ThyssenKrupp Elevator Technology

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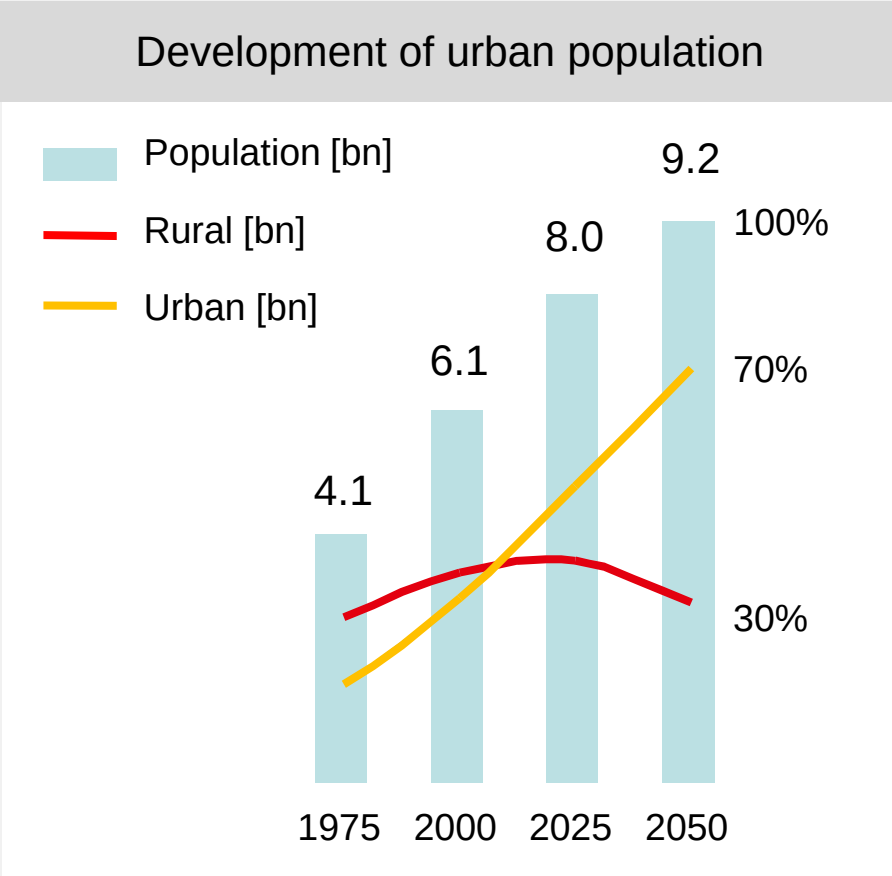
October 14th, 2015

Elevator Technology for High Rise Buildings

ThyssenKrupp Aufzugswerke

ThyssenKrupp

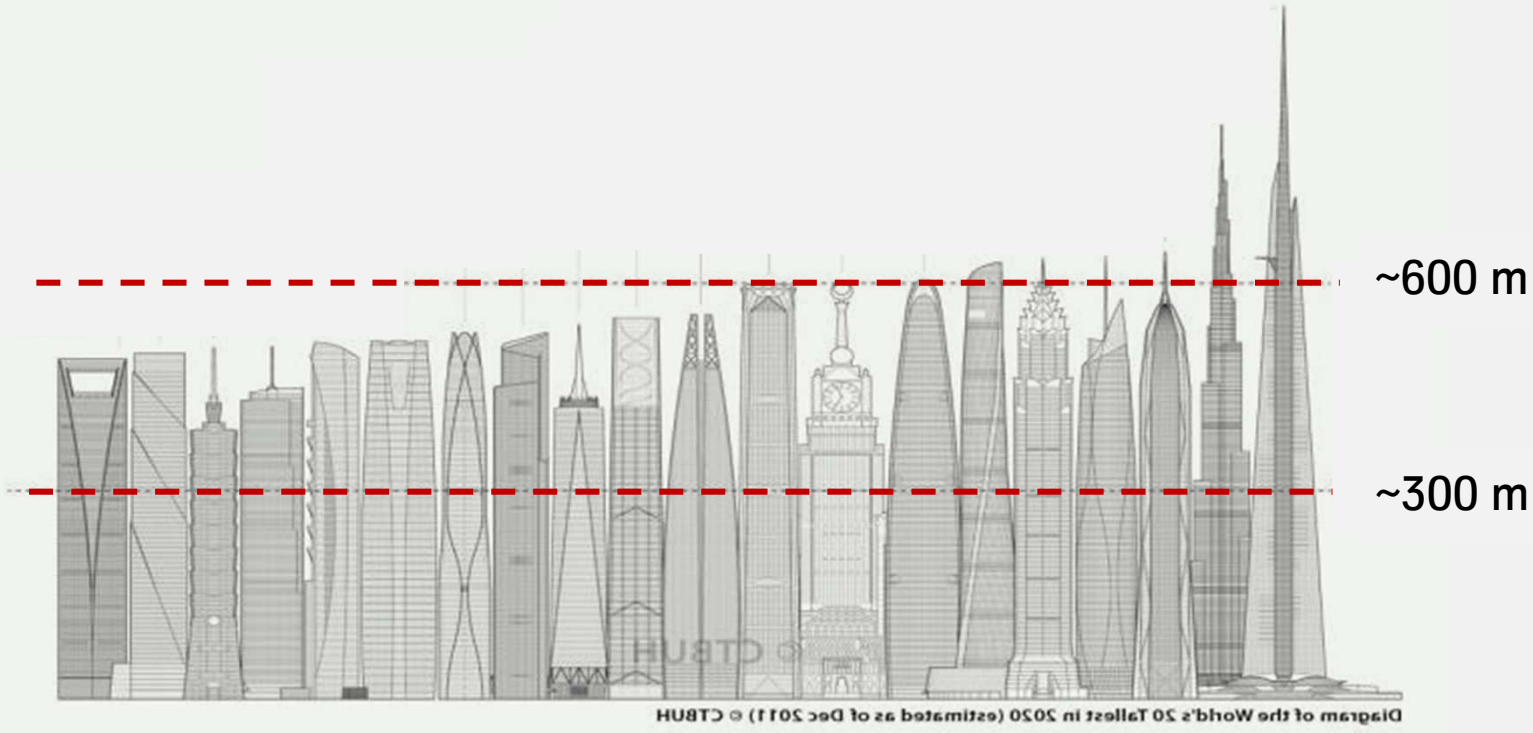
Urbanization



By 2050 cities will contain almost 70% of world's population

The 21st century is the first metropolitan century

- The equivalent of a 1-million people city is being built every day
- Since 2000 the number of high-rise buildings (>200 meters) has tripled
- Over 180 buildings currently under construction are above 250 meters



References

Socar Tower,
Aserbaidshan

TV-Tower,
Kazachstan

National Bank,
Kuwait

European Central
Bank, Germany

References

Dalian Yujin,
China

Shanghai World Financial Center, China

Olympic Tower Beijing, China

References

Mercury Tower,
Russia

Evolution Tower,
Russia

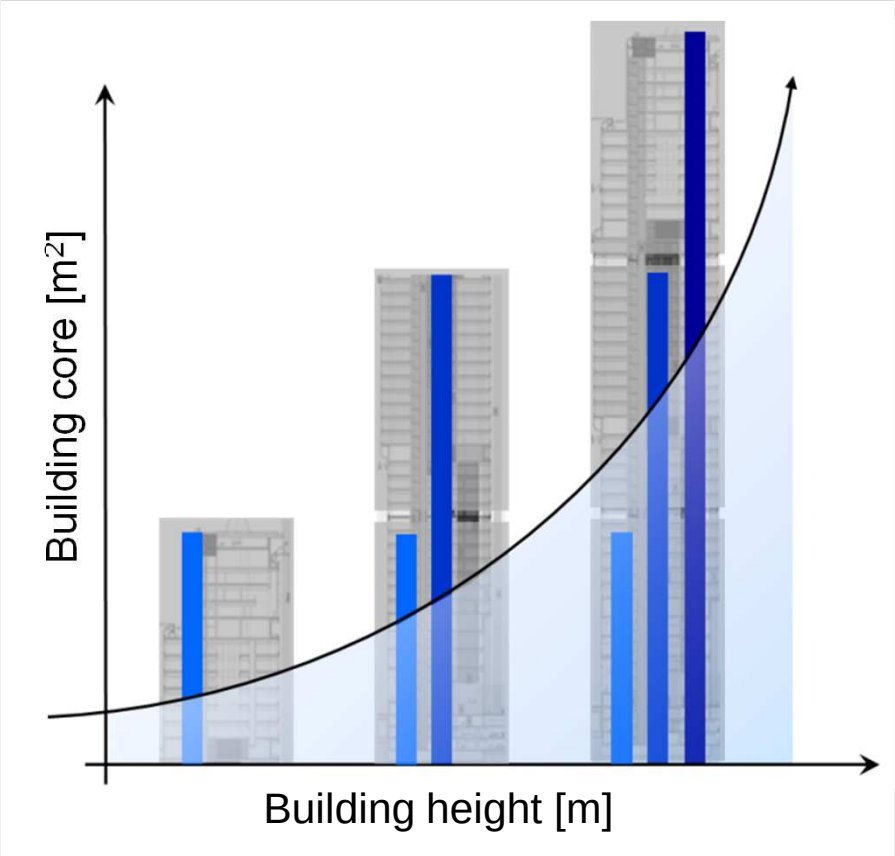
One World Trade Center,
USA

CMA Tower,
Saudi Arabia

Buildings today: Elevators are the bottleneck of evolution

Elevator footprint vs. usable space

Increasing loss of usable space

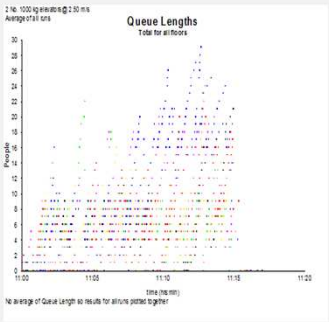


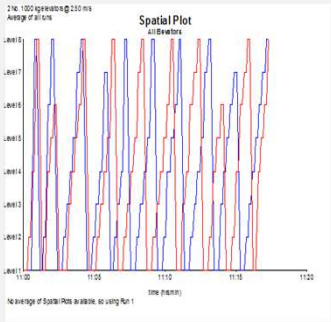
Not good!

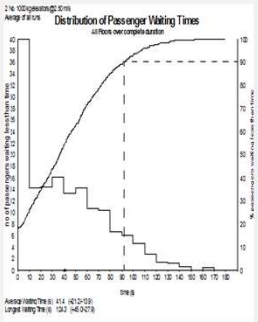
Planning

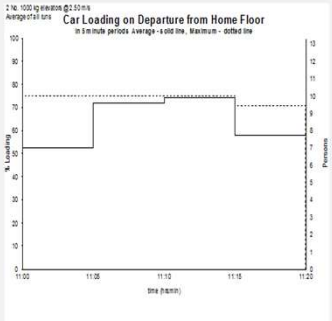
Traffic- / Building planning

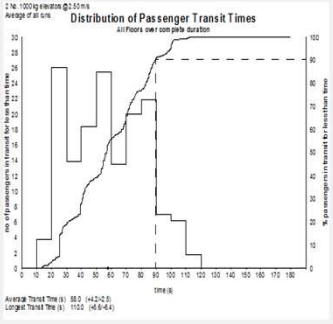
Simulation provides detailed data and analysis

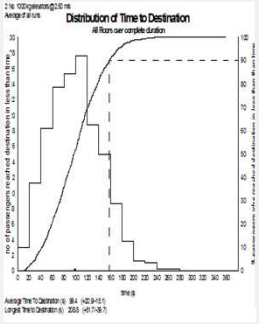


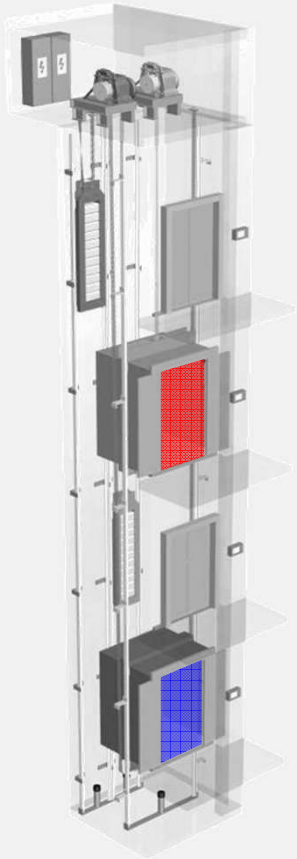


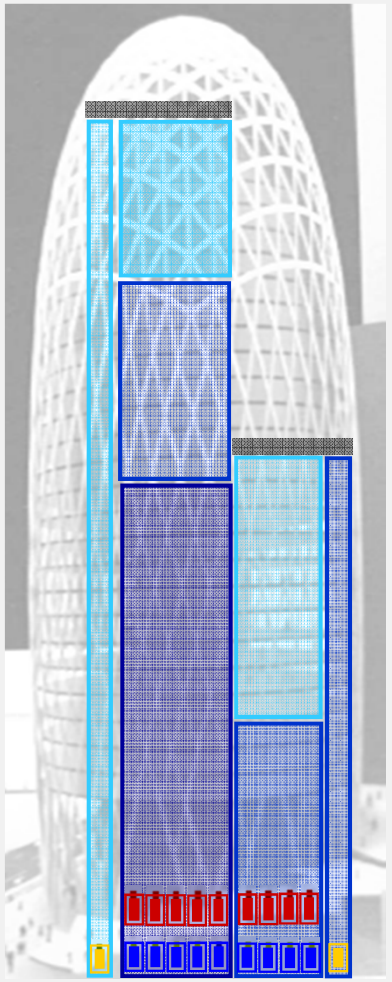












Systems

Introduction of product portfolio

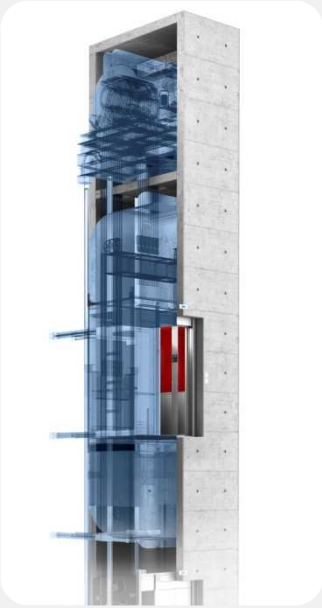
synergy BLUE

- MRL
- 1.0 & 1.6 m/s
- Up to 60 m
- 450 – 1,600 kg

EVOLUTION BLUE

- MRL
- 1.0 – 3.0 m/s
- Up to 100 m
- 320 – 4,500 kg

High Rise



TWIN

- Two cabs in one shaft
- Up to 7.0 m/s
- Up to 270 m
- 1,000 & 1,800 kg

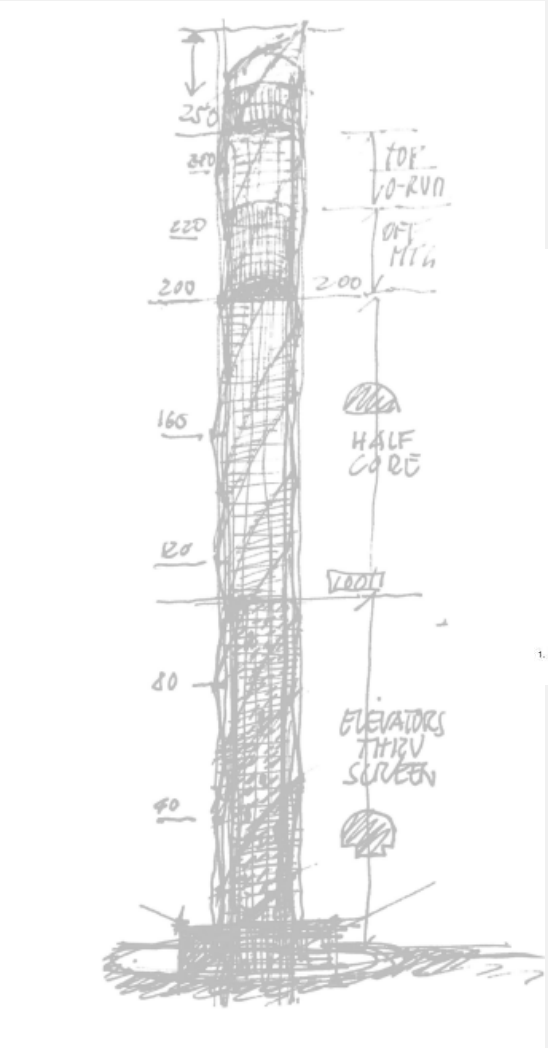
Double Decker

- Double-deck
- Up to 10.0 m/s
- Up to 350 m
- 1,250 – 2,000 kg

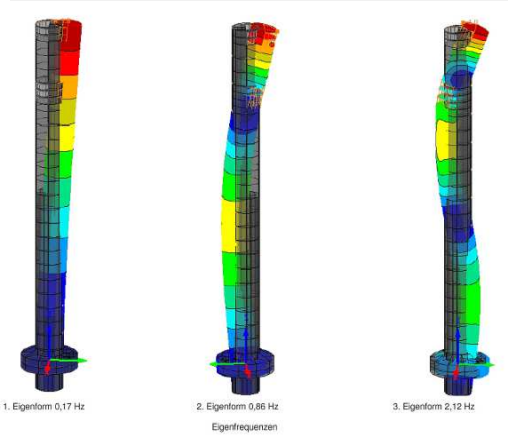
Single Deck

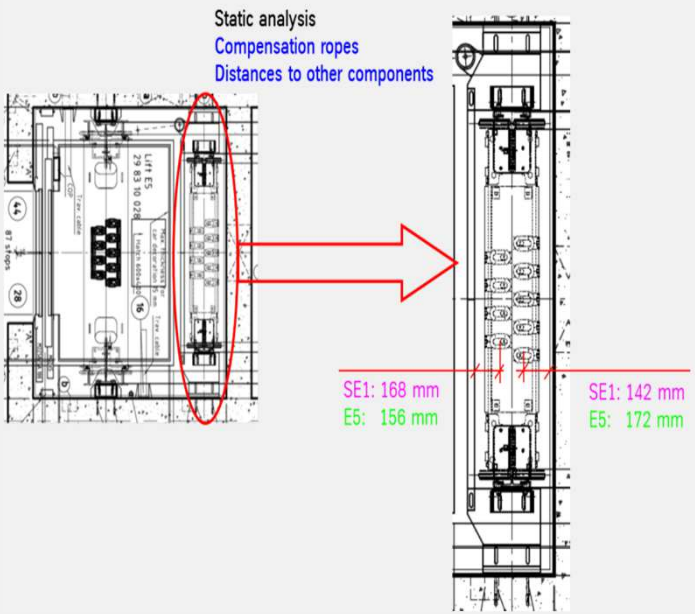
- High-speed SD
- 12.0 m/s
- Up to 500 m
- 630 – 2,000 kg

Building Sway



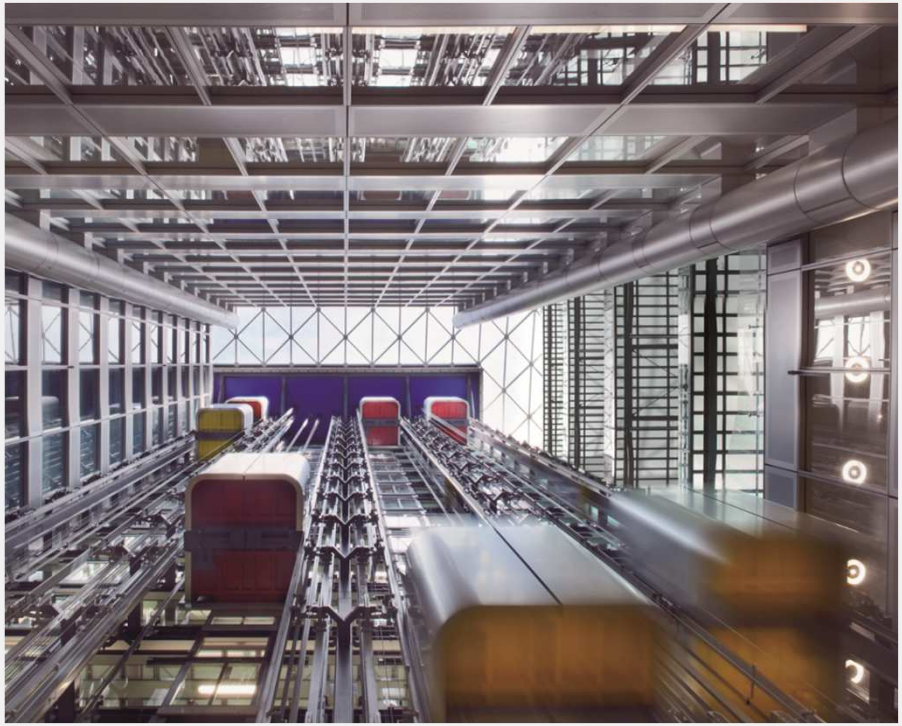
Building sway requires rope sway calculation + simulation



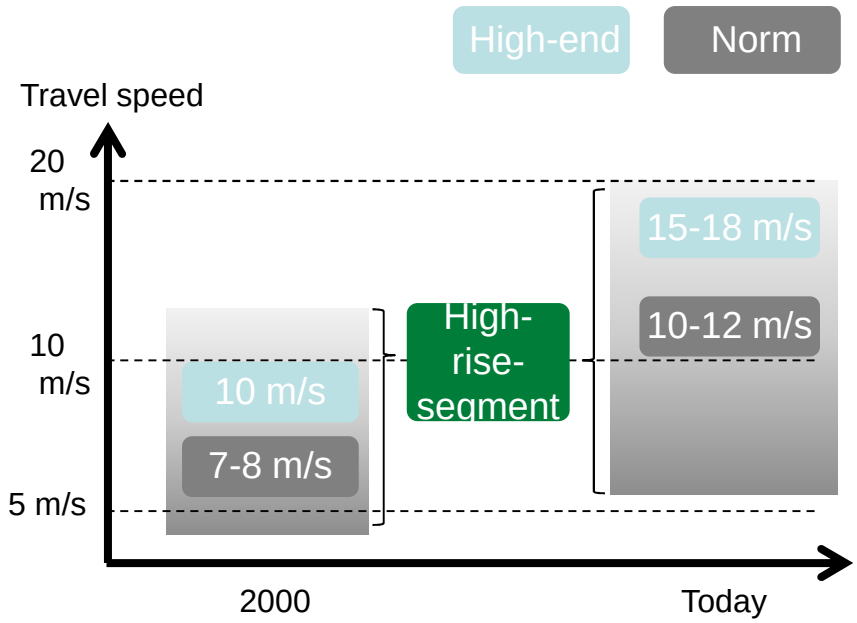


Rope sway can destroy the ropes itself and other components in the shaft → protection means to be defined

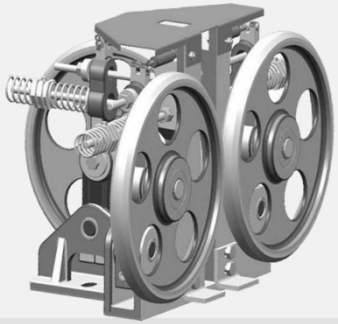
Do high-rise buildings need higher speed requirements?

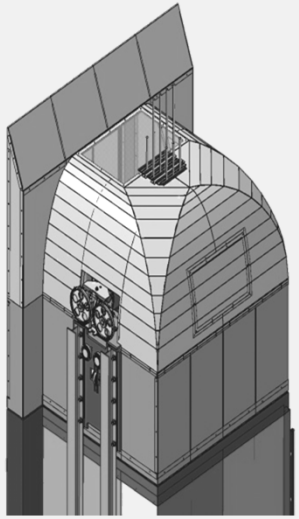


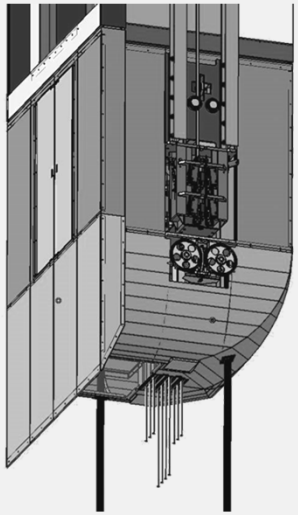
Increasing height and travel speed



No limits technically?



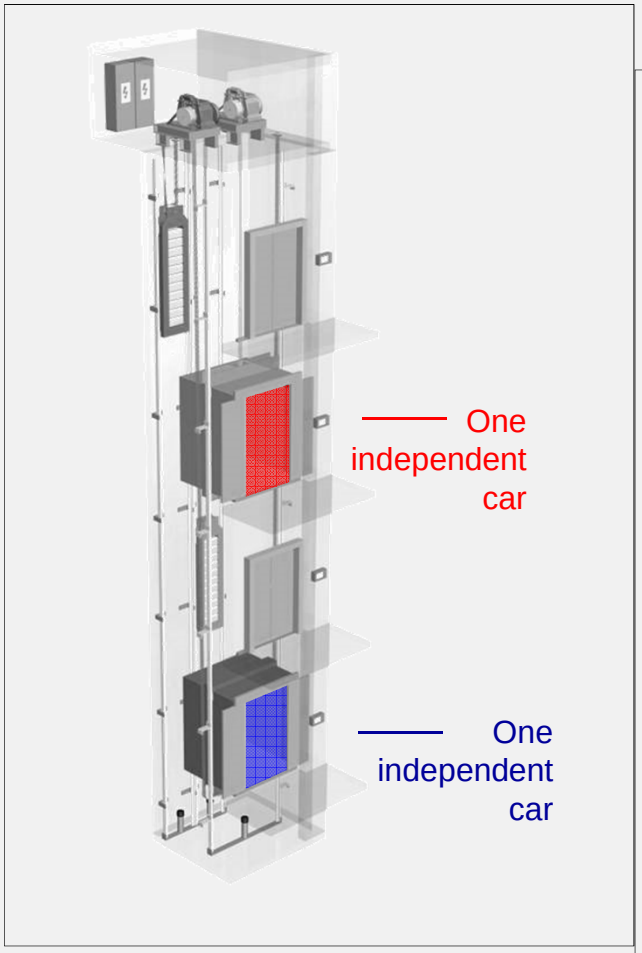




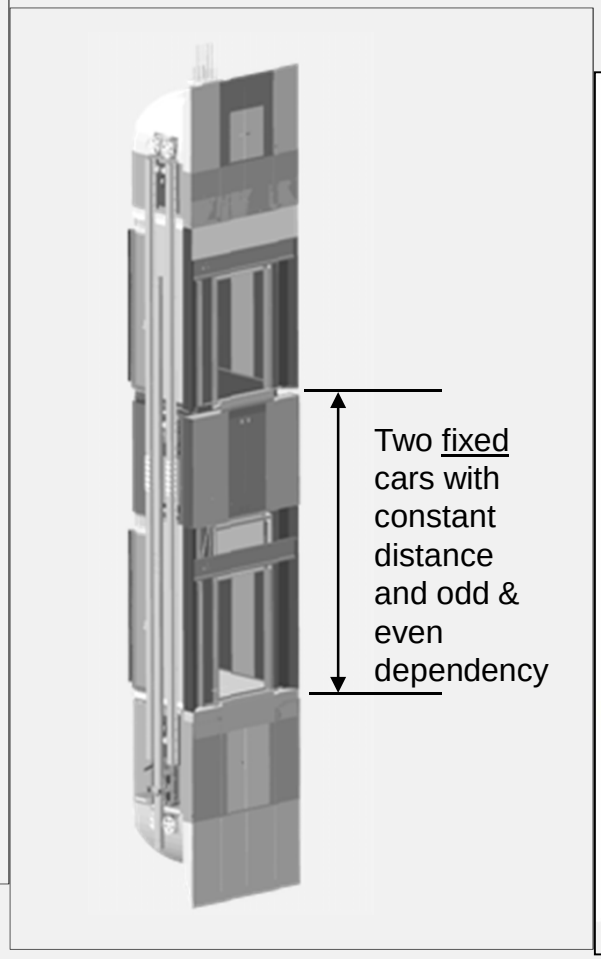
Limited by human body

Concepts with Multi-Cabin-Systems

TWIN® : System with 2 independent cars



Double Decker



MULTI

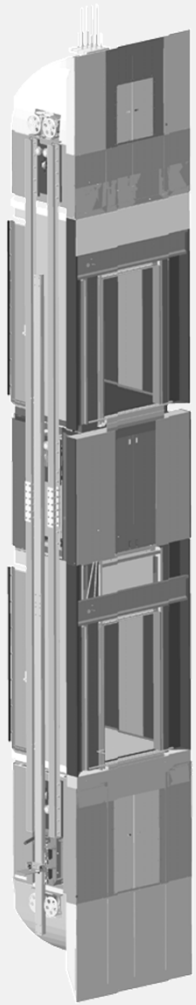
Double Decker

Advantage:

- Group arrangement one on top of the other for core saving
- Preferred as express shuttles to serve sky lobbies
- High efficiency during up peak
  > car stops at two adjacent floors at same time
- Fewer total stops

Disadvantage:

- Transfer necessary
- Two entry levels required
- All cars in a group must be double deck
- Equal floor distances nearly always required
- Heavy car masses to be moved in case of light traffic



Disadvantage for passengers:

- Less flexibility in the shaft due to connected cars
- **Passenger irritation when other deck is loading / unloading**

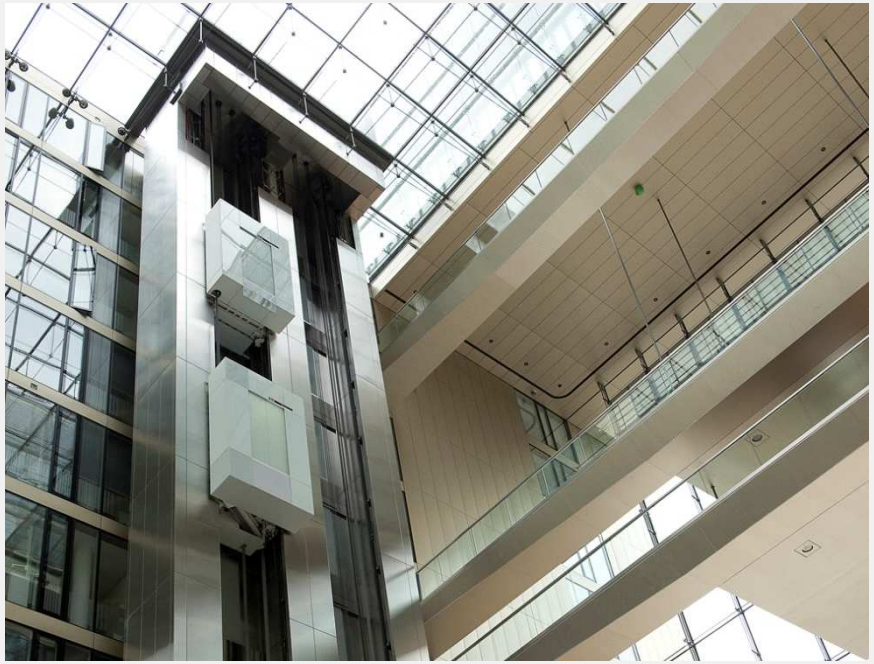
Inter-floor traffic with Double Decker system

The performance of Double Decks during inter-floor traffic is inefficient – odd & even traffic cannot be adhered anymore.
In worst case the system loses 50% of the cars during interfloor traffic – it was never a problem for single deck configurations, but with “Double Car Systems” the number of landings in a group can be close to double of single car arrangements and then it can be to less cars for too much tenants.

TWIN®

Expanding capacity

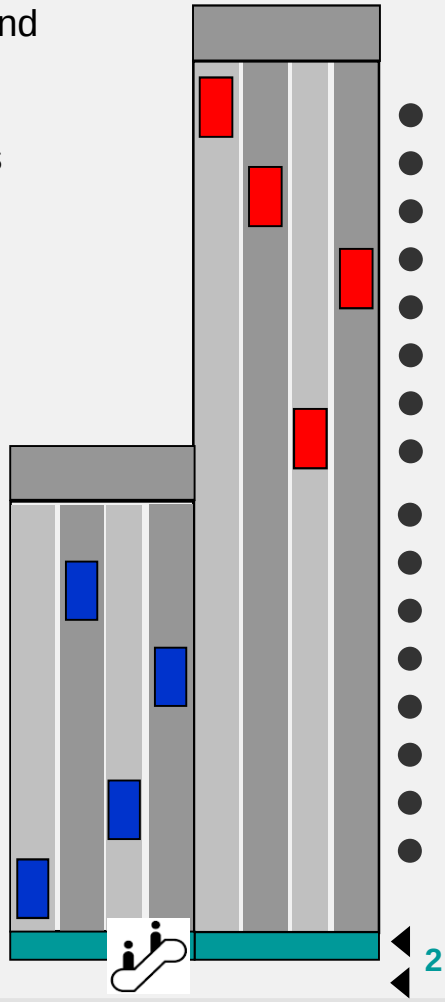
- Two cabs independent in one shaft
- Up to 30% more capacity
- Up to 30% reduction in space requirements
- Advanced destination dispatch algorithm
- More than 200 TWIN worldwide installed



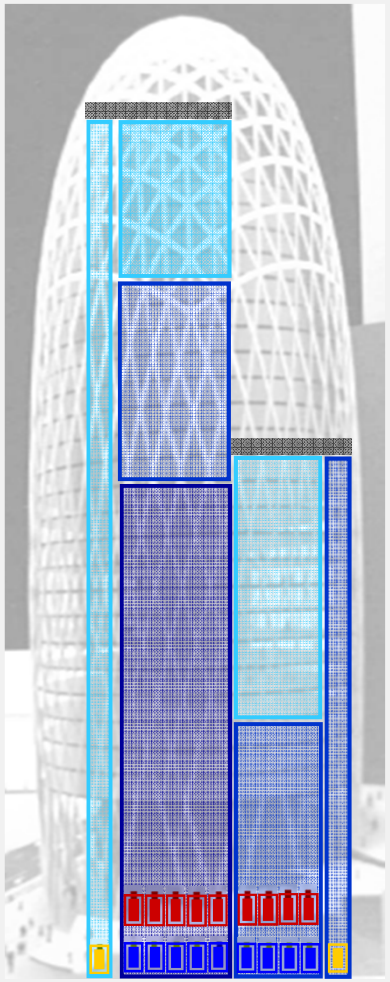
Certified safety concepts

TWIN®

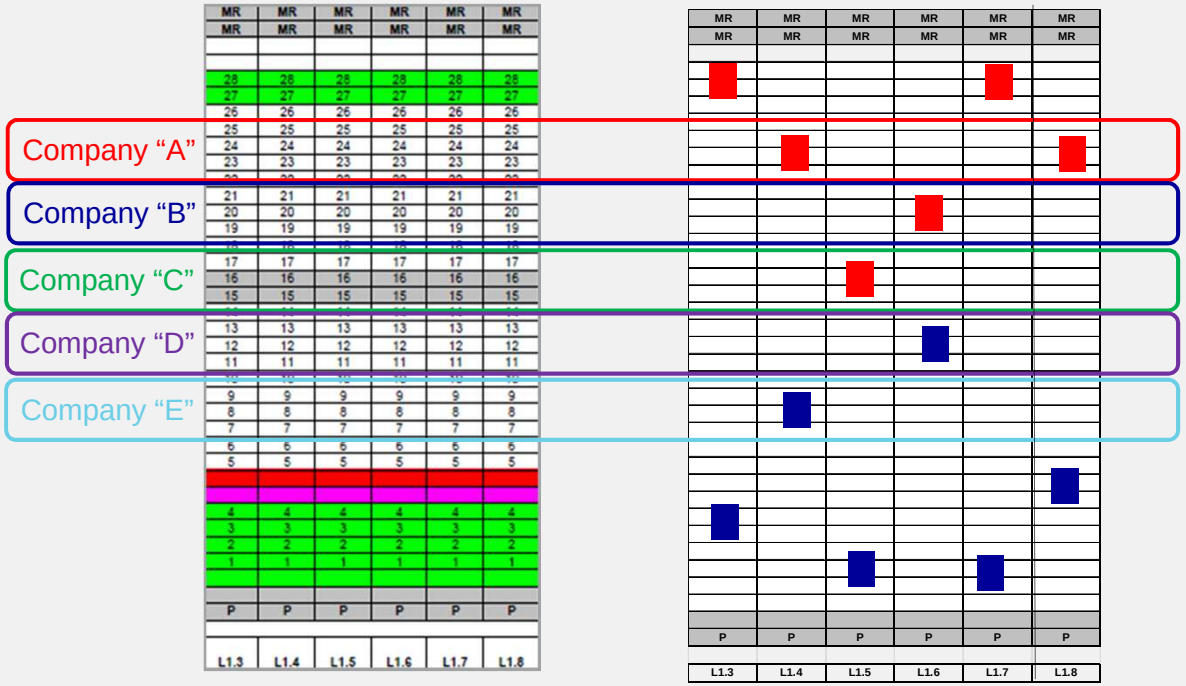
- Bring together low rise and high rise groups.
- Enable 2 entrance levels



2 Entrance Levels



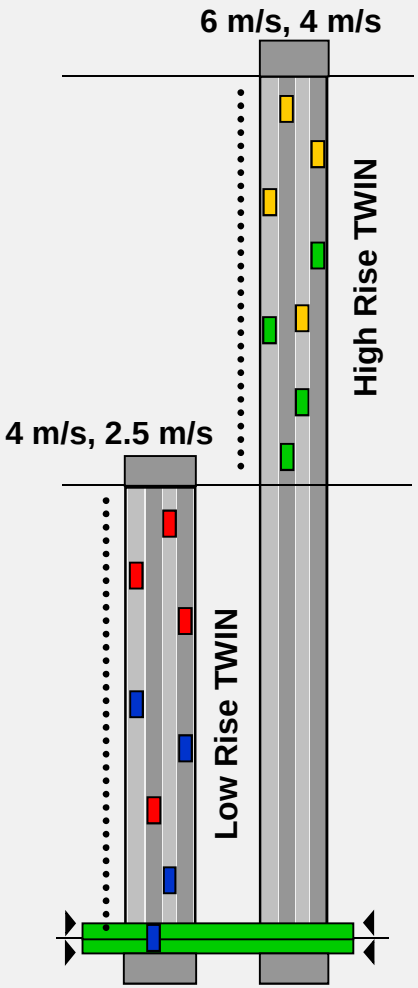
TWIN®



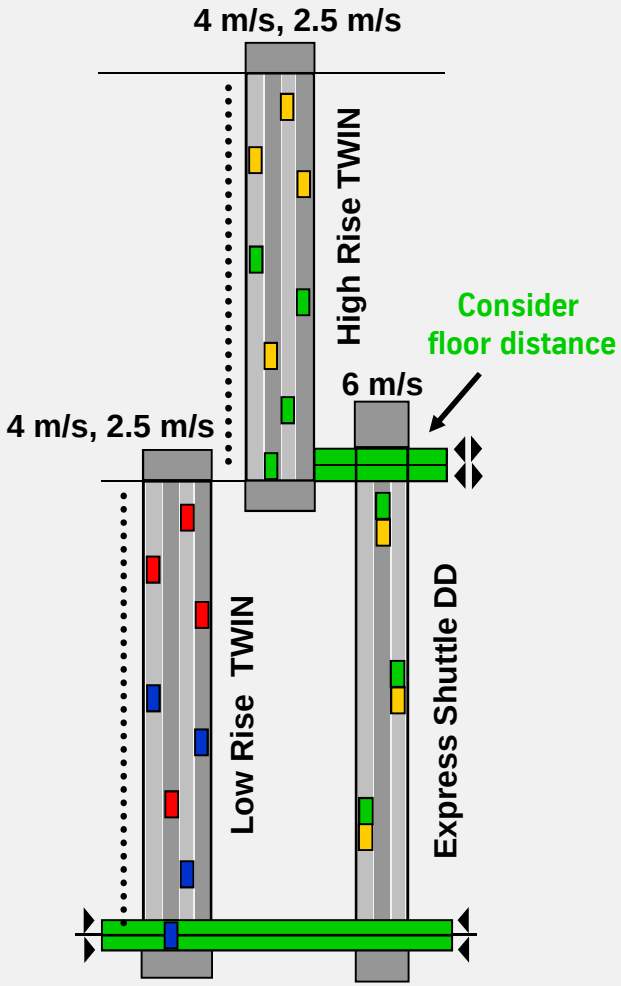
Flexible operation for inter-floor traffic - more independent cars allow better distribution within the shafts for better performance.
Each car of the system can perform independent from the other – no odd and even dependency.

Shaft Arrangements and System Combinations

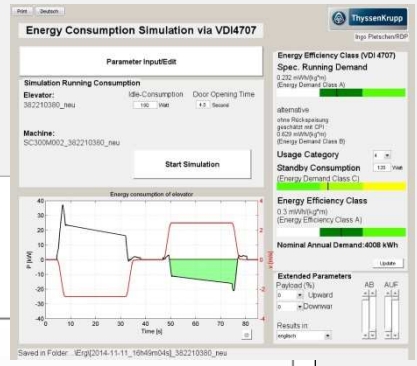
Low Rise – High Rise

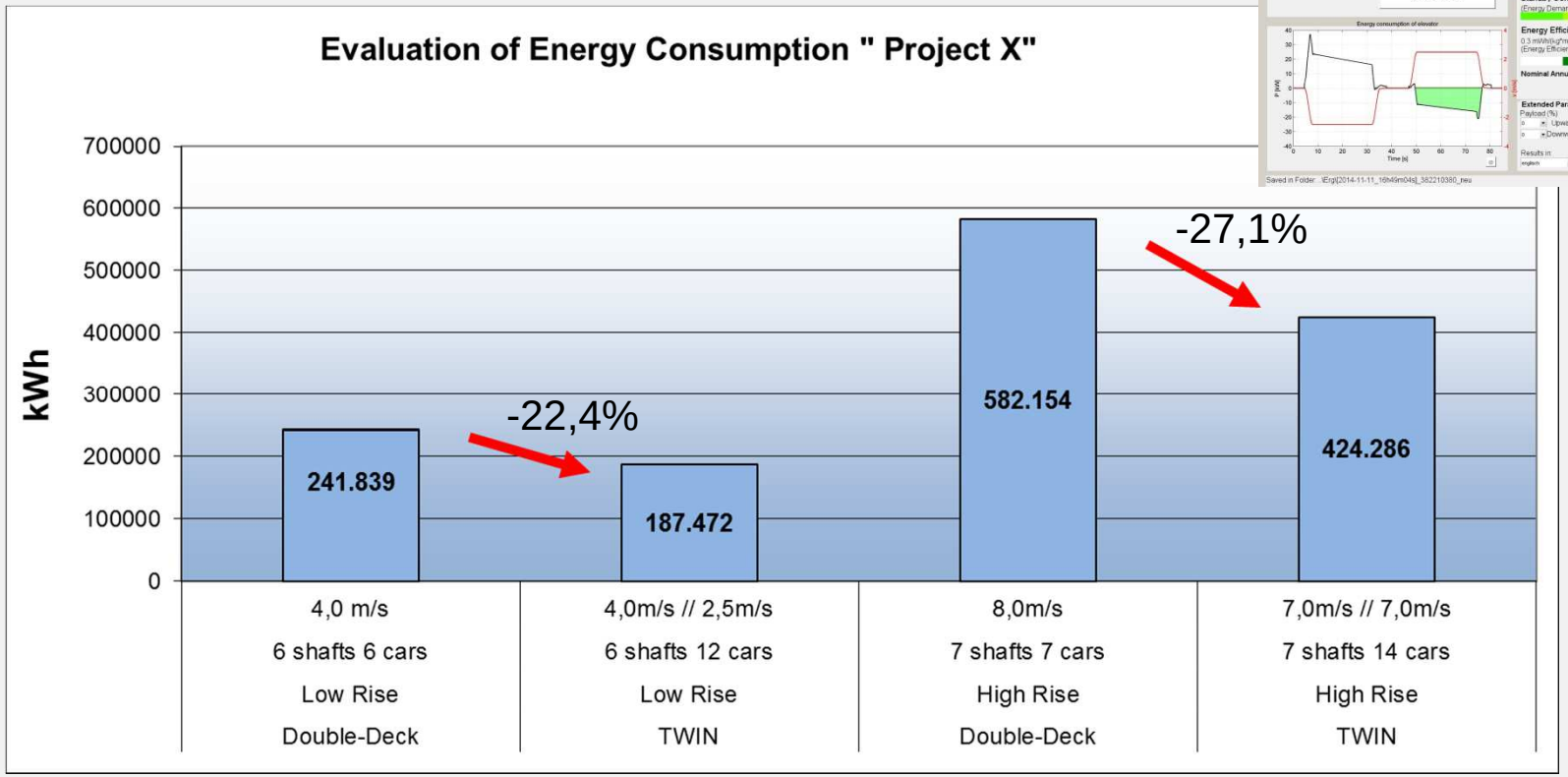


Low Rise – High Rise – DD Shuttle



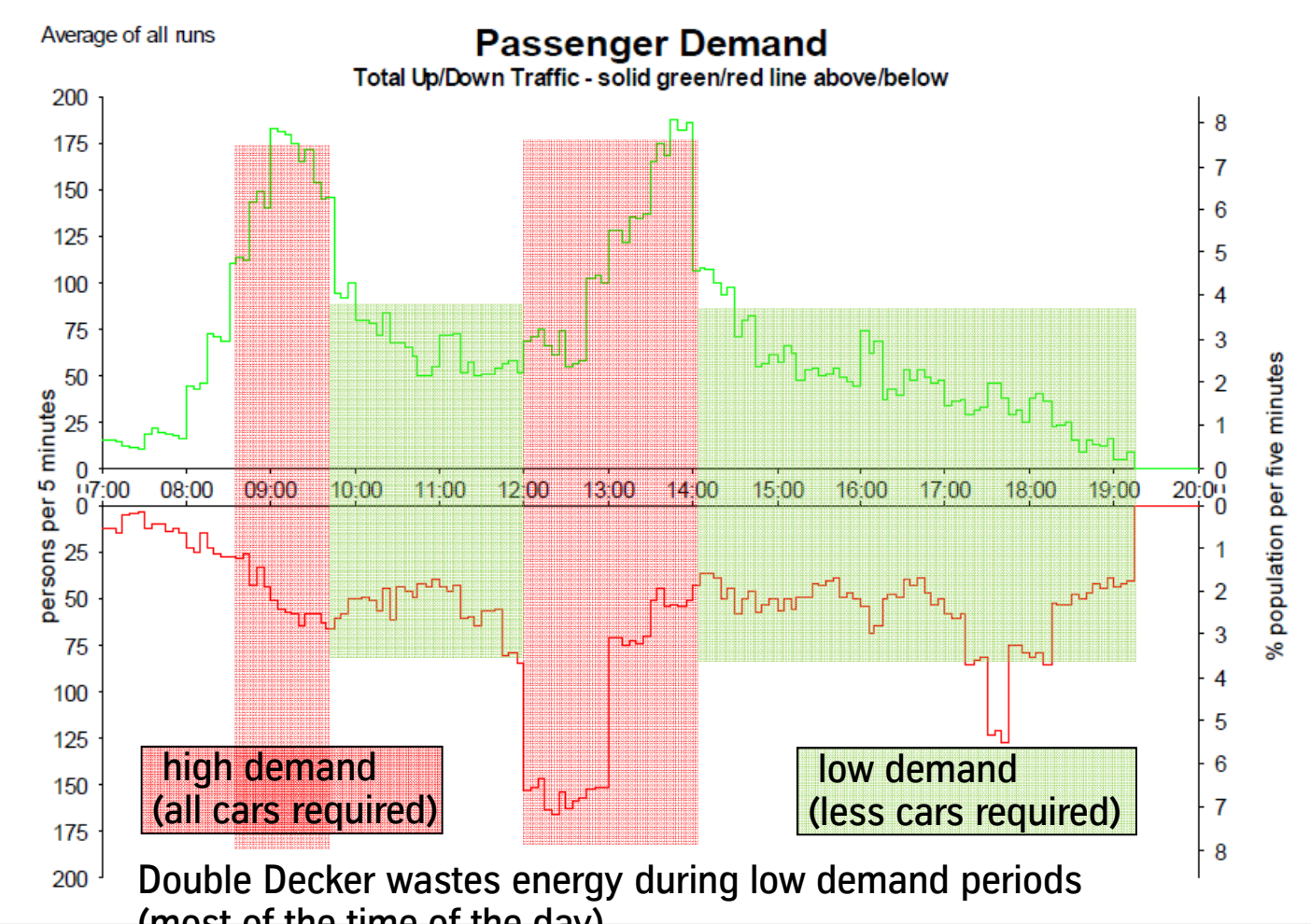
Energy Consumption of Lift Groups





Comparision of system with 2 independent cars (TWIN®) versus Double Decker with **same traffic demand and similar quality of service**.
VDI 4707 Rating → **both systems „Energy Efficiency Class A**“

Energy Consumption / Traffic in Office Buildings



Double Decker wastes energy during low demand periods (most of the time of the day)

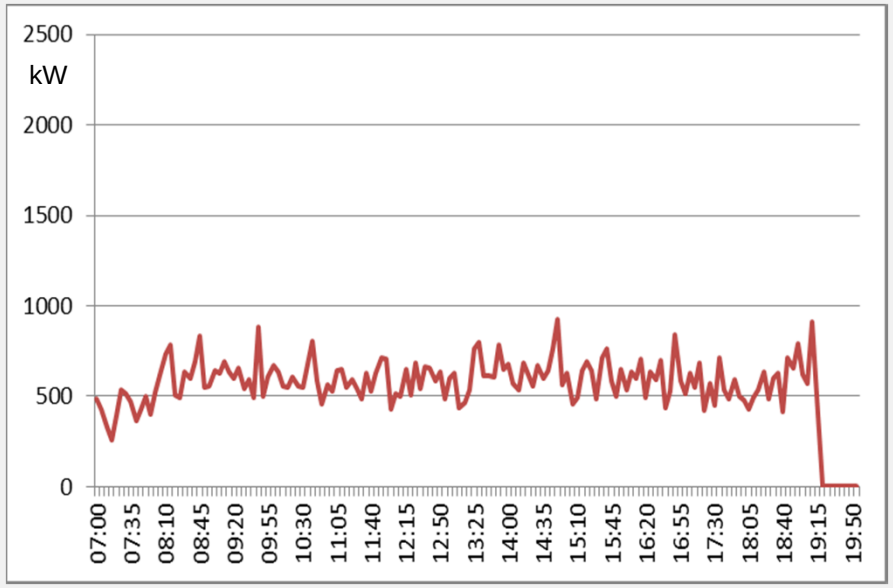
Always 2 cars are moving, even if only 1 car required or can be allocated

Electical Loads of Lift Groups

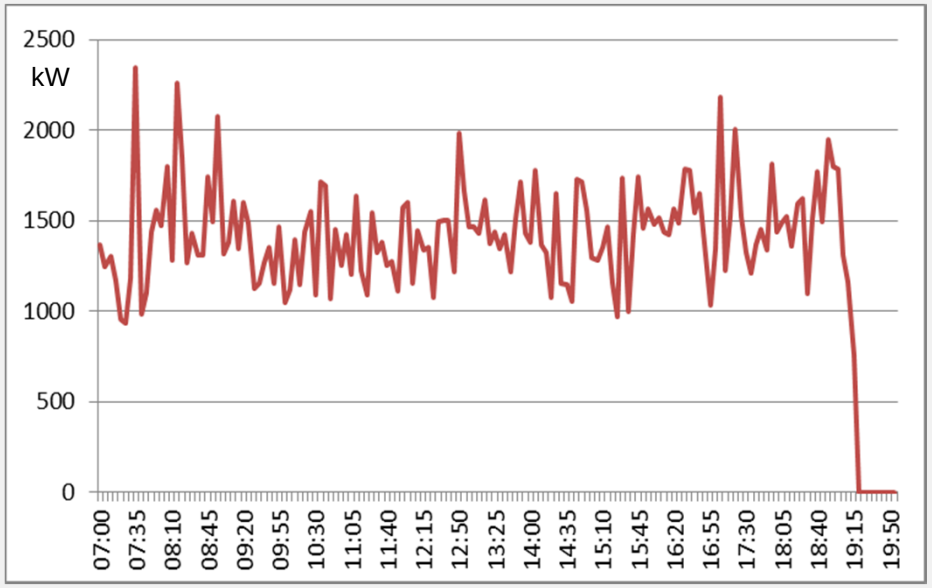
6 x HIGH RISE
TWIN®

6x Double Decker
HIGH RISE

Max. Electrical Loads [kW]

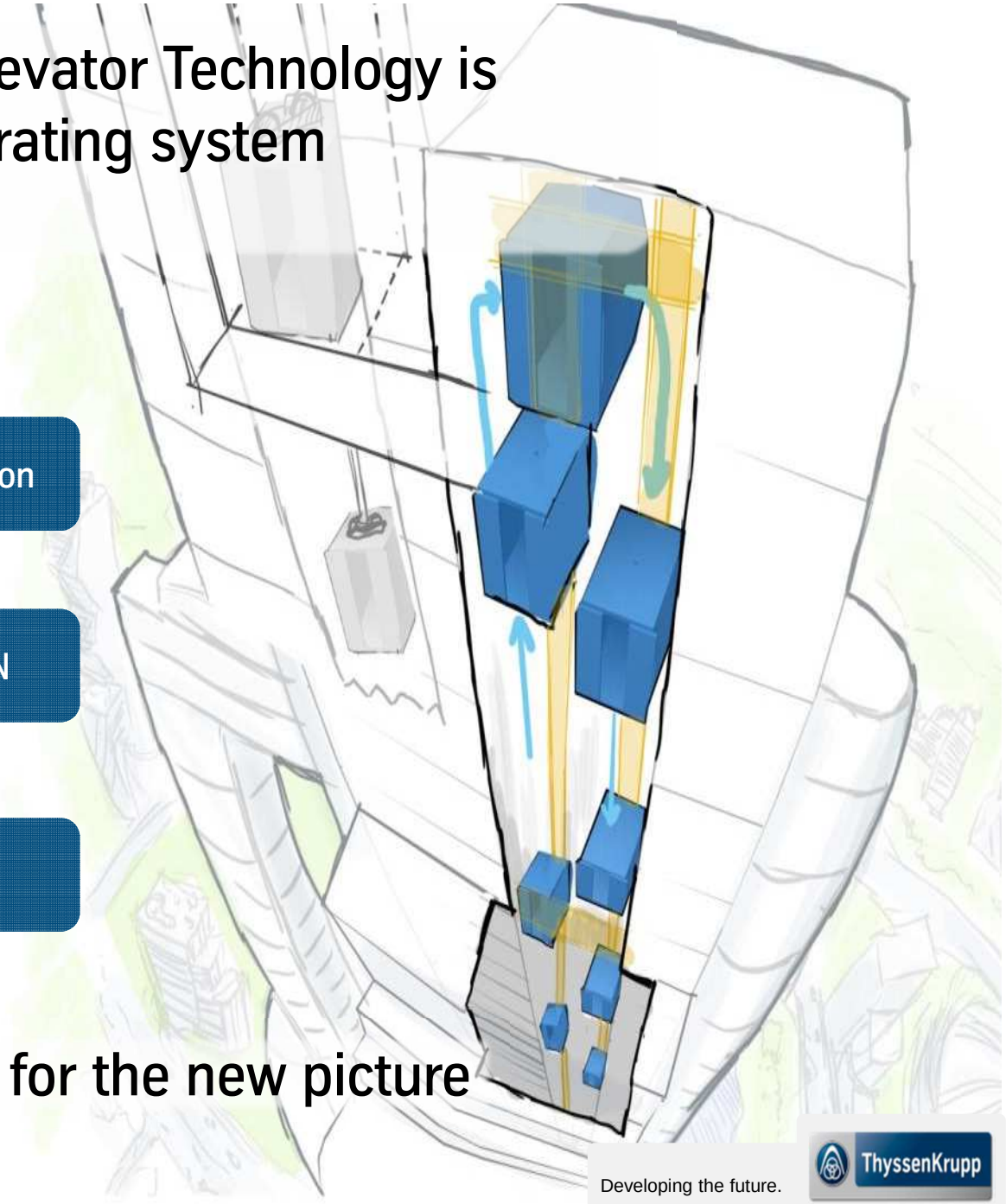


1600kg / 7m/s / 7m/s



2x1600kg / 8m/s

Now – ThyssenKrupp Elevator Technology is ready to provide an operating system by means of all



- Continuous passenger transportation
- Advanced safety features of TWIN
- Linear motor technology

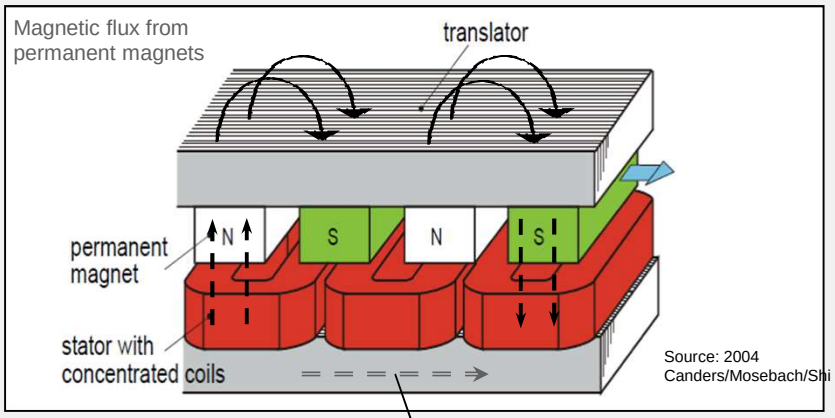
…all pieces are together for the new picture

MULTI – the next dimension

…vertical movement eliminated ropes

- Applying proven technology of Maglev Train to move an elevator vertically and horizontally by means of linear drive

Active principle of linear motor with permanent magnets

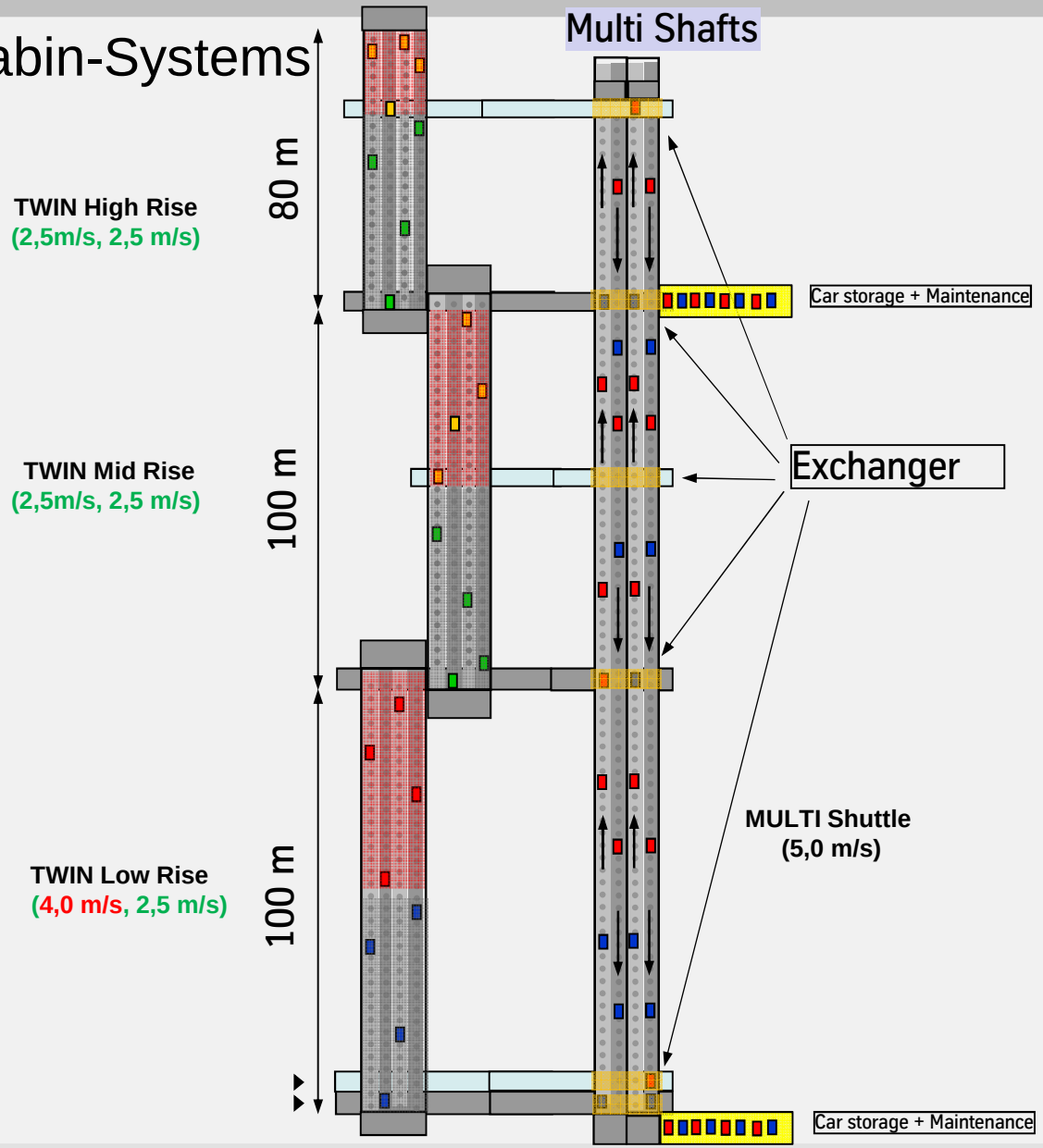


Travelling wave, generated by 3-phase current with variable frequeny – supplied by inverters

Concepts with Multi-Cabin-Systems

Example_
ThyssenKrupp Planning

TWIN + MULTI
combination



Source: CTBUH

Thank you for your attention!