Signal Training Bulletin

Committee G: Education & Training
Communication & Signal Division, AAR

F-4 Classification Yard (Hump Yard)

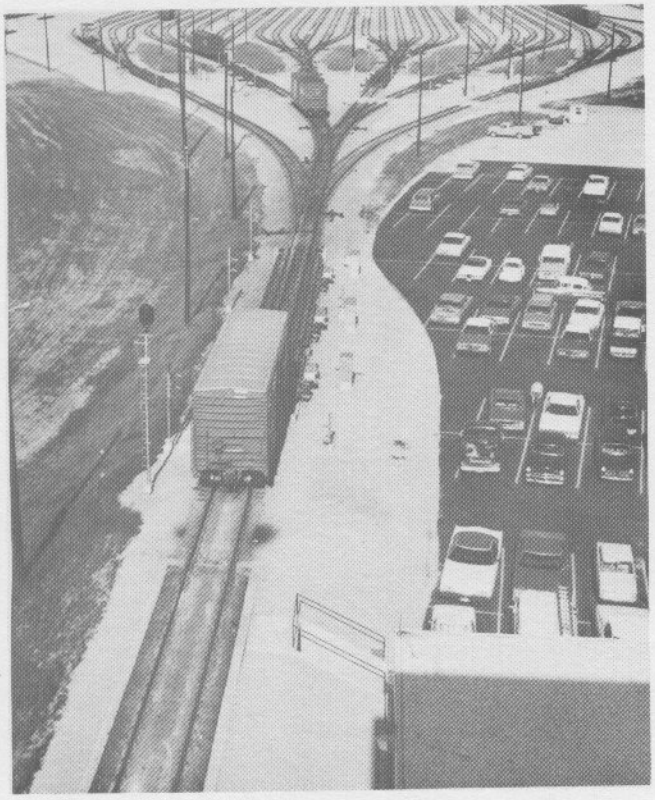
Approved December 1981

Definition: Yard, Hump- Classification yard in which the classification of cars is accomplished by pushing them over a summit, known as a hump, beyond which they run by gravity.

Symbol: None

Description: Automatic, gravity type classification yards, hereafter referred to as hump yards, are comprised of four basic areas and perform three basic functions (Refer to Figure 1). The four basic areas from the entrance to the exit are: receiving yard, hump, classification track area (bowl) and departure yard. Three basic functions performed are: receiving trains, sorting cars as to their respective destinations and assembling trains.

Other areas may be included depending on terminal requirements and the degree of centralizing activities. For example, a particular yard may also contain diesel, caboose and car repair, transfer yards, storage yards, etc.



Retarder classification yard as viewed from the hump.

Purpose and Application: Regardless of the apparent complexity, degree of sophistication or awesome size of a modern yard, the main purpose is to classify freight cars as quickly and economically as possible.

Hump yards can be located to service only one direction of running for a railroad, both directions, or can be designed into an area where multiple railroad lines join or cross.

General Information: The height of the hump crest must be sufficient to allow gravity to pull the poorest rolling car, under adverse weather conditions, to the farthest point on the farthest class track at the proper coupling speed. Therefore, better rolling cars destined to other class tracks under better weather conditions, must be slowed down. The equipment that routes a car or cut of cars to the proper class track at the proper coupling speed is the process control computer and associated subsystems.

Detailed Operation: The following will be a simulation of a train into an automatic computer-controlled hump yard, its classification and assemblage. The emphasis will be on signal department responsibilities.

No two hump yards are exactly alike. Each is designed for an individual location and according to the requirements of a specific railroad. Therefore, the following is a general sampling of equipment that would be found in some hump yards.

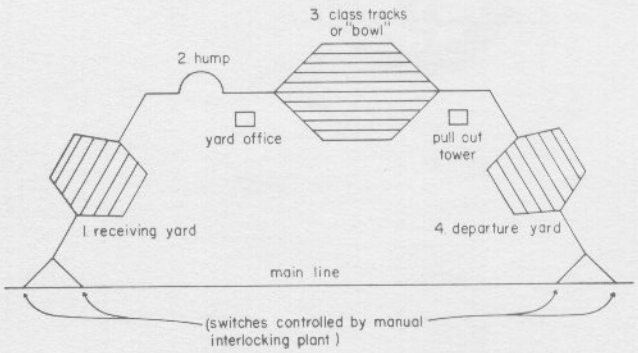


Figure 1 — Basic Hump Classification Yard Layout Hump yards serve three basic functions: (1) Yard train for receiving function (Area 1); (2) Split train for sorting function (Areas 2 and 3 — humping and classification functions); and (3) make-up train — assemblying function (Area 4).

Train arrives at receiving yard (see Figure 1) from main line and is routed to appropriate predetermined receiving yard track.

In receiving yard, cars are inspected for bad orders and brakes are bled of air to allow cars to roll freely when humped.

When train is ready to hump, it is pushed up hump lead from receiving yard to hump crest by hump engine. Detectors located on the hump lead check each car for dragging equipment and loose wheels.

The computer assumes control of the speed of the hump engine as the first car in the train arrives at a point marking its approach to the crest of the hump. Hump signals and/or cab signals continually inform engineer of status of humping operation.

As the first car or cut of cars (two or more cars coupled) pass the crest of the hump, an employee (pin puller) uncouples the car or cut of cars from the train. A pin puller retarder may be positioned slightly past the hump crest. When closed, the retarder allows the train to slack to assist the pin puller in uncoupling difficult cars.

Once uncoupled, the speed of the cut and route are controlled from the hump crest to appropriate classification track by the process control computer.

The field subsystems that provide inputs to the computer to enable the automatic routing and speed control system to perform its function are as follows, in sequential order (refer to Figure 2):

Hump Wheel Detector (HWD)

Informs computer that car is entering master retarder.

Hump Radar 1 & 2 (HR 1 & 2)

HR 1 informs computer of car speed when car enters first section of retarder.

HR 2 informs computer of car speed when car enters last section of retarder.

Master Retarder

Slows good rolling cars to a speed that group retarders will be able to handle. Slowing of cars is accomplished by forcing brake shoes against both sides of the car wheels. The amount of pressure applied by brake shoes is controlled by the computer.

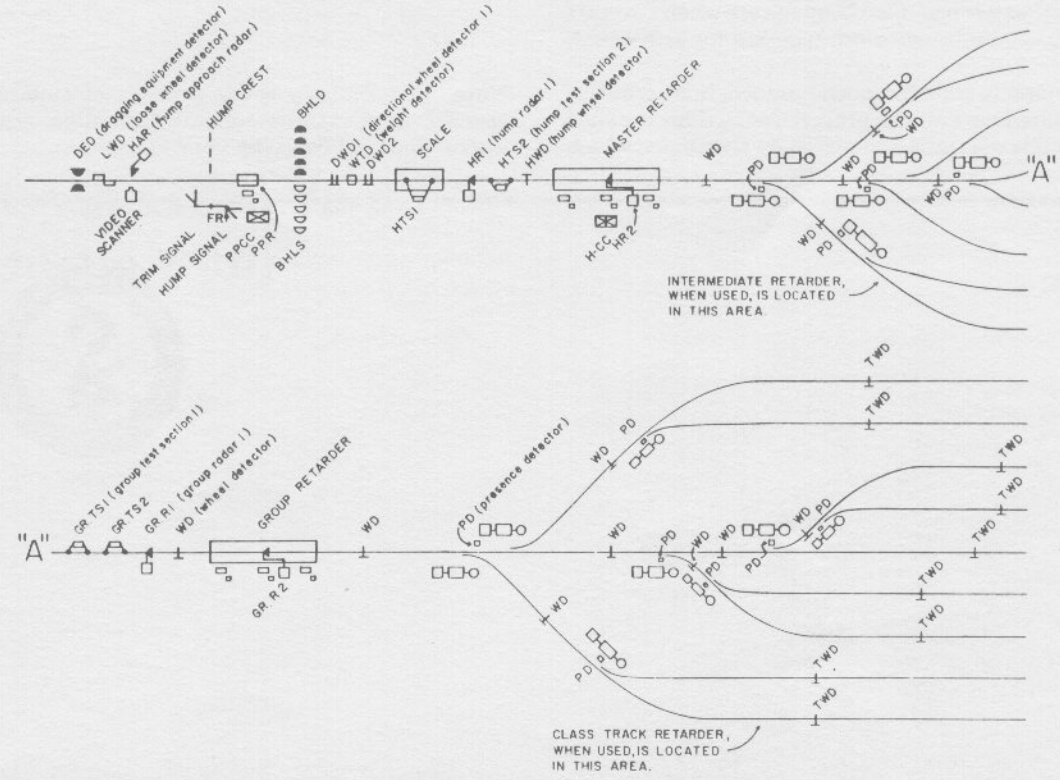


Figure 2 — Automatic retarder yard layout.

Bulk Head Height and Length Detector (BHLD)

A vertical series of photo-electric cells positioned so that each car passes between light source and light detector. Maximum height and length of car are determined by the number and length of time the light sources are blocked.

Directional Wheel Detectors (DWD 1 & 2)

Consists of two wheel detectors on one rail appropriately spaced. Used to keep count or inventory of individual cars and their direction by counting wheels.

Weight Detector (WTC)

Specially designed weigh rail used to inform computer as to the approximate weight of a car (i.e., light, medium, heavy or extra heavy).

Weigh-in-Motion Scale (Scale)

Provides the weight of each car for corrected cut list. Used later in computing the tonnage of the new departing train.

Hump Test Section 1 & 2 (HTS 1 & 2)

Computes the car rolling characteristics (ability to gain speed). Measures car speed in each of the two test sections located a known distance from each other.

Wheel detector prior to each switch (could also be a track circuit).

Used for tracking each car through hump.

Presence Detector (PD) (could also be a track circuit).

Locks switch, i.e., prevents switch from changing position if car is on switch.

Approximately the same tests are made for group retarder section. The group retarder delivers cuts to the point of coupling on the class tracks at a predetermined coupling speed. When the cut clears the group test section, the computer calculates the velocity at which the cut should exit from the group retarder. This calculation includes the following factors:

A. Temperature.

B. Moisture (humidity).

C. Wind speed and direction.

D. Standing time of the train prior to humping (wheel bearings cool as train stands in receiving yard).

E. Cut maximum height (wind resistance).

F. Cut rolling characteristics as determined by group test section and other known factors.

G. Route conditions ahead, includes grades and total curve resistance.

H. Distance-to-couple on assigned class track.

I. Desired coupling speed — manually set and stored in computer.

By adding intermediate and class track retarders, Figure 2, exit speed of cars leaving all retarders except class track retarders can be increased thereby theoretically increasing yard capacity (humping rate). However, installation and maintenance costs also increase.

Tangent Wheel Detector (TWD)

Informs computer when car enters class track.

Distance-to-couple track circuit

Informs computer of the distance remaining from class track clearance point to first axle (truck) on class track.

Occasionally a car will be misrouted because of equipment failure or "catch-up." Catch-up occurs when two cars are descending the hump too close together for safe switch operation.

After the complete train has been humped, it is necessary to place misrouted cars on the proper tracks. This is called "trimming" and is normally completed by the engine which humped that train. While trimming is in process a trim signal at the crest of the hump is cleared and humping is stopped.

Assembling the new train is a function performed in the departure yard. As a class track becomes full, a "pull-down" engine moves the block of cars from the class track to the departure yard. When a complete train is assembled and checked, it is ready to move from departure yard to main line.

Many railroads have instructions outlining installation, maintenance, inspection and safety procedures with regard to hump yards. It is most important that you become familiar with the requirements of your company.

Note: this Bulletin is for general information only. For specific applications consult the rules, standards and instructions published by your railroad.

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