



***Beyond Oil: Transforming Transportation
Cascadia Rail Week***

From DMUs to High Speed Rail

**Portland, OR/ Seattle, WA
May 27,28 2009**

Topics

Who is Siemens

Rolling Stock

FRA Compliant Diesel Multiple Unit Technology

Higher Speed Rail

Higher Speed Rail – The Railjet


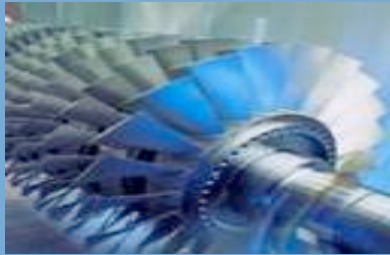


200 MPH+ High Speed Rail Valero/ ICE 3

Who is Siemens

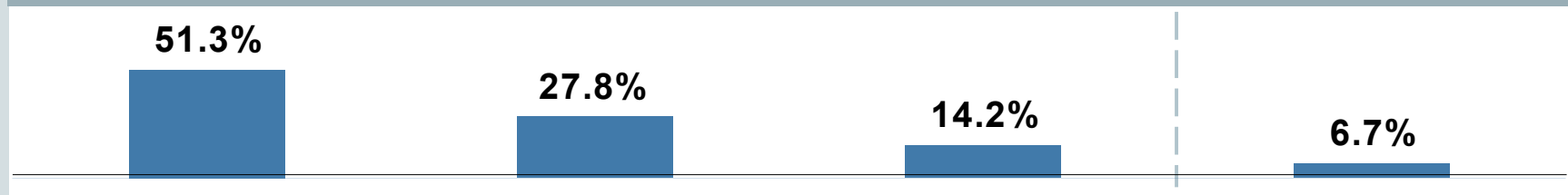
Who is Siemens ?

We're Active in three Business Sectors

SIEMENS

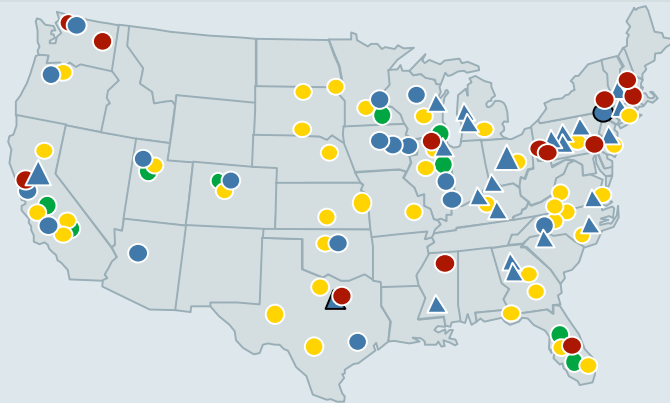
Industry	Energy	Healthcare	Cross-Sector Businesses
			
Automation and Drives	Power Generation	Medical Solutions	Siemens IT Solutions and Services
Industrial Solutions and Services	Power Transmission and Distribution		Siemens Financial Services
Siemens Building Technologies			
Mobility Systems			
OSRAM			

External sales of Sectors excluding Other Operations



U.S. – broad presence in the world's toughest market

SIEMENS



● Only major locations ▲ Top manufacturing locations
● Sales & service ● Manufacturing/assembly
● Engineering / R&D

Overview of fiscal 2008

Sales (in billions of dollars)	19.8
Employees	69,000
R&D* (in billions of dollars)	1.3
Global business HQs	9
Locations	795



Siemens is improving the U.S. infrastructure

- In **energy**, our power generation solutions help meet one-third of America's total energy needs every day
- In **healthcare**, we are the #1 application service provider, processing an average of 170 million transactions daily for more than 1,000 customers
- In **industry**, we process 100% of the nation's mail

* As of 2007

Siemens in Washington / Oregon

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Employees:
1679



Sales:
\$818.2 M



Employee Wages:
\$140.4 M



Total Locations:
32

Siemens Industries

Building Technologies

Siemens Energy & Automation

Siemens Healthcare

Siemens Information Services

Siemens Medical

Siemens Mobility

Mobility Division: Integrated transportation and logistics solutions from a single source

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Rolling Stock



Public Transit



Components



Integrated Services

Traffic Solution



Traffic Solutions

Infrastructure Networks



Rail Automation



Electrification

Infrastructure Logistics



Postal Automation



Airport Logistics

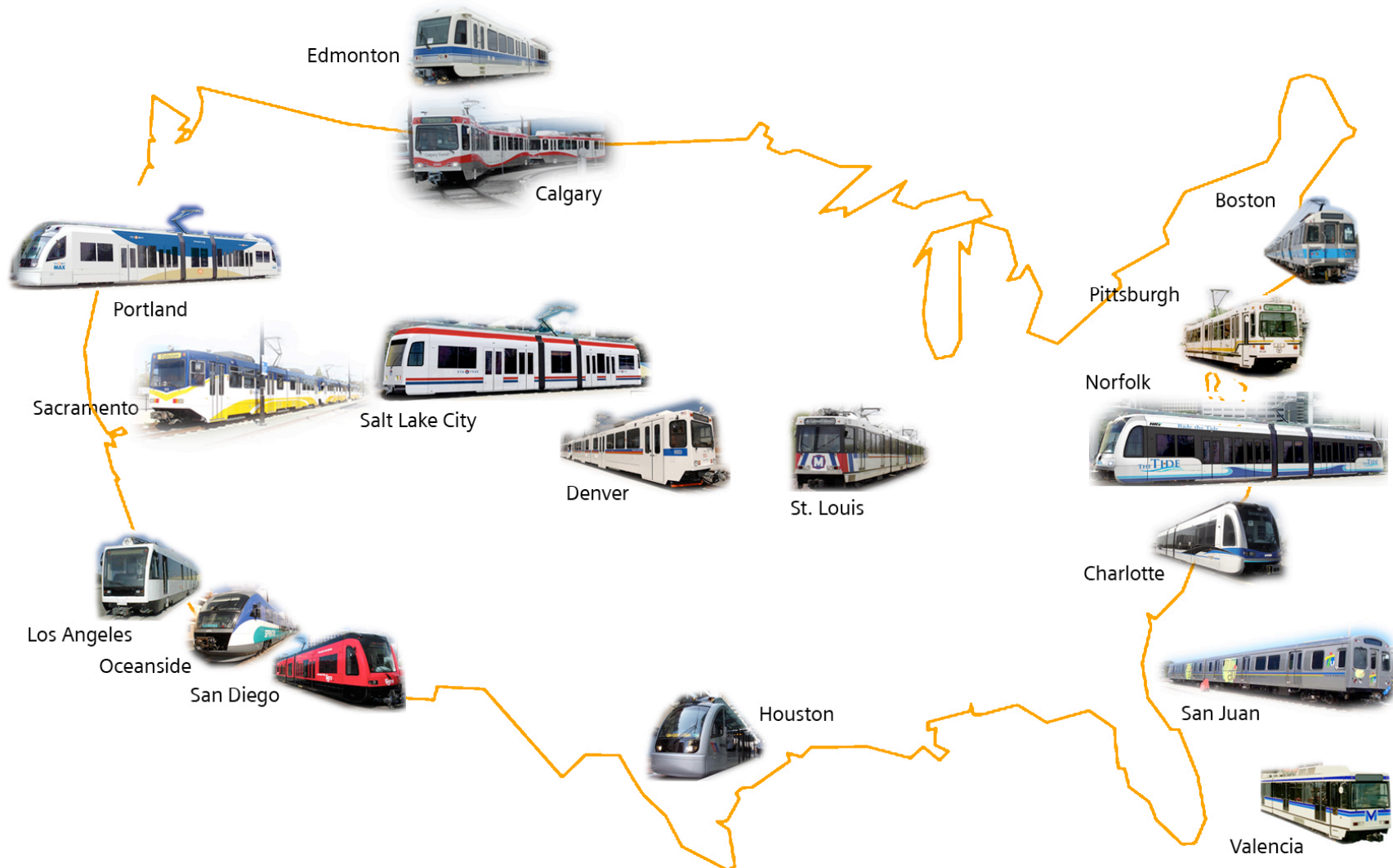
Turnkey Systems



Turnkey Systems

**Siemens has contracted for more than
1,000 mass transit vehicles in 17 North
American locations**

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**STS Sacramento Facility – Commitment to the
North American market with 300,000sq ft of
manufacturing floor space**

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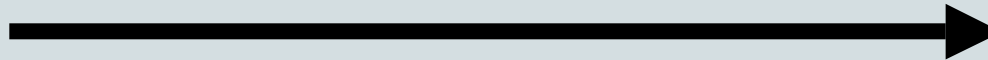
Rolling Stock

The diagram shows a light blue rectangular box representing the main body of the rolling stock. Below this box is a smaller, light blue component with a semi-circular top, representing the bogie or wheel assembly. The entire assembly is centered on a light gray background.

FRA Compliant
Diesel Multiple Unit (DMU)

The FRA-compliant DMU Challenge

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HOW TO GET FROM THERE

Within the rail transit market the concept of an FRA Diesel Multiple Unit (DMU) has been discussed for the past 20+ years.

With the exception of Colorado Railcar, no major car manufacturer has undertaken the task of building a compliant DMU using current technology.

For the DMU market there has been a “Catch 22” effect – “I’ll buy an FRA DMU if one exists” vs. “I’ll build a FRA DMU if there is sufficient volume to cover the onetime costs”.

When confronted with resource issues a carbuilder will focus on the business that provides the best ROI.

The Budd company was able to build close to 400 RDC cars between 1949 and 1962 using one basic concept and relatively simple technology. Back then the RR’s operated the service, regulatory requirements were less restrictive, passenger comfort requirements were simpler.

Today the situation is a bit different – transit agencies must deal with the RRs. Regulations are more restrictive, the riding public is more sophisticated.

TO HERE

Siemens Commitment to the DMU Market

The DMU market, while challenging, is of considerable interest to Siemens Mobility USA since it is a natural extension of our success in the Light Rail market. It's attractiveness stems from the following:

- it has good potential for growth
- It is a niche market that would allow for one to two companies to compete in
- the volumes are manageable from a risk perspective

Siemens Mobility has invested considerable resources in the past in the pursuit of the DMU market. That investment continues with the development of the FRA DMU/EMU platform that will be presented.

Siemens has considerable experience with it's European based technology but given the regulatory environment here in North America and the need to interchange in many cases with freight operations our belief is that for most DMU applications the pragmatic approach is to provide a compliant product.

Our commitment to the North American market is evident in the investments made to develop products specifically for North America to be manufactured in North America.



STS RS / Tucson Sky Streetcar



The Siemens FRA Compliant DMU Platform



Platform Approach

Siemens is developing a new passenger rail vehicle platform that meets all applicable requirements of the US Federal Railway Administration for mainline service.

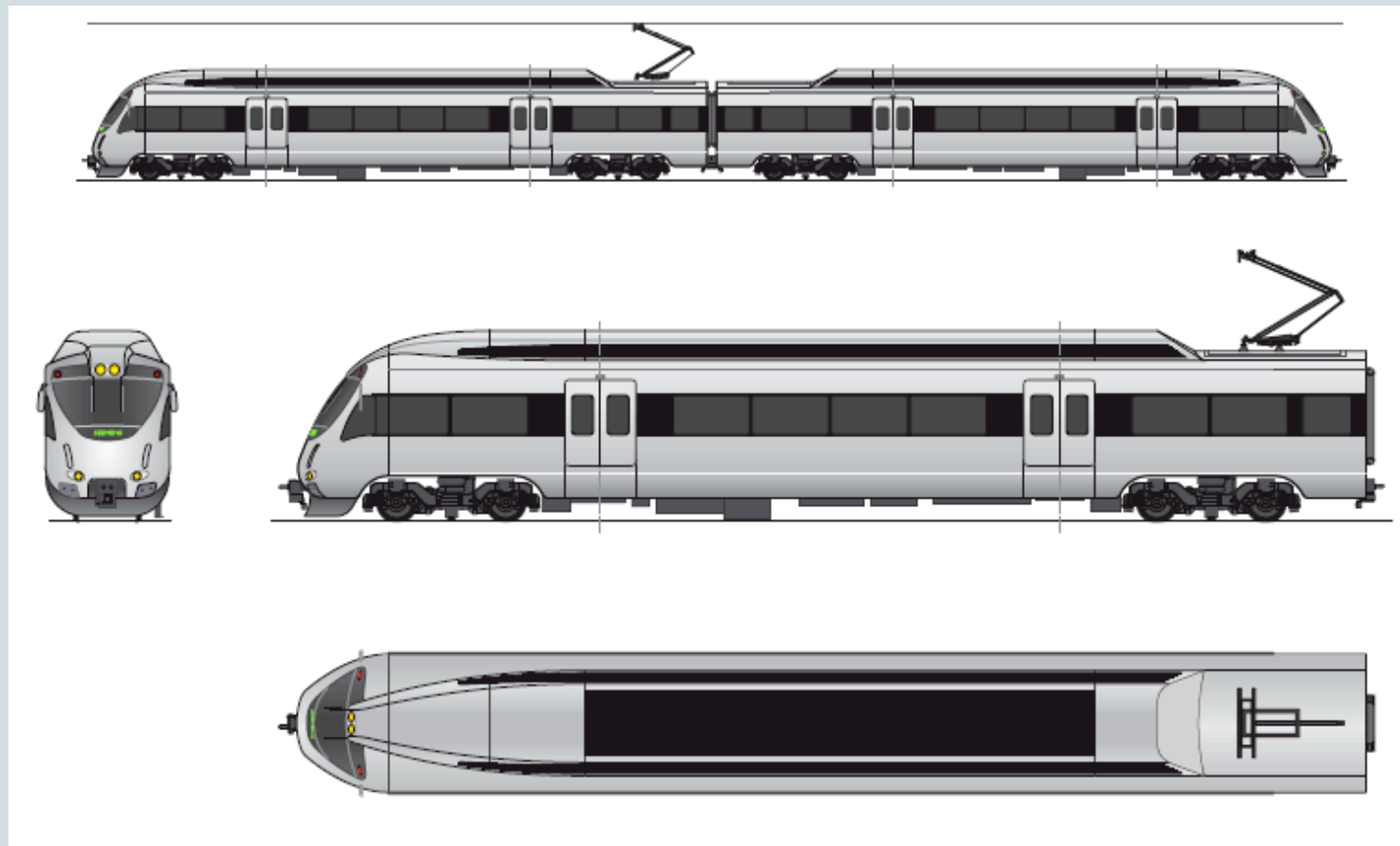
The new vehicle platform is offered as a Siemens standard design with limited, customer specific options.

FRA Compliant DMU/ EMU Platform

Renderings

European Style Full Width Cab

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FRA Compliant DMU Platform

SIEMENS

Passenger Seating (Example Only)



Platform Development Approach

To minimize exposure to engineering and cost risk, the DMU platform is being developed in incremental steps from known designs.

“Delta Approach”

We are progressing towards a “Ready for Proposal” stage in three phases:

- ✓ 1. Clarify the plan and determine concept feasibility
- ✓ 2. Develop integrated platform concept
3. Prepare initial customer proposal

The Basic DMU Concept

Will meet all applicable requirements of US Regulations for “Tier 1” passenger rail vehicles (e.g. FRA, ADA, AREMA)

The basic configuration will be the Married-Pair (MP)

Propulsion system is diesel-electric

51” floor height for high level (48-51”) platform service, steps for low level platform service

Maximum operating speed will be 79 mph for operation on Class 4 track

Vehicle dimensions governed by AMTRAK clearance limits (85 feet long, 10 feet wide)

Car shell constructed from stainless steel material

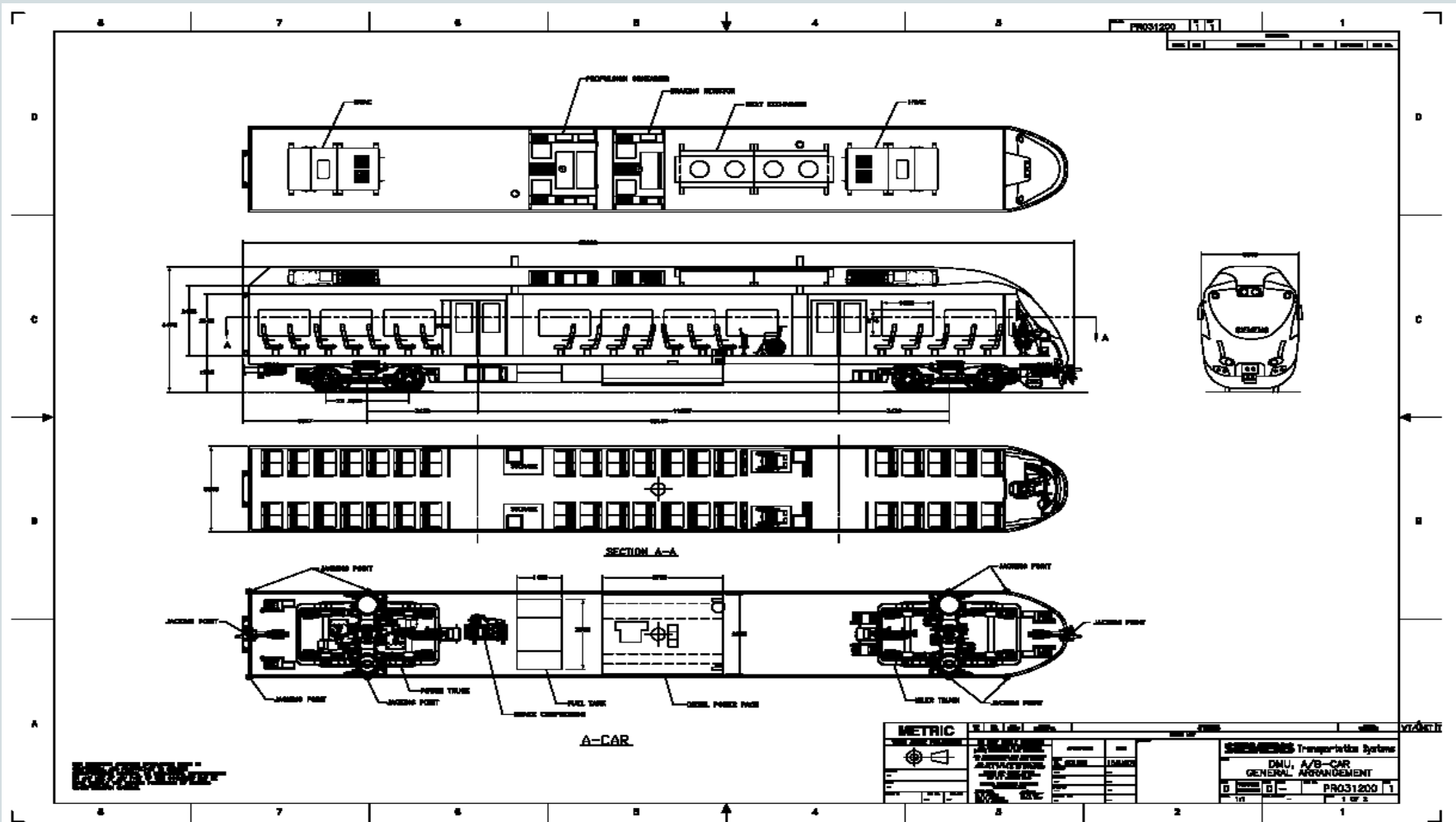
Doors will be electrically powered sliding plug doors

Bridge plates and/or wheelchair lifts when required for ADA accessibility

FRA Compliant DMU Platform

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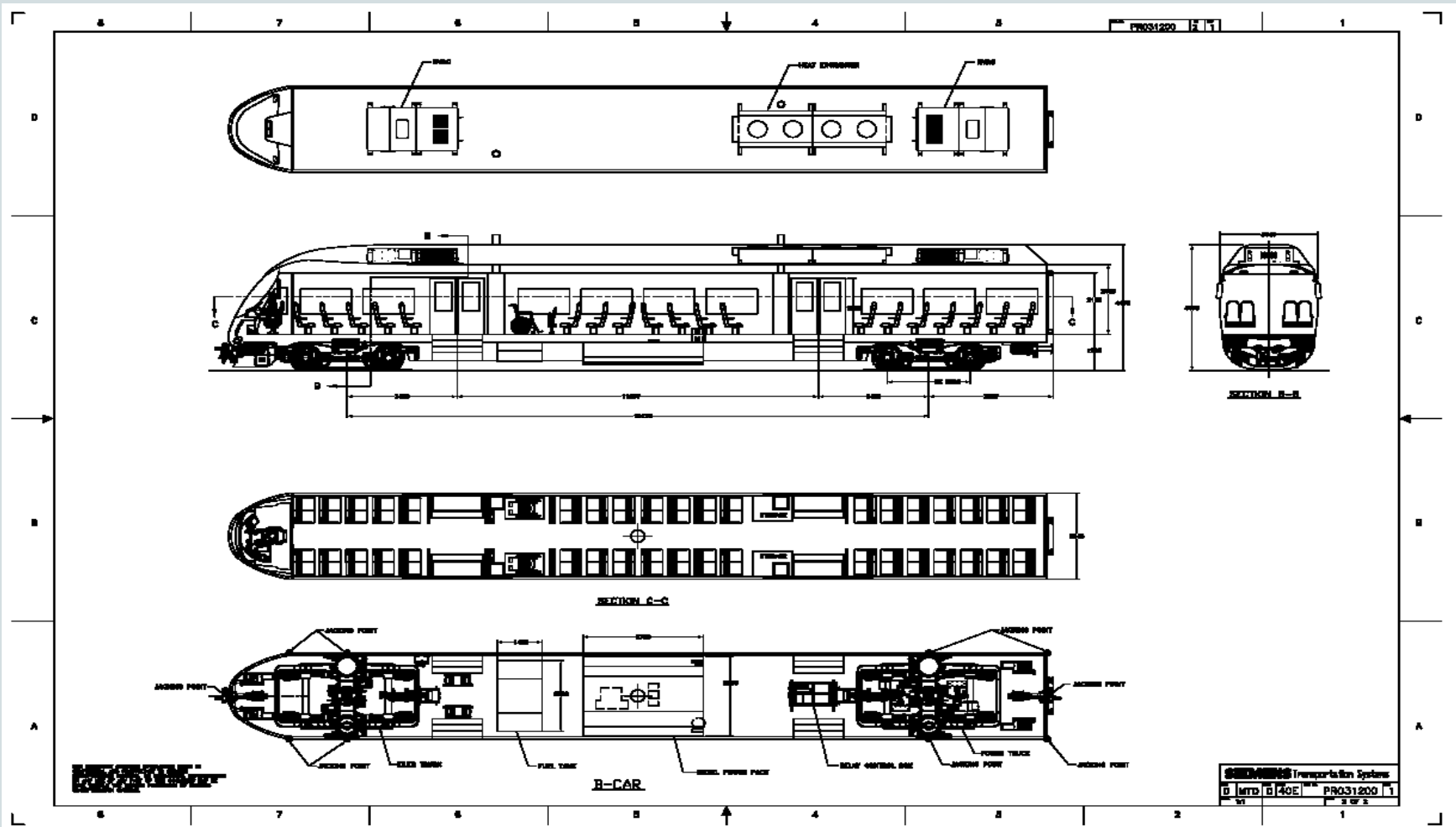
Full Cab General Arrangement (1 of 2)



FRA Compliant DMU Platform

SIEMENS

Full Cab General Arrangement (2 of 2)

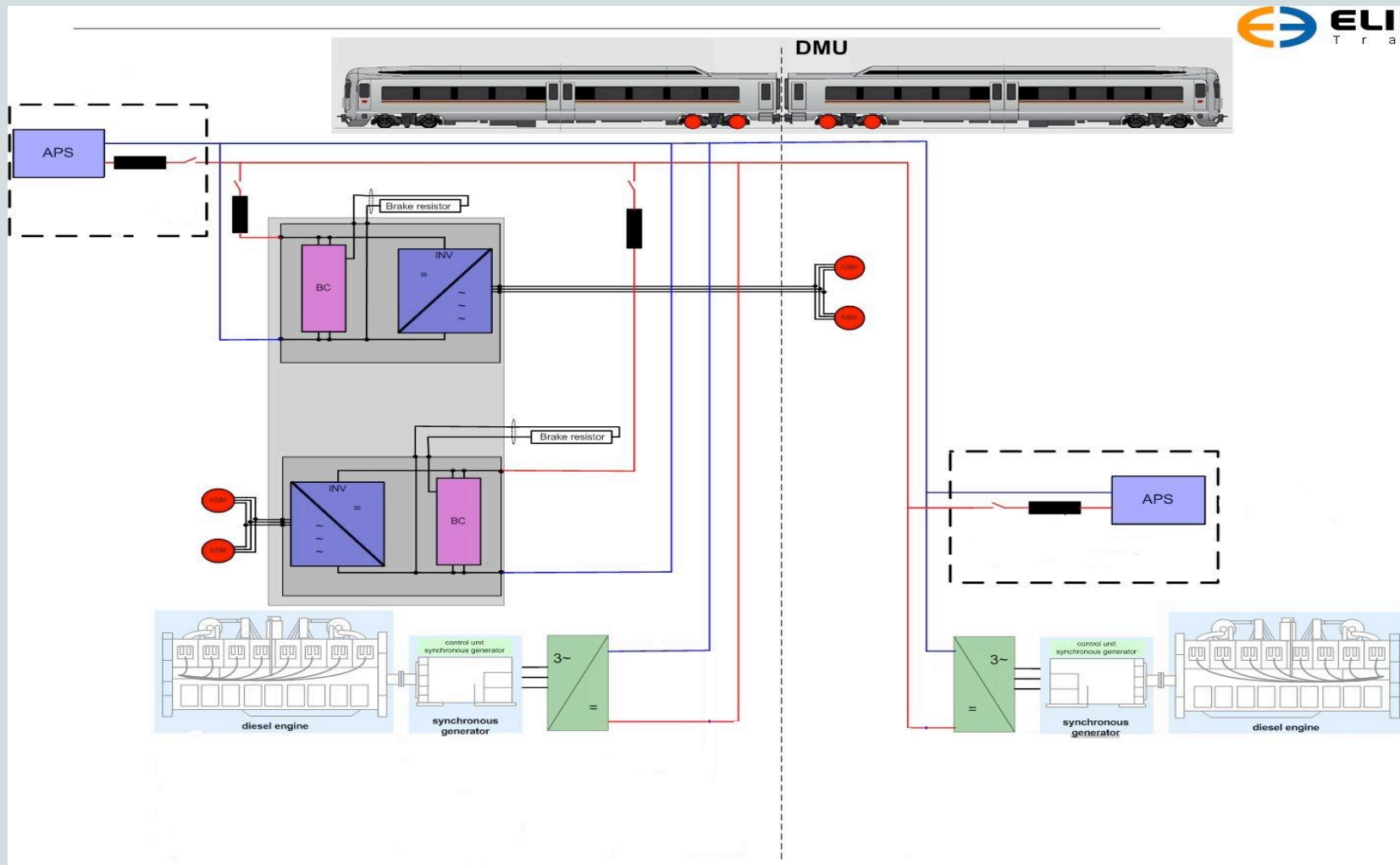


DMU Married Pair Propulsion System

*Four axles are driven in the DMU married pair,
two in each car*

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ELIN EBG
Traction



FRA Compliant DMU Platform

Potential Diesel Power Pack (Cummins QSK 19L)

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Application Factors:

- **Horizontal Displacement**
- **Years of experience**
- **Domestic Production**

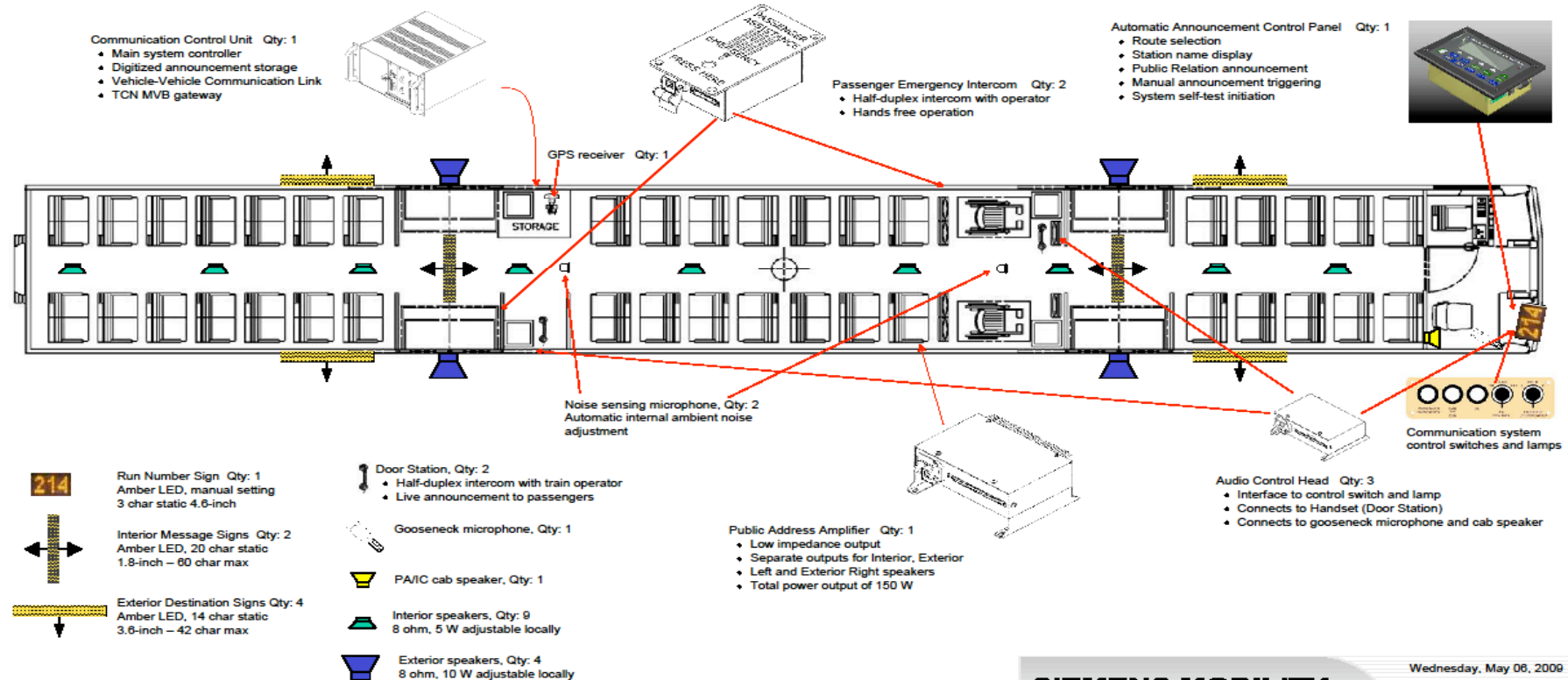
FRA Compliant DMU Platform
Columbus Steel Castings Truck System

SIEMENS

FRA Compliant DMU Platform Passenger Information System Concept

SIEMENS DMU/EMU - COMMUNICATION SYSTEM EQUIPMENT TYPE & LOCATION¹

Note 1:
Not all equipment is shown, for example the Ethernet switch interconnecting the devices and the optional units such as the wireless Internet access equipment.



SIEMENS MOBILITY

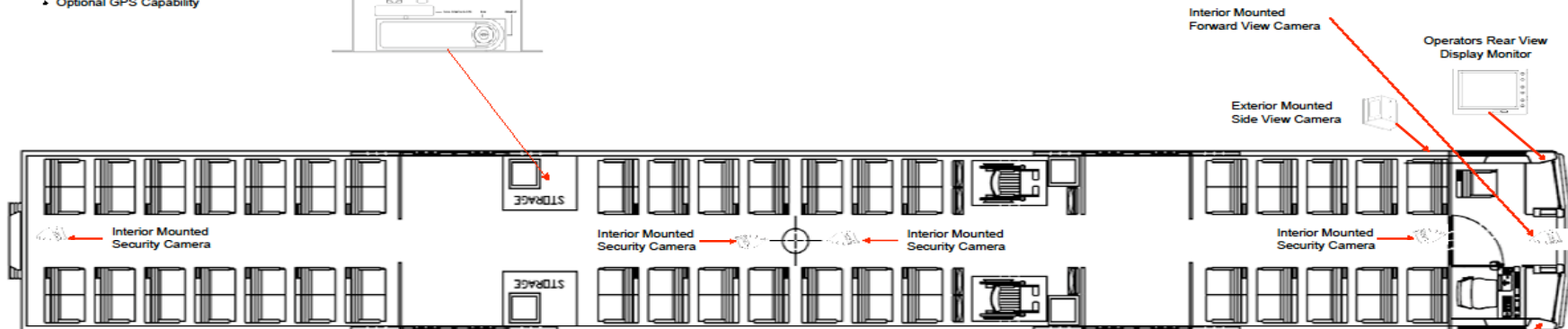
Wednesday, May 06, 2009

FRA Compliant DMU Platform CCTV Option

SIEMENS DMU/EMU - CLOSED CIRCUIT TELEVISION WITH SIDE VIEW MONITORS (CCTV) SYSTEM EQUIPMENT TYPE & LOCATION

Digital Video Recorder Qty: 1 Per Car

- 10 Camera Capacity
- Solid State Hard Disk
- Security Key for disk removal
- Optional GPS Capability



Rear View Display Monitor Qty: 2 Per Car
• Displays Side View Of Vehicle



Exterior Mounted Side View Camera Qty: 2 Per Car
• Captures Side View Of Vehicle



Interior Ceiling Mounted Security Cameras Qty: 4 Per Car
• Captures Interior View of Passenger Area

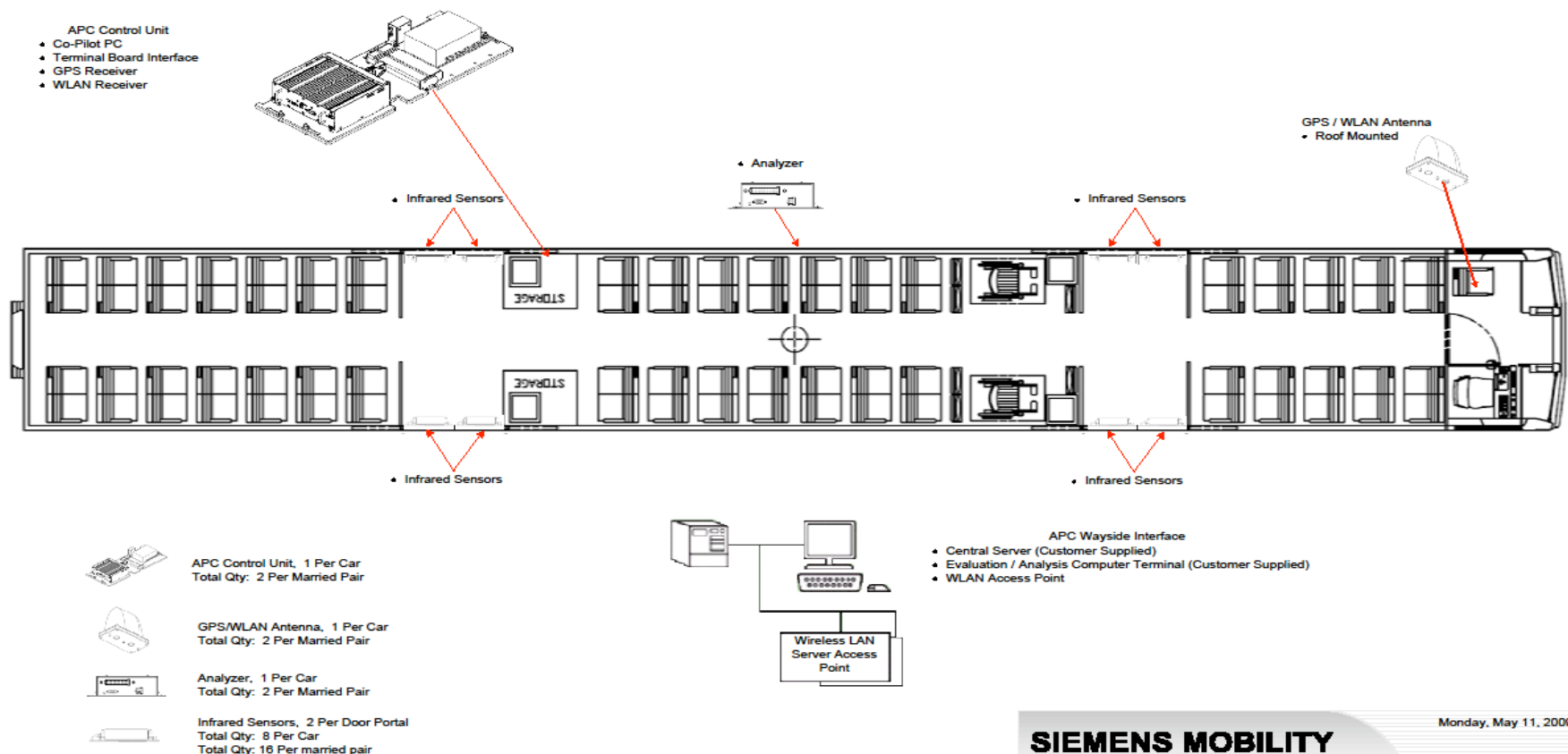
Forward Facing Cameras Camera Qty: 1 Per Car
• Captures Forward View of Vehicle

SIEMENS MOBILITY

Monday, May 11, 2009

FRA Compliant DMU Platform Passenger Counting System Option

SIEMENS DMU/EMU - AUTOMATIC PASSENGER COUNTER (APC) SYSTEM EQUIPMENT TYPE & LOCATION



SIEMENS MOBILITY

Monday, May 11, 2009

FRA Compliant DMU Platform

Renderings

Traditional Walk Through Cab

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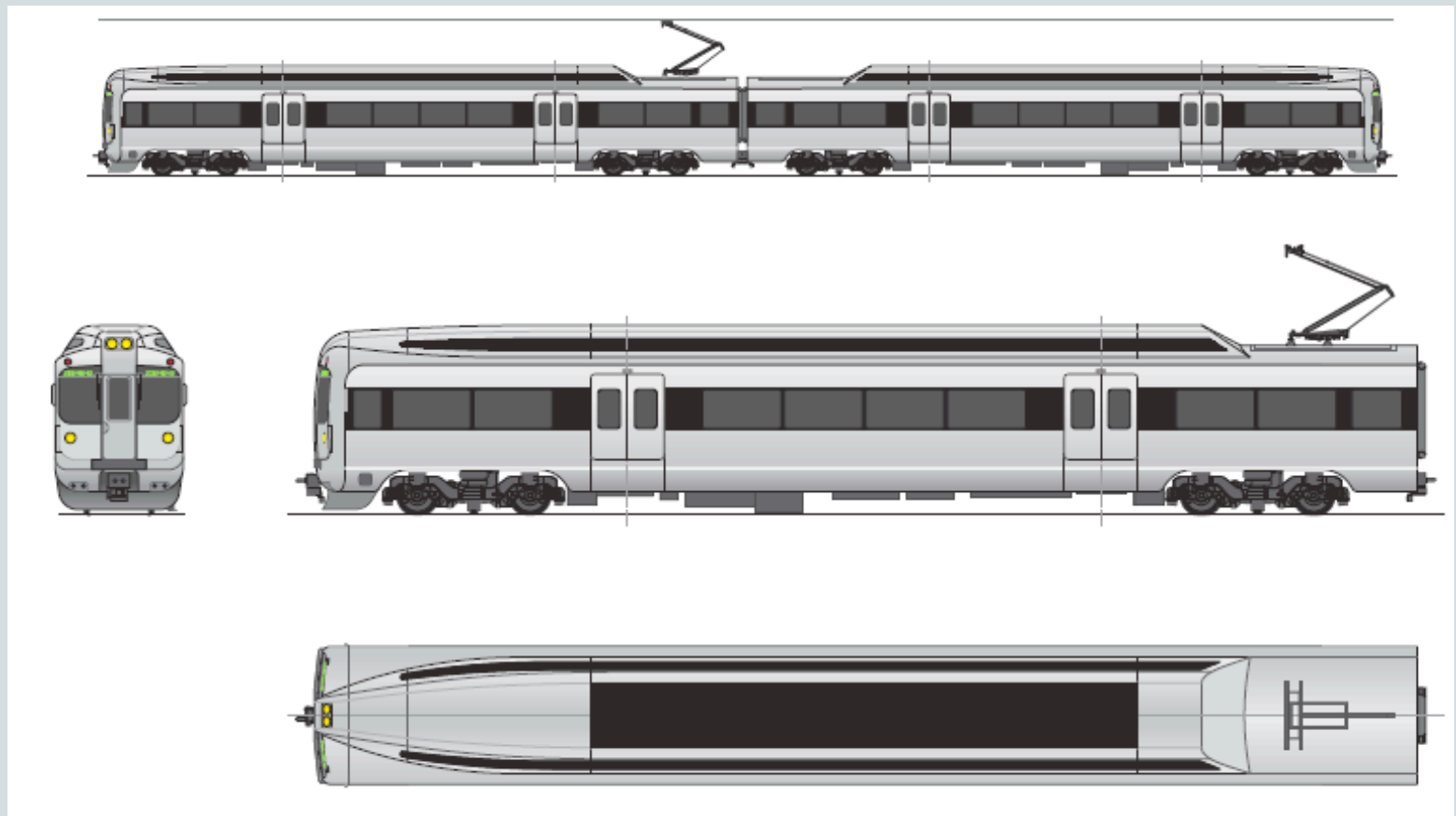


FRA Compliant DMU Platform

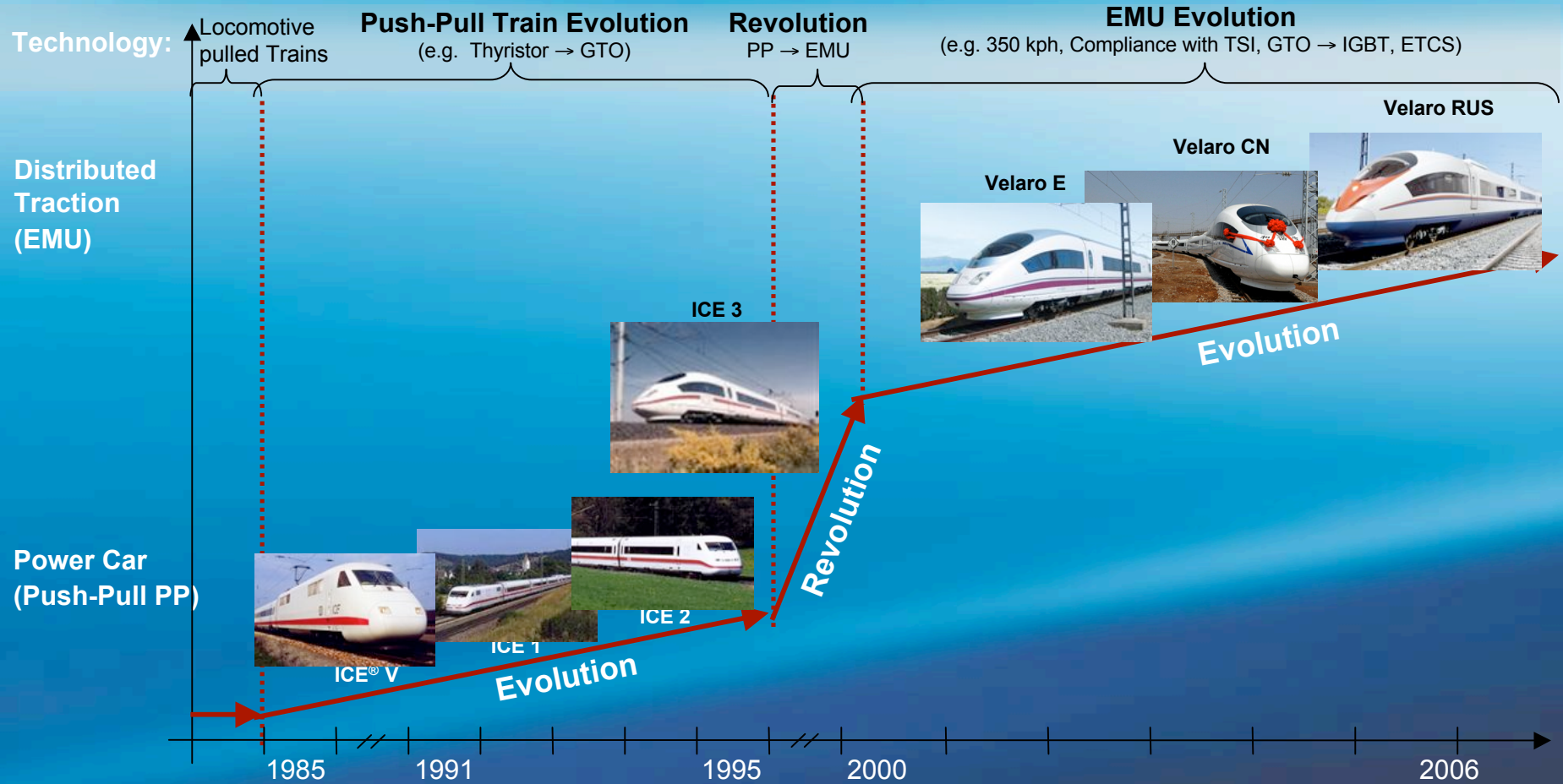
Renderings

Traditional Walk Through Cab

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High Speed Rail



ICE® is a registered trademark of DB AG

Higher Speed Rail - The Railjet

SIEMENS



Safe with Comfort

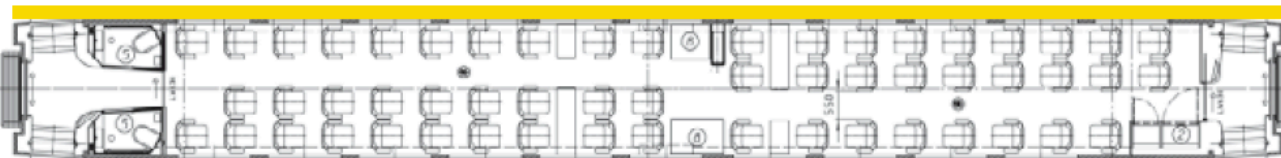
- Spacious, modern interior
- Wide, closed gangway
- 230/250 km/h max. operating speed
- Multi-system technology for easy cross-border traffic
- Automatic folding step for convenient entrance
- Luggage racks for bulk luggage
- Wheelchair area with elevator and universal toilet
- Dedicated seats for passengers with special requirements
- 469 cars (67 trains) to Österreichische Bundesbahn (ÖBB), delivery starting 2008



Technical Data

Car types	¹⁾ Premium Cap Car Afmpz (1pc.) ²⁾ First Car Ampz (1pc.) ³⁾ Bistro Car ARbmpz (1pc.) ⁴⁾ Economy Car Bmpz/1 (3pcs.) ⁵⁾ Economy Car Bmpz/2 (1pc.)
Track gauge	1,435 mm
Length over buffers	26,850 ¹⁾ / 26,500 ²⁾³⁾⁴⁾ / 26,450 ⁵⁾ mm
Carshell length	26,409 ¹⁾ / 25,980 ²⁾³⁾⁴⁾⁵⁾ mm
Car height above ToR	4,050 mm
Car width	2,825 mm
Floor height compartment above ToR	1,250 mm
Clear width entrance	2 x 850 mm
Clear width passageway	1,100 mm
Entrance height above ToR	1,250 mm
Pivot pitch	19,000 mm
Bogie wheelbase	2,500 mm
Bogie	SF400
Brake system	3 discs per axle, Mg
Wheel diameter (new)	920 mm
Max. service speed	230 ... 250 km/h
Min. curve radius (uncoupled)	150 (80) m
Tare mass, type dependant	50.4 ¹⁾ / 45.4 ²⁾ / 47.1 ³⁾ / 46.4 ⁴⁾ / 47.2 ⁵⁾ t
Total mass, type dependant	54.9 ¹⁾ / 50.0 ²⁾ / 52.8 ³⁾ / 53.0 ⁴⁾ / 53.9 ⁵⁾ t
Toilets	1 ¹⁾⁵⁾ / 2 ²⁾⁴⁾ / 1 Universal ³⁾ , Vacuum
Power supply	1,000 V AC 16 ^{2/3} / 50 Hz; 1,500 V AC 50 Hz; 1,500 V DC; 3,000 V DC
Passenger capacity	27 ¹⁾ / 55 ²⁾ / 15 ... 20 ³⁾ / 80 ⁴⁾ / 76 ⁵⁾ seats

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ÖBB railjet®

- Premium
- First
- Economy
- Wheelchair area
- Catering



ES64U4

High-performance multi-system locomotive platform

ES64U4

High-performance multi-system locomotive platform

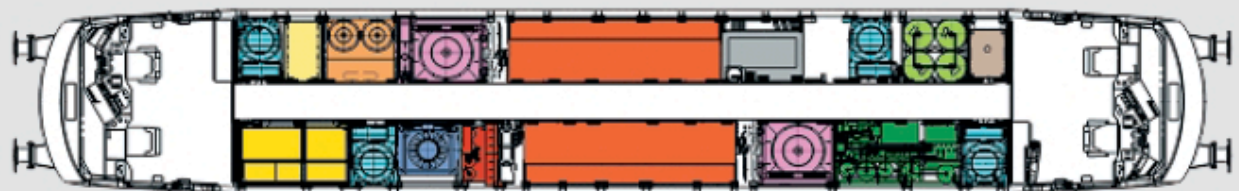
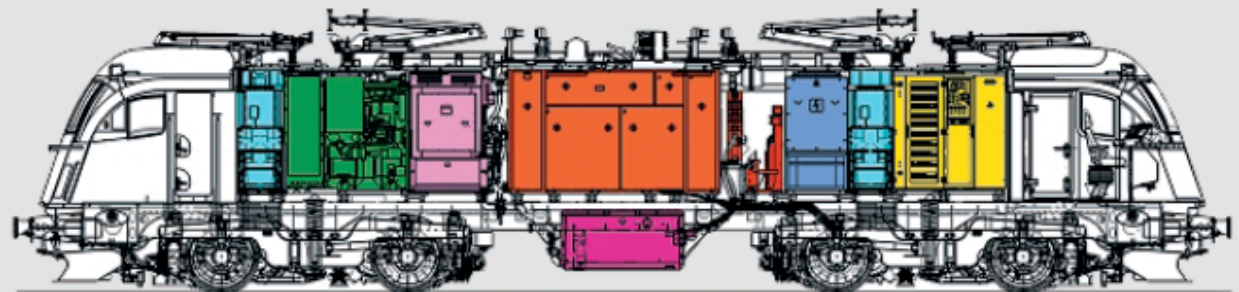
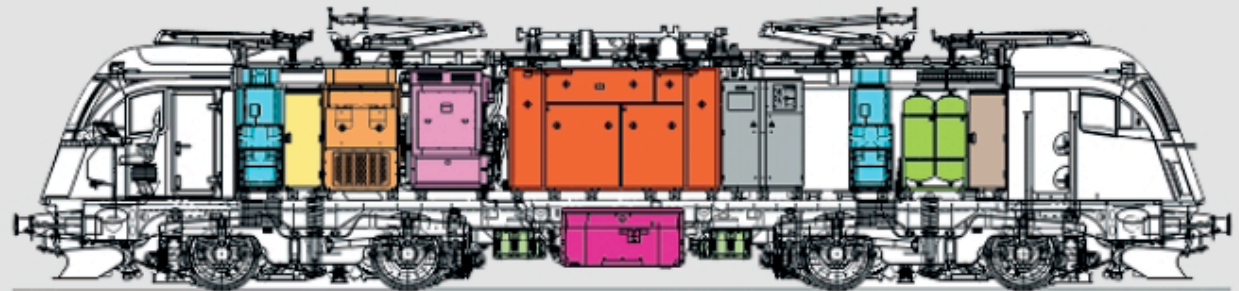
The ES64U4 is a high speed multi-system locomotive for the European AC and DC route network. It expands the Siemens EuroSprinter® family ("ES") in the range of high continuous ratings of up to 6,400 kW ("64"), which includes the existing high speed multi-system universal locomotives ("U") for AC systems and the existing multi-system freight locomotives for AC and DC systems. The ES64U4 is suitable for operation in the following power supply systems, depending on the variant:

AC	15 kV	16.7 Hz
AC	25 kV	50 Hz
DC	1.5 kV	
DC	3 kV	

The EuroSprinter family incorporates state-of-the-art three-phase AC drive technology for universal locomotives of the highest performance class. It combines advanced technology with proven high reliability.

Technical information	
Wheel arrangement	Bo'Bo'
Temperature range	–25 °C to +40 °C (possibly with reduced tractive effort at >35 °C)
Operating elevation	1,400 m
Continuous rating (max.)	6,000–6,400 kW (traction and regenerative brake) at AC 25 kV and at AC 15 kV 6,000 kW (traction and regenerative brake) at DC 3 kV 3,000–4,200 kW (traction and regenerative brake) at DC 1.5 kV 2,000–3,000 kW (rheostatic brake) at DC 3 kV and DC 1.5 kV (AC mode optional)
Max. speed	200–230 km/h
Weight	87 metric tons ± 2.5 %
Starting tractive effort	300 kN at $\mu = 0.36$ and 87 metric tons locomotive weight
Continuous tractive effort	250 kN
Electric braking effort	150–240 kN
Power factor	> 0.95 (at $P > 2$ MW)
Structure clearance gauge	UIC 505-1 Section 6.1, 6.2 and 6.4
Track gauge	1,435 mm
Length	19,580 mm
Width	3,019 mm
Distance between bogie centers	9,900 mm
Bogie wheelbase	3,000 mm
Wheel diameter	1,150 mm / 1,070 mm (new/worn)

- Main transformer
- Traction converter
- Cooling system
- 3 kV rack
- Traction motor blower
- Auxiliary transformer rack
- Air rack
- Air reservoir rack
- Train protection cabinet
- Auxiliary equipment rack
- Battery container
- Braking resistor
- Electronics cabinet
- Fire extinguishing system



**200 MPH+ High Speed Rail
Velaro/ ICE 3**

Velaro – The Siemens High Speed Platform Speed

SIEMENS

- Max. speed: 350 kph at optimal ride comfort
- Better than flying for distances up to 800 km (e.g. Madrid-Barcelona: 625 km in 2 ½ hours)



404 km/h – world record

Velaro E – the most rapid series production train set

(252mph)

Transportation Systems

SIEMENS

Velaro - Flexibility

Flexible Velaro Configurations

SIEMENS

Trainset configuration	Length (m)	Power	Doors (ext.)	Toilets	Standard capacity	High density capacity
8 cars 	200	8MW	24	10+1	515	ca. 600
10 cars 	250	8MW	28	14+1	671	ca. 750
16 cars 	400	16MW	40	14+2	1050	ca. 1200

The Velaro concept offers various configurations for high density solutions.

The EMU concept permits long train solutions, which increase the advantage of seat capacity and accessibility compared with Push Pull Solutions.

Velaro – The Siemens High Speed Platform Flexibility

SIEMENS

High Comfort

High Density

Velaro E

ICE 3 ¹⁾

ICE 3
Option ¹⁾

Velaro „HD“ ²⁾

Velaro CN

Velaro RUS ³⁾




Technical Data	
Seats	404
4 Service Areas	
Club	37
Preferente	103
Turista	264

Technical Data	
Seats	415
Restaurant	
1. Class	141
2. Class	250
+ 24 Restaurant	

Technical Data	
Seats	458
Bistro	
1. Class	98
2. Class	360

Technical Data	
Seats	651
1. Class	144
2. Class	507

Technical Data	
Seats:	601
2 Classes + Bistro	
1. Class	72
2. Class	529

Technical Data	
Seats:	604
2 Classes + Bistro	
 Class	104
2. Class	500

1) Interior furnishings comparable to the Velaro platform

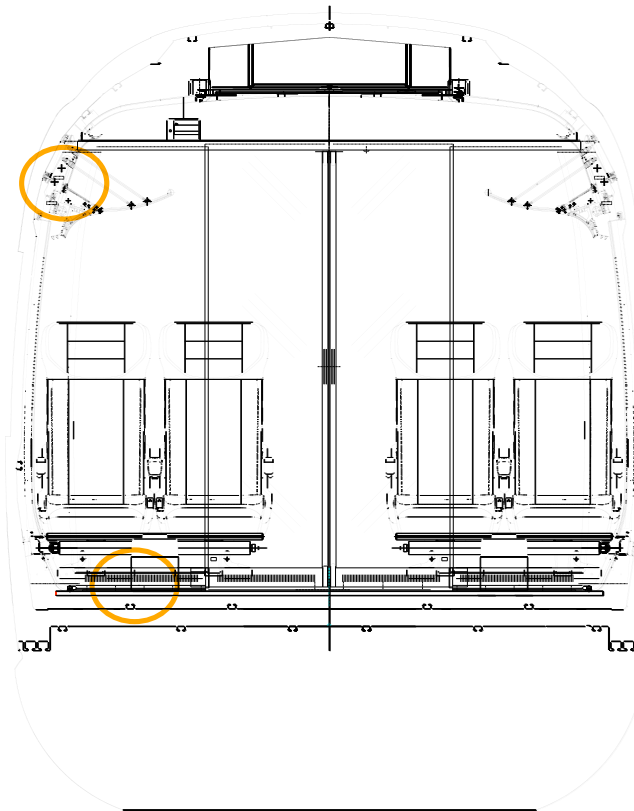
2) HD: High-Density, study for max. possible seating capacity in a 200 m single deck train (2x2 seating, UIC profile)

3) 10 car concept

Velaro - Flexibility Flexibility due to Empty Tube Principle

C-shaped bar interface for mounting seats and luggage racks.

The Authority can change the interior as required to accommodate changing demands over time.



Standardized plugs for 230V and communication systems in the side wall.

Space for luggage can be added and reduced overnight because of standardized interfaces.

The modular interior configuration ensures quick responses to new requirements in assembly and operation.

Velaro – The Siemens High Speed Platform Top Class Comfort

SIEMENS



The Authority's mission was to provide an experience unlike anything before

Velaro – Comfort

Excellent passenger comfort

SIEMENS

Excellent passenger comfort
ranges from luxury lounge ...



... to seating areas in
passenger cars.

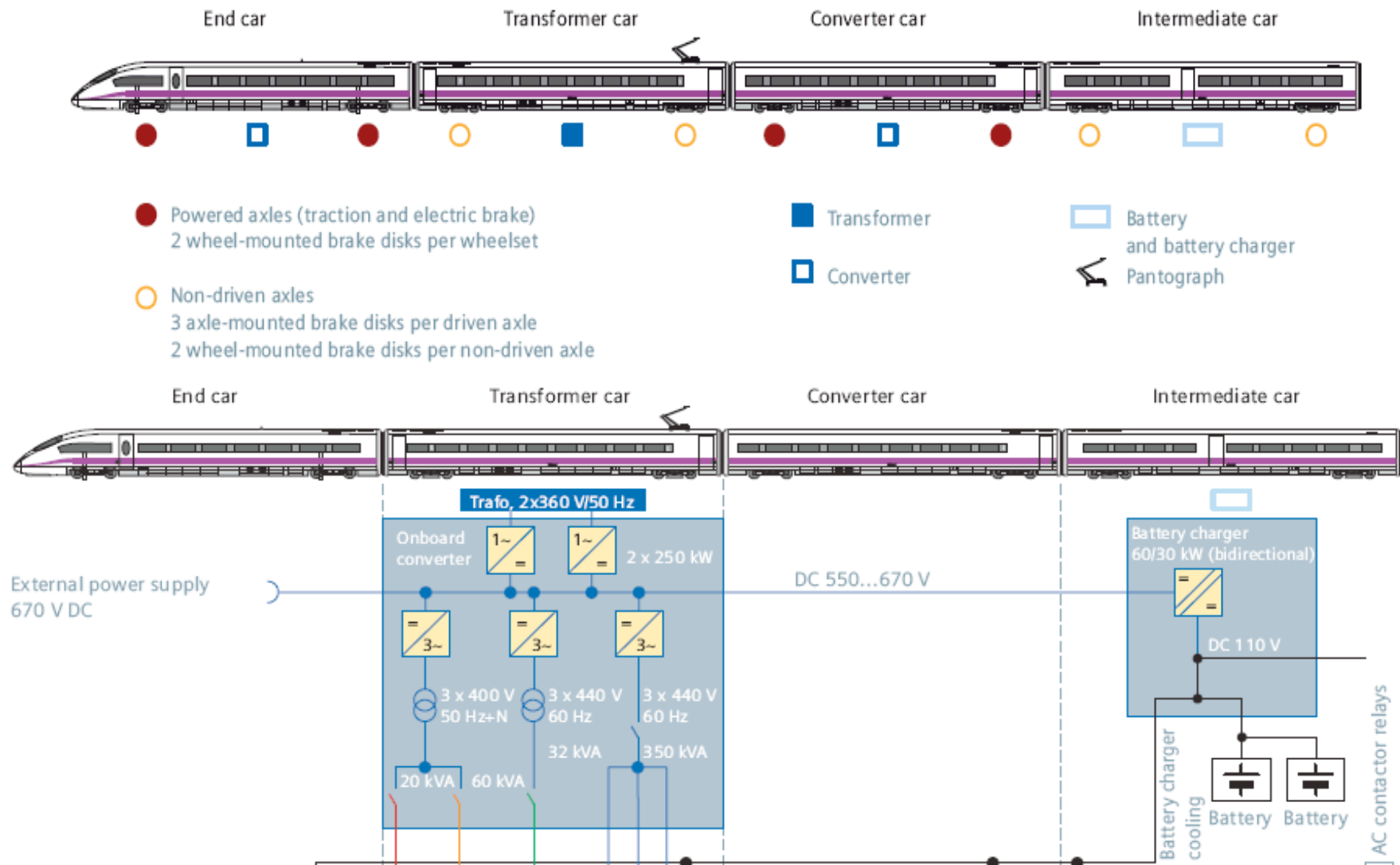
Velaro – Family of High Speed Trains Technical data at a glance

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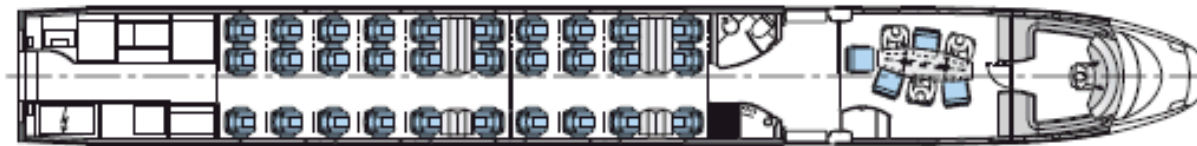


Technical Data		Velaro E	Velaro CN	Velaro RUS
Year of manufacture:		starting 2005	starting 2007	starting 2008
Number of cars:		8	8	10
Operating voltage:	[kV/Hz]	25/50 AC	25/50 AC	3 DC and 25/50 AC
Max. speed	[kph]	350	300	250, upgradeable to 300
Track gauge:	[mm]	1,435	1,435	1,520
Seat capacity:		404	601	604
Tractive power:	[kW]	8,800	8,800	8,000

Velaro E – Power Distribution



Velaro E – Seating Configuration



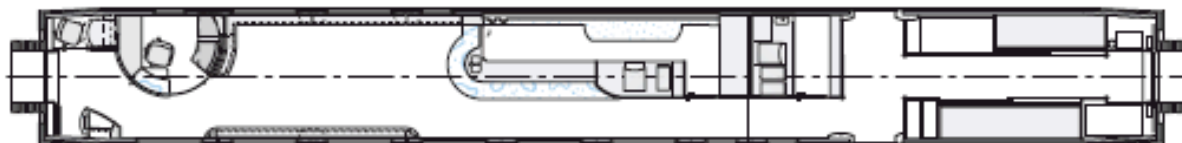
end car Club



transformer car Preferente

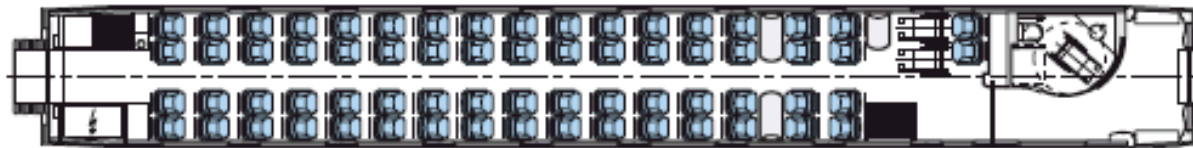


converter car Preferente

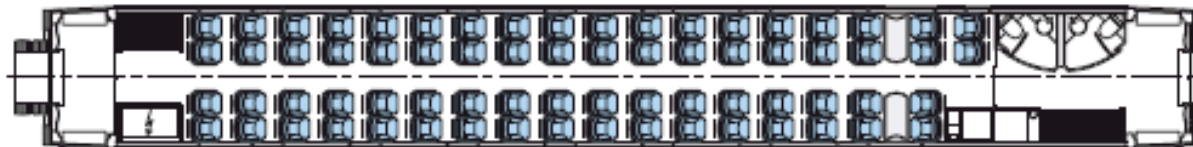


intermediate car Cafeteria

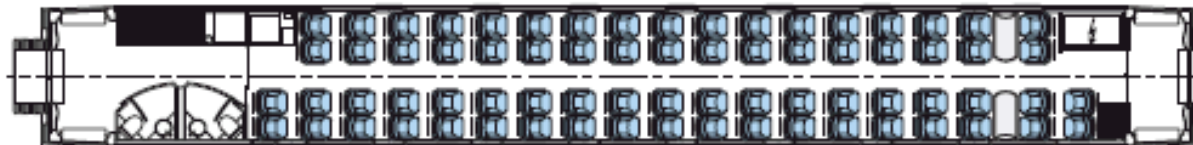
Velaro E – Seating Configuration



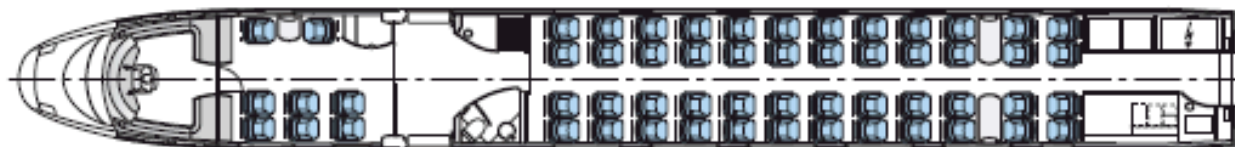
intermediate car Turista



converter car Turista



transformer car Turista

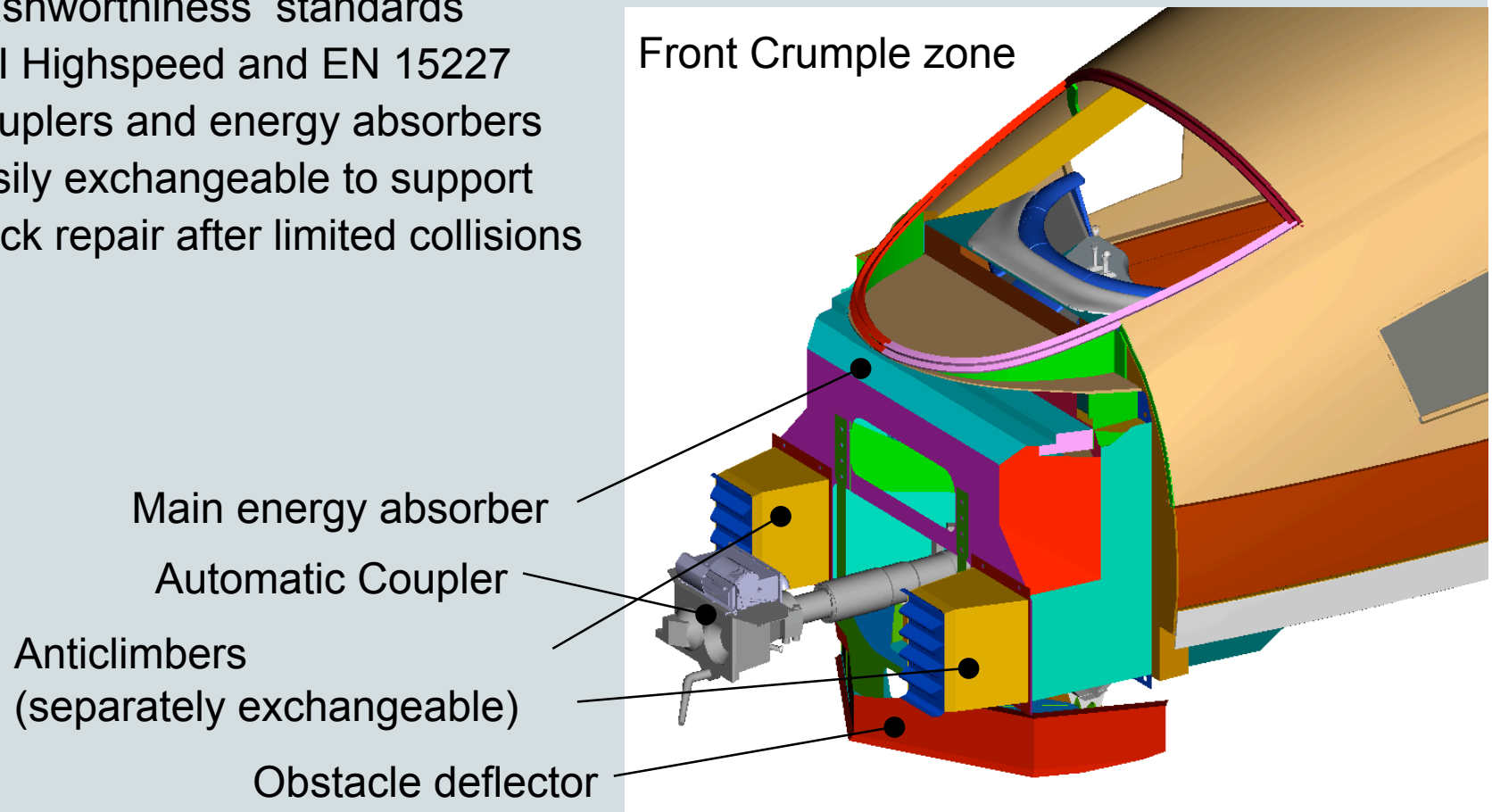


end car Turista

Current Implementations of CEM Velaro High Speed Train

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- Fully compliant with latest European crashworthiness standards TSI Highspeed and EN 15227
- Couplers and energy absorbers easily exchangeable to support quick repair after limited collisions

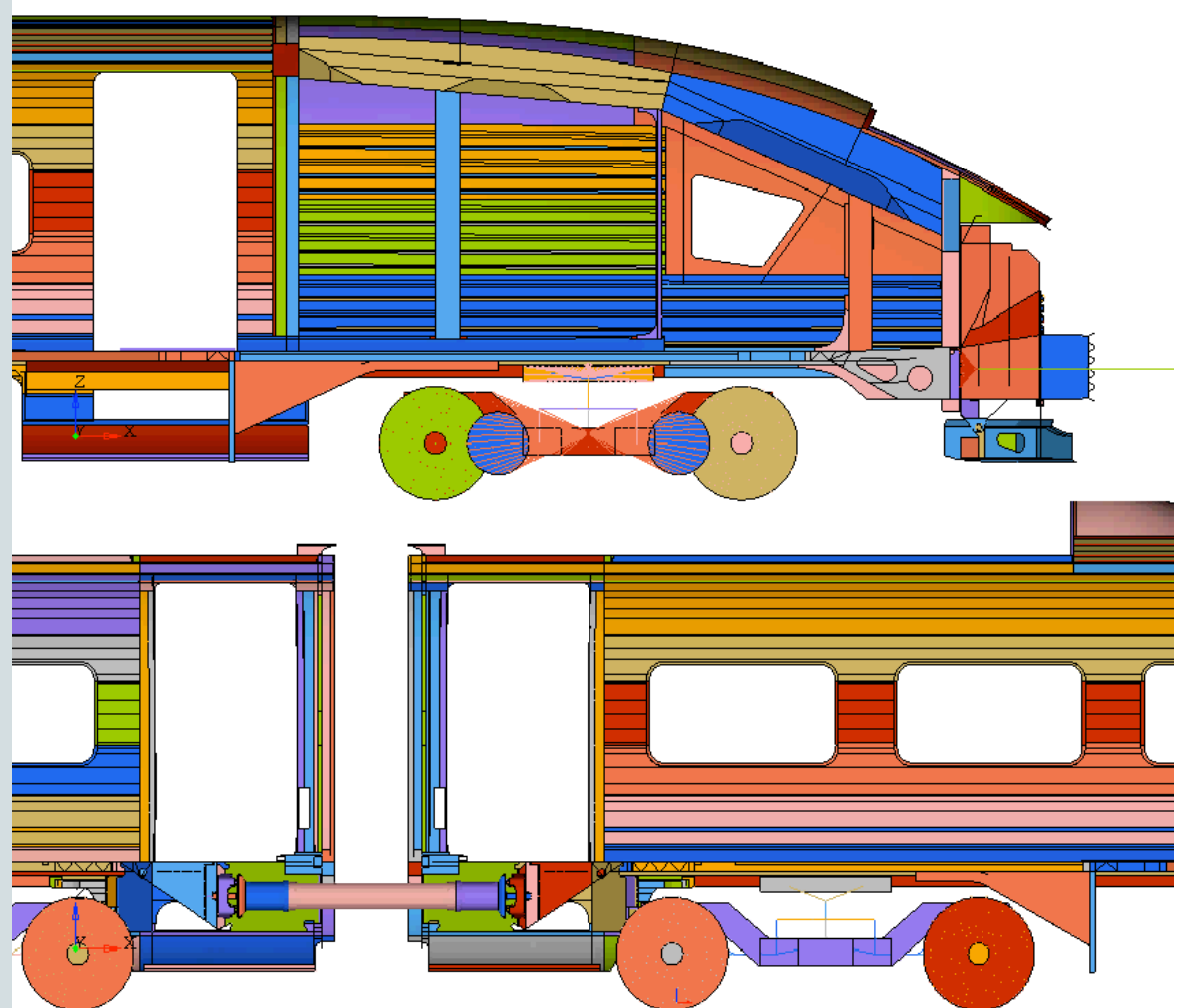


Current Implementations of CEM Velaro High Speed Train

SIEMENS

Crash simulation Scenario 1
TSI HS / EN 15227

- Identical trains
- 36 km/h (22.4 mph) closing speed
- Stabilizing pivots of intermediate couplers prevent pole-vaulting

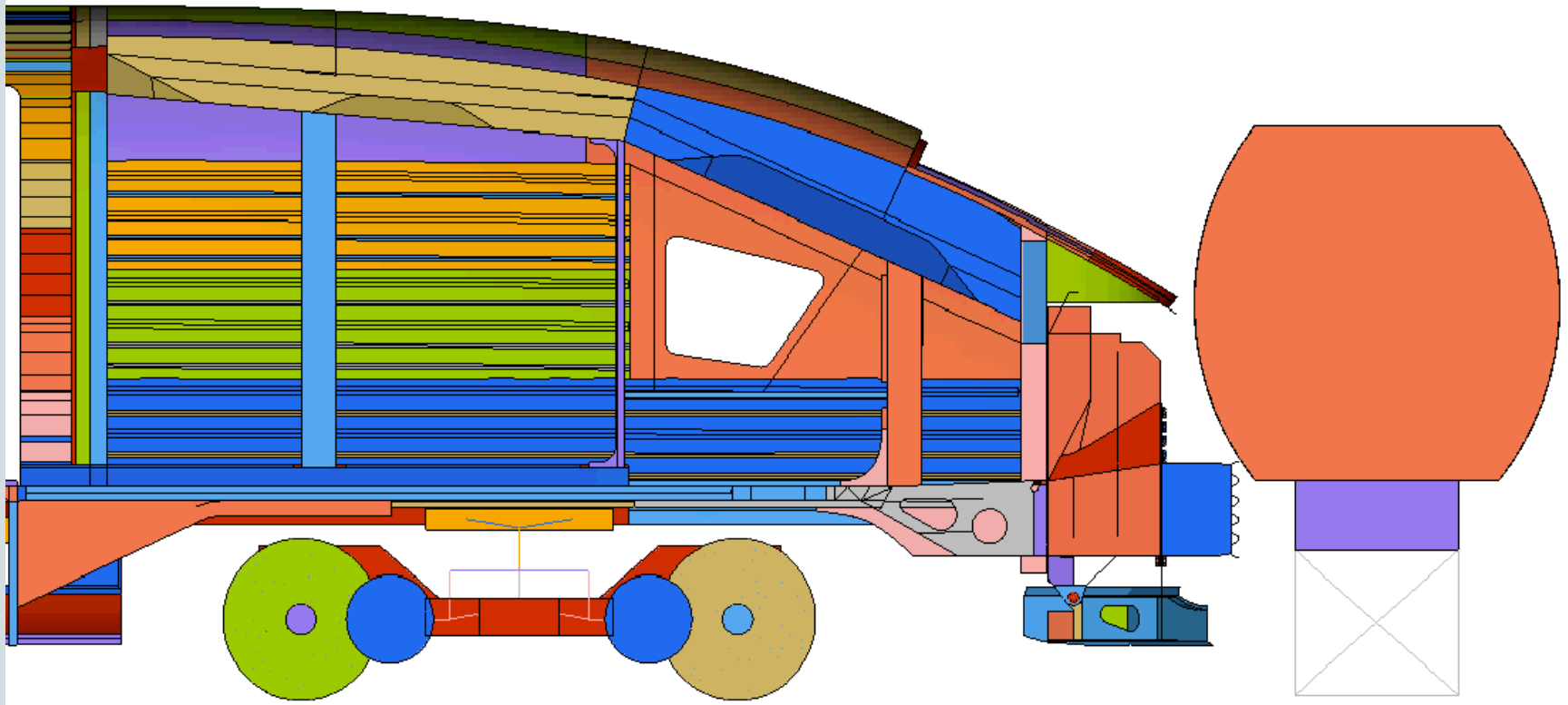


Current Implementations of CEM Velaro High Speed Train

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Crash simulation Scenario 3 TSI HS / EN 15227

- Grade Crossing, 15 t truck, represented by numerical model
- 110 km/h (68.4 mph) impact speed



What's next - Development News: Velaro "D"



15 train award December 2008 - 8 Car configuration similar to Velaro Spain

What's next: Velaro "CA"



**Train service in the State of California by 2015!
100 trains in service throughout the state by 2030**

Thank You!