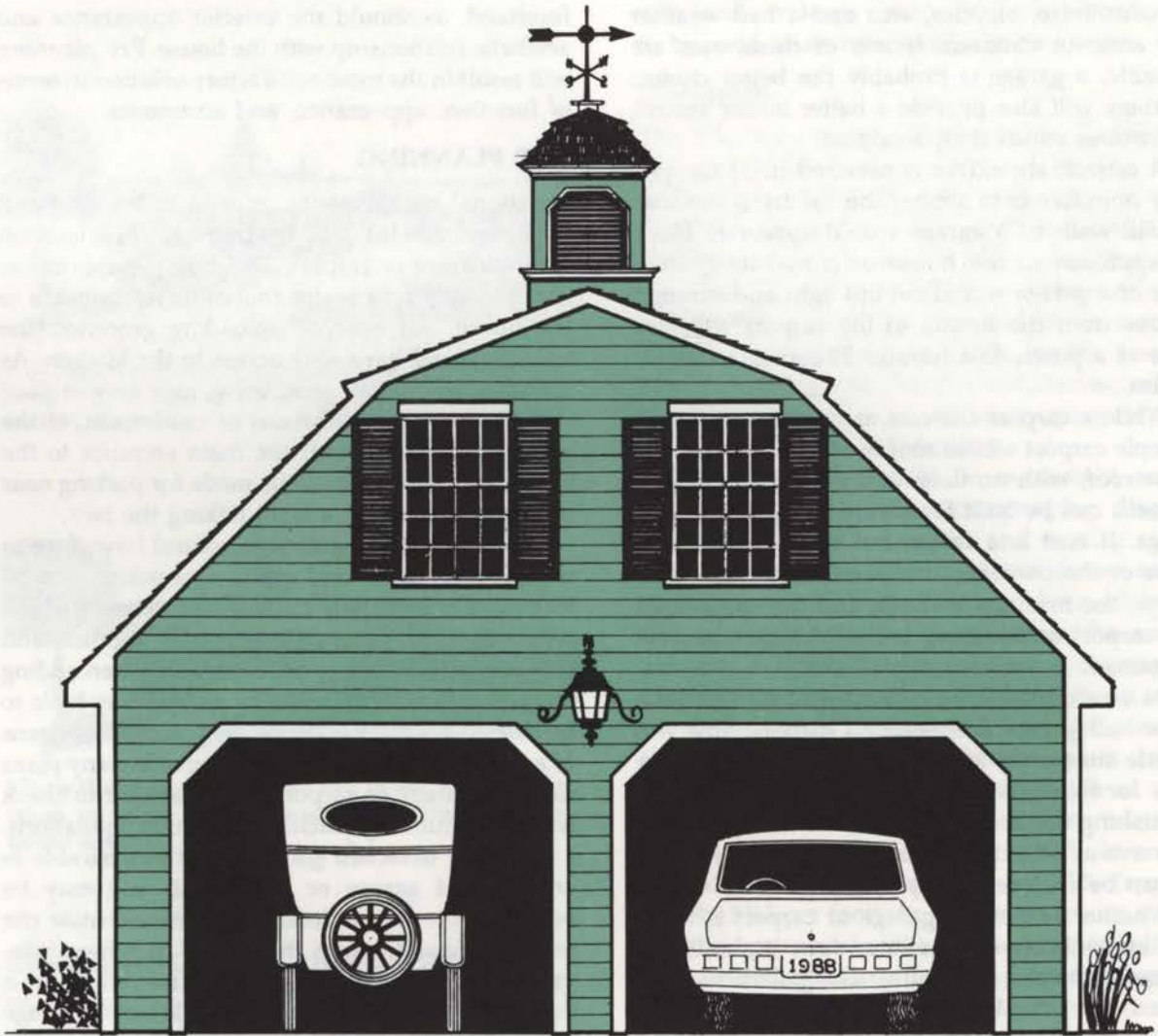


COUNCIL NOTES



C5.9 GARAGES AND CARPORTS

When deciding whether to build a garage or a carport, several factors will have to be considered. Intended uses of the space for activities other than storing a car, and climate will probably have the greatest influence in making this decision. Many areas of the country are simply too cold, and subject to too much driving rain and blowing snow, for a carport to provide satisfactory shelter for a car. The garage or carport often doubles as a workshop area; utility area for laundry equipment; storage for garden equipment, porch and lawn furniture, bicycles, etc.; and a bad weather play area for children. If any of these uses are probable, a garage is probably the better choice. A garage will also provide a better buffer against cold winter winds than a carport.

A carport should be considered if: 1) the primary objective is to shelter the car from the sun; 2) solid walls of a garage would appear to block the approach to the house or crowd it; 3) solid walls of a garage would cut out light and summer breezes from the house; 4) the carport will also serve as a porch or a terrace; 5) cost is a consideration.

While a carport can cost as much as a garage, a simple carport whose roof is an extension of the house roof, with no floor, and no built-in storage cabinets, can be built for considerably less than a garage. If cost is a factor, but the design of the house or the owners' anticipated needs call for a garage, the roof can be built, and the space used as a carport until money is available to complete the garage.

As a compromise, a structure can be built which is one half garage and one half carport. This will provide storage for two or more cars, plus indoor space for work and storage, while saving the cost of finishing the entire structure. The carport area can serve as an extension of outdoor living space, but can be enclosed easily at a later date.

Whether or not the garage or carport is to be built immediately or at a later date, it should be planned from the beginning, along with the rest of the house. The location on the site, orientation, and functional relationship with the rest of the house and yard should all be decided upon be-



The garage area can serve as the principal entrance court to the house, as is shown here. Both the front door and the service door are easily accessible from the driveway. The turn-court is another desirable feature.

forehand, as should the exterior appearance and aesthetic relationship with the house. Pre-planning will result in the most satisfactory solution in terms of function, appearance, and economics.

SITE PLANNING

Functional requirements, as well as building set-back requirements, will determine the best location for the garage or carport. The multiple uses of the garage will play a major role in its relationship to the house. For ease of unloading groceries, the garage should have easy access to the kitchen. As a workshop or play area, the garage service door should be near a bathroom or mud room. If the garage itself is not near the main entrance to the house, provisions should be made for parking near the front door, with a walk linking the two.

Local building regulations control how close to the property lines and street a structure can be located. On extremely narrow lots, these set-back regulations can drastically affect the location and size of a garage or carport, especially when adding one to an existing house. The garage may have to be located behind the house, with access by means of a rather long driveway. Before making any plans to add a garage or carport, it is advisable to check with local building officials about such regulations.

While a detached garage is not as desirable as an attached garage or carport, its use may be necessary on narrow lots, where the alternate use requires isolation from the house, or where side-yard set-back regulations are less restrictive for a detached building. If possible, the detached garage should be connected to the house by a breezeway or porch.

If a choice of location for the garage is available, it should be oriented with respect to prevailing winds, and winter and summer sun. Where the direction of prevailing wind in winter is different than that in summer, such as a southwest breeze in summer and northwest wind in winter, the garage can sometimes be located to protect the house from winter winds without blocking the summer breezes. Placing the garage on the west side of the house can protect the house or outdoor living area from the hot summer afternoon sun.

COUNCIL NOTES

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Material in this publication revised by:

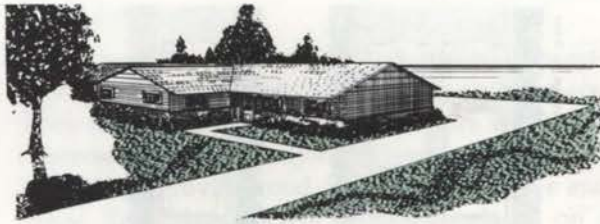
Donna L. Milner, SHC-BRC

Previous editions by R. A. Jones, J. T. Lendrum, and W. H. Kapple

Editor: Henry R. Spies

Illustrations: Mark Pedersen
Joan Zagorski

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A rear-entrance garage takes less side yard than the side-entrance garage, and the garage contents are not on view when the door is left open.



A garage facing the side lot line requires more side yard, but the door is not as dominant in the appearance of the house.



When the garage door faces the street, care must be taken to select a door which harmonizes with the house design.

DESIGN OF GARAGE AND DRIVEWAY

Too often, a garage or carport is tacked on to a house with little or no thought given to how the structure will look. The attached garage is important in the architectural design of the house. Garages that extend the line of the house ridge or the lines of the eaves, or those which seem to add to the total length of the walls, generally make the house look larger and more attractive. Designs which use a strong contrast in color or material often detract from the appearance of the house and should be avoided. For those who object to the garage opening facing the street, the side-entrance garage can often be used, as long as there is enough room on the lot.

Because of its size, the garage door must be selected with an eye to appearance, particularly if the garage faces the street. Doors should be simple in design so they do not dominate the house. A strong, contrasting color or pattern on the door is generally undesirable. If the garage is to be used as an occasional extension of the living area, consideration should be given to providing light and air without necessarily having to open the automotive door. A large door in the back of the garage will provide access to the back yard. This will facilitate lawn chores, and allow the garage to be used as an extension of a rear patio.

Driveways

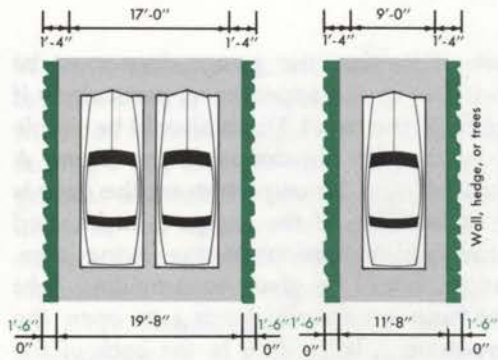
The driveway should provide the most direct access possible from the street to the garage. If the driveway is off a busy street, it is especially desirable to provide a turn-around so that it is possible to pull out into traffic rather than back out. This turnaround will also provide off-street parking for guests. It is important to have an unobstructed view of oncoming traffic. Locating the driveway close to the corner of a house, existing trees or utility poles, or tall landscaping creates a potentially hazardous situation.

The driveway should be as straight and as short as possible. The accompanying diagrams have suggestions for widths and turning radius. While many of the new, small cars do not require as large a turning radius as the older models, it is still advisable to allow generous widths and diameters. A driveway designed for a compact car may not be adequate for a van or pick-up truck.

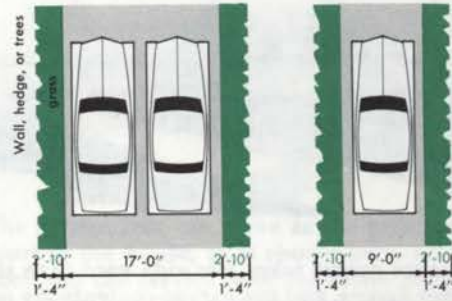
Ideally, the drive is sloped from the garage to the street for drainage. The minimum recommended slope is $\frac{1}{8}$ " per foot of length or width of pavement, with $\frac{1}{4}$ " per foot recommended. The maximum recommended slope is 12%. In no case should the slope exceed 14% or 15% (approximately $1\frac{3}{4}$ " per foot). In a steep driveway, one car length of pavement without noticeable slope should be provided at the street and in front of the garage or carport. To avoid "bottoming out" on a steep driveway, the maximum crest should be 6" in 10' and the maximum dip should be 10" in 10'.

If it is not possible to slope the driveway away from the garage, a drain covered by a grate should be installed the entire width of the garage opening. This drain should be cleaned regularly.

It is also advisable to build the driveway with a slight crown, or raised center. This will allow water to run off the pavement to the side, as well as toward the street and storm sewer or culvert. If it is not possible to slope the driveway to the street, it can be sloped to the side, or to an inlet or ditch as required.

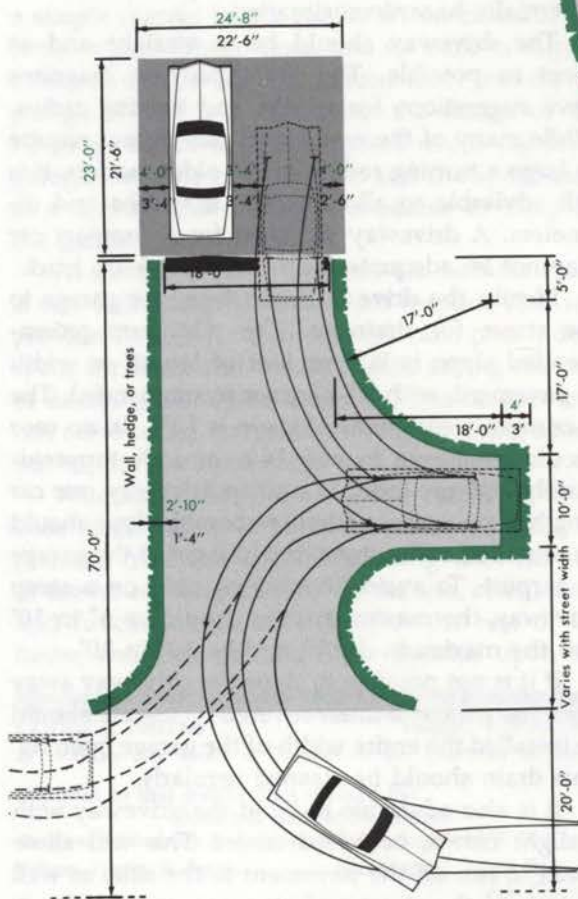
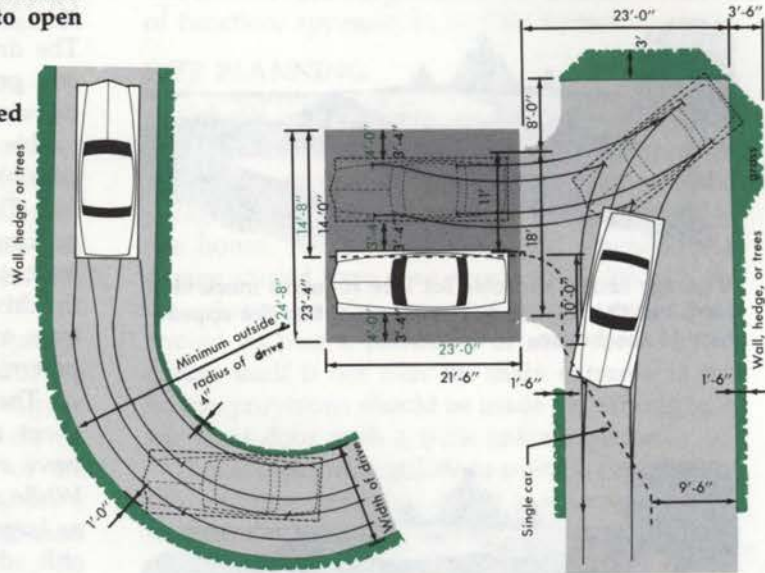


The above minimum (black) and recommended (color) driveway widths are suggested where the driveway is used for both parking and as a walkway. An additional two feet can be added to the width of the double drive to allow space for the doors to open between cars.

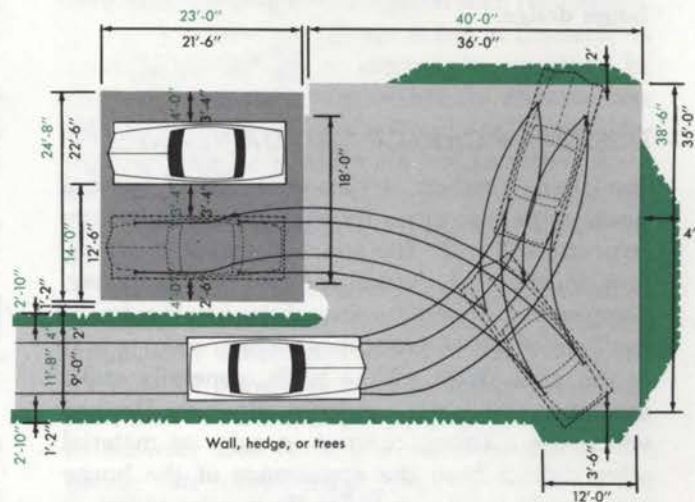


The above minimum (black) and recommended (color) driveway widths are for use where the driveway is used for parking only and not as a walkway.

The minimum outside radius for a single curved drive depends upon the width of the drive.



The minimum (black) and suggested (color) dimensions for a side-entrance garage are shown above. An 18-foot garage door is required to allow entrance and exit with only one backing maneuver.



The minimum (black) and suggested (color) dimensions for a rear-entrance garage are shown above. Less side yard but more back yard is required. An 18-foot door was assumed in sizing the turning area.

On many streets, it is dangerous to back into traffic, and a turnaround area is desirable if there is space available at the front of the lot.

Pavement

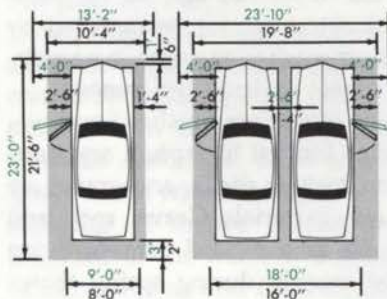
Concrete. Properly mixed and placed concrete provides a more durable, low-maintenance surface. Since freezing and thawing of moisture within the concrete can cause major problems, care should be taken to provide good drainage both above and below the slab. Concrete should be placed on a well-drained subsurface, such as four to six inches of compacted gravel. If the driveway is crowned, the gravel should also have a crown. Pipes or drains under the drive should be avoided if possible.

A concrete driveway must be thick enough to support the loads it must carry. While a four-inch slab is adequate for cars and small pick-up trucks, heavier loads such as garbage and fuel trucks require a six-inch slab.

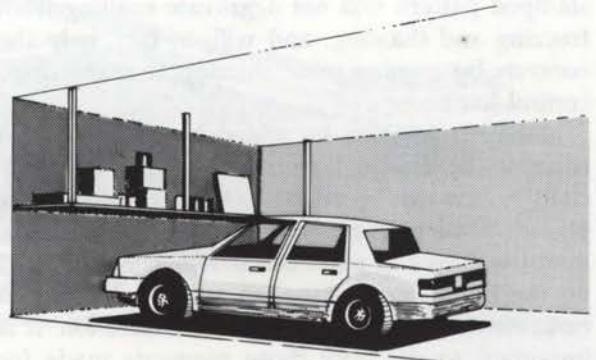
Wire mesh reinforcing helps keep the slab from caving in if the dirt washes out from under it (often due to improper base preparation), and helps prevent cracking in the slab due to frost heave. When using wire mesh reinforcement, it is important that the mesh be raised so that there is 1-1½" of concrete under it.

In some areas, the soil provides a suitable base. In most places, a sand or gravel base will be necessary. A good granular base provides drainage under the slab to keep water from penetrating the slab from underneath. Granular fills can be packed well to ensure that the base is firm and stable.

During the curing of concrete, small cracks form near the surface due to shrinkage and evaporation. They can form an unsightly random pattern on the surface, and provide places where water can enter the slab and begin deterioration from freezing and thawing. To control the formation of these cracks, control joints, which are grooves tooled into the surface of the wet concrete every three or four feet, are used. Presumably, the cracking will occur along those lines.



Minimum dimensions for the single and double garage are shown in black. For ease of access, the dimensions shown in color are recommended. The area shown is for car storage only, and additional space should be allowed for general storage and work areas. All dimensions in this publication are based on full-sized cars.



Space over the hood of the car can be used for storage.

Another type of joint necessary to concrete work is the construction joint. Construction joints occur at the end of a piece of work, and are determined by how large an area is suitable to be worked at a given time. In the case of a concrete slab, they are usually 10 to 20 feet apart.

Isolation joints are used at any intersection of the driveway with a sidewalk, garage floor or wall, etc. These joints allow differential movement between the two surfaces, and help prevent cracking.

While construction and isolation joints are typically made with asphalt-impregnated particle-board, it is possible to use redwood, cedar, or pressure-treated wood. Then the joints can become a visual part of the design, as well as a functional part, and the usually unsightly joints can add attractive character, texture, line, and form to the approach to the house.

An important consideration for a concrete driveway is the type of surface finish. A magnesium or wood float provides a good plain finish. A steel trowel finish, such as used on a basement floor, would be too slick, especially if there is any moisture or spilled oil on the pavement. A broom finish, produced by dragging a broom across the surface, perpendicular to the direction of traffic, will give good traction. Additional traction, and a pleasing appearance, can be obtained by tooling grooves, perpendicular to traffic, at regular intervals.

Other surface finishes include exposed aggregate and stamped pattern. Using special colored aggregate in the concrete, and exposing it, can give an attractive color and textured appearance to the drive. The aggregates can be whatever shape, size, and color will most enhance the appearance of the driveway, and complement the rest of the house. However, exposing the aggregate may leave small spaces through which water can enter the concrete and cause spalling. Another way to add interest and texture is to use a stamp to create an embossed pattern in the concrete. A

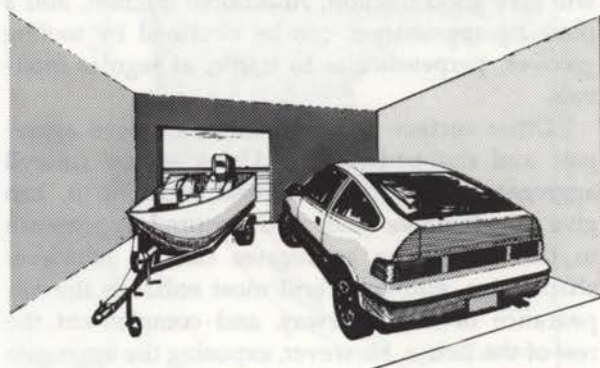
stamped pattern will not aggravate spalling from freezing and thawing, and will, in fact, help the concrete by creating what amounts to many small control joints.

Interest can also be added by using colored concrete. Several pigments are available commercially which can be added to the mix before it is placed. Some pigments may be attractive, but will limit the choice of paint colors which can be used on the house and garage, so any use of colored concrete must be given careful consideration. It is important to use only those pigments made for use in concrete.

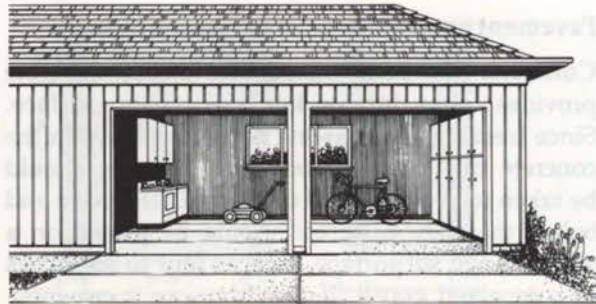
In regions subject to freeze-thaw cycles, it would be wise to consider using air-entrained concrete. Air-entrained concrete involves a chemical additive to the concrete which causes small air bubbles to form within the concrete as it cures. These air pockets absorb some of the stresses from the expansion of freezing water within the concrete, making the concrete more durable under freezing conditions.

The care during the first one or two years after placement is the most critical in influencing the durability of concrete. On concrete which is not air-entrained, a solution of linseed oil and petroleum spirits brushed onto the slab has been found to be an effective sealer. Such a coating should be available from concrete suppliers. Application of this coating in the fall, particularly for the first year or two, will help protect the concrete. It should be applied when the temperature is above 40°F.

Asphalt. Another popular driveway surface is asphaltic concrete, commonly referred to as blacktop. Blacktop is a mixture of asphalt and aggregate which is applied hot, then rolled to compress and smooth it. Like concrete, blacktop requires a well-compacted, well-drained base, usually 4-7" of gravel. Many contractors apply 1½" to 2" of surfacing over an aggregate base. Engineering studies,



A large door in the back wall of the garage allows access to the rear yard for storage or work. It also permits the garage to be used as an extension of a rear patio area.



This double garage is arranged so there is a raised laundry area along the wall which opens into the kitchen. Storage units are built into the opposite wall. Two 9-foot garage doors are used for convenience.

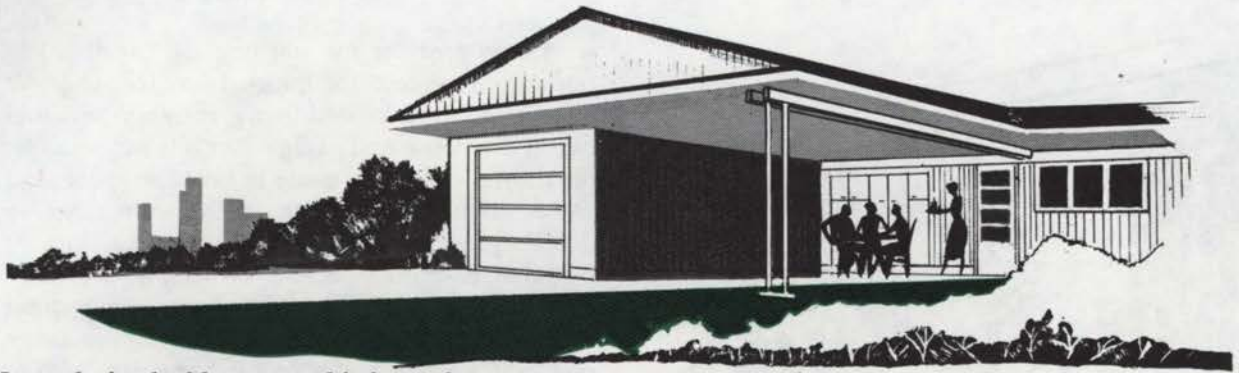
however, indicate that this thickness may not be adequate to support the weight of service vehicles which may use the driveway. Three to four inches of pavement over an aggregate base will be more satisfactory.

While blacktop does not provide a wearing surface that is as durable as concrete, it is more resilient. However, blacktop performs better in situations where it is subject to a lot of traffic. Exposure to wind and sun tend to dry out the surface, causing small cracks to form. Tires running over the surface work the surface and keep the blacktop bonded together. For driveways, it is best to use a mixture which is heavy on asphalt. Under heavy traffic situations, asphalt-rich mixes will tend to rut more, but in a low-traffic driveway, surface cohesion is more important.

A blacktop driveway should be sealed after the first year, then resealed every two or three years after that. Cracks allow water to penetrate the surface, which leads to freeze-thaw breakup. The use of commercially available sealers fills these cracks. Sealing also protects the surface from spills of oil and gasoline, and builds up the wearing surface. If a blacktop driveway is properly placed, and well-maintained, it should last 12-14 years. Unlike concrete, blacktop cannot be installed by the do-it-yourself homeowner, as expensive equipment is required to heat and roll the material.

Others. The choice of surface finishes for driveways is by no means limited to asphalt and concrete. Brick, crushed rock or shells, and gravel are also suitable driveway materials. Gravel, rock, and shells are not suitable as extended outdoor living areas, and may be muddy during spring thaws and rains.

Brick is an attractive choice for paving any driveway or patio. Its main drawback, however, is the tendency of bricks to heave up unevenly and crumble apart as the ground freezes in winter. In areas subject to freeze-thaw cycles, it is best to install paving brick laid in a sand bed without



Instead of a double garage, this house has a carport and a single garage. The carport also serves as a covered outdoor living area. Storage space is provided in one wall of the carport.

mortar, over a concrete base. Paving bricks are harder and more resistant to moisture. Even the best paving bricks are not as resistant to breaking up as concrete. Redwood, treated wood, or cedar boards can be used as edging and dividers to create attractive patterns in a brick driveway, and the brick can be laid in any number of patterns to give texture and variety to the surface.

De-Icing

Regardless of the surface treatment used, de-icing salts are destructive. When water enters a pavement and freezes, the growth of ice-crystals and pressure from unfrozen water which the crystals displace breaks the material apart from the inside out. The use of de-icing salts more than doubles the hydraulic pressure already present, especially near the surface, and causes more destruction than freezing and thawing alone. It is best to just remove the snow and/or use sand for traction. If salt must be used, the same things which protect pavement from plain freezing and thawing will reduce salt damage. In new construction, air-entrained concrete is recommended; old concrete can be protected with linseed oil treatments as mentioned above. Regular use of sealer will help protect a blacktop driveway.

Underground snow melting systems are also available but are costly to install and operate. They consist of electric heating cables or hot water pipes embedded in the driveway, and their appropriate controls. Automatic snow melting can be particularly useful where the driveway has a steep slope. Drainage of melted run-off must be provided, however, or the water will refreeze at the bottom of the driveway and form a patch of ice. In heavy snows, such systems are not effective unless the bulk of the snow is removed by other means.

GARAGE CONSTRUCTION

Size: The size of the garage will vary according to the uses planned for it. The illustrations indicate the minimum dimensions and clearances for one-

and two-car garages for automobile storage only. If the garage is to be used as a workshop, etc., the dimensions should be increased accordingly.

Garage Door: For the single garage, an 8-foot door is common and minimum. A door 9 feet wide is well worth the additional cost. On a double garage, a 16-foot door is cheapest and a minimum. Two single doors will provide clearance between cars for easier access. An 18-foot single door is desirable, and is necessary if the approach to the garage is other than straight. The usual heights of doors are 6'-4" to 7'-0"; taller ones are available and should be considered if recreational vehicles or vans are to be stored. The height of the door is important if the garage door(s) faces the street. For example, if a 6'-4" door were installed near the doors and windows of the main part of the house where the door and window heads are all at 6'-8", the front of the house could appear awkward. It would be advisable to either use a taller garage door, or install a fixed panel above the garage door to make it appear to be as tall as the others.

Overhead doors, either one piece or sectional, are available in a variety of designs and with several types of operating hardware. Some project outward when opened; others slide back into the garage. Some require no space over the doors; others require 16" to 18" above the top of the door opening. Doors which are hinged and swing outward can be difficult to open, especially in snow and wind. Sliding and folding doors hung from overhead tracks take valuable garage wall space, and obstructions such as sticks and stones can interfere with door operation.

Door Operators: Automatic electric operators are available for most types of overhead doors. They may be controlled from permanent push-button installations or by radio.

Other Doors: One service door is recommended in addition to the automobile door. If the garage is attached, a second door to the adjacent yard is desirable in addition to the house door. Screen



Storage units form one wall of this carport. The raised sidewalk and roof of the carport provide a pleasant covered outdoor area.

doors for ventilation will be desirable if the garage is to be used as a work or play area.

Windows: At least one window is needed for natural light. Windows are needed for light and ventilation if the garage is to be used for other purposes.

Roof: If there is enough room within the roof structure, provisions should be made for attic-type storage. A folding, pull-down stairway is useful. Insulation is needed if the garage is to be heated.

Fire Separation: Most building codes require the wall between the house and an attached garage to have a one-hour fire rating. For frame construction, this would typically be Type X (fire-resistant) gypsum board or lath and plaster on the garage side of the wall. If there is no ceiling, this protection should extend to the roof line. The wall should be insulated, and should not contain plumbing which is subject to freezing. If there is a living area above the garage, the ceiling also should be fire-rated.

Foundation Wall: The foundation wall should extend at least four inches above the garage floor. When attaching a garage to an existing house, the foundation should extend to the same depth as the house foundation to minimize differential settlement.

Floor: A concrete slab floor should be one or two inches above the driveway and sloped one to two inches toward the door so that water dripping from the car will run out the door, and so that melting snow will not seep under the door. The floor of an attached garage should be one or two steps lower than that of the house to prevent gasoline fumes and dirt and water from seeping under the door. Laundry, storage, or work areas and walkways should be raised above the area where the car stands.

Plumbing: If the garage contains a laundry area, plumbing will be necessary. It is also desirable in

workshop areas or for washing the car. It is important to protect the pipes from freezing. All pipes should be located in the common wall between the house and garage. If this is not possible, provisions should be made to heat the space, and valves should be installed in the water lines so that they can be drained.

While floor drains are convenient, most plumbing codes prohibit them, because a floor drain could allow gasoline or oil into the storm drainage system. Plumbing codes prohibit any explosive or flammable materials from being deposited into the drainage system. Local codes may permit a floor drain in a garage if it discharges into a drywell.

Electricity: Garage lights should be installed with three-way switches so they can be controlled from both the house and the garage. Most electric door operators turn on a light automatically when the garage door is opened. The wiring system for the door operator should include a switch so that this light can be turned off if the door is to be open for long periods of time, and to prevent accidental operation when on vacation, etc.

Convenience outlets should be provided for cleaning, car repair, and laundry or workshop equipment. All garage outlets must be protected with a Ground Fault Circuit Interrupter. If a workshop is planned, it should be on a separate circuit, and a 240-volt outlet may be needed.

Heating: In cold regions, the availability of heating is recommended in the garage even if it is only used for automobile storage. In this instance, it is only necessary to provide enough heat to facilitate starting the engine on bitterly cold mornings. If the garage is to be used as a utility, work, or play area, the heating system should be capable of maintaining 70°F. Heat can be supplied either through the central heating system or by a separate heater. If the house system is used, there should be no return air from the garage. The supply ducts should be located well above the garage floor; one model code requires they be at least 6'-6" from the floor; and be equipped with a backdraft and fire damper.

Some local codes prohibit installation of a separate heater in a garage while others place major restrictions on it. One model code requires that any combustion chamber, ash pit, pilot light, etc., be raised 18" above the floor to prevent possible ignition of any gas fumes on the floor. Any heating device should be installed to protect it from impact by a car. Locating it on a raised concrete or masonry platform which is higher than the bumper of a typical car or pick-up truck would be one way to protect the heater from accidental damage.