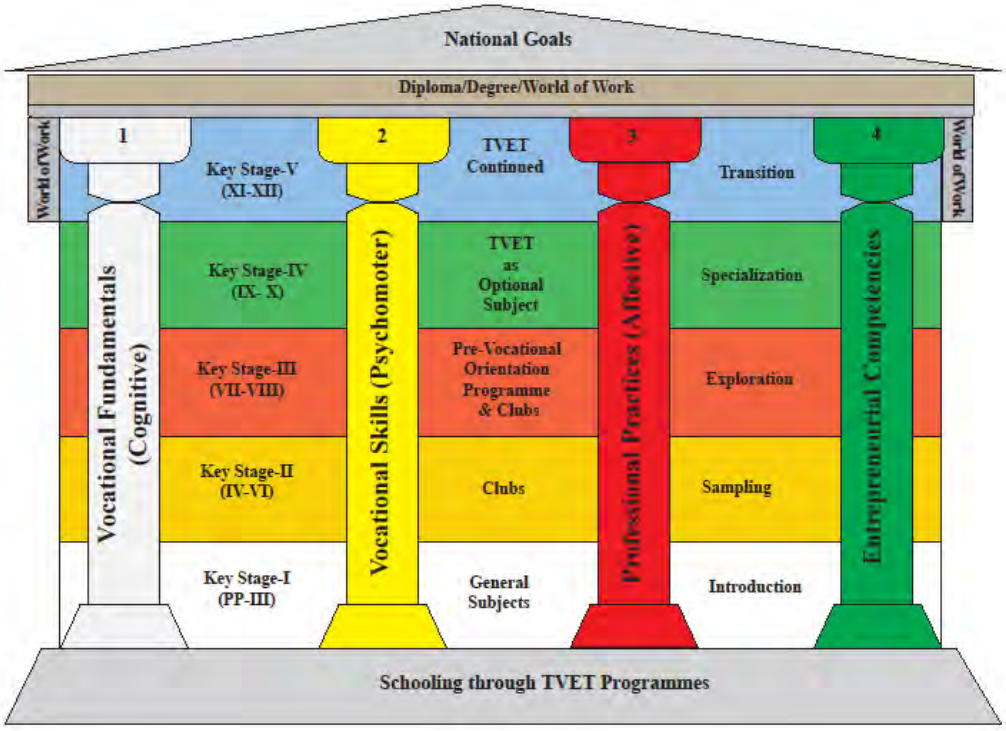
TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET)

NEW NORMAL CURRICULUM

INSTRUCTIONAL GUIDE

(WELDING)

CLASS: XII



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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 2: CARRYING OUT OXY-ACETYLENE PROCESS

Chapter 1: Perform Oxy-acetylene welding

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

Learning objectives	Core concepts(Chapters/Topics)
1.1.1 Introduce oxy-acetylene welding 1.1.2 Explain the working principle of oxy-acetylene welding 1.1.3 Explain the tools used in oxy-acetylene welding and their functions 1.1.4 Describe the features of the oxygen and acetylene cylinder 1.1.5 State the Dos and Don'ts of gas cylinders handling 1.1.6 State the types of gas 1.1.7 Explain the types of welding position 1.1.8 Explain the welding techniques 1.1.9 Describe the importance of maintaining blowpipe angle 1.1.10 Explain the characteristics of the hose 1.1.11 Describe the selection of nozzle 1.1.12 Perform flame setting for oxyacetylene welding 1.1.13 Perform setup for oxy-acetylene welding 1.1.14 *Ensure appropriate use of PPE.*	**1.1 Performing setup for oxy-acetylene welding**

B. Competencies:

i. Adjust and set the welding equipment to perform gas welding.

C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.1
  - ✓ Share the web links https://youtu.be/XJ1Loh7eF-A and https://youtu.be/mibENu9te20 to further clarify the working principle of oxy-acetylene welding.
  - ✓ Let the learners in the group discuss different tools used in oxy-acetylene welding and their functions. The learner looks for the information referring to the CBLM and the link shared.
  - ✓ Using the information gathered from the various resources, let the learners in the group prepare a presentation on different types of tools used in oxy-acetylene welding.

- ✓ Let the learners read the information on the Do's and Don'ts of gas cylinders handling from the CBLM and the link http://www.ionapex.com/safety-talks/all-topics/gas-cylinders-dos-and-donts.shtml
- ✓ Demonstrate the flame setting referring to the SKILL SHEET 1.1 and OPERATION SHEET 1.1 for oxy-acetylene welding set up.
- ✓ Let the learners perform SKILL SHEET 1.1 and OPERATION SHEET 1.1 in groups followed by individual practices.
- ✓ Let the learners seek and provide feedback to each other.
- ✓ Let the learners solve SAMPLE SELF CHECK 1.1.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.1
  - ✓ Share the web link https://youtu.be/XJ1Loh7eF-A to further clarify the working principle of oxy-acetylene welding.
  - ✓ Share the web link https://youtu.be/YskH4MHBQFw to explore gas welding safety.
  - ✓ Let the learners read the information on the Dos and Don'ts of gas cylinders handling from the CBLM for Classes XII, Page no 5 & 6 and from the link http://www.ionapex.com/safety-talks/all-topics/gas-cylinders-dos-and-donts.shtml
  - ✓ Let the learners in the group discussion about different tools used in oxy-acetylene welding and their functions. Let the learners look for information from the internet or by referring to the CBLM for Classes XII(Zoom, Meet, Skype, etc)
  - ✓ Using the information gathered from the various resources, let the learners in the group prepare a presentation using any one of the presentation software on different types of tools used in oxy-acetylene welding.
  - ✓ Let the learners read the SKILL SHEET 1.1 and OPERATION SHEET 1.1.
  - ✓ Share the web link https://www.boc.com.au/wcsstore/AU_BOC_Industrial_Store/pdf/product/en_AU/Guidelines-for%20Gas-Welding-and-Cutting.pdf (refer page no 14-18) to explore setting up, lighting up, and shutting down of the oxy-acetylene welding.
  - ✓ Let the learners seek and provide feedback to each other.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.1.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of different tools used in oxy-acetylene welding using a rubric.
  - ✓ Assess the learners' performance referring to SKILL SHEET 1.1 and OPERATION SHEET 1.1
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.1
  - ✓ Provide necessary intervention.

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of different tools used in oxy-acetylene welding using a rubric.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.1 uploaded in Google Classroom or any other social media platforms.
  - ✓ Provide necessary intervention.

E. Resources(online and offline)

- Competency-Based Learning Material for Class XII.
- https://youtu.be/XJ1Loh7eF-A (Explanation on the working principle of oxy-acetylene welding.)
- https://youtu.be/mibENu9te20 (Explanation on the working principle of oxy-acetylene welding.)
- http://www.ionapex.com/safety-talks/all-topics/gas-cylinders-dos-and-donts.shtml (Explanation on the Do's and Don'ts of gas cylinder)
- https://youtu.be/YskH4MHBQFw(Explains (Explains on gas welding safety)
- https://www.boc.com.au/wcsstore/AU_BOC_Industrial_Store/pdf/product/en_AU/Guidelines-for%20Gas-Welding-and-Cutting.pdf (Lighting up, setting up and shutting down of the oxy-acetylene welding)

A. Learning Objectives/Broad theme/Strand/Chapter/Topics:

Learning objectives	Core concepts(Chapters/Topics)
1.2.1 State the types of base metal 1.2.2 Describe types of flame and their characteristics 1.2.3 Describe the application of flames 1.2.4 State the function of flashback arrestor (FBA) 1.2.5 State the indication, causes, and remedies of backfire and flashback 1.2.6 Describe the importance of cracking gas cylinders 1.2.7 Describe the application of straight-line bead without filler rod 1.2.8 State the types of regulator 1.2.9 Describe the function of the regulator 1.2.10 Explain the working principle of the regulator 1.2.11 Describe the construction of blowpipe 1.2.12 State the types of the blowpipe and their functions 1.2.13 Explain the importance of cleaning nozzle tip 1.2.14 Explain the marking tool and its purpose 1.2.15 State the selection of parameters for oxyacetylene welding 1.2.16 Perform straight-line bead without filler rod 1.2.17 Operating guillotine machine.	**1.1 Performing straight line bead without filler rod**

B. Competencies:

i. Carry out straight line bead without filler rod as per the job requirement.

C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.2.
  - ✓ Share the web link https://youtu.be/ibbqPMR1sYU to clarify the working principle of flashback arrestor of oxy-acetylene welding.
  - ✓ Let the learners in groups explore the following web links: https://weldguru.com/welding-metals/ https://youtu.be/X96UnvRtHRo https://youtu.be/9adOLZaP7SA to discuss different materials used to weld and hazards of oxy-acetylene welding.

- ✓ Using the information gathered from the various resources, let the learners in the group prepare a presentation on gas welding materials and gas welding hazardous.
- ✓ Let the learners read the information on the working principle of regulator and blowpipe and their function from the CBLM.
- ✓ Demonstrate the operation of the Guillotine machine and marking of materials referring to the SKILL SHEET 1.2a, SKILL SHEET 1.2b, and OPERATION SHEET 1.2 for cutting the sheet metals.
- ✓ Let the learners perform SKILL SHEET 1.2a, SKILL SHEET 1.2b, and OPERATION SHEET 1.2 in groups and later individually.
- ✓ Let the learners solve SAMPLE SELF CHECK 1.2.
- ✓ Let the learners seek and provide feedback to each other.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.2 and OPERATION SHEET 1.2.
  - ✓ Share the web link https://youtu.be/ibbqPMR1sYU to clarify the working principle of flashback arrestor of oxy-acetylene welding.
  - ✓ Share the web link https://youtu.be/YskH4MHBQFw to explore gas welding safety.
  - ✓ Let the learners explore the weblink https://weldguru.com/welding-metals/, https://youtu.be/X96UnvRtHRo and https://youtu.be/9adOLZaP7SA.
  - ✓ Let the learners read the information on the working principle of regulator and blowpipe and their function from the CBLM.
  - ✓ Using the information gathered from the various resources, let the learners in the group prepare a presentation on gas welding materials and gas welding hazardous.
  - ✓ Let the learners read the SKILL SHEET 1.2a, SKILL SHEET 1.2b, and OPERATION SHEET 1.2.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.1.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of gas welding materials and gas welding hazardous through the presentation using rubrics and a checklist.
  - ✓ Assess the learners' performance referring to SKILL SHEET 1.2a, SKILL SHEET 1.2b, and OPERATION SHEET 1.2.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.2
  - ✓ The learner seeks and provides feedback to each other.

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of gas welding materials and gas welding hazardous through the presentation uploaded in Google Classroom using rubrics and checklist.

- ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.2 uploaded in Google Classroom.
- ✓ The learner seeks and provides feedback to each other.

E. Resources (Online and offline):

- Competency-Based Learning Materials for Class XII.
- https://weldguru.com/welding-metals/ (Explanation on types of welding metals)
- https://youtu.be/ibbqPMR1sYU (Explanation on the principle and function of flashback arrestor)
- https://youtu.be/JObaMblT8Bs (Explanation of the principle and function of flashback arrestor)
- https://youtu.be/X96UnvRtHRo (Explanation of the causes of flashback)
- https://youtu.be/9adOLZaP7SA (Explanation of the hazards of gas welding)

A. Leaning objectives/Broad theme/Strand/Chapter/topics:

Learning objectives	Core Concept(Chapters/Topics)
1.3.1 Purpose of filler rod 1.3.2 Feeding technique of filler rod 1.3.3 Purpose of flux 1.3.4 Types of clamping devices 1.3.5 Distortion and its control 1.3.6 Describe the application of straight-lined bead with filler rod 1.3.7 Perform straight-line bead with filler rod 1.3.8 *Ensure appropriate use of PPE*	**1.2 Performing straight line bead with filler rod**

B. Competencies:

i. Deposit filler rod metal in a joint on the base metal.

C. Pedagogy/Learning Experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.3
  - ✓ Share the web link https://youtu.be/YA5NJqSQrYc to understand more on the technique to perform straight weld bead with filler rod and without filler rod.
  - ✓ Demonstrate the techniques to perform the straight line bead without and with filler rod in gas welding.
  - ✓ Let the learners practice in a group followed by individual practice referring to OPERATION SHEET 1.3.
  - ✓ Provide guided practice to the learners
  - ✓ Provide necessary intervention.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.3
- **Non-contact:**
  - ✓ Share the web link https://youtu.be/YA5NJqSQrYc to understand more on the technique to perform straight-line bead with filler rod and without filler rod.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.3.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.3.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.3.
  - ✓ Provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.3 uploaded in Google Classroom or any other social platforms.

E. Resources (Online and Offline):

- Competency-Based Learning Materials for Class XII.
- https://youtu.be/YA5NJqSQrYc (Explanation on the techniques to perform straight-line bead with or without filler rod)

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

Learning objectives	Core concepts(Chapters/Topics)
1.4.1 Describe *1F* 1.4.2 Describe the application of welding fillet joints in the flat position 1.4.3 Weld fillet joint in flat position (1F) *1.4.4 Ensure appropriate use of PPE.*	**1.3 Welding fillet joint in flat position (1F)**

B. Competencies:

i. Weld metals in the flat position.

C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.4
  - ✓ The link https://youtu.be/hr4bKrv0rsI (from 0sec to 1min 46sec) can be shared to explore the techniques of gas welding while performing OPERATION SHEET 1.4.
  - ✓ Demonstrate how to gas weld fillet joints in the flat position
  - ✓ Let the learners perform OPERATION SHEET 1.4 in groups and later individually.
  - ✓ The learners seek and provide feedback to each other.
- **Non-contact:**
  - ✓ The learners read INFORMATION SHEET 1.4
  - ✓ The link https://youtu.be/hr4bKrv0rsI (from 0sec to 1min 46sec) can be shared to explore the techniques of gas welding while reading OPERATION SHEET 1.4.
  - ✓ The learners seek and provide feedback to each other.

D. Assessment

- **Contact:**
  - ✓ The learners perform SKILL SHEET 1.4 and OPERATION SHEET 1.4 and assess their performances.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.4
  - ✓ Provide additional questions.
  - ✓ Assess the learners' conceptual understanding of gas welding fillet joints on flat position (1F) using a rubric and provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.4 uploaded in Google Classroom or any other social media.
  - ✓ Assess the learners' conceptual understanding of gas welding fillet joints on flat position (1F) using a rubric and provide necessary intervention.

E. Resources(online and offline):

- Competency-Based Learning Material for Class XII.
- https://youtu.be/hr4bKrv0rsI (Explanation on the techniques of gas welding)

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

Learning objectives	Core concepts(Chapters/Topics)
1.5.1 Describe *1G* 1.5.2 Describe the application of welding butt joint in the flat position 1.5.3 Weld butt joint in flat position (1G) *1.5.4 Ensure appropriate use of PPE.*	**1.4 Welding butt joint in flat position (1G)**

B. Competencies:

i. Weld butt joint in the flat position.

C. Pedagogy/learning experience

- **Contact:**
  - ✓ The learners read INFORMATION SHEET 1.5
  - ✓ Demonstrate how to weld butt joint in flat position (1G) in group-wise
  - ✓ Let the learners practice in a group followed by individual practice.
  - ✓ Let the learners perform OPERATION SHEET 1.5
- **Non-contact:**
  - ✓ The learners read INFORMATION SHEET 1.5
  - ✓ Share the web link https://youtu.be/FDSSEef3CL0 to explore the techniques of performing gas welding butt joint in flat position (1G) while reading OPERATION SHEET 1.5.
  - ✓ Let the learners seek and provide feedback to each other.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance to OPERATION SHEET 1.5 and assess their conceptual and practical understanding of gas welding butt joint in flat position(1G) using a rubric.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.5
  - ✓ Provide additional questions.
  - ✓ Provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 1.5 uploaded in Google Classroom or any other social media.
  - ✓ Assess the learners' conceptual understanding of gas welding butt joints in a flat position (1G) using a rubric.
  - ✓ Provide necessary intervention.

E. Resources(online and offline):

- Competency-Based Learning Material, for Class XII
- https://youtu.be/FDSSEef3CL0 (Explanation on the techniques of performing gas welding butt joint in flat position (1G))

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

Learning objectives	Core concept(Chapters/Topics)
1.6.1 Describe 2F 1.6.2 Describe the application of welding fillet joints in the horizontal position 1.6.3 Weld fillet joints in the horizontal position(2F) *1.6.4 Ensure appropriate use of PPE*	**1.5 Welding fillet joints in the horizontal position (2F)**

A. Competencies:

i. Weld fillet joints in the horizontal position.

B. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.6.
  - ✓ Share the web link https://youtu.be/Li_pAMrUWSw to understand the technique to weld fillet joints in the horizontal position of gas welding.
  - ✓ Share the web link https://weldguru.com/welding-positions/ to explore fillet and groove weld joint in a different position.
  - ✓ Demonstrate the techniques to weld the fillet joint in the horizontal position in gas welding.
  - ✓ Let the learners practice in a group followed by an individual.
  - ✓ Provide guided practices and necessary intervention.
  - ✓ 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/Li_pAMrUWSw to understand the technique to weld fillet joints in the horizontal position of gas welding.
  - ✓ Share the web link https://weldguru.com/welding-positions/ to explore fillet and groove weld joint in a different position.
  - ✓ Let the learners perform OPERATION SHEET 1.6
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.6.

C. Assessment

- **Contact:**
  - ✓ Assess the learners' performance to OPERATION SHEET 1.6 and assess their conceptual and practical understanding of gas welding fillet joints in the horizontal position (2F) using a rubric.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.6
  - ✓ Provide additional questions.

- ✓ Provide necessary intervention.

- **Non-contact:**
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.6 uploaded in Google Classroom and any other social platforms.
  - ✓ Provide feedback and intervention.

D. Resources(Online and offline):

- Competency-Based Learning Materials for Class XII.
- https://youtu.be/Li_pAMrUWSw (Demo of fillet weld join in horizontal position)
- https://weldguru.com/welding-positions/ (Articles on fillet and groove weld joint in a different position)

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

Learning objectives	Core concepts(Chapters/Topics)
1.7.1 Define 2G 1.7.2 Describe the application of welding butt joint in the horizontal position 1.7.3 Weld butt joint in the horizontal position (2G) *1.7.4 Ensure appropriate use of PPE*	**1.6 Welding butt joint in the horizontal position (2G)**

B. Competencies:

i. Weld butt joint in the horizontal position.

C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.7
  - ✓ Demonstrate how to weld butt joint in the horizontal position (2G) in the group.
  - ✓ Let the learners perform OPERATION SHEET 1.7 in a group followed by individual practice.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.7.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.7 and OPERATION SHEET 1.7.
  - ✓ Let the learners solve SAMPLE SELF CHECK 1.7.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of butt joint in horizontal position conducting the class test.
  - ✓ Assess the learners' performance referring to OPERATION SHEET 1.7.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.7
  - ✓ Let the learners seek and provide feedback to each other.

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of the butt joint in the horizontal position by conducting an online class test.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.7
  - ✓ Let the learners seek and provide feedback to each other.

E. Resources(online and online):

- Competency-Based Learning Material for Class XII.

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

Learning Objectives	Core concept (Chapter/topic)
1.8.1 Describe 3F 1.8.2 Describe the application of welding fillet joints in the vertical position 1.8.3 State the difference between SMAW and oxy-acetylene welding 1.8.4 State the advantages and limitations of Oxy-acetylene welding 1.8.5 Weld fillet joints in the vertical position (3F) 1.8.6 *Ensure appropriate use of PPE.*	**1.7 Welding fillet joints in the vertical position (3F)**

B. Competencies:

i. Weld fillet joints in the vertical position for welding sheet metals.

C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.8.
  - ✓ Demonstrate the techniques to weld the fillet joint in the vertical position in gas welding.
  - ✓ Let the learners read and perform OPERATION SHEET 1.8 in a group followed by an individual. Provide guided practice.
  - ✓ Let the learners solve SAMPLE SELF CHECK1.8.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 1.8 and OPERATION SHEET 1.8.
  - ✓ Make a video of performing fillet joint in the vertical position and upload it in Google Classroom.
  - ✓ Let the learners solve SAMPLE SELF CHECK1.8.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance of OPERATION SHEET 1.8.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.8.
  - ✓ Provide feedback.
- **Non-contact:**
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 1.8 uploaded in Google Classroom.
  - ✓ Provide feedback through Google Classroom.

E. Resources(online and offline):

- Competency-Based Learning Material for Class XII
- Video on performing fillet joint in the vertical position

Chapter 2: Perform oxy-acetylene cutting

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

Learning objectives	Core concepts(Chapters/Topics)
2.1.1 Introduce oxy-acetylene cutting process 2.1.2 Explain the working principle of oxy-acetylene cutting and its application 2.1.3 Describe the construction of cutting blowpipe 2.1.4 State the difference between oxy-acetylene cutting blowpipe and welding blowpipe 2.1.5 Explain cutting tolerance and its importance 2.1.6 State the types of cutting nozzle 2.1.7 Describe the selection of cutting nozzle 2.1.8 Describe the importance of gas pressure setting 2.1.9 State advantages and limitation of the oxy-acetylene cutting process 2.1.10 State the comparison between oxy-acetylene cutting and shielded metal arc cutting 2.1.11 Perform flame setting for oxy-acetylene cutting 2.1.12 Set up oxy-acetylene cutting equipment 2.1.13 *Ensure appropriate use of PPE.*	**2.1 Setting up oxy-acetylene cutting equipment**

B. Competencies:

i. Set the oxy-acetylene equipment to perform the cutting.

C. Pedagogy/learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.1
  - ✓ Share the web link https://youtu.be/DaRnLakLoAc to further clarify the working principle of oxy-acetylene cutting, the cutting process, and the construction of blowpipe.
  - ✓ Let the learners in the group discuss the difference between the oxy-acetylene cutting blowpipe and welding blowpipe. The learner looks for information from the CBLM for Classes XII.
  - ✓ Based on the information gathered, the learners in the group prepare a presentation using any one of the presentation software on the difference between oxy-acetylene welding blowpipe and cutting blowpipe.
  - ✓ The learners read the information on cutting tolerance, its importance, and types of cutting nozzle from the CBLM.
  - ✓ Demonstrate the flame setting referring to the SKILL SHEET 2.1 and OPERATION SHEET 2.1 for oxy-acetylene cutting set up.

- ✓ Let the learners read and perform SKILL SHEET 1.1 and OPERATION SHEET 1.1 in groups followed by individual practice.
- ✓ Let the learners solve SAMPLE SELF CHECK 2.1.
- ✓ The learners seek and provide feedback to each other.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.1 and OPERATION SHEET 2.1.
  - ✓ Share the web link https://youtu.be/DaRnLakLoAc to further clarify the working principle of oxy-acetylene cutting, the cutting process, and the construction of blowpipe.
  - ✓ Let the learners take notes on the difference between the oxy-acetylene cutting blowpipe and welding blowpipe. The learner looks for information from the CBLM.
  - ✓ Based on the information gathered, let the learners take notes on the difference between oxy-acetylene welding blowpipe and cutting blowpipe.
  - ✓ The learners read the information on cutting tolerance, its importance, and types of cutting nozzle from the CBLM.
  - ✓ Let the learners read SKILL SHEET 2.1 and OPERATION SHEET 2.1.
  - ✓ Let the learners seek and provide feedback to each other.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of oxy-acetylene cutting by providing assignments.
  - ✓ Assess the learners' performance on SKILL SHEET 2.1 and OPERATION SHEET 2.1 using the checklist.
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 2.1.
  - ✓ Provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of oxy-acetylene cutting by providing assignments uploaded in Google Classroom.
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 2.1.
  - ✓ Provide feedback through Google Classroom.

E. Resources(online and offline):

- Competency-Based Learning Material for Class XII
- https://youtu.be/DaRnLakLoAc (Explanation on working principle of gas cutting)

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

Learning objectives	Core concepts(Chapters/Topics)
2.2.1 Explain cutting techniques 2.2.2 Describe the application of straight cutting 2.2.3 State gas cutting defects and its remedies 2.2.4 Explain the importance of maintaining the gap between the tip of the cone and the workpiece 2.1 Perform straight cutting 2.2.5 *Ensure appropriate use of PPE.*	**2.2 Performing straight cutting**

B. Competencies:

i. Perform straight cutting in gas welding as per the job requirement.

C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let learners read INFORMATION SHEET 2.2 and OPERATION SHEET 2.2.
  - ✓ Share the web link https://youtu.be/7EGmrPiumEU to understand the techniques of gas cutting in straight lines and the importance of maintaining the gap between cutting torch and workpiece.
  - ✓ Demonstrate the techniques to cut materials and the importance of maintaining the gap between cutting torch and workpiece.
  - ✓ Let the learners perform OPERATION SHEET 2.2 in a group followed by an individual. Provide guided practice.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.2.
  - ✓ Provide necessary intervention.

- **Non-contact:**
  - ✓ Let learners read INFORMATION SHEET 2.2 and OPERATION SHEET 2.2.
  - ✓ Share the web link https://youtu.be/7EGmrPiumEU to understand the techniques of gas cutting in straight lines and the importance of maintaining a gap between torch and workpiece.
  - ✓ Based on the information gathered, let the learners take notes on techniques to cut the materials with gas cutting, defects of gas and its remedies, and the importance of maintaining the gap between cutting torch and materials.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.2.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 2.2 using a checklist.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.2.
  - ✓ Provide necessary intervention.

- **Non-contact:**
  - ✓ Assess the learners' notes uploaded in Google classroom or any other social media platforms.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.2.
  - ✓ Provide necessary feedback through Google Classroom.

E. Resources(Online and offline)

- Competency-Based Learning Materials for Class XII
- https://youtu.be/7EGmrPiumEU (Explanation and demonstration of gas cutting in a straight line)

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

Learning objectives	Core concept(Chapters/Topics)
2.3.1 State method of piercing a hole 2.3.2 Describe the application of angle cutting 2.3.3 Perform angle gas cutting 2.3.4 *Ensure appropriate use of PPE.*	**2.3 Performing angle cutting**

B. Competencies:

i. Prepare edges of the workpiece to weld the plates.

C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.3 and OPERATION SHEET 2.3.
  - ✓ Share the explore web link https://youtu.be/IIEjwFSz2SQ to understand the techniques to perform gas cutting at angle or circle.
  - ✓ Demonstrate the techniques to cut materials at an angle or in a circle.
  - ✓ Let the learners perform OPERATION SHEET 2.3 in a group followed by an individual. Provide guided practice.
  - ✓ 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 explore web link https://youtu.be/IIEjwFSz2SQ to understand the techniques to perform gas cutting at an angle or in a circle.
  - ✓ Based on the information gathered, let the learners take notes on techniques to perform gas cutting in angle or circle and its application.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.3.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 2.3 using the checklist.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.3.
  - ✓ Provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' notes uploaded in Google classroom or any other social media platforms.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 2.3.
  - ✓ Provide necessary feedback through Google Classroom.

F. Resources(Online and offline):

- Competency-Based Learning Materials for Class XII
- https://youtu.be/IIEjwFSz2SQ (Explanations on techniques to perform gas cutting in circle or angle)

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

Learning objectives	Core concepts(Chapters/Topics)
2.4.1 Describe the types of cutting in profile 2.4.2 Explain the importance of templates 2.4.3 State the methods of profile cutting 2.4.4 Perform profile cutting *2.4.5 Ensure appropriate use of PPE*	**2.4 Performing profile cutting**

B. Competencies:

i. Create the cut surface without concavity.
ii. Cut mild steel in profile shapes.

C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.4
  - ✓ Demonstrate different shape to be cut in metal and methods of profile cutting referring to OPERATION SHEET 2.4
  - ✓ Let the learners practice in a group followed by individual practice.
  - ✓ Let the learners perform OPERATION SHEET 2.4
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.4.
- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 2.4 and OPERATION SHEET 2.4.
  - ✓ Let the learners solve SAMPLE SELF CHECK 2.4

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance OPERATION SHEET 2.4 using the checklist.
  - ✓ Assess the answers of SAMPLE SELF CHECK 2.4
  - ✓ Assess the learners' conceptual understanding of profile cutting using a rubric.
  - ✓ Provide necessary intervention.
- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of profile cutting using a rubric.
  - ✓ Assess the answers to SAMPLE SELF CHECK 2.4 uploaded in Google Classroom or any other social media.
  - ✓ Provide necessary intervention through Google Classroom.

E. Resources(online and offline):

- Competency-Based Learning Material for Class XII.

Chapter 3: Perform post work for oxy-acetylene processes

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

Learning objectives	Core concepts(Chapters/Topics)
3.1.1 Explain the importance of visual inspection 3.1.2 Describe the importance of proper lighting while welding 3.1.3 Using weld gauge 3.1.4 Perform visual inspection workpiece 3.1.5 *Ensure appropriate use of PPE.*	**3.1 Performing visual inspection workpiece**

B. Competencies:

i. Inspect the workpiece visually before and after welding.

C. Pedagogy/Learning Experiences:

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.1.
  - ✓ Share the web link https://youtu.be/Ncguc7THEUY to understand the methods to inspect the workpiece.
  - ✓ Let the learners inspect their job piece that they have practice referring to OPERATION SHEET 3.1 and SKILL SHEET 3.1.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.1.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.1 and OPERATION SHEET 3.1.
  - ✓ Share the web link https://youtu.be/Ncguc7THEUY to understand the methods to inspect the workpiece.
  - ✓ Based on the information gathered, let the learners write a report on the inspection of the welded materials.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.1.

D. Assessment

- **Contact:**
  - ✓ Assess the learners' performance on OPERATION SHEET 3.1 using the checklist.
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 3.1.
  - ✓ Provide necessary intervention.

- **Non-contact:**
  - ✓ Assess the learners' response to SAMPLE SELF CHECK 3.1.
  - ✓ Assess the learners' reports uploaded in Google classroom or any other social media platforms.

E. Resources(Online and offline):

- Competency-Based Learning Materials for Class XII
- https://youtu.be/Ncguc7THEUY (Demonstration on the inspection of welded materials)

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

Learning objectives	Core concepts(Chapters/Topics)
3.2.1 Explain the importance of maintenance 3.2.2 Explain preventive maintenance of oxy-acetylene equipment 3.2.3 Maintain oxy-acetylene equipment 3.2.4 *Ensure appropriate use of PPE.*	**3.2 Maintaining oxy-acetylene equipment**

B. Competencies:

i. Prevent the failure of equipment while using oxy-acetylene equipment.

C. Pedagogy/Learning experience

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.2
  - ✓ Share the link https://youtu.be/WIf7-9utYdw to further clarify preventive measures and care of the oxy-acetylene setup.
  - ✓ Let the learners in the group discuss types of maintenance. The learner looks for information from https://www.interplaylearning.com/blog/different-types-of-maintenance and the CBLM.
  - ✓ Based on the information gathered, let the learners in the group prepare a presentation using any one of the presentations.
  - ✓ Demonstrate the flame setting referring to the OPERATION SHEET 3.2 to maintain oxy-acetylene equipment.
  - ✓ Let the learners perform OPERATION SHEET 3.2 in groups and later individually.
  - ✓ Let the learners seek and provide feedback to each other.
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.2.

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.2
  - ✓ Share the web link https://youtu.be/WIf7-9utYdw to further clarify preventive measures and care of the oxy-acetylene setup.
  - ✓ Let the learners in the group discuss types of maintenance. The learner looks for information from https://www.interplaylearning.com/blog/different-types-of-maintenance and the CBLM.
  - ✓ Based on the information gathered, let the learners in the group prepare a presentation using any one of the presentation software on the difference between oxy-acetylene welding blowpipe and cutting blowpipe(Meet, Zoom, Skype, etc)
  - ✓ Let the learners read the information on cutting tolerance, its importance, and types of cutting nozzle from the CBLM.
  - ✓ Let the learners read the OPERATION SHEET 3.2.

- ✓ Let the learners solve SAMPLE SELF CHECK 3.2.
- ✓ The learners seek and provide feedback to each other.

D. Assessment

- **Contact:**
  - ✓ Assess the presentation of the learner to assess the conceptual understanding of types of maintenance and their importance using the rubric and provide necessary intervention.
  - ✓ Assess the learners' performance on OPERATION SHEET 3.2 using rubrics.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.2.

- **Non-contact:**
  - ✓ Assess the presentation uploaded in Google Classroom to assess the learner's conceptual understanding of types of maintenance and their importance using the rubric and provide necessary intervention.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.2 uploaded in Google Classroom or any other social media.

E. Resources(online and offline)

- Competency-Based Learning Material for Class XII
- https://youtu.be/WIf7-9utYdw (Explanation on the preventive measures and care of the oxy-acetylene setup.)
- https://www.interplaylearning.com/blog/different-types-of-maintenance (Notes on types of maintenance)

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

Learning objectives	Core concept(Chapters/Topics)
3.3.1 Describe estimation and costing 3.3.2 Estimate the weight of materials 3.3.3 Estimate the cost of the product 3.3.4 Estimate the cost of an oxyacetylene process 3.3.5 Estimate the materials 3.3.6 *Ensure appropriate use of PPE*	**3.3 Estimating the materials**

B. Competencies:

i. Calculate the cost of materials before performing any fabrication and repair works.

C. Pedagogy/Learning experiences

- **Contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.3
  - ✓ Let the learners solve SAMPLE SELF CHECK 3.3

- **Non-contact:**
  - ✓ Let the learners read INFORMATION SHEET 3.3
  - ✓ Let the learners explore the purpose of estimation.
  - ✓ Let the learners research how they estimate materials when they make any kind of product.
  - ✓ Let the leaners do simple estimations.
  - ✓ Let learners solve SAMPLE SELF CHECK 3.3.

D. **Assessment:**

- **Contact:**
  - ✓ Assess the learners' conceptual understanding of estimating and costing by conducting the class test.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.3.

- **Non-contact:**
  - ✓ Assess the learners' conceptual understanding of estimating and costing by conducting the class test.
  - ✓ Assess the learners' responses to SAMPLE SELF CHECK 3.3.

E. Resources (online and offline):

- Competency-Based Learning Material for Class XII.

RESOURCES

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