Grades 9 to 12 Heavy Duty Equipment Technician

Manitoba Technical-Vocational Curriculum Framework of Outcomes

Manitoba

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Available in alternate formats upon request.

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Technical-Vocational Education Overview

In 2013, Manitoba Education released the document *Technical-Vocational Education Overview* (see www.edu.gov.mb.ca/k12/cur/teched/sy_tech_program.html) to provide the philosophical and pedagogical underpinnings for curriculum development and the teaching of courses in the Senior Years Technology Education Program (SYTEP). This overview provides educators with the vision and goals of technical-vocational education (TVE) in Manitoba. Topics include the following:

- curriculum revitalization and renewal
- curriculum framework and implementation
- articulation of programming
- assessment and reporting
- safety
- employability/essential skills and career development
- sustainable development

TVE clusters of courses are designed to encourage students to explore career options and to address labour shortages in these vocational areas. The TVE curriculum includes course clusters for both trades (those designated for apprenticeship training and certification by Apprenticeship Manitoba) and non-trade occupations (those not designated as trades by Apprenticeship Manitoba). TVE curriculum is significantly different from other subject areas such as industrial arts. It has distinct qualities that, when respected, will provide students with a uniquely valuable experience that they cannot receive from any other curriculum.

TVE gives students the opportunity to learn the theoretical and practical aspects of one trade or non-trade occupation in order to facilitate their transition from school to work or to post-secondary education in that occupation, or into an associated one. This transition is accomplished by having students complete an entire TVE cluster of courses, learning from industry-certified teachers with industry experience in a setting that, as much as possible, emulates an actual workplace. TVE curriculum includes Grades 9 to 12 courses in a variety of trades and non-trade occupations, including heavy duty equipment technician.

Senior Years Technology Education Program (SYTEP) Diploma

Students who complete eight required courses from one approved technical-vocational cluster are eligible to receive a Senior Years Technology Education Program (SYTEP) diploma. (The optional Grade 9 course is not required.) They also need to complete the 17 compulsory credits and 5 optional credits. (Students can also earn a SYTEP diploma by successfully completing eight applied commerce education courses.) For more information about Technology Education Program graduation requirements, visit www.edu.gov.mb.ca/k12/policy/gradreq/docs/grad_req_te_new.pdf.

Heavy Duty Equipment Technician (HDET) Overview

Grades 9 to 12 Heavy Duty Equipment Technician: Manitoba Technical-Vocational Curriculum Framework of Outcomes identifies the goals, general learning outcomes (GLOs), and specific learning outcomes (SLOs) for nine heavy duty equipment technician (HDET) courses. Manitoba Education and Early Childhood Learning developed this framework for use in all Manitoba schools teaching HDET as part of the Senior Years Technology Education Program. As with all other TVE clusters, schools need approval from the department to teach HDET courses and need to offer the complete cluster of eight required courses (the Grade 9 course is optional). This is one of several unique features of TVE.

2022 Revisions

During the 2020/2021 school year, Manitoba Education and Early Childhood Learning struck a committee of HDET educators to revise the high school curriculum in order to reflect the changes to the following three common core Level 1 technical training documents from Apprenticeship Manitoba:

- Heavy Duty Equipment Technician
- Agricultural Equipment Technician
- Truck and Transport Mechanic

These technical training documents had undergone revisions as part of the National Red Seal Harmonization Initiative, which aligned trades training across Canada. The 2022 version of this high school curriculum reflects these changes to provide HDET students in Manitoba the opportunity to complete their Level 1 technical training in those three trades in high school.

HDET as a Technical-Vocational Education (TVE) Cluster

Grades 9 to 12 Heavy Duty Equipment Technician: Manitoba Technical-Vocational Curriculum Framework of Outcomes has been developed as a technical-vocational education cluster of courses.

Like all other TVE courses, the HDET courses should be taught only as part of a complete cluster, approved by Manitoba Education and Early Childhood Learning.

The HDET curriculum provides specific heavy duty equipment technician training, and, because it includes the common core Level 1 technical training from Apprenticeship Manitoba, it also prepares students for apprenticeship in all three trades of heavy duty equipment technician, agricultural equipment technician, and/or truck and transport mechanic.

The Three Common Core HDET Trades

The Level 1 curriculum for the following three trades are identical because apprentices in these trades need to learn the same foundational skills and knowledge.

- Heavy Duty Equipment Technician
  www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/heavydutyequiptech.html
- Agricultural Equipment Technician
  www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/agequip.html
- Truck and Transport Mechanic
  www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/trucktransportmech.html

The term *common core Level 1* describes this arrangement. In Levels 2 to 4, students specialize in only one of the three trades. The advantage of teaching the common core Level 1 to high school students is that they learn the foundational skills and knowledge for all three trades, but they do not yet have to choose which trade they will enter. This is important because Apprenticeship Manitoba registers apprentices in only one trade. This curriculum contains **all of the outcomes** found in the Level 1 technical training for the three trades.

Students also have the opportunity to register as apprentices, and work in one of the three trades. For more information, please see www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/.

Level 1 Apprenticeship in the Three Common Core HDET Trades

Under the following conditions, students have the opportunity to earn their Level 1 apprenticeship technical training in the three common core HDET trades:

1. Students need to complete the **eight required courses**—those in Grades 10 to 12. (The Grade 9 course is optional.)
2. The eight required courses must have an S (Specialized) or E (EAL) designation.
3. Apprenticeship Manitoba needs to have accredited the high school's program. The high schools whose programs are accredited are listed at the bottom of this page: www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/heavydutyequiptech.html.

Teachers requesting accreditation for their program should refer to the completed *Unit to Course Comparison (UCC) Form – HDET Level 1*, available at www.edu.gov.mb.ca/k12/cur/teched/sytep/hd_equip/index.html. This form lists where each Apprenticeship Manitoba Level 1 outcome is taught in the eight required courses. This information is essential for accreditation. For more information on accreditation, see "Information for Instructors and Educators" on the Apprenticeship Manitoba website at www.gov.mb.ca/wd/apprenticeship/generalinfo/print,instructoreducators.html.

Specialized (S) or EAL (E) Designation Required for Level 1 Accreditation

All courses in this cluster are designated as S (Specialized), E (EAL), or M (Modified). Students who successfully complete the eight required courses with all of them designated S or E may be eligible for Level 1 technical training accreditation from Apprenticeship Manitoba in the three common core HDET trades. This is because the S and E designated courses contain **the entire Level 1 technical training curriculum** prescribed by Apprenticeship Manitoba. However, students who complete the cluster with one or more M designated courses are **not** eligible for Level 1 accreditation.

Employment Opportunities for HDET Graduates

Graduates of this cluster of courses can seek employment in a number of areas, including as a service consultant, parts advisor, parts rebuilder, maintenance technician, specialty/after-market technician, sales consultant, tools and equipment representative, and military vehicle technician.

Graduates are typically employed by agriculture equipment dealerships, trucking companies, mining companies, independent service centres, specialty repair shops, parts suppliers, sales and leasing companies, parts recyclers and manufacturers, organizations with fleets of equipment, truck body repair centres, and the military. They can be found working on many types of equipment such as small engines, cars, heavy equipment, trains, and ships.

These HDET courses provide a foundation for students to go directly to work, or to continue into post-secondary education or further training in heavy duty equipment technology, mechanical engineering, design manufacturing, and management in the heavy duty equipment industry.

Students who have completed the HDET cluster of courses will be able to do the following:

- perform basic maintenance and service
- perform vehicle safety inspections
- complete repairs and servicing
- complete preventive maintenance procedures
- understand and use computerized systems
- communicate and work with peers, employers, and customers
- think logically and make decisions
- work independently or as part of a team

HDET Teacher Qualifications

Only vocationally certified teachers are allowed to teach TVE courses, including the ones in this cluster. Vocational certification for HDET includes three components:

1. **Journeyperson Certification** in one of the three trades (heavy duty equipment technician, agricultural equipment technician, truck and transport mechanic). HDET teachers need to have personally achieved certification as journeypersons in one of these trades so that they can share that experience with their students.

2. **Industry Experience:** HDET teachers need to have been employed in the industry for at least six years (including the time that they spent as apprentices). This will enable them to share their industry experience with students to prepare them for working in the heavy duty equipment (HDE) industry.

3. **Technical Vocational Teaching Certificate:** All TVE teachers need to earn their technical vocational teaching certificate, obtained by completing Red River College Polytechnic's one-year Technical Vocational Teacher Education diploma program. For information about this program, see https://catalogue.rrc.ca/Programs/WPG/FullTime/TECVF-DP.

Employing only vocationally certified teachers to teach TVE courses preserves the integrity of TVE programming by ensuring that teachers are able to share their first-hand experience, as well as their familiarity with industry certification. Students receive instruction from somebody who has been involved in that industry. School boards risk significant liability if they employ non–vocationally certified teachers to teach TVE courses. Vocational certification confirms that a teacher has the requisite skills and knowledge to teach the health, safety, and security concerns. For further information, see sections 6 and 12(1) of the *Teaching Certificates and Qualifications Regulation* (115/2015) of *The Education Administration Act* (C.C.S.M. c. E10) at https://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=115/2015, and page 23 of the current *Subject Table Handbook: Technology Education* at www.edu.gov.mb.ca/k12/docs/policy/sthte/.

Comparison of TVE HDET with Industrial Arts Power Mechanics Technology

Like all TVE curricula, *Grades 9 to 12 Heavy Duty Equipment Technician: Manitoba Technical-Vocational Framework of Outcomes* has been developed to prepare high school students for a career in a trade. In this case, students will learn the knowledge, skills, and attitudes required to work in one of the three HDET trades. It has not been developed as a general interest cluster of courses in power mechanics technology. Schools interested in teaching such a course are invited to teach the industrial arts curricula, which can be found on the department's website at www.edu.gov.mb.ca/k12/cur/teched/ind_arts.html.

Although HDET and industrial arts power mechanics technology curricula share some common content, they have been developed for completely different purposes and have significant differences. The chart on the following page summarizes some of the differences between HDET (as a TVE cluster) and power mechanics technology (as an industrial arts cluster).

TVE HDET and Industrial Arts Power Mechanics Technology Comparison Chart

Frequently Asked Questions	TVE Heavy Duty Equipment Technician	Industrial Arts Power Mechanics Technology
1. Is the purpose to facilitate students' transition to the HDET trades?	Yes	No
2. Does the instruction try to emulate, as far as possible, a regular workplace?	Yes	No
3. Does the curriculum mandate employability skills such as punctuality and time management?	Yes	No
4. Is the teacher required to be a journeyperson in one of the HDET trades?	Yes	No
5. Is the teacher required to have experience working in one of the HDET trades?	Yes	No
6. Does the cluster prepare students for certification as a journeyperson in one of the HDET trades?	Yes	No
7. Does the cluster focus on preparing students for entry-level employment in one of the HDET trades after high school?	Yes	No
8. Is the teacher required to have a Manitoba general teacher certificate?	No	Yes
9. Is the teacher required to have a Manitoba technical vocational teacher certificate?	Yes	No
10. Do schools require special permission from Manitoba Education and Early Childhood Learning to offer the cluster of courses?	Yes	No
11. Do schools have to offer all of the courses in the cluster?	Yes	No
12. Can schools offer hybrid clusters, made up of courses from several clusters?	No	Yes
13. Will students receive a Senior Years Technology Education Program (SYTEP) Diploma when they complete a cluster of courses?	Yes	No

How This HDET Framework Is Organized

The TVE frameworks, including this one, are organized into course goals, general learning outcomes (GLOs), and specific learning outcomes (SLOs).

HDET Course Goals

The goals for all TVE curricula represent the broadest aims of that cluster of courses.

Goals consist of one or more GLOs. If there are only a few SLOs under that goal, then there is only one GLO, which is identical to the goal. When there are a large number of SLOs, they are usually organized logically under two or more GLOs.

General Learning Outcomes (GLOs)

As is stated in the *Technical-Vocational Education Overview* document, "General learning outcomes (GLOs) are overarching statements about what students are expected to learn in each course. They identify the broad categories of knowledge, skills, and attitudes that students are expected to learn and are able to demonstrate in a subject area or course" (8).

GLOs are used to organize SLOs. In certain courses, some GLOs are not listed because there are no SLOs under that GLO.

Curriculum Goals and General Learning Outcomes

Goal 1:	Describe and apply appropriate **safety** practices for heavy duty equipment technicians.
GLO 1.1:	Describe and apply appropriate **safety** practices for heavy duty equipment technicians.
Goal 2:	Identify, select, use, and maintain **tools, equipment, materials, and consumables.**
GLO 2.1:	Identify, select, use, and maintain **tools, equipment, materials, and consumables.**
Goal 3:	**Maintain, diagnose, and repair** HDE systems.
GLO 3.1:	Perform **maintenance** on HDE systems.
GLO 3.2:	**Diagnose** issues with HDE systems.
GLO 3.3:	**Repair** HDE systems.
Goal 4:	Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology.
GLO 4.1:	**Read, interpret, and communicate** information relevant to HDE technology.
GLO 4.2:	Apply knowledge and skills from **mathematics** to HDE technology.
GLO 4.3:	Apply knowledge and skills from the **sciences** to HDE technology.
GLO 4.4:	Apply knowledge and skills from **information and communication technology** to HDE technology**.**

Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology.

- **GLO 5.1:** Describe the HDE industry's **sustainability practices** and its impact on the environment.
- **GLO 5.2:** Describe the impact of the HDE industry on **human health and well-being.**
- **GLO 5.3:** Describe **sustainable business practices** within the HDE service and repair industry.

Goal 6: Demonstrate an awareness of **ethics** and **legal standards** as they pertain to the HDE industry.

- **GLO 6.1:** Demonstrate an awareness of **ethics** as they pertain to the HDE industry.
- **GLO 6.2:** Demonstrate an awareness of **legal standards** as they pertain to the HDE industry.

Goal 7: Demonstrate **employability skills** related to the HDE industry.

- **GLO 7.1:** Demonstrate fundamental **employability skills.**
- **GLO 7.2:** Demonstrate an understanding of the **business operation** of a HDE service and repair facility.
- **GLO 7.3:** Demonstrate the knowledge, skills, and attitudes required to **think critically** in order to **solve complex problems**.
- **GLO 7.4:** Demonstrate an awareness of **cultural competence**, and its importance in the workplace.

Goal 8: Demonstrate an understanding of the **scope** of the HDET trades (along with associated occupations), including **working conditions**, and **training** and **career opportunities**.

- **GLO 8.1:** Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**.
- **GLO 8.2:** Demonstrate an understanding of **career** and **training opportunities** in HDE technology and associated professions.

Goal 9: Demonstrate an awareness of the **evolution** of HDE technology, including its **technological progression and emerging trends.**

- **GLO 9.1:** Describe the **evolution** of HDE service and repair, including its **technological progression and emerging trends.**

HDET Specific Learning Outcomes (SLOs)

Specific learning outcomes (SLOs) define what students are expected to achieve by the end of a course. Teachers are required to teach and assess each SLO. Students' final grades are based only on the course's SLOs.

Most SLOs are found in only one course. However, the committee repeated some SLOs, especially those dealing with safety practices and employability skills, in several courses in order to emphasize their importance.

In order to emphasize and simplify the correlation between this document and the technical training from Apprenticeship Manitoba, this document has, as much as is practical, kept all of the objectives from each Apprenticeship Manitoba unit together under one GLO, even when some of the objectives might be more logically placed under a different GLO.

For example, all of the objectives under Apprenticeship Manitoba's Unit A10 (Frames, Suspensions, and Structural Components) have been placed under GLO 4.2 in course 8675 Chassis, Frame, and Undercarriage Systems. Logically, Objective A10.2 (Identify hazards and describe safe work practices pertaining to frames, front and rear axles, suspension systems, and cab components.) would be placed under GLO 1.1, which focuses on safety practices. However, the committee felt that teachers would prefer to have all of the objectives in Unit A10 together, in order, under the same GLO, because they would not have to search the entire curriculum to find the SLOs.

When most or all objectives from one Apprenticeship Manitoba Level 1 Unit are listed together in one course, a heading has been placed above that list, along with the total number of hours allocated by Apprenticeship Manitoba, for example, **A2 Trade Safety Awareness (7 hours)**.

Apprenticeship Manitoba Objectives as SLOs

To align the high school curriculum with the Apprenticeship Manitoba technical training, the **Apprenticeship Manitoba objectives** are included in the high school curriculum verbatim. These objectives become some of the **high school curriculum's specific learning outcomes** (SLOs). An **alphanumeric code** (for example, A1.1) is included at the end of the SLO, which indicates the unit and objective from which they were taken. Other SLOs related to the heavy duty equipment technician trade that are not from Apprenticeship Manitoba do not have the alphanumeric code. For example, here is SLO 12D.9.1.1 from 8704 Applied Heavy Duty Equipment Technology:

> 12D.9.1.1 Describe structure and scope of the agricultural equipment technician, heavy duty equipment technician, and truck and transport mechanic trades. **(A1.1)**

A1.1 indicates that the SLO is **Objective 1** from **Unit A1 Learning about Work**, from page 1 of the 2019 version of *Agricultural Equipment Technician, Heavy Duty Equipment Technician, and Truck and Transport Mechanic: Common Core Level 1*, available online at www.gov.mb.ca/wd/apprenticeship/pdfpubs/pubs/discover/mb_trades/truck_transport_mech/truck_trans_mech_lev1.pdf.

The Level 1 document also includes the following **essential content under A1.1**:

1. Describe structure and scope of the Agricultural Equipment Technician, Heavy Duty Equipment Technician, and Truck and Transport Mechanic trades.
   a. The Apprenticeship and Certification Act
      - Apprenticeship and Certification Board and Provincial Advisory Committees
      - General and specific trade regulation
      - Policies regarding attendance, evaluation procedures, conduct, and progression requirements (Apprenticeship Manitoba, Training provider)
   b. Uses of the National Occupational Analysis (NOA)
      - Technical training in-school curriculum
      - On-the-job record book of hours (Manitoba blue book)
      - Examinations (level placement tests, final certification examinations)
   c. Opportunities and future career options
      - Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.
      - Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers.
      - Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the drawbacks to being away from home for several weeks at a time?
      - Job hierarchies and innovations. What trade-specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

These details are a necessary part of this curriculum. So, when teaching this SLO, teachers must ensure that they are covering each point listed. Teachers also need to become familiar with the common core Level 1 documents for these trades. These documents provide invaluable background to this curriculum, and are found at the following web pages:

- www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/heavydutyequiptech.html
- www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/agequip.html
- www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/trucktransportmech.html

The Two Formats: Multi-course and Individual Course

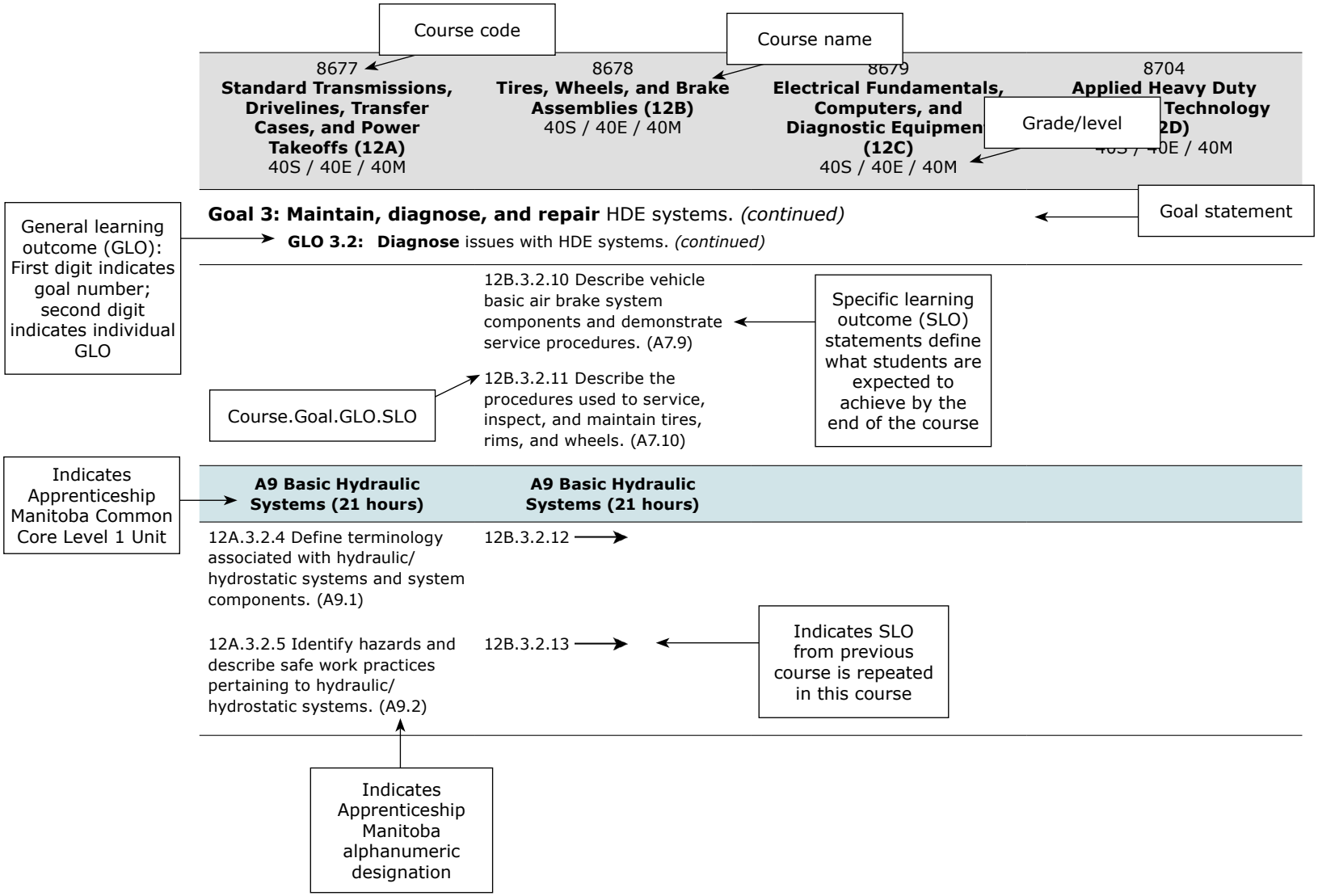
This curriculum is available in two formats:

- The **multi-course format** comprises either five columns (one course each in Grades 9 and 10, and three in Grade 11) or four columns (the four Grade 12 courses). It is found in this document, starting on page 19.
- The **individual-course files** are made up of one course per file. Those nine files can be found at www.edu.gov.mb.ca/k12/cur/teched/sytep/hd_equip/index.html.

The most important difference is that the **multi-course files do not contain all of the content**. Specifically, while they contain all of the specific learning outcomes (SLOs), they **do not contain all of the detailed content** associated with each SLO. That detailed content is found only in the individual-course files. Therefore, **teachers need to use the individual-course files**.

The multi-course format does not contain all of the content simply because there is not enough room for it. If it were to contain all of the content, some individual SLOs and their content would fill a narrow column for several pages, making the document difficult to navigate. The multi-course format is very useful, nevertheless, because it allows teachers to compare the four or five courses listed there, and to see how students progress from one course to the next within each goal and general learning outcome.

Guide to Reading HDET Goals and Learning Outcomes (Multi-course Format)



Implementation of HDET Courses—Additional Information

GLOs 1.1, 5.2, 7.1, and 8.1: Young Worker Readiness Certificate Course

The government of Manitoba, in partnership with SAFE Work Manitoba, has launched a new Young Worker Readiness Certificate Course in order to "prepare young Manitobans for entering the workforce and help keep them safe." Youth can complete the course online. HDET teachers might find this course helpful in teaching GLOs 1.1, 5.2, 7.1, and 8.1. A link to the course materials can be found at the bottom of this page: www.edu.gov.mb.ca/k12/cur/cardev/safety.html.

GLO 1.1: Teaching Safety in the Trades

Apprenticeship Manitoba has released *Building a Safer Workplace Workshop Manual* (2020) as a resource for teaching safety in the trades. It is found at the bottom of this web page: www.gov.mb.ca/wd/apprenticeship/generalinfo/print,instructoreducators.html.

GLO 6.1: Teaching Ethics

Ethics can be defined as a person or group's **moral principles** that direct their behaviour. Most people share similar ethics, even if they are from different backgrounds. For example, most people are in favour of the Golden Rule, "Do to others as you would have others do to you." Examples of ethical characteristics include the following:

- caring for others
- awareness of others and their needs
- courage
- integrity
- honesty
- citizenship
- fairness
- responsibility
- transparency
- loyalty
- respect
- inclusiveness

The ultimate goal of TVE is to help students live a productive, fulfilling life while providing useful and valuable products and services, thereby contributing to the greater welfare of society. This can only be done if they act in an ethical manner. Since TVE curriculum focuses on preparing students for the workplace, students need to understand ethics, and to act ethically in order to coexist peacefully with others and achieve their full potential.

An individual's personal ethics are based on a number of factors, including the culture(s) to which they belong. In a pluralistic society like ours, different cultures have different ethical standards. Students need to understand that there are various points of view, and they should be encouraged to ask others for their points of view and to take those into consideration when formulating their own.

Here are some ethical issues that can be found in the workplace, including the HDE industry:

- taking paid sick leave when you are not sick
- stealing
- overcharging for hours, parts, services, etc.
- inappropriate use of electronic devices
- not putting in a full day's work
- shoddy work
- disrespecting or discriminating against others
- avoiding a situation out of fear
- using used parts when the customer assumes that you will be using new parts
- inappropriately disclosing confidential information or gossiping
- dishonesty
- acting in an environmentally unethical manner (ignoring environmental regulations, illegal dumping, wasting resources, etc.)
- not demonstrating empathy when it would be appropriate to do so

GLO 7.3: Teaching Critical Thinking and Problem Solving

To succeed in life, school, and the workplace, students need to be able to think critically in order to solve problems, including complex problems in which solutions take several steps and which might need input from several people. One of the main uses of critical thinking in the workplace is in diagnosing problems and deciding on the best solution. Critical thinking is the process of analyzing facts, and arriving at a conclusion based **only** on the facts. The process is unbiased and rational. Students with strong problem-solving skills are more likely to gather the correct information, isolate the problem, and solve it.

> Critical thinking involves the intentional process of analyzing and synthesizing ideas using criteria and evidence, making thoughtful decisions, and reflecting on the outcomes and implications of those decisions.
>
> The competency of critical thinking facilitates the in-depth examination of situations, questions, problems, opportunities, and perspectives. It encompasses a willingness to challenge assumptions, thoughts, beliefs, and actions.
>
> Critical thinking is fundamental to learning more broadly and deeply, and making ethical decisions as reflective and contributing citizens. (Manitoba Education and Early Childhood Learning, draft of *Competency Definitions and Indicators*)

Problem solving has been identified as one of the Skills for Success by the Government of Canada. These are the skills that are needed for work, learning, and life. You can find out more at the following website: https://www.canada.ca/en/services/jobs/training/initiatives/skills-success/understanding-individuals.html.

GLO 7.4: Teaching Cultural Competence

Culture includes the customs, behaviours, norms, beliefs, arts, and laws of groups of people.

Cultures are determined by factors such as race, ethnicity, nationality, gender, sexual orientation, religion, and social class. People typically belong to more than one culture.

To succeed at school and in the workplace, students need to be able to understand, appreciate, and interact with people from cultures or belief systems different from their own. That is cultural competence. Cultural competence is more than tolerance, which involves putting up with differences. Instead, cultural competence acknowledges and respects diverse cultures.

GLO 8.1: Teaching the Scope of the Three Trades

The scope of the three trades includes general aspects of the trades that high school students are likely unaware of, and are unlikely to inquire about. Topics include the following:

- What are the working conditions typically associated with this trade? Do apprentices and journeypersons often work outside? Do they work different shifts? Are they on call?
- What salaries are typical in this trade? Do they vary much? If so, under which conditions?
- Which types of organizations typically employ HDETs? Where do they work?
- Are there specialists in this trade? If so, in what do they specialize? What are their working conditions and salaries?
- Do apprentices and journeypersons typically have to travel far to the workplace? If so, what are the consequences of being away from home for long periods of time?
- What are the opportunities for becoming a supervisor in this trade?
- Are apprentices and journeypersons typically unionized? How are the salaries and working conditions of unionized tradespersons different from the non-unionized?
- What are some of the organizations associated with the three HDET trades (industry groups, trade associations, labour unions, etc.)? What roles do these organizations play?

SLOs: Demonstrating Awareness versus Demonstrating Understanding

This curriculum often contains almost identical SLOs with only slight changes in the wording. For example, under GLO 8.2, the Grade 10 course includes this SLO: "Demonstrate an **awareness** of career and training opportunities in HDE technology and associated occupations." A **corresponding SLO** is found in Grade 12, with only one word different. "Demonstrate an **understanding** of career and training opportunities in HDE technology and associated occupations." This means that students are introduced to this topic in an earlier course and then learn about it in more detail in later courses.

"Demonstrate an ***awareness*** of . . ." is an entry-level SLO. It means that students need to become aware of the topic by exploring it. They do **not** need to have a comprehensive conceptual understanding of the topic. Students should end up with enough awareness of the topic to know the following:

- key information
- why it is interesting or relevant to them
- how to become better informed about it
- how it affects apprentices and journeypersons

"Demonstrate an ***understanding*** of . . ." is a higher-level SLO. Students need to have deeper conceptual understanding of this topic than of those SLOs that begin with "Demonstrate an awareness of . . ." For students to understand something, they need to be able to reflect on it, analyze it, and apply it in order to solve a problem.

Order of Teaching SLOs

This curriculum is not sequential. In other words, teachers might teach learning outcomes in an order different from how they appear in the document.

HDET Cross-Curricular Learning Outcomes

Cross-curricular learning outcomes include essential skills from subject areas including, but not limited to, English language arts, mathematics, and the sciences. Teachers should integrate these essential skills into the authentic experiences of the courses, along with learning outcomes dealing with the following topics:

- health and safety
- evolution, technological progression, and emerging trends
- sustainability
- ethical and legal standards
- employability skills
- the HDE industry

Learning Experiences

In most courses, the emphasis is for students to learn by completing tasks, as opposed to learning abstract concepts. For instructional purposes, the sequence of learning outcomes can vary based on the learning experiences within the course. Teachers should select learning experiences best suited for students to learn the SLOs, based on a variety of

factors including access to resources or regional interests and needs. In light of rapid changes in technology, the committee encourages teachers to update learning experiences in order to meet the needs of students.

Additional Resources

Red Seal HDET Resources

Because the three HDET trades are designated Red Seal trades across Canada, the Apprenticeship Manitoba curriculum is aligned with the Canada-wide Red Seal curriculum. High school HDET teachers, as well as students working towards their Level 1 apprenticeship for HDET, can find valuable resources such as sample examination questions used on Red Seal examinations in the following sections of the Red Seal website.

- Agricultural Equipment Technician: https://www.red-seal.ca/eng/trades/.1gr.3_t.2ch.shtml
- Heavy Duty Equipment Technician: https://www.red-seal.ca/eng/trades/hd.2t.shtml
- Truck and Transport Mechanic: https://www.red-seal.ca/eng/trades/tr.5ck_tr.1nsp_m.2ch.shtml

Canadian Apprenticeship Forum

The Canadian Apprenticeship Forum / Le Forum canadien sur l'apprentissage (CAF-FCA) is "a non-profit organization that connects Canada's apprenticeship community" (https://caf-fca.org/about-caf-fca/). Information about CAF-FCA is provided in this document because it contains current, valuable resources for teachers and students regarding trades and apprenticeship.

- Canadian Apprenticeship Forum: https://caf-fca.org/
- Careers in Trades: https://careersintrades.ca/
- Trades Explorer Tool: https://caf.insite.com/custom/caf/surveys/forms/youthassessment/start.aspx
- Careers in Trades videos: https://careersintrades.ca/resources/videos/
- *Apprenticeship: Post-Secondary Education That Matters! An Educator's Guide to Careers in the Skilled Trades*: https://careersintrades.ca/wp-content/uploads/2018/10/CAF_Educator_Guide-EN.pdf
- *Apprenticeship: Your Career Starts Now! A Guide to Careers in the Skilled Trades and Apprenticeship and Careers in the Skilled Trades: A Guide for Educators*: https://careersintrades.ca/resources/career-influencers/

HDET Course Descriptions

8672 Exploration of Heavy Duty Equipment Technology

15S/15E/15M
10S/10E/10M

This is an optional course intended for students wishing to explore HDE technology. The emphasis is on hands-on experiences. Students are introduced to safety practices, tools, equipment, systems, and service procedures.

8673 Introduction to Heavy Duty Equipment Technology

20S/20E/20M

Students learn safety practices, tools and equipment, and HDE systems and service procedures, and are introduced to diagnosis strategies.

8674 Diesel Engine Fundamentals and Service

30S/30E/30M

Students learn the basic principles of diesel engines, the inner workings and relations of the engine components, and how those relate to vehicle operation. They also learn the procedures to service, repair, and replace engines and their components.

8675 Chassis, Frame, and Undercarriage Systems

30S/30E/30M

Students learn basic principles of the vehicle chassis, frame, and undercarriage systems. They will be able to describe, diagnose, and repair problems with vehicle chassis, frame, and undercarriage systems, and with steering alignment.

8676 Welding Processes and Fuels

30S/30E/30M

Students will develop skills in oxyacetylene welding and cutting and metallurgy. The student will also be able to diagnose and repair a variety of fuel-related problems, and demonstrate familiarity with alternate fuels.

8677 Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs

40S/40E/40M

Students will learn the basic principles of standard transmissions, drivelines, transfer cases, and power takeoffs. They will be able to service standard transmissions, drivelines, transfer cases, and power takeoffs, and diagnose and repair problems with them.

8678 Tires, Wheels, and Brake Assemblies

40S/40E/40M

Students will learn about tires, wheels, and brake assemblies. They will be able to service tires, wheels, and brake assemblies, and diagnose and repair problems with them.

8679 Electrical Fundamentals, Computers, and Diagnostic Equipment

40S/40E/40M

Students will learn electrical fundamentals, computers and diagnostic equipment, and electrical theory, including circuits. They will be able to use electronic diagnostic interfaces to service HDE systems and to diagnose and repair problems with them.

8704 Applied Heavy Duty Equipment Technology

40S/40E/40M

Students will learn to apply diagnostic strategies to a variety of vehicle systems and components. They will demonstrate the ability to address customer concerns by diagnosing and correcting problems, and to complete vehicle repairs to accepted industry standards.

Grades 9 to 11
Heavy Duty Equipment Technician

General and Specific Learning Outcomes by Goal

Grades 9 to 11 Heavy Duty Equipment Technician: General and Specific Learning Outcomes by Goal

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. **GLO 1.1:** Describe and apply appropriate **safety** practices for heavy duty equipment technicians.				
9.1.1.1 Demonstrate the ability to describe and apply appropriate health and safety practices.	10.1.1.1 →	11A.1.1.1 →	11B.1.1.1 →	11C.1.1.1 →
9.1.1.2 Demonstrate the ability to create and maintain a safe and organized working environment.	10.1.1.2 →	11A.1.1.2 →	11B.1.1.2 →	11C.1.1.2 → 11C.1.1.3 Demonstrate an understanding of hazards associated with electric drive vehicles. 11C.1.1.4 Demonstrate an understanding of safety procedures associated with electric drive vehicles.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)* **GLO 1.1:** Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*				
	10.1.1.3 Apply safety procedures associated with hydraulic hydrostatic system servicing.	11A.1.1.3 →	11B.1.1.3 →	11C.1.1.5 →
	10.1.1.4 Apply safety procedures associated with HVAC system servicing.	11A.1.1.4 →	11B.1.1.4 →	11C.1.1.6 →
A2 Trade Safety Awareness (7 hours)	**A2 Trade Safety Awareness (7 hours)**	**A2 Trade Safety Awareness (7 hours)**	**A2 Trade Safety Awareness (7 hours)**	**A2 Trade Safety Awareness (7 hours)**
9.1.1.3 Identify safety and health requirements. (A2.1)	10.1.1.5 →	11A.1.1.5 →	11B.1.1.5 →	11C.1.1.7 →
9.1.1.4 Identify personal protective equipment (PPE) and procedures. (A2.2)	10.1.1.6 →	11A.1.1.6 →	11B.1.1.6 →	11C.1.1.8 →
9.1.1.5 Identify electrical safety. (A2.3)	10.1.1.7 →	11A.1.1.7 →	11B.1.1.7 →	11C.1.1.9 →

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

GLO 1.1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

A2 Trade Safety Awareness (7 hours) ***(continued)***	**A2 Trade Safety Awareness (7 hours)** ***(continued)***	**A2 Trade Safety Awareness (7 hours)** ***(continued)***	**A2 Trade Safety Awareness (7 hours)** ***(continued)***	**A2 Trade Safety Awareness (7 hours)** ***(continued)***
9.1.1.6 Identify fire safety. (A2.4)	10.1.1.8 →	11A.1.1.8 →	11B.1.1.8 →	11C.1.1.10 →
9.1.1.7 Identify ergonomics. (A2.5)	10.1.1.9 →	11A.1.1.9 →	11B.1.1.9 →	11C.1.1.11 →
9.1.1.8 Hazard recognition and control. (A2.6)	10.1.1.10 →	11A.1.1.10 →	11B.1.1.10 →	11C.1.1.12 →
9.1.1.9 Hazard of confined space entry. (A2.7)	10.1.1.11 →	11A.1.1.11 →	11B.1.1.11 →	11C.1.1.13 →
9.1.1.10 Identify First Aid/CPR. (A2.8)	10.1.1.12 →	11A.1.1.12 →	11B.1.1.12 →	11C.1.1.14 →
9.1.1.11 Identify the safety requirements as they apply to WHMIS. (A2.9)	10.1.1.13 →	11A.1.1.13 →	11B.1.1.13 →	11C.1.1.15 →
9.1.1.12 Identifying and controlling hazards. (A2.10)	10.1.1.14 →	11A.1.1.14 →	11B.1.1.14 →	11C.1.1.16 →

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 2: Identify, select, use, and maintain **tools, equipment, materials, and consumables**. **GLO 2.1:** Identify, select, use, and maintain **tools, equipment, materials, and consumables**.				
9.2.1.1 Demonstrate the knowledge and skills required to identify, select, use, and maintain HDET tools, equipment, materials, and consumables.	10.2.1.1 →	11A.2.1.1 Demonstrate the knowledge and skills required to identify, select, use, and maintain tools, equipment, materials, and consumables used in the maintenance and repair of diesel engines.	11B.2.1.1 Demonstrate the knowledge and skills required to identify, select, use, and maintain tools, equipment, materials, and consumables used in the maintenance and repair of chassis, frame, and undercarriage systems.	11C.2.1.1 Demonstrate the knowledge and skills required to identify, select, use, and maintain tools, equipment, materials, and consumables used in welding.
	10.2.1.2 Demonstrate the knowledge and skills required to select and use diagnostic tools, such as infrared temp guns, calipers, and ultrasonic cleaners.			11C.2.1.2 Demonstrate an understanding of the various fuels used in HDE technology.
				11C.2.1.3 Demonstrate an awareness of alternate fuels (e.g., biodiesel, hydrogen, ethanol) used in HDE technology.
				11C.2.1.4 Demonstrate an understanding of the use of electrical drive systems found in HDE technology.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 2: Identify, select, use, and maintain **tools, equipment, materials, and consumables**. *(continued)*

GLO 2.1: Identify, select, use, and maintain **tools, equipment, materials, and consumables**. *(continued)*

		A3 Tools and Equipment (28 hours)		
		11A.2.1.2 Define terminology associated with workshop practices and materials. (A3.1) 11A.2.1.3 Describe and identify tools and equipment. (A3.2) 11A.2.1.4 Explain and demonstrate the principles of use of workshop tools and equipment. (A3.3) 11A.2.1.5 Describe the procedures used to start, move, and shut down machinery. (A3.4)		

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 3: Maintain, diagnose, and repair HDE systems.				
GLO 3.1: Perform **maintenance** on HDE systems.				
9.3.1.1 Demonstrate the knowledge and skills required to perform maintenance on HDE systems.	10.3.1.1 →	11A.3.1.1 Demonstrate the knowledge and skills required to perform maintenance on diesel engines.	11B.3.1.1 Demonstrate the knowledge and skills required to perform maintenance on chassis, frame, and undercarriage systems.	
GLO 3.2: **Diagnose** issues with HDE systems.				
9.3.2.1 Demonstrate an understanding of the importance of diagnosis in HDE systems.	10.3.2.1 Demonstrate the knowledge and skills required to diagnose issues found in heavy duty equipment systems.	11A.3.2.1 Demonstrate the knowledge and skills required to diagnose issues related to diesel engines.	11B.3.2.1 Demonstrate the knowledge and skills required to diagnose issues related to chassis, frame, and undercarriage systems.	11C.3.2.1 Demonstrate an understanding of fuel injection systems. 11C.3.2.2 Demonstrate the knowledge and skills required to diagnose issues related to the use of inappropriate fuels.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.2: Diagnose** issues with HDE systems. *(continued)*				
				11C.3.2.3 Demonstrate the knowledge and skills required to diagnose problems with welds. 11.C.3.2.4 Demonstrate the knowledge and skills required to diagnose problems with welding equipment.
		A8 Hoisting and Lifting (7 hours)	**A10 Frames, Suspensions, and Structural Components (14 hours)**	**A12 Welding I (28 hours)**
		11A.3.2.2 Define terminology associated with hoisting and lifting. (A8.1)	11B.3.2.2 Define terminology associated with frames, front and rear axles, suspension systems, and cab components. (A10.1)	11C.3.2.5 Define terminology associated with cutting, heating, and welding. (A12.1)

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.2: Diagnose issues with HDE systems. *(continued)*

		A8 Hoisting and Lifting (7 hours) *(continued)*	**A10 Frames, Suspensions, and Structural Components (14 hours) *(continued)***	**A12 Welding I (28 hours) *(continued)***
		11A.3.2.3 Describe towing, lifting, and hoisting equipment and their procedures. (A8.2)	11B.3.2.3 Identify hazards and describe safe work practices pertaining to frames, front and rear axles, suspension systems, and cab components. (A10.2)	11C.3.2.6 Identify hazards and describe safe work practices pertaining to cutting, heating, and welding. (A12.2)
			11B.3.2.4 Identify and describe tools and equipment used to service and repair frames, front and rear axles, and suspension systems. (A10.3)	11C.3.2.7 Identify and describe the types of oxyacetylene cutting, heating, and welding equipment. (A12.3)
			11B.3.2.5 Describe the operation of frames, front and rear axles, and suspension systems. (A10.4)	11C.3.2.8 Explain and demonstrate the principles of operation of oxyacetylene cutting, heating, and welding equipment. (A12.4)

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.2: Diagnose issues with HDE systems. *(continued)*

			A10 Frames, Suspensions, and Structural Components (14 hours) *(continued)*	**A12 Welding I (28 hours) *(continued)***
			11B.3.2.6 Identify frame, suspension system, and cab components, and describe their purpose and operation. (A10.5) 11B.3.2.7 Describe and demonstrate procedures used to inspect, diagnose, and maintain. (A10.6) 11B.3.2.8 Describe and demonstrate servicing procedures for systems. (A10.7) 11B.3.2.9 Describe and demonstrate servicing procedures for cab components. (A10.8)	11C.3.2.9 Demonstrate and perform processes using oxyacetylene equipment. (A12.5)

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.3: Repair HDE systems.

A5 Engine Principles (35 hours)			
9.3.3.1 Demonstrate an awareness of HDE systems and repair procedures.	10.3.3.1 Demonstrate the knowledge and skills required to repair HDE systems.	11A.3.3.1 Define terminology associated with engine principles. (A5.1)	11B.3.3.1 Demonstrate an awareness of chassis, frame, and undercarriage systems.
	10.3.3.2 Demonstrate an awareness of basic electrical components and their operation.	11A.3.3.2 Explain the principles and theories of engine operation. (A5.2)	11B.3.3.2 Demonstrate the knowledge and skills required to repair chassis, frame, and undercarriage systems.
	10.3.3.3 Demonstrate an awareness of and use test equipment, and diagnose problems with basic electrical wiring and components.	11A.3.3.3 Identify types and classifications of engines and describe their applications. (A5.3)	11B.3.3.3 Demonstrate the knowledge and skills required to describe and install sealing devices, and to perform seal service.
	10.3.3.4 Demonstrate an awareness of the purpose and design of batteries, along with battery service ratings.	11A.3.3.4 Identify major engine components and describe their purpose and operation. (A5.4)	

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.3: Repair** HDE systems. *(continued)*				
	10.3.3.5 Demonstrate the knowledge and skills required to explain battery charging and precautions, to diagnose battery problems, and to service batteries.	11A.3.3.5 Demonstrate the knowledge and skills required to repair diesel engine systems.		
	10.3.3.6 Demonstrate an awareness of battery boosting procedures.	11A.3.3.6 Demonstrate the knowledge and skills required to describe sealing devices, to install them, and to perform seal service. 11A.3.3.7 Demonstrate an awareness of engine performance. 11A.3.3.8 Demonstrate an awareness of engine construction.		

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.3: Repair** HDE systems. *(continued)*				
		11A.3.3.9 Demonstrate the knowledge and skills required to perform the removal, installation, disassembly/ assembly inspection, and reconditioning of engine systems. 11A.3.3.10 Demonstrate the knowledge and skills required to describe and perform procedures to diagnose, service, and repair engine lubrication systems. 11A.3.3.11 Demonstrate an awareness of the servicing of engine oil and filters.		

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.3: Repair** HDE systems. *(continued)*				
		11A.3.3.12 Demonstrate an awareness of cooling system types, operation, and service. 11A.3.3.13 Demonstrate an awareness of HDE starting aids. 11A.3.3.14 Demonstrate an awareness of air intake and exhaust system design and operation.		

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 4: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology. **GLO 4.1: Read, interpret, and communicate** information relevant to HDE technology.				
	10.4.1.1 Demonstrate the ability to read, interpret, and communicate information found on components, equipment, manuals, and service records. 10.4.1.2 Locate and interpret identification codes found on the vehicle and vehicle components. (A4.3)	11A.4.1.1 →	11B.4.1.1 →	11C.4.1.1 Demonstrate the ability to read, interpret, and communicate information found on welding equipment, accessories, and supplies.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 4: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology. *(continued)*

GLO 4.2: Apply knowledge and skills from **mathematics** to HDE technology.

	10.4.2.1 Demonstrate the mathematical knowledge and skills required for working on HDE systems.	11A.4.2.1 Demonstrate the mathematical skills required for working on diesel engines.	11B.4.2.1 Demonstrate the mathematical skills required for working on chassis, frame, and undercarriage systems.	11C.4.2.1 Demonstrate the mathematical skills required for welding.
	10.4.2.2 Demonstrate proficiency in the use of fractions, decimals, ratios, and percentages, and in converting between different units of measure (i.e., metric and imperial [standard]).	11A.4.2.2 →	11B.4.2.2 →	11C.4.2.2 →

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 4: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology. *(continued)* **GLO 4.3:** Apply knowledge and skills from the **sciences** to HDE technology.				
		11A.4.3.1 Demonstrate an understanding of the viscosity of liquids.		11C.4.3.1 Demonstrate an understanding of metallurgy as it applies to welding.
		11A.4.3.2 Demonstrate an understanding of pressure in diesel engine systems.		11C.4.3.2 Demonstrate an awareness of alternate fuels (e.g., hydrogen, electric).
		11A.4.3.3 Demonstrate an understanding of the chemicals used in diesel engine systems.		

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M

Goal 4: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology. *(continued)*

GLO 4.4: Apply knowledge and skills from **information and communication technology** to HDE technology.

	10.4.4.1 Describe general organization and basic retrieval strategies for trade-related documents. (A4.5)	11A.4.4.1 →	11B.4.4.1 →	11C.4.4.1 →
	10.4.4.2 Demonstrate trade-related computer skills. (A4.6)	11A.4.4.2 →	11B.4.4.2 →	11C.4.4.2 →
	10.4.4.3 Demonstrate an awareness of shop management software (e.g., electronic work order software).	11A.4.4.3 →	11B.4.4.3 →	11C.4.4.3 →
	10.4.4.4 Demonstrate an understanding of the use of electronic diagnostic tools.	11A.4.4.4 →	11B.4.4.4 →	11C.4.4.4 →

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology. **GLO 5.1:** Describe the HDE industry's **sustainability practices** and its impact on the environment.				
9.5.1.1 Demonstrate an awareness of the HDE industry's sustainability practices and impact on the environment.	10.5.1.1 →	11A.5.1.1 Demonstrate an awareness of the impact of chemical hazards on the environment.	11B.5.1.1 Demonstrate an awareness of the use of second-hand or rebuilt parts versus new parts.	11C.5.1.1 Demonstrate an awareness of the effects of fuel spillage on the environment.
	10.5.1.2 Demonstrate an awareness of efficient materials usage and environmentally responsible disposal practices.	11A.5.1.2 Demonstrate an awareness of efficient material usage to reduce waste and its impact on the environment.	11B.5.1.2 Demonstrate an awareness of the environmental advantages of rebuilding components versus using new components.	11C.5.1.2 Demonstrate an awareness of the effects of fuel emissions on the environment.
	10.5.1.3 Demonstrate an awareness of the use of lightweight and recyclable materials in vehicle production.	11A.5.1.3 Demonstrate environmentally responsible disposal practices.		11C.5.1.3 Demonstrate an awareness of the environmental advantages of using alternate fuels.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology. *(continued)* **GLO 5.2:** Describe the impact of the HDE industry on **human health and well-being**.				
9.5.2.1 Demonstrate an awareness of sustainability as it relates to human health and well-being.	10.5.2.1 Demonstrate an understanding of sustainability as it relates to human health and well-being. 10.5.2.2 Demonstrate an awareness of ergonomics. 10.5.2.3 Demonstrate an awareness of the long-term health hazards related to the work of HDE mechanics.	11A.5.2.1 Demonstrate an awareness of the long-term health hazards related to the servicing and maintenance of diesel engines.	11B.5.2.1 Demonstrate an awareness of the long-term health hazards related to the servicing and maintenance of chassis, frame, and undercarriage systems.	11C.5.2.1 Demonstrate an awareness of the long-term health hazards related to welding.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology. *(continued)* **GLO 5.3:** Describe **sustainable business practices** within the HDE service and repair industry.				
	10.5.3.1 Demonstrate an awareness of the relationship between the state of the economy and the repairing of existing equipment versus the purchase of new equipment.	11A.5.3.1 Demonstrate an awareness of the relationship between the state of the economy and the nature of repairs and servicing requested by customers.		
Goal 6: Demonstrate an awareness of **ethics** and **legal standards** as they pertain to the HDE industry. **GLO 6.1:** Demonstrate an awareness of **ethics** as they pertain to the HDE industry.				
9.6.1.1 Demonstrate an awareness of ethics.	10.6.1.1 →	11A.6.1.1 Demonstrate an awareness of own ethics, and how they might have been acquired. 11A.6.1.2 Demonstrate an awareness of some of the ways in which own ethics benefit self and others.	11B.6.1.1 Demonstrate an awareness of some of the consequences, to self and others, of acting ethically. 11B.6.1.2 Demonstrate an awareness of some of the consequences, to self and to others, of acting unethically.	11C.6.1.1 Demonstrate the ability to reflect on own ethics for the purpose of evaluating and possibly adjusting them.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 6: Demonstrate an awareness of **ethics** and **legal standards** as they pertain to the HDE industry. *(continued)* **GLO 6.2:** Demonstrate an awareness of **legal standards** as they pertain to the HDE industry.				
	10.6.2.1 Demonstrate an awareness of liability concerns related to HDE systems and service.	11A.6.2.1 →	11B.6.2.1 Demonstrate an awareness of regulations related to HDE systems and service.	11C.6.2.1 Demonstrate an awareness of liability concerns that could be related to welding and fuels.
	10.6.2.2 Demonstrate an awareness of the motor vehicle licences required to operate heavy duty equipment. 10.6.2.3 Demonstrate an awareness of regulations, including legislation, related to HDE systems and service.	11A.6.2.2 →		11C.6.2.2 Demonstrate an awareness of regulations related to welding and fuels.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 7: Demonstrate **employability skills** related to the HDE industry. **GLO 7.1:** Demonstrate fundamental **employability skills**.				
9.7.1.1 Demonstrate regular attendance and punctuality.	10.7.1.1 →	11A.7.1.1 →	11B.7.1.1 →	11C.7.1.1 →
9.7.1.2 Demonstrate the ability to take responsibility for own actions.	10.7.1.2 →	11A.7.1.2 →	11B.7.1.2 →	11C.7.1.2 →
9.7.1.3 Demonstrate adaptability, initiative, and effort.	10.7.1.3 →	11A.7.1.3 →	11B.7.1.3 →	11C.7.1.3 →
9.7.1.4 Demonstrate the ability to accept and follow direction and feedback.	10.7.1.4 →	11A.7.1.4 →	11B.7.1.4 →	11C.7.1.4 →
9.7.1.5 Demonstrate the ability to work as a member of a team.	10.7.1.5 →	11A.7.1.5 →	11B.7.1.5 →	11C.7.1.5 →
9.7.1.6 Demonstrate the ability to stay on task and to make effective use of time.	10.7.1.6 →	11A.7.1.6 →	11B.7.1.6 →	11C.7.1.6 →

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 7: Demonstrate **employability skills** related to the HDE industry. *(continued)*				
GLO 7.1: Demonstrate fundamental **employability skills**. *(continued)*				
9.7.1.7 Describe the importance of effective communication. (A4.1)	10.7.1.7 →	11A.7.1.7 →	11B.7.1.7 →	11C.7.1.7 →
9.7.1.8 Describe and demonstrate the methods of professional communication. (A4.2)	10.7.1.8 →	11A.7.1.8 →	11B.7.1.8 →	11C.7.1.8 →
GLO 7.2: Demonstrate an understanding of the **business operation** of an HDE service and repair facility.				
	10.7.2.1 Demonstrate an awareness of the importance of documentation and service reporting.	11A.7.2.1 →	11B.7.2.1 →	11C.7.2.1 →
	10.7.2.2 Demonstrate an awareness of the importance of efficiency in the business operation of an HDE service and repair facility.	11A.7.2.2 Demonstrate an awareness of the use of flat rate guidelines in the HDE service and repair industry.	11B.7.2.2 Demonstrate an awareness of the effects of technicians' errors on the financial viability of an HDE service and repair facility.	

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 7: Demonstrate **employability skills** related to the HDE industry. *(continued)*				
GLO 7.3: Demonstrate the knowledge, skills, and attitudes required to **think critically** in order to **solve complex problems**.				
	10.7.3.1 Demonstrate an awareness of critical thinking and problem solving.	11A.7.3.1 Demonstrate an awareness of some of the steps required to solve problems.	11B.7.3.1 Demonstrate the ability to list the steps used to diagnose a problem and arrive at a logical decision.	11C.7.3.1 Demonstrate the ability to solve problems by focusing only on the facts, and not allowing any biases to interfere with that process.
GLO 7.4: Demonstrate an awareness of **cultural competence**, and its importance in the workplace.				
	10.7.4.1 Demonstrate an awareness of culture and the place of culture in the workplace.	11A.7.4.1 Demonstrate an awareness of cultural competence. 11A.7.4.2 Demonstrate an awareness of at least one of one's own cultures.	11B.7.4.1 Demonstrate an awareness of some of the ways in which own cultural practices benefit self and others.	11C.7.4.1 Demonstrate an awareness of some of the consequences, to self and to others, of being culturally competent.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 8: Demonstrate an understanding of the **scope** of the HDET trades (along with associated occupations), including **working conditions**, and **training** and **career opportunities**.				
GLO 8.1: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**.				
	10.8.1.1 Demonstrate an awareness of the scope of HDET trades and associated occupations.	11A.8.1.1 →	11B.8.1.1 Demonstrate an awareness of the working conditions typically found in HDET and associated occupations.	11C.8.1.1 Demonstrate an awareness of the scope of the use of alternate fuels in HDET trades and associated occupations.
GLO 8.2: Demonstrate an understanding of **career** and **training opportunities** in HDE technology and associated professions.				
9.8.2.1 Demonstrate an awareness of career and training opportunities in HDE technology and associated occupations.	10.8.2.1 →	11A.8.2.1 Demonstrate an awareness of career and training opportunities related to servicing diesel engines. 11A.8.2.2 Demonstrate an awareness of apprenticeship and the High School Apprenticeship Program (HSAP).	11B.8.2.1 Demonstrate an awareness of career and training opportunities related to servicing chassis, frame, and undercarriage systems.	11C.8.2.1 Demonstrate an awareness of career and training opportunities related to servicing fuel systems.

8672 **Exploration of Heavy Duty Equipment Technology (9)** 15S / 15E / 15M 10S / 10E / 10M	8673 **Introduction to Heavy Duty Equipment Technology (10)** 20S / 20E / 20M	8674 **Diesel Engine Fundamentals and Service (11A)** 30S / 30E / 30M	8675 **Chassis, Frame, and Undercarriage Systems (11B)** 30S / 30E / 30M	8676 **Welding Processes and Fuels (11C)** 30S / 30E / 30M
Goal 8: Demonstrate an understanding of the **scope** of the HDET trades (along with associated occupations), including **working conditions**, and **training** and **career opportunities**. *(continued)* **GLO 8.2:** Demonstrate an understanding of **career** and **training opportunities** in HDE technology and associated professions. *(continued)*				
		11A.8.2.3 Demonstrate an awareness of apprenticeship, including how to become an apprentice and how to earn journeyperson certification.		
Goal 9: Demonstrate an awareness of the **evolution** of HDE technology, including its **technological progression and emerging trends**. **GLO 9.1:** Describe the evolution of HDE service and repair, including its **technological progression and emerging trends**.				
9.9.1.1 Demonstrate an awareness of the evolution of HDE technology, including its technological progression and emerging trends.	10.9.1.1 Identify changes to vehicle design and their effect on safety, fuel economy, emissions, and equipment performance.			11C.9.1.1 Discuss the evolution of heavy duty equipment, including the trend towards electric drive vehicles.

Grade 12 Heavy Duty Equipment Technician

General and Specific Learning Outcomes by Goal

Grade 12 Heavy Duty Equipment Technician: General and Specific Learning Outcomes by Goal

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. **GLO 1.1:** Describe and apply appropriate **safety** practices for heavy duty equipment technicians.			
12A.1.1.1 Describe and apply appropriate health and safety practices.	12B.1.1.1 →	12C.1.1.1 →	12D.1.1.1 →
12A.1.1.2 Create and maintain a safe and organized working environment.	12B.1.1.2 →	12C.1.1.2 →	12D.1.1.2 →
12A.1.1.3 Apply safety procedures associated with hydraulic hydrostatic system servicing.	12B.1.1.3 →	12C.1.1.3 →	12D.1.1.3 →
12A.1.1.4 Apply safety procedures associated with HVAC system servicing.	12B.1.1.4 →	12C.1.1.4 →	12D.1.1.4 →
12A.1.1.5 Demonstrate an understanding of the safe use of HDET tools and equipment.			12D.1.1.5 Demonstrate initiative in dealing with health and safety hazards.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

GLO 1.1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

A2 Trade Safety Awareness (7 hours)	**A2 Trade Safety Awareness (7 hours)**	**A2 Trade Safety Awareness (7 hours)**	**A2 Trade Safety Awareness (7 hours)**
12A.1.1.6 Identify safety and health requirements. (A2.1)	12B.1.1.5 →	12C.1.1.5 →	12D.1.1.6 →
12A.1.1.7 Identify personal protective equipment (PPE) and procedures. (A2.2)	12B.1.1.6 →	12C.1.1.6 →	12D.1.1.7 →
12A.1.1.8 Identify electrical safety. (A2.3)	12B.1.1.7 →	12C.1.1.7 →	12D.1.1.8 →
12A.1.1.9 Identify fire safety. (A2.4)	12B.1.1.8 →	12C.1.1.8 →	12D.1.1.9 →
12A.1.1.10 Identify ergonomics. (A2.5)	12B.1.1.9 →	12C.1.1.9 →	12D.1.1.10 →
12A.1.1.11 Hazard recognition and control. (A2.6)	12B.1.1.10 →	12C.1.1.10 →	12D.1.1.11 →

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

GLO 1.1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians. *(continued)*

A2 Trade Safety Awareness (7 hours) *(continued)*	**A2 Trade Safety Awareness (7 hours) *(continued)***	**A2 Trade Safety Awareness (7 hours) *(continued)***	**A2 Trade Safety Awareness (7 hours) *(continued)***
12A.1.1.12 Hazard of confined space entry. (A2.7)	12B.1.1.11 →	12C.1.1.11 →	12D.1.1.12 →
12A.1.1.13 Identify First Aid/ CPR. (A2.8)	12B.1.1.12 →	12C.1.1.12 →	12D.1.1.13 →
12A.1.1.14 Identify the safety requirements as they apply to WHMIS. (A2.9)	12B.1.1.13 →	12C.1.1.13 →	12D.1.1.14 →
12A.1.1.15 Identifying and controlling hazards. (A2.10)	12B.1.1.14 →	12C.1.1.14 →	12D.1.1.15 →

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 2: Identify, select, use, and maintain **tools, equipment, materials, and consumables**. **GLO 2.1:** Identify, select, use, and maintain **tools, equipment, materials, and consumables**.			
12A.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used for working with standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used for working with tires, wheels, and brake assemblies.	12C.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used for working with electrical fundamentals, computers, and diagnostic equipment.	12D.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used in HDE technology. 12D.2.1.2 Select the appropriate tools and equipment to correct diagnosed faults with a minimum of supervision and direction.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 3: Maintain, diagnose, and repair HDE systems.			
GLO 3.1: Perform **maintenance** on HDE systems.			
12A.3.1.1 Demonstrate an understanding of standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.3.1.1 Demonstrate an understanding of tires, wheels, and brake assemblies.	12C.3.1.1 Demonstrate an understanding of electrical systems.	12D.3.1.1 Demonstrate an understanding of heavy duty equipment.
12A.3.1.2 Demonstrate the ability to perform maintenance on standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.3.1.2 Demonstrate the ability to perform maintenance on tires, wheels, and brake assemblies.	12C.3.1.2 Demonstrate the ability to perform maintenance on electrical systems.	12D.3.1.2 Demonstrate the ability to perform maintenance on heavy duty equipment with a minimum of supervision.
GLO 3.2: **Diagnose** issues with HDE systems.			
		A6 Electrical Fundamentals (70 hours)	
12A.3.2.1 Diagnose issues related to standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.3.2.1 Diagnose issues related to tires, wheels, and brake assemblies.	12C.3.2.1 Define terminology associated with electrical systems. (A6.1)	12D.3.2.1 Select appropriate repair procedures.
		12C.3.2.2 Identify hazards and describe safe work practices pertaining to electrical systems. (A6.2)	12D.3.2.2 Inspect vehicle to determine repair or maintenance required.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.2: Diagnose issues with HDE systems. *(continued)*

A8 Hoisting and Lifting (7 hours)	**A7 Braking Systems and Wheel-End Safety (35 hours)**	**A6 Electrical Fundamentals (70 hours) *(continued)***	
12A.3.2.2 Define terminology associated with hoisting and lifting. (A8.1)	12B.3.2.2 Define terminology associated with the braking system and wheel-end. (A7.1)	12C.3.2.3 Identify and describe tools and equipment used to service and repair electrical systems. (A6.3)	12D.3.2.3 Select the appropriate diagnostic strategies to isolate the cause of customer concern.
12A.3.2.3 Describe towing, lifting, and hoisting equipment and their procedures. (A8.2)	12B.3.2.3 Identify hazards and describe safe work practices pertaining to the brake system and wheel-end. (A7.2)	12C.3.2.4 Explain and apply the principles of electrical systems and electricity. (A6.4)	12D.3.2.4 Diagnose faults with a minimum of supervision and direction.
	12B.3.2.4 Identify and describe tools and equipment used to service and repair vehicle brake systems, tires, rims, and wheels. (A7.3)	12C.3.2.5 Identify conventional electrical system components. (A6.5)	12D.3.2.5 Interpret diagnostic test results.
	12B.3.2.5 Identify types of tires, rims, and wheels, and describe their characteristics and applications. (A7.4)	12C.3.2.6 Identify electronic system components. (A6.6)	
		12C.3.2.7 Interpret schematics and symbols. (A6.7)	

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.2: Diagnose issues with HDE systems. *(continued)*

	A7 Braking Systems and Wheel-End Safety (35 hours) *(continued)*	**A6 Electrical Fundamentals (70 hours) *(continued)***	**A11 HVAC and Environmental Controls I (7 hours)**
	12B.3.2.6 Explain the types and principles of vehicle brake systems. (A7.5)	12C.3.2.8 Describe and maintain batteries. (A6.8)	12D.3.2.6 Define terminology associated with heating, ventilation, and air conditioning (HVAC) systems and system components. (A11.1)
	12B.3.2.7 Identify hydraulic brake system components and describe their purpose and operation. (A7.6)	12C.3.2.9 Perform basic tests to service and repair electrical systems. (A6.9)	12D.3.2.7 Identify hazards and describe safe work practices pertaining to HVAC systems. (A11.2)
	12B.3.2.8 Describe vehicle hydraulic brake system components and demonstrate service procedures. (A7.7)	12C.3.2.10 Diagnose issues related to electrical fundamentals.	
	12B.3.2.9 Describe vehicle electric brake system components and demonstrate service procedures. (A7.8)		

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.2: Diagnose** issues with HDE systems. *(continued)*			
	12B.3.2.10 Describe vehicle basic air brake system components and demonstrate service procedures. (A7.9) 12B.3.2.11 Describe the procedures used to service, inspect, and maintain tires, rims, and wheels. (A7.10)		
A9 Basic Hydraulic Systems (21 hours)	**A9 Basic Hydraulic Systems (21 hours)**		
12A.3.2.4 Define terminology associated with hydraulic/ hydrostatic systems and system components. (A9.1)	12B.3.2.12 →		
12A.3.2.5 Identify hazards and describe safe work practices pertaining to hydraulic/ hydrostatic systems. (A9.2)	12B.3.2.13 →		

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)*

GLO 3.2: Diagnose issues with HDE systems. *(continued)*

A9 Basic Hydraulic Systems (21 hours) ***(continued)***	**A9 Basic Hydraulic Systems (21 hours)** ***(continued)***
12A.3.2.6 Identify and describe tools and equipment used to service and repair hydraulic/ hydrostatic systems. (A9.3)	12B.3.2.14 →
12A.3.2.7 Explain the principles and theories of hydraulics/ hydrostatics. (A9.4)	12B.3.2.15 →
12A.3.2.8 Identify hydraulic/ hydrostatic system components and interpret hydraulic/ hydrostatic-related symbols. (A9.5)	12B.3.2.16 →
12A.3.2.9 Describe and demonstrate procedures used to inspect, diagnose, and maintain hydraulic/ hydrostatic systems. (A9.6)	12B.3.2.17 →
12A.3.2.10 Describe and demonstrate servicing procedures for hydraulic/ hydrostatic systems. (A9.7)	12B.3.2.18 →

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 3: Maintain, diagnose, and repair HDE systems. *(continued)* **GLO 3.3: Repair** HDE systems.			
			12D.3.3.1 Apply service manual procedures to repairs. 12D.3.3.2 Perform repairs with a minimum of supervision and direction. 12D.3.3.3 Perform a comprehensive inspection to determine the vehicle's condition (e.g., seasonal inspections, potential purchase). 12D.3.3.4 Determine additional maintenance or repairs required.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 4: Describe and demonstrate the transferable cross-curricular knowledge and skills pertaining to HDE technology.

GLO 4.1: Read, interpret, and communicate information relevant to HDE technology.

12A.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.	12B.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices as they apply to tires, wheels, and brake assemblies.	12C.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.	12D.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices. 12D.4.1.2 Select and interpret the service information documents relevant to the issue. 12D.4.1.3 Interpret service information (e.g., technical bulletins). 12D.4.1.4 Identify and interpret types of service-related documents. (A4.4)

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 4: Describe and demonstrate the transferable cross-curricular knowledge and skills pertaining to HDE technology. *(continued)*

GLO 4.2: Apply knowledge and skills from **mathematics** to HDE technology.

12A.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.	12B.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to tires, wheels, and brake assemblies.	12C.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.	12D.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to HDE technology.
12A.4.2.2 Demonstrate an understanding of gear ratios.	12B.4.2.2 Demonstrate an understanding of aspect ratios. 12B.4.2.3 Calculate all aspects of tire sizes.		

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Goal 4: Describe and demonstrate the transferable cross-curricular knowledge and skills pertaining to HDE technology. *(continued)*

GLO 4.3: Apply knowledge and skills from the **sciences** to HDE technology.

12A.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.	12B.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices as they apply to tires, wheels, and brake assemblies.	12C.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.	12D.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices.

GLO 4.4: Apply knowledge and skills from **information and communication technology** to HDE technology.

12A.4.4.1 Apply knowledge and skills from information and communication technology relevant to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.	12B.4.4.1 Apply knowledge and skills from information and communication technology relevant to heavy duty equipment technicians' practices as they apply to tires, wheels, and brake assemblies.	12C.4.4.1 Apply knowledge and skills from information and communication technology relevant to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.	

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Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology.

GLO 5.1: Describe the HDE industry's **sustainability practices** and its impact on the environment.

12A.5.1.1 Describe the HDE industry's sustainability practices in the areas of standard transmissions, drivelines, transfer cases, and power takeoffs, and their impact on the environment.	12B.5.1.1 Describe the HDE industry's sustainability practices with regard to tires, brakes, and wheel assemblies, and their impact on the environment.	12C.5.1.1 Describe the HDE industry's sustainability practices with regard to electrical fundamentals, computers, and diagnostic equipment, and their impact on the environment.

GLO 5.2: Describe the impact of the HDE industry on **human health and well-being**.

12A.5.2.1 Describe the HDE industry's sustainability practices in the areas of standard transmissions, drivelines, transfer cases, and power takeoffs, and their impact on human health and well-being.	12B.5.2.1 Describe the HDE industry's sustainability practices with regard to tires, wheels, and brake assemblies, and their impact on human health and well-being.	12C.5.2.1 Describe the HDE industry's sustainability practices with regard to electrical fundamentals, computers, and diagnostic equipment, and their impact on human health and well-being.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology. *(continued)*

GLO 5.3: Describe **sustainable business practices** within the HDE service and repair industry.

12A.5.3.1 Describe sustainable business practices within the HDE service and repair industry as they apply to standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.5.3.1 Describe sustainable business practices within the HDE service and repair industry as they apply to tires, wheels, and brake assemblies.	12C.5.3.1 Describe sustainable business practices within the HDE service and repair industry as they apply to electrical fundamentals, computers, and diagnostic equipment.	

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Goal 6: Demonstrate an awareness of **ethics** and **legal standards** as they pertain to the HDE industry.			
GLO 6.1: Demonstrate an awareness of **ethics** as they pertain to the HDE industry.			
12A.6.1.1 Demonstrate an awareness of the need for ethics in the workplace.	12B.6.1.1 Demonstrate an awareness of the need for ethics in the HDE industry.	12C.6.1.1 Demonstrate an awareness of some of the ethical issues in the HDE industry.	12D.6.1.1 Demonstrate the ability to describe two opposing ethical points of view, including some of the benefits and disadvantages of each one. 12D.6.1.2 Demonstrate the ability to select the most appropriate of two opposing ethical points of view, and explain why it was chosen.
GLO 6.2: Demonstrate an awareness of **legal standards** as they pertain to the HDE industry.			
		12C.6.2.1 Demonstrate an awareness of some of the legal issues associated with operating an HDE service facility.	12D.6.2.1 Demonstrate an awareness of the licences required for driving various types of HDE vehicles.

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Goal 7: Demonstrate **employability skills** related to the HDE service and repair industry. **GLO 7.1:** Demonstrate fundamental employability skills.			
12A.7.1.1 Demonstrate regular attendance and punctuality.	12B.7.1.1 →	12C.7.1.1 →	12D.7.1.1 →
12A.7.1.2 Demonstrate accountability by taking responsibility for own actions.	12B.7.1.2 →	12C.7.1.2 →	12D.7.1.2 →
12A.7.1.3 Demonstrate adaptability, initiative, and effort.	12B.7.1.3 →	12C.7.1.3 →	12D.7.1.3 →
12A.7.1.4 Demonstrate the ability to accept and follow direction and feedback.	12B.7.1.4 →	12C.7.1.4 →	12D.7.1.4 →
12A.7.1.5 Demonstrate teamwork skills.	12B.7.1.5 →	12C.7.1.5 →	12D.7.1.5 →
12A.7.1.6 Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.	12B.7.1.6 →	12C.7.1.6 →	12D.7.1.6 →
12A.7.1.7 Describe the importance of effective communication. (A4.1)	12B.7.1.7 →	12C.7.1.7 →	12D.7.1.7 →

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Goal 7: Demonstrate **employability skills** related to the HDE service and repair industry. *(continued)*			
GLO 7.1: Demonstrate fundamental employability skills. *(continued)*			
12A.7.1.8 Describe and demonstrate the methods of professional communication. (A4.2)	12B.7.1.8 →	12C.7.1.8 →	12D.7.1.8 →
GLO 7.2: Demonstrate an understanding of the **business operation** of an HDE service repair facility.			
12A.7.2.1 Demonstrate an understanding of the business operation of an HDE service and repair facility with regard to standard transmissions, drivelines, transfer cases, and power takeoffs.	12B.7.2.1 Demonstrate an understanding of the business operation of an HDE service and repair facility with regard to tires, wheels, and brake assemblies.	12C.7.2.1 Demonstrate an understanding of the business operation of an HDE service and repair facility with regard to computers.	12D.7.2.1 Verify and document customer concerns. 12D.7.2.2 Demonstrate an understanding of work orders. 12D.7.2.3 Read, interpret, and follow work orders. 12D.7.2.4 Communicate with customers regarding diagnosis, repair, and maintenance procedures.

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M
Goal 7: Demonstrate **employability skills** related to the HDE service and repair industry. *(continued)*			
GLO 7.3: Demonstrate the knowledge, skills, and attitudes required to **think critically** in order to **solve complex problems**.			
12A.7.3.1 Demonstrate an awareness of some of the types of complex problems in HDE technology that require critical thinking (e.g., diagnosing complex issues).	12B.7.3.1 Demonstrate an understanding of some of the steps required to solve complex problems in HDE technology.		12D.7.3.1 Demonstrate the ability to solve complex problems that require assistance, other resources, and several steps.
GLO 7.4: Demonstrate an awareness of **cultural competence**, and its importance in the workplace.			
12A.7.4.1 Demonstrate an awareness of workplace culture.	12B.7.4.1 Demonstrate an awareness of the need for cultural competence in the workplace. 12B.7.4.2 Demonstrate an understanding of the need to interact positively with people of different cultures, especially in the workplace.	12C.7.4.1 Demonstrate an awareness of the need for cultural competence in the HDE industry.	12D.7.4.1 Demonstrate an awareness of some of the culture-related issues in the HDE industry, or in a typical HDE workplace.

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Goal 8: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**, and **training** and **career opportunities**.

GLO 8.1: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**.

			A1 Learning about Work (7 hours)
			12D.8.1.1 Describe structure and scope of the agricultural equipment technician, heavy duty equipment technician, and truck and transport mechanic trades. (A1.1) 12D.8.1.2 Describe two levels of workplace competency. (A1.2) 12D.8.1.3 Describe accommodation for apprentices with disabilities. (A1.3)

8677 **Standard Transmissions, Drivelines, Transfer Cases, and Power Takeoffs (12A)** 40S / 40E / 40M	8678 **Tires, Wheels, and Brake Assemblies (12B)** 40S / 40E / 40M	8679 **Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)** 40S / 40E / 40M	8704 **Applied Heavy Duty Equipment Technology (12D)** 40S / 40E / 40M

Goal 8: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**, and **training** and **career opportunities**. *(continued)*

GLO 8.1: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**. *(continued)*

			12D.8.1.4 Demonstrate an understanding of the wages that are typical in the HDE industry, and associated occupations. 12D.8.1.5 Demonstrate an understanding of the working conditions of the HDE industry. 12D.8.1.6 Demonstrate an understanding of the scope of the three HDET trades. 12D.8.1.7 Demonstrate an understanding of some of the organizations associated with the three HDET trades (industry groups, trade associations, labour unions, etc.) and the roles that these organizations play.

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Goal 8: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**, and **training** and **career opportunities**. *(continued)* **GLO 8.2:** Demonstrate an understanding of **career and training opportunities** in HDE technology and associated occupations.			
12A.8.2.1 Demonstrate an awareness of training and career opportunities related to servicing transmissions, drivelines, transfer cases, and power takeoffs.	12B.8.2.1 Demonstrate an awareness of training and career opportunities related to servicing tires, wheels, and brake assemblies.	12C.8.2.1 Demonstrate an awareness of training and career opportunities related to servicing electrical fundamentals, computers, and diagnostic equipment.	12D.8.2.1 Demonstrate an understanding of career and training opportunities in HDE technology and associated occupations. 12D.8.2.2 Demonstrate an understanding of the High School Apprenticeship Program (HSAP). 12D.8.2.3 Demonstrate an understanding of apprenticeship, including how to become an apprentice and a journeyperson. 12D.8.2.4 Demonstrate an understanding of some of the specialized occupations in HDE technology. 12D.8.2.5 Demonstrate the knowledge and skills required to search for employment in an HDET trade or associated occupation.

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Goal 9: Demonstrate an awareness of the **evolution** of HDE technology, including its **technological progression and emerging trends**.

GLO 9.1: Describe the evolution of HDE service and repair, including its technological progression and emerging trends.

12A.9.1.1 Describe the evolution of HDE service and repair, including its technological progression and emerging trends, as related to transmissions, drivelines, transfer cases, and power takeoffs.	12B.9.1.1 Describe the evolution of HDE service and repair, including its technological progression and emerging trends, as related to tires, wheels, and brake assemblies.	12C.9.1.1 Describe the evolution of HDE service and repair, including its technological progression and emerging trends, as related to electrical fundamentals, computers, and diagnostic equipment.

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