Building maintenance is a basic two-year trade education course requiring 2 1/2 hours of study on each of 160 teaching days per year. Student abilities should range from those capable of the simplest custodial work to those who may eventually be superintendents of building complexes. The syllabus is organized in sections by traditional skills groupings (custodial services, grounds maintenance, redecorating, carpentry, masonry, electricity, plumbing, climate control, drawings and specifications, bookkeeping and estimating). A two-column format lists course content with suggested audiovisuals and methodology. Appended are lists of texts, references, and audiovisuals; a source directory; and a list of tools and equipment considered to be the minimum necessary for a class group of 20 students. (MS)
BUILDING MAINTENANCE SYLLABUS
BUILDING MAINTENANCE SYLLABUS
BUILDING MAINTENANCE

SYLLABUS
THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of the University (with years when terms expire)

1985  Everett J. Penny, B.C.S., D.C.S., Vice Chancellor ------------------------------ White Plains
1978  Alexander J. Allan, Jr., LL.D., Litt.D. ------------------------------------------ Troy
1977  Joseph T. King, LL.B. -------------------------------------------------------- Queens
1974  Joseph C. Indelicato, M.D. ----------------------------------------------- Brooklyn
1979  Francis W. McGinley, B.S., J.D., LL.D. ---------------------------------------- Glens Falls
1986  Kenneth B. Clark, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc. ---------------------- Hastings on Hudson
1283  Harold E. Newcomb, B.A. ------------------------------------------------------ Owe go
1981  Theodore M. Black, A.B., Litt.D. --------------------------------------------- Sands Point
1988  William A. Genrich, LL.B. ---------------------------------------------------- Buffalo
1982  Emlyn I. Griffith, J.D. ------------------------------------------------------ Rome

President of the University and Commissioner of Education

Ewald B. Nyquist

Executive Deputy Commissioner of Education

Gordon M. Ambach

Deputy Commissioner for Elementary, Secondary, and Continuing Education

Thomas D. Sheldon

Associate Commissioner for Instructional Services

William L. Bitner III

Assistant Commissioner for Instructional Services (General Education)

Bernard F. Haake

Director, Division of Curriculum Development

Gordon E. Van Hoof

Chief, Bureau of Secondary Curriculum Development

Assistant Commissioner for Occupational Education

Robert S. Seckenforf

Director, Division of Occupational Education Instruction

Robert H. Bielefeld

Chief, Bureau of Trade and Technical Education

Carl G. Benenati
The rapid increase in population, with attendant proliferation of schools, shopping centers, and industrial and residential complexes has created a need for many people skilled in cleaning and maintaining property. Concurrently, the expansion of occupational education allowed a change in emphasis from a few narrow skill areas, available to those whose ability matched requirements of such study, to many broad occupational clusters wherein students of nearly all ability levels can be prepared for employment. Building Maintenance exemplifies such a cluster.

In the spring of 1971, teachers of building maintenance courses in selected geographical areas were contacted regarding organization of a syllabus. During that summer Donald Conklin of Rockland BOCES, Richard Jones of Oneida-Madison-Herkimer BOCES, and Edwin Smith of Chemung-Schuyler-Tioga BOCES, met with Charles Stebbins, Associate, Bureau of Trade and Technical Education, and Joseph Messier, Associate in Vocational Curriculum, Bureau of Secondary Curriculum Development, to create a first-draft manuscript. A second draft, incorporating sample performance objectives and expanded teaching suggestions, was prepared by Joseph Fischer of Albany (City) Vocational Center, and Mr. Messier during the summer of 1972, and evaluated by State Education Department personnel and a teacher committee. A final draft, revised to reflect the evaluation, became this syllabus in Building Maintenance.

G. Earl Hay, Supervisor
Vocational Curriculum Unit
Bureau of Secondary Curriculum Development

Gordon E. Van Hooft, Director
Division of Curriculum Development
Building Maintenance is a basic 2-year trade education course requiring 2 1/2 hours of study on each of 160 teaching days per year. The broad scope of the subject matter and the multilevel skill structure of subsequent employment, open this course to well-motivated students of nearly all levels of ability. Student abilities should range from those whose employment prospects are the simplest custodial work under close supervision, to those who, with experience and some advanced education, may eventually be superintendents of building complexes — residential, commercial, or industrial — or own a private maintenance contracting business.

The syllabus is organized in sections by traditional skills grouping. This is not a teaching progression. The teacher using the syllabus to write a course of study reflecting local conditions must select content from the syllabus, organizing it in a teaching order which best serves his situation. The suggested time allocations, based on "average-ability," must also be adapted to the particular teaching situation.

A two-column format is used. The first column lists the course content; the second column contains suggested audiovisuals and methodology. Neither column is prescriptive. The teacher is expected to vary the content to fit the abilities and aspirations of each individual student. The teaching suggestions are intended to stimulate the teacher's ingenuity and resourcefulness in tailoring instruction to each individual.

Appended are lists of texts, references, and audiovisuals; a source directory; and a list of tools and equipment considered to be the minimum necessary for a class group of 20 students. A section demonstrating several levels of performance objectives for a selected unit of instruction, as it should appear in a teacher's course of study, begins on page one. This sample should be carefully studied before proceeding to use of the syllabus.

Carl G. Benenati, Chief
Bureau of Trade and Technical Education

Robert H. Bielefeld, Director
Division of Occupational Education Instruction
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOREWORD</td>
<td>iii</td>
</tr>
<tr>
<td>TO THE TEACHER</td>
<td>iv</td>
</tr>
<tr>
<td>USING THE SYLLABUS</td>
<td>1</td>
</tr>
<tr>
<td>CUSTODIAL SERVICES</td>
<td>7</td>
</tr>
<tr>
<td>GROUNDS MAINTENANCE</td>
<td>15</td>
</tr>
<tr>
<td>REDECORATING</td>
<td>18</td>
</tr>
<tr>
<td>CARPENTRY</td>
<td>23</td>
</tr>
<tr>
<td>MASONRY</td>
<td>28</td>
</tr>
<tr>
<td>ELECTRICITY</td>
<td>33</td>
</tr>
<tr>
<td>PLUMBING</td>
<td>36</td>
</tr>
<tr>
<td>CLIMATE CONTROL</td>
<td>41</td>
</tr>
<tr>
<td>DRAWINGS AND SPECIFICATIONS</td>
<td>45</td>
</tr>
<tr>
<td>BOOKKEEPING AND ESTIMATING</td>
<td>47</td>
</tr>
<tr>
<td>RESOURCE LIST</td>
<td>49</td>
</tr>
<tr>
<td>SOURCE DIRECTORY</td>
<td>58</td>
</tr>
<tr>
<td>SUGGESTED EQUIPMENT</td>
<td>60</td>
</tr>
</tbody>
</table>
USING THE SYLLABUS

The course content of this syllabus was selected by a committee of experienced teachers as being taught to the student of average abilities — the student who can become proficient in all and in the supervision of other workers. Less talented students should be evaluated on mastery of the content which is within their employment capabilities. More talented students should be administering a maintenance department or service, as well as attaining proficiency in the course.

The teacher of building maintenance could then, be responsible for a class group which will be several, or all of the following ability/employability groupings:

<table>
<thead>
<tr>
<th>Trainable</th>
<th>Closely supervised institutional service.</th>
<th>Basic cleaning of floor glass, and outside area.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educable</td>
<td>Generally supervised industrial, commercial, educational complex service.</td>
<td>The above tasks, plus simpler machines such as polishers, lawn mowers, throwers, and power sweepers.</td>
</tr>
<tr>
<td>Average</td>
<td>Loosely supervised general service, requiring much independent responsibility.</td>
<td>All above, plus inventories, customer relations, some supervision of other workers.</td>
</tr>
<tr>
<td>Talented</td>
<td>General service of a supervisory and administrative or totally independent responsibility.</td>
<td>All above, plus duties of an apartment or office building superintendent and of a building superintendent.</td>
</tr>
</tbody>
</table>
USING THE SYLLABUS

tent of this syllabus was selected by a committee of experienced teachers as that which should
be suitable for the student of average abilities — the student who can become proficient in all maintenance duties,
and of other workers. Less talented students should be evaluated on mastery of only that part
which is within their employment capabilities. More talented students should receive instruction in
maintenance department or service, as well as attaining proficiency in the course content.

Building maintenance could then, be responsible for a class group which will contain one,
the following ability/employability groupings:

Closely supervised institutional service.

Generally supervised industrial, commercial, educational complex service.

Loosely supervised general service, requiring much independent responsibility.

General service of a supervisory and administrative or totally independent responsibility.

Basic cleaning of floors, walls, glass, and outside areas.

The above tasks, plus operation of simpler machines such as floor polishers, lawn mowers, snow throwers, and power sweepers.

All above, plus inventory, purchase orders, customer relations, and some supervision of other workers.

All above, plus duties of the apartment or office building superintendent and of the assistant superintendent of a building complex.
It must be clearly understood that these terms and descriptions are broad generalizations intended for convenience in instructional organization, since no individual can be exactly and irrevocably cast in the mold of another. The primary duty of the teacher of building maintenance is to evaluate pupil personnel tests and measures in the light of his own industrial experience, to determine the probable employability capabilities of each student, and then to develop an individualized program of instruction calculated to bringing the student to his maximum achievement.

Successful completion of this course must then, be based on projected employability at the demonstrated level of ability, rather than on mastery of any fixed percentage of the total course content.

After familiarizing himself with the contents of this syllabus, the teacher should begin organizing his contents of study which, using the syllabus as a base, reflects the teaching conditions and employment situations in his specific geographic area. The first task may be to reorganize the content into a tentative teaching program. The first section of the syllabus is "Grounds Maintenance," but the teacher may prefer to begin instead with "Custodial Services." Likewise, the syllabus places "Floors" as Unit I of "Custodial Services" and "Walls" as Unit II, listing first sections of tasks and frequency of performance. The teacher can, if he desires, teach "Unit II -- Walls" as an initial unit since these operations would be first in a job sequence where an entire room is to be papered. After the teacher completes a tentative sequence of instruction his next task is to set limits of breadth of instruction in each unit of content, thus defining exactly what the student should know and what he should possess as a result of the instruction. Considering the variety of student ability level inherent in building maintenance, the teacher of this course should find performance objectives of inestimable value.

In industry, the competent worker given an apprentice or new employee to instruct, judges the performance of the learner and the effectiveness of his instruction by whether or not the learner, on his own ability, perform the particular task.
understood that these terms and descriptions are broad generalizations intended for
organizational organization, since no individual can be exactly and irrevocably categorized. It is
the teacher of building maintenance to evaluate pupil personnel tests and measurements in
trial experience, to determine the probable employment capabilities of each individual, and
individualized program of instruction calculated to bring the student to his highest level of

The first task may be to reorganize the content into a tentative teaching progression. The
syllabus is "Grounds Maintenance," but the teacher may prefer to begin instruction with
Likewise, the syllabus places "Floors" as Unit I of "Custodial Services" due to simplicity of performance. The teacher can, if he desires, teach "Unit II — Wall and Ceiling" as the

a tentative sequence of instruction his next task is to set limits of breadth and depth of
it of content, thus defining exactly what the student should know and what new skills he
result of the instruction. Considering the variety of student ability levels and employment
arding maintenance, the teacher of this course should find performance objectives to be of

competent worker given an apprentice or new employee to instruct, judges both the development
effectiveness of his instruction by whether or not the learner, on his own, can actually
task.
In teaching building maintenance, the industrially experienced instructor will instinct performance criteria in evaluating student progress. He should also use it as a means of successful teaching methods. The teacher should then, write performance objectives before d plans which state how he intends to teach. An added benefit of performance objectives is the they not only clearly define the instruction but also constitute a test of the effectiveness. While writing performance objectives for use by others requires some particular language abi one's own use is quite simple.

Performance objectives must always be stated in terms of the student, never in terms of. Performance objectives must require demonstration of ability rather than an assumption that they say that the student performs the skill, or describes the performance. Never do they s student "understands," or the student "appreciates." Performance objectives always will state student can demonstrably do, 2) to what level of proficiency he must perform, and 3) under w perform. For example, the unit of instruction may be the mixing of the cleaning agent for floors, if not a performance objective and is not of much use in determining instructional for evaluation. A performance objective for this task, written for three levels of ability

**Average and Talented**

Given a custodial chart which requires mopping of a vinyl f given access to pertinent materials and equipment, the stu (or describe, orally or in writing) the proper container and prepare (or describe preparation of) the proper water/deter correct sequence. No errors allowable.

**Educable**

Given the proper materials and equipment the student will m and water in correct sequence, to within 10 percent of prop on a minimum of 9 out of 10 attempts.

Among the instructional methods following the objectives might be 1) opaque projecti name and instructions) of all detergents commonly used for the purpose, or overhead project
Building maintenance, the industrially experienced instructor will instinctively use the same criteria in evaluating student progress. He should also use it as a means of selecting probably methods. The teacher should then, write performance objectives before developing lesson how he intends to teach. An added benefit of performance objectives is that, properly stated, early define the instruction but also constitute a test of the effectiveness of the instruction. Performance objectives for use by others requires some particular language ability, writing for quite simple.

objectives must always be stated in terms of the student, never in terms of the teacher. Objectives must require demonstration of ability rather than an assumption that it exists, therefore, a student performs the skill, or describes the performance. Never do they state merely that the hands," or the student "appreciates." Performance objectives always will state 1) what the intrinsically do, 2) to what level of proficiency he must perform, and 3) under what conditions he must ample, the unit of instruction may be the mixing of the cleaning agent for mopping floors. To student will understand how to mix liquid detergents and water in proper proportions for mopping performance objective and is not of much use in determining instructional methods or criteria. A performance objective for this task, written for three levels of ability might be:

Given a custodial chart which requires mopping of a vinyl floor, and given access to pertinent materials and equipment, the student will select (or describe, orally or in writing) the proper container and detergent and prepare (or describe preparation of) the proper water/detergent mixture in correct sequence. No errors allowable.

Given the proper materials and equipment the student will mix detergent and water in correct sequence, to within 10 percent of proper proportion, on a minimum of 9 out of 10 attempts.

Instructional methods following the objectives might be 1) opaque projection of labels (brand nonations) of all detergents commonly used for the purpose, or overhead projection of facsimile trans-
parencies; 2) distribution of job instruction sheet; 3) teacher demonstration; 4) any combination
The column of suggestions, and the appended Resource Lists may be helpful here.

Evaluation of this instruction may be by observation of student performance during the course
of student behavior during a scheduled performance test, and by evaluation of student answers to
A performance test requires only that the performance objective be reworded as a job instruction
oral quiz is constructed by rephrasing the objective as questions. The teacher who constructs h
on a basis of student performance, and phrases his desired teaching outcomes as performance obje
have, at the same time, constructed an outline for evaluating the success of the course and of t

All course objectives need not be stated in performance terms, however. Performance object
easily written for the psychomotor domain of skill development and the cognitive domain of occup
It is more difficult to write complete performance objectives in the affective domain areas of s
for evaluation of student attitudes remains a function of the teacher's judgement. When evaluat
"appreciation" the teacher should think in terms of performance objectives, but should not become
precise writing.

Unit I — FLOORS, of the CUSTODIAL SERVICES section, is offered as one example of how the
study should be developed from this syllabus.

UNIT I — FLOORS

PERFORMANCE OBJECTIVES

<table>
<thead>
<tr>
<th>Materials</th>
<th>The student should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>Identify the material composing each of a</td>
</tr>
<tr>
<td>Masonry</td>
<td>representative group of teacher-supplied</td>
</tr>
<tr>
<td>. Concrete</td>
<td>samples of standard floor materials.</td>
</tr>
<tr>
<td>. Brick</td>
<td>Describe the principal characteristics of</td>
</tr>
<tr>
<td>. Ceramic</td>
<td>each floor material.</td>
</tr>
<tr>
<td>. Stone</td>
<td></td>
</tr>
<tr>
<td>Composition</td>
<td></td>
</tr>
<tr>
<td>Carpeting</td>
<td></td>
</tr>
</tbody>
</table>
tion of job instruction sheet; 3) teacher demonstration; 4) any combination of these.

is instruction may be by observation of student performance during the course, by observation
during a scheduled performance test, and by evaluation of student answers to questioning.
quires only that the performance objective be reworded as a job instruction, while a written/
ted by rephrasing the objective as questions. The teacher who constructs his course of study
performance, and phrases his desired teaching outcomes as performance objectives, will
constructed an outline for evaluating the success of the course and of the student.

tives need not be stated in performance terms, however. Performance objectives are most
psychomotor domain of skill development and the cognitive domain of occupational know-how.
t write complete performance objectives in the affective domain areas of student attitudes,
t remains a function of the teacher's judgement. When evaluating attitudes and
acher should think in terms of performance objectives, but should not become entangled in

e, of the CUSTODIAL SERVICES section, is offered as one example of how the teacher's course of
oped from this syllabus.

PERFORMANCE OBJECTIVES

The student should be able to:
Identify the material composing each of a representative group of teacher-supplied samples of standard floor materials.

Describe the principal characteristics of each floor material.

NOTES

Motivation is the crucial problem here.
Maintenance
- Frequency
  - Daily
  - Periodic
- Processes
  - Cleaning
  - Stripping
  - Sealing
  - Waxing
- Equipment
  - Vacuums
  - Scrubbers
  - Polishers
- Repair
  - Staff work
  - Contracted service

The student should be able to:
- Demonstrate ability to perform duties in sequence outlined on custodial charts, performance meeting field standards of acceptability.
- Demonstrate ability to interpret chart information regarding procedures, equipment, and materials to be used.
- Demonstrate ability to operate floor maintenance equipment, conforming to field standards of safety and competency.
- Recognize the limits of minor repairs to be performed by custodial staff.
- Demonstrate an ability to perform minor repairs to standard floor materials.

Having written a course of study organized in this manner, the teacher can more easily of instruction — both group and individual — which will be more effective, evaluate the and modify the instruction where effectiveness can be improved.
The student should be able to:

- Demonstrate ability to perform duties in sequence outlined on custodial charts, performance meeting field standards of acceptability.

- Demonstrate ability to interpret chart information regarding procedures, equipment, and materials to be used.

- Demonstrate ability to operate floor maintenance equipment, conforming to field standards of safety and competency.

- Recognize the limits of minor repairs to be performed by custodial staff.

- Demonstrate an ability to perform minor repairs to standard floor materials.

Title job as "custodial mechanic" or similar term, rather than janitor.

Use power equipment wherever feasible.

For written a course of study organized in this manner, the teacher can more easily plan units of instruction — both group and individual — which will be more effective, evaluate the effectiveness, and improve the instruction where effectiveness can be improved.
CUSTODIAL SERVICES

Suggested Time: 120 Hours

TEACHING SUGGESTIONS

Use of actual floors or reasonably large mock-ups is more effective than small samples of materials.

The custodial chart should be used wherever student ability allows.

Emphasize need to provide for safety of traffic through work area.

Standards of competency should vary both with the ability of the student and requirements of possible job openings.

The point where minor repairs become major differs with the size and nature of the maintenance staff. The teacher should set a realistic cut-off point.

UNIT I — FLOORS

- Materials
  - Wood
  - Masonry
    - Concrete
    - Brick
    - Ceramic
    - Stone
  - Composition
    - Linoleum
    - Vinyl
    - Vinyl-Asbestos
    - Asphalt
  - Carpeting
    - Wool
    - Synthetics

- Maintenance
  - Frequency
    - Daily
    - Periodic
  - Processes
    - Cleaning
    - Stripping
    - Sealing
    - Waxing
  - Equipment
    - Vacuums
    - Scrubbers
    - Polishers

- Repair
  - Staff work
  - Contract
UNIT II — WALL AND CEILING

- Surfaces
  - Wall
    - Ceramic
    - Glass
    - Vinyl
    - Melamine
    - Applied finish
      - Paints
      - Lacquers
      - Varnishes
      - Sealers
  - Ceiling
    - Acoustic tile
    - Vegetable fiber
    - Asbestos
    - Glass fiber panel
    - Applied finish
    - Maintenance
      - Custodial chart

The student should be able to distinguish applied surfaces and those which are part of the structure.

Emphasize the necessity of removing, preparing, reconditioning floors, window sills, rails, and similar areas.

Instruction in cleaning exterior glass and floor level requires particular teacher safety and supervision.

Instruction should include the damage which results from use of improper materials or methods, as well as practice in use of and methods.

Proper erection of scaffolding and use of extreme importance.

UNIT III — WINDOWS

- Design
  - Double hung
  - Casement
  - Vent
    - Awning
    - Hopper
  - Sliding

- Materials
  - Wood
  - Aluminum

It is not necessary that all students be able to identify window types by name, but if there is a need of safety, all students must:

- Demonstrate ability to identify movable fixed lights.
- Demonstrate ability to unlatch, open, and relatch each type of movable sash.

Removal, handling, storage, and reinstatement of removable double glazing must be taught.
The student should be able to distinguish between applied surfaces and those which are part of the structure.

Emphasize the necessity of removing, protecting, or reconditioning floors, window sills, radiators, and similar areas.

Instruction in cleaning exterior glass above ground-floor level requires particular teacher attention to safety and supervision.

Instruction should include the damage which can result from use of improper materials or methods on particular materials, as well as practice in use of proper material and methods.

Proper erection of scaffolding and use of ladders is of extreme importance.

It is not necessary that all students be able to identify window types by name, but if only for purposes of safety, all students must:

Demonstrate ability to identify movable sash and fixed lights.

Demonstrate ability to unlatch, open, close, and relatch each type of movable sash.

Removal, handling, storage, and reinstallation of removable double glazing must be taught.
- Glass
  - Strength
  - Style
    - Transparent
    - Translucent
    - Tinted
    - Ribbed
- Mechanism
  - Operator
    - Manual
    - Rotary
  - Latch
    - Cam
    - Bolt
- RDG
- Weatherstripping
- Maintenance
  - Process
    - Cleaning
    - Lubricating
  - Frequency
    - Daily
    - Periodic

UNIT IV — SANITARY FACILITIES

- Major fixtures
  - Service
    - Lavatories
    - Showers
    - Urinals and closets
    - Mirrors

The student should know the system of glass and the types of safety glass. A broad understanding of the characteristics and standard uses of each.

Emphasize the importance of keeping tracks and slots clean, free of debris, and lubricated.

Several types, in several materials, are available for student inspection and practice. The use of graphic representations is allowed.
The student should know the system of "strengths" of glass and the types of safety glass. He should have a broad understanding of the characteristics and standard uses of each.

Emphasize the importance of keeping mechanisms, tracks, and slots clean, free of debris, and where required, lubricated.

Several types, in several materials, should be available for student inspection and practice, but some use of graphic representations is allowable.
Job status can be a real problem in the classroom. The teacher should give much thought to maintaining motivation. A good starting point is to remind that their mothers perform these tasks at home and are not considered "degrading".

Use of the custodial chart is very vital.

The habit of continual use of the custodial chart will be developed.

The student should also acquire judgment in selecting furnishings are moved to facilitate redecorating; which should be moved should require equipment; and which should be selected for moving particu...
Job status can be a real problem in this area. The teacher should give much thought to means of accomplishing motivation. A good starting point may be to remind that their mothers perform these services at home and are not considered "degraded."

Use of the custodial chart is very valuable here.

The habit of continual use of the custodial chart must be developed.

The student should also acquire judgment as to which furnishings are moved to facilitate routine cleaning, and which are moved only for periodic cleaning or redecorating; which should be moved manually, and which should require equipment; and which piece of equipment should be selected for moving particular furnishings.
The course equipment should include a sample of carts, dollies, and handtools.

It is extremely important that all students learn the "body mechanics" of proper lifting and carrying.

UNIT VI — SPECIAL AREAS

- Service
  - Auditorium
  - Gymnasium
  - Stadium
  - Cafeteria
  - Athletic field
  - Conference room

The student should be aware of the part he is involved in maintenance of each area, procedures to be used. Field trips to service or special areas before, during, and immediately after the course will be valuable.

A good method is to effect a cooperation with school custodial staffs which will result in work at school facilities.
The course equipment should include a representative sample of carts, dollies, and handtrucks.

It is extremely important that all students be taught the "body mechanics" of proper lifting, pushing, and carrying.

VI — SPECIAL AREAS

Service
- Auditorium
- Gymnasium
- Stadium
- Cafeteria
- Athletic field
- Conference room

The student should be aware of the particular problems involved in maintenance of each area, as well as the procedures to be used. Field trips to these areas before, during, and immediately after use should be valuable.

A good method is to effect a cooperative arrangement with school custodial staffs which will allow students live work at school facilities.
UNIT VII — SUPPLIES AND EQUIPMENT

- Procedures
  - Preparatory
    - Cleaning
    - Setting up
  - Maintaining set up
  - Follow up
    - Removing temporaries
    - Storing temporaries
    - Cleaning

- Equipment
  - Tools
    - Hand
    - Power
  - Equipment maintenance
    - Cleaning
    - Lubricating
    - Repairing
  - Applicators
    - Brushes
    - Cloths
    - Sponges
  - Storage units

- Supplies
  - Cleaning agents
    - Caustic
    - Abrasive
    - Detergent
    - Neutral
  - Waxes and polishes
  - Disinfectants
  - Deodorant
  - Dispenser supplies
  - Gasoline, oil, and grease

The student must, of course, know proper and equipment. He should be able to select common items from stock, for the job teacher should emphasize the effects of waste and abuse of tools, equipment, and conversely, of working with worn out, improper materials.

The student's apparent ability should reflect of equipment maintenance knowledge which he should be accountable.

The student should be conditioned to check the label of each new container, and follow exactly.

Not only should the student be aware of obviously dangerous materials, he should be harmful and hazardous substances can be created by mixing cleaning agents.
The student must, of course, know proper names of tools and equipment. He should be able to select the commoner items from stock, for the job to be done. The teacher should emphasize the effects on profits of waste and abuse of tools, equipment, and supplies, and conversely, of working with worn out, defective, or improper materials.

The student's apparent ability should indicate the extent of equipment maintenance knowledge and skills for which he should be accountable.

The student should be conditioned to carefully read the label of each new container, and follow directions exactly.

Not only should the student be aware of the more evidently dangerous materials, he should also know that harmful and hazardous substances can sometimes be created by mixing cleaning agents.
UNIT VIII — SAFETY

- Property damage
  - Utility lines
    - Gas
    - Electricity
    - Water
  - Storage
    - Combustibles
    - Spoilables
- Equipment operation
  - Glass breakage
  - Structure damage
  - Landscape damage
- Fires
  - Prevention
  - Classification
  - Extinguishing

- Personal injury
  - Cuts and punctures
    - Equipment-caused
    - Materials-caused
      - Glass
      - Metals
      - Plastics
  - Burns
    - Thermal
    - Chemical
    - Electrical
  - Shock
    - Electrical Equipment
      - Supply lines
    - Impact
      - Personal falls
      - Falling objects

Safety — both personal and public — and property protection should be an inherent part of all instruction. It is separately categorized here only for convenience of presentation.

The student should be taught what he must not do, as well as proper procedures, and should understand why he should or must not.

It is especially important that building maintenance personnel knows the classification of fires, the proper extinguishers for each, and the dangers of using the wrong type.

The student must be made aware of the injury potential of common tools, equipment, and materials.
— Asphyxia
  . Smoke
  . Gas
  . Oxygen deficiency
— Emergency procedures
  . Securing help
  . Preventing further injury
  . First aid
    Limits
    Procedures

UNIT IX — HUMAN RELATIONS

  • Interstaff
    — Fellow workers
    — Superiors
    — Subordinates
  • Nonstaff
    — Visitors
    — Occupants

It is desirable that the student receive instruction in basic first-aid. It is mandatory that he receive instruction in emergency procedures.

The teacher should emphasize the importance of tolerance and courtesy; that far more employees are discharged because they antagonize other people, than because they do not perform the work.
GROUND MAINTENANCE

Suggested Time: 50 Hours

UNIT I — ROADS, WALKS, PARKING AREAS

- Cleaning
  - Sweeping
    - Hand
    - Power
  - Washing
  - Sealing

- Weather problems
  - Snow removal
  - Ice removal
  - Drainage

- Traffic flow
  - Signs
  - Markings
  - Lighting
  - Barricades

UNIT II — LANDSCAPE

- Type
  - Lawns
  - Shrubbery
  - Flowers
  - Trees

TEACHING SUGGESTIONS

The student should be capable of selecting sweeping equipment for a given job, as well as using it.

The teacher should emphasize why these sur as well as how to do so.

The student should be acquainted with the problems which result from improper maintenance, flooding and runoff from plowed-in drains, disruptions due to covered signs and markings.

Instruction should include testing and replacing photoelectric and timed lighting controls.

The student should be able to demonstrate selected means, an ability to classify any as tree or shrub; grass, flower, or weed.
GROUNDS MAINTENANCE

Suggested Time: 50 Hours

--- ROADS, WALKS, PARKING AREAS

Cleaning
Sweeping
  . Hand
  . Power
Washing
Sealing

Weather problems
Snow removal
Ice removal
Drainage

Traffic flow
Signs
Markings
Lighting
Barricades

II -- LANDSCAPE

Type
Lawns
Shrubbery
Flowers
Trees

The student should be capable of selecting the proper sweeping equipment for a given job, as well as capable of using it.

The teacher should emphasize why these surfaces are sealed, as well as how to do so.

The student should be acquainted with the less evident problems which result from improper maintenance, such as flooding and runoff from plowed-in drains, and traffic disruptions due to covered signs and markings.

Instruction should include testing and replacement of photoelectric and timed lighting controls.

The student should be able to demonstrate by any teacher selected means, an ability to classify any common sample as tree or shrub; grass, flower, or weed.
The ability to use a procedural chart and manuals to determine maintenance of existing should be developed.

Emphasize the hazardous nature of all insecticides, fungicides, and herbicides, and of some the need to obey instructions exactly.

UNIT III — EQUIPMENT

• Snow blowers
  - Single stage
  - Two stage

• Lawn mowers
  - Type
    . Rotary
    . Reel
  - Drive
    . Manual
    . Self-propelled
      Walking
      Riding

• Lawn cleaners
  - Type
    . Sweeper
    . Vacuum
  - Drive
    . Manual
    . Trailer
    . Self-propelled

The operating of power equipment can be  

While power equipment is generally more hand tools, its use in the field is con  
moving factor.

All students should be instructed in the functioning, the potential hazards and s  
and practical field operation of all cut  
equipment. All students should be provi  
other students.

The teacher will, of course, ex  

particular students.
The ability to use a procedural chart and horticultural manuals to determine maintenance of existing landscape should be developed.

Emphasize the hazardous nature of all insecticides, fungicides, and herbicides, and the need to obey instructions exactly.

The operating of power equipment can be a powerful motivating factor.

While power equipment is generally more dangerous than hand tools, its use in the field is constantly increasing. All students should be instructed in the functions and functioning, the potential hazards and safe procedure, and practical field operation of all currently used power equipment. All students should be provided the opportunity to demonstrate competence under close teacher supervision. The teacher will, of course, exercise his judgment in regard to loosely supervised operation by particular students.
- Function
  - Operation
  - Maintenance

- Watering systems
  - Underground
  - Self-propelled
  - Manually placed

- Feeding and protecting systems
  - Liquid sprayers
  - Power spreaders
  - Granule spreaders

Competence in routine cleaning and lubrication, directed by manufacturers' literature, is a prerequisite to the student being listed who the teacher will assign to operating.

The maintenance, adjustment, and minor repair of valves, timers, lines, and other parts of these systems should be taught, as well as the safe and efficient use of the equipment.
Competence in routine cleaning and lubricating, as directed by manufacturers' literature, should be a prerequisite to the student being listed with those who the teacher will assign to operating power equipment.

The maintenance, adjustment, and minor repair of valves, timers, lines, and other parts of these systems should be taught, as well as the safe and efficient use.
REDECORATING

Suggested Time: 55 Hours

UNIT — SURFACE PREPARATION

- Cleaning
  - Washing
    - Detergents
    - Solvents
  - Stripping
    - Abrasives
      - Hand
      - Power
    - Heat
    - Chemicals
    - Scrapers

- Patching
  - Surface
    - Masonry
    - Wood
    - Metal
    - Plastic
  - Materials
    - Putty
    - Wood doughs
    - Spackle
    - Dry wall cement
    - Mortar
    - Epoxy fillers
    - Stick shellac

- Smoothing
  - Tools
    - Planes
      - Hand
      - Power
    - Rasps and files
    - Scrapers
    - Surforms

TEACHING SUGGESTIONS

The student must be made aware of the crucial importance of properly preparing the surfaces before they are refinished.

Emphasize that some surfaces need only be cleaned of deposits, some may require roughening or some may require removal of previously applied materials and equipment.

The student should be instructed in the stripping of various surfaces and the selection of stripping materials and equipment.

The student should be assisted in developing a knowledge of the physical properties of various materials and respective patching materials, and be taught to select materials, equipment, and procedures for the operations necessary to patch various surfaces of quality, any teacher-designated surfaces.

Dry wall joint system application must be taught. Whether it is considered the domain of the mason, or the carpenter differs with locality and nonunion status of the workers.

Instruction should include an explanation of the tools function.

The student should be able to perform routine maintenance of tools, including sharpening of those that are honed in the field.
REDECORATING

Suggested Time: 55 Hours

SURFACE PREPARATION

Cleaning
  - Detergents
  - Solvents

Washing

Stripping
  - Abrasives
    - Hand
    - Power
  - Heat
  - Chemicals
  - Scrapers

Patching
  - Surface
    - Masonry
    - Wood
    - Metal
    - Plastic
    - Putty
    - Wood doughs
    - Spackle
    - Dry wall cement
    - Mortar
    - Epoxy fillers
    - Stick shellac

Smoothing
  - Tools
    - Planes
      - Hand
      - Power
    - Rasps and files
    - Scrapers
    - Surforms

TEACHING SUGGESTIONS

The student must be made aware of the critical importance of properly preparing the surface to be refinished.

Emphasize that some surfaces need only be washed clean of deposits, some may require roughening or smoothing, and some may require removal of previously applied finishes.

The student should be instructed in the safe use of stripping materials and equipment.

The student should be assisted in developing a general knowledge of the physical properties of common building materials and respective patching materials.

The student should be able to demonstrate an ability to select materials, equipment, and procedure, and to perform the operations necessary to patch to field standards of quality, any teacher-designated surface.

Dry wall joint system application must be taught. Whether it is considered the domain of the painter, the mason, or the carpenter differs with locality and union/nonunion status of the workers.

Instruction should include an explanation of how the tools function.

The student should be able to perform routine maintenance of tools, including sharpening of those commonly ground or honed in the field.
Emphasize that a good finish cannot be at poorly prepared surface.

The student should know the system of ide composition, grit size, backing, and other of coated abrasives, well enough to propose stock for any particular smoothing operation.

The student should know the strengths, weak probable side effects of the different as being proficient in their use.

UNIT II — FINISHES

- Types
  - Clear
    - Varnish
    - Shellac
    - Lacquer
    - Synthetic resins
    - Sealers
  - Paint
    - Base
      - Oil
      - Water emulsion
    - Use
      - Primer
      - Finish coat
    - Surface finish
      - Flat
      - Semigloss
      - Gloss
      - Textured

Instruction should include the strengths of the various finishes, use of solvents and conditions during and after application to damage the finish.

It is important that the student be able to finish as either oil-base or water-base, information provided on the label.

The student should be instructed in the or undesirability, of certain characteristics resistance, easy washability, high reflect govern selection for particular uses.
Emphasize that a good finish cannot be attained on a poorly prepared surface.

The student should know the system of identifying grit composition, grit size, backing, and other characteristics of coated abrasives, well enough to properly select from stock for any particular smoothing operations.

The student should know the strengths, weaknesses, and probable side effects of the different stains, as well as being proficient in their use.

Instruction should include the strengths and weaknesses of the various finishes, use of solvents and thinners, and conditions during and after application which might damage the finish.

It is important that the student be able to identify a finish as either oil-base or water-base, through information provided on the label.

The student should be instructed in the desirability, or undesirability, of certain characteristics — soil resistance, easy washability, high reflectivity — which govern selection for particular uses.
UNIT III — WALL COVERINGS

- Roll materials
  - Paper
  - Fabric
  - Plastic

- Service
  - Interior
  - Exterior

- Solvents
  - Mineral spirits
  - Turpentine
  - Lacquer thinner
  - Alcohol
  - Other

- Application
  - Brush
    - Types
    - Sizes
    - Materials
  - Roller
    - Types
    - Pan
    - Pressure
    - Materials
    - Mohair
    - Lamb's wool
  - Spray
    - Suction
    - Pressure

Emphasize that while the use of interior is merely uneconomical, the use of lead paints indoors can be injurious to health.

The student should be aware of the importance of using the correct solvent.

Instruction should include such possible accidents as destruction of particular plastics and the dangers of vapors.

Emphasize skin and eye protection as well as inhalation and ingestion.

Strive to develop students' judgment in the selection of brush, roller, and spray type and size, and bristle material. The student should know when it is more efficient to use a brush which is on hand, than to delay to acquire the "correct" brush.

Emphasize the importance of using the type of paint and the correct application as required for the type of paint to be used.

Instruction should include a comparison and evaluation of the advantages and disadvantages of the two application methods.

The student should be able to demonstrate the proper cleaning and care of clean brushes, rollers, and spray equipment standards of acceptability.

The student should be able to identify samples as being either roll or sheet, and to identify materials from which each is made.
Emphasize that while the use of interior paints outdoors is merely uneconomical, the use of lead-base exterior paints indoors can be injurious to health.

The student should be aware of the importance of using the correct solvent.

Instruction should include such possible side effects as destruction of particular plastics and spark ignition of vapors.

Emphasize skin and eye protection as well as hazards of inhalation and ingestion.

Strive to develop students' judgment in selecting brush type and size, and bristle material. The student should know when it is more efficient to use a slightly "wrong" brush which is on hand, than to delay to obtain exactly the "correct" brush.

Emphasize the importance of using the type cover which is required for the type of paint to be applied.

Instruction should include a comparison of the relative advantages and disadvantages of the two spray systems.

The student should be able to demonstrate an ability to clean brushes, rollers, and spray equipment, to field standards of acceptability.

The student should be able to identify teacher-supplied samples as being either roll or sheet, and to state the materials from which each is made.
UNIT IV — SAFETY

Materials
- Storage
- Fire
  - Type
  - Extinguishers

The student should have a general understanding of combustion is, and how it takes place. He will be

able to list the common materials in each type of fire. He will be able to identify teacher-selected extinguishers as Type A, Type C, or Type B/C, and explain why each must not be used on teacher-specified burn

Instruction should include why sizes and shapes are used, and how they work.

The strengths, and weaknesses, as well as the uses, of the various adhesives should be included in the instruction.

The student should develop the ability to select appropriate adhesives as well as to use various pieces of equipment properly.

The teacher should be prepared to conduct remedial instruction in measurement and cutting techniques, and to demonstrate the importance of straight, plumb or level joints, and well-matched parts.

Extinguishers

The student will be able to list the common materials in each type of fire. He will be able to identify teacher-selected extinguishers as Type A, Type C, or Type B/C, and explain why each must not be used on teacher-specified burn materials.
REDECORATING

Instruction should include why sizes and sealers must be used, and how they work.

The strengths, and weaknesses, as well as the appropriate uses, of the various adhesives should be included in instruction.

The student should develop ability to select and maintain, as well as to use various pieces of equipment.

The teacher should be prepared to conduct review or remedial instruction in measurement and computation.

Emphasize the supreme importance of straight, tight, plumb or level joints, and well-matched patterns.

T IV — SAFETY

The student should have a general understanding of what combustion is, and how it takes place. He should know that while most common materials require oxygen from the atmosphere in order to burn, many supply their own oxygen and will, therefore, be difficult to extinguish with water.

The student will be able to list the common combustible materials in each type of fire. He will be able to identify teacher-selected extinguishers as Type A, Type B, Type C, or Type B/C, and explain why each must be, or must not be, used on teacher-specified burning materials.
Equipment
  - Tools
    . Electrical hazards
    . Cuts
    - Ladders and scaffolds
  - Personal
    - Eye and skin
    - Ingestion
    - Inhalation

Procedures
  - First-Aid
  - Report forms
  - Workmen's Compensation
  - Hospitalization
  - Insurance

Standard safety procedures must not only be taught, but continuously enforced. The teacher must himself obey safety regulations and observe safety procedures.

The student should be able to identify common materials as being conductors or insulators.

Instruction should include the most basic of First-Aid procedures, completion of accident report forms, and general information on coverages, benefits, and applications for benefits of Compensation and hospital insurance plans.
CARPENTRY

Suggested Time: 180 Hours

UNIT I — TOOL UTILIZATION

TEACHING SUGGESTIONS

- Type
  - Hand
  - Power
    - Portable
    - Stationary

- Function
  - Cutting
  - Boring
  - Smoothing
  - Driving
  - Holding
  - Turning
  - Layout

- Use
  - Woods
  - Metals
    - Ferric
    - Nonferric
  - Plastics
  - Other

Students should become familiar with the craft tools through use rather than through memorization exercises. By this means he will also acquire particular tools with specific work tasks.

Use of the common power tools should be reintroduced, and entry-level proficiency with hand tools has been attained.

The teacher must unvaryingly enforce all safety procedures regarding tools, and unfailingly on himself. It is suggested that dated, written safe, proper procedures be administered before students are allowed to use power tools, and that test results as "passing" be kept on file.

Students should be able to maintain in proper readiness, those tools customarily shared and adjusted by the craftsman, on the job.

UNIT II — MATERIALS UTILIZATION

- Framing
  - DIM lumber
  - Laminated parts

The student must know the system of sizing and be aware of the difference between nominal and actual dimensions. He should have a general knowledge of the chief species of wood used, and their physical properties.

The student should be instructed in why some materials provide superior performance.
Carpentry

Suggested Time: 180 Hours

Teaching Suggestions

Type
- Hand
- Power
  - Portable
  - Stationary

Function
- Cutting
- Boring
- Smoothing
- Driving
- Holding
- Turning
- Layout

Use
- Woods
- Metals
  - Ferric
  - Nonferric
- Plastics
- Other

II — Materials Utilization

Framing
- DIM lumber
- Laminated parts

 Students should become familiar with the common hand tools through use rather than through memorization exercises. By this means he will also associate particular tools with specific work tasks.

Use of the common power tools should be reserved until entry-level proficiency with hand tools has been attained.

The teacher must unvaryingly enforce all safety procedures regarding tools, and unfailingly observe them himself. It is suggested that dated, written tests of safe, proper procedures be administered before students are allowed to use power tools, and that those graded as "passing" be kept on file.

Students should be able to maintain in proper condition of readiness, those tools customarily sharpened, cleaned, and adjusted by the craftsman, on the jobsite.

The student must know the system of sizing DIM lumber and be aware of the difference between nominal and actual dimensions. He should have a general knowledge of the chief species of wood used, and their properties.

The student should be instructed in why laminated members provide superior performance.
- Insulation
  - Rigid
  - Flexible
  - Granular

- Sheathing
  - Composition
  - Plywood
  - Board

- Roofing
  - Strip shingle
  - Wood shingle
  - Roll
  - SIS
  - Hot built-up
  - Slate
  - Tile

- Window and door units
  - Rough openings
  - Frame/jamb
  - Doors
    - Panel/flush
    - Hollow core/solid
  - Windows
    - Double hung
    - Casement
    - Vent
    - Gliding
  - Glass

- Exterior finish
  - Shakes
  - Wood siding
  - Aluminum siding
  - Composition

The student should be able to demonstrate an understanding of the theory of heat transfer by examples of conduction, convection, and radiation.

The student should be able to identify by preferred use, samples of such common materials as fiberboards, expanded mica, aluminum foil, and asbestos fibers.

The student must know the systems of size and composition of sheathing; both panels and lineal stock. Instruction should include comparison of the strengths and weaknesses of the common materials.

The student should be able to identify by preferred use and samples of common roofing. Instruction should include the strengths, weaknesses, and method of operation of the various roofing materials. The student should be aware of the advantages and usefulness of the mill book.

Instruct the student on the strengths, weaknesses, and method of operation of the various window and door units. The student should be aware of the advantages, disadvantages, and usefulness of, the mill book.

The student should be able to demonstrate, by teacher-selected means, an ability to identify, name, and describe the characteristics of window and door units.

Instruction should include the "strengths" and "weaknesses" of glass.

The student should be able to identify the existing interior and exterior surfaces, by sight, by "rapping," or by other nondestructive means.
Insulation
- Rigid
- Flexible
- Granular

Sheathing
- Composition
- Plywood
- Board

Roofing
- Strip shingle
- Wood shingle
- Roll
- SIS
- Hot built-up
- Slate
- Tile

Window and door units
- Rough openings
- Frame/jamb
- Doors
  - Panel/flush
  - Hollow core/solid
- Windows
  - Double hung
  - Casement
  - Vent
  - Gliding
- Glass

Exterior finish
- Shakes
- Wood siding
- Aluminum siding
- Composition

The student should be able to demonstrate an understanding of the theory of heat transfer by giving examples of conduction, convection, and radiation.

The student should be able to identify by name and preferred use, samples of such common materials as fiberboards, expanded mica, aluminum foil, and glass and asbestos fibers.

The student must know the systems of sizes used for sheathing; both panels and lineal stock. Instruction should include comparison of the strengths and weaknesses of the common materials.

The student should be able to identify by name "live" examples, photos or valid sketches, or materials samples of common roofing.

Instruct the student on the strengths, weaknesses, and method of operation of the various window and door units. The student should be aware of the existence of, and usefulness of, the mill book.

The student should be able to demonstrate by any teacher-selected means, an ability to identify by name and describe the characteristics of the common window and door units.

Instruction should include the "strength" system for glass.

The student should be able to identify the nature of existing interior and exterior surfaces, either by sight, by "rapping," or by other nondestructive test.
o Interior finish
  - Gypsum board
  - Plypanel
  - Phenolic panels
  - Millwork
    - Base
    - Casing
    - Mouldings

o Hardware
  - Locks and latches
    - Surface
    - Inset
  - Hinges
    - Butt
    - Double acting
    - Cabinet
  - Door closers
    - Hydraulic
    - Pneumatic
  - Window mechanisms
    - Sash balances
    - Crank operators
  - Miscellaneous
    - Door and drawer pulls
    - Push and kick plates
    - Door stops
    - Panic bars

o Supplies
  - Nails
    - Common
    - Finishing
    - Other
  - Screws
    - Head shape and type
    - Material

Instruction should include the strengths and weaknesses of the various materials, and the preferred use.

Students should be able to classify the common hardware, and describe its operation. They will be required to repair the cylinder of pin-tumbler locks or internal parts of hydraulic door closers.

It is necessary that students be able to identify the length, gauge, and type of nails. The system should be learned by using the instruction rather than by rote.
Interior finish
Gypsum board
Plypanel
Phenolic panels
Millwork
  . Base
  . Casing
  . Mouldings

Hardware
Locks and latches
  . Surface
  . Inset
Hinges
  . Butt
  . Double acting
  . Cabinet
Door closers
  . Hydraulic
  . Pneumatic
Window mechanisms
  . Sash balances
  . Crank operators
Miscellaneous
  . Door and drawer pulls
  . Push and kick plates
  . Door stops
  . Panic bars

Supplies
Nails
  . Common
  . Finishing
  . Other
Screws
  . Head shape and type
  . Material

Instruction should include the strengths and weaknesses of the various materials, and the preferred points of use.

Students should be able to classify the common building hardware, and describe its operation. They should not be required to repair the cylinder of pin-tumbler locks or internal parts of hydraulic door closers.

It is necessary that students be able to identify by sight the length, gauge, and type of nails and screws. The system should be learned by using the items, rather than by rote.
Adhesives
- Epoxies
- Resorcinol resin
- Polyvinyl resin
- Contact cements
- Organic glues

UNIT III — MAINTENANCE AND REPAIR

- Exterior
  - Ramps and docks
  - Stairs and railings
  - Roofing and flashing
  - Gutters and downspouts
  - Vents and louvers
  - Awnings
  - Doors and windows
    - Glass
    - Screening
    - Hardware
  - Surface finishes
    - and trim
  - Stadium seating

- Interior
  - Walls and ceilings
  - Floors
  - Stairways
  - Storage units
    - Cabinets
    - Shelves
    - Racks
  - Doors and windows
  - Movable partitions
  - Seating
    - Auditorium
    - Gymnasium
  - Furniture

The student should be made aware of the many general purpose adhesives commonly used in construction and maintenance, and of the attendant on the strengths and weaknesses. Emphasize that the label should be read and understood before the container is opened.

There are no valid guidelines regarding whether a particular job becomes contract size instead of "normal" maintenance staff work — size and competencies, economic considerations, union contracts, and other local factors having affect. Each teacher may decide how "big" a job must be to remove it from "normal" maintenance staff work. This does not include instruction in depth of those students of benefitting therefrom, but minimum competence required for employment should continue to be the criteria of student success.
Adhesives
- Epoxies
- Resorcinol resin
- Polyvinyl resin
- Contact cements
- Organic glues

III — MAINTENANCE AND REPAIR

Exterior
- Ramps and docks
- Stairs and railings
- Roofing and flashing
- Gutters and downspouts
- Vents and louvers
- Awnings
- Doors and windows
  - Glass
  - Screening
  - Hardware
- Surface finishes
  and trim
- Stadium seating

Interior
- Walls and ceilings
- Floors
- Stairways
- Storage units
  - Cabinets
  - Shelves
  - Racks
- Doors and windows
- Movable partitions
- Seating
  - Auditorium
  - Gymnasium
- Furniture

The student should be made aware of the many special and general purpose adhesives commonly used in building construction and maintenance, and of the preferred uses attendant on the strengths and weaknesses of each. Emphasize that the label should be read and understood before the container is opened.

There are no valid guidelines regarding where a particular job becomes contract size instead of maintenance staff work — size and competency of staff, economic considerations, union contracts, and other local factors having affect. Each teacher must decide how "big" a job must be to remove it from "normal" maintenance staff work. This does not preclude instruction in depth of those students capable of benefitting therefrom, but minimum competencies required for employment should continue to be the criteria of student success.
UNIT IV — ADDITIONS AND NEW WORK

- Framing
  - To existing structure
  - Freestanding

- Blending-in
  - Roofing
  - Walls
  - Floors
  - Trim

- Form building
  - Walks
  - Steps
  - Slabs

Emphasize the importance of blending additions to existing structures, appearance wise.

Joints of new-to-old should be "staggered" leaving an obvious outline.

Emphasize the importance of accurate work in building, even though the structures are...
Emphasize the importance of blending additions to existing structures, appearance wise.

Joints of new-to-old should be "staggered" to avoid leaving an obvious outline.

Emphasize the importance of accurate work in form building, even though the structures are temporary.
UNIT I — CONCRETE

- Composition
  - Cement
  - Aggregate
  - Water
  - Admixtures

- Preparation
  - Proportions
  - Equipment
    - Hand mix
    - Power mix
  - Procedure

- Placing
  - Pouring
  - Finishing
    - Screed
    - Float
    - Edger
    - Groover
    - Trowel
  - Protecting
  - Curing

- Use
  - Walks
  - Curbs
  - Slabs
  - Footings

The student should know that different types of cement and aggregates are available, as well as proportions, to obtain concrete whose quality is suitable for specific uses. He should understand that specifications should be carefully followed, and it is not necessary that he memorize types, proportions, or designations of components.

Emphasize proper methods of storing and handling concrete.

The student should be able to combine ingredients in a stated amount of concrete, both by hand and by machine, the specified proportions for any teacher-selected use.

Emphasize the importance of maintaining proper consistency for the mix.

The student should sufficiently understand the curing process, by which concrete sets to be aware of the dangers of honeycomb. He should be familiar with all methods of curing. He should be able to place, screed, float, edge, groover, and trowel a section of concrete, the result being to field standards of quality.
MASONRY

Suggested Time: 60 Hours

I — CONCRETE

TEACHING SUGGESTIONS

The student should know that different types of cement and aggregates are available, as well as various proportions, to obtain concrete whose qualities fit it for specific uses. He should understand that mix specifications should be carefully followed. It is not necessary that he memorize types, properties, and designations of components.

Emphasize proper methods of storing and handling cement.

The student should be able to combine in proper sequence, both by hand and by machine, the specified components of a stated amount of concrete, the mix being of proper consistency for any teacher-selected use.

Emphasize the importance of maintaining the purity of the mix.

The student should sufficiently understand the process by which concrete sets to be aware of the adverse effects on a new pour of too much or too little heat, and of rain or flowing water, and of the need for moisture during curing. He should be familiar with all means of avoiding honeycomb.

The student should be able to place, screed, float, and trowel a section of concrete, the resulting finish being to field standards of quality.

Composition
- Cement
- Aggregate
- Water
- Admixtures

Preparation
- Proportions
- Equipment
  - Hand mix
  - Power mix
- Procedure

Placing
- Pouring
- Finishing
  - Screed
  - Float
  - Edger
  - Groover
  - Trowel
- Protecting
- Curing

Use
- Walks
- Curbs
- Slabs
- Footings
Walls
- Stairs
- Floors
- Patching
- Trimming
- Slurry
- Filling

UNIT II — PLASTER

- Composition
  - Water
  - Sand
  - Fiber
  - Aggregates
    - Expanded mica
    - Other
  - Cements
    - Limes
    - Gypsum
      - Plaster of paris
      - Keene's cement
      - Portland
  - Prepared mixes

- Base surfaces
  - Type
    - Metal lath
    - Wood lath
    - Gypsum board
    - Existing plaster
      - Holes
      - Cracks
      - Loose sections
  - Preparation
    - Cleaning
    - Dovetailing
    - Wetting

Preparing and filling holes and cracks is a must for masonry maintenance men. They should be adept at all phases of this work matching.

It is not necessary that the students memorize exact components of the various plasters; it is necessary that they know the basic components of each plaster, that special components for particular uses exist, and where to find the specifications of each type needed.

Emphasize the importance of following the manufacturer's instructions for using plaster.

The student should be able to identify specific plaster bases and describe the special problems and specific uses of each. He should be able to prepare base surfaces for each kind of plaster.
Preparing and filling holes and cracks is a skill which is a must for masonry maintenance men. The student should be adept at all phases of this work except color matching.

It is not necessary that the students memorize the exact components of the various plasters. It is necessary that they know the basic components of any plaster, that special components for particular uses exist, and where to find the specifications for the type needed.

Emphasize the importance of following exactly, the manufacturer's instructions for using prepared mixes.

The student should be able to identify samples of common plaster bases and describe the special properties and specific uses of each. He should be able to demonstrate an ability to prepare base surfaces for application of plaster.
UNIT III — CERAMIC TILE

- Problems
  - Broken fixtures
  - Cracked tile
  - Lost grout

- Repair
  - Removing damaged units
    - Tools
    - Procedures
  - Resetting
    - Cutting
      - Tools
      - Procedures
    - Adhesives
      - Concrete plaster
      - Mastics
  - Regrouting
    - Mixing
    - Applying

The student should be able to mix, to field quality, any plaster for which specifications provided, and for which equipment and necessary components are available.

Emphasize the importance of keeping components, tools and equipment, clean and free of impurities.

While new plastering of comparatively large areas should not be neglected, emphasis should be placed on relatively small areas of existing plaster. Ability in patching should be at a higher level than is entry-level ability in replastering.

The setting of ceramic tile is a highly specialized field. Maintenance staff involvement is usually limited to regrouting and to replacing fixtures and the occasional cracked tile.

Students should be made aware of the much greater difficulty inherent in repairing tile set in plaster, than in that set in mastic.

The student should be able to demonstrate the ability to remove damaged tile and fixture, replace the base surface, and set the replacement tile.

The student should be able to demonstrate the ability to prepare and regout an existing tile surface, and achieve results equaling or exceeding field standards.
Mixing

- Proportions
- Procedures
  - Tools
  - Equipment

Application

- Base coat
- Finish coat
- Tools

II-- CERAMIC TILE

Problems

- Broken fixtures
- Cracked tile
- Lost grout

Repair

- Removing damaged units
  - Tools
  - Procedures
- Resetting
  - Cutting
    - Tools
    - Procedures
  - Adhesives
    - Concrete plaster
    - Mastics
- Regrouting
  - Mixing
  - Applying

The student should be able to mix, to field standards of quality, any plaster for which specifications have been provided, and for which equipment and necessary components are available.

Emphasize the importance of keeping components, and tools and equipment, clean and free of impurities.

While new plastering of comparatively large surfaces should not be neglected, emphasis should be on repairing relatively small areas of existing plaster. Entry-level ability in patching should be at a higher level of quality, than is entry-level ability in replastering.

III-- CERAMIC TILE

The setting of ceramic tile is a highly specialized field. Maintenance staff involvement is, therefore, usually limited to regrouting and to replacing broken fixtures and the occasional cracked tile.

Students should be made aware of the much greater difficulty inherent in repairing tile set in concrete plaster, than in that set in mastic.

The student should be able to demonstrate an entry-level ability to remove damaged tile and fixtures, prepare the base surface, and set the replacement units.

The student should be able to demonstrate an ability to prepare and regROUT an existing tile surface, the results equaling or exceeding field standards for acceptable quality.
UNIT IV — BRICK AND BLOCK

Pointing
- Preparing the joint
  . Raking
  . Wetting
- Mortar
  . Mixing
  . Applying
- Tooling

Alterations
- Cutting openings
  . Equipment
    Hand
    Power
  . Procedure
- Shoring
- Safety

Setting new units
- Description
  . Size
  . Type
  . Absorptivity
- Layout
  . Running bond
  . Random bond
  . Common bond
  . English bond
  . Other
- Procedure
  . Methods
  . Tools

Instruction in mixing of mortar should impartment of an understanding of the properties of cements and the effects of each on the mortar.

Students should be able to mix mortars to specifications, and to a proper working condition. They should develop the ability to distinguish mortar that has stiffened through evaporation; it can be retempered — and mortar which has not.

The student should be able to demonstrate ability to prepare joints, mix mortar, and tool the joints.

The students should gain experience in using and equipment — hand and power; chipping, boring. Hardhats, eyeshields, respirator, shoes must be mandatory equipment.

Instruction must emphasize proper shoring if needed.

Instruction and daily use should acquaint with the more common styles, sizes, and types of brick and block, and with the relative ability of each.

The student should be able to identify by photographs, or live samples. He should work out those bonds widely used in his geography.

The student should be able to lay up a wall of block; joints uniform in size, all plumb, and true.
Pointing
- Preparing the joint
- Raking
- Wetting

Mortar
- Mixing
- Applying
- Tooling

Alterations
- Cutting openings
  - Equipment
    - Hand
    - Power
  - Procedure
- Shoring
- Safety

Setting new units
- Description
  - Size
  - Type
  - Absorptivity
- Layout
  - Running bond
  - Random bond
  - Common bond
  - English bond
  - Other
- Procedure
  - Methods
  - Tools

Instruction in mixing of mortar should include development of an understanding of the properties of various cements and the effects of each on the mortar.

Students should be able to mix mortars to provided specifications, and to a proper working consistency. They should develop the ability to distinguish between mortar that has stiffened through evaporation — and can be retempered — and mortar which has set.

The student should be able to demonstrate an entry-level ability to prepare joints, mix mortar, and point and tool the joints.

The students should gain experience in use of all tools and equipment — hand and power; chipping, cutting, and boring. Hardhats, eyeshields, respirators, and safety shoes must be mandatory equipment.

Instruction must emphasize proper shoring, and why it is needed.

Instruction and daily use should acquaint the students with the more common styles, sizes, and shapes of brick and block, and with the relative absorptivity of each.

The student should be able to identify by name, any of the common bonds represented by teacher-selected sketches, photographs, or live samples. He should be able to lay out those bonds widely used in his geographical area.

The student should be able to lay up a section of brick, and of block; joints uniform in size, all work level, plumb, and true.
Instruction on flashings should include purpose, materials, the installation of thruwall flashing, and fabrication and installation of counter flashing.

Students should know why new masonry must be cleaned. They should be acquainted with the various types of cleaners, their properties, and proper methods of use. The teacher must emphasize safety and conformity to procedure. Demonstrating the effects of muriatic acid on samples of cloth, wood, and metal is frequently useful.

Instruction should include why waterproofing is needed, what materials are used in what locations, and how the work is performed. Students should attain entry-level proficiency in applying parge coatings and at least the one type sealer most used in that geographical area.
UNIT I — ELECTRICAL ENERGY

- Nature of Electricity
  - Electron theory
  - Production of AC
  - Transmission of current
    - Conductors
    - Insulators

- Safety
  - Shock
  - Fire
    - Type B/C extinguishers
  - Equipment
  - First-aid

UNIT II — CIRCUITS

- Codes
  - National
  - Local

- Conductors
  - Type
    - Armored
    - Nonmetallic
  - Sizes
  - Conduits

ELECTRICITY

Suggested Time: 60 Hours

TEACHING SUGGESTIONS

Instruction should include an overview of electrical theory, production of current, and transmission of current.

The student should be able to classify conductor or insulator, any commonly encountered type.

Safety instruction is of supreme importance. The student should be alert to the danger of shock and fire from electrical energy. Use of safety equipment must be unvaryingly enforced. All students must know basic first-aid procedures; they must be able to do in rescue procedure, what extinguishers must not be used on electrical fires.

The Code is constantly changing; students should be taught to check its requirements rather than rely on memory. The teacher must be the final decision-maker in each case, before power is switched on.

The shop inventory should include a record of all the various sizes and types of material encountered by electrical maintenance. Students should learn component identification of these materials.
ELECTRICAL ENERGY

Suggested Time: 60 Hours

TEACHING SUGGESTIONS

Instruction should include an overview of basic electrical theory, production of current, and transmission of current.

The student should be able to classify as either conductor or insulator, any commonly available material.

Safety instruction is of supreme importance in this occupational area. The student should be continually alert to the danger of shock and fire inherent in use of electrical energy. Use of safety equipment must be unvaryingly enforced. All students should know basic first-aid procedures; they must know what not to do in rescue procedure, what extinguishing agent must not be used on electrical fires, and why not.

The Code is constantly changing; students should be taught to check its requirements rather than rely on memory. The teacher must be the final "inspector" in each case, before power is switched on.

The shop inventory should include a realistic supply of all the various sizes and types of materials commonly encountered by electrical maintenance men. Students should learn component identification through use of these materials.
- Connection boxes
  - Types
  - Sizes
  - Methods of installing

- Switches
  - Type
    - Mechanical
    - Mercury
    - Rheostat
  - Function
    - Single-pole
    - Three-way
    - Other

- Receptacles
  - Interior
  - Exterior
  - Higher voltage

- Connections
  - Live
    - Screw clamp
    - Spring clamp
  - Ground

- Protective devices
  - Fuses
    - Plug
    - Cartridge
      - Unit
        - Replacable element
    - Breakers

Students should have a general understanding of several types of switches function, that able to diagnose problems resulting from

Emphasize the importance of clean, tight proper grounding.

The student should be able to install any representative circuits, diagnose and reset tripped breakers, forming to the Underwriters Code and standard procedure.

Emphasize the importance of circuit protection and of maintaining the correct rating for the circuit.
Connection boxes

Types
Sizes
Methods of installing

Switches
Type
  Mechanical
  Mercury
  Rheostat
Function
  Single-pole
  Three-way
  Other

Receptacles
Interior
Exterior
Higher voltage

Connections
Live
  Screw clamp
  Spring clamp
Ground

Protective devices
Fuses
  Plug
  Cartridge
    Unit
    Replacable element
Breakers

Students should have a general understanding of how the several types of switches function, that they may be able to diagnose problems resulting from faulty switches.

Emphasize the importance of clean, tight connections and proper grounding.

The student should be able to install and connect representative circuits, diagnose and replace defective components, and reset tripped breakers, all work conforming to the Underwriters Code and standards of safe procedure.

Emphasize the importance of circuit protective devices, and of maintaining the correct rating for the particular circuit.
UNIT III — ELECTRICAL DEVICES

- Illumination
  - Type
    . Incandescent
    . fluorescent
  - Cleaning
  - Maintenance
    . Lighting elements
    . Diffusers
    . Reflectors
    . Ballasts
    . Emergency lighting units
  - Unit replacement

- Motors
  - Cleaning
  - Lubricating
  - Replacing brushes
  - Checking connections

- Alarm and signal systems
  - Device
    . Bell
    . Buzzer
    . Flasher
  - Checking connections
  - Checking switches
  - Routine maintenance

School facilities should provide permanent and shop inventory should provide practice which will afford students experience in cleaning, repairing, and replacing both incandescent and lighting units.

School facilities should provide numerous examples of motors, in addition to shop samples, which will provide practice in motor maintenance.

Emphasize the importance of proper maintenance in achieving the total reliability necessary to electrical and signal systems.

It is not necessary that students be capable of installing a system; they should be able to check, repair, and replace defective components.

The use of the scheduled-inspection maintenance should be taught.
School facilities should provide permanent installations, and shop inventory should provide practice units, which will afford students experience in cleaning, maintaining, repairing, and replacing both incandescent and fluorescent lighting units.

School facilities should provide numerous electric motors, in addition to shop samples, which will provide practice in motor maintenance.

Emphasize the importance of proper maintenance in achieving the total reliability necessary to alarm and signal systems.

It is not necessary that students be capable of installing a system; they should be able to locate and replace defective components.

The use of the scheduled-inspection maintenance chart should be taught.
PLUMBING

Suggested Time: 45 Hours

UNIT I — WATER SUPPLY

TEACHING SUGGESTIONS

Instruction and practice should sufficiently
the student with the common pipe materials,
properties of each, that he can identify ma
sight and describe the strengths and weakne

The students should have a general knowled
dard pipe diameters and lengths, and under
and O.D. measurement.

The student should be able to select from
of any type, size, and material specified:

Students should be able to identify by nam
any common type valve. Instruction should
familiarization with internal features of
areas of probable trouble. Emphasize

Students should be able to replace washers
and perform routine maintenance of common

- Piping
  - Material
    . Iron
    . Copper
    . Plastics
  - Sizes

- Fittings
  - Material
  - Sizes
  - Types
    . Elbows
    . Tees
    . Couplings
    . Unions
    . Other

- Valves
  - Automatic
    . Check
    . Relief
    . Float
    . Other
  - Nonautomatic
    . Globe
    . Gate
    . Waste
    . Other
  - Maintenance
    . Washers
    . Packing
PLUMBING

Suggested Time: 45 Hours

TEACHING SUGGESTIONS

Instruction and practice should sufficiently familiarize the student with the common pipe materials, and with the properties of each, that he can identify materials on sight and describe the strengths and weaknesses of each.

The students should have a general knowledge of standard pipe diameters and lengths, and understand I.D. and O.D. measurement.

The student should be able to select from stock, fittings of any type, size, and material specified by the teacher.

Students should be able to identify by name and function, any common type valve. Instruction should include familiarization with internal features of each type, and areas of probable trouble. Emphasize proper flow installation.

Students should be able to replace washers and packing, and perform routine maintenance of common water system valves.
Faucets
- Plain
- Mixing
- Single-lever

Location
- Buildings
  - Sinks and lavatories
  - Baths and showers
  - Sanitary facilities
  - Drinking fountains
  - Laundry units
  - Water heaters
- Exterior
  - Lawn sprinklers
  - Drinking fountains
  - Sill cocks

Weather protection
- Insulation
- Draining

Hot water supply
- Relief valve

Codes

UNIT II — DRAINAGE SYSTEM

Functions
- Main soil lines
- Waste lines
- Storm drains

Instruction should include Fuller and group but should concentrate on compression faucets. The student should be able to remove and replace type faucets. He should be able to diagnose, disassemble, repair, and reassemble all styles of compression faucet.

Instruction and practice should acquaint students with the various types of terminals of water supply systems and the maintenance and probable troubles it may give. Emphasize the importance of quickly locating shut-offs.

Students should be aware of the danger of exposed lines. They should know the methods of thawing, and be able to properly drain lines. Students should recognize the physical and environmental differences of the various drain systems, and identify examples of each.

The student should be able to explain the operation of the pressure-temperature relief valve, if needed.
PLUMBING

— Faucets
  - Plain
  - Mixing
  - Single-lever

— Location
  - Buildings
    . Sinks and lavatories
    . Baths and showers
    . Sanitary facilities
    . Drinking fountains
    . Laundry units
    . Water heaters
  - Exterior
    . Lawn sprinklers
    . Drinking fountains
    . Sill cocks

— Weather protection
  - Insulation
  - Draining

— Hot water supply
  - Relief valve

— Codes

II — DRAINAGE SYSTEM

— Functions
  - Main soil lines
  - Waste lines
  - Storm drains

Instruction should include Fuller and ground-key faucets, but should concentrate on compression faucets.

The student should be able to remove and replace all type faucets. He should be able to diagnose troubles, disassemble, repair, and reassemble all styles of compression faucet.

Instruction and practice should acquaint student with the various types of terminals of water supply lines, and the maintenance and probable trouble areas of each. Emphasize the importance of quickly locating line shut-offs.

Students should be aware of the danger of freezing of exposed lines. They should know the methods of insulating, and be able to properly drain lines. They should have an understanding of safe thawing procedures.

The student should be able to explain the functioning of the pressure-temperature relief valve, and why it is needed.

Students should recognize the physical and functional differences of the various drain systems, and be able to identify examples of each.
• Waste disposal system
  - Municipal
  - Septic
  - Codes

• Materials
  - Iron
  - Copper
  - Glass
  - Plastic
  - Cast iron
  - Other

• Fittings
  - Couplings
  - Elbows
  - Tees
  - Increasers
  - Clean-outs
  - Other

• Traps
  - S
  - P
  - Drum
  - Other

• Stacks
  - Vent
  - Ventilation

• Freeing stoppages
  - Waste lines
    . Chemicals
    . Force cup
    . Snake

Instruction should include an overview of and mechanics of both municipal and septi(Students should be able to use — but not to memorize — plumbing codes.

The student should be able to identify an selected sample drain as to material, size uses.

The student should be able to identify an functioning of the various traps. He must understand the health and safety reasons existence, and the principle on which the

Emphasize the importance of ventilating d Instruction should include the difference and ventilation stacks.

Instruction should include probable probl the nature of materials usually causing s each such point. Students should be inst selection and safe use of chemical and m of clearing stoppages, and made aware of improper or careless use.
Waste disposal systems
Municipal
Septic
Codes

Materials
Iron
Copper
Glass
Plastic
Cast iron
Other

Fittings
Couplings
Elbows
Tees
Increasers
Clean-outs
Other

Traps
S
P
Drum
Other

Stacks
Vent
Ventilation

Freeing stoppages
Waste lines
Chemicals
Force cup
Snake

Instruction should include an overview of the principles and mechanics of both municipal and septic systems.

Students should be able to use — but not be expected to memorize — plumbing codes.

The student should be able to identify any teacher-selected sample drain as to material, size, and proper uses.

The student should be able to identify and describe the functioning of the various traps. He must completely understand the health and safety reasons for their existence, and the principle on which they function.

Emphasize the importance of ventilating drains. Instruction should include the difference between vent and ventilation stacks.

Instruction should include probable problem points and the nature of materials usually causing stoppages at each such point. Students should be instructed in selection and safe use of chemical and mechanical means of clearing stoppages, and made aware of the hazards of improper or careless use.
UNIT III — JOINING COMPONENTS

Galvanized iron
- Cutting
  . Manual
  . Machine
- Threading
  . Equipment
  . Procedure
- Joining
  . Equipment
  . Procedure
- Testing

Copper
- Cutting
- Sweating
  . Preparation
  . Joining
- Testing

Emphasize the danger inherent in large volumes backed up — especially vertically — by siphoning. Stress the importance of using correct methods of control under these conditions.

The student should be able to demonstrate ability to:

- Cut galvanized pipes within acceptable limits of stated lengths, using each cutting tool commonly used in the field.

- Cut standard threads, using both manual and machine threading equipment.

- Join sections of threaded pipe and special fittings into a watertight unit.

- Cut copper tubing to length, using a hackaw.

- Prepare components for joining, using abrasives and flux.

- Join sections of tubing and selected fittings into a watertight unit, using solder and propane butane torch.
Emphasize the danger inherent in large volumes of liquid backed up — especially vertically — by stoppages, and the importance of using correct methods of opening drains under these conditions.

III — JOINING COMPONENTS

Galvanized iron
- Cutting
  - Manual
  - Machine
- Threading
  - Equipment
  - Procedure
- Joining
  - Equipment
  - Procedure
- Testing

Copper
- Cutting
- Sweating
  - Preparation
  - Joining
- Testing

The student should be able to demonstrate an entry-level ability to:

Cut galvanized pipes within acceptable tolerances of stated lengths, using each cutting tool commonly used in the field.

Cut standard threads, using both manual and power dies.

Join sections of threaded pipe and specified fittings into a watertight unit.

Cut copper tubing to length, using wheelcutter and hacksaw.

Prepare components for joining, using coated abrasives and flux.

Join sections of tubing and selected fittings into a watertight unit, using solder and propane or butane torch.
The student should be able to demonstrate an entry-level ability to:

- Cut, fit, and clamp or solvent-weld components of plastic pipe to form a watertight unit.

- Cut bell-and-spigot pipes within acceptable tolerances, using cold chisel and chain wheel cutter.

- Assemble, pack, lead, and calk specified components into a unit which will remain watertight under specified gravitational or introduced pressures.

- Provide supports as required by the type, material, diameter, and run length of pipe.

Emphasize use of eye, foot, and other safety equipment.

Instruction should include safeguarding against such hazards as spattering of hot flux and explosion of molten lead poured into wet bell-and-spigot joints.
CLIMATE CONTROL

Suggested Time: 45 Hours

UNIT I — INTRODUCTORY INFORMATION

- Factors
  - Temperature
  - Conduction
  - Convection
  - Radiation
  - Humidity
    - Too high
    - Too low
- Application
  - Food storage
  - Laboratories
  - Electronics manufacturing
  - Personal comfort
- Climate control systems
  - Heating systems
    - Warm air
    - Hydronic
    - Radiant
  - Cooling systems
    - Forced air flow
    - Refrigeration
  - Humidifiers
    - Plate
    - Drum
    - Dehumidifiers

TEACHING SUGGESTIONS

Students should be instructed in what heat is, in which it travels, and why some materials and others are insulators. The teacher should explain the molecular motion theory of temperature in achieving comfort, and the effects of improper humidity.

Emphasize the relationship of relative humidity in achieving comfort, and the effects of improper humidity.

The students should be made aware of the applications of climate control which are more exacting than the obvious use in human comfort.

Instruction should include a comparative study of the mechanical, financial, esthetic, and environmental aspects of each of the three main heating systems.

The student should be aware of the nature of evaporative cooling through forced air, and the advantages and disadvantages of cooling refrigerated air.

The student should understand the principle of humidifiers and dehumidifiers, the methods of each type, and the effects of "liming" in air.
CLIMATE CONTROL

Suggested Time: 45 Hours

I I — INTRODUCTORY INFORMATION

Factors
- Temperature
  - Conduction
  - Convection
  - Radiation
- Humidity
  - Too high
  - Too low

Application
- Food storage
- Laboratories
- Electronics
  - Manufacturing
- Personal comfort

Climate control systems
- Heating systems
  - Warm air
  - Hydronic
  - Radiant
- Cooling systems
  - Forced air flow
  - Refrigeration
- Humidifiers
  - Plate
  - Drum
- Dehumidifiers

TEACHING SUGGESTIONS

Students should be instructed in what heat is, the ways in which it travels, and why some materials are conductors and others are insulators. The teacher should be prepared to explain the molecular motion theory of heat transfer.

Emphasize the relationship of relative humidity to temperature in achieving comfort, and the effects and side effects of improper humidity.

The students should be made aware of the many important applications of climate control which are more technically exacting than the obvious use in human comfort.

Instruction should include a comparative examination of the mechanical, financial, esthetic, and functional aspects of each of the three main heating systems.

The student should be aware of the nature and limitations of evaporative cooling through forced air flow, and of the advantages and disadvantages of cooling through refrigerated air.

The student should understand the principle and functioning of humidifiers and dehumidifiers, the effectiveness of each type, and the effects of "liming" on the evaporator elements.
UNIT II — WARM AIR SYSTEMS

- Furnaces
  - Central
  - Room unit

- Fuels
  - Oil
  - Gas

- Heat flow
  - Plenum
  - Blower
    . Motor
    . Controls
  - Distribution ducts
  - Registers
  - Return ducts
  - Filters
    . Mechanical
    . Electronic

- Maintenance
  - Cleaning
    . Furnace
      Combustion parts
      Grills
    . Filters
    . Humidifiers
    . Registers
    . Thermostats
  - Lubricating
  - Restarting
  - Regulating
    . Thermostats
    . Fuel/air flow
    . Humidistats

Instruction should include room unit furnace, emphasis must be on central systems.

The students should know the comparative major problems of the common fuels, as well as requirements for different combustion equipment each require.

Emphasize safety procedures regarding leaks.

The student should be able to describe, orally or writing, the circulation of air through a warm air system, list the components, and explain the functioning of each.

The student should be able to describe, orally or writing, how a forced warm air system is "on" and the effects of duct size on distribution.

The student should be able to perform all maintenance procedures, in conformance with procedural charts.

The student should be able to repair or replace damaged sections of duct, and to assemble a new branch.

The student should be able to locate and repair components, and to install replacement parts.
Instruction should include room unit furnaces, although emphasis must be on central systems.

The students should know the comparative maintenance problems of the common fuels, as well as recognizing the different combustion equipment each requires.

Emphasize safety procedures regarding leaks and fires.

The student should be able to describe, orally or in writing, the circulation of air through a forced warm air system, list the components, and explain the functioning of each.

The student should be able to describe, orally or in writing, how a forced warm air system is "balanced," and the effects of duct size on distribution.

The student should be able to perform all routine maintenance procedures, in conformance with provided procedural charts.

The student should be able to repair or remove and replace damaged sections of duct, and to assemble and cut in a new branch.

The student should be able to locate and remove faulty components, and to install replacement parts.
UNIT III — HYDRONIC SYSTEMS

- Boilers
  - Hot water
  - Steam

- Fuels
  - Gas
  - Oil

- Heat flow
  - Gravity flow
    - One pipe
    - Two pipe
  - Forced flow
- Radiators
  - Convector cabinets
  - Baseboard cabinets
  - Radiant panels
  - Cast iron

- Maintenance
  - Cleaning
    - Furnace
      - Combustion parts
      - Boiler
    - Radiators
    - Lines
    - System controls
      - Thermostats
      - Aquastats
      - Relief valves
  - Lubrication
    - Circulators
  - Restarting
  - Regulating
    - Thermostats
    - Aquastats
    - Valves
    - Fuel delivery

The student should have a basic knowledge of hot water systems. He should not be expected to be familiar with the details of the various types.

The student should be able to demonstrate an understanding of the functioning of the various distribution systems, and an ability to identify sample components.

Instruction should include a comparative evaluation of the relative advantages of the various radiant panels and when connected to the different distribution systems.

Emphasize the importance of keeping radiant panel dust mats.

The student should be able to perform all maintenance procedures in conformance with procedural charts and factory specifications.

The student should be able to locate fault diagnosis and repair or remove and replace parts when connected to the different distribution systems.

Emphasize the importance of maintaining correct pressure, and of maintaining accurate functioning pressure indicators and safety valves.
II — HYDRONIC SYSTEMS

Boilers
- Hot water
- Steam

Fuels
- Gas
- Oil

Heat flow
- Gravity flow
  - One pipe
  - Two pipe
- Forced flow

Radiators
- Convector cabinets
- Baseboard cabinets
- Radiant panels
- Cast iron

Maintenance
Cleaning
- Furnace
  - Combustion parts
  - Boiler
- Radiators
- Lines
- System controls
  - Thermostats
  - Aquastats
  - Relief valves

Lubrication
- Circulators

Restarting
Regulating
- Thermostats
- Aquastats
- Valves
- Fuel delivery

The student should have a basic knowledge of steam and hot water systems. He should not be expected to become familiar with the details of the various types and models.

The student should be able to demonstrate an understanding of the functioning of the various distribution systems, and an ability to identify samples by type.

Instruction should include comparative examination of the relative advantages of the various radiators per se, and when connected to the different distribution systems.

Emphasize the importance of keeping radiators free of dust mats.

The student should be able to perform all routine maintenance procedures in conformance with provided procedural charts and factory specifications.

Emphasize the importance of maintaining correct internal pressure, and of maintaining accurate functioning of pressure indicators and safety valves.
UNIT IV — COOLING SYSTEMS

- Room unit
  - Types and sizes
    - Cooling needs
    - Structure design factors
    - Installation
  - Adjustments
    - Deflectors
    - Fan speed control
    - Vent/Cool controls
  - Maintenance
    - Cleaning
    - Winter protection

- Central systems
  - Types and sizes
    - Reciprocating
    - Centrifugal
    - Absorption
  - Function
    - Components
      - Motors
      - Pumps
      - Drives
      - Controls
  - Inspection
    - Visual
    - Tests
  - Maintenance
    - Repairs
    - Adjustments
    - Cleaning
    - Lubrication

It is necessary that students possess a standing of the functioning of air conditioning systems.

The student should be aware of the considerations of cooling capacity of the nature of the structure, and the physical location of the unit conditioners in accordance with manufacturer's literature.

The student should be able to perform routine seasonal maintenance in accordance with procedural charts, and those repairs described in manufacturer's literature.

The student should be well grounded in the functional differences of the three types of systems, and the relative advantages of each.

The student should be able to verbally identify a representative system, identifying and describing their function and function.

The student should be able to perform annual seasonal maintenance in accordance with procedural charts and manufacturer's instructions.

The students should be able to perform annual seasonal maintenance in accordance with procedural charts and manufacturer's instructions.

Note: Dual systems require maintenance — routine and seasonal — for both heating and cooling systems.
It is necessary that students possess a basic understanding of the functioning of air conditioning units.

The student should be aware of the considerable effect on cooling capacity of the nature of the building, its structure, and the physical location of the unit itself.

The student should be able to install and adjust room unit conditioners in accordance with manufacturer's instructions.

The student should be able to perform routine and seasonal maintenance in accordance with provided procedural charts, and those repairs described in manufacturer's literature.

The student should be well grounded in the physical and functional differences of the three types of central systems, and the relative advantages of each.

The student should be able to verbally trace a schematic of a representative system, identifying component parts and describing their function and functioning.

The student should be able to perform all routine and seasonal maintenance in accordance with provided procedural charts and manufacturer's instructions.

The students should be able to perform the troubleshooting and repair procedures authorized by the manufacturer and described in his literature.

Dual systems require maintenance — routine and seasonal — for both heating and cooling systems.
DRAWINGS AND SPECIFICATIONS

Suggested Time: 15 Hours

UNIT I — DRAWINGS

- Type
  - Architectural
    - Plot plan
    - Floor plan
    - Elevation
    - Section
    - Detail
  - Mechanical/Electrical
    - Pictorial
    - Assembly
    - Exploded
    - Detail
    - Schematic

- Interpretation
  - Notation
  - Symbols
  - Line weights
  - Measurement
    - Stated
    - Scaled

UNIT II — SPECIFICATIONS

- Construction
  - Materials
  - Procedures
  - Standards of quality

TEACHING SUGGESTIONS

Instruction and practice should enable the student to identify a drawing by name and to state characteristics which make it a distinct type.

The student must be able to correctly interpret a drawing. It is not necessary that he be able to read every part of a drawing.

The student should be able to locate an identified teacher-specified point of information provided drawing.

Students should have an overall knowledge and breadth of information contained in the drawings.

Emphasize that, where drawings and specifications agree, specifications take precedence.
DRAWINGS AND SPECIFICATIONS

Suggested Time: 15 Hours

TEACHING SUGGESTIONS

Instruction and practice should enable the student to identify a drawing by name and to state the characteristics which make it a distinct type.

The student must be able to correctly interpret drawings; it is not necessary that he be able to make drawings.

The student should be able to locate and interpret any teacher-specified point of information contained on a provided drawing.

IT II — SPECIFICATIONS

Students should have an overall knowledge of the depth and breadth of information contained in specifications.

Emphasize that, where drawings and specifications do not agree, specifications take precedence.
Manufacturers' Equipment
- Installation
- Maintenance
- Repair
- Supplies
- Use
- Storage
- Parts lists

The student should be able to locate and interpret any teacher-specified point of information contained in provided specifications.

It is not necessary that the student be able to write legally acceptable specifications. He should be able to write complete, clear, purchase orders.
BOOKKEEPING AND ESTIMATING

Suggested Time: 15 Hours

UNIT I --- BASIC ACCOUNTING

TEACHING SUGGESTIONS

Students should be capable of keeping a run of stock, of equipment, and of maintenance records.

- Supplies inventory
- Equipment and plant maintenance
  - In-house
  - Contracted
- Insurance
  - Required by law
  - Optional
- Utilities
  - Fuels
  - Electricity
  - Water
  - Waste disposal
    - Garbage
    - Trash
    - Sewerage
- Labor
  - Term
    - Staff
    - Ad hoc
  - Records
    - Employment
      - Job interviews
      - Resumés
      - Proficiency credentials
      - Union memberships
      - Youth working papers
      - Terminations

Instruction should include familiarization with maintenance required and optional, and with maintenance records.

Students should be aware of the need for controlling utilities expenditures, for proof of pay estimating future expenditures, and for operating economy.

Students should be provided broad background of this aspect of supervision and management. Staff should be made aware of the legal ramifications of employment and compensation records.
BOOKKEEPING AND ESTIMATING

Suggested Time: 15 Hours

— BASIC ACCOUNTING

Students should be capable of keeping a running inventory of stock, of equipment, and of maintenance work performed.

TEACHING SUGGESTIONS

Instruction should include familiarization with coverages, required and optional, and with maintenance of necessary records.

Students should be aware of the need for complete records of utilities expenditures, for proof of payment, for estimating future expenditures, and for operational economy.

Students should be provided broad background knowledge of this aspect of supervision and management. They should be made aware of the legal ramifications of employment and compensation records.
UNIT II — ESTIMATING

- Operational supplies
  - Custodial
  - Groundskeeping
  - Repair and maintenance
    - Equipment
    - Buildings

- Contingency supplies
  - Emergencies
  - Acts of nature
  - Unexpected crowds

- Labor
  - Staff
    - Full-time
    - Part-time
    - Subcontracted

- Utilities
  - Water
  - Power
    - Fuels
    - Electricity
  - Waste disposal
    - Sewer taxes
    - Garbage/trash collection

Instruction should include methods of needs.

Students should be capable of demonstrating estimating procedure, basing figures of previous expenditures. Greater accuracy is expected in estimating supplies than labor but at the entry-level correct procedure is more important than resulting figures.
II --- ESTIMATING

Operational supplies
- Custodial
- Groundskeeping
- Repair and maintenance
  - Equipment
  - Buildings

Contingency supplies
- Emergencies
- Acts of nature
- Unexpected crowds

Labor
- Staff
  - Full-time
  - Part-time
- Subcontracted

Utilities
- Water
- Power
  - Fuels
  - Electricity
- Waste disposal
  - Sewer taxes
  - Garbage/trash collection

Instruction should include methods of estimating future needs.

Students should be capable of demonstrating good estimating procedure, basing figures on provided records of previous expenditures. Greater accuracy should be expected in estimating supplies than in labor time/costs, but at the entry-level correct procedure is more important than resulting figures.
RESOURCE LIST

BOOKS


____ **Millwrights and mechanics guide.** Indianapolis. Theodore Audel & Co.

Award Books. **Family Handyman's 1001 questions and answers.** New York. Universal Publishing & D


____ & Townsend, G. **How to remodel a house.** Chicago. American Technical Society.

Delmar Publishers Division. **Concrete form construction.** Albany. The Division.

____ **Framing, sheathing, and insulation.** Albany. The Division.

____ **Hand tools and portable machinery.** Albany. The Division.

____ **Mathematics for carpenters.** Albany. The Division.

____ **Simplified stair layout.** Albany. The Division.
RESOURCE LIST


Risers Division. *Concrete form construction.* Albany. The Division.

Risers, sheathing, and insulation. Albany. The Division.

House tools and portable machinery. Albany. The Division.

Mechanics for carpenters. Albany. The Division.

Simplified stair layout. Albany. The Division.


Mix, Floyd.  *All about house wiring.* South Holland, Ill. Goodheart-Willcox Co.


& Roberts, R.H. Instruction and information unit for hand woodworking. New York. McCormick-


Society.


Concrete masonry handbook for architects, engineers, and builders. Chicago. American

Building Association.


Sack, Thomas F. *A complete guide to building and plant maintenance.* Englewood Cliffs, Prentice
Woodin, J.C. & Hayes, L. *Home and building maintenance.* Bloomington, Ill. McKnight & McKnight
1969.

**PAMPHLETS**


**PERIODICALS**


**CHARTS**


Safety charts, #06-990, 18 pcs. Stanley Tools. New Britain.
FILMS — 16mm. SOUND

Cornell University Film Library

Boring and drilling tools. 10 min. b&w.
Chisels and gouges. 10 min. b&w.
Every drop fit to drink. 15 min. color.
First aid now. 26 min. b&w.
Furniture refinishing. 23 min. b&w.
Hand saws. 10 min. b&w.
Hand soldering. 20 min.
Joining and gluing. 10 min. b&w.
Knowing woods and their uses. 15 min. b&w.
Know your fire exit. 20 min.
Landscaping design. 5 min. b&w.
Lawn care. 14 min. color.
Longer life for wood. 17 min.
Man's problems. 14 min. color.
Measuring and squaring tools. 10 min. b&w.
More power for the job. 20 min.
Planes. 10 min. b&w.
Safe shop. 10 min.
Safe use of pesticides. 21 min. color.
Sizing sense. 15 min. b&w.
This is lumber. 15 min. b&w.
Using screws and nails. 10 min. b&w.
Welding comes to the farm. 24 min.
Wood finishing. 10 min. b&w.
Your date with life. 15 min. color.
Your lawn's enemies. 5 min. b&w.

Modern Talking Picture Co.

Choosing the right valve. color.
Energy on the move. color.
Impact. color.
Piping pointers. color.
Search for total comfort. color.
The toughest inch. color.
Modern Talking Picture Co.

There are my people. color.
This is steel. color.
Underground study of natural gas. color.

National Association of Plumbing, Heating and Cooling Contractors

A drink for Judy.
Designs for better living.
Explosion danger lurks.
Life lines of your community.
Loop and circuit vent'ng in the plumbing system.
Modern pipe for modern living.
Modern sewers for modern communities.
Municipal sewage treatment processes.
Pipe schemes.
Piping safety.
Piping to the clouds.
Safe water in the homes.
Sewers — guardian of community health.
The grass is always greener.
Wrought iron — yesterday, today, tomorrow.

Sterling Educational Films

Instrumentation: floor control devices.
Instrumentation: pressure control devices.
Instrumentation: temperature control devices.
Paperhanging: application. 14 min.
Paperhanging: preparation. 14 min.
Plumbing: joints. 14 min.
Plumbing: traps and vents. 14 min.
Portable electric sander. 13 min.
Power drills for woodwork. 13 min.
Scroll saw. 13 min.
Sheet metal: elbows and tees. 14 min.
Steamfitting: pipe bending. 14 min.
The art of hanging a door. 14 min.
FILM LOOPS — 8mm.

Sterling Educational Films

Aviation snips; S-69-D
Brazing; S-71-B
Care of files; S-68-C
Circuit concepts; S-65-B
Combination snips; S-69-B
Complete circuit; S-65-C
Curved snips; S-69-C
Cutting: oxyacetylene; S-71-E
Drafting: lines, dimensions, symbols; S-57-B
Drill press operations; S-72-A through S-72-E
Fastening metals; S-73-A through S-73-E
Hand soldering; S-70-E
Isometric drawings; S-60-C
Measuring and marking tools; S-67-A
Metal files: Sizes, shapes, and cuts; S-68-A
Scribers, punches, and dividers; S-67-C
Series and parallel; S-65-E
Shapes in sheetmetal; S-58-D
Sheetmetal terms; S-58-C
Soldering equipment; S-70-A
Soldering seams; S-70-D
Straight snips; S-69-A
Switches; S-65-D
Tinning an iron; S-70-B
Tinning metal; S-70-C
Try-squares, dividers, and calipers; S-67-B
Types of files; S-68-B
What is electricity; S-63-A
Woodworking: hand tools; S-84-A through S-95-E
Woodworking: machine tools; S-99-A through S-100-E
FILMSTRIPS — 35mm.

Jam Handy Organization

Band saws and circular saws
Belt sanders
Chisels, screwdrivers, and files
Disc sanders
Drill presses
Eye protection
Hand tools, hammers, and saws
Hand and power hack saws
Jig saws
Jointers
Layout tools and measuring instruments
Layout work, parts I and II
Maintaining a safe shop
Planes, bits, and knives
Play safe — work safely
Power supply
Scrapering
Tool grinders

Paxton-Patterson Equipment and Supply

Boring tools for woodworking. 151 fr.
Chisels for woodworking. 139 fr.
Hammers, screwdrivers, nails, and screws. 149 fr.
Hand saws for woodworking. 141 fr.
Measuring, testing, and marking tools for woodworking. 114 fr.
Planes. 126 fr.
SLIDES — 35mm.

Cornell Film Library

Exterior building materials for your home; HD-59.
Foundations for your home; HD-54.
Heating and cooling for your home; HD-53.
Interior building materials for your home; HD-52.
Keep out of reach of children; KRC.
Landscape planning for homesteads and grange-likes; L-3.
Lawn care and lawn problems; L-7.
Powerful tips on how to treat a power mower; H-45.
Safe use of pesticides; SUP.
Shop safety with power tools; H-32.
Shrubs that mature; PM-5.
Window treatment; HD-2.
Wiring for your home; HD-56.

TRANSPARENCIES

DCA Educational Products

Architectural drafting; AD-1 through AD-27.
Building construction; BC-1 through BC-24.
Power tools; PT-1 through PT-24.
Residential electrical wiring; REW-1 through REW-14.
Soldering; W-5.
Wood technology; WT-1 through WT-20.

Stanley Tools

Correct use of hand woodworking tools. Set of 38.
SOURCE DIRECTORY

American Institute of Maintenance
710 West Wilson Avenue
P.O. Box 2068
Glendale, California 91209

American Plywood Association
1119 A Street
Tacoma, Washington 98401

American Technical Society
848 E. 58th Street
Chicago, Illinois 60637

Bruce Publishing Company
400 North Broadway
Milwaukee, Wisconsin 53201

Charles A. Bennett Co., Inc.
809 W. Detweiller Drive
Peoria, Illinois 61614

Charles Scribner's Sons
597 Fifth Avenue
New York, New York 10017

Cornell University Film Library
Ithaca, New York 14850

D.C.A. Educational Products, Inc.
4865 Stenton Avenue
Philadelphia, Pennsylvania 91944

Delmar Publishers Division
Litton Educational Publications, Inc.
P.O. Box 5087
Mountainview Avenue
Albany, New York 12205

Doubleday and Company, Inc.
277 Park Avenue
New York, New York 10016

Dur-o-wal Products, Inc.
P.O. Box 628
Syracuse, New York 13201

Geerpress Wringer, Inc.
Box 658
Muskegon, Michigan 49443

Goodheart-Willcox Co., Inc.
123 W. Taft Drive
South Holland, Illinois 60473

Jam Handy Organization
2781 E. Grand Boulevard
Detroit, Michigan 48211

John Wiley & Sons, Publisher
605 Third Avenue
New York, New York 10016

McCormick-Mathers Publishing
Subs. of Litton Educational
450 W. 33rd Street
New York, New York 10001

McGraw-Hill Book Co.
Webster Division
Manchester Road
Manchester, Missouri 63011

McKnight & McKnight Publishers
Tonawanda Avenue and Route 6
Bloomington, Illinois 61701
SOURCE DIRECTORY

American Institute of Maintenance
West Wilson Avenue
Box 2068
Irvine, California 92609

American Plywood Association
9 A Street
Tama, Washington 98401

American Technical Society
E. 58th Street
Chicago, Illinois 60637

ACE Publishing Company
North Broadway
Waukegan, Wisconsin 53201

Charles A. Bennett Co., Inc.
W. Detweiller Drive
Champaign, Illinois 61820

Charles Scribner's Sons
Fifth Avenue
New York, New York 10017

Clemens University Film Library
Tampa, New York 14850

Educational Products, Inc.
5 Stenton Avenue
Philadelphia, Pennsylvania 91944

Emerald Publishers Division
Hilton Educational Publications, Inc.
2157 Broadway
Buffalo, New York 12205

Doubleday and Company, Inc.
277 Park Avenue
New York, New York 10016

Dur-o-wal Products, Inc.
P.O. Box 628
Syracuse, New York 13201

Geerpresse Wringer, Inc.
Box 658
Muskegon, Michigan 49443

Goodheart-Willcox Co., Inc.
123 W. Taft Drive
South Holland, Illinois 60473

Jam Handy Organization
2781 E. Grand Boulevard
Detroit, Michigan 48211

John Wiley & Sons, Publishers
605 Third Avenue
New York, New York 10016

McCormick-Mathers Publishing Co., Inc.
Subs. of Litton Educational Publishing, Inc.
450 W. 33rd Street
New York, New York 10001

McGraw-Hill Book Co.
Webster Division
Manchester Road
Manchester, Missouri 63011

McKnight & McKnight Publishing Co.
Tonawanda Avenue and Route 66
Bloomington, Illinois 61701
Meredith Publishing Company
250 Park Avenue
New York, New York 10017

Modern Talking Picture Service
1212 Avenue of the Americas
New York, New York 10036

National Association of Plumbing, Heating, and Cooling Contractors
1016 20th Street N.W.
Washington, D.C. 20036

National Concrete Masonry Association
1015 Wisconsin Avenue N.W.
Washington, D.C. 20007

National Gypsum Company
325 Delaware Avenue
Buffalo, New York 14202

National Safety Council
425 N. Michigan Avenue
Chicago, Illinois 60611

Park Publishing Company
P.O. Box 5527
Minneapolis, Minnesota 55408

Paxton-Patterson Equipment & Supply
45 Samworth Road
Clifton, New Jersey 07012

Popular Library, Inc.
Subs. of Cadence Industries, Inc.
355 Lexington Avenue
New York, New York 10017

Portland Cement Association
33 W. Grand Avenue
Chicago, Illinois 60076

Prentice-Hall Company
Educational Book Division
Englewood Cliffs, New Jersey 07632

Sears, Roebuck & Company
Publications Department
425 Homan Avenue
Chicago, Illinois 60607

Simmons-Boardman Publishing Corporation
350 Broadway
New York, New York 10013

Stanley Tools Division
The Stanley Works
600 Myrtle Street
New Britain, Connecticut 06050

Sterling Educational Films
241 E. 34th Street
New York, New York 10016

Theodore Audel & Company
Division of H.W. Sams & Co., Inc.
4300 W. 42nd Street
Indianapolis, Indiana 46206

Universal Publishing and Distributing Corp.
235 E. 45th Street
New York, New York 10017
SUGGESTED EQUIPMENT

A suggested minimum inventory considered necessary to successful presentation of this program of education, this list was compiled on a basis of 20 students per class group.

While durability, effectiveness, cost, ease-of-use, and inherent safety of the various make a given item should be carefully considered in order to obtain the best, it must be remembered that it should be exposed to different makes and models of essentially equal desirability rather than exposing one type which is preferred by the selecting authority.

### HAND TOOLS

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caliper; inside</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Caliper; outside</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Micrometer; C&quot; to 1&quot;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tape measure; 12'</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tape measure; 50'</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tape measure; 100'</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rule; zig-zag, 6'</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Chalk box; 50'</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Protractor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Wing divider; 6&quot; w/interchangeable lead/point</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Scriber; w/pencil</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Scratch awl</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Square; framing</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Square; combination</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Square; try, 8&quot;</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Square; T, drywall</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Sliding T bevel; 8&quot;</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gage; butt</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gage; wire</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Snips; 3 1/2&quot; cut</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Snips; curved, 3&quot; cut</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Snips; aviation, combination</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Knife; utility</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Shears; shrub</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Shears; pruning</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Saw; crosscut, 8 pt., straightback</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Saw; crosscut, 11 pt., straightback</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Saw; rip, 5 1/2 pt., straightback</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Saw; back, 13 pt.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Saw; coping, 6 1/2&quot; depth</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Saw; compass, 3/asst'd bit</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Saw; hole, 1 3/8&quot;, 1 3/4&quot;</td>
<td>1 ea.</td>
<td></td>
</tr>
<tr>
<td>Saw; hack, Diston #368, 6&quot;</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Plane; smooth, Stanley #6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Plane; jack, Stanley #5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Plane; jointer, Stanley #6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Plane; block</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>sets Chisel; wood, Stanley #60</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chisel; 2&quot; butt, Stanley</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>sets Cold chisel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cutter; pipe, 3&quot; cap.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cutter; tubing, 1 1/2&quot; cap.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cutter; glass</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>sets Bit; screwdriver, 5/16&quot;</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bit; expansive, 7/8&quot; to 1&quot;</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>sets Bit; spade, 3/8&quot; to 1&quot;</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>Bit; auger, 1/4&quot; to 1&quot;</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>sets Bit; masonry, carbide, 1/8&quot;</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>Screwdriving attachment; Versamatic #4100, or equivalent</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hammer; rip claw, steel</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Hammer; curved claw, steel</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hammer; rip claw, steel</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hammer; ball pein, 16 oz</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>


**SUGGESTED EQUIPMENT**

A minimum inventory considered necessary to successful presentation of this program of occupational skill was compiled on a basis of 20 students per class group.

Utility, effectiveness, cost, ease-of-use, and inherent safety of the various makes and models of tools be carefully considered in order to obtain the best, it must be remembered that students are exposed to different makes and models of essentially equal desirability rather than experience only that tool preferred by the selecting authority.

### HAND TOOLS

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw; rip, 5 1/2 pt., straightback</td>
<td>2</td>
</tr>
<tr>
<td>Saw; back, 13 pt.</td>
<td>2</td>
</tr>
<tr>
<td>Saw; coping, 6 1/2&quot; depth</td>
<td>6</td>
</tr>
<tr>
<td>Saw; compass, 3/8&quot; blades</td>
<td>2</td>
</tr>
<tr>
<td>Saw; hole, 1 3/8&quot;, 1 3/4&quot;, 2&quot;, 2 1/4&quot;</td>
<td>1 ea.</td>
</tr>
<tr>
<td>Saw; hack, Diston #368, or equiv.</td>
<td>6</td>
</tr>
<tr>
<td>Plane; smooth, Stanley #3, or equiv.</td>
<td>6</td>
</tr>
<tr>
<td>Plane; jack, Stanley #5, or equiv.</td>
<td>3</td>
</tr>
<tr>
<td>Plane; jointer, Stanley #7, or equiv.</td>
<td>2</td>
</tr>
<tr>
<td>Plane; block</td>
<td>3</td>
</tr>
<tr>
<td>Chisel; wood, Stanley #66, or equiv.</td>
<td>2 sets</td>
</tr>
<tr>
<td>Chisel; 2&quot; butt, Stanley #60, or equiv.</td>
<td>2 sets</td>
</tr>
<tr>
<td>Cold chisel</td>
<td>2 sets</td>
</tr>
<tr>
<td>Cutter; pipe, 3&quot; cap.</td>
<td>3</td>
</tr>
<tr>
<td>Cutter; tubing, 1 1/2&quot; cap.</td>
<td>12</td>
</tr>
<tr>
<td>Cutter; glass</td>
<td>2 sets</td>
</tr>
<tr>
<td>Bit; screwdriver, 5/16&quot; to 1/2&quot;</td>
<td>3</td>
</tr>
<tr>
<td>Bit; expansive, 7/8&quot; to 3&quot;</td>
<td>2 sets</td>
</tr>
<tr>
<td>Bit; spade, 3/8&quot; to 1&quot;</td>
<td>2 sets</td>
</tr>
<tr>
<td>Bit; auger, 1/4&quot; to 1&quot;</td>
<td>2 sets</td>
</tr>
<tr>
<td>Bit; masonry, carbide, 1/4&quot; to 3/4&quot;</td>
<td>2 sets</td>
</tr>
<tr>
<td>Twist drill; high speed, 1/16&quot; to 1/2&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Screwdriving attachment; Supreme Versamatic #4100, or equiv.</td>
<td>10</td>
</tr>
<tr>
<td>Hammer; rip claw, steel shank, 16 oz.</td>
<td>5</td>
</tr>
<tr>
<td>Hammer; curved claw, steel shank, 16 oz.</td>
<td>5</td>
</tr>
<tr>
<td>Hammer; rip claw, steel shank, 20 oz.</td>
<td>5</td>
</tr>
<tr>
<td>Hammer; ball pein, 16 oz.</td>
<td>4</td>
</tr>
<tr>
<td>Quantity</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Hammer; ball pein, 12 oz.</td>
</tr>
<tr>
<td>1</td>
<td>Hammer; sledge, 8 lb.</td>
</tr>
<tr>
<td>2</td>
<td>Hammer; plastic face, 8 oz.</td>
</tr>
<tr>
<td>6</td>
<td>Hammer; bricklayer's</td>
</tr>
<tr>
<td>4</td>
<td>Mallet; hickory</td>
</tr>
<tr>
<td>2</td>
<td>Mallet; hard rubber</td>
</tr>
<tr>
<td>10</td>
<td>Pliers; sidecut, 8&quot;</td>
</tr>
<tr>
<td>6</td>
<td>Pliers; diagonal, 7&quot;</td>
</tr>
<tr>
<td>2</td>
<td>Pliers; end cut, 8&quot;</td>
</tr>
<tr>
<td>6</td>
<td>Pliers; utility, 6&quot;</td>
</tr>
<tr>
<td>6</td>
<td>Pliers; vise-grip</td>
</tr>
<tr>
<td>6</td>
<td>Pliers; needle-nose, 6&quot;</td>
</tr>
<tr>
<td>2 sets</td>
<td>Wrench; Allen</td>
</tr>
<tr>
<td>1 set</td>
<td>Wrench; box</td>
</tr>
<tr>
<td>1 set</td>
<td>Wrench; socket, 1/4&quot; drive</td>
</tr>
<tr>
<td>1 set</td>
<td>Wrench; socket, 3/8&quot; drive</td>
</tr>
<tr>
<td>1 set</td>
<td>Wrench; open end</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; pipe, 10&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; pipe, 14&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; pipe, 18&quot;</td>
</tr>
<tr>
<td>4</td>
<td>Wrench; adjustable, 4&quot;</td>
</tr>
<tr>
<td>4</td>
<td>Wrench; adjustable, 6&quot;</td>
</tr>
<tr>
<td>4</td>
<td>Wrench; adjustable, 8&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; adjustable, 10&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; adjustable, 12&quot;</td>
</tr>
<tr>
<td>1 set</td>
<td>Wrench; flat, 1/4&quot; to 11/16&quot;</td>
</tr>
<tr>
<td>2</td>
<td>Wrench; spark plug</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; monkey, 10&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wrench; monkey, 15&quot;</td>
</tr>
<tr>
<td>10</td>
<td>Handscraper</td>
</tr>
<tr>
<td>3</td>
<td>Countersink; brace</td>
</tr>
<tr>
<td>3</td>
<td>Countersink; power</td>
</tr>
<tr>
<td>1 ea.</td>
<td>Reamer; brace, power</td>
</tr>
<tr>
<td>6</td>
<td>Push drill; Yankee 41Y, or equiv.</td>
</tr>
<tr>
<td>4</td>
<td>Brace; ratchet, 12&quot; swing</td>
</tr>
<tr>
<td>3</td>
<td>Screwdriver; ratchet, Yankee #30A, or equiv.</td>
</tr>
<tr>
<td>3 sets</td>
<td>Screwdriver; Irwin #400-M7, or equiv.</td>
</tr>
<tr>
<td>12</td>
<td>Knife; putty</td>
</tr>
<tr>
<td>12</td>
<td>Knife; spackling</td>
</tr>
<tr>
<td>6</td>
<td>Knife; electrician's</td>
</tr>
<tr>
<td>12</td>
<td>Cable rip</td>
</tr>
<tr>
<td>6</td>
<td>Wire stripper</td>
</tr>
<tr>
<td>4</td>
<td>Fuse puller</td>
</tr>
<tr>
<td>12</td>
<td>Tester; neon</td>
</tr>
<tr>
<td>4</td>
<td>Crimping tool</td>
</tr>
<tr>
<td>2</td>
<td>Bar; wrecking, 30&quot;</td>
</tr>
<tr>
<td>6</td>
<td>Catspaw</td>
</tr>
<tr>
<td>24</td>
<td>Nailset; assorted</td>
</tr>
<tr>
<td>1 set</td>
<td>Punch; pin</td>
</tr>
<tr>
<td>6</td>
<td>File; mill, bastard cut, 10&quot;</td>
</tr>
<tr>
<td>4</td>
<td>File; mill, 2d cut, 10&quot;</td>
</tr>
<tr>
<td>4</td>
<td>File; triangular, slip tape</td>
</tr>
<tr>
<td>12</td>
<td>Rasp; assorted</td>
</tr>
<tr>
<td>24</td>
<td>Handle; file</td>
</tr>
<tr>
<td>6</td>
<td>File card</td>
</tr>
<tr>
<td>6</td>
<td>Spirit level; 24&quot;, Stanley</td>
</tr>
<tr>
<td>6</td>
<td>Spirit level; 48&quot;, magnesi</td>
</tr>
<tr>
<td>1</td>
<td>Spirit level; 72&quot;, magnesi</td>
</tr>
<tr>
<td>6</td>
<td>Plumb bob</td>
</tr>
<tr>
<td>6</td>
<td>Jointer; bricklayer's</td>
</tr>
<tr>
<td>6</td>
<td>Trowel; brick</td>
</tr>
<tr>
<td>6</td>
<td>Trowel; pointing</td>
</tr>
<tr>
<td>6</td>
<td>Trowel; concrete finishing</td>
</tr>
<tr>
<td>6</td>
<td>Trowel; plasterer's</td>
</tr>
<tr>
<td>6</td>
<td>Float; wood</td>
</tr>
<tr>
<td>3</td>
<td>Float; cork faced</td>
</tr>
<tr>
<td>3</td>
<td>Float; sponge rubber</td>
</tr>
<tr>
<td>1</td>
<td>Fuzzy; plasterer's</td>
</tr>
<tr>
<td>6</td>
<td>Hawk; plasterer's</td>
</tr>
<tr>
<td>3</td>
<td>Edger; concrete finishing</td>
</tr>
<tr>
<td>3</td>
<td>Groover; concrete finishing</td>
</tr>
<tr>
<td>3</td>
<td>Rubbing brick</td>
</tr>
<tr>
<td>4</td>
<td>Caulking gun; cartridge</td>
</tr>
<tr>
<td>6 ea.</td>
<td>Brush; paint and varnish, 3&quot;, 4&quot;</td>
</tr>
<tr>
<td>6 sets</td>
<td>Roller &amp; Pan; assorted cover</td>
</tr>
<tr>
<td>1 unit</td>
<td>Roller; pressurized</td>
</tr>
</tbody>
</table>

ERI
ammber; ball pein, 12 oz.  
ammber; sledge, 8 lb.  
ammber; plastic face, 8 oz.  
ammber; bricklayer's  
allet; hickory  
allet; hard rubber  
liers; sidecut, 8"  
liers; diagonal, 7"  
liers; end cut, 8"  
liers; utility, 6"  
liers; vise-grip  
liers; needle-nose, 6"  
ench; Allen  
ench; box  
ench; socket, 1/4" drive  
ench; socket, 3/8" drive  
ench; open end  
ench; pipe, 10"  
ench; pipe, 14"  
ench; pipe, 18"  
ench; adjustable, 4"  
ench; adjustable, 6"  
ench; adjustable, 8"  
ench; adjustable, 10"  
ench; adjustable, 12"  
ench; flat, 1/4" to 11/16"  
ench; spark plug  
ench; monkey, 10"  
ench; monkey, 15"  
sandscrap  
countersink; brace  
countersink; power  
amer; brace, power  
ush drill; Yankee 41Y, or equiv.  
ace; ratchet, 12" swing  
crewdriver; ratchet, Yankee #30A,  
or equiv.  
crewdriver; Irwin #400-M7, or equiv.  
ife; putty  
ife; spackling  
  6  Knife; electrician's  
  6  Cable rip  
  6  Wire stripper  
  4  Fuse puller  
  12  Tester; neon  
  4  Crimping tool  
  2  Bar; wrecking, 30"  
  6  Catspaw  
  24  Nailset; assorted  
set  Punch; pin  
  6  File; mill, bastard cut, 10"  
  4  File; mill, 2d cut, 10"  
  4  File; triangular, slip taper, 6"  
12  Rasp; assorted  
  24  Handle; file  
  6  File card  
  6  Spirit level; 24", Stanley #313, or equiv.  
  6  Spirit level; 48", magnesium alloy  
  1  Spirit level; 72", magnesium alloy  
  6  Plumb bob  
  6  Raster; bricklayer's  
  6  Trowel; brick  
  6  Trowel; pointing  
  6  Trowel; concrete finishing  
  6  Trowel; plasterer's  
  6  Float; wood  
  3  Float; cork faced  
  3  Float; sponge rubber  
  1  Darby; plasterer's  
  6  Hawk; plasterer's  
  3  Edger; concrete finishing  
  3  Groover; concrete finishing  
  3  Rubbing brick  
  4  Caulking gun; cartridge  
  6 ea. Brush; paint and varnish, 1/2", 1", 2", 3", 4"  
  6 sets Roller & Pan; assorted covers  
  1 unit Roller; pressurized
## GENERAL EQUIPMENT

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workbench, 4-place; steel locker base,</td>
<td>4</td>
<td>hardwood top; w/2 rapid-acting 10&quot; woodworking vises (Equiv. 2-place benches may be substituted).</td>
</tr>
<tr>
<td>Workbench; standard metalworking, 6'</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bench; glue and stain</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cabinet; hardware</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bin; parts</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Flaring tool; ROL-AIR #500-FA, or equiv.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pipe threader; Ridgid #111-R, or equiv.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tubing bender; 1/4&quot; to 5/8&quot; O.D.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Vise; pipe, 2&quot; cap.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Vise; machinist's, 4&quot; jaw</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Vise; utility, 5&quot; cap.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Vise; jeweler's</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Saw clamp; Diston #2, or equiv.</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>Saw set; Diston #24, or equiv.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tap and die</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>Screw extractor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Wheel puller</td>
<td>1</td>
<td>Arbor press; w/pedestal; Dake #0, or larger.</td>
</tr>
<tr>
<td>Clamp; &quot;C&quot;, 2&quot;, 4&quot;, 6&quot;</td>
<td>12 ea.</td>
<td></td>
</tr>
<tr>
<td>Clamp; bar, 5'</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Clamp; double bar, 5'</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Handscrew; Jorgenson #1, or equiv.</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Miterbox, w/saw; Stanley #358, or equiv.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cutter; ceramic tile</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Staple gun; Arrow T-50 MP, or equiv.</td>
<td>2 kits</td>
<td></td>
</tr>
<tr>
<td>Propane torch; Bernzomatic TX-25, or equiv.</td>
<td>6 kits</td>
<td></td>
</tr>
<tr>
<td>&quot;Pop&quot; riveter</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Oilstone; Norton Multi-Oilstone, or equiv.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Oilstone; silicon carbide, course/fine;</td>
<td>2</td>
<td>8&quot; x 2&quot; x 1&quot;</td>
</tr>
<tr>
<td>Oiler; pump; Eagle #33F, or equiv.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Oiler; bench, Eagle #3004, #3006, or equiv.</td>
<td>3 ea.</td>
<td></td>
</tr>
<tr>
<td>Extension cord; heavy</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hose; water, 3/4&quot;, rusted</td>
<td>100 ft.</td>
<td></td>
</tr>
<tr>
<td>Mortar box</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mortar pan</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Mortar board</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Tamper; jitterbug</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hoe; mortar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shovel; square point, 60&quot;</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Shovel; pointed, 27&quot;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Post hole digger</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Crowbar; 60&quot;</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rake; lawn</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rake; grading</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Broom; floor, 18&quot;</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Broom; floor, heavy #550, or equiv.</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Counter duster; utili</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Dust mop</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Pail and wringer doll</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Dolly; Waber #LOW-5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hand truck; steel, w/</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ladder; step, 8'</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ladder; step, 6'</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Ladder; extension, wood</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ladder; extension, wood</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Wall papering kit</td>
<td>3 sets</td>
<td></td>
</tr>
<tr>
<td>Oil Waste Can; Eagle</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Safety Waste Can; ASI</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Respirator; replaceable</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Pouch; electrician's</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Face shield</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Safety glasses</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>
GENERAL EQUIPMENT

Workbench, 4-place; steel locker base, hardwood top; w/2 rapid-acting 10" woodworking vises (Equiv. 2-place benches may be substituted) 3
Workbench; standard metalworking, 6' 10
Bench; glue and stain 1
Cabinet; hardware 1
Bin; parts 1
Flaring tool; ROL-AIR #500-PA, or equiv. 3
Pipe threader; Ridgid #111-R, or equiv. 1
Tubing bender; 1/4" to 5/8" O.D. 1
Vise; pipe, 2" cap. 1
Vise; machinist's, 4" jaw 6
Vise; utility, 5" cap. 6
Vise; jeweler's 6
Saw clamp; Diston #2, or equiv. 3
Saw set; Diston #24, or equiv. 6
sets Tap and die
sets Screw extractor
set Wheel puller
Arbor press; w/pedestal; Dake #0, or larger. 2
ea. Clamp; "C", 2", 4", 6" 4
Clamp; bar, 5' 6
Clamp; double bar, 5' 4
Handscrew; Jorgenson #1, or equiv. 1
Miterbox, w/saw; Stanley #358, or equiv. 3
Cutter; ceramic tile 1
kits Staple gun; Arrow T-50 MP, or equiv. 1
kits Propane torch; Bernzomatic TX-25, or equiv. 6
"Pop" riveter 24
Oilstone; Norton Multi-Oilstone, or equiv. 1
Oilstone; silicon carbide, course/fine; 8" x 2" x 1" 1
Oiler; pump; Eagle #33F, or equiv. 6
ea. Oilier; bench, Eagle #3004, #3006, or equiv. 3

Extension cord; heavy duty, 3-wire, 50' 100 ft.
Hose; water, 3/4", rubber 1
Mortar box 1
Mortar pan 6
Mortar board 1
Tamper; jitterbug 1
Hoe; mortar 1
Shovel; square point, 27" D handle 1
Shovel; pointed, 60" straight handle 1
Shovel; pointed, 27" D handle 1
Post hole digger 1
Crowbar; 60" 1
Rake; lawn 1
Rake; grading 1
Broom; floor, 18" 1
Broom; floor, heavy duty, 24"; Monarch #550, or equiv. 6
Counter duster; utility 1
Dust mop 6
Pail and wringer dolly; w/mop 2
Dolly; Waber #LOW-5, or equiv. 2
Hand truck; steel, w/ratchet strap 4
Ladder; step, 8' 6
Ladder; step, 6' 6
Ladder; step, 4' 4
Ladder; extension, wood, 32' 1

sets Wall papering kit
sets Oily Waste Can; Eagle #910FL, or equiv. 6
Safety Waste Can; ASI equivalent 6
Respirator; replaceable filter 6
Pouch; electrician's 6
Face shield 6
Safety glasses 6

ERI
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drill press; floor model, 15&quot; cap., step-pulley or split-pulley speed control, 3/4 H.P., key chuck, tilting table</td>
</tr>
<tr>
<td>1</td>
<td>Vise; drill press</td>
</tr>
<tr>
<td>1</td>
<td>Vise; drill press, float lock</td>
</tr>
<tr>
<td>1</td>
<td>Grinder; 7&quot; pedestal model w/shields, tool rests, blade grinding attachment, assorted wheels, and wheel dresser, 1/2 H.P.</td>
</tr>
<tr>
<td>1</td>
<td>Saw; radial arm, 10&quot; floor model w/accessories, assorted blades, and dado head set, 2 H.P.</td>
</tr>
<tr>
<td>1</td>
<td>Saw; scroll, 24&quot; floor model, 1/3 H.P. variable speed</td>
</tr>
<tr>
<td>1</td>
<td>Saw; portable electric, Porter-Cable #597, or equiv.</td>
</tr>
<tr>
<td>2</td>
<td>Saw; saber, heavy duty, adjustable base plate</td>
</tr>
<tr>
<td>1</td>
<td>Drill; portable electric, 1/4&quot; cap., Porter-Cable #355, or equiv.</td>
</tr>
<tr>
<td>2</td>
<td>Drill; portable electric, 3/8&quot; cap., variable speed, Black &amp; Decker #1170, or equiv.</td>
</tr>
<tr>
<td>1</td>
<td>Drill; portable electric, 1/2&quot; cap., reversible, Stanley #127, or equiv.</td>
</tr>
<tr>
<td>2</td>
<td>Sander; belt, Skil #449, or equiv.</td>
</tr>
<tr>
<td>2</td>
<td>Sander; finishing, Skil #692, or equiv.</td>
</tr>
<tr>
<td>1</td>
<td>Router; 1/4&quot; shaft, w/guides, cutter assortment, and plastic laminate trimmer</td>
</tr>
<tr>
<td>1</td>
<td>Vacuum; Clarke M400, or equiv.</td>
</tr>
<tr>
<td>2</td>
<td>Vacuum; wet or dry, heavy duty, w/accessories</td>
</tr>
<tr>
<td>2</td>
<td>Floor maintainers; heavy duty, w/strapping and buffing pads</td>
</tr>
<tr>
<td>1</td>
<td>Hammer; impact, electric</td>
</tr>
<tr>
<td>1</td>
<td>Engine; gasoline, 2 cycle</td>
</tr>
<tr>
<td>1</td>
<td>Lawn mower; gasoline, reel</td>
</tr>
<tr>
<td>1</td>
<td>Lawn mower; gasoline, rot</td>
</tr>
<tr>
<td>1</td>
<td>Snow blower; gasoline, 2-s</td>
</tr>
<tr>
<td>1</td>
<td>Compressor; portable elect air guns, and accessory or equiv.</td>
</tr>
<tr>
<td>1</td>
<td>Buffer; pedestal, long-sha buffing wheels and wire</td>
</tr>
<tr>
<td>1 set</td>
<td>Welding and cutting equipm GW2-0-43, or equiv.</td>
</tr>
<tr>
<td>1</td>
<td>Spot welding gun; REDI-SPO</td>
</tr>
<tr>
<td>4</td>
<td>Soldering iron; 25w. to 55 variable speed</td>
</tr>
<tr>
<td>4</td>
<td>Soldering gun; 25w. to 450 variable speed</td>
</tr>
<tr>
<td>1</td>
<td>Sanitizing cabinet, for sa respirators</td>
</tr>
</tbody>
</table>
**POWER TOOLS**

- Drill press; floor model, 15" cap., step-pulley or split-pulley speed control, 3/4 H.P.; key chuck, tilting table.
- Drill press, float lock.
- Router; 7" pedestal model w/shields, tool rests, blade grinding attachment, assorted wheels, and wheel dresser, 1/2 H.P.
- Saw; radial arm, 10" floor model w/accessories, assorted blades, and dado head set, 2 H.P.
- Saw; scroll, 24" floor model, 1/3 H.P. variable speed.
- Saw; portable electric, Porter-Cable #597, or equiv.
- Saw; saber, heavy duty, adjustable base plate.
- Drill; portable electric, 1/4" cap., Porter-Cable #355, or equiv.
- Drill; portable electric, 3/8" cap., variable speed, Black & Decker #1170, or equiv.
- Drill; portable electric, 1/2" cap., reversible, Stanley #127, or equiv.
- Sander; belt, Skil #449, or equiv.
- Sander; finishing, Skil #692, or equiv.
- Router; 1/4" shaft, w/guides, cutter assortment, and plastic laminate trimmer.
- Vacuum; Clarke M400, or equiv.
- Vacuum; wet or dry, heavy duty, w/accessories.
- Floor maintainers; heavy duty, w/stripping and buffing pads.
- Hammer; impact, electric.

1. Engine; gasoline, 2 cycle, 2 1/2 H.P.
2. Lawn mower; gasoline, reel.
3. Lawn mower; gasoline, rotary, self-propelled.
4. Snow blower; gasoline, 2-stage.
5. Compressor; portable electric/ w/spray guns, air guns, and accessories, Sprayit, #3040, or equiv.
6. Buffer; pedestal, long-shaft model, w/8" buffing wheels and wire brushes.
7. Welding and cutting equipment, Marquette GW2-0-43, or equiv.
8. Spot welding gun; REDI-SPOT #21A24, or equiv.
9. Soldering iron; 25w. to 550w.
10. Soldering gun; 25w. to 450w.
11. Sanitizing cabinet, for safety glasses and respirators.