

# NATEF PROGRAM ACCREDITATION STANDARDS

## Automobile



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Administered by:

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## BACKGROUND

### AUTOMOBILE TECHNICIAN TRAINING ACCREDITATION PROGRAM

The Board of Trustees of the National Automotive Technicians Education Foundation (NATEF) is responsible for accreditation of automotive (automobile, collision repair & refinish, medium/heavy truck) programs at secondary and post-secondary levels. NATEF 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 NATEF Board of Trustees and such personnel designated or employed by NATEF.

#### History

On January 1, 2011, NATEF assumed the role of accreditation of automotive programs as an extension of its role as the evaluation organization with the family of organizations of the National Institute for Automotive Service Excellence (ASE). 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. NATEF'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 were "certified" by ASE for a period of five (5) years.

Effective January 1, 2011, all programs that held current ASE program certification, were grandfathered as accredited by NATEF until such time that they were due to renew their accreditation.

After a lengthy process that included discussions with industry, employers, and educators, NATEF conducted a series of workshops and webinars to review the automobile standards. In June 2012 NATEF published a new model for automobile program standards. 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)**. Each successive level includes all the tasks of the previous level in addition to newly designated tasks. In other words, the AST task list includes all of the MLR tasks plus additional tasks. The MAST task list includes all of AST tasks plus additional tasks specifically for MAST.

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, on-site team evaluation materials, and the honorarium and expenses of the Evaluation Team Leader (ETL).

## OPTIONAL LIGHT/MEDIUM DUTY CNG/LPG

The CNG/LPG standards are temporarily unavailable under the new model. Programs that are accredited in the CNG/LPG areas will be recognized as accredited until the program is due for accreditation renewal.

# 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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

#### 1.1 Employment Potential

- A. - B. Provide a copy of the annual survey and a summary of the results.

### **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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

#### 1.2 Program Description/Goals

- A. Provide a copy of the brochure and/or catalog with appropriate pages identified (use sticky notes, highlighter, etc. to make the information easy to find).

## **STANDARD 2 - ADMINISTRATION**

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

#### **Standard 2.1 - Student Competency Certification**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.1 Student Competency Certification

- A. Show an example of the certificate, diploma, transcript, degree plan and/or ASE Student Certification.

#### **Standard 2.2 - Chain of Command**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.2 Chain Of Command

- A. Show a copy of the school organizational chart.

#### **Standard 2.3 - Administrative Support**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.3 Administrative Support

- A. - F. Provide a copy of the school policy or letter of support from the administration that addresses the various issues of planned in-service and update training; tools, equipment, and service publications; curriculum; and budget preparation. For programs reaccrediting - provide documentation regarding the status of recommended improvements made by the evaluation team at the previous on-site evaluation.

### **Standard 2.4 - Written Policies**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.4 Written Policies

- A. - C. Provide a copy of the school policy and teacher/student handbook with pages marked with sticky note and references highlighted.

### **Standard 2.5 – Customer Vehicle Work**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.5 Customer Vehicles

- A. - B. This applies only to programs that use customer vehicles. Show the policy statement on collecting, disbursing, and accounting for funds.

### **Standard 2.6 - Legal Requirements**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 2.6 Legal Requirements

- A. Provide copies of Policies and Procedures. Post Haz-Mat signs. Show MSDS sheets.

### **2.7 FIRST AID**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

- A. Provide a copy of the written policy on First Aid.

## **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 manufacturer's 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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 3.1 Service Information

- A. – B. State the location of all service information such as manuals, CDs, on-line access, etc.

### **Standard 3.2 - Multimedia**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 3.2 Multimedia

- A. – B. Provide a list and give the location of all technology available for student and instructor use.

### **Standard 3.3 - Periodicals**

Current general and technical automobile media should be available for student and instructor use.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 3.3 Periodicals

- A. Provide a list, give the location, and show examples of periodicals.

### **Standard 3.4 - Student Resources**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 3.4 Student Resources

- A. Provide a copy of each textbook and other materials used for instruction.

## **STANDARD 4 - FINANCES**

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

#### **Standard 4.1 - Budget**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 4.1 Budget

- A. State the process used to determine the program budget.
- B. Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.
- C. Refer to 4.1 A. Provide copies of budget requests. ETLs may interview program staff.
- D. Provide a copy of the last quarter's report.

## **STANDARD 5 - STUDENT SERVICES**

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

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 5.1 Learning Assessment

- A. Provide the policy statement and a description of the process used for learning assessment. Learning assessment may take place prior to or early in the program. Provide a copy of the assessment instrument, if available.
- B. Provide program explanatory material with pertinent information highlighted. Note availability for students.
- C. Highlight pertinent information in program materials, catalog, brochure, etc.

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 5.2 Pre-Admission Counseling

- A. Highlight access to the career counseling process and student services available, as cited in catalog or other materials.

### **Standard 5.3 - Placement**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 5.3 Placement

- A. Provide the policy or explanation of the placement process.

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

A follow-up system should be used to determine graduates' employment location and for feedback regarding the efficiency, effectiveness, and appropriateness of training. The follow-up procedure should be designed to assure feedback regarding needed additions to or deletions from the training curriculum, program, and tools and equipment. Follow-up of graduates employed outside of the 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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 5.4 Annual Follow-Up

- A. - D. Provide an explanation and a sample document.
- E. Describe the procedure to use the information obtained in follow-up and give an example of changes made to program based on feedback, if available.

## **STANDARD 6 – ADVISORY COMMITTEE (New effective 7/1/2013)**

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

#### **Standard 6.1 – Membership**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 6.1 Membership

- A. – B. Meeting minutes from at least two meetings per year (one year for initial accreditation; five years for reaccreditation)
- C. List of all Advisory Committee members and their affiliations.

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

The Advisory Committee should provide input and review budgeted funds.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 6.2 Review of Budgeting Funds

- A. Highlight pertinent discussion in Advisory Committee meeting minutes.
- B. Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 6.3 Annual Follow-up

- A. Describe the annual review process and provide an example from the annual survey data and Advisory Committee minutes with pertinent information highlighted.

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 6.4 Review of Curriculum

- A. Highlight pertinent information in the Advisory Committee minutes.

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

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 6.5 Evaluation of Instruction, Tools and Equipment and Facilities

- A.– D. Highlight pertinent information in the Advisory Committee minutes.

## **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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

#### 7.1 Program

- A. Provide a copy of the course outline and brochure.

### **Standard 7.2 - Student Training Plan**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

#### 7.2 Student Training Plan

- A. Show an example of a student training plan or advisement sheet.

### **Standard 7.3 - Preparation Time**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

#### 7.3 Preparation Time

- A. Show a copy of the Master Schedule and instructor office hours.

### **Standard 7.4 - Teaching Load**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.4 Teaching Load

- A. - B. Show student enrollment sheets, indicate the number of training stations, and identify teaching assistants (if any).

### **Standard 7.5 - Curriculum**

All tasks have been given a priority rating. Ninety-five percent (95%) of the tasks designated as Priority 1 (P-1) must be taught in the curriculum. Eighty percent (80%) of the tasks designated as Priority 2 (P-2) must be taught in the curriculum. Fifty percent (50%) of the tasks designated as Priority 3 (P-3) must be taught in the curriculum.

Instruction on the legal aspects and responsibilities of the automobile 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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.5 Curriculum

- A. Cross reference to curriculum and student progress instrument.
- B. The evaluation team will conduct a visual inspection. Provide a copy of the tool inventory / location.
- C. Provide syllabus (with information highlighted), course descriptions, job sheets, student materials, etc.
- D. Provide samples of work order forms, parts order form, and show how time spent on task is recorded.

### **Standard 7.6 - Student Progress**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.6 Student Progress

- A. Provide the school policy on student evaluation, sample of student progress chart, and use an actual record with student identifying information blocked out.

### **Standard 7.7- Performance Standards**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.7 Performance Standards

- A. Provide a task sheet or progress chart.
- B. Provide the evaluation criteria from the syllabus, progress chart, or task sheet.
- C. Provide a task sheet or student progress chart.

### **Standard 7.8 - Safety Standards**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.8 Safety Standards

- A. - B. Show an example of the safety test, course of study, course outline, posters, etc.
- C. The evaluation team will conduct a visual inspection of markings on guards and lanes, posting of safety rules and signage, and present an example of a student contract.

### **Standard 7.9 - Personal Standards**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.9 Personal Standards

- A. The evaluation team will conduct a visual inspection. Provide instructional materials, class / lab / shop rules.

### **Standard 7.10 - Work Habits/Ethics**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.10 Work Habits/Ethics

- A. - B. The evaluation team will conduct a visual inspection. Describe attendance policy, etc.

### **Standard 7.11 - Provision for Individual Differences**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.11 Provisions For Individual Differences

- A. Provide ADA information, equipment modifications, differential instruction, and provide an example of an Individual Education Plan (IEP) if applicable.

**Standard 7.12 - Related Instruction**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 7.12 Related Instruction

- A. Show syllabus with objectives and examples of tasks where related instruction is provided (OHM's Law, Pascal's Law, gear ratio, etc.); SkillsUSA Professional Development Program if appropriate.
- B. Show copy of instructor teaching credential.

**Standard 7.13- Testing**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 7.13 Testing

- A. Show samples of written tests.
- B. Show sample job sheets.
- C. Show sample of the rating scale used.
- D. Show posters, ASE test registration materials, describe provisions made for taking ASE tests.

### **Standard 7.14- Evaluation of Instruction**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.14 Evaluation Of Instruction

- A. - E. Provide an explanation of the overall program evaluation policy and plan. Show samples of the instructor evaluation instrument, etc.

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

On-vehicle service and repair work should be scheduled to benefit the student and supplement ongoing instruction on items specified in the NATEF 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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.15 On-Vehicle Service And Repair Work

- A. Show task sheets and repair orders. The evaluation team will conduct a visual inspection.
- B. Show course of study and a copy of the student progress chart.
- C. Provide a copy of the program policy.
- D. Show a sample work order. The evaluation team will conduct a visual inspection.

### **Standard 7.16 - Articulation**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 7.16 Articulation

- A. Show copy of the articulation agreement. Note: this may be N/A.

## **STANDARD 8- EQUIPMENT**

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

### **Standard 8.1 - Safety**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.1 Safety

- A. - B. The evaluation team will conduct a visual inspection.

### **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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.2 Quantity And Quality

- A. The evaluation team will conduct a visual inspection of the tools and equipment needed for instruction.
- B. The evaluation team will conduct a visual inspection of class size and inventory.
- C. The evaluation team will conduct a visual inspection tools and equipment used to meet industry quality standards.

### **Standard 8.3 - Consumable Supplies**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.3 Consumable Supplies

- A. The evaluation team will conduct a visual inspection. Provide inventory sheets and describe replenishment procedure.

### **Standard 8.4 - Preventive Maintenance**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.4 Preventive Maintenance

- A. Provide a copy of the preventive maintenance schedule or spreadsheet.

### **Standard 8.5 - Replacement**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.5 Replacement

- A. Describe the annual review process and provide an example from the annual survey data and Advisory Committee minutes with pertinent information highlighted.

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.6 Tool Inventory and Distribution

- A. Provide the inventory list and describe how tools are disbursed and/or signed in/out to students.

### **Standard 8.7 - Parts Purchasing**

A systematic parts purchasing system should be in place..

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.7 Parts Purchasing

- A. If purchasing parts, provide a written procedure or parts request form.
- B. ETL may discuss this issue with instructor.

### **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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 8.8 Hand Tools

- A. Provide an inventory. The evaluation team will conduct a visual inspection.
- B. Explain policy and provide information available for students detailing recommended tool list and vendor visits.

## **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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.1 Training Stations

- A. The evaluation team will conduct a visual inspection. Provide information on class size for each course.

### **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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.2 Safety

- A. The evaluation team will conduct a visual inspection of the location of signs.
- B. The evaluation team will conduct a visual inspection of fire extinguishers.
- C. The evaluation team will conduct a visual inspection and location of posted policy/procedures.
- D. The evaluation team will conduct a visual inspection of lighting.
- E. Note inspection schedule, show check list, and highlight pertinent comments in Advisory Committee minutes.
- F. The evaluation team will conduct a visual inspection to verify that all other applicable safety standards are met., i.e. eye wash, shower, spill kit, etc.
- G. The evaluation team will look for the identified vehicle traffic lanes.

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

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.3 Emergency Maintenance And Repair

- A. Provide copy of written policy and procedures.

### **Standard 9.4 - Housekeeping**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.4 Housekeeping

- A. - B. The evaluation team will conduct a visual inspection.

**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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 9.5 Office Space

- A. The evaluation team will conduct a visual inspection.

**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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 9.6 Instructional Area

- A. The evaluation team will conduct a visual inspection.

**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.

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 9.7 Storage

- A. - E. The evaluation team will conduct a visual inspection.

**Standard 9.8 - Support Facilities**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

## 9.8 Support Facilities

- A. - B. The evaluation team will conduct a visual inspection.

### **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.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.9 Ventilation

- A. The evaluation team will conduct a visual inspection and verify the function of exhaust fume removal system.
- B. The ETL and team members will interview instructors and students.

### **Standard 9.10 - First Aid**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 9.10 First Aid

- A. - C. Provide copy of the written policy. The evaluation team will conduct a visual inspection.

## **STANDARD 10- INSTRUCTIONAL STAFF**

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

### **Standard 10.1 - Technical Competency**

Instructors must hold current ASE certification to meet the requirements for the level of program accreditation sought (MLR, AST or MAST).

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 10.1 Technical Competency

- A. - B. Provide information on each instructor, diplomas earned, and copy of ASE Certification.

### **Standard 10.2 - Instructional Competency**

Instructors should meet all state teaching requirements.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 10.2 Instructional Competency / Certification

- A. Provide a copy of the teaching certificate for each instructor.

### **Standard 10.3 - Technical Updating**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 10.3 Technical Updating

- A. Provide a copy of the inventory of trade publications, service bulletins, etc. The evaluation team will conduct a visual inspection.
- B. Provide certificate, transcript, or completion forms for each instructor.

### **Standard 10.4 – Substitutes**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 10.4 Substitute

- A. Provide a written policy on substitute teachers and schedule for orientation of new substitutes.

## **STANDARD 11 – WORKBASED LEARNING**

**WRITTEN POLICIES AND PROCEDURES SHOULD BE USED FOR WORK-BASED LEARNING PROGRAMS. (This applies only to programs that offer work-based learning.)**

### **Standard 11.1 - Standards**

The student training plan and performance standards should be developed and coordinated by the automobile instructor, and include employer expectations and role.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 11.1 Standards

- A. Show overall work-based learning plan, sample training plan, and progress of student into the workforce. The ETL will talk with instructor. This may be N/A.

### **Standard 11.2 - Agreements**

All agreements should be written and legally binding.

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 11.2 Agreements

- A. Show a sample agreement. This may be N/A.

### **Standard 11.3 - Supervision**

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

#### **What's Needed and/or acceptable documentation to support the program evaluation rating:**

##### 11.3 Supervision

- A. Show written policy on supervision, identify the person responsible for supervision; the ETL should interview the person who supervises the work-based learning program. This may be N/A.

## **STANDARD 12 – E-LEARNING**

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

### **Standard 12.1 – Access**

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

#### **What’s Needed and/or acceptable documentation to support the program evaluation rating:**

##### 12.1 Access

- A. Provide a copy of the policy regarding the availability of appropriate technology for students to access e-learning instructional 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).

#### **What’s Needed and/or acceptable documentation to support the program evaluation rating:**

##### 12.2 Curriculum And Student Progress

- A. Highlight e-learning activities in the course of study materials.
- B. Cross-reference e-learning activities to content/tasks in the program plan.
- C. Correlate instructional hours to be credited toward meeting up to 25 percent of the program specialty hour requirements with the vendor’s average completion time for each instructional module.
- D. Show an example of the Learning Management System (LMS) used to track student progress.

**Standard 12.3 – Advisory Committee Input**

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

**What's Needed and/or acceptable documentation to support the program evaluation rating:**

12.3 Advisory Committee Input

- A. Highlight pertinent information in the Advisory Committee meeting minutes.

# **AUTOMOBILE STANDARDS STATEMENTS**

## **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 2 – ADMINISTRATION**

Program administration should ensure that instructional activities support and promote the goals of the program.

## **STANDARD 3 – LEARNING RESOURCES**

Support material, consistent with both program goals and performance objectives, should be available to staff and students.

## **STANDARD 4 – FINANCES**

Funding should be provided to meet the program goals and performance objectives.

## **STANDARD 5 – STUDENT SERVICES**

Systematic skills assessment, interviews, counseling services, placement, and follow-up procedures should be used.

## **STANDARD 6 – ADVISORY COMMITTEE (New in 2012)**

The Advisory Committee, a group of volunteers that meets regularly on a long-term basis to provide advice and/or support to a training program.

## **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 8 – EQUIPMENT**

Equipment and tools used must be of the type and quality found in the repair industry and must also be the type needed to provide training to meet the program goals and performance objectives.

## **STANDARD 9 – FACILITIES**

The physical facilities must be adequate to permit achievement of the program goals and performance objectives.

## **STANDARD 10 – INSTRUCTIONAL STAFF**

The instructional staff must have technical competency and meet all state and local requirements for accreditation.

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

Written policies and procedures should be used for cooperative and apprenticeship training programs. (This applies only to programs that offer cooperative/apprenticeship training.)

## **STANDARD 12 – E-LEARNING**

Written policies and procedures must be followed when e-learning curricular materials are used outside of scheduled classroom/lab/shop time for the purpose of meeting NATEF instructional hour requirements. (This applies only to programs that are using e-learning to meet program hour requirements. This is a go/no go Standard that requires validation of a ‘yes’ response to each of the criteria.)

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## **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 NATEF.

### **NATEF Review**

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

**Programs will have a maximum of 18 months to complete the accreditation process from the date their Application for Accreditation or Application for Renewal of Accreditation is received by the NATEF office (this timeframe may be shortened when applying under standards that are in the process of being phased out).**

**NOTE:** All applications for accreditation renewal should be submitted before the program accreditation expiration date. If NATEF does not receive the application within six (6) months of the expiration date the program is required to follow all procedures for initial accreditation.

### **On-Site Evaluation**

If the program qualifies, an Evaluation Team Leader (ETL), an educator certified by ASE and trained by NATEF, is assigned to the program and an on-site visit is conducted.

### **Recommendation for Accreditation**

When the standards are met, the program will become accredited for a period of five years.

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

3. **The average rating on each of Standards 6, 7, 8, 9 and 10 must be a four** 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 NATEF 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 NATEF, 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 MLR instructors must be ASE certified in G1, A4, A5, and A6.

All AST and MAST instructors must hold current ASE certification in G1, A6 and in the automobile area(s) (A1, A2, A3, A4, A5, A7, and A8) they teach.

MAST instructors teaching Engine Performance must also be ASE certified in L1 – Advanced Engine Performance.

Instructor Qualifications		
MLR	G1 & A6	A4 & A5
AST		Instructor Area(s) Taught. Program must cover A1-A8
MAST		Instructor Area(s) Taught : A1-A8, (Engine Performance Instructor(s) must also have L1) Program: must cover A1-A8, L1

Instructors that are ASE Master Certified Technicians, but do not currently hold G1 ASE certification will be required to obtain that certification (G1) at the recertification of their ASE Technician certification(s) credentials.

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

**95% of all Priority 1 (P-1) tasks must be taught**  
**80% of all Priority 2 (P-2) tasks must be taught**  
**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 Student Certification test cannot be used to meet this requirement.

11. The concern for safety is paramount to the learning environment. Each program level has the following safety requirement preceding all related tasks:

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

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

Evaluation Team Leaders (ETLs) are educators who have been trained by NATEF to lead the on-site evaluation. The NATEF office will assign an ETL once a program has been approved for an on-site evaluation. Every effort will be made to assign an ETL located close to the school to reduce the cost for the evaluation. Three additional team members, selected by the program and approved by the ETL, are required for 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 NATEF office at (703) 669-6650, email - [webmaster@natef.org](mailto:webmaster@natef.org), or their state Trade & Industrial Supervisor for more details.

## QUALIFICATIONS OF ON-SITE EVALUATION TEAM MEMBERS

The program requesting accreditation is responsible for recruiting and recommending on-site evaluation team members. The ETL must approve individuals recommended by the program. The on-site evaluation team members must be practicing automobile technicians, service managers or shop owners from businesses in the area served by the training program. For initial accreditation only, one team member may be an automobile instructor from another school district/system.\*

Team members must have:

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

ASE automobile certification is recommended but not required.

\* An automobile instructor from another school district/system must have a minimum total of five years experience, which must include three or more years full-time experience as an automobile technician.

The **initial** accreditation evaluation team is composed of four individuals: the ETL and three team members. Two team members must be from industry (one from a dealership and one from an independent repair facility). The third member may be from one of the following: a dealership, an independent repair facility or an automobile training program.

The **renewal of accreditation** evaluation team is composed of three individuals: the ETL and two team members. One team member must be from a dealership and one team member must be from an independent repair facility.

Each program requesting initial accreditation or renewal of accreditation must identify their choices for evaluation team members on the On-Site Evaluation Team Member List. An alternate team member choice must be identified on the On-Site Evaluation Team Member List in the event that one of the team members is unable to conduct the on-site evaluation. **The alternate team member must be from either a dealership or from an independent repair facility.**

**Team members must not be advisory committee members, former instructors or graduates of the program within the past five years or relatives of the administrator or instructor.**

## TASK LIST INFORMATION

An essential element of any curriculum or training program is a valid task list. 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 NATEF policy that the task list developed by the National Institute for Automotive Service Excellence (ASE) serves as the basis for the NATEF task list. Panels of technical service experts from the automotive service industry and career technical education are called upon to develop and validate the ASE and NATEF task lists.

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

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

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

- **Ninety-five percent (95%) of Priority 1 (P-1) tasks must be taught.**
- **Eighty percent (80%) of Priority 2 (P-2) tasks must be taught.**
- **Fifty percent (50%) of the Priority 3 (P-3) tasks must be taught.**

## TOOLS AND EQUIPMENT INFORMATION

The basic tools and equipment that must be available for use in the 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.

## **AUTOMOBILE PROGRAM EVALUATION**

NATEF 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 five (5) members, convene a minimum of two working meetings per year?
- 6.5C** Is the Advisory Committee including when conducting an annual evaluation of the facilities to assure adequacy in meeting program goals.
- 7.5A** Does the automobile program provide theory and “hands-on” training for 95% of the P-1, 80% 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?
- 7.5B** Are the tools and equipment available for the tasks taught at the program level being accredited?
- 8.1A** Are all shields, guards, and other safety devices in place, operable, and used?
- 8.1B** Do all students, instructors, and visitors wear safety glasses in the lab/shop area while lab is in session?
- 10.1** Do instructors hold current ASE certification appropriate for the program level being accredited?
- 10.3B** Do instructors attend a minimum of 20 hours per year of recognized [industry update training](#) relevant to the program?

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

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

Programs must be able to support a yes response for all seven items (thirteen items if using Standard 12 – E-learning). Programs must also meet the hour requirements listed in item 2 of the

[Automobile Minimum Requirements](#) appropriate for the level of accreditation sought. **If these responses are not achieved, do not apply for accreditation at this time.**

**In addition, an on-site evaluation will not be scheduled unless the average score on each of Standards 6, 7, 8, 9, and 10 is at least a 4 on the 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 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 NATIONAL AUTOMOTIVE TECHNICIANS EDUCATION FOUNDATION AND MEET STANDARDS OF QUALITY FOR THE TRAINING OF AUTOMOBILE TECHNICIANS AT THE FOLLOWING LEVEL:

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Institutions receiving NATEF 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 the National Automotive Technicians Education Foundation and has completed instruction at the following level:

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

Programs granted initial accreditation will also receive a 24"x30" sign indicating that the training program is NATEF 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 NATEF Board of Trustees has approved an updated version of integrated academic skills in the disciplines of English, mathematics, and science for automotive technicians. This document includes a listing of communication, math, and science skills required of automotive technicians to effectively analyze, diagnose, service and/or repair today's technically sophisticated automobiles.

Furthermore, the integrated academic skills have been correlated with comparable national standards for English, mathematics, and science as published respectively by the International Reading Association/National Council of Teachers of English, the National Council of Teachers of Mathematics, and the National Science Teachers Association. Such correlations add credibility to the multi-disciplinary approach to training automotive technicians.

NATEF 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 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* manual for automobile technicians is available on the NATEF website at [www.natef.org](http://www.natef.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 office 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: NATEF ACCREDITED PROGRAMS**

The Appeals Committee will also advise the NATEF President of its judgments and recommendations for action in any cases of malpractice or misrepresentation involving the misuse of NATEF 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 NATEF 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 NATEF President the appropriate sanctions or courses of action against the parties charged.

## DEFINITIONS – EDUCATIONAL TERMS

1. **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.
2. **COMPETENCY: (Hands On)** - Performance of task to the level or degree specified in the performance standard and curriculum for the task.
3. **COMPETENCY: (Written)** – Understanding of task to the level or degree specified in the performance standard and curriculum for the task.
4. **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.)
5. **E-LEARNING**: An electronically-based instructor-managed and student-driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop timeframe—*and includes integrated and scored auditable assessment and reporting* in compliance with NATEF’s e-learning general framework criteria.
6. **GOAL**: A statement of the intended outcome of participation in the training program.
7. **LEARNING MANAGEMENT SYSTEM (LMS)**: An electronically based, instructor managed, and student driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop time frame—*and includes integrated and scored auditable assessment and reporting* in compliance with NATEF’s e-learning general framework criteria.
8. **MASTERY**: (See Competency - Hands On and Competency - Written).
9. **OBJECTIVE, PERFORMANCE**: A written statement describing an intended outcome (competent task performance) in terms of student performance. (Also called "behavioral" objective or instructional objective) R.F. Mager Associates, 13245 Rhoda Drive, Los Altos Hill, California.

10. **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.
11. **PERSONAL CHARACTERISTIC**: Attributes that are not readily measurable and are generally in the affective or cognitive domains.
12. **PRIORITY RATINGS**: Indicates the minimum percentage of tasks that a program must include in its curriculum in order to be accredited.
13. **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)
14. **STANDARD – (PERFORMANCE)**: A written specification of the results of acceptable task performance.
15. **STANDARD – (PERSONAL)**: An attribute or characteristic of an individual that facilitates entry into or advancement within an occupation.
16. **STANDARD – (PROGRAM)**: A specific quality or desired characteristic of a training program designed to prepare individuals for employment or advancement.
17. **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.
18. **TRAINING STATION**: An area with appropriate tools and equipment, large enough to allow the development of both safety and competency in task performance.
19. **WORK-BASED LEARNING**: For NATEF program accreditation purposes, work-based learning is a formalized and structured credit bearing instructional dimension of the automotive training program that is an integral part of the institution's master schedule, is available to all automotive students at the appropriate grade level, and meets the following criteria:
  - a) A written customized training plan and performance standards that each student is expected to meet, to be signed off by the student, the student's parent or legal guardian, the authorized work-based learning site representative, and the work-based learning coordinator.

- b) A written agreement between the sponsoring educational institution and the work-base learning site that is in compliance with state/federal rules and regulations governing work-based learning programs.
- c) A written plan of oversight and supervision designating who has the authority to coordinate, monitor and evaluate the work-based learning program, including individual student performance.

\*\*\*\*\*

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

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

May or could expresses freedom to follow a suggested alternative.

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## **NATEF POLICIES ON ARTICULATION AGREEMENTS**

There is no provision for articulated accreditation for automobile training programs under the 2012 Automobile program standards. Regardless, NATEF Trustee action, as well as language in the Carl D. Perkins Vocational Education Act, encourages articulation between programs at the secondary and post-secondary levels.

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

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

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# PROCEDURES FOR ACCREDITATION/RENEWAL OF ACCREDITATION

## Process Overview

**NOTE:** NATEF 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 NATEF website at [www.natef.org](http://www.natef.org). **Initial accreditation requires the program have at least one graduated class before application submission.**

To begin the accreditation process, the program must return two (2) copies of the following items:

#### **Application for Accreditation or Renewal of Accreditation to 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)

**NOTE:** All applications for accreditation renewal should be submitted before the program accreditation expiration date. If NATEF does not receive the application six (6) months after the expiration date, the program is required to follow all procedures for initial accreditation.

### 2. NATEF review of application

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

- a. Qualified for on-site evaluation for the level listed on the application.
- b. Not qualified for an on-site evaluation at that time. NATEF 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

NATEF will assign an Evaluation Team Leader (ETL) to the program, and notify the program of its selection providing the necessary ETL contact information. Included with the notification of ETL assignment will be an On-site Evaluation Agreement. The On-site Evaluation Agreement

will be sent with instructions that outline the plans for the local administration and the costs for the ETL's services and expenses. All costs will be paid by the institution requesting accreditation. This agreement must be completed and returned to the ETL and a copy provided to NATEF after the on-site date has been established.

With a legitimate reason, the Program Coordinator may contact the NATEF office 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.) The ETL will contact the Program Coordinator to arrange a date for the on-site evaluation. It is also acceptable for the Program Coordinator to initiate contact with the ETL.

**4. Send on-site evaluation agreement, copy of the application submitted to NATEF, course of study, a list of on-site evaluation team members and Program Graduate Employer Contact form listing 6 previous graduates of the program to the ETL**

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

**Items required prior to on-site evaluation:**

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

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

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

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

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

## **5. On-site evaluation**

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

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

## **6. ETL reports results to NATEF**

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

## **7. Program accreditation**

The national office 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 NATEF Board of Trustees. The NATEF President will approve accreditation as sanctioned by the Board of Trustees.

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

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

## **8. Display and reporting of accreditation materials**

A wall plaque identifying the accredited level will be forwarded from the national office to the program administrator. Schools **must** accurately report the level of NATEF accreditation.

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

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

## **10. Annual Report – (New effective July 2013)**

Each year all accredited programs will receive notification from NATEF and are required to update all contact information.

## **11. Compliance report**

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 NATEF standards. NATEF 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 NATEF Trustees, staff, consultants, or other designated representatives to verify program compliance prior to the program status being restored to 'Accredited.'

Additionally, NATEF may randomly select programs at the 2½-year period for an on-site compliance review by an ETL and NATEF Trustees, staff, consultants, or other designated representatives. Selected programs will be notified, in advance, of the on-site review by the NATEF office. 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 NATEF.

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

## **12. Renewal of Accreditation**

The NATEF office will contact the program eleven (11) months prior to the accreditation expiration date. Programs can download the accreditation materials at [www.natef.org](http://www.natef.org) and follow the process outlined above.

## On-site Evaluation Cost Sheet

### AUTOMOBILE

	ACCREDITATION FEE	RENEWAL OF ACCREDITATION FEE
Base Accreditation Fee	\$850.00	\$750.00
Manufacturer Specific Accreditation Fee (if applicable) <b>This fee is in addition to the Base Accreditation Fee</b>	\$425.00	\$375.00
Honorarium for Evaluation Team Leader (ETL) @ \$250/day <b>*Please see below</b>	*\$500.00	*\$250.00
<u>Estimated</u> mileage, hotel, and meal expenses for the ETL <b>**Please see below</b>	<u>\$300.00</u>	<u>\$150.00</u>
<u>ESTIMATED TOTAL COSTS</u> Base program only	\$1,650.00	\$1,025.00

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

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

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

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

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

**Costs of accreditation/renewal of accreditation are subject to change. Contact the NATEF office for current information.**

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# EVALUATION GUIDE

## Automotive Program Evaluation

Everyone associated with an automotive program, whether it is automobile, collision repair & refinish, or medium/heavy truck, should be aware that an extensive program evaluation must be conducted by school personnel and certain criteria must be met to be approved for an on-site team evaluation. Documentation must be available for the on-site team to verify that the program meets all requirements for NATEF accreditation. The good news is that 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 you through the accreditation process. These hints were developed by a group of experienced ETLs, NATEF staff and Trustees. The result is a collection of suggestions for schools and ETLs alike to be used as a guide for preparing, reviewing, and evaluating the documentation needed for program accreditation. These suggestions are meant as examples and we are confident that there are many other documents that can be used to show how programs meet the standards for accreditation.

When evaluating the statements on the Program Evaluation form read the statement on the form, review the “What’s Needed” hint, and refer to the Program Standards section of the manual for additional information on each standard sub-section. It is helpful if you make notes of reference materials you used to rate the standard. As you continue to prepare for the on-site evaluation, it is helpful if you make copies of the information, clearly mark the reference, and highlight specific information for each sub-section. For example, Standard 1.2 A. asks you 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 you provide 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 NATEF Standards

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

Standard	Contents	Documentation
<b>6.1 A</b>	<b>Does the Advisory Committee, consisting of at least five (5) members, convene a minimum of two working meetings per year?</b>	<b>Meeting minutes from at least two meetings per year (one year for initial accreditation; five years for renewal of accreditation).</b>
6.1 B	Rate the input of committee members in terms of participation, providing input on program improvement, and attendance as indicated in the minutes.	Meeting minutes
6.1 C	Rate the mix of committee members in terms of being representative of the following groups: automobile technicians, local employers, consumer groups, former students, others (automotive trainers, parents, etc.)	List of all advisory committee members and their affiliations.
6.2A	Rate the Advisory Committee input in reviewing budgeted funds allocated to and used by the program.	Highlight pertinent discussion in Advisory Committee meeting minutes.
6.2 B	Rate the funding in terms of being adequate for program operation.	Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.
6.3A	Does the Advisory Committee review the information from the annual follow-up procedure and provide input for modifications to the training program?	Highlight pertinent information in Advisory Committee minutes.
6.4A	Rate the use of the Advisory Committee to provide input on additional tasks, and if added, their approval of those additional tasks.	Highlight pertinent information in the Advisory Committee minutes.
6.5A	Rate the use of the Advisory Committee review in the evaluation process (evaluation of instruction).	Highlight pertinent information in Advisory Committee minutes.

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

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

## TASK LIST AND ASSUMPTIONS

The NATEF task list was reviewed and updated in June 2012. A national committee was assembled in Leesburg, Virginia 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 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 student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources;
- \* at all levels of accreditation, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing 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 training programs being evaluated for accreditation should have written and detailed 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;
- \* a system is in place that informs all students of their individual progress through all phases of the training program.

4. It is assumed that:

- \* individual courses of study will differ across 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.

5. It is assumed that:

- \* all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, 'Right to Know Law', and state and local requirements;
- \* hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.

## **2013 Maintenance and Light Repair (MLR) Task List**

### **ENGINE REPAIR**

**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 applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Verify operation of the instrument panel engine warning indicators. P-1
3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
4. Install engine covers using gaskets, seals, and sealers as required. P-1
5. Remove and replace timing belt; verify correct camshaft timing. P-1
6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
7. Identify hybrid vehicle internal combustion engine service precautions. P-3

#### **I. ENGINE REPAIR**

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

1. Adjust valves (mechanical or hydraulic lifters). P-1

#### **I. ENGINE REPAIR**

##### **C. Lubrication and Cooling Systems**

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action. P-1

- 2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
- 3. Remove, inspect, and replace thermostat and gasket/seal. P-1
- 4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1
- 5. Perform engine oil and filter change. P-1

<b>ER Total Tasks</b>	
P-1	12
P-2	0
P-3	1
	13

## AUTOMATIC TRANSMISSION AND TRANSAXLE

**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 applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1
- 3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1
- 4. Check transmission fluid condition; check for leaks. P-2

### II. AUTOMATIC TRANSMISSION AND TRANSAXLE

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

- 1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
- 2. Inspect for leakage at external seals, gaskets, and bushings. P-2
- 3. Inspect replace and align power train mounts. P-2
- 4. Drain and replace fluid and filter(s). P-1

## II. AUTOMATIC TRANSMISSION AND TRANSAXLE

### C. Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT).
2. Describe the operational characteristics of a hybrid vehicle drive train.

AT Total Tasks	
P-1	4
P-2	4
P-3	2
P-3	10

## MANUAL DRIVE TRAIN AND AXLES

**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 applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Drain and refill manual transmission/transaxle and final drive unit. P-1
3. Check fluid condition; check for leaks. P-2

## III. MANUAL DRIVE TRAIN AND AXLES

### B. Clutch

1. Check and adjust clutch master cylinder fluid level. P-1
2. Check for system leaks. P-1

## III. MANUAL DRIVE TRAIN AND AXLES

### C. Transmission/Transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

### III. MANUAL DRIVE TRAIN AND AXLES

#### D. Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

1. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-2
2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-2

### III. MANUAL DRIVE TRAIN AND AXLES

#### E. Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2
2. Check and adjust differential housing fluid level. P-1
3. Drain and refill differential housing. P-1

#### E.1 Drive Axles

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

### III. MANUAL DRIVE TRAIN AND AXLES

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

1. Inspect front-wheel bearings and locking hubs. P-3
2. Check for leaks at drive assembly seals; check vents; check lube level. P-2

MD Total Tasks	
P-1	6
P-2	6
P-3	2
	14

## SUSPENSION AND STEERING

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

**Comply with personal and environmental safety practices associated with 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 SYSTEMS

#### A. General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Disable and enable supplemental restraint system (SRS). P-1

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

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

1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-1
2. Determine proper power steering fluid type; inspect fluid level and condition. P-1
3. Flush, fill, and bleed power steering system. P-2
4. Inspect for power steering fluid leakage; determine necessary action. P-1
5. Remove, inspect, replace, and adjust power steering pump drive belt. P-1
6. Inspect and replace power steering hoses and fittings. P-2
7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-1
8. Inspect tie rod ends (sockets), tie rod sleeves, and clamps. P-1
9. Inspect upper and lower control arms, bushings, and shafts. P-1
10. Inspect and replace rebound and jounce bumpers. P-1
11. Inspect track bar, strut rods/radius arms, and related mounts and bushings. P-1
12. Inspect upper and lower ball joints (with or without wear indicators). P-1
13. Inspect suspension system coil springs and spring insulators (silencers). P-1
14. Inspect suspension system torsion bars and mounts. P-1
15. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links. P-1
16. Inspect strut cartridge or assembly. P-1
17. Inspect front strut bearing and mount. P-1
18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. P-1

- 19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1
- 20. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1
- 21. Inspect electric power-assisted steering. P-3
- 22. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2
- 23. Describe the function of the power steering pressure switch. P-3

**IV. SUSPENSION AND STEERING**

**C. Wheel Alignment**

- 1. Perform prealignment inspection and measure vehicle ride height; determine necessary action. P-1

**IV. SUSPENSION AND STEERING**

**D. Wheels and Tires**

- 1. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1
- 2. Rotate tires according to manufacturer’s recommendations. P-1
- 3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1
- 4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2
- 5. Inspect tire and wheel assembly for air loss; perform necessary action. P-1
- 6. Repair tire using internal patch. P-1
- 7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps. P-2
- 8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system. P-2

<b>SS Total Tasks</b>	
P-1	26
P-2	6
P-3	2
	<b>34</b>

## **BRAKES**

**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 applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1
3. Install wheel and torque lug nuts. P-1

### **V. BRAKES**

#### **B. Hydraulic System**

1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1
2. Check master cylinder for external leaks and proper operation. P-1
3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action. P-1
4. Select, handle, store, and fill brake fluids to proper level. P-1
5. Identify components of brake warning light system. P-3
6. Bleed and/or flush brake system. P-1
7. Test brake fluid for contamination. P-1

### **V. BRAKES**

#### **C. Drum Brakes**

1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action. P-1

2. Refinish brake drum and measure final drum diameter; compare with specifications. P-1
3. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1
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; make final checks and adjustments. P-2

## V. BRAKES

### D. Disc Brakes

1. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. P-1
2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1
3. Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1
4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1
5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1
6. Remove and reinstall rotor. P-1
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1
9. Retract and re-adjust caliper piston on an integral parking brake system. P-3
10. Check brake pad wear indicator; determine necessary action. P-2
11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. 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. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

**V. BRAKES**

**F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)**

- 1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1
- 2. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2
- 3. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1
- 4. Check operation of brake stop light system. P-1
- 5. Replace wheel bearing and race. P-2
- 6. Inspect and replace wheel studs. P-1

**V. BRAKES**

**G. Electronic Brakes, and Traction and Stability Control Systems**

- 1. Identify traction control/vehicle stability control system components. P-3
- 2. Describe the operation of a regenerative braking system. P-3

<b>BR Total Tasks</b>	
P-1	26
P-2	6
P-3	4
	36

## ELECTRICAL/ELECTRONIC SYSTEMS

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

**Comply with personal and environmental safety practices associated with 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 applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Use wiring diagrams to trace electrical/electronic circuits. P-1
4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1
5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-2
6. Check operation of electrical circuits with a test light. P-2
7. Check operation of electrical circuits with fused jumper wires. P-2
8. Measure key-off battery drain (parasitic draw). P-1
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
10. Perform solder repair of electrical wiring. P-1
11. Replace electrical connectors and terminal ends. P-1

### VI. ELECTRICAL/ELECTRONIC SYSTEMS

#### B. Battery Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1
3. Maintain or restore electronic memory functions. P-1
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1
5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

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

### **C. Starting System**

1. Perform starter current draw test; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary 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 necessary action. P-2

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

### **D. Charging System**

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

- 3. Remove, inspect, and re-install generator (alternator). P-2
- 4. Perform charging circuit voltage drop tests; determine necessary 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); replace as needed. P-1
- 2. Aim headlights. P-2
- 3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

**VI. ELECTRICAL/ELECTRONIC SYSTEMS**

**F. Accessories**

- 1. Disable and enable airbag system for vehicle service; verify indicator lamp operation. P-1
- 2. Remove and reinstall door panel. P-1
- 3. Describe the operation of keyless entry/remote-start systems. P-3
- 4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1
- 5. Verify windshield wiper and washer operation; replace wiper blades. P-1

<b>EE Total Tasks</b>	
P-1	26
P-2	8
P-3	3
	37

## HEATING AND AIR CONDITIONING

For every task in Heating and Air Conditioning, 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 AND AIR CONDITIONING

#### A. General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

### VII. HEATING AND AIR CONDITIONING

#### B. Refrigeration System Components

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1
2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. P-2
3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-1

### VII. HEATING AND AIR CONDITIONING

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

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

### VII. HEATING AND AIR CONDITIONING

#### D. Operating Systems and Related Controls

1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1
2. Identify the source of A/C system odors. P-2

HA Total Tasks	
P-1	5
P-2	2
P-3	0
	7

## ENGINE PERFORMANCE

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 applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action P-1
3. Perform cylinder power balance test; determine necessary action. P-2
4. Perform cylinder cranking and running compression tests; determine necessary action. P-1
5. Perform cylinder leakage test; determine necessary action. P-1
6. Verify engine operating temperature. P-1
7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

### VIII. ENGINE PERFORMANCE

#### B. Computerized Controls

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Describe the importance of operating all OBDII monitors for repair verification. P-1

### VIII. ENGINE PERFORMANCE

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

1. Replace fuel filter(s). P-1
2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

- 3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1
- 4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1
- 5. Check and refill diesel exhaust fluid (DEF). P-3

**VIII. ENGINE PERFORMANCE**

**D. Emissions Control Systems**

- 1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2

<b>EP Total Tasks</b>	
P-1	12
P-2	2
P-3	1
	15

**Grand Total - Tasks**

P-1 117  
P-2 34  
P-3 15

**REQUIRED SUPPLEMENTAL TASKS** 26

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## **REQUIRED SUPPLEMENTAL TASKS**

### **Shop and Personal Safety**

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

### **Tools and Equipment**

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

### **Preparing Vehicle for Service**

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

### **Preparing Vehicle for Customer**

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

**2013 Automobile Service Technology (AST)  
TASK LIST**

**ENGINE REPAIR**

**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: Engine Diagnosis; Removal and Reinstallation (R & R)**

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. 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 necessary action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Remove and replace timing belt; verify correct camshaft timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove and replace engine mounts. P-2
9. Identify hybrid vehicle internal combustion engine service precautions. P-3
10. Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition. P-3

## **I. ENGINE REPAIR**

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

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. P-1
2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-1
3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2
4. Adjust valves (mechanical or hydraulic lifters). P-1
5. 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 components; verify correct camshaft timing. P-1
6. Establish camshaft position sensor indexing. P-1

## **I. ENGINE REPAIR**

### **C. Engine Block Assembly Diagnosis and Repair**

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer). P-2

## **I. ENGINE REPAIR**

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

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action. P-1
2. Identify causes of engine overheating. P-1
3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1
5. Inspect, remove, and replace water pump. P-2

- |  |     |
|--|-----|
| 6. Remove and replace radiator.  | P-2 |
| 7. Remove, inspect, and replace thermostat and gasket/seal.                                  | P-1 |
| 8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. | P-1 |
| 9. Perform oil pressure tests; determine necessary action.                                   | P-1 |
| 10. Perform engine oil and filter change.  | P-1 |
| 11. Inspect auxiliary coolers; determine necessary action.                                   | P-3 |
| 12. Inspect, test, and replace oil temperature and pressure switches and sensors.            | P-2 |

ER Tasks	
P-1	20
P-2	6
P-3	3
	29

## AUTOMATIC TRANSMISSION AND TRANSAXLE

**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: Transmission and Transaxle Diagnosis

- |   |     |
|---|-----|
| 1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. | P-1 |
| 2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins.                   | P-1 |
| 3. Diagnose fluid loss and condition concerns; determine necessary action.  | P-1 |
| 4. Check fluid level in a transmission or a transaxle equipped with a dip-stick.  | P-1 |
| 5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.  | P-1 |
| 6. Perform stall test; determine necessary action.  | P-3 |
| 7. Perform lock-up converter system tests; determine necessary action.  | P-3 |

- 8. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1
- 9. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal’s Law). P-2

**II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

**B. In-Vehicle Transmission/Transaxle Maintenance and Repair**

- 1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
- 2. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
- 3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1
- 4. Drain and replace fluid and filter(s). P-1
- 5. Inspect, replace and align power train mounts. P-2

**II. AUTOMATIC TRANSMISSION AND TRANSAXLE**

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

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

<b>AT Tasks</b>	
P-1	10
P-2	5
P-3	4
	19

## MANUAL DRIVE TRAIN AND AXLES

**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: Drive Train Diagnosis

1. Identify and interpret drive train concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Check fluid condition; check for leaks; determine necessary action. P-1
4. Drain and refill manual transmission/transaxle and final drive unit. P-1

### III. MANUAL DRIVE TRAIN AND AXLES

#### B. Clutch Diagnosis and Repair

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

- 6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1
- 7. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

**III. MANUAL DRIVE TRAIN AND AXLES**

**C. Transmission/Transaxle Diagnosis and Repair**

- 1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2
- 2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

**III. MANUAL DRIVE TRAIN AND AXLES**

**D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair**

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

**III. MANUAL DRIVE TRAIN AND AXLES**

**E. Drive Axle Diagnosis and Repair**

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

- 1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2
- 2. Check and adjust differential housing fluid level. P-1
- 3. Drain and refill differential housing. P-1

- 4. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2

**E.2 Drive Axles**

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

**III. MANUAL DRIVE TRAIN AND AXLES**

**F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair**

- 1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
- 2. Inspect front-wheel bearings and locking hubs; perform necessary action(s). P-3
- 3. Check for leaks at drive assembly seals; check vents; check lube level. P-3
- 4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3

<b>MD Tasks</b>	
P-1	17
P-2	8
P-3	5
	30

**SUSPENSION AND STEERING**

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

**Comply with personal and environmental safety practices associated with 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: Suspension and Steering Systems**

- 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

## **IV. SUSPENSION AND STEERING**

### **B. Steering Systems Diagnosis and Repair**

1. Disable and enable supplemental restraint system (SRS). P-1
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2
7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2
8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. P-2
9. Determine proper power steering fluid type; inspect fluid level and condition. P-1
10. Flush, fill, and bleed power steering system. P-2
11. Inspect for power steering fluid leakage; determine necessary action. P-1
12. Remove, inspect, replace, and adjust power steering pump drive belt. P-1
13. Remove and reinstall power steering pump. P-2
14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2
15. Inspect and replace power steering hoses and fittings. P-2

16. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2
17. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1
18. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2
19. Inspect electric power-assisted steering. P-3

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

##### **C. Suspension Systems Diagnosis and Repair**

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1
2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1
3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers. P-3
4. Inspect, remove and install strut rods and bushings. P-3
5. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators). P-2
6. Inspect, remove and install steering knuckle assemblies. P-3
7. Inspect, remove and install short and long arm suspension system coil springs and spring insulators. P-3
8. Inspect, remove and install torsion bars and mounts. P-3
9. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links. P-3
10. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3
11. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts. P-1

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

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

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1
2. Remove, inspect, and service or replace front and rear wheel bearings. P-1
3. Describe the function of the power steering pressure switch. P-3

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

##### **E. Wheel Alignment Diagnosis, Adjustment, and Repair**

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1
2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. P-1
3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel. P-1
4. Check toe-out-on-turns (turning radius); determine necessary action. P-2
5. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2
6. Check rear wheel thrust angle; determine necessary action. P-1
7. Check for front wheel setback; determine necessary action. P-2
8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3
9. Reset steering angle sensor P-2

#### IV. SUSPENSION AND STEERING

##### F. Wheels and Tires Diagnosis and Repair

- |   |     |
|---|-----|
| 1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action. | P-1 |
| 2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.  | P-2 |
| 3. Rotate tires according to manufacturer's recommendations.  | P-1 |
| 4. Measure wheel, tire, axle flange, and hub runout; determine necessary action.  | P-2 |
| 5. Diagnose tire pull problems; determine necessary action.   | P-2 |
| 6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).  | P-1 |
| 7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.   | P-2 |
| 8. Inspect tire and wheel assembly for air loss; perform necessary action.  | P-1 |
| 9. Repair tire using internal patch.  | P-1 |
| 10. Identify and test tire pressure monitoring system (indirect and direct) for operation; verify operation of instrument panel lamps.  | P-2 |
| 11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.   | P-1 |

SS Tasks	
P-1	22
P-2	22
P-3	11
	55

#### BRAKES

**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: Brake Systems Diagnosis

- |  |     |
|--|-----|
| 1. Identify and interpret brake system concerns; determine necessary action. | P-1 |
|--|-----|

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS). P-1
4. Install wheel and torque lug nuts. P-1

## V. BRAKES

### B. Hydraulic System Diagnosis and Repair

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 necessary action. P-1
3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1
4. Remove, bench bleed, and reinstall master cylinder. P-1
5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-3
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action. P-1
7. Replace brake lines, hoses, fittings, and supports. P-2
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2
9. Select, handle, store, and fill brake fluids to proper level. P-1
10. Inspect, test, and/or replace components of brake warning light system. P-3
11. Identify components of brake warning light system. P-2
12. Bleed and/or flush brake system. P-1
13. Test brake fluid for contamination. P-1

## **V. BRAKES**

### **C. Drum Brake Diagnosis and Repair**

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

## **V. BRAKES**

### **D. Disc Brake Diagnosis and Repair**

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action. P-1
2. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. P-1
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1
5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1
6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1
7. Remove and reinstall rotor. P-1

8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1
9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1
10. Retract and re-adjust caliper piston on an integrated parking brake system. P-3
11. Check brake pad wear indicator; determine necessary action. P-2
12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1

## V. BRAKES

### E. Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action. P-1
4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action. P-3
5. Measure and adjust master cylinder pushrod length. P-3

## V. BRAKES

### F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-3
2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1
3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2
4. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1

- 5. Check operation of brake stop light system. P-1
- 6. Replace wheel bearing and race. P-2
- 7. Inspect and replace wheel studs. P-1
- 8. Remove and reinstall sealed wheel bearing assembly. P-2

**V. BRAKES**

**G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair**

- 1. Identify and inspect electronic brake control system components; determine necessary action. P-1
- 2. Identify traction control/vehicle stability control system components. P-3
- 3. Describe the operation of a regenerative braking system. P-3

<b>BR Tasks</b>	
P-1	33
P-2	10
P-3	8
	51

**ELECTRICAL/ELECTRONIC SYSTEMS**

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

**Comply with personal and environmental safety practices associated with 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: Electrical System Diagnosis**

- 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
- 2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s Law). P-1
- 3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1
- 4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
- 5. Check operation of electrical circuits with a test light. P-1

- |   |     |
|---|-----|
| 6. Check operation of electrical circuits with fused jumper wires.  | P-1 |
| 7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.  | P-1 |
| 8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.   | P-1 |
| 9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.   | P-1 |
| 10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. | P-1 |
| 11. Replace electrical connectors and terminal ends.  | P-1 |
| 12. Repair wiring harness.  | P-3 |
| 13. Perform solder repair of electrical wiring.   | P-1 |

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

### **B. Battery Diagnosis and Service**

- |   |     |
|---|-----|
| 1. Perform battery state-of-charge test; determine necessary action.  | P-1 |
| 2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.  | P-1 |
| 3. Maintain or restore electronic memory functions.   | P-1 |
| 4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.   | P-1 |
| 5. Perform slow/fast battery charge according to manufacturer's recommendations.  | P-1 |
| 6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.   | P-1 |
| 7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.  | P-3 |
| 8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. | P-1 |

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

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

### **C. Starting System Diagnosis and Repair**

1. Perform starter current draw tests; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary 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 necessary action. P-2
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

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

### **D. Charging System Diagnosis and Repair**

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

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

### **E. Lighting Systems Diagnosis and Repair**

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action. P-1
2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1
3. Aim headlights. P-2
4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

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

### **F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair**

1. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action. P-2
2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action. P-2

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

### **G. Horn and Wiper/Washer Diagnosis and Repair**

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1
2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2
3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

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

### **H. Accessories Diagnosis and Repair**

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2

2. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action. P-2
3. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action. P-3
4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2
5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1
6. Remove and reinstall door panel. P-1
7. Check for module communication errors (including CAN/BUS systems) using a scan tool. P-2
8. Describe the operation of keyless entry/remote-start systems. P-3
9. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1
10. Verify windshield wiper and washer operation, replace wiper blades. P-1

EE Tasks	
P-1	34
P-2	13
P-3	5
	52

## HEATING AND AIR CONDITIONING

**For every task in Heating and Air Conditioning, 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 AND AIR CONDITIONING

#### A. General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Performance test A/C system; identify problems. P-1
4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2

5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1
6. Leak test A/C system; determine necessary action. P-1
7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2
8. Determine recommended oil and oil capacity for system application. P-1
9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

## **VII. HEATING AND AIR CONDITIONING**

### **B. Refrigeration System Component Diagnosis and Repair**

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1
2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2
3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2
4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2
5. Determine need for an additional A/C system filter; perform necessary action. P-3
6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2
7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1
8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2
9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1
10. Inspect evaporator housing water drain; perform necessary action. P-1
11. Determine procedure to remove and reinstall evaporator; determine required oil quantity. P-2

## **VII. HEATING AND AIR CONDITIONING**

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

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1
2. Inspect and test heater control valve(s); perform necessary action. P-2
3. Determine procedure to remove inspect, and reinstall heater core. P-2

## **VII. HEATING AND AIR CONDITIONING**

### **D. Operating Systems and Related Controls Diagnosis and Repair**

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1
2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2
3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2
4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3
5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3
6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1
7. Identify the source of A/C system odors. P-2
8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

## **VII. HEATING AND AIR CONDITIONING**

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

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1

2. Identify and recover A/C system refrigerant.	P-1	<b>HA Tasks</b> P-1 17 P-2 14 P-3 4 35
3. Recycle, label, and store refrigerant.	P-1	
4. Evacuate and charge A/C system; add refrigerant oil as required.	P-1	

## ENGINE PERFORMANCE

**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: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine necessary action.	P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
3. Diagnose abnormal engine noises or vibration concerns; determine necessary action.	P-3
4. Diagnose the cause of excessive oil consumption coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2
5. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P-1
6. Perform cylinder power balance test; determine necessary action.	P-2
7. Perform cylinder cranking and running compression tests; determine necessary action.	P-1
8. Perform cylinder leakage test; determine necessary action.	P-1
9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.	P-2
10. Verify engine operating temperature; determine necessary action.	P-1
11. Verify correct camshaft timing.	P-1

## **VIII. ENGINE PERFORMANCE**

### **B. Computerized Controls Diagnosis and Repair**

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. 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 necessary action. P-2
4. Describe the importance of running all OBDII monitors for repair verification. P-1

## **VIII. ENGINE PERFORMANCE**

### **C. Ignition System Diagnosis and Repair**

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

## **VIII. ENGINE PERFORMANCE**

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

1. Check fuel for contaminants; determine necessary action. P-2
2. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1
3. Replace fuel filter(s). P-1
4. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

- 5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
- 6. Inspect and test fuel injectors. P-2
- 7. Verify idle control operation. P-1
- 8. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action. P-1
- 9. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1
- 10. Perform exhaust system back-pressure test; determine necessary action. P-2
- 11. Check and refill diesel exhaust fluid (DEF). P-3

**VIII. ENGINE PERFORMANCE**

**E. Emissions Control Systems Diagnosis and Repair**

- 1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-3
- 2. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2
- 3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. P-3
- 4. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action. P-2
- 5. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action. P-3
- 6. Inspect and test catalytic converter efficiency. P-2
- 7. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action. P-1
- 8. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. P-3

<b>EP Tasks</b>	
P-1	19
P-2	12
P-3	7
	<b>38</b>

	<b>Grand Total - Tasks</b>	
	P-1	172
	P-2	90
	P-3	47
<b>REQUIRED SUPPLEMENTAL TASKS</b>		26

335

## **REQUIRED SUPPLEMENTAL TASKS**

### **Shop and Personal Safety**

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

### **Tools and Equipment**

1. Identify tools and their usage in automotive applications.

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

#### **Preparing Vehicle for Service**

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

#### **Preparing Vehicle for Customer**

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

**2013 Master Automobile Service Technology (MAST)  
Task List**

**ENGINE REPAIR**

**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: Engine Diagnosis; Removal and Reinstallation (R & R)**

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. 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 necessary action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Remove and replace timing belt; verify correct camshaft timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove and replace engine mounts. P-2
9. Identify hybrid vehicle internal combustion engine service precautions. P-3
10. Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition. P-3

## I. ENGINE REPAIR

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

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. P-1
2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-1
3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2
4. Adjust valves (mechanical or hydraulic lifters). P-1
5. 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 components; verify correct camshaft timing. P-1
6. Establish camshaft position sensor indexing. P-1
7. Inspect valve springs for squareness and free height comparison; determine necessary action. P-3
8. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action. P-3
9. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action. P-3
10. Inspect valves and valve seats; determine necessary action. P-3
11. Check valve spring assembled height and valve stem height; determine necessary action. P-3
12. Inspect valve lifters; determine necessary action. P-2
13. Inspect and/or measure camshaft for runout, journal wear and lobe wear. P-2

14. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action. P-3

## **I. ENGINE REPAIR**

### **C. Engine Block Assembly Diagnosis and Repair**

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer). P-2

2. Disassemble engine block; clean and prepare components for inspection and reassembly. P-1

3. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action. P-2

4. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action. P-2

5. Deglaze and clean cylinder walls. P-2

6. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action. P-3

7. 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 necessary action. P-1

8. Inspect main and connecting rod bearings for damage and wear; determine necessary action. P-2

9. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action. P-3

10. Inspect and measure piston skirts and ring lands; determine necessary action. P-2

11. Determine piston-to-bore clearance. P-2

12. Inspect, measure, and install piston rings. P-2

13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time. P-2

14. Assemble engine block. P-1

## I. ENGINE REPAIR

### D. Lubrication and Cooling Systems Diagnosis and Repair

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core and galley plugs; determine necessary action. P-1

2. Identify causes of engine overheating. P-1

3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

5. Inspect, remove, and replace water pump. P-2

6. Remove and replace radiator. P-2

7. Remove, inspect, and replace thermostat and gasket/seal. P-1

8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. P-1

9. Perform oil pressure tests; determine necessary action. P-1

10. Perform engine oil and filter change. P-1

11. Inspect auxiliary coolers; determine necessary action. P-3

12. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

13. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action. P-2

ER Tasks	
P-1	23
P-2	17
P-3	11
	51

## AUTOMATIC TRANSMISSION AND TRANSAXLE.

**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: Transmission and Transaxle Diagnosis

1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. P-1
2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Diagnose fluid loss and condition concerns; determine necessary action. P-1
4. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1
5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1
6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action. P-1
7. Diagnose noise and vibration concerns; determine necessary action. P-2
8. Perform stall test; determine necessary action. P-3
9. Perform lock-up converter system tests; determine necessary action. P-3
10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1
11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2

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

### **B. In-Vehicle Transmission/Transaxle Maintenance and Repair**

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
2. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1
4. Drain and replace fluid and filter(s). P-1
5. Inspect, replace and align powertrain mounts. P-2

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

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

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-1
2. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. P-1
3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2
4. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
5. Describe the operational characteristics of a hybrid vehicle drive train. P-3
6. Disassemble, clean, and inspect transmission/transaxle. P-2
7. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, checkvalves/balls, screens, spacers, and gaskets). P-2
8. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action. P-2

9. Assemble transmission/transaxle.	P-2
10. Inspect, measure, and reseal oil pump assembly and components.	P-2
11. Measure transmission/transaxle end play or preload; determine necessary action.	P-1
12. Inspect, measure, and replace thrust washers and bearings.	P-2
13. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2
14. Inspect bushings; determine necessary action.	P-2
15. Inspect and measure planetary gear assembly components; determine necessary action.	P-2
16. Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.	P-2
17. Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.	P-2
18. Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
19. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates, bands and drums; determine necessary action.	P-2
20. Measure clutch pack clearance; determine necessary action.	P-1
21. Air test operation of clutch and servo assemblies.	P-1
22. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, retainers; determine necessary action.	P-2

<b>AT Tasks</b>	
P-1	15
P-2	20
P-3	4
	39

## MANUAL DRIVE TRAIN AND AXLES

**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: Drive Train Diagnosis

1. Identify and interpret drive train concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Check fluid condition; check for leaks; determine necessary action. P-1
4. Drain and refill manual transmission/transaxle and final drive unit. P-1

### III. MANUAL DRIVE TRAIN AND AXLES

#### B. Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. P-1
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. P-1
3. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1
4. Bleed clutch hydraulic system. P-1
5. Check and adjust clutch master cylinder fluid level; check for leaks. P-1
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1
7. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

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

#### **C. Transmission/Transaxle Diagnosis and Repair**

1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2
2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3
3. Diagnose noise concerns through the application of transmission/transaxle powerflow principles. P-2
4. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. P-2
5. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. P-3
6. 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) Joint Diagnosis and Repair**

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

### III. MANUAL DRIVE TRAIN AND AXLES

#### E. Drive Axle Diagnosis and Repair

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

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2
2. Check and adjust differential housing fluid level. P-1
3. Drain and refill differential housing. P-1
4. Diagnose noise and vibration concerns; determine necessary action. P-2
5. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2
6. Inspect ring gear and measure runout; determine necessary action. P-3
7. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings. P-3
8. Measure and adjust drive pinion depth. P-3
9. Measure and adjust drive pinion bearing preload. P-3
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-3
11. Check ring and pinion tooth contact patterns; perform necessary action. P-3
12. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. P-3
13. Reassemble and reinstall differential case assembly; measure runout; determine necessary action. P-3

##### E.2 Limited Slip Differential

1. Diagnose noise, slippage, and chatter concerns; determine necessary action. P-3
2. Measure rotating torque; determine necessary action. P-3

**E.3 Drive Axles**

- 1. Inspect and replace drive axle wheel studs. P-1
- 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 necessary action. P-2
- 5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. P-2

**III. MANUAL DRIVE TRAIN AND AXLES**

**F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair**

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

<b>MD Tasks</b>	
P-1	17
P-2	12
P-3	20
	49

## SUSPENSION AND STEERING

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

**Comply with personal and environmental safety practices associated with 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: Suspension and Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify and interpret suspension and steering system concerns; determine necessary action. P-1

### IV. SUSPENSION AND STEERING

#### B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2
7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2
8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. P-2

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|--|-----|
| 9. Determine proper power steering fluid type; inspect fluid level and condition.  | P-1 |
| 10. Flush, fill, and bleed power steering system.  | P-2 |
| 11. Inspect for power steering fluid leakage; determine necessary action.  | P-1 |
| 12. Remove, inspect, replace, and adjust power steering pump drive belt.   | P-1 |
| 13. Remove and reinstall power steering pump.  | P-2 |
| 14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.                                | P-2 |
| 15. Inspect and replace power steering hoses and fittings.   | P-2 |
| 16. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. | P-2 |
| 17. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.  | P-1 |
| 18. Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action.  | P-3 |
| 19. Identify hybrid vehicle power steering system electrical circuits and safety precautions.                                  | P-2 |
| 20. Inspect electric power-assisted steering.  | P-3 |

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

##### **C. Suspension Systems Diagnosis and Repair**

- |  |     |
|--|-----|
| 1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. | P-1 |
| 2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.              | P-1 |
| 3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers.                              | P-3 |
| 4. Inspect, remove and install strut rods and bushings.  | P-3 |

5. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators). P-2
6. Inspect, remove and install steering knuckle assemblies. P-3
7. Inspect, remove and install short and long arm suspension system coil springs and spring insulators. P-3
8. Inspect, remove and install torsion bars and mounts P-3
9. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links. P-3
10. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3
11. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings. P-3
12. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts. P-1

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

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

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1
2. Remove, inspect, and service or replace front and rear wheel bearings. P-1
3. Describe the function of the power steering pressure switch. P-3

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

##### **E. Wheel Alignment Diagnosis, Adjustment, and Repair**

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1
2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. P-1

3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel. P-1
4. Check toe-out-on-turns (turning radius); determine necessary action. P-2
5. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2
6. Check rear wheel thrust angle; determine necessary action. P-1
7. Check for front wheel setback; determine necessary action. P-2
8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3
9. Reset steering angle sensor P-2

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

##### **F. Wheels and Tires Diagnosis and Repair**

1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1
2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2
3. Rotate tires according to manufacturer's recommendations. P-1
4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. P-2
5. Diagnose tire pull problems; determine necessary action. P-2
6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1
7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2
8. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

9. Repair tire using internal patch.	P-1	<b>SS Tasks</b>	P-1	23
10. Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps.	P-2		P-2	22
			P-3	12
11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.	P-1			57

## BRAKES

**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: Brake Systems Diagnosis

1. Identify and interpret brake system concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS). P-1
4. Install wheel and torque lug nuts. P-1

### V. BRAKES

#### B. Hydraulic System Diagnosis and Repair

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 necessary action. P-1
3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1
4. Remove, bench bleed, and reinstall master cylinder. P-1

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-3
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action. P-1
7. Replace brake lines, hoses, fittings, and supports. P-2
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2
9. Select, handle, store, and fill brake fluids to proper level. P-1
10. Inspect, test, and/or replace components of brake warning light system. P-3
11. Identify components of brake warning light system. P-2
12. Bleed and/or flush brake system. P-1
13. Test brake fluid for contamination. P-1

## **V. BRAKES**

### **C. Drum Brake Diagnosis and Repair**

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

## V. BRAKES

### D. Disc Brake Diagnosis and Repair

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

## V. BRAKES

### E. Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action. P-1
4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action. P-3
5. Measure and adjust master cylinder pushrod length. P-3

## V. BRAKES

### F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-3
2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1
3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2
4. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1
5. Check operation of brake stop light system. P-1
6. Replace wheel bearing and race. P-2
7. Remove and reinstall sealed wheel bearing assembly. P-2
8. Inspect and replace wheel studs. P-1

## V. BRAKES

### G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action. P-1
2. Identify traction control/vehicle stability control system components. P-3
3. Describe the operation of a regenerative braking system. P-3

4. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action. P-2
5. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action. P-2
6. Depressurize high-pressure components of an electronic brake control system. P-3
7. Bleed the electronic brake control system hydraulic circuits. P-1
8. 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-3
9. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3

BR Tasks		
P-1		34
P-2		12
P-3		11
		57

## ELECTRICAL/ELECTRONIC SYSTEMS

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

**Comply with personal and environmental safety practices associated with 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: Electrical System Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1

4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
5. Check operation of electrical circuits with a test light. P-1
6. Check operation of electrical circuits with fused jumper wires. P-1
7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1
8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. P-1
11. Replace electrical connectors and terminal ends. P-1
12. Repair wiring harness. P-1
13. Perform solder repair of electrical wiring. P-1
14. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. P-2
15. Repair CAN/BUS wiring harness. P-1

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

### **B. Battery Diagnosis and Service**

1. Perform battery state-of-charge test; determine necessary action. P-1
2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1
3. Maintain or restore electronic memory functions. P-1
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1
5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

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

### **C. Starting System Diagnosis and Repair**

1. Perform starter current draw tests; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary 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 necessary action. P-2
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

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

### **D. Charging System Diagnosis and Repair**

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

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

### **E. Lighting Systems Diagnosis and Repair**

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action. P-1
2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1
3. Aim headlights. P-2
4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

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

### **F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair**

1. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action. P-2
2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action. P-2

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

### **G. Horn and Wiper/Washer Diagnosis and Repair**

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1
2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2
3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

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

### **H. Accessories Diagnosis and Repair**

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2

2. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action. P-2
3. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action. P-3
4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2
5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1
6. Remove and reinstall door panel. P-1
7. Check for module communication errors (including CAN/BUS systems) using a scan tool. P-2
8. Describe the operation of keyless entry/remote-start systems. P-3
9. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1
10. Verify windshield wiper and washer operation, replace wiper blades. P-1
11. Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action. P-3
12. Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action. P-3
13. Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems. P-3
14. Describe the process for software transfers, software updates, or flash reprogramming on electronic modules. P-3

<b>EE Tasks</b>	
P-1	36
P-2	14
P-3	8
	<b>58</b>

## HEATING AND AIR CONDITIONING

**For every task in Heating and Air Conditioning, 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 AND AIR CONDITIONING

#### A. General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Performance test A/C system; identify problems. P-1
4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2
5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1
6. Leak test A/C system; determine necessary action. P-1
7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2
8. Determine recommended oil and oil capacity for system application. P-1
9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

### VII. HEATING AND AIR CONDITIONING

#### B. Refrigeration System Component Diagnosis and Repair

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1
2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2
4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2
5. Determine need for an additional A/C system filter; perform necessary action. P-3
6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2
7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1
8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2
9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1
10. Inspect evaporator housing water drain; perform necessary action. P-1
11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. P-2
12. Determine procedure to remove and reinstall evaporator; determine required oil quantity. P-2
13. Remove, inspect, and reinstall condenser; determine required oil quantity. P-2

## **VII. HEATING AND AIR CONDITIONING**

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

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1
2. Inspect and test heater control valve(s); perform necessary action. P-2
3. Diagnose temperature control problems in the heater/ventilation system; determine PCM) to interrupt system operation; determine necessary action. P-2
4. Determine procedure to remove, inspect, and reinstall heater core. P-2

## VII. HEATING AND AIR CONDITIONING

### D. Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1
2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2
3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2
4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3
5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3
6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1
7. Identify the source of A/C system odors. P-2
8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

## VII. HEATING AND AIR CONDITIONING

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

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1
2. Identify and recover A/C system refrigerant. P-1
3. Recycle, label, and store refrigerant. P-1
4. Evacuate and charge A/C system; add refrigerant oil as required. P-1

<b>HA Tasks</b>	
P-1	17
P-2	17
P-3	4
	38

## ENGINE PERFORMANCE

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: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Diagnose abnormal engine noises or vibration concerns; determine necessary action. P-3
4. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action. P-2
5. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1
6. Perform cylinder power balance test; determine necessary action. P-2
7. Perform cylinder cranking and running compression tests; determine necessary action. P-1
8. Perform cylinder leakage test; determine necessary action. P-1
9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. P-2
10. Verify engine operating temperature; determine necessary action. P-1
11. Verify correct camshaft timing. P-1

### VIII. ENGINE PERFORMANCE

#### B. Computerized Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. 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 necessary action.   | P-2 |
| 4. Describe the importance of running all OBDII monitors for repair verification.   | P-1 |
| 5. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.   | P-1 |
| 6. Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.   | P-1 |
| 7. 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); perform necessary action.   | P-2 |
| 8. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM installed accessories, or similar systems); determine necessary action. | P-3 |

## **VIII. ENGINE PERFORMANCE**

### **C. Ignition System Diagnosis and Repair**

- |   |     |
|---|-----|
| 1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. | P-2 |
| 2. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.   | P-1 |

- 3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. P-3
- 4. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

**VIII. ENGINE PERFORMANCE**

**D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair**

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

## VIII. ENGINE PERFORMANCE

### E. Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-3
2. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2
3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. P-3
4. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. P-2
5. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action. P-2
6. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. P-2
7. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action. P-2
8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action. P-3
9. Inspect and test catalytic converter efficiency. P-2
10. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action. P-1
11. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. P-3

<b>EP Tasks</b>	
P-1	21
P-2	17
P-3	9
	47

#### **Grand Total - Tasks**

P-1	186
P-2	131
P-3	79

**REQUIRED SUPPLEMENTAL TASKS** 26

422

## **REQUIRED SUPPLEMENTAL TASKS**

### **Shop and Personal Safety**

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

### **Tools and Equipment**

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.

4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

### **Preparing Vehicle for Service**

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

### **Preparing Vehicle for Customer**

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

## Task List Priority Item Totals (by accreditation level)

### Maintenance & Light Repair

P-1 = 117    95% = 111 tasks  
P-2 = 34    80% = 27 tasks  
P-3 = 15    50% = 8 tasks

Required Supplemental Tasks = 26

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### Automobile Service Technology

P-1 = 172    95% = 163 tasks  
P-2 = 90    80% = 72 tasks  
P-3 = 47    50% = 24 tasks

Required Supplemental Tasks = 26

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### Master Automobile Service Technology

P-1 = 186    95% = 177 tasks  
P-2 = 131    80% = 105 tasks  
P-3 = 79    50% = 40 tasks

Required Supplemental Tasks = 26

**Total Tasks 422**

## DEFINITIONS – TECHNICAL TERMS

1. ADJUST - To bring components to specified operational settings.
2. ALIGN - To r restore the proper position of components.
3. ANALYZE - Assess the condition of a component or system.
4. ASSEMBLE (REASSEMBLE) - To fit together the components of a device or system.
5. BALANCE - To establish correct linear, rotational or weight relationship.
6. BLEED - To remove air from a closed system.
7. CAN – Controller Area Network. CAN is a network protocol (SAE J2284/ISO 15765-4) used to interconnect a network of electronic control modules.
8. CHARGE - To bring to a specified state, e.g., battery or air conditioning system.
9. CHECK - To verify condition by performing an operational or comparative examination.
10. CLEAN - To rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.
11. DEGLAZE – To remove a smooth glossy surface.
12. DETERMINE - To establish the procedure to be used to perform the necessary repair.
13. DETERMINE NECESSARY 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.
14. DIAGNOSE - To identify the cause of a problem.
15. DISASSEMBLE - To separate a component's parts as a preparation for cleaning, inspection or service.
16. DISCHARGE - To empty a storage device or system.

17. EVACUATE - To remove air, fluid or vapor from a closed system by use of a vacuum pump.
18. FLUSH - To internally clean a component or system.
19. HIGH VOLTAGE – Voltages of 50 volts and higher.
20. HONE - To restore or resize a bore by using rotating cutting stones.
21. JUMP START - To use an auxiliary power supply to assist a battery to crank an engine.
22. LOCATE – Determine or establish a specific spot or area.
23. MEASURE - To determine existing dimensions/values for comparison to specifications.
24. NETWORK - A system of interconnected electrical modules or devices.
25. ON-BOARD DIAGNOSTICS (OBD) - Diagnostic protocol which monitors computer inputs and outputs for failures.
26. PARASITIC DRAW - Electrical loads which are still present when the ignition circuit is OFF.
27. PERFORM - To accomplish a procedure in accordance with established methods and standards.
28. 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.
29. PURGE - To remove air or fluid from a closed system.
30. REMOVE - To disconnect and separate a component from a system.
31. REPAIR - To restore a malfunctioning component or system to operating condition.
32. REPLACE - To exchange a component; to reinstall a component.
33. RESURFACE – To restore correct finish.
34. SERVICE - To perform a procedure as specified in the owner's or service manual.
35. TEST - To verify condition through the use of meters, gauges or instruments.

36. 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).
37. VERIFY - To confirm that a problem exists after hearing the customer's concern; or, to confirm the effectiveness of a repair.
38. VOLTAGE DROP - A reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.

## TOOLS AND EQUIPMENT

Local employer needs and the availability of funds are key factors for determining each program's structure and operation. The NATEF Standards recognize that not all programs have the same needs, nor do all programs teach 100 % of the NATEF 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 NATEF tool lists are organized into three basic categories: *Hand Tools*, *General Lab/Shop Equipment*, and *Tools and Equipment by Level*. The Specialty Tools and Equipment section is further separated into the three NATEF Automobile Accreditation categories. When referring to the tools and equipment list, please note the following:

- A. The organization of the tool list is not intended to dictate how a program organizes its tool crib or student tool sets (i.e., which tools should be in a student set, if utilized, and which should be in the tool crib or shop area).
- B. Quantities for each tool or piece of equipment are determined by the program needs; however, sufficient quantities to provide quality instruction should be on hand.
- C. For *Tools and Equipment by Level*, the program need only have those tools for the level being accredited.
- D. Programs may meet the equipment requirements by borrowing special equipment or providing for off-site instruction (e.g., in a dealership or independent repair shop). Use of borrowed or off-site equipment *must* be appropriately documented.
- E. No specific brand names for tools and equipment are specified or required.
- F. Although the NATEF 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 Blow Gun (meeting OSHA requirements)  
Allen (Wrench or Socket) Set - Standard (.050" - 3/8")  
Allen (Wrench or Socket) Set - Metric (2mm - 8mm, 10mm, 12mm)  
Battery Post Cleaner  
Battery Terminal Pliers  
Battery Terminal Puller  
Chisels:  
    Cape 5/16"  
    Cold 3/8", 3/4"  
Chisel Holder  
Claw Type Pickup Tool  
Combination Wrenches:  
    Standard (1/4" – 1 1/4")  
    Metric (7mm - 24mm)  
Crowfoot Wrench Set - Metric  
Crowfoot Wrench Set – Standard  
Ear Protection  
Feeler Gauge (Blade Type):  
    .002" - .040"  
    .006mm - .070mm  
Files:  
    Coarse 6" and 12"  
    Fine 6" and 12"  
    Half Round 12"  
    Round 6" and 12"  
Flare Nut (tubing) Wrenches:  
    3/8" - 3/4"  
    10mm - 17mm  
Flashlight  
Fuse Puller  
Fused Jumper Wire Set (with various adapters)  
Hack Saw  
Hammers:  
    16 oz. Ball Peen  
    Brass  
    Dead Blow Plastic Mallet  
    Plastic Tip  
    Rubber Mallet  
Inspection Mirror  
Magnetic Pickup Tool  
Pliers:

- Combination 6"
- Hose Clamp
- Locking Jaw
- Needle Nose 6"
- Side Cutting
- Slip Joint (Water Pump)
- Pry Bars:
  - Rolling Head
  - Straight
- Punches:
  - Center
  - Brass Drift
  - Pin 1/8", 3/16", 1/4", 5/16 "
  - Taper 3/8", 1/2", 5/8"
- Safety Glasses (meeting OSHA requirements)
- Scraper:
  - Carbon 1"
  - Gasket 1"
- Screwdriver - Blade Type:
  - Stubby
  - 6", 9", 12"
  - Offset
- Screwdriver - Phillips:
  - Stubby #1, #2
  - 6" #1, #2
  - 12" #3
  - Offset #2
- Screwdriver - Impact Driver Set
- Screw Starter:
  - Phillips
  - Standard
- Socket Set - 1/4" Drive:
  - 1/4" - 1/2" Standard Depth
  - 1/4" - 1/2" Deep
  - 6mm - 12mm Standard Depth
  - 6mm - 12mm Deep
  - Flex/Universal Type
  - 3", 6" Extensions
  - Ratchet
- Socket Set - 3/8" Drive:
  - 5/16" - 3/4" Standard Depth (6 point)
  - 3/8" - 3/4" Deep (6 point)
  - 10mm - 19mm Standard Depth
  - 10mm - 19mm Deep
  - 3", 5", 10" Extensions
  - Flexhead Ratchet

Ratchet  
Spark Plug Sockets 5/8", 13/16"  
Speed Handle  
Universal Joint  
Flexible Socket Set 3/8" - 3/4"  
Flexible Socket Set 10mm - 19mm  
Socket Set - 1/2" Drive:  
7/16" - 1 1/8" Standard Depth  
7/16" - 1 1/8" Deep  
10mm - 24mm Standard Depth  
10mm - 24mm Deep  
3", 6", 12" Extensions  
Flex Handle (Breaker Bar)  
Ratchet  
Spark Plug Feeler Gauge (Gap Tool)  
Tape Measure – Standard and Metric  
Test Light (12V and self-powered)  
Tire Pressure Gauge  
Tire Tread Depth Gauge  
Torque Wrench:  
3/8" Drive (10 - 250 lb. in.)  
3/8" Drive (5 - 75 lb. ft.)  
1/2" Drive (50 - 250 lb. ft.)  
Torx® Set (screwdrivers and/or sockets):  
T-8 to T-60  
Wire Brush

## GENERAL LAB/SHOP EQUIPMENT

The tools and equipment on this list are used in general lab/shop work but are not generally considered to be individually owned hand tools. A well-equipped, accredited program should have all of these general tools and equipment readily available and in sufficient quantity to provide quality instruction.

Air Chisel Set (various bits)  
Air Compressor and Hoses  
Air Pressure Regulator  
Air Ratchet (3/8" drive)  
Automotive Stethoscope (electronic recommended)  
Axle Stands (Jack Stands)  
Axle Support Stands (Screw Jacks)  
Battery Charger  
Battery/Starter/Charging System Tester  
Bearing Packer (hand operated)  
Belt Tension Gauge  
Bench or Pedestal Grinder  
Coolant/Combustion Gas Detector (recommended)  
Coolant Tester  
Cooling System Pressure Tester and Adapters  
Creeper  
Cylinder Leakage Tester  
Dial Indicator with Flex Arm and Clamp Base  
Digital Multimeter (DMM) with various lead sets (sufficient quantities to meet instruction goals)  
Drain Pans  
Drill - 3/8" variable speed, reversible  
Drill - 1/2" variable speed, reversible  
Electric Heat Gun  
Engine Coolant Recovery Equipment or Recycler or Coolant Disposal Contract Service  
Extension Cords  
Face Shields  
Fender Covers  
Floor Jack (1½ Ton Minimum)  
Hand Held Vacuum Pump  
Hoist(s)  
Hood Prop  
Hydraulic Press with adapters  
Impact Socket Sets - 3/8" Drive (Standard and Metric)  
Impact Sockets - 1/2" Drive (7/16" - 1 1/8")  
Impact Sockets - 1/2" Drive (12mm – 24mm)  
Impact Sockets – 1/2" Drive Deep (30 mm, 32 mm, 36mm)  
Impact Wrench - 1/2" Drive

Impact Wrench - 3/8" Drive  
Jumper Cables  
Master Puller Set  
Micrometer (Depth)  
Micrometers - 0-1", 1-2", 2-3", 3-4", 4-5" (Outside Type)  
Oil Can - Pump Type  
Oil Filter Wrench and Sockets  
Oxy-Acetylene Torch Set  
Parts Cleaning Tank and Gloves (non-solvent based cleanser suggested)  
Remote Starter Switch  
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  
Snap Ring Pliers Set - external  
Snap Ring Pliers Set - internal  
Soldering Gun  
Soldering Iron (Pencil Tip)  
Spark Plug Boot Puller  
Tap and Die Set - Standard  
Tap and Die Set – Metric  
Temperature Sensing Device  
Thread Repair Insert Kit  
Tire Inflator Chuck  
Trouble/Work Lights (Non-incandescent)  
Tube Quick Disconnect Tool Set  
Tubing Bender  
Tubing Cutter/Flaring Set (Double-lap and ISO)  
Twist Drill Set - 1/64" - 1/2"  
Ultra Violet Leak Detection Device (Black Light)  
Used Oil Receptacle with extension neck and funnel  
Valve Core Removing Tool  
Vernier Calipers  
    0 - 6"  
    0 - 125mm  
Wheel Chocks  
Workbenches with vises

## **SPECIALTY TOOLS AND EQUIPMENT**

### **WITHIN EACH ACCREDITATION CATEGORY**

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

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

## **MAINTENANCE & LIGHT REPAIR**

### **SUSPENSION & STEERING**

- Brake Pedal Depressor
- Hand Grease Gun
- Shock Absorber Tools
- Tire Mounting Machine (rim clamp type)
- Tire Patching Tools and Supplies
- Wheel Balancer - Electronic Type
- Wheel Weight Pliers

### **BRAKES**

- 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 Kit
- Brake Lathe (bench with disc and drum service attachments)
- Brake Lathe (on car)
- Brake Shoe Adjusting Gauge
- Brake Spring Remover/Installer
- Brake Spring Pliers
- Brake Spoon
- Piston Retraction Set
- Wheel Stud Service Kit

### **ENGINE PERFORMANCE**

- Compression Tester
- Cylinder Power Balance Tester
- Infrared Thermometer (or appropriate substitute)
- Vacuum/Pressure Gauge

## **ELECTRICAL/ELECTRONIC SYSTEMS**

Connector Pick Tool Set

Door Panel Trim Tool(s)

Headlight Aimer or Screen

Heat Gun (or equivalent for heat shrinking operations)

Wire and Terminal Repair Kit

## **MANUAL DRIVE TRAIN AND AXLES**

Axle Nut Socket Set (or equivalent)

**Spindle Rethreader Die Set**

Universal Joint Tools

## **ENGINE REPAIR**

Antifreeze/Coolant Tester

## SPECIALTY TOOLS AND EQUIPMENT

### AUTOMOBILE SERVICE TECHNOLOGY

#### SUSPENSION & STEERING

Ball Joint Press and other Special Tools

Brake Pedal Depressor

Bushing Driver Set

Coil Spring Compressor Tool

Chassis Ear (recommended)

Frame Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught)

Hand Grease Gun

Inner Tie Rod End Tool

Pitman Arm Puller

Power Steering Pump Pulley Special Tool Set (appropriate for tasks being taught)

Shock Absorber Tools

Steering Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught)

Steering Column Special Tool Set (appropriate for teaching tasks being utilized)

Strut Spring Compressor Tool

Tie Rod Puller

Tire Mounting Machine (rim clamp type)

Tire Patching Tools and Supplies

Tire Pressure Monitoring System (TPMS) Tool (appropriate for tasks being taught)

Wheel Alignment Equipment-4 wheel (including alignment tools)

Wheel Balancer - Electronic Type

Wheel Weight Pliers

#### BRAKES

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 Kit

Brake Lathe (bench with disc and drum service attachments)

Brake Lathe (on car)

Brake Shoe Adjusting Gauge

Brake Spring Remover/Installer

Brake Spring Pliers

Brake Spoon

Master Cylinder Bleeder Kit

Piston Retraction Set

Wheel Stud Service Kit

## **HEATING AND AIR CONDITIONING**

A/C Compressor Clutch Service Tools

A/C Service Port Adapter Set

Dye Injection Kit

Hygrometer

Leak Detector (to meet current industry standard)

Manifold Gauge Set or equivalent (to meet current industry standard)

Refrigerant Charging Station (to meet current industry standard)

Refrigerant Recovery/Recycling Machine (to meet current industry standard)

Thermometer(s) (digital)

Sealant Detector Kit

## **ENGINE PERFORMANCE**

Cylinder Power Balance Tester

Fuel Injection Pressure Gauge Sets with Adapters

Infrared Thermometer (or appropriate substitute)

Injector Pulse Tester

Leak Detector (Smoke or Nitrogen)

Logic Probe (suggested)

Oxygen Sensor Socket

Pinch-off Pliers

Sending Unit Socket(s)

Spark Plug Thread Tap

Spark Tester

Timing Advance Light

Vacuum/Pressure Gauge

## **AUTOMATIC TRANSMISSION/TRANSAXLE**

Transmission Jack(s)

Transmission/Transaxle Flushing Equipment (recommended)

Transmission/Transaxle Holding Fixtures

Transmission/Transaxle Removal and Installation Equipment

Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)

## **ELECTRICAL/ELECTRONIC SYSTEMS**

Connector Pick Tool Set

Door Panel Trim 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

## **MANUAL DRIVE TRAIN AND AXLES**

- Axle Nut Socket Set (or equivalent)
- Clutch Alignment Set
- Clutch Pilot Bearing/Bushing Puller/Installer
- Constant Velocity Joint (CV) Service Tools:
  - Boot Installation Tool
  - Boot Clamp Pliers or Crimping Ring
- Front Wheel Drive Engine Support Fixture
- Rotating Torque Wrench (beam-type or equivalent)
- Universal Joint Tools
- Spindle Rethreader Die Set**

## **ENGINE REPAIR**

- Antifreeze/Coolant Tester
- Oil Pressure Gauge
- Straight Edge
- Torque Angle Gauge

## SPECIALTY TOOLS AND EQUIPMENT

### MASTER AUTOMOBILE SERVICE TECHNOLOGY

#### SUSPENSION & STEERING

Ball Joint Press and other Special Tools

Brake Pedal Depressor

Bushing Driver Set

Coil Spring Compressor Tool

Chassis Ear (recommended)

Frame Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught)

Hand Grease Gun

Inner Tie Rod End Tool

Pitman Arm Puller

Power Steering Pump Pulley Special Tool Set (appropriate for units being taught)

Power Steering Pressure Gauges (recommended)

Shock Absorber Tools

Strut Spring Compressor Tool

Steering Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught)

Steering Column Special Tool Set (appropriate for teaching units being utilized)

Tie Rod Puller

Tire Mounting Machine (rim clamp type)

Tire Patching Tools and Supplies

Tire Pressure Monitoring System (TPMS) Tool (appropriate for tasks being taught)

Wheel Alignment Equipment-4 wheel (including alignment tools)

Wheel Balancer - Electronic Type

Wheel Weight Pliers

#### BRAKES

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 Kit

Brake Lathe (bench with disc and drum service attachments)

Brake Lathe (on car)

Brake Shoe Adjusting Gauge

Brake Spring Remover/Installer

Brake Spring Pliers

Brake Spoon

Master Cylinder Bleeder Kit

Piston Retraction Set

Wheel Stud Service Kit

## **HEATING AND AIR CONDITIONING**

A/C Compressor Clutch Service Tools

A/C Service Port Adapter Set

**Dye Injection Kit**

Hygrometer

Leak Detector (to meet current industry standards)

Manifold Gauge Set or equivalent (to meet current industry standards)

Refrigerant Charging Station (to meet current industry standards) or equivalent

Refrigerant Identification Equipment

Refrigerant Recovery/Recycling Machine (to meet current industry standards)

Thermometer(s) (digital)

**Sealant Detector Kit**

## **ENGINE PERFORMANCE**

Cylinder Power Balance Tester

Four or Five Gas Exhaust Analyzer (Five Gas recommended)

Fuel Injection Pressure Gauge Sets with Adapters

\* Graphing Multimeter (GMM) and/or Digital Storage Oscilloscope (DSO)

Infrared Thermometer (or appropriate substitute)

Injector Pulse Tester

Leak Detector (Smoke or Nitrogen)

Logic Probe (appropriate for tasks being taught)

Oxygen Sensor Socket

Pinch-off Pliers

Sending Unit Socket(s)

Spark Plug Thread Tap

Spark Tester

Timing Advance Light

Vacuum/Pressure Gauge

\* Also necessary to accomplish tasks in other MAST categories (Brakes and Electrical/Electronic Systems)

## **AUTOMATIC TRANSMISSION/TRANSAXLE**

**Differential Set-up Tools**

Hydraulic Pressure Gauge Set

Transmission Jack(s)

Transmission/Transaxle Flushing Equipment (recommended)

Transmission/Transaxle Removal and Installation Equipment

Transmission/Transaxle Holding Fixtures

Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)

## **ELECTRICAL/ELECTRONIC SYSTEMS**

Connector Pick Tool Set  
Door Panel Trim 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

## **MANUAL DRIVE TRAIN AND AXLES**

Axle Nut Socket Set (or equivalent)  
Clutch Alignment Set  
Clutch Pilot Bearing/Bushing Puller/Installer  
Constant Velocity Joint (CV) Service Tools:  
    Boot Installation Tool  
    Boot Clamp Pliers or Crimping Ring  
Front Wheel Drive Engine Support Fixture  
Rotating Torque Wrench (beam-type or equivalent)  
Special Tools for Transmissions/Transaxles (appropriate for units being taught)  
Spindle Rethreader Die Set  
Universal Joint Tools

## **ENGINE REPAIR**

Ball (Small Hole) Gauges  
Cam Bearing Driver Set (suggested)  
Camshaft Holding Tool (appropriate for units being taught)  
Cylinder Deglazer  
Dial Bore Indicator  
Antifreeze/Coolant Tester  
Engine Stands/Benches  
Inside Micrometer Set:  
    0 - 6"  
    0 - 125mm  
Oil Pressure Gauge  
Outside Micrometer Set:  
    0 - 6"  
    0 - 125mm  
Portable Crane - 1/2 Ton  
Ring Compressor  
Ring Expander  
Ring Groove Cleaner  
Precision Straight Edge  
Telescopic Gauge Set  
Torque Angle Gauge  
V-Blocks  
Valve Spring Compressor  
Valve Spring Tester