isoplus®
Piping Systems

How to Install A District Energy Piping System Efficiently To Ensure a Longer Service Life

Leading supplier of pipes,
including a full range of
components and accessories

CASE: SHERIDAN COLLEGE

Project Sheridan College

- Sheridan has 4 different campuses with 40,000 students enrolled.
- The project goal was to reduce overall energy consumption by 65% and CO_2 emissions by 45% by installing new district heating and cooling systems the two largest of the four locations.

Case: Sheridan College

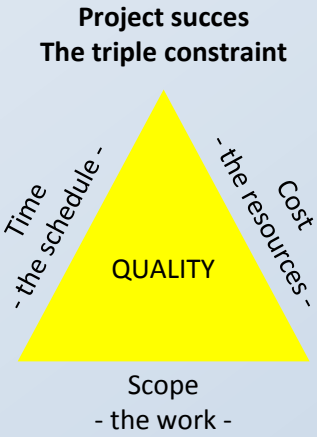
- **Project:** District Heating and Cooling Project Sheridan College - Trafalgar Campus Oakville, ON. & Davis Campus Brampton, ON.
- **Total number of feet delivered:** approx. 11,480 ft of pipe supplied to both locations 7,544 ft in single pipe & 3,936 ft of double pipes.
- **Leak detection system:** connected at both locations.


Onsite training


Installation

Sheridan and the installation crew broke ground in early May 2016 and this phase of pipe installation was completed in October 2016

Sheridan has been a tremendous success



Project Sheridan College

- **Dimensions:**
  DN 4” – DN 6” single pipes
  & DN 1” – DN 5” double pipes.
- **Insulation class:**
  Single in Series 1 for cooling
  & 2 for heating, double in Series 2.
- **Fittings:**
  Bends, T’s, Y’s and Branches –
  Total number installed at both locations 134.
- **Joints:**
  Approximate number of joints installed at both locations well over 500.

Project Sheridan College

- **Leak detection system:** connected at both locations and to the 4500 isoAlarm model.

- **Other relevant/special project data:** Sheridan and the installation crew broke ground in early May 2016 and this phase of pipe installation was completed in October 2016

Project Sheridan College

CONTRACTORS

There were five main stakeholders on the Sheridan team.

- Sheridan College (customer)
- Consulting firm
- Project management company
- Installation construction contractor
- isoplus Piping Systems

Project Sheridan College

isoplus's role in the project was to supply all European Norm and Standard pre-insulated pipe and fittings for the project and also provide training and technical support before, during and after the install.

Doing everything right from the beginning saves time and resources

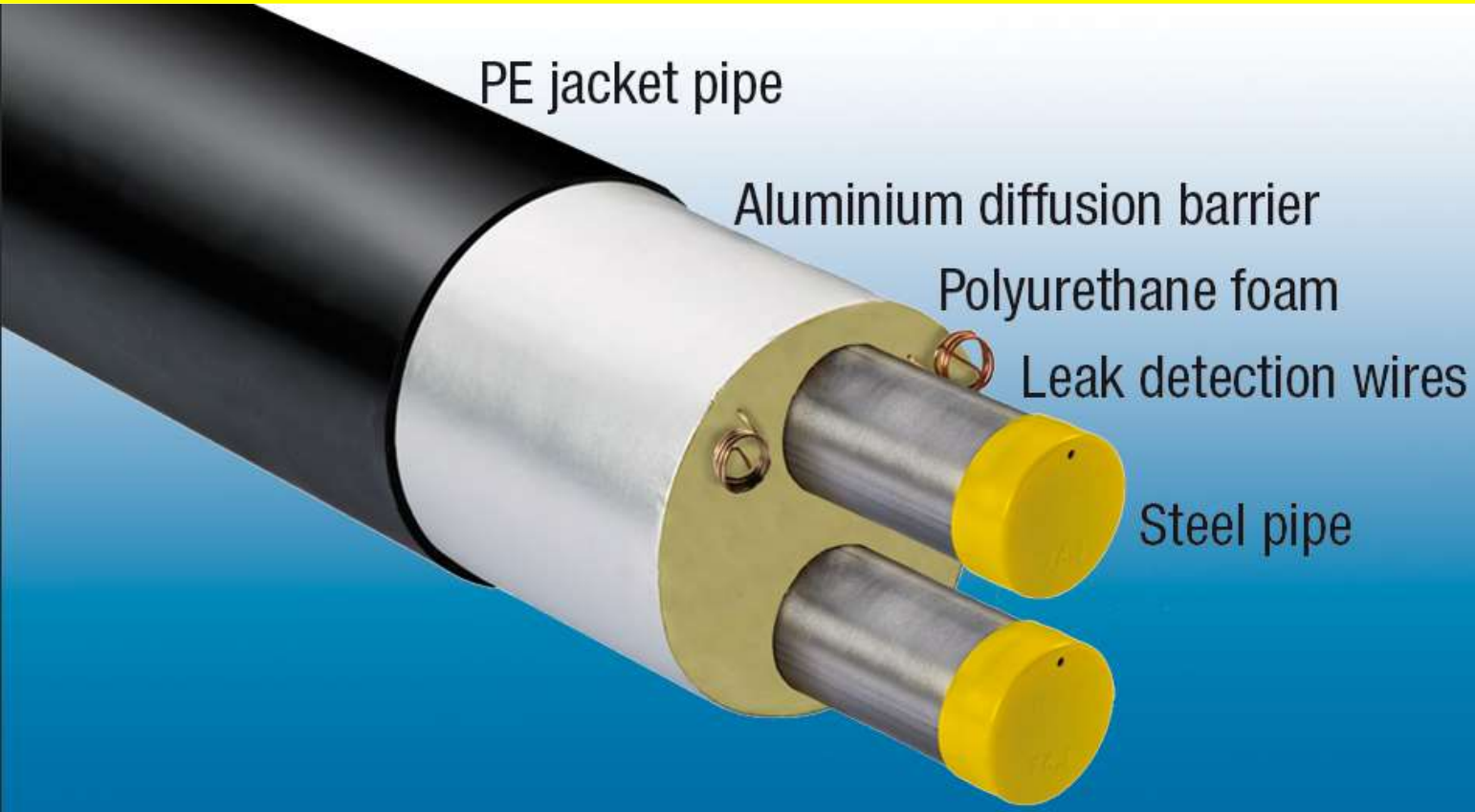
CHOOSING CORRECT PRODUCTS AND DESIGN

ASTM VS. EN Standards

ASME B36.10	Welded and Seamless Wrought Pipe	EN 10216	Seamless Steel Pipe
		EN 10217	Welded Steel Pipe
ASTM A53	Steel Pipe		
ASTM A106	Seamless Steel Pipe		
		EN 253	District Heating Pipes
ASTM F2165	Pre-Insulated Piping	EN 448	District Heating Fittings
		EN 488	District Heating Valves
		EN 489	District Heating Joints
ASME B31.1	Power Piping	EN 13941	Design and Installation of District Heating Pipes
		EN 14419	Surveillance Systems

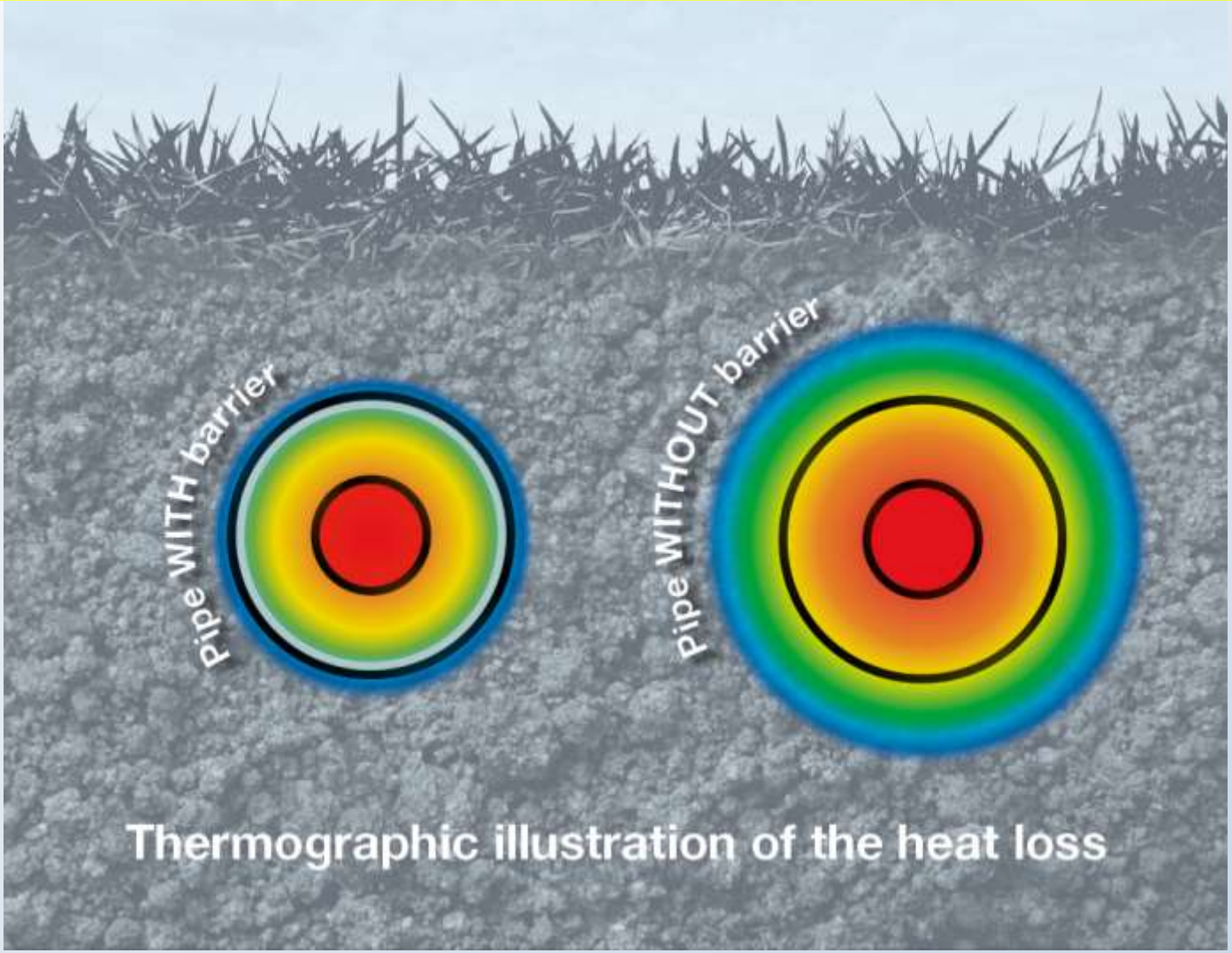
Source: Ramboll

The significance of heat loss



Reduce heat loss by up to 21%

The significance of heat loss

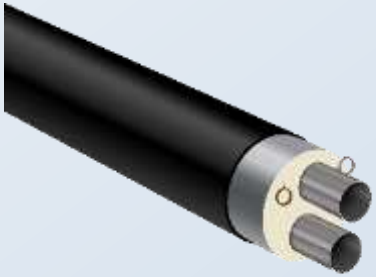


Steel pipes

Single pipes – continuous

Dimensions

1’’- 8’’ / 14’’
33-219/355



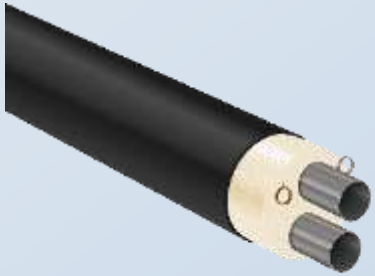
Double pipes – continuous

1’’- 4’’ / 14’’
33+33-114+114/355

Single pipes – discontinuous

Dimensions

¾’’– 47’’
26.9 – 1200



Double pipes – discontinuous

1’’- 8’’
33+33 - 219+219

isoSense

24 hours-monitoring.
Receive fault message before a fault develops into a rupture.

isoSense

isoAlarm 4500

Welding of steel carrier pipes

- **Pipe laying EN 13941**
- **Weld preparation**
  - Joint end preparation EN 13941
  - Ajustment welding seam
  - Corrosion
  - Ovality
- **Welding technique**
  - TIG (all dimensions)
  - Autogenous ≤ DN100
  - MMA ≥ DN125
- **Tightness/strength test**
  - Tightness
    - Vacuum
    - Air; max 0,5 bar
  - Strength
    - Pressure test/standards
      1,44 x design pressure

- **Control**
  - Visual; principle/procedure
    EN 970 and EN 13018; acceptance EN ISO 5817 Niveau B
  - Frequency/quality
    Frequency referring to EN 13941 Tabel 12
    Quality EN ISO 3834-1-3-4
  - 3rd party
    NDT welding control should be carried out by independent 3rd party, ordered and payed by the owner
  - NDT
    - Radiographic; principle/procedure EN 444 and EN 1435; acceptance EN 12517-1 level 1
    - Ultrasonic; principle/procedure EN 1714 and EN 583-1; acceptance EN 1712
    - Penetrant; principle/procedure EN517-1; acceptance EN 1289
    - Magnetic particle; principle/procedure EN 1290; acceptance EN 1291

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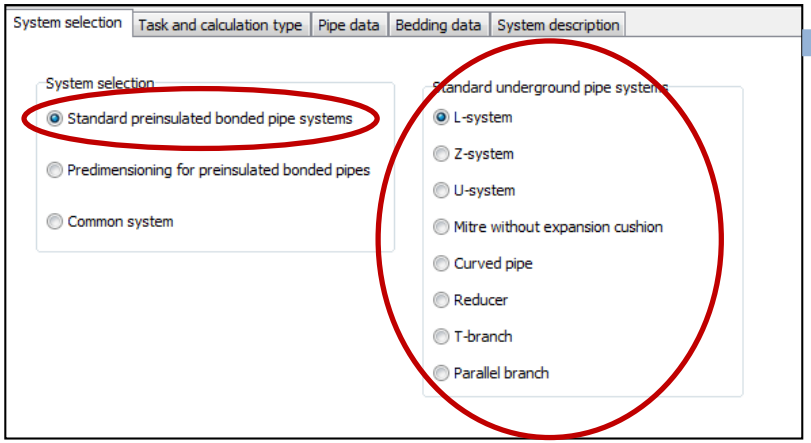
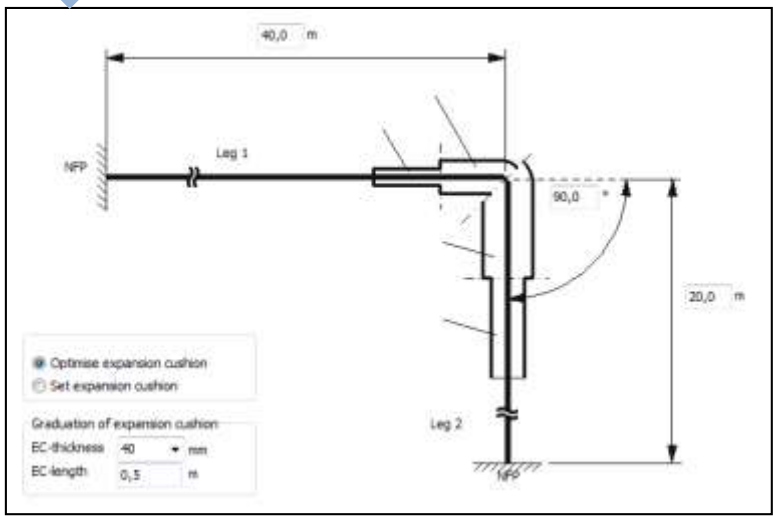
STATIC DESIGN PLANNING

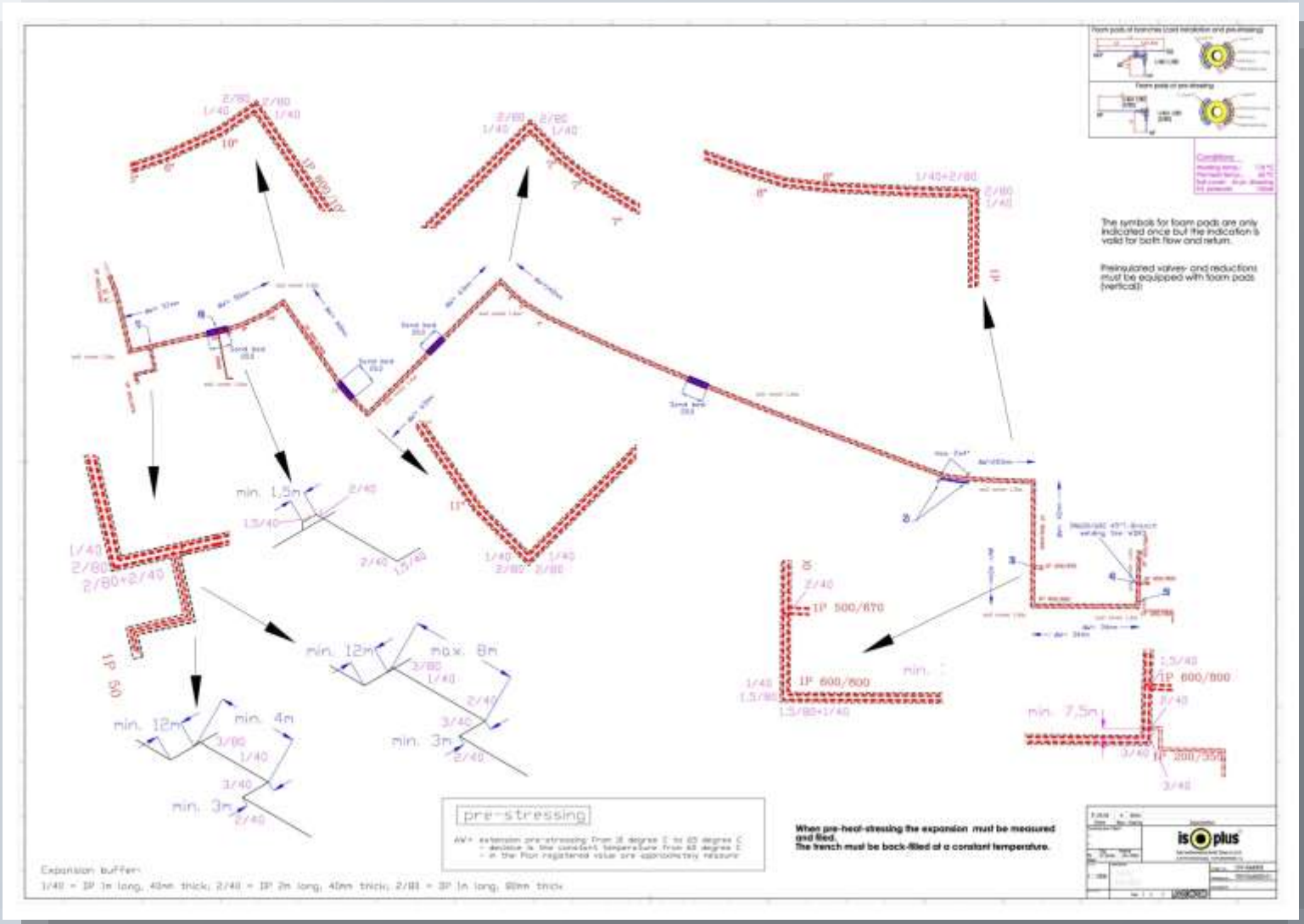
Static calculations

sisKMR is a program for the static calculation of underground and above ground pipe systems.





Static layout



Doing everything right from the beginning saves time and resources

TRAINING; INSTALLATION, SUPERVISION AND HANDLING

Key succes factor

- Even the best products in the world is worth nothing, if not installed correctly

Training according to EN 489

Qualification of fitters installing casing joints in preinsulated bonded pipe networks

Knowledge and skills
The fitters installing joints in preinsulated pipe networks and persons supervising such work shall be able to demonstrate theoretic knowledge and practical skills with respect to:

- The material to be used
- The relevant jointing system
- The insulation procedure
- The installation of surveillance system
- Quality and fault characteristics
- Preparation for installation and handling of materials
- Quality inspection and documentation
- Rules for accident prevention, valid measures of protection

Training according to EN 489

Annex C
(informative)

Qualification of fitters installing joints in preinsulated bonded pipe networks

C.1 Knowledge and skills

The fitters installing joints in preinsulated pipe networks and persons supervising such work shall be able to demonstrate theoretic knowledge and practical skills with respect to:

— the material to be used;

— the relevant jointing system;

— the insulation procedure;

— the installation of surveillance system;

— quality and fault characteristics;

— preparation for installation and handling of materials;

— quality inspection and documentation;

— rules for accident prevention, valid measures of protection.

This Annex describes the recommended minimum for basic training including adequate testing, as well for upgrading of the specialists' skills.

The necessary training programs can be set up by manufacturers, suppliers or other competent organizations, e.g. technical schools. An evidence of qualification should be issued specifying training undergone and skills acquired.

C.2 Background for training and testing

Practical experience with installation of preinsulated pipe networks is recommended for those who are intended to receive further education, relevant to the instaling of joints.

The training programs should include the following fields and listed subjects and give reasonable time for practical exercises in jointing techniques, insulation procedures and [5] assembly of surveillance systems, Installation of joints under site conditions should be part of the training.

C.3 Subjects for training and testing

C.3.1 General

Specialists who carry out installation work on preinsulated pipe systems and on joint systems should prove a basic knowledge of the behaviour of the casing material as well as the appropriate handling of the preinsulated pipes in order to avoid general damage of the preinsulated pipe system.

5) Jan Ellenis, 050713.

Who is to be trained

- Installers/joint fitters
  – before contractor submits final price
- Supervisors/inspectors
- Civil workers
  – before contractor submits final price
- Contractors project managers
- Future instructors

Importance of proper training

- Initially the supplier carries out the training, later on local instructors can instruct on their own
- We believe it is of utmost importance that the supplier carries out the necessary supervision in the start-up phase of the project
- If the contractor does not have the necessary know-how or feels uncertain, it can have great impact on the project cost - civil work usually amounts to a high percentage of the total project cost!

Process of setting up training

- Supplier will prepare theoretical training material
- Supplier provides instructor on site
- Training center must be set up, at a local location.
- Field studies
  - field trip to different DE projects, on site installation, civil work, welding etc.




Inspection of joints acc. to EN 489

Annex B
(informative)

General guidelines for inspection of the joint on site

Table B.1 — Inspection programme for the steel welds

No.	Operation	Inspection activity	Reference
1	Evaluation of welder's qualifications	Inspection of welder's certificate	A.3
2	Inspection of steel quality, diameter, wall thickness, marking, etc.	Visual Measurements	Steel pipe manufacturer's manual Standards Project specification
3	Verification of electrode/wire type	Check for correct electrode/wire type.	Project specification
4	Storage of electrodes/wires on sites	Check for storage conditions.	Electrode/wire manufacturer's information
5	Removal of burrs, scales, paint, rust, dirt, etc. from the welding zone	Visual	Project specification A.3
6	Removal of dirt, sand, stones, etc. from the internal steel pipe surface		
7	Cutting and bevelling of pipe ends	Visual Measurement of cutting angle/joint profile	A.4
8	Positioning of the tubular joint components and attachment to pipe	Check for presence of tubular joint components.	Components manufacturer's manual
9	Lining up Positioning of surveillance system components	Visual Measurement of misalignment	A.4
10	Creation of optimum work environment	Visual	A.4
11	Removal of moisture and frost by preheating steel pipe ends	Check for absence of moisture and frost.	Project specification
12	Welding Heat treatment if necessary	Measurements of temperatures	A.3
13	Surface examination after welding	Visual check of cleanliness and imperfections	Annex A, A.6
14	Testing of welds	Leak-tightness test with air/gas	A.6.2
15		Leak-tightness test with water	A.6.3
16		Radiographic examination	A.6.4
17		Ultrasonic examination	A.6.5
18	Identification and marking of welds	Visual Check of records	Project specification

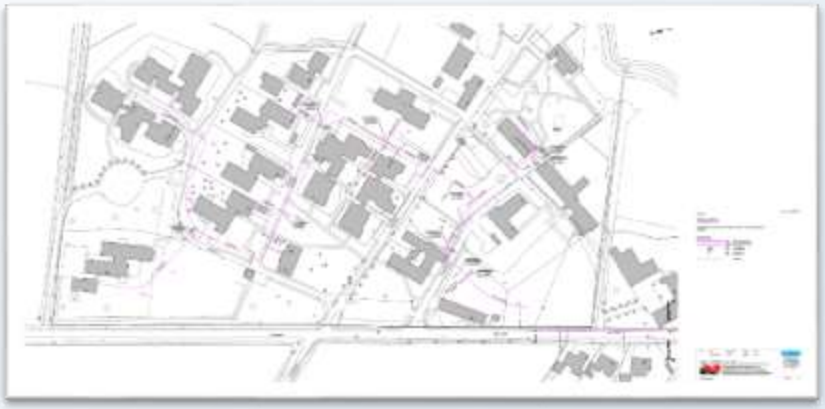
Table B.2 — Inspection programme for insulating and sealing

No.	Operation	Inspection activity	Requirement
1	Preparation	Check of organization, materials, disposition and storage Check of fitters qualification and equipment	Project specification
2	Creation of optimum work environment	Visual	4.3.2 Installation instruction
3	Cleaning of joint area Removal of wet foam	Visual	4.3.3
4	Assembly of surveillance system	Visual Check of continuity of measuring elements	4.3.4
5	Preparation of insulating and sealing materials	Check for condition	Installation instruction
6	Insulating and sealing	Check for correct methods	4.3.6 and 4.3.7
7	Preparation of records by installation company	Inspection of records	Presence of data for on site foamed joints on raw materials, mixing ratio, mixing method, and temperatures
8	Testing of PUR-foam	Sampling of test specimens	Project specification

Doing everything right from the beginning saves time and resources

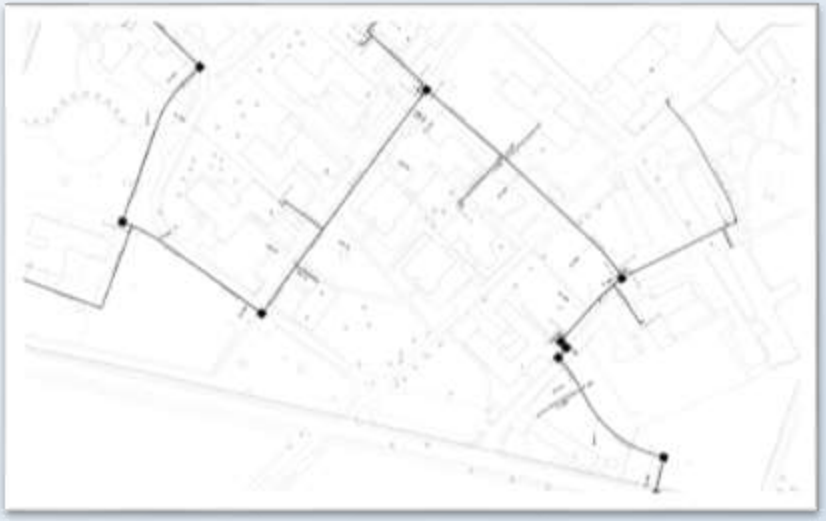
DETAILED INSTALLATION DRAWINGS; PIPE AND SURVEILLANCE SYSTEM & LIST OF MATERIALS

Drawings and material take-off

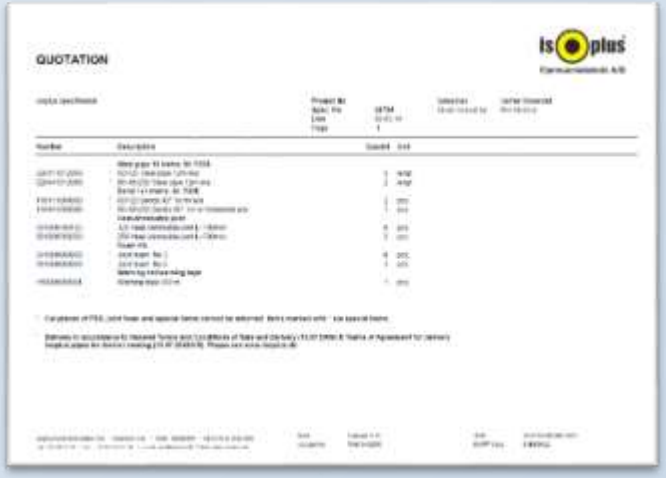


Example of drawing from consultant

Example of isoplus drawing (leak detection)



Example of isoplus drawing (pipes)



Example of material take-off

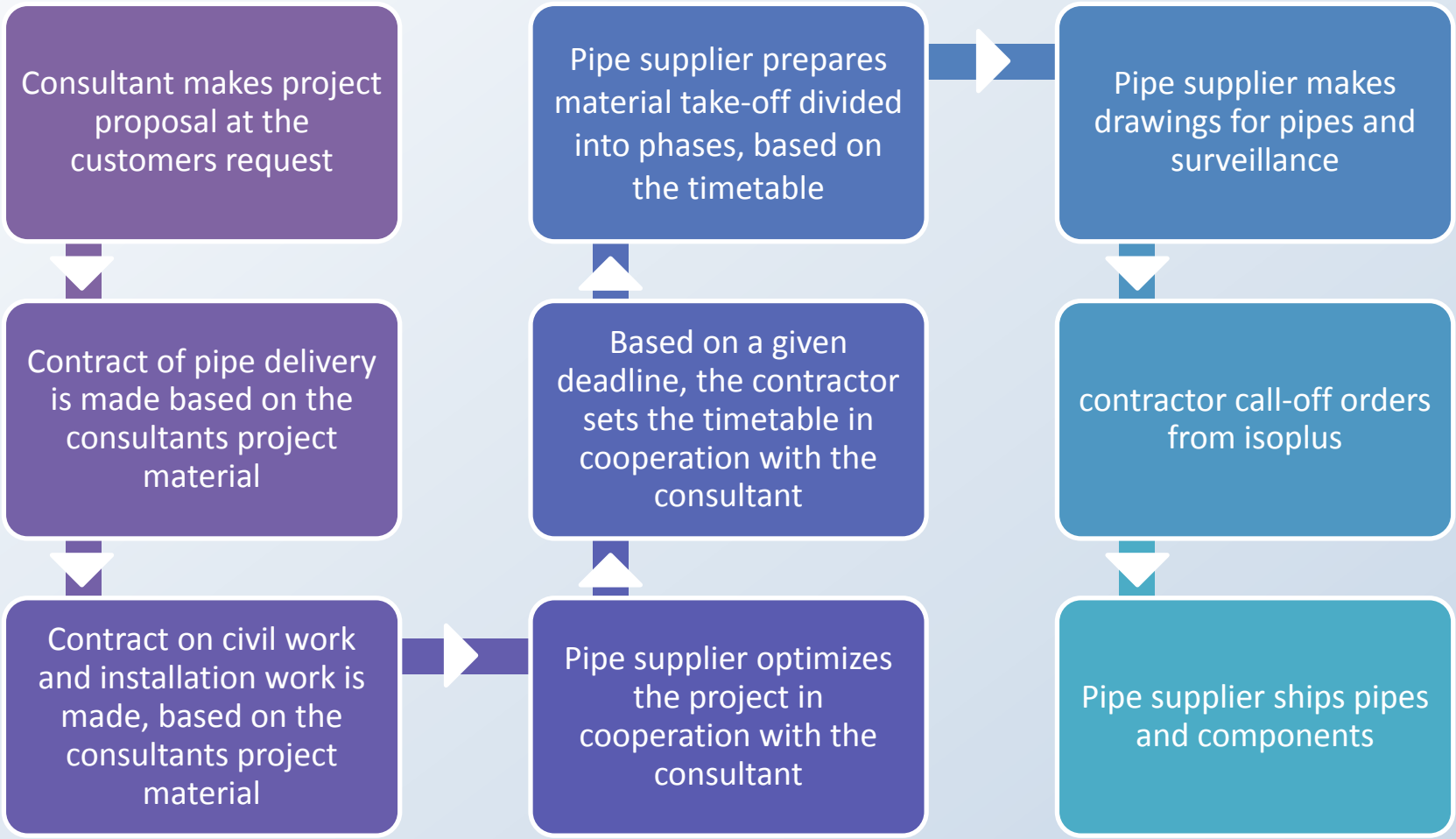
Tasks and division of responsibilities

Consultant
- Dimensioning
- General routing
- Project management
- Supervision
- Contact to public authorities; permits, approvals etc.

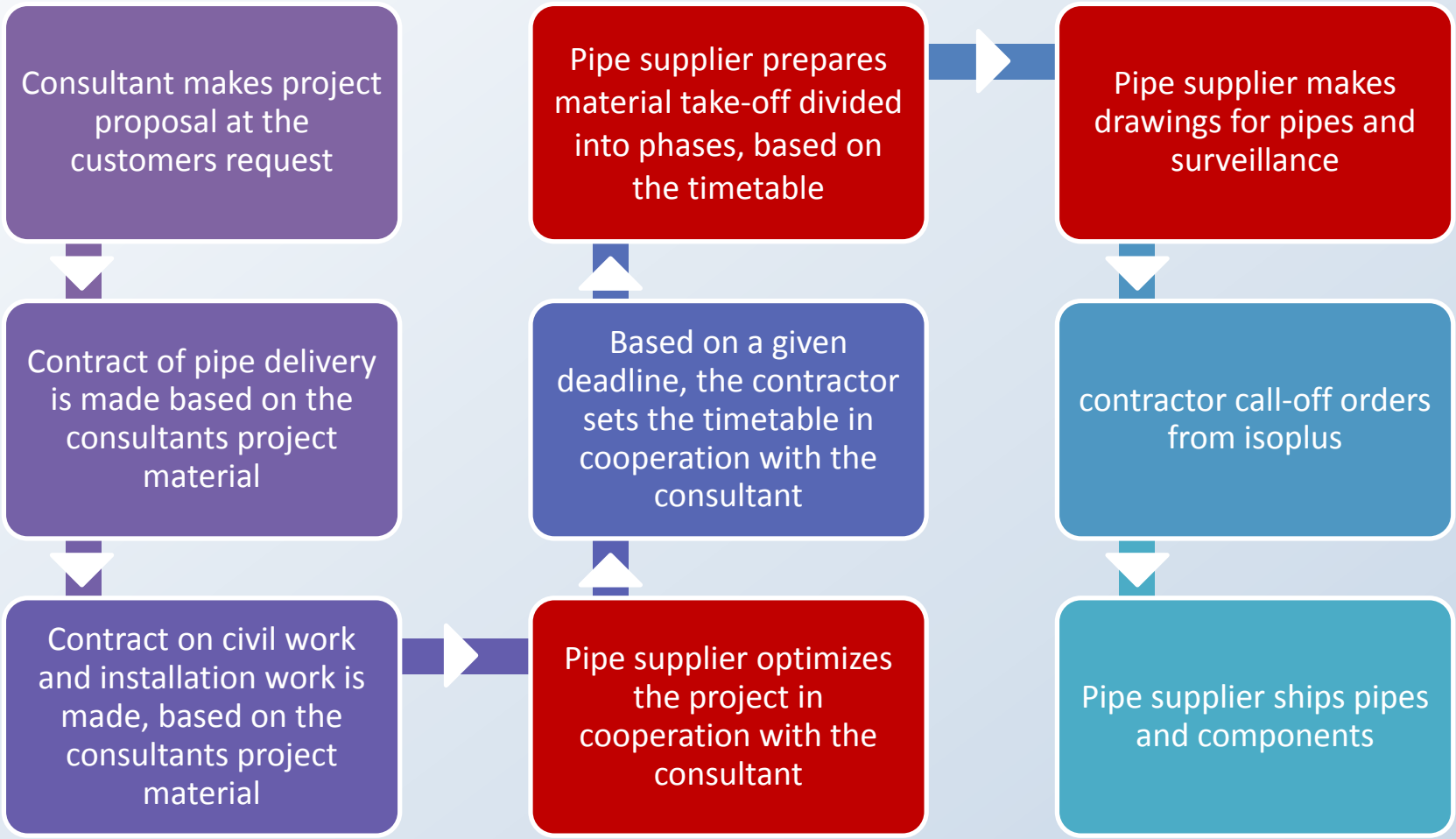
Pipe supplier
- Pipe statics
- Pipe design
- Surveillance design
- Pipe- and surveillance drawings
- Material take-off
- Delivery plan
- Training
- Initial supervision

Contractor
- Time table
- Civil works
- Installation
- Stock handling
- Internal transport

How we work with other partners in the project



When unexpected changes occurs



Doing everything right from the beginning saves time and resources

MAINTENANCE

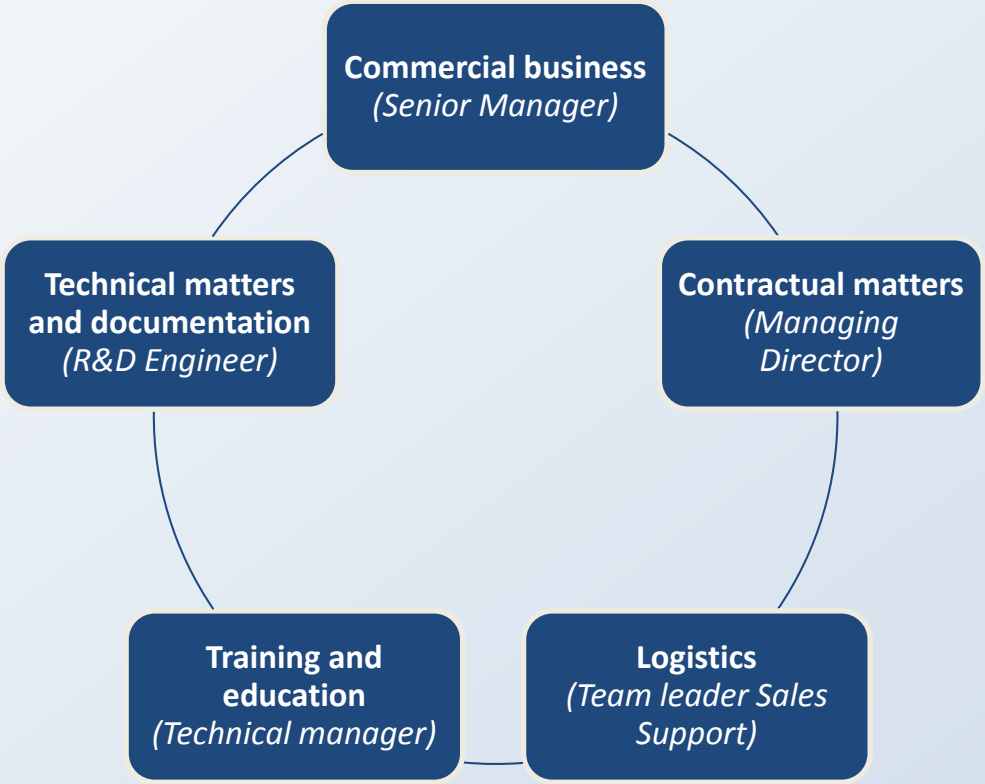
Maintenance

- Commissioning instructions
- Documentation pre-insulated pipe system
  - As built drawings
- Documentation leak detection
  - As built drawings
  - Measurement reports
- Documentation installation
  - Contractor’s documentation
  - Joint casing protocols
- Instruction and maintenance manual
  - Leak detection system
  - Valves
  - water treatment
- Contact list

Doing everything right from the beginning saves time and resources

PROJECT MANAGEMENT AND LOGISTICS

Division of responsibilities within the suppliers project team



- Optimize deliveries
- Direct communication within the pipe suppliers organization
- Eliminate mistakes
- Optimize workflow
- Fast response from all parties
- Available 24 hours

How to make the project a success

- Clear division of responsiblities
- Supervision and training of staff
- Detailed progress plan / delivery plan
- Workflow for submission of drawings

CHOOSING THE RIGHT SOLUTION

- based on **local conditions**
- focusing on minimizing the **total life-cycle costs**

Questions?