

# European Region Project Planning Process

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# Overview

1. Typical planning for a large scale Project
2. Site investigation
3. Formalities with Host Country Authorities
4. LHC Schedule for civil engineering
5. Methodology & follow-up for Time Schedules plus Examples
6. Selection Procedures
7. Work Packages
8. Insourcing/Outsourcing
9. Mandate to CE Consultants
10. Experience gained at LHC with FIDIC Contracts for the Works
11. Main Risks for delays
12. Conclusion

## 1. Typical planning for a large scale Project (1)

1. Initiation of the Project / Baseline Configuration Document
  - Reception of project request
  - Appointment of Project Leader with mandate
  - Project Launch meeting
  - Identification of the requestor's needs
2. Feasibility Study / Reference Design Report
  - Analysis of needs and translation into technical needs
  - Project scheduling and distribution of tasks
  - Feasibility study : technical solution, cost and time estimates
  - **Green light from requestor and funding in place**
3. Design Stage / Engineering Design Report
  - Studies carried out within each group under supervision of Project Leader (with or without outside consultants)
  - Validation of design by Requestor
  - Drawing up of Tender documents by each group
  - Contractors/Suppliers selection procedures established
  - Preparation of execution drawings

## 1. Typical planning for a large scale Project (2)

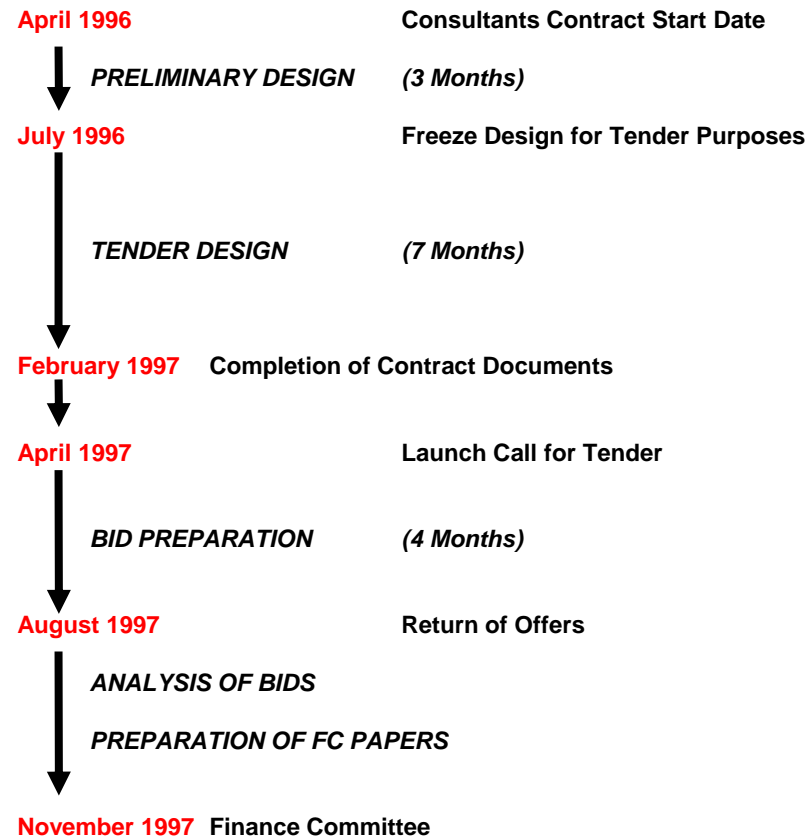
### 4. Execution Stage

- Issue a 'Start of Works' Notice
- Kick-Off meeting organised by PL and all participants
- Performance and Supervision of the Works managed by technical groups with the help of Global groups (and possible outside consultants)
- Testing & Acceptance by technical groups
- Hand over to Requestor of completed works
- Lifting of reservations
- Acceptance by operating services
- Supply of a full set of operation & maintenance documents

### 5. Assessment Stage

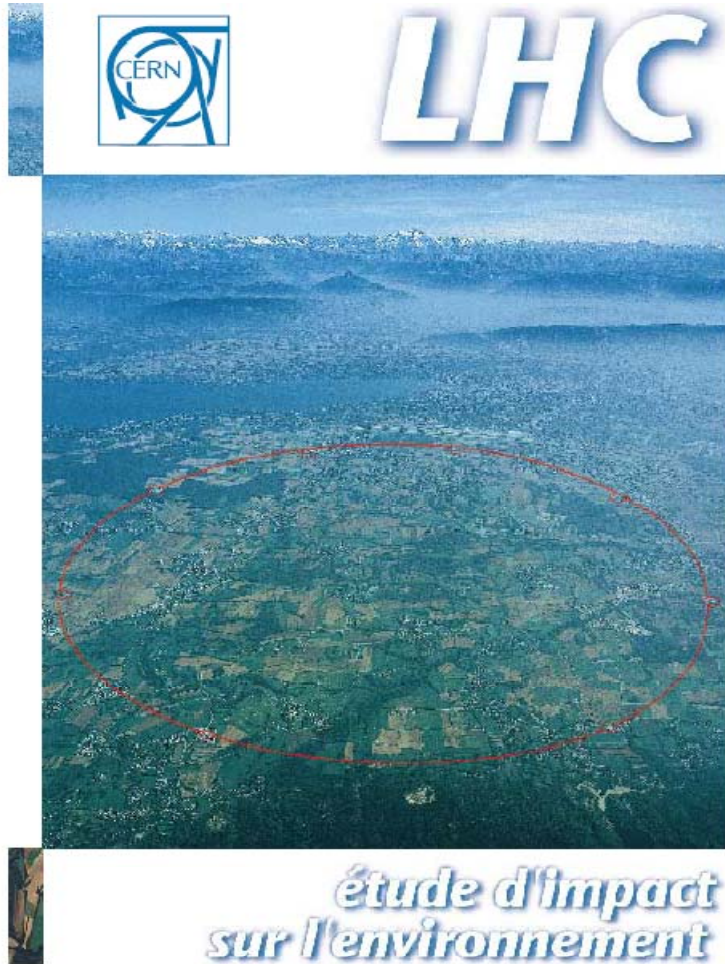
- Establishment of finished Project File
- Internal and External assessment
- Modification of procedures for future projects

# 1. Typical planning for a large scale Project (3) - LHC Civil Engineering Pre-Contract Award Phase



## 2. Site Investigation

- For LHC studies, all LEP geotechnical investigative reports were collated and new specific borings executed 3-4 years before the start of the worksite.
- As an example, for the CMS worksite, 11 new boreholes were drilled and tested. Information collated included :
  - Detailed cross sections of ground geology
  - Any known faults in the underlying rock identified
  - Ground permeability
  - Existence of underground water tables
  - Rock strengths etc etc
- Separate contracts were awarded for these site investigations prior to Tender design studies starting.



## Conventional Facilities and Siting GG

7

### 3. Formalities with Outside World (1) - Environmental Impact Study

#### Main Contents :

- Scientific Basis of the Project
- Project Description (Machine & Detectors)
- Civil Engineering
- Works Management
- Impact on the Environment
- Measures in place to mitigate Impact

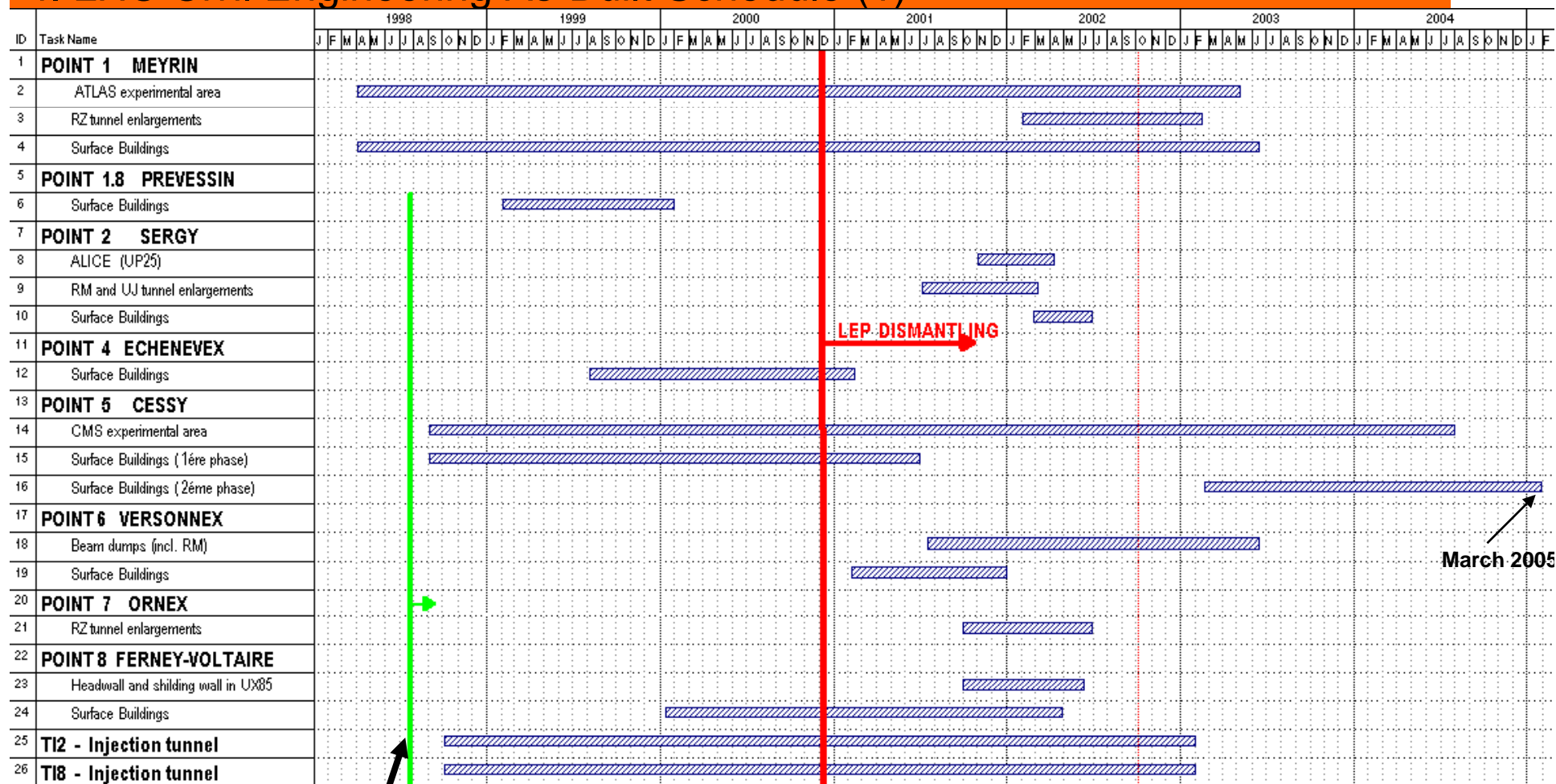
**3. Formalities with Outside World (2) - Building Permit Procedures**

- In order to prepare the Building Permits specialist consultants must be appointed :
  - Building Architects
  - Land Surveyors
  - Landscape Architects
- This process can take several months.
- The submissions must include layout drawings, safety details, landscaping profiles, cadastral drawings, standard administrative forms etc..





## 4. LHC Civil Engineering As-Built Schedule (1)

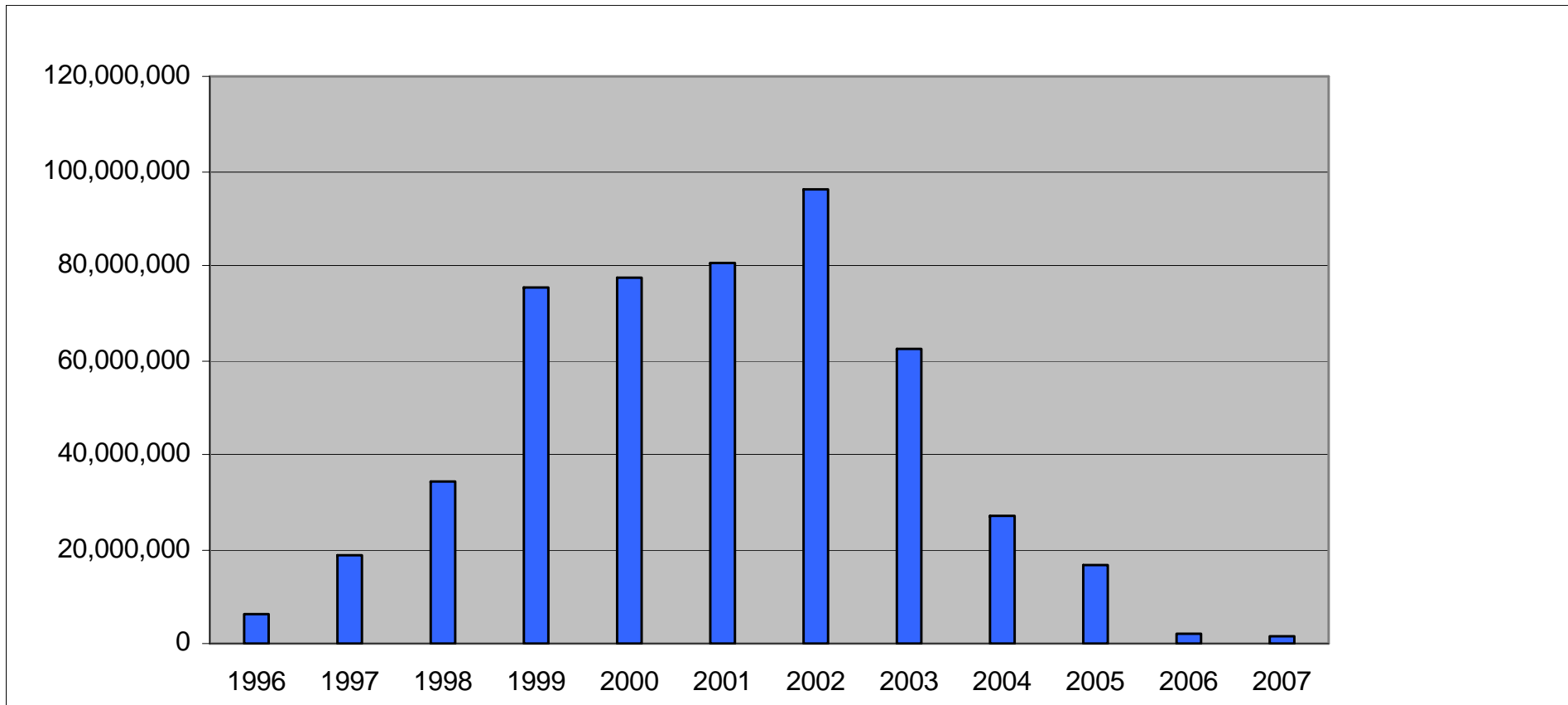


Planning Approval granted by French Prime Minister L.Jospin (following CERN Impact Study)

End of LEP operation

## 4. LHC Civil Engineering As-Built Schedule (2)

- LHC civil engineering cash flow MCHF



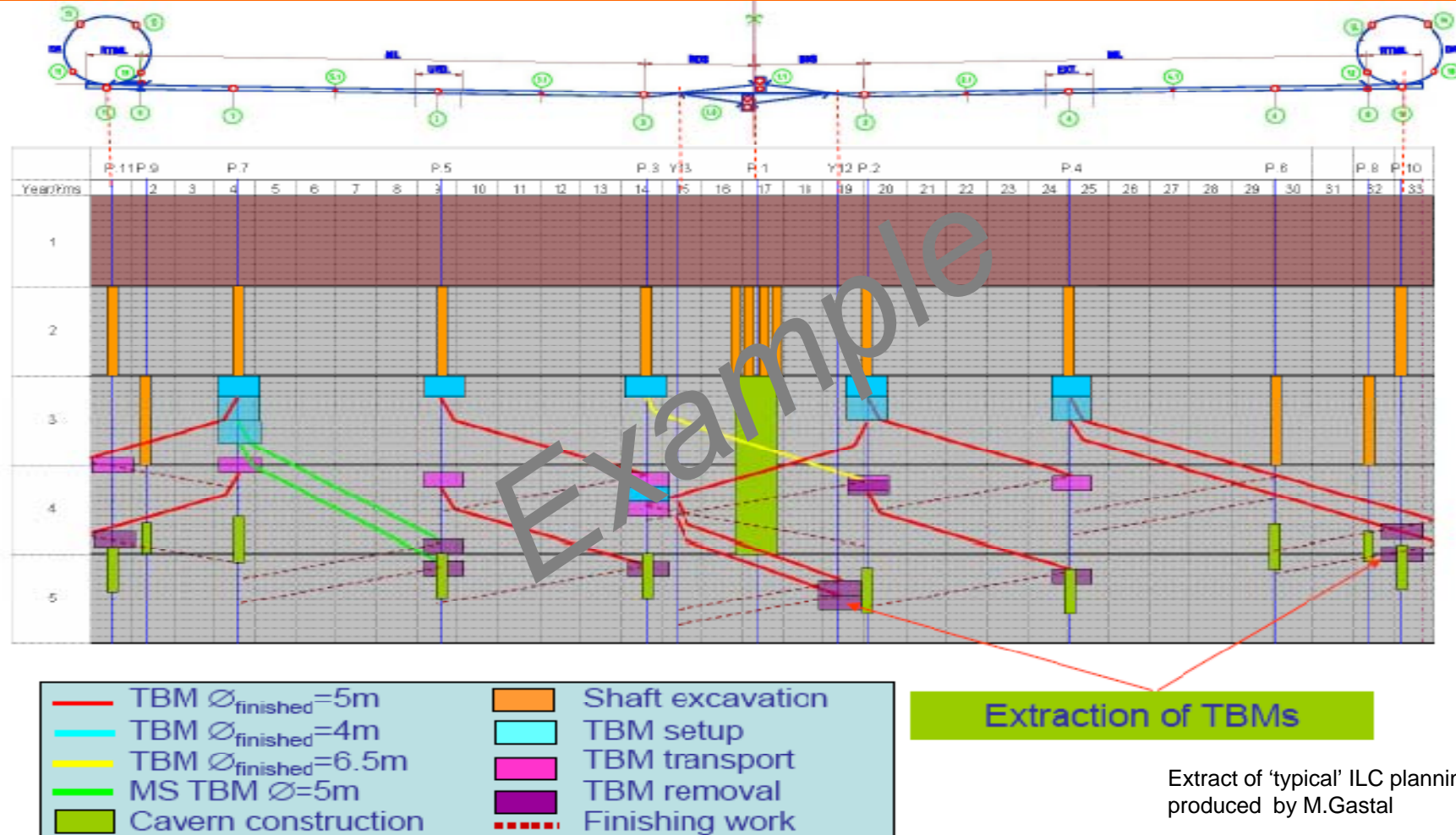
5. Methodology & follow-up for Time Schedules (1)

11

- Planning Methodology for LHC :
  - Master Schedule :
    - strategic goals and major milestones
  - General co-ordination schedule :
    - implement most effective sequence of installation ( with resources & time)
  - Detailed Installation schedule :
    - ensure resources are available / work feasible within allocated time slot
- Installation Sequence :
  - Phase 1 general services
  - Phase 2 cryogenic line
  - Phase 3 Machine components
  - Phase 4 Hardware commissioning
- Technical Dept. follow up :
  - Day to Day progress monitoring
  - Early warning on delays
  - Short term planning methodology
  - Continuous feedback to allow dynamic modifications

## 5. Methodology & follow-up for Time Schedules (2)

- Example of ILC Civil Engineering planning methodology



Extract of 'typical' ILC planning  
produced by M.Gastal

## Sector



6. Selection Procedures (1)

- LHC Civil Engineering Selection Procedure for Contractors using the 'Two Envelope Technique'

Technical Envelope :

- Administration information
- Planning
- Sub-contracting
- Execution methods
- Plant
- Labour resources
- Alternatives

JURY

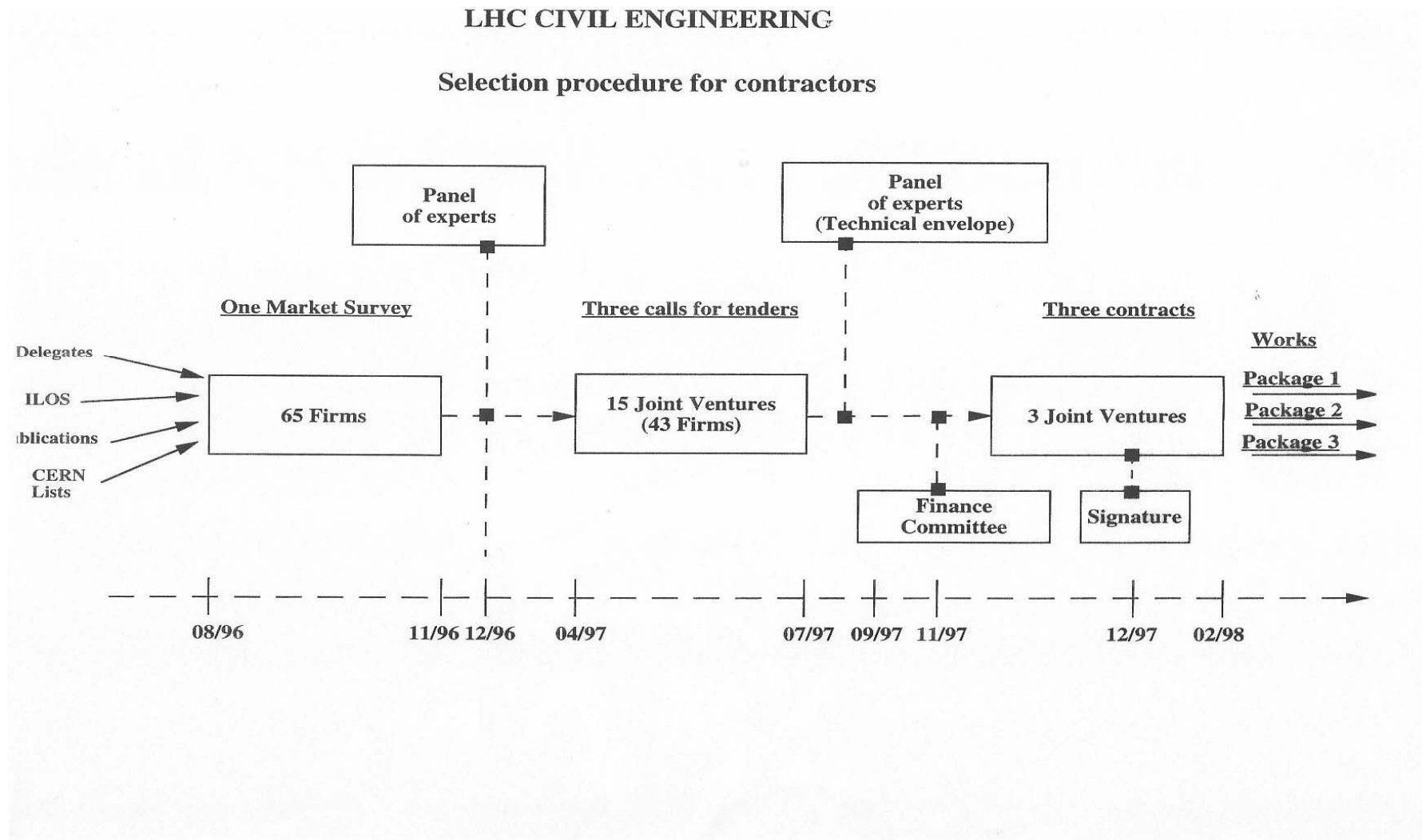
Commercial Envelope :

- Total Price
- Financial conditions
- Price breakdown
- Payment cashflow



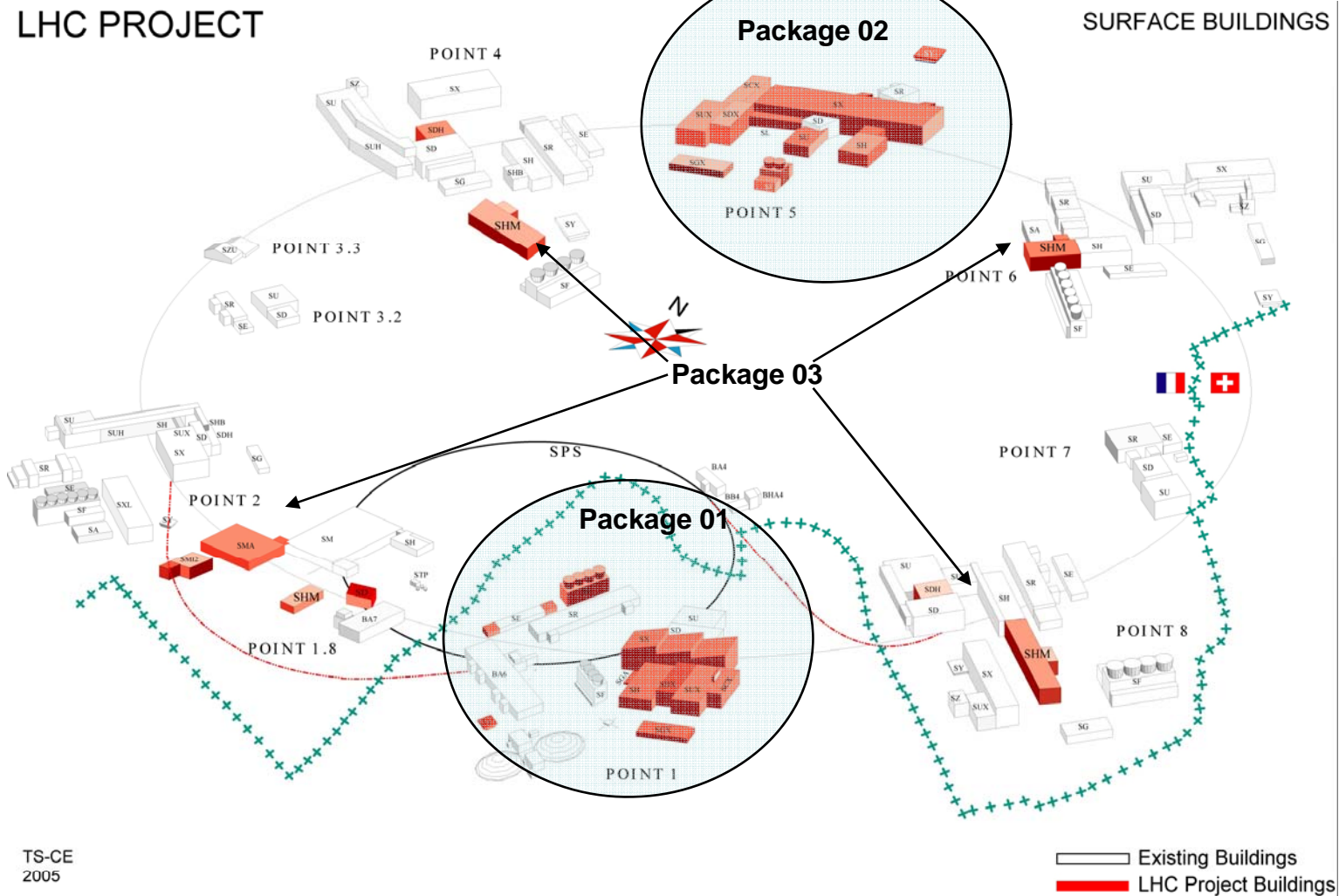


6. Selection Procedures (2) - LHC Civil Engineering Selection Procedure



## 7. Work Packages (1) - Geographical layout of surface works for LHC

16

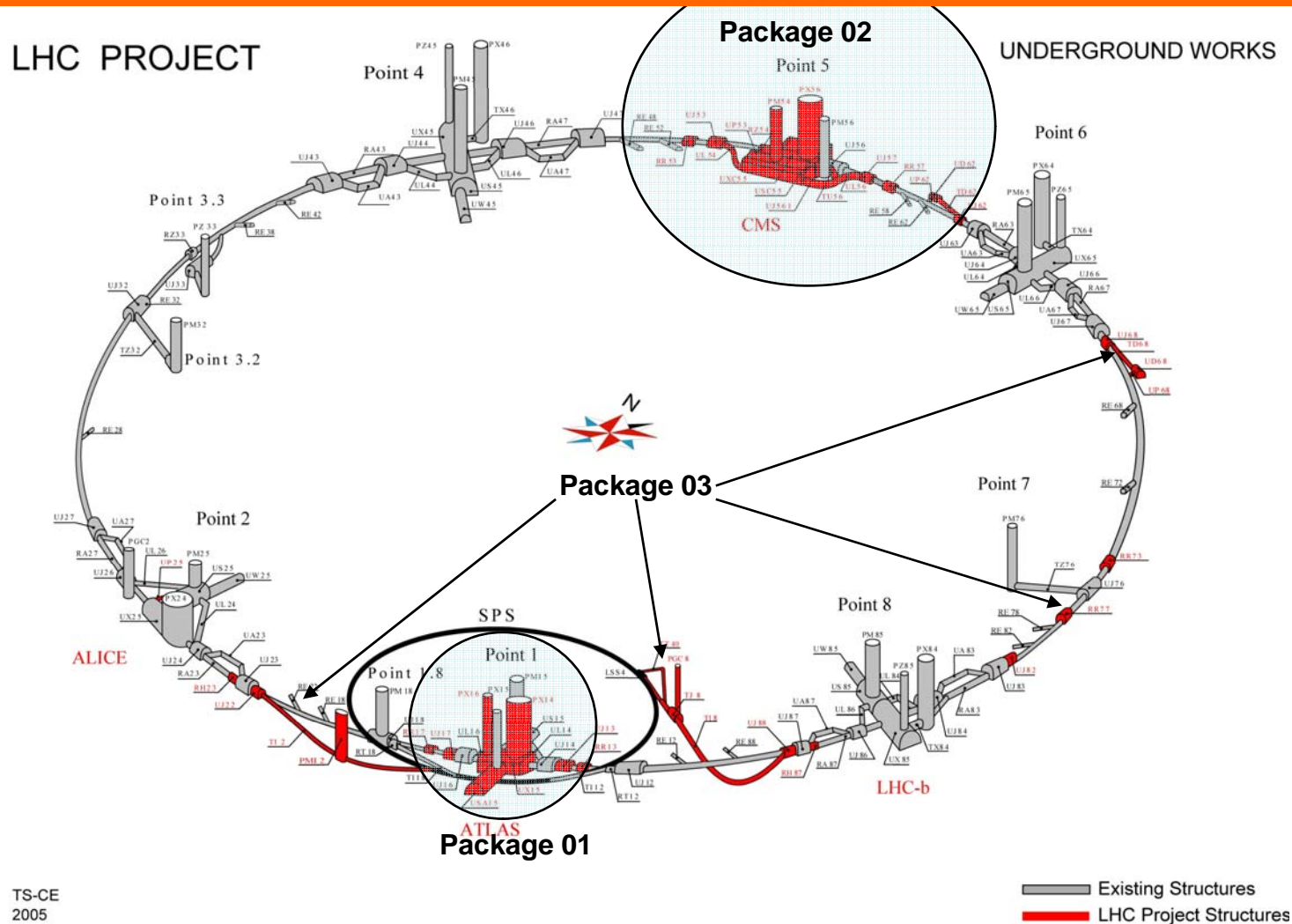


TS-CE  
2005



**7. Work Packages (2) - Geographical layout of underground works for LHC**

17



TS-CE  
2005

## 7. Work Packages (3)

Package	PLACE	PROJECT	CONSULTANT	CONTRACTOR
1	POINT 1	ATLAS	- EDF (F) - KNIGHT & PIESOLD (GB)	- TEERAG-ASDAG (A) - BARESEL (D) - LOCHER (CH)
2	POINT 5	CMS	- GIBB (GB) - GEOCONSULT (A) - SIG (CH)	- DRAGADOS (E) - SELI (I)
3A	AUTRES POINTS	ALL OTHER WORKS EXCEPT TI 8	- BROWN & ROOT (GB) - INTECSA (E) - HYDROTECHNICA (P)	- TAYLOR-WOODROW (GB) - AMEC (GB) - SPIE-BATIGNOLLES (F)
3B	TI 8	TI8 TRANSFER TUNNEL	DITO	- LOSINGER (CH)

## 8. Insourcing / Outsourcing (1)

- At a very early stage it was decided to outsource as many result-oriented activities for LHC as possible.
- For example the Civil Engineering design & supervision.
- Key responsibilities were managed in-house. For example :

Planning approval processes

Preliminary design

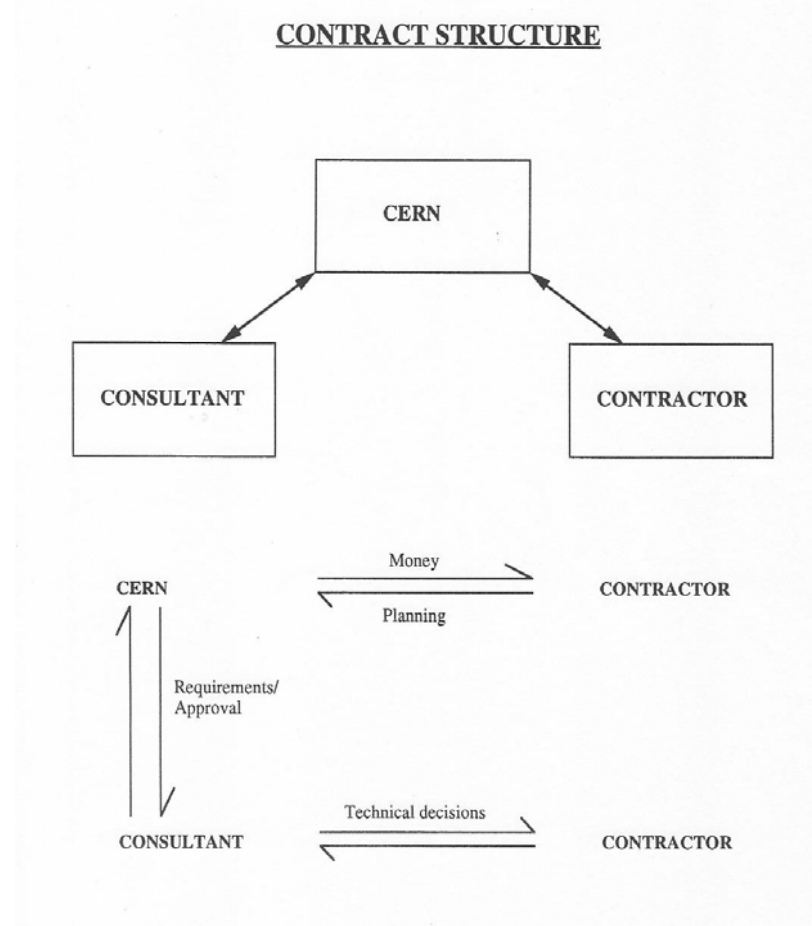
Feasibility studies

Financial Control including claim management

Site co-ordination with other CERN groups

## 8. Insourcing/Outsourcing (2)

### - Civil engineering outsourcing structure



## 9.Mandate to CE Consultants

- For LHC, consultancy contracts were awarded for the design & supervision of the Works. The services were phased, with penalties in case of late delivery :

- Phase 1 : Prepare all preliminary layout drawings, designs and cost estimates

- Phase 2 : Prepare the 'Tender Design' including drawings, bill of quantities, specification etc. assuming 50 year lifespan

- Phase 3 : Prepare Execution Documents & Assist in tender analysis

- Phase 4 : Site Supervision

- Phase 5 Maintain staff on site until Final Payment Certificate agreed.

# 10. Experience gained at LHC with FIDIC Contracts (1)

## - Why FIDIC form of Contract ?

- **FIDIC** – the International Federation of Consulting Engineers.
- CERN used a modified version of FIDIC “Conditions of Contract for Works of Civil Engineering Construction” 4<sup>th</sup> Edition, or “**The Red Book**”. Re-measurement type of contract.
- This type of contract is well suited to the ILC type of construction for the following reasons :
  - Well recognised contract documents for International Projects
  - Suitable for projects where main responsibility for the design lies with the Client (or his Engineer).
  - Work done is measured, payment via Bill of Quantities
  - Scope to modify the works via Variation Orders
  - Adjudication Process for Claims & Disputes

## 10. Experience gained at LHC with FIDIC Contracts (2)

### - Major Modifications made by CERN to the standard Contract

- **Powers of the Engineer** : Technical decisions remained with the Engineer, whereas financial ones remained with CERN (with advice from the Engineer).
- **Sufficiency of Contract** : The contractors were obliged to satisfy themselves on the sufficiency of all tender documents to carry out the works described.
- **In case of disputes** : Panel of Adjudicators, then if required, Arbitration in Geneva after completion of the Works
- **Penalties** for late delivery rather than liquidated damages.

## 10. Experience gained at LHC with FIDIC Contracts (3)

### - CERN's experience for LHC with FIDIC

- **Adjudication** procedure was deemed a great success.
- A panel of 5 “experts” agreed with the Contractors.
- 3 disputes were referred to the panel (2 with the Contractors and 1 with the Consultants).
- Several disputes settled without need for Adjudication because one party “feared losing control”.
- Decisions made very quickly (within 2 months) in accordance with Contract.
- Each adjudication cost less than 1.5% of the adjudicated amount.
- **All disputes** during LHC construction have been resolved.
- No Arbitrations.



## **10. Experience gained at LHC with FIDIC Contracts (4) - Value Engineering**

- Value Engineering was developed for one of the LHC Packages during the course of the Works.
- Due to delays on CERN's side (LEP running longer than expected) and due to the introduction of the new 35hour law in France, it became apparent that the tender planning was not realistic.
- A Target Cost for the project was agreed with Contractor which could fluctuate depending on CERN's requirements.
- Partnering Agreement established with Profit/Loss sharing concept.
- The contractor had to be transparent with his 'real' costs under this new agreement.
- The Works were completed to the satisfaction of both parties under this agreement.

## 11. Main Risks for delay for CE Works (1)

*A full risk assessment must be carried out for both the **pre-construction phase and execution phase** of the works.*

*The **Pre-construction phase** must assess risks such as :*

- Delay during the planning permission approval process
- Objections raised from the public on environmental grounds
- Problems with the project management team
- Project financing uncertainties
- Tenders submissions not reaching minimum bidding standards

## 11. Main Risks for delays for CE Works (2)

***The execution phase of the works must assess risks such as :***

- Uncertainties with geological, hydrological and climate conditions, including:
  - Unstable tunnel excavation face
  - Fault zones
  - Large amounts of water inflow
  - Unexpected ground movements (especially in large caverns)
- Anomalies in contract documents (e.g. large quantity inaccuracies)
- Interference from outside sources
- Delayed submission of approved execution drawings
- Design changes from the consultants and/or owner
- Lack of thorough safety and/or environmental control
- Labour relations
- etc

## 12. Conclusions

- Insourcing/Outsourcing policy must be decided at an early stage
- Establishing a competent time scheduling team for initial schedule and monitoring
- Detailed Site Investigation essential
- The form of Contract must be carefully chosen e.g. FIDIC for LHC proved successful

# Savings.....



"... and we can save 700 lire by not taking soil tests."