Central Technical Division
Contents

4 An Overview – Central Technical Division
   4 The Central Technical Division within the Group

6 Turnkey Construction
   6 Architecture and Turnkey Construction
   8 Sustainable Construction
   9 Renewable Energy
   10 M&E Engineering
   12 Facade Engineering

14 Structural Engineering
   14 Structural Engineering

16 Geotechnical Engineering and Tunnelling
   16 Geotechnical Engineering
   18 Tunnelling

20 Construction Process Management
   20 Construction Management Application Services
   23 Estimation and Work Preparation
   24 LEAN.Construction – Civil and Structural Engineering
   25 LEAN.Construction – Transportation Infrastructures

26 Digitalisation and Software Engineering
   26 BIM 5D®
   28 Supply Chain Optimisation
   29 Software Engineering

30 Development and Innovation
   30 Development & Innovation
   31 Corporate Responsibility
   31 Innovation Management
   31 IPR Intellectual Property Rights
A pillar of technical know-how

The Central Technical Division (ZT) is where the Group’s most important technical planning capabilities are concentrated. The services for the support of the Group’s operative units include the turnkey construction works, structural engineering, civil engineering and tunnelling, construction process management as well as digitalisation and software engineering. Hence, ZT accompanies the entire construction process: from the acquisition phase, to tender bid processing, to execution planning, through to specialist construction management.

In order to strengthen the Group’s technical competitiveness for the future, ZT accelerates the specialist and interdisciplinary innovation. In addition, ZT looks after the entire Group’s patent system, i.e. the registration and management of patents and trademarks. The basis for an efficient planning and construction process is the maintenance and further development of tools such as software for the planning, estimation, and site management. Thus, ZT is also the central source of know-how for BIM 5D striving to advance this field for the entire Group.

Many of our young engineers start their career in the ZT to later assume responsibility on one of our many construction sites. In this way, university graduates obtain an overview of the full range of fields of activity and are, therefore, quickly able to implement what they have learnt. In addition to the young professional’s practical training, the ZT also offers specialist in-house training within the individual fields of work to all Group employees.

Our contribution to the Group’s public relations activities includes lectures and presentations at national and international conferences and workshops, as well as publications in technical journals, and the participation in professional committees.

Locations

In order to support our customers quickly and directly, the ZT has offices in 29 locations with head offices in Stuttgart and Vienna.
teamconcept – the Group’s Partnering Model

Price competition in the construction industry has not brought about the expected good price/value-ratio for the parties involved. On the contrary; product quality, confidence in the performance capability, customer satisfaction as well as the necessary economic cost-efficient performance of the contracted companies have all suffered.

With the partnering model teamconcept, the Group promotes and strengthens the quality competition: If all parties involved in a project collaborate in a constructive partnership and in an open and trusting way, the project goals, high quality, customer satisfaction and efficiency can be fully achieved. It is thus essential to have a contractual environment that allows the general contractor to contribute its expertise in a comprehensive way during the early design phase of the project. The teamconcept approach aims for a continuous design, planning and execution process, whereby valuable information is retained for the later project phases.

An early involvement of ZT’s technical competences enables the optimising of the construction time as well as costs at the highest possible quality. The modular services enable ZT to accurately tailor the offer to the individual needs of our clients. The teamconcept approach is based on the idea that all parties involved compile the contractual, commercial, and technical aspects as well as deadlines and goals of a project together and as equal partners.

Areas of work

ZT has more than 1,000 employees – spread across the five main business fields: Turnkey Construction, Structural Engineering, Civil Geotechnical Engineering and Tunnelling, Construction Process Management as well as Digitalisation and Software Engineering, which are organised in divisions and sub-divisions (see chart).
Tasks and Objectives

Construction is a complex process requiring cooperation and coordination. It is our aim for turnkey construction projects to jointly acquire, carry out and successfully complete the works by pooling all our resources. We understand our task as being the application of the knowledge accrued in all phases of the works and in the various building processes in such a way that sustainable solutions are developed to the economic benefit of our clients.

Experienced members of staff ensure a wholistic view of the construction tasks and, in doing so, consider the customer service, design, technology, functionality, cost and contract conditions requirements.

We additionally support our construction sites by seconding of site and project managers as is required. It is our aim, within the frame of the object planning, to provide the site in good time with drawings that have been agreed and cleared by the client. This is achieved using clearly defined procedures, detailed schedules and target parameters.

Efficient design and planning tools enable us to gain a competitive advantage. For more than 10 years we have been actively involved with the implementation of BIM, and since the beginning of 2017 all internal processes have been upgraded to a model based working method.
Services and Support

**Tender bid processing, estimation, tendering and award**
Complete processing of turnkey projects, estimation in cooperation with internal specialist departments, externa designers as well as subcontractors, tendering in the offer and execution phases, as well as support with acquisition and award. Adoption of the overall project management for inter-departmental project work and that across business units.

**Architectural design**
As a service provider within a construction company, we are able to strike a balance between our creative potential and the demand for economically designed, high quality solutions.

**Consultancy**
Providing support for the operative units, for example during teamconcept negotiations with a potential client, by assessing the requirements, acquisition design, as well as considering topics such as sustainability and resource efficiency.

**General design**
In close cooperation with other specialised ZT departments, we can take on the full responsibility of the complete planning and design management, enabling us to offer the clients a fully coordinated general design from a single source.

**Design coordination**
Design work is an integrated process. Communication and particularly the technical understanding between everyone involved in the project, both internal and external, determines the speed of planning as well as the quality of the design.

**Staff training**
Training of the operative employees in the tasks relating to turnkey construction.

**Interior finishing works**
We offer both consultancy and procurement support for the interior finishing works.

**BIM 5D®, Visualisation**
Model based design and estimation and correspondingly the production of tender presentations, digital sampling inspection and VR models.
Sustainable Construction

Tasks and Objectives

Given the rising energy prices and the ever more noticeable effects of climate change, the construction industry has been witnessing a paradigm shift: buildings are optimised in view of their lifecycle costs and not only according to investment criteria. Both quality and resource efficiency are becoming a higher priority.

In the field of Sustainable Construction (TSC) we audit buildings based on well-established certification systems, thereby make their qualities measurable and comparable. We accompany and optimise structures throughout their entire life-cycle based on the principles of sustainability. Sustainable buildings are economically efficient, environmentally friendly, and resourceful. They meet high standards for both functionality and design.

Our services are tailored to the needs of the clients and are, therefore, an ideal add-on to the integrated teamconcept approach. Furthermore, we are actively involved in the research and development of sustainable construction. In this way new resource efficient technologies and processes are introduced at the early stages of planning, design, and construction.

Services and Support

Audit certification according to DGNB¹, LEED²
Apart from the audit certification process itself, our services also include quick and low-cost pre-assessments, detailed preliminary assessments of the design or project, manuals for expert planners and building contractors, as well as the supervision of the project during the entire certification process.

Consultancy
Irrespective of the certification process, we offer our clients advice in all phases of design, execution, and in operation, with the aim of optimally implementing sustainability and resource efficiency in the project.

Environmental life-cycle (ecological balance)
We determine the environmental impact through building materials (CO₂, greenhouse gases, etc.) during the construction and operation of a building and hence derive a building’s Environmental life-cycle.

Life-cycle costs
We identify the investment and follow-up costs of a building.

¹ DGNB (German Sustainable Building Council)
² LEED (Leadership in Energy and Environmental Designs)
Renewable Energy

Tasks and Objectives

The use of renewable energy sources and the increase in efficiency of existing processes in terms of an energy’s use are fundamental social objectives. In our context the use of renewable energy sources are always connected to some sort of construction work. As part of an innovative engineering group we have the task of developing and implementing new creative, efficient, and forward-looking ideas and methods based on our vast technical experience in construction engineering. Integrated trade and material solutions are possible due to the technically diverse processing of projects and ideas within ZT. Through joint research projects together with universities and scientific institutions, the latest technical standards are guaranteed, and the knowledge gained is fully applied.

Focus on Integrated Energy Concepts

Creation of integrated energy supply and distribution systems
- Cogeneration of heat and power
- Heat pump technology
- Creation and supply of design documentation for the design, approval procedures and the coordination of external planners

Focus on Energy Generation

Solar power
- Photovoltaic plants in the building shell
- Participation in the development of parameter variables and efficient building-integrated photovoltaic modules (BIPV) in the context of an EU research project

Geothermal
- Creation and design of geothermal plants

Biomass
- Creation and design of plants for the energetic use of biomass

Wind and sea energy
- Design and planning of foundation structures and of wind energy plant towers offshore and on land (pre-stressed concrete, jackets, steel, timber) as well as marine power stations.

Focus Energy Storage Concepts

Pumped storage hydro power stations
- Support of site developed hydro energy storage

Thermal storage
- Development and individual dimensioning of thermal storage for solar power stations and industrial waste heat plants.
M & E Engineering

Tasks and Objectives

Mechanical and Electrical Engineering (M&E) makes buildings come to life. ZT assists operative units in all phases of turnkey projects using highly qualified M&E specialists. The task is to pool and constantly widen its specialist knowledge in the fields of heating, ventilation, and plumbing, fire protection systems, cooling systems, electrical, engineering automation, and conveyor technology as well as to integrate all the decentralised M&E units.

Based on our M&E in-depth expertise we identify and minimise risks, optimise technical systems, ZT fosters the competitiveness of the Group. The services offered range from advising on individual issues for smaller projects, to the complete processing of the M&E requirements throughout all phases of more complex projects. ZT also monitors the M&E market for new technologies, developments, demands, and market changes in order to provide the operating units with the optimum service.

Services and Support

Tender processing
- Value engineering in the acquisition phase
- Technical and commercial viability checks during tender phase
- Tender optimisation
- Integration of innovation and development of alternative proposals
- Cost estimation
- Processing of projects according to the teamconcept model
- Assistance of PPP projects and project development
- Assistance in contract drafting
- Risk Assessment
- Expert know-how in areas such as Data Centre (i.e. Injazat Data Centre, Abu Dhabi)
Contact

Stuttgart, Frankfurt am Main
Holger Sack
Tel. +49 711 7883-9812

Vienna, Oberwart
Roman Velikovsky
Tel. +43 1 22422-1346

Procurement Austria
Robert Magdits
Tel. +43 1 22422-1349

International
Robert Krakhofer
Tel. +43 1 22422-1358

Graz, Spittal
Markus Gneist
Tel. +43 1 22422-1361

Jena
Michael Pawlik
Tel. +49 3641 20744-10

Cologne
Ronald Falkenhain
Tel. +43 221 824-3397

Linz, Thalgau
Burkhard Meisinger
Tel. +43 512 574404-326

Munich, Nuremberg
Jürgen Feser
Tel. +49 89 360555-3535

Zirl
Werner Kohlegger
Tel. +43 512 574404-324
tga@zentraletechnik.com

Innovation
– Development of alternative proposals for higher energy efficiency and sustainability
– Participation in national and international R & D projects
– Market observations, evaluations and integration of new technologies

Work preparation – procurement
– Tendering, bid evaluation and negotiations
– Drafting of price comparison lists and recommendation of contractors
– Preparation of contract documents for M & E subcontractors
– Drafting of framework contracts

M & E Planning
– M & E planning in all phases of planning
– Application of the BIM method
– Development of M & E BIM tools
– Thermal simulation and stream simulation for concept evaluation
– Daylight and artificial light simulation
– Passive house projections
– Energy Saving Regulations (EnEV) calculations for residential and non-residential buildings

Execution
– M & E project and construction management
– Interface coordination
– Examination of engineering design, design controlling
– Customer care
– Claims management
– Documentation
– Assistance for operation, inspection and handover
– Evaluation of subcontractors
– Certified activities relating to thermography (certificate currently in preparation)
– Provision of various measuring instruments and the corresponding service

Warranty
– Checking of revision documents
– Assistance in acceptance procedures, prevention of defects
– Remedial works management
Facade Engineering

Tasks and Objectives

We view it as one of our main tasks to pool the Group’s facade engineering know-how, to constantly advance its development, and to apply it whenever a project has been acquired or is being executed within the Group.

In addition to further development of facade concepts are the detection and minimisation of risks, the identification of potential savings, and the optimisation of the various approaches available.

Working in close cooperation with both the operating units and the central procurement department, we keep abreast of the current market situation in facade engineering as well as the growing requirements and developments in order to support our clients using our state of the art, technical know-how in the execution of their projects.

Most of the projects that we are involved in, pose some difficult technical challenges that provide us with additional experience and detailed knowledge.

1 UPPER WEST, Berlin / 2 UPPER WEST, Berlin / 3 Axeltorv, Copenhagen (Denmark) / 4 adidas World of Sports, Herzogenaurach, © Behnisch Architekten, Stuttgart
Services and Support

Comprehensive consultancy
- Optimisation of the building concept with a comprehensive view of the interaction between the structural works, the facade and M&E engineering works in cooperation with other departments within the ZT
- Comprehensive support for all project phases on issues regarding the entire construction works, including building law, architectural issues, energy-saving and economical aspects

Tender processing
- Cost estimates for the entire construction works, as well as the checking and verification of prices tendered by subcontractors and partner companies
- Elaboration of alternative proposals with their respective specifications, and details for cost and quality optimisation

Technical design
- Support in tender estimation, presentations and obtaining of subcontractor quotations with our own design details and technical solutions
- Technical design for the building’s structural works with in-house personnel
- Structural analysis: Use of specialist software solutions for the determination of glass superstructures and profile dimensions

Request for quotation / procurement
- Preparation of request for quotations, and of awards including the comprehensive technical clarification
- SC-teamconcept: preparation of contracts within the teamconcept approach – also for subcontractors
- Project specific elaboration and implementation in cooperation with the Central Procurement Department

Execution
- Coordination of the construction design, workshop and assembly drawings for the building works between the parties involved for architectural, structural and facade planners, authorities, inspecting authorities and subcontractors. This is done in close cooperation with the operating project team
- On-site coordination of the entire construction works as well as execution of the permanent installations and quality control until final acceptance of the works, including the relevant schedule and cost control

Building physics
- Preparation of EnEV-certificates (energy passes, parts catalogues)
- Stationary thermal calculations
- Transient hygrothermal simulations
- Sound insulation and room acoustics
- Blower Door measurements with thermography and anemometer measurements
- Special verifications for summer heat protection
- Thermal simulation: tests on the influence of the facade design and the shading devices on the room climate and comfort using numerical simulation programs

BIM 5D®
- Production of working documents and development of methods for the model-based preparation of tender for the building works
Tasks and Objectives

Structural engineering is the backbone of every sophisticated infrastructure and building project, and is thus, by tradition, an essential field within the ZT. Well thought through proposals as well as implementation friendly design of engineering works and complex load-bearing structures are all part of the basis for the successful completion of a project. To master these tasks we have experienced, flexible, and hardworking staff who are provided with continual training to ensure they are always able to apply state of the art technology in our projects.

The goal is to optimise the load-bearing structures so that the production of the constructions are of the highest quality while adhering to the minimum cost. This allows operational units to simultaneously offer the client both economical and high-quality solutions. In turn all the experience and knowledge gained is pooled together, and innovative structural engineering solutions are further developed and continuously improved.

Every division within the company and their respective projects benefit directly from the know-how gained. Moreover, our qualified specialist engineers have been involved for more than two decades in the development and defining of the current recognised rules of technology and in committees for the definition of standards and codes.
We design and optimise load-bearing structures for buildings and civil engineering projects, and together with the construction management choose suitable materials and construction methods for each project. Using static and – if necessary – dynamic preliminary investigations the optimal structures and dimensions are developed. Quantities are determined based on models and the subsequent results are transparently and comprehensively documented. In addition, we create the bills of quantities and detailed specifications for the work and then determine the production costs of the building works providing a quick estimate of the total construction costs. Furthermore, we develop three-dimensional construction schedules for tenders, executions, presentations and interface checks. Moreover, we also offer experienced site management, and the drafting of expert reports as required.

As a basis for the construction execution we carry out static and dynamic calculations. We illustrate the load-bearing structures in the structural drawings in a clear and comprehensive way and in accordance with the construction schedule. As a rule we create the design in 3D, and thus introduce our experience into BIM projects. In addition to managing the structural design works, we offer the planning of the design works, and the installation of various drawing platforms.

We possess specialist expertise in the areas of high rise structures, pre-tensioning, bridge construction, timber construction and steel construction works as well as in the specialist technical areas of sound insulation along traffic routes, slab track, cantilever construction equipment for bridges and BIM design in structural engineering.

We have developed structural engineering solutions that go far beyond current standards and as a rule by agreement directly benefit our execution projects. We have thus, in individual cases, been able to use for example more economical, slimmer and more flexible support structures for high rise buildings to the benefit of all parties involved. Here, reinforced concrete supports of high-strength concrete and reinforcement have replaced the conventional steel composite solutions.
Geotechnical Engineering

Tasks and Objectives

“It’s always dark in front of the pick!” This old miners’ saying applies to all underground activities. In contrast to the building and finishing trades with its industrially produced materials, ground engineering is working in and dealing with soil and rock materials that are only partially known and potentially quite inhomogeneous.

The evaluation and control of the associated specific technical risks during construction are part of the main tasks of ground engineering designs. Here, cooperation between the partners and the early coordination between the staff of the Technical Office and the team on site are an essential basis for a successful project execution.

Value Engineering

Our goal is an efficient design which is technically creative, sophisticated, and geared to the requirements of the execution works.

At a glance

National and international technical tendering, and the complete execution design of the civil engineering, geotechnical and transportation infrastructure works:

- Combined pile and slab foundations
- Frame and trough structures
- Cut-and-cover tunnel construction
- Underground stations
- Dewatering
- Hydraulic engineering
- Port construction
- Locks
- Dams
- Construction pits
- Foundation slabs
- (Deep) foundations
- Underpinnings
- Soil improvement
- Ground freezing
- Grouting works
- Monitoring
- Route planning
- Drainage planning
Contact

Stuttgart
Siegfried Nagelsdiek
Tel. +49 711 7883-218

Vienna
Jens Hoffmann
Tel. +43 1 22422-1511

Berlin
David Bastian
Tel. +49 30 789599-8254

Budapest
Attila Sarosi
Tel. +43 1 22422-1692

Duisburg
Oliver Sand
Tel. +49 203 2820-406

Hamburg
Torsten Alms
Tel. +49 40 20208-1602

Munich
Hubert Uhl
Tel. +49 89 360555-2114

Pruszków
Eugen Bindek
Tel. +48 22445-3822

Stockholm
Alina Miehe
Tel. +46 72 2228348
tiefbau@zentraletechnik.com

Service and Support

Geotechnical consultation, design coordination, value engineering for:

Construction pits
Design of pit supports and underpinning works, including measurement technique, dewatering and excavation concepts, are among the core competences of ZT. The range of possible trench shoring works hereby ranges from soil-nailed pit walls to diaphragm and bored pile walls for deep urban construction pits.

Structures
A key aspect is the construction design of cut-and-cover tunnels, underground stations, framed and trough structures. Tight space conditions, the up-keeping of the traffic, and the time available are decisive parameters for the appropriate construction solutions.

Transportation infrastructures
Design for road and rail constructions, route and drainage planning is provided regarding the special tasks of these works. Particularly the model based design and close interaction with the execution on sites is a strong advantage for these inhouse consultancy.

Foundations
Foundation design for differing structures is a challenging engineering task. The necessary foundation element is created according to the boundary conditions and requirements; this could include ground improvement works or pile foundations using large bored piles, displacement piles or driven piles, often also as a combined pile and slab foundation.

Hydraulic engineering
Ports and quays, locks and weirs, hydroelectric power plants, and land reclamation measures both national and international, are designed and planned with consideration given to the local characteristics, and in close consultation with the executing divisions.

Special solutions
ZT exhibits unique competence in the design of underpinning works for buildings, and in specialist processes such as jacking or shifting large construction components and raising building structures.

Tunnelling

Tasks and Objectives

Design and engineering services in both tunnelling and in underground construction works are an essential part of ZT’s competence, and have been part of our core tasks for over 30 years. Our services and products are based on the knowledge and dedication of our employees, who – on behalf of our operating units – alone during the last five years have carried out the preliminary and detailed design for more than 20 tunnelling projects around the world.

Our special focuses:
- Achievement of a high level of customer satisfaction through technical competence and good quality
- Efficiency and innovation skills applied in all construction phases of our tunnelling works
- Education and development of enthusiastic and capable staff for our company
- Accumulation and provision of tunnelling specific know-how for the whole Group

Products

SOFIA – software for grouting works
Design and monitoring of grouting schemes (e.g. compensation grouting in urban tunnelling projects or permeation grouting for tunnels in soft ground)

Shield Transfer System (STS)
Special designed carrier for TBM’s used for the transport of TBM’s through stations where the conventional longitudinal shifting is not possible

Energy tunnel lining segment (Energietübbing®)
Special PCC segments equipped with geothermal elements to make use of the geothermal energy available underground

RFB-segments
Steel segments allowing for unlimited orientation of boreholes for freezing and grouting purposes.

Q-Bolt
Coupling bolt for the transmission of large shear forces in segmental lining and other PCC elements
Geotechnical Engineering and Tunnelling

Service and Support

- Design services in all key topics of tunnelling, such as tunnel drive design (e.g. face support pressure), segmental lining design, primary and secondary lining design for conventional tunnelling, pipe jacking, settlement calculations, building damage assessment (BDA), monitoring schemes, etc.
- Design of special construction works such as emergency tunnels, pen stock tunnels, cross passages and shafts as well as the design of temporary construction works in conventional tunnelling, such as tunnel eyes and pipe canopies
- Launching tubes as well as auxiliary constructions for TBM (e.g. shield cradles, shove constructions or launch seals) and TBM transportation through stations
- Grouting design for low and high pressure grouting works, e.g. jet grouting canopies or compensation grouting in urban tunnelling
- Ground freezing design including thermal calculations to determine freezing time and energy demand and for the investigation of specific issues, such as the consideration of high groundwater velocity
- Pressurized air heading design including the corresponding temporary structures, compressed air consumption calculations and blowout prevention
- Design and layout of separation plants for slurry shields

Geotechnical engineering and geology

- Geotechnical layout drawings for tunnel drives tailored to meet project specific requirements and analysis or interpretation of geotechnical data
- Geothermal calculations to analyse and optimise the extraction of heating and cooling energy from the ground

Grouting and freezing technology

- In-house software solutions for the design, dimensioning and monitoring of grouting and freezing works

Mechanical tunnelling

- Parameterised segment design using three-dimensional CAD solutions
- In-house software for optimised tunnel dimensioning, also accounting for different standards used in other parts of the world
- Execution of complex 2D/3D FE calculations for special tasks or problems
- Optimisation of the data management on site using in-house software solutions tailored for ground engineering and tunnelling projects

Research and development

- Energy self-sufficient radio systems for the operation of tunnel equipment, compressed air energy storage units, construction works with special safety requirements, such as hybrid tunnel lining segments with pressure-absorbing properties, segment couplings for dynamic loads and fiber-reinforced concrete using ultra-high performance concrete

1 TBM arrival at Statenweg Station, Randstad Rail Rotterdam / 2 Altabstieg tunnel, new rail route Wendlingen-Ulm / 3 Reinforcement works on the inner shell, Bechergasse, Cologne / 4 3D Model Powerhouse Cavern Las Lajas, Alto Maipo Project, Chile / 5 Ice-Wall around a Cross Passage, Tunnel Rastatt
Construction Management Application Services

Tasks and Objectives

The determination of estimation costs for a tender bid and cost monitoring within the context of project controlling are always based on the relevant building methods and processes used in the project concerned. They are the basis for the cost estimate. The comparison between the estimated execution costs and the actual construction costs recorded in the commercial system provide the basis for an evaluation of the planning data for construction site controlling across the Group.

The field of Construction Management Application Services has the task of standardising and developing these processes within the tender estimation process, and also the controlling activities for the whole Group.

With iTWO and AS4U as core applications within the Group, a network of interfaces and dependencies between the various applications have been developed. For users these facilitate a logical progression of various tasks from project acquisition to its completion. These include interfaces to the controlling software pro-CON, to the procurement tool STRAbis, and to the project information platform STRAthek.

STC

The STRABAG Trade Code (STC) is an implemented trade key system of the Group to classify the construction works into a pre-defined structure relating to the construction estimation, construction process, subcontractor management, and project filing. This organisational structure is reflected in iTWO’s master data and sample projects, thus allowing a uniform evaluation of estimation data.
iTWO

iTWO baseline is the standard software used within the Group. Extended with additional modules iTWO 5D enables 3D models to be created, viewed, evaluated and further developed (see BIM 5D®, page 26f).

iTWO forms the basis for quotation, awarding and billing of subcontractor works, as well as estimation and construction management within the Group. It is available as a full version in German, English, Polish, Dutch, Hungarian, Swedish, Italian, French, Croatian, Czech and Russian.

Standard interfaces are available for Austrian and German tendering formats. For other countries interfaces for importing data have been designed and made available.

Project control on the basis of the bills of quantities, estimation data, and the updating of project prognosis are the main points of attention during the execution phase.

pro-CON

pro-CON (abbreviation for project controlling) is the reporting system of the Group. The pro-CON product family includes the following elements:

**Excel report**
Detailed estimated/actual cost comparison, item list, list of claims, chance and risk analysis report, collection sheet for accruals and deferrals

**Project report**
Reporting instrument for the monthly performance report, platform for the updating of the performance and results forecast for the remaining construction period, and for site approval.

**Project monitor**
Overview of all execution projects, approval level for management, warning list, project overview with graphical analysis, project tracking with detailed information from AS4U and iTWO.

The product family pro-CON obtains its data directly from iTWO, STRAthek and AS4U using interface-software with additional fields being completed manually. The various pro-CON applications can be started centrally through the Web application goAPP as well as using data transfer directly from iTWO.
Contact

Stuttgart
Patrick Mink
Tel. +49 711 7833-9380

Martin Kröner
Tel. +49 711 7833-9605
STRAbis/STC

Jeanette Warneke
Tel. +49 711 7833-9313
BBA Training

Vienna
Robert Jungwirth
Tel. +43 1 22422-1580

Budapest
Laszo-Peter Nemeth
(Buildings and Civil Engineering)
Tel. +36 1 358-5279

Tamas Kis
(Transportation Infrastructures)
Tel. +36 1 358-5363

Cologne
Dr. Frank Ziegler
Tel. +49 221 824-2892

Prague
Zlatica Jiraskova
Tel. +420 602 190-844

Pruszków
Waldemar Chelchowski
Tel. +48 22 4453-915

Zagreb
Zrinka Kotarski
Tel. +385 1 639-2314

bba@zentraletechnik.com

STRAbis

STRAbis is an application-software for the entire Groups’ processing of sub-contractor awards. The focus is on the exchange of information between the projects. For this purpose, address data, trade allocations, and productivity as well as evaluation and certificates of consolidated companies, RV partners, suppliers and sub-contractors, are managed in the address module enabling systematic and strategic bidder selection.

The project module is where the procurement activities such as award scheduling, invitations to tender, and award of sub-contractor works are managed. The evaluation of the awarded volume per trade and/or supplying company as well as the assessment of the cooperativeness of sub-contractors are possible from these process evaluations, which in turn are the basic requirements for a strategic bidder search in the address module.

In the future an updated interface between STRAthek, iTWO, Zebra/iPaper, Puma and credit standing databases will improve the workflow across all the applications.

Services and Support

Provision of iTWO across the Group
This includes the organisation and configuration of the data structures as well as access rights and the creation of authority levels, including the project files for operative units.

Training
- iTWO basic introduction, estimation for structural works / turnkey construction / traffic engineering / specialist works, quantity takeoff and billing, updating of the working estimation, controlling for engineers and commercial staff, interfaces with scheduling programs, courses in dealing with project reports and project monitoring as well as individually customised workshops

Application and process support
- Telephone hotline as a support for the operative units
- Consultation for bidder consortiums, JVs and operative units for the determination of methods in estimations and controlling
- Creation of the first working estimation
- Monthly support in the updating of project data
- Temporary staff deployment on site for construction works (nationally and internationally) for the creation of the working estimation, billing, cost control and processing of change orders.
Estimation and Work Preparation

Tasks and Objectives

A crucial precondition for the successful completion of construction projects is the consideration of construction management principles and their consequential implementation. Our work begins in the tendering phase with the creation of the tender estimation, and the development of scheduling and site installation concepts. In the execution phase, we are responsible for schedule planning, formwork, site installation and site logistics, and we strive to keep these updated throughout the construction phase.

Services and Support

Estimation/civil engineering and bridge construction
- Estimation of the shell construction works for bills of quantities and functional building specifications (in close cooperation with the other departments of ZT)
- Partial estimation of process-determined services for civil engineering works (i.e. tank construction, power plants, tower block constructions, towers)
- Realisation of alternative proposals in agreement with the operative units
- Development of technical concepts for shell construction / structural engineering
- Complete tender estimation for shell construction works / structural engineering works
- Temporary staff deployment (project management, addendum administration / management)

Work preparation in tender and execution phase:
- Creation of the site installation design
- Creation of the milestone and schedule planning
- Development of logistics concepts
- Development of formwork and support scaffolding concepts
- Support of the operative units for the tendering and awarding of these works
- Temporary staff deployment (project management, creation and updating of the scheduling and site installation planning)
- Training for Power Project at Stuttgart main office as well as on site
- Training for MS Project at the Stuttgart main office as well as on site
- Training for SYNCHRO at the Stuttgart main office as well as on site
- Training for TILOS located in Stuttgart and Vienna offices as well as on site
- Product coordination, user support and telephone hotline as support for the operative units – for the scheduling programs POWER PROJECT, PRIMAVERA, TILOS, MS PROJECT, SYNCHRO

Contact

Civil engineering and bridge construction Stuttgart
Thomas Lehmann
Tel. +49 711 7883-9379

Work Preparation Stuttgart
Jochen Vogel
Tel. +49 711 7883-4450

Work Preparation Vienna
Marcello Gebhardt
Tel. +43 1 22422-1305

Work Preparation Munich
Björn Wilke
Tel. +49 89 360555-3415
bav@zentraletechnik.com

1 Power plant Maasvlakte, Rotterdam (Netherlands)/
2 New construction Rhine bridge, Rheinfelden
LEAN.Construction – Civil and Structural Engineering

Contact

Stuttgart
Rainer Barth
Tel. +49 711 7883-3600

Vienna
Mag. Dr. Margit Schlederer
Tel. +43 1 22422-1480
LEAN@zentraletechnik.com

Targets

- High level of client satisfaction
- Stable project realisation with a high level of process reliability
- Clear schedule framework with schedule certainty
- Transparency, communication with all parties involved in the construction works
- Reduction of remedial costs
- Increased efficiency
- High measure of visualisation and communication

Tasks

LEAN.Construction is our way to a perfectly run, low-consumption construction site.

The Systematic process optimization is a core task for the management. This applies to all operative processes – from the designing, procurement and work preparation, to the construction and hand-over to the client. The LEAN Civil and Structural Engineering Division has worked closely with the project managers and foremen to adapt the principles of LEAN management to the Group’s needs. The process arrangement according to the LEAN principles (flow, timing, pull, error minimisation), combined with a high degree of visualisation, form the basis of our LEAN system for our civil and structural engineering construction sites.

Due to the intensive cooperation between the subcontractors, designers and client, a comprehensive co-operation evolves. An important element thereof is the consistent introduction of activity timing on the site – in conjunction with the joint determination of the optimal trade ordering process. The processes are illustrated with simple visual aids such as wall posters and sticky notes. As a result, the site communication and transparency have been clearly improved.

The LEAN system can be implemented in all construction works such as residential and office projects as well as in other specialist construction works.

Services and Support

- LEAN training for construction teams and subcontractors as well as for clients and designers
- Initiation and consulting for the implementation of the sequence planning and timing control for all construction phases (planning, shell construction, façade, finishing, commissioning etc.)
- LEAN construction site logistics – linked to the timing
- Workshops for process mapping and for continuous process improvement
- Development of processes and standards as well as their professional coordination
- Training and qualification of LEAN trainers
- Measurement of the effectiveness of our LEAN methods and systems
LEAN.Construction – Transportation Infrastructures

Contact
Stuttgart
Gunther Mai
Tel. +49 711 7883-7200

Vienna
Mag. Dr. Margit Schlederer
Tel. +43 1 22422-1480
LEAN@zentraletechnik.com

Tasks
In order to remain competitive in today’s business world, marked by technical innovations, innovative leaps alone are no longer sufficient. Rather, it is important to continually improve the internal processes to gain a competitive advantage over one’s competitors. Continuous Process Improvement (CPI) is one of our main tasks.

Service and Support
Support, implementation and anchoring of the process optimisation
– Implementing the methods locally on site using LEAN Construction concepts

Value stream mapping and design
LEAN Construction workshops and trainings on construction process optimisation
Training and support of LEAN Construction specialists
in the optimisation of business processes and their implementation within the Group

Work preparation in the tendering and execution phase
such as schedules (Tilos, Power project, iTwo process models, crew and equipment plans

Creation of LEAN and logistic concepts
in the tendering and estimation phase.

Further development of LC planning tools:
– Standardised tools for the planning of earth works, asphalt and surface milling works that enable harmonisation and control of the overall process

User support and development of paver terminals:
– A system for the automatic process recording with visual processing of installation performance and advance as well as the documentation of the entire work day

Targets
• Saving of resources
• Reduction of incidents and delays
• Improving the products and customer satisfaction
• Increasing the product, process and service quality
• Reducing performance pressure on employees
• Improving the teamwork and corporate culture

1 Finished Terminal, Airport Klagenfurt / 2 PPP A8 Augsburg – Ulm
Tasks and Objectives

The more transparent and the faster that know-how can be shared, the more efficient and sustainable a modern building project can be designed, realized and operated. With BIM 5D®, we have developed a new digital working method for the construction industry, for STRABAG and for our clients, which involves all parties right from the start, thus enabling an interdisciplinary analysis of the data and the data context – and at the same time providing an early error detection system.

Step-by-step the BIM 5D® team continuously introduces the necessary working methods, tools, and templates for the company:

- Centrally organised across the Group coordination of the maintenance and development of agreed methods and templates
- Definition of developmental requirements for software and hardware with partner companies
- Service support in all available BIM 5D® applications
- Transfer of know-how: consultation and training for the use of BIM 5D®

We provide additional information about the current status via STRANET or under www.zentraletechnik.com.
Contact

Stuttgart
Konstantinos Kessoudis
Tel. +49 711 7883-3450

Désirée Klein
Tel. +49 711 7883-8728
BIM 5D® Training

Vienna
Theodor Sanskrit Strohal
Tel. +43 1 22422-1311

Aude Bougain
Tel. +43 1 22422-1500
BIM 5D® Training

Berlin
Pelle Møholm
Tel. +49 30 75487-190

Düsseldorf
Arnim Marx
Tel. +49 211 5996-317

BIM5D@zentraletechnik.com

Services and Support

BIM management / BIM 5D® project management
– Coordination of internal and external BIM 5D® planning

Supply of methods and templates for the BIM 5D® processes
– Templates in accordance with the requirements of the STRABAG Trade Code (STC) for structural works, finishing and shell works
– Templates for further trades in the building construction and civil engineering, as well as infrastructure works are also being developed
– Templates for BIM management (BIM project management plans, modeling guidelines, etc.)

Model-based collision checking / trades coordination

Model-based scheduling
– Connection of the schedule provided (ASTA Power Project / MS Project / Primavera) with the 3D models of the building and site installation

Model-based quantity determination
– Provision of quantities or direct evaluation in iTWO 5D based on a 3D model

Model-based production design / work preparation
– Support of formwork production design
– Creation of the required 3D design of support and temporary structures for complex shapes in cooperation with the work preparation team

BIM 5D® modelling capacity
– Provision of models based on 2D design from specialist design works, or the information provided by the client

Prequalification / proof of technical skills
– Provision of references regarding proof the technical skills for BIM 5D®

Visualisation
– Presentation of tenders and technical solutions using all possibilities of presentation, such as 3D images, 3D animations, photomontages, films and virtual reality

1 Blox, Copenhagen (Denmark) / 2+3 Collision checking / 4 Linking of schedule with 3D model / 5 Overlaying of 3D laser scan and as-built model
Supply Chain Optimisation

Tasks and Objectives

Construction projects usually have large transportation requirements, often within a relatively short period of time. This places considerable demands on the transport space provided and on the coordination of the individual material movements – the logistics. The underlying logistics network of the larger projects, especially in road construction, with a wide variety of fluctuating material stockpiles is of such great complexity that the use of mathematical methods and models to achieve optimisation is essential. An assessment prognosis of the entire supply chain, ideally at an early stage in the course of the work preparation, not only promotes cost-effective and resource-efficient construction, but also serves to minimise risk through the identification and management of the logistics critical leverage for each project.

STRAsco offers support in the strategic and operational optimisation of material flows and supply structures. We see ourselves as a consulting and service department for the entire area of logistics for the civil engineering trade.

Services and Support

Supply optimisation of mixing plants and production sites
- Ensuring an optimal allocation of natural resources for the mixing plants
- Comparison of alternatives
- Identification of bottlenecks, overcapacities and idle times

Design, planning and ongoing optimisation of logistics for large construction projects
- Optimisation of earth movement using plant and other means of transportation
- Sequence and efficiency optimisation
- Feasibility check
- Bases for transportation for tender quotation

Simulation of logistic processes and procedures
- Dynamic reproduction of actual situations in models
- Better understanding of processes and effect-interrelations
- Risk assessment by incorporating random effects and scenarios
- Graphic output for a better grasp of the entire system

Location and strategy concepts
- Support in location and investment decisions
- Assessment of the market environment and analysis of the market connection
- Creation of cost comparisons and feasibility analyses
- Illustration of catchment areas

Contact
Vienna
Dr. Gerhard Höfinger
Tel. +43 1 22422-1986
strasco@zentraletechnik.com

1 Market coverage of STRABAG-asphalt mixing plants in Austria and the surrounding area. With this information, existing sites can be evaluated and new optimal locations can be found.
Software Engineering

Tasks and goals for ITC Engineering

The core competences of ITC Engineering include the specification of technical tasks and their formatting for the software development as well as the architectural design and the subsequent programming of these software systems for the construction industry. This includes the cross-boundary networking of mobile site-dependent process data with powerful and sophisticated sensors as well as the monitoring of safety-relevant processes in operation during the building construction and civil engineering works, as well as for infrastructure projects.

ITC’s goal is, working closely together with our clients, to accelerate the decision-making processes and to limit process risks in the software-based process management, in order to execute our projects more cost-effectively and securely. To this end, highly qualified engineers as well as software and scientific specialists are cooperating to develop the IRIS information system for application in challenging ground engineering and tunnelling projects, traffic infrastructure works and structural and civil engineering projects. We support our clients providing the necessary workshops and training in the application and data evaluation.

As a think-tank for such innovative products and services within the digitalisation of the construction industry ITC Engineering stands for the following guidelines for action:
- clear responsibilities through small project groups consisting of specialist staff from Sales, Project Management and Product Development
- high demands on the quality of the supplied software
- agile product development with our clients in mind
- close co-operation with partner companies in future fields of information development

Products, maintenance and services

Customer satisfaction is the top priority for ITC. For this reason, we offer a comprehensive service for our products. This includes the early support for the clients during the project start-up phase regarding the modules and services required, the product installations necessary and the on-site training of the colleagues as well as the continuous product update. We currently offer the following services and products:
- technical software specifications of construction specific problems by way of Userbility workshops and BoQ deduction methods for the realization of the IT technical solutions
- IRIS.teams for the project execution for all construction categories (management of process, task and documentation)
- IRIS.scm for the controlling of material and building component supply processes
- IRIS.forms for the supply of forms during the construction process
- IRIS.tunnel, IRIS.dpm and IRIS.dzy for the controlling, monitoring and work acceptance during tunnel projects

Our training concentrates on the implementation of IRIS for a project, in the handling of the various modules, the creation of processes and interfaces with the task management and the analysis of down times and disturbances of the construction process.
Development and Innovation

As an internationally operating technology group for construction services, we have to monitor changes in our environment including changes which directly affect our business and influence our customers’ behaviour. Although we distinguish between economic, technological, social and political developments, it is obvious that these are interrelated. If we want to understand the impact of these changes on our main business of construction, we have to act in a comprehensive and integrated way.

Technological progress allows for enormous increases in production and efficiency while at the same time causing highly visible global consequences for the environment and for mankind. These effects have already led to reactions, which we must deal with on both a social and political level. For example the demand to stop global warming had initially been promoted by non-governmental organisations such as the Carbon Disclosure Project. As a result, companies, at least energy intensive industries, have committed themselves to measure and publish their energy consumption and related CO₂ emissions.

However, now legally enforced energy management systems are introduced, for businesses to use fossil fuels more efficiently and to reduce greenhouse gas emissions. Even in the private sector the consequences of entrepreneurial activity, and especially its influence, are recognised. For pre-qualifications we now have to demonstrate in ever greater detail which management or production processes we use in order to deal with the issues concerned, and in which way we ensure quality standards. But even these are to be continually developed, applying LEAN Construction principles (see pp. 24f) not only to our production processes, but also to our administrative processes.

Alternatively, let’s have a look at the technological development: The breathtaking pace at which the information and communication technology is developing will lead to all areas of work and living being affected by digitalisation. Building Information Modelling (see pp. 26f) enables to process the vast amount of information regarding technical, financial and logistical aspects throughout the life cycle of a structure in a comprehensive way, so that those involved are able to make informed decisions. However, only viewing an individual project is no longer sufficient: data and information have to be promptly intertwined in order to be effective for the construction projects ahead.

Here too, appropriate tools and methods are to be developed and updated. These are only a few examples of the reasons why the boundary conditions of our business also have to be observed from a broader context. In addition, ideas are continuously developed, and need to be protected as a patent, utility model or brand for the benefit of the company. The teams for Corporate Responsibility, Innovation Management, and IPR Intellectual Property Rights in the Development and Innovation Department approach many of these tasks in close coordination with the operational and other central units.

OUR CONTRIBUTION TO OUR COMPANY:
Being agile and prepared for changes that may be relevant to our competitiveness, and using these to our advantage.
Contact

CR Management
Fabian Bauer
Tel. +49 711 7883-9751
cr@strabag.com

Innovation Management
Rudolf Oesterreicher
Tel. +43 1 22422-1367
fue@zentraletechnik.com

IPR Intellectual Property Rights
Andreas Kugler
Tel. +49 711 7883-813
ipr@strabag.com

Corporate Responsibility

Sustainability is a word on everyone’s lips – but we understand it to mean: to comply with the responsibility for environmental and social impacts of our business in the entire added value chain, internationally also called corporate responsibility. Clients, investors and development banks require in the course of pre-qualifications, submissions and ratings ever more comprehensive and detailed information on the sustainability performance of STRABAG. We have to explain the Group’s principles or guidelines, objectives and measures on the subjects of health and safety, compliance, energy, governance, human rights, employees, quality management / assurance and environment.

Services and support
We ...
– develop, support, and coordinate projects and activities that contribute to a sustainable development, such as resource-efficient procurement, or energy and fuel management.
– design and induce LCAs on building products, construction / organisation processes, construction service works.
– answer external requests regarding the Group’s sustainability performance for prequalification and submissions, from credit rating agencies such as EcoVadis as well as from NGOs and the press.
– compile and control the non-financial reports
– identify early changes in the social environment and their potential impact on our core business.

Innovation Management

For the long-term success of the company we have to constantly develop our construction materials, technologies, procedures and tools. In addition, we are vigilantly looking for solutions outside the Group which may give new impetus to our core business.

Services and support
We ...
– acquire external funding (or support the operative units in this) and manage the ZT’s R & D budget.
– report internally and externally on the R & D activities throughout the Group.
– develop tools, work techniques and methods together with the operative units in order to inspire ideas.
– manage and expand an international innovation network for Construction, which consists of companies, research institutions, development agencies, universities and associations.
– evaluate opportunities for our business from developments and technologies presented to us.

IPR Intellectual Property Rights

Formal property rights such as patents, registered designs and trademarks are a registered, active virtually worldwide protection of our intellectual property (Intellectual Property Rights).

Services and support
We ...
– look after Group industrial property rights from registration to the end of period of validity.
– advice regarding industrial property rights.
– support:
  • the attainment of industrial property rights in all phases.
  • the enforcement or defence of our own rights, if these are violated by the competition.
  • the legal bypassing of third party rights.
– monitor deadlines and fees for the maintenance of our rights.
– observe the compliance of the employees’ invention rights.
– inform on a weekly basis regarding the newly published patent rights in the official journal.
– perform project-related research in the patent literature.
Mobile, modular charging station in timber construction for electric vehicles