

6. LAND LAUNCH FACILITIES

Overview Land Launch has the advantage of using proven and established facilities at Baikonur Cosmodrome. These include:

- Krainy Airport for launch personnel arrival and departure
- Yubileiny Airport for spacecraft and ground support equipment shipment
- Two payload processing facilities: Site 31 and Site 254. Site 31 will be the primary processing facility until Site 254 facilities improvements are completed. The Block DM-SLB is processed in Site 254.
- Zenit technical complex located at Site 42 for Zenit processing and mating of the Ascent Unit (Zenit-3SLB) or Payload Unit (PLU) with the Zenit stages followed by check-out of the integrated launch vehicle (ILV).
- Zenit launch complex located at Site 45 for launching the Zenit-3SLB ILV and the Zenit-2SLB ILV.

A map of the Land Launch Baikonur facilities is shown in figure 6-1

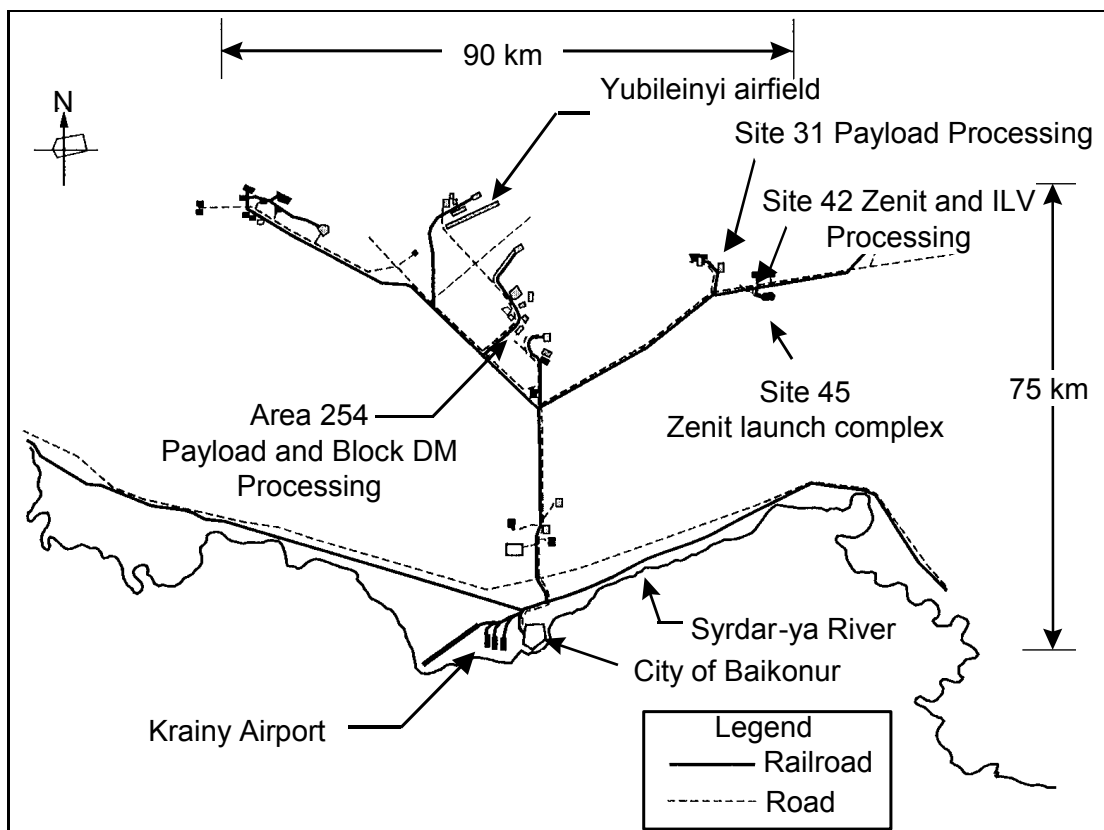


Figure 6-1. Location of the Principal Land Launch Facilities at Baikonur Cosmodrome

6.1 Transportation of Personnel and Cargo to and from Baikonur

Krainy Airport

Personnel fly between Moscow and Baikonur via Krainy Airport (Figure 6-2), which is situated six kilometers to the west of Baikonur city. It can accommodate midsize aircraft for passenger travel throughout the year. Flights are available to and from Vnukovo-1 or Vnukovo-3 airports in Moscow on both commercially scheduled and dedicated charter flights. Land Launch will assist customer personnel in obtaining visas through the Federal Space Agency, and will provide customer representatives with access to the Cosmodrome as well as badges to the required facilities.



Figure 6-2. Krainy Airport at Baikonur

Yubileiny Airport

Yubileiny Airport is located 45 km north of Baikonur city within Baikonur Cosmodrome and is operated by Rosaviacosmos. Its runway, which is 4,500 meters long and 84 meters wide and conforms to International Civil Aviation Organization (ICAO) standards for Class 1 airports, was built to accommodate the landings of the Buran space shuttle. It handles aircraft of all classes for both freight and charter flights, including Boeing 747s and Antonov 124s. Commercial launch customers have used it many times for delivering spacecraft and associated support equipment. The airfield can operate year-round at any time of day. A typical off-load is shown in Figure 6-3.

Upon arrival of aircraft, the SC container and associated equipment are offloaded from the aircraft and transferred to railcars that are located approximately 50 to 80 meters from the aircraft. Cranes, forklifts and other necessary equipment are available for these operations. The airport is connected by rail and road to all major cosmodrome facilities.



Figure 6-3. Spacecraft Off Load at Yubileiny Airport

Transportation at the Cosmodrome

Rail and road networks connect all Land Launch facilities at Baikonur. Land Launch provides the customer with all necessary transportation of equipment and people on base. Generally, equipment will move between facilities by rail while people will move by road. The spacecraft makes three major moves between facilities: from Yubileiny to the PPF, from the PPF to the launcher assembly building (Area 42) and from Area 42 to the launch complex (Area 45). Spacecraft moves are conducted by rail (Figure 6-4), inside protected enclosures (its own shipping container for the first move, and the fairing for the second and third moves) that are continuously purged with clean, conditioned air as described in Section 4.



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Figure 6-4. Ascent Unit Transportation with Thermostating Car

6.2 Site 31 Payload Processing Facility

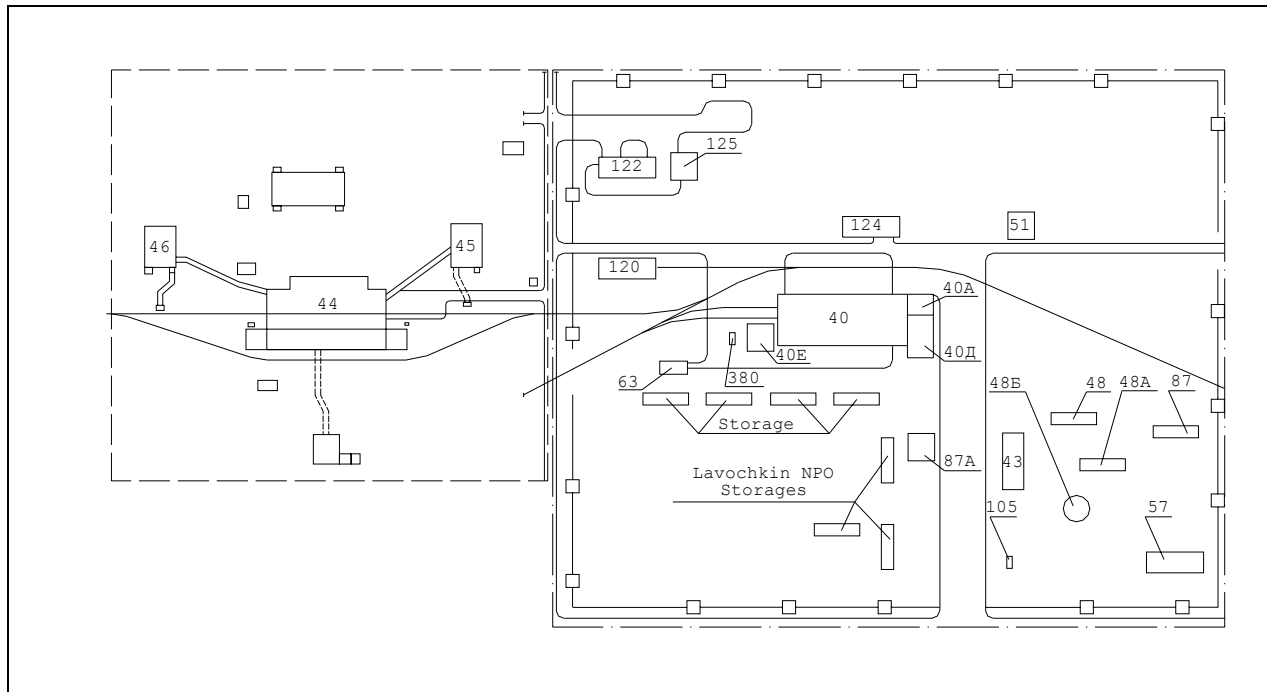
Overview

Launch Launch's primary Payload Processing Facility (PPF) consists of the existing Site 31 complex of buildings and facilities, which has been used previously to process numerous Western and CIS payloads. Site 254 will become the primary PPF when facility upgrades and improvements are completed. All spacecraft processing, propellant filling operations, pressurization, ordnance preparation, and payload fairing encapsulation operations are conducted here. The PPF has controlled access to ensure compliance with United States governmental security regulations as well as self-imposed customer security requirements and procedures.

Major PPF features include:

- spacecraft processing areas
- spacecraft fueling area
- fuel storage room
- oxidizer storage room
- control rooms for spacecraft ground support equipment
- garment change rooms with personnel airlock
- an encapsulation area
- office areas for spacecraft personnel

The layout of the principal buildings at Area 31 is shown in Figure 6-5.



40	Assembly & Test Building (ATB)	51	Support building
40A	ATB Annex (Vacuum Chamber)	57	Boiler Facility
40Д	ATB Annex (Clean Area)	63	Receiver Facility
40E	Ventilation Facility	87A	Uninterruptable Power Supply Facility
43	Charge-Storage Battery Station	105	Transformation Station (6/0.4 kV)
44	Fueling Area	120	IAE Storage
45	Oxidizer storage	122	Refrigerating Center
46	Fuel storage	124	Laboratory Building
48	Cooling Tower	125	Cooling Tower
48A	Water Recycling Pump Station	380	Electro-Diesel Station (mobile, 200 kW)
48B	Water Tank	87	Workrooms

Figure 6-5. Area 31 Partial Facility Lay-Out

**Building
40/40D, PPF**

Buildings 40/40D at Area 31 are used for non-hazardous payload processing. Building 40 has three principal work areas, Area A, B and C, that are shown in Figure 6-6. The SC and equipment are brought into Area C from the airport, unloaded and transitioned into building 40D, room 119 for processing. Rooms 119, 119A and 119B in Building 40D are the usual locations for SC processing and check out prior to fuelling, and are shown in Figure 6-7.

After the SC is fueled in Building 44 (see below), it is returned to Building 40, Area A for the beginning of joint operations. In Area A, the SC will be mated to the spacecraft adapter and then to the Block DM in the Zenit-3SLB configuration. This unit will then be rotated to horizontal and encapsulated. For the Zenit-2SLB configuration, the SC will be mated to the spacecraft adapter and intersection bay, and then rotated to the horizontal position for encapsulation.

**Building 40D
Office areas,**

Air-conditioned office facilities are provided at Site 31. These facilities provide private office and conference space for resident spacecraft personnel teams, including separate office space for the spacecraft manufacturer and satellite customer. International data and voice communications circuits are available.

**Building 44,
HPF**

The SC is fueled in the Hazardous Processing Facility, Building 44, located about 300 meters from Building 40/40D. Transfer of the SC back and forth is accomplished inside a conditioned container. A layout of Building 44 is shown in Figure 6-8. Key features of Building 44 include:

- Clean tent preserving Class 100,000 conditions for the SC
- Control room with blast-hardened bay window overlooking the fuel island and clean tent
- Fueling island with spill containment system, hazardous vapor monitors and emergency egress doors
- Communications, fire-fighting and emergency egress systems
- Supplies of clean water, liquid nitrogen and facility air
- Breathing air systems for SCAPE
- Changing rooms

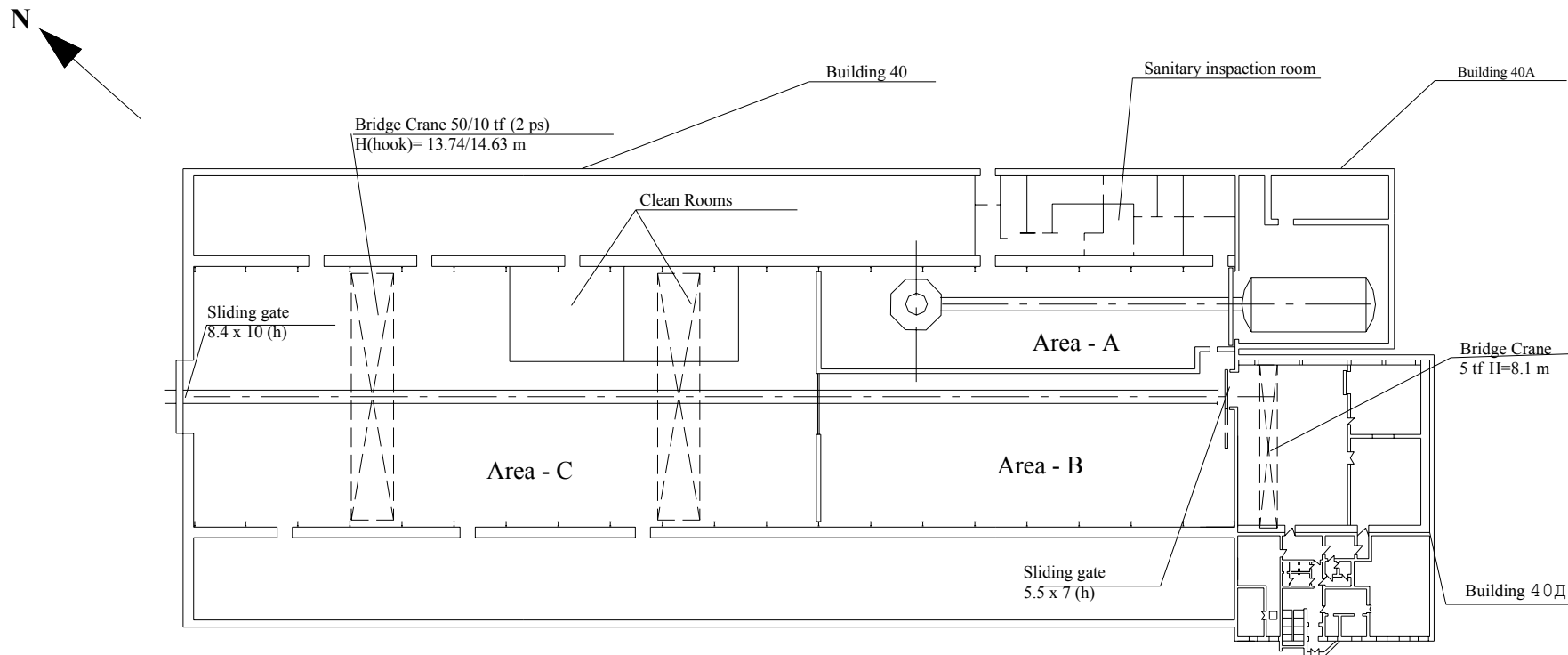


Figure 6-6. Lay-out of Buildings 40 and 40D

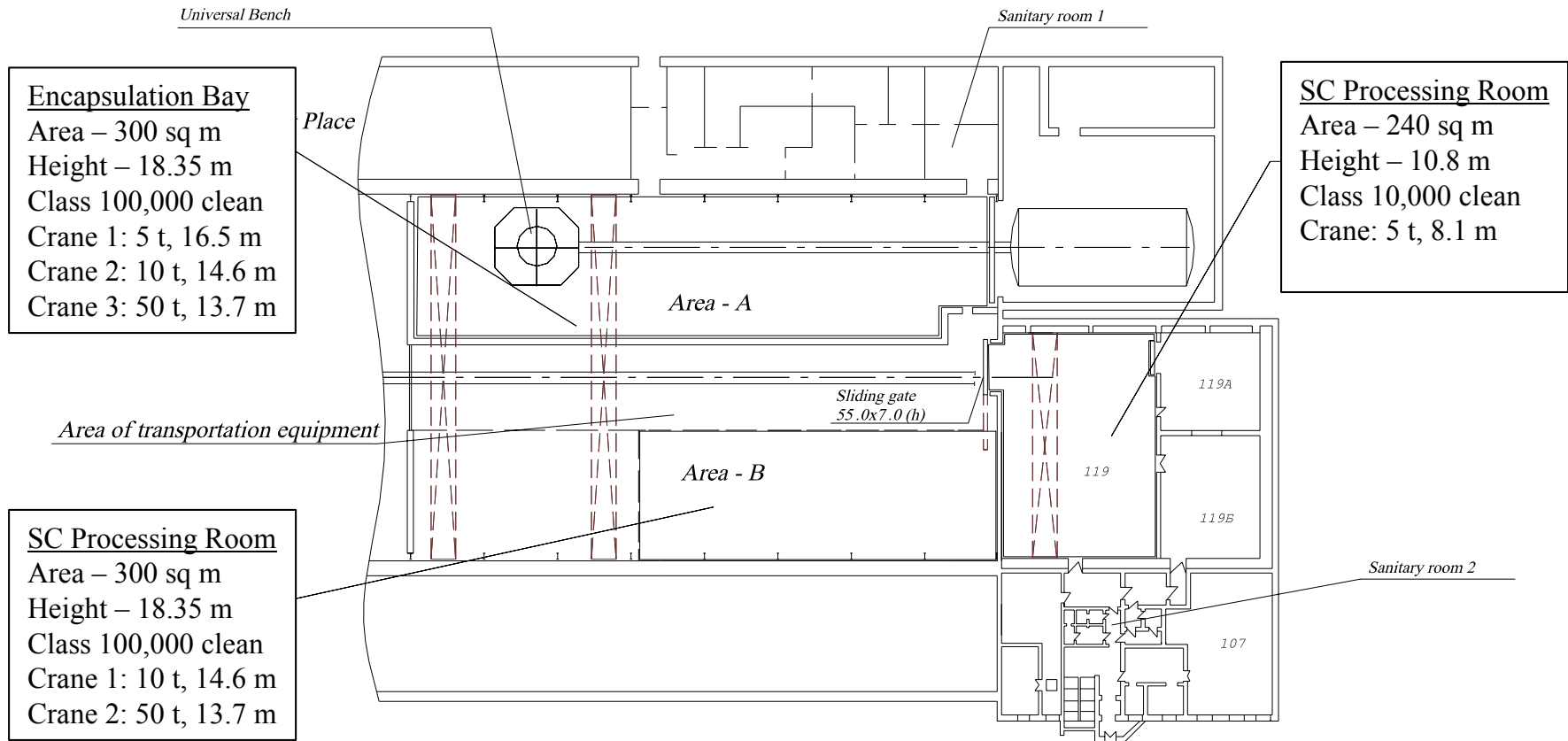


Figure 6-7. SC Processing and Joint Operations Area in Buildings 40 and 40D

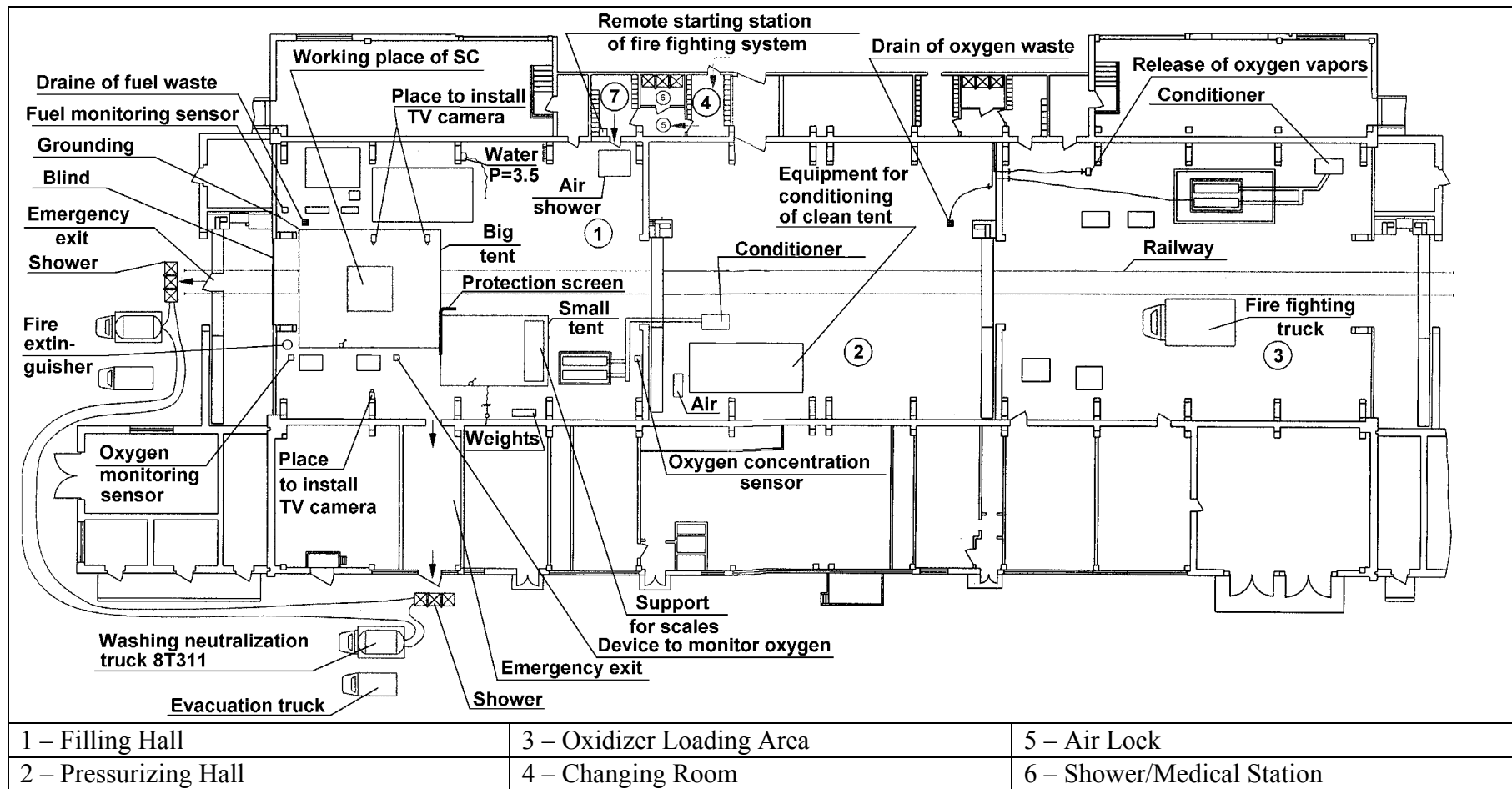


Figure 6-8. Hazardous Processing Facility, Building 44, at Site 31

6.3 Site 254 Payload Processing Facility

Overview Site 254 will become the primary spacecraft processing facility for Land Launch after various upgrades and improvements have been completed. The upgrades include an additional processing/fuelling cell adjacent to an existing building. A layout of the existing PPF with the proposed processing cell is shown in Figure 6-9.

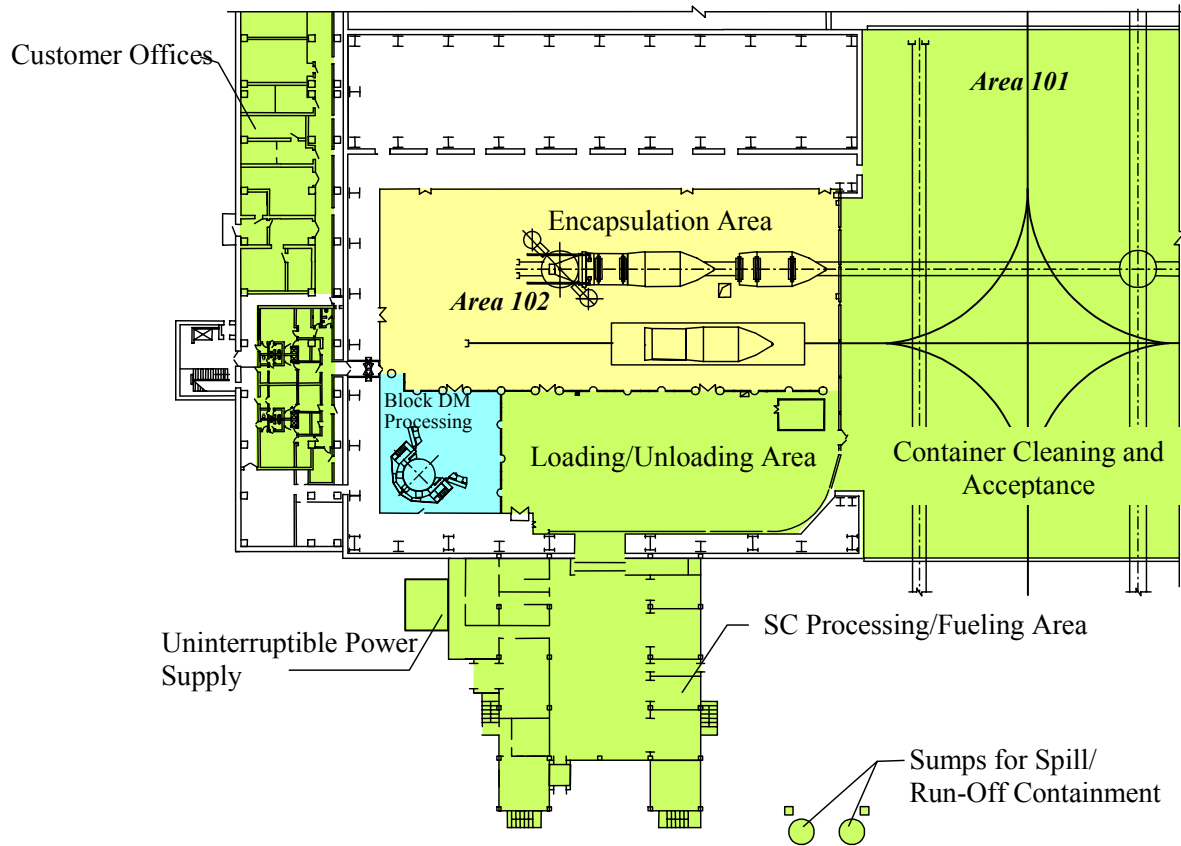


Figure 6-9. Lay-out of SC PPF at Site 254 with proposed adjacent building

Site 254 PPF layout

The main areas of the PPF for the SC are 101, 102 and the proposed new processing cell. Upon arrival from Yubileini, the SC container and equipment are off-loaded in Area 101 that is located in the central bay of the PPF. Cleaning and acceptance of the cargo is performed in Area 101. The proposed new processing area is located adjacent to Area 102. All SC autonomous operations are performed in this cell. Integrated operations occur in Area 102 as illustrated in Figure 6-10.

Site 254

The PPF is equipped with systems to support all SC processing. Major PPF

PPF features

technical systems include:

- Power supply, 380/220 V, 50 Hz; 280/120 V, 60 Hz
- Compressed gases (air, nitrogen, helium)
- Conditioned air
- SC processing area
- SC fueling area, including remote control room
- SC storage room
- Oxidizer storage room
- Control rooms for spacecraft ground support equipment
- Garment change rooms with personnel airlock
- Encapsulation area
- Office areas for spacecraft personnel



RSC Energia Photo

Figure 6-10. Encapsulation Operations in Site 254 Room 102

6.4 Zenit Technical Complex Site 42

Overview

The Zenit-TM technical complex located within Site 42, which includes the launch vehicle assembly and testing Building 41 (Figure 6-11), is used for:

- Standalone integration and testing of the Zenit stages
- Mating of the Zenit with the Ascent Unit (Zenit-3SLB) or with the Payload Unit (Zenit-2SLB), to form the Integrated Launch Vehicle (ILV)
- Integrated ILV testing
- ILV loading onto the transporter/erector, prior to moving to the launch complex for launch

The complex also includes office space for customer personnel, an equipment room, and a clean room.



SDO Yuzhnoye Photo

Figure 6-11. North Rail at the Zenit Technical Complex, Site 42

Integration Area Layout/Features

Building 41 is 120 meters long and 60 meters wide, with three parallel sets of floor-mounted rails. The center rails are used for hardware delivery into and out of the building. The rails on the north side are used for launch vehicle integration operations, while the south rails are currently used for hardware storage. Two traveling bridges each have two cranes, with 50-tonne and 10-tonne capacities. Straddling the north side rail is the clean room (Figure 6-12) that is used for mating the Ascent Unit/PLU to the Zenit second stage. The environmental parameters of this clean room are defined in Section 4. While the fairing is in the clean room the customer has the option of accessing the spacecraft through doors in the fairing. Stands and ladders are available if required.



SDO Yuzhnoye Photo

Figure 6-12. Clean Room at Area 42

Spacecraft Equipment Room

An equipment room is available for customer use in Building 41, equipped with the power supplies and the umbilical connections to the spacecraft that are defined in Section 5.

Customer Office Areas Air-conditioned customer office facilities are provided at in Building 41, Site 42. These facilities provide private office and conference space for resident spacecraft personnel teams. The customer is provided with local and international telephone communication, internal technological communication, broadcasting communication, access to data transmission channels within Baikonur cosmodrome as well as to the international communication channels from Site 42.

6.5 Zenit Launch Complex (LC) – Site 45

Overview A general lay-out of the Zenit launch complex is shown in Figure 6-13. It consists of two adjacent launch pads supported by shared infrastructure, including propellant tank farms, bunkered launch control complex, and control equipment. Land Launch employs the operational #1 launch pad for both Zenit-3SLB and –2SLB missions. Many features are nearly identical to the ones found on Sea Launch, including launch pad, auto-coupling and fueling systems, the transporter/erector and the control system.

Launch Complex Automated Systems Launch operations are highly automated on Land Launch just as on Sea Launch. This has many advantages including:

- short time spent on the pad (approximately 28 hours, unless the customer needs more time for spacecraft testing)
- inherent safety to personnel, since there is no need to physically approach the launch vehicle
- high launch-on-time probability

If the launch process does experience an anomaly requiring termination, it does so automatically, assuring safety of the launch vehicle, spacecraft, and launch complex. If they are needed, launch vehicle de-fueling operations are also implemented remotely from the control post.

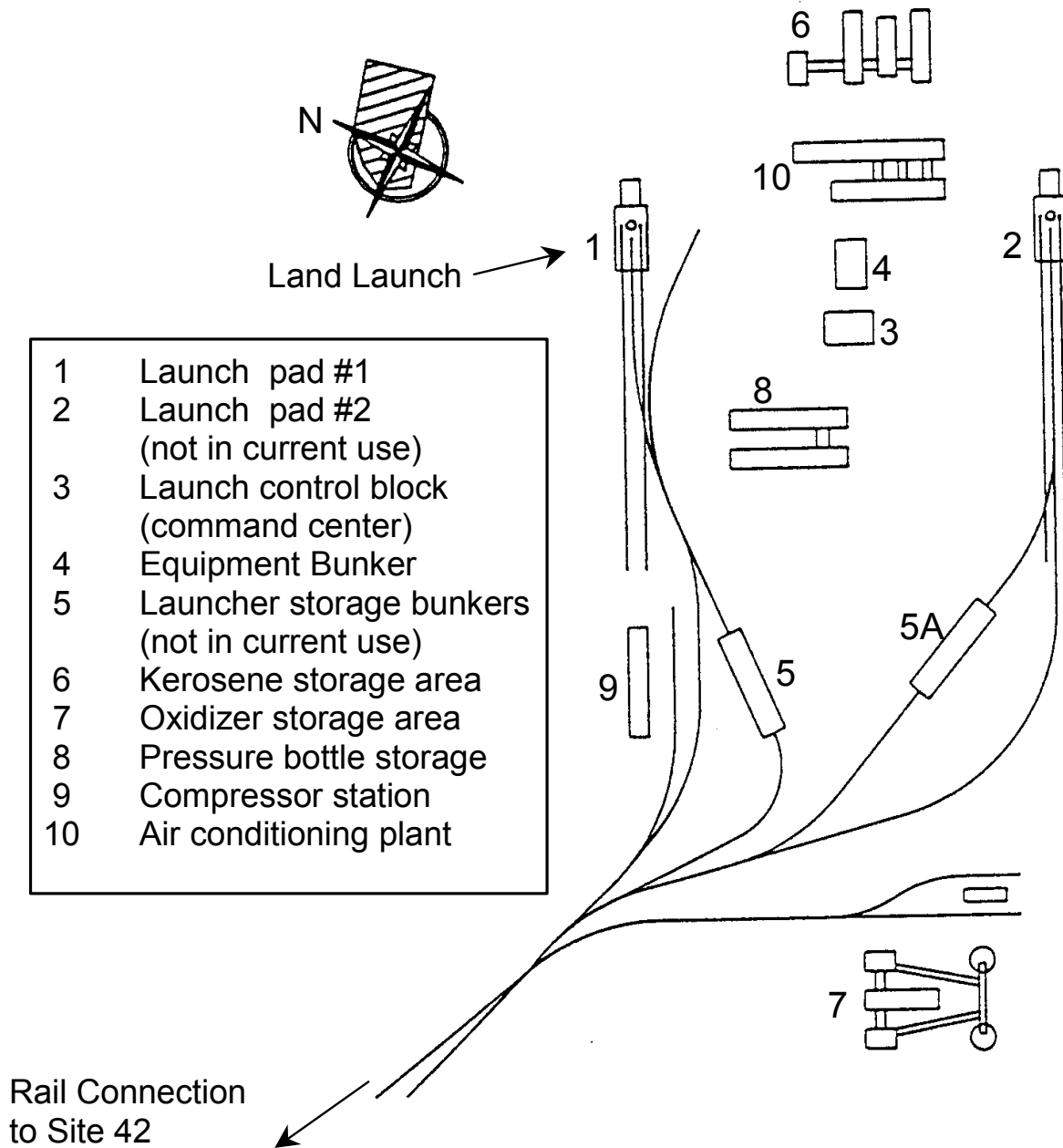


Figure 6-13. Lay-out of the Zenit Launch Complex, Area 45

Customer EGSE Room (Bunker)

Umbilical connection to the spacecraft (described in Section 5) is provided via the cable mast connected to the Zenit second stage and is disconnected at lift-off of the ILV. RF connection to the spacecraft is made through RF windows in the fairing, and also described in Section 5.

The customer EGSE for connecting to these umbilical and RF links is positioned in room 114, an underground equipment room located near the launch pad (Figure 6-14). Room 114 is 10.5 meters by 5.6 meters in size. Though it is in the “unmanned area” during launch final countdown, it is well protected from the environment generated by the launch.

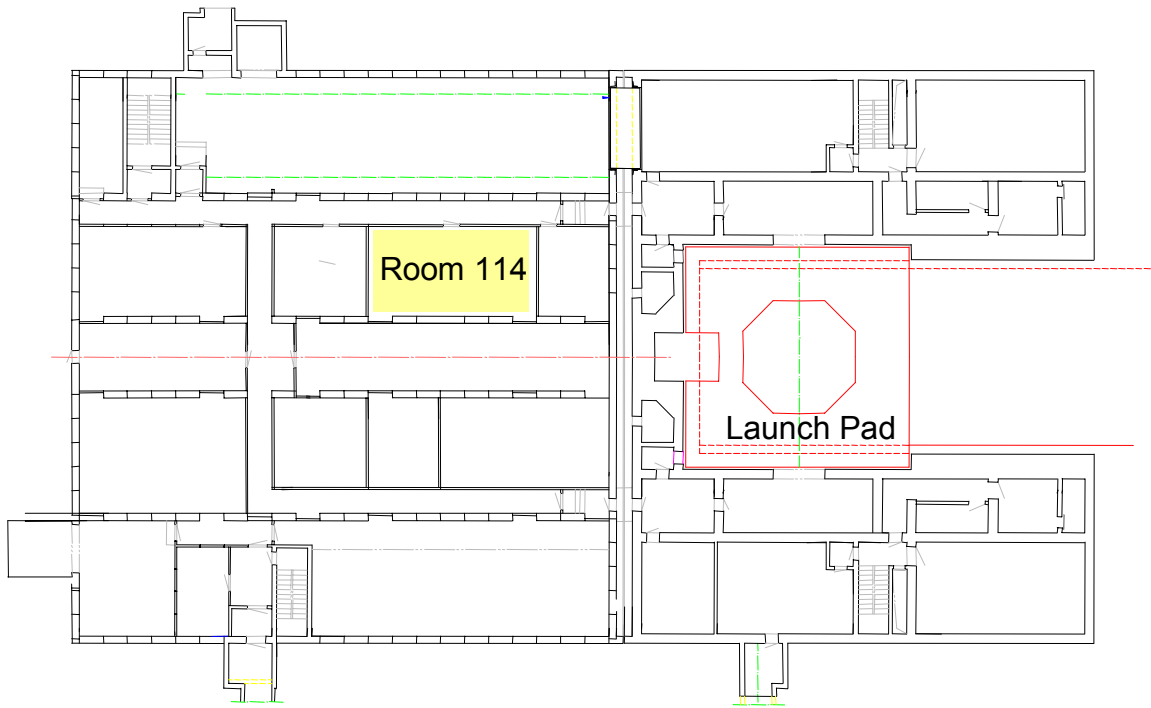


Figure 6-14. Location of Room 114 (Customer EGSE Room)

Command Center

During pre-launch and launch, SC personnel are located in the Command Center (CC), in rooms 131, 132 and/or 137 as shown in Figure 6-15. Each of these rooms is more than 60 square meters in size. Customer areas in the CC are equipped with:

- fire and environmental control systems
- CCTV monitoring of the launch pad and the ILV
- connections to spacecraft EGSE in the bunker, for monitoring of SC parameters during the countdown
- connections to the voice net for customer polling during countdown

The CC is two levels down inside a reinforced concrete underground building that provides protection for personnel during launch.

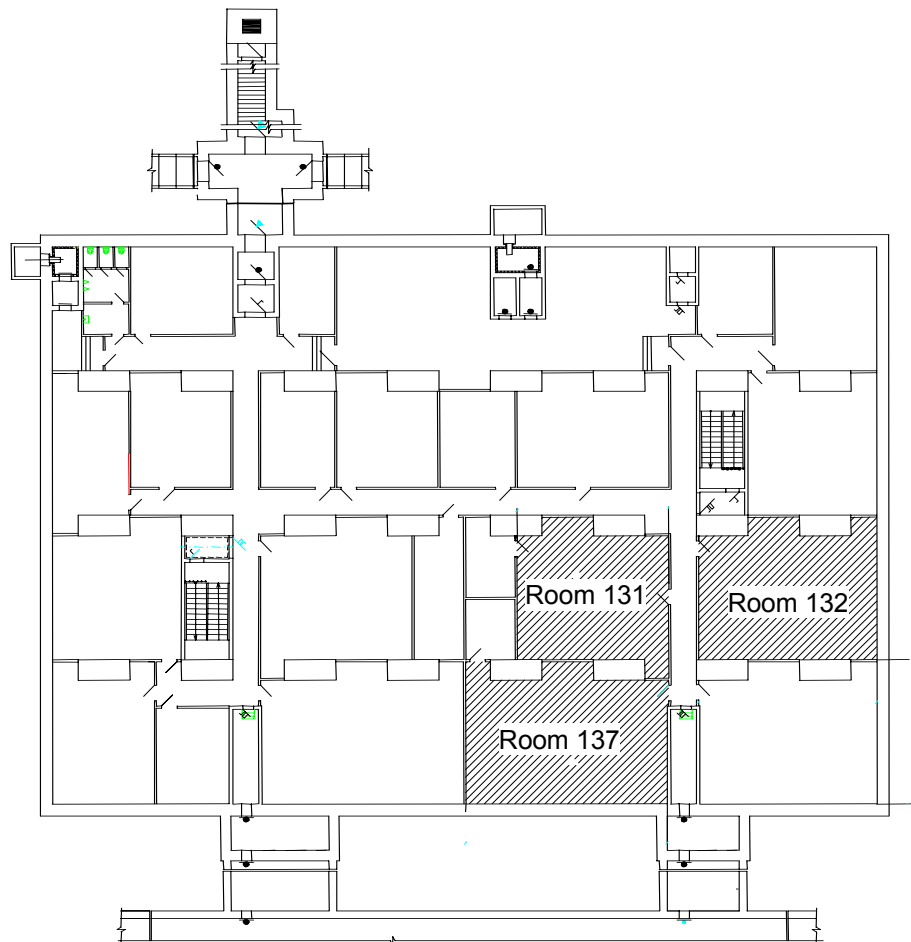


Figure 6-15. Customer Location Options in the Launch Command Center

6.6 Cosmodrome Amenities

Visa and Access Authorization	Land Launch supports customers in obtaining entry visas to Russia by providing the written invitations. To travel to Baikonur cosmodrome it is necessary to obtain a double or multiple visa. Land Launch also provides customer representatives with access to the Cosmodrome as well as badges to the required facilities.
Customs Clearance	Land Launch supports the customer in obtaining customs clearances at all ports of entry and exit as required for the transport of spacecraft and associated GSE. According to the existing customs regulations, the SC and associated GSE will be brought into Kazakhstan as temporary imports (for re-export) and therefore exempt from duties. Nominal administrative fees may be associated with customs clearance in Russia. If so, such fees are the responsibility of the customer. Any customs or export/licensing processes (export license authorization) in the customer's country of origin for equipment and propellants are the responsibility of the customer. The customer is also responsible for providing all associated packing lists and invoices.
Transportation	All work-related transportation of customer personnel and equipment is provided, starting from arrival at the local airport until departure from the airport. All vehicles for personnel are equipped with air-conditioning and heating systems. If necessary, additional vehicles (e.g., VIP transportation) may be rented in Baikonur. Upon request, and preferably one day in advance, Land Launch can provide transportation to meet atypical customer needs, including night shifts.
Consumables	The customer will be provided in the PPF and/or HPF with de-ionized water, ethyl alcohol, compressed air for tool operation, pressurized nitrogen and helium, breathing air system for SCAPE and clean room garments. The customer should provide his own safety-critical equipment such as SCAPE.
Security	Around-the-clock security is ensured to preclude access of unauthorized personnel to the SC. This coverage commences with SC arrival to the Cosmodrome Baikonur airport through launch.
Schedules	Customers are provided with daily and workweek schedules. The typical workweek is six days, Monday through Saturday. Additional working time or other daily/weekly schedules can be arranged on a case-by-case basis.

External Communications

The customer is provided with local and international telephone/facsimile communication, e-mail and internet access, and access to allotted commutated ground and satellite international channels to transmit data between Baikonur cosmodrome and the SC customer control center. Usage fees will be coordinated in advance.

Medical Care

During the launch campaign, Land Launch provides continuous access to a medical staff that can provide treatment to sick or injured personnel. Land Launch has the capability for an emergency medical evacuation to the United States or Europe if required. The medical center for providing the first treatment is located at Site 254 and at a clinic at Site 2Zh located two kilometers from Site 254.

Accommodations and Dining

Hotel accommodations are available at the Sputnik hotel (<http://www.sputnikhotel.com/>), located in the city of Baikonur, and on base in hotels at Site 2Zh near site 254. The Sputnik Hotel offers 120 comfortable rooms and five suites, one restaurant, a bar, a fitness center, a conference hall, offices, a swimming pool, a sauna, a gymnastic hall, a hairdresser, mountain bikes and a variety of other amenities. The hotels at 2Zh (Figure 6-16) accommodate up to 350 people in comfortable single and double rooms. Site 2Zh also features a café-canteen, a medical clinic, the Baikonur museum and the original buildings used by Yuri Gagarin and Academician Korolev – which upon special arrangement can be toured and photographed.



Figure 6-16. Hotel 1 at Site 2Zh Near the Site 254 PPF

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