

# TS-CV contracts case study



LHC pipelines and HVAC  
for Experimental Areas  
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# [ Case Study 1 ]

LHC pipeline Contract F467

# [ Contract characteristics ]

## F467 LHC pipeline

- 220 km pipelines
  - Demineralised water distribution circuit, compressed air, drainage, helium quench, recovery and ring lines
  - Stainless steel AISI 304L
  - From DN65 to DN250
  - From PN10 to PN25 and
  - From 50°C to -196°C
- Very short time available for MS and IT
- No basic engineering available in 2000
- Installation depending from the basic engineering production
- Estimation 24 MCHF

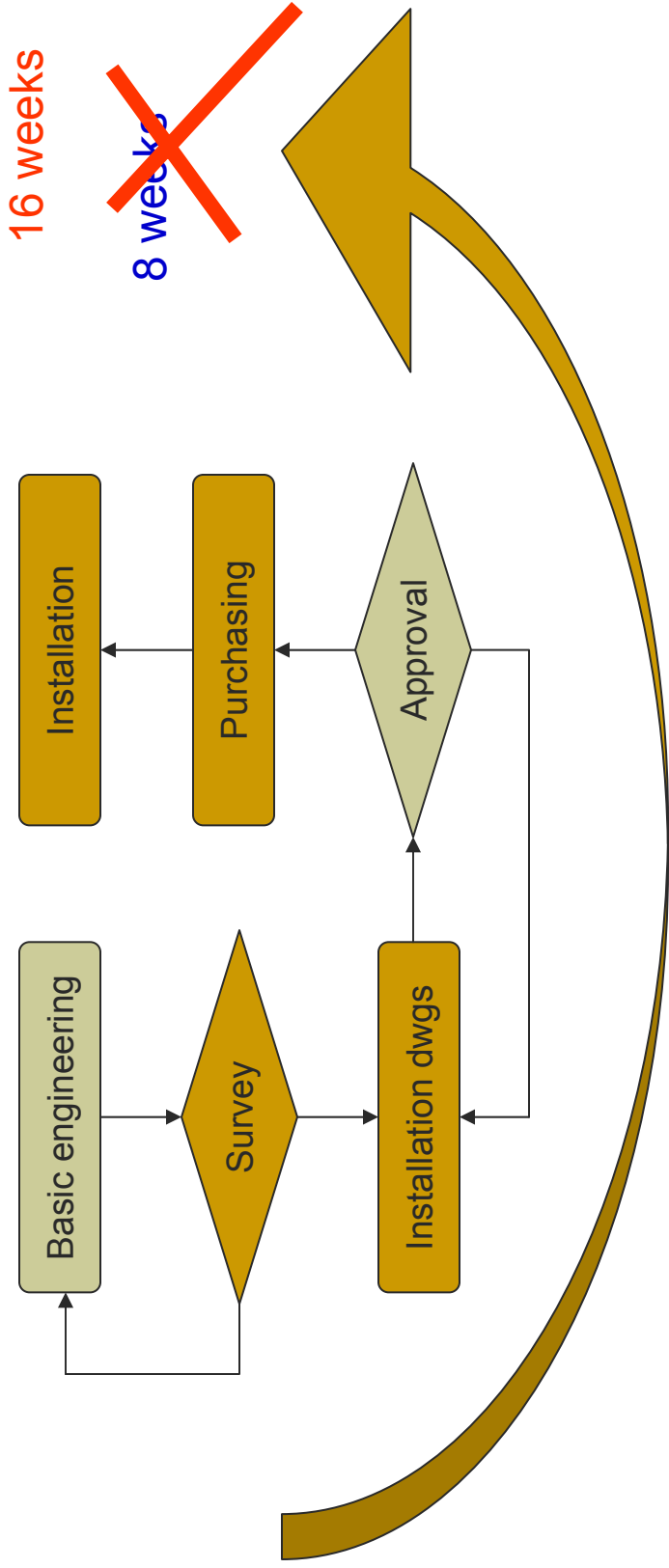
# [Tendering

- 15 consortia selected after a large market survey
- Dossier for the invitation to tender ready in three months
  - DQE based on basic engineering available in 2000
  - Re-measurement contract
  - Commercial and juridical aspects probably required a better check: i.e. schedule variation vs. cost impact
- Contract to the cheapest offer : lowest bid below CERN estimates, delta 6 MCHF
- Contract award on May 22<sup>nd</sup>, 2002

# [ Design phase ]

- Drawings
  - CDD procedure and Euclide
  - Execution methods: from 3D to 2D and isometrics
  - Quality of the first drawings
  - Timing in the delivery
- Approval process
- Engineering
  - Specification of the components and CERN specific requirement: i.e. rad-hard material or chemicals (i.e. MSDS)
  - Procedures for installation (i.e. method of statement), testing, cleaning, etc.

# [ Approval process ]



# [ Execution phase ]

- First months:
  - CERN environment
    - Safety, i.e. PPSPS, VIC, etc..
    - Access conditions, permits, space availability
    - Method of statement
  - Technical aspects, i.e. orbital welding DN200, taping construction
  - CERN work supervision
- Timing due to engineering
- Schedule
  - Non continuous basis, not even in a sector
  - Access to the working areas
- Recently
  - high production rate vs. logistics vs. engineering
    - ⇒ stand-by hours, claims



# [ Commercial approach ]

- **Very aggressive commercial policy**
  - No clear interface (CERN PE vs. Site manager, construction manager, project manager)
  - No stable management team at CERN
  - No clear issues (PE vs. Contractor)
  - Continuous by-pass
- ⇒ **Work stops or late delivery**
  - ⇒ Schedule and work site coordination concerns
  - ⇒ **Claims – amendment – claim**
- **A real continuous fight, high pressure**

# [ Performance of F467 ]

- Around 130 km of pipelines
- 5-6 out of 8 sectors installed
- 300 tons of supports: ~ 25'000
- ~ 15'000 welds (orbital and TIG)
- Welding: 0% repairs in the last sectors
- No helium leaks detected during He leak tests, pressure tests always successful



# [ Case Study 2 ]

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HVAC for Experimental Areas at  
points 1 & 5, F405.

# [ Contract characteristics ]

- Basic engineering and integration done at CERN.
- Detail engineering and selection of material by Contractor.
- Supply and installation of HVAC of underground areas at points 1 & 5, comprising:
  - Heating and Ventilating of surface buildings,
  - Air conditioning of underground spaces,
  - More than 80 air handling units,
  - Steel structures in SUxs 1 & 5,
  - Some 1000 m of large (above 1000 mm) ducts,
  - Two supervision systems and more than 10 PLCs,
  - Tens of electrical cubicles,
  - Tests and Commissioning.

# [Tendering

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- Technical specification sent out in summer 2000.
- Lowest bid below CERN estimates (15 MCHF).
- Bid of poor quality (incomplete technical information). Discussions held at the time to ensure that scope defined in specification would be respected.
- Contractor had no large experience in HVAC field (except marine environment).
- Contract F405 placed in 2001.

# [ Design phase ]

- Difficulties by the Contractor in setting a stable project team. Several engineers left project/firm during the detailed engineering stage of project.
- Production of drawings not uneventful, linked to proposal of material of inferior quality to bid's.
- Detailed engineering missing or late. Contractor subcontracted also detailed studies to inexperienced companies.
- Electrical diagram software (unavailable in Italy) implemented very late by Contractor.

# [ Execution phase ]

- Inexperienced project engineer and site managers. Volatile Contractor's teams. Several changes over the extent of installation at point 1.
- All of site work subcontracted until late stages. Poor quality of S & I. Contractor unable to supervise his subcontractor's work.
- Site management very poor. Uncontrolled delivery and storage lead to damage or loss of material. Only a few people could identify pieces!
- Clear misunderstanding of applicable laws. Contractor's staff in illegal situation in CH.
- Safety neglected (in design and execution phase).
- Contractor put in place a larger and more experience team when situation became impossible.



# [ Performance of F405 ]

- Ductwork of poor quality, accepted for schedule reasons in some cases but, unacceptable in experimental cavern.
- Allotted “prime” time wasted largely due to Contractor’s fault but... CERN’s cranes not available when required and CERN supervision not incisive enough.
- Safety concerns and legal situation of staff lead to stop of works and eventually replacement of subcontractor for PX15 (and PM54).
- Contractor accepted responsibility and accepted to work in given “secondary” time slots.
- New ductwork subcontractor’s material of much better quality.
- Difficulties in commissioning of SCX1. Commissioning of USA/UX units to start in coming weeks.

# Conclusions

- Both contracts very different. F467 enough competent technically but commercial policy very aggressive. CERN not adapted to cope with this approach. F405 clearly not experienced in necessary scope. This (hinted from early stages) would have required a CERN supervision much closer to the contractor.
- CERN legal service involvement in the running of contracts, in a similar fashion to Purchase office, clearly needed.
- The risks (announced and) assumed at the placing of the contracts should have been translated into additional measures.
- Daily work on site must be carefully addressed. The smallest site occurrence or indiscretion becomes a potential claim in hours. Communication with contractors via the responsible groups for good reasons.