

## CHECKING ROUTINE

### GARAGES AND GARAGE WORK-CENTERS

#### PROJECT PLANNING AND DESIGN

#### 1. GENERAL

1.01 This section furnishes a general outline of suggested principles to be considered in the planning and design of garages and garage work-centers. A checking routine is recommended for the analysis of specific building projects to determine the design requirements with consideration of the factors which affect the utility, cost and appearance of the building.

1.02 It is important to the control of building projects that consideration be given to the principles of initial planning in regard to location, site selection, and scope of the project. The review of building projects by application of a checking routine before plans and specifications are submitted for bids, provides an additional control to the project.

1.03 Many of the items listed in BSP Section H20.220, Checking Routine - Building Project Planning and Design, are applicable to the design and planning of garages and garage work-centers as well as to telephone buildings and are included in this section. It is thought that a tabulation of the items or questions to be considered will be helpful in the application of a checking routine.

1.04 The varying factors involved in developing well-balanced elements of utility, economy and appearance when selecting sites and preparing plans for garages and garage work-centers require the individual consideration of each project.

#### 2. SELECTION OF GARAGE LOCATION

2.01 As a guide in determining garage locations, study plans are made of the work operations of Plant Installation, Maintenance, Construction and Repair Forces to be used as a basis for determination of the proper size and desirable location of garages prior to the acquisition of sites. A cost comparison of contemplated sites and a review of the items outlined in the succeeding paragraph are included in this analysis.

2.02 Factors to be considered in determining location:

- (a) Location with minimum travel time to reduce labor cost and vehicle expense, unless available sites are excessive in cost and it is advisable to acquire land in a less accessible area.
- (b) Influence of surroundings upon the architectural design of the building. Garages are frequently located in industrial or commercial areas where architectural treatment may be further simplified resulting in more economical construction.
- (c) Reactions of adjacent property owners.
- (d) The situation with respect to comfort and safety of employees. Accessibility to transportation facilities.
- (e) Requirements and economy of combining associated plant offices, storeroom and garage at one location. The establishment of garage work-centers by locating offices for foreman, supervisors and even district offices in conjunction with garage facilities has localized plant operations and improved efficiency. In this way the supervision is nearer to the actual plant operations.
- (f) Method and cost of handling supplies and need for plant storeroom.
- (g) Community growth trend and direction as affecting motor vehicle operations and permanency of garages at location selected.
- (h) Present and future boundaries of divisions, districts, etc.
- (i) Size and number of garages for a given community and their relation to existing or contemplated central offices, other offices, storerooms, garages and work centers, rail lines for adjacent pole yards, street car and bus routes, arterial highways, etc.
- (j) Usefulness for disaster operations in the event of natural disaster or an enemy attack.

- (k) Cost of land and building at each site.  
Include cost of garage operating personnel and equipment in studies used to determine number of garages. Several plans are studied of larger and smaller installations at various locations before the most efficient types and sizes are selected.
- (l) Deed, zoning and building code regulations.
- (m) Fire or other hazards due to surrounding buildings and class of occupants.
- (n) Wide street for safe exit and entrance.
- (o) Avoidance of fronting on main arteries.
- (p) Avoidance of congested districts.
- (q) Efficiency of operations and house service costs.
- (r) Availability of suitable commercial repair shops.
- (s) Proposed or possible future city planning or road construction which might affect the lot by changes in width or grades of the sidewalk or street.
- (t) Possible future changes in the character or development of the neighborhood.

### 3. SELECTION OF SITE

3.01 Factors to be considered in this section are outlined in more detail in BSP Section H21.111, Selection of Building Sites for Central Offices and Section H21.215, Survey Information.

3.02 Requirements with respect to type and use of proposed building.

- (a) Adequate size for present and future needs for offices, employee facilities and parking, number of vehicles, storage of materials, supplies, poles, cable, hardware, trailers, etc., and unforeseen contingencies. Size of an average lot in suburban areas for a 30-car garage may be approximately 120-foot frontage with a depth of at least 200 feet. This will provide space for a driveway alongside the office portion of the building and space for employees' cars. The additional depth is required to provide for future growth, for storage of trailers and for storage of outside plant material. In outlying areas a ground plot of three to four times the size of the building, according to ground usage, is usually satisfactory. Conditions at each site, of course, will govern appropriate size of lot.

- (b) Sufficient land area where feasible so that building may be set back about 15 feet from curb at entrance to permit view of street for safety in entering traffic and to allow a suitable turning radius.

- (c) Where an associated pole yard is required, consideration is given to obtaining land where a railroad siding can be made available.

- (d) Availability and capacities of water and gas mains, electric distribution systems and storm and sanitary sewers.

- (e) Corner lot advantageous: more flexibility in arranging entrances to yard and garage. Increased natural light and air. Decreased fire exposure.

- (f) Interior lot satisfactory if it extends through to parallel street, or driveway access or easement is obtainable.

- (g) Interior lot with exit to one street should provide for minimum of 12-foot driveway along outside wall of building if practicable.

- (h) Employee parking is provided where economically practicable or where ground is held for future telephone use and preparation costs are not excessive.

- (i) Zoning and building code restrictions.

- (j) Favorable neighborhood reaction to the project.

3.03 Avoidance of hazardous locations.

- (a) Flood hazard of sites near streams.

- (b) Good drainage. Adequacy of storm sewer facilities where available.

- (c) Consideration of the type and occupancy of adjacent buildings and surrounding area from fire exposure and fire spread standpoint.

- (d) Location as far away from most likely targets for enemy action as practicable.

- (e) Hazards of locations near air craft landing areas.

3.04 Site conditions affecting building costs.

- (a) Bearing capacity of the soil and type of foundations required.

- (b) Slope and contour of lot with consideration of drainage problems, retaining walls, driveways, excessive cut or fill excavation, etc.

- (c) Natural and established grades in relation to proposed floor elevations.

#### 4. PLANNING

##### 4.01 Scope of work.

- (a) Early consideration of scope of work and design with architect.
- (b) Decisions as to type of construction, materials and mechanical and electrical equipment.
- (c) Planning the project development with the architect.

##### 4.02 Working drawings.

- (a) Advantage of complete plans and specifications. Possible reuse on other projects.
- (b) Use of typical design for smaller garages.
- (c) Reuse of mechanical, electrical, and plumbing detail sheets, gasoline tank and pump layouts, etc.

##### 4.03 Requirements and considerations.

###### (a) General

- (1) Importance of making prompt use of new plant and fullest practicable use of existing plant, salvaging existing buildings for reuse when applicable.
- (2) Comparative costs of construction based on the use of the various applicable structural materials.
- (3) Advantages in use of standard manufactured products.
- (4) Selection of materials and design to reduce number of crafts involved and simplify coordination problems.
- (5) Consideration of possible future growth of the garage in locating auxiliary spaces, heating and fueling equipment, etc.

###### (b) General garage plan.

- (1) A rectangular building plan for parking area more efficient as regards cost per vehicle, with offices, etc., in separate lean-to with lower ceiling height. T and L-shaped arrangements or other irregular plans usually more costly per vehicle to be parked.

- (2) Two rows of vehicles served by one vehicle aisle or four rows of vehicles served by two vehicle aisles are economical of space.

- (3) Parking at right angle: 1-1/2 feet minimum between vehicles. An average parking area of 8 feet width is ordinarily used in calculating space for small vehicles.

- (4) Width of garage generally 60 feet for one vehicle aisle with two rows of vehicles.

- (5) Double aisle garages generally 110 feet minimum to 120 feet maximum width with separate entrance doors for each aisle, both front and rear. Parking area free of obstructions by placing interior roof columns only at line where two rows of vehicles meet (55 to 60-foot truss spans).

- (6) Aisle width should be equal to length of larger vehicles to be parked, excluding consideration of one or two exceptionally long trucks.

- (7) It is desirable for trucks to be headed into wall to permit night loading of supplies from aisle.

- (8) Vehicle parking areas are limited preferably to one floor level because of cost factors and ramp construction.

###### (c) Garage capacity

- (1) Although the layout for a specific location is governed by the needs, conditions and fleet make-up of the particular locality, generally the following types of buildings will be most suitable.

- (a) Single aisle garage with lean-to (10 to 50-car capacity).

- (b) Double aisle garage with lean-to (40 to 100-car capacity).

- (2) Garages built initially with capacities of 10 to 40 cars are usually of the single aisle type, whereas capacities of over 40 cars are generally built with double aisles having two entrances at front and two at the rear. However, lot size and shape available or other conditions may indicate a modification of these basic types.

- (3) Initial layout plans are prepared so that they may be expanded, if required, by providing additional bays at the rear and by changing the size of office and related facilities in the lean-to accordingly.

(d) Auxiliary space

(1) Offices, training room, employee facilities, locker rooms, storerooms, tool-rooms, etc., most economically provided by building one-story lean-to along the side wall of garage with lower ceiling height (usually 8 feet). However, two-story additions for office space also have been used in some cases with satisfactory results. In other cases a two-story District Office Building has been erected, for example, on the front of the lot with a one-story garage at the rear.

(2) Additional detail regarding the layout and arrangement of attended storerooms is contained in Section 61.001 of Supply Operating Practices.

(e) Construction tool storage

(1) Space is provided for storage of construction equipment not in daily use such as pumps, generators, blowers, long ladders, ropes, blocks, etc. This may be located in lean-to, in garage proper enclosed with wire mesh partition, or in shed in yard, based on local conditions.

(f) Loading platform

(1) Platform attached to building at transport truck bed height with outside ramp and door leading to storeroom has been found practicable for ease of handling supplies where such facilities are required. Platforms built recently have been equipped with a cast-iron bumper. This bumper protects the platform but is severe on a truck which is forced against it too rapidly. It is possible to bolt a substantial wood bumper to the metal bumper if protection of the trucks is desired.

(g) Yard paving and driveways

(1) Heavily traveled areas such as entrance drives are usually hard surfaced. Generally, yard paving is of crushed rock or gravel except for those portions where travel is heavy necessitating use of black top or concrete.

(2) Concrete paving strips are provided in some yards as pads for the open storage of certain items such as cable reels, conduit, etc.

(3) Paving is considered at rear of garage which could be removed easily if garage is extended.

(4) Yard is adequately drained away from the garage building.

(5) Driveway curves at curb line are of sufficient radius to permit easy entrance of vehicles into traffic lanes.

(h) Smaller garages

(1) High cost per vehicle offset by simple treatment.

(2) Use of local contractors, labor and materials, where available, for lower costs.

(3) Consider use of prefabricated metal structures for economy.

5. DESIGN

5.01 General.

(a) Construction and maintenance economies of simplified general design of garages.

(b) Avoidance of eccentricities of architectural design.

(c) Consideration of surrounding structures.

5.02 Excavation and grading.

(a) Appropriate design of garage and appurtenant facilities to avoid excessive excavation, fill and grading costs.

(b) Consideration given to deferring improvement of part of lot where lot is larger than current requirements and area and surroundings permit.

5.03 Footings.

(a) Bottom below frost line and have proper bearing area. Appropriate design of building to avoid excessive foundation cost.

5.04 Floors.

(a) Garage floor reinforced concrete usually 5 inches or more thick, 1/8- to 1/4-inch slope per foot to drain to center of vehicle aisle. Provision of natural drainage of entire floor to permit hose cleaning and avoid need for squeegeeing of the floor is recommended. Every effort should be made to obtain a uniform surface without depressions where water will collect. Desirable to steel trowel floor finish to produce a hard dense surface which is as

impervious as possible to penetration of oil and grease drippings thereby facilitating sweeping and cleaning. Marking of the floor in sections with edging tools is not recommended. A concrete floor is preferred which is entirely smooth except for expansion joints required for large areas. Consideration is given to surface hardening treatment for floors as outlined in BSP Section H53.105.

(b) If multistory garage can not be avoided, grade of ramp for light vehicles should not exceed 13 per cent and preferably 10 per cent. Surface finish ramps with an abrasive such as carborundum, and ribbed at a 45° angle, V-shaped to center of ramp to aid traction and drainage.

(c) Offices, etc., 4-inch concrete, except storerooms with heavy floor loads.

(d) Consideration given to the provision of a walkway about 3 feet wide in garage adjacent to office space about 4 inches to 5 inches higher than garage floor; office floor to be at the raised level. Walkway should terminate short of the materials door to storeroom to facilitate movement of hand supply trucks from storeroom to garage. Storeroom floor should be at same level as garage floor.

(e) Concrete finished floors in all areas without floor coverings to save first cost and maintenance, except offices where asphalt tile is considered. Asphalt tile (greaseproof) used in important storerooms.

(f) Curved, circular wheel guards at steel H columns with a minimum horizontal extension of 4 inches offer added protection to vehicles and eliminate dirt accumulations.

#### 5.05 Walls.

(a) Avoidance of face brick, terra cotta and other costly finishes is recommended.

(b) Common brick exterior is recommended if appearance controlling. Face brick front considered only if necessary to conform to adjacent buildings.

(c) Reinforced concrete with minimum finishing usually satisfactory and economical.

(d) Neat, well-pointed concrete block masonry will usually give a good appearance.

(e) Quality of block important to avoid later dusting, shrinkage, spalling and rust spots.

(f) Waterproofing cement paints above grade on exterior of concrete block walls recommended to decrease porosity and improve appearance.

(g) Exterior walls of uniform height on all sides of garage proper, as outlined in Paragraph 5.07 (a) (4) are recommended.

#### 5.06 Ceiling height.

(a) Twelve feet to trusses, or equal to door height if greater, recommended.

(b) Minimum ceiling height reduces construction cost and heating requirements.

#### 5.07 Roof structure.

##### (a) Framing

(1) Wood bow-string truss - low original cost but higher in maintenance and heating.

(2) Metal bow-string truss - economical steel type but parallel chord steel truss may result in less heating volume.

(3) Beam and girder or flat slab construction - provide low roof with minimum volume to be heated, but are usually higher in first cost for a 60-foot span.

(4) Where bow-string trusses are used, the cost of construction may be reduced and appearance improved if the roof surface on each end bay is sloped downward from the top of the last bow-string truss to a horizontal roof line at the end walls. This arrangement permits exterior walls of uniform height and avoids high masonry walls at gable ends.

##### (b) Joists and sheathing

(1) Wood joists and wood sheathing - not fire resistive.

(2) Steel joists with precast gypsum slabs or precast concrete slabs more costly but not combustible.

##### (c) Roofing material

(1) Built-up roofing on solid sheathing or steel deck is recommended.

(2) Insulation is considered where advisable. Two-inch thickness rigid insulation provides savings in heating cost.

5.08 Doors.

- (a) Vehicle door width usually 12 to 14 feet as required. Height 12 feet for telephone trucks or higher based on State regulations for maximum height of vehicles if commercial freight trucks are to enter.
- (b) Overhead type doors generally used, electrically operated in larger garages with opening controls at strategic points and closing controls only at locations where clear view through doorway is possible. A red flashing safety light on electrically operated doors is helpful in preventing accidents.
- (c) Both sides of door-jambes are protected with wheel guards to a height of 3 feet.
- (d) Front and rear vehicle doors in garage are provided where possible.
- (e) Pedestrian sidewalk and door are provided separate from vehicle entrance.

5.09 Windows.

- (a) Commercially projected steel sash adequate and economical.
- (b) Wired glass for fire protection, recommended particularly in walls which are adjacent to combustible structures or other exterior exposure.
- (c) Bottom of window frames in garage section are located above projecting ladders on vehicles.
- (d) Glass block lighting usually not economical and does not permit ventilation.
- (e) Minimum windows in garage area are provided as required for adequate ventilation. Natural lighting advantage secondary - vehicle servicing generally a night operation.
- (f) Heat loss in northern climates, and fire exposure are considered when determining number of windows.

5.10 Partitions in auxiliary space.

- (a) Cinder or stone concrete block.
- (b) Non-combustible wallboard over studding.
- (c) Lath and plaster over studding or plaster on masonry in finished areas.

5.11 Ceiling finish of auxiliary space.

- (a) Mineral board or lath and plaster.

5.12 Toilet wall surface.

- (a) Painted masonry. Smooth salt glazed tile wainscot at wash basins is considered in important large garages.

5.13 Toilet stalls.

- (a) Metal recommended because of moderate first cost and low maintenance.

5.14 Skylights.

- (a) Skylights are avoided where possible because of cost, heat loss and continuous maintenance.
- (b) Consideration given corrugated wire glass or Plexiglas flush with roof surface when effect of skylights is considered necessary.

5.15 Heating.

- (a) Heating plants for garages should be cut off from the building by an unpierced fire wall (except for heating pipes) and fire resistive ceiling, with door entrance only from outside.

(b) Types of Heating Systems:

- (1) Steam-heating preferred for larger garages. Coal-fired boiler equipped with stoker or bin feed type. Oil or gas fuel preferable to coal if economically practicable. Unit steam heaters in garage area and direct steam radiation in lean-to. Vacuum return pump. Hot water provided by coil in boiler and adequate storage tank. Boiler equipped with aquastat and necessary controls for providing hot water in nonheating season.

- (2) Direct fired overhead unit heaters, gas, electric or oil installed at least 8 feet above floor, usually placed at truss height. Safe distance from adjacent combustible materials.

- (3) Hot air or warm air systems designed in accordance with the requirements of the National Board of Fire Underwriters, Pamphlet No. 88, are sometimes employed because of economic considerations. Recirculation of vapors or odors from garage into office spaces is avoided.

- (4) Gravity warm air systems not used because of fire hazard.
- (c) Heating systems should be installed in accordance with the requirements of the National Board of Fire Underwriters.
- (d) Automatic heat shutoff when garage doors are open is considered.
- (e) The provision of means of controlling office and garage spaces at differing required temperatures is recommended. Lower temperature usually maintained in garage area.
- (f) The provision of partitioned vehicle servicing area, if economical in heating layout, is recommended.
- (g) Walls, floor and ceiling of heater room (including domestic hot water heater space) are of noncombustible materials as outlined in the National Building Code.

#### 5.16 Ventilation.

- (a) Local ordinances may require facilities for ventilating garages - some cities have regulations requiring special exhaust systems.
- (b) If engines are to be run during repairs in service space, underfloor suction ducts with flexible hose for vehicle exhaust pipes are recommended.
- (c) The requirements for occasional ventilation, either by natural or mechanical means, made necessary by operating conditions is contained in National Board of Fire Underwriters Pamphlet No. 88.

#### 5.17 Electrical work.

- (a) Five-foot candle light intensity usually provided for general illumination in garage.
- (b) Incandescent or fluorescent - original cost versus cost of electricity.
- (c) Fluorescent lighting fixtures not generally extended to areas where the quality and amount of light is not important or where the lighting is only occasionally used.
- (d) Lighting circuits are arranged to minimize cost of electricity.
- (e) Vehicle servicing areas require supplementary lighting.

- (f) Storeroom areas require supplementary lighting for material selection and repair work. Lighting should be arranged to meet storeroom requirements.
- (g) Use of paints with high reflectance on walls and underside of roof improves lighting.
- (h) Three-prong polarity grounded electric outlets for power tools and drop lights located at least four feet above the floor are provided around the garage.
- (i) Electrical installation should conform with National Electrical Code.

#### 5.18 Plumbing.

- (a) Number of fixtures determined by maximum number of persons as covered in BSP Section H24.520.
- (b) Consideration given to facilities for women at work-centers.
- (c) Toilet fixtures are arranged to make most efficient use of building space and piping for water and waste. Urinals with water seal above all drain openings to facilitate cleaning are recommended.
- (d) Showers provided where justified by need.
- (e) Water piping installed in garage area for car washing purposes.
- (f) Trough drains, or individual floor drains along center line of vehicle aisle and equipped with slotted cover (not perforated cover) are recommended.
- (g) Wash fountain is considered where economical rather than individual wash basins.
- (h) Janitor's service sink and storage provided in separate small room opening to garage area.

#### 5.19 Gasoline tank and pumps.

- (a) Underground storage tank is provided.
- (b) Size of tank governed by number of vehicles served.
- (c) Storage requirements for a minimum of two weeks is provided.
- (d) Cost factor is considered - price of gasoline dependent upon quantity delivered at one time.

- (e) Gas pumps located preferably on an elevated concrete island in the open yard, and gassing of trucks done outside.
- (f) Island is of sufficient height and size to protect pumps.
- (g) If pumps must be within garage, a long filler hose for outside servicing is provided.
- (h) Portable gasoline tanks are avoided where possible.
- (i) Lubricant storage in separate room or underground.
- (j) Handling of gasolines, oils and flammable liquids, and location of storage tanks in accordance with the standards of the National Board of Fire Underwriters, Pamphlet No. 30.

#### 5.20 Compressed air.

- (a) Outlets along walls and on center columns for inflating tires are provided.
- (b) Air compressor motor of explosion-proof type unless located at height of 4-feet or more above the floor.
- (c) Local regulations concerning location of compressor are observed; however, it should not be placed where high room temperatures exist.

#### 5.21 Vehicle lift.

- (a) Where vehicle servicing operations are to be performed, consideration is given to the provision of a two-column vehicle lift installed so as to be at floor level when in the lowered position.
- (b) A lift is preferably installed in a corner of the garage or in lean-to space if available.
- (c) Installation at about 45° angle to aisle to expedite placing of vehicle on the lift is recommended.

#### 5.22 Fencing.

- (a) Fence usually essential to protection of supplies and equipment. Fences seven feet in height with three strands of barbed wire at the top to provide additional protection against vandalism and theft have been used.
- (b) Woven wire fabric and wood or steel posts generally used. Chain link fence more costly.

- (c) Consideration is given to fencing only minimum area required, leaving portion of land for future development when needed.

#### 5.23 Fire protection.

- (a) Wired glass in windows will furnish considerable resistance to a fire in an adjacent building, and may afford some protection in the case of interior fires by assisting in excluding oxygen.
- (b) Wired glass should be placed in metal window frames.
- (c) Automatic sprinkler system would provide additional fire protection for building and contents especially where wood roof construction is used or where there is a large concentration of vehicles.
- (d) Heat actuated fire signaling devices, less costly than sprinklers, sometimes are used on combustible ceilings to quickly detect fire and automatically close an electrical circuit to sound an alarm.
- (e) Portable fire extinguishing equipment as recommended in BSP Section H43.010, for putting out incipient fires when personnel are on duty.
- (f) Extinguishers should be located where they will not be damaged by trucks.
- (g) Extinguisher locations clearly marked on columns or walls at height visible above parked vehicles.
- (h) Repair work involving open flames or other hazardous work done only in a room separated from storage section by a fire wall. Outside entrance to repair room where possible, otherwise entrance should be equipped with an approved self-closing fire door in tight fitting frame.
- (i) Bell System Practice, Section H40.055, covers the requirements for painting vehicles in Company garages.
- (j) Good practice requirements for construction and protection of garages is discussed in the National Building Code and in Pamphlets Nos. 30 and 88 issued by the National Board of Fire Underwriters.
- (k) Fire and safety inspection and advisory services rendered by Marsh and McLennan are covered in BSP Section H44.015.

6. PREFABRICATED METAL GARAGES

6.01 Various types of prefabricated metal buildings are being manufactured which may be suitable for garages in some locations. This type of construction provides low cost garaging. Some are sufficiently well constructed that the structure would not suffer the expense of shortened useful life. Where such an economical design can be used, it should save money in capital investment; and yet it does not appear to be so cheap as to be too costly in future operation and maintenance. Greatest economy can be obtained in prefabricated metal garages when heating is unnecessary and simplest construction can be used.

6.02 The stock design which seems to be most efficient for garages is 60 feet wide, varying in length, with columns along the walls every 16 feet. It will accommodate two lines of vehicles parked at right angles to the side walls with an aisle down the center. A separate lean-to may be included for office and toilet space. The standard ceiling height to underside of garage trusses would be 12 feet. An overhead door could

be placed in each end of the garage and any suitable window arrangement could be provided.

7. OPEN-SHED TYPE GARAGES

7.01 A low cost open-shed type of garage has been used to some extent in warm climates. Those built generally have been of galvanized sheet metal on wood or steel frame, using gravel or sea shells for floors. The roof supports are located so as to provide proper spacing of vehicles for maximum use of space. The columns are placed back from the front roof line with cantilever roof construction to facilitate parking.

7.02 In several instances these sheds have been erected at the rear of the lot behind a central office building. However, they are often built as part of a group of buildings to serve as a complete work-center. Other facilities included in the work-center, such as plant offices, storerooms, training rooms, wash rack, vehicle servicing structure, etc., are of the same general type of construction except that office spaces are finished with wallboard on interior of walls and ceiling and asphalt tile on floors.