NSDA Reference
To be added by NSDA

Revised Application Documentation: Version 5 /25 May, 2015

QUALIFICATION FILE – CONTACT DETAILS OF SUBMITTING BODY

Name and address of submitting body:

Electronics Sector Skills Council of India,

422, Okhla Industrial Estate, Phase – III, New Delhi - 110020

Name and contact details of individual dealing with the submission

Name: Rakesh Mathur

Position in the organisation: Senior Vice President

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List of documents submitted in support of the Qualifications File

1. Qualification Pack for AOI Machine Operator
2. Occupation Map
3. RFP for development of National Occupational Standards
4. Mapping of Manpower skills in IT Hardware and Electronics Industry – MAIT (2009) http://www.essc-india.org/Essc/reports/MAIT0Report2008_15711.pdf
5. Approval of QP/ NOSs
   a) Minutes of the meeting of GC
   b) Composition of the Technical Committee
6. ESSCI IMaCSLMIS Report
7. List of Companies and industry associations which participated in the development of these qualifications packs
8. Assessment Procedure – Assessing bodies and Assessor

QUALIFICATION FILE SUMMARY

Qualification Title:	AOI Machine Operator; ELE/Q6601
Body/bodies which will assess candidates	Electronics Sector Skills Council of India
Body/bodies which will award the certificate for the qualification.	Electronics Sector Skills Council of India
Body which will accredit providers to offer the qualification.	Electronics Sector Skills Council of India
Occupation(s) to which the qualification gives access	Automated Optical Inspection Operator: Also called, 'AOI Inspector', the Automated Optical Inspection (AOI) Operator conducts non-contact tests on bare board and assembled printed circuit boards (PCB) at different stages of PCB assembly for automotive electronics.
Proposed level of the qualification in the NSQF.	4
Anticipated volume of training/learning required to complete the qualification.	240
Entry requirements / recommendations.	ITI, Diploma
Progression from the qualification.	Testing Assistant, Quality Engineer, Reflow oven operator, Chip mounter machine operator
Planned arrangements for RPL.	Will be done at the place where required lab. Facility could be arranged.
International Comparability.	Not established.

Formal structure of the qualification

Title of unit or other component (include any identification code used)	Mandatory/ Optional	Estimated size (learning hours)	Level
ELE/N6601 Conduct AOI test and visual check	Mandatory	140	4
ELE/N9919 Work with superiors and colleagues	Mandatory	50	4
ELE/N9920 Follow safety procedures	Mandatory	50	4

Please attach any document giving further detail about the structure of the qualification – eg a Curriculum or Qualification Pack.
Give details of the document here:
Refer Page 1 for the list of attachments

SECTION 1

ASSESSMENT

Name of assessment body:
If there will be more than one assessment body for this qualification, give details.

- **Aspiring Minds**
- **Mettl**
- **IQAG**

Will the assessment body be responsible for RPL assessment? Yes.

Give details of how RPL assessment for the qualification will be carried out and quality assured.

RPL will be based on the same Qualification Pack and Assessment Criteria mentioned in the QP. The process of RPL assessment is under development.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, consistent and fair and show that these are in line with the requirements of the NSQF:

The emphasis is on practical demonstration of skills and knowledge based on the performance criteria. Assessment design team carries on research for understanding job details, followed with competencies mapping for the module and for the performance criteria. The assessment papers are created by the Subject Matter Experts and moderated by Assessment Designers of Assessment Partners as per the assessment criteria, for theory and practical questions considering the lab. facility available for the assessments. The Assessment Sets prepared by Assessment Partners are reviewed by ESSCI for consistency and match with the level of the QP.

The assessment partners are instructed to hire assessors with integrity, reliability and fairness and have them sign an agreement confirming confidentiality, no conflict of interest or any other position, which may compromise the quality of assessment. The assessors need to have adequate hands-on experience in the domain, preferably at a level above the position for which they conduct the assessment.
Assessors are trained on the assessment process, and the question set. At the time of the assessment, the assessors check the identity of the candidates with a photo identification card and attendance during the training. They also take snapshots photographs of the practical assessments, and get the attendance for the assessment signed off by the candidate.

Please attach any documents giving further information about assessment and/or RPL.
Give details of the document(s) here:

ASSESSMENT EVIDENCE

Complete the following grid for each grouping of NOS, assessment unit or other component as listed in the entry on the structure of the qualification on page 1.

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role	**Automated Optical Inspection Operator**
QP #	**ELE/Q6601**
Sector Skill Council	**Electronics Sector Skills Council of India**

Guidelines for Assessment:

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create *unique question papers for theory part for each candidate at each examination/training center*(as per assessment criteria below)
4. Individual assessment agencies will create *unique evaulations for skill practical for every student at each examination/training center* based on this criteria
5. To pass the Qualification Pack , every trainee should score a minimum of 70% in every NOS
6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

				Marks Allocation	
Element	**Performance Criteria**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
ELE/N6601 Conduct AOI test and visual check					
Programming AOI machine	PC1. receive assembled boards from different stages of assembly line		3	1	2
	PC2. record lot number and size, and board type and the stage of inspection		3	1	2
	PC3. set program as per board specifications before starting AOI machine		3	1	2
	PC4. program x and y coordinates for setting boundaries of camera's movement		3	1	2
	PC5. load new program on computer and set parameters		3	1	2
	PC6. ensure the parameters are as per OEM standards and specification		3	1	2
Operating AOI machine	PC7. place the tested sample board matching specification inside the AOI machine		3	1	2

	PC8. record the readings captured by the AOI machine on the sample board		3	1	2
	PC9. set the captured readings on the machine to test the boards as per specification		3	1	2
	PC10. set the standards as per specification given by the OEM		3	1	2
	PC11. place bare board or assembled PCB on the AOI conveyor		3	1	2
	PC12. select program and start AOI machine for scanning the boards		3	1	2
	PC13. run the pass/fail test, i.e., compare instrument reading or monitor display with reading from sample board and accept or reject defective units		3	1	2
	PC14. use light sources for illuminating the boards such as X-rays, visible light depending on the layers of hidden components or tracks		2	1	1
	PC15. use in-circuit tester for packages such as ball-grid arrays (BGA) where optical inspection is constrained		2	1	1
	PC16. identify recurring faults and suggest corrective actions		2	1	1
	PC17. auto-save data in the component database		2	1	1
	PC18. record type and quantity of defect		2	1	1
	PC19. verify dimensions of parts, using standard gauges		2	1	1
	PC20. ensure solder joints tests are accurate as the auto component needs to withstand vibration		2	1	1
	PC21. check soldering against acceptable level		2	1	1
	PC22. place the appropriate test marks on all passed boards		2	1	1
	PC23. ensure zero-error while conducting test		2	1	1
	PC24. ensure all passed boards meets the standards		2	1	1
	PC25. run tester diagnostics at specified intervals		2	1	1
	PC26. download and verify software code		2	1	1
	PC27. decide whether the module can be repaired or can be replaced		2		2
	PC28. estimate cost of repair		2	1	1
Checking boards visually	PC29. identify component and board level defects on failed boards		2	1	1
	PC30. give feedback for improvement in quality and avoiding rework		2	1	1
	PC31. use the results of inspection to reject defective component or board lots		3	1	2
	PC32. check visually the board and look for discoloured components or any other signs of over heating		3	1	2
	PC33. perform visual check after AOI test also		3		3

	PC34. send boards for rework or to next stage of assembly		2	1	1
	PC35. document the outcome		2	1	1
Undertaking preventive machine maintenance	PC36. ensure that the AOI machine and inspection line works as specified		2	1	1
	PC37. detect early, any damage to computing, lighting, scanning and camera set up		2	1	1
	PC38. carry out preventive maintenance such as cleaning and replacing worn out parts as per manufacturer's specifications		2	1	1
Achieving productivity and quality standards	PC39. achieve the target number of boards to be tested		2	1	1
	PC40. deliver board in time to the next process		2	1	1
	PC41. ensure 100% inspection		2	1	1
	PC42. ensure zero downtime of AOI machine and inspection line		2	1	1
		TOTAL	100	40	60
ELE/N9919 Work with superiors and colleagues					
Interacting with supervisor	PC1. understand work requirements by receiving instructions from reporting supervisor	**100**	8	3	5
	PC2. understand standard operating procedure of the company		8	3	5
	PC3. escalate problems that cannot be handled including repetitive PCB defects, machine failures, potential hazards, process disruptions, repairs and maintenance of machine		7	3	4
	PC4. report work completed and receive feedback on work done		7	3	4
	PC5. resolve personnel issues		7	3	4
	PC6. rectify errors as per feedback and minimize mistakes to zero in future		7	3	4
	PC7. communicate about process flow improvements, quality of output, product defects received from previous process, repairs and maintenance of tools and machinery as required and find technical solutions on specific issues		7	3	4
	PC8. handover completed work and deliver the work of expected quality despite constraints		7	3	4
Interacting with colleagues	PC9. collect required spares and raw materials from tool room or stores		7	2	5
	PC10. deposit unused or faulty materials, parts and tools to stores		7	2	5
	PC11. assist colleagues where necessary and as per capability		7	3	4
	PC12. resolve conflicts with colleagues at work to achieve smooth workflow		7	3	4
	PC13. complete rework in time based on feedback from quality or process departments		7	3	4
	PC14. put team over individual goals		7	3	4

		TOTAL	100	40	60
ELE/N9920 Follow safety procedures					
Understanding potential sources of accidents	PC1. spot and report potential hazards on time	100	6	3	3
	PC2. follow company policy and rules regarding hazardous materials		6	3	3
	PC3. avoid accidents related to use of potentially dangerous chemicals, gases, sharp tools and hazards from machines which involves exposure to possible injuries such as cuts, bites, stings, minor burns, etc.		6	2	4
	PC4. handle with care when using an electrical drill and sharp cutting objects		6	2	4
Using safety gear	PC5. understand which safety gear must be used for a particular task		6	2	4
	PC6. eye, respiratory and hearing protection as per company policy		5	2	3
	PC7. use safety gear such as respirator, mask, skull caps, gloves, googles, jacket , etc., as prescribed for the job		5	2	3
Understanding of safety procedures	PC8. comply with standard health and safety procedure followed in the company while handling an equipment and hazardous materials and tools or situations		5	2	3
	PC9. understand and follow the evacuation procedure properly such as fire drills, emergency evacuation procedures, first aid to self and others, etc., which help in case of an emergency		5	2	3
Following daily safety measure	PC10. take adequate safety measures while on work to prevent accidents		5	2	3
	PC11. ensure zero accidents in work		5	2	3
	PC12. avoid damage of components due to negligence in ESD procedures		5	2	3
	PC13. ensure no loss for company due to safety negligence		5	2	3
	PC14. ensure proper machine maintenance, work process achieving quality outputs as per the company standard		5	2	3
Communicating to supervisor	PC15. improve process flow to reduce anticipated or repetitive hazards		5	2	3
	PC16. report on mishandling of tools, machines or hazardous materials and on electrical problems that could result in accident		5	2	3
	PC17. escalate about any hazardous materials or things found in the premises		5	2	3
	PC18. report about any breach of safety procedure in the company		5	2	3
	PC19. follow electrostatic discharge (ESD) measures for electronic component safety		5	2	3
		TOTAL	100	40	60

SECTION 2

EVIDENCE OF NEED

What evidence is there that the qualification is needed? **Feedback from the industry was collected with respect to the past and projected industry growth, projected employee growth during next 5 years (Refer to Pages 14 to 27 of the LMIS report), skill gaps identified in entry level qualified workforce for the sub-sector (Refer to Page 31 of the LMIS report), and current employment number for the qualification (Refer to Occupation Map). This enabled prioritization of the development of the qualification packs.**
What is the estimated uptake of this qualification and what is the basis of this estimate? **Estimated uptake of the qualification is obtained from the current employment (refer to the Occupation Map) times the projected employee growth for the sub-sector (Refer to Pages 21 to 27 of LMIS report). This is the basis for planning training with the industry and training providers.**
What steps were taken to ensure that the qualification(s) does/do not duplicate already existing or planned qualifications in the NSQF? **NSDCQRC team checks and confirms this.**
What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated? **Technical Committee's inputs are sought from time-to-time as needed to check the relevance of QP/ NOSs, and the revision exercise is undertaken, as needed.**

Please attach any documents giving further information about any of the topics above.
Give details of the document(s) here:
Refer Page 1 for the list of attachments

SECTION 3

SUMMARY EVIDENCE OF LEVEL

Level of qualification: 4

Summary of Direct Evidence (from learning outcomes):

Qualification Title and Classification Code:**AOI Machine Operator; ELE/Q6601**					
Process Required	**Professional Knowledge**	**Professional Skills**	**Core Skills**	**Responsibility**	**Level**
The job holder must be able to: place the tested sample board matching specification inside the AOI machine, record the readings captured by the AOI machine on the sample board, set the captured readings on the machine to test the boards as per specification, set the standards as per specification given by the OEM, place bare board or assembled PCB on the AOI conveyor, select program and start AOI machine for scanning the boards, run the pass/fail test, i.e., compare instrument reading or monitor display with reading from sample board and accept or reject	**The job holder needs to know and understand: basic electronics and components values and polarities , different stages of inspection such as bare board, solder paste, component placement prior to reflow, post-reflow component condition, post reflow solder joints, distorted components, reversed polarity, solder bridges, volume defects, damage or contamination , Due to the requirement of Factual knowledge of the job requirements, this is pegged at level 4**	**The job holder needs to know and understand how:to operate the various tester machines such as AOI, AXI, in-circuit, etc., to use oscilloscopes, multi-meter, electronic screwdrivers, and other, to run or use measuring devices, gauges and inspection tools Since job holder is required to Recall and demonstrate practical skill, routine and repetitive using appropriate rule and tool, this is pegged at level 4**	**The job holder needs to know and understand how:to maintain logs and records, to use computer, to read job sheet, process, production schedules, machine operation manuals, to read circuit and wiring diagrams, to note the diagnosis process, to document the test results Considering these outcomes, the job role is pegged at level 4.**	**The job holder must be able to Program the AOI test equipment, Operate the AOI machine and run test, Check passed and failed boards visually, Undertake preventive maintenance of AOI machine, Achieve quality and productivity standards, The job holder is responsible for his own job and self-learning and no supervision of others and hence pegged at level 4.**	**4**

defective units, use light sources for illuminating the boards such as X-rays, visible light depending on the layers of hidden components or tracks, use in-circuit tester for packages such as ball-grid arrays (BGA) where optical inspection is constrained, Considering the repetitive nature, it is pegged at level 4.					

Summary of other evidence (if used):

SECTION 4

EVIDENCE OF RECOGNITION OR PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

Vertical mobility options are available in the Occupation map.

Please attach any documents giving further information about any of the topics above.
Give details of the document(s) here:
Refer Page 1 for the list of attachments