ABSTRACT

This project was designed to collect information on the types of skills common to the appliance repair, refrigeration, and air conditioning service areas. A single task inventory was constructed from available course materials, revised by consultants, and administered to a random sample of 30 incumbent workers in each of the two service areas in two counties of Arizona. Completed task inventory forms were analyzed by computer with the tasks ranked according to percent of sample performing each task and time spent by workers performing each task. A report of the analyzed data was distributed to teachers in Arizona to be used as a basis for curriculum revision. This report defines the problem area and describes the goals and objectives, procedures, design and methodology, selection of sample, administration of inventory, and data analysis. Tables provide information about distribution of respondents by job title and years of experience, mean years of experience in service area by job title, and frequency of responses to the question of where training was received by service area. Also included are the task inventory instrument and the task analysis which indicates percentage of respondents performing task and time spent ratings. (NJ)
FINAL REPORT

PROJECT NO. 76-RMG-1305

A SURVEY OF COMMON ELEMENTS IN APPLIANCE REPAIR,
REFRIGERATION AND AIR CONDITIONING

Conducted Under
Section 131(b) Part C of Public Law 90-576

The activity which is the subject of this report was supported in whole or in part by the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

Clair S. Hill, Ph.D.
Northern Arizona University
Flagstaff, Arizona 86001

June 30, 1976
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PROJECT TITLE: A Survey of Common Elements in Appliance Repair, Refrigeration and Air Conditioning

AGENCY: Northern Arizona University
Flagstaff, Arizona 86001

PROJECT DIRECTOR: Clair S. Hill, Ph.D.
Industrial Education Department

DURATION: May 17, 1976 to June 30, 1976

COSTS: RCU $4,335.00 TOTAL $4,335.00

DESCRIPTION OF PROJECT: This project was designed to collect information on the types of skills which were common to the Appliance Repair, Refrigeration and Air Conditioning service areas. These skills along with skills from the Automotive service areas, which have been identified in previously conducted task inventories, could be merged together to form common skill elements for a Mechanical Service cluster course at the high school level.

A single task inventory was constructed from available course materials. This initial task inventory was then revised under the supervision of two consultants who were employed in each of the two service areas.

The revised inventory was administered to a random sample of thirty incumbent workers in each of the two service areas in Maricopa and Coconino counties.

OUTCOMES: Completed task inventory forms were analyzed utilizing the computer at Northern Arizona University. Tasks were ranked according to percent of sample performing each task and time spent by workers performing each task.

A report of the analyzed data obtained from the task inventory was distributed to teachers in Arizona who were teaching or planning to teach one of the mechanical service areas. This material could be used as a basis for curriculum revision and be further validated by local advisory committees.
BODY OF THE REPORT

Problem Area

The 1975-76 Arizona State Plan for Vocational Education in Arizona indicated that there was a basic need for research to identify common skill and knowledge competencies in various occupational areas. It specifically stated that there was a need to identify or develop a task inventory for the mechanical services cluster. These competencies, when derived from workers on the job, could be used by instructors to keep their course content up-to-date and relative to current job skills and knowledge.

The Arizona Department of Economic Security estimated that approximately five hundred twenty new job opportunities would develop for air conditioning and refrigeration servicemen in the state between 1975 and 1978. Four hundred eighty new job opportunities would develop for appliance servicemen. Through the 1970's it was projected that Arizona could expect a "faster than average" growth among service workers.

At the time of this project there were three high school programs for refrigeration and air conditioning in the state. Programs for appliance repair were non-existent at the high school level.

A search of the literature revealed that only a single task inventory was available from the Ohio State Department of Education in air conditioning and refrigeration. No task inventories had been developed for appliance repair. Several states including Missouri, New Jersey, Florida, Mississippi and Texas have developed curriculum materials for the air conditioning and refrigeration area. A few states had also developed curriculum materials for the appliance repair area. A course outline developed by the Association of Home Appliance Manufacturers was also useful for developing the initial task inventory. These curriculum materials were utilized for producing the initial task inventory. Only those tasks which were thought to be performed by incumbent workers were included.

Goal and Objectives

The goal of this project was to provide instructors with an up-to-date analysis which shows the common skill and knowledge elements in the appliance repair, refrigeration and air conditioning service occupations so that job preparation for a number of the job areas in the mechanical services cluster may result.

Objectives were as follows:

1.1 On or before June 1, 1976, the Project director and a consultant in each of the two service areas compiled an initial task inventory which contained at least 200 common elements from the appliance repair, air conditioning
An initial task inventory was developed by searching existing
appliance repair, air conditioning and refrigeration text books, curriculum guides and courses of study. Only the tasks that were thought to be performed by an incumbent worker in these service areas were included. The primary sources of task statements were:

(1) An Analysis of the Air Conditioning, Refrigeration and Heating Occupations (1975)
Frass, Melvin K.; Krause, Marvin
Ohio State Department of Education
The Ohio State University
Columbus, Ohio 43210

(2) Course Outlines for: Refrigeration, Air Conditioning and Appliance Repair (1973)
Dade County Public Schools
Miami, Florida

(3) Air Conditioning and Refrigeration-Instructor's Guides (1973)
University of Missouri
Instructional Materials Laboratory
Columbia, Missouri 65201

(4) Training the Home Appliance Technician (1971 Curriculum Guide)
Association of Home Appliance Manufacturers
20 North Wacker Drive
Chicago, Illinois 60606

(5) Instructional Texts & Materials - Appliance Repair
Whirlpool Corporation
Benton Harbor, Michigan 49022

Westinghouse Area Vocational High School
City of Chicago Board of Education
Chicago, Illinois

(7) Modern Refrigeration and Air Conditioning Laboratory Manual (1968)
The Goodheart-Willcox Co., Inc.
South Holland, Illinois

After the initial identification, the tasks were grouped into areas called duties. The duty categories for the project were identified as:

A. Working with the Public & Customer Relations
B. Using Hand and Power Tools
C. Soldering, Brazing & Welding
D. Testing, Electrical Circuits & Components
E. Making Mechanical Repairs
F. Repairing Refrigerators and Freezers
G. Repairing Ranges
H. Repairing Washing Machines
I. Repairing Dryers
J. Repairing Dishwashers
K. Repairing Disposals
L. Repairing Window Air Conditioners
M. Troubleshooting Refrigeration and Air Conditioning Equipment
N. Servicing & Repairing Refrigeration & Air Conditioning Equipment

Task statements were then assigned to duty statements in the sequential order in which they were normally performed on the job. These task statements were listed in sequential order under each duty so that the incumbent service technician could follow the sequence of servicing an appliance or a unit in his mind as he completed the task inventory.

The initial task inventory was then reviewed and revised by two consultants from each of the two service areas. Mr. Kenyon P. Whitney, Service Manager, Climate Control Co., Inc., and Mr. Chic Hope, owner of Hope's Appliance & T.V. Service served as the final evaluators for the final task inventory.

Each consultant was asked to respond to each task statement individually and comment on its clarity, appropriateness and order in the sequence. One major duty statement was eliminated and two other duty statements were combined. Many task statements were changed or added to make the final inventory of two hundred sixty-seven task statements.

Selection of the Worker Sample

Because this study was conducted during the busy season of a very seasonal type of service work, a minimum number of companies was utilized. Six major companies were used which were recommended by the Executive Director of the Electric League of Arizona.

A random sample of thirty incumbent workers in each service area was selected for the study. These workers were employed by the six companies as service technicians. The majority of the technicians worked out of service trucks. A few of the technicians worked in the shop.

Administration of Inventory

Task inventory forms were personally delivered to the immediate supervisor in charge of the servicemen in each company. The purpose of the study was briefly explained to the supervisor as follows: Each respondent was to complete the four background information questions on the cover page of the inventory form. Next he was asked to read the directions on the first page of the inventory. At this point, if there were no questions, he then checked the tasks which he
performed and rated the tasks which he had checked on a five (5)
point relative time spent scale. A rating of one (1) indicated that
he spent very little time on that task compared with other tasks he
performed. A rating of five (5) indicated that he spent an average
amount of time on that task.

The supervisor was to administer the inventory to his workers
at the weekly or monthly service meeting. Only those workers who had
been chosen in the random sample completed the inventories. The completed
forms were then mailed by the supervisor to the University for
processing. Examples of the cover page and inventory are included in
Appendix A.

A total of twenty-three inventories was completed and returned
from appliance repair servicemen. Three of these were not completed
properly or only completed partially. Twenty of these inventories
were used in the final analysis of the data.

Twenty-one inventories were returned which had been completed
by air conditioning and refrigeration servicemen. Twenty of these
were used in the final data analysis.

Data Analysis

In order to make comparisons between incumbent workers on
specific tasks, the relative time spent ratings were converted to
percentage values. These values were regarded as estimates of the
percentage of work time spent by the respondent on each task. It
was assumed that the sum of the respondent's raw ratings represented
100 percent of his work time. Based on this assumption, each raw
rating was expressed as a percentage of that total. The following
formula was used in converting the raw ratings to percentages of time
spent on each task:

\[
\text{Percentage of time} = \frac{\text{individual raw rating}}{\text{sum of all raw ratings}} \\
\text{for each task} \quad \text{by that individual}
\]

Background Information Summary

An analysis of the data from the background information
cover page presented some interesting findings. The distribution of
respondents by job title and years of experience (Table 1) indicated
that 39.6 percent of the respondents were employed as appliance
repair servicemen. Fifty-one percent were employed as refrigeration
and air conditioning repair servicemen. Almost two percent were
employed as a supervisor. About 7.5 percent indicated the job title
of "other." "Other" was specified as: office owner, dispatcher and
accredited technician. The total number of respondents was forty.
However, several respondents marked more than one job title on their
inventory. Six respondents marked both appliance repair and refri-
geration and air conditioning as a dual job title.
TABLE I. DISTRIBUTION OF RESPONDENTS BY JOB TITLE
AND NUMBER OF YEARS OF EXPERIENCE

<table>
<thead>
<tr>
<th>YEARS OF EXPERIENCE</th>
<th>Appliance Repair</th>
<th>Refrigeration &amp; Air Conditioning Repair</th>
<th>Supervisor</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 (N)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(n)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3-5 (N)</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>(n)</td>
<td>11</td>
<td>7</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6-10 (N)</td>
<td>5</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(n)</td>
<td>9</td>
<td>23</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>11-15 (N)</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>(n)</td>
<td>7</td>
<td>9</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>16-20 (N)</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(n)</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>over 20 (N)</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(n)</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTE: The total number of respondents was forty (40). However, several respondents marked more than one job title on their inventory.
The largest proportion of the refrigeration and air conditioning repair servicemen had an average of six to ten years of work experience. The largest proportion of appliance repair servicemen had three to five years of work experience.

The respondents were a stable group with a number of years in the service area, as indicated by Table 2. The overall mean years of experience for the total sample of forty was 10.44 years. Appliance repairmen averaged 11.0 years of experience. Refrigeration and air conditioning repairmen averaged 9.9 years of experience.

TABLE 2. MEAN YEARS OF EXPERIENCE IN THE SERVICE AREA BY JOB TITLE

<table>
<thead>
<tr>
<th>JOB TITLE</th>
<th>MEAN YEARS WORKED IN SERVICE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appliance Repairman</td>
<td>11.0</td>
</tr>
<tr>
<td>Refrigeration &amp; Air Conditioning Repairman</td>
<td>9.9</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>10.44</td>
</tr>
</tbody>
</table>

The workers’ responses by job title to the question of where they received their training are given in Table 3. It should be noted that a respondent could have checked more than one source of training.

The largest proportion (80 percent) of respondents in all positions received training on-the-job; 43.4 percent received training in private vocational schools. Most of these private schools are sponsored by the large manufacturers of appliances and air conditioning units. Thirty-four and a half (34.5) percent obtained at least part of their training through an apprenticeship program; 21.1 percent received training in the military. These were the major sources of training.
<table>
<thead>
<tr>
<th>TYPE OF TRAINING</th>
<th>JOB TITLE</th>
<th>Appliance Repair</th>
<th>Refrigeration &amp; Air Conditioning Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-the-job</td>
<td>(N)</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>(self-learned)(%)</td>
<td>46.7</td>
<td>33.3</td>
</tr>
<tr>
<td>Military School</td>
<td>(N)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>10.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Private Vocational School</td>
<td>(N)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>26.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Apprenticeship Program</td>
<td>(N)</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>6.7</td>
<td>27.8</td>
</tr>
<tr>
<td>High School Program</td>
<td>(N)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>6.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Community College Program</td>
<td>(N)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>3.3</td>
<td>5.6</td>
</tr>
<tr>
<td>Adult Education Program</td>
<td>(N)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>3.3</td>
<td>2.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>(N)</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

NOTE: Any single respondent may have indicated more than one training program.
Task Analysis

The task analysis for all respondents employed in the two service areas is given in Table 4. The letter and number in the column labeled D-TRK (duty-task) refers to the location of the task on the task inventory which was administered to the respondents. The letter refers to the duty heading under which the task was categorized and the number indicates the placement of the task under that duty heading. A complete list of the duties and task statements is given in Appendix A.

The four columns of figures to the right of the task statements have been calculated to show: (1) percent of members performing each task, (2) average relative time spent by the members performing the task, (3) average relative time spent by all members, and (4) cumulative sum of the average percent time spent by all members.

Examination of the task analysis revealed that a variety of tasks were performed by both groups of service workers as a part of their normal job. The tasks are listed in order of the percent of members performing as shown in the first column. Although many of the tasks received a rather low rating, these tasks are rather specialized and are performed by only one of the service areas. These tasks would be taught in a specialized course.

Recommendations

This study indicates the common tasks related to appliance repair, refrigeration and air conditioning. The analysis provided in Table 4 should be further validated by local advisory committees. After validation it can be merged with the tasks from the automotive service area and used as a basis for a mechanical service cluster program at the high school level.
<table>
<thead>
<tr>
<th>TASK</th>
<th>TASK TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 08</td>
<td>Listen to customer's complaints &amp; observations</td>
</tr>
<tr>
<td>A 09</td>
<td>Test unit &amp; diagnose trouble</td>
</tr>
<tr>
<td>A 10</td>
<td>Estimate job costs &amp; explain to customer</td>
</tr>
<tr>
<td>A 11</td>
<td>Explain malfunction &amp; repairs needed</td>
</tr>
<tr>
<td>A 12</td>
<td>Perform service or repairs required</td>
</tr>
<tr>
<td>A 13</td>
<td>Check unit for proper operation</td>
</tr>
<tr>
<td>A 14</td>
<td>Complete the service order</td>
</tr>
<tr>
<td>A 15</td>
<td>Obtain customer's signature</td>
</tr>
<tr>
<td>B 02</td>
<td>Care for and maintain hand tools</td>
</tr>
<tr>
<td>B 03</td>
<td>Use screwdrivers</td>
</tr>
<tr>
<td>B 04</td>
<td>Use wrenches, sockets and nutdrivers</td>
</tr>
<tr>
<td>B 05</td>
<td>Use pliers and wire strippers</td>
</tr>
<tr>
<td>B 06</td>
<td>Use volt-ohmmeter</td>
</tr>
<tr>
<td>B 07</td>
<td>Read electrical wiring diagrams</td>
</tr>
<tr>
<td>B 08</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 09</td>
<td>Use punches</td>
</tr>
<tr>
<td>B 10</td>
<td>Use tube cutting and reaming tools</td>
</tr>
<tr>
<td>B 11</td>
<td>File metal</td>
</tr>
<tr>
<td>B 12</td>
<td>Operate electric hand drill</td>
</tr>
<tr>
<td>B 13</td>
<td>Use miter saw</td>
</tr>
<tr>
<td>B 14</td>
<td>Use hacksaw</td>
</tr>
<tr>
<td>B 15</td>
<td>Use tube wrench</td>
</tr>
<tr>
<td>B 16</td>
<td>Use socket wrench</td>
</tr>
<tr>
<td>B 17</td>
<td>Use wire strippers</td>
</tr>
<tr>
<td>B 18</td>
<td>Use tube cutter</td>
</tr>
<tr>
<td>B 19</td>
<td>Use pliers</td>
</tr>
<tr>
<td>B 20</td>
<td>Use spanners</td>
</tr>
<tr>
<td>B 21</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 22</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 23</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 24</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 25</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 26</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 27</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 28</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 29</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 30</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 31</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 32</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 33</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 34</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 35</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 36</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 37</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 38</td>
<td>Use test probes</td>
</tr>
<tr>
<td>B 39</td>
<td>Use replacement parts</td>
</tr>
<tr>
<td>B 40</td>
<td>Use test probes</td>
</tr>
<tr>
<td>TASK</td>
<td>TASK TITLE</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>A 06</td>
<td>Obtain service schedule assignment from dispatcher</td>
</tr>
<tr>
<td>B 08</td>
<td>Use chisel</td>
</tr>
<tr>
<td>B 10</td>
<td>Use hammers and mallets</td>
</tr>
<tr>
<td>B 17</td>
<td>Use flaring and swaging tools</td>
</tr>
<tr>
<td>B 19</td>
<td>Use refrigeration charging tools</td>
</tr>
<tr>
<td>D 05</td>
<td>Use ohmmeter</td>
</tr>
<tr>
<td>D 25</td>
<td>Check and adjust a thermostat</td>
</tr>
<tr>
<td>D 31</td>
<td>Test a capacitor-start hermetic motor</td>
</tr>
<tr>
<td>E 11</td>
<td>Install belts and adjust pulleys and belts</td>
</tr>
<tr>
<td>E 12</td>
<td>Measure temperatures</td>
</tr>
<tr>
<td>C 01</td>
<td>Fit parts &amp; clean surfaces</td>
</tr>
<tr>
<td>C 02</td>
<td>Apply flux</td>
</tr>
<tr>
<td>C 04</td>
<td>Clean joints (flux)</td>
</tr>
<tr>
<td>D 20</td>
<td>Check a current relay</td>
</tr>
<tr>
<td>D 22</td>
<td>Check a thermal relay</td>
</tr>
<tr>
<td>E 13</td>
<td>Test for leaks</td>
</tr>
<tr>
<td>C 03</td>
<td>Operate soldering gun, copper or torch</td>
</tr>
<tr>
<td>C 08</td>
<td>Apply flux</td>
</tr>
<tr>
<td>C 09</td>
<td>Adjust regulator</td>
</tr>
<tr>
<td>C 10</td>
<td>Light torch</td>
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<tr>
<td>C 11</td>
<td>Adjust flame</td>
</tr>
<tr>
<td>C 16</td>
<td>Clean joints (flux)</td>
</tr>
<tr>
<td>D 12</td>
<td>Use time and temperature recorder</td>
</tr>
<tr>
<td>D 32</td>
<td>Test &amp; operate a capacitor-start capacitor-run hermetic motor</td>
</tr>
<tr>
<td>E 02</td>
<td>Make flared tube connections</td>
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<tr>
<td>E 03</td>
<td>Repair soldered or brazed connection</td>
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<tr>
<td>E 04</td>
<td>Make a swaged tubing connection</td>
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<tr>
<td>E 07</td>
<td>Operate service valves</td>
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<tr>
<td>E 16</td>
<td>Evacuate a system</td>
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CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

AVERAGE PERCENT TIME SPENT BY ALL MEMBERS -

AVERAGE PERCENT TIME SPENT BY ALL MEMBERS PERFORMING--

RANKED BY PERCENT OF MEMBERS PERFORMING------------------

D-TSK TASK TITLE

<table>
<thead>
<tr>
<th>Task</th>
<th>Task Title</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>F</th>
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<td>Use flywheel pullers</td>
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<td>C 06</td>
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<td>Assemble &amp; support parts</td>
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<td>Use dial thermometer</td>
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<td>D 16</td>
<td>Wire circuits and check measurements</td>
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<td>Measure with steel rule or tape</td>
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<td>Therocouple temperature tester</td>
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<td>Install &amp; test access valves &amp; process tube adaptors</td>
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<td>Shut off valve &amp; bleed off acetylene</td>
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<td>Make a complete tubing assembly</td>
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<td>Check components &amp; Wiring of a 24 volt circuit</td>
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<td>G 18</td>
<td>Set up and test equipment</td>
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CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

RANKED BY PERCENT OF MEMBERS PERFORMING

D - TSK   TASK TITLE

C 19    Fit mating parts     .6500  .0064  .0042  .5408
E 14    Install guages on an external drive refrigerating system .6500  .0076  .0049  .5457
A 05    Establish method of payment .6250  .0161  .0101  .5558
A 17    Make call-back to check customer satisfaction .6250  .0046  .0029  .5587
B 22    Use hand truck .6250  .0047  .0030  .5617
C 20    Clamp and support parts .6000  .0039  .0024  .5641
C 27    Cut using oxyacetylene .6000  .0035  .0021  .5662
C 25    Weld pipe .5750  .0055  .0032  .5694
D 26    Dismantle, repair & assemble a single-phase motor .5500  .0046  .0025  .5719
E 09    Dismantle, assemble and test external drive piston type compressor .5500  .0080  .0044  .5763
C 14    Silver braze stainless steel .5250  .0049  .0026  .5789
D 14    Use sling psychrometer .5250  .0045  .0024  .5813
B 01    Identify and replace unsafe tools .5000  .0042  .0021  .5834
B 06    Use torque wrench .5000  .0046  .0023  .5857
D 11    Use thermistor temperature tester .5000  .0038  .0019  .5876
E 10    Dismantle, assemble and test an external drive rotary type compressor .5000  .0078  .0039  .5915
M 02    Check circuitry of the compressor protector and relay .5000  .0075  .0037  .5952
M 03    Check relay .5000  .0072  .0036  .5988
M 05    Check circulation fan motors .5000  .0077  .0039  .6027
M 07    Attach manifold and gauges to service valves and check pressure .5000  .0083  .0042  .6069
M 08    Install in-line service valves and measure pressures .5000  .0065  .0033  .6102
M 09    Check compressor efficiency .5000  .0066  .0032  .6135
M 10    Locate leak in a refrigeration system using electronic leak detector .5000  .0061  .0031  .6166
M 11    Locate leak in a refrigeration system using halide torch .5000  .0085  .0042  .6208
## Cumulative Sum of Average Percent Time Spent by All Members

### Average Percent Time Spent by All Members

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Percent of Members Performing</th>
<th>I</th>
<th>I</th>
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</thead>
<tbody>
<tr>
<td>Locate leak in a refrigeration system using bubble method</td>
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<tr>
<td>Check unit operation-oil level-sight glass-moisture indicator</td>
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<tr>
<td>Check, test and adjust thermostatic expansion valve</td>
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<tr>
<td>Check and adjust low pressure safety control</td>
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<tr>
<td>Check and adjust high pressure safety control</td>
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<tr>
<td>Adjust and calibrate oil pressure control</td>
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<tr>
<td>Check and adjust water valve</td>
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<tr>
<td>Check condensate pump and drain</td>
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<tr>
<td>Check blows assembly and filter</td>
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<tr>
<td>Check heat pump reversing system</td>
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<tr>
<td>Evacuate a refrigeration system</td>
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<tr>
<td>Pump system down into receiving tank</td>
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<tr>
<td>Recharge system using sight glass</td>
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<tr>
<td>Recharge system weighing in refrigerent</td>
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<tr>
<td>Remove and replace capacitor</td>
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<tr>
<td>Remove and replace fan motors</td>
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<tr>
<td>Repair leak in copper lines of system</td>
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<tr>
<td>Remove and replace compressor</td>
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<tr>
<td>Add oil to system</td>
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<tr>
<td>Remove and replace thermostatic expansion valve</td>
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<tr>
<td>Install a drier, sight glass or moisture indicator</td>
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<tr>
<td>Remove and replace high or low pressure safety control</td>
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<tr>
<td>Balance the air conditioning system</td>
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<tr>
<td>Check and replace filters - clean indoor &amp; outdoor coils</td>
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<tr>
<td>Operate bench grinder</td>
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<tr>
<td>Hook hermetic compressor directly to power supply</td>
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### Task Titles

- Locate leak in a refrigeration system using bubble method
- Check unit operation-oil level-sight glass-moisture indicator
- Check, test and adjust thermostatic expansion valve
- Check and adjust low pressure safety control
- Check and adjust high pressure safety control
- Adjust and calibrate oil pressure control
- Check and adjust water valve
- Check condensate pump and drain
- Check blows assembly and filter
- Check heat pump reversing system
- Evacuate a refrigeration system
- Pump system down into receiving tank
- Recharge system using sight glass
- Recharge system weighing in refrigerent
- Remove and replace capacitor
- Remove and replace fan motors
- Repair leak in copper lines of system
- Remove and replace compressor
- Add oil to system
- Remove and replace thermostatic expansion valve
- Install a drier, sight glass or moisture indicator
- Remove and replace high or low pressure safety control
- Balance the air conditioning system
- Check and replace filters - clean indoor & outdoor coils
- Operate bench grinder
- Hook hermetic compressor directly to power supply
CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING

RANKED BY PERCENT OF MEMBERS PERFORMING

D-TSK   TASK TITLE

M 06  Check and adjust control thermostat          .4750  .0074  .0035  .7191
M 23  Check humidity with sling psychrometer       .4750  .0031  .0015  .7206
M 24  Check and adjust humidstat                    .4750  .0048  .0023  .7229
N 05  Fill dial a charge                             .4750  .0040  .0019  .7248
N 06  Recharge a refrigeration system using dial a charge .4750  .0041  .0019  .7267
N 07  Remove and replace control thermostat         .4750  .0054  .0026  .7293
N 09  Remove and replace motor overload protector    .4750  .0055  .0026  .7319
N 25  Remove and replace oil pressure safety control .4750  .0082  .0039  .7358
N 28  Remove and replace condensation pump motor     .4750  .0043  .0020  .7378
B 23  Use dollie                                     .4500  .0049  .0022  .7400
C 13  Braze cast iron                                .4500  .0024  .0011  .7411
C 26  Weld cast iron                                 .4500  .0032  .0015  .7426
M 22  Check hot gas defrost dolenoid and valve       .4500  .0030  .0014  .7440
N 08  Remove and replace defrost timer               .4500  .0032  .0014  .7454
N 12  Remove and replace defrost terminator          .4500  .0027  .0012  .7466
N 13  Remove and replace relay                       .4500  .0059  .0027  .7493
N 18  Remove restriction from capillary tube         .4500  .0033  .0015  .7508
N 29  Remove and replace humidstat                   .4500  .0041  .0018  .7526
M 16  Check and adjust pressure motor control        .4250  .0069  .0029  .7555
M 20  Check icemaker for operation                   .4250  .0042  .0018  .7573
N 11  Remove and replace defrost heater               .4250  .0026  .0011  .7584
N 24  Remove and replace high or low pressure motor control .4250  .0077  .0033  .7617
D 03  Use oven tester                                 .4000  .0066  .0027  .7644
F 01  Troubleshoot & diagnose refrigerator or freezer problems .4000  .0084  .0034  .7678
F 02  Replace or adjust thermostats                   .4000  .0074  .0030  .7708
F 05  Repair and replace relays, overload devices     .4000  .0071  .0028  .7736
F 06  Repair & replace defroster controls, heater & timer .4000  .0075  .0030  .7766
F 09  Adjust tubing to eliminate noise                .4000  .0068  .0027  .7793
F 10  Remove and install door gasket                  .4000  .0053  .0021  .7814
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<th>CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS</th>
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<td>Adjust and clean burners</td>
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<td>Test and replace thermostats</td>
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<td>Use oven test thermometer</td>
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<td>H 04</td>
<td>Replace or repair regular motor</td>
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<td>.4000  .0058  .0023</td>
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<td>Replace throw-away motor</td>
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<td>Replace water pump</td>
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<td>Clean or replace inlet valve</td>
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<td>Replace belts</td>
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<td>Test and replace control panel switches</td>
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<td>Explain washability problems to customer</td>
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<td>Adjust belts and pulleys</td>
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<td>CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS</td>
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<td>Replace heating element</td>
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<td>Replace drum seals (felts)</td>
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<td>I 09</td>
<td>Clean lint from system</td>
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<td>Test gas valve</td>
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<td>Test and repair constant pilot</td>
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<td>Test and replace surface units</td>
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<td>Troubleshoot and analyze problem</td>
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<td>Locate &amp; repair refrigerant leak</td>
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<td>.0028</td>
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<td>Repair trans-gear case</td>
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<td>Repair overload switch</td>
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<td>.0053</td>
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<td>K 03</td>
<td>Repair motors</td>
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<td>K 06</td>
<td>Repair or replace switches</td>
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<td>.0016</td>
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<td>Replace &amp; adjust thermostats, relays &amp; overloads</td>
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<td>Replace cutters</td>
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<td>L 04</td>
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<td>.0013</td>
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<td>F 12</td>
<td>Service or replace capillary tube</td>
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<td>.0051</td>
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<td>Install dryer</td>
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<td>.0039</td>
<td>.0011</td>
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<td>Install dishwasher</td>
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<td>.0057</td>
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<td>0.0007</td>
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<td>L 10</td>
<td>Install a window unit</td>
<td>2000</td>
<td>0.0023</td>
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<td>B 15</td>
<td>Operate drill press</td>
<td>2000</td>
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<td>K 07</td>
<td>Install a food waste disposal-siphon break</td>
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<td>Remove and replace capillary tube</td>
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<td>D 15</td>
<td>Use a closed end manometer</td>
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<td>Repair evaporator with epoxy</td>
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<td>C 28</td>
<td>Form, bend and hardface</td>
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<td>N 20</td>
<td>Remove &amp; replace automatic expansion valve</td>
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</table>
APPLIANCE REPAIR, REFRIGERATION & AIR CONDITIONER
TASK INVENTORY

BACKGROUND INFORMATION

1. Check your present job title:
   Appliance Repairman ___  Supervisor ___
   Refrigeration & Air Conditioning Repairman ___
   Other (specify) ___

2. How many years have you worked as a repairman?
   ___ years

3. Where did you receive your training? (check one or more)
   On-the-job (self-learned) ___
   Military school ___
   Private vocational school ___
   Apprenticeship program ___
   High School program ___
   Community College Program ___
   Adult Education Program ___

4. Are you specialized in a mechanical service area?
   (e.g. washing machines & dryers or four ton A/C units)
   Yes ___  No ___
## INSTRUCTIONS FOR COMPLETING TASK INVENTORY

Carefully read each of the task statements and place a check mark (✓) in the column labeled Check for each task which you perform on your present job.

After checking all tasks which you perform, then rate only the tasks you have checked by placing a number 1, 2, 3, 4 or 5 in the column labeled Time Spent which most closely estimates the amount of time you spend in performing the task.

Time spent means the total time you spend on each task you are rating, compared with the time you spend on each of the other tasks you do.

At the bottom on any page, write in and rate any tasks you do which are not listed.

---

### Task Inventory

#### A. Working with the Public & Customer Relations

<table>
<thead>
<tr>
<th>Check</th>
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<tr>
<td>2.</td>
<td>Slightly Below Average</td>
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<tr>
<td>3.</td>
<td>Average</td>
</tr>
<tr>
<td>4.</td>
<td>Slightly Above Average</td>
</tr>
<tr>
<td>5.</td>
<td>Above Average</td>
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</tbody>
</table>

- 1. Answer telephone service call and make appt.
- 2. Prepare service order
- 3. Check service file for past service history
- 4. Explain guarantee or warranty status
- 5. Establish method of payment
- 6. Obtain service schedule assignment from dispatcher
- 7. Establish route & travel to destination
- 8. Listen to customer’s complaints & observations
- 9. Test unit & diagnose trouble
Listed below are the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

**A. Working with the Public & Customer Relations (continued)**

<table>
<thead>
<tr>
<th>Task</th>
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<th>Time Spent</th>
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<tbody>
<tr>
<td>10. Explain malfunction &amp; repairs needed</td>
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<tr>
<td>11. Estimate job costs &amp; explain to customer</td>
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<tr>
<td>12. Perform service or repairs required</td>
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<td></td>
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<tr>
<td>13. Check unit for proper operation</td>
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<tr>
<td>14. Clean-up servicing area &amp; unit</td>
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<td>15. Complete the service order</td>
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<td>16. Obtain customer's signature</td>
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<tr>
<td>17. Make call-back to check customer satisfaction</td>
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## APPLIANCE REPAIR, REFRIGERATION & AIR CONDITIONING TASK INVENTORY

Listed below are a duty and the task which it includes. Check all tasks which you perform. If any tasks you do which are not listed, then rate the tasks you have checked.

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<tr>
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<th>Time Spent</th>
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<td>1. Below Average</td>
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<td>2. Slightly Below Average</td>
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<tr>
<td>3.</td>
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</tr>
<tr>
<td>4.</td>
<td>4. Slightly Above Average</td>
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<tr>
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</table>

### 6. Using Hand and Power Tools

1. Identify and replace unsafe tools
2. Care for and maintain hand tools
3. Measure with steel rule or tape
4. Use screwdrivers
5. Use wrenches, sockets and nutdrivers
6. Use torque wrench
7. Cut metal with hack saw
8. Use chisels
9. Use punches
10. Use hammers and mallets
11. File metal
12. Use pliers and wire strippers
13. Operate bench grinder
14. Operate electric hand drill
15. Operate drill press
16. Cut internal and external threads
17. Use flaring and swaging tools
18. Use tube fitting and reaming tools
19. Use refrigeration charging tools
20. Use flywheel pullers
21. Use pump service tools
22. Use hand truck
23. Use dollie
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

C. Soldering, Brazing and Welding

**Soft Soldering**

1. Fit parts & clean surfaces
2. Apply flux
3. Operate soldering gun, copper or torch
4. Clean joints (flux)

**Brazing**

5. Fit mating parts & establish clearances
6. Clean metal
7. Assemble & support parts
8. Apply flux
9. Adjust regulator
10. Light torch
11. Adjust flame
12. Braze mild steel
13. Braze cast iron
14. Silver braze stainless steel
15. Silver braze copper alloys
16. Clean joints (flux)
17. Shut off valve & bleed off acetylene

**Oxyacetylene Welding**

18. Set up and test equipment
19. Fit mating parts
20. Clamp and support parts
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

C. Soldering, Brazing and Welding (continued)

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<td>4. Slightly Above</td>
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<td>5. Above Average</td>
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<td>21.</td>
<td>Select proper rod &amp;</td>
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<td>22.</td>
<td>Light torch</td>
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<tr>
<td>23.</td>
<td>Adjust flame</td>
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<td>24.</td>
<td>Weld mild steel</td>
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<tr>
<td>25.</td>
<td>Weld pipe</td>
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<td>26.</td>
<td>Weld cast iron</td>
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<td>27.</td>
<td>Cut using oxyacetylene</td>
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<td>28.</td>
<td>Form, bend and hardface</td>
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Listed below are a duty and the tasks which includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

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<tr>
<th>D. Testing Electrical Circuits and Components</th>
<th>Check Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify electric components</td>
<td>1. Below Average</td>
</tr>
<tr>
<td>2. Read electrical wiring diagrams</td>
<td>2. Slightly Below</td>
</tr>
<tr>
<td>3. Use oven tester</td>
<td>Average</td>
</tr>
<tr>
<td>4. Use thermocouple temperature tester</td>
<td>3. Average</td>
</tr>
<tr>
<td>5. Use ohmmeter</td>
<td>Done</td>
</tr>
<tr>
<td>6. Use volt-ohmmeter</td>
<td>4. Slightly Above</td>
</tr>
<tr>
<td>7. Use volt-wattmeter</td>
<td>Average</td>
</tr>
<tr>
<td>8. Use clamp-on volt ammeter</td>
<td>5. Above Average</td>
</tr>
<tr>
<td>9. Use test probes</td>
<td></td>
</tr>
<tr>
<td>10. Use dial thermometer</td>
<td></td>
</tr>
<tr>
<td>11. Use thermistor temperature tester</td>
<td></td>
</tr>
<tr>
<td>12. Use time and temperature recorder</td>
<td></td>
</tr>
<tr>
<td>13. Use thermostat tester</td>
<td></td>
</tr>
<tr>
<td>14. Use psychrometer</td>
<td></td>
</tr>
<tr>
<td>15. Use a closed end manometer</td>
<td></td>
</tr>
<tr>
<td>16. Wire circuits and check measurements</td>
<td></td>
</tr>
<tr>
<td>17. Adjust and test switches</td>
<td></td>
</tr>
<tr>
<td>18. Check circuit protective devices</td>
<td></td>
</tr>
<tr>
<td>19. Replace wires and make connections</td>
<td></td>
</tr>
<tr>
<td>20. Check a current relay</td>
<td></td>
</tr>
<tr>
<td>21. Check a potential relay</td>
<td></td>
</tr>
<tr>
<td>22. Check a thermal relay</td>
<td></td>
</tr>
<tr>
<td>23. Check a solid state relay</td>
<td></td>
</tr>
</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
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<tbody>
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</tbody>
</table>

**D. Testing Electrical Circuits and Components (continued)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>24.</td>
<td>Check a solenoid valve</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Check and adjust a thermostat</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Dismantle, repair &amp; assemble a single-phase motor</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Check components &amp; wiring of a 24 volt circuit</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Check components &amp; wiring of a 120 volt circuit</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Check components &amp; wiring of a 240 volt circuit</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Test an open type capacitor-start motor</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Test a capacitor-start hermetic motor</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Test &amp; operate a capacitor-start capacitor-run hermetic motor</td>
<td></td>
</tr>
</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

E. Making Mechanical Repairs

<table>
<thead>
<tr>
<th>Task</th>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify assembly devices and tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Make flared tube connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Repair soldered or brazed connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Make a swaged tubing connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Make a complete tubing assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Operate gauge manifold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Operate service valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Install &amp; test access valves &amp; process tube adaptors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Dismantle, assemble and test external drive piston type compressor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Dismantle, assemble and test an external drive rotary type compressor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Install belts and adjust pulleys and belts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Measure temperatures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Test for leaks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Install gauges on an external drive refrigerating system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Repair a leak using epoxy compounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Evacuate a system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Use a service cylinder</td>
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</tr>
</tbody>
</table>
### F. Repairing Refrigerators and Freezers

- 1. Troubleshoot & diagnose refrigerator or freezer problems
- 2. Replace or adjust thermostats
- 3. Test, repair and replace compressors
- 4. Test, repair and replace evaporators
- 5. Repair and replace relays, overload devices
- 6. Repair & replace defroster controls, heater and timer
- 7. Repair or replace condensers
- 8. Locate & repair refrigerant leak
- 9. Adjust tubing to eliminate noise
- 10. Remove and install door gasket
- 11. Repair automatic icemaker
- 12. Service or replace capillary tube
- 13. Clean fins & tubing of condenser
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Below Average</td>
<td></td>
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<tr>
<td>2. Slightly Below Average</td>
<td></td>
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<tr>
<td>3. Average</td>
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<tr>
<td>4. Slightly Above Average</td>
<td></td>
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<tr>
<td>5. Above Average</td>
<td></td>
</tr>
</tbody>
</table>

G. Repairing Ranges

**Electric**

1. Troubleshoot & diagnose range unit problems
2. Read & interpret wiring diagram
3. Test and replace switches
4. Test and replace surface units
5. Test and replace thermostats
6. Test and replace automatic timers
7. Test, replace or repair automatic surface unit with sensors
8. Adjust doors
9. Repair light
10. Test, replace or repair self-cleaning oven unit
11. Repair or replace electronic control boards
12. Install range

**Gas**

13. Adjust and clean burners
14. Adjust and clean pilots
15. Test and replace thermostats
16. Test and replace timers
17. Repair light
18. Use oven test thermometer
19. Change oven from natural gas to LP. gas
20. Repair self-cleaning oven
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

### H. Repairing Washing Machines

<table>
<thead>
<tr>
<th>Task</th>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Troubleshoot &amp; diagnose washing machine probs.</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>2. Replace timers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Replace solenoids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Replace or repair regular motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Replace throw-away motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Replace water pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Repair trans-gear case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Clean or replace inlet valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Replace belts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Check and repair overload protectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Install washing machine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Test and replace control panel switches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Explain washability problems to customer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Adjust belts and pulleys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Analyze problem with timed fill switch</td>
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</tr>
</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Check</th>
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</thead>
<tbody>
<tr>
<td>1. Repairing Dryers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Troubleshoot &amp; diagnose dryer problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Replace timers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Replace thermostats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Test &amp; replace relays-overload switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Replace motors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Replace heating element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Replace drum seals (felts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Repair vent system</td>
<td></td>
<td></td>
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<tr>
<td>9. Clean lint from system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Install dryer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Test gas valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Test and repair constant pilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Test, repair or replace automatic pilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Replace drum seals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Test and replace thermostats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Test and replace high limits switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Clean vent system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Below Average</td>
</tr>
<tr>
<td></td>
<td>2. Slightly Below Average</td>
</tr>
<tr>
<td></td>
<td>3. Average</td>
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<tr>
<td></td>
<td>4. Slightly Above Average</td>
</tr>
<tr>
<td></td>
<td>5. Above Average</td>
</tr>
</tbody>
</table>

J. Repairing Dishwashers

1. Troubleshoot & diagnose dishwasher problems
2. Replace motors
3. Replace solenoids
4. Clean or replace water valve
5. Replace overload switch
6. Replace pump, seal kit or pump assembly
7. Replace timers
8. Replace heating elements
9. Replace pump and motor assembly
10. Install dishwasher
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If</td>
</tr>
<tr>
<td></td>
<td>Done</td>
</tr>
<tr>
<td></td>
<td>1. Below Average</td>
</tr>
<tr>
<td></td>
<td>2. Slightly Below Average</td>
</tr>
<tr>
<td></td>
<td>3. Average</td>
</tr>
<tr>
<td></td>
<td>4. Slightly Above Average</td>
</tr>
<tr>
<td></td>
<td>5. Above Average</td>
</tr>
</tbody>
</table>

K. Repairing Disposals

1. Free stuck cutters
2. Inspect and replace seals
3. Replace motors
4. Check overload protectors
5. Replace cutters
6. Repair or replace switches
7. Install a food waste disposal-siphon break
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>If</td>
<td>1. Below Average</td>
</tr>
<tr>
<td>Done</td>
<td>2. Slightly Below Average</td>
</tr>
<tr>
<td></td>
<td>3. Average</td>
</tr>
<tr>
<td></td>
<td>4. Slightly Above Average</td>
</tr>
<tr>
<td></td>
<td>5. Above Average</td>
</tr>
</tbody>
</table>

L. Repairing Window Air Conditioners

1. Troubleshoot and analyze problem
2. Clean condensers and evaporator
3. Replace blower motors
4. Test, repair and replace compressors
5. Repair and install capillary tubing
6. Replace and adjust thermostats, relays and overloads
7. Locate and repair refrigerant leak
8. Test and replace shorting and running capacitors
9. Discharge and recharge system
10. Install a window unit
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

**I. Troubleshooting Refrigeration and Air Conditioning Equipment**

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hook hermetic compressor directly to power supply.</td>
<td></td>
<td>1. Below Average</td>
</tr>
<tr>
<td>2. Check circuitry of the compressor protector and relay</td>
<td></td>
<td>2. Slightly Below Average</td>
</tr>
<tr>
<td>3. Check relay</td>
<td></td>
<td>Done 3. Average</td>
</tr>
<tr>
<td>4. Check circuitry on defrost equipment</td>
<td></td>
<td>4. Slightly Above Average</td>
</tr>
<tr>
<td>5. Check circulation fan motors</td>
<td></td>
<td>5. Above Average</td>
</tr>
<tr>
<td>6. Check and adjust control thermostat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Attach manifold and gauges to service valves and check pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Install in-line service valves and measure pressures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Check compressor efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Locate leak in a refrigeration system using electronic leak detector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Locate leak in a refrigeration system using halide torch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Locate leak in a refrigeration system using bubble method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Check unit operation-oil level-sight glass-moisture indicator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Check and adjust automatic expansion valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Check, test and adjust thermostatic expansion valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Check and adjust pressure motor control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Check and adjust low pressure safety control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Check and adjust high pressure safety control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Adjust and calibrate oil pressure control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Check icemaker for operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Check and adjust water valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Check hot gas defrost solenoid and valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Check humidity with sling psychrometer</td>
<td></td>
<td></td>
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</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

<table>
<thead>
<tr>
<th>Check</th>
<th>Time Spent</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>If Done</td>
</tr>
<tr>
<td>1. Below Average</td>
<td></td>
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<tr>
<td>2. Slightly Below Average</td>
<td></td>
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<tr>
<td>3. Average</td>
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<tr>
<td>4. Slightly Above Average</td>
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<tr>
<td>5. Above Average</td>
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</tbody>
</table>

24. Check and adjust humidstat
25. Check condensate pump and drain
26. Check blower assembly and filter
27. Check heat pump reversing system
N. Servicing & Repairing Refrigeration & Air Conditioning Equipment

<table>
<thead>
<tr>
<th>Task</th>
<th>Check</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Evacuate a refrigeration system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Pump system down into receiving tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Recharge system using sight glass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Recharge system weighing in refrigerant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fill dial a charge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Recharge a refrigeration system using dial a charge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Remove and replace control thermostat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Remove and replace defrost timer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Remove and replace motor overload protector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Remove and replace capacitor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Remove and replace defrost heater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Remove and replace defrost terminator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Remove and replace relay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Remove and replace fan motors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Repair leak in copper lines of system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Remove and replace compressor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Add oil to system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Remove restriction from capillary tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Remove and replace capillary tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Remove and replace automatic expansion valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Remove and replace thermostatic expansion valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Install a drier, sight glass or moisture indicator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Remove and replace high or low pressure safety control</td>
<td></td>
<td></td>
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</tbody>
</table>
Listed below are a duty and the tasks which it includes. Check all tasks which you perform. Add any tasks you do which are not listed, then rate the tasks you have checked.

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<thead>
<tr>
<th>Task Description</th>
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<th>Time Spent</th>
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<tbody>
<tr>
<td>1. Below Average</td>
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<td></td>
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<tr>
<td>2. Slightly Below Average</td>
<td></td>
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<td>3. Average</td>
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<td>4. Slightly Above Average</td>
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<td>5. Above Average</td>
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N. Servicing & Repairing Refrigeration & Air Conditioning Equipment (continued)

24. Remove and replace high or low pressure motor control
25. Remove and replace oil pressure safety control
26. Remove and replace hot gas defrost solenoid and valve
27. Repair evaporator with epoxy
28. Remove and replace condensation pump motor
29. Remove and replace humidistat
30. Balance the air conditioning system
31. Check and replace filters - clean indoor & outdoor coils