# Table of Contents

Introduction ................................................................................................................... 4

Examination Information ........................................................................................................ 4
  Purpose of Examination ................................................................................................. 4
  Examination Format ....................................................................................................... 4
  Eligibility ....................................................................................................................... 4
  Examination Registration ............................................................................................. 4
  Location of Examination Centres and Virtual Proctoring ............................................ 4
  Exam Time and Location Confirmation ....................................................................... 5
  Policy for Reschedules, Rewrites, and Attempts ....................................................... 5
  Exam Accommodations for Candidates with Disabilities ........................................... 6

Examination Content ........................................................................................................ 7
  Study Resources for Examination ............................................................................... 8
  Practice Exam for Purchase ......................................................................................... 9

Day of Examination ........................................................................................................ 9
  Admission to the Examination Centre ........................................................................ 9
  Permissible Items ....................................................................................................... 10
  Prohibited Items ....................................................................................................... 10
  Calculator Policy ....................................................................................................... 10
  Taking the Exam ....................................................................................................... 10

After the Examination ................................................................................................... 11
  Examination Scoring ................................................................................................. 11
  Pass Mark .................................................................................................................. 11
  Results ....................................................................................................................... 11
  Review and Appeal Process ....................................................................................... 11

Appendix A: Instrumentation Technologist Professional Competencies ...................... 12
# Table of Contents

Introduction .......................................................................................................................... 4

Examination Information .................................................................................................... 4
  Purpose of Examination ............................................................................................... 4
  Examination Format ...................................................................................................... 4
  Eligibility ....................................................................................................................... 4
  Examination Registration ............................................................................................ 4
  Location of Examination Centres and Virtual Proctoring ........................................ 4
  Exam Time and Location Confirmation ....................................................................... 5
  Policy for Reschedules, Rewrites, and Attempts ....................................................... 5
  Exam Accommodations for Candidates with Disabilities ............................................. 6

Examination Content ...................................................................................................... 9
  Study Resources for Examination ............................................................................. 9
  Practice Exam for Purchase ....................................................................................... 9

Day of Examination ......................................................................................................... 9
  Admission to the Examination Centre ....................................................................... 9
  Permissible Items ........................................................................................................ 10
  Prohibited Items .......................................................................................................... 10
  Taking the Exam ......................................................................................................... 10

After the Examination ................................................................................................... 11
  Examination Scoring .................................................................................................. 11
  Pass Mark .................................................................................................................... 11
  Results ......................................................................................................................... 11
  Review and Appeal Process ...................................................................................... 11

Appendix A: Instrumentation Technologist Professional Competencies ...................... 11
Introduction

The Instrumentation Technologist Certification Exam Handbook has been prepared for instrumentation engineering technologists who are required to pass a certification exam to achieve registration as a Certified Engineering Technologist or Applied Science Technologist. The handbook is designed to provide candidates with essential information regarding the certification examination.

Examination Information

Purpose of Examination

The purpose of the Instrumentation Technologist Certification Examination is to identify competent instrumentation engineering technologists who possess technical competencies in their discipline, as outlined in a discipline-specific competency profile (see Appendix A). The goal is to protect the public by granting designations only to those professionals who have the skill and knowledge necessary to perform their job in a safe and competent manner.

Examination Format

The examination consists of 110 multiple-choice questions, including questions with graphs, diagrams, and schematics and questions that require calculations. There are 10 experimental questions of the 110 that are not counted towards the candidate’s exam score and are used for future exam development. Each multiple-choice questions has four answer options, only one of which is correct. Exam questions vary in the level of cognitive difficulty.

Eligibility

To be eligible to write the exam, candidates must have at least 24 months of work experience at the technologist level. For this reason, student and T.T. members may not register to write the exam.

Examination Registration

Applicants who are required to complete the Instrumentation Technologist Certification Examination will register for the examination at the time of application. Please see the ASET, CTTAM, or ASTTBC websites for current information on examination dates and deadlines.

Location of Examination Centres and Virtual Proctoring

The Instrumentation Technologist Certification Exam is administered on a computer in one of Yardstick’s exam centres or through the virtual proctoring service.

Physical locations in Alberta include Edmonton, Calgary, Grande Prairie*, and Lethbridge*. Please contact ASTTBC or CTTAM for information on testing centres in British Columbia and Manitoba. *limited seating
Virtual Proctoring: This method of exam delivery uses a webcam with a virtual proctor to allow the candidate to write the exam from a home or work office. This method has the following additional requirements:

1. A desktop computer or laptop with a functioning free-standing or integrated webcam. Note: tablet, smartphones, or iPads are not acceptable devices for use.
2. Chrome web browser installed and updated.
3. A room/office with a door, free of any type of interruption for the duration of the exam.
4. Reliable internet connection: preferably to be wired to the internet source for stability.
5. Candidates’ location: province and time zone will be requested from ASET Staff for coordination with Yardstick’s virtual proctoring service prior to the exam date.
6. A pre-exam compatibility check and additional specifications are emailed one or two weeks before the exam by Yardstick. This check must be completed ahead of the exam date to ensure that candidates can successfully access the online exam platform.

Exam Time and Location Confirmation

All candidates will receive a confirmation email with the writing time and address of the testing centre location (physical location only) that was chosen at the time of application by email from Yardstick one to two weeks before the exam date. The confirmation email is important to review and a printed copy is required for admission to write the exam. Candidates can contact Yardstick directly at testingsupport@getyardstick.com to have the exam registration information re-sent if they did not receive the confirmation email by the deadline above.

Policy for Reschedules, Rewrites, and Attempts

Alberta Candidates
Candidates who wish to reschedule their exam must email the ASET Registration Department (exams@aset.ab.ca) with the new exam date. Candidates who reschedule after the registered exam’s Registration Deadline Date are required to pay the full exam fee to reschedule. If the request is received before this deadline date, then there are no fees to reschedule.

Candidates who are required to re-write the examination must email the ASET Registration Department (exams@aset.ab.ca) with the requested exam date. ASET Staff will follow up to obtain payment of the full exam fee in order to register for the requested date.

Candidates may attempt the exam a maximum of three times within one year from the date of application and must pass the exam within this time period.

British Columbia and Manitoba Candidates
Please contact ASTTBC or CTTAM directly to confirm the policy for reschedules, rewrites, and exam attempts.
Exam Accommodations for Candidates with Disabilities

According to Canadian human rights legislation and test industry standards, exam developers are responsible for providing candidates with disabilities with exam accommodations where appropriate and feasible. Exam accommodations are designed to remove barriers related to individual characteristics of candidates that may prevent them from demonstrating their technical competencies on the exam. “An appropriate accommodation is one that that responds to specific individual characteristics but does so in a way that does not change the construct the test is measuring or the meaning of scores.”

Candidates with disabilities should request accommodations to write the certification exam at the time of application and at least seven (7) weeks before the exam date of their choice by submitting a request in writing to the ASET, ASTTBC, or CTTAM. To protect the integrity of the examination, documented evidence of the candidate’s disability must be submitted to ASET, CTTAM, or ASTTBC along with the application form. Such evidence includes a formal detailed diagnosis of the specific disability from an appropriate professional (e.g., physician, psychologist, rehabilitation counsellor) and supporting documentation citing the need for exam accommodations and what accommodations the candidate received in the past.

ASET, CTTAM, or ASTTBC will review the candidate’s written request for accommodation and determine if it can be supported. Depending on the candidate’s individual needs, ASET, CTTAM, or ASTTBC may modify exam administration conditions, including exam setting, exam presentation, or the addition of individuals to the exam (e.g., readers, scribes). Each request will be reviewed on a case-by-case basis.

Below is a list of reasonable exam accommodations for candidates with a disability.*

1. **Separate Room**
   A separate room is provided to candidates who due to the nature of their disability require an exam environment that minimizes distractions resulting from noise or movement or process information by talking aloud.

2. **Additional Time**
   Extending additional time to candidates is a frequently used exam accommodation that is used with a variety of disability-related conditions. Often candidates are offered time-and-one-half to complete the exam (e.g., a 3-hour exam is extended to 4.5 hours).

3. **Interpreter**
   Candidates with hearing impairment may request an interpreter who has proficiency in sign language.

4. **Reader**
   A reader is an individual who reads exam instructions and/or exam questions to a candidate. Candidates with visual impairment or those with a learning disability may benefit from services of a reader during the examination.

---

5. **Recorder**
   A recorder is an individual who fills in the answers for a candidate who has difficulty writing independently.

“All costs related to exam accommodations will be the responsibility of the candidate.

**Examination Content**

The Instrumentation Technologist Certification Examination tests candidates’ competencies in four areas (see Table 1 and Appendix A for detailed information on examination content).

**Technical Analysis:** In this competency area, candidates are expected to be able to apply knowledge of instrumentation technology to the analysis of measurement, control, and automation of process applications.

**Technical Design:** This competency area deals with candidates’ ability to specify, design, and/or modify instrumentation for measurement, control, and automation of various process applications in accordance with technical specifications, client requirements, and applicable codes and regulations.

**Technical Evaluation:** In this competency area candidates are expected to be able to install, calibrate, troubleshoot, maintain and evaluate the quality or performance of pneumatic, hydraulic, digital, electronic or microcomputer-based equipment in industrial and field environments in accordance with technical specifications, client requirements, and applicable codes and regulations.

**Project Management:** This competency area deals with candidates’ ability to assist in the management of projects to ensure high quality of deliverables, client satisfaction, and adherence to schedules and budgets.

**Table 1. Description of Examination by Competency Area**

<table>
<thead>
<tr>
<th>Competency Area</th>
<th>Percentage of Questions</th>
<th>Number of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technical Analysis</td>
<td>30 - 40%</td>
<td>39</td>
</tr>
<tr>
<td>2. Technical Design</td>
<td>25-35%</td>
<td>29</td>
</tr>
<tr>
<td>3. Technical Evaluation</td>
<td>20-30%</td>
<td>22</td>
</tr>
<tr>
<td>4. Project Management</td>
<td>5-15%</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2 provides the breakdown of exam questions by cognitive level. “Knowledge” questions require that candidates recall information and provide its interpretation. “Application” questions require that candidates apply their knowledge to practical situations, while “Critical thinking” questions require that candidates analyze complex situations and provide solutions.
Table 2. Description of Examination by Cognitive Level of Questions

<table>
<thead>
<tr>
<th>Cognitive Level</th>
<th>Percentage of Questions</th>
<th>Number of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>25-35%</td>
<td>26</td>
</tr>
<tr>
<td>Application</td>
<td>35-45%</td>
<td>45</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>25-35%</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100</td>
</tr>
</tbody>
</table>

As can be seen in Table 3, 25-35% of exam questions have an image (e.g., a graphic, figure, table, or a schematic).

Table 3. Description of Examination by Images

<table>
<thead>
<tr>
<th>Images</th>
<th>Percentage of Questions</th>
<th>Number of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions with Images</td>
<td>25-35%</td>
<td>25</td>
</tr>
<tr>
<td>Questions without Images</td>
<td>65-75%</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100</td>
</tr>
</tbody>
</table>

Study Resources for Examination

The following resources may be of use to candidates interested in refreshing their knowledge prior to writing the examination. **Candidates are not expected to study each of these resources as the certification exam is designed to test entry-level competencies related to the practice of instrumentation engineering technology.** Rather, candidates may wish to review particular content areas in which they feel they would like to update their current knowledge. For detailed information on the content areas covered on the exam, candidates should refer to **Appendix A**.


National Occupational Analysis (NOA). (2013). Instrumentation and Control Technician. [http://www.red-seal.ca/trades/instrumentcntltech/2013n.4.1__4v.2rv.3.2w-eng.html](http://www.red-seal.ca/trades/instrumentcntltech/2013n.4.1__4v.2rv.3.2w-eng.html)


Practice Exam for Purchase

Practice exam questions are available for purchase through Yardstick. As these questions are hosted by a third-party educational partner, candidates will need to create a new account to access the practice exam. This login is not associated with the candidate’s ASET ID.

Available practice exams:
- One time attempt of 25 questions*
- Three attempts of the 25 questions*

* The practice exam questions are the same for either option above. The questions will not change in the three attempt option or if the candidate purchases more practice exams at a later date. The three attempt option is suitable for candidates who may be studying together for the exam or a candidate who wishes to test themselves on the same questions multiple times.

Day of Examination

Admission to the Examination Centre

ASET, CTTAM, and ASTTBC provide Yardstick with a list of examination candidates for each exam sitting. When an exam appointment is made, candidates will receive a booking confirmation email from Yardstick. It is important that candidates bring this email with them to an examination center on the day of the examination.

Upon entering the examination center, candidates will be asked to register with the proctor. The following information will need to be provided to the proctor.

- Candidate’s first and last name (must match candidate’s registration as submitted by ASET, CTTAM, or ASTTBC)
- Valid government-issued photo ID (not expired)
- Candidate’s printed confirmation email as provided by Yardstick

After the initial verification of identity, candidates will be asked to sign a roster.

Candidates’ personal belongings, such as bags and jackets, will be stored in a designated area. Electronic devices, including but not limited to cell phones, tablets, and reference books, may not under any circumstances be brought into the exam center. The only exception to this rule is personal calculators. The proctor is responsible for inspecting candidate’s calculators prior to the exam.
Permissible Items

- Disposable ear plugs (provided by candidate)
- Scrap paper and pencils will be provided by the proctor to the candidates before the exam (if requested) and collected after the exam
- Approved calculator (see policy below)
- Formula sheet (provided by the proctor at the examination)

Prohibited Items

- Electronic devices (i.e., cell phones, pagers, digital assistants etc.)
- All types of food and beverages
- Unauthorized examination aids, assistance or collaboration materials

Calculator Policy

- Candidates can bring in a Scientific Calculator that is non-programmable, non-graphing and have no memory storage capabilities.
- Please review the Calculator Policy prior to examination day. It contains a list of approved and non-approved calculator models
- It is highly recommended that the candidate bring their own calculator as the centre does not have any on site.
- It is the candidate’s responsibility to ensure their calculator is approved prior to the exam, either by being indicated on the approved list or by obtaining approval from ASET, CTTAM, or ASTTBC. If a candidate does not obtain approval prior to the exam, their calculator may be deemed inadmissible and prohibited from the exam.

Taking the Exam

At the beginning of the examination, candidates will hear verbal examination instructions from the proctor and read the Candidate’s Statement of Understanding and/or Non-disclosure Agreement in the software. Failure to comply with the regulations outlined in these documents will result in the candidate’s results being invalidated. Candidates will not be able to begin the examination without agreeing to the conditions outlined in the document. The assigned Yardstick ID and chosen password will be used to log in when prompted by the proctor.

Next, candidates will be given written exam instructions in the software. These exam instructions will emphasize the fact that some exam questions contain images and/or require calculations. If the images appear too small on the screen, candidates will be advised to hover their mouse over them to get an expanded view. Following the exam instructions, there will be a tutorial available to candidates before they proceed to the exam.

Upon submitting their exam responses, candidates will be offered an opportunity to provide feedback on exam material and exam administration conditions by completing a short online survey. Results of the exam are not provided to the candidates at this time. Candidates will then submit their scrap paper to the proctor, sign out from the candidate roster, and leave the examination centre.
After the Examination

Examination Scoring

Multiple-choice examination questions are scored dichotomously, using a score of “0” for an incorrect response and a score of “1” for a correct response. The Technologist Certification Examinations are criterion-referenced exams, which means that a candidate should obtain a score that is equal or higher than an exam pass mark to pass the examination.

Pass Mark

Each Certification Examination has its own pass mark. The pass mark for the Instrumentation Technologist Certification Examination was determined by the Exam Committee, which took into account the difficulty of exam questions and the expected level of performance for a minimally competent engineering technologist. A psychometrically acceptable standard-setting methodology was used to set examination pass marks. ASET does not publish the examination pass marks due to the variation between exam forms.

Results

Candidates are emailed their exam results within two to three weeks after the exam date. Exam results are reported to the candidate as “pass” or “fail”.

Unsuccessful candidates will also receive a performance report indicating a failure to pass, their score, and areas of strength and weakness in the four tested competency areas. The unsuccessful candidates will be able to retake the exam. Please refer to the Rewrite Policy section in this handbook to schedule the next exam.

Review and Appeal Process

A candidate who fails the Certification Examination may request that their exam score be verified. Due to the automated scoring and extensive quality control procedures, errors in scoring are extremely unlikely. However, candidates may request that ASET, CTTAM, or ASTTBC manually rescore their exam to verify the original score. The candidate will be responsible for any expenses incurred during the review and appeals process.
Appendix A: Instrumentation Technologist Professional Competencies

Role Description

Entry-level Instrumentation Engineering Technologists collect data for analysis of process control systems and interpret, create or maintain instrumentation documents (e.g., basic P&IDs, loop diagrams, data sheets, and logic drawings). Working under supervision, they diagnose basic technical problems and provide basic solutions based on reliable measurement and sound knowledge of physics, electronics, and computer-based systems. In addition,

<table>
<thead>
<tr>
<th>Competency Name:</th>
<th>Technical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competency Definition:</td>
<td>Apply knowledge of instrumentation technology to assessment of measurement, control, and automation of process applications.</td>
</tr>
<tr>
<td>Competency Indicators</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Competency Indicators</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------</td>
</tr>
<tr>
<td>1.1</td>
<td>Explain the principles of operation and application of instruments for measurement of pressure, level, temperature, flow, weight, and density.</td>
</tr>
<tr>
<td>1.2</td>
<td>Explain the principles and operation of analytical instruments for measurement of chemical composition, chemical detection, and vibration.</td>
</tr>
<tr>
<td>1.3</td>
<td>Explain the principles and operation of final control elements, including control and on-off valves.</td>
</tr>
<tr>
<td>1.4</td>
<td>Describe common control processes (e.g., temperature, pressure, flow, and level).</td>
</tr>
<tr>
<td>1.5</td>
<td>Describe the difference between continuous and batch control processes.</td>
</tr>
<tr>
<td>1.6</td>
<td>Describe different types of control strategies (e.g., cascade, ratio, split range, and low/high select).</td>
</tr>
<tr>
<td>1.7</td>
<td>Describe the principles of proportional, integral, and derivative (PID) control and their effects on the control loop.</td>
</tr>
<tr>
<td>1.8</td>
<td>Recognize situations with control loops that require tuning (e.g., feedback lag and dead band).</td>
</tr>
<tr>
<td>1.9</td>
<td>Describe the effects of analog to digital and digital to analog conversion on the accuracy and resolution of measurement.</td>
</tr>
<tr>
<td>1.10</td>
<td>Identify and describe basic control loop components.</td>
</tr>
<tr>
<td>1.11</td>
<td>Assess issues with a basic feedback control loop (e.g., final control element performance, process disturbance, and set point change).</td>
</tr>
<tr>
<td>1.12</td>
<td>Perform testing of control loops.</td>
</tr>
<tr>
<td>1.13</td>
<td>Interpret control documentation (e.g., P&amp;IDs, installation drawings, wiring diagrams, data sheets, shut-down key, logic drawings, and control-loop diagrams).</td>
</tr>
<tr>
<td>1.14</td>
<td>Obtain technical data from vendors, equipment manuals, technical specifications, and standards.</td>
</tr>
<tr>
<td>1.15</td>
<td>Examine historical data from instruments to validate measurements, diagnose issues, and/or determine corrective actions (e.g., asset management, alarm diagnostics, and frequency of data collection).</td>
</tr>
<tr>
<td>1.16</td>
<td>Use calculations to validate instrument measurements (e.g., differential pressure level calculations, scaling signals for different ranges, number conversions from decimal to binary to hexadecimal).</td>
</tr>
<tr>
<td>1.17</td>
<td>Verify instrument measurements against measurement standards</td>
</tr>
</tbody>
</table>
1.18 Describe simple network topologies, devices, and access methods used in industrial communication protocols.

1.19 Identify common types of communication protocols and their components (e.g., HART, Fieldbus, Modbus).

1.20 Identify the principles of PLC and DCS operation.

1.21 Distinguish between hydraulic and pneumatic controlled systems.

1.22 Interpret flow diagrams in pneumatic and hydraulic systems.

1.23 Explain the structure and operation of a safety instrumentation system (SIS).

**Competency Name:**

**Technical Design**

**Competency Definition:**

Specify, design, and/or modify instrumentation for measurement, control, and automation of various process applications in accordance with technical specifications, client requirements, and applicable codes and regulations.

<table>
<thead>
<tr>
<th>#</th>
<th>Competency Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Identify applicable codes and standards to follow in the design and selection of instrumentation (e.g., CSA, ISA, ANSI, Canadian Electrical Code, ABSA).</td>
</tr>
<tr>
<td>2.2</td>
<td>Identify regulations related to measurement accuracy and traceability (e.g., ISO and ASTM).</td>
</tr>
<tr>
<td>2.3</td>
<td>Size, specify and select appropriate control and on-off valves.</td>
</tr>
<tr>
<td>2.4</td>
<td>Size, specify and select appropriate measurement instruments (e.g., flow, pressure, temperature, level).</td>
</tr>
<tr>
<td>2.5</td>
<td>Distinguish between safety instrument systems (SIS) and non-SIS (e.g., safety integrity level (SIL), safety PLC, and safety instrument function).</td>
</tr>
<tr>
<td>2.6</td>
<td>Describe the operation of basic series and parallel circuits (e.g., DC, AC).</td>
</tr>
<tr>
<td>2.7</td>
<td>Select appropriate I/O hardware for a PLC and DCS control system.</td>
</tr>
<tr>
<td>2.8</td>
<td>Develop a logic program for a DCS, RTU, or PLC.</td>
</tr>
<tr>
<td>2.9</td>
<td>Develop a closed loop for process control.</td>
</tr>
<tr>
<td>2.10</td>
<td>Develop simple control loops for process control (e.g., low select, on-off, and ratio control loops).</td>
</tr>
<tr>
<td>2.11</td>
<td>Perform functional testing. (e.g., control loops, analytical instrumentation)</td>
</tr>
<tr>
<td>2.12</td>
<td>Explain when and where isolators, shielding, and grounding are required.</td>
</tr>
<tr>
<td>2.13</td>
<td>Assist in the development of procedures for calibration, loop function testing, logic testing and commissioning of instrumentation systems.</td>
</tr>
<tr>
<td>2.14</td>
<td>Create or modify control system documentation, such as P&amp;ID, instrument index, loop diagrams, data sheets, specification forms, and location plans.</td>
</tr>
<tr>
<td>2.15</td>
<td>Identify ways to reduce electromagnetic interference for instrumentation signals.</td>
</tr>
<tr>
<td>2.16</td>
<td>Select proper material for instrumentation in accordance with process conditions and environment (e.g., NACE, ISA, CEC).</td>
</tr>
</tbody>
</table>
**Competency Name:**

**Technical Evaluation**

**Competency Definition:**

Install, calibrate, troubleshoot, maintain and evaluate the performance of pneumatic, hydraulic, digital, and electronic equipment in industrial and field environments in accordance with technical specifications, client requirements, and applicable codes and regulations.

<table>
<thead>
<tr>
<th>#</th>
<th>Competency Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Commission a controller for a basic control strategy. (e.g., on/off controller, proportional controller, PID controller)</td>
</tr>
<tr>
<td>3.2</td>
<td>Troubleshoot various configurations in a basic control system.</td>
</tr>
<tr>
<td>3.3</td>
<td>Troubleshoot digital (or smart) instruments using the appropriate communications protocol.</td>
</tr>
<tr>
<td>3.4</td>
<td>Troubleshoot control systems (e.g., PLCs and DCS).</td>
</tr>
<tr>
<td>3.5</td>
<td>Perform equipment inspection in an industrial environment.</td>
</tr>
<tr>
<td>3.6</td>
<td>Troubleshoot system components (e.g., input/output cards, and power supply).</td>
</tr>
<tr>
<td>3.7</td>
<td>Complete system-level testing (e.g., SAT and FAT).</td>
</tr>
<tr>
<td>3.8</td>
<td>Calibrate measurement instruments (e.g., level, pressure, flow, and temperature systems) using appropriate test standards and equipment.</td>
</tr>
<tr>
<td>3.9</td>
<td>Describe the principles of signal and shield grounding and their effects on signal measurement and/or control loops.</td>
</tr>
<tr>
<td>3.10</td>
<td>Perform tuning of simple control loops.</td>
</tr>
<tr>
<td>3.11</td>
<td>Assist in changing hardware in an industrial network.</td>
</tr>
<tr>
<td>3.12</td>
<td>Install hydraulic, pneumatic, and digital instruments (e.g., transducers, transmitters, control valves, switches, measuring devices, process analyzers, relays, alarm panels, and thermocouples).</td>
</tr>
<tr>
<td>3.13</td>
<td>Maintain hydraulic, pneumatic, and digital instruments (e.g., transducers, transmitters, control valves, switches, measuring devices, process analyzers, relays, alarm panels, and thermocouples).</td>
</tr>
</tbody>
</table>

**Competency Name:**

**Project Management**

**Competency Definition:**

Assist in the management of projects to ensure high quality of deliverables, customer satisfaction, and adherence to codes, project schedules and budgets.

<table>
<thead>
<tr>
<th>#</th>
<th>Competency Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Research equipment or component needs, sources, competitive prices, delivery times, or operational costs.</td>
</tr>
<tr>
<td>4.2</td>
<td>Assist in the identification of client's objectives and application requirements.</td>
</tr>
<tr>
<td>4.3</td>
<td>Prioritize own work activities to ensure that project objectives are met on time and on budget.</td>
</tr>
<tr>
<td>4.4</td>
<td>Assist in estimating costs, materials, quantities and resources required for projects.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>4.5</strong></td>
<td>Quantify one’s work that is completed to-date.</td>
</tr>
<tr>
<td><strong>4.6</strong></td>
<td>Report changes in own scope of work to the appropriate authorities.</td>
</tr>
<tr>
<td><strong>4.7</strong></td>
<td>Establish and maintain effective working relationships with internal and external clients.</td>
</tr>
<tr>
<td><strong>4.8</strong></td>
<td>Explain the value of workplace safety legislation.</td>
</tr>
<tr>
<td><strong>4.9</strong></td>
<td>Comply with workplace safety legislation.</td>
</tr>
</tbody>
</table>