Automated Container Terminal Today

An Introduction To the Integrated Automated Container Terminal [IACT]

AAPA Facility Engineering Seminar
Charleston South Carolina
Panel V
18 November 2009

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Current Container Terminal Automation Systems

e Complex Systems with Many Machi

n Be Expensive ($2.5-$2.8 MM per A

Not Eliminate Congestion At the Ber

ll Do Not Allow the STS Cranes to

hieve Max Operational Efficiency

Methods

Y Stacks Arranged Perpendicular to the Quay "End-
oaded“ –

HHLA - CTA - Altenwerder

APMT - Portsmouth

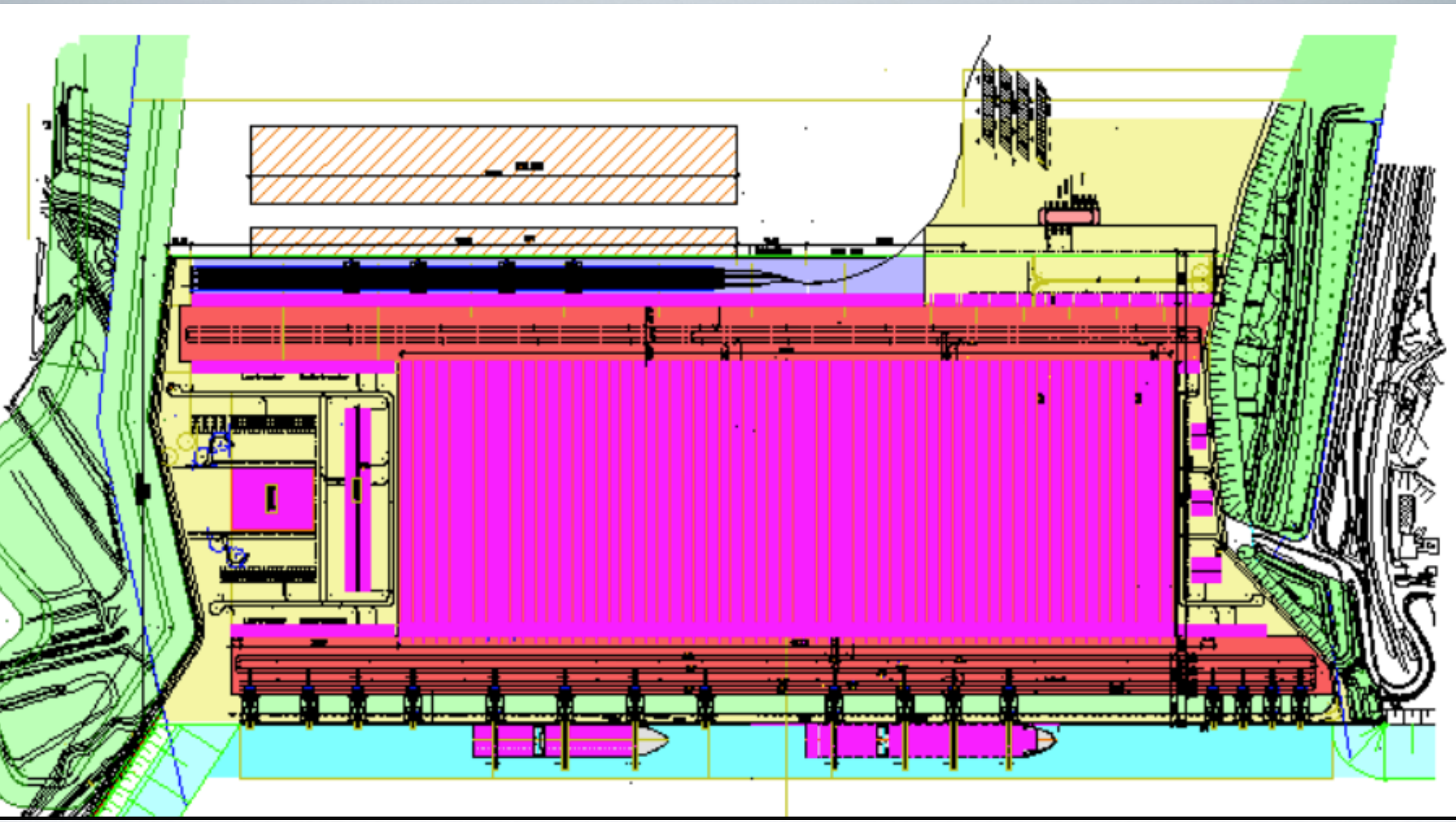
EuroMax - Rotterdam

ZPMC - Shanghai Prototype

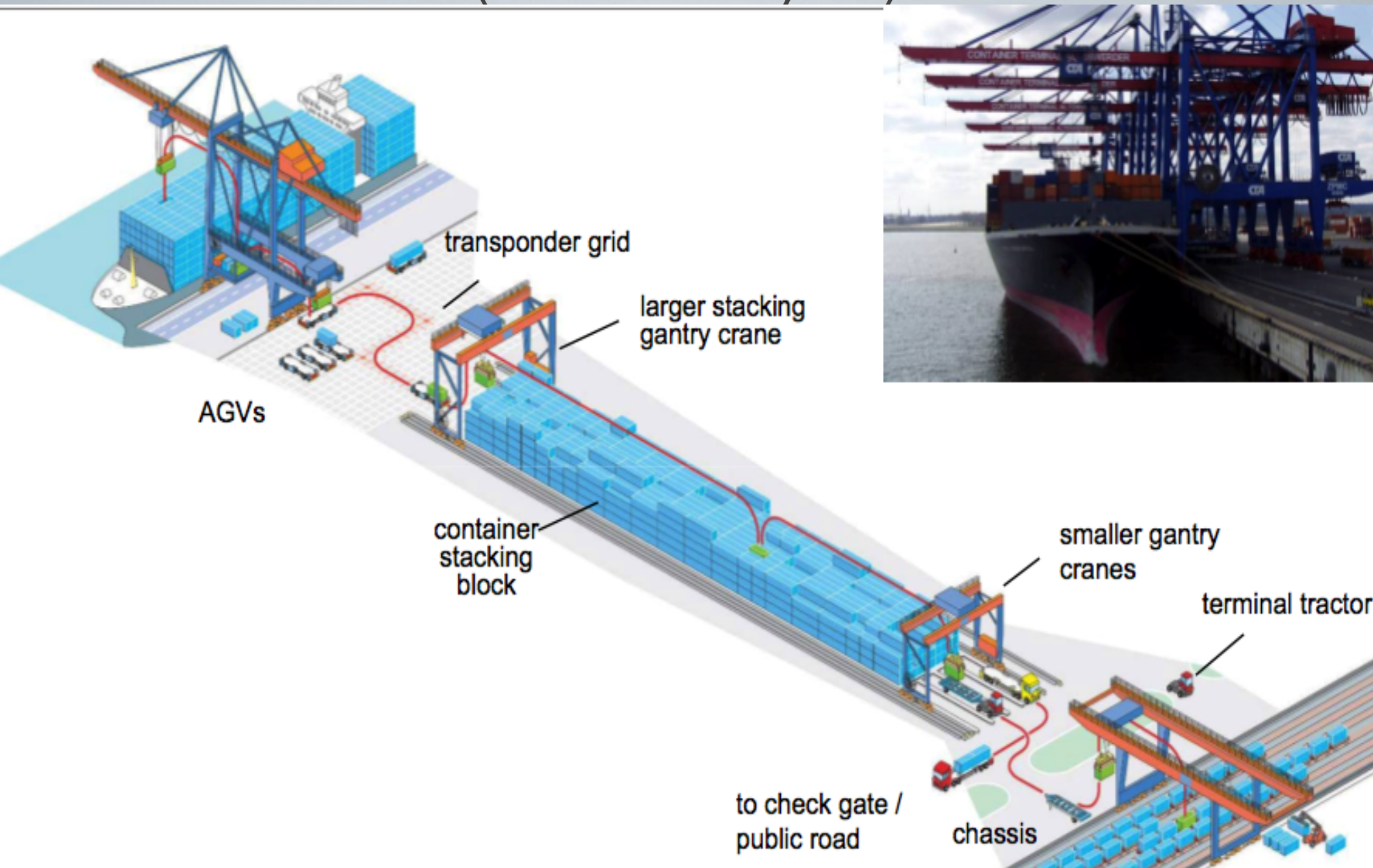
Y Stacks Arranged Horizontally to the Quay "Side-Loa

Automated Terminal Systems - the Integrated Autom
Container Terminal [IACT]

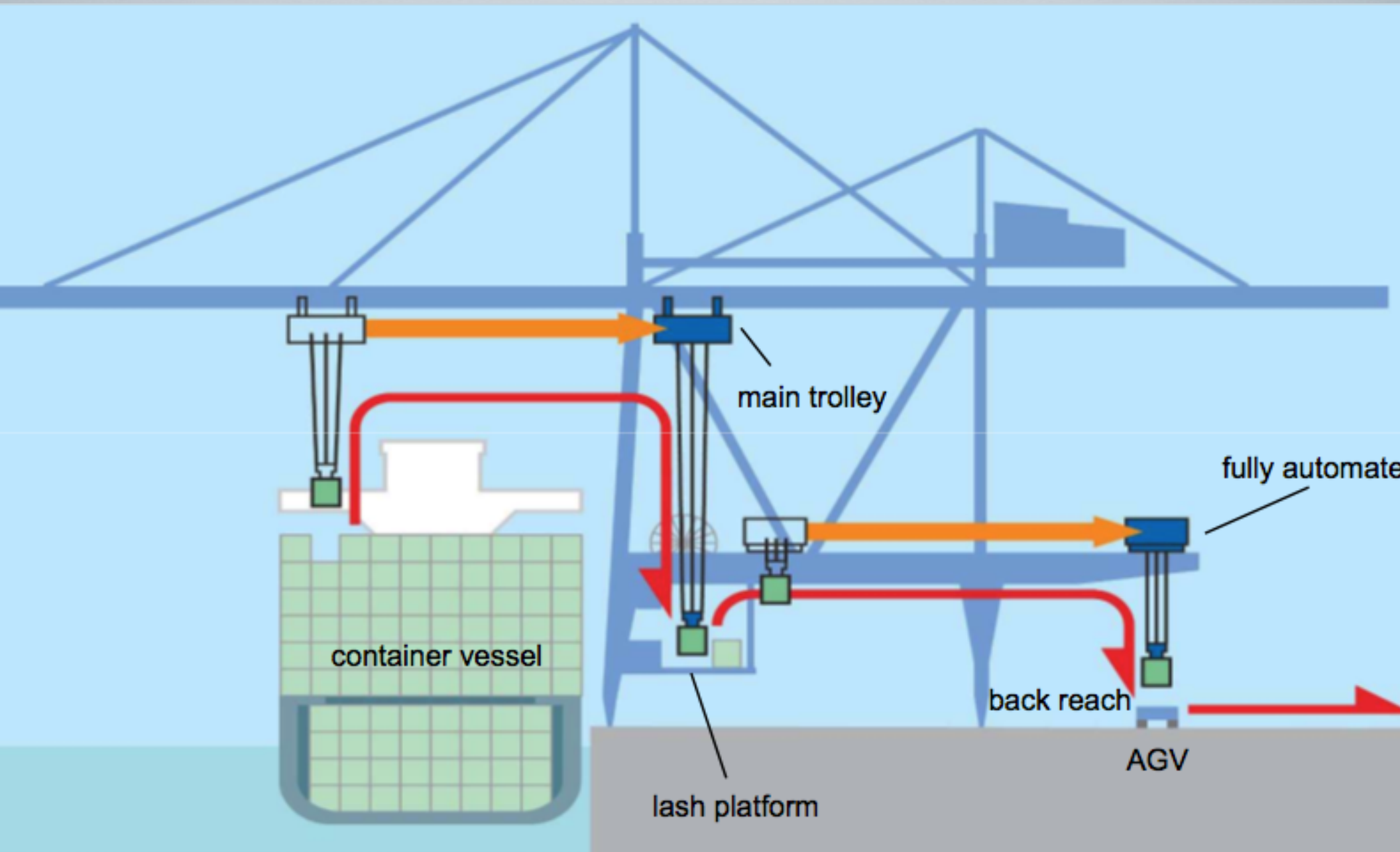
Typical End-Loaded Perpendicular Design



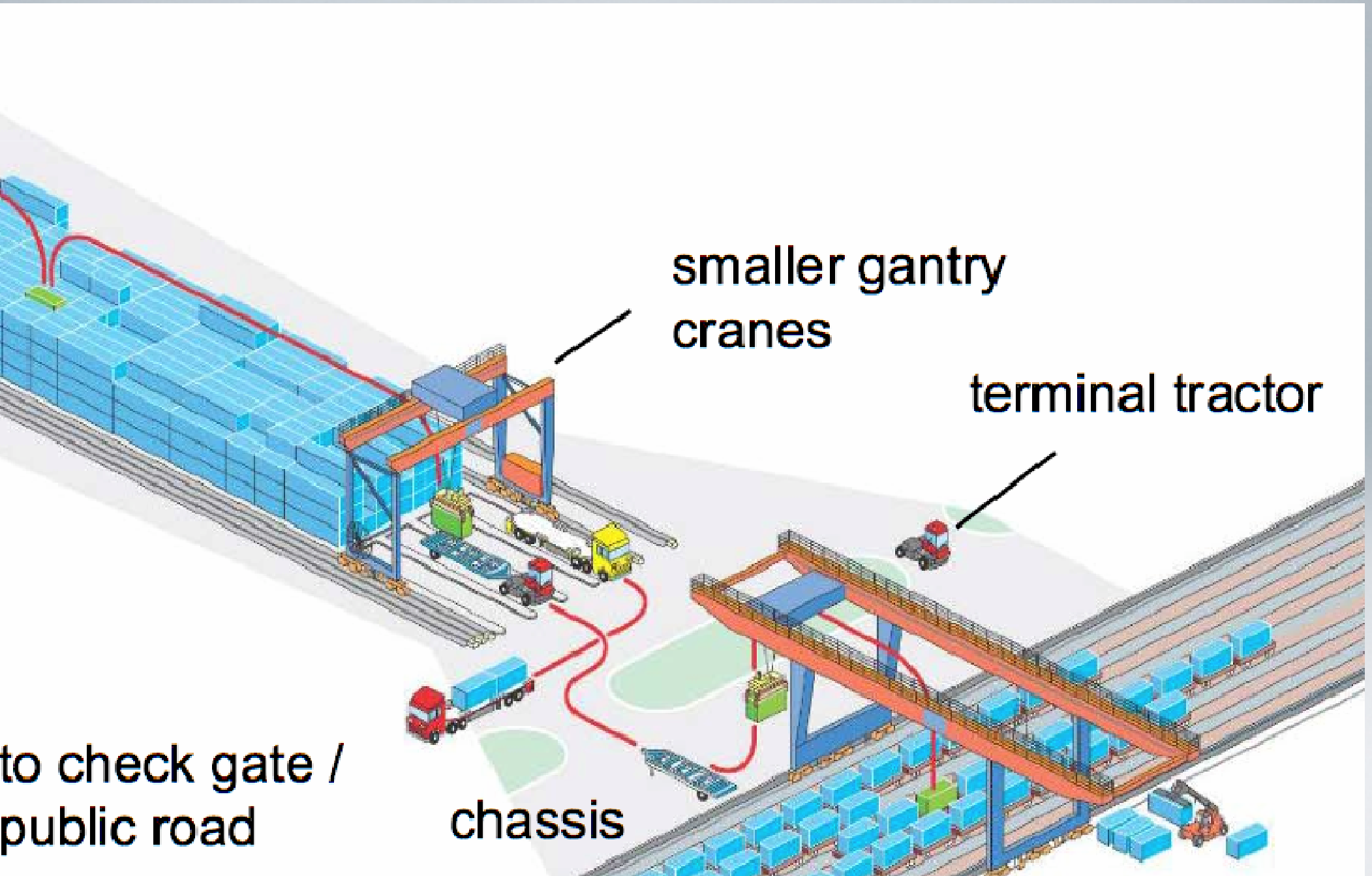
Typical End-Loaded Concept (Euro-Style)



WO PHASE STS TRANSFE

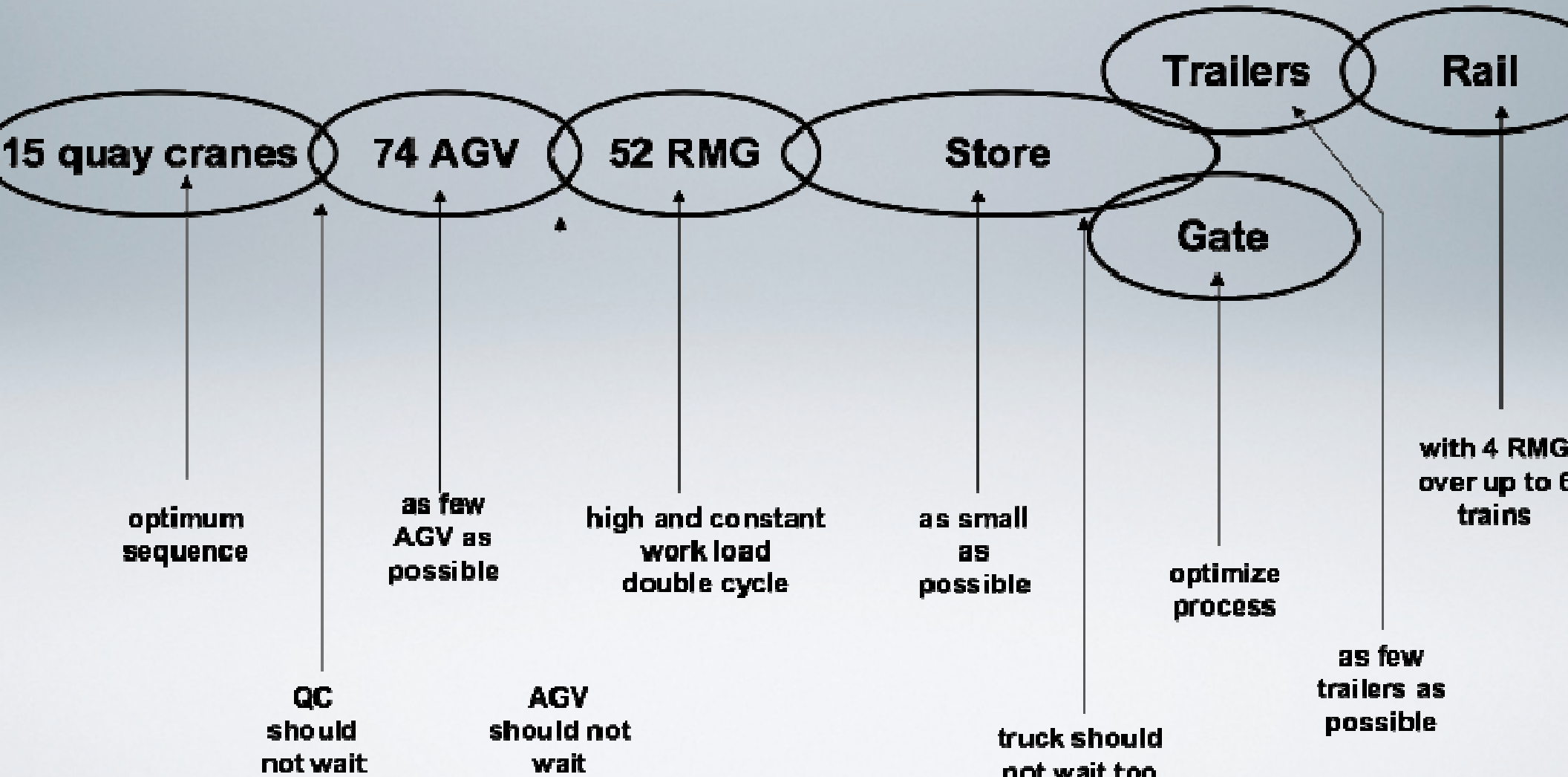


TYPICAL
TRUCK + RAIL INTERFACE



Requires Many Machines

Elements and Interfaces of Handling System



HHLA - CTA - Altenwerder

HHLA - CTA – Altenwerder

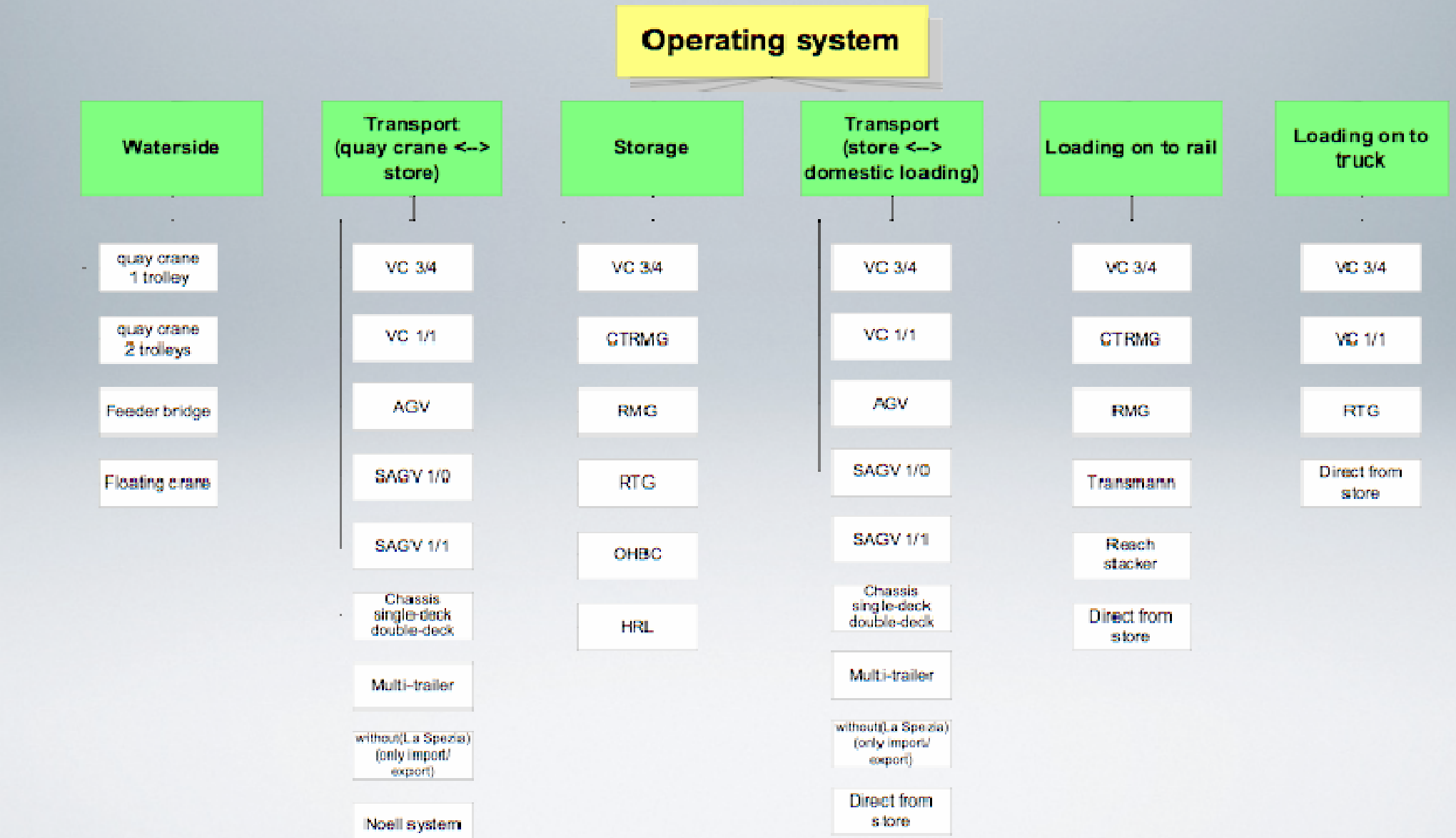
15 – Quay Cranes
74 - AVGs
52 – RMG/Stacking Cranes
4 – RMGs at Rail Loading

145 – Total Machines

quires Complex Operating Syste

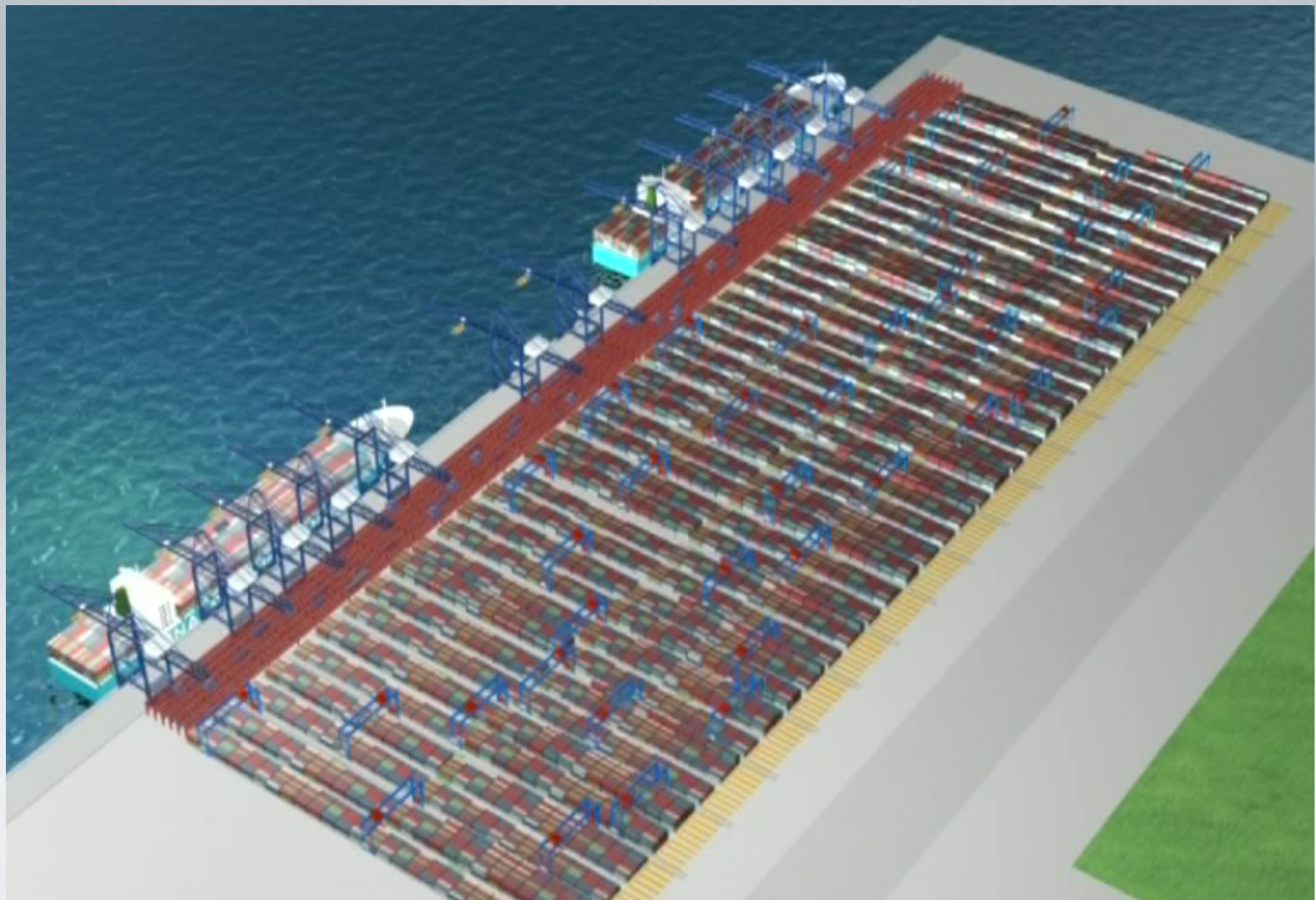
Operation System Components

Hamburg Port Auth

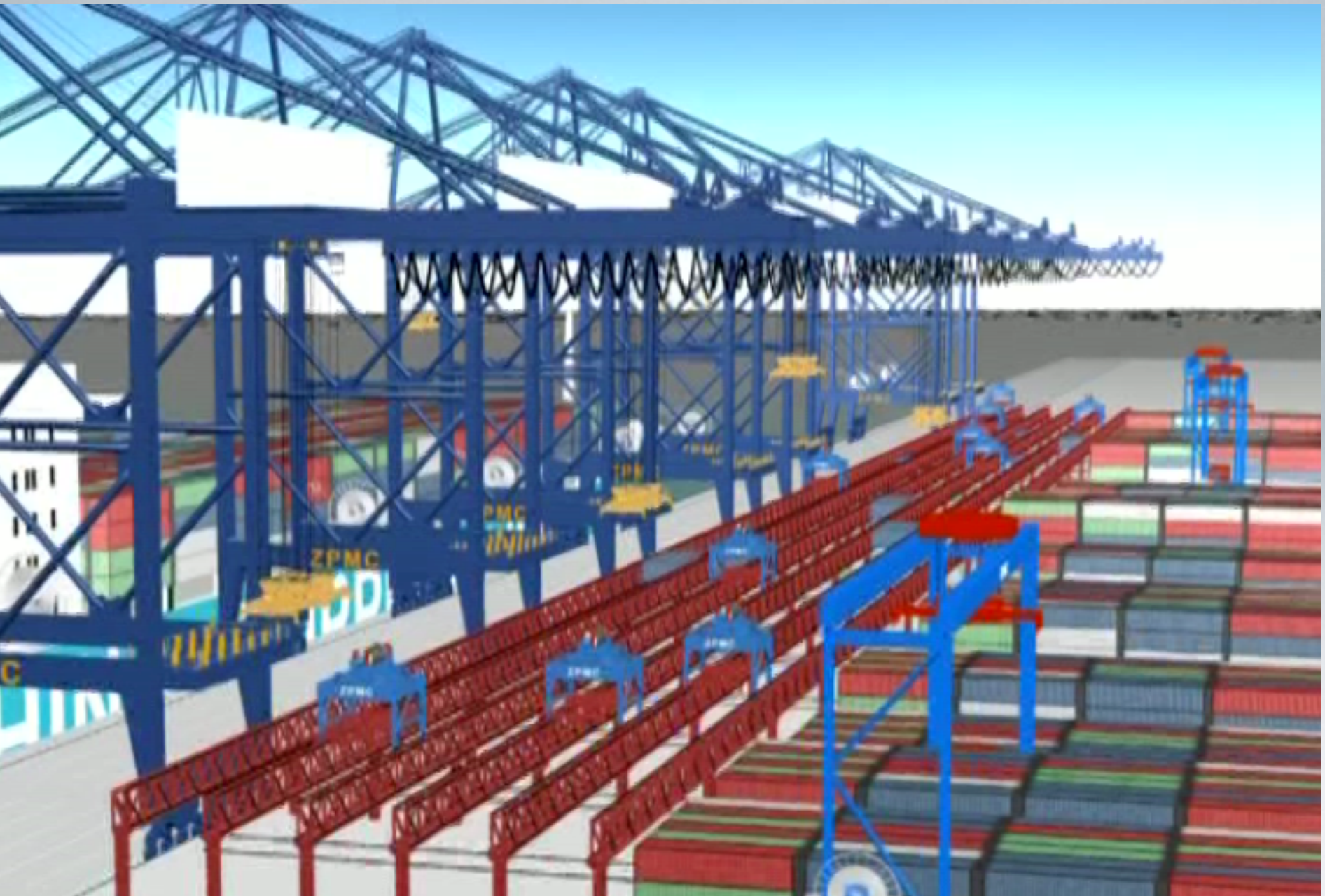


CONGESTION AT THE BERTH

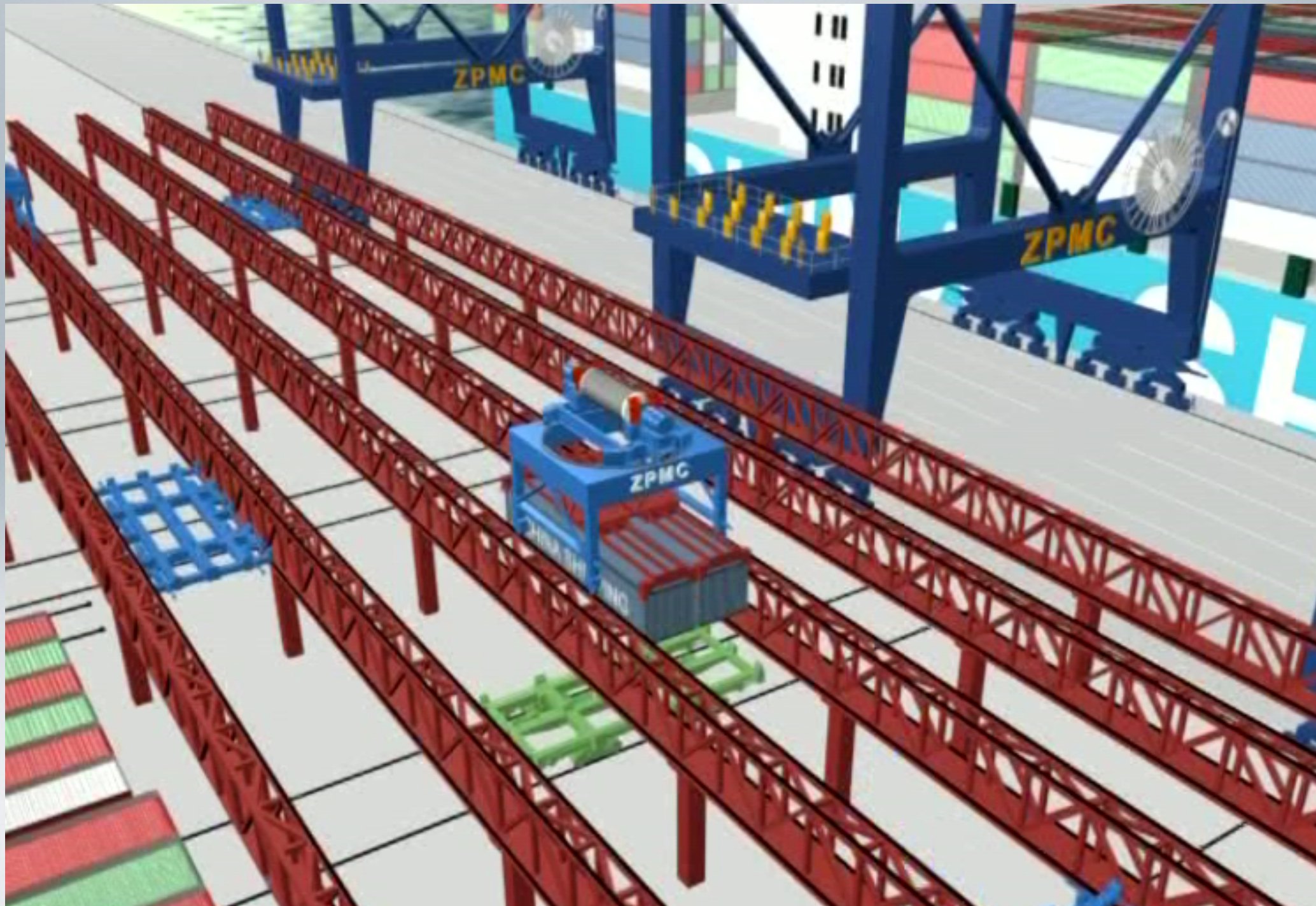
The PROTOTYPE is Another Design Concept



RRIERS WITH RAIL MOUNTED TRANS
SYSTEM



TO GROUND SHUTTLE



ZPMC PROTOTYPE

uces CO_2 by Replacing Diesel Electric Shuttles or AG
a Steel Infrastructure + More Cranes, But:

arge Complex Steel Infrastructure = High CAPEX

empts to Resolve the Congestion Issue But:

dds Machines

dds Complexity

creases Dynamic + Static Loads on the Quay Structu

Terminal Just Cause More Congestion At the Berth

- ponse to Larger Ships
- dding More Ship-to-Shore Cranes
- st Adds More Congestion on the Berths
- Vhich In-Turn Adversely Impacts Overall Crane/Termi erformance

A Better Automation System Would Then

w Each Machine To Operate Independently;

vide "Buffer" Areas Between Operations to Allow For akdowns In any One Process;

w For Full Automation

TS to Stacks

Within Stacks For Storage and Retrieval

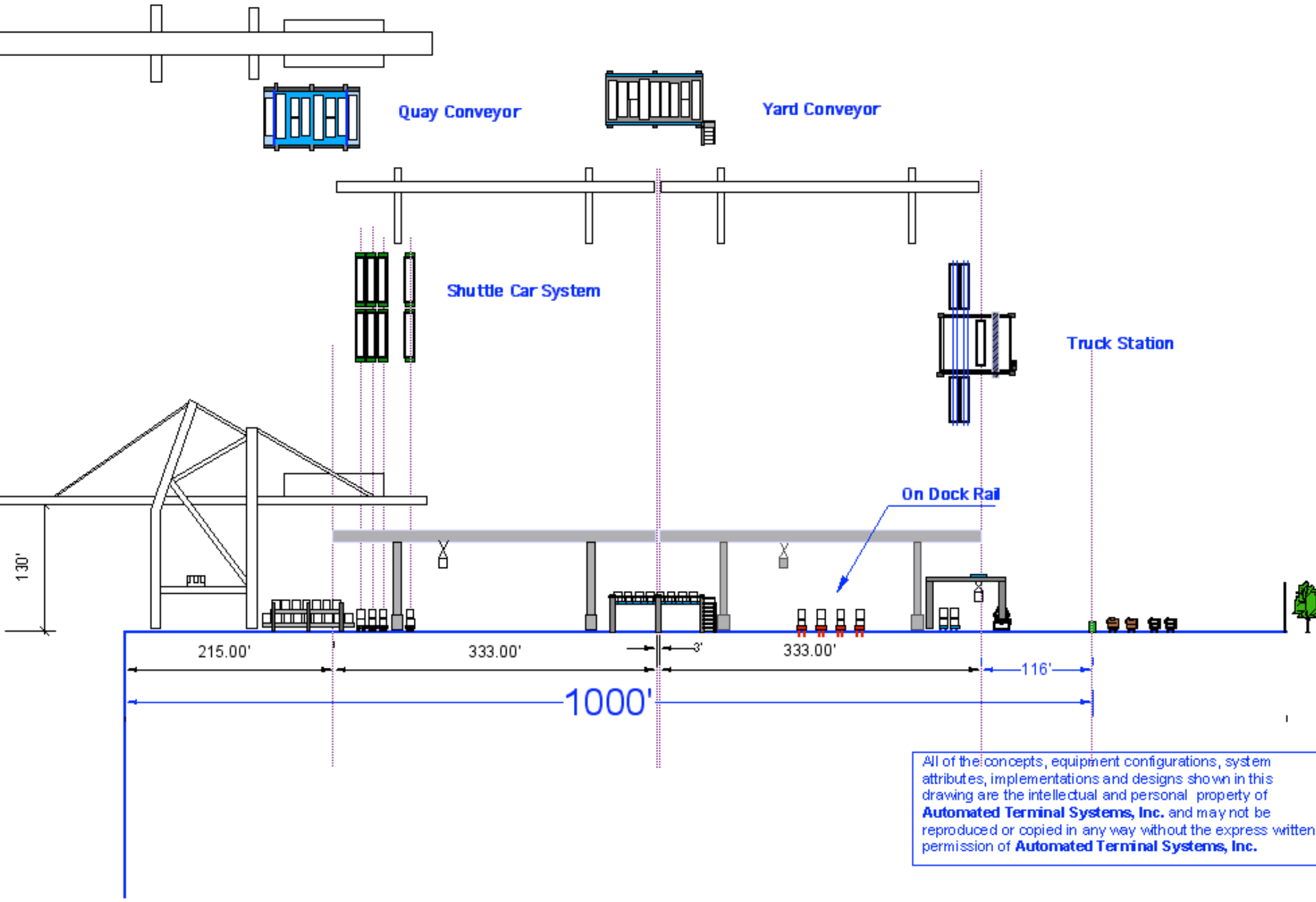
etween Stacks and Rail

The IATC System

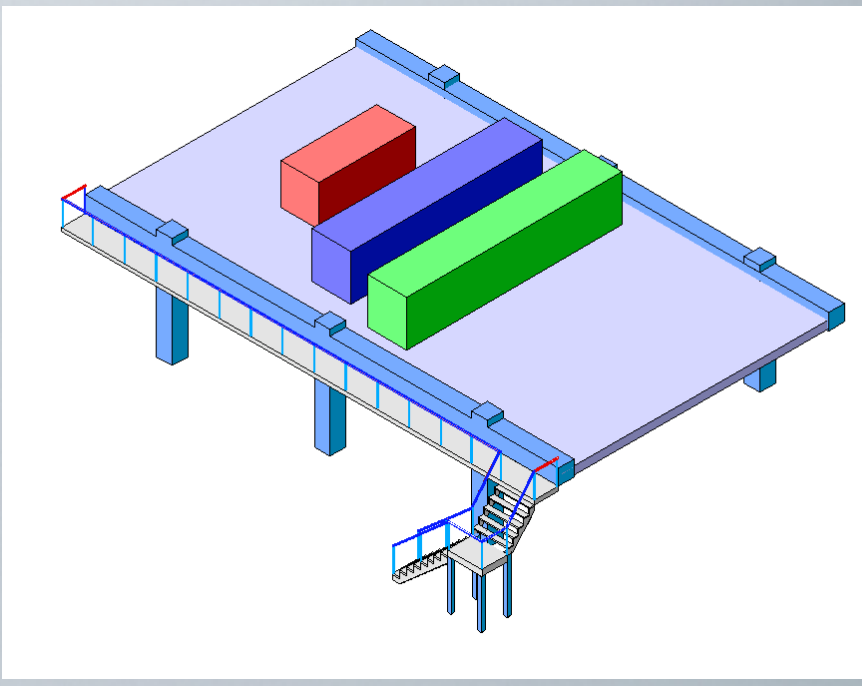
- Use of Larger More Robust Equipment - Rail Mounte
  try Cranes [RMGs] (+200' Gage, w/ Cantilevered End
  al width +300')
- olify Facility Layouts
- opt a more "Factory-Like" Approach to Processing
  ntainers
- Electric Designs

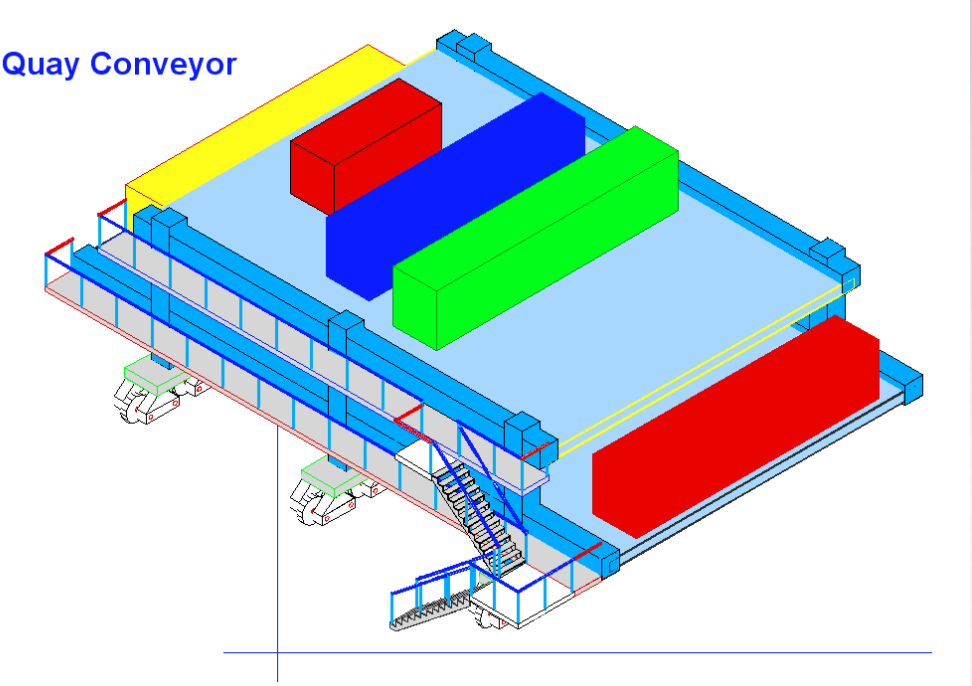
TYPICAL END-LOADED DESIGNS

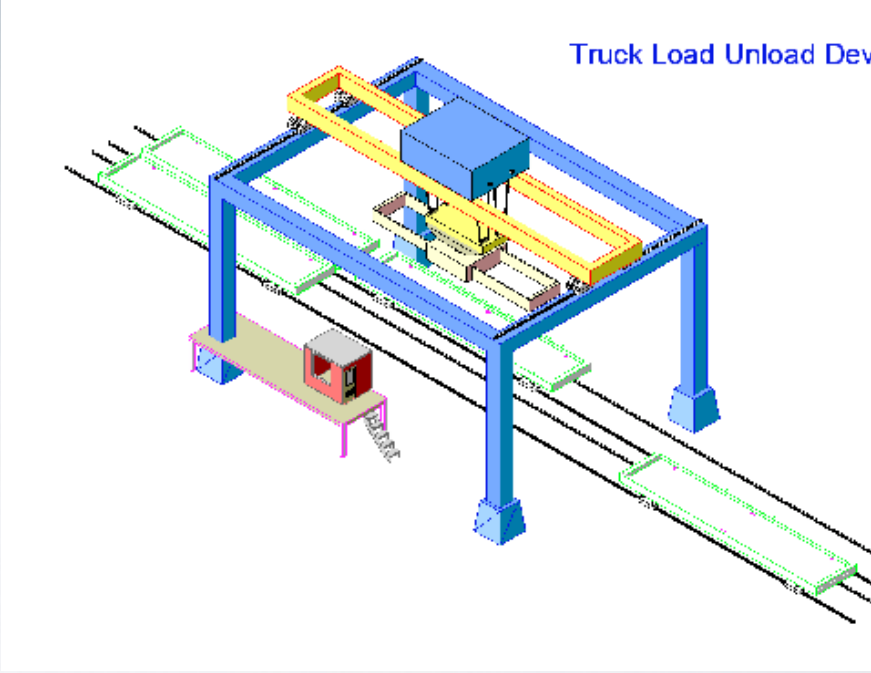
Integrated Automated Container Terminal



IACT COMPONENTS







Typical System Requirements

Euro	
S CRANE	Dual Hoist Tandem Pick
ANSFER TO ACK	Semi Automated AGVs Transfer Strads
ck erations	Small RMGs Perpendicular Operator In the Loop
ck + Rail nsfers	Manual
erating tem	Expert
mplexity	High

IACT	
STS CRANE	Standard Design Automated over land
TRANSFER TO STACK	Indexed Conveyor Fully Automated
Stack Operations	Large RMGs Fully Automated Industrial Design
Truck + Rail Transfers	Semi-Automated
Operating System	Computational Intelligence Real-Time Process Control
Complexity	Low

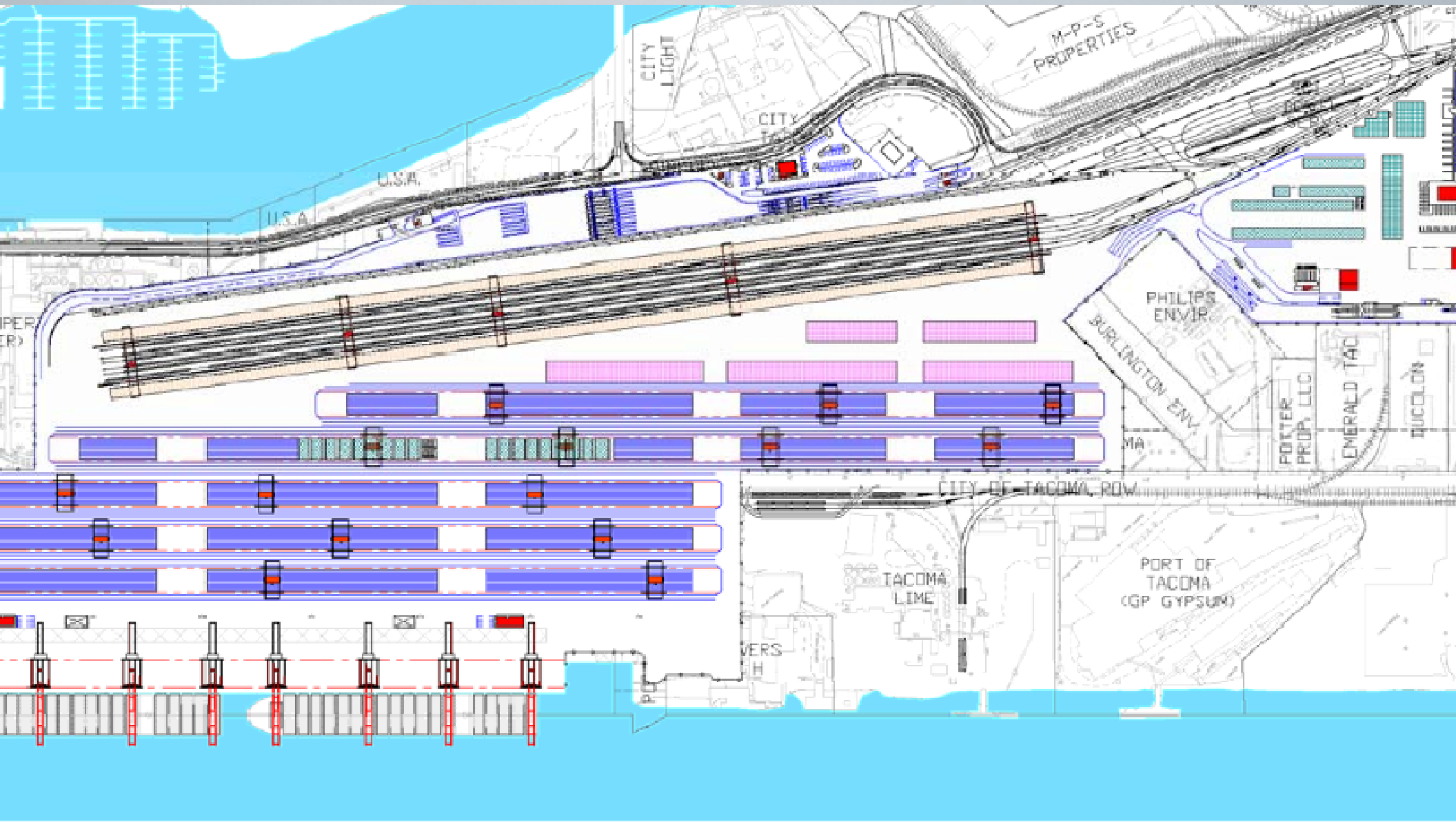
(Typical 4-Berth Terminal)

Euro	
rths	4
S Cranes	12
Blocks	26
Gs	54
Vs/Shuttle Strads	>125
ck Handlers	30

IACT	
Berths	4
STS Cranes	12
CY Blocks	8
RMGs	18
Conveyors	30
Truck Stations	8

mparison of Automated Systems A
Proposed NYK Terminal
At Port of Tacoma

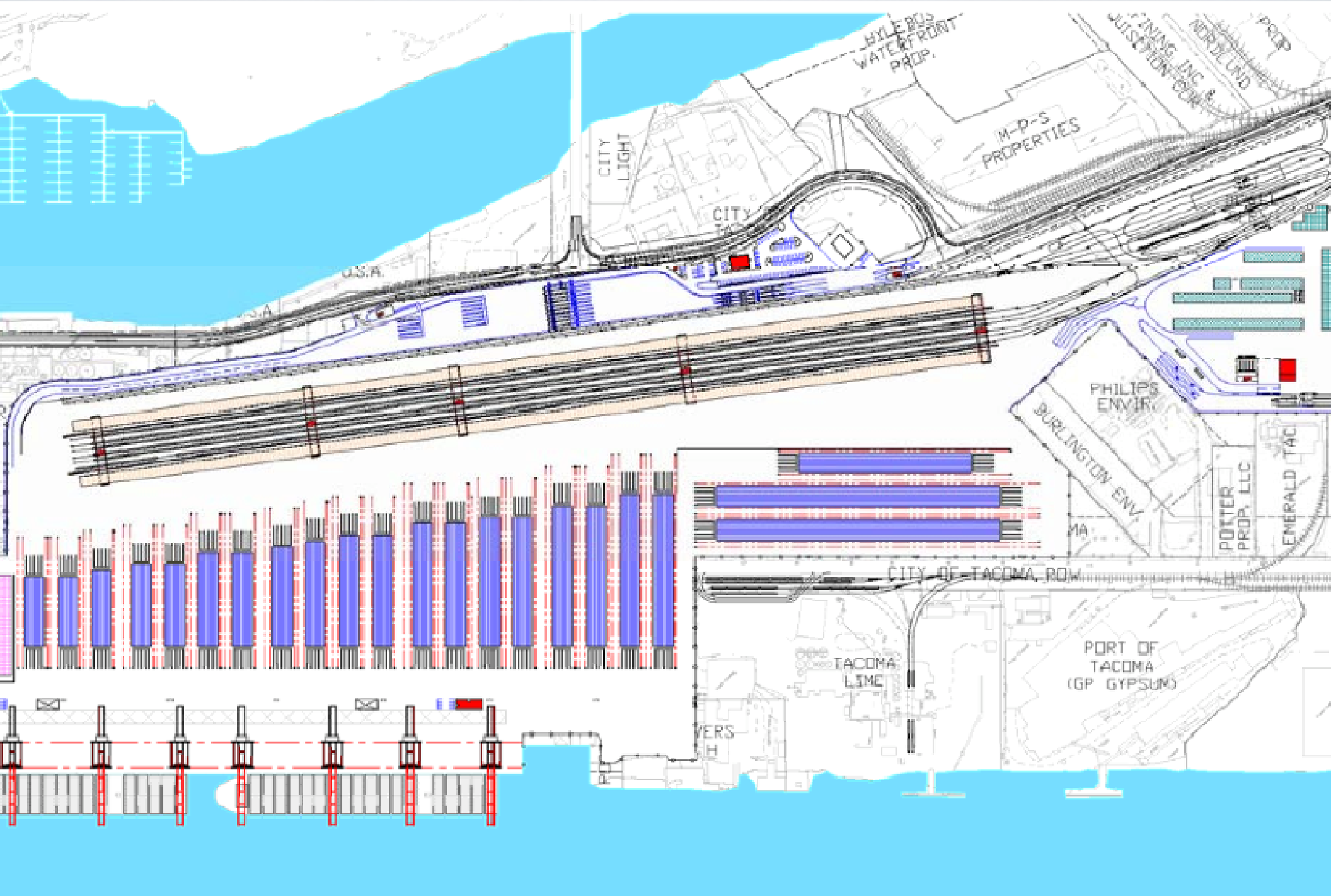
TYPICAL SIDE-LOADED RMG DESIGN



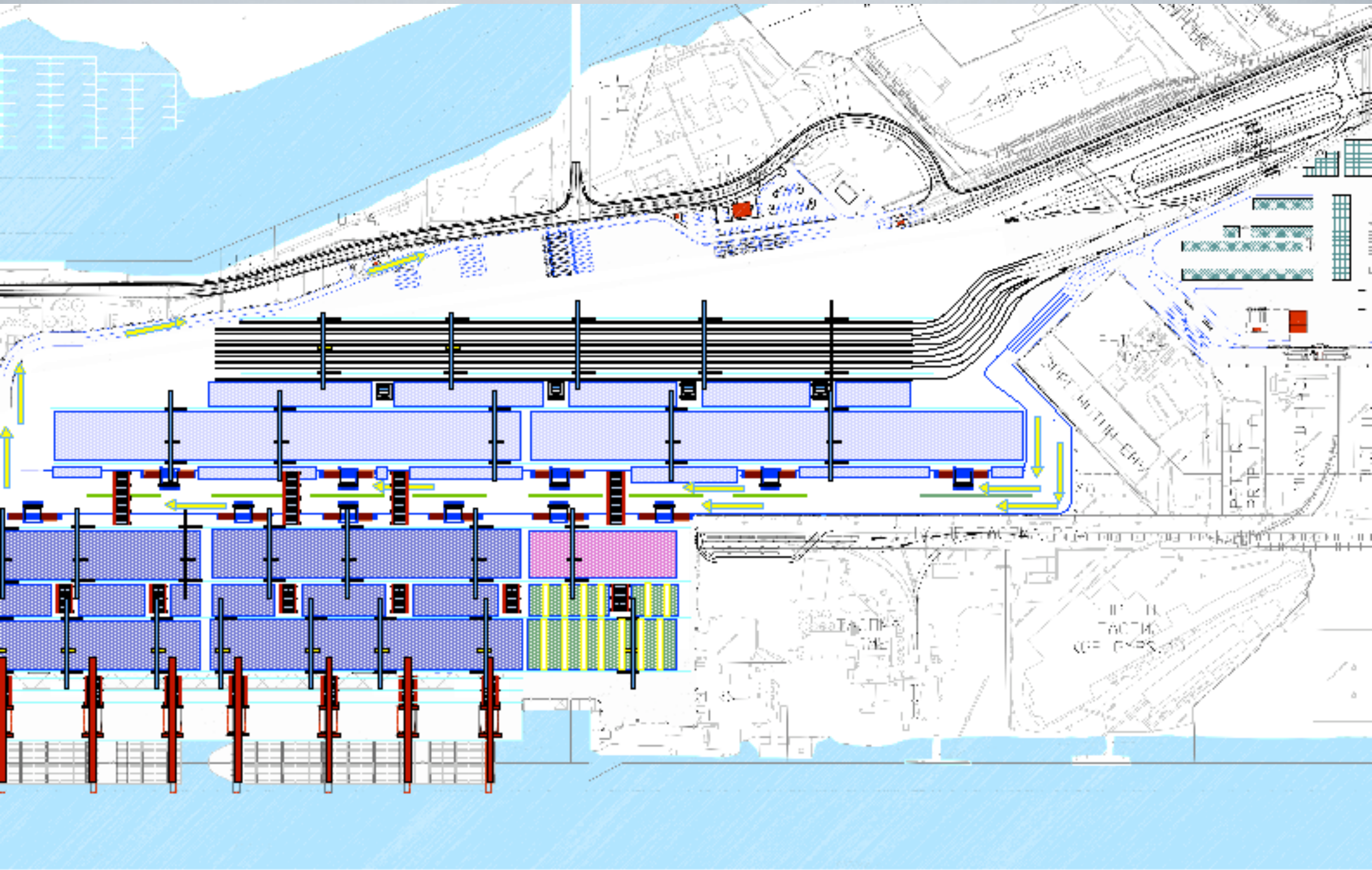
PROBLEMS WITH CONVENTIONAL SIDE-LOADED RMG DESIGNS

- to Take Advantage of RMG Capabilities
- ain Beam Spans too Limited
- ack Heights too Low
- erated as if the RMGs Were Large RTGs
- ely on Chassis Hustlers to Move Containers Between acks + STS Cranes

OSSIBLE END-LOADED LAYOU



IMPACT ALTERNATIVE
DIRECT TRANSFER BY CONVEYORS



REQUIRED EQUIPMENT

uipment Type	IACT	End Loaded RMG	Side Loade RMG
RMGs	27	50	46
stler Combos	0	76	84
Side Picks	2	4	4
Truck L/UI	12		
Conveyors	23		

QUIPMENT COSTS COMPARE
ALL COSTS IN $MM

ipment Type	IACT	Cost	End Loaded RMG	Cost
RMGs	27 @ 4.5M	121.5	50 @ 3.5M	175.0
stler Combos	0 @125,000	0	76 @125,000	9.5
Side Picks	2 @ 500K	1.0	4@500K	2.0
Truck L/Ul	12 @ 1.0M	12.0		
Conveyors	23 @ 1.0M	23.0		
rane Rail + oundations			+6,200 lf (Over IACT)	5.0
Totals		157.5		191.5

Conclusion

he Equipment Required For the IACT is Availa
nd Proven;

milar Systems Are Operational In Heavy Indus

HE IACT System Can Reduce Equipment Cos
nd Complexity while Increasing Throughput
apacity (TEUs/AC./YR.)

s All About The Operating System

Additional Detail Available from Automated Terminal Systems Inc.

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