PRINCIPLES

OF

HUMP GRAVITY-YARD DESIGN

BY

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THESIS

FOR THE

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THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

THEODORE HERMAN TRAMS

ENTITLED PRINCIPLES OF HUMP GRAVITY-YARD DESIGN

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE

OF Bachelor of Science in Civil Engineering.

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G R A V I T Y Y A R D S.

The freight yards and freight terminals form a large part of a railroad system. The total length of yards is a considerable part of the total mileage of any road; and the cost of yard construction and operation is a large per cent of the cost of construction and operation of the whole system. Of five railroads terminating at Boston, Mass.,having a total mileage of 3619 miles, 1015 miles are sidings and yards; and for the same roads the total cost of train operation in 1894 was $ 38,516,885, of which amount $ 6,406,381 was for switching alone.

It is because the yards do form such an important part of a railroad system, that the study of the principles applicable to the design of hump gravity yards were undertaken, mainly with the idea of showing where this kind of a yard can be used to advantage in place of the yards in more common use. Some of the material for this paper has been obtained from current literature, some through the help of practicing engineers, and a small part from personal experience in track maintenance.

CLASSIFICATION OF YARDS.

By a yard is meant three or more parallel tracks arranged in a series for the convenient switching or storage of cars. Yards are divided according to the method of switching cars, into the following classes: tail switching or bunting yard, poling yard, hump or summit yard, and pure gravity yards.

TAIL SWITCHING or BUNTING YARD. One in which an engine is attached to a train or string of cars, and pushes or bunts them to their proper positions. This method of switching, because of its slowness, is applicable only to small yards.

POLING YARD. A yard in which the movement of cars is produced by the use of a pole or stake operated by an engine on an adjoining parallel track. Poling yards perhaps out number all other classes of yards combined, since they can be laid out on almost any kind of ground without much regard to the elevation of the different parts of the yard. This class of yard can be found on any large railroad system, such as the C. B. & Q., the Pennsylvania, the Union Pacific, the Illinois Central and others.

HUMP or SUMMIT YARD. One in which the movement of the cars is produced by pushing them slowly over a summit, beyond which they run by gravity. In order that the cars may be distributed more readily and that they will not stop before they have cleared all switches below the hump, each track may be given a slight additional grade beginning at the foot of the hump proper.

GRAVITY YARD. A yard in which the movement of cars is produced by gravity alone. In this type of yard all switching is done in one direction, i.e., all trains are taken to to the receiving yard which is located at the highest point of the yard, from whence the cars run down grade through separating, sorting, and marshaling yards. During this process of distribution the cars are separated into the necessary classes, and are made up into trains. Only two such yards are known to the writer one at Edge-Hill, England, the other at Dresden, Germany.

Subdivisions of the Yard.

Each form of yard may be subdivided into the following parts: receiving yard, separating yard, classification yard, departure yard, storage yard, and repair yard.

Receiving Yard. A yard for the reception of yraffic.

Separating Yard. A yard, next in order to a receiving yard, in which the traffic is separated by districts or commodities.

Classification Yard. A yard next in order to the separating yard, in which the traffic is classified into time, through, and dead freight. The time freight takes precedence over the through, and the through, over the dead freight.

Storage Yard. A yard in which cars awaiting disposition are held.

Departure Yard. A yard in which trains made up in the classification yards are placed awaiting departure.

Repair Yard. A yard in which all cars needing repairs are placed.

E X A M P L E O F P U R E G R A V I T Y Y A R D.

Although the following pages are to deal chiefly with the third division, under the classification of yards, i. E., hump yards, yet the first example of a gravity yard will be the pure gravity yard of Edge Hill, England. This is done so that the difference between the pure and hump gravity yards may be more clearly understood.

EDGE HILL GRAVITY YARD.

The Edge Hill yard is located near Liverpool, England, on the London and Northwestern Railroad. All trains arriving at Liverpool are broken up at Edge Hill, and all trains leaving Liverpool are made up at the same place. A gravity yard was suggested by the character of the ground on which the yard is located. The surface has a gradual rise from west to east, so the tracks could be laid on a uniform gradient at small cost.

For the economic operation two conditions seemed essential: first, that all changes necessary in the relative positions of cars must be made between the summit and the foot of the incline without the assistance of locomotives. To meet the first condition the yard was divided into the following parts: First, the upper reception yard of six tracks having a capacity of 264 cars. Second, the sorting yard comprising 24 tracks with a capacity of 1064 cars, into which the cars first run, each siding receiving the cars for a particular train. Third, two small groups of marshaling sidings through which the cars pass to be arranged in proper order on their way to the fourth or departure yard. Fourth, the departure yard having a capacity of 183 cars or four trains. The second condition was met by the use of the chain drag, which consists of a heavy flexible cable placed in a wrought iron tank below and between the rails. A steel hook connected to the cable is held by means of a loose socket, in such a position that it will catch on the axle of any car unless the socket and hook are lowered by means of a lever arranged for this purpose,

before the car reaches the hook. When a car gets beyond the control of the shunters, the socket is left in its normal position and the hook catches on the axle of the passing car and drags the cable out of the tank and over the loose ballast untill friction stops the car. The car is hauled back to its starting point by an engine, and the cable is allowed to drag as far back to its original position when it is unhooked from the car axle and placed in position for use when again needed.

The gradient of the tracks varies from 46 to 88 feet per mile, being greatest at the lower end of the reception, sorting, and gridiron sidings. The gradients are such that the greatest moving force is provided where cars are required to start quickly and also where they must encounter the most resistance. All curves have a 462-foot radius. The gradient, curves, and general plan of the yard is shown on Plate 1.*

All cars or trains on arrival in the yards proceed directly to the upper reception yard, where the engine is detached from the train, and the cars are dropped into the sorting yard, each car having first been numbered with the same number as that of the track to which it is to go. The man who separated the cars inspects the breakes of each car, and on releasing the car, signals the shunter or switchman of the track to which the car is to go . From the sorting sidings the cars pass through the gridiron yards where they are arranged in station order.

The maximum number of cars passing through the yard per 24 hours is 2600, and this number can be increased to 5000 or 6000.

* Owing to an accident during the past summer, which resulted in the loss of my right hand, I was compelled to do all the drafting with my left hand.

cars with a small increase of sorting sidings. It requires 75 men to do this work, the larger per cent of sorting being done from 5.to 9. P. M.

E X A M P L E S O F H U M P G R A V I T Y Y A R D S.

Some examples of the better known hump gravity yards are those of the westbound yard of the Chicago, Burlington, & Quincy Railroad at Hawthorne, Ill., and the yard at Galesburg, Ill., of the same road, the Chicago and Eastern Illinois railroad yard at Dolton Ill., the Lake Shore yard at Elkhart, Ind., and the Indiana Harbor and Southern Yard at Gibson, Indiana.

HAWTHORNE YARD.

The westbound yard of Chicago, Burlington & Quincy railroad at Hawthorne, Ill., though it could hardly be called a modern model for hump yards, has a number of very good points about it, and when the work now in progress has been completed the yard will be much improved. The yard consists of a Receiving, Sorting , Departure, Repair, Storage, and Transfer Yard. The general plan of the yard is shown in Plate II.

RECEIVING YARD. The receiving yard has a capacity of about 500 cars. On the lead from this yard to the hump-approach track is a surface scale to be used as an auxiliary to the 50-feet automatic scale on the hump track.

HUMP GRADES. The length of the hump-approach track is

900 feet, and it has a I I/3% grade. The hump scales are situated 75 feet beyond the crest of the hump, the velocity grade from the crest of the hump across the scales a distance of 170 feet is at 3%; the velocity grade beyond the scales is 135 feet at 3.5%; the assisting grade of 400 feet through switches has a one per cent; beyond the switches the tracks have a 0.3% grade for a distance of a 1000 feet.

SORTING YARD. When the improvements now in progress have been completed, the sorting yard will comprise 28 tracks with a capacity of something over 600 cars.

DEPARTURE YARD. The departure yard is an extension of 16 of the sorting yard tracks, and has a capacity of about 300 cars.

Method of Handling Trains.

After the trains have entered the receiving yard the road engine is uncoupled and goes to the round house. The brakes of the cars are then examined; and the number of the track to which the car is to go is marked on the end of the car with a peice of chalk, by the foreman of one of the yard engines. The cars are then pushed by the hump engines up the hump-approach track, two engines being necessary to push the 70- or 80- car trains up the approach track because of the heavy grade due to the Robinson Avenue viaduct.

At the present time all cars except the empty stock cars are handled over the hump. The stock cars enter the yard in bunches and are pushed around the hump over a surface scale

directly into the 80-car make-up tracks. When the proposed transfer tracks have been connected up, the merchandise cars can be pushed from these tracks directly into the departure yard.

All cars except empties and those loaded with company material are weighed on the 50-foot automatic scale. This method of weighing makes it necessary to make as many cuts as there are cars in the train, even though two or more succeeding cars go to the same track; and as this requires about 40 per cent additional time, the maximum sorting capacity of the hump can not be attained.

Because the velocity grade and the assisting grades through the switches are not sufficient to carry all cars clear of the leads, it is necessary to use two engines to clear up the yard after each string of cars has been humped. Twelve brakemen (or riders) are used during heavy business, and it requires 36 classifications to properly distribute the trains in the Departure Yard.

Cost of Switching.

The approximate cost per car is 15 cents. This is made up by computing the wages of 12 riders and of two switch engines with three switchmen and two men to each engine.* During a trial conducted during a strong wind with the temperature 30 degrees above zero, 155 cars necessitating 108 cuts were humped in 150 minutes. This was not up to the average number, which is 1200 per 10 hours, because the strong wind made the cars run much slower than usual, so that it was frequently necessary to stop humping long enough to push the cars into the clear.

*This together with much of the other data on this yard was obtained through the help of Mr.J.N.Schackel Div. Eng.of the C.B.& Q.Ry

GALESBURG YARD.

The Galesburg Yard of the Chicago, Burlington, and Quincy Railroad was modled after the Hawthorne Yard of the same road. It consists of two duplicate yards one for each direction of train movement. Each yard is made up as follows: Receiving Yard of six tracks, each track having a capacity of 80 cars; Hump Approach consisting of 800 feet at a 0.3 per cent grade; 700 feet at 0.8 per cent; 200 feet at 4.0 per cent; and the Velocity Grade to the sorting yard consists of 1600 feet at a 1.0 per cent grade. The scales are located on the hump track just below the crest of the hump, the cars being weighed as they go over the scales on their way to the sorting yards. The Sorting Yard consists of twenty one tracks with a capacity of 650cars.. From the sorting yard the cars pass to the Outgoing Yard, which is of the same size as the receiving yard. The Repair and Storage Yards are located near the round house. The storage yard has a capacity of 179 cars.

Method of Handling Trains.

After the train has entered the receiving yard the engine is uncoupled and pass from the receiving yard over the engine track to the running track on which they go to the round house. The location of these tracks is shown on the general plan of the yard-- see PlateIII. The cars are marked in the receiving yard, after which they are pushed over the hump by the hump engine. All movement of cars is in the direction of traffic except when a reverse movement of freight must occur, in which case the cars are switched directly from the north and east incoming yard to the north and east sorting

yard, and thence to the departure yard. The switches are operated by electricity from towers adjacent to the humps.

COST OF CONSTRUCTION. In order to build the yards it was necessary to make one new yard and to remodel the old one. This required 200,000 cubic yards of grading for the 30 miles of track; and the total cost was something over $ 400,000.00.

DOLTON YARD.

The Dolton Yard of the Chicago and Eastern Railroad at Dolton Ill., was at first not a gravity yard, but the increase in business made a gravity yard necessary for the more expeditious handling of cars. In order that the necessary improvements could be made, 160 acres were purchased just south of the old yard. On this new tract a north-bound gravity yard was built, and the old yard was remodled into a south-bound gravity yard. Each yard is adjacent to the corresponding track, and communication between the yards is across the main tracks, the crossing being protected by interlocking.

The north-bound yard has a capacity of 3200 cars and is made up of the following parts:

RECEIVING YARD of 11 tracks having a capacity of 688 cars, with provision for 3 additional tracks holding 188 cars.

HUMP GRADES. The hump grades of the north-bound yard are of the following lengths and velocities, about 200 feet at 0.5 per cent, 100 feet at 1.0 per cent, 475 feet at 2.11 per cent.

The grades beyond the crest are 105 feet at 1.92 per cent, 115 feet at 0.8 per cent 165 feet at 3.0 per cent, 45 feet at 2.11 per cent, 200 feet at 1.5 per cent, 600 feet at 0.5 per cent. One important change since the plans were first made is in raising the grade of the"run around" so that the knuckle of the "run around" is higher than that of the hump proper. The "run around" in the north-bound yard is 1.27 feet higher than the hump proper, so this track can be used when the scale is out of commission or the track is blocked for some other reason, or when the track is not of sufficient elevation to carry the cars into the clear on very windy days. The hump scales are provided with the Streeter-Amet automatic weighing device.

SORTING YARD consists of 16 tracks having a capacity of 607 cars. The sorting tracks connect to the running track, which was extended so as to facilitate the movement to the connecting lines and to the city yards. This arrangement minimizes the traffic through the throat between the north- and south-bound yards, which is across the main tracks. There are three cross-overs between the running and main tracks, so arranged that a 50-car train can stand between each, and also arranged so that either train can be pulled out independently of the other.

STORAGE YARDS. There are three storage yards lying east of and parallel to the sorting yard. Storage yard No. 1 has 13 tracks holding 520 cars; No.2 has 11 tracks holding 528 cars; and yard No.3 has 11 tracks holding 440 cars with room for four more tracks of 153 cars capacity. In addition to these, there are two

caboose tracks and two set-out tracks located just west of the main hump track with connections to the receiving-yard ladder just ahead of the hump lead.

SOUTH BOUND YARD represents an adaptation of requirements to existing conditions. The land on which this yard is located is not shaped for the gravity yard plan, and because of this the cars do not have a continuous forward movement through the yard. The larger part of the business through this yard is the handling of empty coal cars.

RECEIVING YARD has a capacity of 703 cars on nine tracks, the longest of which hold 84 cars.

HUMP GRADES. The first 100 feet of hump approach are on a 0.5 per cent grade, the remainder of the hump approach a distance of 725 feet is on a 2.5 per cent grade. At the crest of the hump, the grade is level for a distance of 100 feet, so any change found necessary may be made. Beyond the crest the velocity grades are 1 100 feet at 3.0 per cent, 100 feet at 0.8 per cent, about 100 feet at 3.0 per cent, 90 feet at 2.0 per cent, about 650 feet at 1.0 per cent, and a 0.067 per cent extends for some distance into the classification yard.

SORTING YARD. The sorting yard consists of 14 tracks having a capacity of 126 cars is adjacent to the receiving yard, the hump being on the north end.

REPAIR TRACKS. The repair yard of five tracks holding 90 cars is located at the south end of the yard near the roundhouse.

The four "holding tracks" shown on Plate IV are for hold-

ing trains made up in the sorting yard for which no motive power is available. Parallel to the holding tracks are three tracks for cars awating repairs. The engine, caboose, coal and other tracks are also shown.

ELKHART YARD.

The new gravity yard of the Lake Shore Railroad at Elkhart Ind., lies entirely on one side of the main tracks. The general lay out and profile are given in Plate V. On this road the trains run left handed. The total length of yard is nearly four miles. East bound freight trains leave the main track at station 5140 and continue east ward along an east inbound freight track adjacent to the south-bound main track.

RECEIVING YARD consists of five tracks, each holding 88 to 90 cars. About the middle of the receiving yard is a series of crossover tracks, for the purpose of dividing up trains so the parts can be handled separately.

HUMP GRADES. The east bound receiving yard has an ascending grade of 0.3 per cent except near the summit where the grade increases to 0.85 per cent; after leaving the summit of the hump, it drops at the rateof 4.3 per cent for a distance of about 300 feet, and then continues on through the switches into the sorting yard on a descending grade of 0.6 per cent. The hump track is quite long, and all the tracks in the east-bound sorting yard have a descending grade of 0.16 per cent.

SORTING YARDS. The east-bound sorting yard consists of 14 tracks with room fo 8 additional tracks when needed. The west-bound yard is made up of 17 tracks so arranged that 10 more tracks can be added when needed.

Method of Handling Trains

The movement of cars in the north-bound yard, after the road engine has been uncoupled and the cars have been inspected and marked is over the hump which is controlled by a semaphore operated by the man in charge of the hump. The house for the hump riders is adjacent to the hump. Three special enginesof the 0-8-0 type, weighing 200,000 pounds , all on the drivers do the humping work, and beside these there are fourteen 0-6-0 type, switching engines for the general yard work. As soon as a train has been made up in the sorting yard, a switch engine gets a caboose from the caboose track and pushes the caboose over the hump into the sorting yard. There being no separate departure yard the road engine is then backed down and coupled to the train in the sorting yard. The method of operation is the same in the south as in the north-bound yard except that the hump engines must back out of the receiving yard with each string of cars, and then switch across to the hump lead before distribution can be begun.

LIGHTING: A series alternating lighting system consisting of a 100 horse-power high-speed engine and a 60 k.w. Fort Wayne alternating generator, installed near the round house, furnishes the light for the yards.

There are three cinder pits, a coal chute of 78 pockets, 5 water cranes, a sand house with a capacity of 35 cars, a large machine shop, a round house of 20 stalls, oil house and a store room in the south yard; and a water softening plant having two tanks of 85,000 gallons each is located in the north yard. These facilities allow of the rapid handling of the engines so there will be no delay in getting motive power.

REPAIR YARD. The repair yard is between the two hump tracks, and consists of 8 tracks. The supply sheds lie in the center of this yard, and are convienient to all tracks.

Method of Handling Trains

After the train has entered the receiving yard the engine is uncoupled and proceeds to the engine track and thence to the round house, which is located near station 5330. The train is then inspected and marked, after which it is classified over the hump, by pushing the cars up the hump approach and separating them in the sorting yard, which has a capacity of 836 cars. After the trains have been made up in the sorting yard a switch engine gets a caboose from the caboose track, which is connected to the hump track, and backs up to the hump track , and then pushes the caboose into the sorting yard where it is coupled to the train. After the train is made up, an east bound engine backs down, and couples onto the train and pulls it out of the yard.

GIBSON YARD.

The Gibson Yard of the Chicago, Indiana & Southern Railroad is a new yard of the double hump gravity type built practically of duplicate halves for east and west bound business, and was not completed until December of 1906. Each half of the yard consists of the following parts:

RECEIVING YARD. The west bound yard consists of six tracks, three of the tracks having a capacity of 115 cars and the other three 245 cars. Connecting the south track of this yard with the east-bound hump track is a yard of five tracks for west bound freight which comes in over the east-bound tracks. The east-bound receiving yard is similar to the west-bound yard except that it holds 391 cars instead of 360. The yard of six tracks connecting the north track of the receiving yard with the west-bound hump track for east bound cars coming in over the west bound track is shown on Plate VI.

HUMP GRADES. In this yard the hump approach tracks are short and have a small grade because the yard is so built that the receiving yards have a small grade toward the humps. The west-bound has a 0.25 per cent grade toward the hump, which increases to 0.6 per cent in the hump approach which is 600 feet long; beyond this there are 100 feet to the crest of the hump at a 1.5 per cent grade. The velocity grades beyond the crest of the hump are: 75 feet at 2.5 per cent, 50 feet at 0.0 per cent, 100 feet at 3.5 per cent, 60 feet at 1.5 per cent, about 1300 feet at 0.7 per cent, and 1400 feet at 0.3 per cent. The grades leading to crest of the

hump in the east-bound yard are: 600 feet at 0.26 percent, 1000 feet at 0.35 per cent, 700 feet at 0.26 per cent 1500 feet at 0.35 per cent, 900 feet at 0.6 per cent, and 100 feet at 1.5 per cent; beyond the crest of the hump the grades are the same as those in the west-bound yard.

CLASSIFICATION YARDS. The classification yards are joined to the hump tracks, and in each case consist of 15 tracks with a capacity of 675 cars. Ample room has been left adjacent to each classification yard for future development.

DEPARTURE YARD. The departure yards are in both cases an extension of four of the classification-yard tracks and have a capacity of 368 cars.

REPAIR YARD. This is located at the east end of the yard near the round house and shops, and has a capacity of 300 cars 100 of which may be placed in position for repairs at one time.

LIGHTING. The yard is lighted with 25 a.c. lights placed on the sides instead of in the center as usually.

Method of Handling Trains

The movement of cars is similar through both yards, that through the west-bound yard is as follows: The road engine having drawn its train into the receiving yard, cuts off, and if possible backs down the north track of the receiving yard, which is kept open if possible, to the round house; or it may use the engine detour track to cross-over to the main yard tracks. The cars are then marked and the brakes inspected. The pusher engine next takes the train over the hump into the classification yard. Any cars

having an eastward movement are diverted to the tracks so marked on Plate VI. From here they are drawn into the east and south-bound receiving yards and are "rehumped" over the eastward summit into the east-bound classification yard. Road engines can either pass over the hump to the round house or they may back down the central track of the receiving yard to the main yard track and thence to the round-house.

WELL DESIGNED YARD.

The requirements necessary for the important parts of a well designed yard as determined by the study of the preceding examples are:-

RECEIVING YARD. The Receiving Yard should have tracks of sufficient length to admit the maximum length of trains arriving at the yard, without doubling in. In making the estimate for length of tracks an engine length is assumed at seventy-five feet, a car length at forty feet, and a caboose length from twenty to forty-five feet according to the standard on different roads; and to this a few hundred feet should be added to the length of track for the inexact stoppage of trains. At least a portion of these tracks should be provided with cross-overs to thoroughfare tracks so a short train will not block an entire track. Also an independent outlet from the yard should make it possible for the road engine to take a train of perishable or live freight directly to the icing plant or stock yards.

The time required from the entrance of the train into the receiving yard to the coupling on of the yard engine should not exceed one hour, which time should be sufficient for inspecting the cars, making light repairs, such as fixing brakes, etc. There should be a sufficient number of tracks to hold all the trains likely to accumulate during some congestion in the advance movement through the yard.

Adjacent to every receiving yard should be a yard for "hold cars", which should be well provided with outlets so it will readily be accessible from the receiving yard and so that cars can readily be taken from these tracks for a forward movement when these "hold cars" have been ordered forward. These "hold tracks" should never be very long, as it will require too much time to pull a long string of cars in order to get three or four cars for which disposition has been received.

Provision should be made so that the road engines can proceed directly to the round-house from the receiving yard, care being used that in so doing they do not foul the other yard tracks more than absolutely necessary.

A transfer yard should be located near the receiving yard, from which it is readily accessible so that improperly loaded cars can be easily taken to this yard for re-loading. This yard should also be connected to the hump approach so no time will be lost in forwarding cars from this yard.

HUMP APPROACH. The hump-approach track must not be made unnecessarily long or time will be lost by the pusher engines. The length of hump approach necessary is determined to a large extent by

the grades necessary to bring the crest of the hump to the required elevation, hence if the receiving yard is raised so that it is nearly at the elevation required for the crest of the hump, the length of approach can be reduced and the pusher engines will be able to handle the maximum trains more easily.

MOMENTUM GRADES. The grades beyond the crest of the hump are one of the most difficult things to adjust in the design of a yard, because the efficiency of the yard is to a large extent determined by the movement of cars over the hump. The grades must be such that the cars will start forward quickly as they pass over the crest of the hump, and also that they will acquire enough momentum to carry them through the switches and into the classification yard. The grades necessary vary with the load of the cars , empties requiring steeper grades than loads; the amount of curvature in the switch leads also increases or decreases the grade necessary according as the degree of curve is large or small.

From the comparison of the examples given and the study of the table given by Mr. W. C. Cushing of the Pennsylvania Railroad in the Railroad Gazette of 1905, it seems that the most satisfactory starting grades are from 3.0 to 3.5 per cent for a distance of 150 to 200 feet when there is no scale on the hump track. When the scales are on the hump track, the conditions are changed because a moderate speed is required for the proper weighing of cars. The scale grade should be from 2.0 to 3.0 per cent for a distance of 50 to 75 feet, and rarely if ever should the scale be over 100 feet from the apex of the hump. The grade through the ladders should be about 0.1 per cent; and the grade through the yard should be from

0.1 to 0.3 per cent for a distance sufficient to carry the cars to the end of the yard.

CLASSIFICATION YARD. In every yard provision should be made so that solid trains of through freight can be taken directly from the receiving yard to the classification yard and thence to the departure yard without passing over the hump. The classification yard tracks should be sufficient in number to make all the classifications necessary, and the length should be adjusted according to the amount of business. If the traffic is so heavy that the maximum train length of cars will accumulate within the time limits of holding such cars, the tracks should be of a maximum train length; but if this is not the case the length of tracks should be reduced and cars from two tracks should be bunched together and taken to the departure yard.

DEPARTURE YARD. The departure yard is for holding trains made up ready to go as soon as the road engine and the caboose can be attached, an hence the tracks must be of sufficient length to hold the maximum length trains. Some of these tracks should be provided with cross-overs to provide for the short trains. An independent track should lead from the round house to the departure yard for the use of road engines.

REPAIR YARD. A good location for the repair yard is parallel to the hump lead between the receiving and classification yards. This will locate the yard so that it will be readily accessible from both these yards.

AUXILIARY FEATURES. The round house should be conveniently located and well provided with all appliances necessary for the

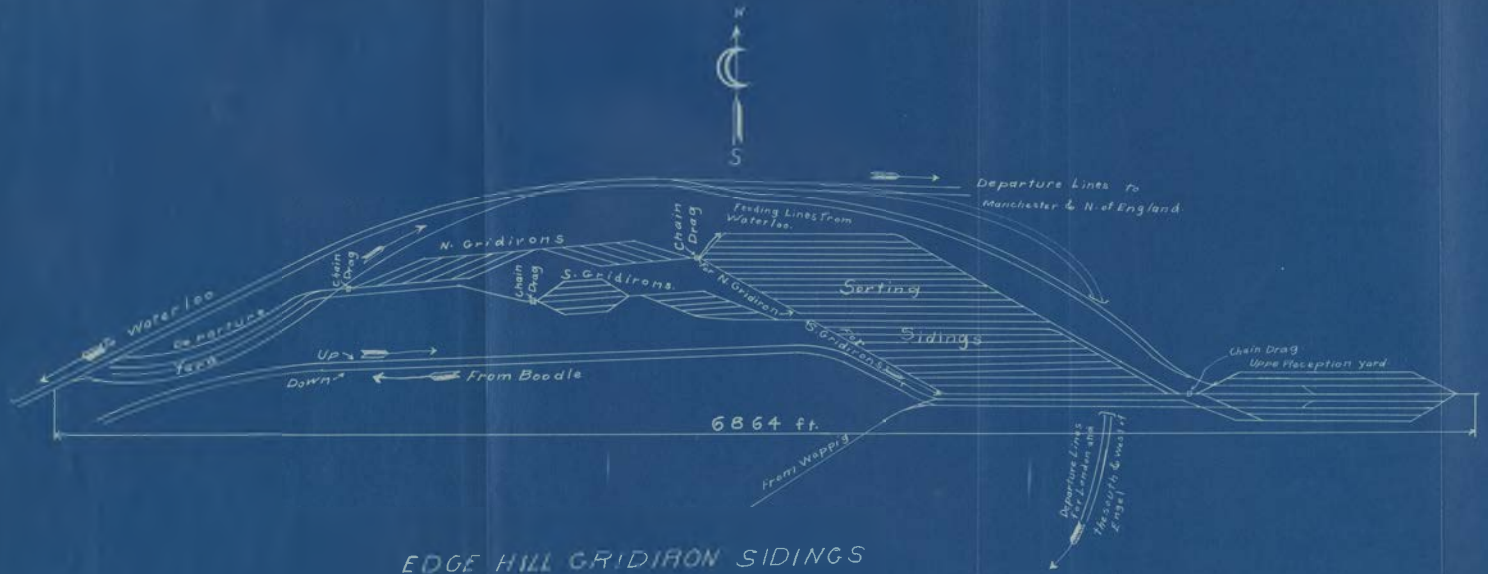
work to be done at this place. An icing plant should be placed at a convenient point so that it can be easily reached from the receiving yard.

LIGHTING. The lighting of a yard is a very important feature of a well designed yard. Since a considerable portion of the work in the yard must be done during the night, every means should be used to make the work as easy as possible by supplying the yard with the best system of lighting available. This will not only remove much of the danger due to darkness, but will also increase the amount of work which can be done.

CONCLUSION.

From the study of the examples given and the reading of a number of articles on the design of gravity yards in many of the engineering magazines by engineers of different railroads, the following conclusions have been drawn:- In order to make a good design of a yard the designer should make a careful study of the proposed yard site, and he should obtain all the information possible relative to the nature and amount of traffic likely to be handled in the future at this point. Having decided upon the amount of business to br handled, work out a plan for handling this business with the idea of building enough of the final plan to handle the present business, and of making additions as the growth of the business requires. Adopt a type of design in accordance with the business to be handled i.e. never adopt a gravity yard for ordinary

division or for terminals to handle general merchandise, lumber, grain and coal unless the traffic is sufficient so that the cost of switching per car through the yard will not be more than 12 to 15 cents each. The number of cars passing through the yard per day to keep the cost at this price varies with the number of cuts necessary to properly classify the cars, the arrangement of switches, etc.

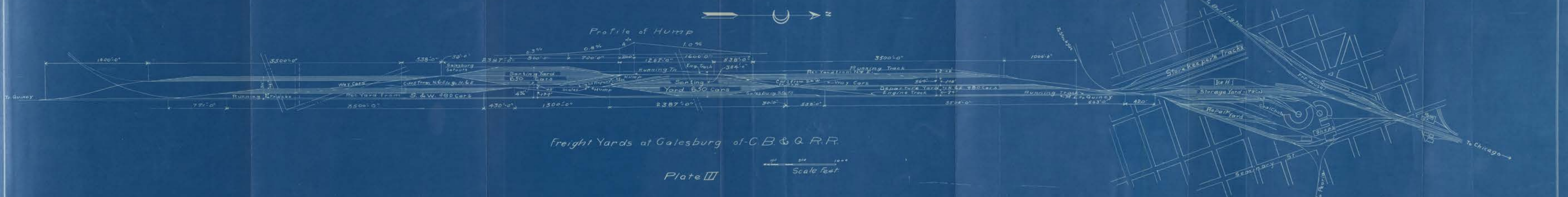


EDGE HILL GRIDIRON SIDINGS

Scale 785 Feet

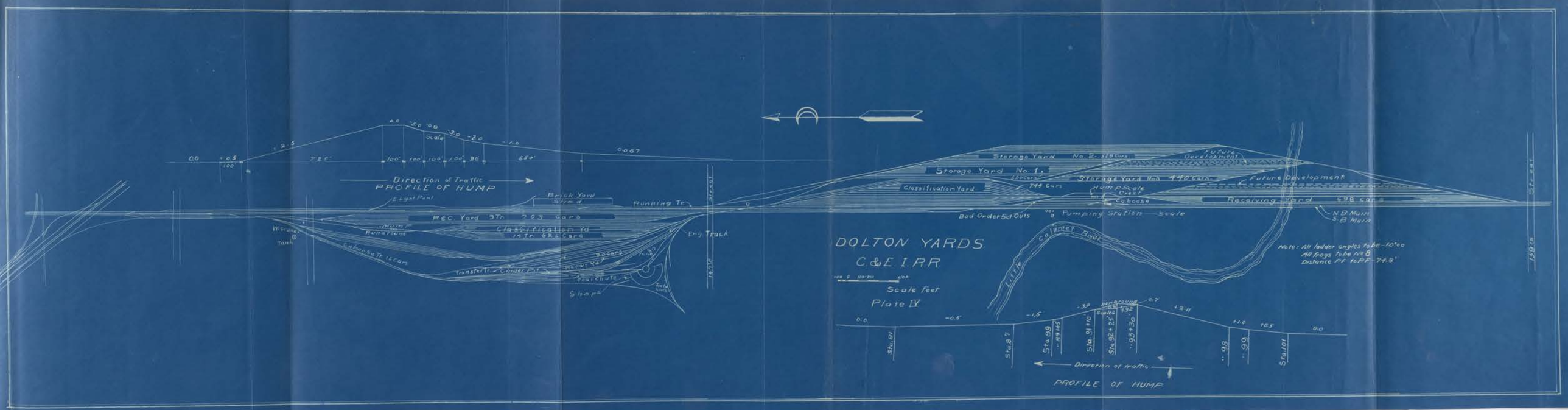
Plate I

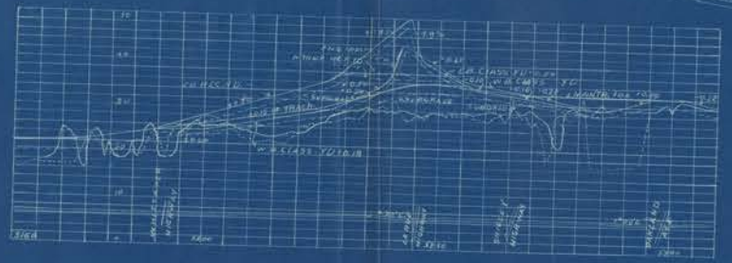

(Proposed Location)
of
Round House
WEST BOUND HAWTHORNE YARD
of the
C.B.&Q.R.R.
Scale 1 in. = 100 ft.
Plate II
Profile at Hump
Direction of Traffic
28th
ST
PRAIRIE AVE
FREIGHT TRANSFER
YARD
COVERED PLATFORM
SORTING YARD
DEPARTURE YARD
80 Car Tracks
MAIN TRACKS
Repair Yard
Yard Office
Caboose Tracks
CEMENT SHED
Storage Yard
Receiving Yard
MORTON PARK
26th
ST



Freight Yards at Galesburg of C.B.&Q.R.R.

Plate III


Direction of Traffic
PROFILE OF HUMP
Brick Yard Siding
Running Track
Rec. Yard 3 Tr. 203 Cars
Classification Yard 14 Tr. 626 Cars
Eng. Track
Water Tank
Runaround
Caboose Tr. 16 Cars
Transfer Tr. / Cinder Pit
Roads
Coal Chute
Shops
Storage Yard No. 2. 328 Cars
Storage Yard No. 1. 1200 Cars
Future Development
Classification Yard 744 Cars
Hump Scale
Crest
Caboose
Storage Yard No. 4 Tracks
Future Development
Receiving Yard 498 cars
Bad Order Set Outs
Pumping Station
N.B. Main
S.B. Main
DOLTON YARDS
C. & E. I. R.R.
Scale feet
Plate IV
Calumet River
Little
Note: All ladder angles take - 10°00
All frogs to be No 8
Distance PF to PF - 74.8'
Sta 87
Sta 89
Sta 89 + 99.45
Sta 91 + 10
Sta 92 + 25
Sta 93 + 30
Sta 98
Sta 99
Sta 101
Direction of traffic
PROFILE OF HUMP

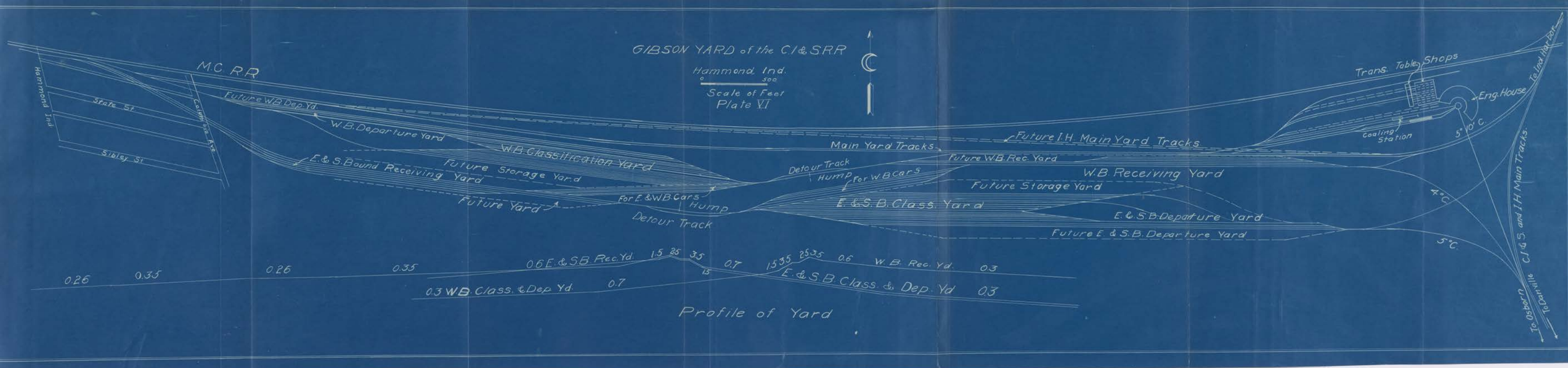


Profile of Elkhart Yard

Lake Shore Freight Yard - Elkhart Ind

Note: Trains run left handed on this Road
No 8 Frogs used

Plate V


GIBSON YARD of the C.I.& S.R.R.
Hammond, Ind.
0 500
Scale of Feet
Plate VI
M.C. R.R.
Hammond Ind.
State St.
Sibley St.
Calumet Ave.
Future W.B. Dep. Yd.
W.B. Departure Yard
W.B. Classification Yard
E. & S. Bound Receiving Yard
Future Storage Yard
Future Yard
For E. & W.B. Cars
Hump
Detour Track
Main Yard Tracks
Future I.H. Main Yard Tracks
Future W.B. Rec. Yard
W.B. Receiving Yard
Future Storage Yard
E. & S.B. Class. Yard
E. & S.B. Departure Yard
Future E. & S.B. Departure Yard
Trans. Tables
Shops
Eng. House
Coaling Station
5° 10' C.
4° C.
5° C.
To Osborn
C.I.& S. and I.H. Main Tracks
To Dalton
To Ind. Hbr. Belt
0.26 0.35 0.26 0.35 0.6 E. & S.B. Rec. Yd. 1.5 2.5 3.5 1.5 0.7 1.5 2.5 3.5 0.6 W.B. Rec. Yd. 0.3
0.3 W.B. Class. & Dep. Yd. 0.7
E. & S.B. Class. & Dep. Yd 0.3
Profile of Yard