Chapter 6

Conventional Facilities

Authors and Contributors

Conventional Facilities

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Contents

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6 CONVENTIONAL FACILITIES

6.1 OVERVIEW

This note describes the main modifications to conventional facilities, which are a consequence of the final layout of the ESS reference linac. At the time of the ESS Bonn project presentation in May 2002 [ESS, 2002] several feasible linac options were still under consideration.

Early in 2003, it became clear that a decision to build the ESS facility would not be forthcoming by the end of 2003 as originally envisaged, and that the project would be delayed. As a consequence, the ESS council decided to stop all technical project activities early 2003.

The building programme for the conventional facilities could thus not be completed and has to be taken up again when re-launching ESS.

6.2 MODIFICATION OF CF BUILDINGS AND INSTALLATIONS

In Figure 6.2.1, the footprint of the ESS facility is shown for the final 2003 ESS super- conducting (SC) reference linac, which is 570 m in length. The total length from the ion source to the long pulse target station thus adds up to 748 m.

The first part up to 400 MeV is the 280/560 MHz normal conducting (NC) linac design as described in [ESS, 2002]. This is a feasible and technically robust design with reasonable cost.

From 400 MeV upwards 1120 MHz SC cavities are used to accelerate the beam up to its final energy, see chapter 1. This new SC linac reference design was proposed in January 2003 by the ESS accelerator team and subsequently approved by the ESS Council. It is ~200 m shorter than the 280/560 MHz NC alternative,. (See chapter 1).

The 262 m long NC linac section is unchanged, except for the front-end. As beams for both, short and long pulse target stations, can be provided by H^- ion sources, the front-end building could be reduced to ~40% in volume (see Figure 6.2.2); the crane for handling shielding blocks could thus be reduced from 70t to 10t .

For the 308 m long 1120 MHz SC linac, the klystron hall is 4 m wider than for the 280/560 MHz NC structures necessary for shielding in order to protect the klystrons from neutrons produced by particle loss. The tunnel height of 6m remains unchanged.

The central helium liquefier (CHL) building requires installation of only 4 MW electrical power to provide liquid helium for the new reference SC linac. The previous SC linac, described in [ESS, 2002], needed 10MW electrical power instead. The new SC reference linac design requires a site area of 100 ha, the lengths of the sides being 850 m and 1,150 m, see Figure 6.2.1. The NC linac required 110 ha at 850 m and 1400 m side lengths, [ESS, 2002].

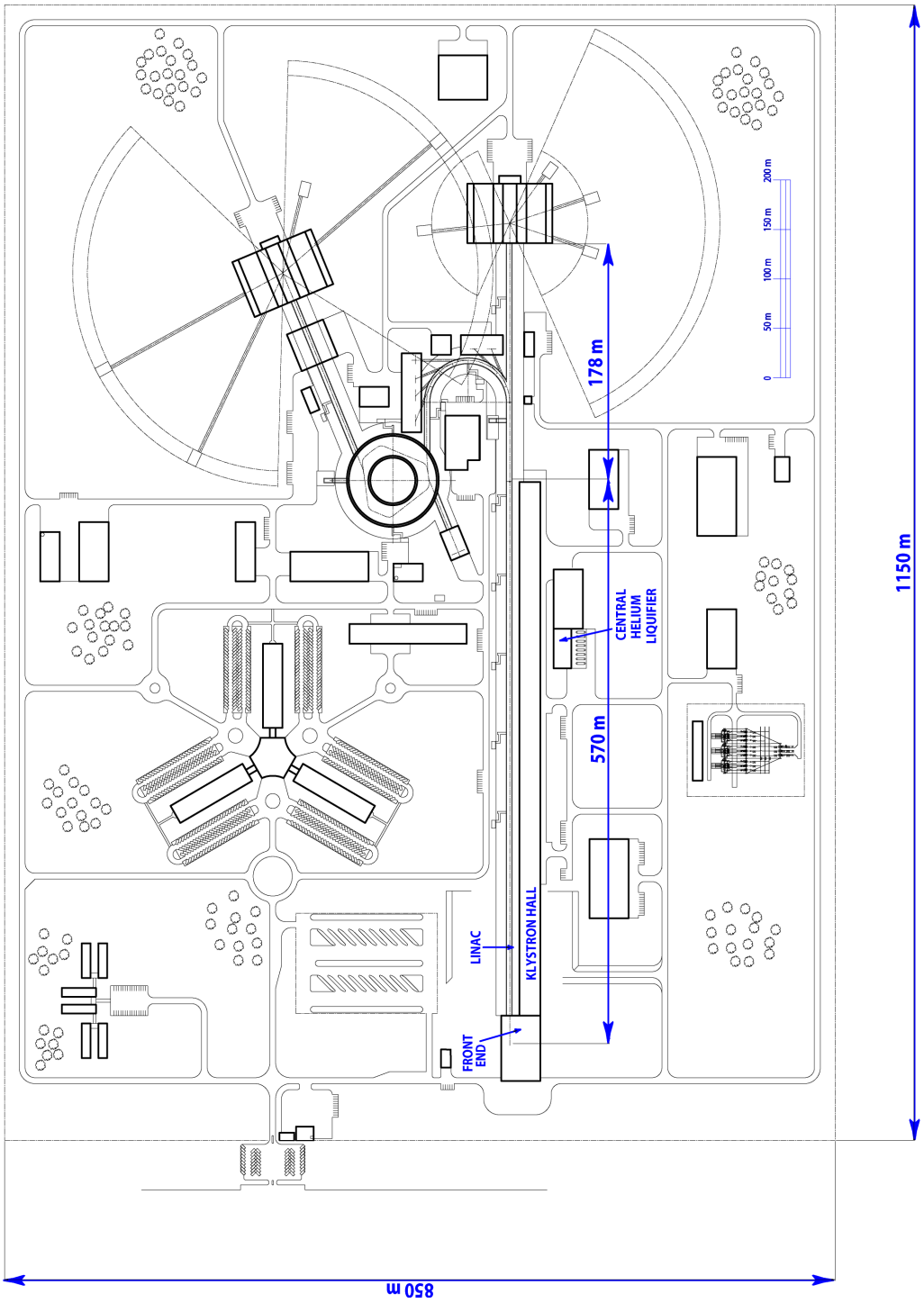

Figure 6.2.1: ESS facility with the SC reference linac

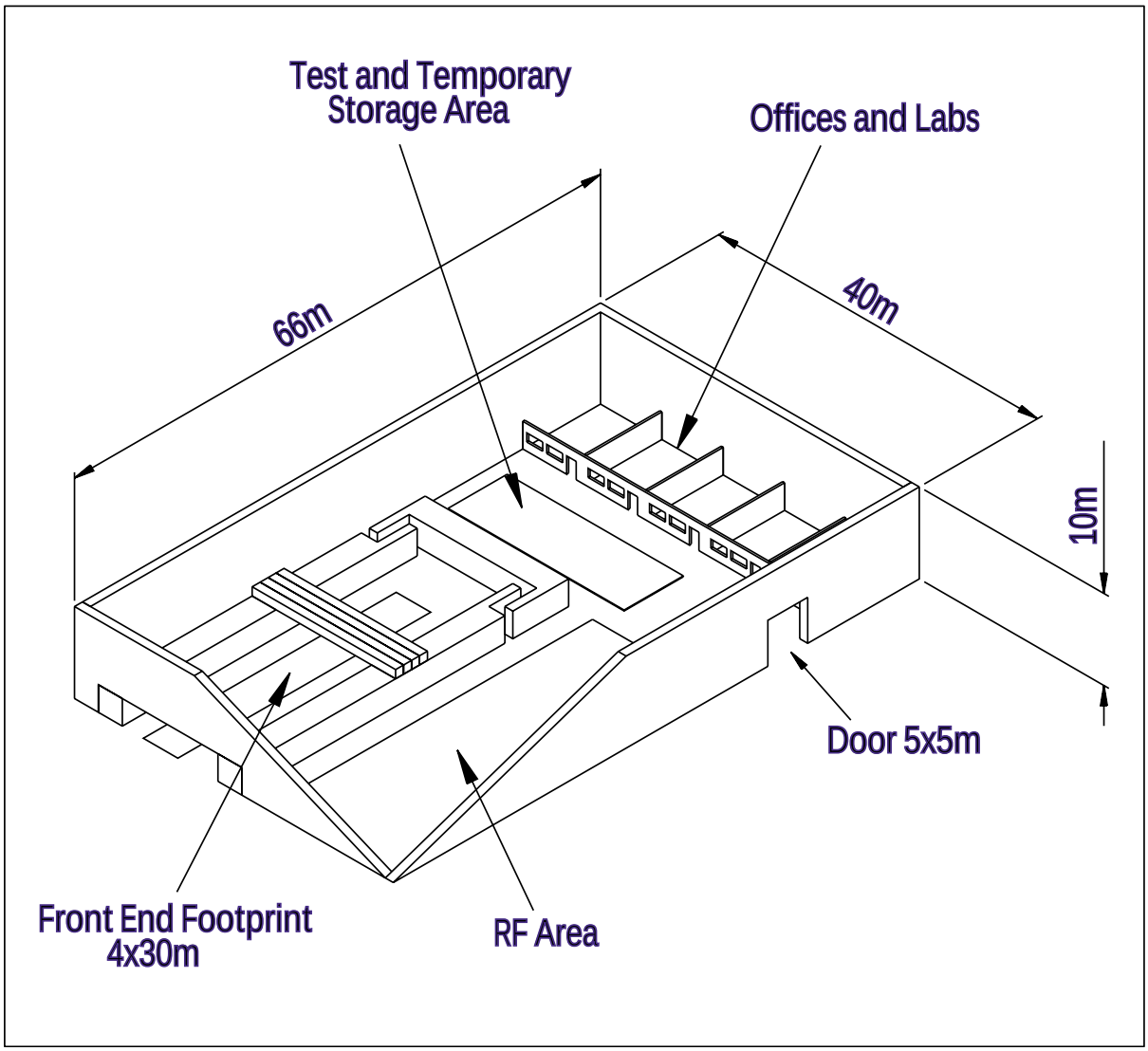

Figure 6.2.2: ESS front end building for the SC reference linac. Not shown is the crane for handling the shielding blocks

6.3 COST OF MODIFICATIONS REGARDING CF BUILDINGS AND INSTALLATIONS

Rough estimates show that the reductions in volume of the front end and accelerator buildings together with reduced cryogenic power requirements will lead to overall cost savings in the order of 10 M€$_{2000.}$

6.4 PRE-PLANNING FOR CONVENTIONAL FACILITIES WHEN RE-LAUNCHING ESS

The CF building programme, with its volume of ~35% of the total project costs, is the most critical one with respect to schedule and costs. Since generally machine subsystems are ready for installation and testing well before buildings are being completed, highest priority has to be given to prepare the building programme for conventional facilities well before project approval. This implies that construction pre-planning for most of the conventional facilities including reception, acceptance and testing procedures will have to be completed prior to the construction phase.

The part of pre-planning which has to be completed prior to construction of conventional facilities consists of the following steps:

1. Basic findings
2. Preplanning
3. Outline design
4. Licensing planning
5. Construction planning
6. Contract preparation

Up to the decision to terminate all technical ESS activities, the following planning steps have been completed [Bohn, 2003/1]:

1. Basic findings
2. Preplanning
3. Outline design

The following planning steps have still to be completed:

4. Licensing planning
5. Construction planning
6. Contract preparation

The effort to complete these unfinished pre-planning steps (4, 5, and 6.) prior to the start of construction has been estimated at:

150 PY (person years)

In summary: In view of technical risk, scheduling, and cost reliability It is of great importance for the development of the conventional facility building programme to involve already during the pre-planning phase professional expertise through civil engineering companies or industrial architects, to ensure that pre-planning and construction execution is optimised [Bohn, 2003/2].

6.5 DOCUMENTATION

Documentation of the CF building programme is available on electronic media / hardcopies [Bohn, 2003/3].

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