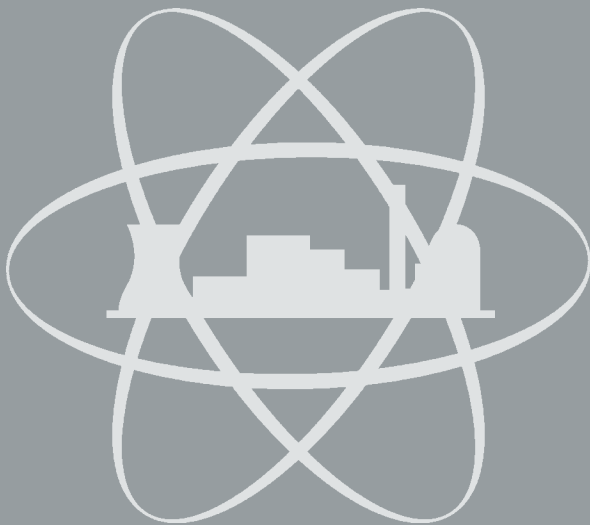
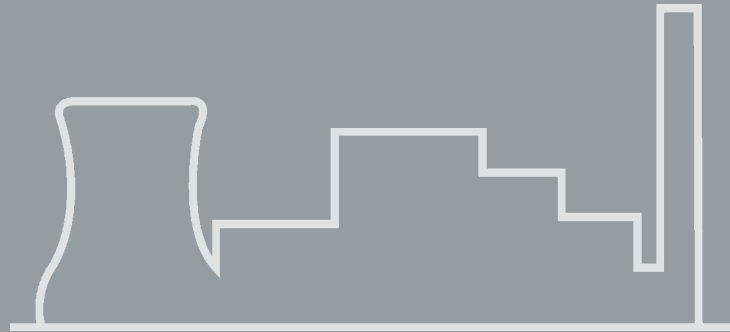


Supplementary services, engineering, field service

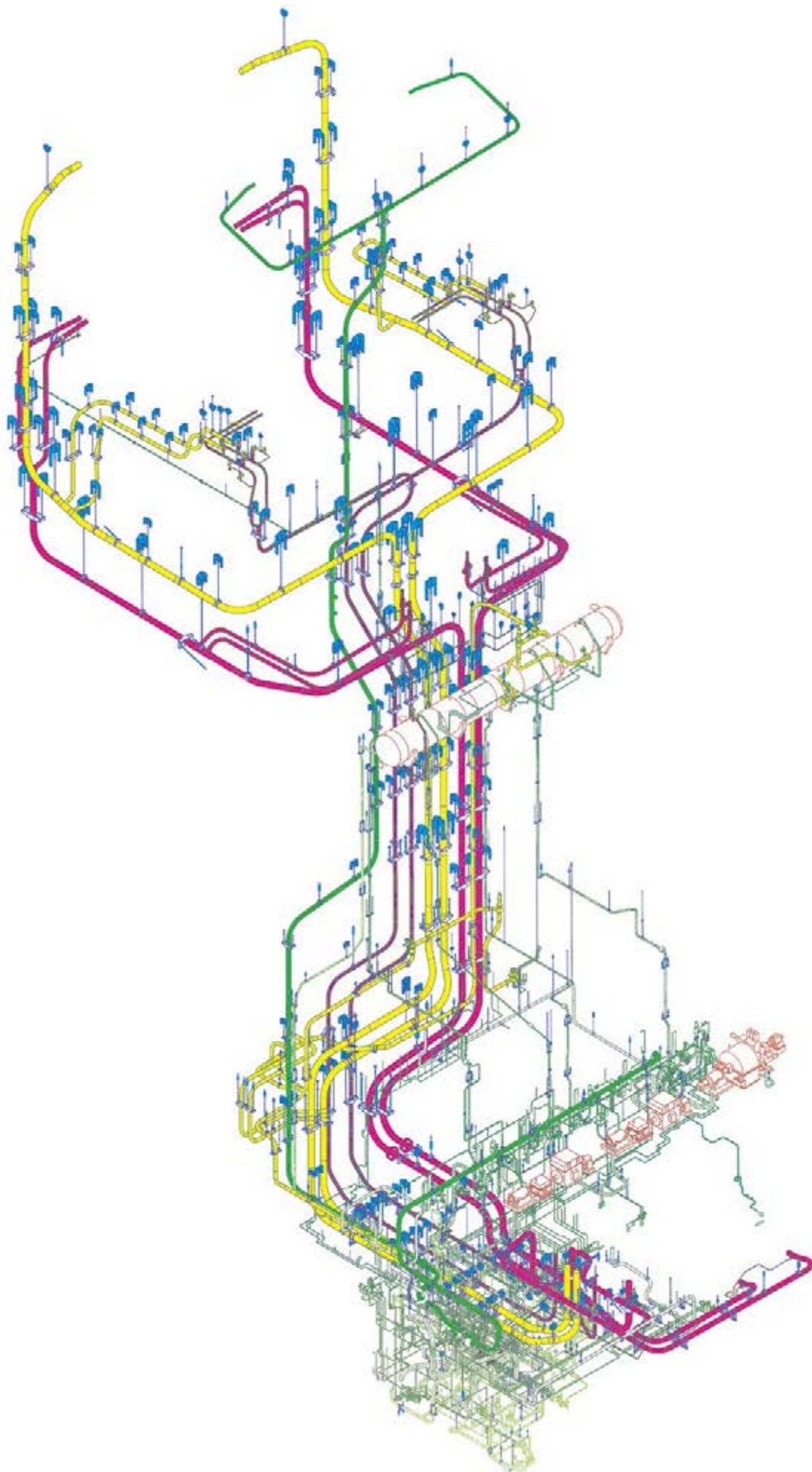
9

SUPPLEMENTARY SERVICES,
ENGINEERING, FIELD SERVICE



PRODUCT
GROUP

9



Supplementary services, engineering, field service

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Engineering, support design	9.5
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PRODUCT
GROUP **9**

Supplementary services

Product group 9

The LISEGA product program presented in this catalog **STANDARD SUPPORTS** incorporates the latest technical developments with respect to the proper support of pipe systems in industrial plant construction.

The relevant international stipulations are observed to the fullest extent.

Special fields of application

The standard design described covers the normal field of application. In special sectors, for example, nuclear or offshore installations, supplementary measures with regard to material quality or corrosion protection may be required. The implementation of particular customer specifications is ensured by the integrated quality management system. Certificates of approval are supplied with the order.

Service areas

The LISEGA performance package includes not only the product spectrum but a range of services within the framework of product application. In the field of engineering they cover the whole process chain from pipe system design to support planning in all the current 3D design sectors. The service field comprises the usual support when commissioning, right through to plant analyses and walk-downs.

Standardized supplementary services

By means of tightly-focused supplementary services the LISEGA standard program can be adapted to particular requirements. In this way the field of application of the products is widened and the LISEGA performance package optimized. All major supplementary services are standardized in line with the LISEGA modular system and cataloged in product group 9.

9.0 Supplementary services

9.1 Adjustment work

Constant and spring hangers/supports are adjusted to installation load on a hydraulic test bench via computerized force and travel measurement, then blocked.

9.1.1 Storage of the blocking devices

On request the spring hangers/supports can be equipped for permanent storage of the blocking devices (after deblocking) on the casing. This is standard practice on the constant hangers.



9.2 Quality assurance

9.2.1 Inspection reports

If required, inspection reports with digitally recorded values can be supplied as function verification for constant hangers, spring hangers and snubbers.

9.2.2 In-service tests

In-service tests can be performed on the mechanically operating components of any make in the respective LISEGA factories or by using mobile test benches directly within the plant itself.

9.2.3 Material certification

The following material certification can be supplied on request.

9.2.4 Supplier's certificate

Manufacturer and shipment in compliance with the order can be confirmed with a supplier's certificate according to DIN EN 10204-2.1.

9.2.5 Material certificates DIN EN 10204-2.2

The materials used in all catalog components can be verified by verification certificates according to DIN EN 10204-2.2.



Compilation of component documentation

9.2.6 Acceptance test certificates DIN EN 10204-3.1

Components exposed to the direct flow of force such as, for example, the springs in constant and spring hangers or supports, can be supplied with certificates according to DIN EN 10204-3.1.

9.2.7 Complete traceability through acceptance test certificates DIN EN 10204-3.1

Due to separate fabrication, complete traceability is possible of materials in all catalog components with test certificates according to DIN EN 10204-3.1.

9.2.8 Pre-examination documents

The standardized products were largely certified by independent inspection bodies by specified suitability and type tests according to KTA 3265.3 and VGB-R 510 L.

Pre-examination documents such as design drawings, parts lists, calculations, test sequence schedules and welding plans can be produced for special designs, particularly non-standardized components (also for other codes).

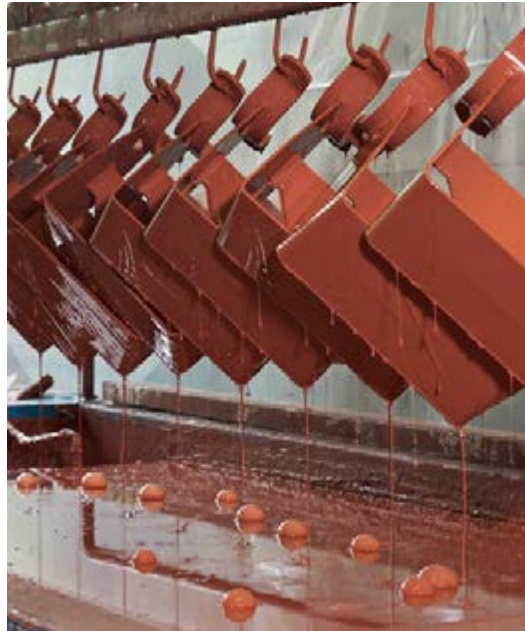
9.2.9 Increased quality requirements

For applications subject to increased safety and quality demands, such as nuclear installations, the highest level of the quality assurance program is implemented. All stages of order processing and execution are followed according to recognized procedures, in line with the quality stipulations in the standard codes KTA or ASME section III, NCA and NF.

The following areas are thereby taken into special account:

- material acquisition from approved suppliers
- complete traceability of materials
- strict supervision of manufacture

All areas are fully documented.



Cataphoretic immersion priming

9.3 Surface treatment

In addition to specified standardized surface protection, further corrosion protection can be supplied according to technical specifications, from p. 0.10.



Spray painting



Pre-assembly of load chains

Special treatment

Besides the standard designs available from stock, special designs providing extra corrosion protection can be agreed on. For this, separate manufacturing may be required.

9.4 Pre-assembly

If not otherwise agreed, the components belonging to one scope of supply will be packed in bundles according to types.

9.4.1 Pre-assembly of load chains

For simple handling and time-saving assembly at site, the individual components can, however, be supplied already pre-assembled into load chains, bundled and marked.

Constant and spring hangers/supports, as well as larger pipe clamps (bulky components), are kept separate for easier handling and are correspondingly marked.

9.4.2 Pre-assembly of pipe clamps and clamp bases

Pipe clamp and clamp base halves are bolted ready for shipment and supplied as complete units.

9.5 Labelling and marking

If not otherwise agreed, the components are sorted according to type, packed and marked with quantity, type number and order number. Additional labeling and marking can, if required, be applied.

9.5.1 Marking of individual parts

If required, all components can be marked individually with type, support position number or order number.

9.5.2 Second name plate

If required, spring hangers and constant hangers can be fitted with a second name plate.

9.5.3 Second load and travel scale

If required, constant spring hangers/spring supports can be fitted with a second travel scale and constant hangers/supports with a second load scale.

9.6 Packaging

Appropriate forms of packaging are provided for the various requirements.



Load chains, pre-assembled, bundled and marked

9.6.1 Inland packaging

For road or rail transport, sturdy wooden crates or pallets are offered, fitted with skids for fork-lifting.

9.6.2 Seaworthy packaging

For sea transport, special wooden crates are used, with skids for fork-lifting and with reinforced side walls for any transport by crane. The lids of the crates are lined inside with plastic shrink wrap as protection against moisture.

Other special forms of packaging can be agreed upon in detail.

9.6.3 Export control and shipment processing

As a globally operating export company, LISEGA and all its affiliated companies take full responsibility for completely fulfilling all customs and export stipulations.

To ensure and properly execute export control, LISEGA has set up structures that correspond, on the one hand, to legal requirements and, on the other, to a smooth and effective work flow.

By certification as “Authorized Economic Operator” (AEO-F) in the year 2009 and as “Known Consignor” in March 2012, LISEGA has shown that it meets all prerequisites for the support of a secure supply chain.

Together with the simplified customs procedures granted by the AEO certificate for the accelerated export of goods, the independent declaration of preferences, as well as the package acceptance free of any control for airfreight due to our “Known Consignor” status, this contributes noticeably to the trouble-free preferential export processing of LISEGA products.

The personnel in our export office all have comprehensive and regularly updated expert knowledge in all aspects of shipment processing.

Should LISEGA not already be responsible for customs clearance according to the terms of delivery, we will assume this at the customer’s request, also in the form of direct representation, after being granted power of attorney for customs.

Our notable competence in shipping processing is matched by the high standards of packaging and marking at LISEGA, fully covering all international standardized stipulations in the land, sea and air transport sectors. This is confirmed by the unanimously high acceptance shown by our customers.

9.7 Transport

If requested, we will take charge of the logistics processing for shipment of the components to the construction site or any other shipping addresses.



Project-related order logistics



Seaworthy packaging



Part of the dispatch department

Engineering support design

The proper functional integration of pipe supports into the existing piping and plant concept has a decisive influence on the long-term behavior of the pipe systems. Support design should therefore be given the same care and attention as the piping itself. In this regard, selection of the component, the availability of the latest design software and especially the long experience of the planning engineers have a decisive influence on the quality of design.

Engineering support design

Besides stringent demands concerning quality it is also important in support planning to fulfill strict requirements regarding tight schedules and economic targets. In order not to endanger the budgets and logistics of entire projects, complete planning phases are outsourced to engineering offices specialized in the work.

As a specialist, LISEGA has long been qualified in the processing of complex planning projects by offering the relevant expertise from over 50 years' experience in support technology. At all LISEGA locations highly qualified and experienced technicians and engineers are on hand. For internationally overlapping projects and whenever required, the engineering sections of the individual locations work in collaboration with each other.

The following benefits are offered to the customer when using LISEGA's planning expertise:

- **economical limitation of their own personnel deployment**
- **high security and professional execution through the use of experienced specialists**
- **rapid and flexible processing of the whole project, from ordering to shipping, following the principle 'All from a single source'**
- **quick delivery due to prompt processing**
- **complete and permanent computerized documentation**
- **highly qualified experts always on hand for follow-up service**

Pipe supports for complete plants, including secondary steelwork are conceived, planned and reproduced in drawings. On the basis of the LISEGA modular system and decades of experience, ready-to-install load chains – from structural attachments through to pipe-surrounding components – are generated from standard supports.

Should components be required that do not form part of the standard LISEGA program (e.g. anchors etc.) LISEGA can provide appropriate solutions.

Recognized international technical codes and standards, as well as customer specifications, are thereby taken into account.

The relevant pipe stress analysis data are observed for the design and dimensioning of supports, as well as the detailed pipe system layout plans and structural situation.

Besides LISEGA's LICAD® program, the latest software is applied for the efficient conversion of the support situations into 2D or 3D models and for the economical generation of drawings. The following standard programs are currently being used:

- **LICAD®**
- **AutoCAD®**
- **MicroStation®**
- **PDMS™**
- **Staad.Pro® (static/dynamic calculations for secondary steelwork)**
- **SmartPlant® review**
- **Navisworks®**
- **ROHR2®**
- **CAESAR II®**



Engineering in Zeven, Germany



Analysis of complex support systems

Shown below is an example of a planning sequence for a suitable LISEGA support design in **seven steps**. Depending on needs and specifications the engineering services can also be offered individually.

Pipe system calculations

The following typical load cases are generally calculated per support point for new and existing plants:

1. **Primary loads**
 - weight and internal pressure
2. **Secondary loads (thermal expansion)**
 - operating loads
 - design conditions
 - boiler out of service
 - (AB operation of pumps)
3. **Occasional loads**
 - earthquakes
 - wind
 - pressure impact loads
4. **Test loads**
 - water pressure tests
 - pickling (acid clean)

On the basis of the stipulations and information, ready-to-install load chains from standard attachments to pipe-surrounding components are generated with the LISEGA design program LICAD®.

For the calculations the codes ASME B31.1, ASME B31.3 and DIN EN 13480 are usually followed. When ordering, the desired code issue according to version and year must be stated.

In existing plants it is frequently necessary, for reasons of operational safety, to update pipe systems and their supports to meet the requirements of the latest technology. Very often, sufficient calculation documentation on the original layout design is no longer available. If required, the stress analysis can also be supplied for these pipe systems.

LICAD®

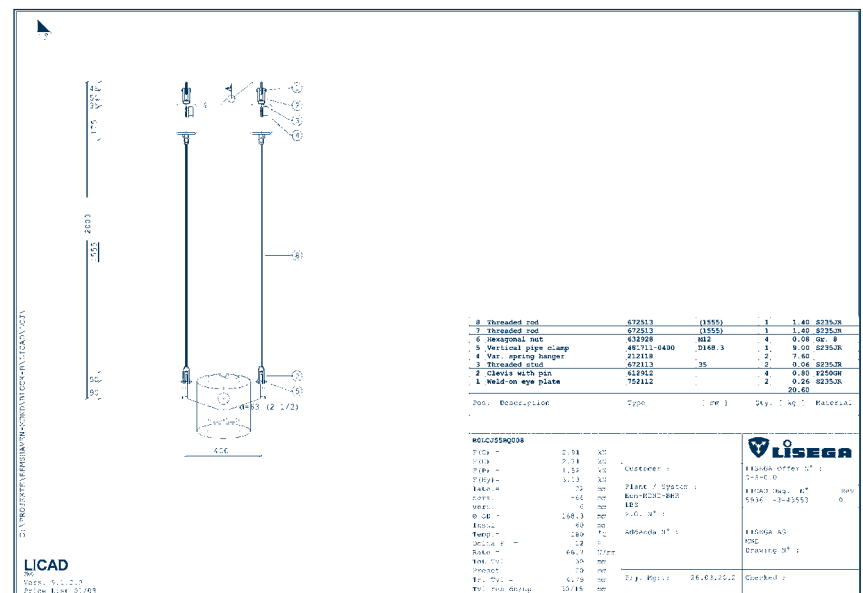
In accordance with calculations and customer stipulations, the installed load chain is generated from standard supports with the LICAD design program, from structural attachments right through to pipe-surrounding components.

RESULTS -- Program ROHR2 BBS/31.0 -- Page 34
 Commiss. AGX43458 Date 13.12.11 10:54:35
 BOLCJ30/35/50/55BR010 BOLCJ35/55BR020

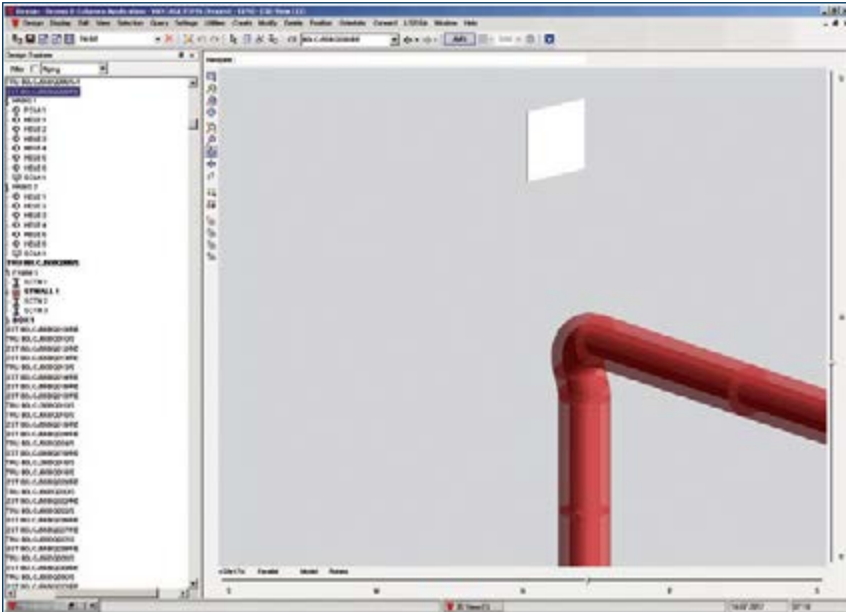
Line	3	Point	329	S NR	BOLCJ55BQ008		
Support in Absolute Coordinate System							
Spring hanger							
LoadCase	WX	WY	WZ	AGX	AGY	AGZ	
	PX	PY	PZ	KX	KY	KZ	
	mm	mm	mm	kNm	kNm	kNm	
	mmrad	mmrad	mmrad				
Dead Weight	-0.10	-0.15	0.00	0.000	0.000	-2.906	
	-0.03	-0.26	0.10	0.000	0.000	0.000	
Operation Load 1	-7.51	2.29	2.91	0.000	0.000	-2.712	
	1.98	0.22	2.29	0.000	0.000	0.000	
Operation Load 2	-1.46	3.37	2.16	0.000	0.000	-2.762	
	1.35	0.93	1.28	0.000	0.000	0.000	
Operation Load 3	-6.88	2.36	2.82	0.000	0.000	-2.718	
	1.91	0.31	2.19	0.000	0.000	0.000	
Earthq.dyn.1 X	51.28	13.63	2.48	0.000	0.000	0.165	
	4.54	1.18	11.21	0.000	0.000	0.000	
Earthq.dyn.1 Y	27.28	12.87	2.10	0.000	0.000	0.140	
	3.16	2.54	5.95	0.000	0.000	0.000	
Earthq.dyn.1 Z	2.55	1.72	0.97	0.000	0.000	0.065	
	0.41	0.39	0.58	0.000	0.000	0.000	
Extreme value	-65.65	22.19	6.30	0.000	0.000	-3.131	
	7.54	3.76	14.99	0.000	0.000	0.000	
Hydraulic Test	-0.09	-0.15	0.00	0.000	0.000	-2.906	
	-0.03	-0.25	0.09	0.000	0.000	0.000	

Labels in image: support point, function, marking number, load cases, travel + twist, loads and moments

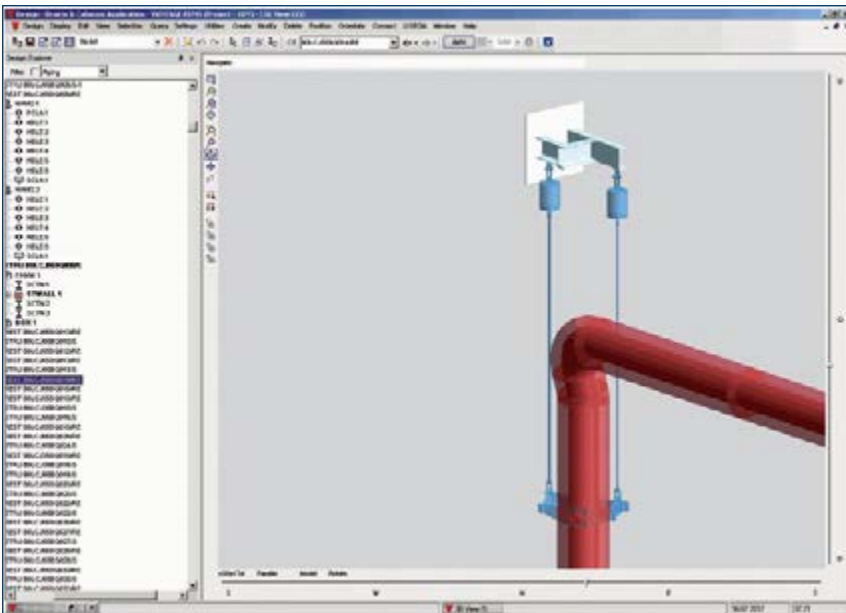
Step 1: Pipe stress analysis (ROHR 2®): travel / deflections / loads / moments (pipe stress analysis as iterative process)



Step 2: Application of LICAD® - technical selection of pipe support



Step 3: Checking the technical data and surrounding structure in the 3D model (e.g. PDMS™, PDS®, SmartPlant®)



Step 4: Integration of the LICAD® support into the 3D model with collision analysis and integration of secondary steelwork

Support design in 3D

For the design of pipe supports in 3D the customer provides a model complete with pipe systems, steelwork, building structures and components, as well as all the necessary databases. In addition, any specific requirements are to be indicated for the design of the pipe supports.

The support designs are planned directly in 3D (PDMS / SmartPlant), including the secondary steelwork required, and laid out. The load chains generated in LICAD® are imported via existing interfaces into the 3D model. Any secondary steelwork needed can be supplemented directly in PDMS.

Finally, a check is made for any possible interference. The customer receives a database of the 3D model that contains all the support designs checked for freedom from interference.

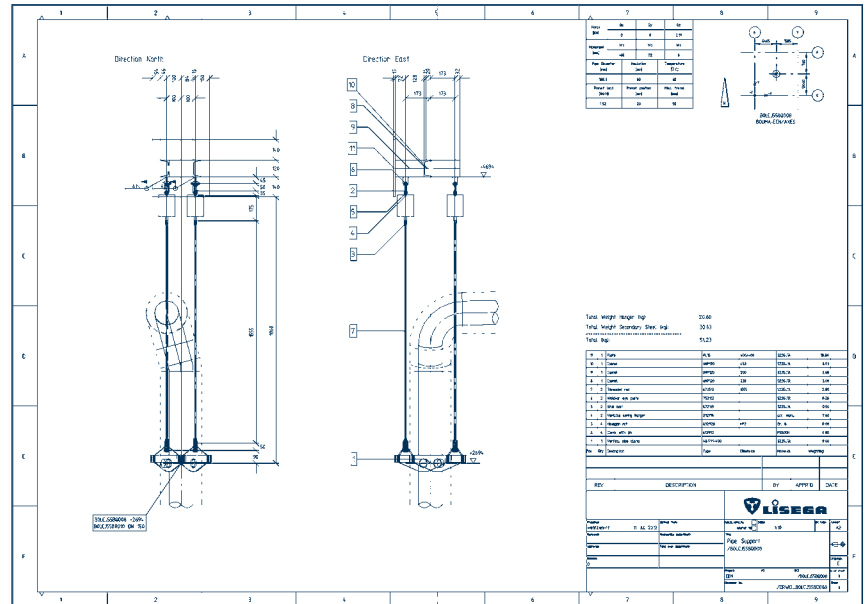
In almost all other 3D programs LISEGA can, by way of the viewer, edit the characteristics necessary for support design.

Generation of 3D models with MicroStation® for PDS®

For the creation of 3D models on MicroStation® the pipe supports are first generated as 2D displays from a sketch. The 2D data are transformed by LICAD® into 3D data and exported via an interface into the MicroStation® 3D model. Any secondary steelwork required is supplemented in the 3D model. In PDS® the completed 3D models can be used for collision tests.

Generation of drawings

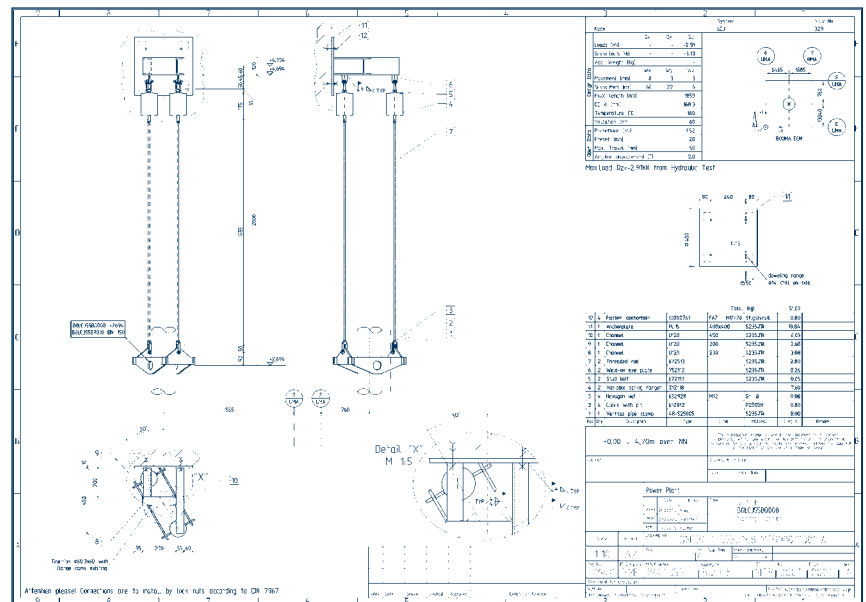
A 2D drawing is generated directly from the PDMS™ model in DXF format with different views. Parts list, site plan and all the technical specifications are stored as data sets and can be further edited. If required an isometric display of the support on the drawing is possible.



Step 5: Extract from the 2D drawing with parts list, loads, displacements and site plan from the 3D model

From the drawing generated automatically in Step 5, a production drawing in DWG (AutoCAD®), DXF or DGN (MicroStation®) format is generated. In this, all the information required for installation, including welding specifications, borehole patterns etc. can be seen.

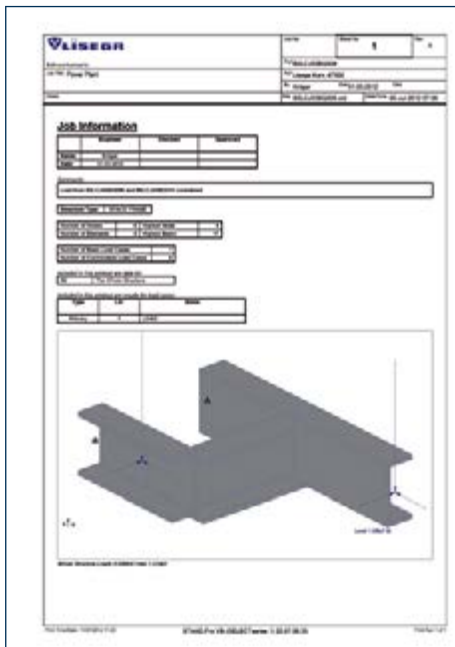
The title block can be individually designed.



Step 6: Generation of a detail drawing (installation drawing) with different views and sections

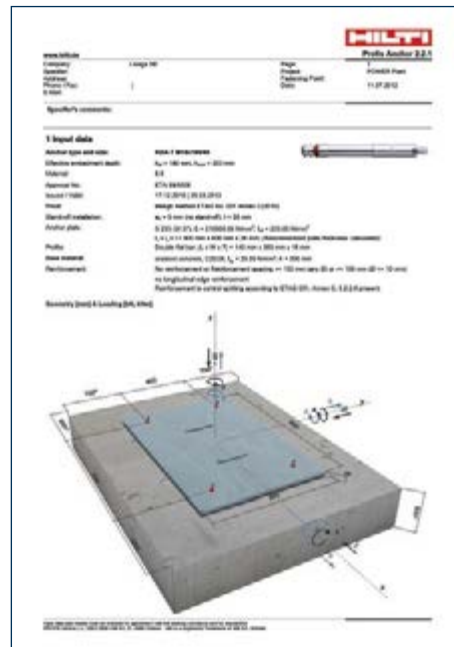
Static calculation of secondary steel including structural attachment loads

LISEGA supplies the design report summary for the dimensioning of the planned secondary steel according to the AISC code or Eurocode 3. This summary is provided with the STAAD PRO® statics program.



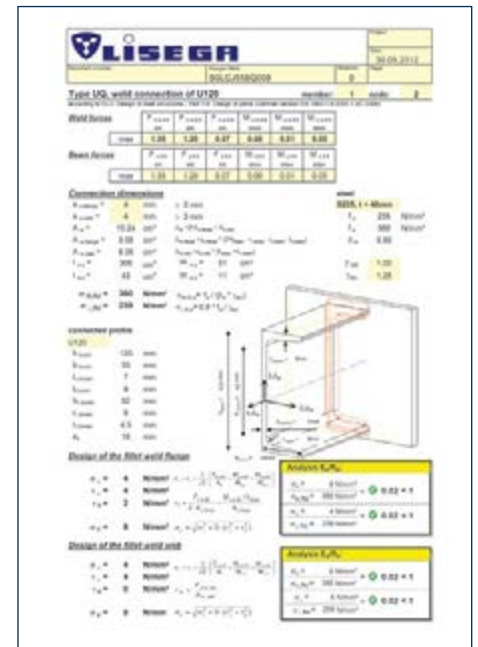
Anchor certification

Individual certificates can be provided for most anchor manufacturers with the aid of the corresponding design programs. For economic planning a standard has been developed by which individual certificates can be dispensed with. If required the necessary documentation can be produced.

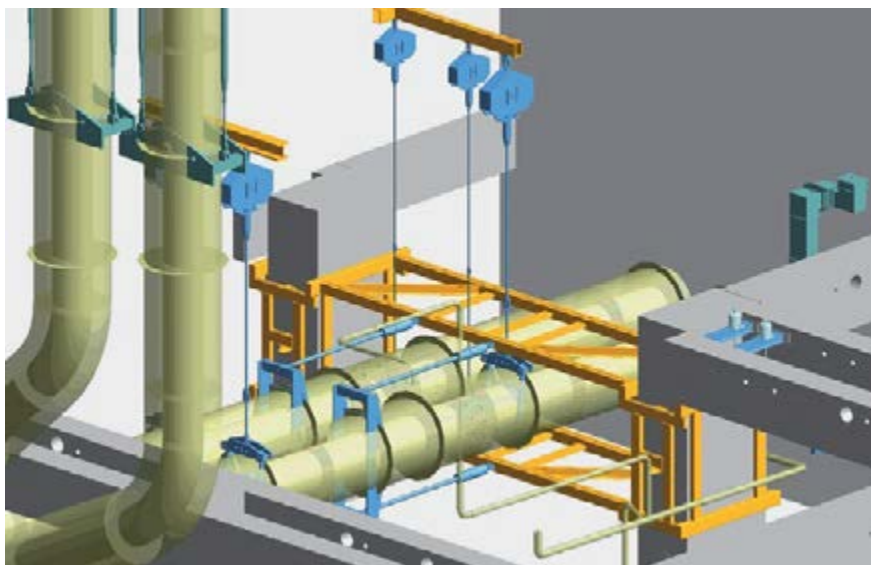


Welding certification

In accordance with the specified codes, individual weld seam certification for steelwork attachments can be provided.



- Step 7: provision of certification (optional)
- statics secondary steel incl. structural attachments
 - anchors
 - weld seam



Pipe supports with complex secondary steel design in 3D model

Plant service

Additional stress and strain due to low quality pipe supports can lead during operation to lasting damage that can considerably increase the risk of malfunction and breakdowns in the plant.

Frequently occurring defects in the pipe supports are:

- poor support designs
- faulty installation
- incorrect load settings
- unsuitable layout
- deficient quality of support components

A particular problem often arises in aged installations when spring and constant hangers with springs that are not pre-relaxed (see p. 1.15 on this). In these cases an ever-increasing loss of ultimate load occurs due to growing relaxation over time. The resulting load deviations can lead to impermissible additional stresses, especially at sensitive points such as connections. Timely inspection in the plant can contribute to the prompt identification and elimination of critical stresses.



LISEGA service team on construction site

For this special service we offer the resources of an international market leader, with qualified and experienced specialists on hand at all LISEGA Group locations.

Our experts check the thermal pipe displacement and inspect the support systems. They prepare detailed reports on this and propose suitable solutions. For the presentation and documentation of the findings, special software is applied.

The service team is specially trained for the execution of such services in the pipe support field and works strictly in accordance with quality management stipulations and recognized safety guidelines.

The operational safety of pipe systems and hence the readiness and long life of the plants depend in great measure on the condition and functional capacity of the supports used.

To avoid costly damage and breakdowns, regular inspections of the thermal pipe displacement and the condition of the supports – particularly in older plants – is urgently recommended!

Recording List for Pipe Supports



Plant Name: _____		Temp.(1): ambient		Recording cold (1): May 2000		Performed by:																							
Piping System: 1AB-H01- Main Steam Unit 1		Temp.(1): 540°C		Recording hot (1): Nov. 2000		Name: _____, Liseqa SE																							
		Temp.(2): 540°C		Recording cold (2): _____		Name: _____, Liseqa SE																							
				Recording hot (2): April 2013		Name: _____, Liseqa SE																							
Information on the Name Plate																													
No.	Diameter (mm)	Type	Serial Number	Calculated (mm)	Theoretical (mm)	Recording during cold set			Recording during operation			Travel reserve	Max. possible travel position	Poss. travel	See separate lists														
						B Load scale (kN)	C White (mm)	E Actual (mm)	E1 Dev. (mm)	E1.1 Upwards (mm)	E1.2 Downwards (mm)					E1.3 Travel is possible?	D Theoretical (mm)	F Actual (mm)	F1 Dev. (mm)	F1.1 Upwards (mm)	F1.2 Downwards (mm)	F1.3 Travel is possible?							
U1	39.0	1AB-H-01-001	118215	9877505/48	65.58	76	13	35	-22	35	67	no	89	105	102	-13	102	0	yes	-76	-70	-67	0	-	102	102		X	
U1	39.0	1AB-H-01-001	118215	9877505/66	65.53	76	13	35	13	0	102	yes	89	107	108	-19	108	-6	yes	-76	-72	-73	0	-	102	102		X	
U1	34.0	1AB-H-01-002	guide																										X
U1	30.0	1AB-H-01-003	119315	9877940/21	83.40	157	27	80	27	0	200	yes	181	179	192	-8	192	8	yes	-157	-99	-112	0	-	200	200			
U1	30.0	1AB-H-01-003	119315	9877940/18	83.40	157	22	85	22	0	200	yes	179	205	193	-14	193	7	yes	-157	-120	-108	0	-	200	200			
U1	30.0	1AB-H-01-003	306318	98814353/05									265	273			273			-160	-273	0	-	300				X	
U1	30.0		118315	9878592/50	22.82				60	0	210	yes	210				223	26	yes	-160	-110	-123	0						

Record from a hanger inspection



Controlling a pipe support

The service package covers the following fields of performance:

Inspection of pipe supports

- inspection of general condition of pipe supports
- load and travel checking of the spring hangers
- function testing of constant and spring hangers with mobile test facilities at the plant or on stationary test benches at the LISEGA facility.

- elaboration of solutions to problems arising from restrictions in space
- design of pipe supports via LICAD® and AutoCAD
- preparation of lists of parts and materials



Testing constant hangers on-site with a mobile test bench

Inspection of pipe system displacement

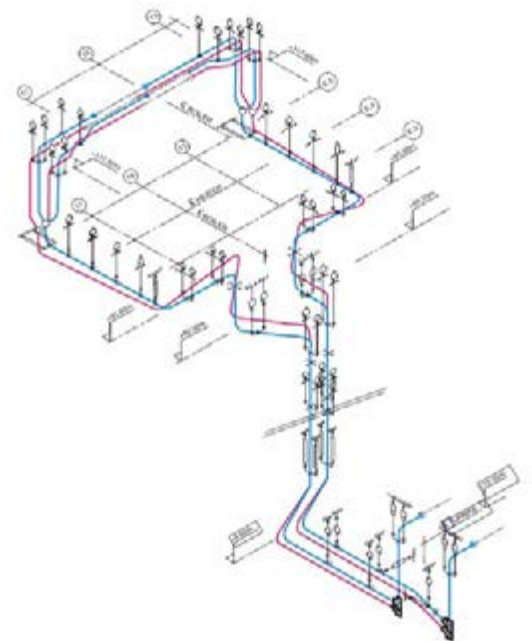
- inspection of the general condition of the piping sections and if necessary the geometric positioning
- inspection of the pipe systems for unrestricted freedom of movement in all three planes
- determination of the vertical displacement at all support points, at the pipe system connections and selected points in all three planes



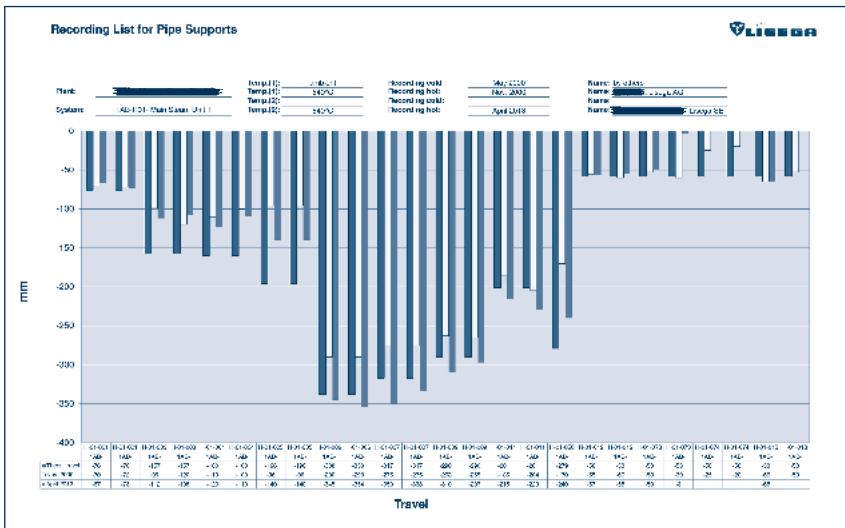
Discussion of findings and observations from the inspection of pipe systems

Design of supports at the plant

- design and layout of pipe supports for updating and modifications in older plants
- measurement work at the plant



Cold/hot position of a pipe system



Graphic display of pipe system displacement

Construction supervision, installation and commissioning

- material reception and control
- organization and administration of warehouse stocks
- pre-assembly and arrangement of complete support configurations
- installation of supports at designated points
- supervision of installation of piping into supports prepared
- inspection of the system for correct installation according to drawings and installation and operating instructions
- deblocking and commissioning of supports in line with agreed procedures
- load and travel checks after commissioning according to requirements
- inspection for freedom of movement in pipe systems in all 3 planes
- subsequent regulation of hangers if load differences are detected

Testing, maintenance and inspection of snubbers of all makes

- visual inspection for signs of possible malfunctioning
- dismantling of snubbers acc. to stipulations or requirements and documentation of external condition and surrounding conditions
- function testing on mobile test benches at the plant or on corresponding test facilities at the LISEGA facility
- dismantling of snubbers and inspection of individual components for wear and damage



Inspection of supports at the plant

- exchange of all seals, hydraulic fluid and any other components showing noticeable wear
- final function tests acc. to test program and specifications on hand
- re-installation of snubbers at the plant
- provision of complete final documentation

The wide spectrum of the LISEGA service package applies in particular to pipe supports and their application. If properly implemented, LISEGA service work makes a valuable contribution to the functional safety and long life of complex piping systems.



Visual inspection of snubbers



Testing snubbers of different makes at the plant using a mobile LISEGA test bench.