



## FIRST CLASS ENGINEERING

Technical Calculation - Development of technical Solution

# Company

About us

- Team with more than 110 employees at the locations **Basel**, **Bautzen**, **Chemnitz**, **Essen** and **Leipzig**
- More than **25 years** of market presence and specialisation in the rail vehicle sector
- Ensuring highest expertise in the redevelopment, modernisation or conversion of rail vehicles



# Company

Brief summary

**1992**

ESTABLISHMENT  
IKB Ingenieur- und  
Konstruktionsbüro  
GmbH

**2001**

ACCREDITATION  
Surveyors &  
Welding Company

**2008**

OPENING  
Basel branch

**2003**

OPENING of  
branch  
Chemnitz

**2013**

INTEGRATION  
in Friedhelm  
Loh Group

1990

**1995**

ISO 9001  
CERTIFICATION

**2002**

RENAMING  
to CIDEON Engineering  
GmbH

**2008**

OPENING of  
Leipzig branch

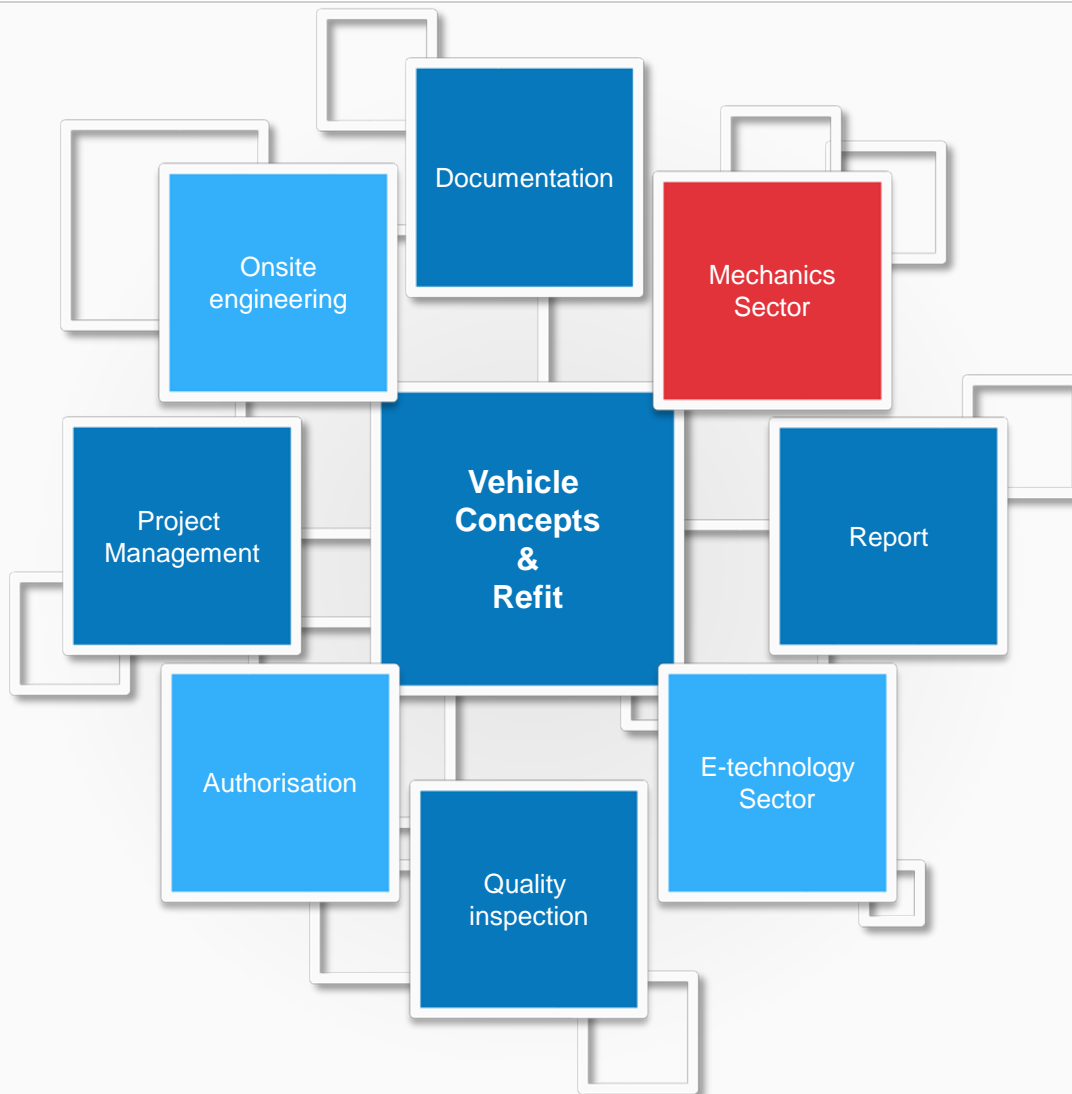
**2016**

INTEGRATION  
in CRCCE

2020

# Services

## Overview



# Mechanics sector - Technical calculation

Portfolio overview



# Technical calculation

## Focus areas

- The company has 25 years of experience in the planning and implementation of engineering services
- In the past, the focus was on the sectors
  - Rail vehicle technology
  - Automotive supply industry
  - General Engineering

- **Specialist department "technical calculation" comprises 10 employees**
  - Two employees are authorised EBA consultants for the areas of vehicle body, bogies, chassis, crash, train and impact direction of rail vehicles
- **Strength tests with finite element systems**

▪ Solver	NX / MSC Nastran, Abaqus
▪ Pre- / Post processor	Patran, HyperMesh, FEMAP
▪ Bolt calculations	MDESIGN
▪ Welding connections	FATEVAS
▪ Solid bodies / Casting	RIFEST

# Technical calculation

Focus areas

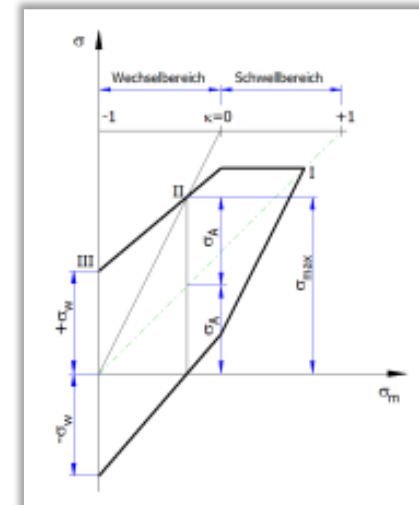
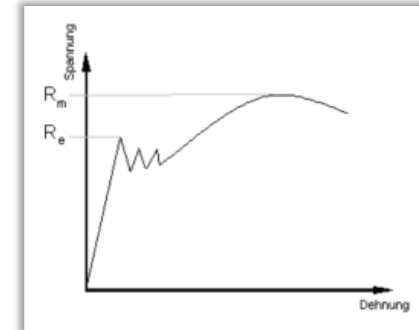
- Extensive experience has been gained in the **construction and reconstruction of rail vehicles**, their assemblies, as well as in the **design of operating equipment for Production**.
- The **verification of static strength and fatigue strength** of assemblies or entire vehicles allows an **optimisation of material usage** and **minimisation of safety risk**.



# Technical calculation

Types of evidence

- **Static strength analysis unusual loads**
  - Proof against permanent deformations or breakage
  
- **Fatigue strength verification of operating loads**
  - Acceptance of recurring loads for a defined operating life



# References

Strength tests for rail vehicle components, among others, for transformer boilers

## Requirements

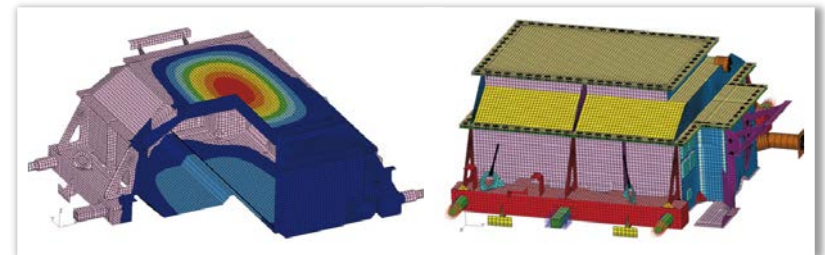
- Creation of calculation models for transformer boilers for the Desiro, e.g. Mainline 2.
- The underlying set of standards comprises a number of aspects which require both the strength properties of all materials used, as well as the depiction of different stress scenarios and ways to deal with them.

## Customer benefits

- Fast project implementation
- Use of existing experience in dealing with the claims for a strength analysis for submission to national or international authorities.
- Minimisation of material, production and operating costs

## Implementation

- Calculation services
- Relationship between design and calculation
- Joint development of constructive solutions



# References

Project: Calculation of the bogie Solaris Tram Leipzig | Customer: Solaris Bus & Coach S.A.

## Requirements

- Preparation of load values in accordance with VDV152 and EN13749
- Evaluation of static strength and fatigue strength
- Supervision of the tests on the test bench

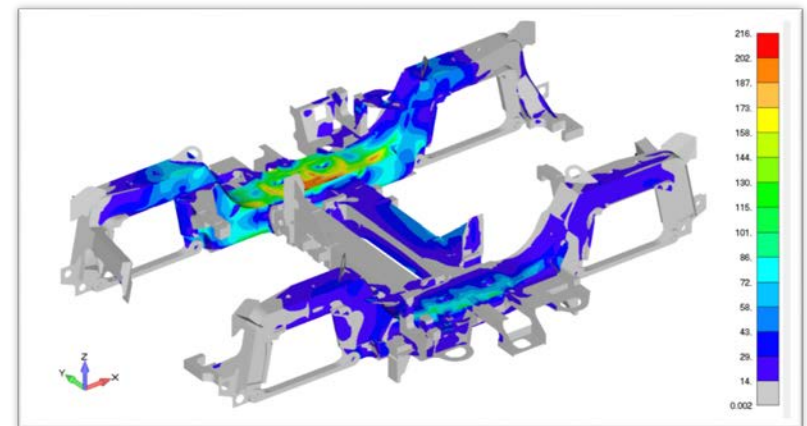
## Implementation

- Creation of compliant proofs for structural strength
- Preparation of a test specification
- Validation of results from the test bench

## Customer benefits



- Efficient optimisation of the load bearing structure in coordination with the customer
- Close coordination with the responsible experts and the testing institute for a successful implementation of the project



# References

Project: Construction and calculation of the track milling train and grinding train

## Requirements

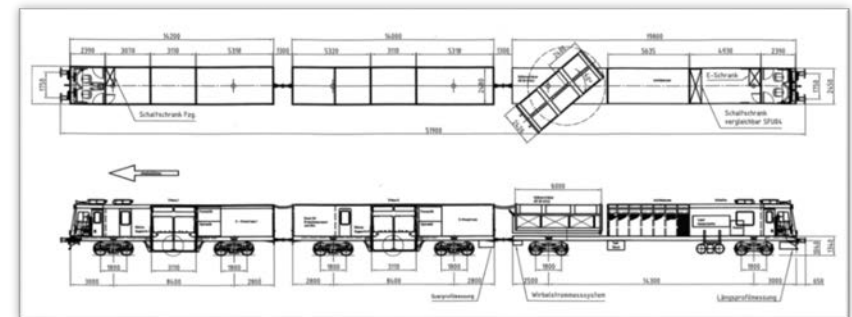
- Track milling and grinding train combined
- Compliance with two reference profiles
  - W6-A of Network Rail and
  - G1 according to UIC505-1
- Maximum speed of 100 km / h for self-drive and towing
- Continuously adjustable in work travel mode in the range between 0 to 15 km / h

## Implementation

- Development of the carcass support structure, incl. FEM proof of all 3 vehicle bodies
- Integration of add-on parts determining the carcass according to project layout
- Expansion of the vehicle bodies with flaps, flooring and equipment parts
- Control heads engineering and integration of a driver's cab

## Customer benefits

- According to the vehicle layout and customer propositions
- Design and analysis of larger parts of the vehicle by an engineering partner
- Use of know-how as well as access to experts from the areas of FEM/approvals and specific areas of expertise



# References

Project: Calculation Monorail | Customer: ZELC – CRRC Zhuzhou Electric Locomotive Corp. Ltd.

## Requirements

- Initial project in the field of railways
- Collaboration with a Chinese client
- Coordination of installation components with Chinese suppliers

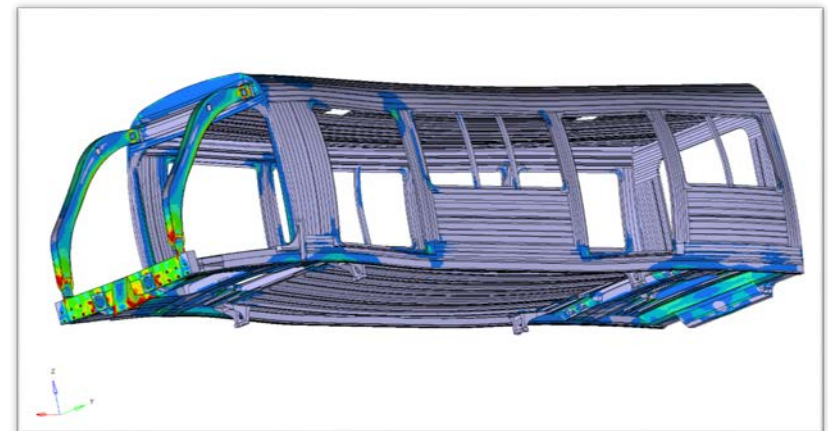
## Customer benefits



- Design study, development, design and calculation of the vehicle by an engineering partner
- Use of the technical know-how of experts from different disciplines

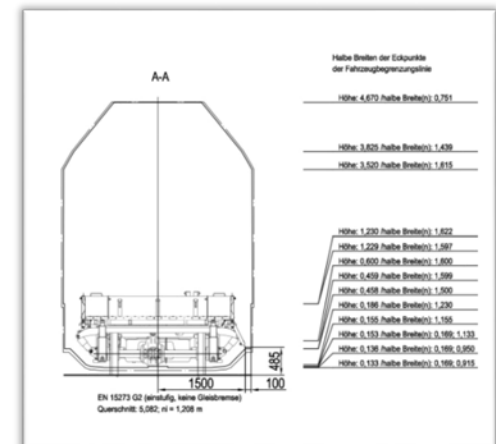
## Implementation

- Provision of aluminium extrusion profiles
- FE analysis of vehicle structure in accordance with ASCE standard (Automated People Mover)
- Development and designing of the chassis

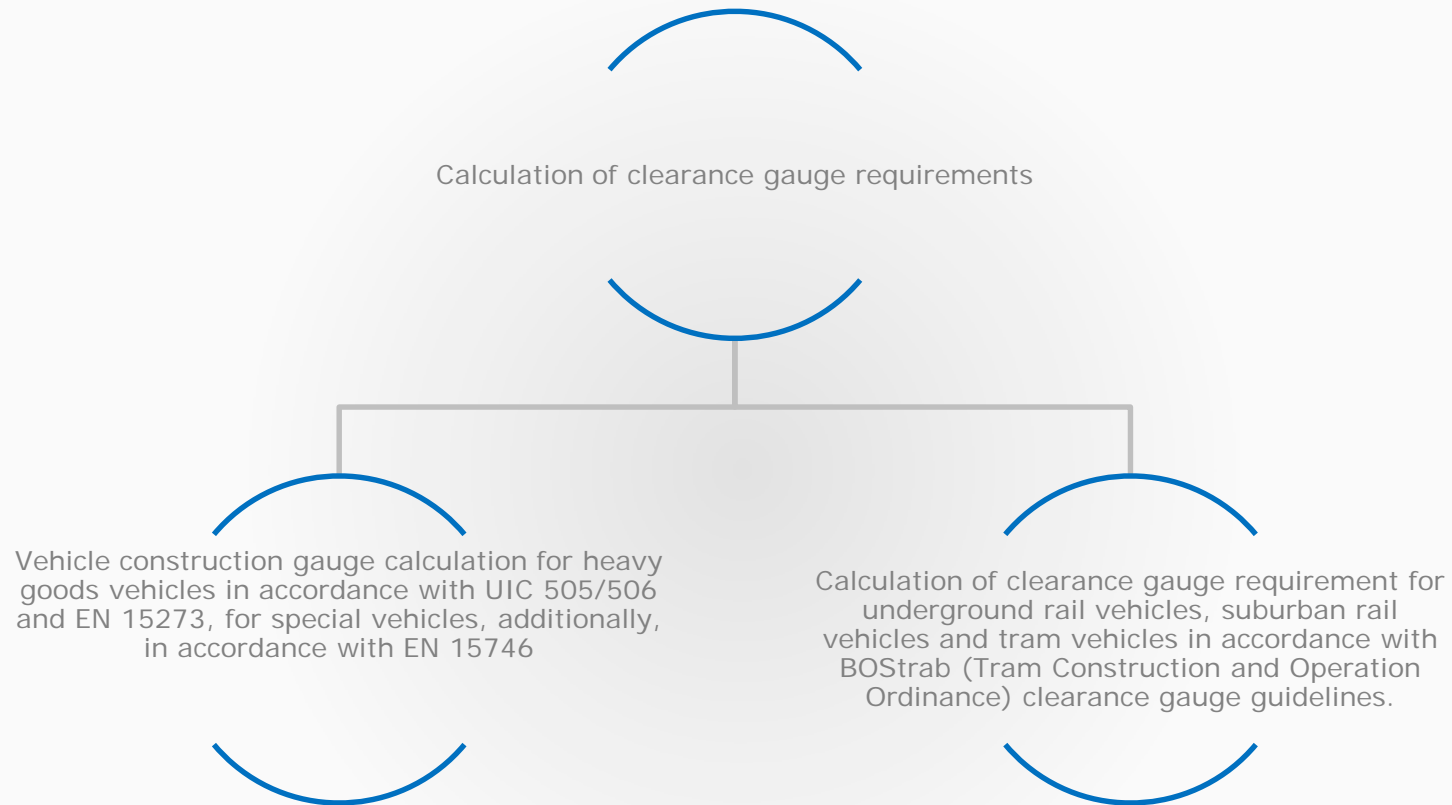


# Vehicle construction gauge calculations

- **Subject Vehicle construction gauge calculations of rail vehicles**
  - Two employees are authorised experts of the EBA
- **Tool DIMA is used for the calculations**
  - **UIC 505-1**
    - vehicle gauges for railway vehicles
  - **EN 15273-2**
    - Railway applications - loading gauges - part 2: Vehicle gauges



# Clearance gauge requirement



# References

Calculation of clearance gauge requirements and vehicle construction gauge

- **Locomotives**

- Lok D60C for Gmeinder

- **Freight wagons**

- Car transport carriage Hccrrs 5.860 / 5.870 / 5.850 for Carwaggon AG

- **Auxiliary vehicles**

- Material transport vehicle MTR 100 for Badische Gleisbaumaschinen GmbH
- Carrier MTF17 / MTF24 DB rescue train for Tatravagonka Poprad



Car transport carriage Hccrrs 5.860 / 5.870



Material transport carriage MTR 100



# References

Calculation of clearance gauge requirements and vehicle construction gauge

- **Special-purpose vehicles**
  - Railway cranes KRC 910 / 1200 / 1600 for Kirow Ardelt
- **Calculation**
  - Tramway Citylink for Vossloh Rail Vehicles
  - Rail grinder car for Vossloh High Speed Grinding
- **Enveloping space calculations in accordance with BOStrab Clearance Guidelines**
  - AVENIO Siemens for SWM



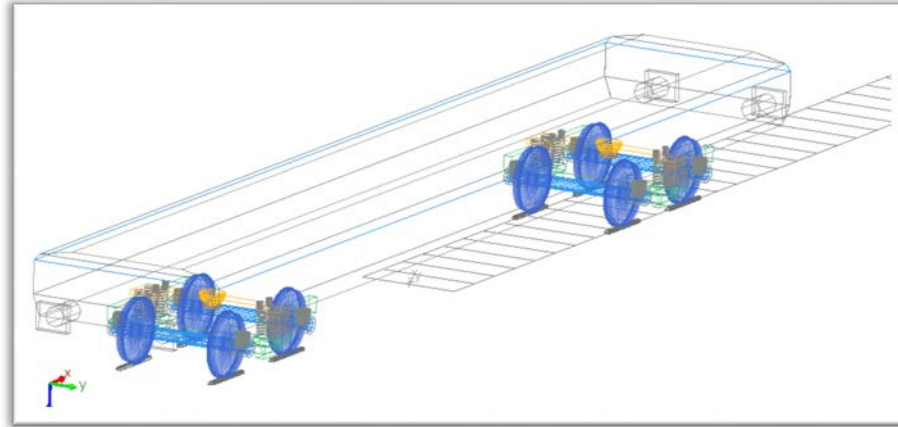
Tramway Citylink Chemnitz

# Proof of derailment safety

- Within the framework of an **individual case study**, vehicles are tested for their derailment safety in accordance with the applicable standards and technology.
  - **EN 14363**
    - Railway applications - Approval process with regard to the driving control characteristics of railway vehicles - Testing of driving behaviour and stationary tests
  - **ERRI (ORE) B55**
    - Derailment safety system of goods wagons in track twists

# Multibody simulation (MBS)

## Basics



- MBS is a method of **computer simulation**, in which real multibody systems are depicted by several non-deformable bodies
- A **multibody system** is a mechanical system of individual bodies, which are coupled by joints or force elements (e.g. springs, dampers) and are under the influence of forces

# Multibody simulation (MBS)

Focus areas

- We cover the following performance spectra using the multibody simulation tool Simpack:
  - Proof of driving safety
  - Proof of driving stability
  - Clearance gauge requirement calculations as per EBO (restriction calculation as per EBO by simulation)
  - Clearance gauge requirement calculations as per BOStrab
  - Derivation of vehicle gauges
  - Driving comfort



# Multibody simulation (MBS)

## Advantages

- **Sound basis for decision-making**
  - Simulations can be used to analyse the consequences of a decision before implementation, and to identify and avoid problems at an early stage.
- **Competitive advantage through product optimisation**
  - Concepts, ideas, alternatives, scenarios are analysed and optimised in simulation models - before commissioning.
- **Reduction of development time and costs**
  - Product development and product optimisation are carried out within the simulation model. Tests can be shortened or avoided.

# Reference

Project: MBS to rail milling machines Beijing | Customer: CRCC

## Requirements

- American track quality FRA5
- Evaluation in accordance with GBT 17246
  - Maximum driving comfort 3.5

## Customer benefits



中国铁建

- Reduction of driving tests

## Implementation

- Driving comfort calculation in the driver's cabin
- Milling train MM1000B Beijing 2-parts



Thank you for your attention!



**CE cideon engineering GmbH & Co. KG**  
Bautzen, Chemnitz, Essen, Leipzig – Germany

**CE cideon engineering Switzerland AG**  
Basel - Switzerland