

## PP6 - Port of Rijeka Authority (PRA)

### PRAILWAY - Port of Rijeka Authority Railway Wagon Loading Optimization Application

#### - OVERVIEW -

When loading cargo on wagons, it is extremely important to optimize loading in relation to the wagon capacity. The current mode is that operators, according to previous experience and using simple Excel table, or even just by using mental effort and skipping formal optimization, create wagon utilization calculation and loading plan. Such primitive way of work cannot ensure the ideal utilization of wagon capacity. The result is a loss of space and capacity on the wagon, and inefficient work and transport by rail with significant financial impact.

The solution is to create tailor-made software that will independently calculate the loading plan based on cargo and wagon data. This will speed up the loading process and increase the productivity of rail transport. Ultimately it also contributes to increasing the competitiveness of the transport route.

**Container train** is composed of a number of wagon cars:



**Each wagon** type possesses specific technical data, among which the most important are:

1. Number of axles
2. Weight
3. Maximum total weight
4. Length

Wagons are loaded with containers, and each wagon depending on type, can carry one or more containers loaded at wagon positions predefined by technical characteristics data.

**Containers** are divided by their length and standardized. Most commonly used in the area of port of Rijeka are:

1. 20 ft.
2. 30 ft.
3. 35 ft.
4. 40 ft.

Furthermore, containers can be Dry Van (DV/DB), High Cube (HQ/HC), Flat Rack (FR), Refrigerated-reefer (RF), and Open Top (OT), and these models in various configurations.



The task the application achieves is to load and distribute containers that need to constitute one shipment to available train wagon composition to be transported from point A to B and show them visually/graphically.

Application configuration:

1. Ability to enter container models and data
2. Ability to enter and save train composition (up to 20 wagons each)
3. Ability to exchange saved train composition data with other registered users
4. Administrative rights for selected users

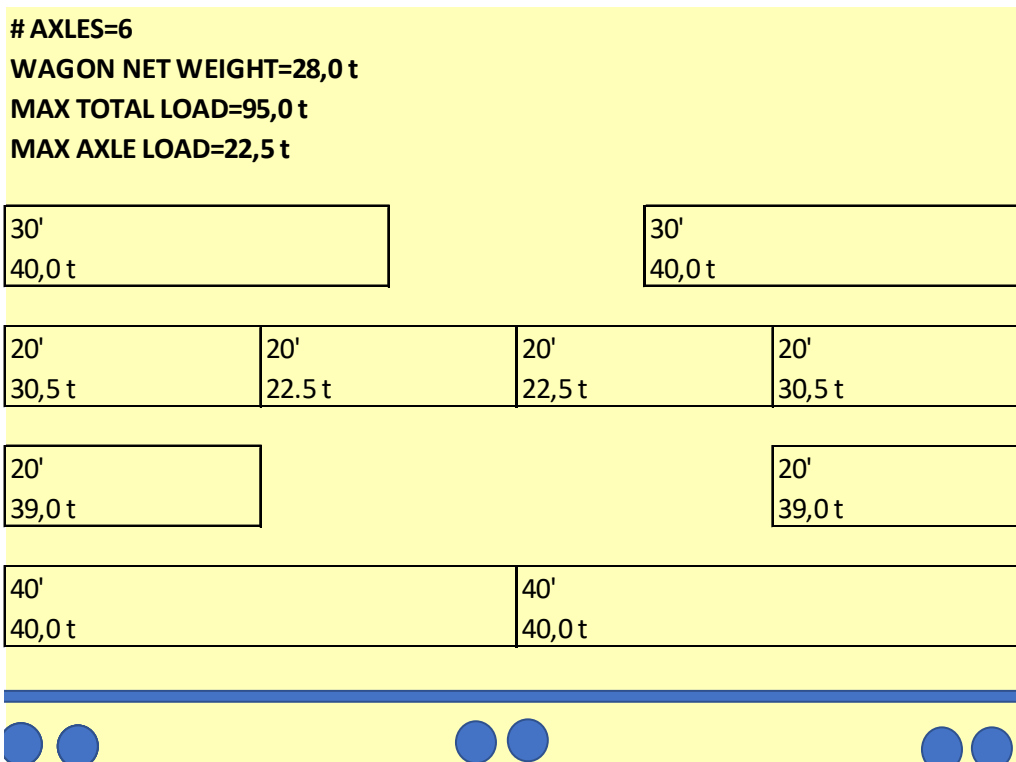
Application functionalities:

1. Input number and type of containers to be transported
2. Load cargo list in predefined Excel form (sample provided)
3. Load and save train composition to be used
4. Automatically distribute containers to wagons according to business rules – optimization goal is full wagon utilization by weight
5. Possibility of „manual“ mode: redistribution of containers on wagons after computer-assisted optimization
6. Save loaded cargo train composition
7. Every user can access only own data related to train composition and end result, but can use predefined container types common for all users
8. Dangerous cargo is automatically placed at the end of train composition

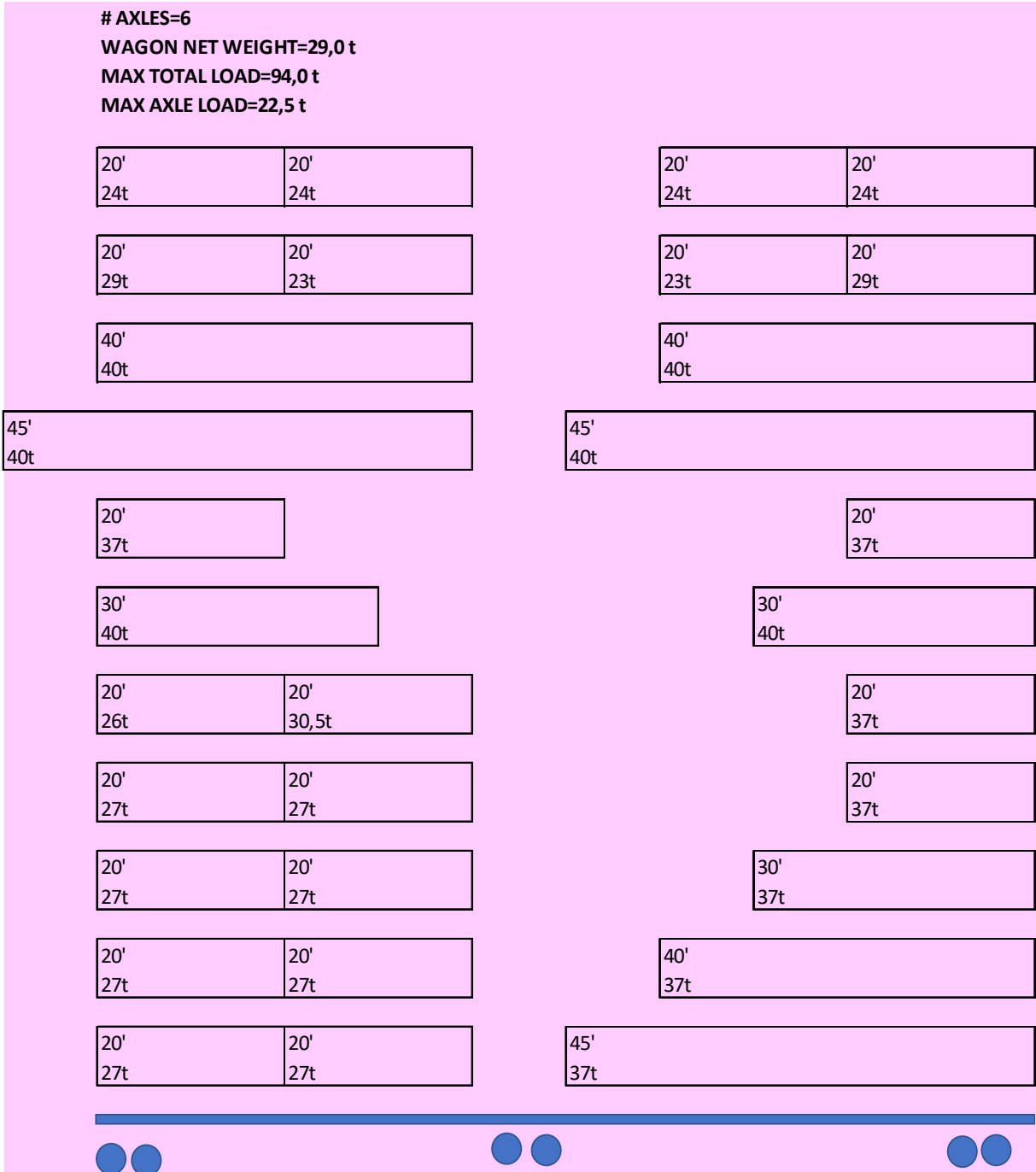
9. Application respects maximum length of the train according to State of the railway network, maximum weight, maximum axle load and technical characteristics of the used wagons

Predefined and loaded dynamic loading schemas for the following wagons used with locomotives in the port of Rijeka:

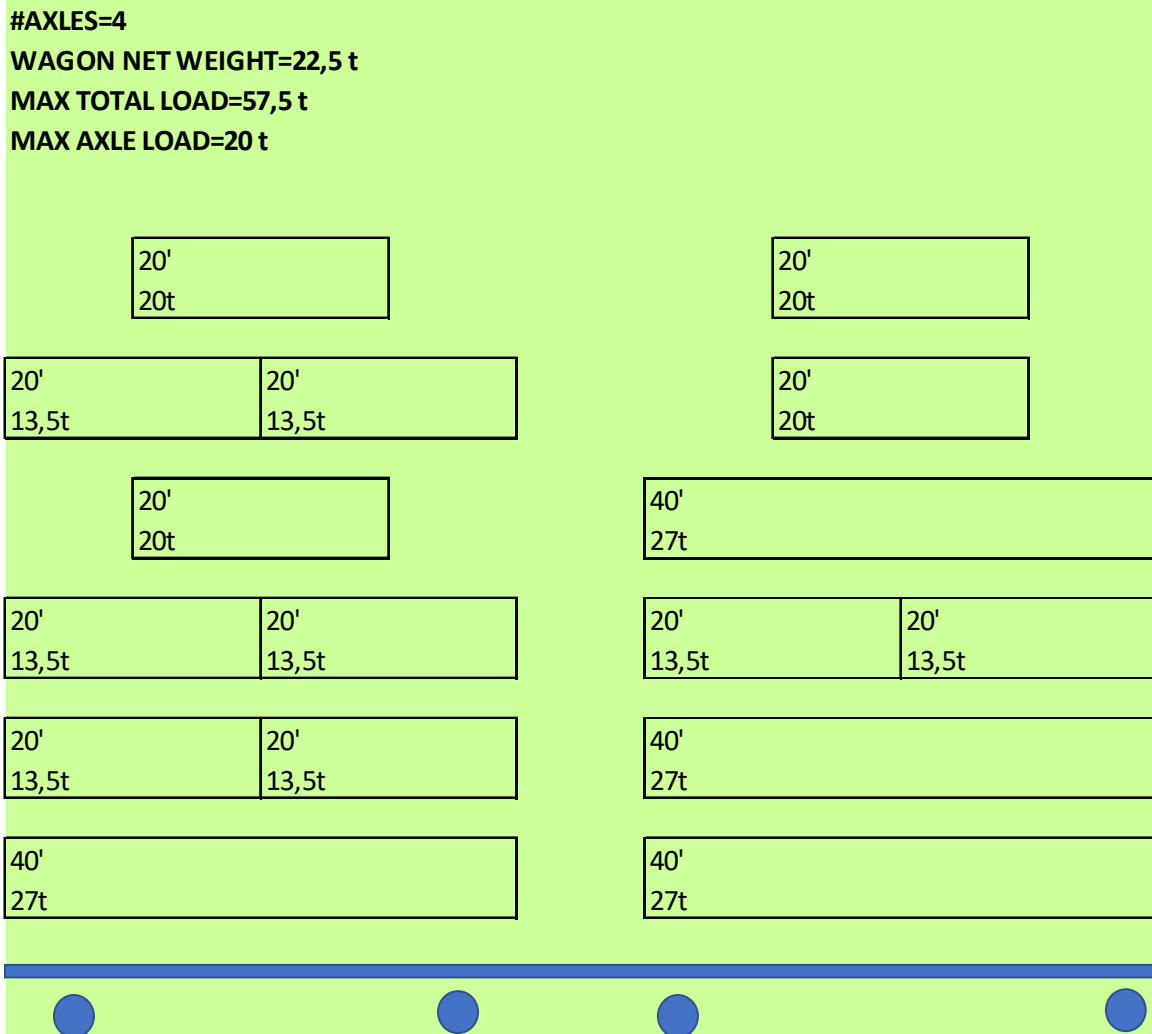
**Wagon type 1: Sggrs(s) 80'**



**Wagon type 2: Sgmrss 90'**



### Wagon type 3: Laags 90'



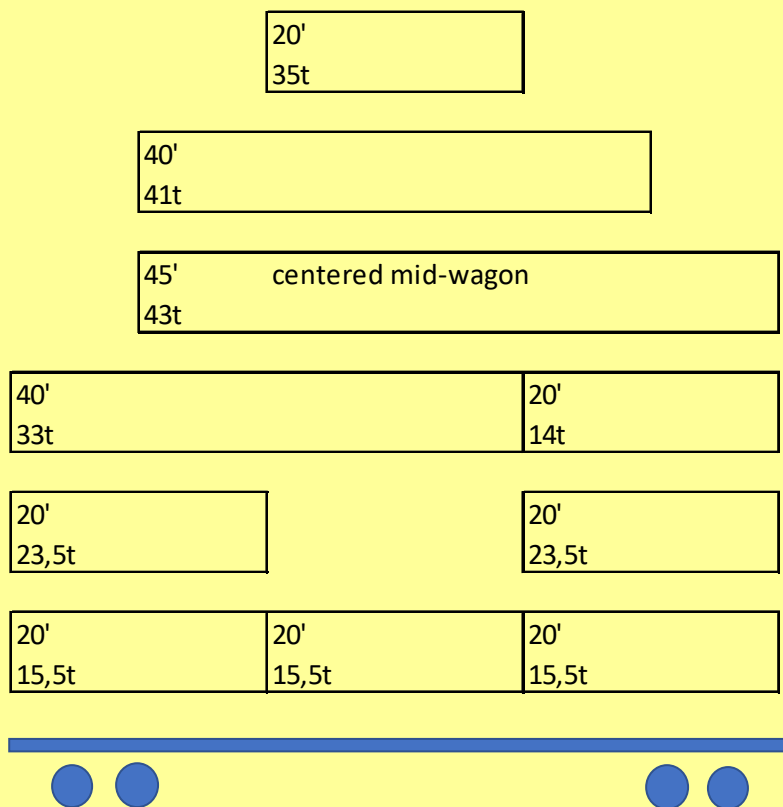
## Wagon type 4: Rgs-Z 60'

# AXLES=4

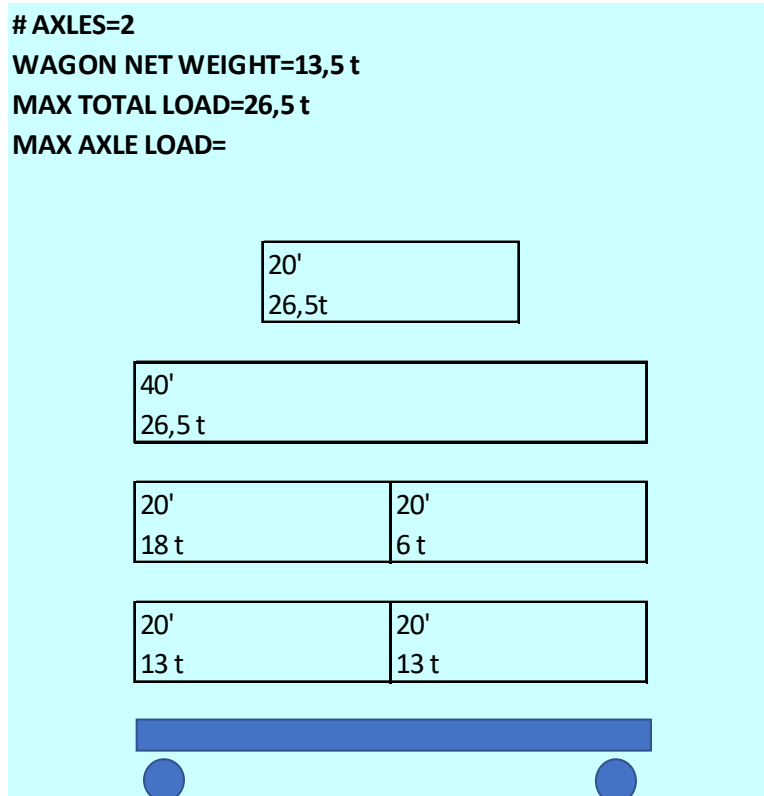
WAGON NET WEIGHT=22,0 t

MAX TOTAL LOAD=57,5 t

MAX AXLE LOAD=20 t



## Wagon type 5: KGS-Z 40'



## Wagon type 6: LGS-Z 40'

