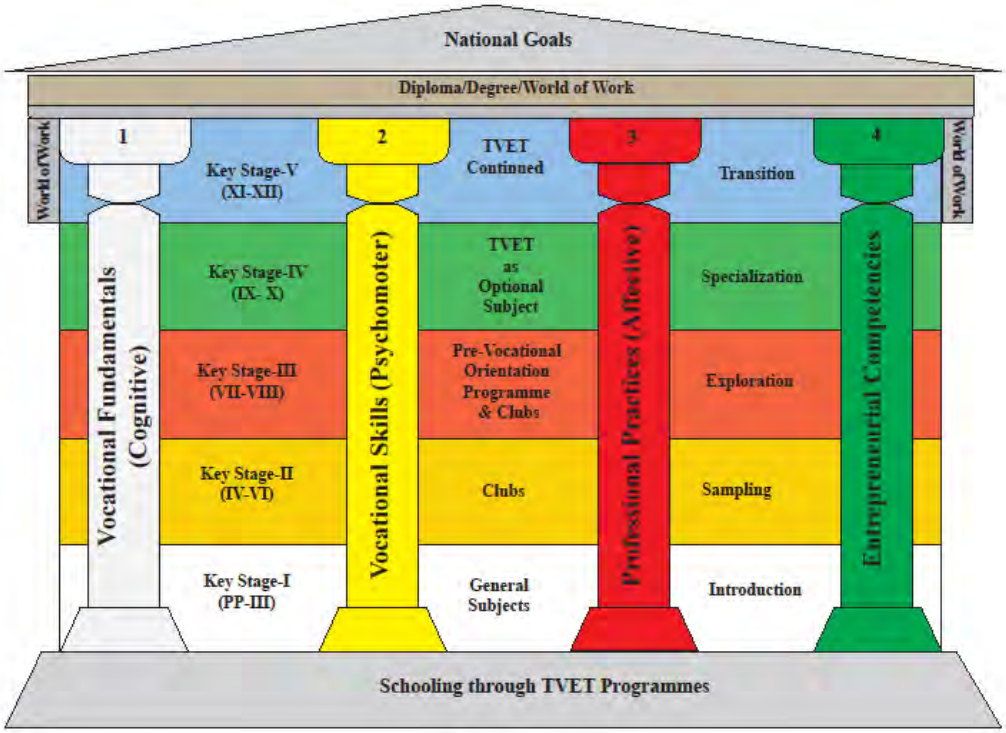
# TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET)

## NEW NORMAL CURRICULUM

## INSTRUCTIONAL GUIDE

## (WELDING)

## CLASS: IX




# Royal Education Council

# Paro: Bhutan

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# FOREWORD

COVID-19 has suddenly caused unforgiving disruptions in the public education all over the world, and brought about threats of fragmentation due to disparities in accessibility and connectivity in many systems. In Bhutan too, continuity of education and learning has been severely affected as a result of nationwide school closures and due to restrictions and health protocols. The disruptions have led to challenges in many existing patterns and trends in education resulting in a massive shift away from learning and teaching in traditional settings with physical interactions to the maximum in terms of relevancy and efficiency. This has caused a major problem for children living in poverty worldwide, who often rely on the physical settings of their schools for educational materials, guidance, and, sometimes, the only decent meal of the day.

In the new normal education, human interaction and well-being is a priority. Technology, particularly digital technology that enables communication, collaboration and learning across distance, is a formidable tool – not a panacea but a source of innovation and expanded potentials. As we embrace this exceptional opportunity to transform the world, and as we reimagine the organization of our educational institutions and learning environments, we will need to think about where we want to go.

In the post COVID 19 era, we must prioritize the development of the whole person not just academic knowledge. Inspiration for the change can be drawn from the 1996 Delors report, *Learning the treasure within*, in its specification of four pillars of learning as "learning to know", "to do", "to be", and "to live together". Therefore, curricula must be increasingly perceived as an integrated and based on themes and problems that allows learners to learn to live in peace with our common humanity and our common planet. This has the potential in the development of a strong base of knowledge about one's self and about the world and find purpose and be better able to participate in social and political milieu.

The New Normal Curriculum is, not just a mere response to the pandemic, but also a culmination of the curriculum reform work for the last four years by the Royal Education Council. It is an attempt to transform education from the teaching of "what" to learning of "how" and "why" towards empowering learners with the transversal competencies and the 21st century skills, and preparing them to be lifelong learners. We are optimistic that this move orients our education process towards nurturing nationally rooted and globally competent citizens.

Wish all our learners and teachers a life enriching experiential teaching and learning.

**Kinga Dakpa,**

**Director General**

# INTRODUCTION

Technical and Vocational Education and Training (TVET) is education and training which provides knowledge and skills for employment. It comprises of education, training and skills development related to a wide range of occupational fields, production, services and livelihood. The Royal Education Council and Ministry of Education envisage that the TVET curriculum has a place in the mainstream education system, as it is the case in most of the education systems of the developed world. The formal Technical and Vocational Education and Training (TVET) began in 1965 at Don Bosco Technical School (DBTS), in Kharbandi (presently known as Rinchending) in Phuntsholing. Even after that, major curriculum reform was planned by the then Department of Curriculum Research and Development (DCRD) under the Ministry of Education in an attempt to make education relevant to the Bhutanese society through diversification of Secondary Education Curriculum in the schools, which included the introduction of TVET.

As per 'National Education Framework' developed collaboratively by the Royal Education Council (REC) and the Ministry of Education (MoE), it provides a pathway on integrating technical/vocational education in the mainstream school education curriculum and as elective subjects in higher classes (NEF, 2009; page 64).

With the collaborative efforts of the Ministry of Labour and Human Resources and the erstwhile Department of Curriculum Research and Development under Ministry of Education, Vocational Curriculum has been introduced in the schools with assistance from TTIs since 2011. After the first MoU that was signed between MoE and MoLHR in 2011, the second MoU was signed again in 2014, to improve technical/vocational courses. The technical/vocational courses offered by the TTIs/IZCs are adapted and redesigned and are offered in schools aligning to the 'Bhutan Education Blue Print' 2014-2024, which recommends upscaling and diversification of TVET in schools through the provision of alternative pathways in schools and the tertiary education systems, owing to the limited access to such courses, despite the growing demand for technical skills in the country.

The resolutions of the National School Curriculum Conference 2016, also strongly emphasised the need to upscale and deepen TVET. Accordingly, the TVET framework is developed from classes PP to XII, schools equipped with necessary resources and instructors trained. Tripartite MoU among REC, MoE and MoLHR was also signed in 2018 to implement the programmes collaboratively.

Although the TVET curriculum is competency based with more emphasis on hands-on experience, further improvements have been made taking care of cognitive and affective domains besides psychomotor. Teaching and learning approaches have also been enriched with the recommendation to use ICT and online resources. Since the pandemic (COVID-19) has resulted in the closure of schools, it has taught us lessons to be prepared for such an untoward situation in the future. Thus, the New Normal Curriculum Instructional Guide is prepared not only to encourage blended learning but also to facilitate remote learning. Thus, the guide would help the schools to implement the curriculum effectively without limiting to contact teaching/learning besides using a variety of pedagogies.

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# MODULE 1: PERFORMING ARC WELDING

## Chapter 1: Practicing Occupational Health and Safety (OHS)

### A. Learning objectives/Broad theme / Strand/Chapter:

| Learning objectives | Core concepts (Chapters/Topics) |
|---|---|
| 1.1.1 Define 5S.<br>1.1.2 State the purposes of 5S.<br>1.1.3 Explain the principles of 5S<br>1.1.4 Define OHS.<br>1.1.5 State the importance of OHS.<br>1.1.6 Explain the rights of the employee.<br>1.1.7 State the main causes of accidents.<br>1.1.8 Explain the safety rules.<br>1.1.9 Apply Principles of 5S<br>1.1.10 *Ensure appropriate use of PPE*<br>1.1.11 *Ensure to refer OHS manual* | **1.1 Applying Principles of 5S** |

### B. Competencies:

i. Practice OHS procedures in any task for safety

### C. Pedagogy/Learning Experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.1 of CBLM.
  - ✓ Share the web link https://youtu.be/n9sxq34D9HQ that explains the principles of 5S.
  - ✓ Provide handouts to learners.
  - ✓ Let the learners perform OPERATION SHEET 1.1 of CBLM.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1.
- **Non-contact:**
  - ✓ Instruct learners to read INFORMATION SHEET 1.1 and perform OPERATION SHEET 1.1 of CBLM for classes IX through Google Classroom. (The learners may arrange available tools and materials at home)
  - ✓ Provide handouts to learners through Google Classroom or any other social media platforms.
  - ✓ Share the web link https://youtu.be/n9sxq34D9HQ that explains the principles of 5S.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1 and provide additional questions referring to CBLM.

### D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.1 and their conceptual understanding of 5S looking at their performance using rubrics
  - ✓ Assess the responses of the SAMPLE SELF CHECK 1.1 and given additional questions.

- **Non-contact:**
  - ✓ Assess the short video sent by the learner in the Google Classroom or any other social media platforms using the OPERATION SHEET 1.1.
  - ✓ Assess the learners' responses to the SAMPLE SELF CHECK 1.1 uploaded through Google Classroom or any other social media platforms.

E. **Resources (online and offline):**

- Competency-Based Learning Materials for Class IX.
- PPT Handouts
- https://youtu.be/n9sxq34D9HQ (Explanation on principles of 5S)

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.2.1 Define PPE.<br>1.2.2 State the importance of PPE.<br>1.2.3 List the categories of PPE.<br>1.2.4 Use Personal Protective Equipment (PPE)<br>1.2.5 *Ensure to use appropriate PPE.*<br>1.2.6 *Ensure safe disposal of damaged PPE.*<br>1.2.7 *Ensure not to use defective and damaged PPE* | **1.2 Using Personal Protective Equipment (PPE)** |

**B. Competencies:**

i. Practice OHS procedures in any task for safety
ii. Use appropriate PPE in every task.

**C. Pedagogy/Learning experience**

- **Contact**:
  - ✓ Let the learners read INFORMATION SHEET 1.2.
  - ✓ Let the learners read and perform OPERATION SHEET 1.2
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1 and provide additional questions referring to CBLM.

- **Non-contact:**
  - ✓ Instruct the learners to read INFORMATION SHEET 1.2 and OPERATION SHEET 1.2.
  - ✓ Share the web link https://youtu.be/r9vp1q1L2ro that explains the PPE.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1 and provide additional questions referring to CBLM in Google Classroom.

**D. Assessment**

- **Contact:**
  - ✓ Assess learners' ability to understand the usage of PPE while performing OPERATION SHEET 1.2.
  - ✓ Assess the responses of the SAMPLE SELF CHECK 1.2 uploaded through Google Classroom.
- **Non-contact:**
  - ✓ Assess the responses of the SAMPLE SELF CHECK 1.2 and the given additional questions sent through Google Classroom or any other social media platforms.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX.
- https://youtu.be/r9vp1q1L2ro **(**Explanation on PPE**)**

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.3.1 Define safety precaution.<br>1.3.2 List the different types of safety.<br>1.3.3 Explain workshop and personal safety.<br>1.3.4 State the importance of maintaining a workplace and personal safety.<br>1.3.5 Explain the importance of safety signs and symbols.<br>1.3.6 Explain the emergency exit.<br>1.3.7 Describe the layout of the workshop.<br>1.3.8 Maintain workplace and personal safety<br>1.3.9 *Ensure to follow OHS procedures.*<br>1.3.10 *Ensure to keep the workshop clean.*<br>1.3.11 *Ensure to ring the alarm bell before the accident spreads over.*<br>1.3.12 *Ensure to display safety signs and symbols.*<br>1.3.13 *Ensure to use appropriate PPE in the workplace.*<br>1.3.14 *Ensure to avoid horseplay at the workplace.*<br>1.3.15 *Ensure to avoid smoking and eating inside the workshop.*<br>1.3.16 *Ensure to avoid working under influence of alcohol.* | **1.3 Maintaining workplace and personal safety** |

**B. Competencies:**

i. Maintain the workplace and personal safety as per the OHS standard.

**C. Pedagogy/Learning experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.3
  - ✓ Let the learners read and perform the OPERATION SHEET 1.3
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1 and provide additional questions referring to CBLM

- **Non-contact:**
  - ✓ Instruct the learners to read INFORMATION SHEET 1.3 and OPERATION SHEET 1.3 through Google Classroom.
  - ✓ Share the web link https://www.youtube.com/watch?v=4bkr5lpKGUM and https://www.youtube.com/watch?v=WW0U6o1XNec to explore the information on maintaining a workplace and personal safety.

- ✓ Let the learners solve SAMPLE SELF CHECK 1.1 and provide additional questions referring to CBLM and upload in Google Classroom.

**D. Assessment**

- **Contact:**
  - ✓ Assess learners' ability to apply appropriate workplace and personal safety using rubrics
  - ✓ Assess the learners' responses to the SAMPLE SELF CHECK 1.3 and the given additional questions.

- **Non-contact:**
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 1.3 and additional questions uploaded through Google Classroom.
  - ✓ Conduct viva test through Zoom, Meet, or any other social platforms and assess their conceptual understanding on maintaining a workplace and personal safety.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX.
- https://www.youtube.com/watch?v=4bkr5lpKGUM (Explanation on workplace safety)
- https://www.youtube.com/watch?v=WW0U6o1XNec (Explanation on safety tips)

## A. Learning objectives/Broad theme / Strand/Chapter:

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.2.1 Explain tools and equipment safety<br>1.2.2 State the importance of maintaining tools and equipment safety.<br>1.2.3 List the dos and don'ts of tools and equipment.<br>1.2.4 Maintain tools and equipment safety<br>1.2.5 *Ensure all the tools are in workable condition.*<br>1.2.6 *Ensure to keep tools clean and dry, and store them properly after use.*<br>1.2.7 *Ensure to operate the machine when instructed.*<br>1.2.8 *Ensure to refer manual before operation of tools and equipment.* | **1.4 Maintaining tools and equipment safety** |

## B. Competencies:

i. Maintain hand tools and portable power tools for better performance
ii. Maintain the tools and equipment to increase the efficiency.

## C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read the INFORMATION SHEET 1.4
  - ✓ Share the web link http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php to supplement the tools and equipment safety.
  - ✓ Let the learners in a peer discuss Do's and Don'ts for tools and equipment and present to the whole class.
  - ✓ Let the learners perform OPERATION SHEET 1.4 on maintaining tools and equipment safety.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.4.

- **Non-contact:**
  - ✓ Let the learners read the INFORMATION SHEET 1.4 and OPERATION SHEET 1.4.
  - ✓ Share the web link http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php that shows additional DOs and DON'Ts of hand tools.
  - ✓ Instruct learners to watch a video on the web link https://youtu.be/jovscTSq-mg on the tools and equipment safety shared in Google Classroom.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.4.

**D. Assessment**

- **Contact:**
  - ✓ During the peer presentation, let the learners provide constructive feedback among themselves.
  - ✓ Assess the learners' ability to maintain tools and equipment safety using a rubric.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 1.4 and the given additional questions.

- **Non-contact:**
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 1.4 and additional questions uploaded through Google Classroom.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX
- http://www.ehsdb.com/dos-and-donts--hand-tools-equipments.php (Articles on Do's and Don'ts of hand tools)
- https://youtu.be/jovscTSq-mg (Explanations on tools and equipment safety)

## A. Learning objectives/Broad theme/Chapters/Topics:

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.2.1 Define fire extinguisher.<br>1.2.2 Label the parts of a fire extinguisher.<br>1.2.3 Explain types/classes of fire.<br>1.2.4 List the types of fire extinguishers.<br>1.2.5 State the methods of combating/extinguishing fires.<br>1.2.6 Use fire extinguisher<br>1.2.7 *Ensure to read the instructions provided on the fire extinguisher.*<br>1.2.8 *Ensure appropriate use of PPE.* | **1.5 Using fire extinguisher** |

## B. Competencies:

i) Operate and use different fire extinguishers to combat different classes of fires.

## C. Pedagogy/Learning Experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.5
  - ✓ Let the learners read the procedures of OPERATION SHEET 1.5 step by step while the instructor demonstrates the procedure to combat the fire.
  - ✓ Let the learners in a group practice followed by individual practice.
  - ✓ Share the web link https://www.youtube.com/watch?v=PQV71INDaqY to explore the methods on how to use the fire extinguisher to combat a fire.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.5.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.5
  - ✓ Share the web link https://www.youtube.com/watch?v=PQV71INDaqY to explore the methods on how to use the fire extinguisher to combat a fire.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.5.

## D. Assessment

- **Contact:**
  - ✓ Assess learners' conceptual understanding of fire extinguishers by conducting quizzes in the class.
  - ✓ Assess the learners' performance on OPERATION SHEET 1.5 and provide guided practice while performing in groups and individually.
  - ✓ Assess the learners' responses to the SAMPLE SELF CHECK 1.5.

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of fire extinguishers by conducting quiz in the Google Classroom
  - ✓ Assess the learners' responses to the SAMPLE SELF CHECK 1.5 uploaded in Google Classroom.

**E. Resources (online and offline):**

- Competency-Based Learning Materials for Class IX
- https://www.youtube.com/watch?v=PQV71INDaqY (Explanation on methods to combat fire )

## Chapter 2: Setup arc welding

### A. Learning objectives/Broad theme / Strand/Chapter:

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 2.1.1 Define voltage, current, resistance, and their unit.<br>2.1.2 Identify the conductor, insulator, and parallel circuits.<br>2.1.3 Explain the differences between AC & DC.<br>2.1.4 Explain the electrical phases.<br>2.1.5 Explain the capacity and functions of MCB.<br>2.1.6 Perform the basic electrical connection<br>*2.1.7 Use tester.*<br>*2.1.8 Ensure proper handling of tools, equipment, and material.*<br>*2.1.9 Ensure the main supply switch is off while performing an electrical connection.*<br>*2.1.10 Ensure the electrical connection is free from water.* | **2.1 Performing the basic electrical connection** |

### B. Competencies:

i. Carry out arc welding for any task.
ii. Set up the welding connection as per the standard procedures.

### C. Pedagogy/Learning experience:

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.1.
  - ✓ Demonstrate how to use tester referring to the procedures of SKILL SHEET 2.1.
  - ✓ Let one member performs the use of a tester to the group members.
  - ✓ Demonstrate the connection of the arc welding machine to the learners referring to the OPERATION SHEET 2.1.
  - ✓ The learners in the peer perform the connection of the welding machine and provide guided practice by the instructor.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.1.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.1, SKILL SHEET 2.1, and OPERATION SHEET 2.1.
  - ✓ Share the web link https://youtu.be/uHARk4xQLTc to further clarify the connection of welding set up.

- ✓ Provide handouts on AC and DC.
- ✓ Let the learners solve SAMPLE SELF CHECK 2.1.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 2.1 AND SKILL SHEET 2.1.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 2.1.

- **Non-contact:**
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 2.1 uploaded in Google Classroom or any other social media platforms.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX
- Handouts
- https://youtu.be/uHARk4xQLTc (Demonstration on the basic connection of arc welding machine)

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning Objectives | Core concepts(Chapters/Topics) |
|---|---|
| 2.2.1 Define Arc welding.<br>2.2.2 Describe the arc welding machine.<br>2.2.3 List different types of welding machines.<br>2.2.4 Explain arc welding accessories and their function.<br>2.2.5 Explain the working principle of the welding machine.<br>2.2.6 State the current carrying capacity of the welding machine.<br>2.2.7 Set up the arc welding machine<br>*2.2.8 Use spanner/wrench.*<br>*2.2.9 Ensure appropriate use of PPE.*<br>*2.2.10 Ensure the main supply switch and the machine are properly earthed.*<br>*2.2.11 Ensure to safeguard against work hazards.* | **2.2 Setting up the arc welding machine** |

**B. Competencies:**

i. Carry out arc welding for any task
ii. Set up arc welding machines are as per the job requirement.

**C. Pedagogy/Learning experiences**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.2.
  - ✓ Demonstrate the use of spanner or wrench referring to SKILL SHEET 2.2.
  - ✓ Demonstrate the setup of the arc welding machine to the learners referring to the OPERATION SHEET 2.2.
  - ✓ Let the learners perform SKILL SHEET 2.2 AND OPERATION SHEET 2.2.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.2.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.2, SKILL SHEET 2.2, and OPERATION SHEET 2.2.
  - ✓ Share the web link https://youtu.be/QZdY3ZRY9RA to understand the parts of welding setup and basic connections.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.2.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance on SKILL SHEET 2.2 and OPERATION SHEET 2.2 using Checklist.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 2.2

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of the working principle of welding machines by conducting the online test.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.2 uploaded in Google Classroom.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX.
- https://youtu.be/QZdY3ZRY9RA (Shows the parts of welding set up and basic connections).

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 2.3.1 Define electrical terms.<br>2.3.2 Explain all safety measures associated with the test operation of the welding machine.<br>2.3.3 Test operation of welding machine<br>*2.3.4 Ensure appropriate use of PPE.*<br>*2.3.5 Ensure the electrode holder does not contact with earth cable when the machine is in ON mode.* | **2.3 Testing operation of welding machine** |

**B. Competencies:**

**i.** Test the welding machine as per the standard procedure**.**

**C. Pedagogy/Learning experiences**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.3.
  - ✓ Demonstrate how to locate and rectify the fault referring to OPERATION SHEET 2.3.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.3.

- **Non-contact**:
  - ✓ Let the learners read INFORMATION SHEET 2.3 and OPERATION SHEET 2.3.
  - ✓ Share the web link https://youtu.be/o0OX6ZJoQdY to understand the welding hazards and safety precautions.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.3.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 2.3.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.3.

- **Non-contact:**
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.3.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX.
- https://youtu.be/o0OX6ZJoQdY (Explanation on the welding hazards and safety)

## Chapter 3: Carry out arc welding

### A. Learning objectives/Broad theme / Strand/Chapter:

| Learning objectives | Core concepts(Chapter/Topic) |
|---|---|
| 3.1.1 Explain basic metallurgy.<br>3.1.2 Explain the types of edge preparation and their purposes.<br>3.1.3 State the types of files, their functions, and classification.<br>3.1.4 Identify the types of hacksaw and their functions.<br>3.1.5 Describe a high-speed cutter.<br>3.1.6 Describe the angle grinder.<br>3.1.7 Prepare base metal<br>3.1.8 *Use hacksaw.*<br>3.1.9 *Use a high-speed cutter.*<br>3.1.10 *Use file.*<br>3.1.11 *Use angle grinder.*<br>*3.1.12 Ensure safe handling of tools, materials, and equipment.*<br>*3.1.13 Ensure proper disposal of waste material.*<br>*3.1.14 Ensure appropriate use of PPE.* | **3.1 Preparing base metal** |

### B. Competencies:

i. Maintain hand tools and portable power tools for better performance.

### C. Pedagogy/learning experience:

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.1.
  - ✓ Share the web links https://youtu.be/kMqKHr9yxqE and https://youtu.be/FKXeiRaox1k to carry out the cutting and finishing.
  - ✓ Demonstrate how to use a hacksaw, high-speed cutter file, and angle grinder referring to SKILL SHEET 3.1a, 3.1b, 3.1c, 3.1d, and OPERATION SHEET 3.1.
  - ✓ Let the learners perform all the SKILL SHEETS and OPERATION SHEET 3.1.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.1

- **Non-contact:**
  - ✓ Let the learners read information sheet 3.1.
  - ✓ Share the web links https://youtu.be/kMqKHr9yxqE and https://youtu.be/FKXeiRaox1k to carry out the cutting and finishing.
  - ✓ Let the learners take notes from the links and INFORMATION SHEET 3.1.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.1.

## D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance referring to SKILL SHEET 3.1a, 3.1b, 3.1c, 3.1d, and OPERATION SHEET 3.1.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.1.

- **Non-contact:**
  - ✓ Assess the learners' notes by developing rubrics.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.1 uploaded in Google Classroom.

## E. Resources(online and offline):

- Competency-Based Learning Materials for Class IX.
- https://youtu.be/kMqKHr9yxqE (Explanation on the hacksaw and how to use it )
- https://youtu.be/FKXeiRaox1k (Explanation on hand files and how to use them correctly)

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 3.2.1 Demonstrate the technique to align base metal.<br>3.2.2 Explain the distortion preventive measures.<br>3.2.3 Align the workpiece<br>*3.2.4 Use jigs and fixtures.*<br>*3.2.5 Ensure proper use of jigs and fixtures.*<br>*3.2.6 Ensure proper alignment of the workpiece.* | **3.2 Aligning the workpiece** |

**B. Competencies:**

i. Align the workpiece as per the required angle.

**C. Pedagogy/learning experience:**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.2.
  - ✓ Share web link https://youtu.be/CA3GnfImGmw or relevant materials (downloaded digital content, articles, etc.) that describe the different methods of aligning the workpiece can be shared with the learners.
  - ✓ Demonstrate SKILL SHEET 3.2and OPERATION SHEET 3.2.
  - ✓ Let the learners perform SKILL SHEET 3.2 and OPERATION SHEET 3.2
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.2.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.2.
  - ✓ Share web link https://youtu.be/CA3GnfImGmw or relevant materials (downloaded digital content, articles, etc.) that describe the different methods of aligning the workpiece can be shared with the learners.
  - ✓ Let the learners' take notes from the video and information sheet.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.2.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance referring to SKILL SHEET 3.2 and OPERATION SHEET 3.2
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.2.

- **Non-contact:**
  - ✓ Assess the learners' notes gathered based on the information obtained from the web link or relevant materials.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.2.

**E. Resources(online and offline):**

- Competency-Based Learning Materials for Class IX.
- https://youtu.be/CA3GnfImGmw (Describes the different methods of aligning the workpiece)

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning Objectives | Core concepts(Chapters/Topics) |
|---|---|
| 3.2.1 Explain the striking of an arc.<br>3.2.2 Explain the types of striking method.<br>3.2.3 Define arc length.<br>3.2.4 Explain different types of arc length and its effect.<br>3.2.5 Explain the current setting and its importance.<br>3.2.6 Maintain arc length<br>*3.2.7 Ensure to maintain the correct arc length.*<br>*3.2.8 Ensure proper handling of electrode and electrode holder.*<br>*3.2.9 Ensure to maintain the exhaust system in the workshop.*<br>*3.2.10 Ensure appropriate use of PPE.* | **3.3 Maintaining arc length** |

**A. Competencies:**

i. Select the electrode as per the job requirement.

**B. Pedagogy/Learning Experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.3.
  - ✓ Share the web links https://youtu.be/AU9KEKJ2tVI and https://youtu.be/KHDDtFgF2YU to understand more on types of arc length and methods to produce an electric arc.
  - ✓ Demonstrate maintaining arc length referring to OPERATION SHEET 3.3.
  - ✓ Let the learners perform OPERATION SHEET 3.3.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.3.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.3.
  - ✓ Share the web links https://youtu.be/AU9KEKJ2tVI and https://youtu.be/KHDDtFgF2YU to understand more on types of arc length and methods to produce an electric arc.
  - ✓ Let the learners watch videos from the web link https://youtu.be/AU9KEKJ2tVI and https://youtu.be/KHDDtFgF2YU and take notes from the video and submit it in the Google classroom forum or any other social media platforms.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.3.

## C. Assessment

- **Contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 3.3.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.3.

- **Non-Contact:**
  - ✓ Assess the learners' notes using standard rubrics.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.3.

## D. Resources (online and offline)

- Competency-Based Learning Materials for Class IX
- Handout
- https://youtu.be/AU9KEKJ2tVI (Explanation on the types of arc length)
- https://youtu.be/KHDDtFgF2YU (Explanation on the method of a striking electric arc)

**A. Learning objectives/Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 3.2.1 Explain electrode angle and its importance.<br>3.2.2 State the types and coding of the electrode.<br>3.2.3 Identify welding symbols and their application.<br>3.2.4 Maintain electrode angle<br>*3.2.5 Ensure efficient use of electrodes.*<br>*3.2.6 Ensure proper handling of electrode and electrode holder.*<br>*3.2.7 Ensure appropriate use of PPE.* | **3.4 Maintaining electrode angle** |

**B. Competencies:**

i. Maintain an electrode angle at 75 degrees.
ii. Maintain weld bead uniformly in all the welded materials.

**C. Pedagogy/learning experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.4.
  - ✓ Share web links https://youtu.be/cQqsWpgtgMI and https://youtu.be/gAyceJb5OWc to understand more on electrode coding and welding symbols.
  - ✓ Demonstrate maintaining electrode angle referring to OPERATION SHEET 3.4.
  - ✓ Let the learners perform OPERATION SHEET 3.4.
  - ✓ Let the learners' solve SAMPLE SELF CHECK 3.4.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.4.
  - ✓ Share web links https://youtu.be/cQqsWpgtgMI and https://youtu.be/gAyceJb5OWc to understand more on electrode coding and welding symbols.
  - ✓ Let the learner watch the video from the above two weblinks and based on the information gathered from the video, the learner draws a labeled diagram of the welding symbol.
  - ✓ Based on the information obtained from the learning resources, the learner develops notes.
  - ✓ Let the learners' solve SAMPLE SELF CHECK 3.4.

**D. Assessment**

- **Contact**
  - ✓ Assess the learners' performance OPERATION SHEET 3.4
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.4.

- **Non- contact**
  - ✓ Assess the learner's conceptual understanding of coding of the electrode and the welding symbol and its applications based on the learner's note-taking uploaded in Google classrooms or any other social media.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.4.

**E. Resources(online and offline)**

- Competency-Based Learning Material for Class IX
- https://youtu.be/cQqsWpgtgMI (Explanation on the coding of an electrode)
- https://youtu.be/gAyceJb5OWc **(**Explanation on the weld symbol**)**

# MODULE 1: INTERPRETING ENGINEERING DRAWING

## Chapter1: Draw basic signs, symbols, and dimension

### A. Learning Objectives/Strand/Broad theme/Chapter/ topics

| Learning objectives | Core concepts (Chapters/Topics) |
|---|---|
| 1.1.1 Define engineering drawing.<br>1.1.2 State the purposes of engineering drawing.<br>1.1.3 List the types of drawing instruments.<br>1.1.4 State uses of drawing instruments.<br>1.1.5 List types and sizes of drawing papers.<br>1.1.6 Use drawing instruments<br>1.1.7 *Ensure clean and neatness of drawing.*<br>1.1.8 *Ensure proper handling of drawing instruments.* | **1.1 Using drawing instruments** |

### B. Competencies:

i. Carry out basic engineering drawing
ii. Handle the drawing instruments properly.

### C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.1.
  - ✓ Exhibit the real instruments and state their functions which are required for the drawing.
  - ✓ Share web links https://youtu.be/0Q6QwvtjVm8 OR https://youtu.be/kLe_brmh774 to understand the uses of the drawing instrument in engineering.
  - ✓ Demonstrate the uses of drawing instruments referring to OPERATION SHEET 1.1.
  - ✓ Let the learners practice OPERATION SHEET 1.1.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1.

- **Non-Contact**
  - ✓ Let the learners read INFORMATION SHEET 1.1.
  - ✓ Share web links https://youtu.be/0Q6QwvtjVm8 OR https://youtu.be/kLe_brmh774 to understand the uses of the drawing instrument in engineering.
  - ✓ Based on the information gathered from the videos and information sheet, let the learners develop a video that explains the functions of the different drawing instruments.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1.

## D. Assessment

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of different types of drawing instruments and their function by conducting viva.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 1.1.

- **Non-Contact:**
  - ✓ Assess the learners' knowledge on drawing instruments and their function based on the video prepared and uploaded in the Google Classroom.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 1.1.

## E. Resources (Online and offline)

- Competency-Based Learning Materials for Class IX
- https://youtu.be/0Q6QwvtjVm8 (Explanation on the types of drawing instrument and their uses)
- https://youtu.be/kLe_brmh774 (Explanation on the types of drawing instrument and their uses)

## A. Learning objectives/Broad theme/Strand/chapter/topics:

| Learning Objectives | Core Concepts(Chapters/Topics) |
|---|---|
| 1.2.1 Define layout.<br>1.2.2 List terminology used for layouts.<br>1.2.3 Define title block.<br>1.2.4 Explain the purpose of the title block.<br>1.2.5 Layout drawing sheet<br>1.2.6 *Ensure clean and neatness of drawing.*<br>1.2.7 *Ensure Proper handling of drawing instruments.* | **1.2 Layouting drawing sheet** |

## B. Competencies:

i. Layout the drawing sheet as per the required dimensions.

## C. Pedagogy/Learning Experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.2.
  - ✓ Share the web link https://youtu.be/FzMPAiW8O-s to understand the layout of the drawing sheet as per the required standard.
  - ✓ Demonstrate the layout of the drawing sheet referring to OPERATION SHEET 1.2
  - ✓ Let the learners do in the group followed by individual practices.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.2.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.2.
  - ✓ Share the web link https://youtu.be/FzMPAiW8O-s to understand the layout of the drawing sheet as per the required standard.
  - ✓ Provide handouts to learners through Google Classroom or any other social media platforms.
  - ✓ Let the instructor make a video of the layout of the drawing sheet and upload it in Google Classroom or any other social media platforms.
  - ✓ Let the learners practice OPERATION SHEET 1.2.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.2.

## D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance on designing the layout of the drawing sheet referring to OPERATION SHEET 1.2.
  - ✓ Assess the learner's conceptual understanding by letting the learners' responses to SAMPLE SELF CHECK 1.2. Based on the assessment, provide necessary intervention.

- **Non-Contact:**
  - ✓ Assess the learners' performance on designing the layout of the drawing sheet referring to OPERATION SHEET 1.2.
  - ✓ Assess the learner's conceptual understanding by letting the learners' responses to SAMPLE SELF CHECK 1.2. Based on the assessment, provide necessary intervention.

**E. Resources (Online and Offline):**

- Competency-Based Learning Materials for Class IX
- https://youtu.be/FzMPAiW8O-s (Explanation on the layout of drawing sheet)

**A. Learning objectives/ Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.3.1 Define sign and symbol<br>1.3.2 Draw civil signs and symbols<br>1.3.3 Define abbreviation<br>1.3.4 List the abbreviation used in dimensioning<br>1.3.5 List the abbreviation used in drawing<br>1.3.6 List the abbreviation used for the units of length<br>1.3.7 Interpret Engineering Sign, symbols, and abbreviation<br>1.3.8 *Ensure clean and neatness of drawing*<br>1.3.9 *Ensure Proper handling of drawing instruments* | **1.3 Interpreting Engineering Sign, symbols, and abbreviation** |

**B. Competencies:**

i. Interpret the signs and symbols as required.

**C. Pedagogy/learning experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.3
  - ✓ Share the web link https://youtu.be/MfNoq0y1LLY that explains engineering signs and symbols.
  - ✓ Let the learners watch the video from the weblinks and gather information on the engineering signs, symbols, and abbreviations.
  - ✓ Let the learners perform OPERATION SHEET 1.3.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.3.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.3
  - ✓ Share the web link https://youtu.be/MfNoq0y1LLY that explains engineering signs and symbols.
  - ✓ Let the learners watch the video from the weblinks and gather information on the engineering signs, symbols, and abbreviations.
  - ✓ Let the learners perform OPERATION SHEET 1.3.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.3.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 1.3
  - ✓ Assess the learners' notes gathered from the video using rubrics.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.3

- **Non-contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 1.3
  - ✓ Assess the learners' notes gathered from the video uploaded in Google Classroom using rubrics.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.3 uploaded in Google Classroom.

**E. Resources(online and offline):**

- Competency-Based Learning Material for Class IX
- https://youtu.be/MfNoq0y1LLY (Explanation on the engineering signs and symbols)

**A. Learning objectives/Broad theme/Strand/Chapter/topics:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.4.1 Define line.<br>1.4.2 State types of line and their applications.<br>1.4.3 Draw different types of lines<br>*1.4.4 Ensure clean and neatness of drawing.*<br>*1.4.5 Ensure Proper handling of drawing instruments.* | **1.4 Drawing different types of lines** |

**B. Competencies :**

i. Draw different types of lines as per the applications.

**C. Pedagogy/Learning experiences**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.4
  - ✓ Share web links https://youtu.be/SaOoKpLBfYo and https://youtu.be/E6OXZ9OHpVk that explain the different types of lines and their application respectively.
  - ✓ Let the learners take notes on the different types of lines, their applications, and their symbols.
  - ✓ Let the learners perform OPERATION SHEET 1.4.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.4.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.4
  - ✓ Share web links https://youtu.be/SaOoKpLBfYo and https://youtu.be/E6OXZ9OHpVk that explain the different types of lines and their application respectively.
  - ✓ Let the learners take notes on the different types of lines, their applications, and their symbols.
  - ✓ Let the learners perform OPERATION SHEET 1.4.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.4.

**D. Assessment**

- **Contact:**
  - ✓ Assess notes and drawing containing different types of lines using a rubric or a checklist.
  - ✓ Provide necessary intervention based on the assessment.
  - ✓ Assess the learners' responses on SAMPLE SELF CHECK 1.4.

- **Non- Contact:**
  - ✓ Assess the work uploaded in the Google Classroom to assess learners' understanding of different types of lines.
  - ✓ Provide necessary intervention following the assessment.
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 1.4 uploaded in Google Classroom.

**E. Resources (Online or offline):**

- Competency-Based Learning Materials for Class IX
- https://youtu.be/SaOoKpLBfYo (Explanation on the different types of lines)
- https://youtu.be/E6OXZ9OHpVk (Explanation on the application of lines along with the drawing)

**A. Learning objectives/ Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.5.1 Define lettering and numbering.<br>1.5.2 Classify letters style.<br>1.5.3 List the types of letters.<br>1.5.4 Define freehand lettering.<br>1.5.5 List the size of letters.<br>1.5.6 State the rules for lettering and numbering.<br>1.5.7 Draw letters and numbers<br>1.5.8 *Ensure clean and neatness of drawing.*<br>1.5.9 *Ensure Proper handling of drawing instruments.* | **1.5 Drawing Letters and numbers** |

**B. Competencies:**

**i.** Draw letters and numbers as per the given scale.

**C. Pedagogy/Learning experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.5
  - ✓ Share the web link http://ednotebook.hostgator.co.in/basics-of-engineering-drawing that explains the techniques of writing letters and numbers in engineering drawing.
  - ✓ Let the learners perform OPERATION SHEET 1.5.
  - ✓ Let the learners' solve SAMPLE SELF CHECK 1.5.
- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.5
  - ✓ Share the web link http://ednotebook.hostgator.co.in/basics-of-engineering-drawing that explains the techniques of writing letters and numbers in engineering drawing.
  - ✓ Let the learners perform OPERATION SHEET 1.5.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.5.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.5.
  - ✓ Provide necessary intervention and feedback.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.5.

- **Non-contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.5.
  - ✓ Provide necessary intervention and feedback.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.5 uploaded in Google Classroom.

**E. Resources(online and offline):**

- Competency-Based Learning Material for Class IX
- http://ednotebook.hostgator.co.in/basics-of-engineering-drawing (Explanation on the techniques of writing letters and numbers)
- https://youtu.be/onJIaSAkiEs (Description on the ways to write letters and numbers)

**A. Learning objectives/ Broad theme / Strand/Chapter:**

| Learning objectives | Core concepts(Chapters/Topics) |
|---|---|
| 1.6.1 Define dimension.<br>1.6.2 State the types of dimensions.<br>1.6.3 Explain the system of dimensioning.<br>1.6.4 State the terminologies of dimensions.<br>1.6.5 Provide dimensions<br>*1.6.6 Ensure clean and neatness of drawing.*<br>*1.6.7 Ensure Proper handling of drawing instruments.* | **1.6 Providing dimensions** |

**B. Competencies:**

i. Provide dimensions as per the standard.

**C. Pedagogy/learning experience**

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.6
  - ✓ Share the web link https://youtu.be/XS0lJsmy-qg that explains the types of dimensioning and systems of dimensioning.
  - ✓ Let the learners' take notes from the information gathered from the videos.
  - ✓ Let the learners perform OPERATION SHEET 1.6.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.6.
- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.6
  - ✓ Share the web link https://youtu.be/XS0lJsmy-qg that explains the types of dimensioning and systems of dimensioning.
  - ✓ Let the learners take notes from the information gathered from the videos.
  - ✓ Let the learners perform OPERATION SHEET 1.6.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.6.

**D. Assessment**

- **Contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.6.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.6.
- **Non-contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.6.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.6 uploaded in Google Classroom.

**E. Resources(online and online):**

- Competency-Based Learning Material for Class IX
  - ✓ https://youtu.be/XS0lJsmy-qg (Explanation on the types of dimensioning and systems of dimensioning)

## RESOURCES

1. Technical and Vocational Education and Training (TVET) New Normal Curriculum Framework (Classes: PP-XII)
2. Competency-Based Learning Materials (Welding).