



**Education Foundation**

# **MEDIUM/HEAVY TRUCK PROGRAM STANDARDS**

**Effective Date: January 1, 2018**

© 2018

All Rights Reserved

ASE Education Foundation  
1503 Edwards Ferry Rd. N.E., Suite 401  
Leesburg, VA 20176  
(703) 669-6650 – [www.ASEeducationfoundation.org](http://www.ASEeducationfoundation.org)



# Contents

<b>BACKGROUND .....</b>	<b>1</b>
<b>MEDIUM/HEAVY TRUCK PROGRAM STANDARDS .....</b>	<b>2</b>
STANDARD 1 - PURPOSE.....	2
STANDARD 2 - ADMINISTRATION.....	2
STANDARD 3 - LEARNING RESOURCES.....	3
STANDARD 4 - FINANCES.....	4
STANDARD 5 - STUDENT SERVICES.....	4
STANDARD 6 - ADVISORY COMMITTEE.....	5
STANDARD 7 - INSTRUCTION.....	5
STANDARD 8 - EQUIPMENT.....	8
STANDARD 9 - FACILITIES.....	9
STANDARD 10 - INSTRUCTIONAL STAFF.....	10
STANDARD 11 - WORK-BASED LEARNING.....	10
STANDARD 12 - E-LEARNING.....	11
<b>POLICIES .....</b>	<b>12</b>
ACCREDITATION PROCESS.....	12
MEDIUM/HEAVY TRUCK MINIMUM REQUIREMENTS.....	14
QUALIFICATIONS OF EVALUATION TEAM LEADERS (ETLs).....	17
QUALIFICATIONS OF ON-SITE EVALUATION TEAM MEMBERS.....	18
TASK LIST INFORMATION.....	19
TOOLS AND EQUIPMENT INFORMATION.....	20
GO/NO GO STANDARDS.....	21
RECOGNITION FOR ACCREDITATION.....	23
APPLIED ACADEMIC SKILLS RECOGNITION.....	24
APPEALS AND ACTION FOR REVOCATION.....	25
DEFINITIONS - EDUCATIONAL TERMS.....	27
POLICIES ON ARTICULATION AGREEMENTS.....	30
<b>PROCEDURES FOR ACCREDITATION/RENEWAL OF ACCREDITATION .....</b>	<b>31</b>
PROCESS OVERVIEW.....	31
ON-SITE EVALUATION COST SHEET.....	36
SPECIAL CONSIDERATIONS FOR RENEWAL OF ACCREDITATION.....	37
<b>EVALUATION GUIDE .....</b>	<b>38</b>
AUTOMOTIVE PROGRAM EVALUATION.....	38
ADVISORY COMMITTEE TASKS WITHIN PROGRAM STANDARDS.....	39

<b>MEDIUM/HEAVY TRUCK TASK LIST .....</b>	<b>41</b>
TASK LIST AND ASSUMPTIONS.....	41
REQUIRED SUPPLEMENTAL TASKS.....	43
WORKPLACE EMPLOYABILITY SKILLS.....	44
INSPECTION, MAINTENANCE, AND MINOR REPAIR (IMMR).....	45
TRUCK SERVICE TECHNOLOGY (TST).....	61
MASTER TRUCK SERVICE TECHNOLOGY (MTST).....	85
TASK LIST PRIORITY ITEM TOTALS (by accreditation level).....	114
DEFINITIONS - TECHNICAL TERMS.....	115
<b>TOOLS AND EQUIPMENT .....</b>	<b>119</b>
HAND TOOLS.....	120
GENERAL LAB/SHOP EQUIPMENT.....	121
SPECIALTY TOOLS AND EQUIPMENT.....	123
INSPECTION, MAINTENANCE, AND MINOR REPAIR.....	123
TRUCK SERVICE TECHNOLOGY.....	124
MASTER TRUCK SERVICE TECHNOLOGY.....	125

## BACKGROUND

### MEDIUM/HEAVY TRUCK TECHNICIAN TRAINING ACCREDITATION PROGRAM

The Board of the National Institute for Automotive Service Excellence (ASE) is responsible for accreditation of automotive (automobile, collision repair & refinish, medium/heavy truck) programs at secondary and post-secondary levels. ASE will grant accreditation to programs that comply with the evaluation procedure, meet established standards, and adhere to the policies in this document. Program accreditation is under the direct supervision of the Board of Trustees and such personnel designated or employed by the ASE Education Foundation.

#### History

The ASE standards for automobile program certification were introduced in 1982. Standards for collision repair & refinish programs were launched in 1989 and truck standards followed in 1992. The ASE Education Foundation's role in the process was to work with industry and education to update the standards on a regular basis and evaluate programs against those standards. Based on a positive evaluation, programs are accredited by ASE for a period of five (5) years.

Effective January 1, 2018, all programs that held current NATEF program accreditation, were grandfathered as accredited by ASE until such time that they were due to renew their accreditation.

After a lengthy process that included discussions with industry, employers, and educators, the ASE Education Foundation conducted a series of workshops and webinars to review the medium/heavy truck standards. In January 2018, a new model for medium/heavy truck program standards was published. This new model introduced standards based on three (3) levels rather than by medium/heavy truck area (brakes, electrical/electronic systems, etc). The three levels are: **Inspection, Maintenance, & Minor Repair (IMMR)**, **Medium/Heavy Truck Service Technician (TST)**, and **Medium/Heavy Master Truck Service Technician (MTST)**. Each successive level includes all the tasks of the previous level in addition to newly designated tasks. In other words, the TST task list includes all of the IMMR tasks plus additional tasks. The MTST task list includes all of TST tasks plus additional tasks specifically for MTST.

The cost to each program for accreditation will be as reasonable as possible to encourage program participation. This cost will include program evaluation materials, application (processing) fee, and on-site team evaluation materials. The honorarium and expenses of the Evaluation Team Leader (ETL) are paid directly to the ETL from the program being accredited.

## **MEDIUM/HEAVY TRUCK PROGRAM STANDARDS**

### **STANDARD 1 – PURPOSE**

**THE MEDIUM/HEAVY TRUCK TECHNICIAN TRAINING PROGRAM SHOULD HAVE CLEARLY STATED PROGRAM GOALS, RELATED TO THE NEEDS OF THE STUDENTS AND EMPLOYERS SERVED.**

#### **Standard 1.1 – Employment Potential**

The employment potential for medium/heavy truck technicians, trained to the level for the specialty or general areas outlined in the program goals, should exist in the geographic area served by the program.

#### **Standard 1.2 – Program Description/Goals**

The written description/goals of the program should be shared with potential students and may include admission requirements if applicable, employment potential, area(s) of specialty training offered, and the cost of all tuition and fees. Technical qualifications of the faculty and the overall goal(s) of the program should also be included.

### **STANDARD 2 – ADMINISTRATION**

**PROGRAM ADMINISTRATION SHOULD ENSURE THAT INSTRUCTIONAL ACTIVITIES SUPPORT AND PROMOTE THE GOALS OF THE PROGRAM.**

#### **Standard 2.1 – Student Competency Certification**

The certificate or diploma a student receives upon program completion should clearly specify the area(s) of demonstrated competency.

#### **Standard 2.2 – Chain of Command**

An organizational chart should be used to indicate the responsibilities for instruction, administration, and support services.

#### **Standard 2.3 – Administrative Support**

Positive administrative support from institutional and local governing bodies should be demonstrated. Indicators of administrative support would include: support for staff in-service and update training; provision of appropriate facilities; up-to-date tools, equipment, training support materials, and curriculum; and support of continuing program improvement.

#### **Standard 2.4 – Written Policies**

Written policies should be adopted by the administration and policy board for use in decision-making situations and to provide guidance in achieving the program goals. Policies regarding safety, liability, and lab/shop operation should be written and prominently displayed as well as provided to all students and instructors.

**Standard 2.5 – Customer Vehicle Work**

A systematic method of collecting, documenting, and disbursing customer vehicle work repair receipts should be used. Instructional staff should not be required to collect payment for customer vehicle work repairs. (This applies only to programs that accept customer vehicles for instruction.)

**Standard 2.6 – Legal Requirements**

The training program should meet all applicable local, state, and federal requirements.

**Standard 2.7 – First Aid**

Rate the availability of a written policy approved by the school administration on First Aid administration and procedures.

**STANDARD 3 – LEARNING RESOURCES****SUPPORT MATERIAL CONSISTENT WITH BOTH PROGRAM GOALS AND PERFORMANCE OBJECTIVES SHOULD BE AVAILABLE TO STAFF AND STUDENTS.****Standard 3.1 – Service Information**

Service information with current manufacturers' service procedures and specification data for vehicles manufactured within the last ten (10) years should be available. This information should be accessible to students in the lab/shop area.

**Standard 3.2 – Multimedia**

Appropriate up-to-date multimedia materials and technology should be readily available and utilized in the training process.

**Standard 3.3 – Periodicals**

Current general and technical medium/heavy truck media should be available for student and instructor use.

**Standard 3.4 – Student Resources**

Pertinent instructional texts, resources, and e-learning materials should be available for each student to satisfy the objectives of the mode of instruction used. Basic and specialty learning resources should have copyright dates that are not over six (6) years old.

## **STANDARD 4 – FINANCES**

### **FUNDING SHOULD BE PROVIDED TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.**

#### **Standard 4.1 – Budget**

An adequate annual budget should be developed, allocated, and used for the operation of the program. The budget should be prepared by the institutional administration in conjunction with the program faculty with input from the advisory committee. Budget status reports should be made available to program staff at least quarterly.

## **STANDARD 5 – STUDENT SERVICES**

### **SYSTEMATIC SKILLS ASSESSMENT, INTERVIEWS, COUNSELING SERVICES, PLACEMENT, AND FOLLOW-UP PROCEDURES SHOULD BE USED.**

#### **Standard 5.1 – Learning Assessment**

For students to develop the skills and knowledge required to service today's trucks, each student must possess, or be given the opportunity to develop, essential foundation skills in reading, mathematics, and science. To this end, a formal skills assessment instrument (process) for these fundamental skills should be used to evaluate students to determine if each student has a reasonable probability of success as a medium/heavy truck technician. Testing procedures and how the test results will be used (e.g., placement, assessment of student's developmental needs, etc.) should be stated in program explanatory material, and justification for all requirements should be available.

#### **Standard 5.2 – Pre-admission Counseling**

Prior to program admission, a student should be counseled regarding automotive careers.

#### **Standard 5.3 – Placement**

A systematic student placement system should be used to assist program graduates to obtain employment in the truck industry.

#### **Standard 5.4 – Annual Follow-up**

A follow-up system should be used to determine graduates' employment location and for feedback regarding the efficiency, effectiveness, and appropriateness of training. The follow-up procedure should be designed to assure feedback regarding needed additions to or deletions from the training curriculum, program, and tools and equipment. Follow-up of graduates employed outside of the truck industry should indicate reasons for non-truck service employment. When applicable, this information should be used to modify the training quality and/or content.

## **STANDARD 6 – ADVISORY COMMITTEE**

**AN OFFICIALLY SANCTIONED PROGRAM ADVISORY COMMITTEE MUST BE USED TO PROVIDE INPUT ON PROGRAM GOALS.**

### **Standard 6.1 – Membership**

An Advisory Committee of at least five (5) members (not including school personnel), must convene at least two (2) working meetings a year to provide information, counsel and recommendations on behalf of the community served by the training program. This Committee should be broadly based and include former students, employed technicians, employers and representatives for consumers' interests. All members of the Advisory Committee should not be from the same business.

### **Standard 6.2 – Review of Budgeting Funds**

The Advisory Committee should provide input and review budgeted funds.

### **Standard 6.3 – Annual Follow-up**

Information gathered from the annual follow-up of program graduates and employers should be reviewed by the Advisory Committee to assess employment potential and provide input on program modifications.

### **Standard 6.4 – Review of Curriculum**

The Advisory Committee should provide guidance and approve all tasks added to the mandatory task list required for the program accreditation level being sought.

### **Standard 6.5 – Evaluation of Instruction, Tools and Equipment, and Facilities**

The Advisory Committee should provide input in the evaluation of the instructional process to assure that the program goals are met. The Committee should also conduct annual inspections of tools and equipment to assure that they are up-to-date and comparable to industry standards for quality and safety.

The Advisory Committee should review information from safety inspections and conduct an annual evaluation of the facilities to assure compliance with local, state and federal safety and environmental rules and regulations. Additionally, the committee should review all safety practices for appropriateness in meeting program goals.

## **STANDARD 7 – INSTRUCTION**

**INSTRUCTION MUST BE SYSTEMATIC AND REFLECT PROGRAM GOALS. A TASK LIST AND SPECIFIC PERFORMANCE OBJECTIVES WITH CRITERION REFERENCED MEASURES MUST BE USED.**

### **Standard 7.1 – Program**

The training program should progress in logical steps, provide for alternate sequences, where applicable, and be made available to each student.

**Standard 7.2 – Student Training Plan**

A training plan for each student should be developed and used, indicating the student's training goal(s) and specific steps needed to meet that goal. Students should be given a copy of their training plan.

**Standard 7.3 – Preparation Time**

Adequate time should be provided for teacher preparation and program development.

**Standard 7.4 – Teaching Load**

The instructor/student ratio and class contact hours should allow time for interaction on a one-to-one basis. A safe working environment should be considered when determining teacher/student ratio.

**Standard 7.5 – Curriculum**

All tasks have been given a priority rating. Ninety-five percent (95%) of the tasks designated as Priority 1 (P-1) must be taught in the curriculum. Seventy percent (70%) of the tasks designated as Priority 2 (P-2) must be taught in the curriculum. Twenty-five percent (25%) of the tasks designated as Priority 3 (P-3) must be taught in the curriculum.

Instruction on the legal aspects and responsibilities of the medium/heavy truck technician in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements must be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts, and basic record keeping should be a part of the training program.

Tools and equipment must be available to perform the tasks in each of the areas for which accreditation is requested.

**Standard 7.6 – Student Progress**

A record of each student's progress should be maintained through the use of a progress chart or other method. The record should indicate tasks required for program completion.

**Standard 7.7 – Performance Standards**

All instruction should be performance based, with an acceptable performance standard stated for each task. These standards should be shared with students and potential employers. Students should demonstrate competency of a task.

**Standard 7.8 – Safety Standards**

Safety instruction must be given prior to lab/shop work and be an integral part of the training program. A safety test must be included in the training program. Students and instructors should comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

**Standard 7.9 – Personal Standards**

All training activities and instructional material should emphasize the importance of maintaining high personal standards.

**Standard 7.10 – Work Habits/Ethics**

The training program should be organized in such a manner that work habits and ethical practices required on the job are an integral part of the instruction.

**Standard 7.11 – Provision for Individual Differences**

The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accommodated.

**Standard 7.12 – Related Instruction**

Instruction in related mathematics, science, communications, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

**Standard 7.13 – Testing**

Both written and performance based tests should be used to validate student competency. Students should be encouraged to take industry recognized certification tests, such as the ASE Student Certification test or ASE Professional Certification test.

**Standard 7.14 – Evaluation of Instruction**

Instructional procedures should be evaluated in a systematic manner. This evaluation should be through regular reviews by students and the administration. Program evaluation of instruction should also be utilized on a systematic and regular basis. This system should include input from former students and the Advisory Committee members. Instructional procedures should show responsiveness to the feedback from these evaluations.

**Standard 7.15 – On-Vehicle Service and Repair Work**

On-vehicle service and repair work should be scheduled to benefit the student and supplement ongoing instruction on items specified in the task list. A student should have had instruction and practice on a specific repair task before on-vehicle service and repair work requiring that task is assigned. Vehicles donated by the manufacturers or other sources, customer-owned vehicles, and other training vehicles may be used as the primary source of on-vehicle service and repair work. Training program student-owned vehicles, school buses, and other vehicles owned and operated by the governing body of the school must not be the primary source of on-vehicle service and repair work vehicles. All vehicles in the lab/shop should have a completed industry-type work order attached to or on the vehicle.

**Standard 7.16 – Articulation**

Agreements between programs with equivalent competencies should be used to eliminate unnecessary duplication of instruction and foster continued study.

## **STANDARD 8 – EQUIPMENT**

**EQUIPMENT AND TOOLS USED MUST BE OF THE TYPE AND QUALITY FOUND IN THE REPAIR INDUSTRY AND MUST ALSO BE THE TYPE NEEDED TO PROVIDE TRAINING TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.**

### **Standard 8.1 – Safety**

Equipment and tools used in the training program must have all shields, guards, and other safety devices in place, operable, and used. Safety glasses must be worn by all students, instructors, and visitors in the lab/shop area while lab is in session.

### **Standard 8.2 – Quantity and Quality**

The tools and equipment used in the training program should reflect the program goals and performance objectives. Sufficient tools and equipment should be available for the training offered. The tools and equipment should meet industry quality standards.

### **Standard 8.3 – Consumable Supplies**

Sufficient consumable supplies should be readily available to assure continuous instruction.

### **Standard 8.4 – Preventive Maintenance**

A preventive maintenance schedule should be used to minimize equipment down-time.

### **Standard 8.5 – Replacement**

An annual review process should be used to maintain up-to-date tools and equipment at industry and safety standards. Student follow-up and Advisory Committee input should be used in this process.

### **Standard 8.6 – Tool Inventory and Distribution**

An inventory system should be used to account for tools, equipment, parts, and supplies.

### **Standard 8.7 – Parts Purchasing**

A systematic parts purchasing system should be in place.

### **Standard 8.8 – Hand Tools**

Each student should have access to basic hand tools comparable to tools required for employment. Students should be encouraged to purchase a hand tool set during the period of instruction.

## **STANDARD 9 – FACILITIES**

### **THE PHYSICAL FACILITIES MUST BE ADEQUATE TO PERMIT ACHIEVEMENT OF THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.**

#### **Standard 9.1 – Training Stations**

Training stations (bench and on-vehicle service and repair work) should be available in the type and number required for the performance of tasks outlined in the program goals and performance objectives.

#### **Standard 9.2 – Safety**

The facilities should meet all applicable safety standards and an emergency plan should be in place and posted in all classrooms and lab/shop areas.

#### **Standard 9.3 – Emergency Maintenance and Repair**

A written facilities maintenance program should be used to ensure facilities are suitable when required for instruction.

#### **Standard 9.4 – Housekeeping**

The classroom(s), lab/shop, and support area(s) should be kept clean and orderly.

#### **Standard 9.5 – Office Space**

An area separate from the lab/shop should be available and convenient for the instructor(s) to use as an office.

#### **Standard 9.6 – Instructional Area**

A classroom convenient to, but separate from, the lab/shop area should be available for instruction and other non-lab/shop activities.

#### **Standard 9.7 – Storage**

Storage areas for tools, parts, supplies, and trucks should be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

#### **Standard 9.8 – Support Facilities**

Restrooms and clean-up areas should be provided for both male and female students and should be convenient to the instructional area.

#### **Standard 9.9 – Ventilation**

An exhaust fume removal system should be in place and operational. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

#### **Standard 9.10 – First Aid**

A first aid kit should be in place and should be maintained and comply with local regulations and school policy.

## **STANDARD 10 – INSTRUCTIONAL STAFF**

**THE INSTRUCTIONAL STAFF MUST HAVE TECHNICAL COMPETENCY AND MEET ALL STATE AND LOCAL REQUIREMENTS FOR ACCREDITATION.**

### **Standard 10.1 – Technical Competency**

Instructors must hold current ASE certification to meet the requirements for the level of program accreditation sought (IMMR, TST or MTST).

### **Standard 10.2 – Instructional Competency**

Instructors should meet all state teaching requirements.

### **Standard 10.3 – Technical Updating**

Faculty members should be provided technical materials required to maintain their competency. Instructors must complete a minimum of 20 hours of technical update training each year.

### **Standard 10.4 – Substitutes**

A written policy regarding the use of “substitute” instructors should be provided to all instructors.

## **STANDARD 11 – WORK-BASED LEARNING**

**WRITTEN POLICIES AND PROCEDURES MUST BE USED FOR ALL PROGRAM-SANCTIONED WORK-BASED LEARNING ACTIVITIES. (This applies only to programs that offer work-based/apprenticeship training.)**

### **Standard 11.1 – Standards**

The work-based learning component must be an integral part of the automotive program where students spend part of the scheduled time, either on a daily basis or in a block-time configuration, on-site in related classroom instruction and part of the scheduled time off-site in a related and structured work environment.

### **Standard 11.2 – Agreements**

All legally binding agreements should be written and signed by the student, the student's parent (if the student is under 18 years of age), the employer and the program instructor or the institution's designated work-based learning coordinator.

### **Standard 11.3 – Supervision**

A supervising truck instructor or supervising work-based learning coordinator should be assigned responsibility, authority, and time to coordinate and monitor truck work-based learning components.

## **STANDARD 12 – E-LEARNING**

**WRITTEN POLICIES AND PROCEDURES MUST BE FOLLOWED WHEN E-LEARNING CURRICULAR MATERIALS ARE USED OUTSIDE OF SCHEDULED CLASSROOM/LAB/SHOP TIME FOR THE PURPOSE OF MEETING INSTRUCTIONAL HOUR REQUIREMENTS. (This applies only to programs that are using e-learning to meet program hour requirements. This is a go/no go Standard that requires validation of a “yes” response to each of the criteria.)**

### **Standard 12.1 – Access**

Students must have access to the appropriate technology needed to access e-learning materials.

### **Standard 12.2 – Curriculum and Student Progress**

All content/tasks taught by e-learning must be identified and a record of each student’s progress must be maintained through the use of a Learning Management System (LMS).

### **Standard 12.3 – Advisory Committee Input**

E-learning, for the purpose of meeting hour requirements, should be discussed and approved by the Advisory Committee.

**\* A maximum of 25% of the instructional-hours requirement may be met by applicable work-based learning activities, e-learning activities, or a combination of both WBL and e-learning activities**

## **POLICIES ACCREDITATION PROCESS**

### **Program Evaluation**

The accreditation process begins with an extensive program evaluation performed by training program instructors, administrators, and advisory committee members. Members of this group compare the program to national standards, and have the opportunity to make improvements before submitting the application and a summary of the evaluation to the ASE Education Foundation.

### **Application Review**

The application for initial accreditation or renewal of accreditation is sent to the ASE Education Foundation, where it is reviewed to determine if the program qualifies for an on-site team evaluation.

**Programs will have a maximum of 12 months to complete the accreditation process from the date their application for Initial or Renewal of Accreditation is received by the ASE Education Foundation (this time frame may be shortened when applying under standards that are in the process of being phased out).**

### **RENEWAL OF ACCREDITATION:**

- Programs seeking accreditation renewal must submit renewal application prior to program accreditation expiration date.
- If the program has not renewed prior to the program accreditation expiration date, the program will expire, and be removed from the ASE accredited programs list.
- Programs that have expired will have 60 days post expiration to submit a renewal application (under current program requirements). Any program expired beyond 60 days must follow the initial accreditation process.

### **On-Site Evaluation**

If the program qualifies, an Evaluation Team Leader (ETL), an educator (current or retired), of an accredited program, trained by the ASE Education Foundation and with current ASE master certification credentials, is assigned to the program and an on-site visit is conducted.

### **Recommendation for Accreditation**

When the standards are met, ASE program accreditation is valid for five (5) years from the official accreditation date issued. If an accredited program successfully completes the accreditation renewal process before the expiration date of the current five year accreditation timeframe, accreditation renewal does not begin until the current expiration date.

If an accredited program fails to complete the accreditation renewal process before the expiration date of the current accreditation timeframe, the program accreditation ends until the renewal process has been successfully completed.

Programs having difficulty in meeting the hours or tools & equipment accreditation requirements should consider the following options:

- A. Borrowing equipment needed for instruction from a manufacturer, dealership or independent repair shop.
- B. Arranging for instruction on tasks requiring equipment not available in the school program at a dealership or independent repair shop.

Programs choosing option A or B are required to show documentation on where the tasks are taught, by whom, and how students are evaluated.

## MEDIUM/HEAVY TRUCK MINIMUM REQUIREMENTS

1. The minimum program requirements are identical for initial accreditation and for renewal of accreditation.
2. Programs must meet the following hour requirements based on the level of accreditation sought.

<b>Inspection, Maintenance, &amp; Minor Repair</b>	<b>540 hours</b> combined classroom and lab/shop instructional activities
<b>Truck Service Technology</b>	<b>740 hours</b> combined classroom and lab/shop instructional activities
<b>Master Truck Service Technology</b>	<b>1040 hours</b> combined classroom and lab/shop instructional activities

3. **The average rating on each of Standards 6, 7, 8, 9 and 10 must be a four (4) on a five-point scale.** The program will not be approved for an on-site evaluation if the average is less than four (4) on any of those standards. The program should make improvements before submitting the application to the ASE Education Foundation for review. **A program will be denied accreditation if the on-site evaluation team average rating on Standards 6, 7, 8, 9 or 10 is less than four.**
4. A “YES” response must be achieved on all six (6) criteria in Standard 12 if the program is using it to meet the instructional hour requirements for the purpose of accreditation. The program will not be approved for an on-site evaluation if it cannot support a “YES” response to each criterion on the program evaluation form. **A program will be denied accreditation if the on-site evaluation team does not give a “YES” response to all six (6) criteria in Standard 12. This applies only to programs using the provisions in Standard 12 for the purpose of meeting instructional hour requirements.**
5. A program may not be approved for an on-site evaluation if the average rating on Standards 1- 5 and 11 is less than a four on a five-point scale. **A program may be denied accreditation if the on-site evaluation team average rating on Standards 1 - 5 and 11 is less than four.** Approval for on-site evaluation or accreditation will be made by the ASE Education Foundation, based on the number of standards rated at 4 or 5 as well as the individual rating on any standard rated less than four.

- All IMMR instructors must be ASE certified in T4, T6, T8, and one other Medium/Heavy Truck certification (T2, T3, T5, T7).

All TST and MTST instructors must hold current ASE certifications in T6 and T8, and in the medium/heavy truck area(s) (T2, T3, T4, T5, T6, T7, and T8) they teach.

<b>Instructor Qualifications</b>		
<b>IMMR</b>	T6, T8	T4 plus one other Medium/Heavy Truck ASE Certification.
<b>TST MTST</b>		Instructor Area(s) Taught. Program must cover T2-T8

- All instructors must attend a minimum of 20 hours per year of recognized industry update training relevant to their program.
- The program Advisory Committee, consisting of at least 5 members, must conduct at least two working meetings a year. Minutes of the meetings must be provided to the on-site evaluation team for review and must reflect relevant areas of the standards as having been considered by the Advisory Committee.
- The Program Standards recognize that program content requirements vary by program type and by regional employment needs. Therefore, flexibility has been built into the task list by assigning each task a priority number. A program must include in their curriculum the designated percentage of tasks in each priority numbered category (P-1, P-2, and P-3) in order to be accredited. The following percentages are required:

**95% of all Priority 1 (P-1) tasks must be taught**  
**70% of all Priority 2 (P-2) tasks must be taught**  
**25% of all Priority 3 (P-3) tasks must be taught**

10. A program that does not meet the minimum hour requirements may be eligible for accreditation if both of the following conditions are met for the level of accreditation being sought:
  - a. Show evidence that all graduates from the previous academic year have taken the professional level ASE certification examination, and
  - b. Show documentation that 75% of those graduates passed the professional level ASE certification tests. **NOTE:** The ASE Student Certification test cannot be used to meet this requirement.
11. The concern for safety is paramount to the learning environment. Each program level has the following safety requirement preceding all related tasks:

**Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.**

## **QUALIFICATIONS OF EVALUATION TEAM LEADERS (ETLs)**

Evaluation Team Leaders (ETLs) are educators who have been trained by the ASE Education Foundation to lead the on-site evaluation. The ASE Education Foundation will assign an ETL once a program has been approved for an on-site evaluation. Every effort will be made to assign an ETL located close to the school to reduce the cost for the evaluation. Three additional team members, selected by the program and approved by the ETL, are required for a medium/heavy truck program on-site evaluation. (See the following page for additional information about team members and on-site teams.)

Persons selected as ETLs must:

1. have a minimum of six years of combined experience as a medium/heavy truck technician and a current or retired medium/heavy truck instructor (at least three years experience as a medium/heavy truck technician is required);
2. have a B.A. or B.S. in Education from a college or university recognized for teacher training by the state; and
3. be a current ASE certified master medium/heavy truck technician (T2-T8).

Or, if a state does not require medium/heavy truck instructors to have a B.A. or B.S. degree, the following qualifications will apply:

1. six years experience as an medium/heavy truck technician,
2. four years medium/heavy truck teaching experience at the secondary or post-secondary level, and
3. current ASE certified master medium/heavy truck technician (T2-T8).

ETL candidates who are active instructors must be directly associated with an accredited program. ETL candidates who are inactive instructors must have formerly been directly associated with an accredited program.

ETL training is valid for three years. However, an automatic three-year renewal is granted every time an ETL conducts an on-site evaluation. ETLs are required to attend additional training sessions or serve as a team member if they have not conducted an on-site evaluation within three years. This additional training is required even though the individual holds current ASE certification.

Anyone interested in becoming an Evaluation Team Leader should contact the ASE Education Foundation at (703) 669-6650, email - [info@ASEeducationfoundation.org](mailto:info@ASEeducationfoundation.org), or their state Trade & Industrial Supervisor for more details.

## QUALIFICATIONS OF ON-SITE EVALUATION TEAM MEMBERS

The program requesting accreditation is responsible for recruiting and recommending on-site evaluation team members. The ETL must approve individuals recommended by the program. The on-site evaluation team members must be practicing medium/heavy truck technicians, service managers or shop owners from businesses in the area served by the training program.

Team members must have:

1. a high school diploma or the equivalent (industry or military training may be considered as the equivalent), and
2. at least five years full-time experience as a general medium/heavy truck technician.

ASE medium/heavy truck certification is recommended but not required.

1. The initial accreditation evaluation team is composed of four individuals: the ETL and three team members. Two team members must be from industry (one from a dealership and one from an independent repair facility). The third member may be from one the following: a dealership, an independent repair facility or a current advisory committee member.
2. The renewal of accreditation evaluation team is composed of three individuals: the ETL and two team members. One team member must be from a dealership and one team member must be from an independent repair facility.
3. Each program requesting accreditation must identify their choice for an alternate evaluation team member should one of the other team members be unable to participate on the date(s) of the evaluation. The alternate team member may be from a dealership, an independent repair facility or a current advisory committee member. If an advisory committee member is selected they **must not** have participated in the program self-evaluation. Only one current Advisory Committee member can be selected as a team member.

Each program must identify their selections on the On-Site Evaluation Team Member List.

Team members for the onsite visit must not be former instructors or graduates of the program within the past **three** years or relatives of the administrator or instructor.

## TASK LIST INFORMATION

An essential element of any curriculum or training program is a valid task list. Medium/Heavy Truck technician instructors need a well-developed task list that serves as a solid base for course of study outlines and facilitates communication and articulation of their training programs with other institutions in the region.

It is a policy that the task list developed by the National Institute for Automotive Service Excellence (ASE) serves as the basis for the ASE Education Foundation task list. Panels of technical service experts from the automotive service industry and career technical education are called upon to develop and validate the task lists.

The ASE Student Certification tests are based on the ASE Education Foundation task lists. These tests can provide the student with their first industry-recognized certification through ASE.

Additional information on the development of the task list can be found in the Task List section.

**All tasks have a Priority designation.** The Program Standards recognize that program content requirements vary by program type and regional employment needs. Therefore, flexibility has been built into the task list by assigning each task a priority number. The priority number simply indicates the minimum percentage of tasks that a program must include in their curriculum in order to be accredited.

- **Ninety-five percent (95%) of Priority 1 (P-1) tasks must be taught.**
- **Eighty percent (70%) of Priority 2 (P-2) tasks must be taught.**
- **Twenty-five percent (25%) of the Priority 3 (P-3) tasks must be taught.**

## TOOLS AND EQUIPMENT INFORMATION

The basic tools and equipment that must be available for use in the medium/heavy truck program are listed in the Tools and Equipment section. Many tools and much of the equipment are the same for some or all of the three levels. However, some equipment is specialized and must be available for use in the selected program level. The specialized tools/equipment lists for IMMR, TST and MTST are included in the Tools and Equipment section.

The student hand tool list covers all program levels. This list indicates the tools a student will need to own to be successful.

Although no brand names are listed, the equipment and tools must address the following programmatic issues:

1. Safety - Equipment and tools must have all shields, guards, and other safety devices in place, operable, and used.
2. Type and Quality - The tools and equipment used in an accredited program must be of the type and quality found in industry. They must also be adequate and in sufficient quantity to meet the program goals and student performance objectives.
3. Consumable Supplies - Supplies should be in sufficient quantity to assure continuous instruction. Consumable supplies, such as solvents, sand paper, etc. are not listed.
4. Maintenance - A preventive maintenance schedule should be used to minimize equipment down time.
5. Replacement - A systematic schedule for replacement should be used to maintain up-to-date tools and equipment at industry and safety standards. Information gained from student program evaluations as well as advisory committee input should be used in the replacement process.
6. Inventory - An inventory system should be used to account for tools, equipment, parts, and supplies.
7. Parts Purchasing - A systematic parts-purchasing system should be used from work order to supplier.
8. Hand Tools - Each student should be encouraged to purchase a hand tool set during the period of instruction.
9. Storage - Adequate storage of tools should be provided. Space for storage of the students' hand tools should be provided.

## GO/NO GO STANDARDS

The Program Standards for Initial Accreditation and Renewal of Accreditation are identical. Items listed below are considered **Go/No Go** items, and are critical for accreditation and are in **bold** print in the Medium/Heavy Truck Program Evaluation materials.

- 6.1A** Does the Advisory Committee, consisting of at least five (5) members, convene a minimum of two working meetings per year?
- 6.5C** Is the Advisory Committee included when conducting an annual evaluation of the facilities to assure adequacy in meeting program goals?
- 7.5A** Does the medium/heavy truck program provide theory and “hands-on” training for 95% of the P-1, 70% of the P-2, and 25% of the P-3 tasks, as evidenced by cross-referencing the course of study, lesson plans, job sheets, and student progress charts?
- 7.5B** Are the tools and equipment available for the tasks taught at the program level being accredited?
- 8.1A** Are all shields, guards, and other safety devices in place, operable, and used?
- 8.1B** Do all students, instructors, and visitors wear safety glasses in the lab/shop area while lab is in session?
- 10.1** Do instructors hold current ASE certification appropriate for the program level being accredited?
- 10.3B** Do instructors attend a minimum of 20 hours per year of recognized [industry update training](#) relevant to the program?

*For programs using e-learning for the purpose of meeting accreditation instructional hour requirements, support for a ‘YES’ response must be provided for each criterion below:*

- 12.1A** Is there documentation that students have access to appropriate technology for e-learning purposes?
- 12.2A** Are the content/tasks that are to be delivered via e-learning clearly highlighted in the course of study?
- 12.2B** Is there documentation that e-learning is incorporated into the content/tasks in the program plan?
- 12.2C** Do the instructional hours to be credited toward meeting up to 25 percent of the program hour requirements correlate with the vendor’s average completion time for each instructional module?
- 12.2D** Is there documentation of the implementation and use of e-learning instructional materials as evidenced in a Learning Management System (LMS)?
- 12.3A** Are Advisory Committee meeting minutes available to confirm that the committee has discussed and approved e-learning?

Programs must be able to support a yes response for all seven items (thirteen items if using Standard 12 – E-learning). Programs must also meet the hour requirements listed in item 2 of the Medium/Heavy Truck Minimum Requirements appropriate for the level of accreditation sought. **If these responses are not achieved, do not apply for accreditation at this time.**

**In addition, an on-site evaluation will not be scheduled unless the average score on each of Standards 6, 7, 8, 9, and 10 is at least a 4 on the Medium/Heavy Truck Program Evaluation.** Please refer to the Medium/Heavy Truck Program Requirements for more information.

**Instructors must be ASE certified in accordance with the requirements for the program level being accredited. Please refer to item 6 of the Medium/Heavy Truck Minimum Requirements.**

## **RECOGNITION FOR ACCREDITATION**

A program approved for accreditation or renewal of accreditation will receive a plaque that includes the school's name and the expiration date of accreditation. A statement will read:

**"THE INSTRUCTION, COURSE OF STUDY, FACILITIES AND EQUIPMENT OF THIS INSTITUTION HAVE BEEN EVALUATED BY THE ASE EDUCATION FOUNDATION AND MEET STANDARDS OF QUALITY FOR THE TRAINING OF MEDIUM/HEAVY TRUCK TECHNICIANS AT THE FOLLOWING LEVEL:**

---

Institutions receiving ASE program accreditation are encouraged to put the following statement on the graduate's diploma or certificate:

"The person holding this diploma has participated in a medium/heavy truck technician training program that was accredited by ASE and has completed instruction at the following level:

---

A screened ASE Education Foundation logo may be overprinted with the above statement and placed on the graduate's diploma. A logo is provided in the promotional material a program receives upon accreditation.

Programs granted initial accreditation will also receive a 24"x30" sign indicating that the training program is ASE accredited.

## **INTEGRATED ACADEMIC SKILLS RECOGNITION**

The ASE Education Foundation Board of Trustees and the ASE Board of Directors has initiated a process to recognize accredited programs that are integrating academics and technical skills into the curricula. This effort should be a collaborative effort between the collision repair and refinish instructors and the academic instructors in language arts, mathematics, and science.

The ASE Education Foundation will issue a certificate of recognition to those programs that provide documentation including, but not limited to, student assignments or activities, classroom/lab instructional materials, student performance records, and interviews with academic instructors.

Programs that wish to receive recognition must complete the Integrated Academics Recognition form and return it with the application for accreditation. Documentation on integrated academics activities must be available for the ETL at the time of the on-site evaluation.

Programs may receive recognition in Language Arts, Mathematics, Science, or any combination of the three areas.

**The Integrated Academic Skills manual for medium/heavy truck technicians  
is available on the ASE Education Foundation website at  
[www.ASEeducationfoundation.org](http://www.ASEeducationfoundation.org)**

## **APPEALS AND ACTION FOR REVOCATION**

### **APPEALS: PROGRAMS APPLYING FOR ACCREDITATION**

A complaint received from any school concerning the procedures, evaluation or accreditation of the medium/heavy truck technician training program must be made in writing to the ASE Education Foundation in Leesburg, VA. It will be immediately referred to a Grievance Examiner who will acknowledge receipt of the complaint in writing to the complainants. Thereafter, a Grievance Examiner will investigate the complaint and prepare a report. A copy of the report will be given to the complainants and to an Appeals Committee within thirty (30) days of the receipt of the complaint.

The Appeals Committee will review the findings and recommendations of the Grievance Examiner, together with the complaint and any data supplied in connection therewith. The Appeals Committee will be empowered to dismiss the matter or to initiate such action as it may deem appropriate.

If the complainants desire to review the Appeals Committee's evaluation, they may do so at the office of the Grievance Examiner in Leesburg, VA. However, they will not be permitted to make copies of the results.

### **ACTION FOR REVOCATION: ASE ACCREDITED PROGRAMS**

The Appeals Committee will also advise the ASE Education Foundation President of its judgments and recommendations for action in any cases of malpractice or misrepresentation involving the misuse of ASE program accreditation for a technician training program. Upon receipt of a complaint alleging misuse or misrepresentation by an accredited program, a Grievance Examiner will be notified. The Grievance Examiner will notify the parties against whom the complaint has been filed, in writing, indicating the alleged wrongdoing. The parties will be further advised that they may submit a written explanation concerning the circumstances of the complaint within thirty (30) days. After the Grievance Examiner has considered the complaint and received the explanation, if any, the Grievance Examiner will determine whether there is a reasonable basis for a possible wrongdoing. If the Grievance Examiner finds such a basis, the Grievance Examiner will inform the parties of the findings. At that time, the Grievance Examiner will inform the parties of their right to a hearing before an Appeals Committee. The parties will have fifteen (15) days to notify the Grievance Examiner, in writing, of their decision.

In the event the involved parties elect to be bound by the findings of the Grievance Examiner without a hearing, the Grievance Examiner will submit a written report with recommendations to the Chair of the Appeals Committee. This report will be submitted within sixty (60) days of the receipt of the waiver of a hearing. The Chair of the Appeals Committee will mail a copy of the Grievance Examiner's findings and recommendations to the parties. In the event that the involved parties elect to appear at a hearing, the Chair of the Appeals Committee will call a Board of Inquiry. This Board will consist of four ASE Education Foundation and/or ASE Board members. The Board of Inquiry will be convened in Leesburg, VA at a date and time

determined by the Chair. The Board will notify the involved parties, in writing, regarding the time and place of the hearing.

The Grievance Examiner will be responsible for investigating and presenting all matters pertinent to the alleged wrongdoing to the Board of Inquiry. The involved parties will be entitled to be at the hearings with or without counsel. The parties will be given an opportunity to present such evidence or testimony as they deem appropriate.

The Board of Inquiry will notify the Chair of the Appeals Committee of its findings and recommendations in writing within ten (10) days after the hearing is completed.

The Appeals Committee will review the findings and recommendations of either the Grievance Examiner if a hearing was waived, or the Board of Inquiry if a hearing was held. The Appeals Committee will determine if the record on the complaint supports a finding of conduct contrary to or in violation of reasonable practices. If two-thirds of the Appeals Committee so find, the Committee will recommend to the ASE Education Foundation President the appropriate sanctions or courses of action against the parties charged.

## DEFINITIONS – EDUCATIONAL TERMS

1. **ARTICULATION**: A formal written agreement, usually between a secondary and post-secondary institution that are geographically within a reasonable daily commuting distance of each other. The agreement will clearly denote that students completing specific secondary courses in accordance with predetermined performance criteria will have partially completed commensurate requirements for a completion certificate or diploma awarded by the postsecondary institution. Commensurate requirements could be in the form of credit equivalents, advanced placement, task completion, etc. at the post-secondary institution.
2. **CURRICULUM**: All the objectives of the lesson plan with respect to the content and learning activities, arranged in a sequence for a particular instructional area. An orderly arrangement of integrated subjects, activities, time allocations, and experiences which students pursue for the attainment of a specific educational goal.
3. **COMPETENCY: (Hands On)** - Performance of task to the level or degree specified in the performance standard and curriculum for the task.
4. **COMPETENCY:(Written)** – Understanding of task to the level or degree specified in the performance standard and curriculum for the task.
5. **CRITERION REFERENCED MEASURE(S)**: An exercise based on a performance objective for a task, and designed to measure attainment of that objective. (Also called performance test(s) or criterion-referenced test.)
6. **E-LEARNING**: An electronically based, instructor managed, and student driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop timeframe—*and includes integrated and scored auditable assessment and reporting* in compliance with the ASE Education Foundation’s e-learning general framework criteria.
7. **GOAL**: A statement of the intended outcome of participation in the training program.
8. **LIVE WORK**: The processing, assignment, and student performance of the appropriate tasks on vehicles donated by manufacturers or other sources, customer-owned, and other training vehicles.
9. **LEARNING MANAGEMENT SYSTEM (LMS)**: An electronically based, instructor managed, and student driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop time frame—*and includes integrated and scored auditable assessment and reporting* in compliance with the ASE Education Foundation’s e-learning general framework criteria.

10. **MASTERY**: (See Competency - Hands On and Competency - Written).
11. **OBJECTIVE, PERFORMANCE**: A written statement describing an intended outcome (competent task performance) in terms of student performance. (also called "behavioral" objective or instructional objective).
12. **ON-VEHICLE SERVICE AND REPAIR WORK**: The processing, assignment, and student performance of the appropriate tasks on vehicles donated by manufacturers or other sources, customer-owned, and other training vehicles.
13. **PERSONAL CHARACTERISTIC**: Attributes that are not readily measurable and are generally in the affective or cognitive domains.
14. **PRIORITY RATINGS**: Indicates the minimum percentage of tasks that a program must include in its curriculum in order to be accredited.
15. **STANDARD**: "...Something established for use as a rule or basis of comparison in measuring or judging capacity, quantity, content, extent, value, quality, etc." Webster's New World Dictionary (1991)
16. **STANDARD – (PERFORMANCE)**: A written specification of the results of acceptable task performance.
17. **STANDARD – (PERSONAL)**: An attribute or characteristic of an individual that facilitates entry into or advancement within an occupation.
18. **STANDARD – (PROGRAM)**: A specific quality or desired characteristic of a training program designed to prepare individuals for employment or advancement.
19. **TASK**: A psychomotor or cognitive entry-level learning activity consisting of one or more measureable steps accomplished through an instructor presentation, demonstration, visualization or a student application.
20. **TRAINING STATION**: An area with appropriate tools and equipment, large enough to allow the development of both safety and competency in task performance.
19. **WORK-BASED LEARNING**: For ASE program accreditation purposes, work-based learning is a formalized and structured credit bearing instructional dimension of the automotive training program that is an integral part of the institution's master schedule, is available to all automotive students at the appropriate grade level, and meets the following criteria:

- a) A written customized training plan and performance standards that each student is expected to meet, to be signed off by the student, the student's parent or legal guardian, the authorized work-based learning site representative, and the work-based learning coordinator.
- b) A written agreement between the sponsoring educational institution and the work-base learning site that is in compliance with state/federal rules and regulations governing work-based learning programs.
- c) A written plan of oversight and supervision designating who has the authority to coordinate, monitor and evaluate the work-based learning program, including individual student performance.

\*\*\*\*\*

Must or shall is an imperative need, duty or requirement; an essential or indispensable item; mandatory.

Should is used to express a recommendation, not mandatory, but attainment would increase program quality.

May or could expresses freedom to follow a suggested alternative.

## **POLICIES ON ARTICULATION AGREEMENTS**

There is no provision for articulated accreditation for medium/heavy truck technician training programs under the 2018 Medium/Heavy Truck program standards. Regardless, ASE Education Foundation Trustee action, as well as language in the Carl D. Perkins Vocational Education Act, encourages articulation between programs at the secondary and post-secondary levels.

Articulation agreements may be entered into between any consenting institutions, and are generally defined by a formal written agreement. This agreement usually defines the terms of the articulation, including, but not limited to, the terms under which a student completing specific coursework at one institution may receive credit\* from the other institution. Articulation agreements encourage, but cannot require, graduates of secondary programs to go on to post-secondary education.

\* Credit is defined as a form of recognition for work that has been completed at the secondary level. It includes, but is not limited to, granting: academic credit, advanced placement, task completion, etc.

# PROCEDURES FOR ACCREDITATION/RENEWAL OF ACCREDITATION

## PROCESS OVERVIEW

**NOTE:** The ASE Education Foundation recommends that programs maintain a file containing copies of all reference and documentation materials developed during all phases of the accreditation process.

### 1. Application Materials

The program requesting accreditation can download the program evaluation form and application from the ASE Education Foundation website at [www.ASEeducationfoundation.org](http://www.ASEeducationfoundation.org). **Initial accreditation requires the program have at least one graduated class before application submission.**

To begin the accreditation process, the following must be completed prior to application submission:

- An extensive program evaluation must be conducted by school personnel and Advisory Committee members using the [Program Self Evaluation](#) form.
- Standards 1 - 10 and 11/12 if applicable must be rated.
- Initial Accreditation - An average rating of 4 for Standards 1 - 10 and 11/12 if applicable is required prior to submitting the application to the ASE Education Foundation for review.

#### **Application for Accreditation or Renewal of Accreditation includes:**

- Program Evaluation Summary Sheet
- On-site Evaluation Team Member List
- Instructor Qualifications Forms and Instructor Training Forms
- Advisory Committee List
- Integrated Academics Recognition Forms (optional)
- Payment Worksheet—Purchase Order, Check, or Credit Card Authorization for Base Application Fee and additional fees as applicable (applications will be returned if received without payment)

#### **RENEWAL OF ACCREDITATION:**

- Programs seeking accreditation renewal must submit renewal application prior to program accreditation expiration date.
- If the program has not renewed prior to the program accreditation expiration date, the program will expire, and be removed from the ASE Education Foundation accredited programs list.
- Programs that have expired will have **60 days** post expiration to submit a renewal application (under current program requirements). **Any program expired beyond 60 days must follow the initial accreditation process.**

## 2. Review of Application

The ASE Education Foundation will review the materials within 30 days. Following the review, the Program Administrator and the state Trade & Industrial Supervisor will be notified about the status of the program. The program will be identified as one of the following:

- a. Qualified for on-site evaluation for the level listed on the application.
- b. Not qualified for an on-site evaluation at that time. The ASE Education Foundation will indicate specific improvements that must be made before the on-site evaluation can be approved.

## 3. Evaluation Team Leader (ETL) Assigned, Program Coordinator Makes Contacts

- The ASE Education Foundation will assign an Evaluation Team Leader (ETL) to the program.
- The program administrator and primary contact will be notified of the ETL assignment, and provided with the necessary ETL contact information.
- Included with the notification of ETL assignment will be an [On-site Evaluation Agreement](#). The On-site Evaluation Agreement outlines the required documentation to be provided to the ETL and the costs for the ETL's services and expenses. All costs will be paid by the institution requesting accreditation. This agreement must be completed and returned to the ETL and a copy provided to the ASE Education Foundation after the on-site date has been established.
- The ETL will contact the Program Coordinator to arrange a date for the on-site evaluation. It is acceptable for the Program Coordinator to initiate contact with the ETL.
- With a legitimate reason, the Program Coordinator may contact the ASE Education Foundation to request a different ETL. A request for a different ETL must be in writing and specific as to the reason for the request. (The ETL assigned must NOT be a present or former teacher or administrator, or a member of the Advisory Committee of the program to be evaluated.)

## 4. Send On-Site Evaluation Agreement, Copy of the Application, Course of Study, List of On-Site Evaluation Team Members, Program Graduate Employer Contact Form, and Necessary Payment Forms to the ETL.

A copy of the items listed below must be received by the ETL at least **two weeks prior** to the on-site evaluation or the on-site must be rescheduled.

Items required prior to on-site evaluation:

- On-site Evaluation Agreement – signed by the program administrator
- Copy of the Initial or Renewal of Accreditation Application

- Course of Study – which includes:
  - a. Syllabus for each class
  - b. Tasks to be taught specified according to Priority designations P-1, P-2, P-3
  - c. Number of contact hours
  - d. Sequence of instruction to be included in the program
  - e. List of training materials used in training
  - f. Sample evaluation form used to track student progress
- Advisory Committee minutes
  - \* One year’s worth for initial accreditation
  - \* Five year’s worth for renewal of Accreditation
- Program Graduate Employer Contact form

For programs using e-learning (Standard 12) to meet the hour requirements the following must be included in addition to the above list:

- Tasks and information to be taught using e-learning materials outside of classroom/lab/shop time
- Number of hours allocated to using e-learning instructional materials outside of classroom/lab/shop time correlated with vendor/developer’s average completion time for each module
- Sample of the Learning Management System (LMS) used to track student progress

The On-site Evaluation Team Member List must be included for the ETL to review and approve. Once a date has been set and the on-site evaluation team members have been approved by the ETL, the program coordinator must contact the on-site evaluation team members to make arrangements for the evaluation day(s).

Program Graduate Employer Contact form with the names of 6 previous graduates must be provided. The program instructor or administrator should contact the employers prior to the on-site visit informing the employer a representative from ASE Education Foundation will be in contact with them regarding the graduate.

## 5. On-Site Evaluation

**Initial accreditation** requires 2 consecutive days while students are in class for the on-site evaluation review of all the standards. However, if more than one program is applying for accreditation (general automotive and GM ASEP, for example), additional team members and additional days may be required to complete the on-site evaluation. The ASE Education Foundation will determine the need for additional team members and days.

**Renewal of Accreditation** requires a 1-day on-site evaluation while students are in class. The on-site evaluation team reviews Standards 6-10 (and Standard 12 if applicable) as well as all **go/no-go** (critical) items. However, if the Advisory Committee average on Standards 1-5 or Standard 11 is less than 4, the on-site evaluation team must also review these

standards. The ASE Education Foundation will determine whether an additional day or additional team members will be required to complete the evaluation.

## **6. ETL Reports Results**

The ETL will submit all on-site evaluation materials and a final report to the ASE Education Foundation with a recommendation for or against program accreditation.

## **7. Program Accreditation**

The ASE Education Foundation will review the final report and all additional evaluation materials to determine whether the program meets the requirements for accreditation and will make their recommendation to the Board of Trustees. The President will approve accreditation as sanctioned by the Board of Trustees.

Programs that do not earn accreditation will be given a written report specifying improvements that must be made to qualify for accreditation. The decision at the national level will be final unless appealed to the Board of Trustees. Appeals will be heard only at regular meetings of the Board.

The Program Administrator and the state Trade & Industrial Supervisor will be notified of all decisions regarding the approval status of all programs applying for accreditation.

## **8. Display and Reporting of Accreditation**

A wall plaque identifying the accredited level will be forwarded from the ASE Education Foundation to the program administrator. Schools **must** accurately report the level of accreditation.

## **9. Accredited Technician Training Program List**

The ASE Education Foundation maintains a current listing of all ASE accredited programs. The list is made available on the website at [www.ASEeducationfoundation.com](http://www.ASEeducationfoundation.com). Programs that do not complete the renewal process by their expiration date will be removed from the website list.

## **10. Annual Report**

Each year all accredited programs are required to update all contact information.

## **11. Compliance Review**

A program is accredited for five years. A compliance report is completed by the program Advisory Committee after 2½ years. The compliance report is used to verify that a program is maintaining the program standards. The ASE Education Foundation will notify the program administrator at the 2-year anniversary of accreditation that a compliance review is

due. The report is due 6 months after the notification date. If the report is not received within 60 days past the due date, the program's status will be set to "Due to Reaccredit" and the program will be removed from the roster of accredited programs. The program may be required to have an on-site visit conducted by an ETL and ASE Education Foundation Trustees, staff, consultants, or other designated representatives to verify program compliance prior to the program status being restored to "Accredited."

Additionally, the ASE Education Foundation may randomly select programs at the 2½-year period for an on-site compliance review by an ETL and ASE Education Foundation Trustees, staff, consultants, or other designated representatives. Selected programs will be notified, in advance, of the on-site review. Programs should be prepared to provide documentation on how they are maintaining the standards. All costs for this on-site review will be paid by the ASE Education Foundation.

Compliance review forms are available on the website at [www.ASEeducationfoundation.org](http://www.ASEeducationfoundation.org).

## **12. Renewal of Accreditation**

The ASE Education Foundation will contact the program twelve (12) months prior to the accreditation expiration date. Programs can download the accreditation materials at [www.ASEeducationfoundation.org](http://www.ASEeducationfoundation.org) and follow the process outlined above.

## ON-SITE EVALUATION COST SHEET

	ACCREDITATION FEE	RENEWAL OF ACCREDITATION FEE
Base Accreditation Processing Fee	\$950.00	\$850.00
Manufacturer Specific Accreditation Processing Fee (if applicable this fee is in addition to the Base Accreditation Fee)	\$475.00	\$425.00
Honorarium for Evaluation Team Leader (ETL) @ \$250/day <b>*Please see below</b>	*\$500.00	*\$250.00
<u>Estimated</u> mileage, hotel, and meal expenses for the ETL <b>**Please see below</b>	<u>\$300.00</u>	<u>\$150.00</u>
<u>ESTIMATED</u> TOTAL COSTS Base program only	\$1,750.00	\$1,250.00

**NOTE:** It is anticipated that team members recruited from local independent repair facilities and dealerships will serve without charge to the institution.

The ASE Education Foundation must receive the application fee with the completed application. Applications received without payment will be returned to the program for resubmission with payment.

**\*ETLs are to receive an additional honorarium of \$100 per additional program when evaluating multiple programs at one location.** Example: An ETL evaluates one general program and one manufacturer-specific program during an initial accreditation on-site evaluation. The honorarium paid to the ETL would be \$500 for the standard two-day honorarium plus \$100 for the additional program, for a total honorarium of \$600.

**ETLs are paid as independent contractors, not as school employees.**

**\*\*Mileage is to be reimbursed at the “business purpose” rate specified by the IRS. Please visit [IRS.gov](http://IRS.gov) for the current mileage reimbursement rate.**

Costs of accreditation/renewal of accreditation are subject to change. Contact the ASE Education Foundation for current information.

## **SPECIAL CONSIDERATIONS FOR RENEWAL OF ACCREDITATION**

### **Evaluation**

The renewal of accreditation process requires a one-day on-site program evaluation while students are in class. Team members only evaluate Standards 6-10 unless the ETL is given other instructions by the ASE Education Foundation. The ETL must submit a Final Report Form for each program evaluated.

### **Conducting an On-Site Program Evaluation when the Program Advisory Committee has rated a Standard Below 4**

Renewal of accreditation requires that four members of the Advisory Committee complete the Program Evaluation form. If a rating on one or more standards is below a 4 on the 5-point scale, it will be necessary for the on-site evaluation team to rate those standards in addition to Standards 6-10. The ASE Education Foundation will advise the ETL if it will be necessary to rate additional standards. An additional team member or an additional day may be required for the on-site evaluation. The ASE Education Foundation will make that determination before the on-site evaluation is scheduled.

### **Renewal of Accreditation for Two or More Programs**

It may be necessary to schedule an additional day or add team members if more than one program is due to renew their accreditation at the same time (example: general automotive, GM ASEP, etc.). The ASE Education Foundation will make that determination before the on-site evaluation is scheduled. The ETL must submit a Final Report Form for each program.

## EVALUATION GUIDE

### AUTOMOTIVE PROGRAM EVALUATION

Everyone associated with an automotive program, whether it is automobile, collision repair & refinish, or medium/heavy truck, should be aware that an extensive program evaluation must be conducted by school personnel and certain criteria must be met to be approved for an on-site team evaluation. Documentation must be available for the on-site team to verify that the program meets all requirements for accreditation. The good news is the on-site team will evaluate exactly the same items the school evaluated.

Both the Program Standards and Program Evaluation form contain helpful hints to assist programs through the accreditation process. These hints were developed by a group of experienced ETLs, ASE Education Foundation staff and Trustees. The result is a collection of suggestions for schools and ETLs alike to be used as a guide for preparing, reviewing, and evaluating the documentation needed for program accreditation. These suggestions are meant as examples but there are many other documents that can be used to show how programs meet the standards for accreditation.

When evaluating the statements on the Program Evaluation form read the statement on the form, review the “Possible Documents” hint, and refer to the Program Standard for additional information on each standard sub-section. It is helpful to make notes of reference materials used to rate the standard. While preparing for the on-site evaluation, make copies of the information, clearly mark the reference, and highlight specific information for each sub-section. For example, Standard 1.2 A. asks to rate program materials available (brochure or catalog) on the inclusion of admission requirements, employment potential, etc. Have a copy of the school catalog available for the team with the section identified with a sticky note and specific information highlighted.

The evaluation team will look at the same statement and will use the information provided to them to rate the items. The evaluation team should make comments on any sub-section that is rated above or less than 4.

## ADVISORY COMMITTEE TASKS WITHIN PROGRAM STANDARDS

The Advisory Committee is possibly the most important tool that any automotive technician training program can have, particularly when it is used properly and to its full extent. Regular meetings and good documentation of the meetings in the form of minutes is a must. The following are standards that must specifically be addressed by/with the program advisory committee and be reflected in the minutes. In order to ensure that these items are addressed, this document might be used as a guideline for developing an agenda for an advisory committee meeting. Programs should not limit the use of the advisory committee to only these items, but these items **MUST** be addressed:

Standard	Contents	Documentation
<b>6.1 A</b>	<b>Does the Advisory Committee, consisting of at least five (5) members, convene a minimum of two working meetings per year?</b>	<b>Meeting minutes from at least two meetings per year (one year for initial accreditation; five years for renewal of accreditation).</b>
6.1 B	Rate the input of committee members in terms of participation, providing input on program improvement, and attendance as indicated in the minutes.	Meeting minutes
6.1 C	Rate the mix of committee members in terms of being representative of the following groups: technicians, local employers, consumer groups, former students, others (automotive trainers, parents, etc.)	List of all advisory committee members and their affiliations.
6.2A	Rate the Advisory Committee input in reviewing budgeted funds allocated to and used by the program.	Highlight pertinent discussion in Advisory Committee meeting minutes.
6.2 B	Rate the funding in terms of being adequate for program operation.	Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.
6.3A	Does the Advisory Committee review the information from the annual follow-up procedure and provide input for modifications to the training program?	Highlight pertinent information in Advisory Committee minutes.
6.4A	Rate the use of the Advisory Committee to provide input on additional tasks, and if added, their approval of those additional tasks.	Highlight pertinent information in the Advisory Committee minutes.

6.5A	Rate the use of the Advisory Committee review in the evaluation process (evaluation of instruction).	Highlight pertinent information in Advisory Committee minutes.
6.5B	Rate the use of an annual review process, including the use of student follow-up information and local Advisory Committee input, to maintain up-to-date tools and equipment at industry and safety standards.	Describe the annual review process and provide an example from the annual survey data and Advisory Committee minutes with pertinent information highlighted.
6.5C	<b>Is the Advisory Committee included when conducting an annual evaluation of the facilities to assure adequacy in meeting program goals?</b>	<b>Highlight pertinent information in Advisory Committee minutes.</b>
9.2E	Rate safety inspections in terms of being regularly held.	Note inspection schedule, show checklist, and highlight pertinent comments in Advisory Committee minutes.
*12.3 A	<b>Are Advisory Committee meeting minutes available to confirm that the committee has discussed e-learning?</b>	<b>Highlight pertinent information in the Advisory Committee meeting minutes.</b>

*\*Standard 12 applies only to programs using e-learning outside of scheduled classroom/lab/shop time to meet instructional hour requirements for the purpose of achieving accreditation.*

# MEDIUM/HEAVY TRUCK TASK LIST

## TASK LIST AND ASSUMPTIONS

The ASE Education Foundation task list was reviewed and updated in October 2017. A national committee was assembled in Leesburg, Virginia to review the standards used in the medium/heavy truck accreditation program. The committee consisted of individuals representing the major truck manufacturers, truck repair shop owners and technicians, truck instructors and trainers, and truck equipment and parts suppliers.

The committee reviewed the task list, tools and equipment list, program hours, and instructor qualifications. The committee was also provided with the most current National Institute for Automotive Service Excellence (ASE) Medium/Heavy Truck Technician Tests Task Lists for reference purposes.

All the tasks are assigned a priority number: P-1, P-2, or P-3. Information regarding the priority ratings can be found in the Policies section of the Program Standards. **Note: A task is a psychomotor or cognitive entry-level learning activity consisting of one or more measurable steps accomplished through an instructor presentation, demonstration, visualization or a student application.**

Theory instruction and hands-on performance of all the basic tasks will provide initial training for **entry-level** employment in the medium/heavy truck service field or prepare the student for further training. Competency in the tasks, including the Required Supplemental Tasks, will indicate to employers the graduate has the skills needed for entry-level employment in the medium/heavy truck service field.

1. It is assumed that:

- \* at all levels of accreditation, appropriate theory, safety, and support instruction will be required for performing each task;
- \* the instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks;
- \* the student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources; and
- \* at all levels of accreditation, the student has demonstrated professional personal standards and work habits.

2. It is assumed that:

- \* all diagnostic and repair tasks described in this document are to be accomplished and verified in accordance with manufacturers' recommended procedures and industry accepted standards/practices.

3. It is assumed that:
  - \* individual training programs being evaluated for accreditation will have written and detailed performance standards for each task, including the Required Supplemental Tasks, covered and taught in the curriculum;
  - \* the learning progress of students will be monitored and evaluated against these performance standards;
  - \* a system is in place that informs all students of their individual progress through all phases of the training program.
  
4. It is assumed that:
  - \* individual courses of study will differ across medium/heavy truck technician training programs;
  - \* development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.
  
5. It is assumed that:
  - \* all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, “Right to Know Law”, and state and local requirements; and
  - \* hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.
  
6. It is assumed that:
  - \* any tool requiring calibration will be calibrated according to the manufacturer’s specifications periodically or as needed.
  
7. It is assumed that:
  - \* students are given instruction in communication techniques with the customer.
  
8. It is assumed that:
  - \* all students will be instructed in and will practice recommended precautions when handling electro-static sensitive devices

**Note: The Technology and Maintenance Council (TMC) of the American Trucking Association (ATA) publishes a “Recommended Maintenance Practices Manual” as a resource for industry practices. Contact TMC at [www.trucking.org](http://www.trucking.org) for more information.**

## **REQUIRED SUPPLEMENTAL TASKS**

### **Shop and Personal Safety**

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

### **Tools and Equipment**

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

### **Preparing Vehicle for Service**

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

### **Preparing Vehicle for Customer**

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

## **WORKPLACE EMPLOYABILITY SKILLS**

### **Personal Standards (see Standard 7.9)**

1. Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.
2. Dresses appropriately and uses language and manners suitable for the workplace.
3. Maintains appropriate personal hygiene.
4. Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
5. Demonstrates honesty, integrity and reliability.

### **Work Habits / Ethic (see Standard 7.10)**

1. Complies with workplace policies/laws.
2. Contributes to the success of the team, assists others and requests help when needed.
3. Works well with all customers and coworkers.
4. Negotiates solutions to interpersonal and workplace conflicts.
5. Contributes ideas and initiative.
6. Follows directions.
7. Communicates (written and verbal) effectively with customers and coworkers.
8. Reads and interprets workplace documents; writes clearly and concisely.
9. Analyzes and resolves problems that arise in completing assigned tasks.
10. Organizes and implements a productive plan of work.
11. Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
12. Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed.

# INSPECTION, MAINTENANCE, AND MINOR REPAIR (IMMR)

## Task List

The tasks included in the Inspection, Maintenance, and Minor Repair option are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment. They are not intended to satisfy the Annual Federal Vehicle Inspection requirement as prescribed in the Federal Motor Carrier Safety Regulations, Part 396, Appendix G to Subchapter B, Minimum Periodic Inspection Standards.

### DIESEL ENGINES

For every task in Diesel Engines, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The first tasks in Diesel Engines are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

#### I. DIESEL ENGINES

##### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant. P-1
3. Inspect engine assembly for fuel, oil, coolant, air, and other leaks. P-1
4. Check engine operation (starting and running) including: noise, vibration, smoke, etc. P-2
5. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1
6. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking. P-1

#### I. DIESEL ENGINES

##### B. Cylinder Head and Valve Train

1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness. P-1

## **I. DIESEL ENGINES**

### **C. Engine Block**

1. Inspect crankshaft vibration damper; inspect engine mounts. P-1

## **I. DIESEL ENGINES**

### **D. Lubrication Systems**

1. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor. P-1
2. Check engine oil level, condition, and consumption; take engine oil sample. P-1
3. Determine proper lubricant; perform oil and filter service. P-1

## **I. DIESEL ENGINES**

### **E. Cooling System**

1. Check engine coolant type, level, condition, and test coolant for freeze protection and additive package concentration. P-1
2. Verify coolant temperature; check operation of temperature and level sensors, gauge, and/or sending unit. P-1
3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. P-1
4. Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system. P-1
5. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1
6. Inspect water pump, hoses, and clamps. P-1
7. Inspect, and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings. P-1
8. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud. P-1
9. Identify engine block heater(s). P-2

**I. DIESEL ENGINES**

**F. Air Induction and Exhaust Systems**

- 1. Inspect turbocharger(s), wastegate(s), and piping systems. P-2
- 2. Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable). P-1
- 3. Inspect intake manifold, gaskets, and connections. P-1
- 4. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components. P-1
- 5. Inspect crankcase ventilation system; service as needed. P-1

**I. DIESEL ENGINES**

**G. Fuel System**

- 1. Check fuel level and condition. P-1
- 2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings. P-1
- 3. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware). P-1
- 4. Replace fuel filter; prime and bleed fuel system. P-1
- 5. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware). P-1

**I. DIESEL ENGINES**

**H. Engine Brakes**

- 1. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings. P-1

<b>DE Tasks</b>	
P-1	28
P-2	3
P-3	0
P-1	31

## DRIVE TRAIN

**For every task in Drive Train, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Drive Train are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

### II. DRIVE TRAIN

#### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify drive train components, transmission type, and configuration. P-1

### II. DRIVE TRAIN

#### B. Clutch

1. Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action. P-1
2. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action. P-1

### II. DRIVE TRAIN

#### C. Transmission

1. Inspect transmission shifter and linkage; inspect transmission mounts, insulators, and mounting bolts. P-1
2. Inspect transmission for leakage; determine needed action. P-1
3. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action. P-1
4. Check transmission fluid level and condition; determine needed action. P-1
5. Inspect transmission breather; inspect transmission oil filters, coolers and related components; determine needed action. P-2
6. Inspect speedometer components. P-2

- 7. Inspect and test function of REVERSE light, neutral start, and warning device circuits. P-1

**II. DRIVE TRAIN**

**D. Driveshaft and Universal Joints**

- 1. Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts. P-1

**II. DRIVE TRAIN**

**E. Drive Axles**

- 1. Check for fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs. P-1
- 2. Check drive axle fluid level and condition; check drive axle filter; determine needed action. P-1
- 3. Inspect air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. P-2
- 4. Inspect drive axle shafts; determine needed action. P-2
- 5. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action. P-1

<b>DT Tasks</b>	
P-1	13
P-2	4
P-3	0
	17

**BRAKES**

**For every task in Brakes, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Brakes are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

**III. BRAKES**

**A. General**

- 1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

- 2. Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems). P-1
- 3. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic). P-1

**III. BRAKES**

**B. Air Brakes: Air Supply and Service Systems**

- 1. Inspect air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety). P-1
- 2. Verify proper gauge operation and readings; verify low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination. P-1

**III. BRAKES**

**C. Air Brakes: Mechanical/Foundation Brake System**

- 1. Inspect service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action. P-1
- 2. Identify slack adjuster type; inspect slack adjusters; determine needed action. P-1
- 3. Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; determine needed action. P-1
- 4. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
- 5. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action. P-1
- 6. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action. P-1

**III. BRAKES**

**D. Air brakes: Parking Brake System**

1. Inspect and check parking (spring) brake chamber for leaks; determine needed action. P-1
2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; determine needed action. P-1
3. Inspect and test parking (spring) brake application and release valve; determine needed action. P-1
4. Manually release (cage) and reset (uncage) parking (spring) brakes. P-1

### III. BRAKES

#### E. Hydraulic Brakes: Hydraulic System

1. Check master cylinder fluid level and condition; determine proper fluid type for application. P-1
2. Inspect hydraulic brake system components for leaks and damage. P-1
3. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel. P-1

### III. BRAKES

#### F. Hydraulic Brakes: Mechanical/Foundation Brake System

1. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
2. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; determine needed action. P-1
3. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action. P-1

### III. BRAKES

#### G. Hydraulic Brakes: Parking Brake System

1. Check parking brake operation; inspect parking brake application and holding devices. P-1

### III. BRAKES

#### H. Power Assist Systems

1. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable). P-1

- 2. Check operation of emergency (back-up/reserve) brake assist system. P-1

**III. BRAKES**

**I. Vehicle Dynamic Brake Systems (Air and Hydraulic): Antilock Brake System (ABS), Automatic Traction Control (ATC) System, and Electronic Stability Control (ESC) System**

- 1. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light. P-1
- 2. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation. P-2

**III. BRAKES**

**J. Wheel Bearings**

- 1. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method. P-1
- 2. Identify, inspect, and/or replace unitized/preset hub bearing assemblies. P-2

<b>BR Tasks</b>	
P-1	26
P-2	2
P-3	0
	28

**SUSPENSION AND STEERING**

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Suspension and Steering are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

**IV. SUSPENSION AND STEERING SYSTEMS**

**A. General**

- 1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1
- 3. Identify suspension and steering system components and configurations. P-1

#### **IV. SUSPENSION AND STEERING SYSTEMS**

##### **B. Steering Column**

1. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft. P-1
2. Check operation of tilt and telescoping steering column. P-1
3. Check cab mounting. P-2

#### **IV. SUSPENSION AND STEERING SYSTEMS**

##### **C. Steering Pump and Gear Units**

1. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks. P-1
2. Flush and refill power steering system; purge air from system. P-2

#### **IV. SUSPENSION AND STEERING**

##### **D. Steering Linkage**

1. Inspect tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components; lubricate as needed. P-1

#### **IV. SUSPENSION AND STEERING**

##### **E. Suspension Systems**

1. Inspect shock absorbers, bushings, brackets, and mounts; determine needed action. P-1
2. Inspect leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action. P-1
3. Inspect axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, and shims. P-1
4. Inspect tandem suspension equalizer components. P-3
5. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height. P-1
6. Inspect air springs, mounting plates, springs, suspension arms, and bushings. P-1

#### IV. SUSPENSION AND STEERING

##### F. Wheel Alignment

1. Demonstrate understanding of alignment angles. P-3

#### IV. SUSPENSION AND STEERING

##### G. Wheels and Tires

1. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure. P-1
2. Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems. P-2
3. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer's specification using torque wrench. P-1

#### IV. SUSPENSION AND STEERING

##### H. Frame and Coupling Devices

1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings. P-1
2. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage. P-1
3. Inspect frame hangers, brackets, and cross members. P-3
4. Check pintle hook and mounting (if applicable). P-1

SS Tasks	
P-1	17
P-2	3
P-3	3
	23

### ELECTRICAL/ELECTRONIC SYSTEMS

**For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Electrical/Electronic Systems are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **A. General**

1. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance. P-1
4. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
5. Use wiring diagrams to trace electrical/electronic circuits. P-1
6. Measure parasitic (key-off) battery drain. P-1
7. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses. P-1
8. Inspect, repair (including solder repair), and/or replace connectors, seals, terminal ends, and wiring; verify proper routing and securement. P-1
9. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-2
10. Check for malfunctions caused by faults in the data bus communications network. P-2
11. Identify electrical/electronic system components and configuration. P-1

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **B. Battery System**

1. Identify battery type and system configuration. P-1
2. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action. P-1
3. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action. P-1
4. Charge battery using appropriate method for battery type. P-1

- 5. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply. P-1
- 6. Identify low voltage disconnect (LVD) systems. P-2

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**C. Starting System**

- 1. Demonstrate understanding of starter system operation. P-1
- 2. Perform starter circuit cranking voltage and voltage drop tests. P-1
- 3. Inspect starter control circuit switches, relays, connectors, terminals, wires, and harnesses (including over-crank protection). P-1

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**D. Charging System**

- 1. Identify and understand operation of the generator (alternator). P-1
- 2. Check instrument panel mounted voltmeters and/or indicator lamps. P-1
- 3. Inspect generator (alternator) drive belt condition; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment. P-1
- 4. Inspect cables, wires, and connectors in the charging circuit. P-1
- 5. Perform charging system voltage and amperage output tests; perform AC ripple test. P-1

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**E. Lighting Systems**

- 1. Inspect for brighter-than-normal, intermittent, dim, or no-light operation; determine needed action. P-1
- 2. Test, replace, and aim headlights. P-1
- 3. Inspect cables, wires, and connectors in the lighting systems. P-1
- 4. Inspect tractor-to-trailer multi-wire connectors, cables, and holders. P-1

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**F. Instrument Cluster and Driver Information Systems**

1. Check gauge and warning indicator operation.
2. Identify the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information system, and warning systems.

P-1	<b>EL Tasks</b>
	P-1 27
	P-2 4
	P-3 0
P-2	31

## HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

**For every task in Heating, Ventilation and Air Conditioning (HVAC), the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Heating, Ventilation, & Air Conditioning are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

### VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

**All practices and procedures must be performed according to current mandates, standards, and regulations.**

#### A. General

1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configuration. P-1
3. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

### VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

#### B. Refrigeration System Components

1. Inspect A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment. P-1
2. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable). P-1
3. Inspect A/C condenser for airflow restrictions; determine needed action. P-1

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**C. Heating, Ventilation, and Engine Cooling Systems**

- 1. Inspect engine cooling system and heater system hoses and pipes; determine needed action. P-1
- 2. Inspect HVAC system-heater ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1
- 3. Identify the source of A/C system odors. P-2

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**D. Operating Systems and Related Controls**

- 1. Verify blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action. P-1

<b>HA Tasks</b>	
P-1	9
P-2	1
P-3	0
	10

**CAB**

**For every task in Cab the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Cab are to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.**

**VII. CAB**

**A. General**

- 1. Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1

**VII. CAB**

**B. Instruments and Controls**

- 1. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable). P-1

- 2. Check operation of all accessories. P-1
- 3. Understand operation of auxiliary power unit (APU)/electric power unit (EPU). P-3

**VII. CAB**

**C. Safety Equipment**

- 1. Check operation of horns (electric and air); check warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades and arms. P-1

**VII. CAB**

**D. Hardware**

- 1. Check operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass. P-1
- 2. Record all physical damage. P-2
- 3. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables. P-2
- 4. Inspect cab mountings, hinges, latches, linkages, and ride height. P-1
- 5. Inspect quarter fender, mud flaps, and brackets. P-1

<b>CB Tasks</b>	
P-1	8
P-2	2
P-3	1
	11

## HYDRAULICS

For every task in Hydraulics, the following safety task must be strictly enforced:

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

The first tasks in Hydraulics are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.

### VIII. HYDRAULICS

#### A. General

- |   |     |  |
|---|-----|--|
| 1. Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins. | P-3 |  |
| 2. Verify placement of equipment/component safety labels and placards; determine needed action.   | P-3 |  |
| 3. Identify hydraulic system components; locate filtration system components; service filters and breathers.                                  | P-3 |  |
| 4. Check fluid level and condition; take a hydraulic fluid sample for analysis.   | P-3 |  |
| 5. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action.                                   | P-3 |  |

<b>HD Tasks</b>	
P-1	0
P-2	0
P-3	5
	5

	P-1	128
	P-2	19
	P-3	9
	Task Total	156
<b>REQUIRED SUPPLEMENTAL TASKS</b>		43
<b>Grand Total</b>		<b>199</b>

# TRUCK SERVICE TECHNOLOGY (TST)

## Task List

### DIESEL ENGINES

**For every task in Diesel Engines, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Diesel Engines are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

#### I. DIESEL ENGINES

##### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant. P-1
3. Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action. P-1
4. Check engine operation (starting and running) including: noise, vibration, smoke, etc.; determine need action. P-2
5. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1
6. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking. P-1
7. Check engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. P-2
8. Check engine surging, rough operation, misfiring, and/or shut down problems; determine needed action. P-2

## **I. DIESEL ENGINES**

### **B. Cylinder Head and Valve Train**

1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and proper securement; determine needed action. P-1
2. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. P-2
3. Inspect injector sleeves and seals; determine needed action. P-3
4. Inspect valve train components; determine needed action. P-1
5. Adjust valve bridges (crossheads); adjust valve clearances and injector settings. P-2

## **I. DIESEL ENGINES**

### **C. Engine Block**

1. Inspect crankshaft vibration damper; inspect engine mounts; determine needed action. P-1
2. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components. P-1
3. Perform crankcase pressure test. P-1
4. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s); measure flywheel housing face and bore runout; determine needed action. P-2
5. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. P-2

## **I. DIESEL ENGINES**

### **D. Lubrication Systems**

1. Test engine oil pressure; check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action. P-1
2. Check engine oil level, condition, and consumption; take engine oil sample; determine needed action. P-1
3. Determine proper lubricant; perform oil and filter service. P-1

- 4. Inspect, clean, and test oil cooler and components. P-2
- 5. Inspect turbocharger lubrication systems. P-2

**I. DIESEL ENGINES**

**E. Cooling System**

- 1. Check engine coolant type, level, and condition; test coolant for freeze protection and additive package concentration. P-1
- 2. Test coolant temperature; test operation of temperature and level sensors, gauge, and/or sending unit; determine needed action. P-1
- 3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. P-1
- 4. Recover coolant; flush and refill with recommended coolant/additive package; bleed cooling system. P-1
- 5. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1
- 6. Inspect water pump, hoses, and clamps; determine needed action. P-1
- 7. Inspect and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings; determine needed action. P-1
- 8. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; determine needed action. P-1
- 9. Identify engine block heater(s). P-2
- 10. Diagnose engine coolant consumption; determine needed action. P-1
- 11. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-1
- 12. Inspect turbocharger cooling systems. P-2

**I. DIESEL ENGINES**

**F. Air Induction and Exhaust Systems**

- 1. Inspect turbocharger(s), wastegate(s), and piping systems; determine needed action. P-2

2. Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable). P-1
3. Inspect intake manifold, gaskets, and connections; determine needed action. P-1
4. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components; determine needed action. P-1
5. Inspect crankcase ventilation system; service as needed. P-1
6. Demonstrate knowledge of exhaust gas recirculation (EGR) system including: EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action. P-1
7. Perform air intake system restriction and leakage tests; determine needed action. P-1
8. Perform intake manifold pressure (boost) test; determine needed action. P-3
9. Check exhaust back pressure. P-3
10. Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic). P-2
11. Demonstrate knowledge of charge air cooler operation and testing. P-1
12. Demonstrate knowledge of exhaust aftertreatment systems, operation, and components. P-1
13. Inspect and/or replace preheater/inlet air heater or glow plug system and controls. P-2

## **I. DIESEL ENGINES**

### **G. Fuel System**

1. Check fuel level and condition; determine needed action. P-1
2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings; determine needed action. P-1

3. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware); determine needed action. P-1
4. Replace fuel filter; prime and bleed fuel system. P-1
5. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware). P-1
6. Demonstrate knowledge and understanding of the different types of fuel systems. P-1
7. Perform fuel supply and return system tests; determine needed action. P-1
8. Perform cylinder contribution test using electronic service tool(s). P-1

## I. DIESEL ENGINES

### H. Engine Brakes

1. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings; determine needed action. P-1
2. Inspect and adjust engine compression and/or exhaust brake systems; determine needed action. P-2
3. Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids; determine needed action. P-2

DE Tasks	
P-1	40
P-2	16
P-3	3
	59

## DRIVE TRAIN

**For every task in Drive Train, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Drive Train are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

## II. DRIVE TRAIN

### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Identify drive train components, transmission type, and configuration. P-1
3. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

## II. DRIVE TRAIN

### B. Clutch

1. Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action. P-1
2. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action. P-1
3. Inspect, adjust, repair, and/or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. P-2
4. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. P-1
5. Inspect, adjust, and/or replace single-disc clutch pressure plate and clutch disc. P-1
6. Inspect, adjust, and/or replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. P-1
7. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; determine needed action. P-1
8. Inspect, adjust, and/or replace self-adjusting/continuous-adjusting clutch mechanisms. P-1
9. Inspect and/or replace pilot bearing. P-1

## II. DRIVE TRAIN

### C. Transmission

1. Inspect transmission shifter and linkage; inspect and/or replace transmission mounts, insulators, and mounting bolts. P-1
2. Inspect transmission for leakage; determine needed action. P-1

3. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action. P-1
4. Check transmission fluid level and condition; determine needed action. P-1
5. Inspect transmission breather; inspect transmission oil filters, coolers, and related components; determine needed action. P-2
6. Inspect speedometer components; determine needed action. P-2
7. Inspect and test function of REVERSE light, NEUTRAL start, and warning device circuits; determine needed action. P-1
8. Inspect, adjust, and replace transmission covers, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. P-2
9. Identify causes of transmission noise, shifting concerns, lockup, jumping out-of-gear, overheating, and vibration problems. P-1
10. Inspect, test, repair, and/or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. P-2
11. Remove and reinstall transmission. P-2
12. Inspect input shaft, gear, spacers, bearings, retainers, and slingers. P-3
13. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts. P-3
14. Inspect and test transmission temperature gauge, wiring harnesses, and sensor/sending unit. P-2
15. Inspect operation of automatic transmission, components, and controls; diagnose automatic transmission system problems; determine needed action. P-2
16. Inspect operation of automated mechanical transmission, components, and controls; diagnose automated mechanical transmission system problems; determine needed action. P-2

## II. DRIVE TRAIN

### D. Driveshaft and Universal Joints

1. Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts. P-1
2. Identify causes of driveshaft and universal joint noise and vibration problems. P-1

- 3. Inspect driveshaft center support bearings and mounts; determine needed action. P-1
- 4. Measure driveline angles; determine needed action. P-2

**II. DRIVE TRAIN**

**E. Drive Axles**

- 1. Check and repair fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs. P-1
- 2. Check drive axle fluid level and condition; check drive axle filter; determine needed action. P-1
- 3. Inspect and/or adjust air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. P-2
- 4. Inspect drive axle shafts; determine needed action. P-2
- 5. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action. P-1
- 6. Inspect, repair, or replace drive axle lubrication system pump, troughs, collectors, slingers, tubes, and filters. P-3
- 7. Identify causes of drive axle(s) drive unit noise and overheating problems. P-2
- 8. Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action. P-2
- 9. Remove and replace differential carrier assembly. P-2
- 10. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action. P-1

<b>DT Tasks</b>	
P-1	24
P-2	15
P-3	3
	42

## **BRAKES**

**For every task in Brakes, the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Brakes are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

### **III. BRAKES**

#### **A. General**

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems). P-1
3. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic). P-1
4. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

### **III. BRAKES**

#### **B. Air Brakes: Air Supply and Service Systems**

1. Inspect and test air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety); determine needed action. P-1
2. Test gauge operation and readings; test low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination; determine needed action. P-1
3. Demonstrate knowledge and understanding of air supply and service system components and operations. P-1

4. Inspect air compressor drive gear components (gears, belts, tensioners, and/or couplings); determine needed action. P-3
5. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. P-1
6. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; determine needed action. P-1
7. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; determine needed action. P-1
8. Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; determine needed action. P-1

### **III. BRAKES**

#### **C. Air Brakes: Mechanical/Foundation Brake System**

1. Inspect and test service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action. P-1
2. Identify slack adjuster type; inspect slack adjusters; perform needed action. P-1
3. Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; perform needed action. P-1
4. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
5. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action. P-1
6. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action. P-1
7. Identify concerns related to the mechanical/foundation brake system including poor stopping, brake noise, premature wear, pulling, grabbing, or dragging; determine needed action. P-1

### **III. BRAKES**

#### **D. Air brakes: Parking Brake System**

1. Inspect, test, and/or replace parking (spring) brake chamber. P-1

2. Inspect, test, and/or replace parking (spring) brake check valves, lines, hoses, and fittings. P-1
3. Inspect, test, and/or replace parking (spring) brake application and release valve. P-1
4. Manually release (cage) and reset (uncage) parking (spring) brakes. P-1
5. Identify and test anti-compounding brake function. P-2

### **III. BRAKES**

#### **E. Hydraulic Brakes: Hydraulic System**

1. Check master cylinder fluid level and condition; determine proper fluid type for application. P-1
2. Inspect hydraulic brake system for leaks and damage; test, repair, and/or replace hydraulic brake system components. P-1
3. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel; determine needed action. P-1
4. Identify poor stopping, premature wear, pulling, dragging, imbalance, or poor pedal feel caused by problems in the hydraulic system; determine needed action. P-2
5. Test master cylinder for internal/external leaks and damage; replace as needed. P-2
6. Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; determine needed action. P-3
7. Test brake pressure differential valve; test warning light circuit switch, bulbs/LEDs, wiring, and connectors; determine needed action. P-2
8. Bleed and/or flush hydraulic brake system. P-2

### **III. BRAKES**

#### **F. Hydraulic Brakes: Mechanical/Foundation Brake System**

1. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
2. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware and slides; perform needed action. P-1

3. Remove brake drum, clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action. P-1

### III. BRAKES

#### G. Hydraulic Brakes: Parking Brake System

1. Check parking brake operation; inspect parking brake application and holding devices; adjust, repair, and/or replace as needed. P-1

### III. BRAKES

#### H. Power Assist Systems

1. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable). P-1
2. Check operation of emergency (back-up/reserve) brake assist system. P-1
3. Identify concerns related to the power assist system (vacuum or hydraulic), including stopping problems caused by the brake assist/booster system; determine needed action. P-2
4. Inspect, test, repair, and/or replace hydraulic brake assist/booster systems, hoses, and control valves. P-1

### III. BRAKES

#### I. Vehicle Dynamic Brake Systems (Air and Hydraulic): Antilock Brake System (ABS), Automatic Traction Control (ATC) System, and Electronic Stability Control (ESC) System

1. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light; determine needed action. P-1
2. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation; determine needed action. P-2
3. Identify stopping concerns related to the vehicle dynamic brake systems: ABS, ATC, and ESC; determine needed action. P-2
4. Diagnose problems in the vehicle dynamic brake control systems; determine needed action. P-3
5. Check and test operation of vehicle dynamic brake system (air and hydraulic) mechanical and electrical components; determine needed action. P-1

- 6. Test vehicle/wheel speed sensors and circuits; adjust, repair, and/or replace as needed. P-1
- 7. Bleed ABS hydraulic circuits. P-2
- 8. Verify power line carrier (PLC) operation. P-3

**III. BRAKES**

**J. Wheel Bearings**

- 1. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method. P-1
- 2. Identify, inspect, and/or replace unitized/preset hub bearing assemblies. P-2

<b>BR Tasks</b>	
P-1	36
P-2	10
P-3	4
	50

**SUSPENSION AND STEERING**

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Suspension and Steering are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

**IV. SUSPENSION AND STEERING SYSTEMS**

**A. General**

- 1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1
- 3. Identify suspension and steering system components and configurations. P-1
- 4. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

**IV. SUSPENSION AND STEERING SYSTEMS**

**B. Steering Column**

1. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft. P-1
2. Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems. P-1
3. Check cab mounting and adjust cab ride height. P-2
4. Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. P-1
5. Inspect, test, replace, and calibrate steering angle sensor. P-2

#### **IV. SUSPENSION AND STEERING SYSTEMS**

##### **C. Steering Pump and Gear Units**

1. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks. P-1
2. Flush and refill power steering system; purge air from system. P-1
3. Identify causes of power steering system noise, binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems. P-1
4. Inspect, service, and/or replace power steering reservoir, seals, and gaskets. P-2
5. Inspect and/or replace power steering system cooler, lines, hoses, clamps, mountings, and fittings. P-2
6. Inspect and/or replace power steering gear(s) (single and/or dual) and mountings. P-2

#### **IV. SUSPENSION AND STEERING**

##### **D. Steering Linkage**

1. Inspect, service, repair, and/or replace tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components. P-1

#### **IV. SUSPENSION AND STEERING**

##### **E. Suspension Systems**

1. Inspect, service, repair, and/or replace shock absorbers, bushings, brackets, and mounts. P-1
2. Inspect, repair, and/or replace leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action. P-1
3. Inspect, repair, and/or replace axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, shims and attaching hardware; determine needed action. P-1
4. Inspect, repair, and/or replace tandem suspension equalizer components; determine needed action. P-3
5. Inspect, repair, and/or replace air springs, mounting plates, springs, suspension arms, and bushings; replace as needed. P-1
6. Inspect, test, repair, and/or replace air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height. P-1
7. Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers. P-1
8. Measure, record and adjust ride height; determine needed action. P-1
9. Identify rough ride problems. P-3

#### **IV. SUSPENSION AND STEERING**

##### **F. Wheel Alignment Diagnosis and Repair**

1. Demonstrate understanding of alignment angles. P-1
2. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems. P-1
3. Check and record camber. P-2
4. Check and record caster. P-2
5. Check, record, and adjust toe settings. P-1
6. Check rear axle(s) alignment (thrustline/centerline) and tracking. P-2
7. Identify turning/Ackerman angle (toe-out-on-turns) problems. P-3

- 8. Check front axle alignment (centerline). P-2

**IV. SUSPENSION AND STEERING**

**G. Wheels and Tires**

- 1. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure; determine needed action. P-1
- 2. Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems; determine needed action. P-2
- 3. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer’s specification using torque wrench. P-1
- 4. Inspect tire and wheel for proper application (size, load range, position, and tread design); determine needed action. P-2

**IV. SUSPENSION AND STEERING**

**H. Frame and Coupling Devices**

- 1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings. P-1
- 2. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed action. P-1
- 3. Inspect and install frame hangers, brackets, and cross members; determine needed action. P-3
- 4. Inspect, repair, or replace pintle hooks and draw bars (if applicable). P-2
- 5. Inspect, service, and/or adjust sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls. P-2

<b>SS Tasks</b>	
P-1	25
P-2	13
P-3	4
	42

**ELECTRICAL/ELECTRONIC SYSTEMS**

**For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Electrical/Electronic Systems are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

## V. ELECTRICAL/ELECTRONIC SYSTEMS

### A. General

1. Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance. P-1
4. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits; identify and locate faults in electrical/electronic circuits. P-1
5. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1
6. Measure parasitic (key-off) battery drain; determine needed action. P-1
7. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses; perform inspection and testing; determine needed action. P-1
8. Inspect, test, repair (including solder repair), and/or replace components, connectors, seals, terminal ends, harnesses, and wiring; verify proper routing and securement; determine needed action. P-1
9. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-2
10. Check for malfunctions caused by faults in the data bus communications network. P-2
11. Identify electrical/electronic system components and configuration. P-1
12. Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment; interpret readings; determine needed repairs. P-2

## V. ELECTRICAL/ELECTRONIC SYSTEMS

### B. Battery System

1. Identify battery type and system configuration. P-1

2. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action. P-1
3. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action. P-1
4. Charge battery using appropriate method for battery type. P-1
5. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply. P-1
6. Check low voltage disconnect (LVD) systems; determine needed action. P-2
7. Inspect, clean, and service battery; replace as needed. P-1
8. Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed. P-1
9. Test and clean battery cables and connectors; repair or replace as needed. P-1
10. Identify electrical/electronic modules, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-3

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **C. Starting System**

1. Demonstrate understanding of starter system operation. P-1
2. Perform starter circuit cranking voltage and voltage drop tests; determine needed action. P-1
3. Inspect and test starter control circuit switches (key switch, push button, and/or magnetic switch), relays, connectors, terminals, wires, and harnesses (including over-crank protection); determine needed action. P-1
4. Identify causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems; determine needed action. P-1
5. Perform starter current draw tests; determine needed action. P-3
6. Remove and replace starter; inspect flywheel ring gear or flex plate. P-1

## V. ELECTRICAL/ELECTRONIC SYSTEMS

### D. Charging System

1. Identify and understand operation of the generator (alternator). P-1
2. Test instrument panel mounted voltmeters and/or indicator lamps; determine needed action. P-1
3. Inspect, adjust, and/or replace generator (alternator) drive belt; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment; determine needed action. P-1
4. Inspect cables, wires, and connectors in the charging circuit; determine needed action. P-1
5. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action. P-1
6. Perform charging circuit voltage drop tests; determine needed action. P-1
7. Remove, inspect, and/or replace generator (alternator). P-1

## V. ELECTRICAL/ELECTRONIC SYSTEMS

### E. Lighting Systems

1. Identify causes of brighter-than-normal, intermittent, dim, or no-light operation; determine needed action. P-1
2. Test, replace, and aim headlights P-1
3. Inspect cables, wires, and connectors in the lighting systems. P-1
4. Inspect tractor-to-trailer multi-wire connectors, cables, and holders. P-1
5. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action. P-2
6. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action. P-2
7. Inspect switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits; determine needed action P-2

## V. ELECTRICAL/ELECTRONIC SYSTEMS

### F. Instrument Cluster and Driver Information Systems

1. Check gauge and warning indicator operation. P-1
2. Identify faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems; determine needed action. P-2
3. Inspect electronic speedometer, odometer, and tachometer systems. P-3

EL Tasks	
P-1	34
P-2	8
P-3	3
	45

### HEATING, VENTILATION, AND AIR CONDITIONING (HVAC).

**For every task in Heating, Ventilation and Air Conditioning (HVAC), the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Heating, Ventilation, & Air Conditioning are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

## VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

### A. General

1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configuration. P-1
3. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1
4. Identify and interpret heating and air-conditioning problems. P-1
5. Identify refrigerant type; test for contamination; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1
6. Demonstrate understanding of A/C system performance test. P-1
7. Demonstrate understanding of A/C system leak test. P-1

- 8. Inspect condition of refrigerant oil removed from A/C system; determine needed action. P-1
- 9. Determine oil and oil capacity for system application and/or component replacement. P-1

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**B. Refrigeration System Components**

- 1. Inspect, remove, and replace A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment. P-1
- 2. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable). P-1
- 3. Inspect A/C condenser for airflow restrictions; determine needed action. P-1
- 4. Inspect A/C compressor and clutch assembly; check compressor clutch air gap; determine needed action. P-1
- 5. Inspect AC system hoses, lines, fittings, O-rings, seals, and service valves; determine needed action. P-1
- 6. Inspect receiver/drier or accumulator/drier; determine needed action. P-1
- 7. Inspect expansion valve or orifice (expansion) tube; determine needed action. P-1
- 8. Inspect evaporator housing water drain; determine needed action. P-1
- 9. Understand A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation. P-2
- 10. Understand procedure to remove and reinstall evaporator. P-2
- 11. Understand procedure to inspect and/or replace condenser. P-2

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**C. Heating, Ventilation, and Engine Cooling Systems**

- 1. Inspect engine cooling system and heater system hoses and pipes; determine needed action. P-1
- 2. Inspect HVAC system heater ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1

- 3. Identify the source of A/C system odors; determine needed action. P-2
- 4. Identify temperature control problems in the HVAC system; determine needed action. P-2
- 5. Understand procedure to remove, inspect, reinstall, and/or replace engine coolant and heater system components. P-2

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**D. Operating Systems and Related Controls**

- 1. Verify HVAC system blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action. P-1
- 2. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices P-1
- 3. Demonstrate understanding of A/C compressor clutch control systems. P-2
- 4. Demonstrate understanding of vacuum, mechanical, and electrical components and controls of the HVAC system. P-2

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**E. Refrigerant Recovery, Recycling, and Handling**

- 1. Understand correct use and maintenance of refrigerant handling equipment. P-1
- 2. Understand how to identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1
- 3. Understand how to recycle, label, and store refrigerant. P-1

<b>HA Tasks</b>	
P-1	24
P-2	8
P-3	0
	32

**CAB**

**For every task in Cab the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Cab are to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.**

## **VII. CAB**

### **A. General**

1. Research vehicle service information, including, vehicle service history, service precautions, and technical service bulletins. P-1
2. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1

## **VII. CAB**

### **B. Instruments and Controls**

1. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable). P-1
2. Check operation of all accessories. P-1
3. Understand operation of auxiliary power unit (APU)/electric power unit (EPU). P-3

## **VII. CAB**

### **C. Safety Equipment**

1. Test operation of horns (electric and air); test warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades, arms, and linkage; determine needed action. P-1

## **VII. CAB**

### **D. Hardware**

1. Test operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass; determine needed action. P-1
2. Record all physical damage. P-2

- 3. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables. P-2
- 4. Inspect cab mountings, hinges, latches, linkages, and ride height; determine needed action. P-1
- 5. Inspect quarter fender, mud flaps, and brackets; determine needed action. P-1

CB Tasks	
P-1	8
P-2	2
P-3	1
	11

## HYDRAULICS

**For every task in Hydraulics, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Hydraulics are to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.**

### VIII. HYDRAULICS

#### A. General

- 1. Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins. P-3
- 2. Verify placement of equipment/component safety labels and placards; determine needed action. P-3
- 3. Identify hydraulic system components; locate filtration system components; service filters and breathers. P-3
- 4. Check fluid level and condition; take a hydraulic fluid sample for analysis; determine needed action. P-3
- 5. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action. P-3

HD Tasks	
P-1	0
P-2	0
P-3	5
	5

	P-1	191
	P-2	72
	P-3	23
	Task Total	286
<b>REQUIRED SUPPLEMENTAL TASKS</b>		43
	<b>Grand Total</b>	<b>329</b>

# **MASTER TRUCK SERVICE TECHNOLOGY (MTST)**

## **Task List**

### **DIESEL ENGINES**

**For every task in Diesel Engines, the following safety task must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Diesel Engines are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

#### **I. DIESEL ENGINES**

##### **A. General**

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant. P-1
3. Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action. P-1
4. Diagnose engine operation (starting and running) including: noise, vibration, smoke, etc.; determine needed action. P-2
5. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings. P-1
6. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking. P-1
7. Diagnose engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. P-2
8. Diagnose engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and/or shut down problems; determine needed action. P-2

## **I. DIESEL ENGINES**

### **B. Cylinder Head and Valve Train**

1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and proper securement; determine needed action. P-1
2. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. P-2
3. Inspect injector sleeves and seals; determine needed action. P-3
4. Inspect valve train components; determine needed action. P-1
5. Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action. P-3
6. Adjust valve bridges (crossheads); adjust valve clearances and injector settings. P-2
7. Disassemble cylinder head; inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action. P-3
8. Measure valve head height relative to deck; measure valve face-to-seat contact; determine needed action. P-3
9. Reassemble cylinder head. P-3

## **I. DIESEL ENGINES**

### **C. Engine Block**

1. Inspect crankshaft vibration damper; inspect engine mounts; determine needed action. P-1
2. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components; determine needed action. P-1
3. Perform crankcase pressure test; determine needed action. P-1
4. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s); and measure flywheel housing face and bore runout; determine needed action. P-2
5. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. P-2

6. Disassemble and clean engine block; inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion plugs, and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action. P-2
7. Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action. P-2
8. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action. P-2
9. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion). P-2
10. Inspect camshaft bearings for wear and damage; determine needed action. P-3
11. Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action. P-3
12. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action. P-2
13. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play. P-2
14. Inspect, install, and time gear train; measure gear backlash; determine needed action. P-2
15. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; determine needed action. P-3
16. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons. P-3
17. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances. P-2
18. Check condition of piston cooling jets (nozzles); determine needed action. P-2

## **I. DIESEL ENGINES**

### **D. Lubrication Systems**

1. Test engine oil pressure; check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature; check operation of temperature sensor; determine needed action. P-1

2. Check engine oil level, condition, and consumption; take engine oil sample; determine needed action. P-1
3. Determine proper lubricant; perform oil and filter service. P-1
4. Inspect, clean, and test oil cooler and components; determine needed action. P-2
5. Inspect turbocharger lubrication systems; determine needed action. P-2
6. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action. P-2
7. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action. P-2

## **I. DIESEL ENGINES**

### **E. Cooling System**

1. Check engine coolant type, level, and condition; test coolant for freeze protection and additive package concentration. P-1
2. Test coolant temperature; test operation of temperature and level sensors, gauge, and/or sending unit; determine needed action. P-1
3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. P-1
4. Recover coolant; flush and refill with recommended coolant/additive package; bleed cooling system. P-1
5. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1
6. Inspect water pump, hoses, and clamps; determine needed action. P-1
7. Inspect and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings; determine needed action. P-1
8. Inspect, test, and repair thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; determine needed action. P-1
9. Test engine block heater(s); determine needed action. P-2
10. Diagnose engine coolant consumption; determine needed action. P-1

- 11. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-1
- 12. Inspect turbocharger cooling systems; determine needed action. P-2

**I. DIESEL ENGINES**

**F. Air Induction and Exhaust Systems**

- 1. Inspect turbocharger(s), wastegate(s), and piping systems; determine needed action P-2
- 2. Diagnose air induction system problems; inspect, clean, and/or replace cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable). P-1
- 3. Inspect intake manifold, gaskets, and connections; determine needed action. P-1
- 4. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components; determine needed action. P-1
- 5. Inspect crankcase ventilation system; service as needed. P-1
- 6. Diagnose problems/faults in the exhaust gas recirculation (EGR) system including: EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action. P-1
- 7. Perform air intake system restriction and leakage tests; determine needed action. P-1
- 8. Perform intake manifold pressure (boost) test; determine needed action. P-3
- 9. Check exhaust back pressure; determine needed action. P-3
- 10. Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic); determine needed action. P-2
- 11. Demonstrate knowledge of charge air cooler operation and testing. P-1
- 12. Diagnose exhaust aftertreatment system performance problems; determine needed action. P-1
- 13. Diagnose preheater/inlet air heater or glow plug system and controls: determine needed action. P-2

## I. DIESEL ENGINES

### G. Fuel System

1. Check fuel level and condition; determine needed action. P-1
2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings; determine needed action. P-1
3. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware); determine needed action. P-1
4. Replace fuel filter; prime and bleed fuel system. P-1
5. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware). P-1
6. Demonstrate knowledge and understanding of the different types of fuel systems. P-1
7. Perform fuel supply and return system tests; determine needed action. P-1
8. Perform cylinder contribution test using electronic service tool(s). P-1
9. Demonstrate knowledge of how to set performance parameters using electronic service tools and service information system access. P-2

## I. DIESEL ENGINES

### H. Engine Brakes

1. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings; determine needed action. P-1
2. Inspect and adjust engine compression and/or exhaust brake systems; determine needed action. P-2
3. Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids; determine needed action. P-2

DE Tasks	
P-1	40
P-2	28
P-3	11
	79

## DRIVE TRAIN

**For every task in Drive Train, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Drive Train are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

### II. DRIVE TRAIN

#### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify drive train components, transmission type, and configuration. P-1
3. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

### II. DRIVE TRAIN

#### B. Clutch

1. Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action. P-1
2. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action. P-1
3. Inspect, adjust, repair, and/or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. P-2
4. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. P-1
5. Inspect, adjust, and/or replace single-disc clutch pressure plate and clutch disc. P-1
6. Inspect, adjust, and/or replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. P-1

7. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; determine needed action. P-1
8. Inspect, adjust, and/or replace self-adjusting/continuous-adjusting clutch mechanisms. P-1
9. Inspect and/or replace pilot bearing. P-1
10. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action. P-1
11. Remove and install flywheel; inspect mounting area on crankshaft; inspect rear main oil seal; measure crankshaft end play; determine needed action. P-1
12. Inspect flywheel and starter ring gear; measure flywheel face; measure pilot bore runout; determine needed action. P-1
13. Inspect flywheel housing-to-transmission housing/engine mating surface(s); measure flywheel housing face and bore runout; determine needed action. P-2

## II. DRIVE TRAIN

### C. Transmission

1. Inspect transmission shifter and linkage; inspect and/or replace transmission mounts, insulators, and mounting bolts. P-1
2. Inspect transmission for leakage; determine needed action. P-1
3. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action. P-1
4. Check transmission fluid level and condition; determine needed action. P-1
5. Inspect transmission breather; inspect transmission oil filters, coolers, and related components; determine needed action. P-2
6. Inspect speedometer components; determine needed action. P-2
7. Inspect and test function of REVERSE light, NEUTRAL start, and warning device circuits; determine needed action. P-1
8. Inspect, adjust, and replace transmission covers, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. P-2
9. Identify causes of transmission noise, shifting concerns, lockup, jumping out-of-gear, overheating, and vibration problems; determine needed repairs. P-1

10. Inspect, test, repair, and/or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. P-2
11. Remove and reinstall transmission. P-2
12. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action. P-3
13. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts; determine needed action. P-3
14. Inspect and test transmission temperature gauge, wiring harnesses, and sensor/sending unit; determine needed action. P-2
15. Inspect and test operation of automatic transmission, components, and controls; diagnose automatic transmission system problems; determine needed action. P-2
16. Inspect and test operation of automated mechanical transmission, components, and controls; diagnose automated mechanical transmission system problems; determine needed action. P-2

## **II. DRIVE TRAIN**

### **D. Driveshaft and Universal Joints**

1. Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts. P-1
2. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action. P-1
3. Inspect driveshaft center support bearings and mounts; determine needed action. P-1
4. Measure driveline angles; determine needed action. P-2

## **II. DRIVE TRAIN**

### **E. Drive Axles**

1. Check and repair fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs. P-1
2. Check drive axle fluid level and condition; check drive axle filter; determine needed action. P-1

3. Inspect, adjust, repair, and/or replace air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. P-2
4. Inspect drive axle shafts; determine needed action. P-2
5. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action. P-1
6. Inspect, repair, or replace drive axle lubrication system pump, troughs, collectors, slingers, tubes, and filters. P-3
7. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action. P-2
8. Inspect and test drive axle temperature gauge, wiring harnesses, and sending unit/sensor; determine needed action. P-2
9. Remove and replace differential carrier assembly. P-2
10. Identify causes of drive axle wheel bearing noise and check for damage; determine needed action. P-1
11. Inspect and/or replace components of differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings. P-3
12. Inspect and replace components of locking differential case assembly. P-3
13. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action. P-3
14. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings. P-3
15. Measure ring gear runout; determine needed action. P-2
16. Measure and adjust drive pinion bearing preload. P-3
17. Measure and adjust drive pinion depth. P-3
18. Measure and adjust side bearing preload and ring gear backlash. P-2

19. Check and interpret ring gear and pinion tooth contact pattern; determine needed action.

P-2

DT Tasks	
P-1	27
P-2	19
P-3	10
	56

20. Inspect, adjust, or replace ring gear thrust block/screw.

P-3

## BRAKES

**For every task in Brakes, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Brakes are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

### III. BRAKES

#### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems). P-1
3. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic). P-1
4. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

### III. BRAKES

#### B. Air Brakes: Air Supply and Service Systems

1. Inspect, test, repair, and/or replace air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety); determine needed action. P-1
2. Test gauge operation and readings; test low pressure warning alarm operation; perform air supply system tests such as pressure build-up, P-1

governor settings, and leakage; drain air tanks and check for contamination; determine needed action.

3. Demonstrate knowledge and understanding of air supply and service system components and operations. P-1
4. Inspect air compressor drive gear components (gears, belts, tensioners, and/or couplings); determine needed action. P-3
5. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. P-1
6. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; determine needed action. P-1
7. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; determine needed action. P-1
8. Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; determine needed action. P-1

### **III. BRAKES**

#### **C. Air Brakes: Mechanical/Foundation Brake System**

1. Inspect, test, repair, and/or replace service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action. P-1
2. Identify slack adjuster type; inspect slack adjusters; perform needed action. P-1
3. Check camshafts (S-cam), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; perform needed action. P-1
4. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
5. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action. P-1
6. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action. P-1

7. Diagnose concerns related to the mechanical/foundation brake system including poor stopping, brake noise, premature wear, pulling, grabbing, or dragging; determine needed action. P-1

### **III. BRAKES**

#### **D. Air Brakes: Parking Brake System**

1. Inspect, test, and/or replace parking (spring) brake chamber. P-1
2. Inspect, test, and/or replace parking (spring) brake check valves, lines, hoses, and fittings. P-1
3. Inspect, test, and/or replace parking (spring) brake application and release valve. P-1
4. Manually release (cage) and reset (uncage) parking (spring) brakes. P-1
5. Identify and test anti-compounding brake function; determine needed action. P-2

### **III. BRAKES**

#### **E. Hydraulic Brakes: Hydraulic System**

1. Check master cylinder fluid level and condition; determine proper fluid type for application. P-1
2. Inspect hydraulic brake system for leaks and damage; test, repair, and/or replace hydraulic brake system components. P-1
3. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel; determine needed action. P-1
4. Diagnose poor stopping, premature wear, pulling, dragging, imbalance, or poor pedal feel caused by problems in the hydraulic system; determine needed action. P-2
5. Test master cylinder for internal/external leaks and damage; replace as needed. P-2
6. Test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; determine needed action. P-3
7. Test brake pressure differential valve; test warning light circuit switch, bulbs/LEDs, wiring, and connectors; determine needed action. P-2
8. Bleed and/or flush hydraulic brake system. P-2

### III. BRAKES

#### F. Hydraulic Brakes: Mechanical/Foundation Brake System

1. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1
2. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action. P-1
3. Remove, clean and inspect brake drums; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine serviceability. P-1
4. Check disc brake caliper assembly mountings and slides; replace as needed. P-2

### III. BRAKES

#### G. Hydraulic Brakes: Parking Brake System

1. Check parking brake operation; inspect parking brake application and holding devices; adjust, repair, and/or replace as needed. P-1

### III. BRAKES

#### H. Power Assist Systems

1. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable). P-1
2. Check operation of emergency (back-up/reserve) brake assist system. P-1
3. Identify concerns related to the power assist system (vacuum or hydraulic), including stopping problems caused by the brake assist (booster) system; determine needed action. P-2
4. Inspect, test, repair, and/or replace hydraulic brake assist/booster systems, hoses, and control valves. P-1

### III. BRAKES

#### I. Vehicle Dynamic Brake Systems (Air and Hydraulic): Antilock Brake System (ABS), Automatic Traction Control (ATC) System, and Electronic Stability Control (ESC) System

1. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light; determine needed action. P-1

2. Observe automatic traction control (ATC) and electronic stability control (ETC) warning light operation; determine needed action. P-2
3. Identify stopping concerns related to the vehicle dynamic brake systems: ABS, ATC, and ESC; determine needed action. P-2
4. Diagnose problems in the vehicle dynamic brake control systems; determine needed action. P-2
5. Check and test operation of vehicle dynamic brake system (air and hydraulic) mechanical and electrical components; determine needed action. P-1
6. Test vehicle/wheel speed sensors and circuits; adjust, repair, and/or replace as needed. P-1
7. Bleed ABS hydraulic circuits. P-2
8. Verify power line carrier (PLC) operation. P-3

### III. BRAKES

#### J. Wheel Bearings

1. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method. P-1
2. Identify, inspect, and/or replace unitized/preset hub bearing assemblies. P-2

BR Tasks	
P-1	36
P-2	12
P-3	3
	51

### SUSPENSION AND STEERING

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Suspension and Steering are to listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action.**

### IV. SUSPENSION AND STEERING SYSTEMS

#### A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1
3. Identify suspension and steering system components and configurations. P-1
4. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1

#### **IV. SUSPENSION AND STEERING SYSTEMS**

##### **B. Steering Column**

1. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft. P-1
2. Diagnose causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems. P-1
3. Check cab mounting and adjust cab ride height. P-2
4. Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. P-1
5. Inspect, test, replace, and calibrate steering angle sensor. P-2

#### **IV. SUSPENSION AND STEERING SYSTEMS**

##### **C. Steering Pump and Gear Units**

1. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks. P-1
2. Flush and refill power steering system; purge air from system. P-1
3. Diagnose causes of power steering system noise, binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems. P-1
4. Inspect, service, and/or replace power steering reservoir, seals, and gaskets. P-2
5. Inspect and/or replace power steering system cooler, lines, hoses, clamps, mountings, and fittings. P-2

6. Inspect and/or replace power steering gear(s) (single and/or dual) and mountings. P-2

#### **IV. SUSPENSION AND STEERING**

##### **D. Steering Linkage**

1. Inspect, service, repair, and/or replace tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components. P-1

#### **IV. SUSPENSION AND STEERING**

##### **E. Suspension Systems**

1. Inspect, service, repair, and/or replace shock absorbers, bushings, brackets, and mounts. P-1
2. Inspect, repair, and/or replace leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts. P-1
3. Inspect, repair, and/or replace axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, shims and attaching hardware; determine needed action. P-1
4. Inspect, repair, and/or replace tandem suspension equalizer components; determine needed action. P-3
5. Inspect, repair, and/or replace air springs, mounting plates, springs, suspension arms, and bushings. P-1
6. Inspect, test, repair, and/or replace air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height. P-1
7. Inspect and service kingpins, steering knuckle bushings, locks, bearings, seals, and covers. P-1
8. Measure, record and adjust ride height; determine needed action. P-1
9. Diagnose rough ride problems; determine needed action. P-3

#### **IV. SUSPENSION AND STEERING**

##### **F. Wheel Alignment Diagnosis and Repair**

1. Demonstrate understanding of alignment angles. P-1
2. Diagnose causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems. P-1

- 3. Check, record, and adjust camber. P-2
- 4. Check, record, and adjust caster. P-2
- 5. Check, record, and adjust toe settings. P-1
- 6. Check rear axle(s) alignment (thrustline/centerline) and tracking. P-2
- 7. Identify turning/Ackerman angle (toe-out-on-turns) problems. P-3
- 8. Check front axle alignment (centerline). P-2

**IV. SUSPENSION AND STEERING**

**G. Wheels and Tires**

- 1. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure; determine needed action. P-1
- 2. Diagnose wheel/tire vibration, shimmy, pounding, and hop (tramp) problems; determine needed action. P-2
- 3. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer’s specification using torque wrench. P-1
- 4. Inspect tire and wheel for proper application (size, load range, position, and tread design); determine needed action. P-2

**IV. SUSPENSION AND STEERING**

**H. Frame and Coupling Devices**

- 1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings. P-1
- 2. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed action. P-1
- 3. Inspect, install, and/or replace frame hangers, brackets, and cross members; determine needed action. P-3
- 4. Inspect, repair, or replace pintle hooks and draw bars (if applicable). P-2
- 5. Inspect, service, and/or adjust sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls. P-2

<b>SS Tasks</b>	
P-1	25
P-2	13
P-3	4
	42

## ELECTRICAL/ELECTRONIC SYSTEMS

**For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Electrical/Electronic Systems are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

### V. ELECTRICAL/ELECTRONIC SYSTEMS

#### A. General

1. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance. P-1
4. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits; identify and locate faults in electrical/electronic circuits. P-1
5. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1
6. Measure parasitic (key-off) battery drain; determine needed action. P-1
7. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses; perform inspection and testing; determine needed action. P-1
8. Inspect, test, repair (including solder repair), and/or replace components, connectors, seals, terminal ends, harnesses, and wiring; verify proper routing and securement; determine needed action. P-1
9. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-1
10. Diagnose faults in the data bus communications network; determine needed action. P-2

- |  |     |
|--|-----|
| 11. Identify electrical/electronic system components and configuration.  | P-1 |
| 12. Check frequency, pulse width, and waveforms of electrical/electronic signals using appropriate test equipment; interpret readings; determine needed repairs. | P-2 |
| 13. Understand the process for software transfer, software updates, and/or reprogramming of electronic modules.  | P-3 |

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**B. Battery System**

- |   |     |
|---|-----|
| 1. Identify battery type and system configuration.  | P-1 |
| 2. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action.         | P-1 |
| 3. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action.   | P-1 |
| 4. Charge battery using appropriate method for battery type.  | P-1 |
| 5. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.   | P-1 |
| 6. Check low voltage disconnect (LVD) systems; determine needed action.   | P-1 |
| 7. Inspect, clean, and service battery; replace as needed.  | P-1 |
| 8. Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed.  | P-1 |
| 9. Test, and clean battery cables and connectors; repair or replace as needed.  | P-1 |
| 10. Identify electrical/electronic modules, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. | P-2 |

**V. ELECTRICAL/ELECTRONIC SYSTEMS**

**C. Starting System**

- |  |     |
|--|-----|
| 1. Demonstrate understanding of starter system operation.                                    | P-1 |
| 2. Perform starter circuit cranking voltage and voltage drop tests; determine needed action. | P-1 |

3. Inspect and test starter control circuit switches (key switch, push button, and/or magnetic switch), relays, connectors, terminals, wires, and harnesses (including over-crank protection); determine needed action. P-1
4. Diagnose causes of no-crank or slow crank condition; differentiate between electrical and engine mechanical problems; determine needed action. P-1
5. Perform starter current draw tests; determine needed action. P-2
6. Remove and replace starter; inspect flywheel ring gear or flex plate. P-1

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **D. Charging System**

1. Identify and understand operation of the generator (alternator). P-1
2. Test instrument panel mounted voltmeters and/or indicator lamps; determine needed action. P-1
3. Inspect, adjust, and/or replace generator (alternator) drive belt; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment; determine needed action. P-1
4. Inspect cables, wires, and connectors in the charging circuit. P-1
5. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action. P-1
6. Perform charging circuit voltage drop tests; determine needed action. P-1
7. Remove, inspect, and/or replace generator (alternator). P-1

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **E. Lighting Systems**

1. Diagnose causes of brighter-than-normal, intermittent, dim, or no-light operation; determine needed action. P-1
2. Test, replace, and aim headlights. P-1
3. Inspect cables, wires, and connectors in the lighting systems. P-1
4. Diagnose faults in tractor-to-trailer multi-wire connector(s), cables, and holders; determine needed action. P-2

5. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of exterior lighting systems; determine needed action. P-2
6. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of interior lighting systems; determine needed action. P-2
7. Diagnose faults in switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, and control components/modules of auxiliary lighting circuits; determine needed action. P-2

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **F. Instrument Cluster and Driver Information Systems**

1. Check gauge and warning indicator operation. P-1
2. Diagnose faults in the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information systems, and warning systems; determine needed action. P-2
3. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems. P-3

## **V. ELECTRICAL/ELECTRONIC SYSTEMS**

### **G. Cab and Chassis Electrical Systems**

1. Diagnose operation of horn(s), wiper/washer, and occupant restraint systems. P-1
2. Understand operation of safety systems and related circuits (such as: speed control, collision avoidance, lane departure, and camera systems). P-3
3. Understand operation of comfort and convenience systems and related circuits (such as: power windows, power seats, power locks, remote keyless entry, steering wheel controls, and cruise control). P-3
4. Understand operation of entertainment systems and related circuits (such as: radio, DVD, navigation, speakers, antennas, and voice-activated accessories). P-3
5. Understand the operation of power inverter, protection devices, connectors, terminals, wiring, and control components/modules of auxiliary power systems. P-3

- |   |     |
|---|-----|
| 6. Understand operation of telematics systems.  | P-3 |
| 7. Diagnose faults in engine block and engine oil heater(s); determine needed action. | P-2 |

<b>EL Tasks</b>	
P-1	36
P-2	10
P-3	7
	53

### **HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**For every task in Heating, Ventilation and Air Conditioning (HVAC), the following safety requirement must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Heating, Ventilation, & Air Conditioning are to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.**

## **VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

### **A. General**

- |  |     |
|--|-----|
| 1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.                    | P-1 |
| 2. Identify heating, ventilation, and air conditioning (HVAC) components and configuration.  | P-1 |
| 3. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. | P-1 |
| 4. Diagnose heating and air conditioning problems; determine needed action.  | P-1 |
| 5. Identify refrigerant type; test for contamination; select and connect proper gauge set/test equipment; record temperature and pressure readings.                        | P-1 |
| 6. Perform A/C system performance test; determine needed action.   | P-1 |
| 7. Perform A/C system leak test; determine needed action.  | P-1 |
| 8. Inspect condition of refrigerant oil removed from A/C system; determine needed action.  | P-1 |
| 9. Determine oil and oil capacity for system application and/or component replacement.   | P-1 |

## **VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

### **B. Refrigeration System Components**

1. Inspect, remove, and replace A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment. P-1
2. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable). P-1
3. Inspect A/C condenser for airflow restrictions; determine needed action. P-1
4. Inspect, test, service, and/or replace A/C compressor and clutch assembly; check compressor clutch air gap; determine needed action. P-2
5. Inspect, service, and/or replace A/C system hoses, lines, fittings, O-rings, seals, and service valves. P-2
6. Inspect, remove, and/or replace receiver/drier or accumulator/drier. P-1
7. Inspect, remove, and/or replace expansion valve or orifice (expansion) tube. P-2
8. Inspect evaporator housing water drain; perform needed action. P-1
9. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action. P-2
10. Determine procedure to remove and reinstall evaporator. P-3
11. Determine procedure to inspect and/or replace condenser. P-2

## **VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

### **C. Heating, Ventilation, and Engine Cooling Systems**

1. Inspect engine cooling system and heater system hoses and pipes; determine needed action. P-1
2. Inspect HVAC system heater ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1
3. Identify the source of A/C system odors; determine needed action. P-1
4. Diagnose temperature control problems in the HVAC system; determine needed action. P-2

- 5. Determine procedure to remove, inspect, reinstall, and/or replace engine coolant and heater system components. P-2

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**D. Operating Systems and Related Controls**

- 1. Verify HVAC system blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action. P-1
- 2. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. P-1
- 3. Diagnose A/C compressor clutch control systems; determine needed action. P-2
- 4. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the HVAC system; determine needed action. P-3

**VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

**E. Refrigerant Recovery, Recycling, and Handling**

- 1. Understand correct use and maintenance of refrigerant handling equipment. P-1
- 2. Understand how to identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1
- 3. Understand how to recycle, label, and store refrigerant. P-1

<b>HA Tasks</b>	
P-1	22
P-2	8
P-3	2
	32

**CAB**

**For every task in Cab the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Cab are to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.**

**VII. CAB**

**A. General**

- 1. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record P-1

trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.

**VII. CAB**

**B. Instruments and Controls**

- 1. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable). P-1
- 2. Check operation of all accessories. P-1
- 3. Understand operation of auxiliary power unit (APU)/electric power unit (EPU). P-3

**VII. CAB**

**C. Safety Equipment**

- 1. Test operation of horns (electric and air); test warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades, arms, and linkage; determine needed action. P-1

**VII. CAB**

**D. Hardware**

- 1. Test operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass; determine needed action. P-1
- 2. Record all physical damage. P-2
- 3. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables. P-2
- 4. Inspect cab mountings, hinges, latches, linkages, and ride height; determine needed action. P-1
- 5. Inspect quarter fender, mud flaps, and brackets; determine needed action. P-1

<b>CB Tasks</b>	
P-1	8
P-2	2
P-3	1
	11

## HYDRAULICS

**For every task in Hydraulics, the following safety task must be strictly enforced:**

**Comply with personal and environmental safety practices associated with eye/foot/hand/hearing protection, clothing, hand tools, power equipment, lifting practices, and ventilation. Handle, store, and dispose of fuels/chemicals/materials in accordance with federal, state, and local regulations.**

**The first tasks in Hydraulics are to listen to and verify operator's concern, review past maintenance documents, and record condition on appropriate document.**

### VIII. HYDRAULICS

#### A. General

1. Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins. P-3
2. Verify placement of equipment/component safety labels and placards; determine needed action. P-3
3. Identify hydraulic system components; locate filtration system components; service filters and breathers. P-3
4. Check fluid level and condition; purge and/or bleed system; take a hydraulic fluid sample for analysis; determine needed action. P-3
5. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action. P-3
6. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings. P-3
7. Read and interpret system diagrams and schematics. P-3
8. Perform system temperature, pressure, flow, and cycle time tests; determine needed action. P-3
9. Perform system operational tests; determine needed action. P-3

### VIII. HYDRAULICS

#### B. Pumps

1. Identify causes of pump failure, unusual pump noises, temperature, flow and leakage problems; determine needed action. P-3
2. Determine pump type, rotation, and drive system. P-3

3. Remove and install pump; prime and/or bleed system. P-3
4. Inspect pump inlet and outlet for restrictions and leaks; determine needed action. P-3

**VIII. HYDRAULICS**

**C. Filtration/Reservoirs (Tanks)**

1. Identify type of filtration system; verify filter application and flow direction. P-3
2. Service filters and breathers. P-3
3. Identify causes of system contamination; determine needed action. P-3
4. Inspect, repair, and/or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply, and return lines. P-3

**VIII. HYDRAULICS**

**D. Hoses, Fittings, and Connections**

1. Diagnose causes of component leakage, damage, and restriction; determine needed action. P-3
2. Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action. P-3
3. Assemble hoses, tubes, connectors, and fittings. P-3

**VIII. HYDRAULICS**

**E. Control Valves**

1. Pressure test system safety relief valve; determine needed action. P-3
2. Perform control valve operation pressure and flow tests; determine needed action. P-3
3. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic). P-3
4. Identify causes of control valve leakage problems (internal and external); determine needed action. P-3
5. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed. P-3

**VIII. HYDRAULICS**

**F. Actuators**

**Comply with manufacturers’ and industry accepted safety practices associated with equipment lock out/tag out, pressure line release, implement support (blocked or resting on ground), and articulated cylinder devices/machinery safety locks.**

- 1. Identify actuator type (single-acting, double-acting, multi-stage, telescopic, and motor). P-3
- 2. Identify the cause of seal failure; determine needed action. P-3
- 3. Identify the cause of incorrect actuator movement and/or leakage (internal and external); determine needed action. P-3
- 4. Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action. P-3
- 5. Remove, repair, and/or replace actuators. P-3
- 6. Inspect actuators for dents, cracks, damage, and leakage; determine needed action. P-3

<b>HD Tasks</b>	
P-1	0
P-2	0
P-3	31
	31

P-1 194  
P-2 92  
P-3 69

Task Total 355

**REQUIRED SUPPLEMENTAL TASKS 43**  
**Grand Total 398**

## **TASK LIST PRIORITY ITEM TOTALS (by accreditation level)**

### **Inspection, Maintenance and Minor Repair**

P-1 =	128	95% =	122 tasks
P-2 =	19	70% =	13 tasks
P-3 =	9	25% =	2 tasks

Required Supplemental Tasks = 43

---

### **Truck Service Technology**

P-1 =	191	95% =	181 tasks
P-2 =	72	70% =	50 tasks
P-3 =	23	25% =	6 tasks

Required Supplemental Tasks = 43

---

### **Master Truck Service Technology**

P-1 =	194	95% =	184 tasks
P-2 =	92	70% =	64 tasks
P-3 =	69	25% =	17 tasks

Required Supplemental Tasks = 43

## DEFINITIONS – TECHNICAL TERMS

1. ADJUST - To bring components to specified operational settings.
2. ALIGN - To restore the proper position of components.
3. ANALYZE - Assess the condition of a component or system.
4. ASSEMBLE (REASSEMBLE) - To fit together the components of a device or system.
5. BALANCE - To establish correct linear, rotational or weight relationship.
6. BLEED - To remove air from a closed system.
7. CAN - Controller Area Network. CAN is a network protocol (SAE J2284/ISO 15765-4) used to interconnect a network of electronic control modules.
8. CHARGE - To bring to a specified state, e.g., battery or air conditioning system.
9. CHECK - To verify condition by performing an operational or comparative examination.
10. CLEAN - To rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.
11. DEGLAZE - To remove a smooth glossy surface.
12. DEMONSTRATE - To show the understanding of components or systems.
13. DESCRIBE - To represent or give an account of the component or system.
14. DETERMINE - To establish the procedure to be used to perform the necessary repair.
15. DETERMINE NECESSARY/NEEDED ACTION - Indicates that the diagnostic routine(s) is the primary emphasis of a task. The student is required to perform the diagnostic steps and communicate the diagnostic outcomes and corrective actions required addressing the concern or problem. The training program determines the communication method (worksheet, test, verbal communication, or other means deemed appropriate) and whether the corrective procedures for these tasks are actually performed.
16. DIAGNOSE - To identify the cause of a problem.
17. DISASSEMBLE - To separate a component's parts as a preparation for cleaning, inspection or service.
18. DISCHARGE - To empty a storage device or system.

19. EVACUATE - To remove air, fluid or vapor from a closed system by use of a vacuum pump.
20. FLUSH - To internally clean a component or system.
21. HIGH VOLTAGE - Voltages of 50 volts and higher.
22. HONE - To restore or resize a bore by using rotating cutting stones.
23. IDENTIFY - To describe the component or system.
24. INSPECT - To verify condition of component or system via visual examination.
25. INTERPRET - To explain the operation/condition of component or system.
26. JUMP START - To use an auxiliary power supply to assist a battery to crank an engine.
27. LOCATE - Determine or establish a specific spot or area.
28. MEASURE - To determine existing dimensions/values for comparison to specifications.
29. NETWORK - A system of interconnected electrical modules or devices.
30. ON-BOARD DIAGNOSTICS (OBD) - Diagnostic protocol which monitors computer inputs and outputs for failures.
31. PARASITIC DRAW - Electrical loads which are still present when the ignition circuit is OFF.
32. PERFORM - To accomplish a procedure in accordance with established methods and standards.
33. PERFORM NECESSARY ACTION - Indicates that the student is to perform the diagnostic routine(s) and perform the corrective action item. Where various scenarios (conditions or situations) are presented in a single task, at least one of the scenarios must be accomplished.
34. PURGE - To remove air or fluid from a closed system.
35. REMOVE - To disconnect and separate a component from a system.
36. REPAIR - To restore a malfunctioning component or system to operating condition.
37. REPLACE - To exchange a component; to reinstall a component.

38. RESURFACE - To restore correct finish.
39. SERVICE - To perform a procedure as specified in the owner's or service manual.
40. TEST - To verify condition through the use of meters, gauges or instruments.
41. TORQUE - To tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).
42. VERIFY - To confirm that a problem exists after hearing the customer's concern; or to confirm the effectiveness of a repair.
43. VOLTAGE DROP - A reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.

*Page Intentionally Blank*

## TOOLS AND EQUIPMENT

Local employer needs and the availability of funds are key factors for determining each program's structure and operation. The Program Standards recognize that not all programs have the same needs, nor do all programs teach 100 % of the tasks. Therefore, the basic philosophy for the tools and equipment requirement is as follows: for all tasks which are taught in the program, the training should be as thorough as possible with the tools and equipment necessary for those tasks. In other words, if a program does not teach a particular task, the tool from the tool list associated with that task is not required (unless of course it is required for a task that is taught in another area).

The tool lists are organized into three basic categories: Hand Tools, General Lab/Shop Equipment, and Specialty Tools and Equipment. The specialty tools section is further separated into the eight truck categories. When referring to the tools and equipment list, please note the following:

- A. The organization of the tool list is not intended to dictate how a program organizes its tool crib or student tool sets (i.e., which tools should be in a student set, if utilized, and which should be in the tool crib or shop area).
- B. Quantities for each tool or piece of equipment are determined by the program needs; however, sufficient quantities to provide quality instruction should be on hand.
- C. For Specialty Tools and Equipment, the program need only have those tools for the areas being accredited.
- D. Programs may meet the equipment requirements by borrowing special equipment or providing for off-site instruction (e.g., in a dealership or independent repair shop). Use of borrowed or off-site equipment must be appropriately documented.
- E. No specific brand names for tools and equipment are specified or required.
- F. Although the Program Standards recommend that programs encourage their students to begin to build their own individual tools sets prior to entry into the industry, there is no requirement to do so. NOTE: Industry surveys indicate that most (90%) employers require that a candidate for employment provide his/her own basic hand tool set in order to be hired as an entry-level truck technician.

## HAND TOOLS

(Contained in individual sets or the tool crib in sufficient quantities to permit efficient instruction)

Battery Stud-to-Post or Charging/Test Adapter		Starter (3/16" - 3/8")	
Chisels:		Taper	
Cold 5/8", 3/4"		Scraper - 1" Wide or Larger	
Chisel Holder		Screwdriver - Blade Type:	
Combination Wrenches:		1", 6", 9", and 12"	
Standard (3/8" - 1") (up to 1 1/4" optional)		Offset	
Metric (6mm - 19mm) (up to 24mm optional)		Screwdriver - Phillips:	
Digital Multimeter (DMM) - Minimum 10 Meg Ohm Impedance		1" #2	
Eye Protection - Safety Glasses (side panels) and Goggles (per OSHA Requirements)		6" #1, #2	
Files and handles:		12" #3	
Coarse 12"		Socket Set - 1/4" Drive:	
Fine 12"		3/16" - 1/2" Standard Depth	
Half Round 12"		3/16" - 1/2" Deep	
Flare Nut Wrench Set:		4mm - 13mm Standard Depth	
3/8" - 3/4"		4mm - 13mm Deep	
7mm - 19mm		Extensions - Short, Medium, and Long	
Flashlight/Inspection Light		Ratchet Handle	
Hack Saw		Universal Joint	
Hammers:		Socket Set - 3/8" Drive:	
16 oz. Ball Peen		3/8" - 3/4" Standard Depth (12 point) (Impact or Chrome)	
24 oz. Ball Peen		3/8" - 3/4" Deep (6-point) (Impact or Chrome)	
Soft Face		10mm - 19mm Standard Depth (6-point) (Impact or Chrome)	
Hearing Protection (per OSHA Requirements)		10mm - 19mm Deep (6-point) (Impact or Chrome)	
Hex Key Wrench Sets:		Socket Set - 1/2" Drive:	
Standard (.050" - 3/8") (7/16" - 1/2" optional)		1/2" - 1 1/8" Standard Depth (Impact or Chrome)	
Metric (2mm - 12mm)		1/2" - 1 1/8" Deep (Impact or Chrome)	
Inspection Mirror		13mm - 32mm Standard Depth (Impact or Chrome)	
Machinists/Mechanics Steel Rule		13mm - 32mm Deep (Impact or Chrome)	
Magnetic Pickup Tool		Breaker Bar	
Pliers:		Extensions - Short, Medium, and Long	
Adjustable		Ratchet Handle	
Electrical - Crimper/Stripper		Universal Joint	
Locking		Tape Measure - 25'	
Needle Nose		Tire Pressure Gauge (Truck)	
Side Cutters		Tire Tread Depth Gauge	
Slip Joint		Tool Box	
Punches:		Wire Brush	
Aligning			
Center			
Brass			
Pin (3/16" - 3/8")			

## GENERAL LAB/SHOP EQUIPMENT

The tools and equipment on this list are used in general lab/shop work but are not generally considered to be individually owned hand tools. A well-equipped, accredited program should have all of these general tools and equipment readily available and in sufficient quantity to provide quality instruction. A few items on this General Lab/Shop Equipment list are specifically needed for programs accredited at the Truck Service Technology (TST) level and/or the Master Truck Service Technology (MTST) level. Those are indicated by the appropriate acronym.

Adjustable Wrenches (up to 18")	Filter Wrenches - Small, Medium, and Large
Air Blow Gun – Rubber Tip (per OSHA requirements)	Funnels
A/C Condenser/Radiator Fin Comb Set	Gear Oil Dispenser
Back Support Belt	Grease Gun
Belt Tension Gauge	Grinder (Bench or Pedestal)
Belt Wear Gauge	Hammers:
Bushing Driver Set	48 oz. Ball Peen
C-Clamps	24 oz. Brass
Cleaning Tank (per OSHA and Local Requirements)	12 lb. Hand Sledge
Clutch Adjusting Tools	Heat Gun
Combination Wrench Sets:	Hydraulic Press - 20 Ton Minimum (TST and MTST Programs)
Standard 3/8" - 1 1/2"	Impact Driver Set (Manual/Hand)
Metric 6 mm - 32 mm	Impact Wrenches:
Standard Offset 3/8" - 3/4"	1/2" Drive (Air or Electric) with Impact Sockets
Metric Offset 7 mm - 15 mm	3/4" Drive (Air or Electric) with Impact Sockets
Coolant Conditioner Test Kit (Test Strips)	1" Drive with Impact Sockets (TST and MTST Programs)
Cooling System Pressure Tester and Adapters	Impact Universal Joints - 3/8", 1/2"
Creepers	Jacks - Bottle-style, Air Jack, Frame Jack, etc.
Diagnostic Information Platform - PC with appropriate software and/or internet access for reading electronic service information	Lifting Chains (MST and TMST Programs)
Dial Indicator Set - Magnetic Base	Lifting Eyes (MST and TMST Programs)
Digital or Dial Caliper - Standard and Metric	Micrometers:
Drain Pans	Outside - Standard (0" - 6")
Drills:	Outside - Metric (0 mm - 150 mm)
3/8" variable speed, reversible	Inside - Standard (0" - 6')
1/2" variable speed, reversible	Depth - Standard (0" - 6")
Drill Bit Set: 1/16" - 1/2"	Pipe Wrenches (Up to 18" or 24")
Electronic Service Tool - PC or Data Scan Tool with Appropriate Software	Pliers:
Extractor Set (Broken Bolt)	Snap Ring - Internal
Face Shields	Snap Ring – External
Feeler gauges - Blade Type:	Portable Crane/Engine Hoist - 2 Ton Minimum (TMST Programs)
0.005" - 0.050"	Pressure Gauge Set (MST and TMST Programs):
0.005 mm - 0.070 mm	0-300 psi
Brass Feeler Gauge	0-150 psi

Puller Sets (MST and TMST Programs):			
Two-Jaw			
Three-Jaw			
Refractometer (Antifreeze/Battery)			
Safety (Jack) Stands - Minimum 6 Ton			
Seal Puller			
Socket Sets:			
3/4" Drive Set			
Axle Nut Sockets			
Crow's Feet (Standard and Metric)			
Hex Key Drivers (Standard 3/16" - 3/4" and Metric 4mm - 19mm)			
Torx ® Drive T15 - T55			
Torx ® Drive E4 - E18			
Wheel Fastener Socket Set			
Soldering Gun			
Stop Watch			
Tap and Die Sets (Standard and Metric)			
Thermometer - Hand-held Infrared			
Thread Chaser Set			
Tire Cage (TMST Programs)			
Tire Gauge - Master (For Tire Gauge Calibration Checks)			
Tire Inflator Chuck - Truck			
Tire Pressure Gauge - Truck			
Torch Set: Oxy-Acetylene			
Torque Angle Gauge (MST and TMST Programs)			
Torque Multiplier with Adapters (MST and TMST Programs) (Optional)			
Torque Wrenches:			
1/4" Drive (0 - 150 lb. in.)			
3/8" Drive (0 - 100 lb. ft.)			
1/2" Drive (0 - 250 lb. ft.)			
3/4" Drive (up to 600 lb. ft.)			
Tubing Cutter/Flaring Set			
Valve Core Replacement Tool - Tire			
Wheel Chocks			
Wheel Dolly (MST and TMST Programs)			
Wheel Weight Tool			

## SPECIALTY TOOLS AND EQUIPMENT WITHIN EACH ACCREDITATION CATEGORY

This section covers the tools and equipment a lab/shop should have for training in any given specialty area. This equipment is specialized and it must be available in the lab/shop. No specific type or brand names are identified because they will vary in each local situation.

For all tasks which are taught in the program, the training should be as thorough as possible with the tools and equipment necessary for those tasks. In other words, if a program does not teach a particular task, the tool from the tool list associated with that task is not required.

### INSPECTION, MAINTENANCE, AND MINOR REPAIR

<b>DIESEL ENGINES</b>	<b>ELECTRICAL/ELECTRONIC SYSTEMS</b>
Diesel Exhaust Fluid (DEF) Refractometer	Battery Charger (AGM/Gel Compatible)
Fuel System/Air Induction System Dust Cover Cap Set	Battery Terminal Adapters
Soft Jaw Vise or Adapters	Die Type Terminal Crimper (optional)
	Graphing Multimeter (GMM), Oscilloscope, or Digital Multimeter (DMM) with scope capability
<b>SUSPENSION &amp; STEERING</b>	Inductive (Clamp-on) Ammeter
Fifth Wheel Test Pin	Jumper Cable Set (Heavy-Duty)
Tape Measure (50')	Low AMP Automatic Charger or equivalent device to maintain shop batteries
Tire Square	Starting, Charging, and Battery System Tester
	Terminal Repair Kits
<b>BRAKES</b>	Test Lead Kit
Bearing Packer (optional)	
Brake Bleeder	
Brake Fluid Tester or Test Strips	
Brake Lining Thickness Gauge	
Brake Rotor (Disc) Micrometer	
Drum Brake Gauge	
Method for removing asbestos contamination (Parts Cleaner) meeting EPA Standards	
Seal Installers	
Slack Adjuster Installation Index Tool (Templates)	
Trailer Electrical Cord Tester	
<b>HEATING, VENTILATION, AND AIR CONDITIONING</b>	
Gloves	
Thermometer	

## TRUCK SERVICE TECHNOLOGY

DIESEL ENGINES	BRAKES	
Ball/Small Hole Gauges	Air Pressure Gauge Set	
Cooling System Vacuum Fill Equipment	Bearing Packer (optional)	
Dial Bore Gauge or Telescoping Gauges	Bearing Race Installer	
Diesel Exhaust Fluid (DEF) Refractometer	Brake Bleeder	
Engine Stands	Brake Fluid Tester or Test Strips	
Fan Hub Wrenches	Brake Lining Thickness Gauge	
Fuel System/Air Induction System Dust Cover Cap Set	Brake Rotor (Disc) Micrometer	
Injector Removal Tool(s)	Brake Spring Tool	
Liner Installer (universal)	Disc Caliper Tool for Compressing Caliper Pistons	
Liner Puller (universal)	Drum Brake Gauge	
Precision Straight Edge	Method for removing asbestos contamination (Parts Cleaner) meeting EPA Standards	
Protrusion Gauge (Cylinder Liner Height)	Seal Installers	
Ring Compressor	Slack Adjuster Installation Index Tool (Templates)	
Ring Expander(s)		
Rod Bolt Protectors	DRIVE TRAIN	
Soft Jaw Vise or Adapters	3/4" Drive Pinion Nut Sockets	
Valve Spring Compressor	Aligning Studs - 3/8", 1/2", & 5/8"	
Vibration Damper Puller	Axle Shaft Removal Tool	
	Blind Hole/Pilot Bearing Puller	
SUSPENSION & STEERING	Clutch Adjusting Tools (Pull Type)	
Air Hammer with Chisels	Clutch Disc Aligning Tools	
Ball Joint Separator	Clutch Jack and/or Transmission Jack Attachments	
Fifth Wheel Test Pin	Protractor (Angle Gauge)	
Pitman Arm Puller	Transmission Jack	
Power Steering Analyzer	U-Joint Puller	
Tape Measure (50')	Yoke Puller	
Tire Square		
	HEATING, VENTILATION, AND AIR CONDITIONING	
ELECTRICAL/ELECTRONIC SYSTEMS	A/C Leak Detection Tool (Halogen or UV Dye)	
Battery Charger (AGM/Gel Compatible)	Gloves	
Battery Terminal Adapters		
Die Type Terminal Crimper (optional)		
Graphing Multimeter (GMM), Oscilloscope, or Digital Multimeter (DMM) with scope capability		
Inductive (Clamp-on) Ammeter		
Jumper Cable Set (Heavy-Duty)		
Low AMP Automatic Charger or equivalent device to maintain shop batteries		
Starting, Charging, and Battery System Tester		
Test Lead Kit		
Terminal Repair Kits		

## MASTER TRUCK SERVICE TECHNOLOGY

<b>DIESEL ENGINES</b>	<b>BRAKES</b>
Ball/Small Hole Gauges	Air Pressure Gauge Set
Charge Air Cooler Tester	Bearing Packer (optional)
Cooling System Vacuum Fill Equipment	Bearing Race Installer
Diagnostic Smoke Machine (Optional)	Brake Bleeder
Dial Bore Gauge or Telescoping Gauges	Brake Fluid Tester or Test Strips
Diesel Exhaust Fluid (DEF) Refractometer	Brake Lining Thickness Gauge
Engine Stands	Brake Rotor (Disc) Micrometer
Fan Hub Wrenches	Brake Spring Tool
Fuel System/Air Induction System Dust Cover Cap Set	Disc Caliper Tool for Compressing Caliper Pistons
Injector Removal Tool(s)	Drum Brake Gauge
Liner Installer (universal)	Method for removing asbestos contamination (Parts Cleaner) meeting EPA Standards
Liner Puller (universal)	Seal Installers
Manometer - (Water) or Magnehelic Gauge (optional)	Slack Adjuster Installation Index Tool (Templates)
Precision Straight Edge	Trailer Electrical Cord Tester
Protrusion Gauge (Cylinder Liner Height)	
Ring Compressor	<b>ELECTRICAL/ELECTRONIC SYSTEMS</b>
Rod Bolt Protectors	Battery Charger (AGM/Gel Compatible)
Soft Jaw Vise or Adapters	Battery Terminal Adapters
Valve Spring Compressor	Die Type Terminal Crimper (optional)
Vibration Damper Puller	Graphing Multimeter (GMM), Oscilloscope, or Digital Multimeter (DMM) with scope capability
	Inductive (Clamp-on) Ammeter
<b>SUSPENSION &amp; STEERING</b>	Jumper Cable Set (Heavy-Duty)
Air Hammer with Chisels	Low AMP Automatic Charger or equivalent device to maintain shop batteries
Alignment Equipment: Minimum to perform tasks (including tandem alignment)	Starting, Charging, and Battery System Tester
Ball Joint Separator	Test Lead Kit
Fifth Wheel Test Pin	Terminal Repair Kits
Pitman Arm Puller	
Power Steering Analyzer	<b>DRIVE TRAIN</b>
Tire Square	3/4" Drive Pinion Nut Sockets
	Aligning Studs - 3/8", 1/2", & 5/8"
<b>HYDRAULICS</b>	Axle Shaft Removal Tool
Fittings and adapters for specific applications	Blind Hole/Pilot Bearing Puller
Hose Crimper Tool and Pump (either air over hydraulic or hand pump)-(optional)	Clutch Adjusting Tools (Pull Type)
1000 PSI Liquid Filled or Electronic Gauge and Hose Assembly	Clutch Disc Aligning Tools
5000 PSI Liquid Filled or Electronic Gauge and Hose Assembly	Clutch Jack and/or Transmission Jack Attachments
Pressure/Flow Meter	Protractor (Angle Gauge)
Thermometer (up to 250 degrees) Standard or Infrared	

<b>HEATING, VENTILATION, AND AIR CONDITIONING</b>	
A/C Compressor Clutch Removal & Installation Tools	
A/C Leak Detection Tool (Halogen or UV Dye)	
A/C Manifold Gauge Set*	
A/C Recovery/Recharging and/or Recycling Station*	
A/C Refrigerant Identifier	
Gloves	
Heater Hose Clamp-Off Tool	
Measuring Cup	
Micron Meter (Electronic Vacuum Gauge) – (optional)	
Orifice Tube Remover	
Portable Vacuum Pump (may be included with Recovery/Recycling/Recharging Station)	
Spring Lock Coupler Removers	
Thermometer	
Valve Core (Shrader Type) Replacement Tool	
* Meeting EPA Regulations and SAE “J” Standards	