MODERNIZING GRAIN HANDLING FACILITIES IN OHIO

By

John W. Sharp

and

Geo. F. Henning

Department of Agricultural Economics and Rural Sociology
Mimeograph Bulletin No. AE 244

Ohio Agricultural Experiment Station
and
Ohio State University

Columbus, Ohio

October, 1953

In 1952, this project was started by the Department of Agricultural Economics and Rural Sociology of the Ohio Agricultural Experiment Station and Ohio State University to study the various aspects of grain and farm supply handling facilities in Ohio.

L. E. Folsom, Extension Economist in Grain Marketing of the Department of Agricultural Economics and Rural Sociology, Ohio State University, cooperated in the organization of this study. Those elevators interested in building or remodeling their plants may obtain additional information on any phase of this study by consultation with Mr. Folsom or the authors of this study at the Department of Agricultural Economics at the Ohio State University.

Table of Contents

Introduction

The marketing of cash wheat, corn, oats and soybeans in 1951 amounted to $198,703,000 or 18.58 percent of the cash income to the Ohio farmers. The problems of grain marketing are very important to the average farmer, elevator or feeder in Ohio.

A number of new elevators have been constructed based on the ideas and designs of the contractors and there is no one accepted design for grain elevator construction. However, those operators having experience with the operation of new or remodeled facilities can give valuable information on changes needed in elevator construction to adjust to present needs. This study is an effort to obtain a composite of ideas and opinions, based on the knowledge and experience of grain elevator managers and operators, that will result in a better pattern of design for grain elevators.

A sample of 45 of the more modern elevator facilities of different capacities was selected in the principal grain producing counties in the state. (See Figure 1). The elevators were chosen on the basis of being new or recently remodeled. Of those elevators there were 32 constructed of poured concrete, ten concrete stave, seven wood or frame and three of metal construction. The total of over 45 structures is accounted for by the fact that some companies had more than one type of structure.

The data were collected through interview with the person directly in charge of the operation of the elevator. Data on all facilities and equipment were obtained and physical plant layout considered. One of the more important objectives was to obtain the ideas of the operators as to what constitutes the ideal plant for their community.

This preliminary report is a composite of the opinions and observations assembled during the interviews to give in advance such information obtained as will prove helpful to those in the process of building or remodeling their plants at the present time or within the coming months. The opinions included

in this manuscript concerning the efficient operation of a grain elevator are those that were given most frequently to the authors by the operators of the grain elevators included in this report. A more complete technical report will be prepared later.

Figure 1

Location of the 45 Grain Elevators Comprising the Sample

LOCATION OF PLANT

The location of the elevator depends upon the conditions for the particular organization. Most often a new elevator means expansion or remodeling of present facilities. In most cases the land site of old facilities is used for the new. These are generally inadequate in space and lacking in convenience. Any organization planning new facilities should weigh the disadvantages of congested traffic and inadequate buildings against the cost of disposing of the present site and purchase of a more convenient location.

One of the most desirable locations for a country elevator is at the edge of town or city. The availability of railroad facilities will limit the selection of site. Good drainage is needed. A large enough plot should be obtained to provide for further expansion needs. Ideally, the elevator should be so located that the prevailing winds will carry the dust and dirt away from town instead of into town. This will help to eliminate complaints of the community concerning dust from the elevator. Also smoke from burning cobs is more likely to disperse without undue smoke nuisance to the households of the community. Some present elevators, located near the center of town, are no longer allowed to burn cobs. In some cases, they have been compelled to install expensive dust collecting equipment in order to reduce dirt. This appears to becoming more common in many of the smaller towns in the state. It is an important fact to consider in locating a new plant.

The size of the lot should be relative to the present and expected future volume of the operation. There should be adequate parking space to handle heavy traffic during the harvest rush. A frequent obstacle to fast and efficient movement of grain during the rush season is the inability to handle the traffic in and out of the elevator. The well planned lay-out will provide for a set pattern of traffic that moves independently through each step of the grain receiving process. For a comparatively small operation, the managers indicated that a lot 300 x 600 feet would be adequate. For the larger operations more

space would be needed.

But the fact is, that most rebuilding and remodeling has been done on the old elevator site. In many instances it is the available elevator site in the community. When this situation occurs, and plans are made for expansion, special attention should be given to organization of the buildings on the lot. Usually the old building arrangement is very inefficient for modern grain handling and receiving. In order to have the most efficient arrangement some older buildings may have to be moved or torn down. Some managers have found that efficient plant arrangement can save up to one employee. If one employee was eliminated the savings of about $3600 a year would certainly justify an additional capital expenditure of $60,000, based on six percent of investment or $90,000 based on a four percent investment. With these figures as a base one can apply their particular depreciation policies to arrive at a net figure. Careful consideration to efficient building arrangement might well result in such savings, with much less than that amount of additional capital expenditure.

CONSTRUCTION COSTS

Construction costs varied greatly among the elevators covered in this study. A detailed analysis of construction cost will follow in a later publication.

Many factors determine the cost of particular elevators. Some of these factors are:

1. Size of plant.
2. Type of construction.
3. Amount and size of equipment.
4. Type of business (Grain and/or feed or supplies).
5. Relationship of elevator equipment to amount of storage.
6. Competition among contractors.

7. Differences in building costs between areas.

8. Value of real estate, plus grading, leveling, etc.

For the most part, however, storage facilities of 100,000 bushels or more of good construction with a very limited equipment to supplement a present elevator can be constructed at the present time for 45 to 55 cents per bushel. A well constructed elevator equipped with the latest and most adequate handling facilities and equipment would probably cost somewhat less than $2.00 per bushel including office and big scales. It must be remembered that construction and equipment costs will vary greatly according to the needs of the particular organization.

****
* For those that are interested in a more detailed estimate of current con- *
*struction costs on remodeling or building a new elevator, data are available *
*at the Department of Agricultural Economics and Agricultural Extension *
*Service, Ohio State University *
****

ARRANGEMENT OF THE BUILDINGS

The thinking of the most of the elevator operators contacted was that the lot should be rectangular with greater depth than width. Various ideas of how the building should be arranged on the lot were advanced, but most were in accord with the following suggestions.

The location of the office and scales is most important. The office should be so located to permit the manager full visibility of as much of the operation as possible from the office. The transactions for exchange of title or responsilility for the grain would therefore be made at the scales. Figures 2 and 3 give examples of the more popular arrangements of buildings as indicated by the elevator operators contacted on this study. Notice that, with proper window arrangement in the office, the person at the scales or at the counter in

Figure 2

Arrangement of Elevator Facilities on Lot

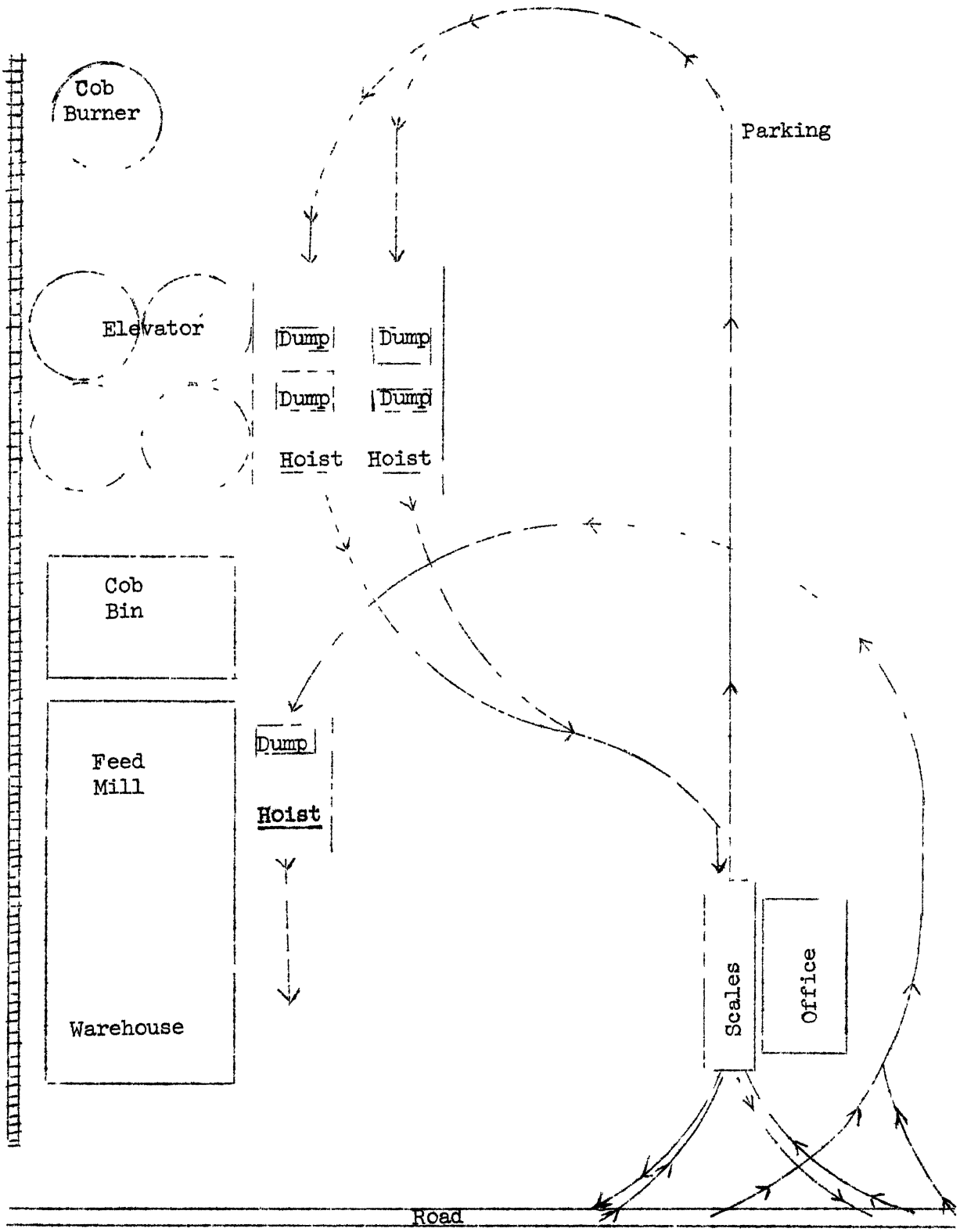
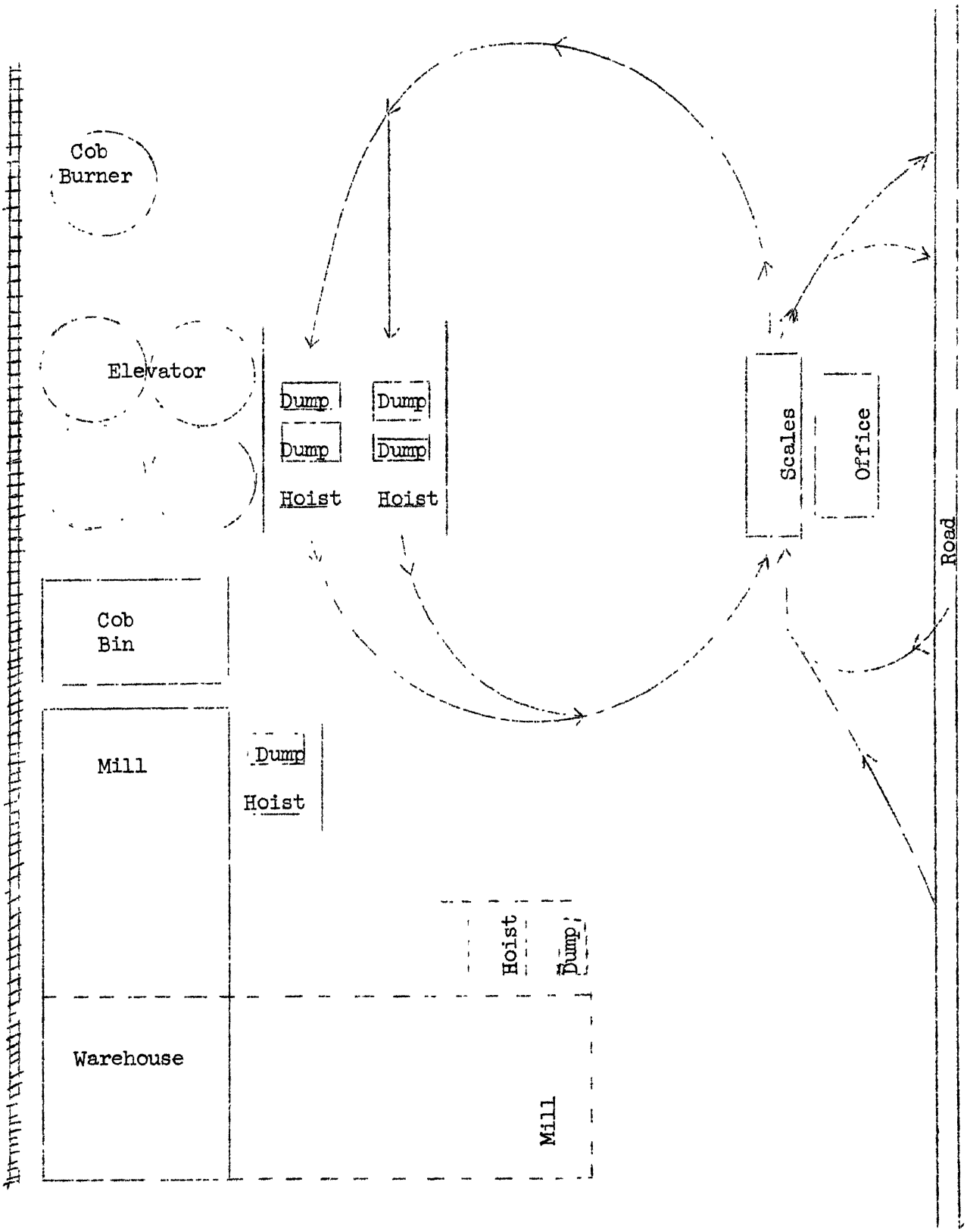


Figure 3

Arrangement of Elevator Facilities on Lot



the office has almost full visibility of the entire grain receiving operation. Traffic can be regulated from the office in rush seasons and a smooth flow of traffic maintained. The bottlenecks can be noticed immediately. With an adequate intercommunication system a manager can direct the labor force to eliminate promptly any temporary holdups and can save steps. He, thus, can maintain his important position at the testing or weighing station where close supervision is very important.

It is important that inspection of the grain delivered be done at the scale before the grain is dumped. Such procedure permits the elevator operator enough time to designate the proper bin for grains of different grade and quality. Sampling from the grain as it is dumped affords great risks of contamination. Any operator who has dumped smutty or garlicky wheat into the pits will testify to this. Contamination of top quality wheat can be very costly.

The arrangement of the buildings on the lot should allow plenty of parking space for the trucks and wagons of grain that have been weighed and are ready to dump. Space for 12 to 15 loads of grain is considered adequate. With high speed receiving equipment at the elevator it is very important to have a free flow of empty trucks and wagons to the scales for weighing out. Some new facilities were designed primarily to eliminate waiting on public streets caused by delay in dumping. The results was a bottleneck in getting the empty vehicles onto the scales to weigh out. Such bottlenecks may be due primarily to lack of traffic management or organization. When this condition exists, the holdup or slowdown in receiving grain can be as serious as the original bottlenecks at the dumps. Should there be any waiting or traffic problem it is much better to have it on the street than on the elevator lot. If this condition exists and slows down the operation, then consideration should be given to a larger lot or relocation, where possible, if building new facilities is being considered. Keep the path clear between the dumps and scales so the empty vehicle can be weighed out as quickly as possible. With good weighing equipment, the grain can generally be

weighed faster than it can be dumped.

A traffic signal system operated from the scales may be useful in avoiding "tie-ups" and bottlenecks, so that the scales will be open for vehicles to weigh after they have dumped their load. Sometimes elevator operators have had to use an extra man to direct traffic during the rush season.

AMOUNT OF STORAGE AND BIN SIZE

The amount of necessary storage will depend upon the volume of grain business in the community. A survey of the production and sale of grain within the expected trade area should be made. The number of competitors within the trade area, along with their available storage capacity, should be considered. Any particular organization within any given trade area, operating with an out-dated house and facilities, might well increase its volume of grain when added storage and efficient handling facilities are made available to the farmer. During the rush of harvest, the farmer does not like to wait to move his grain. He wants to get it dumped, thus enabling him to spend more time at harvest work. He often does not appreciate the problem of a full house because of limited storage or a car shortage. He will probably go elsewhere to market his grain if he can save time.

If the plans of an elevator are to offer storage space for the grain producers in the community or area, either on farmer's account or for government storage, knowledge of the area needs is important. When planning the amount of storage, it is important to consider the fact that between 20 and 30 percent of the facilities must be used for handling, turning, and conditioning the grain. This would permit approximately 70 to 80 percent for storage of grain held over 60 days. The percent of working space will depend upon the capacity of the house. For example, in a house of 50,000 bushel capacity, 40 to 50 percent is needed for working space. The larger the house the less percentage of working space needed. However, it is best not to tie up more than 80 percent of the available space when four grains are received at harvest.

The use of the space is indicated in Table 1 which gives the average volume of grain handled by elevators in each volume classification. These volume data do not include government grain storage.

Table 1

Average Elevator Capacity and Average Volume of Grain Handled Per Elevator in 1952 of the 45 Sample Elevators

Elevator Storage Capacity in Bushels	Number of Elevators	Average Storage Capacity per Elevator (bu.)	Average Volume of Grain Handled in 1952 per Elevator* (bu.)
0 - 49,999	13	30,000	333,000
50,000 - 99,999	14	73,300	428,000
100,000 - 199,999	13	127,200	497,000
200,000 & over	5	577,000	1,398,000

* Does not include government storage.

The working space of an elevator is one of the most important things to be considered in construction. First of all, there must be one large bin available for turning and conditioning. This large bin will usually be the same size as the main storage bins of the elevator. Since all grain that moves to the elevator during harvest is not of equal grade and quality, there is need for some smaller bins for grains of variable quality. Most managers indicated that four to six bins ranging from 2000 bushel to 6000 bushel are adequate for this purpose for most elevator operations with a capacity of approximately 100,000 bushel. New elevators and many of the older are installing grain dryers. In the opinion of the managers, the dryer arrangement should allow for at least a 4000 bushel bin above or leading to the dryer and a 4000 bushel bin below the dryer or have the dry grain run to a bin of this size for loading out or proper blending. The managers indicated that bins of less than carload size are definitely a handicap to smooth elevator operation.

When building a new house or remodeling the old, where grain is stored, installation of some type of temperature indicating system is very useful and helpful in keeping grain in condition. This equipment is the best insurance against very serious loss due to heated grain. It indicates when the grain in a bin needs to be turned and cooled.

SCALES

The most popular type of scales installed in the new elevators today are those which are equipped with a dial indicator and an automatic weight stamping device. With special weight slips designed for the stamping device it offers speed and accuracy in weighing grain. Since receiving capacities have increased so as to dump a load every three to five minutes, speed and accuracy at the scales is needed. The large visible dial gives the customer full view of the weight of his load. A large window in front of the scales enables the driver to see the scales, since he is always interested in the weight of his grain. It is the opinion of some operators such scales and equipment develops customer confidence which is very important for developing volume for any elevator.

The platform size should be adequate to handle large vehicles, including the large semi-truck trailers, with one weighing. An increasing amount of grain is being moved by truck and it is important to have the facilities to weigh them. Scale platforms should be 45 to 50 feet in length to meet the needs of the modern elevator. Managers of elevators that have installed 50 feet scale platforms praised the scales for their efficiency and speed. Such scales will take care of a tractor and two wagon trailers at one weighing. It is important that the scales should be so constructed and maintained as to give utmost confidence to the customer.

The platform size of the scales in the elevators visited in this study are found in Table 2.

Table 2

Scale Platform Length Grouped by Elevator Capacity of 45 Sample Grain Elevators in Ohio

Elevator Capacity in bushels	Scale Platform Length			
	45 ft. & over	35-44 ft.	25-34 ft.	Under 25 ft.
0 - 49,999	3	4	4	2
50,000 - 99,999	2	3	7	2
100,000 - 199,999	2	0	7	4
200,000 & over	2	1	1	1

DRIVEWAYS

When constructing or remodeling the driveways, there are some important facts to consider. The width of the driveway in the elevator should be at least 14 feet. Many have found unloading conditions too crowded when the width is only 12 feet. The height or clearance is probably more important in dumping. In order to dump the large trucks the clearance should be at least 18 feet and preferably 20 feet. This height will enable enough rise on the large trucks to have the grain flow out to the dump and will save much shoveling, especially if the grain is high in moisture.

The driveways should have doors on each end to give protection against rain and cold. This will mean that there must be enough length to the driveway to accommodate a large truck with both doors down. Motor driven doors are labor and time saving and would be recommended for a door of this height.

For better drainage and cleaner operation, there should be some grade or slope in the approach to the drive. This will enable construction with less excavating for the basement. The amount of grade will depend on the topography, drainage, and length of drive, and must be worked out for each individual elevator.

The approach from the line of traffic should be wide enough to enable a continuous movement of traffic and especially the curves to and from the drives should be such that no backing is necessary to move the traffic.

DUMPS AND DUMP PITS

The dump arrangement would depend largely on the location and number of legs. An example of an elevator with two or three main legs and two driveways might be as follows: a small grain and a corn dump in each driveway with the dumps in one driveway opposite from the other. The dump pits should be large and roomy, possibly 500 bushel under each dump. In order to have enough space for the large pits without having a deep basement, it is advisable to have the level of the driveways somewhat above the normal ground level. With grain being transported by tractor and truck, an incline of 10 feet rise to the 100 feet is not too steep, but it is better to have 10 feet to 150 feet.

There are many types of conveyors used to move the grain from the pits to the legs or sheller and most are satisfactory. Should a dump be used for small grain only, the managers indicated that gravity is by far the best method. A dump used for ear corn only, would probably operate best with the shaker type of feed. Dumps used for both corn and small grain would probably cause less difficulty with a double drag chain. In installing the drag chains, a slight uphill incline to the sheller should be made. This appears to move ear corn with less difficulty and requires less "poking" to move it. Ear corn with high moisture will bridge over and with a slight uphill slope to the drag, the bridging will be greatly reduced.

In reality, however, the size of the dump pits actually used was much smaller than the preference indicated by the managers. The size of dump pits in the 45 elevators used in the sample appears in Table 3.

Table 3

Dump Pit Size, in Bushels of Small Grains, of 45 Sample Elevators Grouped by Storage Capacity

Elevator Capacity in Bushels	Bushels					
	2000 bu.&over	1000-1999	500-999	300-499	200-299	Under 200
0 - 49,999	0	0	0	7	6	15
50,000 - 99,999	0	0	2	8	4	7
100,000 - 199,999	3	7	8	16	4	11
200,000 & over	5	3	2	1	2	1

CORN SHELLERS

Corn shellers are best located in the basement or sub-basement. It was the general opinion that one large sheller is adequate for most elevator operation. However, no checks have been made of the time lost due to breakdown and repair of a single sheller. It might be economical to install two shellers. Several managers indicated a need for two shellers. There are two reasons. (1) To handle the rush of the harvest season and (2), to insure against loss of receiving time due to breakdowns. Many of the newer elevators have installed two large shellers to insure against those factors and the result has been a smoother operation in handling corn. Field picker-shellers, if they increase greatly in the future, may aid the elevator in the handling of corn. Several communities in the state have one or two such machines operating at the present time, but at present, they are not a big factor for the local elevator to consider.

When installing a large sheller adequate power for smooth and easy operation is important. The larger shellers, equipped with a 40 or 50 HP motor, shell up to 1500 bushel per hour. The smaller the motor the less the capacity. Installation of overload relays on the drag chains feeding the shellers adds to the shelling capacity.

Table 4

Corn Shelling Capacity per Sheller in Bushel per Hour
of 45 Elevators in Ohio

Elevator Capacity in Bushels	Corn Shelling Capacity per Sheller in Bushel per Hour				
	Under 500	500-749	750-999	1000-1249	1250-over
0 - 49,999	1	8	1	2	1
50,000 - 99,999	2	2	3	6	1
100,000 - 199,999*	0	5	4	3	0
200,000 & over	0	3	1	1	0

* One not given.

Table 4 shows that shelling capacity is definitely a limitation to the amount of corn that can be received since most elevator legs and other equipment are geared to a faster operation.

It is most important, regardless of the number of shellers, that a complete set of spare parts are available at the elevator in case of breakdowns. Rocks, wrenches, crowbars, and other articles can get into shellers and cause breakdowns, in spite of carefully watching for such hazards.

CLEANERS

Proper cleaning equipment is most important in handling and conditioning grain. How much to clean grain and the location of the cleaning equipment are points on which there are wide differences of opinion. Many operators are of the opinion that the cleaning capacity of the elevator should be equal or greater than the receiving capacity on small grains. This was suggested by those that clean a large percent of their small grains.

The majority of the operators believe that cleaning of wheat and beans should be kept to a minimum because cleaning results in proportionate shrinks. The dust collecting equipment installed at the boot of the leg will satisfy most of the cleaning needs of small grains according to this group of operators.

All elevators should be equipped with adequate cleaning equipment for corn and small grains. The amount of cleaning needed will depend on the grain delivered to the elevator. Small grains are generally purchased on a grade basis. The amount of cleaning and the basis of purchasing depends upon the practices of each elevator.

For corn, however, the separation and cleaning is more difficult. The separation and cleaning equipment should be located in the head house so gravity can be used in moving the grain through the equipment. One of the best cleaning arrangements for an elevator with one sheller is one separation and one cleaning device. A large corn reel, preferably one five feet in diameter and 12 to 16 feet in length with a 1 3/4 to 2 inch screen, should be located on the top floor of the head house with the uncleaned corn fed down by gravity to some type of gyrating cleaner on the floor below. This arrangement can be reversed with almost the same success, i.e., having the gyrating cleaner on top floor and running the cobs and coarse screenings to the corn reel equipped with a small screen. Either of the combinations will fill the needs of most elevators enabling them to have adequate cleaning capacity and to do a good job of cleaning corn.

Many elevators now have one cleaner or separator for corn. It may either be a reel or a gyrating cleaner. This method is generally satisfactory for small capacity operations. The difficulty comes when extra capacity is forced through either the corn reel or a gyrating cleaner. With the corn reel it would mean shelled corn left in the cobs and with the gyrating cleaner the result would be inadequate cleaning.

LEGS

With most of the newer elevators, the first installation of elevating legs is the final arrangement. Care must be taken in planning leg capacity required for present or future operations.

When considering a new house, most operators indicated the need for three main legs. This provides for two legs for receiving and turning, and one leg for loading out, receiving and turning. The leg capacity will depend on the volume of grain handled. It is advisable, however, to install legs with peak capacity of approximately 25 percent greater than the normal handling capacity. This will allow for future expansion and prevent large remodeling costs.

The elevators visited during this study varied in the number of main legs from one to six. The total elevating capacity depends both on the number of legs and the elevating capacity per hour of each leg. Table 5 shows the elevators having various numbers of legs and the average total leg elevating capacity per hour of each elevator.

Table 5

Number of Main Legs Per Elevator and Average Total Leg Capacity Per Hour of 45 Grain Elevators in Ohio

Elevator Capacity in Bushels	No. of Elevators	No. of Legs per Elevator	Aver. Total Leg Capacity per Elevator in Bushels per Hour
0 - 49,999	9	2	4,700
	3	3	5,070
	1	4	16,000
50,000 - 99,999	6	2	4,115
	2	3	6,500
	1	4	5,800
100,000 - 199,999	2	1	2,250
	7	2	5,785
	6	3	7,915
	1	4	6,100
	2	6	15,600
200,000 & over	2	2	14,500
	3	4	19,175

When installing new legs or remodeling the old legs, a dust collecting system should be constructed around the boot of the leg. This will eliminate much of the dust and also fulfill some of the cleaning requirements on small grains.

DISTRIBUTOR

There are many types of distributors in the elevators throughout the state. Some are home constructed and others are standardized and patented. They all are constructed to do the same job but many are inadequate for smooth operation.

A distributor must have flexibility, that is so the grain can be moved to any spot in the elevator with one elevation. Many find it necessary to elevate grain two and three times to place grain where they want it simply because of poor distributor construction.

The distributor should be shielded for dust with connections made with dust collecting equipment. This aids in keeping the head house clean and eliminates one of the worst dust problems of an elevator.

The recommended slope of chutes from a distributor to a bin, or any chute in an elevator should not be less than 45°. Most elevator operators indicated that with a slope less than 45°, damp wheat and beans would give trouble.

One of the newer developments in distributor construction is the automatic (electric) control from the work or ground floor. This control enables the operator to direct the flow of grain with very little effort. Many of the new elevators have installed this type of control and found it very satisfactory. Some have experienced difficulty in adjustment but since the equipment has just recently been developed, the difficulties should soon be overcome.

LOADING OUT

It is important that an elevator should have loading out arrangements for both truck and rail. The loading out chute for trucks is generally located in the driveway of the elevator with grain coming from the loading out scales.

The loading out scales should be located in the head house. This will allow the grain to be loaded out with one elevation. In the opinion of most elevator operators, the scales should be automatic with a minimum hopper capacity of ten bushel.

In order to load out by gravity to rail cars, a drop of at least 60 feet is recommended. It is important, however, that this drop be in a straight line from the point of last direct fall to the top of the car door. A slight slope is more satisfactory and with this straight line to the top of the car door, there will be little difficulty in reaching the back of the car.

When there is less than 60 feet fall, it is best to locate the automatic scales on the second floor and install a blower to force grain in the car. With a blower arrangement, a divider on the spout can be used to load both ends of the car at the same time.

Table 6

Height of Loading Out Chutes of 45 Grain Elevators in Ohio

Elevator Capacity in Bushel	Height in Feed				
	0 - 39	40 - 59	60 - 79	80 - 99	100 & over
0 - 49,999	2*	0	10	1	0
50,000 - 99,999	0	2	6	3	3
100,000 - 199,999	0	0	5	1	7
200,000 & over	0	0	2	0	3

* Both had blowers.

When installing a loading out chute, consideration should be given to the quality of spouting. Loading out chutes wear out fast and need replacing. A good quality of heavy pipe is recommended for the chute.

Some elevator operators have devised loading out platforms that are helpful in loading cars. Any elevator operator interested should observe how these platforms are constructed and talk to those who are using them.[1/]

COB DISPOSAL

Corn cob disposal is one of the greatest headaches to the elevator operator. This situation will depend largely on the demands of the farmers by communities. Some organizations dispose of practically all their cobs to the local farmers; other are more fortunate and are able to sell them. Many operators find cob disposal a substantial direct expense in handling corn. Local ordinances which prohibit the elevator from burning the cobs on their own lot complicate disposal. This requires hauling the cobs out of town to be burned.

If an elevator has a surplus cob situation, the cheapest and easiest way to dispose of them is by burning. This cost averages about $500 annually among elevators studied.

Since farmers are finding more and more uses for cobs, it might be advisable to plan facilities that will accommodate them. Cob bins can be economically constructed that will fill the needs. Farmers are using increasingly more crushed cobs for litter and mulching. They are willing to pay for crushed cobs in most livestock areas. The average price throughout the state where cobs are sold will average about $5.00 per ton.

With a demand for crushed and uncrushed cobs in a community, a divided cob bin with a crusher installed in one half of the bin is very satisfactory. Elevators having this service have found increasing demand for crushed cobs. This provides a return on the investment in such equipment, covers operating cost, and helps eliminate the large expense of cob disposal.

1/ Those interested in additional information on constructing loading out platforms can receive this data from the Department of Agricultural Economics and Agricultural Extension Service, Ohio State University.

GRAIN DRYERS

Grain drying is one of the more recent operations incorporated in the grain business. It is the opinion of many elevator operators when constructing a new elevator or remodeling the old plant certainly a grain dryer is an important piece of equipment to be considered. Most of the elevators contacted in this study had grain dryers although a few in the smaller capacity range did not have grain drying facilities. Some of the larger operations had two dryers. The kind of dryers varied from home constructed dryers to the most modern automatic dryers and the capacities varied from 100 bushel to 1250 bushel per hour when reducing the moisture five percent. A total of 37 of the 45 elevators visited during this study had grain drying facilities. Table 7 shows the elevators with various grain drying capacities.

Table 7

Number of the 45 Elevators Having or Not Having Grain Dryers and the Capacity in Bushel Per Hour of the Dryers When Removing Five Percent Moisture from Grain

Elevator Capacity in Bushels	No. Elevators having Dryers	No. Elevators Not Having Dryers	Drying Capacity Removing Five Percent Moisture, Bu. per Hour				
			0-249	250-499	500-749	750-999	1000 & over
0 - 49,999	9	4	5	2	2	0	0
50,000 - 99,999	5	4	1	1	3	0	0
100,000 - 199,999 1/	18*	0	2	4	11	1	0
200,000 & over 2/	5	0	2	1	2	0	2

* The manager of one elevator didn't know drying capacity of his dryer.

1/ One elevator in this group had two dryers.

2/ Two elevators in this group had two dryers each.

In the group of elevators with capacities of 100,000 bushel and over, the trend is toward larger dryers. Out of the 23 elevators in this group having 25 dryers, 16 of the dryers had capacities of 500 bushel per hour or more when removing five percent moisture from grain. The dryers with smaller capacities were in the smaller elevators.

The dryers were generally used for corn and wheat with corn accounting for most of the dryer use.

Most operators indicated that a good grain drying operation is essential to conditioning grain for storage and useful in preparing grain for blending operations. The operators having grain dryers feel that operation without a dryer under present day harvesting methods, would be very difficult when performing all the services required by competition. The drying equipment is certainly an important link in the chain of operations connected with good grain merchandising.