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Project 7663-3
June 19, 1979
Informal Note #20*

VISIT WITH ASEA REPRESENTATIVES

Location: Southern Pacific Railroad, San Francisco

Date: 30 May 1979

Present: Ake Stenow - ASEA, Sweden
Olle Ewers - ASEA, N.Y. office
B. Gallacher - S.P.
W. Hollingsworth - S.P.
M. Fulkes - S.P.
P. Wong - SRI
R. Kiang -SRI
W. Stock - SRI
D. Ploeger - SRI

The meeting was divided in two parts:

- ASEA representatives presented a talk and slide show on ASEA's railroad operation, including
  - Electric locomotives
  - Marshalling yard retarders and design procedures
- SRI discussed the specifications for the base yard design the speed control project.

I. ASEA Presentation

The primary purpose of ASEA's trip to S.P. was to introduce ASEA's marshalling yard (classification yard) equipment to the railroad. ASEA's classification yard equipment consists of

- Hydraulic retarders used in a quasi-continuous control design,
- Cable wagon-hauling system for classification tracks.

The cable wagon-hauling system is used primarily in yards with conventional clasp type retarders. Mr. Stenow noted that the system was designed originally for industrial service (moving cars to be loaded or unloaded) and has not found great acceptance in the European railroad community. It was not discussed extensively at the meeting.

The spiral, hydraulic retarder was discussed at length. The passing

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wheel of the car engages a helical rib on the outside of a cylinder whose axis is parallel to the rail (see Figure 1). The wheel causes the cylinder to rotate one turn. The cylinder's rational speed is proportional to the speed of the car. The rotation operates 18 pistons, 9 in each end of the unit, which pump oil through a control valve. The control valve is preset at the factory to restrict the flow of oil (and resist the rotation of the cylinder and hence the passage of the wheel) only above a certain car speed. The concept of absorbing energy of a passing car by forcing fluid through an orifice is similar to that used by Dowty. The units are mounted to the rail and form a quasi-continuous speed control system, again similar in concept to the Dowty.

Features of the ASEA retarders include:

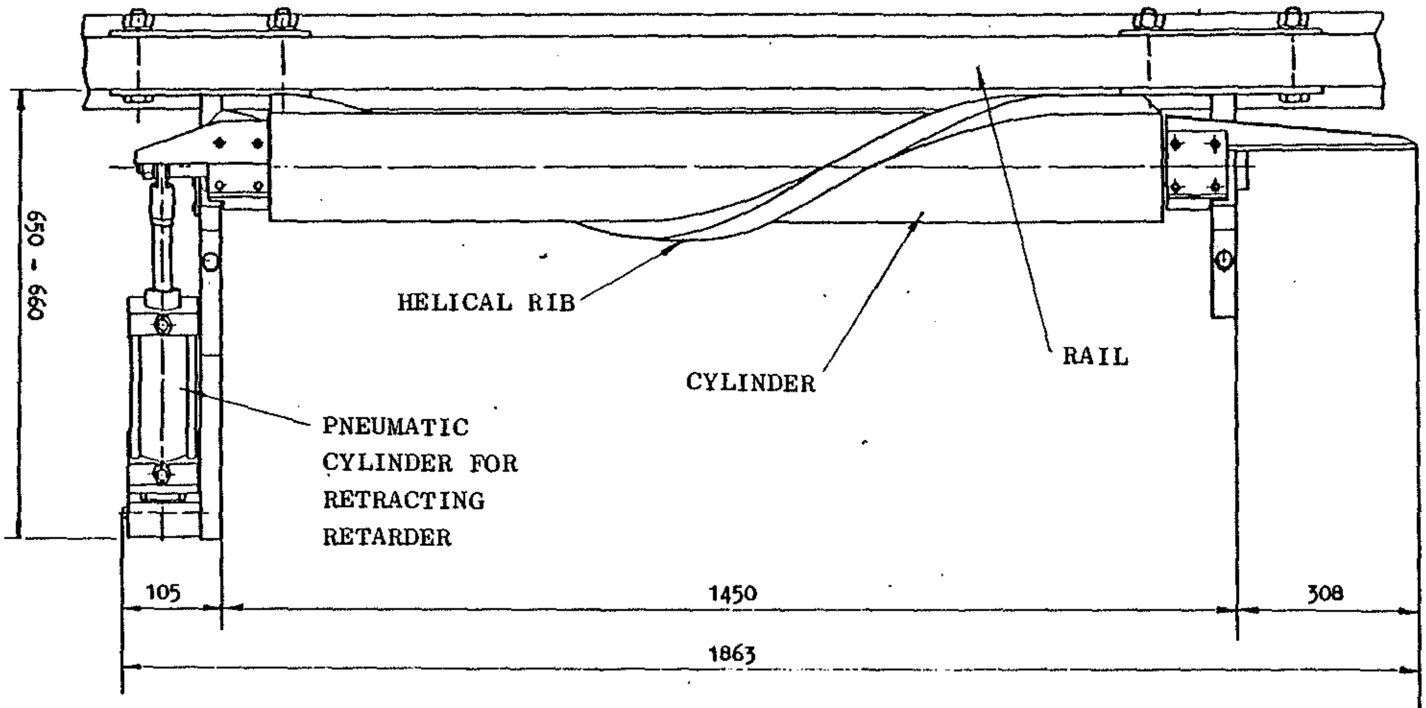
- Energy removal per unit of 10,000 Joules (7,376 ft.-lb.). This is approximately ten times the energy removal of a Dowty unit.
- Retardation has only a very slight dependence on speed above the activation speed.
- The activation speed can be set from 0.5 m/sec. to 5 m/sec. in steps of 0.5 m/sec.
- The idling torque (resistance below activating speed) is only 5% of the full torque.
- The retarders are retractable to allow locomotives to pass or to permit easy pull out from the class tracks.
- Low noise level, crude measurement indicated approximately 75 dB at 10 meters from the unit.
- Oil change and inspection is required every 5 years or 2 million cycles. Ten minutes is required to remove and replace a cylinder.

The disadvantages of the ASEA retarder were discussed and include:

- More complex design than Dowty (the only other competing quasi-continuous system).
- The retractability feature requires a system of air pipes and compressors, thus losing the advantage over clasp-type systems of being entirely self-contained.
- The top of the spiral retarder protrudes 5 inches above the top of the rail. AAR standards allow portions of cars to hang to

Spiral retarder

Head measures



Weights	Spiral cylinder	110 kg
	Fixing parts	105 kg

FIGURE 1 ASEA SPIRAL RETARDER

within 2.5 inches of the top of the rail. There is a significant proportion of the car population that will not pass over the retarders.

Mr. Gallacher feels that the protrusion problem is critical and that S.P. cannot consider adopting the ASEA retarder until the problem is solved. Mr. Stenow indicated that redesign was possible but would be a major effort.

ASEA's yard design philosophy and procedure is similar to Dowty. Referring to Figure 2, the design consists of:

- A steep grade following the hump crest (4.5%) to accelerate and separate the cars.
- A shallower grade (equal to the rolling resistance of the worst rolling car) through the switch area. Retarders are placed to keep the easier rolling cars at a constant speed.
- A deceleration zone with a concentration of retarders is located at approximately the tangent point. The cars are slowed in this section to a safe coupling velocity.
- The class tracks have a grade equal to the average rolling cars. Retarders are spaced along the entire class track to keep cars below the maximum coupling speed. Typical retarder spacing is 28 meters. Hard rolling cars can still stall.

Computer simulation is used extensively. Each track of a yard must be modeled with cuts of all combinations of rolling resistance, car weight and number of cars. Some examples are shown in Figure 3. Table 1 lists the car parameters ASEA uses in their simulations of Swedish yards. Four-axle cars average 12 to 14 meters long, while two-axle cars average 10 to 12 meters long.

II. Discussion of the Yard Project

Table 2 lists all the ASEA equipped yards to date. The yard specification and outline of the project had been reviewed at ASEA prior to the meeting, and ASEA had made the decision to cooperate.

Mr. Stenow had a few points to discuss about the specification. These included:

- Since ASEA's design philosophy differs slightly for high and low capacity yards, they would like a specification on the number of cars per day.

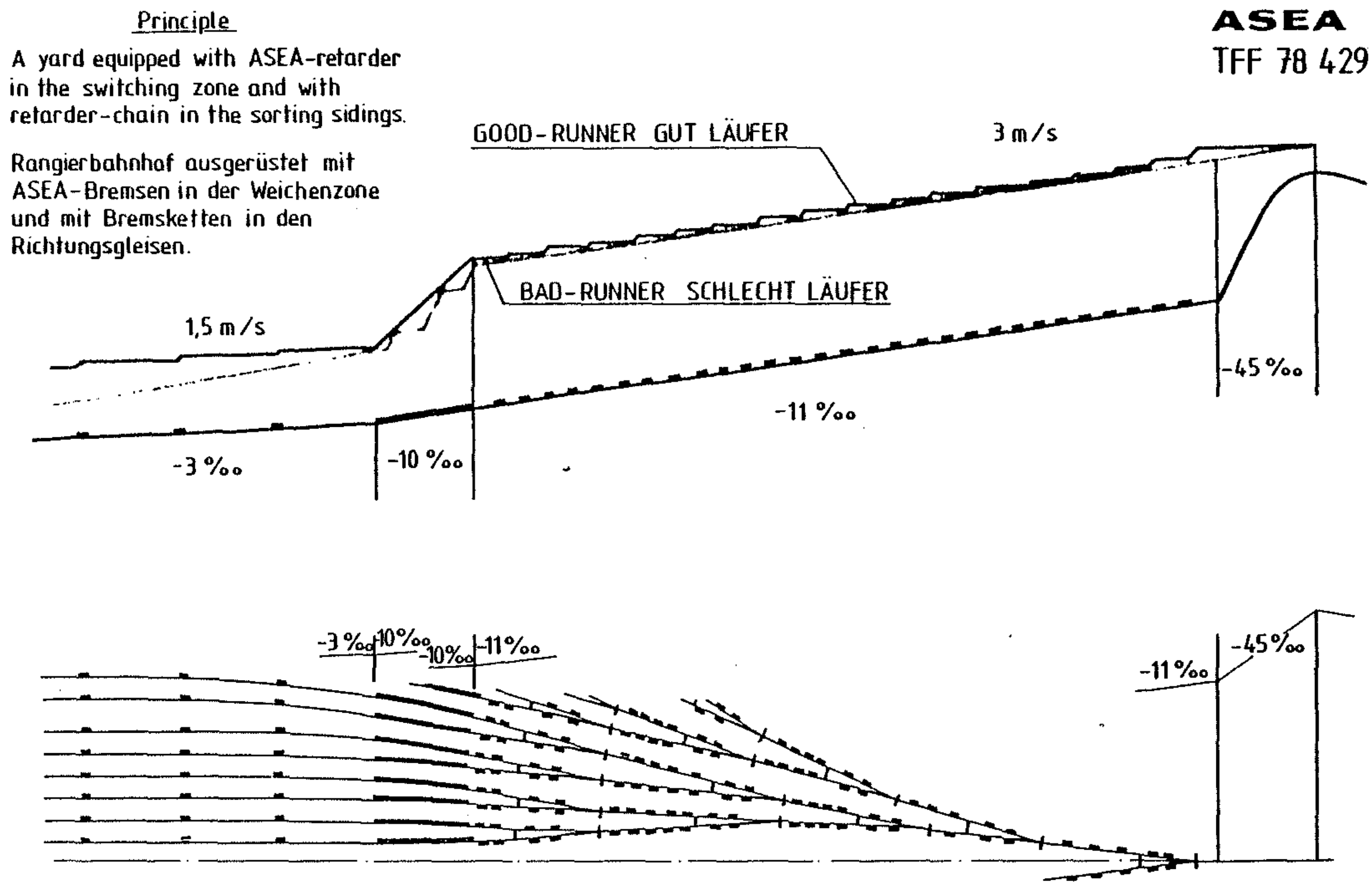


FIGURE 2 TYPICAL ASEA YARD PROFILE

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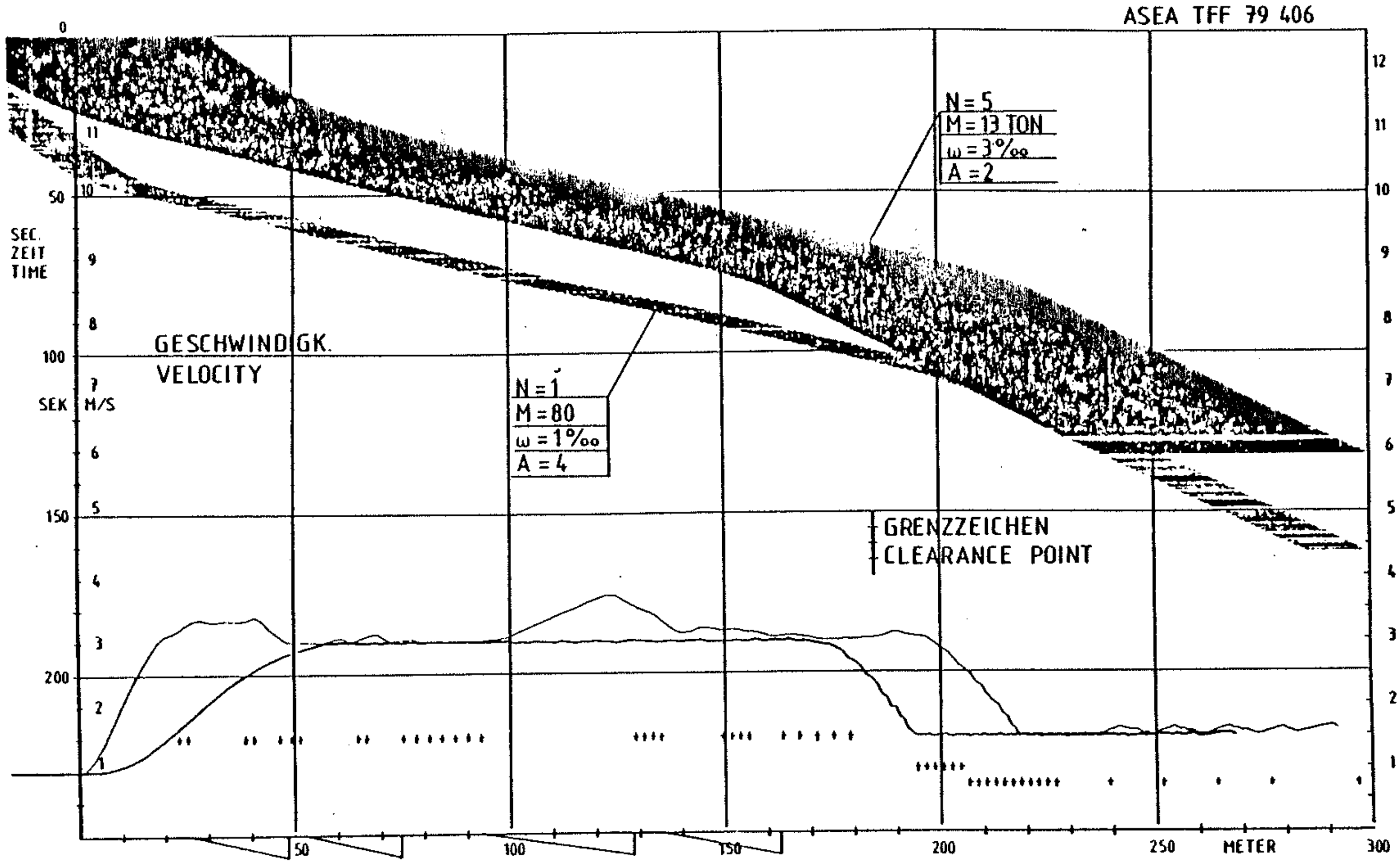

FIGURE 3 COMPUTER SIMULATIONS

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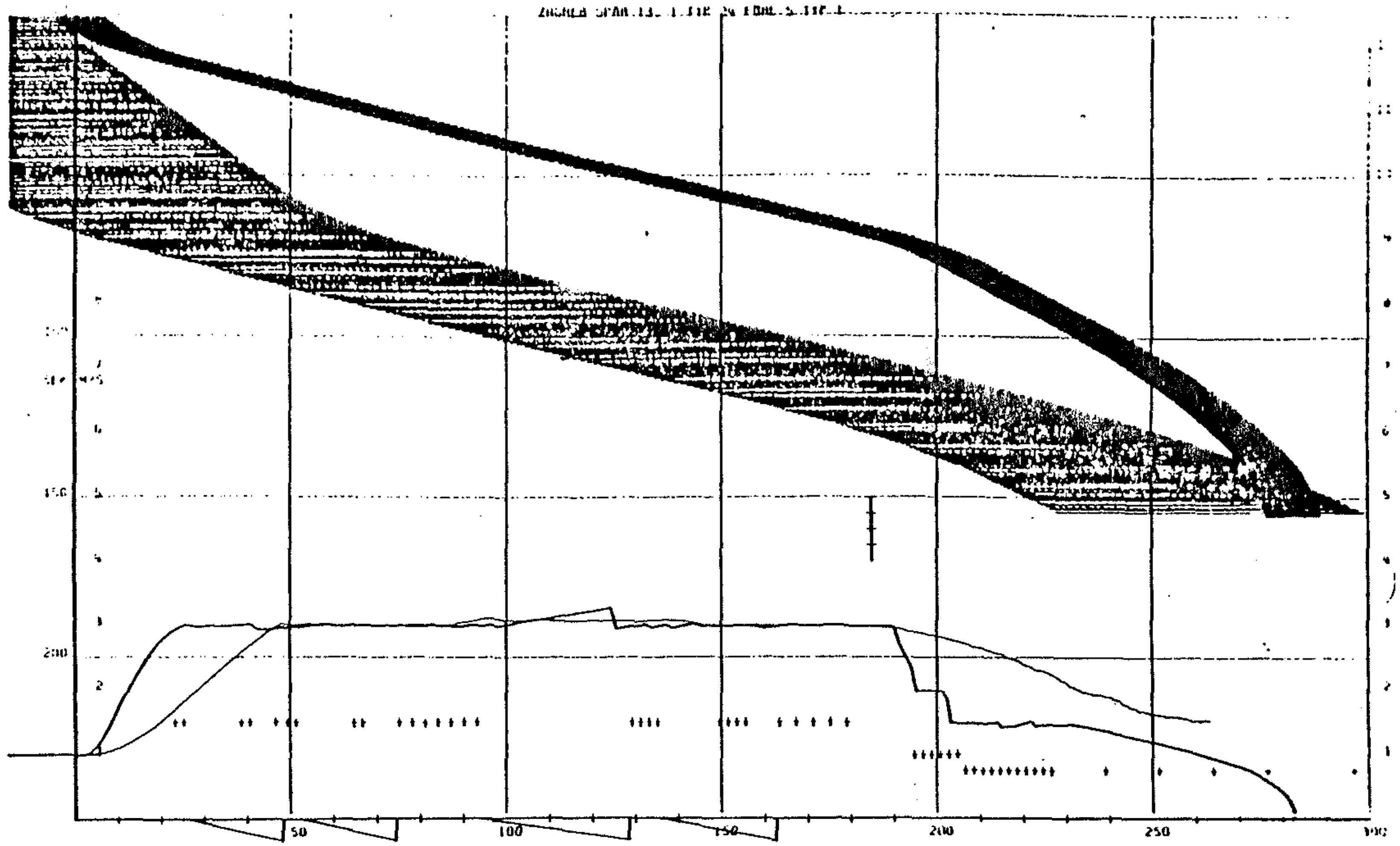

FIGURE 3 COMPUTER SIMULATIONS (continued)

TABLE 1

Data used for wagon speed
Calculations for marshalling yards in Sweden

	Good runner	Mean poor runner	Poor runner
– Rolling resistance inkl wind resistance	1 o/oo	3 o/oo	7 o/oo
– Curve resistance R = Curve radius in m	$\frac{325}{R}$ o/oo	$\frac{650}{R}$ o/oo	$\frac{650}{R}$ o/oo
Resistance in curve R = 200 m	1.625 o/oo	3.25 o/oo	3.25 o/oo
– Switch resistance (over the length of the switch)	0.5 o/oo	0.5 o/oo	0.5 o/oo
– Number of axles	4	2	2
– Axle load	20 tons	6,5 tons	5,25 tons
– Adjusted gravity acceleration	9,6 m/s^2	8,9 m/s^2	8,6 m/s^2

TABLE 2

Retarders and haulage equipment delivered by ASEA to the following marshalling yards.

Sweden	Helsingborg	725 retarders
	Göteborg	800 "
	Malmö	750 "
	Sundsvall	350 "
Denmark	Copenhagen	250 "
DDR	Dresden	850 "
	Halle	280 "
	Seddin	135 "
	Seddin	4 haulage equipment
Switzerland	Basel Muttenz I	21 retarders
	Basel Muttenz I	4 haulage equipment
	Basel Muttenz II	32 haulage equipment
Italy	Milano	500 retarders
	Milano	24 haulage equipment
Canada	Vancouver	12 retarders

- ASEA needs a switch drawing to know where their retarders can be placed within the switch.
- The minimum, average and maximum axle weight for U.S. cars were requested.
- Meeting the 4 mph coupling speed is easy for an ASEA yard. ASEA will also do a design to control cars to 2 mph in the switch area for comparison. (European coupling speed is typically 1.5 m/sec. or 3.36 mph).
- Mr. Stenow predicted that the performance of the ASEA yard would be
  - zero misswitched
  - zero overspeed
  - small fraction stalling on the classification tracks.

Due to the work load and work schedule at ASEA, it will take approximately three to four months to design a yard to our specifications. This means that the earliest we could have a design from ASEA would be October 1.

The scheduling for SRI's trip to Europe to visit ASEA equipped yards was discussed. The three possible times decided on were:

- Early September
- Last two weeks in August
- July.