

SCRAPERS

OUTLINE

- Introduction
- Types of Scrapers
- Volume of Scraper
- Cycle Time of Scraper
- Scraper Production

INTRODUCTION

- Excavating, loading, hauling, & dumping over medium distances.
- Can be used with pusher tractor for increased production.
- Some models have self loading capabilities
- Economical over a wide range of haul lengths
- Can self load and not dependent on other equipment
- Scraper are available with loose heaped capacities up to about 44 cy

TYPES OF SCRAPERS

- Push-Load
 - ❖ Single-powered axle
 - ❖ Tandem-powered axles
- Self Loading
 - ❖ Push-pull, tandem-power axles
 - ❖ Elevating
 - ❖ Auger

Types of Scrapers

- Push-Loaded:
Single Powered
Axle





Types of Scrapers

- Push-Pull: Tandem- Powered Axle
Can work as a team or can operate individually with a pusher



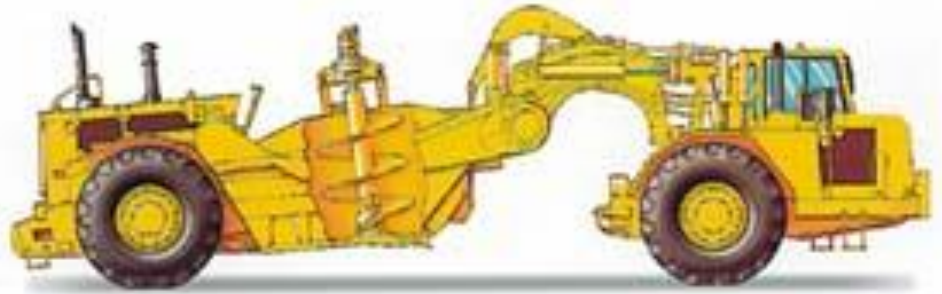
Types of Scrapers



Elevating is loading and hauling scraper

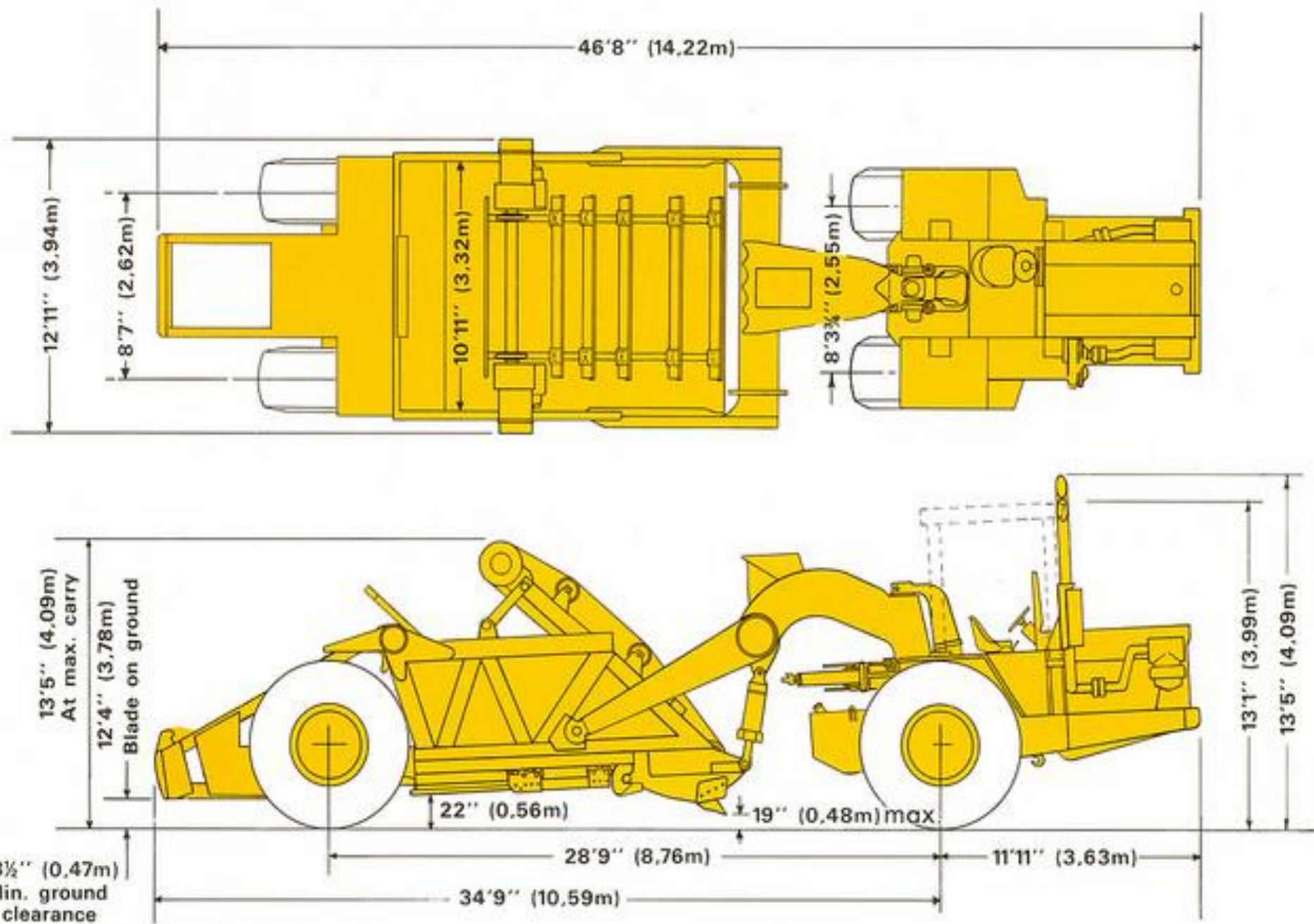
- Used for utility work
- Very good in small quantity situation
- No pusher required

Types of Scrapers



Auger Scraper

- Can self-load in difficult condition (frozen material, lime-stone)
- More costly to own and operate than conventional single-or tandem machine



VOLUME OF A SCRAPER

- The capacity of scraper expressed in bank cubic yard
- Test indicate that the swell factors should be increased by approximately 10% from material push-loaded into scraper
- The volumetric load of a scraper may be specified as either the struck or heaped capacity of the bowl expressed in cubic yard
- The struck capacity is the volume that a scraper capacity is the volume that a scraper would hold if the top of the material were struck off even at the of the bowl

VOLUME OF A SCRAPER (2)

- Example

If a push-loaded scraper haul a heaped load measuring 20.5 cy and the swell factor is 0.8.

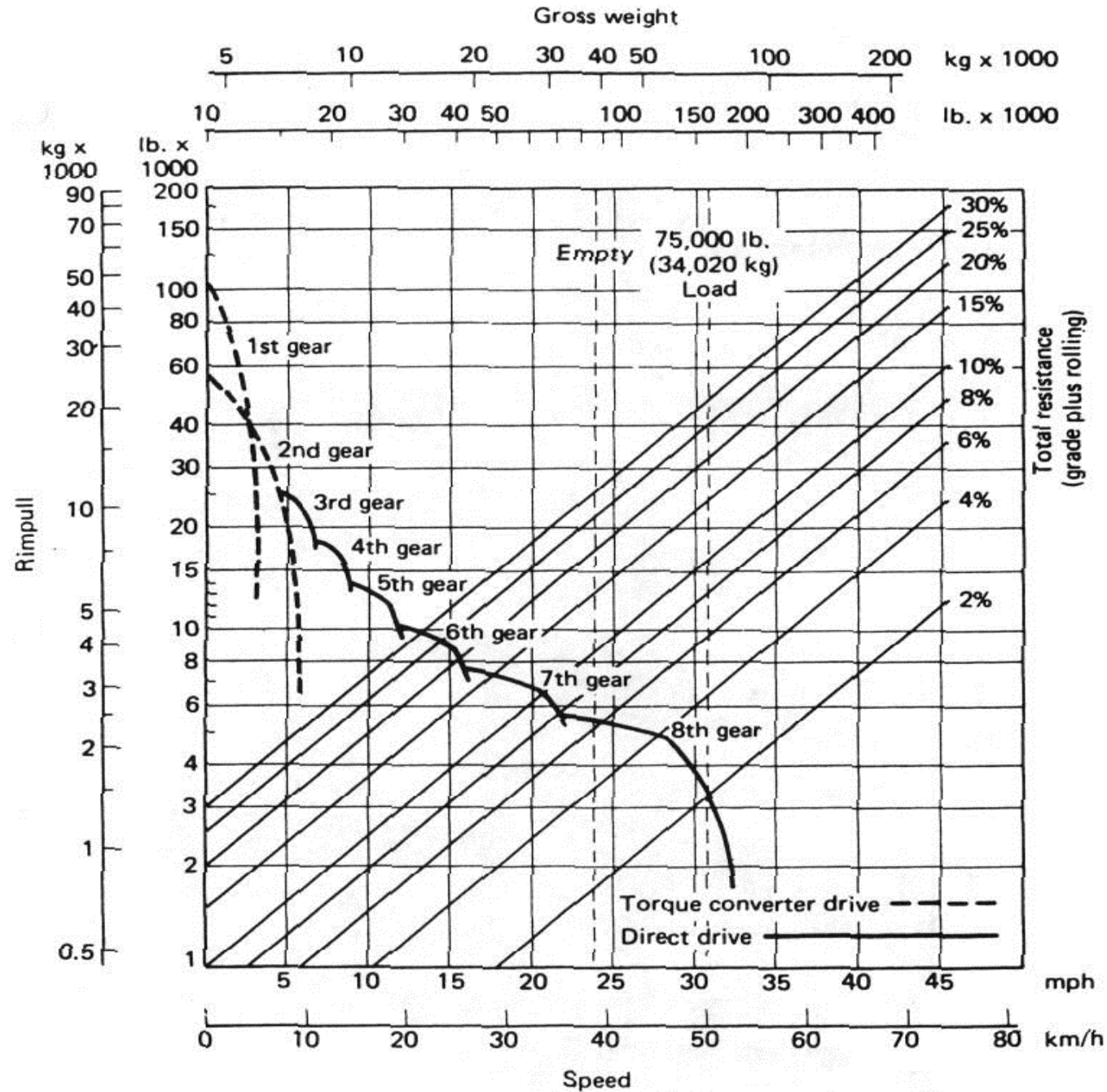
The calculated bank measure volume will be

$$20.5 \text{ cy} \times (0.8 \times 1.1) = 18.04 \text{ bcy}$$

CYCLE TIME FOR A SCRAPER

- The cycle time for a scraper is the time to load, haul, dump, turn, return and turn back into position
- Scraper Configuration
- Job Condition, grades, rolling resistance and material type
- Average load time for push-loader scraper in common earth is 0.85 min
- Both haul and return times depend on the distance traveled and the scraper speed
- Dump times vary with scraper size and project condition
 - ❖ Single engine 0.3 min – 0.44 min
 - ❖ Tandem 0.26 – 0.28
- The average turn time in the cut is 0.3 min and on the fill the average is 0.21 min

Scraper Production Chart



Example

1. If the scraper production cycle time of 5.52 min could be maintained for a period of 60 min, the unit would make

$$60/5.52 = 10.9 \text{ trips per hour}$$

2. Efficiency Factor

Studies of scraper operation suggest that the average productive time is 69% of a perfect 60 min hour (excluding weather delay to the job)

The actual number of trips in the real world would be

$$10.9 \times 0.69 = 7.5 \text{ trips per work hour}$$

Example 2

Problem

Estimate the production of a single two-axle scraper

Total Cycle Time 7 min

Max Heaped Volume = 31 LCY

Max Payload = 75,000 lb

Material: Sandy Clay, 3200 lb/BCY, 2650 lb/LCY,

Operating Conditions = Average

Scraper Production Example

Loads per Cycle

- Heaped Cap. Wt. = $31.0 \text{ LCY} \times 2,650 \text{ lb/LCY}$
= 82,150 lbs
- 82,150 lbs exceeds the 75,000 lbs Rated Max Payload of the Scraper.
- The maximum scraper volume is **limited by weight** to
= $75,000 \text{ lbs (Rated Wt)} / 3,200 \text{ lb/BCY}$
= 23.4 BCY/Load

Scraper Production Example

Number of Trip per 50 min hour $50/7 = 7.14$ trips

Volume per scraper per 50 min hr $23.4 \times 7.14 = 167$ bcy/hr

Push time $T_p = 1.4 L_t + 0.25$

$$1.4 (0.85) + 0.25 = 1.44 \text{ min}$$

Number of scraper required T_{cycle}/T_p

$$7/1.44 = 4.86 \text{ equal } 5 \text{ scraper}$$

Pusher contact per a 50 min hr $\rightarrow 50/1.44 = 34.7$ contact

Production $= (\text{efficiency}/\text{push time}) \times \text{volume per load}$

$$= 34.7 \times 23.4$$

$$= 811 \text{ bcy/hr or}$$

$$= \mathbf{167 \times 4.86}$$

$$= \mathbf{811 \text{ bcy/hr}}$$

Next Week.

Lecture 7



CONSTRUCTION EQUIPMENT AND METHODS