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# CHRONOLOGY OF EXPLOSIVES AND PROPELLANT PLANT 55 PAVLOGRAD, USSR

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PHOTOGRAPHIC INTERPRETATION REPORT

# CHRONOLOGY OF EXPLOSIVES AND PROPELLANT PLANT 55 PAVLOGRAD, USSR

JANUARY 1968

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

## SUMMARY

The Advanced Solid Propellant Production Facility of Explosives and Propellant Plant 55, Pavlograd, USSR, is not operational; however, it appears to be in the late stages of construction. When complete, it will possibly have the first continuous composite solid propellant mixing operation in the USSR. In this respect, the Advanced Solid Propellant Production Facility differs from the apparent basic plan from which the other advanced solid propellant production facilities were built. None of the elaborate test apparatus usually found at solid rocket motor production facilities is present at Explosives and Propellant Plant 55; however, a test position located southeast of Pavlograd could serve the facility.

## INTRODUCTION

This report consists primarily of a chronology of the construction of Explosives and Propellant Plant 55, Pavlograd, USSR, with particular emphasis on the development of the part of the plant which is the Advanced Solid Propellant Production Facility. Also included are descriptions of the more significant structures within the Advanced Solid Propellant Production Facility, of other components of the installation, and of possibly related facilities located in the vicinity of Pavlograd.

Explosives and Propellant Plant 55 [redacted] Pavlograd Explosives Plant) is located 2 nautical miles (nm) northwest of Pavlograd, USSR, at 48-33-50N 035-50-40E (Figure 1). The installation consists of the original Explosives Plant 55, known to be in existence in 1943, and the adjoining Advanced Solid Propellant Production Facility, a new addition which has been under construction since 1962 and is still incomplete (Figures 1, 2, 3, and 4). Associated with the plant is an Explosives/Munitions Storage Area located immediately northeast of Explosives Plant 55 (Figure 1).

In the immediate vicinity of Pavlograd is a Test Range, which is approximately 16 nm long and extends southeast from a Rangehead which is located at 48-29-50N 035-56-55E about 6.5 nm southeast of Explosives and Propellant Plant 55 (Figure 1). A Possible Range

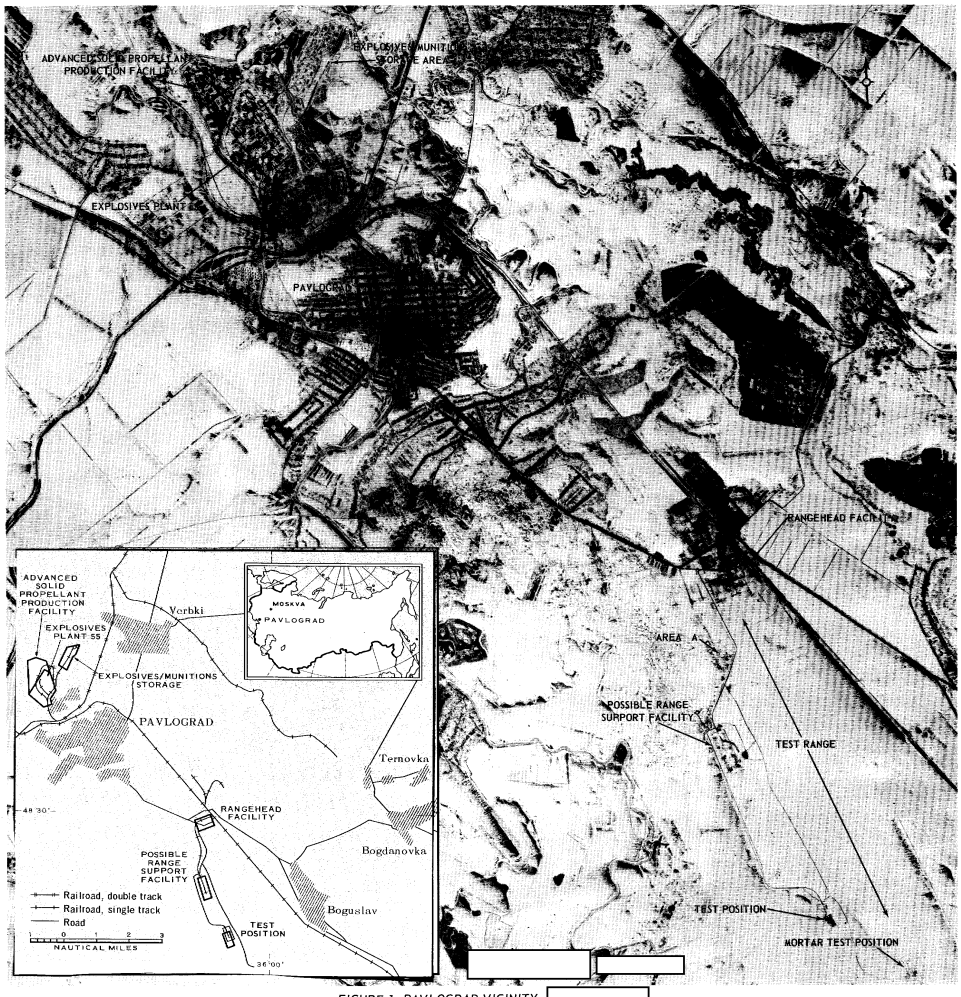


FIGURE 1. PAVLOGRAD VICINITY, [redacted]

Support Facility is located on the edge of the Test Range about 7.75 nm southeast of the plant at 48-27-45N 035-56-55E and a Test Position is located about 1.5 nm southeast of the Possible Range Support Facility at 48-26-25N 035-58-00E (Figure 1). The Test Position (Figure 1) has been in operation at least since 1966 and therefore may not be related to the Advanced Solid Propellant Production Facility which is presently incomplete.

Explosives Plant 55 and its associated Explosives/Munitions Storage Area were observed on 1943 photography of the Pavlograd area. Explosives Plant 55 is enclosed by a continuous wall, is rail served, and produces high explosives, probably TNT, and industrial explosives. When the facility was first observed on [redacted] photography of [redacted] evidence of a new addition was seen adjacent to the northwest side of the original plant. This new addition has been designated as the Advanced Solid Propellant Production Facility. Subsequent [redacted] coverage of the plant, extending through [redacted] has been intermittent, and the earlier small-scale photography was often of poor interpretability. However, several recent photographic reconnaissance missions have obtained coverage of good interpretability, permitting more definitive interpretations and more accurate mensuration of the Advanced Solid Propellant Production Facility than had previously been possible. This report contains 4 tables with functional descriptions, dimensions, and the construction chronology (so far as can be determined) of the principal structures in the Advanced Solid Propellant Production Facility and the Explosives Plant 55 (Table 1), the Rangehead (Table 2), the Possible Range Support Facility and Test Position (Table 3), and the Explosives/Munitions Storage Area (Table 4, accompanying Figure 17). Functional identifications in these tables are based primarily on photographic interpretation. The construction chronology, dates when structures were first observed present and when they were apparently complete, cannot be determined with certainty because of the intermittent coverage and because of the small scale and poor interpretability of some of the photography. No attempt has been made to compile a chronology of the development of road and rail services because these features were frequently not discernible on the earlier photography.

The Advanced Solid Propellant Production Facility, which is not yet operational, appears to be similar to the Advanced Solid Propellant Area of Chemical Combine 101 at Kamensk-Shakhtinskiy, 1/ the Advanced Solid Propellant Production Facility of Munitions and Chemical Combine K. Kirov No 98 at Perm, 2/ and the Advanced Solid Propellant Production Facility of the Ammunition Loading and Explosives Plant Raketa 392 at Kemerovo, USSR. 3/ The design of the Pavlograd facility, however, is apparently a modification of the master plan from which the other 3 facilities were constructed. Although all 4 of the facilities apparently are (or will) be used to produce composite solid propellants, the method used for mixing propellants at Pavlograd apparently will be different in that, when complete, the Pavlograd facility could possibly contain the first continuous solid propellant mixing operation in the USSR.

Highlights of the construction chronology of the Advanced Solid Propellant Production Facility are presented in the first part of the body of this report. Since the designation of that facility was derived, in part, from an analysis of its layout, of its structures, and of similarities of these features to those of the previously identified facilities at Perm, Kemerovo, and Kamensk-Shakhtinskiy, the chronological highlights section of this report is followed by detailed descriptions and illustrations of significant structures in the facility, including comparisons with structures at the other installations. The remainder of this report consists of chronology, descriptions, and illustrations of the range and test facilities, Explosives Plant 55, and the Explosives/Munitions Storage Area.

## HIGHLIGHTS OF CHRONOLOGY OF THE ADVANCED SOLID PROPELLANT PRODUCTION FACILITY

The chronology of the Advanced Solid Propellant Production Facility is considered first in this report because the most significant developments have taken place in that part of the installation. Chronologies of other parts of the installation are considered later in this report. Figure 3 is color coded to illustrate the construction chronology of both the Advanced Solid Propellant Production Facility as well as Explosives Plant 55, and Table 1 contains chronological data on structures in these 2 parts of the installation. In the following paragraphs containing highlights of the chronology of the Advanced Solid Propellant Production Facility from 1962 to 1967, all item numbers refer to items in the appropriate sections of Figure 3 and Table 1.

### 1962

[redacted] photography of poor interpretability revealed 3 revetted possible batch mix/ingredient preparation buildings (items 1 and 3) at the site of the future Advanced Solid Propellant Production Facility.

### 1963

[redacted] photography of poor interpretability showed that rail beds and roads had been extended. Thirteen new buildings were completed during this period. A wall and a dike which had been started the previous year were completed.

### 1964

Two of the revetments for probable casting/curing buildings (items 37 and 39) were partially complete. The revetment for the other probable casting/curing building (item 32) was completed. Six new buildings were constructed during the year.

### 1965

Thirteen new buildings were added, including a possible premix building (item 34), a possible continuous mix building (item 38), and 2 probable casting/curing buildings (items 37 and 39).

### 1966

A probable case preparation building (item 26), a probable lag storage building (item 24), and the revetment around a probable casting/curing building (item 37) were completed.

### 1967

Large-scale photography of good interpretability of [redacted] made possible the identification of the Ad-

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*Table 1. Data on the Advanced Solid Propellant Facility and Explosives Plant 55, Pantagrad, USSR*

*(Item numbers are keyed to Figure 3)*

Note: Horizontal measurements are accurate to within ± 5 feet or 5%, whichever is greater; vertical measurements are accurate to within [redacted] whichever is greater.

| Item | Function/Description | Dimensions (ft) L W H | Roof Cover (sq ft) | Date First Observed & Apparently Complete * | Comments |
|---|---|---|---|---|---|
| ADVANCED SOLID PROPELLANT PRODUCTION FACILITY | | | | | |
| 1-3 | Poss batch mix/ingredient preparation bldgs (3) | | | | Revetted with buried control bldg (see Figure 5) |
| 4 | Support bldg | | | | U/I bldg, [redacted] ft, is located to S side |
| 5 | Support bldg | | | | Bldg has a low bay, [redacted] ft high; rail served |
| 6 | Support bldg | | | | |
| 7 | Poss mandrel removal bldg | | | | Bldg has a low bay, 30 ft high; rail served |
| 8 | Support bldg | | | | |
| 9 | Support bldg | | | | |
| 10 | Prob personnel/storage bunker | | | | Bldg served by 2 rail spurs |
| 11 | U/I bldg | | | | U/C |
| 12 | Prob curing bldg | | | | |
| 13 | U/I bldg, main section Parallel section | | | | |
| 14 | Support bldg | | | | Rail served; a tank, [redacted] dium, is located to SW |
| 15 | Support bldg | | | | Rail served |
| 16 | Prob curing bldg | | | | Bldg has a high bay, [redacted] ft; rail served (see Figure 9) |
| 17 | U/I bldg | | | | Rail served; new construction is evident to the NW |
| 18 | Prob personnel/storage bunker | | | | Served by 2 rail spurs |
| 19 | Support bldg | | | | An Lexhaused bldg covering [redacted] s a large tank are located to the NE & E; an |
| 20 | Support bldg | | | | irregular support bldg cover- ing [redacted] is located to S |
| 21 | Support bldg | | | | Rail served |
| 22 | U/I bldg | | | | End bays are 40 and 25 ft high; rail served |
| 23 | Poss nondestructive test bldg | | | | Partially revetted; bldg has a low bay, 25 ft high; rail served |
| 24 | Prob lng storage bldg | | | | Rail served |
| 25 | Support bldg | | | | |
| 26 | Prob case preparation bldg | | | | Rail served (see Figure 6) |
| 27 | Poss nondestructive test bldg | | | | Partially revetted; bldg has a low bay, 20 ft high; rail served (see Figure 10) |
| 28 | Sensitive storage bldgs (2) | | | | Revetted |
| 29 | Poss oxidizer/ingredients preparation bldg | | | | Bldg has a low bay |
| 30 | Poss casting/curing bldg | | | | Revetting not completed |
| 31 | Sensitive storage bldg | | | | Revetted |
| 32 | Prob casting/curing bldg | | | | Revetted; bldg appeared complete [redacted] |
| 33 | Poss ingredient preparation/ handling bldg | | | | Partially revetted; u/i bldg, irregular, covering [redacted] sq ft is located to the E |
| 34 | Poss premix bldg | | | | Partially revetted (see Figure 7) |
| 35 | Poss additive supply access | | | | Revetted |
| 36 | Poss additive supply access | | | | Revetted |
| 37 | Prob casting/curing bldg | | | | Revetted; 2 rail accesses, 15 ft wide & 15 & [redacted] high; a road access, [redacted] ft high (see Figure 5) |
| 38 | Poss continuous mix bldg | | | | Revetted; 15-ft-wide access, [redacted] (see Figure 8) |
| 39 | Prob casting/curing bldg | | | | Revetted; buried control bldg; 2 rail accesses, 15 ft wide & 25 [redacted] |
| 40 | Poss ingredients preparation bldg | | | | Appeared complete; [redacted] u/i bldg, irregular, covering [redacted] located to S |
| 41 | Poss ingredients preparation bldg | | | | Addition added [redacted] bldg has low bay, 25 ft high; rail served |
| 42 | Poss ingredients preparation bldg | | | | Small protrusion, 25 x 20 ft, on SE end is rail served; bldg linked to item 11 by conveyer |
| 43 | Poss ingredients preparation bldg | | | | |
| 44 | U/I bldg | | | | 2 U/I bldgs, [redacted] are located to SE |
| 45 | U/I bldg | | | | |
| 46 | U/I bldg | | | | U/I bldg, [redacted] located to NE |
| 47 | U/I bldg | | | | |
| 48 | Steamplant | | | | 2 waste gas stacks, 170 & [redacted] are located on N side of bldg; 2 fuel tanks, [redacted] & a conveyer are located to N |
| 49 | U/I bldg | | | | A U/I bldg [redacted] located to NE |
| 50 | U/I bldg | | | | U/C |
| 51 | Prob final assembly bldg | | | | Appeared complete; [redacted] served by 2 rail spurs; an associated bldg [redacted] ft, is located on NE side |
| 52 | U/I bldg | | | | A U/I bldg [redacted] is located to E |
| 53 | Poss laboratory/quality test bldg | | | | Appeared complete; [redacted] a U/I bldg [redacted] is located to SE (see Figure 11) |
| 54 | U/I bldg | | | | |
| 55 | U/I bldg | | | | |
| 56 | U/I bldg u/c | -- | -- | | In early stage of construc- tion |
| EXPLOSIVES PLANT 55 | | | | | |
| 1 | Gatehouse | | | | |
| 2 | Gatehouse | | | | |
| 3 | Prob admin bldg | | | | U/I bldg, [redacted] is located to E |
| 4 | Support bldg | | | | 2 u/i bldgs, one 35 x 25 ft & one irregular cover- ing [redacted] are located to SE & E |
| 5 | Support bldg | | | | |
| 6 | Support bldg | | | | 2 U/I bldgs, one [redacted] & other irregular cover- ing [redacted] are located to NE & E |
| 7 | Support bldg | | | | Bay on E end measures [redacted] |
| 8 | Support bldg | | | | |
| 9 | Support bldg | | | | |
| 10 | Support bldg | | | | U/I bldg, [redacted] is located to SW |
| 11 | Support bldg | | | | |
| 12 | Support bldg | | | | |
| 13 | Support bldg | | | | U/I bldg, [redacted] is located to E |
| 14 | Support bldg | | | | U/I bldg, [redacted] is located near NE end |
| 15 | Support bldg | | | | |
| 16 | Prob warehouse | | | | Appeared complete; [redacted] bldg replaces or enhances small bldg observed in [redacted] |
| 17 | Support bldg | | | | A bldg, [redacted] is u/c near NE end |
| 18 | Support bldg | | | | |
| 19 | Support bldg | | | | |
| 20 | Support bldg | | | | 13 horizontal tanks are located on SW side of bldg; u/i bldg, [redacted] ft, is located to NE |
| 21 | Support bldg | | | | |
| 22 | Admin bldg | | | | 2 U/I bldgs, [redacted] are located to N |
| 23 | Support bldg | | | | An irregular u/i bldg covering [redacted] is located to SW |
| 24 | Support bldg | | | | An electrical substation is located on SW side of bldg; 2 u/i bldgs, [redacted] & irregular covering [redacted] sq ft, are located to W & NW of bldg |
| 25 | Water tower | | | | U/I bldg, [redacted] is located to SE |
| 26 | Support bldg | | | | U/I bldg, [redacted] is located to SE |
| 27 | Support bldg | | | | |
| 28 | Support bldg | | | | |
| 29 | Support bldg | | | | |
| 30 | Warehouse | | | | |
| 31 | Warehouse | | | | |
| 32 | Warehouse | | | | |
| 33 | Support bldg | | | | U/I bldg, [redacted] is located to NE |
| 34 | Support bldg | | | | |
| 35 | Support bldg | | | | |
| 36-38 | Warehouses (3) | | | | |
| 39 | Support bldg | | | | |
| 40 | Support bldg | | | | U/I bldg, [redacted] is located to NW |
| 41 | Support bldg | | | | U/I bldg, [redacted] ft, is located near SE end |
| 42 | Support bldg | | | | U/I bldg, [redacted] is located near SW end |
| 43 | Support bldg | | | | |
| 44 | Support bldg | | | | |
| 45 | Support bldg | | | | Irregular u/i bldg cover- ing [redacted] is located near N corner of bldg |
| 46 | Earth-covered bunker | | | | Access measures [redacted] |
| 47 | Earth-covered bunker | | | | Access measures [redacted] |
| 48 | Explosives processing bldg | | | | Revetted; 2 u/i bldgs, 60 x [redacted] are located to SE |
| 49 | Explosives processing bldg | | | | Revetted; u/i bldg, [redacted] ft, is located near NE end |
| 50 | U/I bldg | | | | 2 settling tanks adjoin bldg |
| 51 | Support bldg | | | | |
| 52 | Support bldg | | | | Bldg being razed as of [redacted] |
| 53 | Explosives storage bldg | | | | Revetted |
| 54 | Explosives processing bldg | | | | Revetted; 2 u/i bldgs [redacted] & irregular covering [redacted] sq ft, are to NE |
| 55 | Support bldg | | | | |
| 56 | Support bldg | | | | |
| 57 | Support bldg | | | | |
| 58 | Support bldg | | | | Partially revetted; an asso- ciated bldg [redacted] is located on SW side; a u/i bldg [redacted] is located to N |
| 59 | Explosives storage bldg | | | | Revetted |
| 60 | Explosives processing bldg | | | | Revetted; u/i bldg [redacted] ft, is located to NE |
| 61 | Support bldg | | | | Rail served |
| 62 | Support bldg | | | | Rail served |
| 63-66 | Support bldgs (4) | | | | Rail served |
| 67 | Support bldg | | | | |
| 68 | U/I construction | | | | Original bldg razed |
| 69 | Steamplant | | | | Rail served; waste gas stack, [redacted] ft high ad- joins bldg |
| 70 | Support bldg | | | | 3 u/i bldgs located to S, E, & NE measure [redacted] |
| 71 | Support bldg | | | | Revetted |
| 72 | Explosives storage bldg | | | | Revetted |
| 73 | Explosives storage bldg | | | | |
| 74 | Warehouse | | | | Revetted |
| 75 | Explosives storage bldg | | | | Revetted |
| 76 | Explosives processing bldg | | | | U/I bldg, [redacted] located to SW |
| 77 | Support bldg | | | | 2 rail-served bldgs [redacted] ft, are located to SW |
| 78 | Prob warehouse | | | | |
| 79-80 | Warehouses (2) | | | | |
| 81 | Explosives storage bldg | | | | Revetted |
| 82 | Support bldg | | | | U/I bldg, 60 x 35 ft, is located to SE |
| 83 | Support bldg | | | | |
| 84 | Support bldg | | | | |
| 85 | Support bldg | | | | 2 u/i bldgs [redacted] ft, are located to SW |
| 86 | Support bldg | | | | |
| 87 | Explosives processing bldg | | | | Revetted |
| 88 | Support bldg | | | | |
| 89 | Support bldg | | | | U/I bldg; [redacted] is located parallel to SE side |
| 90 | Support bldg | | | | |
| 91 | Support bldg | | | | U/I bldg, [redacted] is located to SE |
| 92 | Support bldg | | | | |
| 93 | Explosives processing bldg | | | | Revetted |
| 94 | Support bldg | | | | Partially revetted; u/i bldg, [redacted] is located to E |
| 95 | Explosives storage bldgs (2) | | | | Revetment encloses 2 bldgs, [redacted] |
| 96 | Support bldg | | | | |
| 97 | Support bldg | | | | Tank [redacted] is located to W |
| 98 | Support bldg | | | | |
| 99 | Explosives storage bldg | | | | Revetted |
| 100 | Explosives processing bldg | | | | Revetted; 6 bldgs located to SW measure; one [redacted] |
| 101 | Explosives processing bldg | | | | Revetted; bldg has [redacted] ft protrusion on SW side; 2 u/i bldgs [redacted] are located to E |
| 102 | Support bldg | | | | |
| 103 | Support bldg | | | | |
| 104 | Explosives processing bldg | | | | Revetted |
| 105 | Support bldg | | | | |
| 106 | Support bldg | | | | 4 u/i bldgs located to W measure [redacted] |
| 107 | Support bldg | | | | U/I bldg, [redacted] is located to W |
| 108 | Support bldg | | | | Bldg being razed as of [redacted] |
| 109 | Explosives processing bldg | | | | Completely revetted |
| 110 | Explosives processing bldg | | | | |
| 111 | Explosives processing bldg | | | | Revetted; 2 u/i bldgs [redacted] located to W & NW |
| 112 | Support bldg | | | | Partially revetted |
| 113 | Support bldg | | | | |
| 114 | Explosives storage bldgs (2) | | | | Revetted; bldgs measure [redacted] |
| 115 | Explosives storage bldg | | | | Revetted; u/i bldg [redacted] ft, is located to NE |
| 116 | Explosives storage bldg | | | | Revetted; irregular u/i bldg covering [redacted] located to SW |
| 117 | Warehouse | | | | |
| 118 | Support/sensitive storage bldg | | | | Partially revetted |
| 119 | Warehouse | | | | |
| 120 | Warehouse | | | | Bay, 35 x 15 ft, at N end |
| 121 | Explosives processing bldg | | | | Revetted; bldg located outside revetment near SE end of bldg |
| 122 | Support bldg | | | | Covered walkway leads to item 121 |
| 123 | Support bldg | | | | |
| 124 | Explosives storage bldg | | | | Revetted |
| 125 | Explosives storage bldg | | | | Revetted |
| 126 | Explosives storage bldg | | | | Revetted |
| 127 | Explosives storage bldg | | | | Revetted |
| 128 | Explosives storage bldg | | | | Revetted |
| 129 | Support bldg | | | | |
| 130 | Support bldg | | | | |
| 131 | Support bldg | | | | |
| 132 | Explosives storage bldg | | | | Revetted |
| 133 | Explosives storage bldg | | | | Revetted |
| 134 | Explosives storage bldg | | | | Revetted |
| 135 | Test bldg | | | | U/I bldg, [redacted] located to W, was first observed [redacted] is long; graded or possibly paved u/i site extends to NW |

*Unless otherwise noted under Comments.



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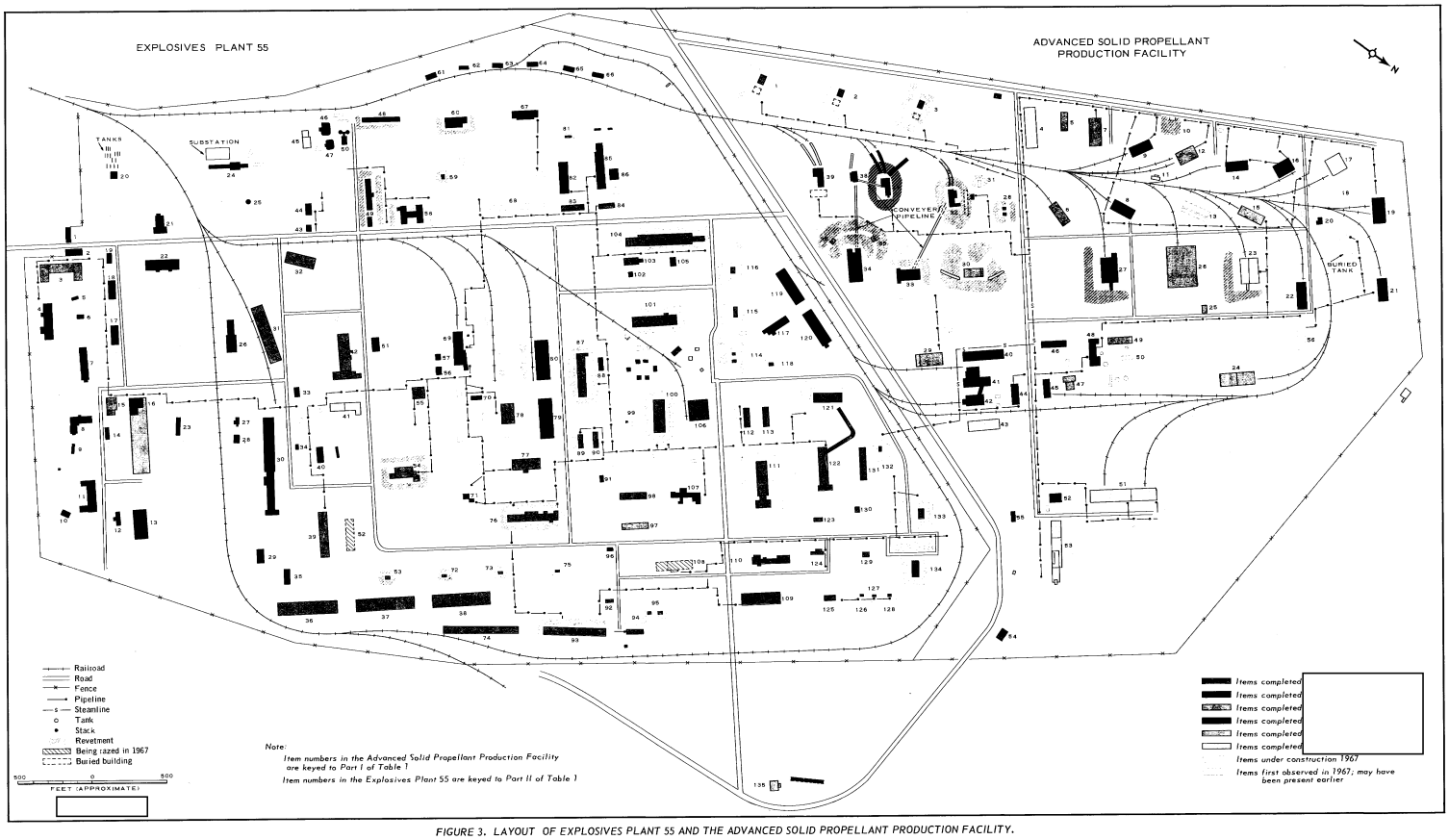
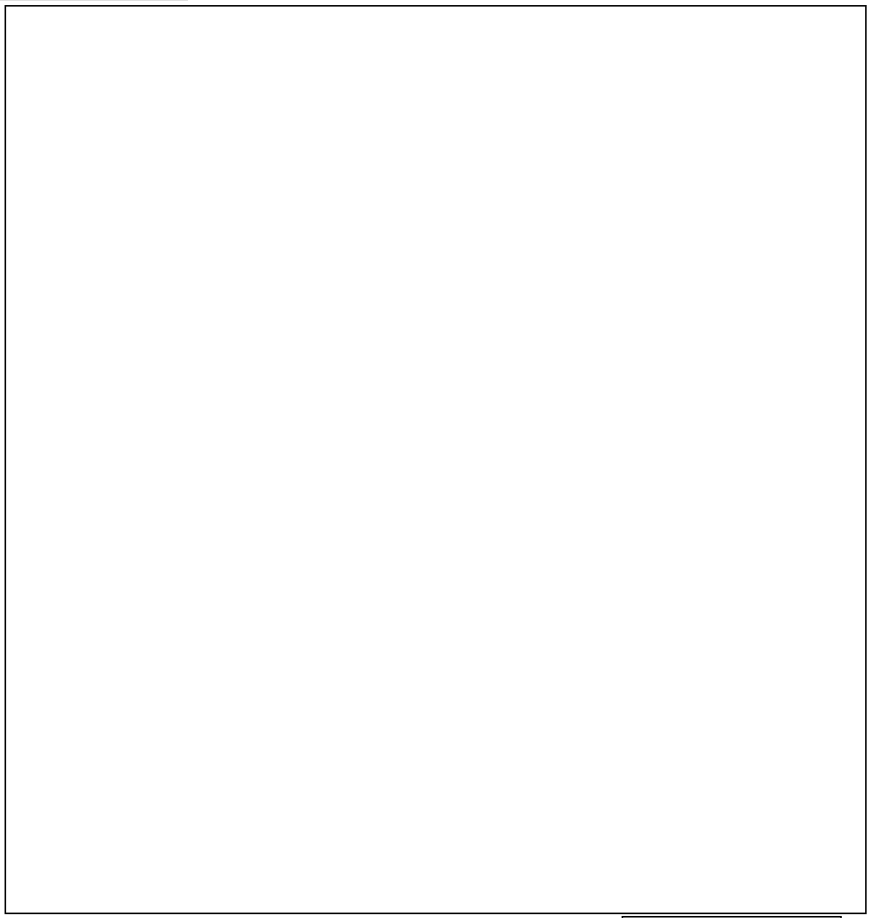



*FIGURE 3. LAYOUT OF EXPLOSIVES PLANT 55 AND THE ADVANCED SOLID PROPELLANT PRODUCTION FACILITY.*






vanced Solid Propellant Production Facility. Details of the perspective drawings (Figures 5-11) were derived from oblique photographic coverage (from north and south) [redacted] Construction during this year was centered on a possible nondestructive test building (item 23), an unidentified building (item 17), a possible laboratory/quality test building (item 53), the completion of the revetment around a probable casting/curing building (item 39), and the completion of a probable final assembly building (item 51). The facility did not appear either complete or operational on photography of [redacted]



## PRINCIPAL STRUCTURES AT THE ADVANCED SOLID PROPELLANT PRODUCTION FACILITY

Because of the importance of the Advanced Solid Propellant Production Facility, only structures in that part of the installation are described in detail in this report, and the following descriptions are of those structures evaluated as the most significant. All item numbers mentioned in the descriptions are keyed to the Advanced Solid Propellant Production Facility sections of Table 1 and Figure 3.

### POSSIBLE BATCH MIX/INGREDIENT PREPARATION BUILDINGS

Three separate possible batch mix/ingredient preparation buildings (items 1-3) are located in the southwest corner of the Advanced Solid Propellant Production Facility. They may have been designed to serve the northwesternmost probable casting/curing building (item 32). Details of one of the batch mix/ingredient preparation buildings (item 1) are shown in a perspective drawing on Figure 5. During the early stages of construction of the buildings, the presence of probable control buildings was detected. These were buried when the revetments were made. Pipelines/pipe galleries connect these buildings with the possible control buildings. Batches of propellant could be moved by road to the probable casting/curing building (item 32). Another possible function for these buildings could be batch preparation of ingredients

which would possibly be fed into a continuous mixing operation.

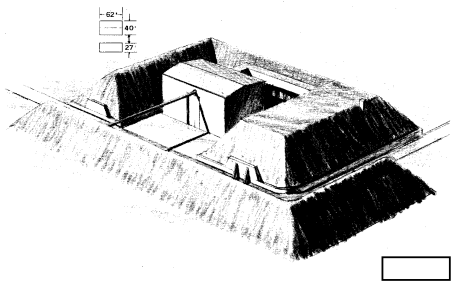


FIGURE 5. POSSIBLE BATCH MIX/INGREDIENT PREPARATION BUILDING (item 1, Figure 3).

## PROBABLE CASE PREPARATION BUILDING

This building (item 26) is located near the center of the facility. The inspection and cleaning of rocket motor cases, the installation of linings, and work preparatory to casting may be performed in it. The arrangement of this building, shown on Figure 6, appears similar to that of the case preparation building at Perm 2/ and, except for the fact that it lacks an additional high-bay section, to those at Kemerovo and Kamensk-Shakhtinskiy. 1, 3/

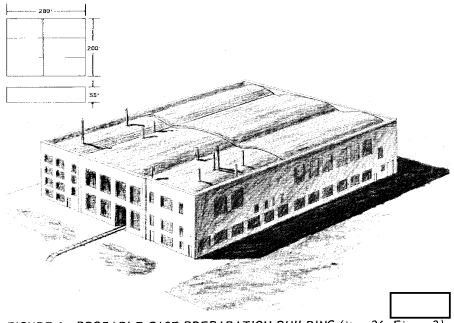


FIGURE 6. PROBABLE CASE PREPARATION BUILDING (item 26, Figure 3).

A single rail spur will apparently serve this building, entering it from the southwest.

## POSSIBLE PROPELLANT PREMIX BUILDING

The possible propellant premix building (item 34) is revetted in a unique fashion. A perspective drawing of this building and its revetments is shown in Figure 7. It has a double C-shaped revetment/barricade on the northwest side with 2 road-served possible additive supply accesses (items 35 and 36) located between the revetments. The possible additives supply accesses appear to be linked to the possible propellant premix building by a conveyer system or walkway. The function of the possible propellant premix building is probably to wet the dry ingredients so they will slurry better in final mixing. The possible propellant premix building is road served and is considerably larger than its counterparts at Perm and Kamensk-Shakhtinskiy. 1, 2/ The possible propellant premix building is linked to the possibly continuous mix building (item 38) by a conveyer/covered pipeline gallery.

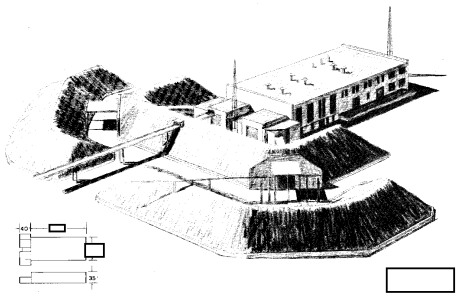


FIGURE 7. POSSIBLE PROPELLANT PREMIX BUILDING (item 34, Figure 3).

## POSSIBLE CONTINUOUS MIX BUILDING

The possible continuous mix building (item 38) is unique in that it is the only mix building that has been so identified located between 2 probable casting/curing buildings (items 37 and 39) at any Soviet advanced solid propellant facility. Details of this building along with one of the adjoining probable casting/curing buildings (item 37) are shown in a perspective drawing, Figure 8. The possible continuous mix building is connected to the probable casting/curing building (item 37) on the north by a pipe gallery which is still under construction and which may carry water, steam, or possibly propellant when complete. No pipe gallery is in evidence between the possible continuous mix building and the southernmost casting/curing building (item 39). The possible continuous mix building is completely revetted and road served on 2 sides. A building of this type would be capable of producing mixed propellants more efficiently and safely than the batch-mix method of production which the Soviets have apparently used at the other advanced solid propellant facilities. A safer method of production is apparently needed since batch method mix-blend buildings were apparently destroyed at Kamensk-Shakhtinskiy in 1965 and at Kemerovo in

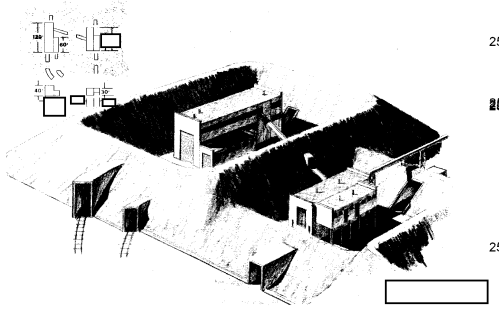


FIGURE 8. POSSIBLE CONTINUOUS MIX BUILDING (item 38, Figure 3) AND PROBABLE CASTING/CURING BUILDING (item 37, Figure 3).

## PROBABLE CASTING/CURING BUILDINGS

Certain factors suggest that the 2 probable casting/curing buildings (items 37 and 39), one of which is shown on Figure 8, may be part of a continuous mix operation. The 2 probable casting/curing buildings at this facility differ structurally from probable casting/curing buildings at other Soviet advanced solid propellant facilities and from the third probable casting/curing building here (item 32) which has a buried L-shaped control building.

1-3/ The 2 similar Pavlograd probable casting/curing buildings are both doubly rail served by tunnels passing through the revetments. One of the tunnels at each building measures approximately 15 feet wide and 15 feet high; the other measures approximately 15 feet wide and [redacted] high. The third probable casting/curing building here, and the probable casting/curing buildings at the other advanced solid propellant facilities, are served by only one rail tunnel which measures approximately 25 feet high. 1-3/ It is believed that after casting takes place at the 3 probable casting/curing buildings at Pavlograd, the partially cured motors are moved by rail to the probable curing buildings, one of which (item 16) is located approximately 3,000 feet to the northwest.

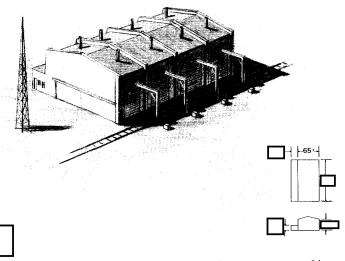


FIGURE 9. PROBABLE CURING BUILDING (item 16, Figure 3).

## PROBABLE CURING BUILDING

A probable curing building (item 16), illustrated on Figure 9, is evident in the Advanced Solid Propellant Production Facility. It is similar to one of the types of curing buildings previously identified at the other advanced solid propellant production facilities. 1-3/ It has 4 bays divided by possible blast walls that extend above the roof line. The bays appear to be served by individual overhead cranes. The relatively small size of this building, its handling capacity, and its location tend to indicate that only small items, possibly closures, may be cured here. It is probable that other curing buildings will be identified at Pavlograd as the Advanced Solid Propellant Production Facility nears completion.

*Table 2. Rangehead Facility (Item numbers are keyed to Figure 12)*

Note: Measurements are accurate to within ±10 feet or 4%, whichever is greater.

| Item | Function/Description | Dimensions (ft) L | W | Roof Cover (sq ft) | Date First Observed & Apparently Complete* | Comments |
|---|---|---|---|---|---|---|
| 1 | Support bldg | 45 | 45 | 2,025 | | |
| 2 | Sensitive storage bldg | 130 | 55 | 7,150 | | Revetted |
| 3 | Poss fabrication bldg | 605 | 145 | 87,725 | | High-bay, drive-through bldg |
| 4 | Support bldg | 65 | 55 | 3,575 | | |
| 5 | Warehouse | 255 | 65 | 16,575 | | Multistoried bldg, rail served |
| 6 | Support bldg | -- | -- | -- | | |
| 7 | Support bldg | 85 | 45 | 3,825 | | Approx measurements |
| 8 | Support bldg | 115 | 50 | 5,750 | | |
| 9 | Support bldg | 75 | 30 | 2,250 | | |
| 10 | Support bldg | 85 | 35 | 2,975 | | |
| 11 | Support bldg | -- | -- | -- | | |
| 12 | Support bldg | -- | -- | -- | | |
| 13 | Warehouse | 330 | 55 | 18,150 | | Multistoried bldg |
| 14 | Sensitive storage bldg | 120 | 40 | 4,800 | | 2 small revetments on N |
| 15 | Support bldg | 205 | 45 | 9,225 | | |
| 16 | Support bldg | 205 | 40 | 8,200 | | Observed complete [redacted] |
| 17 | Support bldg | 135 | 35 | 4,725 | | |
| 18 | Support bldg | 110 | 35 | 3,850 | | |
| 19 | U/I bldg | -- | -- | -- | | Includes small object/structure nearby |
| 20 | Support bldg | -- | -- | -- | | |
| 21 | Support bldg | 145 | 60 | 8,700 | | |
| 22 | Support bldg | -- | -- | -- | | |
| 23 | Support bldg | -- | -- | -- | | |
| 24 | Support bldg | -- | -- | -- | | |
| 25 | Support bldg | -- | -- | -- | | |
| 26 | Poss sensitive storage bldg | -- | -- | -- | | |
| 27 | Poss sensitive storage bldg | -- | -- | -- | | |
| 28 | U/I bldg | 50 | 25 | 1,250 | | 2 small revetted areas on E |
| | Area A poss test/disposal area | -- | -- | -- | | Contains a rail-served L-shaped revetment & 5-15 poss bldgs |

*Unless otherwise noted under Comments.

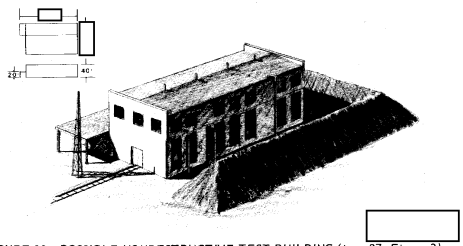


FIGURE 10. POSSIBLE NONDESTRUCTIVE TEST BUILDING (item 27, Figure 3).

## POSSIBLE NONDESTRUCTIVE TEST BUILDINGS

Two partially revetted structures (items 23 and 27) are located in the north-central part of the facility and may be used for some type of inspection or quality control operation normally associated with the production of solid propellant rocket motors. Cured motors could conceivably be X-rayed in the structures. A perspective drawing of one of these buildings (item 27) is presented on Figure 10. Both buildings are rectangular with low sections along the northwest side. L-shaped revetments protect the south-

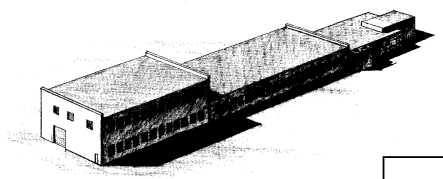


FIGURE 11. LABORATORY/QUALITY TEST BUILDING (item 53, Figure 3).

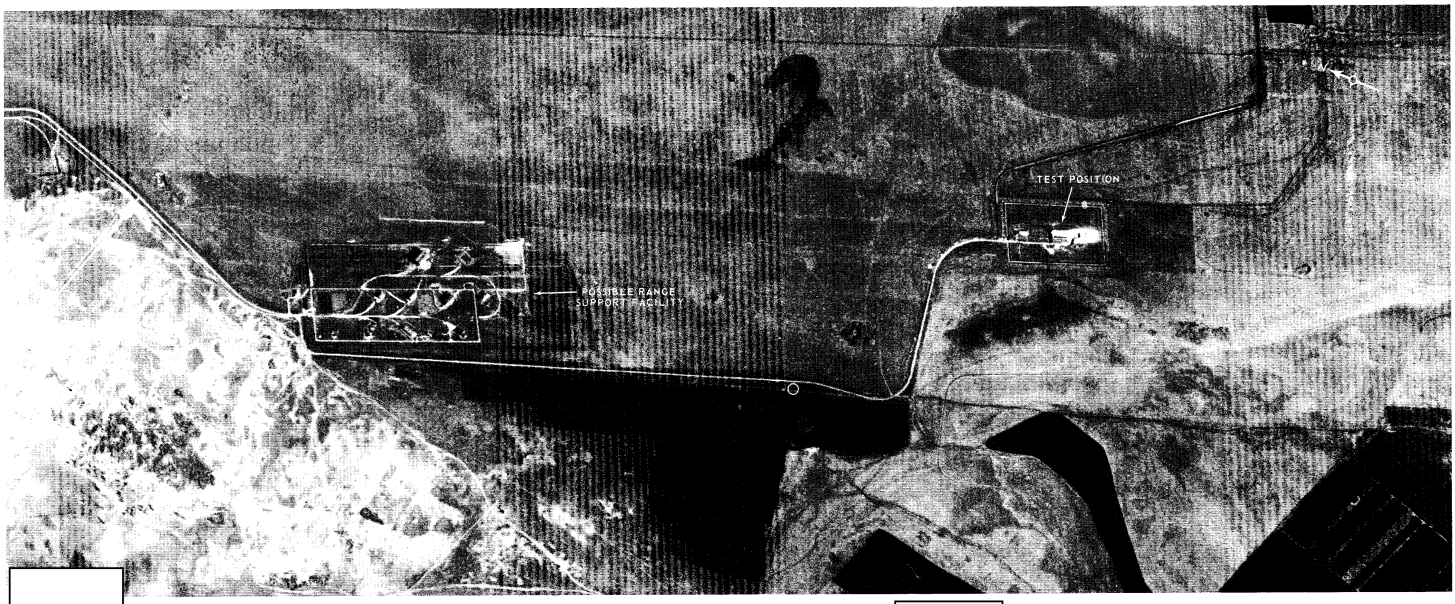



*FIGURE 13. POSSIBLE RANGE SUPPORT FACILITY AND TEST POSITION*

east side of each building, and a concrete blast wall extends along the northeast side of each building into the revetment. These walls could be for the protection of X-ray technicians. The configuration of the concrete wall would direct any blowout toward the L-shaped revetment. Buildings of this configuration are present at Perm, Kemerovo, and Kamensk-Shakhtinskiy. 1-3/

## POSSIBLE LABORATORY/QUALITY TEST BUILDING

Because of the variation in lots of the raw materials used in propellant manufacture, some means of quality control is necessary. All raw materials are generally grouped together and standardized by mixing small batches of propellant which are then loaded into small test motors for sampling of their physical properties. These motors are fired and the burning rate is correlated with the proper amount of ground oxidizer. 4/ A building (item 53) under construction in the northern part of the facility is expected to resemble the possible laboratory/quality test buildings at Perm, Kemerovo, and Kamensk-Shakhtinskiy on completion. 1-3/ A perspective drawing of this building is presented in Figure 11.

## OTHER SIGNIFICANT BUILDINGS

A possible mandrel-removal building (item 7) is located southwest of a possible inspection-type building (item 27). After mandrel removal, the next step in motor production is the X-ray and inspection of the castings. A probable lag-storage building (item 24) in which cast motors are stored while awaiting final assembly is located in the north-central part of the plant. The probable final assembly building (item 51), in which the motors are completed, is served by 2 rail spurs. If the motors are cast in molds, the castings are trimmed and inserted into cases, the closures and nozzles are installed, and the cases are painted in the final assembly building. However, if the motors are cast in the cases, the first 2 steps of the process are omitted.

# HIGHLIGHTS OF THE CHRONOLOGY OF THE RANGE AND TEST FACILITIES

A detailed interpretation of these facilities cannot be made at this time because of a lack of photography of sufficiently good interpretability. A secured Rangehead (Table 2 and Figure 12) is located at the north end of

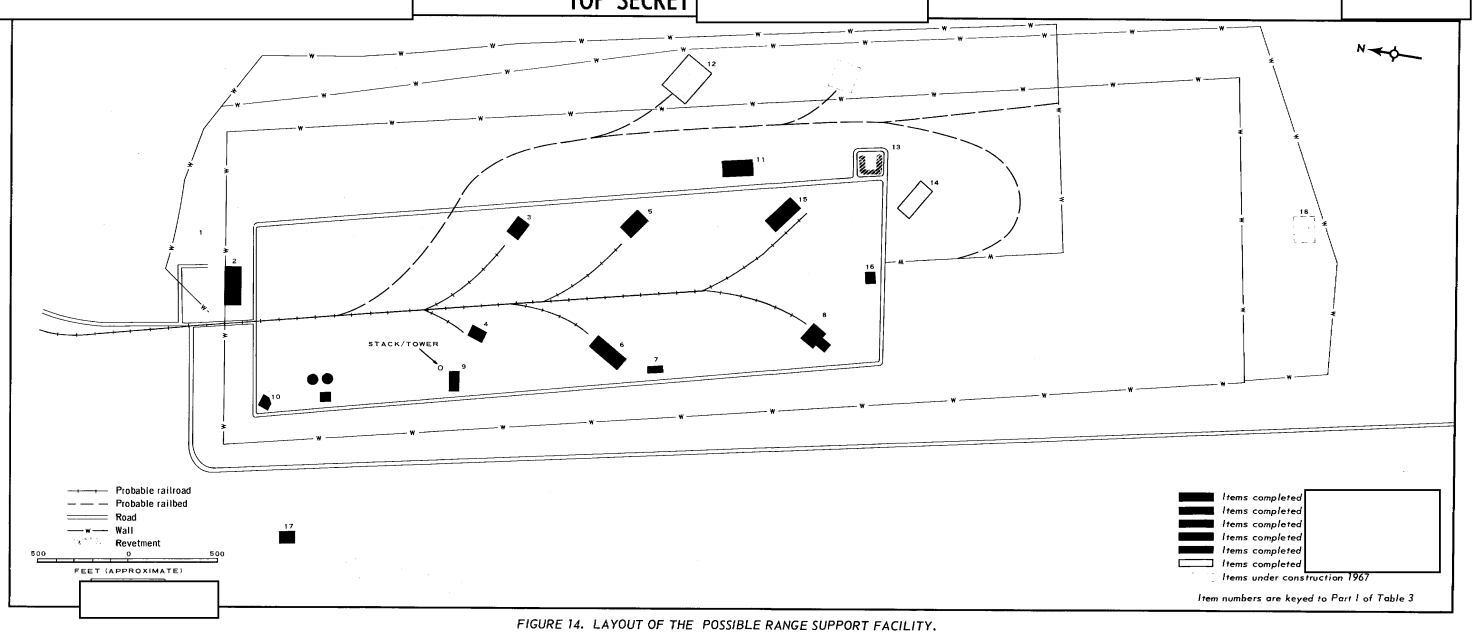



FIGURE 14. LAYOUT OF THE POSSIBLE RANGE SUPPORT FACILITY.

*Table 3. Possible Range Support Facility and Test Position*
*(Item numbers are keyed to Figures 14 and 15)*

Note: Measurements are accurate to within ± 15 feet for Support Facility.

| Item | Function/Description | Dimensions (ft) L | W | Roof Cover (sq ft) | Date First Observed & Apparently Complete* | Comments |
|---|---|---|---|---|---|---|
| POSSIBLE SUPPORT FACILITY (Part 1) | | | | | | |
| 1 | Prob bldg u/c | 120 x | 110 | 13,200 | | Approx measurements |
| 2 | Guardhouse | 190 x | 60 | 11,400 | | |
| 3 | Support bldg | 100 x | 60 | 6,000 | | Rail served |
| 4 | Support bldg | -- x | -- | -- | | Rail served |
| 5 | Support bldg | 140 x | 60 | 8,400 | | Rail served |
| 6 | Support bldg | 205 x | 60 | 12,300 | | Rail served |
| 7 | Support bldg | 85 x | 25 | 2,125 | | Approx measurements |
| 8 | Support bldg | Irregular | | 11,475 | | Observed complete [redacted] rail served |
| 9 | Support bldg | 120 x | 55 | 6,600 | | Has a stack or tower on N side |
| 10 | U/I bldg/objects (4) | Irregular | | [redacted] | | |
| 11 | Support bldg | 155 x | 65 | 10,075 | | |
| 12 | Support bldg | [redacted] | | | | Observed complete [redacted] rail served. U/I construction activity is evident toward the south |
| 13 | Revetment | -- x | -- | -- | | |
| 14 | Support bldg | [redacted] | | 13,660 | | |
| 15 | Support bldg | 175 x | 85 | 14,875 | | Rail served |
| 16 | Prob support bldg | -- x | -- | -- | | |
| 17 | U/I bldg | 75 x | 40 | 3,000 | | |
| 18 | Prob construction site | -- x | -- | -- | | |
| TEST POSITION (Part II) | | -- | | -- | | Fenced area measures 1,705 x 1,040 feet |
| 1 | Test position | 230 x | 60 | 13,800 | | Test cell open; revetted on 3 sides |
| 2 | Prob support bldg | 125 x | 40 | 5,000 | | |
| 3 | Construction activity area | -- x | -- | -- | | 4 u/i objects/bldgs u/c |
| 4 | Prob thrust block | -- | | -- | | |

*Unless otherwise noted under Comments.

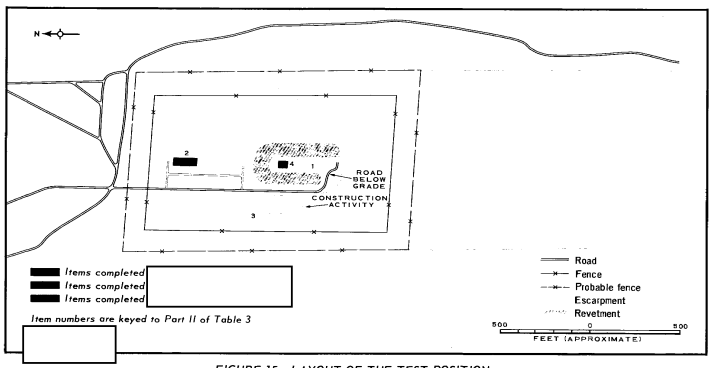



FIGURE 15. LAYOUT OF THE TEST POSITION.

the Test Range (Figure 1). The Test Range extends approximately 16 nm south from the Rangehead and was probably originally an artillery test range.

The Rangehead is road and rail connected to Area A. Area A (Figure 1) is believed to be either a possibly early test position or a disposal facility because of the presence of a large L-shaped revetment. During the later part of 1962 the rail connection from the Rangehead to Area A was extended 2 nm south to join the site of a Possible Range Support Facility (Table 3 and Figures 13 and 14) which was under construction at that time.

A road-served Test Position (Table 3 and Figure 15) is located 1.5 nm south of the Possible Range Support Facility. A Mortar Test Position (Figure 1) is located 0.75 nm southeast of the Test Position.

## RANGEHEAD

The Rangehead (Figure 12) appears to have been operational when first observed in [redacted] No significant changes have occurred there since that time. Data on the structures of the Rangehead are presented in Table 2.

## POSSIBLE RANGE SUPPORT FACILITY AND TEST POSITION

In [redacted] a rail spur to the Possible Range Support Facility (Figures 13, 14, and 15) was evident. Two buildings were present and the facility was fenced. A weapons test cell (since removed) was located approximately 0.25 nm southwest of the Possible Range Support Facility. In 1963 the Range Support Facility showed the addition of a second security fence. Two new rail beds and the completion of 3 medium and 6 small structures were also observed. No significant changes occurred to the facility in 1964. In 1965, two medium-sized support buildings (items 11 and 15, Figure 14) were completed along with another security fence. In 1966 one additional irregularly-shaped building (item 8) was completed. In 1967 one large and 1 medium building (items 12 and 14) were completed. The most recent photography suggests that the facility is being enlarged by approximately 20 percent and roads/railbeds are being extended within the facility. Data on the structures of the facility are presented in Table 3.

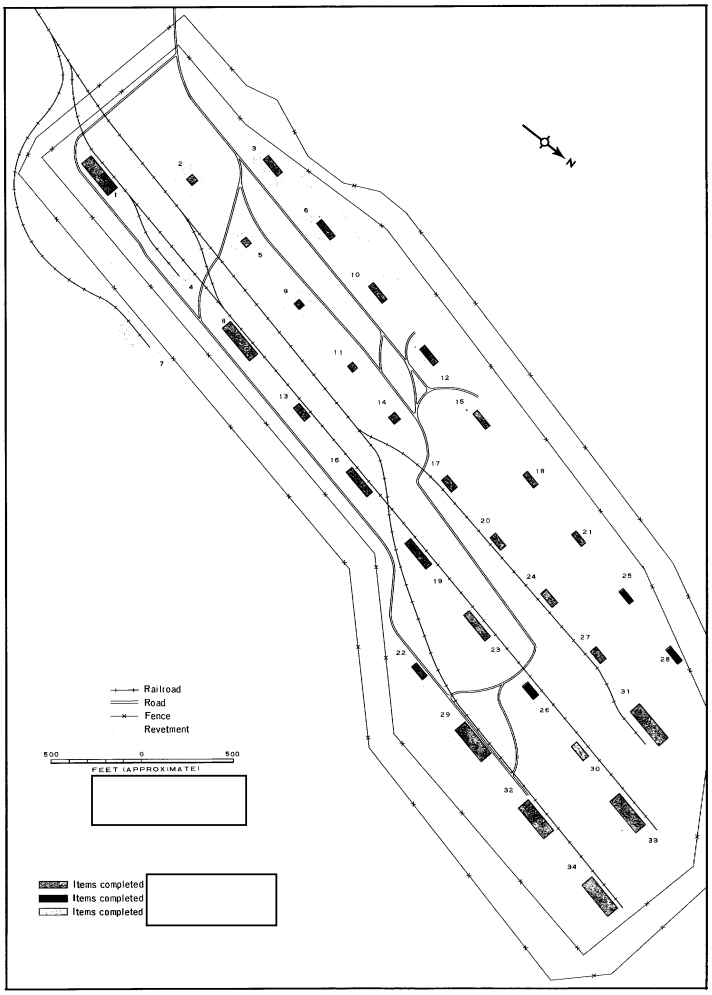



*FIGURE 17. LAYOUT OF THE EXPLOSIVES/MUNITIONS STORAGE AREA.*

*Table 4. Data on the Explosives/Munitions Storage Area*

| Item | Function/Description | Dimensions (ft) L | W | Roof Cover (sq ft) | Date First Observed & Apparently Complete | Comments |
|---|---|---|---|---|---|---|
| 1 | Support bldg | 170 | 50 | 8,500 | [redacted] | Not revetted |
| 2 | Explosives/munitions storage | 60 | 45 | 2,700 | | Revetted |
| 3 | Explosives/munitions storage | 125 | 45 | 5,625 | | Revetted |
| 4 | Revetment | 335 | 75 | -- | | |
| 5 | Explosives/munitions storage | 65 | 50 | 3,250 | | Revetted |
| 6 | Explosives/munitions storage | 125 | 45 | 5,625 | | Revetted |
| 7 | Revetment | 300 | 100 | -- | | Rail served; no bldg |
| 8 | Support bldg | 240 | 80 | 19,200 | | Revetted |
| 9 | Explosives/munitions storage | 70 | 60 | 4,200 | | Revetted |
| 10 | Explosives/munitions storage | 130 | 50 | 6,500 | | Revetted |
| 11 | Explosives/munitions storage | 60 | 60 | 3,600 | | Revetted |
| 12 | Explosives/munitions storage | 130 | 50 | 6,500 | | Revetted |
| 13 | Explosives/munitions storage | 110 | 55 | 6,050 | | Revetted |
| 14 | Explosives/munitions storage | 70 | 55 | 3,850 | | Revetted; approx measurements |
| 15 | Explosives/munitions storage | 140 | 60 | 8,400 | | Revetted |
| 16 | Explosives/munitions storage | 195 | 50 | 9,750 | | Revetted |
| 17 | Explosives/munitions storage | 120 | 55 | 6,600 | | Revetted |
| 18 | Explosives/munitions storage | 110 | 55 | 6,050 | | Revetted |
| 19 | Explosives/munitions storage | 200 | 50 | 10,000 | | Revetted |
| 20 | Explosives/munitions storage | 105 | 45 | 4,725 | | Revetted |
| 21 | Explosives/munitions storage | 110 | 45 | 4,950 | | Revetted |
| 22 | Explosives/munitions storage | 125 | 50 | 6,250 | | Revetted |
| 23 | Explosives/munitions storage | 200 | 50 | 10,000 | | Revetted |
| 24 | Explosives/munitions storage | 85 | 40 | 3,400 | | Revetted |
| 25 | Explosives/munitions storage | 100 | 55 | 5,500 | | Revetted |
| 26 | Explosives/munitions storage | 95 | 35 | 3,325 | | Revetted |
| 27 | Explosives/munitions storage | 105 | 50 | 5,250 | | Revetted |
| 28 | Support bldg | 95 | 50 | 4,750 | | Revetted |
| 29 | Explosives/munitions storage | 235 | 90 | 21,150 | | Revetted |
| 30 | Explosives/munitions storage | 100 | 45 | 4,500 | | Revetted |
| 31 | Explosives/munitions storage | 245 | 85 | 20,825 | | Revetted |
| 32 | Explosives/munitions storage | 245 | 80 | 19,600 | | Revetted |
| 33 | Explosives/munitions storage | 240 | 85 | 20,400 | | Revetted |
| 34 | Explosives/munitions storage | 245 | 80 | 19,600 | | Revetted |

Note: Measurements are accurate to within ±10 feet.

25X1

## TEST POSITION

In a test position (Table 3 and Figures 13 and 15) was first observed under construction. The position appeared nearly complete when first observed and appeared complete and road served by the end of that year. During 1963 a second security fence was added. No apparent changes were observed in 1964. a dark object which could have been a thrust block was observed. A fan-shaped, light-toned area at the south end of the test position indicated test activity in The test position showed further signs of test activity in The fact that the test position has been in operation since 1966 and that the Advanced Solid Propellant Production Facility is not yet operational suggests that the 2 areas are not necessarily related. Some new unidentified construction is apparent on the west side of the test position. Security fencing has been added during 1967 which apparently doubles the size of the secured area of the facility.

# HIGHLIGHTS OF CHRONOLOGY OF OTHER MAJOR AREAS OF EXPLOSIVES AND PROPELLANT PLANT 55

## EXPLOSIVES PLANT 55

Explosives Plant 55 (Figures 2 and 3) was present on The plant produces high explosives and industrial explosives. When first observed on the plant consisted of approximately 30 revetted processing-type buildings and numerous support-type buildings. The plant was enclosed by a wall and was operational at that time. In 1963 numerous buildings were completed or observed for the first time. The plant appeared essentially complete. A small building (item 16, Figure 3) was enlarged into a large probable warehouse in 1964, and in 1965 an additional unidentified building was completed (item 50, Figure 3). No changes were apparent in 1966 and 1967. Data on significant structures of Explosives Plant 55 are presented in the appropriate section of Table 1.

## EXPLOSIVES/MUNITIONS STORAGE AREA

The Explosives/Munitions Storage Area (Figures 16 and 17) consisted of 26 revetted storage-type buildings and 2 unrevetted support-type buildings when first observed on The area had a double security fence and was both rail- and road-served at that time. In 1963 two small revetted buildings (items 25 and 26) were added, and the revetment was constructed for another storage building (item 30) which was added in 1964. No changes were apparent in 1965, 1966, and 1967. Data on the structures in this area are presented in the table accompanying Figure 17.

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REFERENCES (Continued)

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2. NPIC. [redacted] *Chronological Development of Selected Solid Propellant Facilities at the Munitions and Chemical Combine K. Kirov No 98, Perm, USSR,* Feb 67 (TOP SECRET [redacted])
3. NPIC. [redacted] *Chronological Development of the Solid Propellant Rocket Motor Production and Test Facilities, Kemerovo, USSR,* Jun 67 (TOP SECRET [redacted])
4. W. D. Killian, *Chemical Engineering Progress,* Vol 59, No 9, Sep 63, PP. 43-48 (UNCLASSIFIED)


REQUIREMENT

CIA. C-DI5-82,973

NPIC PROJECT

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