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PHOTOGRAPHIC INTERPRETATION REPORT

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CHRONOLOGICAL DEVELOPMENT OF
SELECTED SOLID PROPELLANT FACILITIES
AT THE MUNITIONS AND CHEMICAL COMBINE
K. KIROV NO 98
PERM, USSR

FEBRUARY 1967
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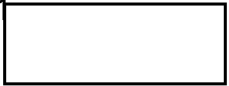
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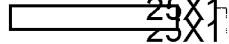
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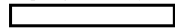
ERRATA

In this publication, the following corrections should be inserted:

Page 1, fifth paragraph, third line, Figure 3 should read Figure 4

Page 5, Figure 3, item 20 should be screened gray for

Page 6, Table 2, item 13, Date Considered Complete should read



Page 7, Figure 4, item 17 should be screened blue-gray for

Page 8, Middle column, third line, Figure 5 should read Figure 7

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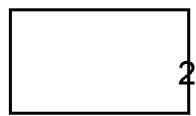
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INTRODUCTION

This report, one of a series of studies of the chronological development of Soviet solid propellant production areas and their associated rocket motor test facilities, is concerned with selected portions of the Munitions and Chemical Combine K. Kirov No 98 [redacted] located at 57-58N 055-54E on the north bank of the Kama, approximately 10.5 nautical miles (nm) east of Perm, USSR (Figure 1).

This combine is quite extensive both in the physical area and in the variety of products that can be manufactured there. The principal areas of the combine that have been identified include a conventional propellant production area with single- and double-base propellant production capability, a large explosive storage area, a solid propellant rocket motor test facility, and 2 recently developed areas designated as the Advanced Solid Propellant Production Facility and the Modified Solid Propellant Plant (Figure 2).

This report will deal with the last three areas: the 2 recently developed propellant production areas and the ancillary rocket motor test area. It will therefore be sufficient to say that the majority of the remaining areas of the combine were present on the first photographic coverage and, with one exception, there have been no major or significant construction changes in these areas since [redacted]. The one exception has been the identification of a casting facility near the double-base propellant area. This facility, along with a series of 5 contiguous offset buildings also identified in this area, appeared to be under construction in mid-[redacted] and was considered to be complete by [redacted]. This facility and building arrangement are similar to ones observed at Biysk, Krasnoyarsk, Kamensk-Shakhtinskiy, and Sterlitamak solid propellant plants. 1/

A small rocket motor test cell and blast deflector were identified on photography of [redacted] in the south corner of the old shell test range which is located southeast of the Rocket Motor Test Facility. The cell is 45 by 25 feet with a 40-foot flared tube at the firing end. The blast deflector is located approximately 150 feet from the test cell. Although the existence of this facility can be traced back to [redacted] the quality of photography did not permit its

identification as a test facility until 4 years later. Data concerning structures at the Advanced Solid Propellant Production Facility (Table 1, Figure 3), Modified Solid Propellant Plant (Table 2, Figure 3), and the Rocket Motor Test Facility (Table 3, Figures 5-7) were derived from 22 photographic missions which covered the Munitions and Chemical Combine K. Kirov No 98 between [redacted]. This data is summarized on layout drawings of these facilities in which structures are color coded to show the chronology of construction and on tables associated with the drawings. In many instances the determination of starting and completion dates of construction could not be accurately assessed due to intermittent photographic data. In addition, the completion or operational status of various structures could not be determined with a great degree of certainty. The photography was of particularly poor quality and small scale during the 1961-63 period, accounting for items listed as observed and completed on the same date.

features, such as the perimeter outlines of the Modified Solid Propellant Plant and the Rocket Motor Test Facility. The blast deflector for the horizontal test cell (item 14, Figure 7) in the latter facility may have been present at this time.

1962

Construction had not begun on the Advanced Solid Propellant Facility at this time, but the major buildings in the Modified Solid Propellant Plant were discernible on photography of [redacted]. These buildings appeared complete and were assumed to be operational (Figure 4). The Rocket Motor Test Facility, which is separately secured and contains a horizontal test cell (item 14, Figure 7) and a large blast deflector (item 15, Figure 7), was identified, suggesting that solid propellants were being produced and tested at the chemical and munitions combine at this time. Other significant buildings observed at the facility included items 5-7, 11, and 12, Figure 7.

1963

The new Advanced Solid Propellant Facility was growing at a rapid pace when observed in [redacted]. Facilities under construction included a curing building (item 8, Figure 3), an administration section (items 39-41, Figure 3), an oxidizer section (items 32 and 36, Figure 3), 2 casting buildings (items 20 and 27, Figure 3), and the associated control houses. Improved photography allowed identification of 2 additional revetted buildings (items 31 and 32, Figure 4) in the Modified Solid Propellant Plant, where new construction included a new administration/engineering building (item 13, Figure 4) and the expansion of a nearby fabrication/assembly building (item 4, Figure 4) which appeared to have been finished in [redacted].

1964

During this year 17 major buildings were constructed at the advanced propellant facility. They included such structures as the case preparation building (item 28, Figure 3), fuel preparation sections (items 17 and 18, Figure 3), a possible pre-mix building (item 25, Figure 3), curing buildings (items 5 and 6, Figure 3) and the propellant blend/mix buildings (items 19 and 26, Figure 3).

HIGHLIGHTS

1961

The combine was first observed on [redacted] photography of [redacted]. This photography was of very poor quality and could be used only for the recognition of gross

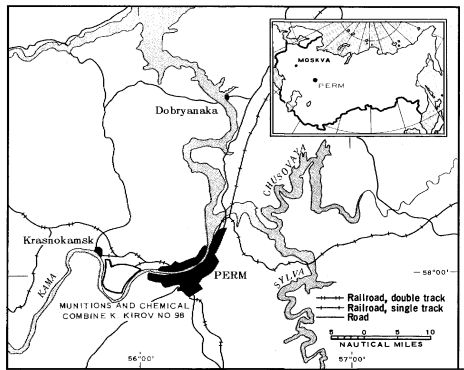


FIGURE 1. LOCATION MAP.



Construction of a casting building (item 13, Figure 3) was first observed in [redacted] Revetments for the various production buildings were begun in this period and an extensive rail network was also discernible for the first time. Another utility, an electrical substation, was built outside the security wall immediately west of the blend/mix buildings.

Early [redacted] photography revealed the completion of a heavily revetted building (item 42, Figure 4) outside the existing perimeter fence on the west side of the Modified Solid Propellant Plant. This structure bears resemblance to a casting building identified at the Kamensk-Shakhtinskiy facility. A rail spur was extended into this area. By [redacted] a second revetted structure (item 41, Figure 4) was under construction. When complete in [redacted] this building was noted to be similar to a curing building (item 6, Figure 3) in the Advanced Solid Propellant Facility.

A possible assembly and checkout building (item 4, Figure 7) was the only major structure constructed at the Rocket Motor Test Facility during 1964. The building, [redacted] feet high, appeared to be externally complete in [redacted]. At this time it was separately secured and this wall was not removed until the middle of 1966. [redacted] of this year, construction of a rail bed was started north of the Rocket Motor Test Facility; when eventually complete, it would link the test facility to the older conventional propellant area.

1965

Construction continued steadily during this year at the Advanced Solid Propellant Facility. However, the construction rate of the casting building (item 13, Figure 3) had slowed down. Personnel bunkers and small support buildings were observed on the photography for the first time. Two large assembly buildings (items 9 and 10, Figure 3), in the early stages of construction in [redacted] [redacted] were nearly complete when observed in [redacted]. There were no significant developments at either the Modified Solid Propellant Plant or the Rocket Motor Test Facility during 1965.

1966

Photography of [redacted] revealed the construction of an

additional propellant blend/mix building in the Advanced Solid Propellant Facility. Pipelines were discernible for the first time and a wall had been built to isolate the more hazardous sections from the remainder of the facility. Ground scarring indicated that at least 3 new structures are to be erected in this area in addition to those already in progress.

Construction activity was observed at the Modified Solid Propellant Plant for the first time in over a year. The center of activity is ostensibly in the west-central portion of the plant immediately west of the propellant processing buildings (items 34 and 35, Figure 4). A rail-served building (item 10, Figure 7) and a small support building (item 2, Figure 7) represent the only significant physical changes at the test facility during 1966.

ADVANCED SOLID PROPELLANT FACILITY

The Advanced Solid Propellant Facility (Figure 3) is located at the northwest side of the munitions and chemical combine, immediately north of the Modified Solid Propellant Plant. A comparison of the advanced solid propellant production facilities at Perm, Kemerovo, and Kamensk-Shakhtinskiy has resulted in the functional interpretation of major buildings and structures. Because detailed descriptions of several similar types of major production buildings have already been done, 2/ they will not be repeated in this report. In addition to the fact that these plants comprise similar building configurations, they also share the obvious advantages of service and support facilities by having been constructed adjacent to an older propellant/explosives combine. However, differences do occur in spatial arrangement, due, perhaps, to topography or the land area available for a construction program; and in the number of buildings utilized for a specific function. The most notable example of this is the current construction of additional mixing and casting units at Perm; unlike the other advanced solid propellant facilities, which have 2 production lines, the Perm facility will have 3.

MODIFIED SOLID PROPELLANT PLANT

The Modified Solid Propellant Plant (Figure 4) consists of 32 processing buildings, the majority of which are revetted, and a support section on the north side of the facility. The support section, which is analogous to the one at the Biysk R&D facility, comprises a large fabrication/assembly building (item 4, Figure 4), 2 large L-shaped administration/engineering buildings (items 13 and 25, Figure 4), a T-shaped building under construction (item 26, Figure 4), and 2 other large rectangular workshop/storage buildings (items 1 and 2, Figure 4). A specific description of the functions of the buildings in the remainder of the facility is difficult because of the lack, until recently, of any photography with sufficient detail, and also the overall diversity and the complexity of the plant area itself. Thus, Table 2 gives only a general description of the buildings, derived from a few of the most recent photographic coverages.

ROCKET MOTOR TEST FACILITY

The Rocket Motor Test Facility (Figure 7) is located southwest of the production areas. The Perm facility represents the only solid motor test facility in which physical activity was increasingly evident on recent photography. This activity includes the movement of numerous rocket motor casings into the main test area: at least 13 casings, ranging in size from [redacted] to 25 by 5 feet, were identified adjacent to the large horizontal test cell (item 14, Figure 7) on photography of [redacted]. Other possible casings were observed at the small rocket motor test building (item 6, Figure 7). Measurements of random samplings of these possible casings revealed objects 20 [redacted] feet in length with a diameter of approximately [redacted] to 5 feet. Also observed in the Rocket Motor Test Facility at this time were 4 large rail cars, measuring [redacted] feet, and 6 smaller cars. Previous observations of rail stock were in [redacted] (at least 9 rail cars) and in [redacted] [redacted] at least 8 cars).

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FIGURE 2. PRINCIPAL AREAS OF THE MUNITIONS AND CHEMICAL COMBINE K. KIROV NO 98, PERM, USSR.

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Five of the more important structures at the Rocket Motor Test Facility are described in detail below.

HORIZONTAL TEST CELL

Of the 8 major structures in the Rocket Motor Test Facility, the most evident is the large rail-served horizontal test cell (item 14, Figure 7; Figure 5) on the west side of the facility. The test building itself measures [redacted] and is approximately 30 feet high. The exhaust end of the test cell is flared, increasing from a 25-foot diameter to a final diameter of [redacted]. A large concrete-faced blast deflector is located 310 feet to the rear of the test cell. The deflector, rising at a slight angle, is 260 feet wide at the base and 130 feet wide at the top. Although

similar test cell configurations have been observed at Sterlitamak, Krasnoyarsk, Biysk, and Kamensk-Shakhtinskly, there are slight dimensional and physical differences which distinguish one test cell from another. The expansion of a small support building and 2 other related small buildings represents the only recent construction activity observed.

There was no evidence of test firing through 1964; however, darkened areas on the snow indicating possible test activity were observed on photography of [redacted]. Weathering of the concrete facing on the blast deflector, indicative of test activity over a long period of time, was noted in [redacted]. Large-scale photography of [redacted] has given first firm evidence of test firing at the horizontal test cell (Figure 7).

ISOLATED TEST POSITION

The isolated test position (item 16, Figure 7) is located 1,800 feet southwest of the main rocket motor facility at the edge of the Kama River. Separately secured and serviced by a single road, the test position consists of a U-shaped revetment with a large earth mound placed perpendicular to the open side, creating a blast deflector. An earth-mounded bunker is located on the east side of the revetment and is connected to the test position by an earth-mounded walkway/cableway. The test position is relatively unsophisticated in that the test area is unsheltered from the weather and utilizes a possible test bench/thrust pad for holding the rocket during hot firings. The length of the test position is 240 feet measured from the closed end of

Table 1. Function/Description, Dimensions, Roof Cover and Chronology of Structures at the Advanced Solid Propellant Production Facility, Perm, USSR

Table with 12 columns: Item No, Function/Description, Dimensions* (Length, Width, Height), Roof Cover (sq ft), Date First Observed, Date Considered Complete, Comments, Item No, Function/Description, Dimensions* (Length, Width, Height), Roof Cover (sq ft), Date First Observed, Date Considered Complete, Comments. Rows 1-42 describe various buildings and structures.

*Horizontal measurements are accurate to within ± 5 ft; vertical measurements are accurate to within ± 15 ft.

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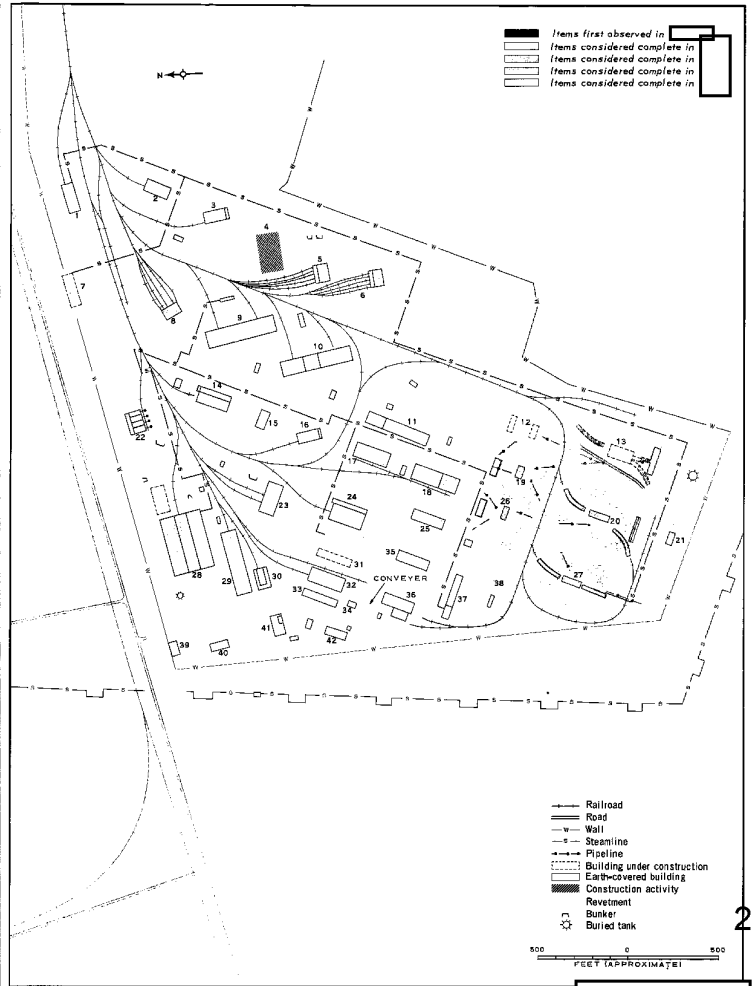


FIGURE 3. ADVANCED SOLID PROPELLANT PRODUCTION FACILITY, [redacted]

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the revetment to the base of the deflector. Blast marks, which covered the entire length of the revetment, have been noted on photography of [] providing first evidence of testing activity at the isolated test position.

An isolated test position has also been identified in the rocket motor test facility at Biysk. Located southwest of the main test area, this facility is quite similar to the one at Perm; it also consists of a large U-shaped revetment and a small test structure in the revetment. However, unlike Perm, the Biysk site lacks a blast deflector; instead, the blast from test firings is directed across a road into the base of a ridge line.

SOLID ROCKET MOTOR TEST BUILDINGS

A rail-served small rocket motor test building (item 6, Figure 7; Figure 6) was identified on large-scale [] photography of []. The identification was made from the initial observation of 4 openings at the north

end of the building, 2 measure [] and the other 2 measure []. These openings are comparable to the design of aircraft engine test cells in that the resultant air blast and exhaust gases from the activated test vehicle are deflected upward and discharged through the openings in the roof at the other end of the test cell. Small rocket motors tested in this building could be fired in a horizontal position similar to aircraft engine test procedure or might be tested in a vertical mode with the rocket firing directly up through the opening.

By using the same process, identification was made of a second possible small solid rocket motor test building (item 7, Figure 7) on photography of []. This building was previously thought to be an assembly and checkout building, similar to H-shaped buildings at other solid propellant test facilities. 1/ The building, rail served, contains several different levels. The overall dimensions for this building are 175 by 145 feet.

These motor test buildings are analogous to ones

observed at Kemerovo and Kamensk-Shakhtinskiy. The building at Kamensk-Shakhtinskiy was first observed in []. This building, located northeast of the large horizontal test cell, measures approximately 110 by 60 feet and is rail served. A pair of openings on its north suggests that there are 2 cells present in the building. In [] a similar building was observed under construction at the Kemerovo test facility. This building measures 115 by 90 feet overall and contains 3 test cells, each served by a separate rail spur. To date the building at Kemerovo is still considered incomplete; a small section on the south side of the building has not been finished.

POSSIBLE INSPECTION BUILDINGS

Three buildings, one in the Rocket Motor Test Facility and 2 in the Advanced Solid Propellant Facility, are apparently involved with the inspection and testing of various products of the solid propellant facility; these buildings

Table 2. Function/Description, Dimensions, Roof Cover, and Chronology of Structures at the Modified Solid Propellant Plant, Perm, USSR

Item No	Function/Description	Dimensions* (ft)			Roof Cover (sq ft)	Date First Observed	Date Considered Complete	Comments	Item No	Function/Description	Dimensions* (ft)			Roof Cover (sq ft)	Date First Observed	Date Considered Complete	Comments
		Length	Width	Height							Length	Width	Height				
1	Workshop/storage bldg							23	Support bldg								
2	Workshop/storage bldg							24	Support bldg								
3	U/I bldg							25	Admin/engineering bldg								
4	Fabrication/assembly bldg							26	T-shaped bldg w/c							Construction has not changed significantly in 8 years on this small T-shaped bldg	
5	U/I bldg							27	Propellant processing bldg							The area was indistinct in 62	
6	U/I bldg							28	Propellant processing bldg							Poss served by multiple rail spurs	
7	U/I bldg							29	Propellant processing bldg							Poss present in 62	
8	Propellant processing bldg							30	Propellant processing bldg							Poor-quality photography in this area in 62	
9	Propellant processing bldg							31	Propellant processing bldg								
10	U/I bldg							32	Propellant processing bldg								
11	Propellant processing bldg							33	Support bldg								
12	Support bldg							34	U/I bldg								
13	Admin/engineering bldg							35	U/I bldg								
14	Propellant processing bldg							36	Propellant processing bldg								
15	Propellant processing bldg							37	U/I bldg								
16	Propellant processing bldg							38	Prob processing bldg								
17	Propellant processing bldg							39	Prob processing bldg								
18	Propellant processing bldg							40	Poss casting bldg								
19	Propellant processing bldg							41	Curing bldg								
20	Propellant processing bldg							42	Casting bldg								
21	Propellant processing bldg								Utilities								
22	Propellant processing bldg								Rail lines								
									Seamlines								

*Horizontal measurements are accurate to within ± 5 ft; vertical measurements are accurate to ± 15 ft.

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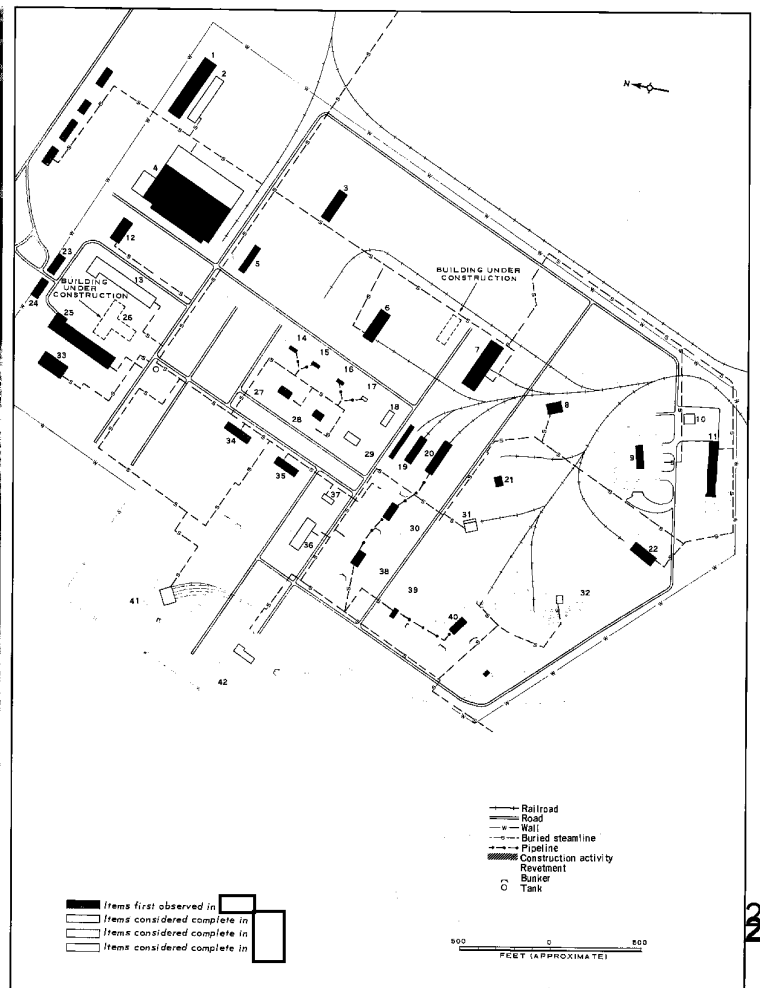


FIGURE 4. MODIFIED SOLID PROPELLANT PLANT.

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Table 3. Function/Description, Dimensions, Roof Cover and Chronology of Structures at the Rocket Motor Test Facilities, Perm, USSR

Item No	Function/Description	Dimensions* (ft)			Roof Cover (sq ft)	Date First Observed	Date Considered Complete	Comments	Item No	Function/Description	Dimensions* (ft)			Roof Cover (sq ft)	Date First Observed	Date Considered Complete	Comments
		Length	Width	Height							Length	Width	Height				
1	Support bldg								11	Poss inspection bldg							High section 40 ft high During 65 bldg extended on south end Dimensions appear on Figure 5 Prob present as early as [redacted] Outline of area visible in [redacted] (element identified) [redacted] 240 ft from base of rocketment to blast deflector Were present in [redacted] when first discernible on photography Presence of buried structures undetermined until [redacted] when snow covering permitted observation of steel-line pattern
2	Support bldg							12	U/I bldg								
3	Admin bldg							13	Support bldg								
4	Poss assembly & checkout bldg						Clearing for bldg was cut in [redacted] steelwork was visible in [redacted] a storage tank was buried near NE corner of bldg in [redacted] bldg appeared complete in [redacted] as separately secured wall has since been razed Dimensions appear in Figure 6 Newly identified [redacted] by means of openings at rear of bldg	14	Horizontal test cell								
5	U/I bldg							15	Blast deflector								
6	Small rocket motor test bldg							16	Isolated test position								
7	Poss small rocket motor test bldg								Utilities								
8	Support bldg								Railroads								
9	Support bldg								Steamlines								
10	U/I bldg																

*Horizontal measurements are accurate to within ± 5 ft; vertical measurements are accurate to within ± 15 ft.

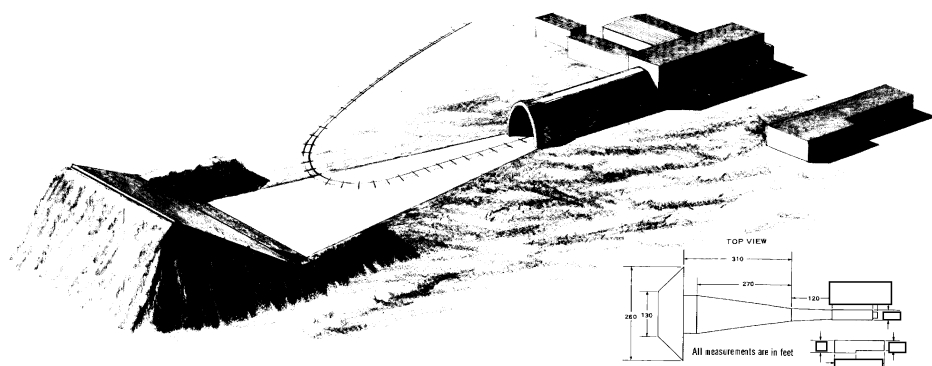


FIGURE 5. ARTIST'S CONCEPTION OF HORIZONTAL TEST CELL IN THE ROCKET MOTOR TEST FACILITY (item 14, Figure 7).

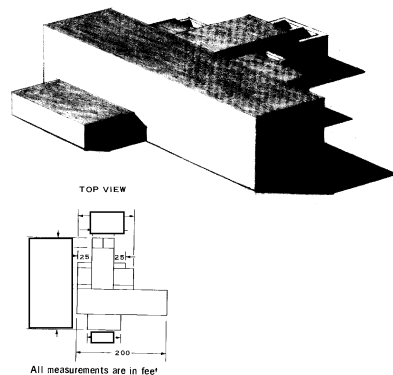


FIGURE 6. ARTIST'S CONCEPTION OF SMALL ROCKET MOTOR TEST BUILDING IN THE ROCKET MOTOR TEST FACILITY (item 6, Figure 7).

are similar to ones observed at Kamensk-Shakhtinskiy and Kemerovo. The function of these buildings appears to be the visual and radiographic inspection of components and assembled motors for flaws or deficiencies, as well as the post-test checks of motors. The rail-served buildings, rectangular in shape, contain a high and a low sec-

tion. All 3 buildings are revetted on the west and south sides. The structure in the Rocket Motor Test Facility (item 11, Figure 5) was first observed in [redacted]. It measures 180 by 55 feet with a low shed section approximately [redacted] feet. Although both inspection buildings in the Advanced Solid Propellant Facility were com-

pleted in [redacted] one (item 24, Figure 3) was begun in [redacted] the other (item 14, Figure 3) in early 1964. Overall dimensions for these structures are similar to those for the building in the Rocket Motor Test Facility. Item 14 (Figure 3) measures [redacted] by 90 feet and item 24 (Figure 3) measures [redacted]

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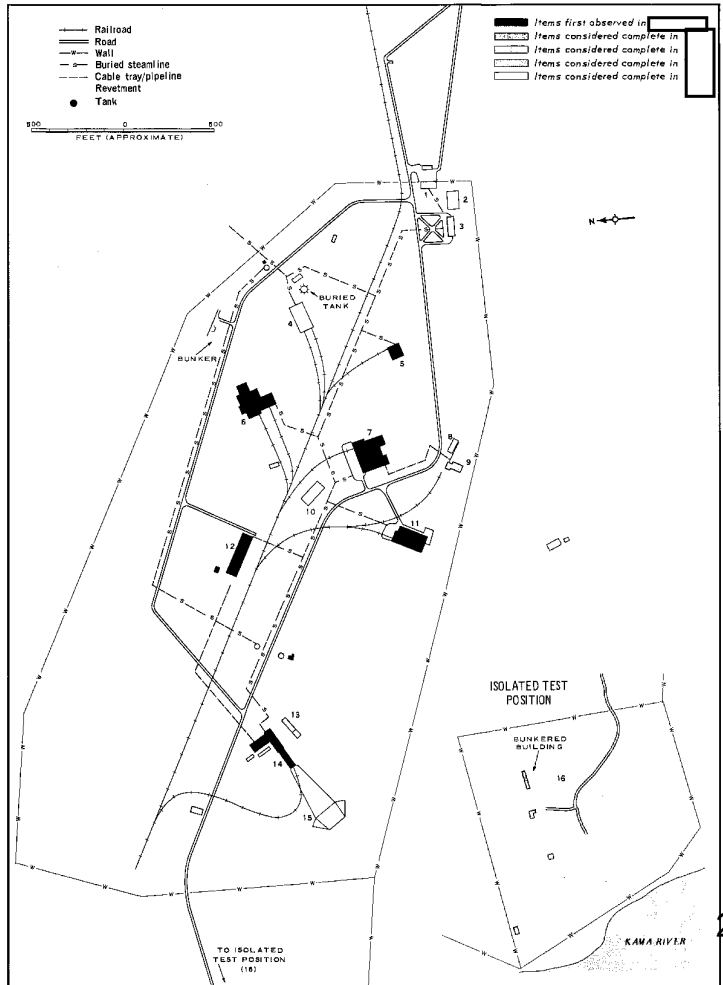


FIGURE 7. ROCKET MOTOR TEST FACILITY.

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REFERENCES (Continued)

MAPS OR CHARTS

ACIC series, scale 1:200,000

DOCUMENTS

- 1. NPIC. [redacted] *Solid Propellant Rocket Motor Test Facilities and Probable Solid Propellant Production Facilities, USSR, Jun 65 (TOP SECRET*
- 2. NPIC. [redacted] *Advanced Solid Propellant Production Area, Chemical Combine No 101, Kamensk-Shakhtinskiy, USSR, Jan 67 (TOP SECRET*

REQUIREMENT

CIA. C-DI5-82,973

NPIC PROJECT

11212/66 (partial answer)

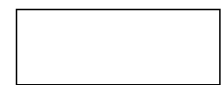
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