets



0732B&CE-245 Produce sketches of station yards and signals

Overview: This competency standard covers the skills and knowledge required to draw sketch of coaching yard, goods yard, locomotive yard, marshling yard and sketches of rail signals.

Competency Units	Performance Criteria
CU1. Draw sketch of coaching yard	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw the connection of rails to sleepers
CU2. Draw sketch of goods yard	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw cross section of broad gauge rail track in cutting
CU3. Draw sketch of locomotive yard	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw cross section of broad gauge rail track of in filling
CU4. Draw sketch of marshling yard	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw various types of rails
CU5. Draw the sketches of rail signals	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw the sketches of rail signals (semaphore, warning, light disc and dwarf signals)

Knowledge & Understanding

The candidate must be able to develop understanding to draw sketch of coaching yard, goods yard, locomotive yard, marshling yard and sketches of rail signals and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain station yards and sketch their layout.
- K2.** State the purpose and types of signals.
- K3.** State the classification of signals according to function and location.
- K4.** Explain signaling and its objects.
- K5.** Describe with sketches the inter locking its principles and requirements.
- K6.** Explain the methods of inter locking.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of coaching yard
- Sketch of goods yard
- Sketch of locomotive yard
- Sketch of marshling yard
- Sketches of rail signals

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-246 Produce sketches of harbour

Overview: This competency standard covers the skills and knowledge required to prepare layout plan of a typical harbour, draw cross section of breakwater, draw sketches of jetties, piers, lock gates, quay, typical light house and floating signals.

Competency Units	Performance Criteria
CU1. Prepare layout plan of a typical harbour	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw layout plan of a typical harbour
CU2. Draw cross section of breakwater	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw cross section of breakwater
CU3. Draw sketches of jetties	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of jetties
CU4. Draw sketches of pier	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of pier
CU5. Draw sketches of lock gates	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of lock gates
CU6. Draw sketches of quay	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of quay
CU7. Draw sketches of a typical light house	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches of a typical light house
CU8. Draw sketches floating signals	P1. Identify drawing tools P2. Fix drawing sheet on drafting table P3. Draw border lines and title bar P4. Draw sketches floating signals



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to develop understanding to prepare layout plan of a typical harbour, draw cross section of breakwater, draw sketches of jetties, piers, lock gates, quay, typical light house and floating signals and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define harbours, state the classification of harbours
- K2.** Explain the requirement of a commercial harbour, its location and size
- K3.** Explain the terms tidal waves, break water and their classification.
- K4.** Explain terms: Wharves, quay walls, jetties, piers, moorings, locks and lock gates, draggers
- K5.** State the classification of docks.
- K6.** Explain beach erosion and its protection
- K7.** Define dredging, state the necessity of dredging
- K8.** Explain the types of dredging devices, methods of dredging and disposal of dredging material
- K9.** Describe navigational aids.
- K10.** Explain types of signals, light house, beacons, light ship and buoys.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Layout plan of a typical harbour
- Drawing of cross section of breakwater
- Drawing of sketches of jetties
- Sketches of pier
- Sketches of quay
- Sketches of lock gates
- Sketches of a typical light house
- Sketches floating signals

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



10.23. Hydraulics Engineering

0732B&CE-247 Determine Hydrostatic pressure

Overview: This competency standard covers the skills and knowledge required to find pressure by pressure gauges, Hydrostatic pressure and center of pressure of vertically immersed surface,

Competency Units	Performance Criteria
CU1. Find pressure by Piezometer	P1. Identify pressure gauge P2. Measure pressure by Piezometer
CU2. Find pressure by manometer	P1. Identify pressure gauge P2. Measure pressure by Manometer
CU3. Find out Hydrostatic pressure and center of pressure on vertically Immersed surface.	P1. Identify the apparatus P2. Immerse the apparatus in water tank P3. Apply the formulae for hydrostatic pressure and center of pressure. P4. Find the area of immersed surface P5. Find moment of inertia of the figure P6. Calculate hydrostatic pressure on surface P7. Find position of centre of pressure
CU4. Find out discharge through a pipe with Pitot tube	P1. Identify the instrument P2. Fix the Pitot tube with pipe P3. Measure height of liquid in the tube P4. Find the velocity by using formula. P5. Find the discharge by using formula
CU5. Find the Metacentric height of a floating body in Lab.	P1. Identify the apparatus. P2. Put apparatus in water tank. P3. Place jokey weight to make the ship symmetrical. P4. Place the ship in water and adjust the plumb to zero mark. P5. Move jokey weight across deck to a specified distance. P6. Measure the angle of inclination. P7. Calculate the metacentric height of ship by formula.

Knowledge & understanding

- K1.** Define Hydraulics and state the scope and significance of Hydraulics in civil engineering.
- K2.** Define density, specific weight, specific volume, specific gravity, surface tension, viscosity compressibility, cohesion, and adhesion.



National Competency Standards Level-5 for “Civil Technology”



- K3.** State pressure, intensity of pressure, pressure head, Pascal's law and its simple applications.
- K4.** Distinguish among atmospheric pressure, gauge pressure and absolute pressure.
- K5.** Describe measurement of fluid pressure by Piezometer tube and different manometers.
- K6.** Define Hydrostatics
- K7.** State pressure on immersed surface.
- K8.** Define centre of pressure and resultant pressure.
- K9.** Calculate the total pressure and centre of pressure on a horizontal vertical and inclined surface immersed in a liquid (i.e. water)
- K10.** Define the terms, buoyancy, floatation, buoyant force and center of buoyancy
- K11.** Define metacenter and metacentric height.
- K12.** State the kinds of equilibrium of a floating body.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to be competent in this competency standard.

- Observe and calculate the reading of piezometer.
- Calculate the liquid pressure from the piezometer reading
- Observation and calculations of hydrostatic apparatus.
- Prepare Calculation sheet for pitot tube.
- Record Observations and calculation for finding metacentric height.

Tools and Equipment

- Piezometer.
- Manometer
- Hydrostatic apparatus.
- Water tank.
- Pilot tube.
- Metacentric height apparatus
- Hydraulic bench



0732B&CE-248 Apply Hydro kinematic Principles

Overview: This competency standard covers the skills and knowledge required to determine coefficient of discharge using venture meter, to calculate energy losses in pipe flow Determine hydraulic Co-efficient for circular orifices Calculate hydraulic and energy gradient for pipelines. Calculate flow in open channels. Calculate flows through notch Calculate flows through weirs.

Competency Units	Performance Criteria
CU1. Determine coefficient of discharge using venturimeter.	P1. Check dimensions of venturimeter and water tank. P2. Observe piezometric readings at inlet and throat P3. Open inlet valve and take piezometer readings P4. Measure the head. P5. Calculate actual discharge. P6. Calculate theoretical discharge. P7. Calculate the coefficient of discharge using formulae.
CU2. Calculate energy losses in pipe flow.	P1. Identify the apparatus. P2. Open valve and pass water through pipe. P3. Check piezometric readings P4. Draw hydraulic grade line.
CU3. Determine hydraulic Co-efficient for circular orifices	P1. Identify the orifice and adjust with the apparatus P2. Set constant head in the tank P3. Measure horizontal and vertical coordinates P4. Find actual discharge by using a container and stop watch P5. Use formulae to calculate coefficient of velocity and discharge
CU4. Calculate hydraulic and energy gradient for pipe lines.	P1. Prepare pipeline design charts using standard formulae. P2. Identify the limitations of formulae. P3. Identify variations in roughness coefficients. P4. Calculate the pressure in pipeline systems using the hydraulic gradient line. P5. Calculate the pipe discharge from reservoirs.
CU5. Calculate flow in open channels.	P1. Identify methods used for measuring flows in open channels. P2. Identify instruments to be used P3. Use formulae for calculating flows in open channels.



National Competency Standards Level-5 for "Civil Technology"



	P4. Find the velocity by current meter and velocity rod P5. Find discharge.
CU6. Calculate flows through Vee and Trapezoidal Notch.	P1. Identify the methods used for measuring flows in notches. P2. Calculate area of notch. P3. Measure head of water over the notch. P4. Use the formulae for calculating flow in notches.
CU7. Calculate flows through weirs	P1. Identify the methods used for measuring flows in notches. P2. Calculate area of weirs P3. Measure head of water over the weirs P4. Use the formulae for calculating flow in weirs

Knowledge & Understanding

- K1.** Define hydro kinematics
- K2.** State discharge and equation of continuity of a liquid flow.
- K3.** Distinguish path lines and stream lines.
- K4.** Distinguish the type of flow in pipes i.e. steady and unsteady flow, uniform and non-uniform flow, turbulent flow.
- K5.** State the term hydrodynamics.
- K6.** State the energies of liquid in motion.
- K7.** State the total head of flowing liquid and total energy.
- K8.** Explain Bernoulli's theorem with its formula, limitations and practical application i.e., venture meter & Pitot tube.
- K9.** Understand the Flow Through Pipes.
- K10.** State and explain difference between flow through pipes and open channel flow
- K11.** Distinguish types of flow in pipes i.e. steady and unsteady flow, uniform and non-uniform flow, turbulent flow.
- K12.** Explain the major and minor losses of head of water flowing through pipes.
- K13.** State Chezy's and Darcy's formulae for friction loss in pipe flow.
- K14.** Apply Chezy's & Darcy's formulae for calculation of losses in pipes.
- K15.** Explain with sketches the hydraulic gradient and total energy line under different conditions.
- K16.** Define orifice
- K17.** State types of orifices
- K18.** State the terms; jet of water, vena contracta, co-efficient of discharge, coefficient of velocity, coefficient of contraction and velocity of approach
- K19.** Derive formulae for discharge through orifices



National Competency Standards Level-5 for “Civil Technology”



- K20. Differentiate between orifice and mouth piece.
- K21. Define notch
- K22. State types of notches
- K23. State the discharge formulae for notches.
- K24. Define weir
- K25. State types of weirs
- K26. Differentiate sharp crested and broad crested weirs.
- K27. State the discharge formulae for weirs.
- K28. State the flow through open channels.
- K29. State Chezy's, Manning & s Bazin's formulae for discharge through open channel.
- K30. State most economical section of channel and condition for maximum discharge through channel.
- K31. State discharge through rectangular & trapezoidal channel section and their formulae.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to be competent in this competency standard.

- Record observations and calculations of venturimeter.
- Record Readings ,Observation and calculations of piezometer.
- Do Calculations of coefficient of velocity and discharge.
- Prepare Calculation sheet of discharge for vee and trapezoidal notch.
- Prepare Calculation sheet of discharge over weir.

Tools and Equipment

- Venturi meter
- Friction in pipes apparatus.
- Orifices.
- Vee and trapezoidal notches.
- Weirs
- Hydraulic bench



10.24. Soil Mechanics

0732B&CE-249 Determine moisture content and specific gravity of soil

Overview: This competency standard covers the skills and knowledge required to determine soil moisture content by Speedy moisture, establish soil moisture content by oven drying and Identify specific gravity of soil sample by pycnometer

Competency Units	Performance Criteria
CU1. Determine soil moisture content by Speedy moisture	P1. Identify apparatus P2. Collect soil sample to be tested P3. Identify chemical to be used in speedy moisture P4. Assemble pressure vessel according to specification P5. Record dial reading after shaking the vessel P6. Interpret moisture content corresponding to the reading of dial gauge
CU2. Determine soil moisture content by oven drying	P1. Determine weight of containers P2. Determine Weight of soil sample with containers P3. Dry soil sample in oven P4. Evaluate moisture content
CU3. Evaluate specific gravity of soil sample by pycnometer	P1. Identify pycnometer P2. Assemble apparatus with soil sample P3. Evaluate specific gravity using formula

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to to determine soil moisture content by Speedy moisture, establish soil moisture content by oven drying and Identify specific gravity of soil sample by pycnometer covered in this competency standard. This includes the knowledge of:

- K1. Soil, soil mechanics, soil engineering
- K2. Objectives of soil mechanics
- K3. Types of soil and their formation
- K4. Soil structure and its group
- K5. Three phase diagram of soil
- K6. Physical properties of soil
- K7. Specific gravity and various densities
- K8. Various interrelationships

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Report on determination of soil moisture content by Speedy moisture
 - Report on determination soil moisture content by oven drying
 - Report on evaluation specific gravity of soil sample by pycnometer

Tools and Equipment

1. Empty clean container
2. Moist Sample
3. Oven
4. Balance accurate to 0.01gm
5. Speedy moisture tester
6. Steel ball of 1.25 inch diameter
7. Brush for cleaning the tester
8. Scoop for measuring Calcium carbide reagent
9. Pycnometer of about 1 liter capacity
10. Glass rod
11. Vacuum pump



0732B&CE-250 Determine Atterberg's Limits

Overview: This competency standard covers the skills and knowledge required to determine liquid limit of soil, plastic limit of soil and shrinkage limit of soil

Competency Units	Performance Criteria
CU1. Determine liquid limit of soil	P1. Identify apparatus P2. Prepare soil sample P3. Assemble soil sample in apparatus P4. Cut groove in sample P5. Record number of blows P6. Repeat soil sample trials by varying moisture content P7. Interpret no. of blows and water content graphically
CU2. Determine plastic limit of soil	P1. Identify apparatus P2. Prepare soil sample P3. Roll treads of soil with fingers P5. Complete Rolling and kneading of soil samples P6. Dry crumbled soil threads in oven P7. Evaluate soil water content
CU3. Determine shrinkage limit of soil	P1. Identify apparatus P2. Prepare soil sample P3. Evaluate volume of wet soil P4. Evaluate weight of wet soil P6. Evaluate volume of dry soil after soil shrinkage P7. Evaluate weight of dry soil after soil shrinkage P8. Identify shrinkage limit formula

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.Consistency of soil
- K2.Description of Atterberg's Limit.
- K3.Different Indices(Plasticity index ,liquidity index, consistency index etc)
- K4.Methods of determination of Atterberg's Limits for given soil sample.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Test report of liquid limit
- Test report of plastic limit
- Test report of shrinkage limit

Tools and Equipment

1. Empty clean container
2. Moist Sample
3. Oven
4. Balance accurate to 0.01gm
5. Speedy moisture tester
6. Steel ball of 1.25 inch Dia
7. Brush for cleaning the tester
8. Scoop for measuring Calcium carbide reagent
9. Pycnometer of about 1 litre capacity
10. Glass rod
11. Vacuum pump



0732B&CE-251 Identify Type of Soil

Overview: This competency standard covers the skills and knowledge required to perform Sieve analysis for soil sample, execute hydrometer test for fine soil, draft gradation curve Classify soil by AASHTO classification, Classify soil by USCS and Classify soil according to textural formation

Competency Units	Performance Criteria
CU1. Perform Sieve analysis for soil sample	P1. Identify sieves sizes P2. Assemble nest of sieves P3. Prepare soil sample P4. Complete soil sample shaking P5. Compute percentage retained P6. Compute percentage passing
CU2. Execute Hydrometer test for fine soil	P1. Identify apparatus P2. Evaluate soil fraction passing sieve#200 P3. Prepare soil sample P4. Identify chemical P5. Complete test P6. Evaluate soil fraction size
CU3. Draft gradation curve.	P1. Identify soil grain size P2. Identify percentage passing of soil sample P3. Identify semi-logarithm graph P4. Plot grain size vs percentage passing of soil sample P5. Interpret soil type graphically
CU4. Classify soil by AASHTO classification	P1. Obtain AASHTO classification chart P2. Identify the required parameters P3. Compile the data of required parameters of sample P4. Classify sample using the AASHTO classification chart
CU5. Classify soil by USCS	P1. Collect USCS tables P2. Identify the required parameters P3. Compile the data of required parameters of sample P4. Classify sample using USCS tables
CU6. Classify soil according to textural formation	P1. Collect textural classification chart P2. Identify the required parameters P3. Compile the data of required parameters of sample P4. Classify sample using textural classification chart

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



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- K1.State classification of soil and its necessity
- K2.Explain Particle size classification system, Textural classification system, AASHTO soil classification system, Unified soil classification system
- K3.Explain well graded, uniformly graded soil, poorly graded soil , Effective grain size, coefficient of uniformity, coefficient of curvature
- K4.Explain the particle size analysis for different soils.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Report on sieve analysis for soil sample
 - Report on Hydrometer test for fine soil
 - Report on classification of soil by AASHTO classification
 - Report on classification of soil by USCS
 - Report on classification of soil according to textural formation

Tools and Equipment

- 9. Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200
- 10. lid and pan
- 11. Balance sensitive to 0.1gm
- 12. Sieve shaker
- 13. Soft brush for cleaning
- 14. Evaporating dish
- 15. Containers
- 16. Oven
- 17. No. 40 sieve with lid and pan



0732B&CE-252 Conduct soil compaction tests

Overview: This competency standard covers the skills and knowledge required to Conduct Standard Proctor test, conduct modified Proctor test, inspect field density by core cutter and inspect soil field density by Sand replacement method

Competency Units	Performance Criteria
CU1. Conduct standard Proctor test	P1. Set up apparatus P2. Prepare soil sample P3. Identify Weight of proctor mold P4. Distribute soil sample in three equal parts P5. Complete soil Compaction P6. Inspect compacted specimen weight P7. Dry compacted soil sample in oven P8. Evaluate bulk density of soil P9. Evaluate dry density of compacted soil P10. Interpret water content and dry density graphically
CU2. Conduct modified Proctor test	P1.Set up Apparatus P2. Prepare soil sample P3. Identify Weight of proctor mold P4. Distribute soil sample in five equal parts P5. Complete soil Compaction P6. Identify weight of compacted specimen P7. Dry compacted soil sample in oven P8. Evaluate bulk density of soil P9. Evaluate dry density of compacted soil P10. Interpret water content and dry density graphically
CU3. Inspect Field density by core cutter	P1. Identify apparatus P2. Evaluate weight and volume of core cutter P3. Perform field soil sampling P4. Evaluate weight of field sample P5. Evaluate water content of field sample P6. Evaluate field density
CU4. Inspect soil field density by Sand replacement method	P1. Identify apparatus P2. Complete apparatus calibration P3. Evaluate volume of hole on ground P4. Identify water content of field soil sample P5. Evaluate field density of soil

Knowledge & Understanding

The candidate must be able to Conduct Standard Proctor test, conduct modified Proctor test, inspect field density by core cutter and inspect soil field density by Sand replacement method underpinning



National Competency Standards Level-5 for “Civil Technology”



knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.State term compaction its significance and necessity.
- K2.Discuss the principles of compaction
- K3.Compare between compaction and consolidation.
- K4.Describe Compaction Effort or Energy.
- K5.List the procedure of standard proctor test and modified compaction test.
- K6.List the procedure of field compaction tests, core cutter method and sand replacement method, Rubber balloon method, Nuclear density meter
- K7.State the factors affecting compaction.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Report on standard Proctor test
- Report on modified Proctor test
- Report on field density by core cutter
 - Report on field density by Sand replacement method

Tools and Equipment

1. Apparatus Standard proctor mould
2. Balance
3. Tray
4. rammer of 2.5Kg (5.5 lb) of fall 25.4Cm (12")
5. 4.54Kg (10 lb), of fall 38Cm (18")
6. moisture container
7. sieve 19 mm (3/4") and 9.5mm (3/8")
8. straight edge
9. Apparatus Core cutter
10. Hammer
11. excavating tools
12. oven
13. Sand bottle
14. calibrating container



National Competency Standards Level-5 for “Civil Technology”



15. glass plate
16. base plate
17. pan
18. tools for excavating hole
19. clean dry sand passing from No.10 (2.0mm) sand retained on No.20 (850 μ m) sieve
20. Speedy moisture tester apparatus.



0732B&CE-253 Determine permeability of soil

Overview: This competency standard covers the skills and knowledge of permeability constant head method and permeability falling head method

Competency Units	Performance Criteria
CU1. Permeability constant head method	P1. Identify apparatus P2. Prepare sample P3. Assemble apparatus P4. Identify water head level difference P5. Evaluate permeability of cohesion-less soil
CU2. Permeability falling head method	P1. Identify apparatus P2. Assemble apparatus P3. Complete apparatus calibration P4. Prepare soil sample P5. Complete test P6. Evaluate permeability of cohesive soils

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Introduction to permeability
- K2. Description of factors affecting permeability.
- K3. Darcy's Law and its validity
- K4. Laboratory permeability tests
- K5. Field permeability tests
- K6. Numerical problems on permeability.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Report on permeability constant head method
- Report on permeability falling head method

Tools and Equipment



National Competency Standards Level-5 for “Civil Technology”



1. Constant head Permeameter device (including constant head filter tank and manometer tubes)
2. 500ml beaker
3. Stop watch
4. Thermometer
5. Apparatus Falling head Permeameter device
6. Ring stand with test tube clamp
7. Burette (100ml)



0732B&CE-254 Investigate shear strength of soil

Overview: This competency standard covers the skills and knowledge required to perform direct shear test and execute triaxial shear test

Competency Units	Performance Criteria
CU1. Perform Direct Shear test	P1. Set up apparatus P2. Prepare sample P3. Assemble apparatus P4. Complete test P5. Interpret readings P6. Evaluate shear strength P8. Produce results graphically P9. Interpret internal friction angle from graph
CU2. Execute Triaxial Shear test	P1. Identify apparatus P2. Identify test P3. Identify soil sample preparation technique P4. Assemble apparatus P5. Complete test depending upon test condition requirement P6. Interpret readings P7. Evaluate readings P8. Produce results graphically P10. Interpret cohesion and internal friction angle graphically

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Introduction to shear strength of soils.
- K2. Coulomb's Law for shear strength of soil.
- K3. Laboratory measurement of shear strength
- K4. Tri axial compression test and Mohr's circle
- K5. Unconfined compression test.
- K6. Factors affecting shear strength of soil
- K7. Differentiate between cohesive and non-cohesive soil

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare samples for direct shear and tri axial machine
- Assemble shear box



National Competency Standards Level-5 for “Civil Technology”



- Assemble sample in loading frame of tri axial machine
- Demonstrate apparatus working
- Describe tests that can be carried out in tri axial machine
- Differentiate between shear test and tri axial test
- Explain unconfined compressive strength
- Explain shear strength

Tools and Equipment

1. Shear box
1. Shear box container
2. Base plate with cross grooves on its top
3. Porous stones (2 Nos)
4. Plain Grid plates (2Nos)
5. Perforated grid plates (2Nos)
6. Loading pad with steel ball
7. Digital weighing machine
8. Loading frame with loading yoke
9. Proving ring
10. Dial gauges (2 Nos)
11. Weights
12. Tampering Rod
13. Spatula
14. Rammer
15. Sampler
16. Distribution Panel
17. Automatic Pressure/Volume Controllers
18. Load Frame
19. Load Cell
20. Displacement transducer
21. Tri axial Cell
22. Pore Pressure Transducer
23. De-aired water supplier
24. Data logger
25. Sample extruder
26. Sample moulds
27. Membranes
28. 'o' rings
29. Porous discs



National Competency Standards Level-5 for “Civil Technology”



- 30. Ruler
- 31. Balance
- 32. Filter papers



0732B&CE-255 Find out bearing capacity of soil

Overview: This competency standard covers the skills and knowledge to Find bearing capacity of soil using Spt test and Identify bearing capacity using California bearing ratio

Competency Units	Performance Criteria
CU1. Evaluate bearing capacity of soil using SPT test	P1. Identify apparatus P2. Identify soil sampler P3. Assemble apparatus P4. Complete test P5. Record number of blows P6. Evaluate bearing capacity
CU2. Identify bearing capacity using California bearing ratio	P1. Identify apparatus P2. Prepare sample P3. Complete test P4. Record readings P5. Interpret penetration and penetration load graphically P6. Evaluate CBR from graph P7. Interpret percentage CBR and dry density of sample graphically P8. Identify CBR graphically at required degree of compaction

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Introduction to bearing capacity of soil.
- K2. Factors affecting bearing capacity.
- K3. Standard penetration test
- K4. California bearing ratio test

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate the working of standard penetration test apparatus
- Demonstrate working of CBR apparatus
 - Explain blow counts and refusal for SPT
 - Calculate bearing capacity with respect to blow counts
 - Draw and interpret graph between percentage CBR and sample dry density
 - Differentiate between field and laboratory test



Tools and Equipment

1. Drilling Rig.
2. Split spoon (tube).
3. Drop hammer
4. Driving head (anvil).
5. Guiding rod.
6. Tripod.
7. Extension rods
8. Cylindrical mould
9. detachable extension collar
10. detachable perforated base plate
11. Spacer disc
12. Metal rammer
13. Weights.
14. Loading
15. Metal penetration piston
16. Two dial gauges reading to 0.01 mm.
17. Sieves. 4.75 mm and 20 mm I.S. Sieves
18. mixing bowl
19. straight edge
20. scales soaking tank or pan
21. drying oven
22. filter paper
23. Containers.



10.25. Bridge Engineering.

0732B&CE-256 Produce sketches of bridges w.r.t. functions

Overview: This competency standard covers the knowledge required to draw sketches of foot, highway, railway, aqueduct and road cum railway bridge.

Competency Units	Performance Criteria
CU1. Draw sketch of foot bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of foot bridge P4. Label the structural components of foot bridge
CU2. Draw sketch of highway bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of highway bridge P4. Label the structural components of highway bridge
CU3. Draw sketch of railway bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of railway bridge P4. Label the structural components of railway bridge
CU4. Draw sketch of aqueduct bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of aqueduct bridge P4. Label the structural components of aqueduct bridge
CU5. Draw sketch of road cum railway bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of road cum railway bridge P4. Label the structural components of road cum railway bridge

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Definition of terms related to bridge engineering
- K2. Structural parts of bridges
- K3. Factors affecting the development of bridges
- K4. Permanent big bridges – Abutment, wing walls, approaches, piers and their foundation.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of foot bridge
 - Sketch of highway bridge
 - Sketch of railway bridge
 - Sketch of aqueduct bridge
 - Sketch of road cum railway bridge

Tools and Equipment

1. Paper
2. Drafting table
3. Pencil
4. Ruler
5. Rubber
6. Sharpener
7. Masking tape



0732B&CE-257 Produce sketches of bridges w.r.t. material of construction

Overview: This competency standard covers the knowledge required to draw sketches of timber, masonry, steel, R.C.C and pre stressed concrete bridges.

Competency Units	Performance Criteria
CU1. Draw sketch of timber bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of timber bridge P4. Label the structural components of timber bridge
CU2. Draw sketch of masonry bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of masonry bridge P4. Label the structural components of masonry bridge
CU3. Draw sketch of steel bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of steel bridge P4. Label the structural components of steel bridge
CU4. Draw sketch of R.C.C bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of R.C.C bridge P4. Label the structural components of R.C.C bridge
CU5. Draw sketch of pre stressed concrete bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of pre stressed concrete bridge P4. Label the structural components of pre stressed concrete bridge

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain components parts and type timber, masonry, steel, R.C.C and pre stressed concrete bridges
- K2. Necessity and suitability
- K3. Comparison of various types
- K4. Characteristics of an ideal site for a bridge (River and Banks, foundation design and construction facilities, approaches)
- K5. Location of an alignment and site
- K6. State Factors governing the choice of a bridge



National Competency Standards Level-5 for “Civil Technology”



K7. Brief description of maintenance of steel, masonry, R.C.C. bridges

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of timber bridge
 - Sketch of masonry bridge
 - Sketch of steel bridge
 - Sketch of R.C.C bridge
 - Sketch of pre stressed concrete bridge

Tools and Equipment

- ❖ Paper
- ❖ Drafting table
- ❖ Pencil
- ❖ Ruler
- ❖ Rubber
- ❖ Sharpener
- ❖ Masking tape



0732B&CE-258 Produce sketches of bridges w.r.t. type of super structure

Overview: This competency standard covers the knowledge required to draw sketches of arch, girder, truss and suspension bridges.

Competency Units	Performance Criteria
CU1. Draw sketch of arch bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of arch bridge P4. Label the structural components of arch bridge
CU2. Draw sketch of girder bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of girder bridge P4. Label the structural components of girder bridge
CU3. Draw sketch of truss bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of truss bridge P4. Label the structural components of truss bridge
CU4. Draw sketch of suspension bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of suspension bridge P4. Label the structural components of suspension bridge

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain components parts and type arch, girder, truss and suspension bridges
- K2. Necessity and suitability
- K3. Comparison of various types
- K4. Characteristics of an ideal site for a bridge (River and Banks, foundation design and construction facilities, approaches)
- K5. Location of an alignment and site
- K6. State Factors governing the choice of a bridge

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of arch bridge
- Sketch of girder bridge
- Sketch of truss bridge
- Sketch of suspension bridge

Tools and Equipment

- ❖ Paper
- ❖ Drafting table
- ❖ Pencil
- ❖ Ruler
- ❖ Rubber
- ❖ Sharpener
- ❖ Masking tape



0732B&CE-259 Produce sketches of bridges w.r.t. floor type

Overview: This competency standard covers the knowledge required to draw sketches of deck, through and semi through bridges

Competency Units	Performance Criteria
CU1. Draw sketch of deck bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of deck bridge P4. Label the structural components of deck bridge
CU2. Draw sketch of through bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of through bridge P4. Label the structural components of through bridge
CU3. Draw sketch of semi through bridge	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of semi through bridge P4. Label the structural components of semi through bridge

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Explain components parts and type deck, through and semi through bridges
- K2. Necessity and suitability
- K3. Comparison of various types
- K4. Characteristics of an ideal site for a bridge (River and Banks, foundation design and construction facilities, approaches)
- K5. Location of an alignment and site
- K6. State Factors governing the choice of a bridge

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of deck bridge
- Sketch of through bridge
- Sketch of semi through bridge

Tools and Equipment

- ❖ Paper



National Competency Standards Level-5 for “Civil Technology”



- ❖ Drafting table
- ❖ Pencil
- ❖ Ruler
- ❖ Rubber
- ❖ Sharpener
- ❖ Masking tape



0732B&CE-260 Produce sketches of culverts, low level and high level causeway

Overview: This competency standard covers the knowledge required to draw sketches of culverts (pipe, box, arch and slab), low level and high level causeway.

Competency Units	Performance Criteria
CU1. Draw sketch of low level causeway	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of low level causeway P4. Label the structural components of low level causeway
CU2. Draw sketch of high level causeway	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of high level causeway P4. Label the structural components of high level causeway
CU3. Draw sketch of pipe culvert	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of pipe culvert P4. Label the structural components of pipe culvert
CU4. Draw sketch of box culvert	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of box culvert P4. Label the structural components of box culvert
CU5. Draw sketch of arch culvert	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of arch culvert P4. Label the structural components of arch culvert
CU6. Draw sketch of slab culvert	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw sketch of slab culvert P4. Label the structural components of slab culvert

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Define Culvert and causeway
- K2. Explain the difference between culvert and causeway
- K3. Explain Types of culverts (pipe, box, arch and slab)
- K4. Explain Types of causeway
- K5. Brief description of maintenance of causeways

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Sketch of low level causeway
- Sketch of high level causeway
- Sketch of pipe culvert
- Sketch of box culvert
- Sketch of arch culvert
- Sketch of slab culvert

Tools and Equipment

1. Paper
2. Drafting table
3. Pencil
4. Ruler
5. Rubber
6. Sharpener
7. Masking tape



10.26. Environmental Technology

0732B&CE-261 Determine Water Pollution

Overview: This competency standard covers the skills and knowledge required to determine Dissolved Oxygen in water, turbidity, total suspended solids, PH value, concentration of nitrates and Biochemical oxygen demand.

Competency Units	Performance Criteria
CU1. Determine Dissolved Oxygen in water	P1. Identify the equipment (dissolved oxygen meter and sensor) P2. Calibrate the equipment for measurement P3. Record the result of dissolved oxygen in water
CU2. Determine Turbidity of water	P1. Identify turbidity meter P2. Calibrate the equipment for measurement P3. Evaluate the result of turbidity
CU3. Determine Total Suspended Solids in water	P1. Identify the equipment P2. Record volume of sample P2. Filter the sample P3. Dry the filtered material P4. Weigh the material P5. Determine the quantitative total suspended solids (TSS)
CU4. Find out the PH value of water	P1. Identify litmus paper P2. Wet the litmus paper with water P3. Compare the color with the key P4. Record the PH value
CU5. Find out the concentration of Nitrates in water	P1. Identify the Spectrophotometer P2. Prepare standard NO ₃ nitrate solution P3. Record absorbance or transmittance against redistilled water set at zero absorbance P4. Obtain absorbance of standard nitrate solution P5. Draw the relationship between concentration and absorbance P6. Calculate the factor m (slope of line) P7. Calculate the concentration of nitrate from the standard curve or from equation



CU7. Determine Biochemical Oxygen Demand of the sample	P1. Determine the amount of sample to be analyzed P2. Place a clean, calibrated thermometer into the constant temperature chamber P3. Turn on the constant temperature chamber to allow the controlled temperature P4. Turn on the dissolved oxygen (DO) instrument P5. Aerate dilution water before adding nutrient solutions P6. Add to dilution water P7. Shake the container of dilution water for about 1 minute P8. Place the dilution water in the constant temperature chamber P9. The initial and final DO tests of the dilution water is determined and recorded

Knowledge & Understanding

The candidate must be able to develop understanding to determine Dissolved Oxygen in water, turbidity, total suspended solids, pH level, concentration of nitrates and biochemical oxygen demand and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Definition of turbidity and pH value
- K2. Explain sources of Water Pollution
- K3. Composition of Sewage
- K4. Properties of Sewage (physical, chemical, biological)
- K5. Tests for Sewage (physical, chemical, biological)
- K6. Sewage treatment and disposal
- K7. Explain the different types of treatment
- K8. Water standards for different uses

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Balance the samples in equipment.
- Maintain the temperature and humidity
- Method to filter the sample
- Maintain safe work environment
- Maintaining the equipment after Tests

Tools and Equipment

1. Dissolved Oxygen meter and sensor



National Competency Standards Level-5 for “Civil Technology”



2. Turbidity meter
3. Litmus Paper
4. Spectrophotometer
5. Thermometer
6. Containers



0732B&CE-262 Evaluate Air Pollution

Overview: This competency standard covers the skills and knowledge required to analyze sources of air pollution, analyze methods of detection/measurement of air pollution, evaluate environment quality standards in ambient air, analyze methods to control air pollution and evaluate pathological effects of air pollution on human life

Competency Units	Performance Criteria
CU1. Analyze sources of air pollution	P1. Identify the air pollutants P2. Identify sources of air pollutants P3. Gather information about mechanism of emission of pollutants P4. Compile data in a presentable form
CU2. Analyze methods of detection/measurement of air pollution	P1. Identify the air pollutants P2. Identify methods for detection and measurement of air pollutants P3. Enlist merits and demerits of methods for measurement of air pollution
CU3. Evaluate environment quality standards in ambient air	P1. Collect environmental quality standards (EQS) of ambient air of Pakistan P2. Collect EQS of developed countries P3. Compare EQS of Pakistan and developed countries
CU4. Analyze methods to control air pollution	P1. Identify the sources of air pollutants P2. Identify methods to control air pollution P3. Enlist merits and demerits of methods to control air pollution
CU5. Evaluate pathological effects of air pollution on human life	P1. Identify the air pollutants P2. Collect information about pathological effects of air pollutants P3. Compile data in a presentable form

Knowledge & Understanding

The candidate must be able to develop understanding to analyze sources of air pollution, analyze methods of detection/measurement of air pollution, evaluate environment quality standards in ambient air, analyze methods to control air pollution and evaluate pathological effects of air pollution on human life and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Definition, sources and emission of air pollutants
- K2. Methods of detection and measurement of air pollution
- K3. Different types of air pollutants and their sources
- K4. Pathological effects on man
- K5. Different Environmental Quality Standards



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Collect the EQS of ambient air
- Identification of air pollutants
- Maintain safe work environment

Tools and Equipment

1. Pencil
2. Charts
3. Eraser
4. Pollution meter
5. Detector
6. Sensor



0732B&CE-263 Determine Noise Pollution

Overview: This competency standard covers the skills and knowledge required to measure the noise pollution, compare the standards and control noise pollution.

Competency Units	Performance Criteria
CU1. Measure the noise pollution	P1. Identify the Noisometer P2. Measure the sound level P3. Compare the sound level with standards P4. Identify the sound level as noise
CU2. Compare the standards	P1. Collect the standards of developed countries P2. Collect standards of Pakistan P3. Compare the sound level values for different zones
CU3. Enlist the methods to control noise pollution	P1. Identify the sources P2. Enlist the methods to control noise pollution P3. Follow the limits of noise level

Knowledge & Understanding

The candidate must be able to develop understanding to measure the noise pollution, compare the standards and control noise pollution and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Definition of noise pollution
- K2. Sources of noise pollution (Noise from traffic, Aircraft noise, Noise from construction and civil engineering works, noise from industry)
- K3. Measurements of intensity of sound
- K4. Effects of noise on peoples' lives
- K5. Control of noise pollution
- K6. Different noise quality standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Balance the samples in equipment.
- Maintain the temperature and humidity
- Maintain safe work environment
- Maintaining the equipment after Tests

Tools and Equipment



National Competency Standards Level-5 for “Civil Technology”



1. Noisometer
2. Pencil
3. Charts
4. Eraser



0732B&CE-264 Evaluate Solid Waste Pollution

Overview: This competency standard covers the skills and knowledge required to evaluate the methods of disposal of solid waste and develop a management plan for disposal of solid waste.

Competency Units	Performance Criteria
CU1. Evaluate the methods of disposal of solid waste	P1. Identify the sources P2. Differentiate the waste as organic/inorganic P3. Enlist the methods of disposal P4. Enlist the merits and demerits of each method
CU2. Develop a management plan for disposal of solid waste	P1. Identify the sources P2. Propose suitable method for different types of waste P3. Develop hierarchy of the organization P4. Present the plan

Knowledge & Understanding

The candidate must be able to develop skills to evaluate the methods of disposal of solid waste and develop a management plan for disposal of solid waste and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Definition of solid waste
- K2. Sources of solid waste
- K3. Difference between organic and inorganic wastes
- K4. Classification of solid wastes
- K5. Collection of solid wastes
- K6. Disposal of solid wastes(sanitary, landfill, incineration, composting, recycling)

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Different types of solid waste
- Different methods to evaluate solid wastes
- Maintain the temperature and humidity
- Maintain safe work environment

Tools and Equipment

1. Pencil



National Competency Standards Level-5 for “Civil Technology”



2. Charts
3. Eraser



0732B&CE-265 Adopt occupational health and safety

Overview: This competency standard covers the skills and knowledge required to identify the fire control equipments, use fire extinguisher and develop an emergency exit plan.

Competency Units	Performance Criteria
CU1. Analyze safety and occupational health codes and standards	P1. Collect occupational health and safety codes and standards P2. Evaluate occupational health and safety codes and standards
CU2. Recognize hazards in construction industry	P1. Identify hazards in construction industry such as falls, stuck in machinery, chemical spills, fire etc. P2. Record hazards in construction industry P3. Interpret risks for enlisted hazards such as injury, burn, cut etc.
CU3. Draw construction safety signs	P1. Identify construction safety signs internationally recognized P2. Interpret safety signs for specific hazards P3. Draw construction safety signs
CU4. Inspect personal protective equipment	P1. Identify personal protective equipment (PPE's) for different risks such as head injury, falls, burns etc. P2. Wear personal protective equipments
CU5. Handle material safely	P1. Identify lifting machinery P2. Identify hazards related to lifting operations P3. Interpret risks for enlisted hazards
CU6. Identify fire control equipments	P1. Identify the fire control equipment P2. Diagnose operations of fire control equipment
CU7. Perform operation of fire extinguisher	P1. Identify fire extinguisher P2. Use fire extinguisher
CU8. Develop an emergency exit plan	P1. Collect a plan of a building P2. Propose emergency exits P3. Draw the emergency plan
CU9. Provide first aid	P1. Identify elements of first aid kit P2. Treat for suffocation, cut, injury, electric shock, snake bite, strains and gastrointestinal problems

Knowledge & Understanding

The candidate must be able to develop understanding to identify the fire control equipments, use fire extinguisher and develop an emergency exit plan and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



- K1. Introduction to safety and PPE's
- K2. Industrial ventilation, exhaust systems.
- K3. Industrial noise and its control.
- K4. Safety Precautionary Measures for scaffolding, formwork, ladder, drilling & blasting, demolition, hot bituminous works, excavation and dewatering
- K5. Fire hazards in building
- K6. Fire resistant construction materials
- K7. Fire control systems
- K8. Fire control operation
- K9. Emergency exit plan

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Use of PPE's
- Collect occupational health and safety standards
- Maintain safe work environment
- Maintain safety sign boards

Tools and Equipment

- ❖ Ear Muff, Ear Plug
- ❖ Safety shoes
- ❖ Gloves
- ❖ Safety Goggles
- ❖ Safety Helmet
- ❖ Respiratory protective equipment i.e. Masks
- ❖ Life Jacket
- ❖ High visibility jacket
- ❖ Safety harness
- ❖ Face shield
- ❖ Rubber shoes/ long shoes
- ❖ Water Buckets
- ❖ Fire Blankets
- ❖ Sand Buckets
- ❖ First Aid Box
- ❖ Thermometer and B.P apparatus
- ❖ Fire Extinguisher



National Competency Standards Level-5 for “Civil Technology”



- ❖ Fire Alarm
- ❖ Sprinklers



0732B&CE-266 Respond to Natural Disaster

Overview: This competency standard covers the skills and knowledge required to prepare structure for disaster risk management, develop a response strategy for pre disaster phase, develop a response strategy for disaster phase and develop a response strategy for post disaster phase.

Competency Units	Performance Criteria
CU1. Prepare structure for disaster risk management	P1. Identify the authority at national level P2. Identify authorities at provincial level P3. Identify different governing bodies at sub sequent levels P4. Develop structure for disaster risk management
CU2. Develop a response strategy for pre disaster phase	P1. Identify risks of disasters P2. Enlist activities for immediate response P3. Identify tools to aware people of risk P4. Propose an immediate response plan
CU3. Develop a response strategy for disaster phase	P1. Identify the measures P2. Enlist the activities for disaster response P3. Make a chart for disaster relief activities
CU4. Develop a response strategy for post disaster phase	P1. Identify the measures P2. Enlist the tools to assess the damage P3. Propose a plan to rehabilitation/reconstruction P4. Propose a plan for sustainable development

Knowledge & Understanding

The candidate must be able to develop understanding the fundamentals of Harbour and Docks (mode of transportation) and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1. Introduction to natural disasters
- K2. Causes of natural disasters
- K3. Effects of natural disasters
- K4. Remedial measures for natural disasters

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Different types of risks
- Maintain safe work environment



Tools and Equipment

1. Pencil,
2. Charts,
3. Eraser



10.27. Construction Project Planning and Management

0732B&CE-267 Develop Project Management Life Cycle

Overview: This competency standard covers the skills and knowledge required to perform operations for initiation of project, support project planning and design processes, assist with project control and execution Assist with project finalization-closure.

Competency Unit	Performance Criteria
CU-1. Perform operations for initiation of project.	P1. Prepare documents for project. P2. Establish relationship between the project and broader organisational strategies and goals P3. Assist in negotiating and documenting project objectives, outcomes and benefits P4. Assist in establishing the project governance structure-Induct requisite staff. P5. Assist in drafting a project charter for approval- feasibility report. P6. Prepare conditions applicable for project. P7. Open project office.
CU-2. Support project planning and design processes	P1. Support breakdown of project objectives into achievable project deliverables P2. Assist in identifying project stages, and key requirements for stage completion-resources, budget, standards, and communication. P3. Identify project milestones and map clearly against time and objectives P4. Assist in consolidating associated plans and baselines in project management plan P5. Support negotiation with relevant stakeholders and project authority to gain approval of project plan



National Competency Standards Level-5 for “Civil Technology”



CU-3. Assist with project control and execution	P1. Maintain and update records against project deliverables and plans at required intervals P2. Prepare status reports on project progress and identified issues P3. Assist with undertaking an impact analysis of proposed changes to the project P4. Maintain relevant project logs and registers accurately and regularly to assist with project audit P5. Update associated plans to reflect project progress against baselines and approved changes
CU-4. Assist with project finalization-closure.	P1. Assist with project finalisation activities where required P2. Prepare project products and associated documentation for handover to client P3. Assist in completing financial, legal and contractual obligations where required P4. Contribute perspectives on project performance to assist with project review assessments

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the objectives and functions of project management
- K2.** Explain the different stages and activities involved in construction projects i.e. planning stage, designing stage, tendering stage and execution stage.
- K3.** State the types of civil engineering projects
- K4.** State the classification of works -original, major, minor & petty work, annual repair and special repair works.
- K5.** List the parties/persons involved in a construction project- scope of duties & responsibilities of construction team
- K6.** Explain the importance and role of each member of construction team
- K7.** Explain project management life cycle i.e. project initiating, planning, execution and project closer.



National Competency Standards Level-5 for “Civil Technology”



- K8.** Explain the organizations i.e. line staff, direct and functional organization, their features, merits and demerits giving merits and demerits of each
- K9.** List the engineering departments of government
- K10.** Draw organizational chart of C&W department Irrigation & power department, public Health Engineering department
- K11.** List the duties of different officers of works departments
- K12.** State the power of sanction of various officers of works departments
- K13.** Explain the classes of establishments in works department
- K14.** State Essential qualities of project Manager

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform operations for initiation of project.
- Support project planning and design processes
- Assist with project control and execution
- Assist with project finalization-closure.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment



0732B&CE-268 Develop Preliminary Project Plan

Overview: This competency standard covers the skills and knowledge required to prepare flow chart for tendering process, prepare tender documents, tender notice and collect proposals.

Competency Unit	Performance Criteria
CU-1. Perform Survey of Area	P1. Perform reconnaissance survey of area for project. P2. Perform topographic survey of area for project. P3. Prepare map of area for project.
CU-2. Allocate fund & select site of project	P1. Prepare rough cost estimate. P2. Get Administrative approval of project. P3. Mark options on the prepared map. P4. Select most suitable and economic site.
CU-3. Design the project features.	P1. Perform Detailed Survey. P2. Prepare structural design of components of project. P3. Prepare geometric design / drawings of project. P4. Prepare working drawings of project.
CU-4. Prepare detailed estimate of project- fund allocation.	P1. Work out quantities of items of work. P2. Prepare cost estimate. P3. Get technical sanction from the authority.
CU-5. Conduct feasibility study for execution of project.	P1. Draft construction and system feasibility- resources for project. P2. Identify budget allocation and earning from project- economy. P3. Identify social benefits from the project-operational. P4. Estimate quantity of work, time, and available resources for project. P5. Decide the feasibility and prepare feasibility report of project.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the importance of preliminary planning



National Competency Standards Level-5 for “Civil Technology”



- K2.** Explain Pre-feasibility study.
- K3.** Explain Types of feasibility study.
- K4.** Explain Steps involved in feasibility study.
- K5.** Explain difference between feasibility report and project report
- K6.** Explain the data to be collected and aspects to be considered in feasibility report
- K7.** Explain aspects to be considered during preparation of project report

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepared flow chart for tendering process
- Prepare tender documents
- Prepare tender notice and collect proposals.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-269 Develop Construction Project Plan

Overview: This competency standard covers the skills and knowledge required to specify the individual activities, determine the sequence of those activities, draw a network diagram, estimate the completion time for each activity, level the resources, apply constraints, identify the critical path (longest path through the network), update the CPM diagram as the project progresses.

Competency Unit	Performance Criteria
CU-1. Specify the individual activities.	P1. Collect data from estimate of construction project. P2. Identify pre-construction tasks. P3. Identify time dependency of activities- Dummy activities. P4. Divide the work into smaller parts. P5. Define the activities depending on resources. P6. Prepare the list of activities along with normal duration
CU-2. Determine the sequence of those activities.	P1. Identify the activities of construction project. P2. Find out predecessor and successor of each activity. P3. Arrange them in sequence.
CU-3. Draw a network diagram.	P1. Represent each activity with arc/ line with an arrow. P2. Draw ellipse/ circles at start and end of activities. P3. Observe the direction of arrows.
CU-4. Estimate the completion time for each activity.	P1. Examine the resources for each activity. P2. Estimate the workability of workforce P3. Examine the productivity of machinery. P4. Determine the activities normal duration. P5. Write down time required to complete each activity.
CU-5. Identify the critical path (longest path through the network)	P1. Perform forward pass by formula at each project activities. P2. Write early start time and early finish time for each activity. P3. Perform backward pass by formula at each project activities. P4. Write late finish time and late start time for each activity. P5. Level the resources of project. P6. Apply constraints due to resources, time, environment, season. P7. Calculate float/ slack time for each activity. P8. Decide the critical path of construction project- activities with zero float/ slack time. P9. Calculate the duration of project for completion.



National Competency Standards Level-5 for “Civil Technology”



CU-6. Expedite/ crash progress of work	P1. Enhance workforce force and machinery for activities. P2. Enhance daily working hours. P3. Assess the impact of each on cost. P4. Calculate critical durations for activities. P5. Calculate time for completion of crash programming.
CU-7. Update the CPM diagram as the project progresses.	P1. Record actual time duration during construction on network. P2. Assess the actual cost.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** State the objectives of scheduling
- K2.** Break down the constructions work in to activities
- K3.** Explain the procedure of making constructions schedule i.e. sequencing and time computation of each activity
- K4.** State the need for material, equipment and Labour schedule
- K5.** Explain methods of procurement of Labour, materials and equipment
- K6.** Plan by bar chart-time and progress chart Gantt Chart
- K7.** Prepare bar chart and explain its limitation
- K8.** Explain the advantages of project planning by network analysis (only with critical path method)
- K9.** Plan and draw C.P.M. network for a construction project
- K10.** Calculate network time, critical path, free float and total float
- K11.** Prepare work progress charts.
- K12.** Draw progress network/ charts for a construction project
- K13.** Review of network and crash programming
- K14.** Under take Resource Scheduling and levelling.
- K15.** Explain characteristics, operations and safety of construction machinery
- K16.** Explain cost of owning and operating construction machinery
- K17.** List main factors in selection of construction machinery
- K18.** Describe productivity of different construction machinery, e.g. Bulldozer, Excavator, etc



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Network diagram showing critical path.
- Levelling of resources.
- Updated Network diagram showing critical path.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipments



0732B&CE-270 Conduct on-site supervision of construction projects

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed site, prepare contract documents, prepare Working Drawings, draft Specifications, Design of RCC slabs, lintels, T & L beams, columns and column footings, prepare estimates- Cost, Materials, Time (labour, machinery), layout Structures and conduct Planning for project for framed structure class room.

Competency Unit	Performance Criteria
CU-1. Determine quality requirements	P1. Determine <i>quality objectives</i>, standards and levels, with input from stakeholders and guidance of a higher project authority, to establish the basis for quality outcomes and <i>a quality management plan</i> P2. Select and use established <i>quality management methods, techniques and tools</i> to determine preferred mix of quality, capability, cost and time P3. Identify quality criteria, obtain agreement from a higher project authority and communicate to stakeholders, to ensure clarity of understanding and achievement of quality and overall project objectives P4. Include agreed quality requirements in the project plan and implement as basis for performance measurement
CU-2. Implement quality assurance processes	P1. Measure and document results of project activities and product performance throughout the project life cycle to determine compliance with agreed quality standards P2. Identify causes of unsatisfactory results, in consultation with client, and recommend appropriate actions to a higher project authority to enable continuous improvement in quality outcomes P3. Conduct inspections of quality processes and <i>quality control</i> results to determine compliance of quality standards to overall quality objectives P4. Maintain a quality management system to enable effective recording and communication of quality issues and outcomes to a higher project authority and stakeholders



National Competency Standards Level-5 for “Civil Technology”



CU-3. Implement project quality improvements	P1. Review processes and implement agreed changes continually throughout the project life cycle to ensure continuous quality improvement P2. Review project outcomes against performance criteria to determine the effectiveness of quality management processes and procedures P3. Identify and document lessons learned and recommended improvements, and pass on to higher project authority for application in future projects

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the need for inspection of works
- K2.** List the duties of various inspecting officers
- K3.** Describe quality management theory, techniques, tools and methodologies
- K4.** Explain roles and responsibilities in project management- sub-engineer regarding works, store and account
- K5.** Explain the use of site order book
- K6.** Explain the principles of supervision
- K7.** Explain need and methods of quality control
- K8.** List the points to be considered in enforcing specifications
- K9.** State the necessity for sampling and testing of materials
- K10.** Explain methods for managing and improving performance
- K11.** Describe relevant legislation codes and national standards:
- K12.** Award and enterprise agreements and industrial instruments
- K13.** Describe construction industry codes of practice
- K14.** Describe legislation from all levels of government that affects business operation, especially in regard to occupational health and safety and environmental issues, equal opportunity, industrial relations and anti-discrimination.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrated evidence of successfully managing project staff so that quality outcomes were achieved on multiple complex projects
- Knowledge of a range of quality management tools, techniques and methodologies.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil



0732B&CE-271 Perform Basic operation in Primavera P6

Overview: This competency standard covers the skills and knowledge required to Load Primavera Software, Unload Primavera Software, Recognize Toolbars, Customize P6 Screen and Display Gantt Chart.

Competency Units	Performance Criteria
CU-1. Load & unload primavera P6 Software.	P1. Locate P6 icon & double click on it P2. Exit from software by menu/ close button/ short key.
CU-2. Prepare interface of software	P1. Identify parts of application window. P2. Identify parts of working window.
CU-3. Customize P6 Screen Layout	P1. Identify the ‘Layout Options Bar’ on the top in Activities category P2. Add required number of columns to the layout. P3. Add created columns in existing layout. P4. Move columns to the left and right for adjustment. P5. Change the order of columns as per requirement.
CU-4. Display Gantt Chart	P1. Open Gantt chart window. P2. Select ‘Layout Options Bar’ → ‘Group and Sort...’ P3. Select ‘Group by’ dropdown list → ‘WBS’ P4. Select other required parameters. P5. Use of snip tool for screen shot.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe the use of Primavera Software
- K2.** Describe Loading / Unloading procedure of P6 software
- K3.** Describe the interface of Primavera P6.
- K4.** Describe the benefits of true Enterprise Project Management systems
- K5.** Describe the names and function of all Views, Layouts, Toolbars and Icons in P6
- K6.** Describe the process of Customizing Layouts
- K7.** Describe process of taking screen shot.

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Physical performance to Customized screen layout.
- Customized screen layout screen shot.

Tools & Equipment

- Computer with mouse & keyboard
- P6 Software installed



0732B&CE-272 Perform road Project Activities Scheduling in Primavera P6

Overview: This competency standard covers the skills and knowledge required to Add Project, Create WBS, Create Activities, Create Relationships, Create Schedule.

Competency Units	Performance Criteria
CU1. Add Project in Primavera	P1. Open ‘Projects’ screen P2. Select the EPS for the new project P3. Enter Project ID and Project Name P4. Enter Planned Start Date for the project and target deadline in ‘Must Finish by’ P5. Select the ‘Responsible Manager’ P6. Select ‘Assignment rate Type’ P7. Check ‘no do not run project architecture’ P8. Open Projects Screen and click on the newly created project P9. Open ‘Notebook’ tab in the opened ‘Project Detail’ window → ‘Add’ → Select the type of note to be added P10. Open ‘Dates’ tab → Add relevant dates
CU2. Create WBS of project in Primavera.	P1. Click ‘WBS’ tab on the Directory Bar on the left to open WBS Window P2. Click ‘Add’ from the command bar on the right P3. Assign a ‘Code’ and ‘Name’ to the newly added WBS Element P4. Add more WBS elements P5. Take a WBS element to a higher hierarchy level by clicking on the LEFT arrow key on the command bar P6. Take a WBS element to a lower hierarchy level by clicking on the RIGHT arrow key on the command bar P7. Move a WBS element to a higher head by clicking the UP arrow key on the command bar P8. Move a WBS element to a lower head by clicking the DOWN arrow key on the command bar P9. Create a detailed WBS
CU3. Create Activities of project in Primavera.	P1. Click the ‘Activities’ icon on the directory bar on the left to open Activities Screen P2. Click ‘Add’ button on the command bar on the right P3. Type activity name in the relevant box



National Competency Standards Level-5 for “Civil Technology”



	P4. Click ‘Activity Type’ tab of the activity P5. Select ‘Start Milestone’ for the first activity P6. Add expected activity duration in the ‘original duration’ column P7. Add activities to other WBS levels P8. Click on ‘Show/Hide Activity Detail’ icon on the toolbar to open Detail View P9. Add other parameters in the tabs shown
CU4. Create Relationships between activities of project in Primavera.	FROM ACTIVITY NETWORK VIEW P1. Click ‘Activity Network’ icon on the toolbar P2. Select a WBS Node P3. Select simultaneously the activities whose relationship is to be defined. P4. Click ‘Edit’ dropdown menu → Click ‘Link Activities’ to create an automatic Start-to-Finish relationship between the two. FROM GANTT CHART VIEW P5. Click the ‘Gantt Chart’ icon on the toolbar P6. Click the Activity name from the Activity Table Window on the left P7. Click the ‘Relationships’ tab on the Activity Detail window on the bottom P8. In the ‘Predecessors’ and ‘Successors’ window, click ‘Assign’ → Select relevant activity from the pop-up window. P9. Click the “Assign’ button on the right of ‘Assign Successor/Predecessor’ pop-up screen → Click on the Close button to exit. P10. Click on the cell in the ‘Relationship Type’ column to change the activity relationship from FS to either SS, or SF or FF, as required. TO VIEW ACTIVITY RELATIONS GRAPHICALLY P11. Click ‘Relationship Lines’ icon on the toolbar P12. Identify the relationship arrows now visible in the Gantt Chart on the right



CU5. Create Schedule of activities of project in Primavera.	P1. Click on the ‘Schedule’ icon on the Toolbar OR Press ‘F9’ Key P2. Add all the relevant parameters in the ‘Schedule’ pop-up window, → Click ‘Schedule’ button on the right.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define Project, its types, constraints
- K2.** Define Activity, activity types, duration and dependencies.
- K3.** Define activity relationships, constraints, float, critical path, forward & backward pass,
- K4.** Define resource and enlist its types
- K5.** Identify Gantt Chart
- K6.** Define Work Breakdown Structure
- K7.** Define Activity and its attributes,
- K8.** Enlist Types of Activities
- K9.** Define task dependent activity, resource dependent activity, start milestone activity, finish milestone activity, level of effort activity
- K10.** Describe Duration Types,
- K11.** Describe the purpose of using Activity Codes,
- K12.** Define Relationship & describe their Types
- K13.** Perform Forward and Backward Pass,

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Physical performance to Relationship assigned gantt chart.
- Relationship assigned gantt chart screen shot.

Tools & Equipment

- Computer with mouse and keyboard
- Primavera P6 software installed



0732B&CE-273 Perform road Project Resources Costing &Planning in Primavera P6

Overview: This competency standard covers the skills and knowledge required to Add Constraints, Create & Assign Calendar, Add, Assign & Analyze Resources, Add Cost and Baseline the Project.

Competency Units	Performance Criteria
CU-1. Add constraints of activities of project in Primavera.	ADDING ACTIVITY CONSTRAINTS P1. Select the activity P2. Click on the ‘Status’ tab in the Activity Detail Window. P3. In the ‘Constraints’ box, select Constraint types and required dates P4. Schedule the project ADDING PROJECT CONSTRAINTS P5. Click on the ‘Projects’ icon in the directory bar to open Projects Screen P6. Select the Project P7. Click on the ‘Dates’ tab in the Project Detail Window. P8. Add a ‘Must Finish by’ date in the Schedule Dates box. P9. Run Scheduler
CU-2. Create Calendar for activities of project in Primavera.	P1. Select ‘Calendars’ from ‘Enterprise’ menu. P2. Click ‘Add’ on the left in the ‘Calendar’ pop-up screen P3. Select the appropriate existing calendar to copy from. P4. Enter the name for the new calendar and press Enter P5. Select the created calendar and click ‘Modify’ on the left side P6. Display ‘detailed work hours/day’ by selecting that option on the top P7. Made necessary modifications TO ASSIGN NON-WORKING/WORKING DAY P8. Select the required day of the week → Click ‘Work’/ ‘Nonwork’ as required TO CHANGE WORKING DAYS PER WEEK P9. Click ‘Workweek’ on the left → Select the day to be marked working/non-working → Select the hours of the day to be marked → Click the appropriate button (‘Work’/‘Nonwork’)
CU-3. Assign Calenders to activities of project in Primavera.	P1. Add ‘Calendar’ column to the layout



National Competency Standards Level-5 for “Civil Technology”



	P2. Click Layout Options bar → Click ‘Show on Top’ → Click ‘Activity Usage Spreadsheet’ (OR Display Activity Usage Spreadsheet) P3. Double click the ‘Calendar’ field of the required activity P4. Select the required calendar from the ‘Select Activity Calendar’ pop-up → Click ‘Assign’ button on the left OR P5. Go to the Activity Detail window → ‘General’ → ‘Activity Calendar’ → Select the required Calendar. P6. Run Scheduler
CU-4. Add Resources to activities of project in Primavera.	P1. Click ‘Resources’ icon on the Directory bar to open ‘Resource Dictionary’ P2. Click the Display bar → ‘Details’ to display the ‘Resource Details’ window P3. Click ‘Add’ button on the right side of the screen P4. Add resource details in the Resource Detail tabs:- - Give Resource ID and Name in ‘General’ tab - Define Resource Type and Working Hours in ‘Details’ tab - Add “effective date”, ‘Max units/time’ and ‘Hourly Rates’
CU-5. Assign Resources of activities of project in Primavera.	P1. Select the activity to which resources are to be assigned P2. Go to Activity Detail window → ‘Resources’ tab → ‘Add Resource’ → Select the appropriate resource from the ‘Assign Resources’ pop-up window P3. Indicate the Primary Resource from the list of resources added.
CU-6. Add Cost of activities of project in Primavera.	P1. Select the required activity P2. Open ‘Expenses’ tab in the Activity Detail window → Click ‘Add’ → Give details as required
CU-7. Analyse Resources of activities of project in Primavera.	P1. Click ‘Resource Usage Profile’ from the toolbar to display ‘Resource Usage Profile Graph’ P2. Click on each project resource listed on the left to display their respective working hours/week graphs P3. Identify work hours per week, working limit and over-allocation from the bar chart on the right P4. Select the ‘Resource’ box to display only the activities involving the selected resource. P5. Identify overlapping activities in the Gantt Chart



National Competency Standards Level-5 for “Civil Technology”



	P6. Click ‘Resources’ button on the right to re-allocate the activity to another resource → Click ‘Replace Resource’ button on the right → Select the appropriate resource as a replacement. P7. Confirm the selected resource is not over-allocated as a result.
CU-8. Perform Baseline process for Project.	CREATE BASELINE P1. Click ‘Project’ menu → ‘Maintain Baselines...’ → ‘Add’ → Select ‘Save a copy of the current project as a new baseline’ P2. Give Baseline Name in the appropriate Box P3. Categorize the Baseline type by selecting the appropriate type from the ‘Baseline Type’ dropdown menu ASSIGN BASELINE P4. Click ‘Project’ menu → ‘Assign Baselines...’ P5. Select the required ‘Project Baseline’ from the dropdown menu DISPLAY THE BASELINE GRAPHICALLY P6. Click Layout Options Bar → Click ‘Bars...’ P7. Select the box before ‘Project Baseline’ and ‘Project Baseline Milestone’ in the ‘Bars’ window P8. Observe the modified bars of actual performance in the Gantt Chart and compare them to the baseline

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe Activity Constraints,
- K2.** Define work calendar, work/non-work days, working hours
- K3.** Describe Roles and Hourly Rates,
- K4.** Define Baselines and describe their use in evaluating project performance

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Road Project planned in Primavera P6- Baseline Plans, Display, Resource Usage Profile, calendars, resources

Tools & Equipment



National Competency Standards Level-5 for “Civil Technology”



- Computer with mouse and keyboard
- Primavera P6 software installed

0732B&CE-274 Manage construction Project in Primavera P6

Overview: This competency standard covers the skills and knowledge required to Status the Project and Mitigate the schedule resulting in monitoring of planning.

Competency Units	Performance Criteria
CU1. Status the Project	P1. Click the ‘Progress Spotlight’ button in the toolbar → Drag the spotlight edge in the Gantt chart to increase/decrease the spotlight timeline. P2. Select the required activity P3. Open the ‘Status’ tab in the Activity Display window P4. Check ‘Started’ and ‘Finished’ box in the ‘Status’ section → Give appropriate dates P5. Click ‘Expenses’ tab → Add Actual Activity Cost P6. Click ‘Schedule’ button on the toolbar → Add ‘Data Date’ in the ‘Current Data Date’ → ‘Schedule’
CU2. Mitigate the schedule	P1. Identify the activities deviating the most from the project baseline P2. Click on that activity P3. Perform any/all of the following: - a. Add more resources to the activity b. Modify the calendar for resources working below their work/hour limit c. Remove constraints causing delay to the activity d. Schedule the project

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Enlist and describe stages of project execution
- K2.** Describe project monitoring and control

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Managed Project - project progress, planned baseline, Resource levelling and describe its purpose, comparison graphically, project progress for a specified time period

Tools & Equipment

- Computer with mouse and keyboard
- Primavera P6 software installed



National Competency Standards Level-5 for “Civil Technology”





0732B&CE-275 Identify Project Risk and Consequences on Project life cycle

Overview: This competency standard covers the skills and knowledge required to identify Risks, hazard, Risks Classification and its consequences on the Project life cycle.

Competency Unit	Performance Criteria
CU-1. Identify potential Risks in Construction Project, identify the Project phases	P1. Prepare Construction Project life cycle P2. Prepare Construction Project Risks analysis team P3. Enlist the Project Phases
CU-2. Prepare Classification of identified risks and break download structures	P1. Plan to identify the Risks in each Phase of Project P2. Prepare the Classification of Identified Risks P3. Prepare Risk Break down Structure (RBS)
CU-3. Determine the likelihood and impact of identified risks	P1. Prepare the data and information from previous project history P2. Prepare the scoring criteria to assess the likelihood and Impact of the identified risks.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define the Risk and Hazards.
- K2.** Define the Risk Management.
- K3.** Explain the Project Life Cycle and Project phases.
- K4.** Explain Project triangle, Cost, time and Quality.
- K5.** Explain the procedure to identify potential Risks.
- K6.** Explain the Classification of Risks and Define the Risk Break Down Structure.
- K7.** Explain brain storming.
- K8.** Define the Likelihood and Impact of Risk.
- K9.** Explain the Scoring Criteria to assess the Likelihood and impact of risks.



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare the project Phases
- Prepare Risks assessment model flow chart diagram.
- Prepare the list of potential risks in each phase of the project.
- Prepare the Risk break down structure.
- Prepare Scoring Criteria to assess the risks.

Instruments & Consumables

S No.	Description (Instruments)
1	Ruler
2	Writing pad
3	Pencil
4	Drawing Lab instruments



0732B&CE-276 Perform Evaluation to assess the severity of Risk and formulate the strategy to manage the risk

Overview: This competency standard covers the skills and knowledge required to Evaluate the risks Levels in term of (Very high, high, moderate, Low) and strategy formulation to manage the risks effectively and rationally.

Competency Unit	Performance Criteria
CU-1. Evaluation of Risk and prepare the severity of Risks.	P1. Identify Approach selecting for Risks analysis method P2. Perform the Qualitative Semi Qualitative and Quantitative methods to evaluate the risks. P3. Perform Risks analysis methods and Quantification P4. Identify Risks Management Process.
CU-2. Formulate the Strategy to Mitigate and Manage the Risks.	P1. Prepare the data management and matrixes to present the severity and Risk Level. P2. Prepare Risk Model to Manage the risk P3. Apply the Risk Model on each Risk to mitigate the adverse consequences of risk P4. Prepare risks monitoring process P5. Prepare the reference for future.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define Risk analysis
- K2.** Explain the approach selecting the Risks analysis method.
- K3.** Explain Qualitative, Semi Qualitative and Quantitative methods to evaluate the Risks.
- K4.** Explain the procedure to perform Risks analysis method and Quantification.
- K5.** Explain the Data management and risks matrixes.
- K6.** Explain the Risk management model to avoid, mitigate, transfer and accept the Risks.
- K7.** Explain monte Carlo simulation
- K8.** Define which party can bear the risk?
- K9.** State type of risks which cannot be transferred.
- K10.** Explain Risk monitoring Process.



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare Risks evaluation model.
- Prepare Risks Matrixes for Cost, time and Quality.
- Prepare Risks Management model flow diagram.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing Lab Instruments



10.28. Transportation Engineering-II

0732B&CE-277 Plan Route Alignment of Highway

Overview: This competency standard covers the skills and knowledge required to analyze considerations for road alignment and demarc the road alignment on given contour map.

Competency Units	Performance Criteria
CU1. Analyze road alignment	P1. Identify factors affecting alignment of road P2. Evaluate factors identified as per specifications
CU2. Mark the road alignment on given contour map	P1. Identify drawing tools P2. Fix the contour map on drafting table P3. Mark the alignment of road

Knowledge & Understanding

The candidate must be able to develop understanding to analyze considerations for road alignment and demarc the road alignment on given contour map and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the necessity, importance and modes of transportation
- K2.** Describe the terms road, highway, carriage way, dual carriage way etc.
- K3.** Define the term road alignment
- K4.** State the fundamental principles of road alignment.
- K5.** State the factors influencing selection of alignment for a road in plain and hilly area
- K6.** Explain the surveys required for fixing alignment

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demarcation of the road alignment on a contour map

Tools and Equipment

- ❖ Drafting Table,
- ❖ Drawing Tools
- ❖ Drawing Sheets



0732B&CE-278 Design Highway Geometrics

Overview: This competency standard covers the skills and knowledge required to draw cross section of typical geometric design including stopping sight distance, overtaking sight distance, super elevation and widening of road at curve.

Competency Units	Performance Criteria
CU1. Draw cross sections of road (National, Urban and Motorway)	P1. Identify national standards for national highway, urban roads and motorway P2. Fix drawing sheet on drafting table P3. Draw cross section of National Highway as per local standards P4. Draw cross section of urban roads as per local standards P5. Draw cross section of Motorway P6. Label components of highway geometrics
CU2. Find out stopping sight distance	P1. Identify given parameters for stopping sight distance P2. Calculate stopping sight distance
CU3. Find out overtaking sight distance	P1. Identify given parameters for overtaking sight distance P2. Calculate overtaking sight distance
CU4. Design super elevation	P1. Identify given parameters for super elevation P2. Calculate super elevation
CU5. Design widening of road at curve	P1. Identify given parameters for widening of road at curve P2. Calculate widening of road at curve

Knowledge & Understanding

The candidate must be able to develop understanding to draw cross section of typical geometric design, design stopping sight distance, design overtaking sight distance, design super elevation and design widening of road at curve and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Define the terms Kerb, Shoulder, Footpath, Drive way, Right of way, Bay of roads, road margins.
- K2.** Explain sight distance, stopping and over taking sight distance.
- K3.** Explain the factors affecting sight distance
- K4.** Define super elevation and state its necessity
- K5.** Explain method of introduction of super elevation.
- K6.** Explain widening at curves.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



National Competency Standards Level-5 for “Civil Technology”



- Drawing of cross section of typical geometric design
- Calculation sheet of stopping sight distance
- Calculation sheet of overtaking sight distance
- Design sheet of super elevation
- Design sheet of widening of road at curve

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-279 Perform tests on stone metal for pavement construction

Overview: This competency standard covers the skills and knowledge required to inspect field density by sand replacement method and perform Los Angeles Abrasion test.

Competency Units	Performance Criteria
CU1. Inspect field density by sand replacement method	P1. Identify apparatus P2. Evaluate volume of cone by filling sand of known specific gravity P3. Evaluate volume of hole on ground P4. Calculate field density of soil/sub-base/base
CU2. Perform Los Angeles Abrasion test	P1. Identify equipment P2. Prepare sample for test P3. Place the charges and sample in drum P4. Operate the machine according to specified revolutions P5. Determine mass loss after revolutions P6. Calculate the percentage of wear

Knowledge & Understanding

The candidate must be able to develop understanding to inspect field density by sand replacement method and perform Los Angeles Abrasion test and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain the components of sub base and base course
- K2.** Explain sand replacement method to find out field density.
- K3.** Explain Los Angeles abrasion test.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Field density report
- Test report of Los Angeles abrasion test

Tools and Equipment

1. Sand bottle
2. calibrating container
3. glass plate
4. base plate
5. pan
6. tools for excavating hole
7. Electronic digital balance
8. Set of sieves
9. Los Angeles abrasion apparatus



0732B&CE-280 Perform tests on bitumen

Overview: This competency standard covers the skills and knowledge required to draw structural components of flexible pavement, perform Ductility Test on Bitumen, perform softening point test for bitumen, perform Flash and Fire point test for bitumen / cutback, perform Marshal stability test for bituminous mixture and extract quantitative bitumen from bituminous paving.

Competency Units	Performance Criteria
CU1. Perform Ductility Test on Bitumen	P1. Identify the equipment P2. Prepare sample for test P3. Place the sample in water bath P4. Measure the distance covered during test
CU2. Perform softening point test for bitumen	P1. Identify Ring and Ball apparatus P2. Prepare sample for test P3. Assemble the apparatus to perform test P4. Record temperature at which balls touch the bottom of cylinder
CU3. Perform Flash and Fire point test for bitumen / cutback	P1. Assemble the apparatus P2. Heat the bitumen sample and stir the bitumen to maintain uniform temperature in sample P3. Apply test flame to sample P4. Record the temperature for flash point P5. Record the temperature for fire point
CU4. Perform Marshal stability test for bituminous mixture	P1. Identify the equipment P2. Prepare sample for test P3. Place the mould in Marshal test setup P4. Load the mould in Marshal test setup P5. Note the reading for vertical deformation of specimen P6. Vary the bitumen content for next trial P7. Compile data in tabular form P8. Compute required parameters P9. Plot the graph using the predetermined parameters P10. Determine optimum bitumen content
CU5. Extract quantitative bitumen from bituminous paving	P1. Identify centrifuge apparatus P2. Prepare sample for test P3. Assemble sample in apparatus according to specifications P4. Add solvent to disintegrate materials P5. Extract bitumen from sample P6. Determine the amount of bitumen
CU6. Determine consistency of bituminous material	P1. Identify penetrometer P2. Prepare sample for test



	P3. Examine and clean the needle P4. Place the sample in assembly to perform test P5. Record the reading from dial gauge

Knowledge & Understanding

The candidate must be able to develop understanding to draw structural components of flexible pavement, perform Ductility Test on Bitumen, perform softening point test for bitumen, perform Flash and Fire point test for bitumen / cutback, perform Marshal stability test for bituminous mixture and extract quantitative bitumen from bituminous paving and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe structural components of flexible pavement with sketches.
- K2.** Explain the component of road i.e. wearing course
- K3.** State the types of surfacing earth surface, general surface, water bound, bituminous
- K4.** Describe the bituminous materials
- K5.** Explain the construction procedure of bituminous roads.
- K6.** Explain the construction detail of surfacing cold and hot process bituminous macadam, premix asphalt macadam, bituminous concrete pavements and sheet asphalt pavement.
- K7.** Explain Ductility, Softening point, Marshal stability, Viscosity, Flash and fire, consistency, Quantitative extraction tests for bitumen

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Drawing of flexible pavement
- Result of Ductility Test on Bitumen
- Temperature of bitumen for softening
- Temperature of bitumen for Flash and Fire point
- Marshal mix design of bituminous mixture
- Detailed procedure for determination of optimum bitumen content
- Quantity of bitumen from bituminous paving
- Consistency value of bituminous material

Tools and Equipment

1. Electronic digital balance



National Competency Standards Level-5 for “Civil Technology”



2. Set of sieves
3. Sieve shaker
4. Digital stop watch
5. Marshal Stability Test apparatus
6. Bitumen ductility test apparatus
7. Thermostatic lab oven
8. Softening point test apparatus
9. Equipment for flash and fire test apparatus
10. Penetration of bituminous material apparatus
11. Centrifuge
12. Spatula
13. Thermometer
14. Water bath



0732B&CE-281 Prepare drawings of flexible/rigid pavement

Overview: This competency standard covers the skills and knowledge required to draw structural components of flexible/rigid pavement, draw cross section of rigid pavement showing longitudinal joints and draw cross section of rigid pavement showing transverse joints.

Competency Units	Performance Criteria
CU1. Draw structural components of flexible pavement	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of flexible pavement P4. Label the structural components of flexible pavement
CU2. Draw structural components of rigid pavement	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of rigid pavement P4. Label the structural components of rigid pavement
CU3. Draw cross section of rigid pavement showing longitudinal joints	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of rigid pavement showing longitudinal joints
CU4. Draw cross section of rigid pavement showing transverse joints	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of rigid pavement showing transverse joints

Knowledge & Understanding

The candidate must be able to develop understanding to identify structural components of rigid pavement, draw cross section of rigid pavement showing longitudinal joints and draw cross section of rigid pavement showing transverse joints and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe structural components of rigid pavement with sketches.
- K2.** Explain the component of road i.e. wearing course
- K3.** Explain the construction procedure of cement bounded roads.
- K4.** Explain the different types of joints in concrete pavement

Critical Evidence(s) Required



National Competency Standards Level-5 for “Civil Technology”



The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Drawing of rigid pavement
- Drawing of cross section of rigid pavement showing longitudinal joints
- Drawing of cross section of rigid pavement showing transverse joints

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



0732B&CE-282 Plan highway drainage

Overview: This competency standard covers the skills and knowledge required to draw cross section of surface drainage and draw cross section of sub surface drainage.

Competency Units	Performance Criteria
CU1. Draw cross section of surface drainage	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of surface drainage
CU2. Draw cross section of sub surface drainage	P1. Identify drawing tools for drawing P2. Fix drawing sheet on drafting table P3. Draw cross section of sub surface drainage

Knowledge & Understanding

The candidate must be able to develop understanding to draw cross section of surface drainage and draw cross section of sub surface drainage and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** State the necessity and importance of highway drainage.
- K2.** Describe with sketch surface drainage.
- K3.** Describe with sketch sub-surface drainage.
- K4.** State drainage of slopes and erosion control.
- K5.** State catch water drain in hilly area.
- K6.** Describe with sketches cross design structures culverts and bridges

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Drawing of cross section of surface drainage
- Drawing of cross section of sub surface drainage

Tools and Equipment

- ❖ Drafting Table,
- ❖ Drawing Tools
- ❖ Drawing Sheets

0732B&CE-283 Develop maintenance plan for roads

Overview: This competency standard covers the skills and knowledge required to identify the defects in road and draft a management plan for road maintenance



National Competency Standards Level-5 for “Civil Technology”



Competency Units	Performance Criteria
CU1. Identify defects in road	P1. Enlist defects in roads P2. Analyze causes of road defects P3. Draw defects in roads
CU2. Draft a management plan for road maintenance	P1. Identify roles of individuals in maintenance of roads P2. Propose positions for different roles P3. Draft hierarchy of organization P4. Propose roles according to positions for maintenance of roads

Knowledge & Understanding

The candidate must be able to develop understanding to identify the defects in road and draft a management plan for road maintenance and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain defects liable to occur in road- corrugations, ruts, pot holes etc.
- K2.** Explain the remedial measures for defects- scraping of existing layers, patch repair, replacing with reinforced layers, resurfacing etc.
- K3.** Describe the causes of defects in concrete roadside pot holes, corrugations and ruts.
- K4.** Describe the repair of defects of concrete road.
- K5.** Describe recycling procedure for road used materials

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Report on defects of roads
- Management plan for maintenance of roads

Tools and Equipment

1. Drafting Table,
2. Drawing Tools
3. Drawing Sheets



10.29. Irrigation Engineering

0732B&CE-284 Produce sketches of canals and head works

Overview: This competency standard covers the skills and knowledge required to draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages, Draw the plan of a multipurpose irrigation project, Draw a plan showing general layout of river training and protection works, Draw cross section of dams, Draw a plan showing the general layout of head works of a perennial canal, Draw cross-sections of a weir floors, Draw the plan and section of a silt ejector

Competency Units	Performance Criteria
CU1. Draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Draw map of Pakistan. P5. Show rivers on map. P6. Draw barrages, main canals, head works and link canals
CU2. Draw the plan of a multipurpose irrigation project	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Draw plan of project. P5. Show all details on plans
CU3. Draw a plan showing river training and Protection works.	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Draw plan of training and Protection works. P5. Show all details on plans
CU4. Draw cross section of dams	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Draw x-section of dam. P5. Label all necessary details on plan.
CU5. Draw a plan showing the general layout of head works of a perennial canal	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Select suitable scale.



National Competency Standards Level-5 for “Civil Technology”



	P5. Draw layout of head works. P6. Label all necessary details on plan.
CU6. Draw cross-sections of a weir floors	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Select suitable scale. P5. Draw weir's section. P6. Label all necessary details.
CU7. Draw the plan and section of a silt ejector	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Select suitable scale. P5. Draw plan and section. P6. Label all necessary details.

Knowledge & Understanding

- K1.** Define irrigation
- K2.** State history of irrigation.
- K3.** State necessity and scope of irrigation.
- K4.** State merits and demerits of irrigation
- K5.** Explain types of irrigation i.e. flow irrigation and lift irrigation
- K6.** Explain various sources of irrigation water.
- K7.** Describe with map the irrigation network in Pakistan.
- K8.** State the characteristics of Pakistan's rivers.
- K9.** State the important barrages of Pakistan.
- K10.** State Indus Basin Project
- K11.** Explain need and details of replacement works in Indus Basin Project
- K12.** Know IRSA and PIDA
- K13.** State the necessity of storage irrigation.
- K14.** Define the various terms used in storage irrigation.
- K15.** Explain the methods of assessment of maximum run off from a catchment area
- K16.** Define reservoirs
- K17.** State the purpose of reservoir and its classification.
- K18.** Describe the location of site selection for reservoir
- K19.** State classification of dams i.e. based on function and use, structural design, materials of construction, shape of X-section



National Competency Standards Level-5 for “Civil Technology”



- K20. State factors to be considered during choice of dam for hydro project
- K21. explain the construction details of earthen dams
- K22. State the causes of failure of earthen dams and their remedies
- K23. Explain methods to control seepage in earthen dams
- K24. Explain necessity of raising of dams.
- K25. Explain methods of raising dam.
- K26. Understand Features and Function of Weir/Barrages.
- K27. Define weir and barrages.
- K28. Distinguish between barrages and weirs and explain their purposes.
- K29. Describe with sketches the components/parts of a barrage.
- K30. State the factors governing the site selection of a barrage.
- K31. State the types of weirs.
- K32. Explain surface flow at weirs.
- K33. Describe the necessity and importance of regulation and silt controlling works.
- K34. Explain head regulator and its types, i.e. flume, meter flume.
- K35. Describe with sketches the silt ejector, silt vanes, silt excluder and skimming platform.
- K36. Describe the necessity and importance of regulation and silt controlling works.
- K37. Describe with sketches the silt ejector, silt vanes, silt excluder and skimming platform.
- K38. List the objects of river training.
- K39. Explain with sketches different types of protective and river training works.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Draw sketches showing rivers barages.
- Draw sketch of multipurpose irrigation project.
- Draw a river training works.
- Draw a dam section.
- Draw head works.
- Draw weir floor.
- Draw silt ejectors

Tools and Equipment

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils



National Competency Standards Level-5 for “Civil Technology”



4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
		5	Sharpener/ Sand paper



0732B&CE-285 Design Canals

Overview: This competency standard covers the skills and knowledge required to Find design discharge of Kharif and Rabi crops for given area, Draw the alignment of a canal, minor distributary and watercourses on contour map, Design a canal by Kennedy Critical velocity theory, Design a canal by Lacey's Regime velocity and Draw the typical X-sections of channels

Competency Units	Performance Criteria
CU1. Find design discharge of Kharif and Rabi crops for given area	P1. Identify area of crops (Kharif or Rabi) P2. Identify delta of each crop P3. Calculate duty P4. Estimate total water requirement
CU2. Draw the alignment of a canal, minor distributary and watercourses on contour map	P1. Arrange drawing instruments P2. Draw a contour map with two meter interval P3. Draw alignment of canal, distributary and water course on some scale
CU3. Design a canal by Kennedy Critical velocity theory	P1. Calculate area of cross-section and wetted perimeter P2. Assume depth and calculate critical velocity P3. Calculate C and R P4. Find velocity by using formulae P5. Calculate CVR P6. Find design parameters.
CU4. Design a canal by Lacey's Regime velocity	P1. Identify formulae for design P2. Calculate f , V , A , P_w . Assume depth and calculate critical velocity P3. Calculate C and R P4. Find velocity by using formulae P5. Calculate CVR P6. Find design parameters.
CU5. Draw the typical X-sections of channels	P1. Arrange drawing instruments P2. Select drawing sheet P3. Set sheet on drawing table as per standards. P4. Select suitable scale. P5. Draw sections of channel P6. Label all necessary details.



Knowledge Area:

- K1. Describe the term water requirement of crops.
- K2. Enlist factors affecting water requirement
- K3. Define the terms crop period, base period, Kharif-Rabi ratio, core watering, cash crop, crop rotation, and delta.
- K4. Explain duty of water, factors affecting and its significance.
- K5. State relation between duty and delta.
- K6. Explain basic methods of water distribution to field i.e. Surface irrigation method, Furrow method, Contour method, Flooding method.
- K7. Explain Sprinkler irrigation method
- K8. Explain Drip or Trickle irrigation method.
- K9. State the types of canal.
- K10. Explain with sketches, components of a canal section
- K11. State classification of canals
- K12. Explain the factors governing alignment of canal.
- K13. Explain lining and its types.
- K14. Enlist factors to be considered for selection of type of lining
- K15. State merits and demerits of lined and unlined channels.
- K16. Describe Kennedy's critical velocity and Lacy's regime velocity for design of canals
- K17. State Water logging
- K18. State Causes and prevention measures.
- K19. Explain Salinity.
- K20. State Causes & prevention measures.
- K21. Explain Methods of reclamation of soil.
- K22. Describe up keep and maintenance of canals.
- K23. Explain breaches in canal, water courses, preventive measure and methods of closing.
- K24. Describe with sketch the silting tanks their classes, objects and working.
- K25. Explain repair to bunds and formation of new bunds.

Tools and Equipment

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils



National Competency Standards Level-5 for “Civil Technology”



4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
		5	Sharpener/ Sand paper



0732B&CE-286 Produce sketches of Hydraulic structures

Overview: This competency standard covers the skills and knowledge required to draw sketches of various canal falls. Draw the plane and L-section of a masonry flume. Prepare drawings of an Aqueduct crossing, Prepare drawings of a pipe outlet. Prepare drawings of an A.P.M Outlet

Competency Units	Performance Criteria
CU1. Draw sketches of various canal falls	P1. Identify falls(Ogee, rapids, stepped, trapezoidal, sarda and glaces) P2. Arrange drawing instruments P3. Select drawing sheet P4. Set sheet on drawing table as per standards P5. Draw sketches of falls
CU2. Draw the plane and L-section of a masonry flume	P1. Identify flume structures P2. Arrange drawing instruments P3. Select drawing sheet P4. Set sheet on drawing table as per standards P5. Select scale as per requirement P6. Make drawing of masonry flume
CU3. Prepare drawings of an Aqueduct crossing	P1. Identify cross drainage works(aqueduct, super passage, level crossing, tail escape) P2. Arrange drawing instruments P3. Select drawing sheet P4. Set sheet on drawing table as per standards P5. Select scale as per requirement P6. Make drawing of aqueduct
CU4. Prepare drawings of a pipe outlet	P1. Identify outlets P2. Arrange drawing instruments P3. Select drawing sheet P4. Set sheet on drawing table as per standards P5. Select scale as per requirement P6. Make drawing of pipe outlet
CU5. Prepare drawings of an A.P.M Outlet	P1. Identify outlets P2. Arrange drawing instruments P3. Select drawing sheet P4. Set sheet on drawing table as per standards



National Competency Standards Level-5 for “Civil Technology”



	P5. Select scale as per requirement P6. Make drawing of A.P.M. outlet

Knowledge & Understanding

- K 1.** Define canal falls.
- K 2.** State the basic requirement of canal fall.
- K 3.** Describe the types of canal falls.
- K 4.** Explain the factors governing the site selection of canal falls.
- K 5.** Explain head regulator and its types, i.e. flume, meter flume.
- K 6.** Describe with sketches the different types of cross drainage works.
- K 7.** Describe with sketches, super passage, syphon supper passage and level crossing.
- K 8.** Describe drainage outlet and tail escape.
- K 9.** Define outlet.
- K 10.** State essential requirements of an outlet.
- K 11.** Explain the characteristics of outlets.
- K 12.** Describe with sketches the types of outlets (modular, semi modular and non-modular).
- K 13.** Design of outlet, modular, semi-modular and non-modular

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Construct drawing of canal falls.
- Construct drawing of masonry flume.
- Costruct drawing of an aqueduct.
- Construct drawing of pipe out let.
- Construct drawing of APM out let

Tools and Equipment

S No.	Description (Instruments)	S No.	Description (Consumable)
1	Drawing board	1	Drawing sheet
2	T square	2	Eraser
3	Pair of Set squares	3	HB, H, 2H, 3H Pencils
4	Drawing Box (Compasses, divider, protractor, rule)	4	Scotch tape
		5	Sharpener/ Sand paper



10.30. R.C.C. Design

0732B&CE-287 Design and Draw Reinforcement for Beams

Overview: This competency standard covers the skills and knowledge required to design and draw Simple rectangular R.C.C beam with UDL, Design and Draw Shear force reinforcement for rectangular beam and check for bond, design cantilever beam, design and draw doubly reinforced beam, Design and draw simply supported Tee and Ell Beam,

Competency unit	Competency criteria
CU1. Design a singly reinforced rectangular beam and Draw reinforcement diagram	P1. Identify the type of beam. P2. Calculate the factored load. P3. Calculate shear force and bending moment. P4. Calculate maximum bending moment P5. Calculate the area of steel. P6. Draw the reinforcement detail.
CU2. Design and draw reinforcement for doubly reinforced beam	P1. Calculate the factored loads. P2. Find out moments. P3. Calculate the area of steel in tension and compression P4. Select the size of bar. P5. Draw the reinforcement detail.
CU3. Design and Draw Shear reinforcement for rectangular beam and check for bond.	P1. Identify the type of beam. P2. Calculate the live and dead loads. P3. Calculate shear force and bending moment P4. Find out the areas of steel by using formula. P5. Calculate the spacing P6. Draw the reinforcement detail.
CU4. Design and draw reinforcement for cantilever beam.	P1. Calculate the factored loads. P2. Find out moments. P3. Calculate the area of steel. P4. Select the size of bar. P5. Draw the reinforcement detail.
CU5. Design and draw reinforcement for Tee beam	P1. Calculate the factored loads. P2. Find out moments. P3. Calculate the area of steel. P4. Select the size of bar. P5. Draw the reinforcement detail.



National Competency Standards Level-5 for “Civil Technology”



CU6. Design and draw reinforcement for Ell beam.	P1. Calculate the factored loads. P2. Find out bending moments. P3. Calculate the area of steel. P4. Select the size of bar. P5. Draw the reinforcement detail.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to:

- K1.** Explain R. C. C. Design
- K2.** Explain Different types of Loads
- K3.** Explain characteristics strength, compressive strength, tensile strength, moduli of elasticity, modular ratio
- K4.** Bending moment and shear force.
- K5.** Loads to be adopted in R. C. C. design-live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors
- K6.** Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).
- K7.** Codes of practice for R. C. C. design: BS Code and ACI Code.
- K8.** Shear and Bond Design in Beam.
- K9.** Types of shear reinforcements-stirrups,
- K10.** Bond between concrete and reinforcement, bond stresses, development length, checking bond stresses in beam.
- K11.** Design steps and formulae.
- K12.** Design of Doubly Reinforced Beam.
- K13.** Elements and assumption related to design,
- K14.** Design of simply supported doubly reinforced beam.
- K15.** Design of Tee and Ell Beam. It's Definition, necessity, advantages, main and secondary beam.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and draw Simple rectangular R.C.C beam with UDL,
- Design and Draw Shear force reinforcement for rectangular beam and check for bond,
- Design cantilever beam,



National Competency Standards Level-5 for “Civil Technology”



- Design and draw doubly reinforced beam,
- Design and draw simply supported Tee and Ell Beam,

Tools and Equipment

1. Calculator
2. Paper
3. Drafting table
4. Pencil
5. Ruler
6. Rubber



0732B&CE-288 Design and Draw Reinforcement for Slabs

Overview: This competency standard covers the skills and knowledge required to design and draw simply supported and overhanging one way slab, Design and draw reinforcement for 2 way slab.

Competency unit	Competency criteria
CU1. Design and Draw reinforcement for simply supported and overhanging one way slab.	P1. Identify the types of slab. P2. Calculate the factored load. P3. Select the preliminary depth of slab P4. Calculate bending moments and shear forces P5. .Find out the areas of steel P6. Select diameter and spacing of reinforcing bars. P7. Draw the reinforcement detail.
CU2. Design and draw reinforcement for simply supported 2- way slab	P1. Identify the type of slab. P2. Select the preliminary depth of slab P3. Find out and check the effective and total depths of slabs P4. .Find out areas of steel P5. Select diameter and spacing of reinforcing bars. P6. Draw the reinforcement detail.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to:

- K1.** Explain R. C. C. Design
- K2.** Explain different types of Loads
- K3.** Explain characteristics strength, compressive strength, tensile strength, moduli of elasticity, modular ratio
- K4.** Bending moment and shear force.
- K5.** Loads to be adopted in R. C. C. design, live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors
- K6.** Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).
- K7.** Codes of practice for R. C. C. design: BS Code and ACI Code.
- K8.** Definition, one way slab, two way slab



National Competency Standards Level-5 for “Civil Technology”



- K9.** Design steps and formulae.
- K10.** Design of simply supported, overhanging one way slab in various situation.
- K11.** Understand the elements and assumption related to design,
- K12.** Understand definition, code provisions and assumptions related to design of 2 way slab,
Loads, bending moment coefficients and its use.
- K13.** Design isolated and two spans two-way slab.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and draw simply supported and overhanging one way slab
- Design and draw reinforcement for two way slab.

Tools and Equipment

1. Calculator
2. Paper
3. Drafting table
4. Pencil
5. Ruler
6. Rubber



0732B&CE-289 Design and Draw Reinforcement for Columns

Overview: This competency standard covers the skills and knowledge required to Design and draw reinforcement for RCC column axially loaded, Square, rectangular and circular.

Competency unit	Competency criteria
CU1. Design and draw R.C.C. rectangular axially loaded short column as per ACI - code	P1. Identify type of column. P2. Calculate load on column. P3. Calculate size of column. P4. Calculate steel area. P5. Calculate size and spacing of rings. P6. Draw the reinforcement detail.
CU2. Design and draw R.C.C. rectangular axially loaded long column as per ACI - code.	P1. Identify type of column. P2. Calculate load on column. P3. Select load reduction factor P4. Calculate size of column. P5. Calculate steel area. P6. Calculate size and spacing of rings. P7. Draw the reinforcement detail.
CU3. Design and draw reinforcement for R.C.C. rectangular axially loaded circular column with lateral ties as per ACI-code	P1. Identify type of column. P2. Calculate load on column. P3. Calculate area of column P4. Calculate diameter of column. P5. Calculate steel area. P6. Calculate size and spacing of lateral ties. P7. Draw the reinforcement detail.
CU4. Design and draw reinforcement for R.C.C. rectangular axially loaded circular column with helical bindings as per ACI-code	P1. Identify type of column. P2. Calculate load on column. P3. Calculate area of column P4. Calculate diameter of column. P5. Calculate steel area. P6. Calculate size and spacing of lateral ties. P7. Draw the reinforcement detail.



Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain R. C. C. Design
- K2.** Explain Different types of Loads
- K3.** Explain characteristics strength, compressive strength, tensile strength, moduli of elasticity, modular ratio
- K4.** Bending moment and shear force.
- K5.** Loads to be adopted in R. C. C. design, live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors
- K6.** Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).
- K7.** Codes of practice for R. C. C. design: BS Code and ACI Code.
- K8.** Design of Axially Loaded Columns. Find out load carrying capacity of RCC columns, Design formulae and code provisions.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and draw R.C.C. rectangular axially loaded short column as per ACI - code
- Design and draw R.C.C. rectangular axially loaded long column as per ACI - code
- Design and draw reinforcement for R.C.C. rectangular axially loaded circular column with lateral ties as per ACI-code
- Design and draw reinforcement for R.C.C. rectangular axially loaded circular column with helical bindings as per ACI-code

Tools and Equipment

1. Calculator
2. Paper
3. Drafting table
4. Pencil
5. Ruler
6. Rubber



0732B&CE-290 Design and Draw Reinforcement for Footings

Overview: This competency standard covers the skills and knowledge required to design and draw Footing reinforcement for isolated and combined footings as per bearing capacity of locality

Competency unit	Competency criteria
CU1. Design and draw reinforcement for isolated footing with bearing capacity as per locality.	P1. Calculate load on column P2. Calculate the thickness of footing due to punching shear. P3. Calculate the thickness of footing due to bending moment. P4. Calculate effective depth P5. Calculate the steel area in both directions. P6. Calculate the spacing of steel. P7. Draw the reinforcement detail.
CU2. Design and draw reinforcement for combine footing with bearing capacity as per locality.	P1. Calculate load on column P2. Calculate the thickness of footing due to punching shear P3. Calculate the thickness of footing due to bending moment. P4. Calculate effective depth P5. Calculate the steel area in both directions. P6. Calculate the spacing steel. P7. Draw the reinforcement detail.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge to:

- K1.** Explain R. C. C. Design
- K2.** Explain Different types of loads, characteristics strength, compressive strength, tensile strength, modulus of elasticity, modular ratio
- K3.** Bending moment and shear force.
- K4.** Loads to be adopted in R. C. C. design, live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors
- K5.** Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).
- K6.** Codes of practice for R. C. C. design: BS Code and ACI Code.
- K7.** Shear and Bond Design in Beam.
- K8.** Bond between concrete and reinforcement, bond stresses, development length, checking bond stresses in beam.
- K9.** Design steps and formulae.



National Competency Standards Level-5 for “Civil Technology”



K10. Elements and assumption related to design.

K11. Definition, code provisions and assumption related to design of 2-way slab Loads, bending moment, coefficients and its use..

K12. Design of Axially Loaded Columns and Footings, Find out load carrying capacity of RCC columns.

K13. Design formulae and code provisions.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and draw reinforcement for isolated footing with bearing capacity as per locality.
- Design and draw reinforcement for combine footing with bearing capacity as per locality.

Tools and Equipment

1. Calculator
2. Paper
3. Drafting table
4. Pencil
5. Ruler
6. Rubber



0732B&CE-291 Design and Draw Reinforcement for Stairs

Overview: This competency standard covers the skills and knowledge required to design and draw reinforcement for the stairs spanning horizontally and vertically.

Competency unit	Competency criteria
CU1. Design and draw reinforcement for stair spanning vertically.	P1. Identify type of Stair P2. Calculate load on stair. P3. Calculate thickness of waist. P4. Calculate steel area P5. Calculate the spacing of bars. P6. Draw the reinforcement detail.
CU2. Design and draw reinforcement for stair spanning horizontally	P1. Identify type of Stair P2. Calculate load on stair. P3. Calculate thickness of waist. P4. Calculate steel area P5. Calculate the spacing of bars. P6. Draw the reinforcement detail.

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Explain R. C. C. Design
- K2.** Explain Different types of Loads
- K3.** Explain characteristics strength, compressive strength, tensile strength, moduli of elasticity, modular ratio
- K4.** Bending moment and shear force.
- K5.** Loads to be adopted in R. C. C. design-live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors
- K6.** Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).
- K7.** Codes of practice for R. C. C. design: BS Code and ACI Code.
- K8.** Shear and Bond Design in Beam.
- K9.** Bond between concrete and reinforcement, bond stresses, development length, checking bond stresses in beam.
- K10.** Design steps and formulae. Design of Simple Stair Case. Types, spanning horizontally and



National Competency Standards Level-5 for “Civil Technology”



spanning longitudinally. Loads, design elements procedure, Design of stair spanning horizontal and longitudinally.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and draw reinforcement for the stairs spanning horizontally.
- Design and draw reinforcement for the stairs spanning vertically.

Tools and Equipment

1. Calculator
2. Paper
3. Drafting table
4. Pencil
5. Ruler
6. Rubber



10.31. Civil Engineering Project

Note: All the 06 competencies of this cluster should be divided to 06 groups of the class.

That is each group will perform one competency. The all 06 competencies should be compiled and provided to all students.

0732B&CE-292 Develop Project for construction of RCC framed Structure Class Room.

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed site, prepare contract documents, prepare Working Drawings, draft Specifications, Design of RCC slabs, lintels, T & L beams, columns and column footings, prepare estimates- Cost, Materials, Time (labour, machinery), layout Structures and conduct planning for RCC framed structure class room project.

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of framed Structure class room.	P1. Perform survey of area. P2. Perform contouring, x-sectioning & long sectioning. P3. Prepare the map.
CU-2. Design structural elements of framed Structure class	P1. Design RCC slab and lintels. P2. Design RCC T & L beams. P3. Design RCC Columns & column footings.
CU-3. Prepare Contract Documents for framed Structure class room.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and



National Competency Standards Level-5 for “Civil Technology”



	Drawings.
CU-4. Prepare Working Drawings for framed Structure class room.	P1. Identify the requirements of client. P2. Observe the standards for size and orientation of building. P3. Prepare plans, elevation, sections, and schedules.
CU-5. Document Specifications for framed Structure class components.	P1. Write down general specifications as per class. P2. Draft detailed & special specifications of building.
CU-6. Prepare Estimates- Cost, Materials, Time (Labour, machinery) of framed Structure class.	P1. Prepare abstract of quantities, BoQ & cost as per CSR. P2. Prepare materials statement for project. P3. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct Planning of framed Structure class.	P1. Read layout drawing of project. P2. Use instrument for layout as per present circumstances. P3. Establish control points & set out framed structure class room elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Describe procedure of carrying out site survey along with production of site map.
- K-2.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K-3.** Define tender, contract, tender notice and tender documents.
- K-4.** Design of RCC slabs, lintels, T & L beams, columns and column footings.
- K-5.** Describe contracting procedure.
- K-6.** Prepare tender documents- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K-7.** Calculate construction materials, time of machinery & labour to be employed.



National Competency Standards Level-5 for “Civil Technology”



K-8. Describe the procedure of layout and planning of framed structure class room.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of RCC framed structure class room.
- Contract Documents for RCC framed structure class room.
- Working Drawings for RCC framed structure class room.
- Specifications for RCC framed structure class room components.
- Design of RCC slabs, lintels, T & L beams, columns and column footings RCC framed structure class room.
- Estimates- Cost, Materials, Time (Labour, machinery) for RCC framed structure class room.
- Layout of Structures and planning chart for RCC framed structure class room.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	AutoCAD/ Computer Lab Equipment
7	Materials Testing Lab Equipment



0732B&CE-293 Develop Project plan for construction of RCC OHR of 10000 gal (UK) capacity.

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed site, perform structural design, prepare contract documents, prepare Working Drawings, draft Specifications, Design of RCC slabs, T & L beams, columns and column footings prepare estimates- Cost, Materials, Time (Labour, machinery), layout Structures and conduct Planning for project for RCC OHR 10000 gal (UK) capacity.

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of OHR.	P1. Perform survey of area. P2. Perform contouring, x-sectioning & long sectioning. P3. Prepare the map.
CU-2. Design structural elements of OHR.	P4. Design RCC slabs P5. Design RCC T & L beams. P6. Design RCC Columns & column footings.
CU-3. Prepare of Contract Documents for OHR.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-4. Prepare Working Drawings for OHR.	P1. Identify the requirements of area. P2. Prepare plans, elevation, sections, and schedules.
CU-5. Document Specifications for OHR components.	P1. Write down general specifications as per design. P2. Draft detailed & special specifications of building.



National Competency Standards Level-5 for “Civil Technology”



CU-6. Prepare Estimates- Cost, Materials, Time (Labour, machinery) for OHR.	P1. Prepare abstract of quantities, BoQ & cost as per CSR. P2. Prepare materials statement for OHR P3. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct planning for OHR.	P1. Read layout drawing of OHR P2. Use instruments for layout as per present circumstances. P3. Establish control points & set out OHR elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe procedure of carrying out site survey along with production of site map of OHR.
- K2.** Design of RCC slabs, T & L beams, columns and column footings for OHR.
- K3.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K4.** Define tender, contract, tender notice and tender documents.
- K5.** Describe contracting procedure for OHR.
- K6.** Prepare tender documents for OHR- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K7.** Calculate construction materials, time of machinery & labour to be employed for OHR.
- K8.** Describe the procedure of layout and planning of OHR.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of OHR.
- Contract Documents for OHR.
- Working Drawings for OHR.
- Specifications for OHR components.
- Design of RCC slabs, lintels, T & L beams, columns and column footings OHR.



National Competency Standards Level-5 for “Civil Technology”



- Estimates- Cost, Materials, Time (Labour, machinery) for OHR.
- Layout of Structures and planning chart of OHR.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	Computer Lab Equipment
7	Materials Testing Lab Equipment



0732B&CE-294 Develop Project plan for construction of Water Supply Scheme.

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed site, design water supply scheme-mark water supply lines & prepare hydraulic statement, prepare contract documents, prepare Working Drawings, draft Specifications, prepare estimates- Cost, Materials, Time (Labour, machinery), layout Structures and conduct Planning for project for construction of water supply scheme for a small Town (200 houses in 25 acres) for population of 1000 persons.

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of water supply scheme.	P1. Perform survey of area. P2. Perform long sectioning. P3. Prepare the map.
CU-2. Design structural elements of water supply scheme.	P1. Mark the location of water supply lines on map. P2. Interpret head losses in pipes. P3. Prepare hydraulic statement of water supply scheme.
CU-3. Prepare of Contract Documents for water supply scheme.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-4. Prepare Working Drawings for water supply scheme.	P3. Identify the requirements of area. P4. Prepare plans, elevation, sections, and schedules.
CU-5. Document	P3. Write down general specifications as per month.



National Competency Standards Level-5 for “Civil Technology”



Specifications for water supply scheme components.	P4. Draft detailed & special specifications of water supply scheme.
CU-6. Prepare Estimates- Cost, Materials, Time (Labour, machinery) for water supply scheme.	P4. Prepare abstract of quantities, BoQ & cost as per CSR. P5. Prepare materials statement for water supply scheme. P6. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct planning for water supply scheme.	Read layout drawing of water supply scheme. Use instrument for layout as per present circumstances. Establish control points & set out water supply scheme elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe procedure of carrying out site survey along with production of site map.
- K2.** Design water Supply scheme- mark pipe lines & prepare hydraulic statement.
- K3.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K4.** Define tender, contract, tender notice and tender documents.
- K5.** Describe contracting procedure water supply scheme.
- K6.** Prepare tender documents- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K7.** Calculate construction materials, time of machinery & labour to be employed.
- K8.** Describe the procedure of layout and planning of water supply scheme.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of water supply scheme.
- Contract Documents for water supply scheme.



National Competency Standards Level-5 for “Civil Technology”



- Working Drawings for water supply scheme.
- Specifications for water supply scheme components.
- Design of water supply scheme-hydraulic statement.
- Estimates- Cost, Materials, Time (Labour, machinery) of water supply scheme.
- Layout of Structures and planning chart of water supply scheme.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	Computer Lab Equipment
7	Materials Testing Lab Equipment



0732B&CE-295 Develop Project plan for construction of sewerage scheme

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed site, mark sewerage line & prepare hydraulic statement, design septic tank & soakage pit, prepare contract documents, prepare Working Drawings, draft Specifications, prepare estimates- Cost, Materials, Time (Labour, machinery), layout Structures and conduct Planning for a colony (200 houses in 25 acres) for population of 1000 persons.

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of sewerage scheme.	P1. Perform survey of area. P2. Perform contouring, x-sectioning & long sectioning. P3. Prepare the map.
CU-2. Design structural elements of sewerage scheme.	P1. Mark the location of sewerage scheme lines on map. P2. Interpret velocity standards for type of pipe. P3. Prepare hydraulic statement of sewerage scheme. P4. Design Septic Tank for scheme. P5. Design soakage pit for scheme.
CU-3. Prepare of Contract Documents for sewerage scheme.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-4. Prepare Working Drawings for sewerage scheme.	P1. Identify the requirements as per design. P2. Prepare plans, elevation, sections, and schedules.
CU-5. Document Specifications	P1. Write down general specifications as per design.



National Competency Standards Level-5 for “Civil Technology”



for sewerage scheme components.	P2. Draft detailed & special specifications of design of scheme.
CU-6. Prepare Estimates- Cost, Materials, Time (Labour, machinery) for sewerage scheme.	P1. Prepare abstract of quantities, BoQ & cost as per CSR. P2. Prepare materials statement for project. P3. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct planning for sewerage scheme.	Read layout drawing of sewerage scheme. Use instrument for layout as per present circumstances. Establish control points & set out sewerage scheme elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Describe procedure of carrying out site survey along with production of site map.
- K-2.** Design of Septic tank, soakage and prepare hydraulic statement
- K-3.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K-4.** Define tender, contract, tender notice and tender documents sewerage scheme.
- K-5.** Describe contracting procedure sewerage scheme.
- K-6.** Prepare tender documents- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K-7.** Calculate construction materials, time of machinery & labour to be employed.
- K-8.** Describe the procedure of layout and planning of sewerage scheme.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of sewerage scheme.
- Contract Documents for sewerage scheme.
- Working Drawings for sewerage scheme.
- Specifications for sewerage scheme components.
- Design of Septic tank, soakage and prepare hydraulic statement



National Competency Standards Level-5 for “Civil Technology”



- Estimates- Cost, Materials, Time (Labour, machinery) of sewerage scheme.
- Layout of Structures and planning chart of sewerage scheme.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	Computer Lab Equipment
7	Materials Testing Lab Equipment



0732B&CE-296 Develop Project plan for construction of Highway

Overview: This competency standard covers the skills and knowledge required to prepare topographic map of proposed site, Design the geometric & structural components, prepare contract documents, prepare Working Drawings, draft Specifications, prepare estimates- Cost, Materials, Time (Labour, machinery), layout structures-alignment and curves, conduct planning for 2km long road.

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of 2km long road.	P1. Perform survey along route of road. P2. Perform contouring, x-sectioning & long sectioning. P3. Prepare the map.
CU-2. Design structural elements of 2km long road.	P1. Design geometric components of road. P2. Perform tests for structural design of road components. P3. Design sub-base, base& surfacing of road
CU-3. Prepare of Contract Documents for 2km long road.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-4. Prepare Working Drawings for 2km long road.	P1. Identify the requirements of traffic. P2. Observe the standards for lane and land width. P3. Prepare plans, long & cross sections, schedules.
CU-5. Document Specifications for 2km long road components.	P1. Write down general specifications as per class. P2. Draft detailed & special specifications of building.
CU-6. Prepare Estimates- Cost,	P1. Prepare abstract of quantities, BoQ & cost as



National Competency Standards Level-5 for “Civil Technology”



Materials, Time (Labour, machinery) for 2km long road.	per CSR. P2. Prepare materials statement for road P3. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct planning for 2km long road.	P1. Read layout drawing of road. P2. Use instrument for layout as per present circumstances. P3. Establish control points & set out road elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K-1.** Describe procedure of carrying out site survey along with production of site map.
- K-2.** Design of geometric & structural components of road.
- K-3.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K-4.** Define tender, contract, tender notice and tender documents.
- K-5.** Describe contracting procedure.
- K-6.** Prepare tender documents for road- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K-7.** Calculate construction materials, time of machinery & labour to be employed.
- K-8.** Describe the procedure of layout and planning of 2 km long road.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of 2km long road.
- Contract Documents for 2km long road.
- Working Drawings-x-sections, long sections for 2km long road.
- Specifications for 2km long road components.
- Design of geometric & structural components of road.
- Estimates- Cost, Materials, Time (Labour, machinery) for 2km long road.
- Layout of road and Planning chart for 2km long road.

Instruments & Consumables



National Competency Standards Level-5 for “Civil Technology”



S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	Computer Lab Equipment
7	Materials Testing Lab Equipment
8	Soil Mechanics Lab Equipment



0732B&CE-297 Develop Project plan for construction of Irrigation Canal

Overview: This competency standard covers the skills and knowledge required to prepare map of proposed route, design the canal, prepare contract documents, and prepare Working Drawings, draft Specifications, footings prepare estimates- Cost, Materials, Time (Labour, machinery), layout canal and conduct planning for irrigation canal 2 RD long

Competency Unit	Performance Criteria
CU-1. Conduct Location Survey and preparation of map of proposed site of 2 RD long canal.	P1. Perform survey for 2 RD long canal. P2. Perform contouring, x-sectioning & long sectioning. P3. Prepare map 2 RD long canal..
CU-2. Design structural elements of 2 RD long canal.	P1. Design RCC slabs P2. Design RCC T & L beams. P3. Design RCC Columns & column footings.
CU-3. Prepare of Contract Documents for 2 RD long canal.	P1. Identify & get formed procurement team. P2. Download latest bidding documents from PEC web site. P3. Identify & Prepare tender document observing PEC directions- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and Drawings.
CU-4. Prepare Working Drawings for 2 RD long canal.	P1. Identify the requirements of client. P2. Observe the standards for size and orientation of building. P3. Prepare plans, elevation, sections, and schedules.
CU-5. Document Specifications for 2 RD long	P1. Write down general specifications as per class. P2. Draft detailed & special specifications of building.



National Competency Standards Level-5 for “Civil Technology”



canal.	
CU-6. Prepare Estimates- Cost, Materials, Time (Labour, machinery) for 2 RD long canal.	P1. Prepare abstract of quantities, BoQ & cost as per CSR. P2. Prepare materials statement for project. P3. Calculate the time for labour & machinery required to be employed.
CU-7. Layout Structures and conduct Planning for 2 RD long canal.	P1. Read layout drawing of project. P2. Use instrument for layout as per present circumstances. P3. Establish control points & set out the project elements.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe procedure of carrying out site survey along with production of site map.
- K2.** Design of irrigation channel.
- K3.** Describe pre-requisite for tendering-administrative approval, technical sanction, Budget
- K4.** Define tender, contract, tender notice and tender documents 2 RD long canal.
- K5.** Describe contracting procedure 2 RD long canal.
- K6.** Prepare tender documents- Instructions to Bidders, Bidding Data, General Conditions of Contract Part-I (GCC), Particular Conditions of Contract Part-II (PCC), Specifications - Special Provisions, Specifications - Technical Provisions, Form of Bid & Appendices to Bid, Bill of Quantities, Form of Bid Security, Form of Agreement, Form of Performance Security/Bond & Mobilization Advance Guarantee/Bond, and drawings.
- K7.** Calculate construction materials, time of machinery & labour for 2 RD long canal.
- K8.** Describe the procedure of layout and planning of 2 RD long canal.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Map of proposed site of 2 RD long canal.
- Contract Documents for 2 RD long canal.
- Working Drawings for 2 RD long canal.
- Specifications for the 2 RD long canal Components.



National Competency Standards Level-5 for “Civil Technology”



- Design of RCC slabs, lintels, T & L beams, columns and column footings.
- Estimates- Cost, Materials, Time (Labour, machinery)
- Layout of Structures and planning chart of 2 RD long ca 2 RD long canal. nal.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Pencil
4	Drawing lab equipment
5	Survey Lab Equipment
6	Computer Lab Equipment
7	Materials Testing Lab Equipment



10.32. Entrepreneurial Skills

0732B&CE-298 Investigate micro business opportunities

Overview: This competency describes the performance outcomes, skills and knowledge required to develop business ideas, and to investigate market needs and factors affecting potential markets.

Competency Unit	Performance Criteria
CU-1. Describe business ideas	P1. Gather information for business ideas from appropriate sources P2. List details of business ideas and opportunities P3. Research alternative business ideas in light of the resources available P4. Specify and list products and services to match business ideas P5. .Identify and research potential customer information for business ideas P6. Identify and take into account financial, business and technical skills available when researching business opportunities
CU-2. Identify market needs	P1. Collect information regarding market size and potential from appropriate sources P2. Investigate market trends and developments to identify market needs relative to business ideas P3. Gather market information from primary and secondary sources to identify possible market needs in relation to business ideas P4. Identify ethical and cultural requirements of the market and their impact on business ideas P5. Identify new and emerging markets and document their features P6. Identify and organise information on expected market growth or decline and associated risk factors
CU-3. Investigate factors affecting the market	P1. Identify projected changes in population, economic activity and the labour force that may affect business ideas P2. Identify movements in prices and projected changes in availability of resources P3. Review trends and developments and identify their potential impact on business ideas



Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1. Define entrepreneurship.
- K2. Explain the concept of entrepreneurship
- K3. Explain the various types of enterprise that exist in the community
- K4. Identify and interpret the terms and elements involved in the concept of enterprise
- K5. Appreciate that the advancement of individual and society in general when entrepreneurship is adopted
- K6. Explain various motivational factors that entrepreneurs possess and utilize.
- K7. Exhibit the skills needed to assess and evaluate a risk
- K8. Describe the outline of small enterprise
- K9. Describe the creativity and innovation
- K10. Apply the techniques for developing creative abilities
- K11. Explain the resources of business idea
- K12. Explain the collective and creative thinking
- K13. Explain how to generate a business idea
- K14. Appreciate the importance of, and possess techniques for identifying and assessing business opportunities.
- K15. Identify the various entrepreneurial characteristics
- K16. Access personal potential for becoming future entrepreneurs.
- K17. Identify leadership qualities which are essential to the success of entrepreneurs
- K18. Identify self- management skills and how they are important to be enterprising
- K19. Apply a rational approach to make personal and business decisions
- K20. Explain the steps for decision making and rating of decision making skills
- K21. Apply the rules of negotiation for resolving business issues

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Evidence of the following is essential:

- Thorough investigation of business opportunities and ideas
- Clearly identified products/services and customer information for each business idea



National Competency Standards Level-5 for “Civil Technology”



- Thorough collection and analysis of market information and associated factors relating to business ideas
- Knowledge of ethical and cultural requirements.

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Papers and Pencil



National Competency Standards Level-5 for “Civil Technology”



0732B&CE-299 Develop a micro business proposal

Overview: This competency describes the performance outcomes, skills and knowledge required to develop an identified business idea, to research the feasibility of the business opportunity and to present a business idea in formats that suit a range of stakeholders

Competency Unit	Performance Criteria
CU1. Evaluate business opportunities	P1. Identify and research key factors that influence viability of business ideas P2. Analyze business ideas in terms of personal or family needs and commitments P3. Evaluate impacts of emerging or changing technology, including e-commerce, on the business P4. Determine viability of business opportunity in line with perceived risks, resources available, financial returns and other outcomes sought P5. Assess and match personal skills/attributes against those perceived as necessary for a particular business opportunity P6. Identify and assess business risks according to resources available and personal preferences
CU2. Detail the business idea	P1. Develop an accurate description of the business idea for key stakeholders P2. Develop an accurate summary of the major products and/or services required to suit personal needs and requirements
CU3. Prepare the business overview to suit different stakeholders	P1. Present an accurate list of key stakeholders and their information requirements P2. Determine an acceptable method of presentation of information for each stakeholder P3. Provide accurate customized information to target audiences

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:



National Competency Standards Level-5 for “Civil Technology”



K1. State and local government legislative requirements relating to business operation, especially in regard to occupational health and safety (OHS) and environmental issues,

K2. Income and expenditure costing

K3. Principles of risk assessment relevant to the business opportunity

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Evidence of the following is essential:

- accurate and complete outline of the business idea that considers the major elements of:
 - products/services
 - customers
 - operations and processes
 - income and expenditure
 - resources
 - marketing
 - location

Instruments & Consumables

S No.	Description (Instruments)
1	Calculator
2	Ruler
3	Papers and Pencil



0732B&CE-300 Develop a marketing plan

Overview: This competency describes the performance outcomes, skills and knowledge required to research, develop and present a marketing plan for an entrepreneurship business

Competency Unit	Performance Criteria
CU-1. Devise marketing strategies	P1.Evaluate marketing opportunity options that address organizational objectives, and evaluate their risks and returns in the selection process P2. Develop marketing strategies that address strengths and opportunities within the organization’s projected capabilities and resources P3. Develop strategies which increase resources or organizational expertise where gaps exist between current capability and marketing objectives P4.Develop feasible marketing strategies and communicate reasons that justifies their selection P5. Ensure strategies align with organization’s strategic direction P6.Develop a marketing performance review strategy, incorporating appropriate marketing metrics to review of organizational performance against marketing objectives
CU-2. Plan marketing tactics	P1. Detail tactics to implement each marketing strategy in terms of scheduling, costing, accountabilities and persons responsible P2. Identify coordination and monitoring mechanisms for scheduled activities P3. Ensure tactics are achievable within organization’s projected capabilities and budget P4. Ensure tactics meeting legal and ethical requirements P5. Ensure tactics provide for ongoing review of performance against objectives and budgets, and allow marketing targets to be adjusted if necessary



CU-3. Prepare and present a marketing plan	P1. Ensure marketing plan meets organizational, as well as marketing, objectives and incorporates marketing approaches and a strategic marketing mix P2. Ensure marketing plan contains a rationale for objectives and information that supports the choice of strategies and tactics P3. Present marketing plan for approval in the required format and timeframe P4. Adjust marketing plan in response to feedback from key stakeholders and disseminate for implementation within the required timeframe

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of: Culturally appropriate communication skills to relate to people from diverse backgrounds and people with diverse abilities

K1. Describe the market & marketing

K2 Differentiate between sellers and buyers' market

K3. Describe the five 'w' of market

K4. Explain the procedure for assessing the market size and demand

K5. Explain the major factors to be considered when selecting a location for a business

K6. Describe the basic types of business ownership and the limitation of each

K7. Explain the computation of initial and working capital needed to start an enterprise

K8. Identify the advantages and disadvantages of using various sources of capital to start an enterprise

K9. Explain the component of cost of product

K10. Explain the breakeven analysis for a new business

K11. Calculate the breakeven point for various new business

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Devising, documenting and presenting a marketing plan

Detailing approaches and

The marketing mix to achieve organizational marketing objectives.

Instruments & Consumables

1 Calculator, 2 Ruler, 3 Papers and Pencil



0732B&CE-301 Develop and review a business plan.

Overview: This competency standard covers the process of developing and reviewing business for a small business enterprise. It requires the application of knowledge and skills to determine the scope of the business plan, prepare a business plan, determine goals, trial systems, and document, monitor and review the business plan.

Competency Unit	Performance Criteria
CU-1. Determine scope of business	P4. Determine scope of the business plan and associated systems is determined in consultation with specialist personnel. P5. Access accurate information for inform business plan development P6. Account for and incorporate trends and seasonal variations into the business plan. P7. Account for strategic goals, targets and directions of the enterprise in the development of the business plan P8. Comply Legal obligations in developing the business plan.
CU-2. Prepare business plan	P4. Develop operational goals and targets to meet the enterprise strategic plan. P5. Identify and incorporate supply chains into the business plan. P6. Identify risk management needs are within the business plan. P7. Incorporate trial systems in order to test budgetary impact and operational potential prior to full implementation of the business plan. P8. Set clear and measureable indicators of operational performance to allow for realistic analysis of performance.
CU-3. Document and review business plan	P4. Include fiscal and operational systems that enhance performance management and suit enterprise requirements. P5. Incorporate resource considerations the business plan.



National Competency Standards Level-5 for “Civil Technology”



	P6. Document accurately and clearly communicate business Plan to all relevant parties. P7. Monitor to identify strengths, weaknesses and areas for improvement performance against the business plan P8. Make recommendations to improve the business plan and associated systems as required.

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Appreciate the importance of business plan
- K2.** Explain the process of writing a business plan
- K3.** Develop feasibility for a business idea
- K4.** Realize the problem that may be encountered when starting a small business/Enterprise
- K5.** Develop a business plan for a small business on the standard format
- K6.** Evaluate the business plan in a real market satiation
- K7.** working knowledge of environmental, OHS, industrial relations, taxation, corporate and industry legislation as they relate to the enterprise

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

Competence in develop and review a business plan requires evidence that demonstrates ability to scope the business plan and determine key objectives and targets. It also requires competence in specifying key performance targets, assessing the relevance of the business plan, and trial systems. The business plan also needs to be documented and reviewed.

The skills and knowledge required to develop and review a business plan must be **transferable** to a different work environment. For example, if competence is demonstrated in developing a business plan for a small enterprise, it must also be evident in reviewing a business plan in medium or large enterprise environment.

Instruments & Consumables

S No.	Description (Instruments)
1	Paper
2	Pencil Rubber Sharpener



0732B&CE-302 Organise finances for the micro business

Overview: This competency standard describes the performance outcomes, skills and knowledge required to investigate the financial capacity to enter into a micro business, to determine the projected cash flow, to source finances and to monitor the profitability of the business.

Competency Unit	Performance Criteria
CU-1. Ascertain own financial position and the ability to provide capital/equity for the business	P1. Realistically detail personal, family or community financial situation in terms of funds available and commitments already incurred P2. Determine equity finance and assets available for micro business from personal, family or community sources
CU-2. Determine projected cash flow for the business	P1. Determine the level of forecast business activity over a year and the business mix P2. Estimate establishment costs for the business and repayment schedule for borrowings P3. Calculate the monthly variable and fixed costs needed to conduct business activity over a year P4. Estimate personal drawings needed to be taken from the business P5. Estimate the monthly income generated by the business for a year based on price per unit item or hourly charge rate for labor P6. Develop a cash flow budget for the first year of business operation P7. Seek professional advice to estimate goods and services tax and operating finance required for the business
CU-3. Source the required funds to establish the business	P1. Estimate required funding to establish and run the business based on expected sales and activity levels, available finances and commitments P2. Investigate methods of accessing alternative sources of finance P3. Identify strategies for meeting financial obligations P4. Implement plans to access available funds as required



National Competency Standards Level-5 for “Civil Technology”



CU-4. Monitor profitability of the business	P1. Maintain and review monthly expenditure and income records P2. Compare equity at beginning and end of a year to estimate business performance P3. Assess the financial viability of the business after a year of operation P4. Seek professional advice on depreciation, insurance and tax implications of the business

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Basic budgeting
- K2.** basic costing for the business
- K3.** financial commitments and requirements
- K4.** financial reports and terminology
- K5.** methods and relative costs of obtaining finance
- K6.** own financial position
- K7.** Sources of advice and assistance.

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

Evidence of the following is essential:

- investigation of own financial position and needs
- investigation of projected cash flow for the business
- estimation of the funding needed to establish and operate the business
- assessment of the financial viability of the business
- Knowledge of basic budgeting.



0732B&CE-303 Manage human resources

Overview: This competency standard covers the skills and knowledge required to manage human resources and to manage and develop human resources to achieve organization’s operational objectives

Competency Unit	Performance Criteria
CU-1. Lead and motivate people	P1. Establish goals for people and teams to optimize achievement in work tasks. P2. Take into account the capabilities of people and teams. P3. Provide advice and support sensitive to the individual's needs to people in the performance of their duties. P4. Undertake activities to achieve commitment to common goals. P5. Recognize and encourage initiative and innovation P6. Recognize and communicate achievements within the organization.
CU-2. Undertake human resource planning	P1. <i>Determine human resource needs</i> within the anticipated operational needs and allocated budget. P2. Analyze alternatives to staffing levels which clearly demonstrate returns to the organization. P3. Develop contingency plans for staffing which meet key provisions of the human resources plan. P4. Compare existing competencies of staff with the needs of the work group. P5. Plan staffing levels and negotiate with stakeholders within the organisational framework to achieve maximum efficiency of operations.



National Competency Standards Level-5 for “Civil Technology”



CU-3. Develop and facilitate performance	P1. Negotiate performance criteria individuals, teams and work groups. P2. Review performance criteria as circumstances change. P3. Conduct performance appraisal based on clearly established and agreed performance criteria. P4. Identify and propose the total performance development system strategies to rectify performance shortfalls and recognize success. P5. Address performance problems confidentially and in a constructive and timely manner, in line with relevant organizational procedures. P6. Make selections, transfers and promotions in accordance with organization policies and supported with documented information. P7. Develop and implement mechanisms for the identification of human resource development needs within the work group taking account of the strategic plan for the organisation.
CU-4. Facilitate training, education and development opportunities	P1. Make information on planned training events widely available throughout the organization. P2. Include training, education and development plans as part of individual/team performance plans. P3. Facilitate individual/team access to, and participation in, training, education and development opportunities. P4. Contribute coaching and mentoring effectively to the training, education and development of personnel in an environment of change. P5. Enhance training, education and development opportunities of individual, team and organizational performance. P6. Create workplace environment in which facilitates training, education and development

Knowledge and understanding



National Competency Standards Level-5 for “Civil Technology”



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe the hiring method/Procedures
- K2.** Describe the term & conditions of services and job description for various employments
- K3.** Describe the characteristics of successful sales personals
- K4.** Communication principles
- K5.** Conflict resolution principles and practice
- K6.** Equal Employment Opportunity
- K7.** Grievance procedures
- K8.** Interpersonal relations
- K9.** Leadership theory and principles
- K10.** Management principles and practice
- K11.** Occupational Health and Safety
- K12.** Training and education principles
- K13.** Training need analysis

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- It is essential that competence be demonstrated in the application of human resource management in a wide range of contexts in achieving the organisation's objectives.
- Evidence should be gathered over a period of time in a range of actual or simulated workplace environments.
- Evidence of competent performance should be obtained by observing an individual in a management role within the workplace or exercise or operational environment. Knowledge may be assessed through written assignments, project reports, debriefings and action learning projects.



0732B&CE-304 Market products and services

Overview: This competency standard covers the skills and knowledge required to analyze market information, Identify and evaluate factors to include in a marketing plan, Develop a marketing plan for your products and services, Determine promotional strategies, Implement marketing activities and Evaluate marketing performance.

Competency Unit	Performance Criteria
CU-1. Analyze market information	P1. Identify, research and analyze existing or new markets for existing or new products or services using techniques to ensure reliable data P2. Analyze past trends and developments to determine market variability and associated risks P3. Develop gross margin budgets to account for market variability P4. Identify and evaluate competing products to determine strengths and weaknesses of own products P5. Monitor market environment to ensure information is current and reliable P6. Identify the legal, ethical and environmental constraints of the markets and their effect on the enterprise P7. Identify product specifications that suit market requirements and price advantage at the time P8. Present clear and concise information to the enterprise management team.
CU-2. Identify and evaluate factors to include in a marketing plan	P1. Identify and evaluate production processes to ensure required product specifications are met P2. Identify and assess alternative selling strategies and techniques to identify marketing targets and methods P3. Identify and assess distribution channels and their role in your marketing strategies P4. Ensure the data used is reliable and the market environment and trends are substantiated P5. Evaluate the role of marketing professionals in providing advice



National Competency Standards Level-5 for “Civil Technology”



CU-3. Develop a marketing plan for your products and services	P1. Establish marketing objectives based on current and potential product specifications P2. Select appropriate production processes to ensure product specifications are met P3. Select selling strategies to ensure required prices are achieved P4. Select appropriate distribution channel options to ensure access to target markets is achieved efficiently and appropriately P5. Establish time-frames for production, distribution and selling activities P6. Develop a gross margin budget to demonstrate the cost effectiveness of the marketing plan P7. Develop partial gross margin budgets to account for market variability
CU-4. Determine promotional strategies	P1. Prepare and record detailed plans for promotional activities P2. Outline objectives, level of exposure and available markets P3. Ensure strategies take account of time management and scheduling issues, and resource constraints P4. Create promotional materials that enhance the product and commercial presentation P5. Record and communicate priorities, responsibilities, timelines and budgets for promotional activities.
CU-5. Implement marketing activities	P1. Schedule planned marketing activities within appropriate timeframes P2. Develop measurable performance targets that meet business plan objectives P3. Organize distribution channels and ensure product and service information is accurate and readily available to clients P4. Implement marketing activities within budgetary constraints to meet legal, ethical and enterprise requirements



CU-6. Evaluate marketing performance.	P1. Review the established marketing objectives to ensure they remain viable P2. Make an objective assessment of the marketing plan and its implementation by a comparison of valid and reliable data against the established objectives P3. Assess product, pricing and distribution policies in relation to market changes, marketing objectives and enterprise requirements P4. Identify areas of positive marketing performance and take corrective action to remedy poor marketing performance areas P5. Document and distribute information for continual analysis and effective planning management

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe the life cycle of product
- K2.** Identify the various ways of selecting suppliers,
- K3.** Explain the inventory management of stock, raw material and finished goods etc.
- K4.** Appreciate the importance of financial record keeping in a small business
- K5.** Explain techniques to keep cost as low as possible
- K6.** Develop balance sheet for a small enterprise
- K7.** Explain the operating cycle concept
- K8.** Explain the income tax computation procedure for a small business
- K9.** Explain the basic scheme of sales tax
- K10.** Explain the assessment procedure for returns and filling of returns.

Critical Evidence(s) Required

The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy holistically all of the requirements of the performance criteria and required skills and knowledge and include achievement of the following:

- identify the marketable features of the product and potential markets
- develop a range of marketing alternatives
- collect and analyses data to assess alternatives in a marketing plan
- evaluate performance targets and recommend modifications or improvements



National Competency Standards Level-5 for “Civil Technology”



- implement and evaluate a marketing plan
- Plan to manage promotional activities.



0732B&CE-305 Monitor and review business performance

Overview: This competency standard covers the skills and knowledge required to evaluate commercial performance, Allocate and co-ordinate business resources, Identify performance requirements and Review business performance

Competency Unit	Performance Criteria
CU-1. Evaluate commercial performance	P1. Gather and analyze data relating to enterprise performance to identify historical and current performance. P2. Review and analyze operational structures to determine the suitability of organizational processes to enterprise objectives. P3. Evaluate enterprise strengths and weaknesses against market conditions to determine current and future capacities. P4. Evaluate enterprise objectives are to identify variations and scope for future development.
CU-2. Allocate and co-ordinate business resources	P1. Identify and communicate roles and responsibilities of personnel. P2. Identify resource requirements for enterprise and cost them using standard financial analysis techniques. P3. Calculate costs of ensuring sustainability of enterprise operations and factor into business planning for the enterprise.
CU-3. Identify performance requirements	P4. Develop realistic performance indicators within available timeframes and resources P5. Identify and minimize factors inhibiting performance against objectives. P6. Monitor and assess market conditions based on relevant data. P7. Prepare and incorporate strategies and programs to promote the sustainability of operations into enterprise procedures.



National Competency Standards Level-5 for “Civil Technology”



CU-4. Review business performance	P8. Review regularly enterprise operations to identify opportunities for improvements in performance. P9. Monitor and anticipate impact of natural conditions on enterprise to assess sustainability of resource use. P10. Compare costs and estimates with resource allocation. P11. Determine operational plans to determine schedule of activities

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Rates of return for products and/or services
- K2.** Financial analysis techniques
- K3.** Structure and operation of small businesses relevant State/Territory Occupational Health and Safety (OHS)
- K4.** Legislative requirements
- K5.** Environmental conditions, positive environmental practices and negative impact minimization measures
- K6.** Human resource requirements for the enterprise
- K7.** Transport requirements for the enterprise
- K8.** Enterprise/property improvement requirements.
- K9.** Market performance in commodities
- K10.** Statutory marketing requirements

Critical Evidence(s) Required

The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy holistically all of the requirements of the performance criteria and required skills and knowledge and include achievement of the following:

gather and analyze data relating to enterprise performance

review operational structures to determine effectiveness

identify available resources to assess capacity

develop realistic performance indicators

review enterprise operations against performance indicators

Plan to improve business performance by addressing results of review.



0732B&CE-306 Negotiate for resolving business issues

Overview: This competency standard covers the skills and knowledge required to Develop and implement issue resolution and grievance procedures and Manage disciplinary matters

Competency Unit	Performance Criteria
CU-1. Develop and implement issue resolution and grievance procedures	P1. Establish problem solving/issue resolution procedures within legislative requirements and organization's guidelines. P2. Manage grievances and complaints are in a timely and caring way to optimize likelihood of a favorable outcome for all parties and in line with organizational objectives and procedures. P3. Document and communicate individual's rights and obligations under industrial awards/agreements and legislation are in a clear and concise manner and in appropriate language. P4. Conduct hearings, interviews and meetings within the principles of industrial democracy and participative, consultative processes. P5. Identify and invite all relevant industrial parties to participate in the resolution process.
CU-2. Manage disciplinary matters	P1. Implement disciplinary matters in accordance with organization's procedures. P2. Conduct investigations in a caring and confidential manner to maintain performance and morale. P3. Provide feedback promptly. P4. Institute appeals processes in accordance with organizational procedures. P5. Recognize and recommend deficiencies in procedures for changes made

Knowledge and understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Describe Concrete ingredients ratio



National Competency Standards Level-5 for “Civil Technology”



- K2. Explain batching and finishing techniques
- K3. Identify concrete materials
- K4. Explain methods of concrete placement
- K5. State curing times for concrete.
- K6. Describe fresh concrete levelling techniques
- K7. Describe types, characteristics, uses and limitations of plant, tools and equipment

Critical Evidence(s) Required

The candidate needs to produce following critical evidences in order to competent in this competency standard.

- Use a hand trowel and power trowel to finish a minimum of 10 square meters of concrete in foundation.

Instruments & Consumables

S No.	Description (Instruments)
1	Paper
2	• Pencil • Rubber • Sharpner



List of Tools, Equipment and Consumable

01: Basic Engineering Surveying

S#	Tools and Equipment	S#	Consumable Material
1	Ranging rods	1.	Lime
2	Steel Tape	2.	Drawing Sheets
3	Steel Band	3.	Lead Pencils
4	Invar tape	4.	Eraser
5	Metallic Tape		
6	Arrows		
7	Pegs		
8	Mallet		
9	Umbrella with stand		
10	Engineer's chain		
11	Gunter's chain		
12	Revenue Chain		
13	Metric chain		
14	Cross staff,		
15	line ranger,		
16	Optical square,		
17	Prismatic compass with stand.		
18	Telescopic Survey compass		
19	Telescopic Alidad		
20	Surveyor's compass		
21	Plane table with all accessories		
22	Tilting Level with parallel plate micrometer (Precise level)		
23	Auto Level		
24	Laser Level		
25	Abney's Level		
26	Levelling Staff		
27	Digital planimeter		
28	Pentagraph		
29	Barometer		
30	Prism with Prism Pole		
31	Ball Pen Hammer		
32	Velocity Rods (Floats).		
33	Current Meter		
34	Sounding Rods		
35	Drawing Lab Instruments		
36	Target Staff		

**02: Civil Engineering****Drawing**

S#	Tools and Equipment	S#	Consumable Material
1.	Drafting Table- Portable (Taper Type), Table size 32" x 24"	1.	Lead Pencils
2.	Instruments Box-Special Compass Set	2.	Eraser
3.	Tee Square (600 mm) Transparent	3.	Tracing Sheets
4.	Set Square- Transparent medium size (300 mm)	4.	Tracing Cloth
5.	Templates- Circle Square, Hexagon, Triangle (03 each)	5.	Drawing Sheets
6.	French Curves - Good Quality, medium size	6.	Graph paper
7.	Sharpener Machine	7.	Scotch Tape
8.	Drafting Machine Elbow type- Table size A o complete with all accessories	8.	Handkerchief

03: Building Materials			
S#	Tools and Equipment	S#	Consumable Material
1	Brick Making Machine	1	Sand
2	Brick Molds	2	Sand Dust
3	Hand roller	3	cement
4	Thermometer	4	Lime
5	Umbrella with stand	5	Brick
6	PPEs	6	Stones
7	Calculator	7	Ferrous metal samples
8	Stone masonry instruments	8	Non-Ferrous metal samples
9	Scissor	9	Pencil,
10	Mason Trowel	10	Eraser,
11	Hammer	11	Sharpener,
12	Hammer Forged steel rectangle head	12	Drawing sheet,
13	Lump hammers		
14	Power Tools		
15	Hand Tools		

04: Workshop Practice-I (Wood Work)			
S#	Tools and Equipment	S#	Consumable Material
1.	Ear Muff, Ear Plug	1.	Timber Deodar
2.	Safety shoes	2.	Timber Partal
3.	Gloves	3.	Nails
4.	Safety Goggles	4.	Screws
5.	Safety Helmet	5.	Gums
6.	Respiratory protective equipment i.e. Masks	6.	Polishes
7.	Life Jacket	7.	Lacquer
8.	High visibility jacket	8.	lac



National Competency Standards Level-5 for “Civil Technology”



9.	Safety harness	9.	paraffin and linseed oils
10.	Face shield	10.	methyated spirits
11.	Rubber shoes/ long shoes	11.	rubbers
12.	Compression testing machine	12.	Deodar Wood for Wooden Joints
13.	Digital weighing balance	13.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)
14.	Laboratory oven	14.	Glue 5 Kg
15.	Files	15.	Kail Wood for Door & Frame
16.	Diamond stones	16.	Kerosene Oil
17.	Water stones	17.	Lubricating Oil / Grease
18.	Oil stones	18.	Nails
19.	Ceramic stones	19.	Overall / Apron for Trainees
20.	Wood tool	20.	Safety Shoes for Trainees
21.	Measuring tool	21.	Screw ¾“, 1“, 1½ “, 2” (2 Packets each)
22.	Marking tools	22.	Sheshum Wood
23.	Holding tool	23.	Veneer Board (4" x 8' x ¾")
24.	Cutting tool		
25.	Planning tool		
26.	Fastening tools		
27.	Boring machine		
28.	Fastenings		
29.	Sprayer		
30.	Circular SAW		
31.	W.W, Planer		
32.	Wood Turning lathe		
33.	Spindle		
34.	Boring machine		
35.	Sander		

05: Workshop Practice-II (Electrical Wiring)			
S#	Tools and Equipment	S#	Consumable Material
1.	Ear Muff, Ear Plug	1.	Cable 3/0.029, 7/0.029, 7/0.036, flexible,
2.	Safety shoes	2.	single core, double core each
3.	Gloves	3.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)
4.	Safety Goggles	4.	Wiring accessories (switch,
5.	Safety Helmet	5.	sockets,



National Competency Standards Level-5 for “Civil Technology”



6.	Respiratory protective equipment i.e. Masks	6.	boards of sizes,
7.	Life Jacket	7.	bulb holders,
8.	High visibility jacket	8.	dimmer,
9.	Safety harness	9.	Ceiling rose,
10.	Face shield	10.	indicators,
11.	Rubber shoes/ long shoes	11.	breakers,
12.	Electrical drawing	12.	main switches,
13.	Computer	13.	two way switch,
14.	Emergency light	14.	change overs,
15.	Ladder	15.	regulators,
16.	drill machine tool kit	16.	cleats,
17.	Thimble puncher	17.	clips,
18.	Shroud	18.	insulation tape,
19.	PVC tape	19.	screws of sizes,
20.	HT tape	20.	steel nails etc
21.	Thimbles	21.	pipes,
22.	cable knife	22.	casing and capping,
23.	wire stripper	23.	batten each
24.	drill machine	24.	bulbs,
25.	PPE	25.	tube lights,
26.	Cable tie	26.	energy savers,
27.	Clamps	27.	Circuit Breakers
28.	Plier	28.	Electric Ballasts (40 W)
29.	Cutter	29.	Panel Board
30.	spiral/ flexible pipes	30.	Earthing system materials
31.	tie base		
32.	ravel bolt		
33.	ravel plug		
34.	hilty bolt		
35.	wooden screw		
36.	AVO meter		
37.	test lamp		
38.	earth tester		
39.	line tester		
40.	megger		
41.	Voltmeter		
42.	Ammeter		
43.	Multi meter		
44.	Ohmmeter		
45.	Drawings, operations manuals		
46.	Layouts, ICT, measuring tools (calipers, cable chart, hand hacksaw, measuring tape, laser gun for length), quality standards, vendor certificate, grinding cutter, drill machines, hammer		
47.	Layouts, lifters, chain-pulley, jacks, sprit level		



National Competency Standards Level-5 for “Civil Technology”



48.	Layouts, measuring tools, cutting tools like wire cutter, side cutter, cable cutter, thimble presser, megger, stacker, tags, glands, shrouds, conduits, cable tray etc		
49.	Layouts, cutting tools e.g. wire cutter, side cutter, cable cutter, stacker, tags etc.		
50.	Drawing, layout, manual, fork lifter, drill machine,		
51.	Layouts, lifters, chain-pulley, jacks, tags		
52.	Soldering, earth tester, thimble presser,		
53.	Drawings, multi meters,		
54.	Wiring Boards 3' x 5' Wall Mounted		
55.	Wood Chisel 1"		
56.	Work Benches 4' x 6' x 2.5'		
57.	Single-Phase Electric Motors		
58.	Single-Phase Energy Meter		
59.	Air Conditioners		
60.	3-Phase Electric Motors		
61.	3-Phase Energy Meter		
62.	AVO Meters		
63.	Clamp on Meter		
64.	Cold Chisels 10" Long		
65.	Combination Pliers 8"		
66.	Electric Bells		
67.	Fluorescent Tubes (with electric choke)		
68.	Hack Saws 15"		
69.	Hand-Drill Machine Electric Two Speeds 3/4" Chuck Heavy Duty		
70.	Kerosene Burners		

06: Advanced Surveying

S#	Tools and Equipment	S#	Consumable Material
1	Digital Theodolite	1.	Lime
2	Total Station complete set along with accessories and software.	2.	Drawing Sheets
3	Dual Frequency GNSS GPS complete set with all accessories and software i/c Battery with Charger.	3.	Lead Pencils
4	Hand Held GPS	4.	Eraser
5	Tribrach		
6	Optical plummets		
7	Target Staff		
8	Single Prism Targets with stands		
9	Tripple Prism Targets with stands		
10	Ball Pen Hammer		
11	Spring balances		
12	Ranging rods		



National Competency Standards Level-5 for “Civil Technology”



13	Steel Tape		
14	Steel Band		
15	Invar tape		
16	Metallic Tape		
17	Arrows		
18	Pegs		
19	Mallet		
20	Umbrella with stand		
21	Engineer's chain		
22	Thermometers		
23	Drawing Lab Instruments		
24	Computer Lab equipment		

07: AutoCAD

S#	Tools and Equipment	S#	Consumable Material
1	Computer latest model with Server		Printer papers
2	Computer latest model work stations		Printer Toner
3	Laptop computer		USB
4	Net working		Printing Paper Roles
5	UPS 2000 Watt with batteries		Plotter Toner
6	Multimedia Projector		
7	Scanner for A-3 paper		
8	Printer LaserJet		
9	USB Sticks		
10	Computer Chair (will be added in furniture portion) without arm rest - 5 legs base		
11	Computer Table (will be added in furniture portion) 2½ x 2 x 2½		
12	License software for education Latest Versions: Auto CAD M.S Office Antivirus Microsoft windows		
13	Plotter		

08: Construction I			
S#	Tools and Equipment	S#	Consumable Material
1.	Brick Making Machine	1.	Sand
2.	Brick Molds	2.	Sand Dust
3.	Hand roller	3.	cement
4.	Thermometer	4.	self-tapping screws
5.	Umbrella with stand	5.	soft sheet nails
6.	PPEs	6.	Wall board adhesive
7.	Calculator	7.	Distemper
8.	Stone masonry instruments	8.	Knotting & Lashing Rope
9.	Scissor	9.	Lime



National Competency Standards Level-5 for “Civil Technology”



10.	Mason Trowel	10.	Paint
11.	Pointing Trowel	11.	Bitumen
12.	Troweling Blades	12.	Polythene Sheet
13.	Hammer	13.	Polythene Role for DPC Bricks
14.	Hammer Forged steel rectangle head	14.	
15.	Lump hammers	15.	Chalk
16.	Hammers (bricks, club and scutch)	16.	Luminous Slip
17.	Sledge hammers	17.	Stone Crush
18.	Air compressors and hoses	18.	Lime beds
19.	Bevels	19.	Pencil,
20.	hand/power saws	20.	Eraser,
21.	Core cutting saw	21.	Sharpener,
22.	Jig saws	22.	Drawing sheet,
23.	Masonry saws	23.	Acoustic underlay material, adhesives
24.	Wet and dry diamond saws	24.	Caulking compound, cement mortar (with and without additives)
25.	Marking equipment	25.	Clouts, cornice adhesive, crack suppression membrane
26.	Measuring tapes and rules,	26.	Fixings and fasteners
27.	Metallic Tape 100 feet (30m)	27.	Patching materials, plasterboard nails, pre-mixed and mixed fillers
28.	Steel Tape- Slide Lock, Automatic Returns, Metallic / plastic case, 5-meter, Graduation on both side in feet & meter	28.	Lime Color (Different)
29.	Measuring scale,	29.	Tile Bond
30.	Nail guns	30.	Tile Spacer (Different Sizes)
31.	Protractors	31.	Brick Ballast
32.	squares (combination/tri)	32.	Road Metals
33.	steel squares and fences	33.	Thermophore for Joints 2” & 1” thick
34.	string lines	34.	Water Stopper for Concrete (Plastic)
35.	Line blocks and line pins	35.	Barrel bolts, Cabin hooks closers, Dead bolts, Flash bolts, flashings, handles hinges (butt and parliament), Latches, locks, Metal, Night latches, Passage sets, Timber.
36.	builders’ lines	36.	Windows may include: All size windows, Casement, Double hung, Glazed sliding doors, curved and bay, Hopper, Straight and sliding
37.	static lines		
38.	Compass		



National Competency Standards Level-5 for “Civil Technology”



39.	Corner Float and float Blades		
40.	Steel float Set (Small, medium, large) Wooden Handle		
41.	Wooden Float (Small, medium, large) Wooden Handle		
42.	Groove Cutter		
43.	Cement sheet cutters		
44.	Tile cutters		
45.	Edger		
46.	Brooms		
47.	Polishers		
48.	Hand Grinders		
49.	Power grinders		
50.	Vibrator		
51.	Vibrating Rod		
52.	Form work		
53.	Molds		
54.	Workability test apparatus		
55.	Core cutting machine		
56.	Hand Drill Machines with drills		
57.	Power drill machines with drills		
58.	Sheet plate		
59.	Plate bar		
60.	Plate rod		
61.	Adjustable base plates		
62.	Channels		
63.	Forgings area		
64.	Casting platform		
65.	Furnace		
66.	Wheel Barrow:		
67.	Bucket		
68.	Paint Scraper Set		
69.	Potien Filler Knife Set		
70.	Chisel Set (9"-12"-18")		
71.	Plumb Bob		
72.	plumb rules		
73.	Straight Edge		
74.	Shovels with handle		
75.	Kassi (Plies) with handle		
76.	Spirit Level (Aluminum 2 ft. length)		
77.	torpedo levels		
78.	Dumpy Level		
79.	Pick Axe		
80.	Tray (Galvanized Iron, 14 SWG) SET		
81.	Pointing Tray		
82.	Striker for vertical joint (pointing)		



National Competency Standards Level-5 for “Civil Technology”



83.	Striker for horizontal joint (pointing)		
84.	Bamboo (10 feet)		
85.	Bamboo (15 feet)		
86.	Battens (5'x3½"x2½")		
87.	Shesham Wood Planks (7'x7"x1½")		
88.	Mortar Pan -GI Sheet (20 SWG) Size, 45 cm dia		
89.	mortar boards		
90.	Adjustable Wrench Set- * Hardened Steel, tempered and chrome plated, * Set include 8" (20cm), 12" (30cm), 18" (45cm)		
91.	Mixing Spoon Set- heavy gauge stainless steel, 150mm, 200mm, and 250mm long, round bottom		
92.	Concrete mixers		
93.	Elevators		
94.	Forklifts		
95.	jointing tools		
96.	Margin or raking tools		
97.	materials hoists		
98.	Cantilevered hoists (materials only with maximum capacity of 500kg)		
99.	Wall Scaffolds		
100.	scaffold belts		
101.	scaffolding planks		
102.	bracket scaffolds (tank and formwork)		
103.	prefabricated scaffolds		
104.	braces		
105.	small petrol or diesel engines and compressors,		
106.	Bolsters		
107.	brick buggies		
108.	brick grabs		
109.	Bends and hitches		
110.	box spanners		
111.	Couplers and accessories		
112.	Fiber ropes		
113.	Gin wheels		
114.	guard rails		
115.	Ledgers		
116.	Mesh guards		
117.	mid rails		
118.	modular and prefabricated components		
119.	Safety nets		



National Competency Standards Level-5 for “Civil Technology”



120.	Stairs or ladders		
121.	Standards		
122.	steel and aluminum tubes (pipes)		
123.	transoms		
124.	Wire nips		
125.	Pallet trolleys		
126.	profiles		
127.	Brushes		
128.	Caulking guns		
129.	Electrical leads		
130.	Hose and water sprays		
131.	Nippers		
132.	Pointed grouters		
133.	power screwdrivers		
134.	sanders		
135.	Rags		
136.	rubber mallets		
137.	Sanding blocks		
138.	spacers and wedges		
139.	Spatulas		
140.	sponges, squeegees		
141.	wire brushes,		
142.	Work platforms		
143.	scribes		

09: Plumbing

S#	Tools and Equipment	S#	Consumable Material
1.	Adjustable Wrench Set	1.	Complete Set Of Bath Room Fitting
2.	Pipe Wrench Chain Type	2.	Complete Set of Bath Sanitary Fixture
3.	Adjustable Pipe Wrench	3.	Complete set of GI pipe fittings
4.	Pipe Reamer	4.	Complete set of CI pipe fittings
5.	Pipe Vice (Stand Type)	5.	Complete set of PPRC pipe fittings
6.	Pipe Vice (Bench Type)	6.	Cement
7.	Pipe Thread Cutting Kit	7.	Sand
8.	Tap Set	8.	Plastic rings
9.	Pipe Cutter	9.	Spun yarn
10.	Pliers Adjustable	10.	Gasket
11.	Cold Chisel Set	11.	Sealant
12.	Steel Tape	12.	Nut bolts, Clamps, Jute, Rubber Rings
13.	Mason's Spirit Level	13.	Lime



National Competency Standards Level-5 for “Civil Technology”



14.	Steel Rule	14.	Plumbing Fixtures each type
15.	Electric Drill Machine	15.	GI, CI, PPRC, Specials each type and size
16.	Screw Driver Set	16.	G.I. Pipe ½ dia
17.	Trowel (200-280 Mm Long Steel)	17.	½-3/4 reducing socket, elbow, bush
18.	Mortar Pan	18.	Gate valve ½
19.	Shovel With Handle	19.	Gate valve ¾
20.	Hack Saw	20.	Check valve ¾
21.	Bench Vice	21.	Ball valve ¾
22.	Ball Pein Hammer Set	22.	Water meter
23.	Claw Hammer	23.	Ferule valve
24.	Files Set	24.	Hand wash basin
25.	Scissors	25.	Basin brackets
26.	Centre Punch	26.	Pillar cock (swan type)
27.	Melting Pot	27.	Rubber connection 18
28.	Ladle	28.	Copper connection pipe 18
29.	Pipe Yarning and Caulking Tools	29.	Stop cock
30.	Oil Cane	30.	Bib cock
31.	Drill/Bit Set	31.	Flushing cistern (low level)
32.	Complete Set Of Bath Room Fitting	32.	Flushing cistern (high level) (cast iron) 02 no.
33.	Complete Set Of Bath Sanitary Fixture	33.	PVC hockey pipe
34.	Personal Protective equipment, dresses	34.	PVC waste pipe
35.	Plungers,	35.	Waster coupling
36.	Turbine with impellers & Motor Electricity	36.	Water closet (Indian type)
37.	Turbine pipe with fittings	37.	Water closet (English type)
38.	Pipe wooden / steel clamps	38.	Urinal
39.	Wheel barrow	39.	P trap
40.	Umbrella	40.	Cast iron pipe 6 ft size
		41.	C.I cowl
		42.	C.I Tee 4
		43.	Lead
		44.	Lead wool
		45.	Threading taps
		46.	PVC pipe and polyethylene pipe ½ size
		47.	Connection clamp with ¾ socket 4 size 06 no
		48.	Steel foot rule
		49.	Hand measuring tape (3 meter/ 15 ft) 25 no
		50.	Ball Peen hammer ½ kg



National Competency Standards Level-5 for “Civil Technology”



		51.	Center punch
		52.	Hacksaw Blade
		53.	Try Square
		54.	Oil cane
		55.	Mobil Oil

10: Digital Skills

S#	Tools and Equipment	S#	Consumable Material
1	Computer latest model with Server		Printer papers
2	Computer latest model work stations		Printer Toner
3	Laptop computer		USB
4	Net working		
5	UPS 2000 Watt with batteries		
6	Multimedia Projector		
7	Scanner for A-3 paper		
8	Printer LaserJet		
9	USB Sticks		
10	Computer Chair (will be added in furniture portion) without arm rest - 5 legs base		
11	Computer Table (will be added in furniture portion) 2½ x 2 x 2½		
12	License software for education Latest Versions: M.S Office Antivirus Microsoft windows		

11: Construction II

S#	Tools and Equipment	S#	Consumable Material
1.	Brick Making Machine	1.	Sand
2.	Brick Molds	2.	Sand Dust
3.	Hand roller	3.	cement
4.	Thermometer	4.	self-tapping screws
5.	Umbrella with stand	5.	soft sheet nails
6.	PPEs	6.	Wall board adhesive
7.	Calculator	7.	Distemper
8.	Stone masonry instruments	8.	Brick Ballast
9.	Scissor	9.	Lime
10.	Mason Trowel	10.	Paint
11.	Pointing Trowel	11.	Thermophore for Joints 2” & 1” thick
12.	Troweling Blades	12.	Water Stopper for Concrete (Plastic)
13.	Hammer	13.	Lime Color (Different)
14.	Hammer Forged steel rectangle head	14.	Road Metals
15.	Lump hammers	15.	Chalk
16.	Hammers (bricks, club and scutch)	16.	Luminous Slip
17.	Sledge hammers	17.	Stone Crush
18.	Air compressors and hoses	18.	Lime beds



National Competency Standards Level-5 for “Civil Technology”



19.	Bevels	19.	Pencil,
20.	hand/power saws	20.	Eraser,
21.	Core cutting saw	21.	Sharpener,
22.	Jig saws	22.	Drawing sheet,
23.	Masonry saws	23.	Acoustic underlay material, adhesives
24.	Wet and dry diamond saws	24.	Caulking compound, cement mortar (with and without additives)
25.	Marking equipment	25.	Clouts, cornice adhesive, crack suppression membrane
26.	Measuring tapes and rules,	26.	Fixings and fasteners
27.	Metallic Tape 100 feet (30m)	27.	Patching materials, plasterboard nails, pre-mixed and mixed fillers
28.	Steel Tape- Slide Lock, Automatic Returns, Metallic / plastic case, 5-meter, Graduation on both side in feet & meter	28.	
29.	Measuring scale,		
30.	Nail guns		
31.	Protractors		
32.	squares (combination/tri)		
33.	steel squares and fences		
34.	string lines		
35.	Line blocks and line pins		
36.	builders' lines		
37.	static lines		
38.	Compass		
39.	Corner Float and float Blades		
40.	Steel float Set (Small, medium, large) Wooden Handle		
41.	Wooden Float (Small, medium, large) Wooden Handle		
42.	Groove Cutter		
43.	Cement sheet cutters		
44.	Tile cutters		
45.	Edger		
46.	Brooms		
47.	Polishers		
48.	Hand Grinders		
49.	Power grinders		
50.	Vibrator		
51.	Vibrating Rod		
52.	Form work		
53.	Molds		
54.	Workability test apparatus		



National Competency Standards Level-5 for “Civil Technology”



55.	Core cutting machine		
56.	Hand Drill Machines with drills		
57.	Power drill machines with drills		
58.	Sheet plate		
59.	Plate bar		
60.	Plate rod		
61.	Adjustable base plates		
62.	Channels		
63.	Forgings area		
64.	Casting platform		
65.	Furnace		
66.	Wheel Barrow:		
67.	Bucket		
68.	Paint Scraper Set		
69.	Potien Filler Knife Set		
70.	Chisel Set (9"-12"-18")		
71.	Plumb Bob		
72.	plumb rules		
73.	Straight Edge		
74.	Shovels with handle		
75.	Kassi (Plies) with handle		
76.	Spirit Level (Aluminum 2 ft. length)		
77.	torpedo levels		
78.	Dumpy Level		
79.	Pick Axe		
80.	Tray (Galvanized Iron, 14 SWG) SET		
81.	Pointing Tray		
82.	Striker for vertical joint (pointing)		
83.	Striker for horizontal joint (pointing)		
84.	Bamboo (10 feet)		
85.	Bamboo (15 feet)		
86.	Battens (5'x3½"x2½")		
87.	Shesham Wood Planks (7'x7"x1½")		
88.	Mortar Pan -GI Sheet (20 SWG) Size, 45 cm dia		
89.	mortar boards		
90.	Adjustable Wrench Set- * Hardened Steel, tempered and chrome plated, * Set include 8" (20cm), 12" (30cm), 18" (45cm)		
91.	Mixing Spoon Set- heavy gauge stainless steel, 150mm, 200mm, and 250mm long, round bottom		
92.	Concrete mixers		
93.	Elevators		
94.	Forklifts		
95.	jointing tools		



National Competency Standards Level-5 for “Civil Technology”



96.	Margin or raking tools		
97.	materials hoists		
98.	Cantilevered hoists (materials only with maximum capacity of 500kg)		
99.	Wall Scaffolds		
100.	scaffold belts		
101.	scaffolding planks		
102.	bracket scaffolds (tank and formwork)		
103.	prefabricated scaffolds		
104.	braces		
105.	small petrol or diesel engines and compressors,		
106.	Bolsters		
107.	brick buggies		
108.	brick grabs		
109.	Bends and hitches		
110.	box spanners		
111.	Couplers and accessories		
112.	Fiber ropes		
113.	Gin wheels		
114.	guard rails		
115.	Ledgers		
116.	Mesh guards		
117.	mid rails		
118.	modular and prefabricated components		
119.	Safety nets		
120.	Stairs or ladders		
121.	Standards		
122.	steel and aluminum tubes (pipes)		
123.	transoms		
124.	Wire nips		
125.	Pallet trolleys		
126.	profiles		
127.	Brushes		
128.	Caulking guns		
129.	Electrical leads		
130.	Hose and water sprays		
131.	Nippers		
132.	Pointed grouters		
133.	power screwdrivers		
134.	sanders		
135.	Rags		
136.	rubber mallets		
137.	Sanding blocks		
138.	spacers and wedges		



National Competency Standards Level-5 for “Civil Technology”



139.	Spatulas		
140.	sponges, squeegees		
141.	wire brushes,		
142.	Work platforms		
143.	scribes		

12: Concrete Technology

S#	Tools and Equipment	S#	Consumable Material
1.	Compression Testing Machine	1.	Cement
2.	Flexure / Tension Machine (cement Mortar Briquette Tensile Testing	2.	Sand
3.	Electronic Digital Balance (Top-Pan Type)	3.	Aggregates of sizes
4.	Electronic Digital Precision Balance (Top-Pan Type)		
5.	Top Pan Weighting Balance		
6.	Buoyancy Balance, 6000g x 0.1 g, ASTM C 127		
7.	Vicat Apparatus		
8.	Lechatlier's Apparatus complete set for soundness		
9.	LE CHATELIER FLASK, ASTM C188; BS 4550 for relative density of cement.		
10.	Sand Equivalent Apparatus ASTM D 2419		
11.	Digital Stop Watch		
12.	Planetary Mixer, ASTM C 305		
13.	Desiccators cabinet		
14.	Specific Gravity Test Set		
15.	Set of Sieve		
16.	Sieve shaker		
17.	Non-Distractive Test (Concrete Test Hammer)		
18.	Flakiness Sieve Set		
19.	SPATULA		
20.	Wire Brush for clearing modules		
21.	Trimming Knife		
22.	Graduated Cylinders		
23.	Flakiness Index Gauge		
24.	Elongation index gauge (length gauge)		
25.	Wire Basket		
26.	Tray (Galvanized Iron, 14 SWG) SET		
27.	Pycnometer		
28.	Conical Flask		
29.	Beakers		
30.	Thermometers		
31.	Wash Bottle (Plastic 250 ml capacity)		



National Competency Standards Level-5 for “Civil Technology”



32.	Specific Gravity Bottles (25ml)		
33.	Metallic Scoops		
34.	Mortar & Pestle		
35.	Mixing Spoon Set		
36.	Mixing Bowl		
37.	Rebar Locator Apparatus		
38.	Concrete Drum Mixer (Tilting Type)		
39.	Platform scale		
40.	MOULDS: - cubes 150mm (6") with clamp attached based plate, easily collapsible sides (made of cast iron)		
41.	cubes 100mm (4") with clamp attached based plate, easily collapsible sides (made of steel)		
42.	cylinders 150mm dia X 300mm height (6" dia x 12" height) complete with base plate and locking arrangement, made of Steel		
43.	mortar cubes 50mm (2") made of brass / steel, three gang mould, machined in internal surfaces, easily collapsible		
44.	beams 150 x 150x600mm (6"x6"x24") made of steel		
45.	Set of Spanners for (cubes and cylinder, beam moulds)		
46.	Tamping Rod for cubes/cylinders 16 mm dia 600 mm long ASTM		
47.	Tamping Rod for mould, 25 x 25 x380 mm (BS 1881)		
48.	Concrete cylinder capping complete including: a. two steel retainers for 6" (15cm) dia cylinders, b- Electric melting pot for melting capping compound (with		
49.	20kg capping compound Tin)		
50.	Vibrating Table		
51.	Poker Vibrator		
52.	Slump Test Apparatus		
53.	Compacting Factor Apparatus		
54.	Mechanical Sieve Shaker		
55.	Wheel Barrow:		

13: Quantity

Surveying

S#	Tools and Equipment	S#	Consumable Material
1.	Calculators	1.	Printer papers
2.	Computer latest model with Server	2.	Printer Toner
3.	Computer latest model work stations	3.	USB
4.	Laptop computer	4.	Lead Pencils



National Competency Standards Level-5 for “Civil Technology”



5.	Net working	5.	Eraser
6.	UPS 2000 Watt with batteries		
7.	Multimedia Projector		
8.	Scanner for A-3 paper		
9.	Printer LaserJet		
10.	USB Sticks		
11.	Computer Chair (will be added in furniture portion) without arm rest - 5 legs base		
12.	Computer Table (will be added in furniture portion) 2½ x 2 x 2½		
13.	License software for education Latest Versions: Auto CAD Civil 3D M.S Office Antivirus Microsoft windows		

14: Contract Management			
S#	Tools and Equipment	S#	Consumable Material
1.	Calculator	1.	Pencil
2.	Ruler	2.	Eraser
3.	Drawing lab equipment		

15: Water Supply and Sanitary Engineering			
S#	Tools and Equipment	S#	Consumable Material
1	Water Hardness Test Apparatus:	1	Drawing sheet
2	Turbidity Test Apparatus	2	Sewers of different materials
3	Personal Protective equipment, dresses	3	Jointing materials (as required)
4	Plungers,	4	Nut and bolts
5	Pressure testing kits,	5	Flanges
6	Radiator tools	6	Cement
7	Calculator	7	Sand
8	Thermometer	8	Yarn
9	Drawing instruments	9	Lead
10	Scissor	10	Kerosine Oil
11	Pressure testing kits,		
12	Umbrella with stand		
13	Spirit level		
14	PPEs		
15	Pegs		
16	Measuring Tape		
17	Compass		
18	Arrows		



National Competency Standards Level-5 for “Civil Technology”



19	Protector		
20	Trench digging tools		
21	Trench sides		
22	Chain pulley		
23	Small crane		
24	Excavator		
25	Clamps		
26	Drain suction machine		
27	Flushing machine with water		
28	Flushing pipes		

16: Mechanics of Structures			
S#	Tools and Equipment	S#	Consumable Material
1.	Calculator	1.	Graph Paper
2.	Rockwell hardness testing machine with accessories,	2.	Lead Pencil
3.	Brinell's hardness tester with accessories	3.	Rubber
4.	Allen key,	4.	Specimen metallic plates.
5.	Indenter.	5.	Steel bars.
6.	Universal testing machine,	6.	Metallic wires.
7.	Vernier calipers,		
8.	Mild Steel Rod of given dimension		
9.	Steel rule.		
10.	Strain gauge		
11.	Young Modulus apparatus along with accessories		

17: Soft Skills			
S#	Tools and Equipment	S#	Consumable Material
1	Calculator	1.	Pencil
2	Ruler	2.	Eraser
3	Drawing lab equipment		

18: Transportation Engineering

S#	Tools and Equipment	S#	Consumable Material
1.	Drawing board	1	Drawing Sheets
2.	T square	2	Graph paper



National Competency Standards Level-5 for “Civil Technology”



3.	Pair of Set squares	3	Scotch Tape
4.	Drawing Box (Compasses, divider, protractor, rule)	4	Handkerchief
5.	Sharpener/ Sand paper	5	Bitumen of grades
6.	Handkerchief	6	Coarse aggregate
7.	French Curves	7	Sand
8.	Set of Card board scales	8	Ballasts
9.	Sand cone Apparatus		
10.	calibrating container		
11.	glass plate		
12.	base plate		
13.	pan		
14.	tools for excavating hole		
15.	Electronic digital balance		
16.	Set of sieves		
17.	Los Angeles abrasion apparatus		
18.	Electronic digital balance		
19.	Set of sieves		
20.	Sieve shaker		
21.	Digital stop watch		
22.	Bitumen ductility test apparatus		
23.	Thermostatic lab oven		
24.	Equipment for flash and fire test apparatus		
25.	Centrifuge		
26.	Spatula		
27.	Standard Penetration Test Apparatus		
28.	Marshal Stability Test (30KN Capacity)		
29.	Say bolt Viscometer		
30.	Softening Point Test (Ring & Ball Apparatus)		
31.	Penetration of Bituminous Material		
32.	Extraction of Bitumen		

19: Hydraulics and Irrigation Engineering

S#	Tools and Equipment	S#	Consumable Material
1.	Piezometer.	1.	Drawing sheet
2.	Water tank.	2.	Eraser
3.	Hydraulic Bench	3.	HB, H, 2H, 3H Pencils
4.	Metacentric Height Measuring Apparatus:	4.	Scotch tape
5.	Hydrostatic Pressure App.		
6.	Venturi meter App.		
7.	Manometer (U-Tube)		
8.	Flow Over Weir Apparatus		
9.	Pitot Tube		
10.	Energy Losses In Pipe Apparatus		
11.	Current Velocity Meter		
12.	Friction in pipes apparatus.		
13.	Orifices.		



National Competency Standards Level-5 for “Civil Technology”



14.	Vee and trapezoidal notches.		
15.	Weirs		
16.	Drawing board		
17.	T square		
18.	Pair of Set squares		
19.	Drawing Box (Compasses, divider, protractor, rule)		
20.	Sharpener/ Sand paper		

20: Soil Mechanics and Bridge Engineering

S#	Tools and Equipment	S#	Consumable Material
2	Empty clean container	1.	Soil samples
3	Oven	2.	clean dry sand passing from No.10 (2.0mm) sand retained on No.20 (850mm) sieve
4	Balance accurate to 0.01gm	3.	Paper
5	Speedy moisture tester	4.	Drafting table
6	Steel ball of 1.25 Inch diameter	5.	Pencil
7	Brush for cleaning the tester	6.	Ruler
8	Scoop for measuring Calcium carbide reagent	7.	Rubber
9	Pycnometer of about 1liter capacity	8.	Sharpener
10	Glass rod	9.	Masking tape
11	Vacuum pump		
12	Set of ASTM sieves containing sieve # 4, 10, 20, 40, 60, 100, 200		
13	lid and pan		
14	Sieve shaker		
15	Soft brush for cleaning		
16	Evaporating dish		
17	No. 40 sieve with lid and pan		
18	Standard proctor Test Apparatus with rammer of 2.5Kg (5.5 lb) of fall 25.4Cm (12")		
19	Balance 5 kg capacity		
20	GI Sheet Tray		
21	Standard proctor Test Apparatus with rammer 4.54Kg (10 lb), of fall 38Cm (18")		
22	sieve 19 mm (3/4") and 9.5mm (3/8")		
23	straight edge		
24	Apparatus Core cutter		
25	Hammer		



National Competency Standards Level-5 for “Civil Technology”



26	excavating tools		
27	Sand Cone Apparatus		
28	calibrating container		
29	Spoon		
30	Ladle		
31	Spade		
32	Trowel		
33	Beater		
34	Drawknife		
35	Sample Bags Chisel		
36	Flat Scoop		
37	Small Curve Scoop		
38	Medium Curve Scoop		
39	Large Curve Scoop		
40	Flat Brush		
41	Canvas 2 X 2 M.		
42	glass plate		
43	Constant head Permeameter device (including constant head filter tank and manometer tubes)		
44	Graduated Cylinder 1000 Ml Capacity		
45	Graduated Cylinder 2000 Ml Capacity		
46	500 ml beaker		
47	1000 ml beaker		
48	Vernier Caliper		
49	Desiccator		
50	Canvas Gloves		
51	Gloves, Latex Rubber		
52	Plastic Bottle, Cap. 2 L.		
53	Plastic Bottle, Cap. 5 L.		
54	Rubber Bucket, Cap. 12 L.		
55	Rubber Bucket, Cap. 18 L.		
56	Stainless Steel Bowls		
57	Steel Hammer		
58	Pick Hammer		
59	Rubber Hammer		
60	Stop watch		
61	Thermometer		
62	Apparatus Falling head Permeameter device		
63	Ring stand with test tube clamp		
64	Burette (100ml)		
65	Shear box		
66	Shear box container		
67	Base plate with cross grooves on its top		
68	Porous stones (2 Nos)		



National Competency Standards Level-5 for “Civil Technology”



69	Plain Grid plates (2Nos)		
70	Perforated grid plates (2Nos)		
71	Loading pad with steel ball		
72	Digital weighing machine		
73	Loading frame with loading yoke		
74	Proving ring		
75	Dial gauges (2 Nos)		
76	Weights		
77	Tampering Rod		
78	Spatula		
79	Triangle Spatula		
80	Sampler		
81	Distribution Panel		
82	Automatic Pressure/Volume Controllers		
83	Load Frame		
84	Load Cell		
85	Displacement transducer		
86	Tri axial Cell		
87	Pore Pressure Transducer		
88	De-aired water supplier		
89	Data logger		
90	Sample extruder		
91	Sample moulds		
92	Membranes		
93	‘o’ rings		
94	Porous discs		
95	Ruler		
96	Filter papers		
97	Drilling Rig.		
98	Split spoon (tube).		
99	Drop hammer		
100	Driving head (anvil).		
101	Guiding rod.		
102	Tripod.		
103	Extension rods		
104	Cylindrical mould		
105	detachable extension collar		
106	detachable perforated base plate		
107	Spacer disc		
108	Metal rammer		
109	Loading frame		
110	Metal penetration piston		
111	Two dial gauges reading to 0.01 mm.		
112	Sieves. 4.75 mm and 20 mm I.S. Sieves		
113	mixing bowl		



2	scales soaking tank or pan		

21: RCC

Design

S#	Tools and Equipment	S#	Consumable Material
1	Calculator	1.	Pencil
2	Ruler	2.	Eraser
3	Drawing lab equipment		

22: Environment

Technology

S#	Tools and Equipment	S#	Consumable Material
	Dissolved Oxygen meter and sensor		Eraser
	Turbidity meter		Pencil
	Litmus Paper		
	Spectrophotometer		
	Thermometer		
	Containers		
	Sound level meter		
	Charts		
	Ear Muff, Ear Plug		
	Safety shoes		
	Gloves		
	Safety Goggles		
	Safety Helmet		
	Respiratory protective equipment i.e. Masks		
	Life Jacket		
	High visibility jacket		
	Safety harness		
	Face shield		
	Rubber shoes/ long shoes		
	Water Buckets		
	Fire Blankets		
	Sand Buckets		
	First Aid Box		
	Thermometer and B.P apparatus		
	Fire Extinguisher		
	Fire Alarm		
	Sprinklers		



	Computer system		

23: Construction Project Planning and Management

S#	Tools and Equipment	S#	Consumable Material
1.	Calculator	1.	Pencil
2.	Ruler	2.	Eraser
3.	Computer with mouse & keyboard	3.	Printer Toner
4.	Primavera P6 Software installed	4.	Printer paper

24: Civil Engineering Project

S#	Tools and Equipment	S#	Consumable Material
1.	Calculator	1.	Pencil
2.	Ruler	2.	Eraser
3.	Drawing lab equipment	3.	Materials related to labs mentioned in equipment list
4.	Survey Lab Equipment	4.	Pencil
5.	AutoCAD/ Computer Lab Equipment		
6.	Materials Testing Lab Equipment		

25: Entrepreneurial

Skills

S#	Tools and Equipment	S#	Consumable Material
1	Calculator	1.	Pencil
2	Ruler	2.	Eraser
3			