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	AUTO CRAFTS CENTERS	
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DESIGN GUIDE

AUTO CRAFTS CENTERS

ENGINEERING DIVISION
MILITARY CONSTRUCTION DIRECTORATE
OFFICE OF THE CHIEF OF ENGINEERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC 20314

AUGUST 1976

Foreword

DG 1110-3-126
August 1976

The Design Guide (DG) series has been established to replace material previously issued under the standard design medium by the Engineering Division, Military Construction Directorate, Office of the Chief of Engineers, U.S. Army.

This guide governs the design of Army Auto Crafts Centers.

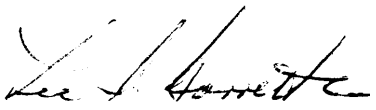
The guide is intended not only to state basic criteria, but also to provide a means by which the user of the guide can apply the criteria in individual ways to respond to local requirements. This guide is applicable to all new construction projects for Army Auto Crafts Centers and projects involving modernization of existing facilities.

Detailed development of this guide was under the direction of the Special Projects Section, Structures Branch of the Engineering Division. Major parts of the material contained herein are based on the results of an architectural services contract with the firm of McLeod Ferrara Ensign, Washington, D. C., under Contract No, DACA 73-73-C-0008. The functional requirements in this guide have been developed in conjunction with, and approved by, the Recreation Directorate of the U.S. Army Adjutant General Center, (DAAG-RE),

Distribution of this guide is limited. Additional essential copies are available from the OCE Publications, Depot, 890 South Pickett Street, Alexandria, Virginia 22304.

Users are invited to send comments and suggested improvements to HQDA (DAEN-MCE-A), Washington, D.C. 20314.

FOR THE CHIEF OF ENGINEERS:



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Chief, Engineering Division
Directorate of Military Construction

Contents

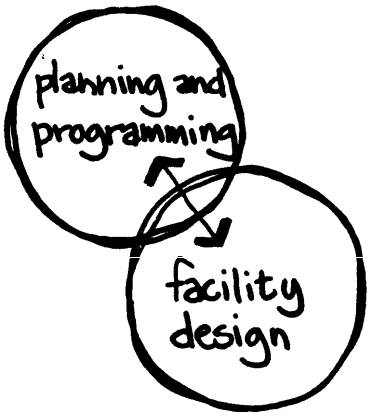
CHAPTER 1
Introduction

1-1 Purpose

a. This guide contains design criteria for Army Auto Crafts Centers which are in some instances referred to as Automotive Self-Help Garages. The term Automotive Self-Help Garage will be used only when preparing budget documents, DD forms 1391 which summarize project requirements for the Military Construction, Army (MCA) Program and for nonappropriated funded projects as stated in AR 28-1 and AR 230-1.

b. The primary purpose of this guide is to provide criteria for design personnel who prepare and evaluate project designs. This guide also provides general guidance for installation personnel and Corps of Engineers field offices in planning and programming project requirements.

c. In addition, it is expected that facility managers will find this guide useful in planning improvements or in better utilizing existing Auto Crafts Centers or other suitable facilities.



Guide Use

d. This guide is directed toward improving early design decisions and toward the development of realistic, cost-effective spaces in conjunction with the regulations and criteria references below. It should be used in the preparation of project development brochures, project data forms, design analyses and drawings.

1-2 Primary References

a. DOD 4270.1 -M, Department of Defense *Construction Criteria Manual.*

b. AR 28-1, *Army Recreation Services.*

c. AR 415-10, *General Provisions for Military Construction.*

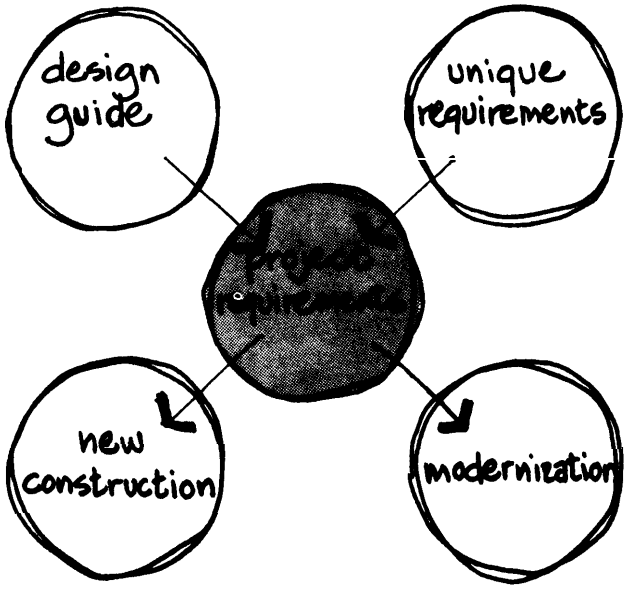
d. AR 415-15, *MCA Program Development.*

e. AR 415-17, *Empirical Cost Estimates for Military Construction.*

f. AF 415-20, *Project Development and Design Approval.*

9. E R -1110-345-700, *Design Analysis.*

1-3 Scope



Application

a. This design guide is applicable to all new construction projects for Army Auto Crafts Centers. It is also applicable, as general guidance, to projects involving the modernization or conversion of existing facilities.

b. While this guide is the basic design criteria document for Auto Crafts Centers, it is not intended to provide all of the information required for successful preparation of project designs. Additional information must be obtained from the installation pertaining to the unique requirements of the users and the locational constraints and opportunities of the site.

c. Maximum space allowances for Auto Crafts Centers are discussed in Department of Defense Construction Criteria Manual 4270.1-M, Chapter 3. These allowances are based on the authorized projected military population of the using installation. Military population is defined as the military strength plus ten percent of the dependent population and ten percent of the retired military personnel living in the area. Although an Auto Crafts Center of 17,000 square feet which serve a military population of 15,000 to 20,000 was chosen to illustrate the criteria contained in the guide, the criteria contained herein are applicable to all sizes of facilities.

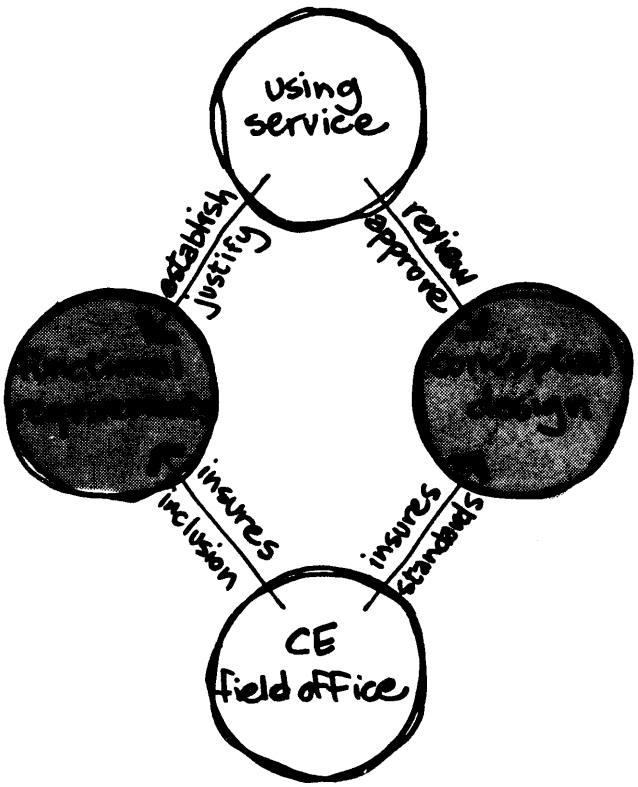
d. Example designs are provided in Chapter 5 for both a new facility of 17,000 square feet and for converting a facility as found space containing 20,000 square feet.

1-4 Emphasis

a. Special emphasis shall be placed on the quality of architectural design since it vitally affects the longevity, economics, usefulness and efficiency of Auto Crafts Centers. In addition to considerations of life-cycle economy and functional efficiency, a prime requirement of the architectural design shall be the attractiveness of both the interior and exterior facilities. An overall interior design scheme should be developed in conjunction with the building design of all new facilities and of major alterations to existing facilities. Items that must be procured using other than construction funds should be programmed early and scheduled for procurement as appropriate.

b. As part of the overall design, a users information book should be assembled to help provide instructions on maintaining and operating the facility to maximum advantage. The book should cover major design intentions for the utilization of the facility and its interior spaces, and related information concerning environmental controls, mechanical facilities and housekeeping in general.

1-5 Responsibilities



Project Responsibilities

a. The using service for individual MCA projects is defined in AR 415-10 and its responsibilities are outlined in AR 415-20. The using service is responsible for:

(1) Establishment of specific project functional requirements within the parameters contained in this guide.

(2) Justification of functional requirements falling outside the parameters of this guide.

(3) Obtaining installation action to gain site approval if the project is not sited in accordance with the approved master plan.

(4) Preparation and submission of project data, DD Form 1391, in accordance with AR 415-15.

(5) Preparation and submission of the project development brochure required by AR 415-20.

(6) Review and approval of concept design drawings to certify compliance with functional requirements.

b. The Corps of Engineers field office responsible for design will insure that:

(1) Functional requirements of the using service are incorporated into the design.

(2) Requirements of the using service are in accordance with the criteria contained herein.

(3) Major deviations from this guide as requested by the using service are explained in the project design analysis.

(4) Quality standards for overall design are emphasized as stated herein.

(5) Assemblage of user information is complete, and is provided, together with the completion records required by AR 415-10, to the using service.

CHAPTER 2
General Considerations

2-1 Automotive Craft Activities

a. Automatize repair is an authorized activity within the Army Arts & Crafts program. Due to the nature of this activity, a separate specialized facility is authorized for each installation.

b. Basic automotive service operations are performed in Auto Crafts Centers. In addition, facilities are provided for instructional programs, club meetings, administrative tasks, tool issuance, and storage, and limited sales of parts.

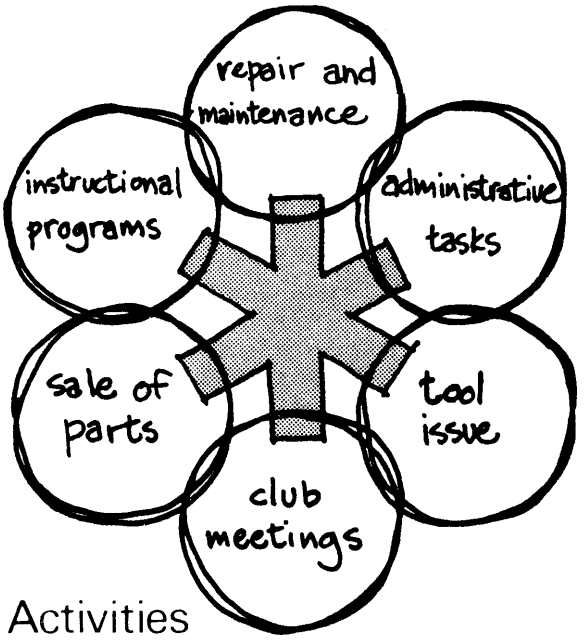
c. Repair and maintenance activities can be categorized by work performed on the following components:

(1) Engines
(2) Fuel Systems
(3) Electrical Systems
(4) Suspension Systems
(5) Braking Systems
(6) Clutch/Drive Line Systems
(7) Transmission
(8) Differentials
(9) Heating, Ventilating and Air Conditioning Systems
(Io) Bodies and Fenders

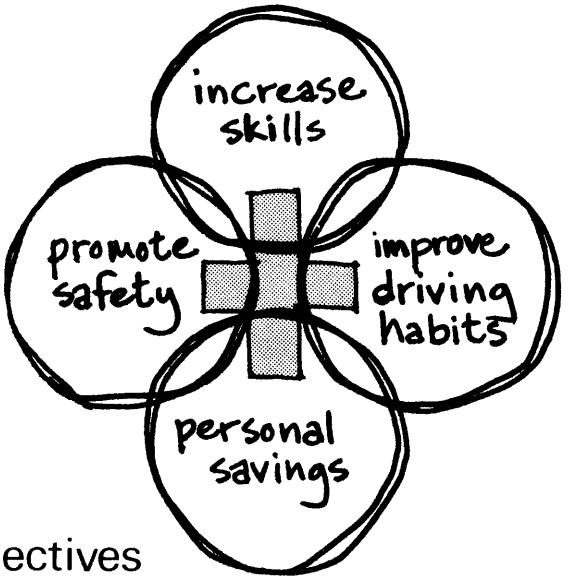
d. Specifically, activities are oriented toward the constructive repair and maintenance of personal vehicles such as cars, trucks, trailers, motorcycles and bicycles. Vehicle owners must perform their own repairs with only guidance from supervisors. Because of high demands on facilities, priority is given to those activities which can be completed in a relatively short time. Shop supervisors are required to limit the scope of a project to the ability of the individual. Therefore, many highly specialized operations are not generally performed, and long term repairs are authorized on a space available basis. Some storage space must be provided for inoperative vehicles, but many installations require disposition of abandoned vehicles, supplies, and personal property left over 30 days.

e. Generally the larger Auto Crafts Centers have tools and equipment available to accomplish the following:

(1) Motor tune-up, engine overhaul and cleaning
(2) Wheel balancing and tire repairs
(3) Steering and front-end alignment
(4) Brake repair and adjustments
(5) Differential adjustment and repair
(6) Fuel, cooling, exhaust, ignition and electrical system work
(7) Clutch and transmission repair
(8) Oil changing and lubrication
(9) Headlight adjustments
(Io) Body repair and spray painting
(11) Cutting and welding parts
(12) Air conditioner repair



Activities



Objectives

(13) Cleaning and repairing car interiors
(14) Installation of accessories
(15) Battery charging
(16) Car washing

f. Automotive craft activities also go beyond the repair of an individual's vehicle. The Army encourages a diversified program with instruction in maintenance, repair, safety and good driving habits. Supervisors organize car clinics, road rallies, gymkhanas, obstacle course competitions, safety inspections and demonstrations.

g. Classes of instruction in auto mechanics, anti-pollution control, upholstery, air conditioning, welding and body work may also be conducted in conjunction with the Army General Education Development (G.E.D.) Program. These classes may utilize the auto repair facilities for practical laboratory experience necessary to develop skills and to meet certain Military Occupational Speciality (MOS) requirements.

2-2 Auto Crafts Centers

a. One Auto Crafts Center is the authorized minimum requirement for each installation. The establishment of additional auxiliary auto crafts centers must be justified by degree of interest, size of installation, and the dispersal of the installation population. Authorization to establish and operate an auxiliary facility will be predicated on availability of funds, supervisory personnel, and the maximum authorized space allowance as established by the Department of Defense *Construction Criteria Manual, 4270.1M.*

b. Facilities can be functionally divided into the following areas: general repair and tune-up stalls; muffler and tire shop; lubrication stalls; body shop; spray paint booth; steam cleaning stall; machine shop and welding area; classroom space; tools and parts storage; off ice space; utility and service areas.

c. Since participants will include dependents and retirees, Auto Crafts Centers must be accessible to and usable by the physically handicapped. Refer to ER 1110-1-102, *Design for the Physically Handicapped,* for guidance.

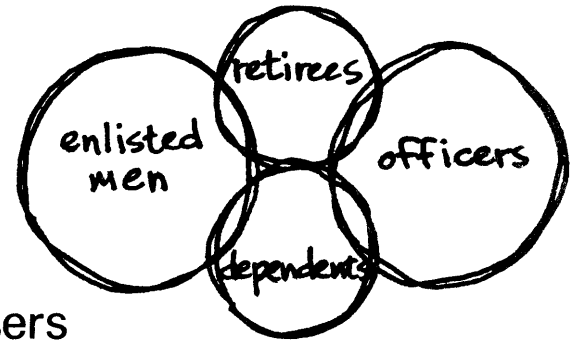
2-3 Participants

a. The Auto Crafts Center is frequently one of the most popular of all arts and crafts facilities. The primary users are assigned military personnel, both officers and enlisted men. Others who are generally eligible to be shop patrons on a space available basis are military retirees and dependents of assigned personnel, whose vehicles are registered with installation authorities.

b. The maximum number of participants to use the center at any one time is limited by the amount of work space available and the amount of space for instruction and demonstrations. Since operating procedures generally require that vehicle owners must perform their own repairs with possible help from friends who are eligible patrons, the number of actual users at any one time is relatively small. For a thirty-four stall facility, a reasonable estimate of the maximum number of users performing repairs at one time might be sixty to seventy-five. Classroom participation could add an additional thirty patrons.

c. Many factors influence the number of participants in automotive craft activities, but one of the most important is the interest that can be generated in a diversified program. Efficient scheduling for a rapid turnover of projects is also necessary for maximum participation. Usually, participation will be proportional to the size of the facilities readily available to the military community. It is especially important that auto craft facilities be open on weekends, holidays, evenings, and times when military personnel are off duty. These are the times of maximum participation.

d. Administrative personnel may include a shop supervisor, one automatize repair instructor for every four stalls in operation, a tool issue/sales attendant, and a few part-time or visiting classroom instructors.

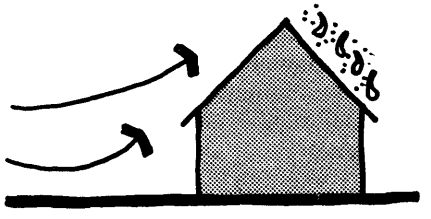


Users

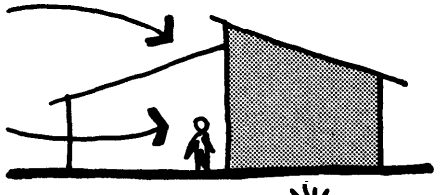
2-4 Climatic Influences

a. Climatic variations play an important part in the building design of Auto Crafts Centers and the selection of materials and systems used therein. Current definitive drawings are based only upon the design approach of each auto stall having direct access to the exterior through large overhead garage doors. This practice, especially in colder climates, should be reevaluated in future projects in view of current energy conservation policies. Frequent use of garage doors lets in cold air which increases energy usage and creates uncomfortable working conditions. On the other hand, it is often desirable to operate with the doors open in warm weather. This one example illustrates the influence climate can have in the design of this building type and reinforces the requirement that careful analysis involving various cost and function trade-offs be made in each instance:

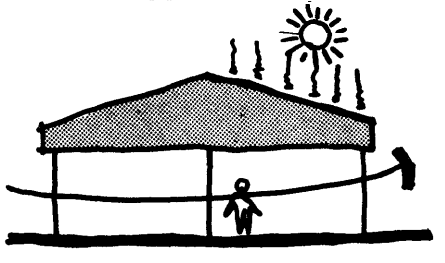
b. In mild climates, many auto craft activities can be performed outdoors or under covered canopies. Within authorized space allowances, covered work areas are calculated at one-half of the square footage of equal sized enclosed spaces and advantage can be made of this to increase the total amount of allowable work space. Outdoor spaces should also be designed with local conditions in mind. For example, wind driven sand can negate the usefulness of a covered outdoor work area which is improperly oriented or shielded from the prevailing winds.



(1) Severe climate dictates compact building forms.



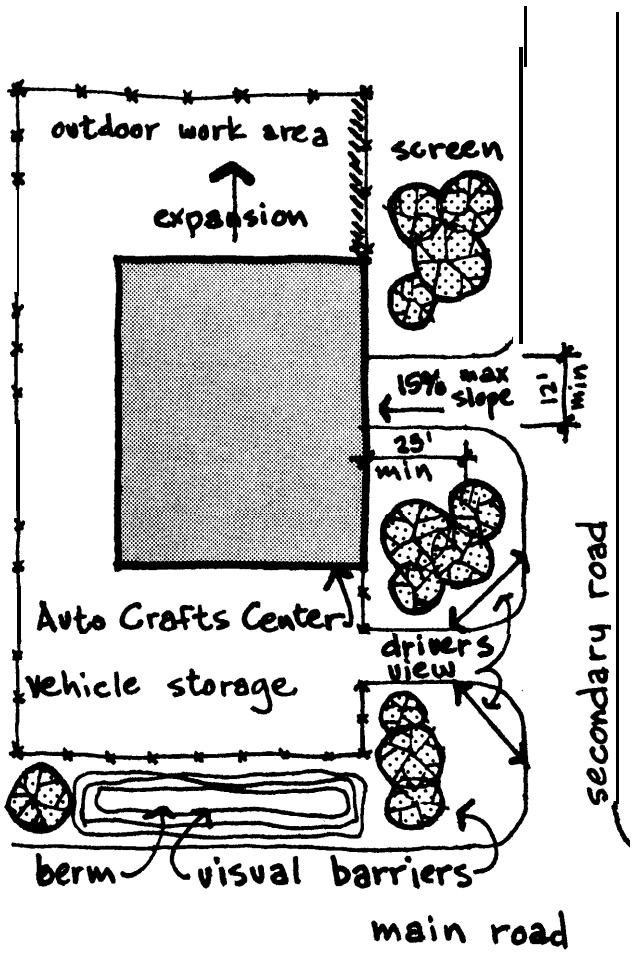
(2) Temperate climate permits the use of natural ventilation and light.



(3) Warm climate permits maximum use of covered exterior work areas in addition to indoor space.

Building Orientation Factors

2-5 Siting



Site Considerations

a. Installation master plans are guides for future land development and indicate specific locations of proposed facilities. They evolve from an analysis of requirements for housing, service activities, and military operations. Ecological considerations, utility and transportation modes, as well as natural characteristics of the terrain are some of the factors which contribute to the formulation of the plan.

b. Unlike other activities of the arts and crafts program, Auto Crafts Centers need not be located close to other social/recreational facilities. Past attempts to combine auto craft facilities with Arts and Crafts Centers have proved unsuccessful, and the practice is now discouraged.

c. The nature of many operations performed in Auto Crafts Centers is largely light industrial, and it is therefore appropriate that these facilities be sited near compatible activities. Auto Crafts Centers with their stored vehicles, security fences, and sometimes noisy operations often tend to become nuisances in residential or community support areas, although this does not have to be the case. Care should be taken in site selection, site development, architectural treatment, and the use of man-made and natural barriers to prevent this from happening.

d. Where ever possible, the vehicular entrances to the site should not be directly from a major thoroughfare, For safety, the distance between any shop entrance and the street should be at least 25 feet. One-way driveways are preferred with a minimum width of 12 feet and a straight entrance into the garage. Sharp turns near entranceways cause accidents. Parking aprons and driveways should slope gradually away from the building for good drainage, but a slope of 15% should be the maximum for entrances. However, by scoring the concrete with grooves, in a "V" shaped pattern, the entrance will have good drainage and less slippage.

e, Patron parking should be provided for a minimum of one-half the vehicular capacity of the shop. This is particularly important for garages geared to a quick turnover of services. The parking area should be convenient to the shop entrance, yet not interfere with car circulation.

f. In addition to patron parking, a paved outdoor work and vehicle storage area should be provided. This area may be used to park inoperative vehicles and store bodies and chassis awaiting parts as well as to provide outdoor work space. Outdoor work and storage areas can be an unattractive nuisance and should be fenced and screened for security and aesthetic reasons.

2-6 Site Development

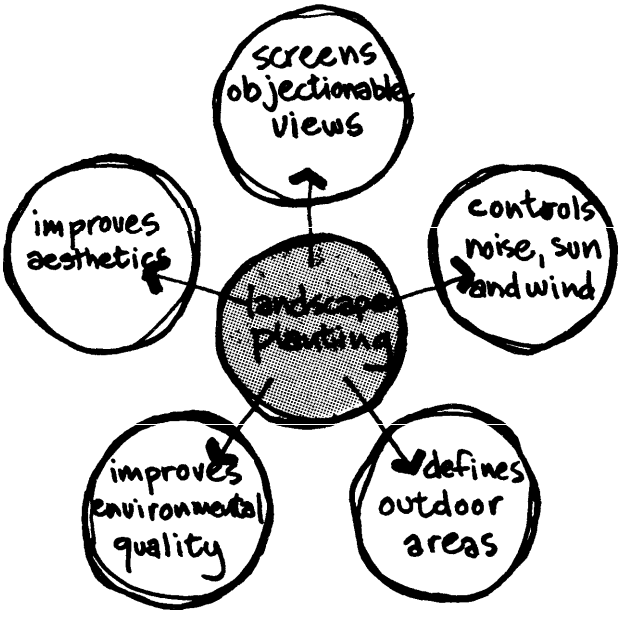
a. Garages have an unfortunate and often undeserved reputation as being potential eyesores. if for no other reason, landscaping can play an important part in refuting this premise. But apart from beautification, foliage and other site improvements can serve a much more functional purpose. Landscape planting can define outdoor work areas, direct the flow of traffic, muffle noise, screen objectionable views, control sun and wind, and conserve energy. Planting adds to the environmental qualities of an area by controlling erosion, absorbing carbon monoxide and dioxide, and discharging oxygen.

b. Landscape designs should be as maintenance-free and vandal proof as possible. However, landscape planting should not be so minimal or so protected that it defeats its functional and aesthetic purposes.

c. Paving materials, benches, and other landscaping structures should be selected for durability together with their other qualities of texture, scale, shape and color.

d. Desirable plants are those that are most resilient or defensive in nature, with tough leaves or bark, or fine thorns. In addition to evergreens, selections should be made from those that blossom in spring, bear foliage or fruit in the summer, and change color in the fall to produce a continuing interest.

e. Improper location of planting can also produce hazards by obstructing the views of drivers and pedestrians. Particular care to avoid this condition should be taken because of the inherent danger of frequent movement of vehicles.

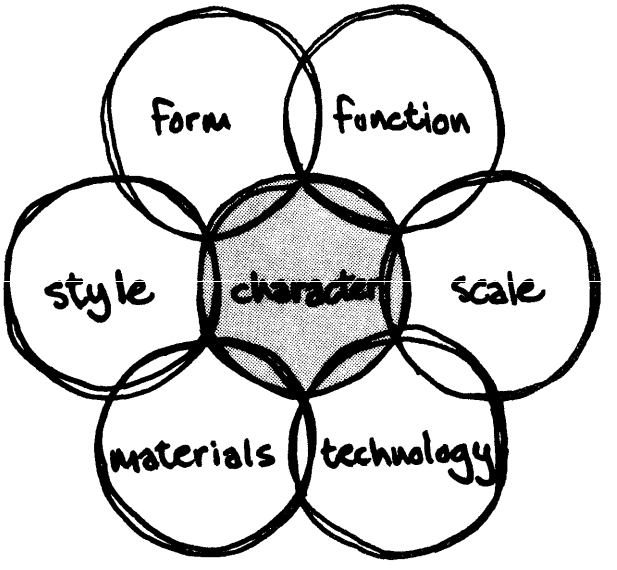


Landscape Functions

2-7 Architectural Character

a. Auto Crafts Centers should be accepted for what they are; structures that house the repair and maintenance of 20th century machines. It seems appropriate that their design should reflect the industrialization and technology of the society that mass produces the vehicles themselves. In addition, these facilities should also reflect the fact they are craft shops. They are places where an individual renews and tunes to peak efficiency his own vehicle within the limits of his ability. Auto Crafts Centers should not be cold, impersonal or overbearing. Careful consideration of color, scale, and texture can do much to enhance the character of these buildings.

b. The adoption of an industrial design approach does not mean that the solution need have an ugly industrial quality. Aesthetically undesirable design products usually result from insensitivity and lack of understanding of good design which is often justified in the name of economy and expediency. Harmonious materials, careful detailing, screening of unsightly areas, and imaginative use of color can all contribute to aesthetic quality. The building should exemplify- desirable characteristics of local construction practices, with materials chosen on the basis of availability, economy, durability and capability to generate visual interest through color and texture.



Character Determinate

2-8 Interior Design

a. Interior design features must be developed in coordination with the architectural design. All features of the building relative to the interior design, whether they are furnished and installed as part of the construction contract or provided later by the using service, must be developed as an overall scheme. Graphic design and signage should be included as part of the overall design to identify activities and facilitate functional effectiveness.

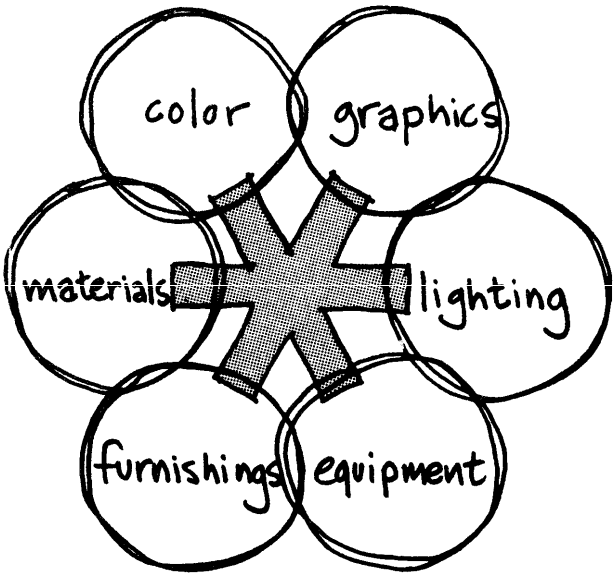
b. Use of color in Army facilities is limited to a practical number selected from Federal Standard 595A, Colors. General guidance for color selection is provided in TM 5-607-7, *Co/ors for Buildings.* Color should be used to stimulate human physical and emotional reactions and to enhance the overall functionality of the Auto Crafts Center. In critical seeing areas, glare, brilliant colors and great brightness differences, both in the lighting system and in the color of walls, floors, furnishings and equipment should be avoided.

c. The effectiveness of an automotive craft program depends on the availability of suitable equipment, tools and supplies. The equipment and furnishings in the buildings can be categorized as follows: those used in the testing and repair of vehicles; those used as instructional aids; and the general furniture and accessories used in the support areas such as the classrooms and office.

d. The *Catalog of Army Arts and Crafts Program Equipment* contains illustrations and specifications for equipment for the Army Arts and Crafts Program. Essential Facilities and Equipment for Program Operations. Arts and Crafts Program, lists essential equipment and budget prices. However, none of these sources cover all program items and costs, and specifications should be obtained from three major sources:

(1) Army schedules for government furnished standard items as indicated by the various commands.
(2) Schedules from GSA and Federal Prison Industries.
(3) Commercial supply firms.

e. The proper spacing of equipment and adequate power supply is essential for the safe operation of the shops. The maximum number of tools is governed by the amount of area required for safe operation. Islands of space around most power tools is essential for safety. These requirements are identified in Chapter 3.



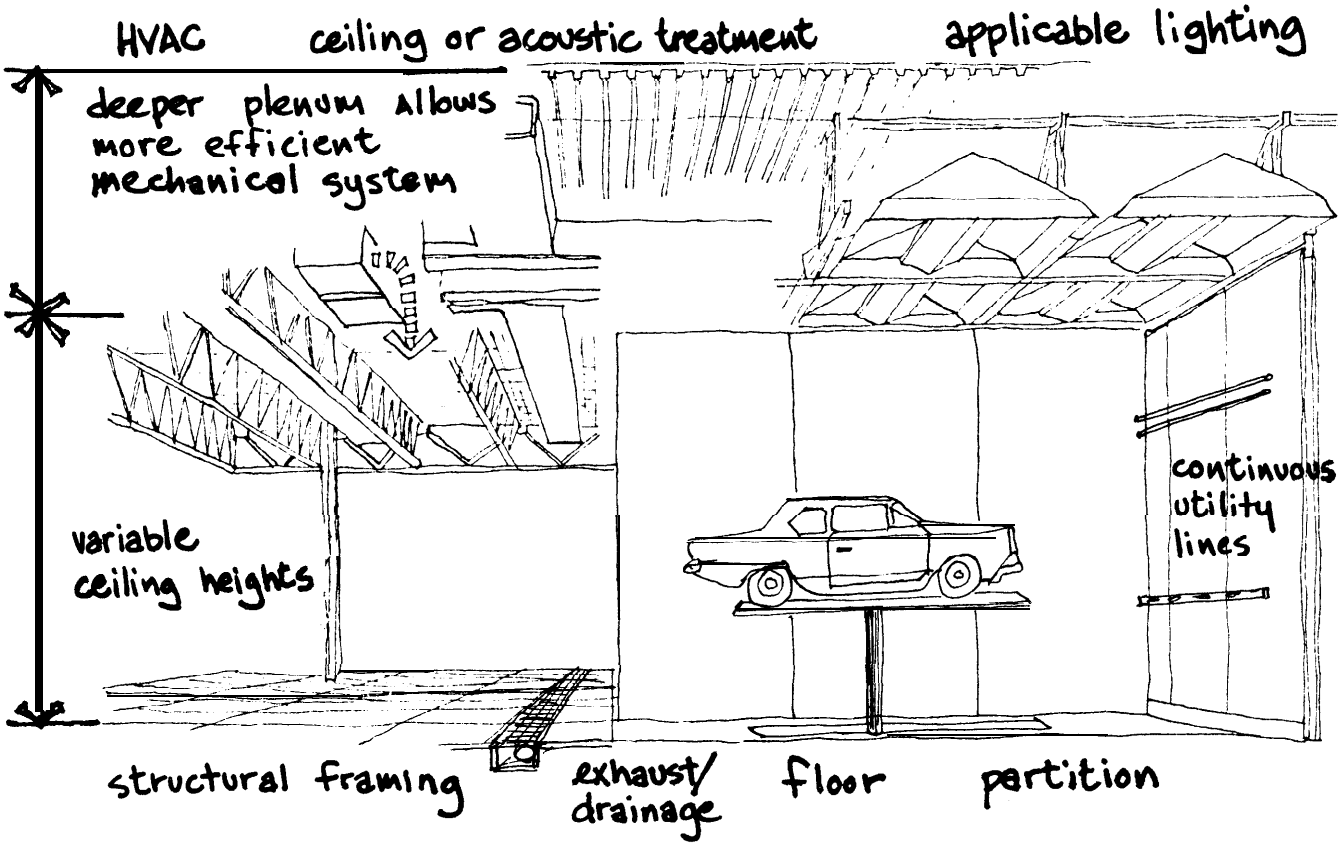
Interior Design Elements

2-9 Systems Building

a. Systems building is the, application of modern production techniques to the building process. While not universally applicable, systems building is expanding in the construction industry.

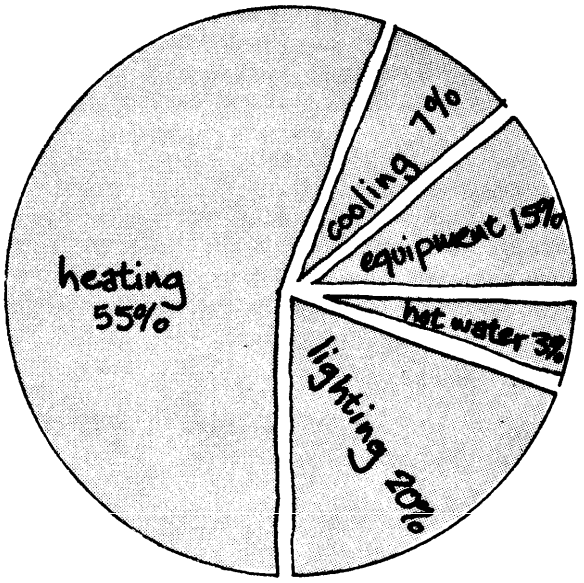
b. Systems built facilities are composed of sub-systems which typically include structural framing systems, lighting and ceiling systems, heating, ventilating and air-conditioning systems, and interior partitioning systems. The best examples of systems built facilities offer economy of both time and money committed to construction, a high degree of quality control, and maximum flexibility of space.

c. In many cases systems building is applicable to military construction, and its feasibility should be considered, particularly for Auto Crafts Centers. Building systems selected should be those which are most economical and suitable based on comparative cost studies for the building.

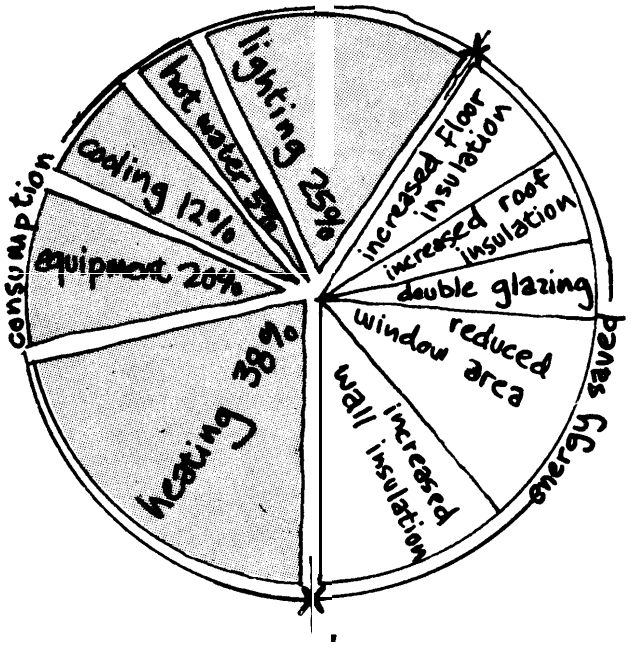


Sub-Systems

2-10 Energy Conservation



Typical Annual Energy Consumption



Possible Savings In Annual Energy Consumption

a. With decreasing energy sources, conservation must be practiced in all facilities at military installations. New construction offers a variety of methods to conserve energy. The skillful exploitation of local climate conditions, topography, trees, solar exposure, and other natural features, combined with building orientation, compact building shapes, and wall shading, offer opportunities for energy conservation. The simple consideration that each side of a building may require different treatment depending on its exposure is often overlooked in designing an energy efficient building.

b. Auto Crafts Centers, with their numerous exterior overhead doors, are often wasteful of energy for heating and cooling. However, in warm climates large openings help provide a comfortable interior environment without the need for mechanical ventilation or cooling. Thus energy conservation can be important when considering the basic design solutions at a particular installation. Another obvious area to consider in energy conservation is the selection of mechanical and electrical systems and their control. Night time control settings and automatic regulation of power equipment can produce significant savings. The amount of building insulation, particularly in the roof, is another important factor, and heat recovery devices must be considered.

c. Long-range (life cycle) costing which compares initial capital improvement costs with extended operational costs is a valid method to determine the most efficient balance between building and mechanical systems.

d. Lighting intensities should conform to the minimum levels recommended by the latest edition of ***///urination Engineering Society Lighting Handbook.*** Where practical, lighting will be designed for specific local tasks instead of providing uniform general loads.

e. The upper chart on this page shows the proportion of typical annual energy consumption for an auto crafts center. The second chart shows a possible 40% savings savings in total consumption due to various conservation techniques, resulting in a reapportionment of energy consumption. Conservation techniques when used at the time of construction provide a real savings during the life of the facility in both resources and operating funds.

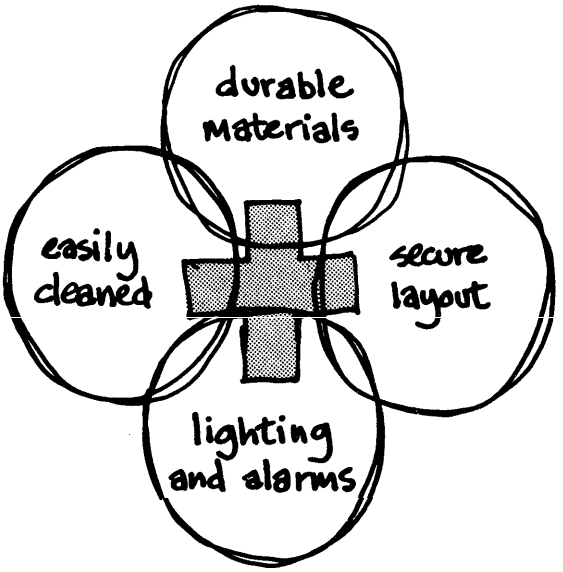
2-11 Minimizing Maintenance and Vandalism

a. Auto Crafts Centers are subject to a high incidence of vandalism, pilfering, accidents, and heavy wear and tear. This is due partly to the fact that moving vehicles can be destructive, and their very weight and mobility are potential dangers. The process of car repair also involves the use of gasoline, grease, toxic fumes, acids, and other substances which soil and create hazards.

b. It is particularly important to exercise care in the selection of materials, finishes, and pieces of equipment that will stand up to heavy use and can be easily maintained. The use of residential type overhead garage doors is a case in point, Except in the most dire economic circumstances they should not be used, because they are not designed to withstand such service and their hoisting mechanisms frequently break down.

c. Security considerations are equally important. Shops contain tools, parts, and automobiles that are attractive temptations to a significant number of people. Points of entrance should be lighted and designed to be easily seen from the outside by security patrols and easy to control internally by the staff. Outdoor vehicle storage areas should be fenced and provided with appropriate lighting.

d. Vandalism is an increasing social problem nearly everywhere, including military installations, and must be considered when designing an Auto Crafts Center. The layout of the building, the elimination of hard to supervise areas, the use of durable materials and security lighting are important in alleviating this problem.



upkeep Factors

2-12 Found Space In Existing Buildings

There are facilities on many installations that no longer serve their designated purposes. Finding and adapting space in such buildings to other functions may be a solution to the space needs of an Auto Crafts Center. However, a careful analysis of functional suitability and economics is required before such a decision can be reached.

b. In order to determine the validity of using found space the planner should, in the preliminary stage, prepare an inventory of existing buildings that are available for the intended use. Any existing facility considered for long term use as an Auto Crafts Center should, as a first principle, fit within the land-use parameters of the installation master plan. An analysis of the suitability of a particular facility for its proposed adaptive use should follow a progressively more detailed evaluation. A primary test of suitability should include:

(1) Location and accessibility – An otherwise suitable building which is in the wrong location in not a viable solution unless other factors can be introduced.

(2) Site Size – The site must be adequate for its proposed function which may also include building additions.

(3) Comparability of Functions – The Auto Crafts Center must be compatible with adjacent facilities,

(4) Availability of Utilities – An advantage of found space may be the cost savings resulting from existing utilities. Conversely, lack of basic services may be grounds for rejecting such space.

c. Facilities that appear to meet the foregoing primary test can be surveyed to determine the feasibility of converting or remodeling the buildings. The survey of an existing structure should follow an analytical format to permit value judgments of its suitability.

d. There are a number of evaluation techniques in use today. The best generally accepted methods rely on a numerical scoring system to arrive at an index of economic and functional acceptability. All methods are necessarily subjective to a greater or lesser extent, and the judgment and experience of the surveyor is an important factor.

e. The chart on page 19 illustrates one analytic format which is suitable for the level of complexity of an Auto Crafts Center. It establishes a numerical framework within which the intrinsic value of a potential “found space” building can be approximately determined,

f. The 12 major site elements and 15 major building elements listed in column 1 are assigned a percentage of the

Survey and Evaluation of Existing Buildings

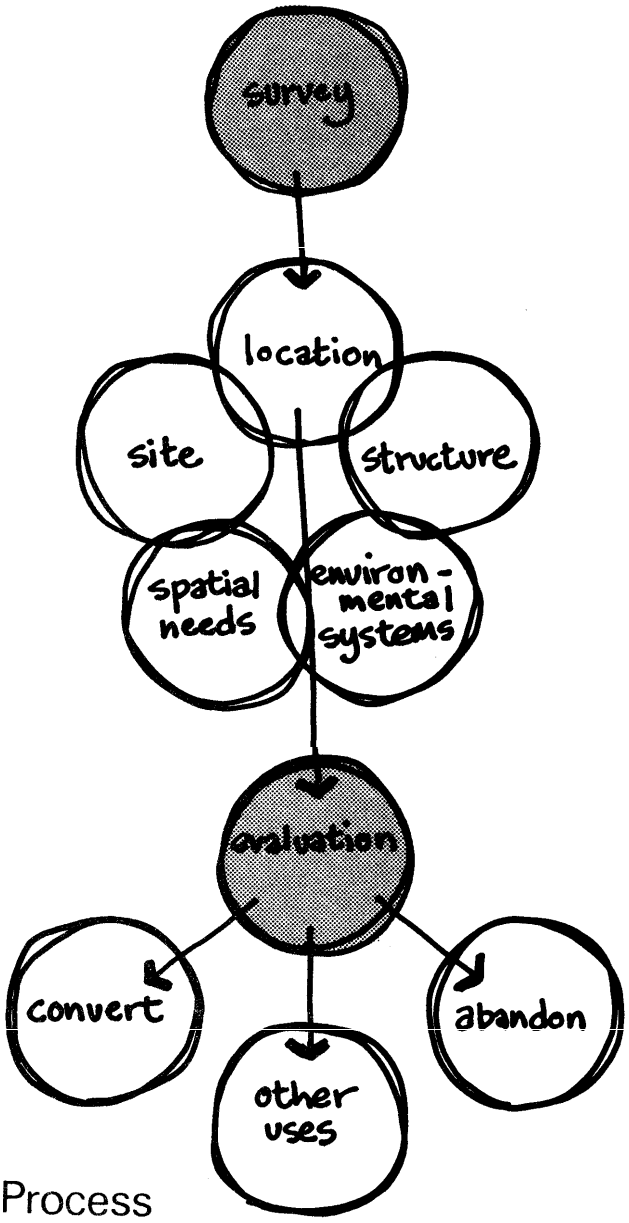
1. SITE AND BUILDING ELEMENTS	2. PERCENTAGE VALUE OF ITEM	3. PERCENTAGE ACCEPTABLE IN THIS BUILDING	4. ACTUAL VALUE FACTOR
LOCATION SURVEY			
1 AVAILABILITY	[30]	[80]	[24.0]
2 PUBLIC TRANSPORTATION	[5]	[50]	[2.5]
3 PRIVATE TRANSPORTATION	[7]	[80]	[5.6]
4 PEDESTRIAN ACCESS	[3]	[70]	[2.1]
5 SAFETY	[5]	[60]	[3.0]
6 COMPATIBILITY	[10]	[75]	[7.5]
SUBTOTAL	[60]		[44.7]
SITE SURVEY			
7 SANITARY SEWER	[10]	[100]	[10.0]
8 ELECTRIC SERVICE	[10]	[50]	[5.0]
9 WATER SERVICE	[10]	[30]	[3.0]
10 SIZE	[5]	[50]	[2.5]
11 ROADS, WALKS, PARKING	[3]	[30]	[0.9]
12 LANDSCAPING	[2]	[10]	[0.2]
SUBTOTAL	[40]		[21.6]
TOTAL	[100]	TOTAL V.F.%	[66.3]*
ARCHITECTURAL SURVEY			
1 SIZE	[5]	[80]	[4.0]
2 EXTERIOR WALLS	[8]	[70]	[5.6]
3 ROOF	[3]	[30]	[0.9]
4 FLOOR	[4]	[90]	[3.6]
5 CEILINGS	[3]	[60]	[1.8]
6 PARTITIONS	[7]	[10]	[0.7]
7 WALL FINISHES	[2]	[0]	[0]
8 FIXED EQUIPMENT	[4]	[0]	[0]
9 MISCELLANEOUS	[4]	[0]	[0]
SUBTOTAL	[40]		[16.6]
STRUCTURAL SURVEY			
10 EXCAVATION AND SUBSTRUCTURE (FOOTINGS)	[5]	[100]	[5.0]
11 SUPERSTRUCTURE (FRAME, COLUMNS)	[2]	[100]	[2.0]
12 HORIZONTAL FRAME (JOISTS, BEAMS, SLABS)	[18]	[90]	[16.2]
SUBTOTAL	[25]		[23.2]
ENVIRONMENTAL SYSTEMS SURVEY			
13 HEATING, VENTILATING, AND AIR-CONDITIONING	[20]	[50]	[10.0]
14 PLUMBING	[5]	[75]	[3.8]
15 ELECTRICAL	[10]	[65]	[6.5]
SUBTOTAL	[35]		[20.3]
TOTAL	[100]	TOTAL V.F.%	[60.1]*

* See paragraph 2-12.h

cost for a complete building. The percentages listed are typical and taken from construction cost indices. They may vary depending on local or special factors.

g. In most cases, a visual inspection by a knowledgeable surveyor, can result in a numerical value being assigned to the percentage acceptable for each element. Those elements that are entirely acceptable are assigned a value, or "feasibility factor" of 100. Those that require modifications are given lower numbers as are judged appropriate. These are entered in column 3.

h. Column 4 provides an "Actual Value Factor". It is determined by multiplying columns 2 and 3, and dividing by 100. The total of all actual value factors produces an overall value factor which offers a useful yardstick in approximating the relative worth of an existing facility compared to a new structure. One rule of thumb is that if the overall value factor is over 50% it would be reasonable to pursue in greater detail the economic feasibility of converting its space. Simplified, that means, the existing facility in its present state is worth half that of a new physical facility. A sample evaluation is shown on the chart.



Process

i. If the proposed facility has passed this test of acceptability, the next step is to establish preliminary cost estimates for bringing the building to a state of usefulness for its new function. This usually requires the preparation of conceptual design drawings and an analysis of the usefulness of the converted space. Experience has shown that if a building is converted to another use, it will usually have to be larger than a building designed specifically for this use, because of inherent problems of flexibility and structural limitations.

j. Following the preparation of a program, a conceptual design response to it, and a preliminary cost estimate, some valid judgments can be made on the advisability of converting space. Obviously, if the cost of the conversions are high in ratio to the Overall Value Factor the economics of conversion are highly suspect.

k. The initial cost of construction or of conversion should not be the only economic criteria for decision making. Life-cycle costing is a method of determining the economic feasibility of facilities taking into account the useful life expectancy of a converted facility against a new one. It recognizes that initial cost is only one, and by no means the largest, expense in a building's life. Operating and maintenance costs are also considered. By amortizing all costs over the life expectancy of a facility, a comparative economic evaluation prorated on an annual basis can be established. This then can form the foundation for economic decisions.

i. In chapter 5 of this Design Guide, an example of converting a common warehouse structure into an Auto Crafts Center is illustrated.

m. Another way of evaluating criteria for found space is through a checklist. The chart on this page is a simplified tabulation of the facility requirements from Chapter 3 of this guide, and is intended to be used as a criteria checklist. A number or specific requirement is written in the top half of many of the squares. If the space being evaluated meets these criteria enter a checkmark or numerical rating in the lower half to indicate how well the requirement is met. Where the darker shading exists in the upper half of the square, there is a requirement without a specific quantity. Again a checkmark or numerical rating should be placed in the lower half. If the space being evaluated does not meet the requirements then a "X" or a zero should be placed in the lower half of the square. Where the lighter shading exists there is no requirement. This checklist is a simple means of evaluation and can be easily used to analyze found space with respect to functional requirements.

Criteria Checklist for Evaluation

ACTIVITY \ REQUIREMENT	Programmed Area	Number of Stalls	Minimum Ceiling Height	Structural Appropriateness	Required Egress	Building Code Requirements	Access to Exterior Areas	Acoustical Treatment	Lighting Level	Power Required	Ventilation	Exhaust System	Vacuum	Water	Floor Drains	Gas	Compressed Air	
General Repairs and Tune-ups	3712	17	12'		2				70 FC	115/220								
Muffler and Tire Shop	1728	6	15'		2				70 FC	115/220								
Lubrication Stalls	1728	6	15'		2				70 FC	115								
Body Shop	864	3	15'		2				70 FC	115/208								
Paint Booth	288	1	12'		2				70 FC	115/208								
Steam Cleaning Stall	288	1	12'		1				50 FC									
Machine and Welding Shop	2000		12'		2				70 FC	115/208								
Office and Storage Areas	1500		10'		2				70 FC	115								
Classroom	650		10'		1				70 FC	115								

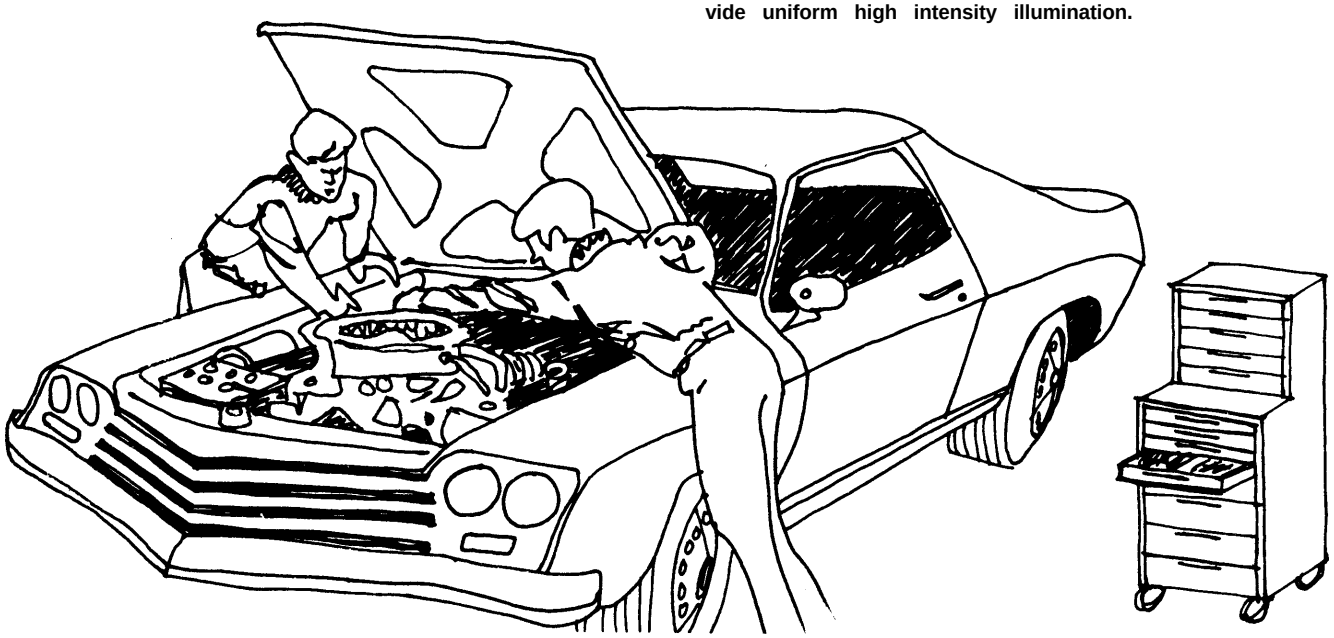
CHAPTER 3
Functional Space Requirements

3-1 General

a. The Department of Defense *Construction Criteria Manual* 4270.1-M establishes the maximum space allowances for Auto Crafts Centers based upon the military population of the installation and the overall maximum allowance for the entire facility of 500 square feet per automobile repair stall. The example illustrations in this guide are for installations with military populations of 15,000 to 20,000. A facility of this size provides 34 stalls and an authorized gross area of 17,000 square feet exclusive of mechanical equipment rooms.

b. The general repair and tune-up stalls, the muffler and tire shop, and the lubrication stalls should be designed to facilitate frequent movement of vehicles. These functions are compatible to the extent that they can all be performed within a common maintenance area.

c. Auto body work stalls should be separated from other work areas because of the dust and noise produced. A separate ventilation system adequate to remove injurious dust and vapors is required. Paint spray booths also require physical separation and independent exhaust systems. Prefabricated spray booths are becoming more popular on military installations and are usually better than those built on site. These may be installed within the garage itself or free standing in an outdoor work area. They are often modular and available in a wide range of sizes. Units must meet stringent design requirements of fire underwriters to confine any accidental blaze. Most booth manufacturers have attempted to position their diffusers and light sources to remove overspray and provide uniform high intensity illumination.

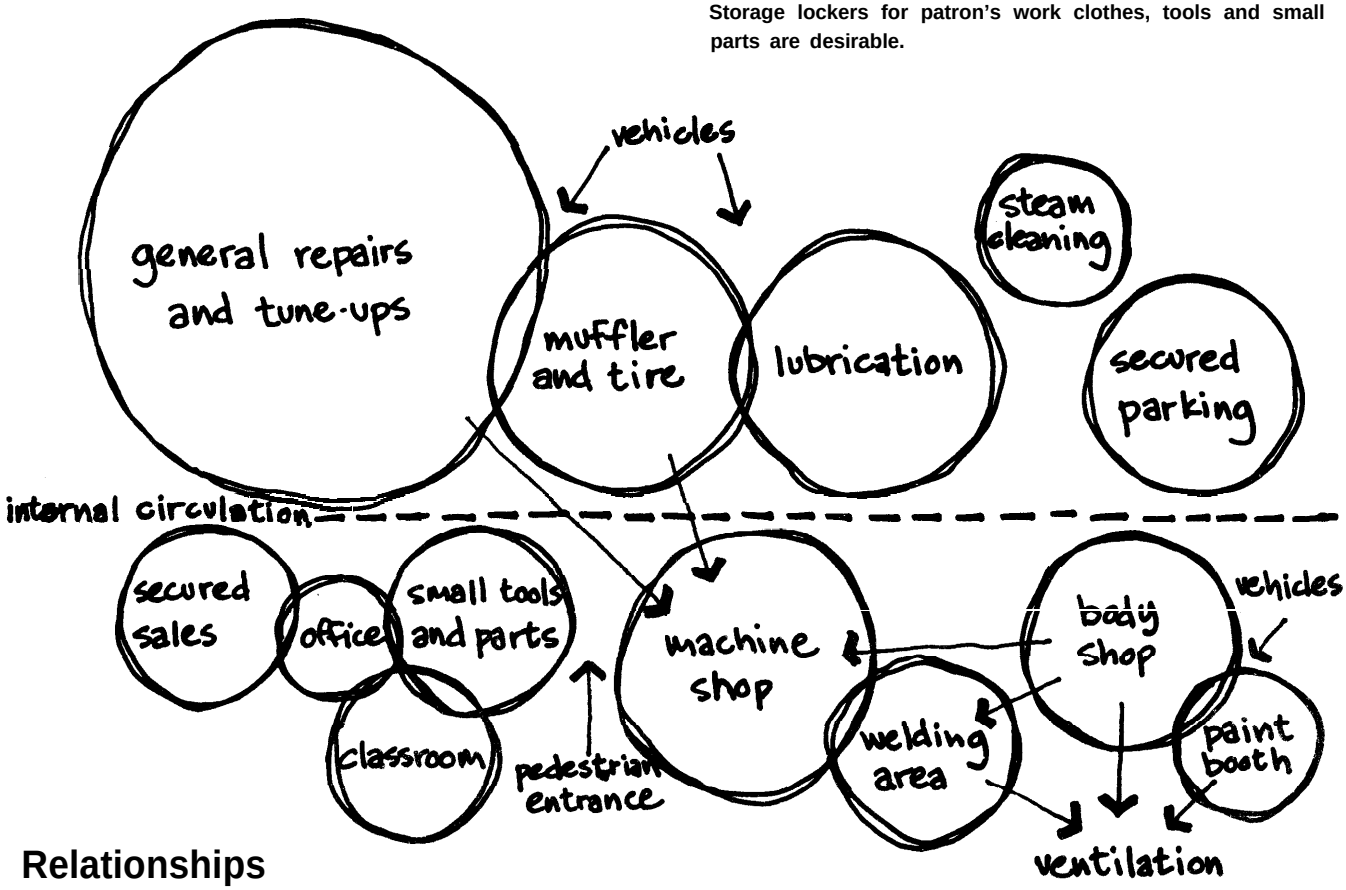


d. Steam cleaning stalls should be separated from dry activity areas. Steam cleaning can also be done outdoors, and ideally the equipment may be located for both indoor and outdoor use. Concrete pads should be provided to eliminate deterioration of asphalt paving.

e. The machine and welding shop should be convenient to the repair areas and storage areas. A separate ventilation system is required for welding booths.

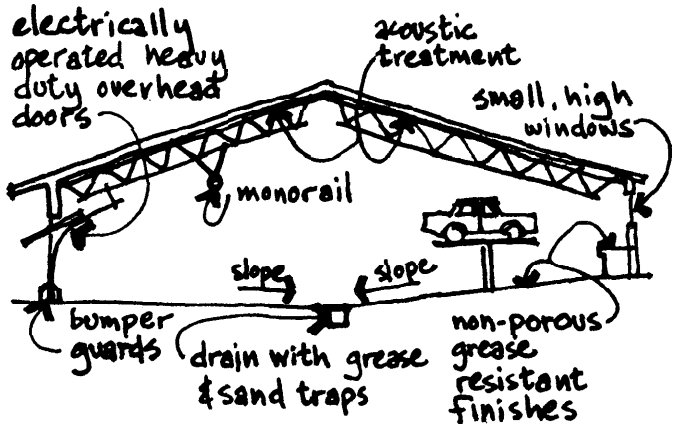
f. The classroom is used for formal instruction and club meetings. A small library may be included. Provisions should be made for the use and storage of visual aids, models and other training materials,

g. The office, sales, tool issue and storage areas should be designed as a unit so they may be controlled from a centrally located supervisor's station. The method of storing and issuing tools varies, but the options include individual tool kits, open tool panels which are sometimes portable, and controlled tool issue rooms. In addition to storage requirements for tools, storage of flammable material such as paint and welding tanks must be provided in enclosures away from the building and from vehicles. Storage lockers for patron's work clothes, tools and small parts are desirable.



Relationships

3-2 Physical Requirements



Treatment

a. Most shop areas can be treated as typical industrial space. Floors should be impervious concrete sloped to adequate floor drains or gutters with special grease and sand traps. Wall surfaces should be durable, impervious to water and grease, and easily washable. The overhead roof structure can be exposed. A minimum ceiling height of 15 feet is necessary for areas with hydraulic lifts and it is frequently more economical to provide this headroom universally throughout the structure. Acoustical materials on the underside of roofs help to reduce noise to a comfortable level. A monorail, with a capacity of not less than one ton, is very desirable along at least one side of the shop. This requires reinforcement of the overhead structural system.

b. Modern automotive shop practice discourages the use of large numbers of windows. Wall space is at a premium for functional purposes. Natural light is not a necessity and the reduction of glazing makes the garage easier to heat and cool. Utility lines ideally are located exposed along walls above work counters and equipment where they can be easily changed or expanded, and where portable equipment can be easily connected,

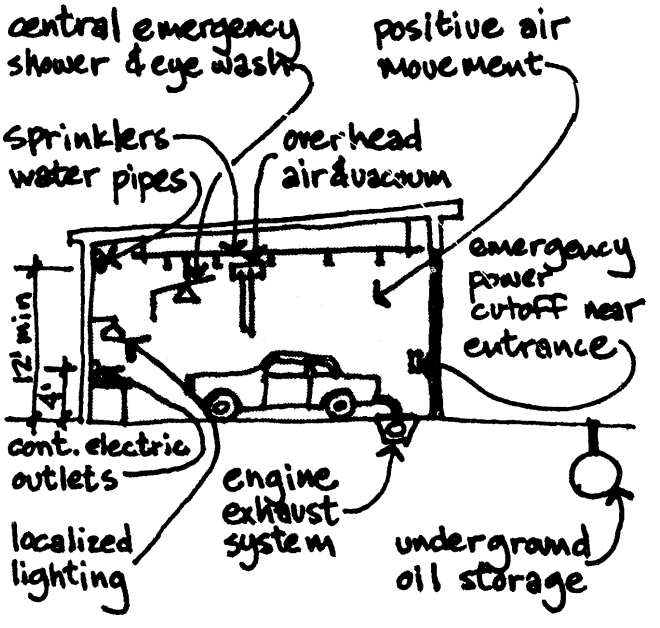
c. The number of overhead vehicle doors depends on the size and layout of the garage. A high quality heavy duty door is important; it is recommended that each door be no less than 12 feet wide by 12 feet high. Residential type doors which have been installed in many facilities do not stand up well under the intensive use common to these garages. Electrically opened doors are preferable if they can be budgeted. They are essential where the design limits the number of openings so that the traffic through them is very heavy. The lower panels of the doors should be solid with vision panels above for safety. Heavy duty bumper guards should be used around all vehicle openings and on exposed wall corners.

d. The classroom is basically an open area and can be treated as typical instructional space. Floors should be provided with grease resistant tiles.

3-3 Technological Requirements

a. An engine exhaust system is essential. It is recommended that this be at least 8 inches in diameter and installed under floors, preferably in trenches with removable steel covers for maintenance, Flexible conduits from outlets at floor level can be connected to tailpipes or engine. If underground ducts are impractical or too expensive, an overhead exhaust system may be used. This means that flexible connections must be brought down from above at convenient locations. A forced convection fan with automatic control and visual indicator is necessary to reduce pressure in the system at all times.

b. Positive air movement through the work areas must be provided to minimize carbon monoxide dangers. Local climate conditions will influence heating, cooling, and ventilation requirements. However, heating, air conditioning and ventilation shall conform to the applicable portions of current editions of NFPA No. 88B, ASHRAE Handbooks and DOD *Construction Criteria Manual*



Services

4270.1 -M. Consideration should be given to such items as comfortable floor level temperatures, hot air compensation for heat loss at exterior doors, and zone heating controls.

c. In the body work area, machine shop and welding booths, separate ventilation systems which remove dust and filings should be provided. Paint booths also require their own ventilation systems, and a hood with independent exhaust should be placed over battery charging benches. Air conditioning may be provided for the classroom and off ice as permitted by the DOD *Construction Criteria Manual 4270.1-M.*

d. An underground storage tank for waste engine oil is the most satisfactory storage solution if a pump removal service is available at the installation.

e. Hot and cold water supplies are necessary to toilet rooms and service sinks in the shops. Electric chilled water drinking fountains are very desirable in each shop. At least one emergency eye wash and shower, centrally located, is essential.

f. Water pipes should run underground or along walls at least 12 feet overhead so they will not be readily damaged. Oil and sand interceptors are required on floor drainage. There are stringent regulations on some installations concerning water discharged into sewage systems and an early check of the requirements should be made when planning a facility. A long interceptor gutter about 15 inches wide covered by sectional metal grating is a good solution to the washdown problem in the shops.

g. Compressed air outlets should be provided at the work counters. In addition to portable fire extinguishers, shops should be sprinklered.

h. Electric outlets should be located at approximately 10 foot intervals along the walls. Power should be 115 V, 60 cycles, single phase, A.C. and also a 6 volt and 12 volt D.C. supply at work benches is important. Heavy duty fans, air compresses and other equipment require 208 volt, three phase A.C. current. Motors, switches, and lights in spray booths must be vaporproof. Circuits should be limited to about four outlets, and master emergency “stop” switches should be provided for each circuit.

3-4 Furnishings and Equipment

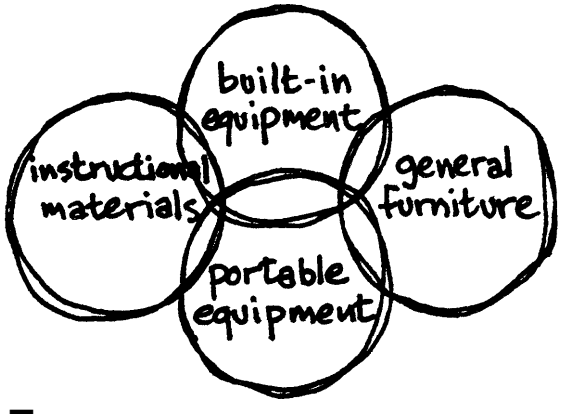
Automotive design is characterized by frequent model changes which affects service procedures and maintenance equipment. Auto Crafts Centers should therefore be equipped for future adaptations as new procedures occur. A case in point is the emission control testing equipment that is necessary in response to the latest federal and state requirements.

b. The following list of service equipment is not intended to be all inclusive but rather to give designers a general idea of built-in and portable items that must be considered:

Paint spray booths, hydraulic lifts, drill presses, bench grinders, two-station arc welding tables, wheel alignment service center, one ton mechanical jacks, two ton hydraulic jacks, transmission and differential lifts, monorail system, one ton differential chair hoist, tire changers, air compresses, parts cleaner, steam cleaner, engine analysis system centers, portable parts cabinets and mechanics chests, steel topped work counters, metal lathes, brake lathes, armature lathes, battery chargers, motor repair stands, wheel balances, and hand tools, both metric and standard.

c. In addition to service equipment, the classroom requires the following instructional materials:

Demonstration table, classroom tablet arm chairs, table for upholstery work, sewing machine, glass demonstration motor with transmission, visual aid demonstration panels, instructor's desk and a supervisor's desk, portable work counters, chalkboard, projection screen, lockable file drawers, and small parts storage cabinets.



Types

Suggested Quantity of Equipment

Equipment Items	Number of Automobile Stalls				
	4	8	12	16	30
Bench Grinder	1-3	1-3	2-4	3-6	6-10
Bench Buffer	1	1-2	2-4	2-4	2-6
Spark Plug Cleaner-Tester	1	1-3	3-6	3-8	4-8
Steel Work Benches	4-6	8-10	12-16	16-20	20-30
2-Station Welding Table	1	2-3	2-4	4-6	4-8
Hydraulic Lift	1	1-2	1-4	1-6	6-8
Alignment Service	0-1	1-2	1-4	1-6	1-6
Bumper Jacks	1-2	2-3	2-6	4-8	8-12
Tire Changer	1	1-3	1-4	1-6	3-8
Metal Lathe	0	0	1-2	1-3	2-4
Brake Lathe	0	0-1	1-2	1-3	2-4
Armature Lathe	1	1-2	1-3	1-6	2-8
Arbor Press	0	0-1	1	1	2
Vacuum Cleaner	1	1	2	2	4
Battery Charger	1-2	1-3	2-4	2-6	4-8
Safety Stands	2-4	4-6	6-8	12-18	30-40
Vacuum Fuel Pump	1	1-3	1-4	1-6	1-8
Tachometer	1-2	1-3	1-4	1-6	1-8
Micrometer	1-2	1-3	1-4	1-6	1-8
Headlight Adjuster	0-1	1-3	1-4	1-6	1-8
Portable Power Tools					
Polisher/Drill/Sander	1-3	1-4	1-6	2-12	20-25
Machinist Vise	1-3	2-4	3-10	4-12	10-20
Blacksmith Anvil	1-3	1-3	2-4	2-6	10-12
Air Compressor	1-2	1-3	1-4	1-6	2-12
Spray Booth	0-1	0-1	1-3	1-4	2-10
Lube Unit	1-2	1-3	2-6	2-8	6-10
Scope Analyzer	0-1	0-2	1-3	1-6	2-8
Soldering Unit	1-2	1-3	1-6	1-8	3-10
Welding Unit	0-1	0-1	1-3	1-6	2-8
Portable Crane	0-1	1-2	1-3	1-4	2-6
Valve Refacer	0-1	0-1	1-3	1-4	2-6
Steam Cleaner	0-1	0-1	1-2	1-3	2-4
Transmission/Differential Lift	1-2	1-3	1-4	2-6	4-6
Motor Repair Stand	1-3	2-4	2-6	2-8	4-10
Parts Cabinet	1-4	1-6	1-8	1-10	3-12
Washer Parts	0-1	0-1	1-3	1-4	2-6
Radiator Testing/Repair	0-1	1-3	1-4	1-6	2-8
Wheel Balancer	0-1	1-3	1-4	1-6	3-10
Impact Wrenches	1-2	1-3	2-4	2-6	6-8
Cylinder Sets	1-2	1-4	2-6	2-8	4-10
Puller Sets	2-3	4-6	9-11	13-18	26-32
Hand Tool Sets	Various	Various	Various	Various	Various

3-5 Summary of Space Allocations

a. Department of Defense *Construction Criteria Manual 4270.1* -M establishes space allowances for the entire Auto Crafts Center at a maximum of 500 square feet per automobile stall. It should be recognized that discretion must be exercised in applying this space allocation to meet the needs of a particular installation. For instance, an outdoor covered work area is computed as one-half the square footage of a similar sized space fully enclosed. Regions of the country with climates which permit extensive use of outdoor covered work areas can take full advantage of this factor. Conversely, in very cold climates it makes little sense to adopt a design which is drafty, uncomfortable, and difficult to heat becuase of a large number of overhead vehicle doors. However, the type of design more common in larger commercial garages, which has a limited number of vehicular entrances also requires more space for maneuvering of cars inside. In such instances, an economic analysis should be made to balance the added cost of constructing extra space for internal vehicular circulation against the reduced cost of operation, the possible savings in perimeter walls, and the improvements in comfort of the participants.

b. The following tables show typical space allocations for two types of Auto Crafts Centers. Table A shows the allocation of space for a facility with vehicular circulation on the outside of the building and with an overhead access door for each auto stall. Table B shows the allocation of space in the same size facility, however, access to auto stalls is by vehicular lanes inside the building. The implications of providing vehicular circulation within the building can be readily seen by comparing the total number of auto stalls provided.

c. An example design for a new facility of 34 stalls and 17,000 square feet is provided in Chapter 5.

TABLE A
External Vehicular Circulation

SPACE	UNIT AREA	ACTIVITY AREA
GENERAL REPAIRS & TUNE-UPS		
17 stalls at 12' x 28'	336	5,712
MUFFLER & TIRE SHOP		
6 stalls at 12' x 24'	288	1,728
LUBRICATION STALLS		
6 stalls at 12' x 24'	288	1,728
BODY SHOP		
3 stalls at 12' x 24'	288	864
PAINT BOOTH		
1 stall at 12' x 24'	288	288
STEAM CLEANING STALL		
1 stall at 12' x 24'	288	288
MACHINE & WELDING SHOP		
Shop area	1,600	
Welding area	400	2,000
OFFICE & STORAGE AREAS		
Office space	100	
Small tools and parts	700	
Issue area	100	
Secured sales	600	1,500
CLASSROOM		
Classroom	600	
Storage room	50	650
SERVICE AREAS		
Mens' toilet & locker	240	
Womens' toilet & locker	150	
Wash areas	200	
Vending areas	50	
Custodial	70	710
TOTAL NET AREA		15,468 square feet
CIRCULATION		600 square feet
CONSTRUCTION		932 square feet
GROSS BUILDING AREA		17,000 square feet
TOTAL NUMBER OF AUTO STALLS		34

TABLE B
Internal Vehicular Circulation

SPACE	UNIT AREA	ACTIVITY AREA
GENERAL REPAIRS & TUNE-UPS		
12 stalls at 12' x 24'	288	3,456
MUFFLER & TIRE SHOP		
5 stalls at 12' x 24'	288	1,440
LUBRICATION STALLS		
4 stalls at 12' x 24'	288	1,152
BODY SHOP		
3 stalls at 12' x 24'	288	864
PAINT BOOTH		
1 stall at 12' x 24'	288	288
STEAM CLEANING STALL		
(Located outside)	---	---
MACHINE & WELDING SHOP		
Shop area	1,600	
Welding area	400	2,000
OFFICE & STORAGE AREAS		
Office space	100	
Small tools and parts	700	
Issue area	100	
Secured sales	600	1,500
CLASSROOM		
Classroom	600	
Storage room	50	650
SERVICE AREAS		
Mens' toilet & locker	240	
Womens' toilet & locker	150	
Wash areas	200	
Vending area	50	
Custodial	70	710
TOTAL NET AREA		12,060 square feet
CIRCULATION		4,340 square feet
CONSTRUCTION		600 square feet
GROSS BUILDING AREA		17,000 square feet
TOTAL NUMBER OF AUTO STALLS		25

CHAPTER 4
Space Planning Concepts

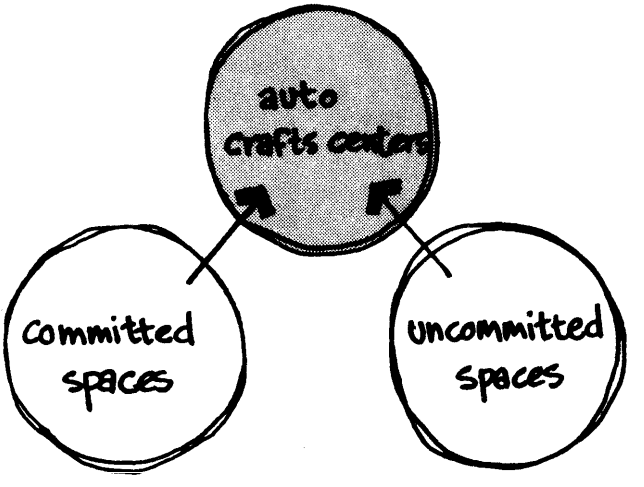
4-1 Conceptual Diagrams

a. Space planning involves arranging the elements of a plan in response to the functional requirements of the programmed activities. The interrelationships of the activities themselves are the most variable factors in the interpretation of the program. Planning, however, must take into account the probability that future space requirements will change because of program modifications.

b. Most buildings incorporate two types of spaces: committed and uncommitted. Committed spaces are those that are designed or used for only a particular activity because of specific requirements or spatial configuration. On the other hand, uncommitted spaces have an amorphous character, allowing them to be used for many unspecialized functions.

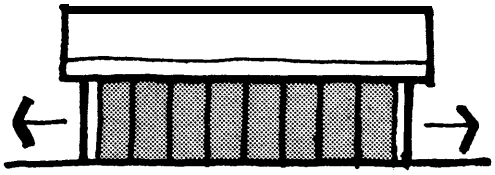
c. Auto craft activities require both types of spaces. Part of the planning process is to identify and, where possible, consolidate those conflicting spaces which have similar environmental requirements, while separating those conflicting ones.

d. The conceptual diagrams that follow illustrate design concepts for the building as a whole responding to differing climatic conditions, site constraints, and space use requirements.

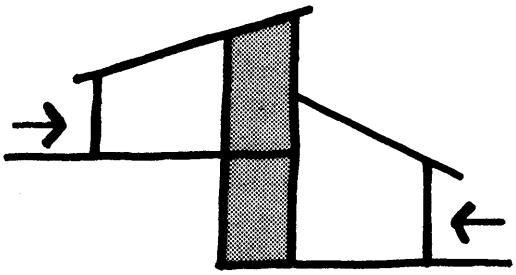


Space Types

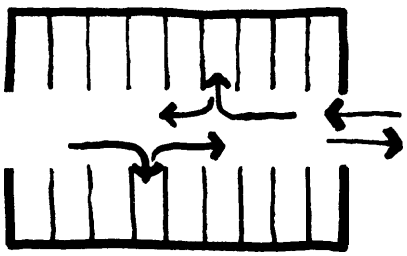
Diagrams



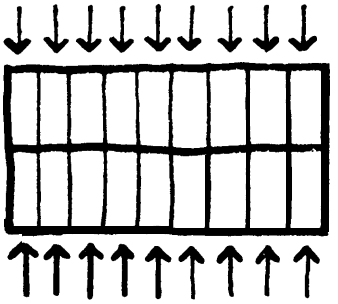
(1) *Horizontal* design concept best suits an unrestricted level site, with direct indoor-outdoor access and flow between activities. Initial construction cost is lower and expansion can occur more readily.



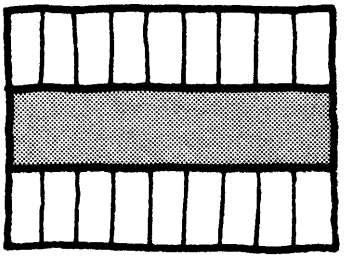
(2) *Vertical* design concept may be required to meet site or terrain restrictions but care is required for vertical continuity and communication.



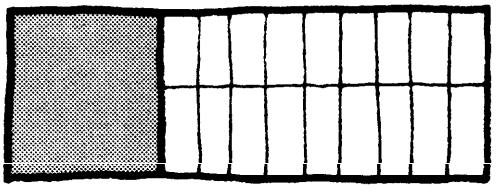
(3) *Internal Access* design concept utilizes interior aisles for vehicular circulation and access to work areas.



(4) *External Access* design concept takes advantage of exterior areas for vehicular circulation and access to work areas. This eliminates the need for indoor aisles but increases the number of exterior doors required.



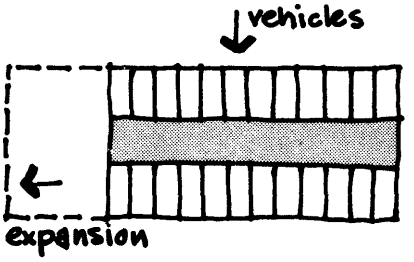
(5) *Central and Linear Core* design concepts have work areas oriented around central support facilities.



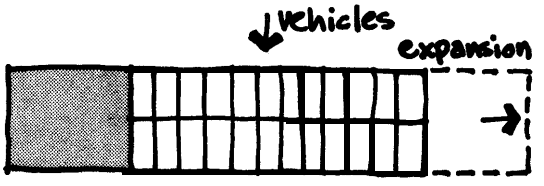
(6) *Separated Core* design concept places support functions in a committed space isolated from work areas.

4-2 Functional Layouts

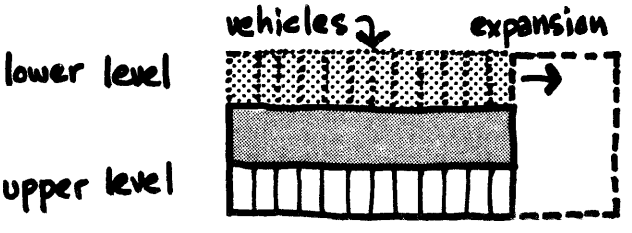
a. The following layouts indicate various concepts for the arrangement of the major functional areas of an Auto Crafts Center. The core area shown in a gray tone includes the support facilities such as the machine and welding shop, office, tool issue and parts sales, classroom, storage and toilets. The areas shown in white are the auto stalls and the arrows indicate vehicular circulation. It should be noted that the circulation pattern is always a primary design factor.



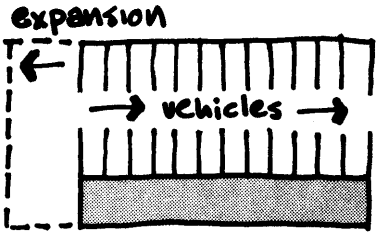
b. Layout using *horizontal, linear core* and *external access* concepts. This layout provides convenient access to support facilities from the auto stalls. In warm weather, individual auto stall doors can be opened to provide good ventilation; however, the large number of doors increases heat loss in cold weather. This plan minimizes interior vehicular circulation space and permits visual control of the entire work area, although it provides no central control of vehicles entering and leaving the building.



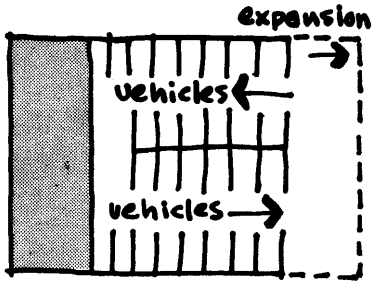
c. Layout using *external access* and *separated core* concepts. This layout has the advantages of excellent natural ventilation in warm weather and a minimum amount of space used for interior vehicular circulation. Disadvantages include high heat loss in cold weather, high initial cost of providing many overhead doors, a long distance between the core area and some of the auto stalls, and poor control of vehicles entering and leaving the building.



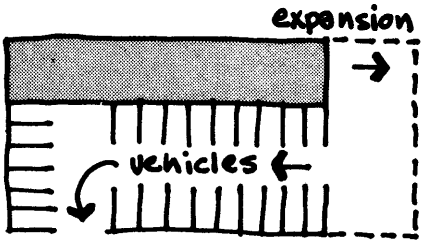
d. Layout using *vertical, linear core* and *external access* concepts. To take advantage of site conditions, a two level layout can be developed using the above concepts. The disadvantage of this layout may be the intercoordination of functions and activities.



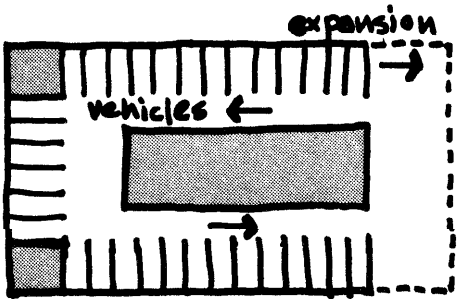
e. Layout using *internal access* and *linear core* concepts. This layout has a vehicular entrance and exit at opposite ends of the building which reduces heat loss and initial cost of overhead doors. The plan allows control of vehicles entering and leaving the building, however, it also requires much more space devoted to the interior circulation of vehicles.



f. Layout using *internal access* and *separated core* concepts. This U-shaped aisle layout has both vehicle entrance and exit on the same side of the building. This plan is particularly appropriate when site conditions restrict vehicular access to one side of the building. Although the plan minimizes exterior vehicle circulation space, more interior space is required for turning.



g. Layout using *internal access* and *linear core* concepts. This L-shaped aisle layout is appropriate for a site restricted on two adjacent sides. The plan provides good control of vehicular circulation, however, additional space is required for turning.



h. Layout using *central core* and *internal access* concepts. This layout has a very compact form and a single vehicle entrance/exit which are both advantageous in very cold climates. Although traffic flow is easy to supervise with only one entrance and exit, some interior space is lost because of single loaded aisles and area needed for turning.

CHAPTER 5
Illustrative Examples

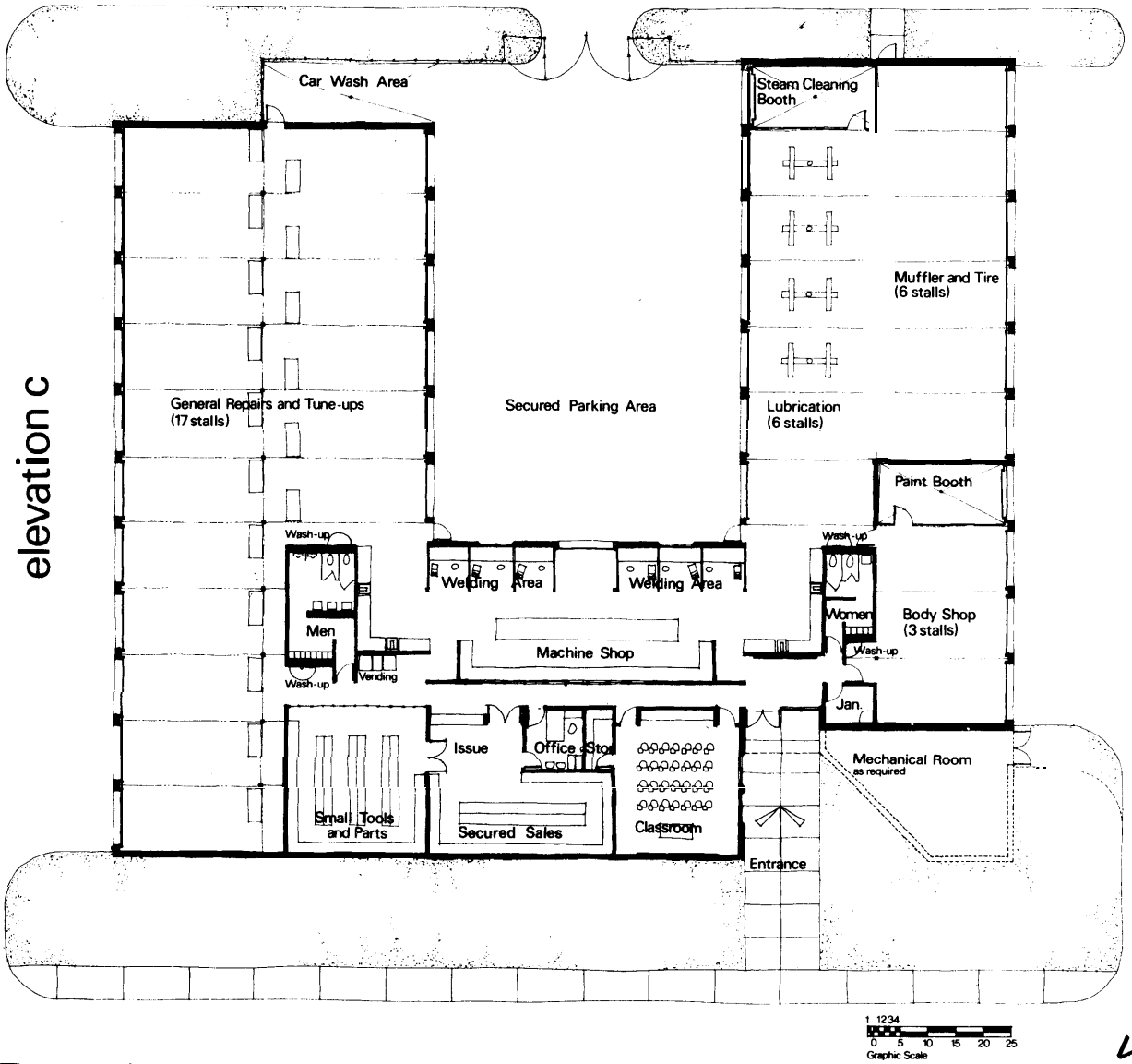
5-1 New Facility Design

a. Examples A and C contain the authorized area of 17,000 square feet and 34 auto stalls (paragraph 3-5 Table A) with an individual vehicle entrance to each stall. Example A, shown with suggested elevations, is a U-shaped plan which breaks excessively long runs of overhead doors and is more pleasing in appearance from the street. Aesthetics is especially important if the center is to be located in an area that is not industrial in nature. Various support activities are located conveniently between the general repair and tune-up stalls and the specialized work stalls.

b. Example B shows an Auto Crafts Center with interior vehicular circulation. It is based on the criteria and space allocation discussed in paragraph 3-5, Table B. Because of the increased area required for interior circulation, only 25 auto stalls are provided instead of the 34 auto stalls authorized for a 17,000 square foot facility. All other areas remain the same size. The facility can be expanded at either end without altering the supporting areas.

c. Example C is similar to Example B except the interior vehicular lane has been eliminated. The result is a long building with vehicle access along the front and back directly to each stall through individual overhead doors. The space used for interior vehicular circulation in Example B has been used to provide the nine additional authorized auto stalls in this example.

Design Solutions

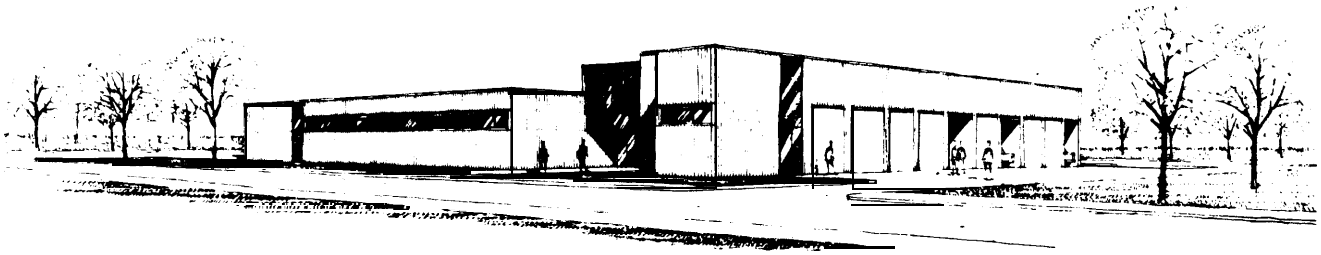


elevation c

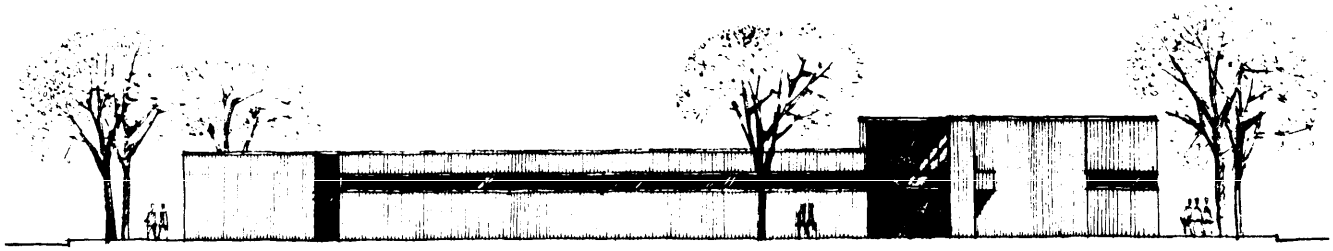
Example A
34 Stalls

elevation b

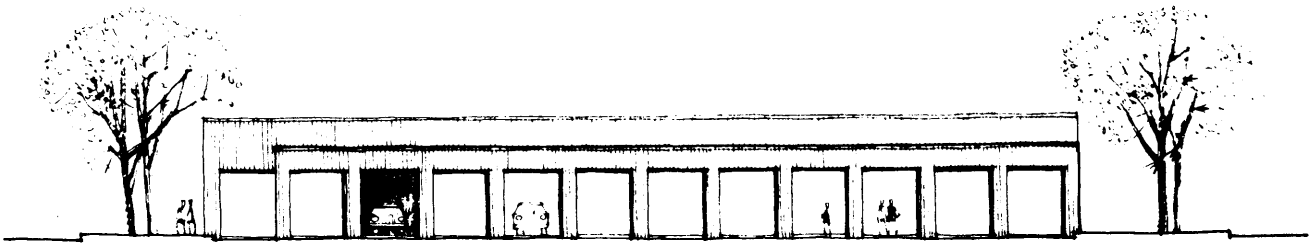
view a



view a

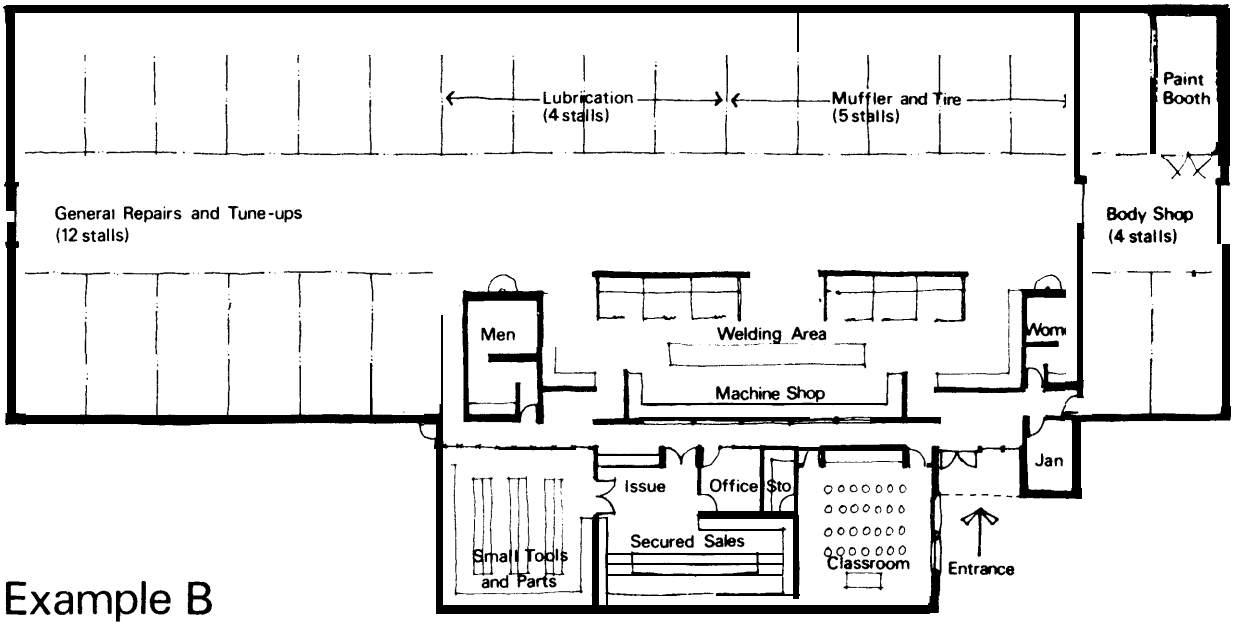


elevation b

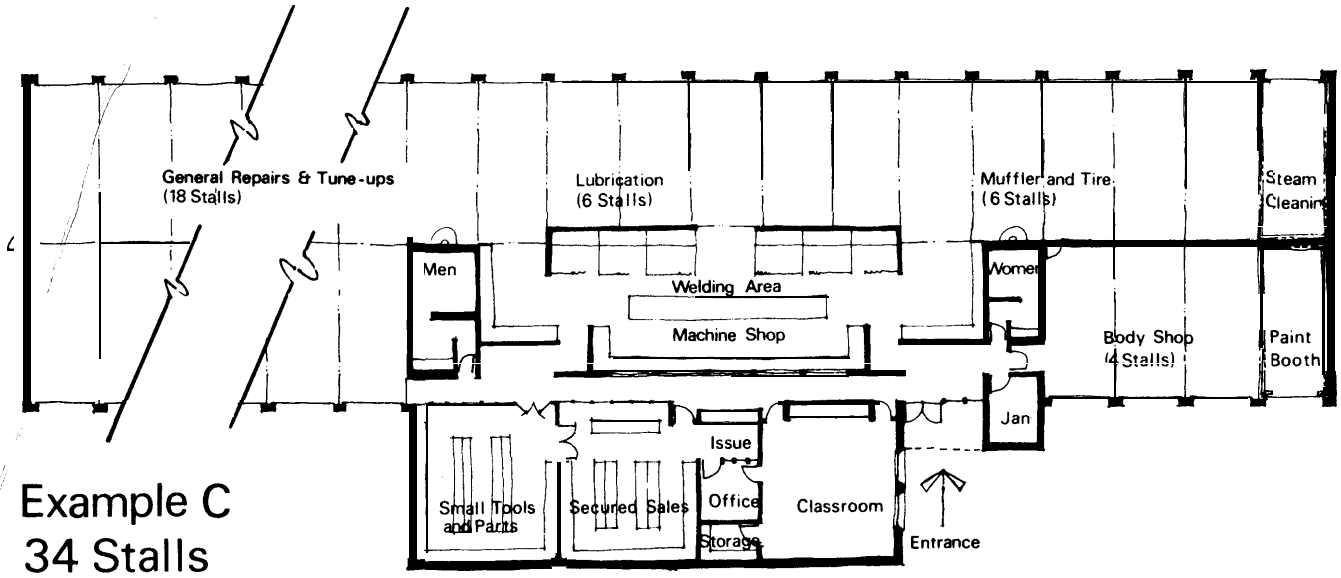


elevation c

Example A



Example B
25 Stalls



Example C
34 Stalls

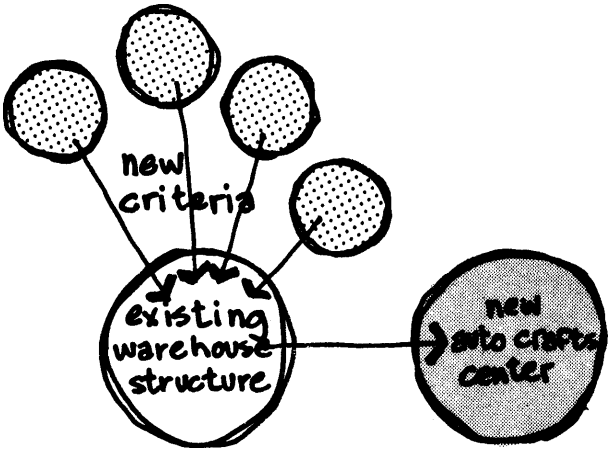
5-2 Conversion of Found Space

a. As the mission or needs change at any installation so do the requirements for particular types of facilities. Thus there is frequently the opportunity to recycle buildings designed for specific uses into functional, economical solutions serving entirely new activities.

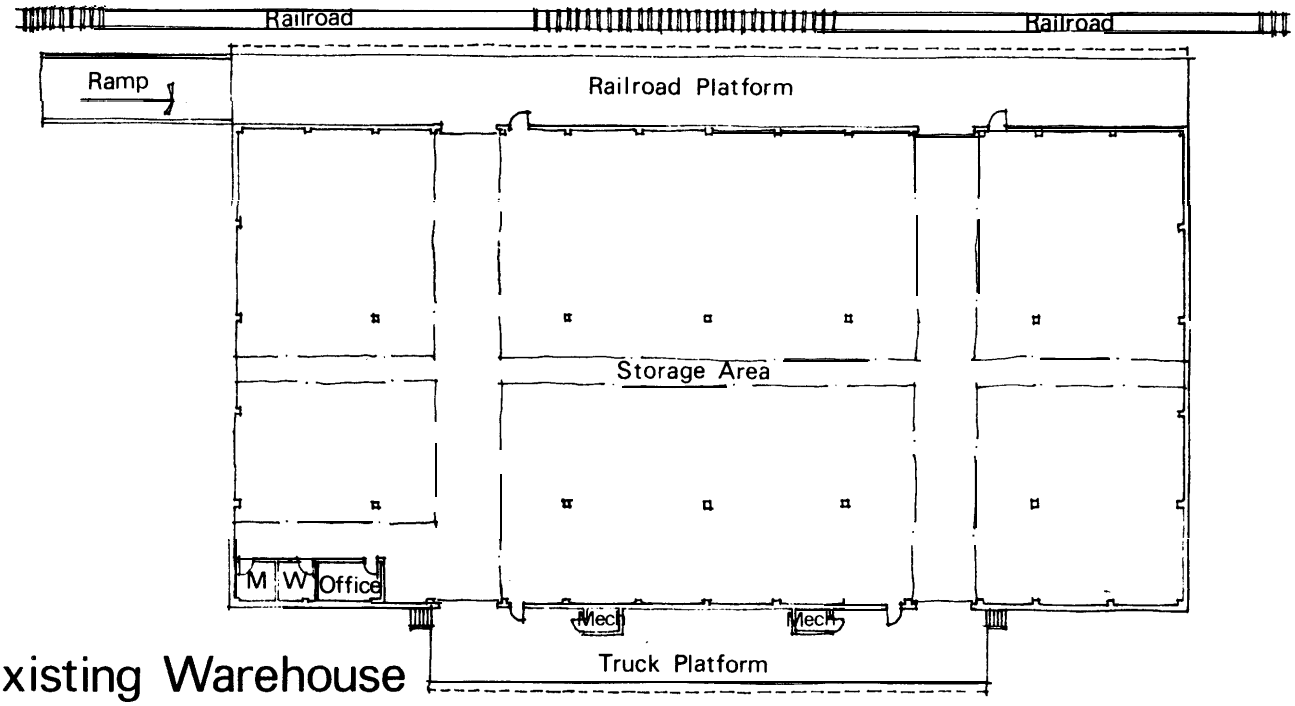
b. To illustrate this point, the following drawings show the conversion of a common warehouse structure into an Auto Crafts Center. The basic description of the original structure is a "Warehouse, Flammable Materials, with Platforms & Canopies, 100' x 200'" as taken from Corps of Engineers Standard Design 33-02-68, dated 19 February 1953. The design solution converts it into an Auto Crafts Center roughly equivalent to other facility types included in this Design Guide.

c. The 20,000 square foot structure provides 31 stalls within the confines of the existing walls, arranged with limited vehicular access from the exterior through existing doors. To the rear, on the railroad platform a prefabricated paint booth and space for steam cleaning adds to the vehicle capacity. Because the floor level is above grade, three ramps have been added, and limited infilling is provided under the front canopy to provide space for an office. Parking for 7 vehicles is provided between the front ramps and additional car storage and parking is available on the sides.

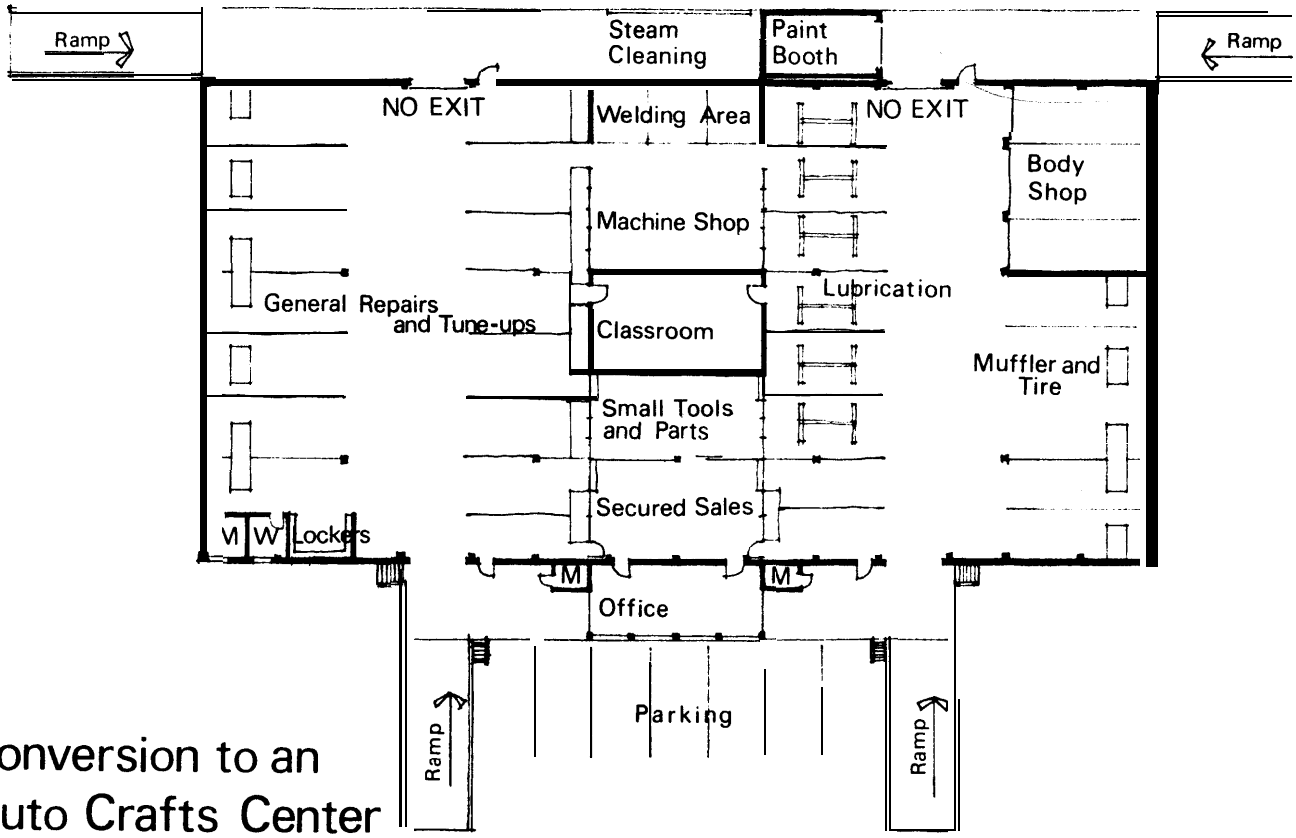
d. This solution is hypothetical and there are many factors to consider in converting found space. Paragraph 2-12 of this guide explores this process in depth.



Conversion



Existing Warehouse



Conversion to an Auto Crafts Center

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