

# **Welcome**

***Stephen Bonina, P.E.***

**Interfleet Technology**

**Representing  
Stadler Rail Group**

# The Stadler Rail Group

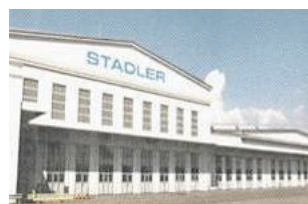
## Stadler Rail Group

Consolidated turnover ~ \$1 Billion  
Number of employees: ~ 2'400

### DIVISION SWITZERLAND



**Stadler Bussnang AG**  
Bussnang  
1'100 employees



**Stadler Altenrhein AG**  
Altenrhein  
350 employees



**Stadler Winterthur AG**  
Winterthur  
200 employees

### DIVISION GERMANY



**Stadler Pankow GmbH**  
Berlin  
500 employees



**Stadler Pankow GmbH**  
Velten  
50 employees

### DIVISION INTERNATIONAL



**Stadler Pusztaszabolcs**  
Hungary  
35 employees



**Stadler Szolnok**  
Hungary  
60 employees



**Stadler Siedlce**  
Poland  
60 employees



**Stadler Algier**  
Algier  
30 employees

# Product portfolio: Railway vehicles

## Modular Vehicle concept



RS1



GTW



FLIRT



DOSTO

## Tailor Made



Locomotives



Passenger  
coaches



Narrow gauge  
railway



Rack-railcars

# Product portfolio: Streetcars

## Modular Vehicle concept



Tango



Variobahn

## Tailor Made



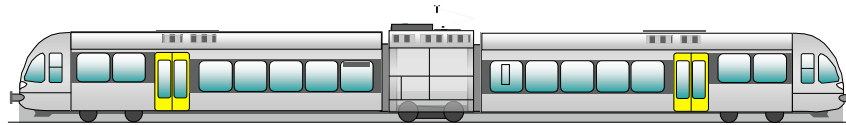
Trogenerbahn



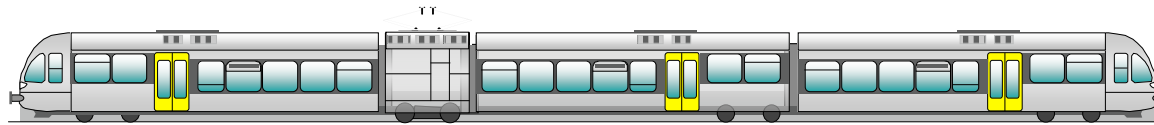
Forchbahn



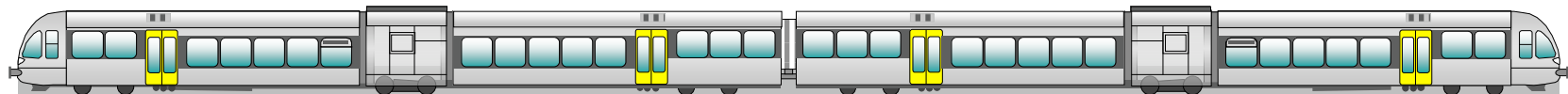
# Overview GTW Versions



GTW 2/6 up to 120 seats

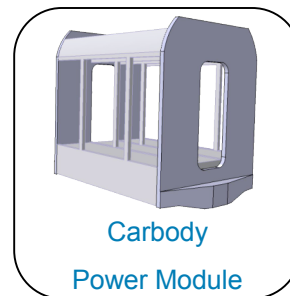
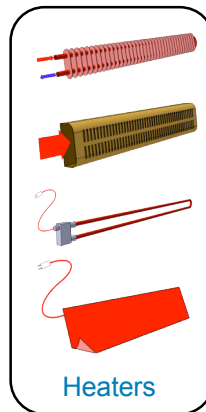
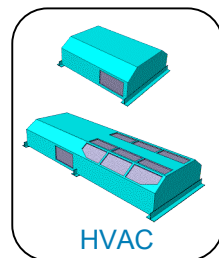
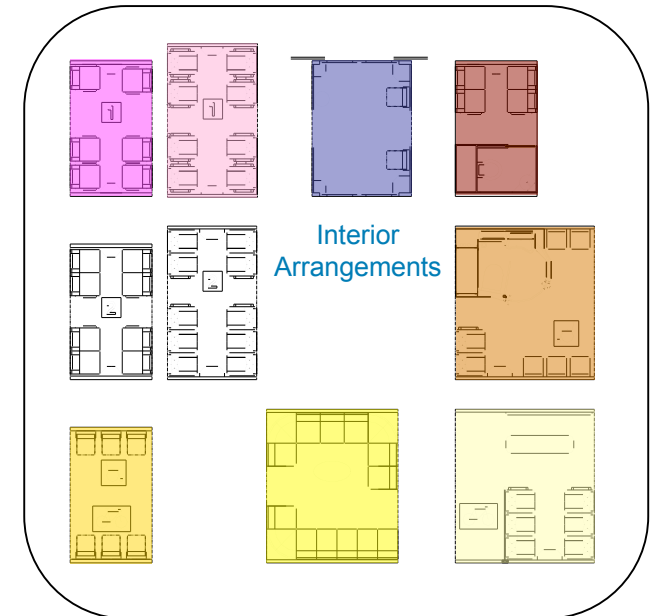
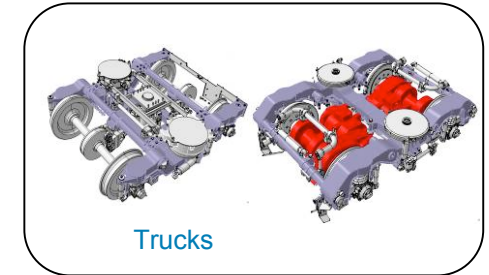
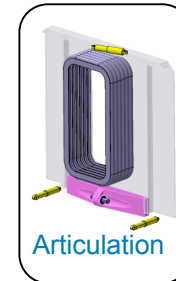
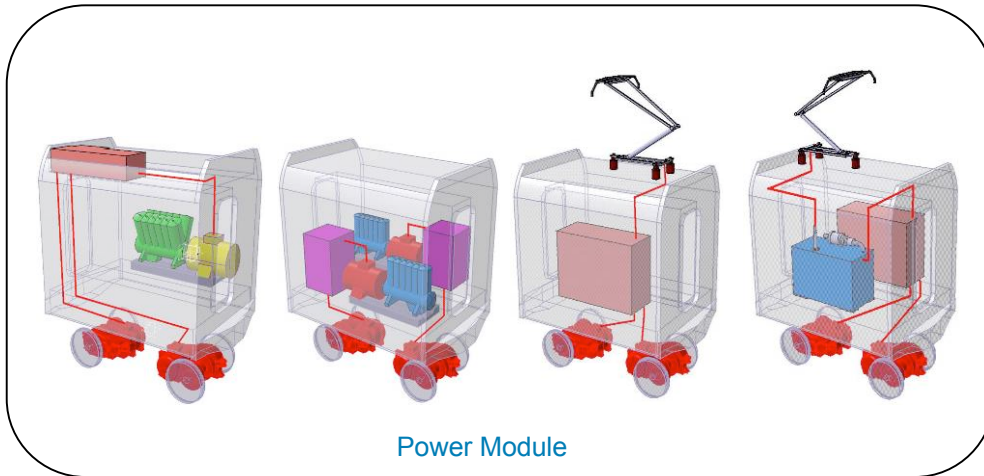


GTW 2/8 up to 175 seats



GTW 4/12 up to 240  
seats

# GTW : a modular train





**Denton County Transportation Authority, Lewisville TX,**  
11 articulated railcars GTW DMU-2 2/6, diesel-electric,  
standard gauge, fulfils EN 15227 (Crashworthiness) + select  
FRA requirements



**Capital Metropolitan Transportation Authority, Austin TX,**  
6 articulated railcars GTW DMU-2 2/6, diesel-electric,  
standard gauge, fulfils EN 15227 (Crashworthiness) + select  
FRA requirements



**Southern New Jersey Light Rail Transit, USA**  
20 articulated railcars GTW 2/6, diesel-electric, standard  
gauge





**Switzerland**  
electric



**Switzerland - SBB**  
Electric



**Greece**  
diesel electric



**Slovakia**  
electric,  
diesel-electric



**Italy**  
diesel electric



**Italy**  
diesel electric  
(4 GTW2/6 and 2  
GTW 4/12)



**Netherlands**  
diesel electric



**Netherlands**  
electric

# GTW : Reference List

Type	Customer	Country	Number	Power Supply	Order year	Delivery	Continuous Rating at wheel (kW)	Max. Speed (km/h)	Gauge (mm)	Seats
GTW 2/6	BTI (Asm) Biel-Täuffelen-Ins-Bahn	CH	7	1200 VDC	1995	1997/1998	320	80	1000	88
GTW 2/6	CEV Chemins de fer Electrique Veveysans	CH	4	900 VDC	1996	1998/1999	320	80	1000	84
GTW 2/6	MThB Mittelthurgaubahn " Seehas"	CH	10	15 kVAC	1997	1998/1999	520	130	1435	118
GTW 2/6	MThB Mittelthurgaubahn " Seehäsele"	CH	3	Diesel-electric	1996	1997/1998	420	120	1435	118
GTW 2/6	HLB Hessische Landesbahn	D	18	Diesel-electric	1997	1999/2000	420	120	1435	120
GTW 2/6	HLB Hessische Landesbahn, Option	D	12	Diesel-electric	1997	2001/2002	420	120	1435	120
GTW 2/6	DB AG Deutsche Bahn , Brandenburg	D	30	Diesel-electric	1997	2001	420	120	1435	108
GTW 2/6	DB AG Deutsche Bahn , Usedom	D	14	Diesel-electric	1997	1998/2000	420	120	1435	126
GTW 2/6	DB AG Deutsche Bahn, Brandenburg Option	D	13	Diesel-electric	1997	2003	420	120	1435	108
GTW 2/6	DB AG Deutsche Bahn , Usedom Option	D	9	Diesel-electric	1997	2003	420	120	1435	126
GTW 2/6	Lilo Linzer Lokalbahn	A	8	750VDC/15kVAC	1997	2000	520	130	1435	126
GTW 2/6	Lilo Linzer Lokalbahn, Option	A	6	750VDC/15kVAC	2003	2005	520	130	1435	126
GTW 2/6	OSE Hellenic Railways Organization S.A.	GR	12	Diesel-electric	1999	2003/2004	400	100	1000	92
GTW 2/6	OSE Hellenic Railways Organization S.A.	GR	17	Diesel-electric	1999	2002/2004	400	115	1435	94
GTW 2/6	ŽSSK, Železničná spoločnosť SR, a.s.	SK	14	1500 VDC	1998	2001/2002	320	80	1000	108
GTW 2/6	ŽSSK, Železničná spoločnosť SR, a.s.	SK	6	Diesel-electric	2000	2003	420	120	1435	109
GTW 2/6	ŽSSK, Železničná spoločnosť SR, a.s.	SK	1	1500 VDC	2004	2006	320	80	1000	108
GTW 2/6	RM Regionalverkehr Mittelland	CH	6	15 kVAC	2000	2003	750	140	1435	103
GTW 2/8	RM Regionalverkehr Mittelland	CH	7	15 kVAC	2000	2004	750	140	1435	163
GTW 2/6	YSC Yverdon-Sainte-Croix	CH	2	15 kVAC	1999	2001	320	80	1000	100
GTW 2/6	CJ Chemin de fer du Jura	CH	4	1500 VDC	1999	2001	320	90	1000	87
GTW 2/6	NJT New Jersey Transit	USA	20	Diesel-electric	2000	2002/2003	420	110	1435	90
GTW 2/8	SBB, Schweizerische Bundesbahnen , Seetal	CH	17	15 kVAC	2000	2002/2003	520	115	1435	139
GTW 2/6 Z	FGC Montserrat / Ribes Nuria	E	7	1500 VDC	2000/2001	2002/2003	600	Z 30/A 45	1000	118
GTW 2-2/6	STA Merano - Malles	I	8	Diesel-electric	2001	2004	600	140	1435	110
GTW 2/6	THURBO AG	CH	51	15 kVAC	2001	2003/2005	750	140	1435	118
GTW 2/8	THURBO AG	CH	24	15 kVAC	2004	2006/2007	750	140	1435	180
GTW 2/6	SNCF Train Jaune Cerdagne	F	2	850 VDC	2002	2003	600	70	1000	86
GTW 2-2/6	ST Sistemi Territoriali S.p.A.	I	3	Diesel-electric	2004	2006	600	140	1435	111
GTW 2-4/12	ST Sistemi Territoriali S.p.A.	I	2	Diesel-electric	2004	2006	1200	140	1435	245
GTW 2-2/6	Arriva	NL	16	Diesel-electric	2005	2006/2007	600	140	1435	115
GTW 2-2/8	Arriva	NL	27	Diesel-electric	2005	2006/2007	600	140	1435	178
GTW 2-2/6	STA Merano - Malles	I	4	Diesel-electric	2005	2006	600	140	1435	110
GTW 2-2/6	Capital Metro	USA	6	Diesel-electric	2005	2007/2008	470	120	1435	108
GTW 2/6	ASm (Aare Seeland mobil)	CH	2	1200 VDC	2005	2007	320	80	1000	88
GTW 2-2/6	ST Sistemi Territoriali S.p.A., Option	I	1	Diesel-electric	2005	2008	600	140	1435	111
GTW 2/8	THURBO AG	CH	5	15 kVAC	2006	2007	750	140	1435	180

► > 470 GTW sold, > 450 in commercial service



# GTW Vehicle Delivers

- Safety
- Environmental conditions
- Off-the-shelf technology
- Ability to meet aggressive delivery schedules
- Joint running capacity (street & dedicated alignment)
- 70% low floor DMU
- 4% grade
- Proven reliability
- Redundancy

# GTW Attributes

- Safety
- Reliability
- Maintainability
- Passenger/operator-friendly

# GTW Attributes

- Safety
  - 5 mph/sec brake rate
  - NFPA 130
  - Crash worthiness
  - Fire detection and suppression system
  - Emergency lighting

# GTW Attributes

- Reliability
  - Redundant systems:
    - Propulsion
    - Aux power
    - Brakes (controls & electronics)
    - Control system
    - HVAC

# GTW Attributes

- Maintainability





# GTW Attributes

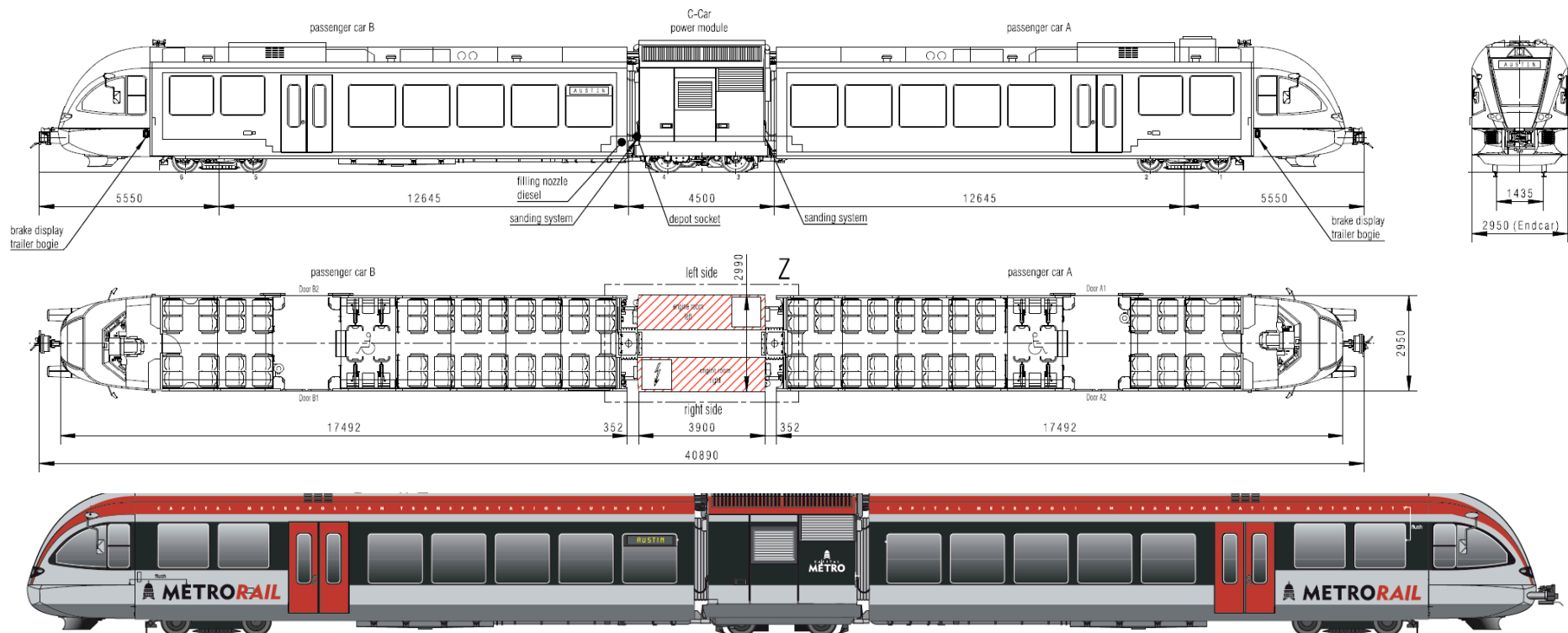
- Passenger/operator-friendly
  - Easy access
  - Multipurpose areas
  - Comfortable seats
  - Work space in high floor
  - Large windows
  - Bright interiors
  - Wi-Fi -ready

# General

- Propelled by two diesel electric engines
- Fully ADA compliant
- Will be able to start and stop faster than traditional commuter rail vehicles
- Capacity of 200 passengers, 108 seated and 92 standing, as well as spaces for passengers with wheelchairs and bicycles

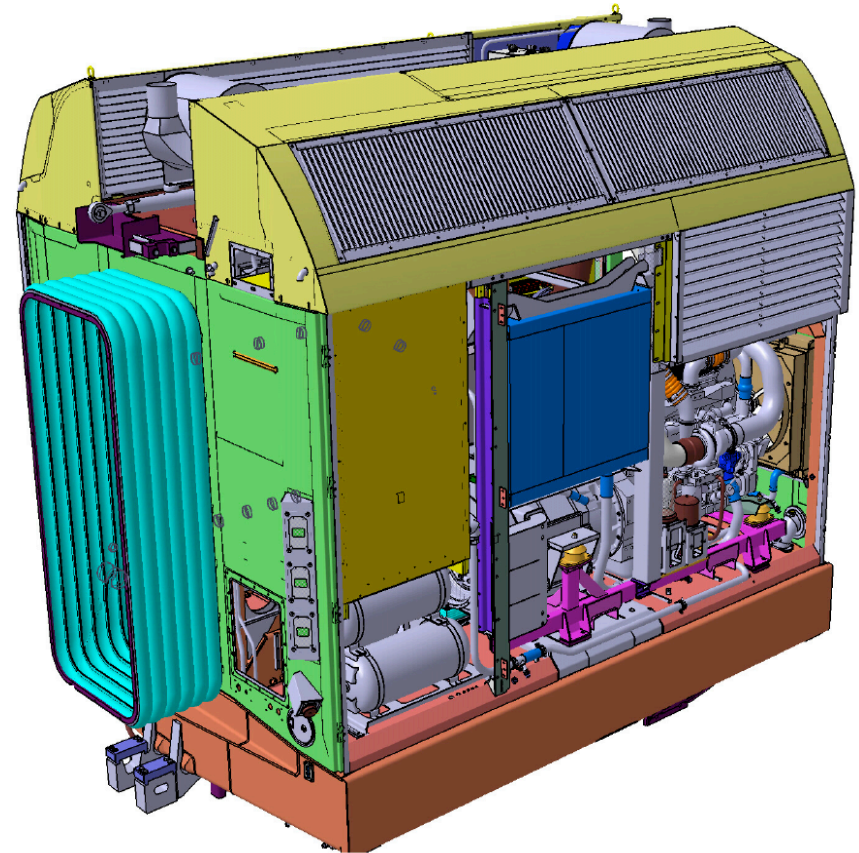
# End car - Overview

- Fixed seats - 96
- Flip up seats - 12
- Wheel chair spaces – 2
- Standee Capacity - 92
- Bicycle racks - 4
- Communications/CCTV system
- GPS location, passenger counter, internet access



# Power Module - Overview

- Two separate engine compartments each with a:
  - Fully redundant, independent Cummins QSM11 diesel engine
  - Generator
  - Traction Inverter/LVPS
  - Fire detection/suppression system
- Center Passageway
- High/Low Voltage Switchgear
- Batteries
- Brake controller/air tanks for power module
- Diagnostics

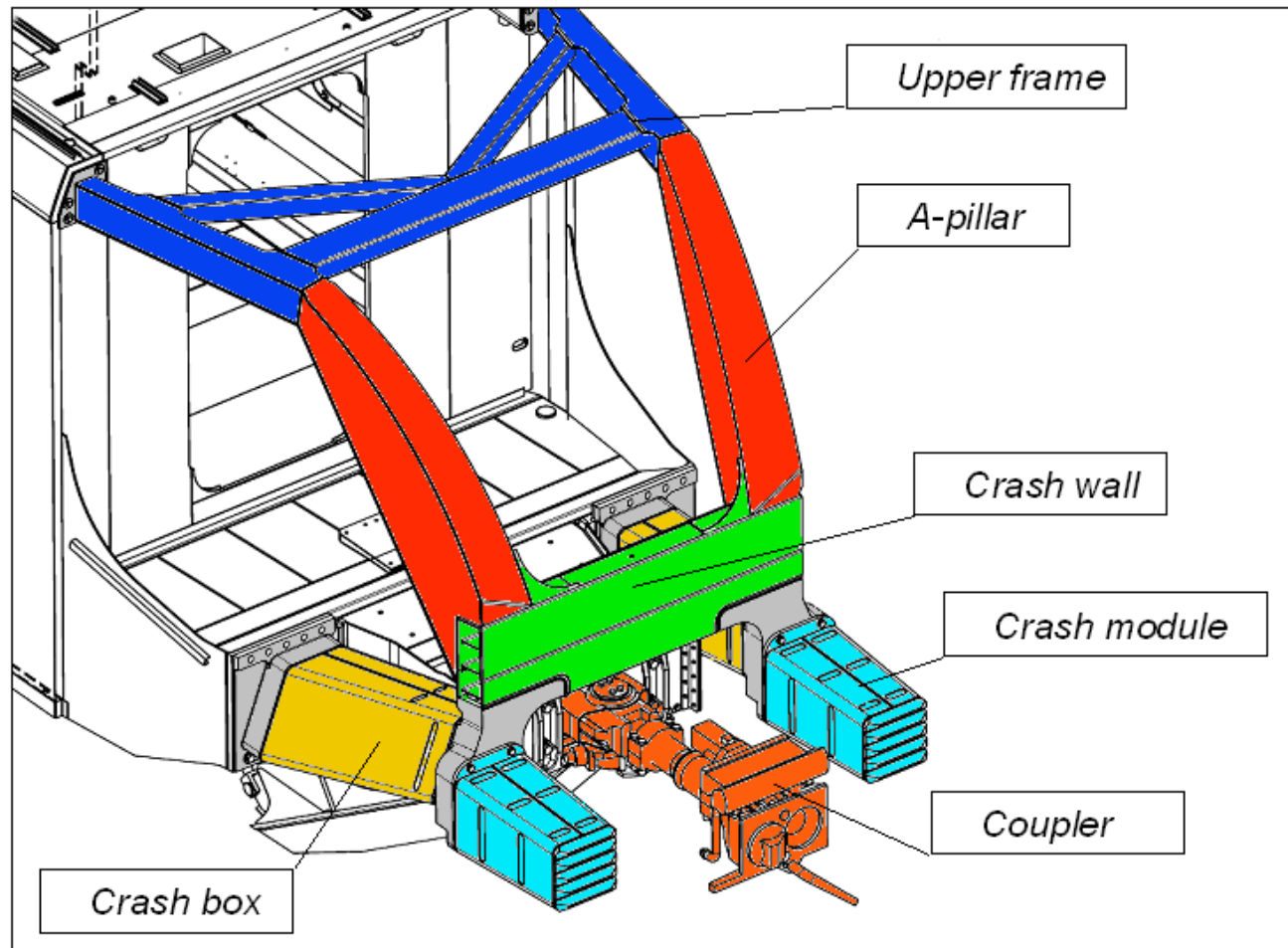


# Brake Rates (worst case)

- Full service
  - 5 mph/s ED, pneumatic & TB
- Emergency rail road mode (fail safe)
  - 4.26 mph/s pneumatic
  - 4.60 mph/s pneumatic & TB
- Emergency street mode
  - 5.0 mph/s pneumatic & TB (speed limited to 30 mph)

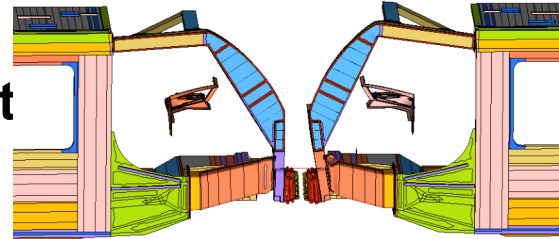


# Crash Energy Management System

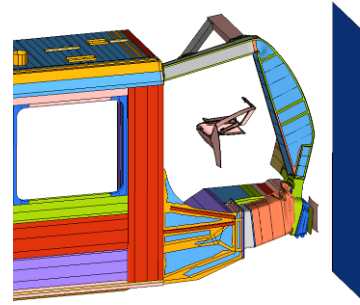


# Frontal Crash Scenarios - (EN 15227):

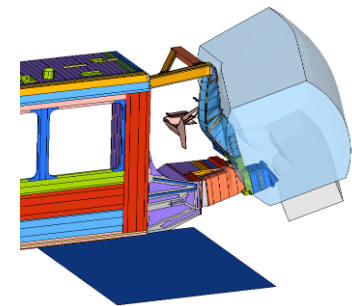
- **Collision Scenario 1:**  
 $v_c = 22.4$  mph Front end impact  
between two identical units,



- **Collision Scenario 2:**  
 $v_c = 22.4$  mph Front end impact  
into a 80-ton-freight wagon



- **Collision Scenario 3:**  
 $v_c = 56$  mph Front end impact with a  
heavy 15-ton obstacle (e.g. truck on  
grade crossing)



# Emergency Eq.

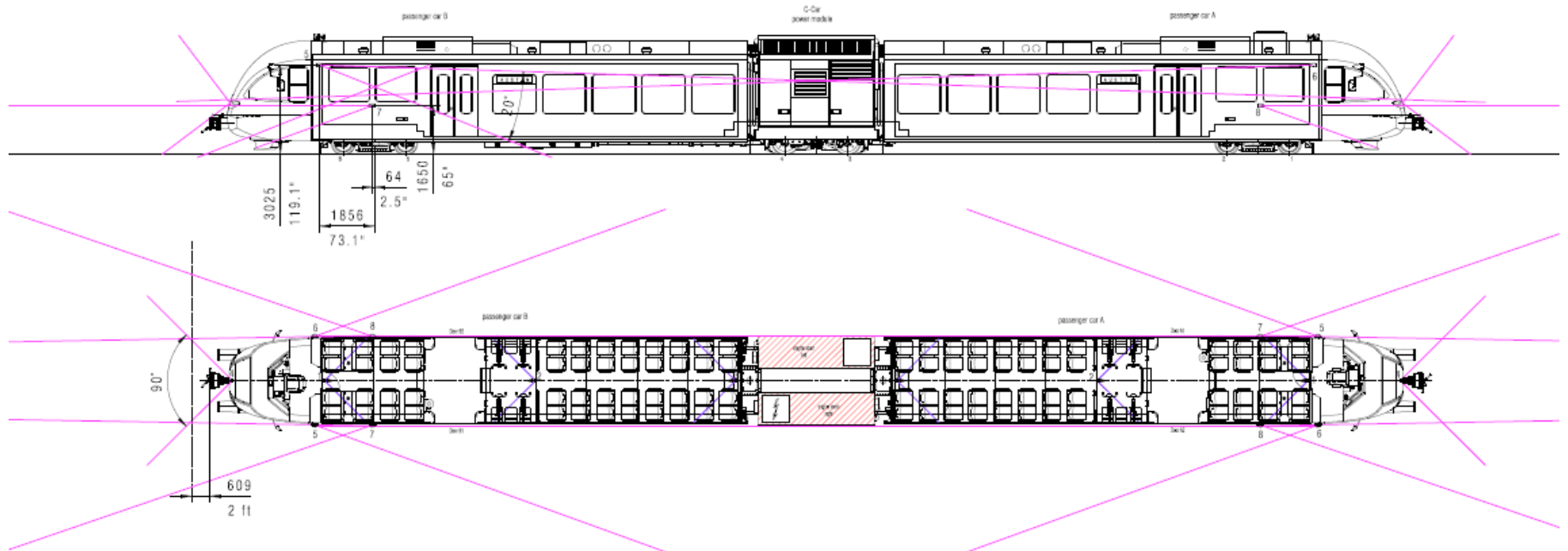
- FRA compliant Emergency signage
- Emergency lighting (exceeds 90 min)
- Exterior clearance and stop/tail lights
- Fire & smoke –NFPA 130 compliant (includes floor fire test)
- 4 fire extinguishers (1 each cab, 1 each passenger compartment)
- Fire detection and suppression system

# Fire Suppression System

- Detection sensor @ fuel tank
- Each engine has a detection & suppression system
- Fire sensors in likely ignition and fuel locations
- Activates at 230°F
- Driver annunciation
- Nozzles placed over likely ignition and fuel locations
- 2.8 gal. of Hydrex foam mixture per engine room
- Alarm is automatically sent to central control

# CCTV

- 16 color cameras
- 72 hour DVR





# Vehicle Interior



# Doors

- IFE door system
  - Overhead operator
  - Reliability test > 1,000,000 operations
- Clear opening 51.2-inches





# Operator's Cab



# Glazing- Windshield

- Both windshield and cab side windows tested to meet UIC 651 (references UIC 560 and 564-1):
  - Test piece struck with a circular shaped, 2.2 lb projectile with an impact speed of 174.5MPH;
  - Projectile cannot break thru the test piece, and the windshield must remain in the test fixture;
  - Test criteria developed to replicate scenarios involving the cab being struck by, “large ice blocks, birds, large pieces of ore falling from freight trains, or bottles, cans, etc. thrown from passing trains.”
  - Considered to be “toughened” safety glass.





# Testing

- Stadler uses the Swiss Federal Rail system for testing
  - 350 mile test run around Switzerland
- Standard battery of serial and type tests



# CMTA Procurement Summary

- Off-the-shelf philosophy - worked
- Teamwork - excellent
- Quality – excellent
- Schedule – ahead of schedule
- Litigation / claims- none



# Contact Information

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# Thank you for your attention



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