Chapter 10

Central Station

In this short chapter we describe a model for the central station which we have used primarily to estimate costs. The estimated costs will be brought together with those of the detectors in the next chapter.

10.1 Central Station

We include in the Central Station a building containing office space and the central data acquisition system, a dormitory building and a shed to store material and assemble the detectors on the site. We assumed that the station should be able to house (office space and bedrooms) up to 10 people. Since the buildings are modular, the cost can easily be updated if other scenarios are envisaged. We include here the estimates of the civil-engineering and general equipment (details of the scientific equipment are given in the corresponding chapters).

10.1.1 The Office Building

We took as the basis of our proposal a barrack-type building of good quality available from a French firm. It has a total surface area of 153 m^2 obtained by using four identical modules each consisting of two office rooms, plus one specific module containing sanitary equipment and a kitchenette. The walls separating the individual office rooms can be suppressed to make larger rooms. Our proposal is to have 5 office rooms (including the kitchenette) and use the remaining space to install the data acquisition system and an electronics workshop. The office modules are 3 m wide, 10 m long (including a corridor separating the two face-to-face office rooms) and they can be added to or removed from the configuration we propose.

The building and equipment include all necessary comfort : thermal and acoustic insulation of roof and exterior walls, heating with thermostatically controlled electrical convection heaters, sanitary equipment, etc. The total cost given includes transport, labor and installation. The labor part of the cost would be around 25%. The furniture is included.

Four office rooms will be configured to contain the data acquisition system, terminal room and an electronics workshop. The latter would occupy the equivalent of one office room, and be equipped with standard laboratory instruments such as oscilloscopes, power supplies and pulse generators. A space equivalent to three offices would be devoted to the data acquisition system equipment and terminal rooms. The servers and electronic crates may be separated from the rest by an insulated partition wall to make a small air-conditioned room of about 10m^2. The air-conditioning clearly depends very much on the local climatic conditions. We were given upper and lower limits for the cost on the basis of 15 m^2 office space. We foresee much more powerful air-conditioning for the small room housing the electronics crates and the servers.

The fire safety installation consists of a general alarm (that can be computer monitored) and two extinguishers for each of the three buildings. A 200 kVA uninterruptable power supply will provide clean power to the electronics.

10.1.2 The Dormitory

The dormitory building is also modular and consists of 6 modules of 3×11.2 m^2, out of which five are pairs of rooms (hence a total of ten bedrooms) and one provides space for two rooms : one is a kitchen and the other may be used as a laundry. The building is delivered with the following equipment included (apart from those mentioned for the office building) : 1500 W thermostatically controlled convection heaters, sanitary facilities (showers, WC in all bedrooms), water heater and equipped kitchenette. The total cost includes transportation and installation.

10.1.3 The Shed

The shed has a surface of 680 m^2 to house an assembly area for the detectors before they are transported to the assigned local station position. The (included) thermal insulation of the shed (if needed) represents 30% of the cost. There is a rather complete mechanical workshop inside the shed.

10.2 Civil Engineering

This is the strongly site and country dependent part. To have a realistic cost estimate, we asked (through the Civil Engineering Department of the French National Research Council, CNRS) a few firms to work on the following scenario. We need to bring electricity, telephone lines, water and a road to the central station. The distance over which all these items are required is 35 km, roughly that from the border of the array to the center. It is not excluded that the facilities are accessible much closer to the central station, so the cost estimates on those items should be considered as very indicative. The ground is supposed to be flat and easy to dig. No rocks or other hard-to-cross obstacles are to be removed. There are no

Equipment	**Cost** (k$)
Deployment and engines	424
Office building	375
Dormitory building	285
Shed/Assembly area	413
Roads	4359
Electrical and telephone lines	5213
Water	611
EDIA for access to site	1175
DAS (without Fly's Eye) and networks	276
Total	13131

Table 10.1: Central station and DAS overall cost estimates (per site).

construction works such as bridges, tunnels or viaducts. All raw materials are assumed to be close to the site, so that no transportation cost is included.

On the site itself, the civil engineering work comprises the concrete slabs for the three buildings (including parking places) and the sewers. The slab for the shed is thick enough to stand heavy loads (trucks). The others are thinner. The labor is estimated at approximately 50% of the total cost.

The road is 35 km long and 3.5 m wide with an asphalt surface. Every 2 km a 40m$\times$4m crossover area is installed. The work includes the clearing of the ground, earth moving (embankments, hard core) and digging two lateral ditches (one of them containing the pipework for water and cableways for electricity and telephone). The asphalt surface lies on foundations.

Both electricity and telephone are transported between two main stations 35 km apart. In each case, three substations relay the lines. The main cost ($100/m, i.e. 87% of the total) comes from the electrical cables. Installing underground cables (the situation envisaged here because of environmental impact issues) is much more expensive than aerial cables on poles. Depending on site details, the latter solution, if used, brings substantial economies on this item. The cold water is transported over the 35 km through 3 pumping sub-stations.