CHAPTER 7

LAUNCH SITE

7.1 General Description

This chapter describes detailed information on the facilities and services provided by XSLC.

XSLC is subordinated to China Satellite Launch and Tracking Control General (CLTC). This launch site is mainly to conduct GTO missions.

XSLC is located in Xichang region, Sichuan Province, southwestern China. Its headquarter is located in Xichang City, 65 km away from the launch site. **Figure 7-1** shows the location of Xichang.

Xichang is of subtropical climate and the annual average temperature is 16ºC. The ground wind in the area is usually very gentle in all the four seasons.

Xichang Airport is located at the northern suburbs of Xichang City. The runway of Xichang Airport is capable of accommodating large aircraft such as Boeing 747 and A-124.

The Chengdu- Kunming Railway and the Sichuan-Yunnan Highway pass by XSLC. The distance between Chengdu and XSLC is 535km by railway. There are a dedicated railway branch and a highway branch leading to the Technical Center and the Launch Center of XSLC.

By using of cable network and satellite communication network, XSLC provides domestic and international telephone and facsimile services for the user.

XSLC consists of headquarter, Technical Center, Launch Center, Communication Center, Mission Center for Command and Control (MCCC), three tracking stations and other logistic support systems.

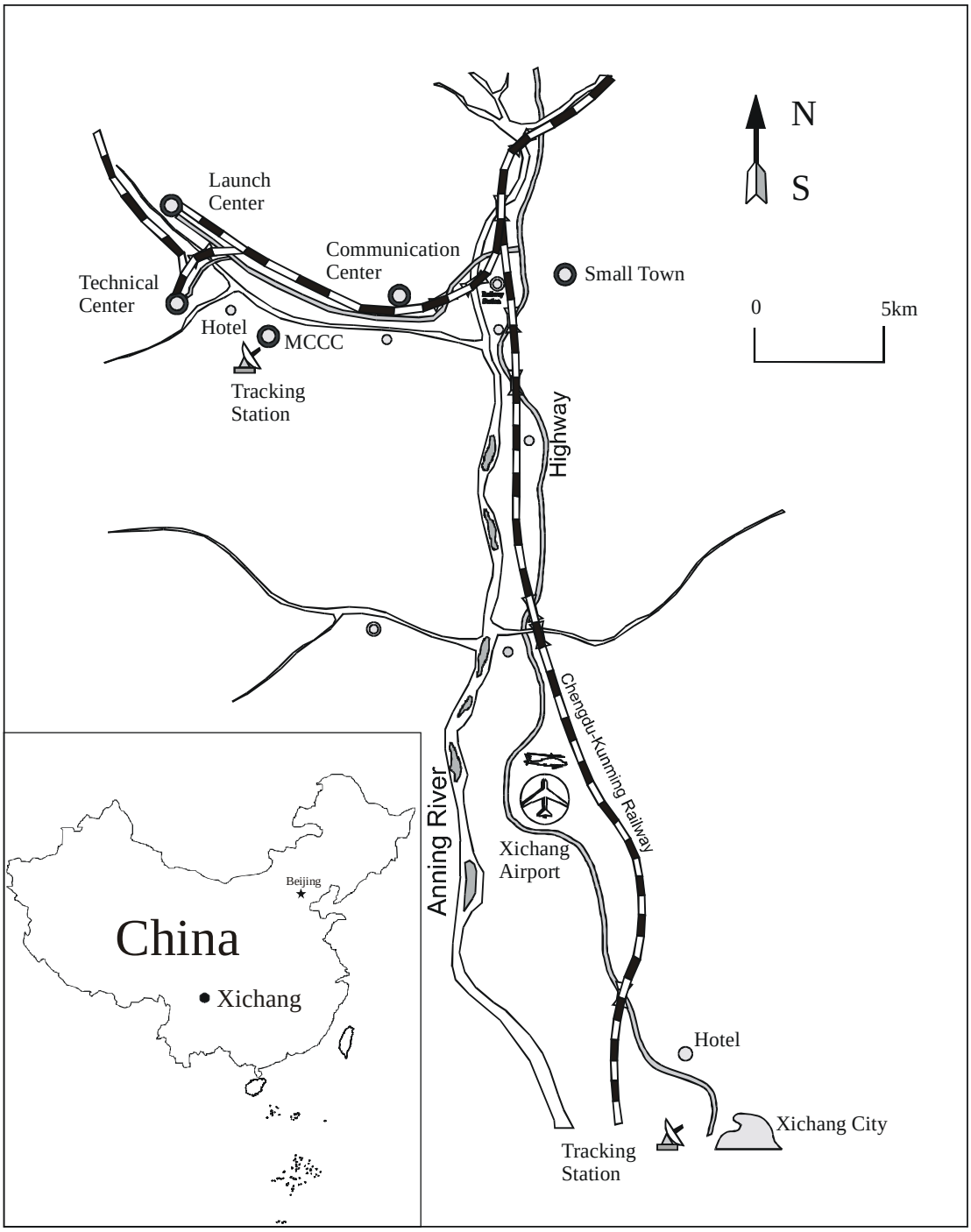

Figure 7-1 XSLC Map

7.2 Technical Center

Technical center includes LV Processing Building (BL), SC Processing Buildings (BS), Power Station, Truck-Barn, etc. The LV and the SC will be processed, tested, checked, assembled and stored in Technical Center. Refer to **Figure 7-2**.

7.2.1 LV Processing Building (BL)

The LV Processing Building (BL) comprises of Transit Building (BL1) and Testing Building (BL2).

7.2.1.1 BL1

BL1 is mainly used for the transiting and loading of the LV and other ground equipment. BL1 is 54 meters long, 30 meters wide, 13.9 meters high. The railway branch passes through BL1. BL1 is equipped with movable overhead crane. The crane has two hooks with capability of 50t and 10t respectively. The crane's maximum lifting height is 9.5meters.

7.2.1.2 BL2

BL2 is mainly used for the testing operation, necessary assembly and storage of the launch vehicle. This building is 90m long, 27m wide and 15.58m high, with the capability of processing one launch vehicle and storing another vehicle at the same time. A two-hook overhead movable crane is equipped in BL2. The lifting capabilities of the two hooks are 15t and 5t respectively. The lifting height is 12 meters. There are testing rooms and offices beside the hall.

7.2.2 SC Processing Buildings (BS)

The SC Processing Buildings includes Test and Fueling Building (BS2 and BS3), Solid Rocket Motor (SRM) Testing and Processing Buildings (BM), X-ray Building (BMX), Propellant Storage Rooms (BM1 and BM2). BS2 is non-hazardous operation building, and BS3 is hazardous operation building (BS3). All of the SC's pre-transportation testing, assembly, fuelling and SC/Adapter operations will be performed in BS2 and BS3. Refer to **Figure 7-3**, **Table 7-1** and **Table 7-2**.

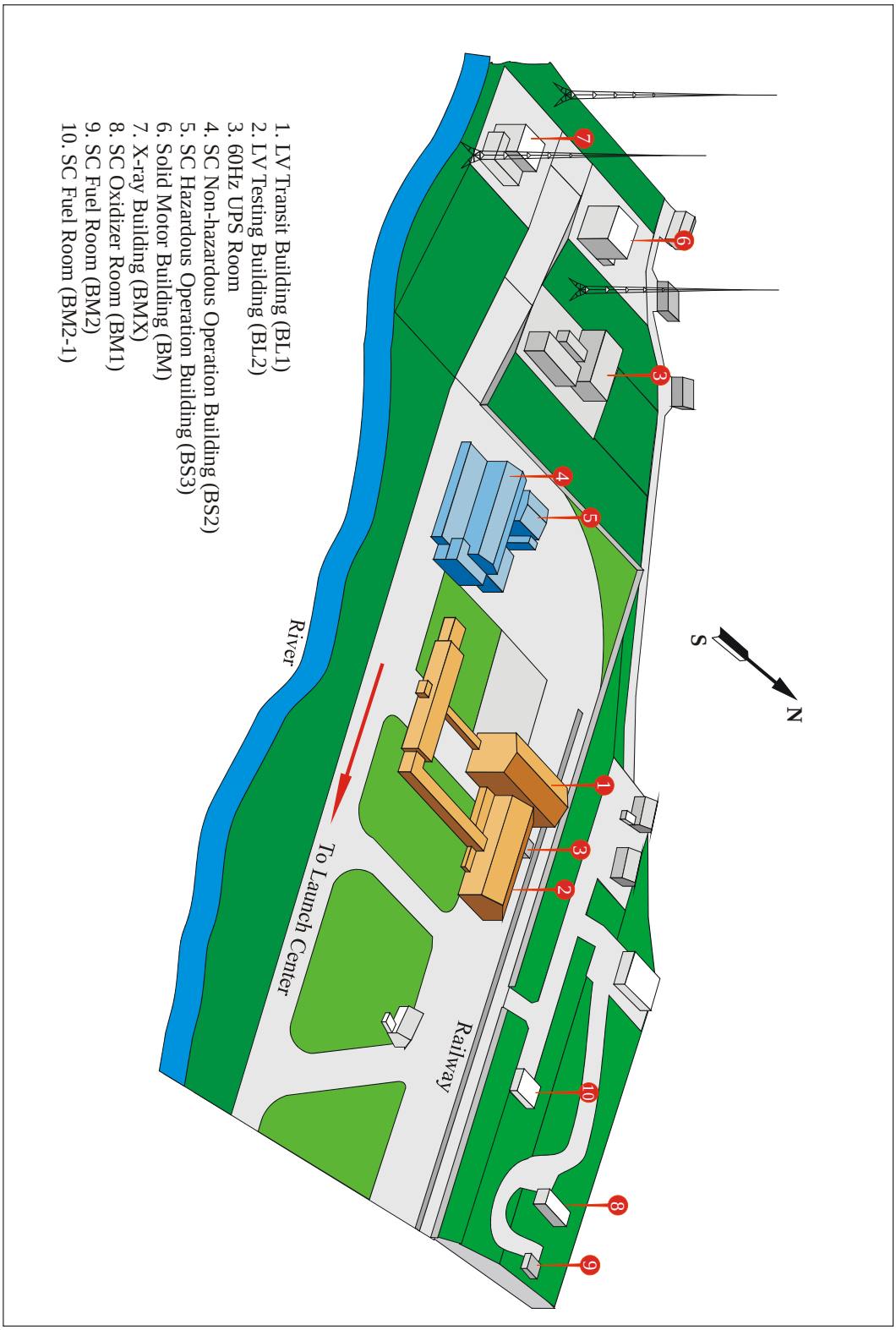

Figure 7-2 Technical Center

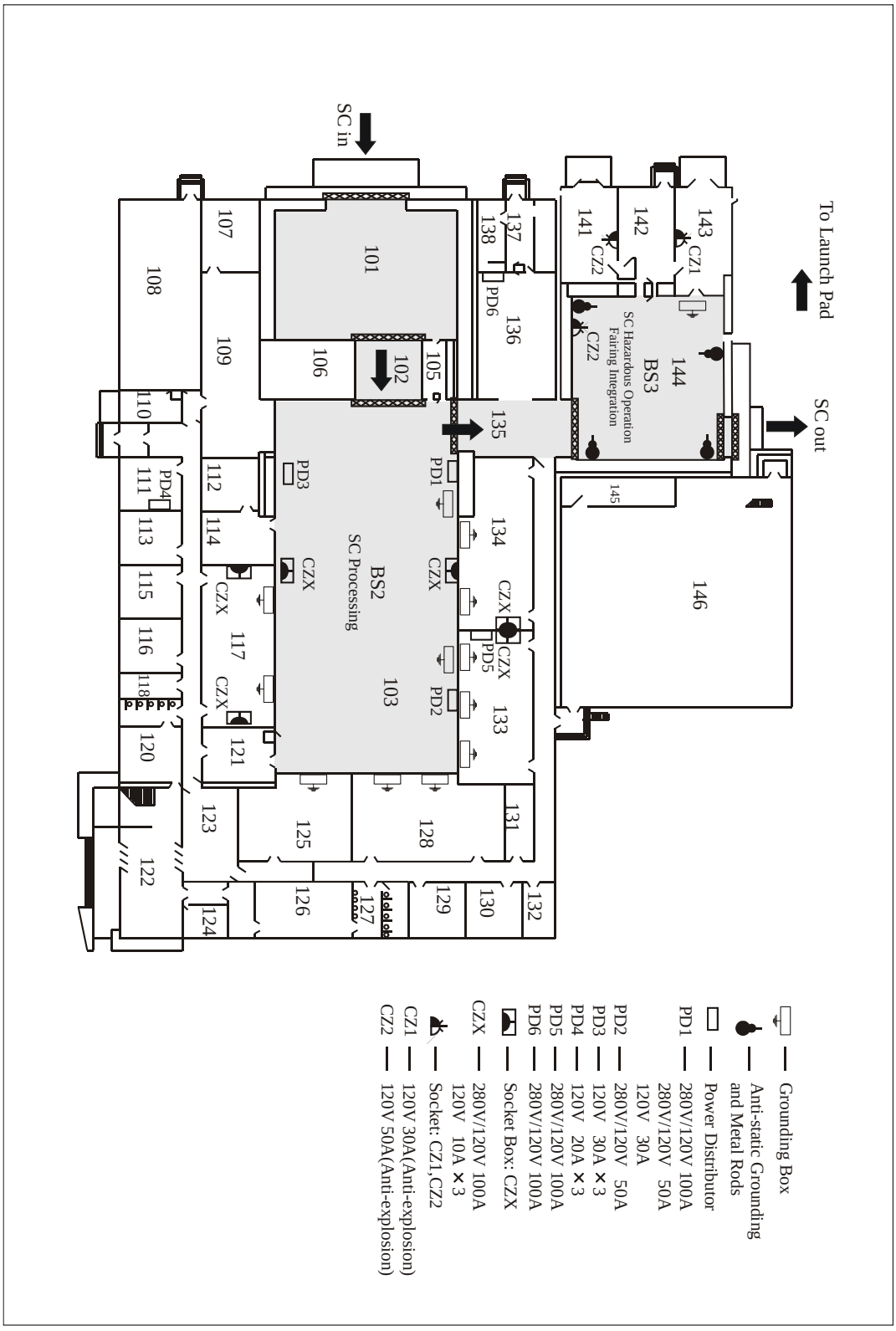

Figure 7-3 Layout of First Floor of BS Building

7.2.2.1 Non-Hazardous Operation Building (BS2)

- **General**

The Non-Hazardous Operation Room Building (BS2) consists of the following parts:

- ✧ Transit Hall (101);
- ✧ Air-lock Room (102);
- ✧ Satellite Test Hall (High Bay, 103);
- ✧ System test Equipment (STE) rooms (134B, 134C)
- ✧ Clean Rooms (107, 109);
- ✧ Battery Refrigerator (131);
- ✧ Leakage Test Rooms (136,137), etc..

Refer to **Figure 7-3** and **Table 7-1**.

- **Transit Hall (101)**

Lifting Capability of the crane equipped in Transit Hall:

Main Hook: 16t
Subsidiary Hook: 3.2t
Lifting Height: 15m

- **Satellite Testing Room (High-bay 103)**

It is used for the satellite's measurement, solar-array operations, antenna assembly, etc. SC weighing and dry-dynamic-balance operation is also performed in high-bay 103.

Lifting capacity:

Main hook: 16t
Subsidiary hook: 3.2t
Lifting height: 15m

Electronic scale weighing range: 50-2721.4kg
Maximum capacity of Dynamic balance instrument: 7700kg

A supporter for fixing the antenna is mounted on the inner wall. A ladder and a platform can be used for the installation of the antenna. There are large glass windows for watching the whole testing procedure from outside. Hydra-set is also available for the SC lifting and assembly. For the dynamic balance test, adapting sets should be prepared by SC side.

Table 7-1 Room Area and Environment in BS2

Room	Usage	Measurement		Door	Environment		
		L×W×H (m× m×m)	Area (m^2)	W×H (m×m)	T (°C)	Humidity (%)	Cleanness (Class)
101	Transit Hall	12×18×18	216	5.4×13	18~28	50±10	100,000
102	Air-Lock	6×5.64×13	33.8	5.4×12.5	18~28	50±10	100,000
103	SC-Level Test Area	42×18×18	756	5.4×12.5	15~25	35~55	100,000
107	Unit-Level Test Room)	6×6.9	41.4	1.5×2.1	22±2	30~36	100,000
109	Unit-Level Test Room)	18×6.9	124.2	1.5×2.1	22±2	30~36	100,000
111	Office	6×6×3	36	1.5×2.1	20~25	30~36	
112	Storage Room	6.9×6×3	41.4	1.5×2.1	20~25	35~55	100,000
113	Office	6×6×3	36	1.5×2.1	20~25	30~60	
114	Storage Room	6.9×6×3	41.4	1.5×2.1	20~25	35~55	100,000
115	Office	6×6×3	36	1.5×2.1	20~25	30~60	
116	Office	6×6×3	36	1.5×2.1	20~25	30~60	
117A	Test Room	18×6.9×3.0	124.2	1.5×2.1	20~25	30~60	
125	Office	10.5×6.9×3	72.5	1.5×2.1	20~25	30~60	
128D	Office	15.9×6.9×3	110	1.5×2.1	20~25	30~60	
129	Security Equipment	6×6×3.0	36	1.5×2.1	20~25	30~60	
130	Communication Terminal Room	6×6×3.0	36	1.5×2.1	20~25	30~60	
131	Battery Refrigerator	6.9×3.9×3.0	27	1.5×2.1	5~15	≤60	
132	Wire-Distributio n Room	6×4.25×3.0	25.5	1.5×2.1	20~25	30~60	
133C	Measurement Equipment	18×6.9×3.0	124.2	1.5×2.1	20~25	30~60	
134B	Measurement Equipment	18×6.9×3.0	124.2	1.5×2.1	20~25	30~60	
135	Passage	6.9×6×13	41.4	5.0×12.5	20~25	≤55	100,000
136	Leakage-Test	12×9.3×7	111.6	3.8×6	20~25	≤55	100,000
137	Leakage Control	6×3.62	21.7	1.5×2.1	18~28	≤70	
138	Passage to BS3	6×3.9	23.4	1.5×2.1	18~28	≤70	

7.2.2.2 Hazardous Operation Building (BS3)

The hazardous operation building (BS3) is a clean building for satellite's hazardous assembly, mono-propellant or bi-propellant fueling, the integration of the satellite and the SRM, spinning balance and weighing.

- **General**

The hazardous operation building (BS3) mainly consists of the following parts:

- ✧ SC fueling and assembly hall (144);
- ✧ Oxidizer fueling-equipment room (141);
- ✧ Propellant fueling-equipment room (143);
- ✧ Fueling operation room (142).

Refer to **Figure 7-3** and **Table 7-2.**

- **SC Fueling and Assembly Hall (144)**

It is used for the fueling of hydrazine or bi-propellant, the integration of satellite and SRM, wet-satellite dynamic balance, leakage-check and SC/LV combined operations.

An explosion-proof movable crane is equipped in this hall. The crane's specifications are as follows:

Lifting capacity:

Main hook:	16t
Subsidiary hook:	3.2t
Lifting height:	15m

The power supply, power distribution and the illumination devices are all explosion-proof. The walls between the fueling operation room and the assembly room, leakage test room, air-conditioning equipment room are all reinforced concrete walls for safety and protection. The door between the fueling and assembly hall and the high-bay 103 in BS2 has the capacity of anti-pressure. Hydra-set is available for satellite assembly and lifting.

A Germany-made weighing scale (EGS300) is equipped. Its maximum weighing range is 2721.4kg(6000lb) with accuracy of 0.05kg (0.1lb). The measurement of the weighing platform is 2m×1.5m(79in×59in). Another weighing equipment up to 10t will be provided.

Inside hall 144, there are eye washing device, gas-alarm and shower for emergency.

- **Measurement Equipment Room (133, 134)**

Room 133 is for system-level test and room 134 is for storage of supporting test equipment. RF system is provided so that SC side can use the equipment in BS2 to monitor the spacecraft wherever it is in BS 3 or at the launch complex (#1 or #2). uplink and downlink RF channel are provided.

Table 7-2 Room Area and Environment in BS3

Room	Usage	Measurement		Door W×H (m×m)	Environment		
		L×W×H (m× m×m)	Area (m^2)		T (°C)	Humidity (%)	Cleanness (Class)
133C	Measurement Equipment	18×6.9×3.0	124.2	1.5×2.1	20~25	30~60	
134B	Measurement Equipment	18×6.9×3.0	124.2	1.5×2.1	20~25	30~60	
135	Passage	6.9×6×13	41.4	5.0×12.5	20~25	≤55	100,000
136	Leakage-Test	12×9.3×7	111.6	3.8×6	20~25	≤55	100,000
137	Leakage Control	6×3.62	21.7	1.5×2.1	18~28	≤70	
138	Passage to BS2	6×3.9	23.4	1.5×2.1	18~28	≤70	
141	Oxidizer Fueling Equipment Storage Room	8.1×6×3.5	48.6	2.8×2.7	18~28	≤60	
142	Fueling Control Room	8.1×6×3.5	48.6	1.5×2.1	18~28	≤60	
143	Propellant Fueling Equipment Storage Room	8.1×6×3.5	48.6	2.8×2.7	18~28	≤60	
144	Fueling /Assembly Hall	18×18×18	324	5.4×13	15~25	35~55	100,000

7.2.2.3 SRM Checkout and Processing Building (BM)

- **General**

The SRM Checkout and Processing Building (BM) is used for the storage of the SRM and pyrotechnics, SRM assembly, pyrotechnics checkout, X-ray checkout of SRM, etc.

BM consists of following parts:

- ✧ Checkout and Processing Hall;
- ✧ SRM Storage Room;
- ✧ Pyrotechnics Storage;
- ✧ Checkout Room;
- ✧ Offices;
- ✧ Locker Room;
- ✧ Room of air-conditioning unit.

Refer to **Figure 7-4**. The area and environment are listed in **Table 7-3**.

Table 7-3 Room Area and Environment in BM

Room	Usage	Measurement		Door W×H(m)	Environment		
		L×W×H (m× m×m)	Area (m^2)		T (°C)	Humidity (%)	Cleanness (Class)
101	Reception	5.1×3×3.5	15.3	1.0×2.7			
102	Rest room	3.3×3×3.5	9.9	1.0×2.7			
103	Office	6.0×5.1×3.5	30.6	1.5×2.7			
104	Spare Room	5.1×3×3.5	15.3	1.0×2.7			
105	Spare Room	5.1×3×3.5	15.3	1.0×2.1			
106	Pyro Storage	5.1×3×3.5	15.3	1.0×2.1	21±5	<55	
107	Pyro Storage	5.1×3×3.5	15.3	1.0×2.1	21±5	<55	
108	Air-conditioning	10.6×6×3.5	93.8	1.5×3.0			
109	SRM Checkout and X-rays Processing	12×9×9.5	108	3.6×4.2	21±5	<55	
110	SRM Storage	6×3.9×3.5	23.4	2.0×2.6	21±5	<55	

- **SRM Checkout and X-rays Processing Room (109)**

This hall is equipped with explosion-proof movable crane. Its lifting capacity is 5t and lifting height is 7m.

A railway (1435mm in width) is laid in the hall. It leads to the SRM X-ray hall (BMX) and the cold soak chamber.

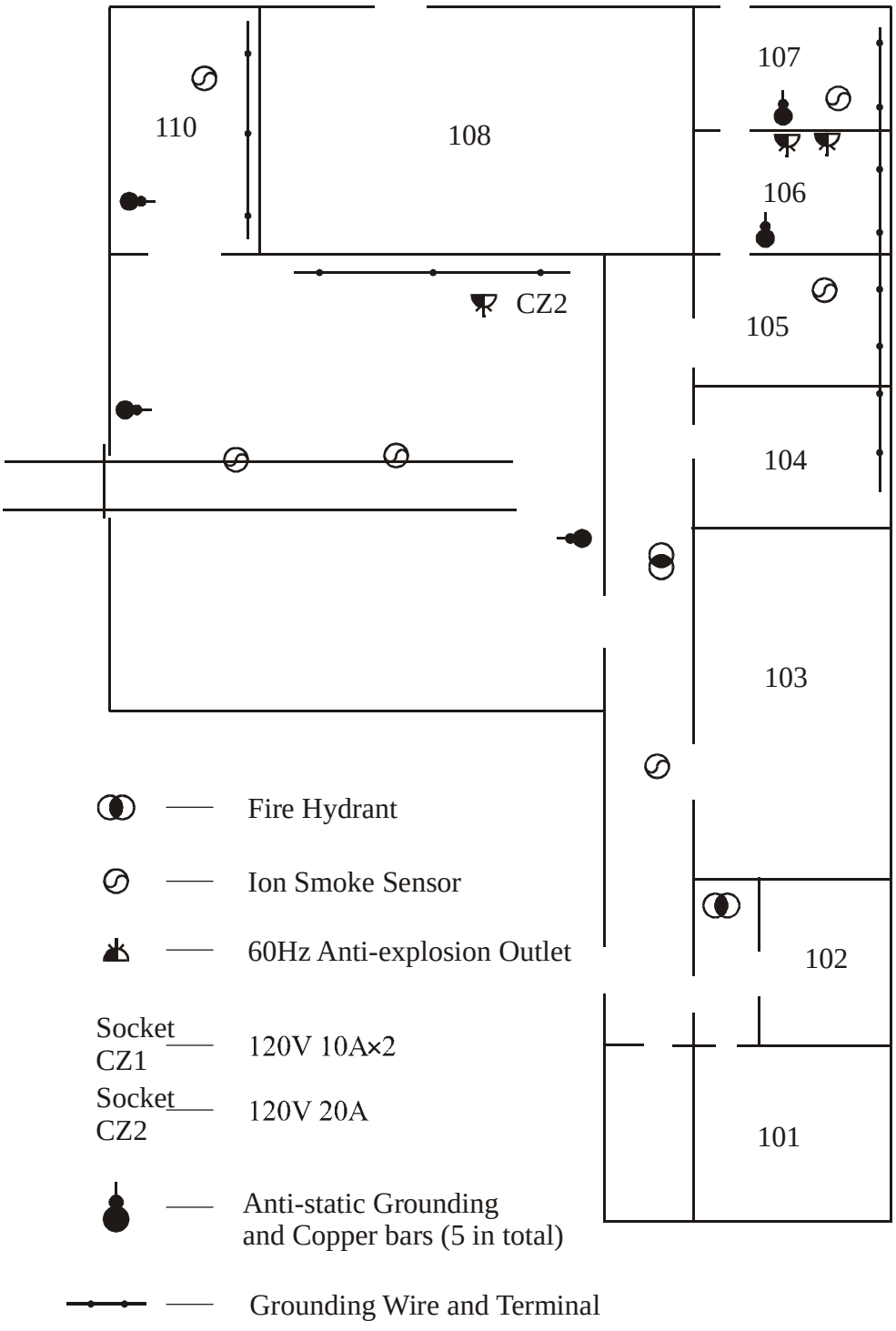

Figure 7-4 Layout of BM

7.2.2.4 SRM X-ray Building (BMX)

- **General**

The BMX is used for X-ray and cold-soak of solid motors. BMX consists of the following parts: cold soak chamber, X-ray operation hall, control room, detecting equipment room, modular cabinet room, film Processing, processing and evaluation rooms, chemical and instrument room, offices, locker room and room of air-conditioning unit. Refer to **Figure 7-5**. The area and environment are listed in **Table 7-4**.

Table 7-4 Room Area and Environment in BM

Room	Usage	Measurement		Door W×H (m)	Environment		
		L×W×H (m)	Area (m^2)		T (°C)	Humidity (%)	Clearance (Class)
101	X-ray Detection	12.5×10×15	125	3.2×4.5	20~26	35~55	
102	Cold-soak	3.2×3×4	9.6	3.2×3.5	0~15	35~55	
103	X-ray Control	5×3.6×3.7	18	1.0×2.1	20~26	35~60	
104	Detection	5×3.3×3.7	16．5	1.0×2.0	20~26	35~60	
105	Modular Cabinet	5×3.3×3.7	16.5	1.5×2.4	20~26	35~60	
106	Film Process	6×5.1×3.7	30.6	1.2×2.1	18~22	<70	
107	Film Processing	3.6×3.1×3.7	11.1	1.0×2.1			
108	Chemical /instrument	5.1×3.3×3.7	16.8	1.0×2.4			
109	Film evaluation	5.1×3.3×3.7	16.8	1.0×2.4			

- **X-ray Detection Room (101)**

This hall is used for x-ray operations of SRM. Linatron 3000A linear accelerator was equipped. The nominal electron beams energy are 6, 9 and 11 million electronic volts (mev). The continuous duty-rated output at full power and nominal energy is 3000 rads/min at one meter on the central axis. The X-ray protection in the hall is defined according to the calculation based on the specifications of the Linatron 3000A. The main concrete wall is 2.5 meters thick.

The doors between the hall and the control room and the large protection door are equipped with safety lock devices. The hall is provided with dosimeter and warning

device, high-voltage emergency cut-off button for X-ray equipment, X-ray beam indicator and various protections. All these mean to assure the safety of the operators.

The hall is equipped with an explosion-proof movable overhead crane with lifting height of 8m and a telescopic arm that supports the head of the X-ray machine.
A railway (1435mm in width) is laid in the hall and leads to the cold-soak chamber and the SRM checkout and Processing hall (BM).

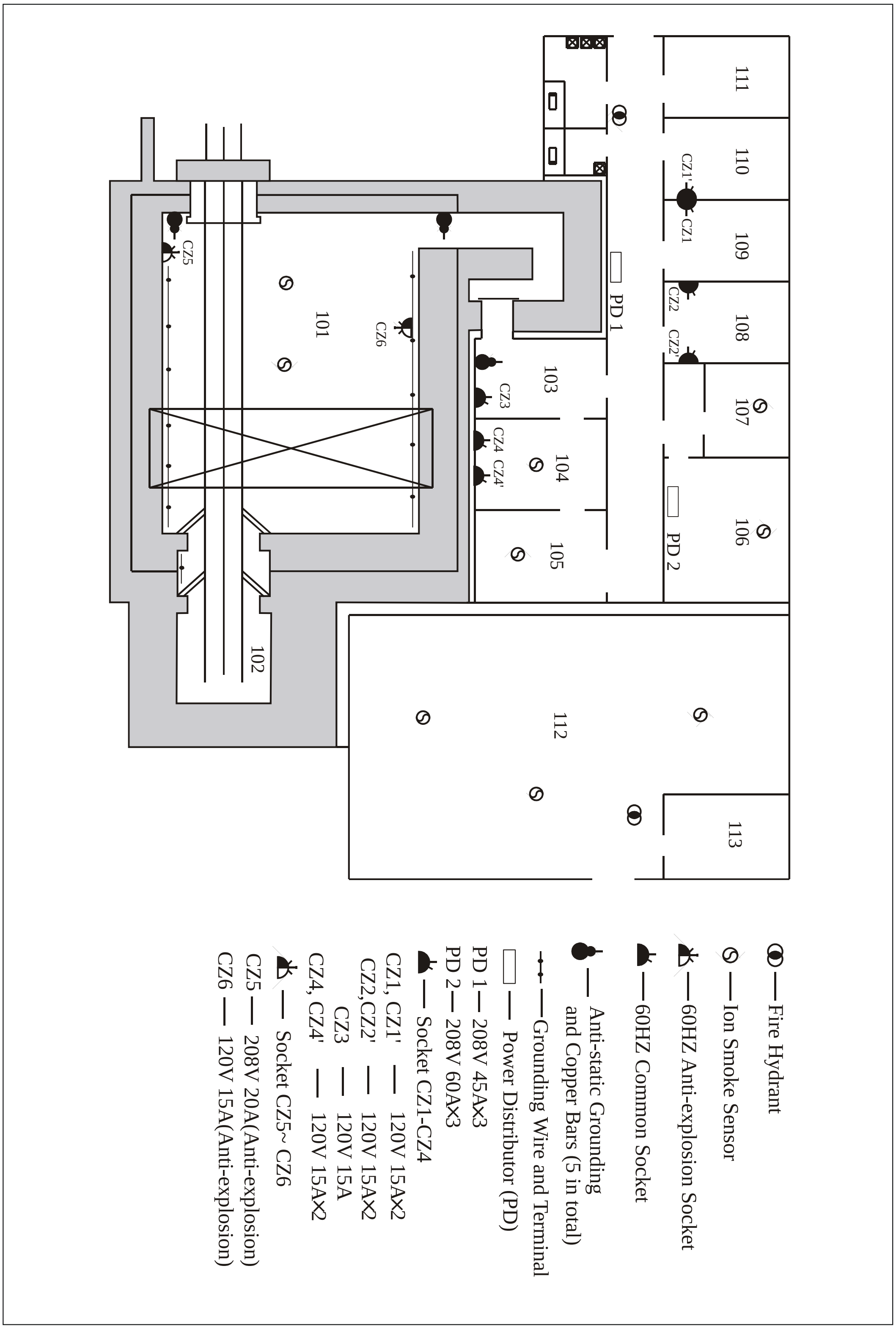

Figure 7-5 Layout of BMX

7.2.2.5 Hazardous Substances Storehouse

Hazardous substance storehouses are used for the storage inflammable and explosive articles. BM1 and BM2 are for the storage of satellite propellants. There are also other houses for the test and storage of LV pyrotechnics.

7.2.2.6 Power Supply, Grounding, Lightning Protection, Fire-Detection and Alarm

- **Power Supply System**

All SC processing hall and rooms, such as 103, 144, 133, 134 etc., are equipped with two types of UPS: 60Hz and 50Hz.

✧ 60Hz UPS

Voltage: 208/110V±1%
Frequency: 60±0.5Hz
Power: 64kVA

✧ 50Hz UPS

Voltage: 380/220V±1%
Frequency: 50±0.5Hz
Power: 130kVA

Four kinds of power distributors are available in the all SC processing halls and rooms. Each of them has Chinese/English description indicating its frequency, voltage, rated current, etc.

All of the sockets inside 144 and other hazardous operation area are explosion-proof.

- **Lightning Protection and Grounding**

In technical areas, there are three kinds of grounding, namely technological grounding, protection grounding and lightning grounding. All grounding resistance is lower than 1Ω.

Grounding copper bar is installed to eliminate static at the entrance of fueling and assembly hall, in the oxidizer fueling equipment room and the propellant fueling equipment room.

The SRM checkout room (109), SRM storage room (110), pyrotechnics storage and checkout rooms (106, 107) are also equipped with grounding copper bar at the entrance to eliminate static. In BMX and terminals room, there are also grounding copper bar to eliminate static. The SRM checkout and Processing building is equipped with a grounding system for lightning protection. There are two separate lightning rods outside SRM.

- **Fire Detection and Alarm System**

The SRM checkout room (109), SRM storage room (110), pyrotechnics storage and checkout rooms (106, 107), air-conditioning equipment room (108) are all equipped with ionic smoke detectors. The office (103) is equipped with an automatic fire alarm system. When the detector detects smoke, the automatic fire alarm system will give an audio warning to alarm the safety personnel to take necessary measures.

X-ray operation hall, control room, equipment room, modular cabinet room, film Processing and processing room, air conditioning room are all equipped with smoke sensors. The control room is equipped with fire alarm system. In case of a fire, the alarm system will give a warning to alarm the safety personnel to take necessary measures.

7.3 Launch Center

7.3.1 General

Coordinates of Launch Pad #2 for LM-3C:

Longitude: 102.02°E,
Latitude: 28.250°N
Elevation: 1826m

The launch site is 2.2 km (shortcut) away from the Technical Center. Facilities in the launch area mainly consist of Launch Complex #1 and Launch Complex #2. Refer to **Figure 7-6**.

Launch Complex #1 is designated for LM-3 and LM-2C launch vehicles.

Launch Complex #2 is about 300 meters away from Launch Complex #1.

Launch Complex #2 is designated for launches of LM-2E, LM-3A, LM-3B and LM-3C. It is also a backup launch complex for LM-3.

Two types of power supply are available in the launch center:

- ✧ 380V/220V, 50Hz power supplied by the transformer station;
- ✧ 120V/60Hz power supplied by the generators.

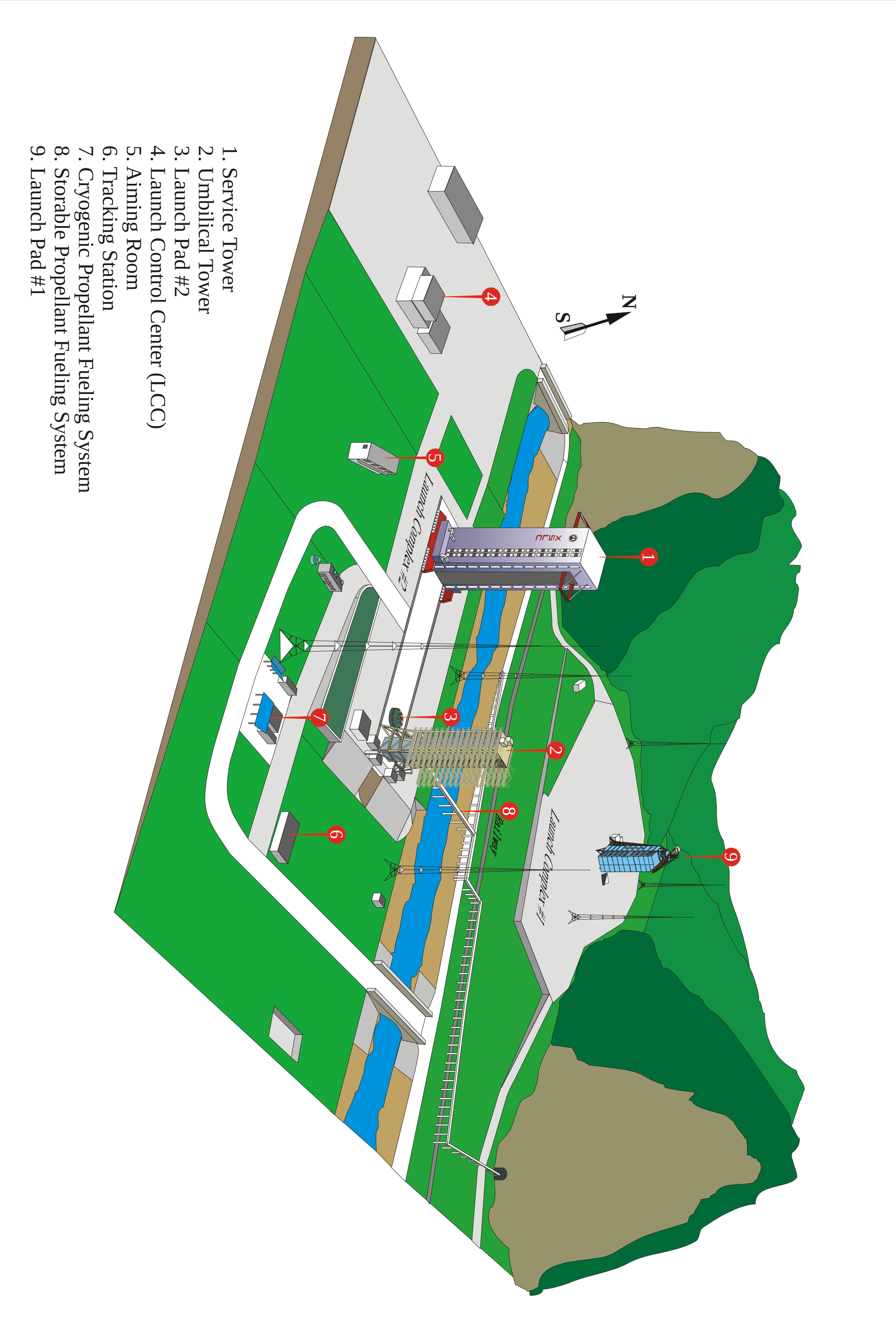

Figure 7-6 Launch Center

7-19

7.3.2 Launch Complex #2

This launch complex includes launch pad, service tower, umbilical tower, launch control center (LCC), fueling system, gas supply system, power supply system, lightning-proof tower, etc. Refer to **Figure 7-7**.

7.3.2.1 Service Tower

Service Tower is composed of tower crane, running gear, platforms, elevators, power supply and distributor, fueling pipeline for storable propellant, fire-detectors & extinguishers, etc.

This tower is 90.60 meters high. Two cranes are equipped on the top of the tower. The effective lifting height is 85 meters. The lifting capability is 20t (main hook) and 10t (sub hook). There are two elevators (Capability 2t) for the lifting of the personnel and stuff. The tower has platforms for the checkouts and test operations of the launch vehicle and the satellite.

The upper part of the tower is an environment-controlled clean area. The cleanliness level is Class 100,000 and the temperature within the satellite operation area can be controlled in the range of 15 ~ 25 °C. SC/LV mating, SC test, fairing encapsulation and other activities will be performed in this area. A telescopic/rotate overhead crane is equipped for these operations. This crane can rotate in a range of 180° and its capability is 8t.

In the Service Tower, Room 812 is exclusively prepared for SC side. Inside room 812, 60Hz UPS (Single phase 120V, 5kW) is provided. The grounding resistance is less than 1Ω. The room area is $8m^2$.

Besides the hydrant system, Service Tower is also equipped with plenty of powder and 1211 fire extinguisher.

7.3.2.2 Umbilical Tower

Umbilical Tower is to support electrical connections, gas pipelines, liquid pipelines, as well as their connectors for both SC and LV. Umbilical Tower has swinging-arm system, platforms and cryogenic fueling pipelines. Through the cryogenic fueling

pipelines, LV side will perform the cryogenic propellant fueling. Umbilical Tower also has air-conditioning system for SC/Fairing, RF system, communication system, rotating platforms, fire-extinguish system, etc.

The ground power supply cables will be connected to the satellite and the launch vehicle via this umbilical tower. The ground air conditioning pipelines will be connected to the fairing also via this tower to provide clean air into the fairing. The cleanliness of conditioned air is class 100,000, the temperature is 15~25°C and the humidity is 35~55%.

In Umbilical Tower, Room 722 is exclusively prepared for SC side. Its area is $8m^2$. Inside 722, 60Hz/50Hz UPS (Single phase 110V/220V/15A) is provided. The grounding resistance is lower than 1Ω.

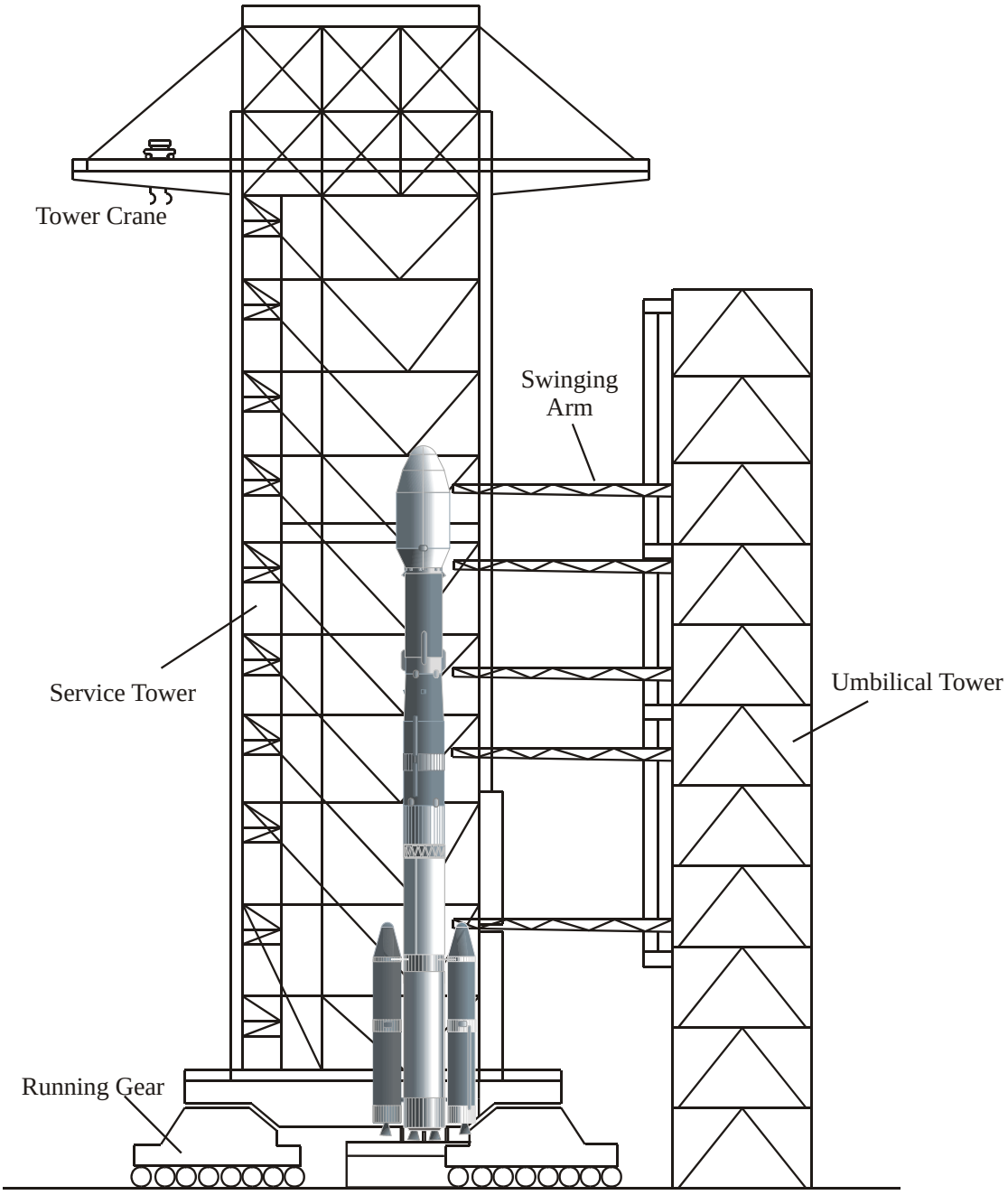

Figure 7-7 Launch Complex #2

7.3.2.3 Launch Control Center (LCC)

- **General**

Launch Control Center (LCC) is a blockhouse structure with ability of explosion-proof. The on-tower operations (such as pre-launch tests, fueling, launch operations) of LV are controlled in LCC. The SC launch control can also be conducted in LCC. Its construction area is 1000m^2. The layout of LCC is shown as **Figure 7-8**.

The LCC includes the launch vehicle test rooms, satellite test rooms, fueling control room, launch control room, display room for mission director, air-conditioning system, evacuating passage, etc. The whole LCC is air-conditioned.

- **Satellite Test Room (104,105)**

There are two rooms for the tests of the satellite, see **Figure 7-8**. The area of each room is 48.6 m^2. The inside temperature is 20±5°C and the relative humidity is 75%.

The grounding resistance is less than 1Ω. 380V/220V, 50Hz and 120V/208V, 60Hz power distribution panels are equipped in each room.

The satellite is connected with the control equipment inside test room through umbilical cables. Refer to **Chapter 5**. The detailed cable interface will be defined in ICD.

- **Telecommunication**

Telephone and cable TV monitoring system are avaiable in the satellite test room, payload operation platform on tower, BS2 and MCCC.

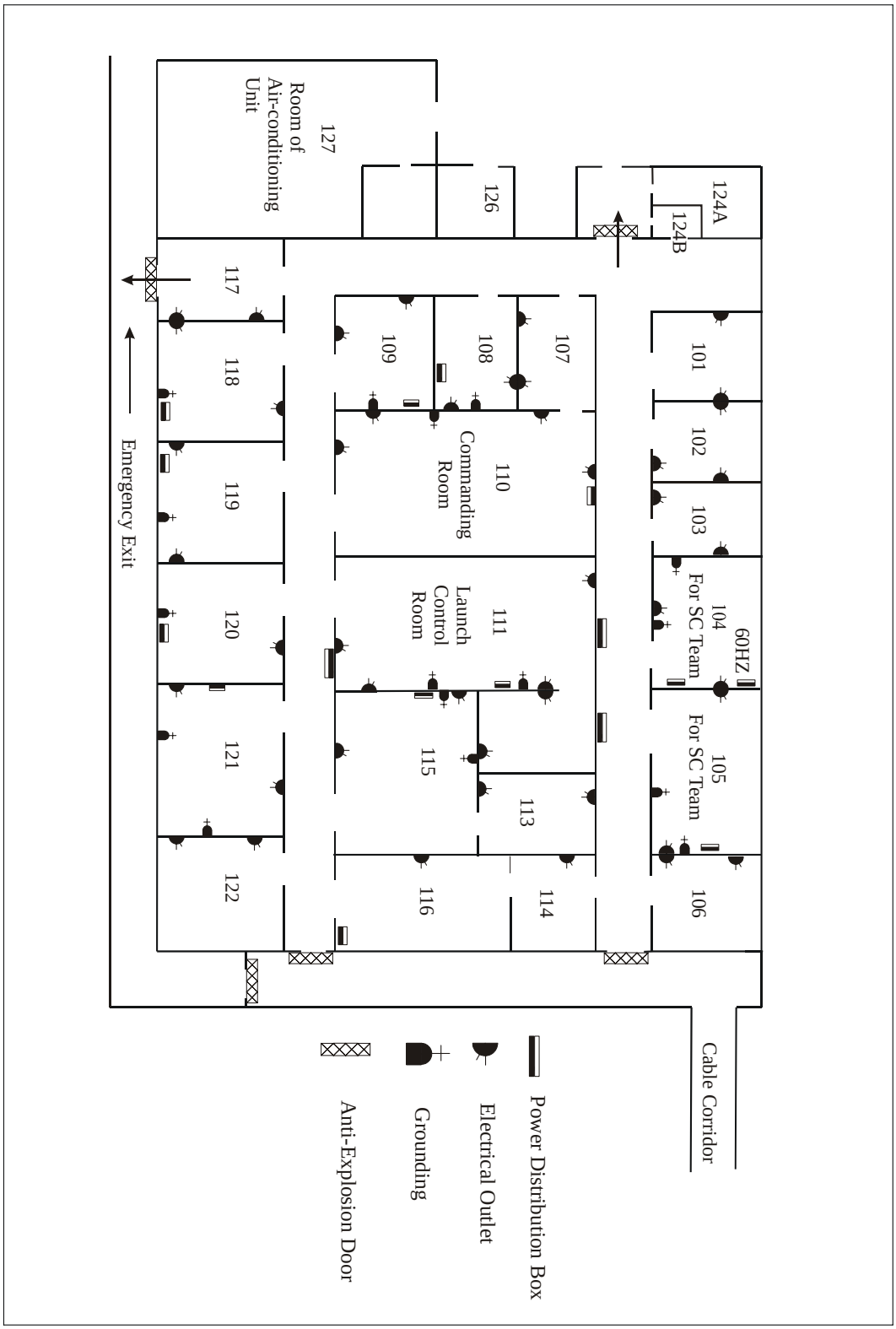

Figure 7-8 Layout of LCC

7.4 Mission Command & Control Center (MCCC)

7.4.1 General

MCCC is located 7km southeast from the launch area. The whole building includes two parts: one is the command and control hall and the other is computer room. The command and control hall consists of two areas: the command area and the range safety control area. Around the hall are operation rooms and offices. There is a visitor room on the second floor and the visitors can watch the launch on television screen. There is cable TV sets for visitors. **Figure 7-9** shows the layout of MCCC.

7.4.2 Functions of MCCC

- ✧ Command all the operations of the tracking stations and monitor the performance and status of the tracking equipment.
- ✧ Perform the range safety control after the lift-off of the launch vehicle.
- ✧ Gather the TT&C information from the stations and process these data in real-time.
- ✧ Provide acquisition and tracking data to the tracking stations and Xi'an Satellite Control Center (XSCC).
- ✧ Provide display information to the satellite working-team console.
- ✧ Perform post-mission data processing.

7.4.3 Configuration of MCCC

- ✧ Real-time computer system.
- ✧ Command and control system.
- ✧ Monitor and display for safety control, including computers, D/A and A/D converters, TV display, X-Y recorders, multi-pen recorders and tele-command system.
- ✧ Communication system.
- ✧ Timing and data transmission system.
- ✧ Film developing and printing equipment.

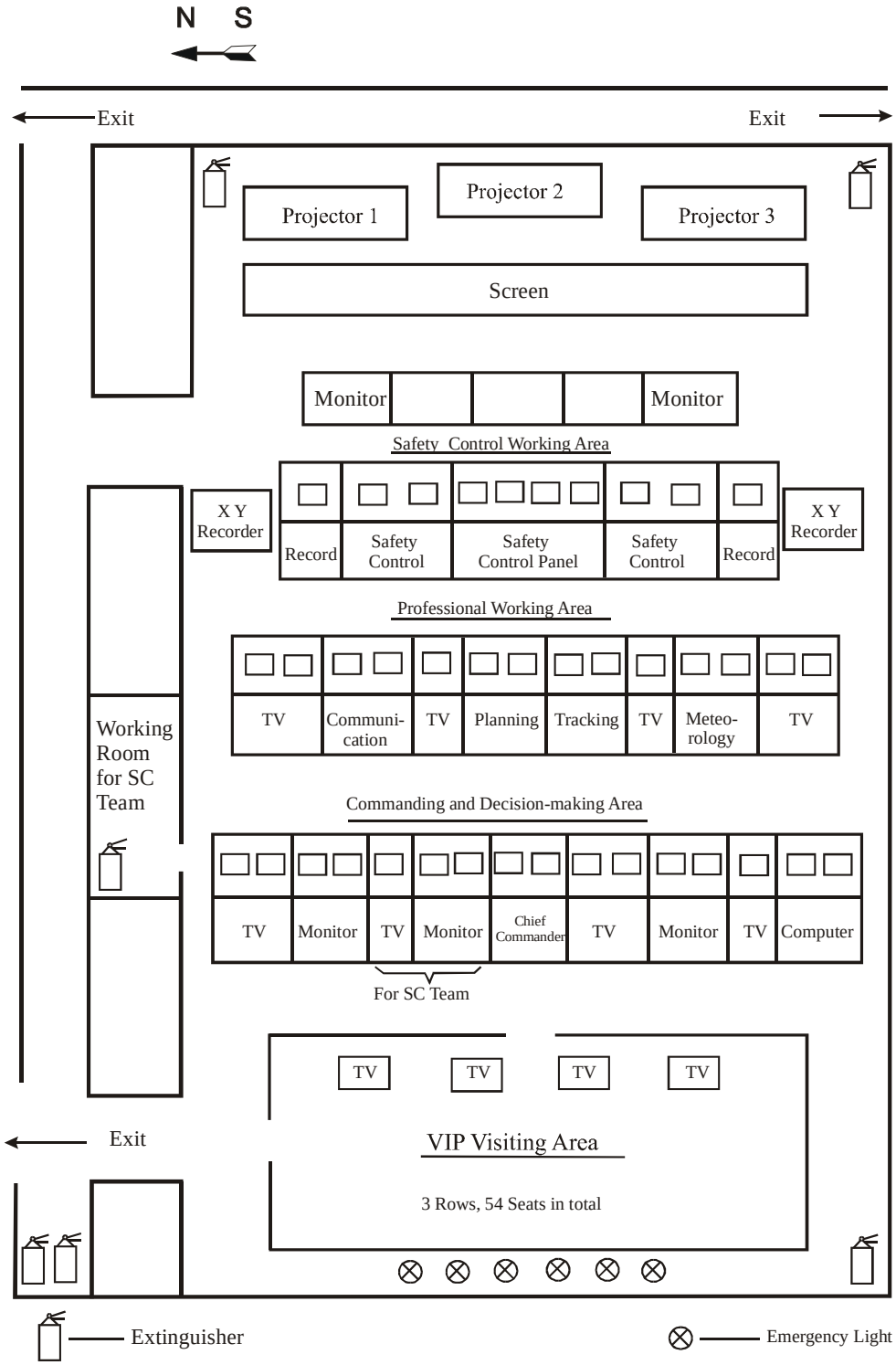

Figure 7-9 Layout of MCCC

7.5 Tracking, Telemetry and Control System (TT&C)

7.5.1 General

The TT&C system of XSLC and TT&C system of Xi'an Satellite Control Center (XSCC) form a TT&C net for the mission.

The TT&C system of XSLC mainly consists of:
- ✧ Xichang Tracking Station;
- ✧ Yibin Tracking Station;
- ✧ Guiyang Tracking Station.

The TT&C system of XSCC mainly includes:
- ✧ Weinan tracking station;
- ✧ Xiamen tracking station;
- ✧ Instrumentation Ships.

Refer to **Figure 7-10**.

Xichang Tracking Station includes optical, radar, telemetry and telecommand equipment. It is responsible for measuring and processing of the launch vehicle flight data and also the range safety control. Data received and recorded by the TT&C system are used for the post-mission processing and analysis.

7.5.2 Main Functions of TT&C

- ✧ Recording the initial LV flight data in real time;
- ✧ Measuring the trajectory of the launch vehicle;
- ✧ Receiving, recording, transmitting and processing the telemetry data of the launch vehicle and the satellite;
- ✧ Making flight range safety decision;
- ✧ Computing the SC/LV separation status and injection parameters.

7.5.3 Tracking Sequence of TT&C System

After LV liftoff, it is tracked immediately by the optical, telemetry equipment and radars around the launch site. The received data will be sent to MCCC. These data

will be initially processed, and sent to the related stations. The station computers receive these data and do coordinate conversion and use the data as acquisition data to guide the TT&C system to acquire and track the target.

After the tracking station acquires the target, the measured data are sent to the computers at the station and MCCC for data processing. The processed data are used for the flight safety control. The results of computation are sent from XSLC to XSCC in real time via the data transmission lines.

In case of a failure during the first stage and second stage flight phases, the range safety officer will make a decision based on the range safety criteria.

The orbit injection of the SC is tracked by tracking ships and sent to XSCC. The results are sent to Xichang MCCC for processing and monitoring.

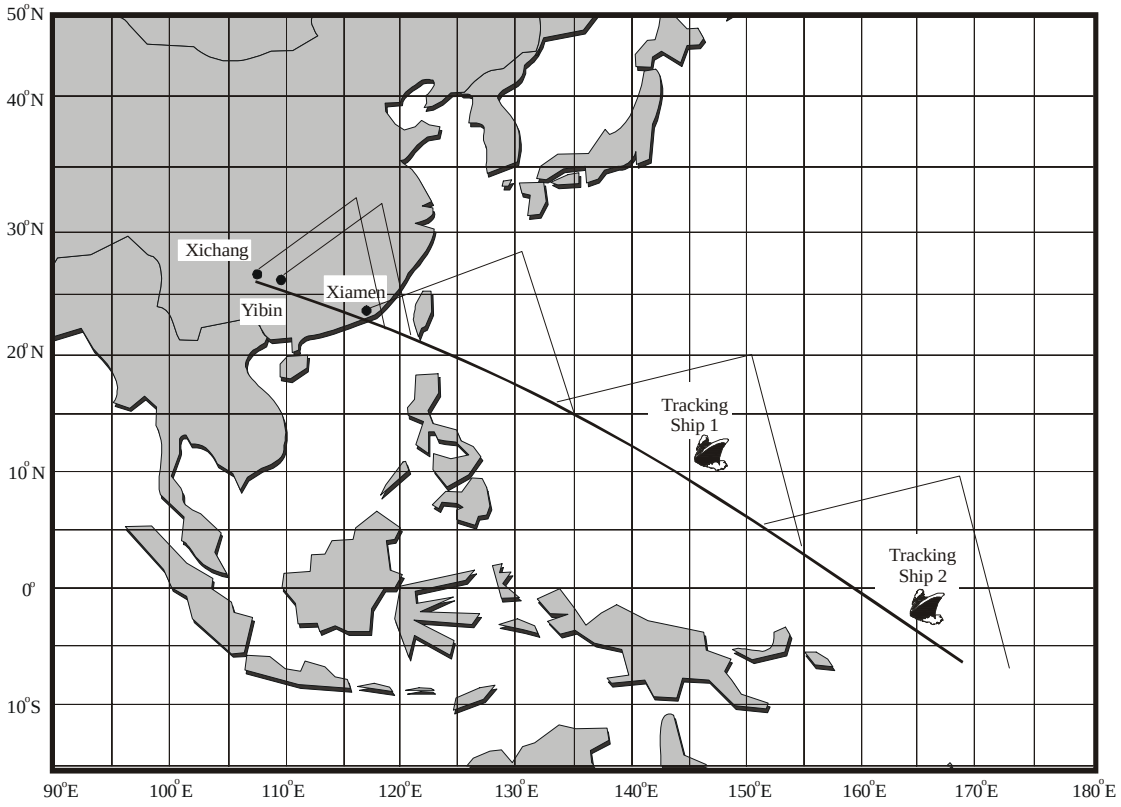

Figure 7-10 Tracking Stations