

31. COST ESTIMATE AND PROCUREMENTS

31.1 COST ESTIMATE

Ever since the initial studies of the CMS magnet the cost of the entire system has always been a major concern. Throughout the entire design phase, which has led to the submission of this Technical Design Report, the cost estimates have been constantly reviewed by various groups of independent, international experts. In particular, the Magnet Advisory Group MAG and the LHC Cost Review Committee (CORE) have critically reviewed the cost estimates at various stages during the design phase and their findings and recommendations have been taken into account in order to refine and optimise the cost estimate.

The most recent cost estimate of the CMS experiment was released on February 3, 1997 and details of the CMS Magnet can be found there. The cost estimate of the four major components of the Magnet are summarised in Table 31.1.

Table 31.1
Cost Estimate of the CMS Magnet

	Estimated Cost [MCHF]
Barrel Yoke	24.3
Endcap Yoke	19.5
Coil	71.2
Magnet Installation	6.0
Total	121.0

31.2 PROCUREMENT

The guidelines for the contributions to the Magnet Project will be outlined in the Memorandum of Understanding and are laid down in the document entitled “Guidelines on CMS Common Project Contributions” [31-1].

31.2.1 Procedures

Article 5 of the Interim Memorandum of Understanding, signed between CERN and the funding agencies supporting the CMS Collaboration for the initial phase of the experiment up to the end of 1997, defines the procurement policy for the CMS Magnet.

“The total construction work for the detector is divided into:

- sub-detector construction proper, ..., and
- Common Projects which involve construction, transport, assembly, and installation at the common expenses of the Collaboration. The “Magnet” and the “Off-line” have been agreed upon as Common Projects.”

“All Parties must contribute to these Common Projects in proportion to their funding of the CMS detector construction, unless otherwise agreed in exceptional cases by the CMS Finance Board ... The Finance Board may also update the Common Projects contribution level, for example due to a major change in the level of participation of an Institute, or due to a new institute joining the Collaboration. Such updates are subject to approval by the CMS Resource Review Board.”

“Contracts for Common Projects will be placed either by CERN in accordance with document “Financial Guidelines for LHC Collaborations” (CERN/FC/3796), or by other Institutes, in accordance with their own purchasing rules and regulations.”

Based on the CMS Interim Memorandum of Understanding and upon the strategies developed over the last few years, the CMS Collaboration is currently discussing the terms of the CMS Memorandum of Understanding to cover the entire CMS construction phase. As decided by the CMS Finance Board contributions to the Common Projects can be made in three ways:

- a) by taking responsibility for an entire Common Project or parts of it, in agreement with the CMS Finance Board. This option is referred to as an “in-kind contribution”.
- b) by payment of invoices for procurement contracts for Common Project items which were placed by one or more Institutes or Funding Agencies following agreement by the CMS Finance Board. This option is referred to as “payments to contracts”.
- c) by cash payments to a dedicated Common Fund which will be established for the Common Projects through CERN Team Account. The Common Fund will be managed and operated by the CMS Resource Manager, taking advice from the CMS Finance Board, and is monitored by the CERN Finance Division and the CMS Resources Review Board.

The technical responsibility remains with the CMS Magnet Project Manager in all the three cases mentioned above. In case of direct payments or in kind contributions to the procurement of parts for the magnet, the institutes involved will delegate contractually defined technical responsibility to the Magnet Project Manager. The institutes shall closely collaborate with the Project Manager and keep him / her informed of all technical commercial aspects.

31.2.2 Initial Large Procurements

The current plans for large procurements are outlined below.

- a) In the preparatory phase of the CMS Magnet construction an important co-operation agreement between CERN and CEA-Saclay has been reached on the design, studies, testing and supervision of work concerning the superconducting coil. Expenses for this project are and will be covered by the CMS Common Fund.
- b) The CMS Collaboration is preparing a call for tender for elements needed for the barrel part of the magnet. These elements include about 6000 tonnes of steel, the vacuum tank housing the superconducting coil, support structures, tooling, manufacture follow - up, trial assembly and transport to CERN. The Collaboration has mandated ETH Zürich to lead a consortium of CMS institutes to take care of these procurements. The consortium will include institutes from Cyprus, Russia, Switzerland, United States of America, and possibly other countries. The market survey has been conducted by CERN in 1996, and the call for tender is scheduled to be released in June 1997. The contract for these elements, which are on the critical path, is expected to be signed immediately after approval of the magnet project so that construction can start at the end of

1997 or, at the latest, in the beginning of 1998. Expenses for this part of the magnet are direct payments.

- c) The University of Wisconsin has been requested to work on developing the design of the magnet endcap system and consequently the CMS Collaboration has agreed to the procurement of the endcaps by the US - CMS Collaboration through competitive international tendering. The University of Wisconsin has accepted to take care of all commercial aspects of this procurement. A market survey for these elements is in preparation at CERN, to be followed by a call for tender in autumn 1997. It is expected to place one or several contracts for the project by mid 1998. Ongoing discussions with the Institute of High Energy Physics Beijing will be continued to explore whether China could make an in kind contribution to the endcap supports. All contributions from the United States for this project are direct payments, whereas eventual Chinese contributions would be in kind.
- d) Following the recommendation by the CMS Magnet Technical Board, the CMS Finance Board has agreed to an offer from Pakistan to provide eight support feet for the barrel part of the magnet. This contribution will be an in kind contribution and its value will be assessed by the CMS Finance Board.
- e) ETH Zürich has expressed technical interest in the work concerning the conductor for the superconducting coil and intends to also organise the commercial aspects of the procurement. Expenses for this part of the magnet are direct payments.
- f) INFN Italy has submitted a preliminary proposal to provide the CMS coil winding, including tools and the winding operation. Most procurements will be made through competitive international tendering. The organisation of the responsibilities are subject of discussions between INFN and the CMS Collaboration.

Procurements of other major components for the CMS magnet will be arranged according to the progress of construction in due time. We note that the six procurements mentioned above represent about two-thirds of the total estimated cost of the magnet construction.