



**Education Foundation**

# **AUTOMOBILE PROGRAM STANDARDS**

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# BACKGROUND

## AUTOMOBILE 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 Directors 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.

In June 2012, a new model for automobile program standards was published. This new model introduced standards based on three (3) levels rather than by automobile area (brakes, electrical/electronic systems, etc). The three levels are: **Maintenance & Light Repair (MLR)**, **Automobile Service Technician (AST)**, and **Master Automobile Service Technician (MAST)**. The task and tools lists were subsequently reviewed and updated in 2016, 2021, and again in 2024.

The Program Standards and Program Evaluation Forms were reviewed and updated in 2020 to streamline and simplify the accreditation process. Those changes are included in this document.

**Programs may begin submitting applications using these materials July 1, 2024.  
Applications using earlier standards will no longer be accepted after December 31, 2024.**

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, ETL honorarium and expenses, and on-site team evaluation materials.

# **AUTOMOBILE PROGRAM STANDARDS**

## **STANDARD 1 – PURPOSE**

**THE AUTOMOBILE 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 automobile 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 – ADMINISTRATIVE PROGRAM SUPPORT**

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

### **Standard 2.1 – 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 2.2 – 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 2.3 – Provisions 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 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 – 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 – FUNDING**

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

### **Standard 4.1 – Funding**

Adequate funding should be allocated and used for the operation of the program. The funding should be allocated by the institutional administration in conjunction with the program faculty with input from the advisory committee. Funding reports should be made available to program staff.

## **STANDARD 5 – STUDENT SERVICES**

**SYSTEMATIC COUNSELING SERVICES, PLACEMENT, AND FOLLOW-UP PROCEDURES SHOULD BE USED.**

### **Standard 5.1 – Pre-admission Program Advisement**

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

### **Standard 5.2 – Placement**

A student placement system should be used to assist students in obtaining employment in industry, related to their training.

### **Standard 5.3 – Annual Graduate 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 program, and tools and equipment. Follow-up of graduates employed outside of the automobile industry should indicate reasons for non-automobile 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) industry members (not counting school personnel or educators from other schools), 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, and employers. All members of the Advisory Committee should not be from the same business.

#### **Standard 6.2 – Review of Student Surveys**

The Advisory Committee should provide input and review student surveys.

#### **Standard 6.3 – Review of Program Funding**

The Advisory Committee should provide input and review funding.

#### **Standard 6.4 – Review of Graduate Follow-up and Employer Surveys**

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

#### **Standard 6.5 – Review of Course of Study**

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

#### **Standard 6.6 – Review of Tools, Equipment, and Facilities**

The Committee should conduct annual inspections of tools and equipment to assure 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 – Preparation Time**

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

### **Standard 7.3 – 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 7.4 – Course of Study**

All tasks in the program task list have been given a priority rating. A specified minimum percentage of tasks rated P-1, P-2, and P-3 (Automobile and Truck programs) or HP-I and HP-G (Collision programs) must be included in the course of study, based on program's accreditation type and level. Instruction on the legal aspects and responsibilities of the service 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 7.5 – Performance Standards and Student Progress**

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. A record of each student's progress should be maintained. The record should indicate tasks required for program completion and students should demonstrate competency of a task.

### **Standard 7.6 – 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 7.7 – Personal Standards**

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

**Standard 7.8 – 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 7.9 – Related Instruction**

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

**Standard 7.10 – 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 Entry-Level Certification tests, the ASE Professional Certification test, and EPA-approved Section 609 credentials.

**Standard 7.11 – Evaluation of Instruction**

Instructional procedures should be evaluated in a systematic manner. This evaluation should be through regular reviews by students and the administration.

**Standard 7.12 – 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 7.13 – Customer Vehicles**

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 7.14 – Articulation**

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

## **STANDARD 8 – TOOLS & EQUIPMENT**

**TOOLS AND EQUIPMENT 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. Graduate follow-up surveys 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 – Facility Maintenance**

A written maintenance program policy should be used to ensure facilities are suitable 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 automobiles 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**

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 Kit**

If allowed by school policy, 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 of the program's type and level of accreditation.

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

Instructors should meet all state, local, or institutional teaching requirements.

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

Faculty members should be provided technical materials required to maintain their competency. Instructors must complete a specified minimum amount 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 AND APPRENTICESHIP ACTIVITIES.**

**(This standard applies only to programs that are using work-based learning or apprenticeship training to meet minimum program hour requirements for the program's type and level of accreditation. 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 work-based learning and e-learning activities.)**

#### **Standard 11.1 – Standards**

The work-based learning component must be an integral part of the automotive program and available to all students. 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 automobile instructor or supervising work-based learning coordinator should be assigned responsibility, authority, and time to coordinate and monitor 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.**

**(This standard applies only to programs that are using e-learning to meet minimum program hour requirements. 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 work-based learning and e-learning activities.)**

#### **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.

## **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 completed application for Initial or Renewal of Accreditation is received by the ASE Education Foundation. After 12 months, the program must submit a new application. This 12-month time frame may be shortened when applying under standards that are in the process of being phased out.

### **Renewal of Accreditation**

Program accreditation is valid for five (5) years. Programs seeking accreditation renewal should submit a renewal application at least six months prior to their program's accreditation expiration date. If the program has not completed the renewal process prior to the program's accreditation expiration date, the accreditation will expire, and the program will be removed from the ASE accredited programs list. Programs whose accreditation has expired will have 60 days post expiration to submit a renewal application under current program requirements. Any program whose accreditation is expired beyond 60 days must follow the Initial Accreditation application 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 a currently 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.



## AUTOMOBILE 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.

### Maintenance & Light Repair

**540 hours**

combined classroom and lab/shop instructional activities

### Automobile Service Technology

**840 hours**

combined classroom and lab/shop instructional activities

### Master Automobile Service Technology

**1200 hours**

combined classroom and lab/shop instructional activities

The ASE Education Foundation accepts what each school's accrediting entity (e.g. state education agency (SEA) or regional or national accrediting body) defines as an instructional hour. Because different SEAs or accrediting bodies may count instructional hours differently, this policy accommodates the unique situation in each school.

For example, if a 90-minute block is recognized as two hours of instruction by a school's accrediting entity and meets 180 days a year, you would calculate  $2 \times 180 = 360$  instructional hours for the year. If it is a 2-year program where the time block for the second year is the same as the first, you would calculate  $360 \times 2 = 720$  total program hours.

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.
6. All Automobile Program instructors must hold current ASE certifications as listed below:

**MLR Instructors:** All MLR instructors must hold current ASE certification in Auto Maintenance & Light Repair (G1), Suspension & Steering (A4), Brakes (A5), and Electrical/Electronic Systems (A6).

**AST Instructors:** All AST instructors must hold current ASE certification in Auto Maintenance & Light Repair (G1), Electrical/Electronic Systems (A6), and in the Automobile area(s) (A1, A2, A3, A4, A5, A7, and/or A8) they teach.

AST programs must have one or more instructors currently certified in each of the following areas: G1 and A1 through A8.

**MAST Instructors:** All MAST instructors must hold current ASE certification in Auto Maintenance & Light Repair (G1), Electrical/Electronic Systems (A6), and in the Automobile area(s) (A1, A2, A3, A4, A5, A7, and/or A8) they teach.

MAST instructors teaching Engine Performance must also hold current ASE certification as an Advanced Engine Performance Specialist (L1).

MAST instructors teaching Hybrid/Electric vehicle (xEV) diagnosis and repair *should* also hold current ASE certification as a Light Duty Hybrid/Electric Vehicle Specialist (L3) and xEV Electrical Safety Level 2.

MAST programs must have one or more instructors currently certified in each of the following areas: G1, A1 through A8, and L1. L3 and xEV Electrical Safety Level 2 are recommended if the program covers Hybrid/Electric vehicle (xEV) diagnosis and repair.

**Master Certification:** At all levels, current certification as an ASE Master Automobile Technician (A1-A8) satisfies the requirements above for G1 certification.

<b>ASE Certification Requirement Summary</b>	
<b>MLR</b>	All instructors must be certified in G1, A4, A5, and A6.
<b>AST</b>	All instructors must be certified in G1, A6 and any other areas taught (A1-A8). The program must have one or more instructors certified in each of these: G1, A1-A8.
<b>MAST</b>	All instructors must be certified in G1, A6 and any other areas taught (A1-A8). Instructors teaching Engine Performance must also be certified in L1. Instructors teaching Hybrid/Electric vehicle diagnosis and repair <i>should</i> be certified in L3 and xEV Electrical Safety Level 2.

	The program must have one or more instructors certified in each of these: G1, A1-A8, and L1. The program <i>should</i> have one or more instructors certified in L3 and xEV Electrical Safety Level 2 if Hybrid/Electrical vehicle (xEV) diagnosis and repair is taught.
<b>MASTER STATUS</b>	At all levels, current certification as a Master Automobile Technician (A1 – A8) satisfies the requirements above for G1 certification.

7. All instructors must complete a minimum of twenty (20) hours of recognized automotive industry technical update training each year, relevant to their program. Automotive instructors may substitute ten (10) hours of documented hands-on work as a technician in a retail or fleet automotive repair business outside the school (e.g., part-time work or summer externship) for one (1) hour of update technical training, up to a maximum of ten (10) hours of update technical training each year, toward the annual update training requirement. The work must be related to the areas they teach and take place in the same year for which substitute credit is sought. The ASE Education Foundation reserves the right to verify all hands-on work information reported and determine whether it meets all requirements.
8. The program Advisory Committee, consisting of at least five (5) industry members (not counting school personnel), 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.
9. 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 (or more) in each priority numbered category (P-1, P-2, and P-3) to be accredited.** For MLR, AST, and MAST Automobile programs, the following minimum percentages are required:

**At least 90% of all Priority 1 (P-1) tasks must be taught**  
**At least 75% of all Priority 2 (P-2) tasks must be taught**  
**At least 50% 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 Entry-Level Certification tests 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. Up to three additional team members, selected by the program and approved by the ETL, are required for an automobile 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 an automobile technician and a current or retired automobile instructor (at least three years experience as an automobile 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 automobile technician (A1-A8).

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

1. six years experience as an automobile technician,
2. four years automobile teaching experience at the secondary or post-secondary level, and
3. current ASE certified master automobile technician (A1-A8).

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 by phone at (703) 669-6650 or email at [info@ASEeducationfoundation.org](mailto:info@ASEeducationfoundation.org) 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 have current or prior experience as service technicians.

Evaluation team members must have:

1. at least three years full-time experience as a general automobile technician and currently employed as an automotive technician, educator, trainer, field service engineer, OEM or aftermarket technical specialist, or automobile service facility manager or owner.

ASE automobile certification is recommended but not required. If you cannot find team members to meet the above requirements, consult with your ASE Education Foundation field manager.

In addition to the ETL, the Initial Accreditation evaluation team has three team members. If the program is manufacturer-specific (e.g., ASEP, ASSET, T-TEN, etc.) it is recommended that the team members be from dealers associated with that manufacturer. If the program is generic, it is recommended the team members be from a mixture of dealer and aftermarket repair facilities.

In addition to the ETL, the Renewal of Accreditation evaluation team has two team members. If the program is manufacturer-specific (e.g., ASEP, ASSET, T-TEN, etc.) it is recommended the team members be from dealers associated with that manufacturer. If the program is generic, it is recommended the team members be from a mixture of dealer and aftermarket repair facilities.

Each program requesting accreditation must also 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.

Team members may be advisory committee members as long as they did not participate in the program self-evaluation.

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

Each program must identify their selections on the On-Site Evaluation Team Member List which is part of the application for Initial or Renewal of Accreditation.

## TASK LIST INFORMATION

An essential element of any curriculum or training program is a valid task list. Automobile 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 Entry-Level 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.

## TOOLS AND EQUIPMENT INFORMATION

The basic tools and equipment that must be available for use in the automobile 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 MLR, AST and MAST 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 Automobile Program Evaluation materials.

- 6.1A** Does the Advisory Committee, consisting of at least 5 members in attendance (not counting school personnel or educators from other programs) convene a minimum of two working meetings per year?
- 6.6B** Is the Advisory Committee included when conducting an annual evaluation of the facilities to assure adequacy in meeting program goals?
- 7.4A** Does the automobile program provide theory and “hands-on” training for 90% of the P-1, 75% of the P-2, and 50% of the P-3 tasks, as evidenced by cross-referencing the course of study, lesson plans, job sheets, and student progress charts?
- 8.1A** Are all shields, guards, and other safety devices in place, operable, and used?
- 8.1B** Do all students, instructors, and visitors comply with safety practices and wear safety glasses in the lab/shop area while lab is in session?
- 8.2A** Are the tools and equipment available for the tasks taught at the program level being accredited?
- 10.1** Do instructors hold current ASE certification appropriate for the level of program accreditation being sought (MLR, AST, or MAST)?
- 10.3B** Do instructors attend a minimum of 20 hours per year of recognized industry update training (or equivalent) 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 eight items (fourteen items if using Standard 12 – E-learning). Programs must also meet the hour requirements listed in item 2 of the Automobile Minimum Requirements appropriate for the level of accreditation sought. **If the program does not meet these go/no-go requirements, do not apply for accreditation until it does.**

**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 Automobile Program Evaluation.** Please refer to the Automobile 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 Automobile Minimum Requirements.**

## **RECOGNITION FOR ACCREDITATION**

A program approved for Initial 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 AUTOMOBILE TECHNICIANS AT THE FOLLOWING LEVEL:**

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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 an automobile technician training program that was accredited by ASE and has completed instruction at the following level:**

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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" x 30" sign indicating that the training program is ASE accredited.

## INTEGRATED ACADEMIC SKILLS RECOGNITION

An automotive technician's job description consists of far more than the performance of manipulative tasks required to service today's complex vehicles. Successful technicians must possess an array of workplace skills and a unique blend of academic and technical skills.

To that end, the ASE Education Foundation Board of Directors has approved an updated version of integrated academic skills in the disciplines of English, mathematics, and science for automotive technicians. This new document, titled *Being Relevant Matters* was made possible through a grant program created by the ACT Foundation. It provides a road map for teachers and school administrators to balance the needs of technical education with the ever-increasing academic requirements for high school students who have opted for a career/technical education over the college prep path.

Teams of automotive and academic teachers, representing the disciplines of English/language arts, mathematics and science, identified academic principles and subject matter embedded in various automotive tasks. These were then formatted into content descriptions that include templates for crafting credit-worthy integrated or stand-alone academic classes for each of the three automobile program accreditation levels: Maintenance and Light Repair (MLR), Automobile Service Technology (AST), and Master Automobile Service Technology (MAST).

The ASE Education Foundation will issue a certificate of excellence 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 Academic Skills Recognition form and return it with the application for Initial Accreditation or Renewal of Accreditation. Documentation on integrated academic skills activities must be available for the ETL at the time of the on-site evaluation.

Programs may receive recognition in English, mathematics, science, or any combination of the three areas.

The Integrated Academic Skills guide *Being Relevant Matters* for automobile 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 automobile 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 an automobile 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 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 learning process— may be outside or in place of the regularly scheduled classroom and support of lab/shop required time frame—*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. **HOURL**: For ASE Education Foundation purposes, an instructor hour as defined by a school’s accrediting entity (e.g. state agency (SEA) or regional or national accrediting body). Different SEAs or accrediting bodies may count instructional hours differently. For example, if a 90-minute block is recognized as two hours of instruction by a school’s accrediting entity and meets 180 days a year, you would calculate  $2 \times 180 = 360$  instructional hours for the year.
9. **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.

10. **LEARNING MANAGEMENT SYSTEM (LMS)**: criteria software application for the administration, documentation, tracking, reporting, automation, and delivery of educational materials and student assessments.
11. **MASTERY**: (See Competency – Hands-on and Competency - Written).
12. **OBJECTIVE, PERFORMANCE**: A written statement describing an intended outcome (competent task performance) in terms of student performance. (also called "behavioral" objective or instructional objective).
13. **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.
14. **PERSONAL CHARACTERISTIC**: Attributes that are not readily measurable and are generally in the affective or cognitive domains.
15. **PRIORITY RATINGS**: Indicates the minimum percentage of tasks that a program must include in its curriculum in order to be accredited.
16. **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)
17. **STANDARD – (PERFORMANCE)**: A written specification of the results of acceptable task performance.
18. **STANDARD – (PERSONAL)**: An attribute or characteristic of an individual that facilitates entry into or advancement within an occupation.
19. **STANDARD – (PROGRAM)**: A specific quality or desired characteristic of a training program designed to prepare individuals for employment or advancement.
20. **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.
21. **TRAINING STATION**: An area with appropriate tools and equipment, large enough to allow the development of both safety and competency in task performance.



22. **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-based 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.

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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 automobile training programs under the current Automobile program standards. Regardless, ASE Education Foundation Board 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 INITIAL ACCREDITATION OR 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.**

**Programs may begin submitting applications using the 2024 standards July 1, 2024. Applications using prior standards will no longer be accepted after December 31, 2024.**

To begin the accreditation process, the following must be completed before an application is submitted:

- An extensive program evaluation must be conducted by school personnel and a minimum of (4) 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.

An application for Accreditation or Renewal of Accreditation must include:

- 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 – Please note:**

- Programs seeking accreditation renewal should submit a renewal application at least six months prior to their program's accreditation expiration date.
- If the program has not completed the renewal process prior to the program's accreditation expiration date, the accreditation will expire, and the program will be removed from the ASE Education Foundation accredited programs list.

- Programs whose accreditation has expired will have **60** days post expiration to submit a renewal application under current program requirements. **Any program whose accreditation is expired beyond 60 days must follow the Initial Accreditation application process.**

## **2. Review of Application**

The ASE Education Foundation will review the materials within 30 days. Following the review, the Program Administrator will be notified about the status of the application. 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. 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, and Program Graduate Employer Contact Form**

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:
  - Syllabus for each class
  - Tasks to be taught specified according to Priority designations P-1, P-2, P-3
  - Number of contact hours
  - Sequence of instruction to be included in the program
  - List of training materials used in training
  - Sample evaluation form used to track student progress
- Advisory Committee minutes
  - One year's worth for Initial Accreditation
  - Five years' 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).

A 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 their experience as a student and 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 2.1A, 6-10 (and Standard 12 if applicable) as well as all **go/no-go** (critical) items. However, if the Program Self Evaluation 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 Directors. The President will approve accreditation as sanctioned by the Board of Directors.

Programs that do not earn accreditation will be given a written report specifying improvements that must be made to qualify for accreditation.

The Program Administrator will be notified of all decisions regarding the approval status of all programs applying for accreditation. Any appeals must follow the stated appeals process.

## **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 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 Directors, 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 Directors, 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**

A program is accredited for five years. 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

	INITIAL ACCREDITATION FEE	RENEWAL OF ACCREDITATION FEE
Base Accreditation Fee	\$2,530.00	\$1,895.00
Manufacturer Specific Accreditation Fee (if applicable this fee is in addition to the Base Accreditation Fee)	\$1,085.00	\$930.00

**NOTE:** See <https://bit.ly/ASE2023pricing> for more details. Payment for the ETL honorarium and the ETL expenses are now included in the base accreditation and manufacturer fees (if applicable) and are paid to the ETL by the ASE Education Foundation at the conclusion of the on-site visit.

Each on-site visit requires the assigned ETL plus additional team members, usually recruited from local repair shops and dealerships. At most schools, the additional team members volunteer their time. Other schools choose to pay those team members for their time and efforts. This is up to each school to decide, and the prices do not include any team member payments other than the ETL.

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.

Costs of Initial Accreditation and 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 Self Evaluation 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 separate Final Report Form for each program.

## **EVALUATION GUIDE**

### **AUTOMOTIVE PROGRAM EVALUATION**

Everyone associated with an automotive training program, whether it is automobile, collision repair & refinish, or medium/heavy truck, should be aware that an extensive program self-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 Directors. 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, 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 5 members in attendance (not counting school personnel or educators from other programs) 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: automobile technicians, local employers, former students, others (automotive trainers, parents, educators from other programs, etc.)	List of all advisory committee members and their affiliations.
6.2A	Rate the use of the Advisory Committee review of student surveys in the evaluation process.	Highlight pertinent discussion in Advisory Committee meeting minutes.
6.3A	Rate the Advisory Committee input in reviewing funds allocated to and used by the program.	Highlight pertinent discussion in Advisory Committee meeting minutes.
6.3 B	Rate the Advisory Committee input on whether the funding is adequate for program operation.	Provide funding information and highlight pertinent discussion regarding adequacy of funding in Advisory Committee minutes.
6.4A	Rate the Advisory Committee's review of information from the annual follow-up completed by the graduate and employer surveys and resulting recommendations for modifications to the training program,	Describe the annual review process and provide an example from the annual survey data and Advisory committee minutes with

		pertinent information highlighted.
6.5A	Rate the use of the Advisory Committee to provide input on the addition/deletion of tasks and its approval of task changes	Highlight pertinent information in the Advisory Committee minutes.
6.6A	Rate the Advisory Committee use of the annual review process to provide input on maintaining up-to-date tools and equipment.	Highlight pertinent discussion in Advisory Committee meeting minutes.
<b>6.6B</b>	<b>Is the Advisory Committee included when conducting an annual evaluation of the facilities to assure safety and adequacy in meeting program goals?</b>	<b>Highlight pertinent information in Advisory Committee minutes.</b>
<b>*12.3 A</b>	<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.*

## AUTOMOBILE TASK LIST TASK LIST AND ASSUMPTIONS

The ASE Education Foundation task list was reviewed and updated in February 2024. A national committee was assembled in person to review the standards used in the automobile accreditation program. The committee consisted of individuals representing the major automobile manufacturers, automobile repair shop owners and technicians, automobile instructors and trainers, and automobile 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) Automobile 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 automotive service field or prepare the student for further training. Competency in the tasks will indicate to employers that the graduate has the skills needed for entry-level employment in the automotive 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 program has access to appropriate vehicles, components, and training aids needed for effective completion of tasks included in the program's curriculum;
- \* 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 developed an understanding of workflow documentation (written or electronic), including the ability to create and update work/repair orders, warranty reports, and inspection reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. This process will incorporate the "Three C's" (concern, cause, and correction) as a format to communicate this information.

2. It is assumed that:

- \* all diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and safety precautions as published.

3. It is assumed that:

- \* individual courses of study will differ across automobile technician training programs;
- \* development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program;
- \* individual training programs being evaluated for accreditation should document performance standards for each task covered and taught in the curriculum;
- \* the learning progress of students will be monitored and evaluated against these performance standards; and
- \* 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:

- \* all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulations 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.

5. It is assumed that:

- \* all required Foundational Tasks and Workplace Skills are being taught; and
- \* programs teach all eight (8) areas of automotive technology included in the task list.

## FOUNDATIONAL TASKS

**Each of these tasks are required to be included at all levels of accreditation.**

### **Shop and Personal Safety**

1. Identify general lab/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, ensuring the configuration and weight rating of the lift is appropriate for the vehicle being lifted, including xEVs.
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. Identify vehicle systems which pose a safety hazard during service such as: supplemental restraint systems (SRS), electronic brake control systems, stop/start systems, and remote start systems.
14. Identify vehicle systems which pose a safety hazard during service due to high voltage such as: xEV drivetrains, lighting systems, ignition systems, A/C systems, injection systems, etc.
15. Locate and demonstrate knowledge of safety data sheets (SDS).
16. Demonstrate knowledge of personal protective equipment (PPE) required for use in high voltage/electric vehicle circuits.

### **xEV Vehicle Safety**

1. Demonstrate knowledge of hazards related to high voltage systems/electric vehicles, including electrocution, fire, explosion, arc flash, gases and fumes, hazardous chemicals, and EMF, and how to properly respond to emergency situations.
2. Demonstrate knowledge of high voltage system and component coloring, warning labels, lights, signage, and lock-out/tag-out procedures.
3. Demonstrate ability to identify which components and circuits contain high voltage.
4. Demonstrate knowledge of steps needed to assess possible hazards prior to servicing a high voltage/electric vehicle, including awareness of automatic systems that may operate while the key switch/ignition is off.
5. Understand limitations on which systems, components, and circuits of a high voltage/electric vehicle a technician is capable of safely servicing based on their level of training and qualification.

6. Demonstrate knowledge of high voltage/electric vehicle intake process, inspection, handling, and in-process monitoring for all vehicles including damaged/compromised vehicles.

### **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 (e.g., micrometer, dial-indicator, dial-caliper).
6. Perform common fastener and thread repair, including removing broken bolts, restoring internal and external threads, and repairing internal threads with a thread insert.

### **Preparing for Vehicle Service**

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of vehicle protection such as: fender covers, mats, seat, and steering wheel covers.
3. Perform a vehicle walk-around inspection; identify and document existing vehicle conditions such as body damage, paint damage, windshield damage, etc.
4. Perform a vehicle multi-point inspection and complete a vehicle inspection report (written and/or electronic).
5. Demonstrate use of the three C's (concern, cause, and correction).
6. Create a plan of action for each specific service or diagnostic situation, including placing vehicle in service mode as required.
7. 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 SKILLS

**Each of these skills are required to be included at all levels of accreditation.**

## **Personal Standards (see Standard 7.7)**

All training activities and instructional material should emphasize the importance of maintaining high personal standards. While these skills should be integrated in instruction, they are not required to be individually measured by student for the purposes of program accreditation. The classroom/lab can be considered the equivalent of a workplace and classmates can be considered coworkers.

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 personal hygiene appropriate for the workplace.
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 7.8)**

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. While these skills should be integrated in instruction, they are not required to be individually measured by student for the purposes of program accreditation. The classroom/lab can be considered a workplace and classmates can be considered coworkers.

1. Complies with workplace policies/laws, including proper and responsible use of personal electronic devices.
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 effectively, both in writing and verbally, 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 (STEM) 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.
13. Respectful of tools and property used in school and workplace environment.
14. Contributes to an inclusive environment where every coworker and customer feels welcomed, heard, and valued.

# MAINTENANCE AND LIGHT REPAIR (MLR) TASK LIST

## ENGINE REPAIR - MLR

For every task in Engine Repair, the following safety requirement must be strictly enforced:

**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.**

### I. ENGINE REPAIR

#### A. General

1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-2
6. Demonstrate knowledge of the procedure for verifying engine mechanical timing. P-2
7. Inspect engine mounts. P-2
8. Identify service precautions related to service of the internal combustion engine of an xEV. P-2

### I. ENGINE REPAIR

#### B. Cylinder Head and Valve Train

1. Identify cylinder head and valve train components and configurations. P-1

### I. ENGINE REPAIR

#### C. Engine Block Assembly

1. Identify engine block assembly components and configurations. P-1

**I. ENGINE REPAIR**

**D. Lubrication and Cooling Systems**

- 1. Identify lubrication and cooling system components and configurations P-1
- 2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1
- 3. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant reservoir/recovery tank, heater core, and galley plugs. P-1
- 4. Identify causes of engine overheating P-2
- 5. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment P-1
- 6. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1
- 7. Identify different types of water/coolant pumps (belt driven, chain driven, and electric). P-2
- 8. Remove, inspect, and replace thermostat and gasket/seal. P-1

**ER Tasks - MLR**

P-1	12
P-2	6
P-3	0

## AUTOMATIC TRANSMISSION AND TRANSAXLE - MLR

**For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:**

**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.**

### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify automatic transmission and transaxle components and configurations, including torque converter automatic, dual-clutch automatic (DCT), CVT, and xEV drive. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick. P-1
5. Demonstrate knowledge of procedures to check transmission fluid condition and level; inspect for leaks on transmission or transaxle not equipped with a dipstick. P-1
6. Demonstrate knowledge of transmission/transaxle gear reduction/multiplication operation using driving, driven, and held member (power flow) principles. P-3
7. Demonstrate knowledge of hydraulic principles (Pascal's Law) in a transmission/transaxle. P-3

### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

#### B. In-Vehicle Transmission/Transaxle

1. Inspect external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2
2. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1
3. Demonstrate knowledge of relearn procedures. P-2

4. Inspect, replace and/or align power train mounts. P-3

## **II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

### **C. Off-Vehicle Transmission and Transaxle**

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
2. Describe the operational characteristics of a hybrid vehicle drive train. P-3
3. Describe the operational characteristics of dual-clutch transmission (DCT). P-3

#### **AT Tasks - MLR**

P-1	6
P-2	2
P-3	6

## MANUAL DRIVE TRAIN AND AXLES - MLR

**For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:**

**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.**

### III. MANUAL DRIVE TRAIN AND AXLES

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify manual drive train and axle components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-2
4. Check fluid condition; check for leaks. P-3
5. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification. P-2

### III. MANUAL DRIVE TRAIN AND AXLES

#### B. Clutch

1. Demonstrate knowledge of procedures to check and adjust clutch primary cylinder fluid level. P-3

### III. MANUAL DRIVE TRAIN AND AXLES

#### C. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive)

1. Inspect and/or remove/replace bearings, hubs, and seals. P-2
2. Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints. P-2

### III. MANUAL DRIVE TRAIN AND AXLES

#### D. Differential and Drive Axles

##### E.1 Ring and Pinion Gears and Differential Housing Assembly

1. Inspect differential housing; check for leaks; inspect housing vent. P-1

2. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification. P-1

3. Drain and refill differential housing; using proper fluid type per manufacturer specification. P-1

### **E.2 Drive Axles**

1. Inspect and replace drive axle wheel studs. P-2

## **III. MANUAL DRIVE TRAIN AND AXLES**

### **E. Four-wheel Drive/All-wheel Drive**

1. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3

2. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2

#### **MD Tasks - MLR**

P-1 5

P-2 6

P-3 3

## SUSPENSION AND STEERING - MLR

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced:**

**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.**

### IV. SUSPENSION AND STEERING

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify suspension and steering system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Disable, enable, and properly handle SRS/airbag system components during vehicle service following manufacturers' procedures. P-2

### IV. SUSPENSION AND STEERING

#### B. Steering Systems

1. Inspect rack and pinion steering gear tie rod ends (sockets) and bellows boots. P-1
2. Inspect power steering fluid level and condition. P-2
3. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification. P-2
4. Inspect for power steering fluid leakage. P-2
5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-2
6. Inspect, remove, and/or replace power steering hoses and fittings. P-2
7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-3
8. Inspect tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion). P-3
9. Demonstrate knowledge of electric power steering system operation. P-2



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

##### **C. Suspension Systems**

1. Inspect upper and/or lower control arms, bushings, and shafts. P-2
2. Inspect and replace rebound/jounce bumpers. P-3
3. Inspect track bar, strut rods/radius arms, and related mounts and bushings. P-2
4. Inspect upper and/or lower ball joints (with or without wear indicators). P-2
5. Inspect suspension system coil springs and spring insulators. P-2
6. Inspect torsion bars and mounts. P-3
7. Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-2
8. Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount. P-2
9. Inspect components of rear suspension systems (Coil, Leaf, and Torsion Beams). P-1
10. Inspect components of electronically controlled suspension systems. P-2

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

##### **D. Related Suspension and Steering Service**

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1
2. Inspect front and rear wheel bearings. P-1
3. Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control). P-2

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

##### **E. Wheel Alignment**

1. Determine the need to recalibrate a vehicle's advanced driver assistance system (ADAS) that may require calibration after repairs or adjustments. P-1
2. Perform pre-alignment inspection; place vehicle in service mode as required; measure vehicle ride height. P-1
3. Describe four-wheel alignment angles (camber, caster, toe, setback, and thrust angle) and effects on vehicle handling/tire wear. P-1

#### IV. SUSPENSION AND STEERING

##### F. Wheels and Tires

1. Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label. P-1
2. Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS). P-1
3. Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly. P-1
4. Inspect tire and wheel assembly for air loss; determine needed action. P-1
5. Repair tire following tire manufacturer approved procedure. P-1
6. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate/relearn system; verify operation of instrument panel lamps. P-1
7. Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a tire pressure monitoring system (TPMS). P-1
8. Perform Road Force balance/match mounting. P-3

##### SS Tasks - MLR

P-1	17
P-2	15
P-3	5

## BRAKES - MLR

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

**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.**

### V. BRAKES

#### A. General

1. Research vehicle service information such as fluid type, system design (hydraulic, electronic, etc.), vehicle service history, service precautions, technical service bulletins, and recalls including xEV and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify brake system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Research the need to place a vehicle in service mode before servicing the brake system. P-1
5. Research the need to perform calibration/recalibration, initialization, or relearn procedures as required. P-1
6. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1
7. Install wheel and torque lug nuts/wheel fasteners. P-1

### V. BRAKES

#### B. Hydraulic System

1. Demonstrate knowledge of hydraulic principles (Pascal's law). P-1
2. Describe proper brake pedal height, travel, and feel. P-1
3. Check primary cylinder for proper operation. P-1
4. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports. P-1
5. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1

- 6. Bleed and/or replace fluid in the brake system. P-1
- 7. Test brake fluid for contamination. P-2
- 8. Identify components of brake warning light system. P-2

**V. BRAKES**

**C. Drum Brakes**

- 1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-2
- 2. Refinish brake drum and measure final drum diameter; compare with specification. P-3
- 3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-3
- 4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-3
- 5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-3

**V. BRAKES**

**D. Disc Brakes**

- 1. Remove and clean caliper assembly; inspect for leaks, damage, and wear. P-1
- 2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage. P-1
- 3. Remove, inspect, and/or replace brake pads and retaining hardware. P-1
- 4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks. P-1
- 5. Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout. P-1
- 6. Remove and reinstall/replace rotor. P-1
- 7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-3
- 8. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. P-3

- 9. Retract and re-adjust caliper piston on an integrated parking brake system. P-2
- 10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation. P-1

**V. BRAKES**

**E. Power-Assist Units**

- 1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2
- 2. Identify components of the brake power assist system (vacuum/ hydraulic/electric). P-2

**V. BRAKES**

**F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)**

- 1. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings. P-3
- 2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. P-2
- 3. Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation. P-2
- 4. Check operation of brake stop light system. P-1
- 5. Inspect and replace wheel studs/fasteners. P-2

**V. BRAKES**

**G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems**

- 1. Identify electronic brake control system components and describe function (ABS, TCS, ESC). P-2
- 2. Describe the operation of a regenerative braking system. P-3

**BR Tasks - MLR**

P-1	21
P-2	10
P-3	8

## ELECTRICAL/ELECTRONIC SYSTEMS - MLR

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

**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.**

### VI. ELECTRICAL/ELECTRONIC SYSTEMS

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify electrical/electronic system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
5. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1
6. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
7. Describe precautions related to the use of test lights. P-3
8. Use fused jumper wires to check operation of electrical circuits per service information. P-2
9. Use wiring diagrams to trace electrical/electronic circuits. P-1
10. Measure key-off battery drain (parasitic draw). P-2
11. Inspect and test fusible links, circuit breakers, and fuses. P-1
12. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair). P-2

13. Research the need to perform calibration/recalibration, initialization, or relearn procedures as required. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **B. Batteries (Low Voltage)**

1. Perform battery state-of-charge test; determine needed action. P-1
2. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test, as recommended by manufacturer. P-1
3. Maintain or restore electronic memory functions as recommended by manufacturer. P-2
4. Inspect and clean battery; check battery cables, connectors, clamps, and hold-downs. P-1
5. Perform battery charging according to manufacturer's recommendations. P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer's recommendations. P-1
7. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **C. Starting System (Low Voltage)**

1. Perform starter current draw test. P-1
2. Perform starter circuit voltage drop tests. P-1
3. Inspect and test starter relays and solenoids. P-2
4. Remove and install starter in a vehicle. P-3
5. Inspect and test switches, connectors, and wires of starter control circuits. P-2
6. Demonstrate knowledge of an automatic idle-stop/start-stop system that uses a low-voltage starter to restart the engine. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **D. Charging System (Low Voltage)**

1. Perform charging system output test. P-1
2. Inspect, adjust, and replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

- 3. Remove, inspect, and replace generator (alternator). P-3
- 4. Perform charging circuit voltage drop tests. P-2

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**E. Lighting Systems**

- 1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1
- 2. Aim headlights. P-2

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

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

- 1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required. P-1

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**G. Body Electrical Systems**

- 1. Demonstrate knowledge of vehicle comfort, convenience, access, safety, and related systems operation. P-3
- 2. Remove and reinstall door panel. P-2
- 3. Describe the operation of keyless entry/remote-start systems. P-3
- 4. Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation. P-2
- 5. Verify windshield wiper and washer operation; replace wiper blades. P-1

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**H. xEV Systems**

- 1. Locate procedures to safe de-energize/de-stable and energize/enable high-voltage systems. P-3

**EE Tasks - MLR**

P-1	21
P-2	12
P-3	6



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

**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 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.**

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

#### A. General

1. Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Demonstrate knowledge of the steps of an A/C performance test, as recommended by manufacturer. P-2
5. Identify abnormal operating noises in the A/C system. P-3
6. Visually inspect A/C system for signs of leaks. P-1
7. Verify heating and air conditioning concerns. P-1
8. Research the need to place a vehicle in service mode before servicing the HVAC system. P-1

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

#### B. Refrigeration System Components

1. Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners. P-1
2. Inspect for proper A/C condenser airflow. P-2
3. Inspect evaporator housing condensation drain. P-1

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

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

- 1. Inspect engine cooling and heater systems hoses and pipes. P-1

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

**D. Operating Systems and Related Controls**

- 1. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets. P-1
- 2. Identify the source of HVAC system odors. P-2

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

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

- 1. Demonstrate knowledge of the requirement to recover, recycle, and handle refrigerants using proper equipment and procedures. P-1

**HA Tasks - MLR**

P-1	11
P-2	3
P-3	1

## ENGINE PERFORMANCE - MLR

For every task in Engine Performance the following safety requirement must be strictly enforced:

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.

### VIII. ENGINE PERFORMANCE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Demonstrate knowledge of proper engine cooling system operation. P-1
4. Demonstrate knowledge of camshaft timing including engines equipped with variable valve timing (VVT) systems. P-1

### VIII. ENGINE PERFORMANCE

#### B. Computerized Controls

1. Identify computerized control system components and configurations. P-1

### VII. ENGINE PERFORMANCE

#### C. Ignition System

1. Identify ignition system components and configurations. P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-2

### VIII. ENGINE PERFORMANCE

#### D. Fuel, Air Induction, and Exhaust Systems

1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable. P-3
3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

- 4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields. P-1
- 5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields. P-1
- 6. Check and refill diesel exhaust fluid (DEF). P-3

**VIII. ENGINE PERFORMANCE**

**E. Emissions Control Systems**

- 1. Identify emission control system components and configurations. P-1
- 2. Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses. P-2

**EP Tasks - MLR**

P-1	11
P-2	2
P-3	2

# AUTOMOBILE SERVICE TECHNOLOGY (AST) TASK LIST

## ENGINE REPAIR - AST

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

**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.**

### **I. ENGINE REPAIR**

#### **A. General**

1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Verify engine mechanical timing. P-1
7. Inspect, remove, and/or replace engine mounts. P-2
8. Identify service precautions related to service of the internal combustion engine of an xEV. P-1

### **I. ENGINE REPAIR**

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

1. Identify cylinder head and valve train components and configurations. P-1
2. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure. P-1
3. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-2

4. Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action. P-2
5. Adjust valves (mechanical or hydraulic lifters). P-2
6. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing/variable lift components; verify correct camshaft timing. P-1

**I. ENGINE REPAIR**

**C. Engine Block Assembly**

1. Identify engine block assembly components and configurations. P-1
2. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer). P-2

**I. ENGINE REPAIR**

**D. Lubrication and Cooling Systems**

1. Identify lubrication and cooling system components and configurations. P-1
2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1
3. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant reservoir/recovery tank, heater core, and galley plugs; determine needed action. P-1
4. Identify causes of engine overheating. P-1
5. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
6. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1
7. Identify different types of water/coolant pumps (belt driven, chain driven, and electric). P-1
8. Inspect, remove, and replace water/coolant pumps. P-2
9. Remove, inspect, and replace thermostat and gasket/seal. P-1
10. Remove and replace radiator. P-2

- 11. Inspect and test fan(s), fan clutch (electrical and/or mechanical), fan shroud, and air dams/shutters; determine needed action. P-1
- 12. Perform oil pressure tests; determine needed action. P-1
- 13. Inspect auxiliary coolers; determine needed action. P-2
- 14. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

**ER Tasks - AST**

P-1	21
P-2	9
P-3	0

## AUTOMATIC TRANSMISSION AND TRANSAXLE - AST

**For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:**

**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.**

### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify automatic transmission and transaxle components and configurations, including torque converter automatic, dual-clutch automatic (DCT), CVT, and xEV drive. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick. P-1
5. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick. P-1
6. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1
7. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2
8. Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action. P-1
9. Diagnose fluid loss and condition concerns; determine needed action. P-1
10. Perform stall test; determine needed action. P-3
11. Perform lock-up converter system tests; determine needed action. P-3
12. Perform pressure tests on transmissions/transaxles equipped with electronic pressure control; determine needed action. P-2



- 13. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

**II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

**B. In-Vehicle Transmission/Transaxle**

- 1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2
- 2. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1
- 3. Perform relearn procedures. P-2
- 4. Inspect, replace and/or align power train mounts. P-1
- 5. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
- 6. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits. P-1

**II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

**C. Off-Vehicle Transmission and Transaxle**

- 1. Describe the operational characteristics of a continuously variable transmission (CVT). P-2
- 2. Describe the operational characteristics of a hybrid vehicle drive train. P-2
- 3. Describe the operational characteristics of dual-clutch transmission (DCT). P-2
- 4. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-2
- 5. Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings. P-1
- 6. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2

**AT Tasks - AST**

P-1	13
P-2	10
P-3	2

## MANUAL DRIVE TRAIN AND AXLES - AST

**For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:**

**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.**

### III. MANUAL DRIVE TRAIN AND AXLES

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify manual drive train and axles components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Check fluid condition; check for leaks; determine needed action. P-2
5. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification. P-2
6. Diagnose drive train concerns; determine needed action. P-2

### III. MANUAL DRIVE TRAIN AND AXLES

#### B. Clutch

1. Check and adjust clutch primary cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. P-2
2. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action. P-3
3. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action. P-3
4. Inspect clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable). P-2
5. Bleed clutch hydraulic system. P-2

6. Inspect flywheel and ring gear for wear and cracks, and discoloration; determine needed action. P-2
7. Measure flywheel runout and crankshaft end play; determine needed action. P-2
8. Describe the operation and service of a system that uses a dual mass flywheel. P-3

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **C. Transmission/Transaxle**

1. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers. P-2

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joints (Front, Rear, All, Four-wheel Drive)**

1. Inspect and/or remove/replace bearings, hubs, and seals. P-1
2. Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints. P-1
3. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action. P-1
4. Diagnose universal joint noise and vibration concerns; determine needed action. P-1
5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action. P-2

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **E. Differential and Drive Axles**

##### **E.1 Ring and Pinion Gears and Differential Housing Assembly**

1. Inspect differential housing; check for leaks; inspect housing vent. P-1
2. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification. P-1
3. Drain and refill differential housing; using proper fluid type per manufacturer specification. P-1
4. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. P-2
5. Demonstrate knowledge of drive pinion and ring gear service and set up including depth, preload, backlash, and gear tooth contact. P-2

## **E.2 Drive Axles**

1. Inspect and replace drive axle wheel studs. P-2
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine needed action. P-2

## **III. MANUAL DRIVE TRAIN AND AXLES**

### **F. Four-wheel Drive/All-wheel Drive**

1. Identify concerns related to variations in tire circumference and/or final drive ratios. P-2
2. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2
3. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-2
4. Inspect axle locking mechanisms; determine needed action(s). P-3

### **MD Tasks - AST**

P-1	11
P-2	18
P-3	4

## SUSPENSION AND STEERING - AST

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced:**

**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.**

### IV. SUSPENSION AND STEERING

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify suspension and steering system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Disable, enable, and properly handle SRS/airbag system components during vehicle service following manufacturers' procedures. P-1
5. Identify and interpret suspension and steering system concerns; determine needed action. P-1

### IV. SUSPENSION AND STEERING

#### B. Steering Systems

1. Inspect rack and pinion steering gear tie rod ends (sockets), and bellows boots; repair or replace as needed. P-1
2. Inspect power steering fluid level and condition. P-2
3. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification. P-2
4. Inspect for power steering fluid leakage; determine needed action. P-2
5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-2
6. Inspect, remove, and/or replace power steering hoses and fittings. P-2
7. Inspect, remove, and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-3

8. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion). P-3
9. Inspect and test electric power steering system; determine needed action. P-2
10. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
11. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action. P-2
12. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-3
13. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-2
14. Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action. P-2
15. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2
16. Remove and reinstall power steering pump. P-2
17. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2

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

##### **C. Suspension Systems**

1. Inspect, remove, and/or replace upper and/or lower control arms, bushings, and shafts. P-2
2. Inspect and replace rebound/jounce bumpers. P-2
3. Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings. P-2
4. Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators). P-3
5. Inspect, remove, and/or replace suspension system coil springs and spring insulators. P-2
6. Inspect, remove, and/or replace torsion bars and mounts. P-3

7. Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-2
8. Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount. P-2
9. Inspect, remove, and/or replace components of rear suspension systems (Coil, Leaf, and Torsion Beam). P-1
10. Inspect, remove, and/or replace components of electronically controlled suspension systems. P-2
11. Inspect, remove, and/or replace steering knuckle assemblies. P-2
12. Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action. P-1

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

##### **D. Related Suspension and Steering Service**

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1
2. Inspect, service, and/or replace front and rear wheel bearings. P-1
3. Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control). P-2

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

##### **E. Wheel Alignment**

1. Determine the need to recalibrate a vehicle's advanced driver assistance system (ADAS) after repairs or adjustments. P-1
2. Perform pre-alignment inspection, place vehicle in service mode as required; measure vehicle ride height; determine needed action. P-1
3. Describe four-wheel alignment angles (camber, caster, toe, setback, and thrust angle) and effects on vehicle handling\tire wear. P-1
4. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front caster, front and rear camber, and toe as required; center steering wheel. P-1
5. Check toe-out-on-turns (turning radius); determine needed action. P-1
6. Check steering axis inclination (SAI) and included angle; determine needed action. P-1

- 7. Check rear wheel thrust angle; determine needed action. P-1
- 8. Check for front wheel setback; determine needed action. P-1
- 9. Identify front and/or rear cradle (subframe) misalignment; determine needed action. P-1
- 10. Reset steering angle sensor. P-1
- 11. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action. P-1

**IV. SUSPENSION AND STEERING**

**F. Wheels and Tires**

- 1. Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label. P-1
- 2. Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring system (TPMS). P-1
- 3. Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly. P-1
- 4. Inspect tire and wheel assembly for air loss; determine needed action. P-1
- 5. Repair tire following tire manufacturer approved procedure. P-1
- 6. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate/relearn system; verify operation of instrument panel lamps. P-1
- 7. Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a tire pressure monitoring system (TPMS). P-1
- 8. Perform Road Force balance/match mounting. P-2
- 9. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action. P-1
- 10. Measure wheel, tire, axle flange, and hub runout; determine needed action. P-2
- 11. Diagnose tire pull problems; determine needed action. P-1

**SS Tasks - AST**

P-1	31
P-2	23
P-3	5



## BRAKES - AST

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

**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.**

### V. BRAKES

#### A. General

1. Research vehicle service information such as fluid type, system design (hydraulic, electronic, etc.), vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify brake system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Perform calibration/recalibration initialization, or relearn procedure as required. P-1
5. Place a vehicle in service mode as needed before servicing the brake system. P-1
6. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1
7. Install wheel and torque lug nuts/wheel fasteners. P-1
8. Identify and interpret brake system concerns; determine needed action. P-1

### V. BRAKES

#### B. Hydraulic System

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1
2. Measure brake pedal height, travel, and free play (as applicable); determine needed action. P-1
3. Check primary cylinder for internal/external leaks and proper operation; determine needed action. P-1

4. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action. P-1
5. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1
6. Bleed and/or replace fluid in the brake system. P-1
7. Test brake fluid for contamination. P-2
8. Remove, bench bleed, and reinstall primary cylinder. P-1
9. Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. P-2
10. Replace brake lines, hoses, fittings, and supports. P-2
11. Fabricate brake lines using proper material and flaring procedures. P-2
12. Identify, inspect, test, and replace components of brake warning light system. P-2

## **V. BRAKES**

### **C. Drum Brakes**

1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-2
2. Refinish brake drum and measure final drum diameter; compare with specification. P-2
3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-2
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2
5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-2
6. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine needed action. P-2

## **V. BRAKES**

### **D. Disc Brakes**

1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1

2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action P-1
3. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1
4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks. P-1
5. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
6. Remove and reinstall/replace rotor. P-1
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-2
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. P-2
9. Retract and re-adjust caliper piston on an integrated parking brake system. P-1
10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation. P-1
11. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action. P-1

## **V. BRAKES**

### **E. Power-Assist Units**

1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2
2. Identify components of the brake power assist system (vacuum/ hydraulic/electric). P-2
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action. P-2
4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action. P-2

## **V. BRAKES**

**F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)**

- 1. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings. P-3
- 2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. P-2
- 3. Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action. P-2
- 4. Check operation of brake stop light system. P-1
- 5. Inspect and replace wheel studs/fasteners. P-2
- 6. Remove, reinstall, and/or replace sealed wheel bearing assembly. P-1
- 7. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. P-2

**V. BRAKES**

**G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems**

- 1. Identify and inspect electronic brake control system components and describe function (ABS, TCS, ESC); determine needed action. P-1
- 2. Describe the operation of a regenerative braking system. P-2
- 3. Bleed the electronic brake control system hydraulic circuits. P-2

**BR Tasks - AST**

P-1	27
P-2	23
P-3	1

## ELECTRICAL/ELECTRONIC SYSTEMS - AST

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

**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.**

### VI. ELECTRICAL/ELECTRONIC SYSTEMS

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify electrical/electronic system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
5. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1
6. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
7. Describe precautions related to the use of test lights. P-3
8. Use fused jumper wires to check operation of electrical circuits per service information. P-1
9. Use wiring diagrams during the diagnosis of electrical/electronic circuit problems. P-1
10. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action. P-1
11. Inspect and test fusible links, circuit breakers, and fuses; determine needed action P-1
12. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action. P-1

- 13. Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action. P-2
- 14. Perform calibration/recalibration, initialization, or relearn procedures as required. P-1

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**B. Batteries (Low Voltage)**

- 1. Perform battery state-of-charge test; determine needed action. P-1
- 2. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test as recommended by manufacturer; determine needed action. P-1
- 3. Maintain or restore electronic memory functions as recommended by manufacturer. P-2
- 4. Inspect and clean battery; check battery cables, connectors, clamps, and hold-downs. P-1
- 5. Perform battery charging according to manufacturer’s recommendations. P-1
- 6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer’s recommendations. P-1
- 7. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-2

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**C. Starting System (Low Voltage)**

- 1. Perform starter current draw test; determine needed action. P-1
- 2. Perform starter circuit voltage drop tests; determine needed action. P-1
- 3. Inspect and test starter relays and solenoids; determine needed action. P-2
- 4. Remove and install starter in a vehicle. P-2
- 5. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action. P-1
- 6. Demonstrate knowledge of automatic idle-stop/start-stop system that uses a low-voltage starter to restart the engine. P-1
- 7. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2
- 8. Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **D. Charging System (Low Voltage)**

1. Perform charging system output test; determine needed action. P-1
2. Inspect, adjust, and replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment; determine needed action. P-1
3. Remove, inspect, and replace generator (alternator); determine needed action. P-2
4. Perform charging circuit voltage drop tests; determine needed action. P-1
5. Diagnose charging system for causes of undercharge, no-charge, or overcharge conditions; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **E. Lighting Systems**

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); determine needed action. P-1
2. Aim headlights. P-2
3. Diagnose the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

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

1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required. P-1
2. Inspect and test gauges and gauge sensors/sending units for causes of abnormal readings; determine needed action. P-2
3. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **G. Body Electrical Systems**

1. Diagnose vehicle comfort, convenience, access, safety, and related systems operation; determine needed action. P-2
2. Remove and reinstall door panel. P-1

3. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed action. P-2
4. Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation. P-1
5. Verify windshield wiper and washer operation; replace wiper blades. P-1
6. Diagnose operation of entertainment/infotainment systems and related circuits (such as: radio, DVD, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed action. P-2
7. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, and washers; determine needed action. P-2
8. Diagnose body electronic system circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action. P-2
9. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **H. xEV Systems**

1. Locate procedures to safe de-energize/destable and energize/enable high-voltage systems. P-3

#### **EE Tasks - AST**

P-1	31
P-2	17
P-3	2



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

**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 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.**

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

#### A. General

1. Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed P-1
4. Perform A/C system performance test as recommended by manufacturer; interpret results; determine needed action P-1
5. Identify abnormal operating noises in the A/C system; determine needed action. P-2
6. Leak test A/C system; determine needed action. P-1
7. Verify and interpret heating and air conditioning concerns; determine needed action. P-1
8. Place a vehicle in service mode as needed before servicing and diagnosing the HVAC system. P-1
9. Identify refrigerant type; test for sealant/contaminant; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1
10. Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action. P-1
10. Determine recommended oil and oil capacity for system application and component(s) replacement. P-1

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

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

1. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, and tensioners; determine needed action. P-1
2. Inspect for proper A/C condenser airflow; determine needed action. P-1
3. Inspect evaporator housing condensation drain; determine needed action. P-1
4. Inspect, test, and/or service A/C compressor clutch components and/or assembly; determine needed action. P-2
5. Remove, inspect, and reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity. P-2
6. Remove and inspect A/C system hoses, lines, fittings, O-rings, seals, and service valves; determine needed action. P-2
7. Remove, inspect, and replace receiver/drier, accumulator/drier or desiccant; determine recommended oil type and quantity. P-2
8. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-2
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; determine required oil type and quantity. P-2
11. Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity. P-3

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

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

1. Inspect engine cooling and heater systems hoses and pipes; determine needed action. P-1
2. Inspect and test coolant control valve(s); determine needed action. P-2
3. Diagnose temperature control problems in the HVAC system related to the engine cooling system, including electric heating; determine needed action. P-3
4. Determine procedure to remove, inspect, reinstall, and/or replace heater core; properly refill system P-2

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

**D. Operating Systems and Related Controls**

- 1. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1
- 2. Identify the source of HVAC system odors. P-2
- 3. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. P-1
- 4. Diagnose A/C compressor control systems; determine needed action. P-2
- 5. Diagnose malfunctions in the vacuum, mechanical, and/or electrical components and controls of the HVAC system; determine needed action. P-2
- 6. Inspect, test, remove and/or replace HVAC system control panel; determine needed action P-2
- 7. Check operation of automatic HVAC control systems; determine needed action. P-2

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

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

- 1. Demonstrate knowledge of the requirement to recover, recycle, and handle refrigerants using proper equipment and procedures. P-1
- 2. Use and maintain refrigerant handling equipment according to equipment manufacturer's standards. P-1
- 3. Identify A/C system refrigerant; test for sealants/contaminants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1
- 4. Recycle, label, and store refrigerant. P-1

**HA Tasks - AST**

P-1	20
P-2	15
P-3	2

## ENGINE PERFORMANCE - AST

For every task in Engine Performance the following safety requirement must be strictly enforced:

**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.**

### VIII. ENGINE PERFORMANCE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify proper engine cooling system operation; determine needed action. P-1
4. Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems; determine needed action. P-1
5. Verify engine performance concerns; determine needed action. P-1
6. Diagnose abnormal engine noises or vibration concerns; determine needed action. P-3
7. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action. P-2
8. Perform engine manifold pressure tests (vacuum/boost); determine needed action. P-1
9. Perform cylinder power balance test; determine needed action. P-2
10. Perform cylinder cranking and running compression tests; determine needed action. P-1
11. Perform cylinder leakage test; determine needed action. P-1

### VIII. ENGINE PERFORMANCE

#### B. Computerized Controls

1. Identify computerized control system components and configurations. P-1
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1

3. Perform active tests of actuators using a scan tool; determine needed action. P-1
4. Demonstrate knowledge of OBD readiness flags, monitors, and drive cycle for repair verification. P-1
5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action. P-2
6. Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM). P-1

## **VIII. ENGINE PERFORMANCE**

### **C. Ignition System**

1. Identify ignition system components and configurations. P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage; determine needed action. P-1
3. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action. P-2
4. Inspect and test crankshaft and camshaft position sensor(s); determine needed action. P-2
5. Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed. P-2

## **VIII. ENGINE PERFORMANCE**

### **D. Fuel, Air Induction, and Exhaust Systems**

1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable. P-3
3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields for leaks and unmetered air; determine needed action. P-1
5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action. P-1
6. Check and refill diesel exhaust fluid (DEF). P-3

7. Check fuel for quality, composition, and contamination; determine needed action. P-2
8. Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action. P-1
9. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air P-1
10. Inspect, test, and/or replace fuel injectors on low- and high-pressure systems. P-2
11. Verify proper idle speed; determine needed action. P-1
12. Perform exhaust system back-pressure test; determine needed action. P-2
13. Demonstrate knowledge of the operation of turbocharger/supercharger systems. P-2

## **VIII. ENGINE PERFORMANCE**

### **E. Emissions Control Systems**

1. Identify emission control system components and configurations. P-1
2. Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action. P-2
3. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action. P-2
4. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, coolers, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system; determine needed action. P-2
5. Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action. P-3
6. Diagnose emissions and driveability concerns caused by catalytic converter system; determine needed action. P-1
7. Diagnose emissions and driveability concerns caused by the evaporative emissions control (EVAP) system; determine needed action. P-1

#### **EP Tasks - AST**

P-1	25
P-2	13
P-3	4

# MASTER AUTOMOBILE SERVICE TECHNOLOGY (MAST) Task List

## ENGINE REPAIR - MAST

For every task in Engine Repair, the following safety requirement must be strictly enforced:

**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.**

### I. ENGINE REPAIR

#### A. General

1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Verify engine mechanical timing. P-1
7. Inspect, remove, and/or replace engine mounts. P-2
8. Identify service precautions related to service of the internal combustion engine of an xEV. P-1
9. Remove and reinstall engine on a newer vehicle equipped with OBDII; reconnect all attaching components and restore the vehicle to running condition. P-3

### I. ENGINE REPAIR

#### B. Cylinder Head and Valve Train

1. Identify cylinder head and valve train components and configurations. P-1
2. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure. P-1

3. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-2
4. Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action. P-1
5. Adjust valves (mechanical or hydraulic lifters). P-2
6. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing/variable lift components; verify correct camshaft timing. P-1
7. Inspect valve springs for squareness and free height comparison; determine needed action. P-3
8. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action. P-3
9. Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action. P-3
10. Inspect valves and valve seats; determine needed action. P-3
11. Check valve spring assembled height and valve stem height; determine needed action. P-3
12. Inspect valve lifters and hydraulic lash adjusters; determine needed action. P-2
13. Inspect and/or measure camshaft for runout, journal wear and lobe wear. P-3
14. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action. P-3

## **I. ENGINE REPAIR**

### **C. Engine Block Assembly**

1. Identify engine block assembly components and configurations. P-1
2. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer). P-1
3. Disassemble engine block; clean and prepare components for inspection and reassembly. P-2
4. Inspect engine block for visible cracks, passage condition, core and galley plug condition, and surface warpage; determine needed action. P-2



5. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action. P-2
6. Perform deglazing and cleaning of cylinder walls. P-2
7. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action. P-2
8. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action. P-2
9. Inspect main and connecting rod bearings for damage and wear; determine needed action. P-2
10. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action. P-2
11. Inspect and measure piston skirts and ring lands; determine needed action. P-2
12. Determine piston-to-bore clearance. P-2
13. Inspect, measure, and install piston rings. P-2
14. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time. P-2
15. Assemble engine block. P-1

## **I. ENGINE REPAIR**

### **D. Lubrication and Cooling Systems**

1. Identify lubrication and cooling system components and configurations P-1
2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1
3. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant reservoir/recovery tank, heater core, and galley plugs; determine needed action. P-1
4. Identify causes of engine overheating. P-1
5. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

6. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1
7. Identify different types of water/coolant pumps (belt driven, chain driven, and electric). P-1
8. Inspect, remove, and replace water/coolant pumps. P-2
9. Remove, inspect, and replace thermostat and gasket/seal. P-1
10. Remove and replace radiator. P-2
11. Inspect and test fan(s), fan clutch (electrical and/or mechanical), fan shroud, and air dams/shutters; determine needed action. P-1
12. Perform oil pressure tests; determine needed action. P-1
13. Inspect auxiliary coolers; determine needed action. P-2
14. Inspect, test, and replace oil temperature and pressure switches and sensors. P-1
15. Inspect oil pump gears or rotors, housing, pressure relief devices, pressure control devices, and pump drive; determine needed action P-2

**ER Tasks - MAST**

P-1	25
P-2	20
P-3	8

## AUTOMATIC TRANSMISSION AND TRANSAXLE - MAST

**For every task in Automatic Transmission and Transaxle, the following safety requirement must be strictly enforced:**

**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.**

### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify automatic transmission and transaxle components and configurations, including torque converter automatic, dual-clutch automatic (DCT), CVT, and xEV drive. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick. P-1
5. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick. P-1
6. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1
7. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-1
8. Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action. P-1
9. Diagnose fluid loss and condition concerns; determine needed action. P-1
10. Perform stall test; determine needed action. P-3
11. Perform lock-up converter system tests; determine needed action. P-2
12. Perform pressure tests on transmissions/transaxles equipped with electronic pressure control; determine needed action. P-1

13. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

14. Diagnose noise and vibration concerns; determine needed action. P-2

## **II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

### **B. In-Vehicle Transmission/Transaxle**

1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-1

2. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1

3. Perform relearn procedures. P-2

4. Inspect, replace/or and align powertrain mounts. P-1

5. Inspect for leakage; replace external seals, gaskets, and bushings. P-2

6. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits. P-1

## **II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

### **C. Off-Vehicle Transmission and Transaxle**

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-2

2. Describe the operational characteristics of a hybrid vehicle drive train. P-2

3. Describe the operational characteristics of dual-clutch transmission (DCT). P-2

4. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-2

5. Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings. P-1

6. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2

7. Disassemble, clean, and inspect transmission/transaxle. P-2

8. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets). P-2

9. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action. P-2
10. Assemble transmission/transaxle. P-2
11. Inspect, measure, and reseal oil pump assembly and components. P-2
12. Measure transmission/transaxle end play and/or preload; determine needed action. P-2
13. Inspect, measure, and/or replace thrust washers and bearings. P-2
14. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls. P-2
15. Inspect bushings; determine needed action. P-2
16. Inspect and measure planetary gear assembly components; determine needed action. P-2
17. Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action. P-2
18. Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; determine needed action. P-2
19. Inspect measure, repair, adjust or replace transaxle final drive components. P-2
20. Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action. P-2
21. Measure clutch pack clearance; determine needed action. P-2
22. Air test operation of clutch and servo assemblies. P-2
23. Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action. P-2

**AT Tasks - MAST**

P-1	16
P-2	26
P-3	1

## MANUAL DRIVE TRAIN AND AXLES - MAST

**For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:**

**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.**

### III. MANUAL DRIVE TRAIN AND AXLES

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify manual drive train and axles components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Check fluid condition; check for leaks; determine needed action. P-2
5. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification. P-2
6. Diagnose drive train concerns; determine needed action. P-1

### III. MANUAL DRIVE TRAIN AND AXLES

#### B. Clutch

1. Check and adjust clutch primary cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. P-2
2. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action. P-3
3. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action. P-3
4. Inspect clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable). P-2
5. Bleed clutch hydraulic system. P-2

6. Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action. P-2
7. Measure flywheel runout and crankshaft end play; determine needed action. P-2
8. Describe the operation and service of a system that uses a dual mass flywheel. P-3

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **C. Transmission/Transaxle**

1. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers. P-2
2. Diagnose noise concerns through the application of transmission/transaxle powerflow principles; determine needed action. P-2
3. Diagnose hard shifting and jumping out of gear concerns; determine needed action. P-2
4. Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action. P-2
5. Disassemble, inspect clean, and reassemble internal transmission/transaxle components. P-3

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel Drive)**

1. Inspect and/or remove/replace bearings, hubs, and seals. P-1
2. Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints. P-1
3. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action. P-1
4. Diagnose universal joint noise and vibration concerns; determine needed action. P-1
5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action. P-2

### **III. MANUAL DRIVE TRAIN AND AXLES**

#### **E. Differential and Drive Axles**

##### **E.1 Ring and Pinion Gears and Differential Case Assembly**

1. Inspect differential housing; check for leaks; inspect housing vent. P-1

2. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification. P-1
3. Drain and refill differential housing; use proper fluid type per manufacturer specification. P-1
4. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. P-2
5. Inspect ring gear and measure runout; determine needed action. P-2
6. Diagnose noise and vibration concerns; determine needed action. P-2
7. Remove, inspect, reinstall or replace drive pinion and ring gear, spacers, sleeves, and bearings. P-2
8. Measure and adjust drive pinion depth. P-2
9. Measure and adjust drive pinion bearing preload. P-2
10. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types). P-2
11. Check ring and pinion tooth contact patterns; determine needed action. P-2
12. Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. P-2
13. Reassemble and reinstall differential case assembly; measure runout; determine needed action. P-2

## **E.2 Drive Axles**

1. Inspect and replace drive axle wheel studs. P-2
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine needed action. P-2
5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action. P-2



### **E.3 Limited Slip Differential**

1. Diagnose noise, slippage, and chatter concerns including electronically controlled systems; determine needed action. P-3
2. Measure rotating torque; determine needed action. P-3

## **III. MANUAL DRIVE TRAIN AND AXLES**

### **F. Four-wheel Drive/All-wheel Drive**

1. Identify concerns related to variations in tire circumference and/or final drive ratios. P-1
2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-2
3. Inspect axle locking mechanisms; determine needed action(s). P-3
4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2
5. Diagnose noise, vibration, and unusual steering concerns; determine needed action. P-2
6. Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems. P-2
7. Disassemble, service, and reassemble transfer case and components. P-3

#### **MD Tasks - MAST**

P-1	12
P-2	31
P-3	8

## SUSPENSION AND STEERING - MAST

**For every task in Suspension and Steering, the following safety requirement must be strictly enforced:**

**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.**

### IV. SUSPENSION AND STEERING

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify suspension and steering system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Disable, enable, and properly handle SRS/airbag system components during vehicle service following manufacturers' procedures. P-1
5. Identify and interpret suspension and steering system concerns; determine needed action. P-1

### IV. SUSPENSION AND STEERING

#### B. Steering Systems

1. Inspect rack and pinion steering gear, tie rod ends (sockets) and bellows boots; repair or replace as needed. P-1
2. Inspect power steering fluid level and condition. P-2
3. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification. P-2
4. Inspect for power steering fluid leakage; determine needed action. P-2
5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-2
6. Inspect, remove, and/or replace power steering hoses and fittings. P-2
7. Inspect, remove, and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-3

8. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps (non-rack and pinion). P-3
9. Inspect and test electric power steering system; determine needed action. P-1
10. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
11. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action. P-2
12. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-3
13. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-1
14. Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action. P-2
15. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2
16. Remove and reinstall power steering pump. P-2
17. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2
18. Test power steering system pressure; determine needed action. P-3

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

##### **C. Suspension Systems**

1. Inspect, remove, and/or replace upper and/or lower control arms, bushings, and shafts. P-2
2. Inspect and replace rebound/jounce bumpers. P-2
3. Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings. P-2
4. Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators). P-2
5. Inspect, remove, and/or replace suspension system coil springs and spring insulators. P-2
6. Inspect, remove, and/or replace torsion bars and mounts P-3

7. Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-2
8. Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount. P-2
9. Inspect, remove, and/or replace components of rear suspension systems (Coil, Leaf, and Torsion Beam). P-1
10. Inspect, remove, and/or replace components of electronically controlled suspension systems. P-1
11. Inspect, remove, and/or replace steering knuckle assemblies. P-2
12. Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action P-1

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

##### **D. Related Suspension and Steering Service**

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings P-1
2. Inspect, service, and/or replace front and rear wheel bearings. P-1
3. Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control). P-2

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

##### **E. Wheel Alignment**

1. Determine the need to recalibrate a vehicle's advanced driver assistance system (ADAS) after repairs or adjustments. P-1
2. Perform pre-alignment inspection, place vehicle in service mode as required; measure vehicle ride height; determine needed action. P-1
3. Describe four-wheel alignment angles (camber, caster, toe, setback, and thrust angle) and effects on vehicle handling\tire wear. P-1
4. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front caster, front and rear camber, and toe as required; center steering wheel. P-1
5. Check toe-out-on-turns (turning radius); determine needed action. P-1
6. Check steering axis inclination (SAI) and included angle; determine needed action. P-1

- 7. Check rear wheel thrust angle; determine needed action. P-1
- 8. Check for front wheel setback; determine needed action. P-1
- 9. Identify front and/or rear cradle (subframe) misalignment; determine needed action. P-1
- 10. Reset steering angle sensor. P-1
- 11. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action. P-1

**IV. SUSPENSION AND STEERING**

**F. Wheels and Tires**

- 1. Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label. P-1
- 2. Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS) P-1
- 3. Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly. P-1
- 4. Inspect tire and wheel assembly for air loss; determine needed action. P-1
- 5. Repair tire following tire manufacturer approved procedure. P-1
- 6. Identify indirect and direct tire pressure monitoring system (TPMS); calibrate/relearn system; verify operation of instrument panel lamps. P-1
- 7. Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a tire pressure monitoring system (TPMS). P-1
- 8. Perform Road Force balance/match mounting. P-1
- 9. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action. P-1
- 10. Measure wheel, tire, axle flange, and hub runout; determine needed action. P-2
- 11. Diagnose tire pull problems; determine needed action. P-1

**SS Tasks - MAST**

P-1	35
P-2	20
P-3	5

## BRAKES - MAST

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

**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.**

### V. BRAKES

#### A. General

1. Research vehicle service information such as fluid type, system design (hydraulic, electronic, etc.), vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify brake system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Perform calibration/recalibration, initialization, or relearn procedure as required. P-1
5. Place vehicle in service mode as needed before servicing the brake system. P-1
6. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1
7. Install wheel and torque lug nuts/wheel fasteners. P-1
8. Identify and interpret brake system concerns; determine needed action. P-1

### V. BRAKES

#### B. Hydraulic System

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1
2. Measure brake pedal height, travel, and free play (as applicable); determine needed action. P-1
3. Check primary cylinder for internal/external leaks and proper operation; determine needed action. P-1

4. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action. P-1
5. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1
6. Bleed and/or replace fluid in the brake system. P-1
7. Test brake fluid for contamination. P-2
8. Identify, inspect, test, and replace components of brake warning light system. P-2
9. Remove, bench bleed, and reinstall primary cylinder. P-1
10. Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. P-1
11. Replace brake lines, hoses, fittings, and supports. P-2
12. Fabricate brake lines using proper material and flaring procedures. P-2

## **V. BRAKES**

### **C. Drum Brakes**

1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-2
2. Refinish brake drum and measure final drum diameter; compare with specification. P-2
3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-2
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2
5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-2
6. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine needed action. P-2

## **V. BRAKES**

### **D. Disc Brakes**

1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1

2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action P-1
3. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1
4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks. P-1
5. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
6. Remove and reinstall/replace rotor. P-1
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-1
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. P-2
9. Retract and re-adjust caliper piston on an integrated parking brake system. P-1
10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation. P-1
11. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action. P-1

## V. BRAKES

### E. Power-Assist Units

1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2
2. Identify components of the brake power assist system (vacuum/ hydraulic/electric). P-2
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action. P-2
4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action. P-2
5. Inspect electric power booster unit; determine needed action. P-3

## V. BRAKES



## **F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)**

1. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings. P-3
2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. P-2
3. Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action. P-2
4. Check operation of brake stop light system. P-1
5. Inspect and replace wheel studs/fasteners. P-2
6. Remove, reinstall, and/or replace sealed wheel bearing assembly. P-1
7. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. P-1

## **V. BRAKES**

### **G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems**

1. Identify and inspect electronic brake control system components and describe function (ABS, TCS, ESC); determine needed action. P-1
2. Describe the operation of a regenerative braking system. P-2
3. Bleed the electronic brake control system hydraulic circuits. P-1
4. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action. P-2
5. Diagnose electronic brake control system electronic control(s) and components using recommended test equipment; determine needed action. P-2
6. Depressurize high-pressure components of an electronic brake control system. P-2
7. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). P-2
8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-2

## BR Tasks - MAST

P-1	31
P-2	24
P-3	2

## ELECTRICAL/ELECTRONIC SYSTEMS - MAST

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

**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.**

### VI. ELECTRICAL/ELECTRONIC SYSTEMS

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify electrical/electronic system components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Perform calibration/recalibration, initialization, or relearn procedure as required. P-1
5. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
6. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1
7. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
8. Describe precautions related to the use of test lights. P-3
9. Use fused jumper wires to check operation of electrical circuits per service information. P-1
10. Use wiring diagrams during the diagnosis of electrical/electronic circuit problems. P-1

11. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action. P-1
12. Inspect and test fusible links, circuit breakers, and fuses; determine needed action. P-1
13. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action. P-1
14. Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **B. Batteries (Low Voltage)**

1. Perform battery state-of-charge test; determine needed action. P-1
2. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test as recommended by manufacturer; determine needed action. P-1
3. Maintain or restore electronic memory functions as recommended by manufacturer. P-2
4. Inspect and clean battery; check battery cables, connectors, clamps, and hold-downs. P-1
5. Perform battery charging according to manufacturer's recommendations. P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer's recommendations. P-1
7. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **C. Starting System (Low Voltage)**

1. Perform starter current draw test; determine needed action. P-1
2. Perform starter circuit voltage drop tests; determine needed action. P-1
3. Inspect and test starter relays and solenoids; determine needed action. P-2
4. Remove and install starter in a vehicle. P-1
5. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action. P-1

6. Demonstrate knowledge of an automatic idle-stop/start-stop system that uses a low-voltage starter to restart the engine. P-1
7. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-1
8. Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **D. Charging System (Low Voltage)**

1. Perform charging system output test; determine needed action. P-1
2. Inspect, adjust, and replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment; determine needed action. P-1
3. Remove, inspect, and replace generator (alternator); determine needed action. P-1
4. Perform charging circuit voltage drop tests; determine needed action. P-1
5. Diagnose charging system for causes of undercharge, no-charge, or overcharge conditions; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **E. Lighting Systems**

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); determine needed action. P-1
2. Aim headlights. P-2
3. Diagnose the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

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

1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required. P-1
2. Inspect and test gauges and gauge sensors/sending units for causes of abnormal readings; determine needed action. P-1
3. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **G. Body Electrical Systems**

1. Diagnose vehicle comfort, convenience, access, safety, and related systems operation; determine needed action P-2
2. Remove and reinstall door panel. P-1
3. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed action. P-1
4. Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation. P-1
5. Verify windshield wiper and washer operation; replace wiper blades. P-1
6. Diagnose operation of entertainment/infotainment systems and related circuits (such as: radio, DVD, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed action. P-2
7. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers) determine needed action. P-1
8. Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action. P-1
9. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-1
10. Demonstrate knowledge of advanced driver assistance systems (ADAS) and related circuits (such as: adaptive cruise control, lane keeping, collision avoidance, parking assist, and back-up camera). P-2
11. Recalibrate a vehicle's advanced driver assistance system (ADAS). P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **H. xEV Systems**

1. Locate procedures to safely de-energize/disable and energize/enable high-voltage systems. P-3
2. Identify potential safety and material handling concerns associated with high-voltage battery/energy storage systems. P-3

3. Demonstrate knowledge of special multimeters, insulated tools, and other test equipment required for use in high-voltage circuits. P-3
4. Demonstrate knowledge of personal protective equipment (PPE) required for use while servicing high-voltage circuits. P-3
5. Demonstrate knowledge of the use of a live-dead-live/zero potential test to verify isolation of the high-voltage battery/energy storage system. P-3
6. Demonstrate knowledge of the testing and verification of ground circuit isolation between vehicle chassis ground and the high-voltage circuits and components. P-3
7. Demonstrate knowledge of safe handling procedures associated with high-voltage A/C/ compressors and wiring. P-3
8. Demonstrate knowledge of high-voltage thermal management systems. P-3
9. Demonstrate knowledge of safe handling procedures associated with high-voltage powertrain components, such as electric motors. P-3

**EE Tasks - MAST**

P-1	42
P-2	8
P-3	10

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

**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 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.**

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

#### A. General

1. Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configurations. P-1
3. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Perform A/C system performance test as recommended by manufacturer; interpret results; determine needed action. P-1
5. Identify abnormal operating noises in the A/C system; determine needed action. P-2
6. Leak test A/C system; determine needed action. P-1
7. Verify and interpret heating and air conditioning concerns; determine needed action. P-1
8. Place a vehicle in service mode as needed before servicing and diagnosing the HVAC system. P-1
9. Identify refrigerant type; test for sealant/contaminant; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1
10. Inspect condition/quantity of refrigerant oil removed from A/C system; determine needed action. P-1
11. Determine recommended oil and oil capacity for system application and component(s) replacement. P-1

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

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

1. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners; determine needed action. P-1
2. Inspect for proper A/C condenser airflow; determine needed action. P-1
3. Inspect evaporator housing condensation drain; determine needed action. P-1
4. Inspect, test, and/or service A/C compressor clutch components and/or assembly; determine needed action. P-2
5. Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity. P-1
6. Remove and inspect A/C system hoses, lines, fittings, O-rings, seals, and service valves; determine needed action. P-2
7. Remove, inspect, and replace receiver/drier, accumulator/drier, or desiccant; determine recommended oil type and quantity. P-2
8. Remove, inspect, and install expansion valve or orifice (expansion) tube. 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-1
10. Determine procedure to remove and reinstall evaporator; determine required oil type and quantity. P-2
11. Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity. P-2

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

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

1. Inspect engine cooling and heater systems hoses and pipes; determine needed action. P-1
2. Inspect and test heater control valve(s); determine needed action. P-2
3. Diagnose temperature control problems in the HVAC system related to the engine cooling system, including electric heating; determine needed action. P-2
4. Determine procedure to remove, inspect, reinstall, and/or replace heater core; properly refill system. P-2



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

**D. Operating Systems and Related Controls**

- 1. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; determine needed action. P-1
- 2. Identify the source of HVAC system odors. P-2
- 3. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. P-1
- 4. Diagnose A/C compressor control systems; determine needed action. P-1
- 5. Diagnose malfunctions in the vacuum, mechanical, and/or electrical components and controls of the HVAC system; determine needed action. P-2
- 6. Inspect, test, remove and/or replace HVAC system control panel; determine needed action. P-2
- 7. Check operation of automatic HVAC control systems; determine needed action. P-2

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

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

- 1. Demonstrate knowledge of the requirement to recover, recycle, and handle refrigerants using proper equipment and procedures P-1
- 2. Use and maintain refrigerant handling equipment according to equipment manufacturer's standards. P-1
- 3. Identify A/C system refrigerant; test for sealants/contaminants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1
- 4. Recycle, label, and store refrigerant. P-1

**HA Tasks - MAST**

P-1	24
P-2	13
P-3	0

## ENGINE PERFORMANCE - MAST

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

**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.**

### VIII. ENGINE PERFORMANCE

#### A. General

1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record on-board diagnostic DTCs, monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify proper engine cooling system operation; determine needed action. P-1
4. Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems; determine needed action. P-1
5. Verify engine performance concerns; determine needed action. P-1
6. Diagnose abnormal engine noises or vibration concerns; determine needed action. P-2
7. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action. P-2
8. Perform engine manifold pressure tests (vacuum/boost); determine needed action. P-1
9. Perform cylinder power balance test; determine needed action. P-1
10. Perform cylinder cranking and running compression tests; determine needed action. P-1
11. Perform cylinder leakage test; determine needed action. P-1

### VIII. ENGINE PERFORMANCE

#### B. Computerized Controls

1. Identify computerized control system components and configurations. P-1
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1

3. Perform active tests of actuators using a scan tool; determine needed action. P-1
4. Demonstrate knowledge of OBD readiness flags, monitors, and drive cycle for repair verification. P-1
5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action. P-1
6. Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM). P-1
7. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data. P-1
8. Diagnose emissions or driveability concerns without stored or active diagnostic trouble codes; determine needed action. P-1
9. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action. P-2

## **VIII. ENGINE PERFORMANCE**

### **C. Ignition System**

1. Identify ignition system components and configurations. P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage; determine needed action. P-1
3. Diagnose no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns related to ignition system problems; determine needed action. P-1
4. Inspect and test crankshaft and camshaft position sensor(s); determine needed action. P-1
5. Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed. P-2

## **VIII. ENGINE PERFORMANCE**

### **D. Fuel, Air Induction, and Exhaust Systems**

1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable. P-3

3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields for leaks and unmetered air; determine needed action. P-1
5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action. P-1
6. Check and refill diesel exhaust fluid (DEF). P-3
7. Check fuel for quality, composition, and contamination; determine needed action. P-1
8. Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action. P-1
9. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-1
10. Inspect, test, and/or replace fuel injectors on low- and high-pressure systems. P-1
11. Verify proper idle speed; determine needed action. P-1
12. Perform exhaust system back-pressure test; determine needed action. P-2
13. Demonstrate knowledge of the operation of turbocharger/supercharger systems. P-2
14. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, and engine run-on, and emissions problems related to fuel air induction, ; determine needed action. P-2
14. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, engine run-on, and emissions problems related to fuel, air induction, and exhaust system problems; determine needed action. P-2

## **VIII. ENGINE PERFORMANCE**

### **E. Emissions Control Systems**

1. Identify emission control system components and configurations. P-1
2. Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action. P-2

3. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action. P-2
4. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, coolers, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action. P-1
5. Inspect and test electrical/electronically operated components and circuits of secondary air injection systems; determine needed action. P-3
6. Diagnose emission and driveability concerns caused by catalytic converter system; determine needed action. P-1
7. Diagnose emissions and driveability concerns caused by the evaporative emissions control (EVAP) system; determine needed action. P-1

**EP Tasks - MAST**

P-1	34
P-2	9
P-3	3

## TASK LIST PRIORITY ITEM TOTALS

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 (or more) in each priority numbered category (P-1, P-2, and P-3) to be accredited.** For MLR, AST, and MAST Automobile programs, the following minimum percentages are required:

**At least 90% of all Priority 1 (P-1) tasks must be taught**

**At least 75% of all Priority 2 (P-2) tasks must be taught**

**At least 50% of all Priority 3 (P-3) tasks must be taught**

**Note that all Foundational Tasks and Workplace Skills are also required to be included at all levels of accreditation.**

### Maintenance & Light Repair

P-1 = 104    90% =    94 tasks

P-2 = 55     75% =    41 tasks

P-3 = 31     50% =    16 tasks

Foundational Tasks & Workplace Skills = 55

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### Automobile Service Technology

P-1 = 179    90% =    161 tasks

P-2 = 128    75% =    96 tasks

P-3 = 20     50% =    10 tasks

Foundational Tasks & Workplace Skills = 55

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### Master Automobile Service Technology

P-1 = 219    90% =    197 tasks

P-2 = 151    75% =    113 tasks

P-3 = 37     50% =    19 tasks

Foundational Tasks & Workplace Skills = 55

## 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. CHARGE – To bring to a specified state, e.g., battery or air conditioning system.
8. CHECK – To verify condition by performing an operational or comparative examination.
9. CLEAN – To rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.
10. DEGLAZE – To remove a smooth glossy surface.
11. DEMONSTRATE – Give a practical exhibition and explanation. For example: how a system or component works, or how a procedure is performed.
12. DESCRIBE – To represent or give an account of the component or system.
13. DETERMINE – To establish the procedure to be used to perform the necessary repair.
14. 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.
15. DIAGNOSE – To identify the cause of a problem.
16. DISASSEMBLE – To separate a component's parts as a preparation for cleaning, inspection, or service.
17. DISCHARGE – To empty a storage device or system.

18. EVACUATE – To remove air, fluid or vapor from a closed system by use of a vacuum pump.
19. FLUSH – To internally clean a component or system.
20. HIGH VOLTAGE – Automotive system voltages greater than 30 VAC or 60 VDC.
21. HONE – To restore cylinder wall finish by creating fine crosshatch imperfections on the surface of the cylinder's bore.
22. IDENTIFY – To describe the component or system.
23. INSPECT – To verify condition of component or system via visual examination.
24. INTERPRET – To explain the operation/condition of component or system.
25. JUMP START – To use an auxiliary power supply to assist a battery to crank an engine.
26. LOCATE – Determine or establish a specific spot or area.
27. MEASURE – To determine existing dimensions/values for comparison to specifications.
28. NETWORK – A system of interconnected electrical modules or devices.
29. ON-BOARD DIAGNOSTICS (OBD) – Diagnostic protocol which monitors computer inputs and outputs for failures.
30. PARASITIC DRAW – Electrical loads which are still present when the ignition is OFF.
31. PERFORM – To accomplish a procedure in accordance with established methods and standards.
32. 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.
33. PRIMARY CYLINDER – Control device that converts mechanical force into hydraulic pressure, typically used in automotive brake and clutch systems. This device controls the secondary cylinder(s) located on the other end of the hydraulic system.
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. SECONDARY CYLINDER – Actuator that converts hydraulic pressure into mechanical force, typically used in automotive brake and clutch systems.
40. SERVICE – To perform a procedure as specified in the owner's or service manual.
41. TEST – To verify condition through the use of meters, gauges or instruments.
42. 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).
43. VERIFY – To confirm that a problem exists after hearing the customer's concern; or to confirm the effectiveness of a repair.
44. VOLTAGE DROP – A reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.
45. xEV – Any electrified propulsion vehicle with a high-voltage system, including, but not limited to, HEV, PHEV, PEV, BEV, FCEV, and EV (SAE J715-1 SEP (2022)).

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## TOOLS AND EQUIPMENT

Local employer needs and the availability of funds are key factors for determining each program's structure and operation. The ASE Education Foundation Program Standards recognize that not all programs have the same needs, nor do all programs teach 100 % of the automobile 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.

The tool lists are organized into three basic categories: *Hand Tools, General Lab/Shop Equipment,* and *Specialty Tools and Equipment.* The Specialty Tools and Equipment section is further separated into the three Automobile Accreditation levels. 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 level of accreditation being sought. In addition, if a program does not teach a particular task, tools associated with that task are not required.
- 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 students to begin to build their own tool sets, this is not a requirement. However, many employers require an entry-level automobile technician to provide his/her own basic hand tool set.

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

Air Nozzle (meeting OSHA requirements)		Hammers:	
Allen (Wrench or Socket) Set - Standard (.050"-3/8")		16 oz. Ball Peen	
Allen (Wrench or Socket) Set - Metric (2mm - 8mm, 10mm, 12mm)		Brass	
Battery Post Cleaner		Dead Blow Plastic Mallet	
Battery Terminal Pliers		Plastic Tip	
Battery Terminal Puller		Rubber Mallet	
Chisels:		Inspection Mirror	
Cape 5/16"		Magnetic Pickup Tool	
Cold 3/8", 3/4"		Pliers:	
Chisel Holder		Combination 6"	
Claw Type Pickup Tool		Hose Clamp	
Combination Wrenches:		Locking Jaw	
Standard (1/4" – 1 1/4") (optional)		Needle Nose 6"	
Metric (7mm - 24mm)		Side Cutting	
Crowfoot Wrench Set - Metric		Slip Joint	
Crowfoot Wrench Set – Standard (optional)		Pry Bars:	
Ear Protection		Rolling Head	
Feeler Gauge (Blade Type):		Straight	
.002" - .040"		Punches:	
.006mm - .070mm		Center	
Files:		Brass Drift	
Coarse 6" and 12"		Pin 1/8", 3/16", 1/4", 5/16 "	
Fine 6" and 12"		Taper 3/8", 1/2", 5/8"	
Half Round 12"		Safety Glasses (meeting OSHA requirements)	
Round 6" and 12"		Scraper:	
Flare Nut (tubing) Wrenches:		Plastic	
3/8" - 3/4"		Gasket 1"	
10mm - 17mm		Screwdriver - Blade Type:	
Flashlight		Stubby	
Fuse Puller/Remover		6", 9", 12"	
Fused Jumper Wire Set (with various adapters)		Offset	
Hack Saw			

(list continued on next page)

Screwdriver - Phillips:		Socket Set - 1/2" Drive:	
Stubby #1, #2		7/16" - 1 1/8" Standard Depth (optional)	
6" #1, #2		7/16" - 1 1/8" Deep (optional)	
12" #3		10mm - 24mm Standard Depth	
Offset #2		10mm - 24mm Deep	
Screwdriver - Impact Driver Set		3", 6", 12" Extensions	
Socket Set - 1/4" Drive:		Flex Handle (Breaker Bar)	
1/4" - 1/2" Standard Depth (optional)		Ratchet	
1/4" - 1/2" Deep (optional)		Spark Plug Feeler Gauge (Gap Tool)	
6mm - 12mm Standard Depth		Tape Measure – Standard and Metric	
6mm - 12mm Deep		Tire Pressure Gauge	
2", 4" Extensions		Tire Tread Depth Gauge	
Ratchet		Torque Wrench:	
Socket Set - 3/8" Drive:		3/8" Drive (10 - 250 lb. in.)	
5/16" - 3/4" Standard Depth (6 point) (optional)		3/8" Drive (5 - 75 lb. ft.)	
3/8" - 3/4" Deep (6 point) (optional)		1/2" Drive (50 - 250 lb. ft.)	
10mm - 19mm Standard Depth (6 point)		Torx® Plus Set External and Internal (optional)	
10mm - 19mm Deep (6 point)		Torx® Set	
3", 5", 10" Extensions		T-8 to T-55	
Flexhead Ratchet		Torx® External Set	
Ratchet		E-4 to E-18	
Spark Plug Sockets 5/8", 13/16", 9/16"		Wire Brush	
Spark Plug Sockets 14mm			
Speed Handle			
Universal Joint			
Flexible Socket Set 10mm - 19mm			

## 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 these general tools and equipment readily available and in sufficient quantity to provide quality instruction.

		Engine Coolant Recovery Equipment or Recycler or Coolant Disposal Contract Service (in accordance with state and local requirements)	
Air or Electric Chisel Set (various bits)			
Air Compressor and Hoses		Engine Coolant Vacuum Refill Tool (optional)	
Air Pressure Regulator		Engine Hoist/Crane	
Air or Electric Ratchet (1/4" and 3/8" drive)		Extension Cords	
Automotive Stethoscope (electronic recommended)		Face Shields	
Axle Stands (Jack Stands)(2 Ton minimum)		Fender Covers	
Axle Support Stands (Screw Jacks)		Floor Jack (2 Ton minimum)	
Bearing Packer (hand operated)		Handheld Vacuum Pump	
Belt Tension/Wear Gauge		Hood Prop	
Bench or Pedestal Grinder (including guards)		Hydraulic Press with adapters	
Calipers – 0-6", 0-125mm		Impact Socket Sets – 3/8" Drive (Standard - optional)	
Comprehensive Puller Set		Impact Socket Sets – 3/8 Drive (8mm-19mm)	
Coolant/Combustion Gas Detector (recommended)		Impact Sockets – 1/2" Drive (7/16" - 1 1/8") (optional)	
Coolant Tester – refractometer type		Impact Sockets – 1/2" Drive (12mm – 24mm)	
Cooling System Pressure Tester and Adapters		Impact Sockets – 1/2" Drive Deep (30 mm, 32 mm, 36mm)	
Creeper		Impact Wrench – 1/2" Drive	
Cylinder Leakage Tester		Impact Wrench – 3/8" Drive	
Dial Indicator with Flex Arm and Clamp Base		Induction Heater, MAP-gas, or Oxy-Acetylene Torch Set (in accordance with state and local requirements)	
Digital Multimeter (DMM) with various lead sets (enough to meet instruction goals)		Jumper Cables	
Drain Pans		Low Voltage Battery Charger (to meet current industry standard)	
Drill - 3/8" variable speed, reversible		Low Voltage Battery/Starter/Charging System Tester (to meet current industry standard)	
Drill - 1/2" variable speed, reversible		Micrometer (Depth) 0-6", 0-125mm	
Drill Bit Set (Twist)		Micrometers - (Outside Type) 0-1", 1-2", 2-3", 3-4", 4-5"	
Electric Hot Air Tool		Oil Can - Pump Type	

Oil Filter Wrench and Sockets	
Parts Cleaning Tank and Gloves (in accordance with state and local requirements, aqueous based recommended)	
Scan Tool OBDII w/CAN capability or Personal Computer (PC) with equivalent interface (appropriate capability to support tasks taught)	
Screw Extractor Set	
Seat Covers	
Serpentine Belt Tensioner Tools	
Shop/Work Lights (Non-incandescent)	
Snap Ring Pliers Set - external	
Snap Ring Pliers Set - internal	
Soldering Tool	
Spark Plug Boot Puller	
Tap and Die Set – Standard (optional)	
Tap and Die Set – Metric	
Temperature Sensing Device	
Thread Repair Insert Kit	
Thread Repair (Thread Chaser) Set	
Tire Inflator Chuck	
Tube Quick Disconnect Tool Set	
Tubing Bender	
Tubing Cutter/Flaring Set (Double-lap and ISO)	
Ultraviolet Leak Detection Kit	
Used Oil Receptacle with extension neck and funnel	
Valve Core Removing Tool	
Vehicle Lift (ALI® certified for new purchases)	
Waste Fluid Storage Container(s) and Disposal Method (in accordance with state and local requirements)	
Wheel Chocks	
Workbenches with vises	

## SPECIALTY TOOLS AND EQUIPMENT

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 or to the program. No specific type or brand names are identified because they will vary in each local situation. A check mark indicates that tool is appropriate for performing tasks at that accreditation level.

*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, tools associated with that task are not required.*

<b>ENGINE REPAIR</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Antifreeze/Coolant Tester - Refractometer	✓	✓	✓	
Ball (Small Hole) Gauges			✓	
Cam Bearing Driver Set			✓	
Camshaft Holding Tool			✓	
Cylinder Deglazer			✓	
Dial Bore Indicator			✓	
Engine Stands and/or Cylinder Head Stands		✓	✓	
Inside Micrometer Set – 0-6”, 0-125mm			✓	
Oil Pressure Gauge		✓	✓	
Portable Crane - 1/2 Ton			✓	
Precision Straight Edge	✓	✓	✓	
Ring Compressor			✓	
Ring Expander			✓	
Ring Groove Cleaner			✓	
Telescopic Gauge Set			✓	
Torque Angle Gauge	✓	✓	✓	
V-Blocks			✓	
Valve Spring Compressor			✓	
Valve Spring Tester			✓	

<b>AUTOMATIC TRANSMISSION/TRANSAXLE</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Differential Set-up Tools			✓	
Hydraulic Pressure Gauge Set		✓	✓	
Transmission Jack(s)		✓	✓	
Transmission/Transaxle Flushing Equipment		✓	✓	
Transmission/Transaxle Removal and Installation Equipment		✓	✓	
Transmission/Transaxle Holding Fixtures		✓	✓	
Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)		✓	✓	



<b>MANUAL DRIVE TRAIN AND AXLES</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Axle Nut Socket Set (or equivalent)	✓	✓	✓	
Clutch Alignment Set		✓	✓	
Clutch Pilot Bearing/Bushing Puller/Installer		✓	✓	
Constant Velocity Joint (CV) Boot Clamp Pliers or Crimping Ring		✓	✓	
Engine Support Fixture		✓	✓	
Rotating Torque Wrench		✓	✓	
Special Tools for Transmissions, Transaxles, Transfer Cases, and Differentials (appropriate for units being taught)			✓	
Universal Joint Tools	✓	✓	✓	
Wheel Stud Installation Tools	✓	✓	✓	

<b>SUSPENSION &amp; STEERING</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Ball Joint Press and other Special Tools		✓	✓	
Brake Pedal Depressor	✓	✓	✓	
Bushing Driver Set		✓	✓	
Coil Spring Compressor Tool		✓	✓	
Chassis Ear or equivalent listening device		✓	✓	
Frame Angle Gauge or Portable Digital Protractor	✓	✓	✓	
Hand Grease Gun	✓	✓	✓	
Inner Tie Rod End Tool		✓	✓	
Pitman Arm Puller		✓	✓	
Power Steering Pump Pulley Special Tool Set		✓	✓	
Power Steering Pressure Gauges			✓	
Strut Spring Compressor Tool (OEM-Recommended)	✓	✓	✓	
Tie Rod Puller/Separator/Remover		✓	✓	
Tire Mounting Machine	✓	✓	✓	
Tire Patching Tools and Supplies	✓	✓	✓	
Tire Pressure Monitoring System (TPMS) Tool	✓	✓	✓	
Wheel Alignment Equipment-4 wheel (including alignment tools)		✓	✓	
Wheel Balancer - Electronic Type (force variation or equivalent recommended)	✓	✓	✓	
Wheel Weight Pliers	✓	✓	✓	

<b>BRAKES</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Bearing Seal and Race Driver Set	✓	✓	✓	
Brake Bleeder (Pressure or Vacuum)	✓	✓	✓	
Brake Disc Micrometer	✓	✓	✓	
Brake Drum Micrometer and Calibration Equipment	✓	✓	✓	
Brake Fluid Test Strips or Tester	✓	✓	✓	
Brake Lathe (bench with disc and drum service attachments)	✓	✓	✓	
Brake Lathe (on car)	✓	✓	✓	
Brake Lining Thickness Measurement Tool	✓	✓	✓	
Brake Shoe Adjusting Gauge	✓	✓	✓	
Brake Spring Remover/Installer	✓	✓	✓	
Brake Spring Pliers	✓	✓	✓	
Brake Spoon	✓	✓	✓	
Caliper Piston Retraction Set	✓	✓	✓	
Primary Cylinder Bleeder Kit		✓	✓	
Wheel Stud/Fastener Service Tools	✓	✓	✓	
Graphing Multimeter (GMM) and/or Digital Storage Oscilloscope (DSO)*			✓	

<b>ELECTRICAL/ELECTRONIC SYSTEMS</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Connector Pick Tool Set	✓	✓	✓	
Molding and Trim Removal Tool(s)	✓	✓	✓	
Headlight Aimer or Screen	✓	✓	✓	
Heat Gun (or equivalent for heat shrinking operations)	✓	✓	✓	
Terminal Tension (Pin Drag) Test Kit/Terminal Probe Kit (or equivalent)	✓	✓	✓	
Wire and Terminal Repair Kit	✓	✓	✓	
Graphing Multimeter (GMM) and/or Digital Storage Oscilloscope (DSO)*		✓	✓	

<b>xEV SHOP/LAB EQUIPMENT</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
xEV Vehicle Safety Kit			✓	
Electrical Insulating Gloves – must meet CAT 0 1000 VAC and 1500 VDC electrical safety glove rating – may have expired certification if used for demonstration only			✓	
Leather Gloves to go over Electrical Insulating Gloves			✓	
xEV charging equipment (level 1 or higher)			✓	
Insulated Retrieval Hook			✓	
Insulation Tester/Multimeter and leads – must meet CAT III 600-volt, CAT III 1000-volt, or CAT IV 600-volt rating			✓	

<b>HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
A/C Compressor Clutch Service Tools		✓	✓	
Dye Injection Kit		✓	✓	
A/C Leak Detector (to meet current industry standard)		✓	✓	
A/C Manifold Gauge Set or equivalent (to meet current industry standard)		✓	✓	
A/C Refrigerant Identification Equipment		✓	✓	
A/C Refrigerant Recovery/Recycling/Recharging Station (to meet current industry standard)		✓	✓	
Thermometer(s)		✓	✓	
A/C Sealant Detector Kit		✓	✓	

<b>ENGINE PERFORMANCE</b>	<b>MLR</b>	<b>AST</b>	<b>MAST</b>	
Compression Tester		✓	✓	
Cylinder Power Balance Tester (Scan Tool/Manual Method)		✓	✓	
Evaporative Emissions Control System (EVAP) Tester		✓	✓	
Exhaust Backpressure Tester (or equivalent)		✓	✓	
Fuel Injection Pressure Gauge Sets with Adapters		✓	✓	
Gasoline Quality Testing Kit (or equivalent)		✓	✓	
*Graphing Multimeter (GMM) and/or Digital Storage Oscilloscope (DSO)		✓	✓	
Infrared Thermometer (or appropriate substitute)	✓	✓	✓	
Injector Pulse Tester (or equivalent)		✓	✓	
Leak Detector (Smoke or Nitrogen)		✓	✓	
Oxygen Sensor Socket(s)		✓	✓	
Pinch-off Pliers		✓	✓	
Sensor/Sending Unit Socket(s)		✓	✓	
Spark Plug Thread Repair Tool(s)	✓	✓	✓	
Spark Tester		✓	✓	
Vacuum/Pressure Gauge (or equivalent)	✓	✓	✓	
*Also necessary to accomplish tasks in other MAST categories (Brakes and Electrical/Electronic Systems)				

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