PART VI -- LABOR TRENDS

General

Adequate manpower for the various required crafts was available and presented no problem upon any of the Titan I Missile Support contracts. Availability of manpower on the prime contract (DA-5919) was effected to a minor degree because of recruitment difficulties during the summer months of 1961. Employee turnover, however, was a continuing problem experienced by the prime contractor and most of its subcontractors during the lifetime of Contract DA-5919.

Recruitment

In the recruitment field the overall manpower requirements were filled by approximately 80 percent transient workmen. The State of South Dakota is a thinly populated state and the regin west of the Missouri River is the most thinly populated part of the state. Rapid City, South Dakota, is situated in the Western part of the state. Although being the second largest city in South Dakota, its population is only about forty or forty-five thousand. In addition, Rapid City is primarily a tourist community; consequently, availability of motels, hotels, rooming houses and boarding houses were quite good to accommodate the influx of transient workmen during the winter months. Increased rental rates (anywhere from 300 to 800 percent) during the summer months, made it economically unfeasible for construction workmen to remain in much of this type housing. Consequently, recruitment of skilled workers during June, July and August 1961, was somewhat difficult; but, almost without exception, contractor man-

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power requirements were filled within a 48-hour period.

Turnover

Turnover was a continuing problem during the construction phase, because such a high percent of the workmen employed on Titan I construction were from other parts of the Nation. The prime contractor and most of its subcontractors were plagued with this difficulty. For example, the skilled crafts, such as the electrical and pipefitter trades, were filled by approximately 90 percent transient workmen. Ironworkers, operating engineers, sheetmetal workers and millwrights were approximately 70 percent transients. Carpenters were approximately 50 percent local and 50 percent transient. Overall, the total construction working force was comprised of approximately 80 percent transient. At its worst, during late summer and early fall of 1961, the prime contractor advised the Area of a 100 percent turnover within a 90-day period. Employee turnover being a costly item, it can readily be seen that this was a costly factor to nearly all the contractors engaged upon missile construction at the Ellsworth Area.

Relationship Between Contractors and Labor

Contractor and labor relationships were very amicable during the course of the work. Several minor jurisdictional type disagreements occurred and were settled with a minimum loss of productive time. The number of actual work stoppage occurrences were fifteen, and except for three stoppages lasting two work days each, the longest period of any one stoppage was one shift.

Productivity

Productivity by the various crafts is considered to have been average with no outstanding praiseworthy or defamatory occurrences. During the winter work periods, when conditions involved considerable unpleasantness if not actual hardship, productivity was reduced as normally could be expected.

Average Wage Scale

The factors used in this study and considered as pertinent are the average wage scale for the beginning of the job, which was around 1 December 1959, as compared to the finish of the job around 15 December 1961. By using the total manhours employed by the prime contractor and its subcontractors, the average wage, including overtime, was computed to be $3.62 per hour. It should be noted that this cost is for basic hourly wages, and no mark up such as insurance, payroll, etc., is taken into account.

SUMMARY OF WORK STOPPAGES AT ELLSWORTH AREA DURING TITAN I CONSTRUCTION

Titan I Missile Support contracts (DA-6134, DA-6894, DA-6675) were free of work stoppages during their lifetime. However, there were both off-site and on-site work stoppages which affected Contract DA-5919. These are described below:

a. Supplier Strike (off-site) affecting Titan I was the General Electric strike during October 1960. This strike affected the timely installation of equipment terminals and propellant ter-

minals at the complexes. Undoubtedly some adverse impact upon the timely construction of the powerhouse was experienced because of this supplier strike. The prime contractor originally claimed $340,000.00, which was subsequently reduced to $85,000.00 and finally settled for $25,537.00.

The prime contractor had filed claims alleging delay due to the Minneapolis-Honeywell regulator strike occurring on or about 7 March 1961 and the IAM strike at the San Francisco Bay Area affecting Pacific Pumping Company occurring on or about 7 April 1961. However, these two claims were determined to be without merit and the prime contractor subsequently withdrew both claims.

A chronological summary of work stoppages occurring (on-site) upon the prime missile contract (DA-5919) is set forth below:

Work Stoppages

There were five work stoppages under attempt to unionize workmen.

1. Taggert non-union operators; 28 September through 30 September 1960.

2. Sheet Metal Workers: left all three complexes and fabrication shops on 16 and 17 January 1961.

3. and 4. All union workmen walked off Complex 1A, 24 January 1961, and some union workmen again walked off the same complex on 26 January 1961 in sympathy with the union sheet metal workers not wanting to work alongside four non-union sheet metal worker employees by another subcontractor.

5. Union sheet metal workers walked off all three

complexes on 1 and 3 April 1961 because of a misunderstanding between management and the union regarding union contractual stipulation and alleged non-compliance to union-management contract by sheet metal workers.

There were three work stoppages due to jurisdictional disputes between the ironworkers and carpenters over installation of certain vertical and horizontal steel "beams" upon which Weber Wallboard metal siding was to be attached.

1. Ironworkers walked off the job at Complex 1B on 16 November 1960 due to above-mentioned jurisdictional dispute with the carpenters.

2. Ironworkers walked off Complex 1A on 30 November 1960 in protest to the same jurisdictional dispute as set forth above.

3. Ironworkers walked off the job on 12 January 1961 at Complex 1A and 1C simultaneously with the arrival of Weber Wallboard materials at the supply yard at two complexes (1A and 1C).

There were three walk offs between electricians; one due to alleged unsanitary drinking water and two walk offs over lay offs allegedly contrary to union-management contractual stipulations.

1. 7 December 1960 (Complex 1B) unsanitary water, etc.

2. 21 December 1960 (Complex 1A) grievances under alleged unfair termination of three journeymen electricians by the subcontractor.

3. 8 March 1961; electricians at Complex 1B walked off in protest concerning alleged incorrect layoff procedures.

There was one partial walk off by plumbers and pipe fitters

(at Complex 1A) protesting the termination of a general foreman under the PLS system. This event took place on 7 April 1961. One dispute wherein pipefitters were dissatisfied at the prospect of a fully trained PLS testing crew being transferred from 1B, thus displacing fitters at 1A.

One dispute whereby the painters protested with management as to correct painter's classification and applicable wage rates thereto.

Lastly, a jurisdictional protest between the sheet metal workers and ironworkers over alleged misassignment of work by an Air Force subcontractor.

Tab 35, Appendix D, Pages 89 and 90, is a tabulation of data pertinent to the work stoppages that occurred on Contract DA-5919.

Tab 36, Appendix D, Pages 91 through 99 is a comparison of wage scales for various crafts for Titan I areas and the prevailing wage paid principal trades at Ellsworth.

Tab 37, Appendix D, Pages 100 and 101, is a summary of the Ellsworth Air Force National Missile Site Labor Relations Committee. This committee came into being on 27 June 1960 and actively functioned throughout the project until its completion.

APPENDIX D

SECTION IV REFERENCES

MODIFICATIONS

TO

CONTRACT DA - 5919

LEAVELL-SCOTT

AND ASSOCIATES

MODIFICATION NUMBER 3

a. ORIGIN - COC No. 121

b. SCOPE: This change (1) required water curing structural concrete in lieu of membrane curing in all missile silos, propellant terminals, vent and fuel structures, (2) provided for sodium silicate sealer on concrete floors in the equipment terminals and control center, (3) revised shock mounts in propellant terminals, (4) required casting antenna silo doors in place in lieu of previous option, (5) increased depth of portal silo, (6) provided various structural steel changes, (7) added extensive amount of painting of electrical conduit, (8) deleted security lighting, (9) required extensive revisions of communications system, and (10) changed the PLS cleaning specifications. Amount of acceleration: $116,706.00

c. FACTORS AFFECTING FINAL COST: The added requirement, specifying the water curing method within the above-cited structures, necessitated partial installation of the temporary water distribution system, necessitated construction of, and subsequent continuing maintenance thereto, of a water spraying facility secured to the underside of the slip forming facility. Further, complying with the specified water curing period, construction progress was affected inasmuch as subsequent operations were relegated to lesser production

due to accumulation of water at the bottom of [illegible] structure. Application of sodium silicate [illegible] required to be accomplished subsequent to complet[illegible] concrete placement. Further, the entire application required approximately 3 passes with interim application and scrubbing concrete areas. Due to the inefficient number of shock mounts in the original contract design, additional shock mount devices were required. This required imbedding securing anchors in the structural shell together with welding plates to the str[illegible] steel located internally within the structure. Specifying the antenna silo doors to be cast in place necessitated extensive form work immediately below the top opening of each antenna silo, which required the use of shoring consisting of both wood and structural steel beam shoring. This shoring was extensive due to the fact that supports for the shoring had to be in part struted from the internal face of the antenna silo walls. Extending the portal silos to a greater depth required a moderate amount of additional excavation on a 1 1/2 to 1 slope and required rehabilitation of completed forms for which the horizontal whalers had to be fabricated with a band saw to form the necessary periphery of the portal silo. Extending the portal silos also necessitated additional concrete and its subsequent finishing and curing, and required extension

of structural elevator steel and cribbing. Additional painting of conduit was required inasmuch as conduit was added within the communications system. This conduit required three separate coats of paint differing from the paint applied to adjacent surfaces to which the conduit is secured. In addition to the above, a major part of the above labor costs had to be accomplished on overtime to preclude delays in construction progress.

d. FINAL COST: $780,302.00

MODIFICATION PROPOSAL NO.

a. ORIGIN - COC NR. 179

b. SCOPE: Revised flexible hose requirements for all flexible hose except those under Sections "Process Piping" and "Process Piping - Fuel System".

Amount of Acceleration: $5,869.00

c. FACTORS AFFECTING FINAL COST:

The original requirement for shock testing these hoses were deleted.

Numerous flexible hoses were added over and above those required under the original contract, and the revised requirements stipulated that, in addition to the flexible hose shown on the drawings, flexible hoses were required at all piping connections between rigid and shock mounted structures and between structures and shock mounted equipment. Specific requirements for vertical and horizontal displacement and physical properties within certain localities and/or systems were also added. Under the original contract requirements, these connections could have been made using rubber piping connections.

d. FINAL COST: $110,093.00

MODIFICATION NUMBER 24

a. ORIGIN - COC No. 271

b. SCOPE: Provided extensive additions to the original Blast Detector System in the Missile Silos, Equipment Terminals, Control Center, Powerhouse, Filtration Facility, Type "A" Tunnels, and certain exterior, below grade, electrical work.

Amount of acceleration, impact and effect: $22,897.00

c. FACTORS AFFECTING FINAL COST:

This modification required the installation of various raceways to accommodate blast detector circuits to blast indicator locations. Installation of these raceways in the missile silos resulted in additional labor expense for hightime. The added exterior, below grade, blast detectors in the Control Center-Powerhouse area necessitated manual backfilling around the conduit riser which extended from the Type "C" Tunnels. This inconvenienced heavy equipment backfill in that vicinity. This change extensively revised the Blast Detector System in twenty-seven (27) structures, exclusive of the Type "A" Tunnels and exterior electrical work.

d. FINAL COST: $163,261.00

MODIFICATION NUMBER 25

a. ORIGIN - SATAF CO-ELL 11 and 35

b. SCOPE: Provided for redesigning of the thirty-six (36), forty-eight (48), and sixty (60) inch blast valves (a total of ninety-nine (99) valves were affected). Amount of acceleration, impact and effect: $13,072.00

c. FACTORS AFFECTING FINAL COST:

Basically the valves were revised internally. They were changed from a double acting, air actuated function to a single acting, air actuated function which required the redesign of numerous components of the valves. The original valves were in various stages of manufacture and assembly. Certain components were revised which had already been manufactured and delivered to the valve fabricator. The original revision required clarification and the fabrication was required to cease all work on the valves and pull them off the production line until the changes could be engineered and effected. One major change, accomplished in the fabricator's plant, required that each internal cylinder of the blast valves had to be reworked on a large coring mill. The subsequent late delivery of these valves also constituted a major factor in this change. Not only was delivery of the valves delayed approximately ninety (90) days but the install-procedure originally established had to be completely altered. Construction of the

facilities receiving the valves had progressed beyond the point where efficient installation of the valves could be accomplished.

Additional crane time, additional positioning and man handling, more complicated setting and considerable interruption of other work schedules were necessary by the later installation of the valves.

d. FINAL COST: $122,967.00

MODIFICATION NUMBER 30

a. ORIGIN - SATAF CO-ELL 20

b. SCOPE: This modification raised the deep well pumps at Complexes 1A and 1B two hundred (200) linear feet, deleted deep well pumps at Complex 1C to accommodate the artesion flow and revised the original water analysis of the wells.

Amount of acceleration, impact and effect: None

c. FACTORS AFFECTING FINAL COST:

The major feature of this change involved the revised water analysis at Complex 1C. The extreme variation in the revised chemical analysis of the water at Complex 1C over the original analysis required a complete revision in the ionics water treatment system. The amount of equipment required to treat the water under the revised analysis approximately doubled. This resulted not only in adding additional equipment but aiding additional supports, electrical circuitry, utilities and appurtenances.

d. FINAL COST: $128,264.00

MODIFICATION NUMBER 34

a. ORIGIN - COC No. 271, CO-ELL (SATAF) 167, 190, 198, 227 and 25, CEBMCO TWX's of 6 April 1961 and 10 July 1961 and CEBMCO letter of 12 May 1961

b. SCOPE: Consisted of PLS testing changes (Mod 34), RP-1 fuel system testing (Mod 152), acceptance testing revisions (Mod 156), repair and cleaning of Government furnished testing equipment (Mod 169), combining PLS Tests L, M and N (Mod 170), revisions for leakage rates of safety relief valves (Mod 172), Government furnished test fluids (Mod 197), revisions to specifications for RP-1 fuel testing (Mods 200 and 201), adjustment of PLS pressure switches (Mod 208), standby supply of spare parts (Mod 221) and standby time for cleaning Government furnished gases (Claims 115 and 251).

Amount of acceleration, impact and effect: None

c. FACTORS AFFECTING FINAL COST:

This change encompassed a wide latitude of revisions, clarifications, and supplementing instructions to the final check out and testing of all the PLS Systems of the project. This entailed the formation of extensive testing crews with representatives of the contractors, subcontractors, suppliers, Air Force, Corps of Engineers and related agencies and compressing the testing schedule into the shortest period of time possible. Numerous amendments to cover furnishing and repairing of Govern-

ment furnished test media and equipment had to be added as well as the corrective actions required when testing failed. An extensive supply of repair parts had to be maintained to make timely correction of deficiencies possible. These factors plus the impact of joint occupancy contributed to the extensive cost growth of this modification.

d. FINAL COST: $1,695,496.00

MODIFICATION NUMBER 36

a. ORIGIN - COC No. 271

b. SCOPE: This modification deletes the communications antenna; revises the TV surveillance system; adds painting in the powerhouse, control center and tunnels and tunnel junctions; revises service elevator controls; adds booster pumps for air conditioning units; adds vacuum blower and associated circuit, controls and ductwork for diesel crankcase ventilation; adds blowdown system for cyclonic separators and heat recovery silencers; makes minor revisions in process piping specifications; doubles length of FH-541; provides additional supports for missile silo junction boxes, and revises pipe supports and shock mounts in launcher area tunnels.

Amount of acceleration, impact and effect: None

c. FACTORS AFFECTING FINAL COST:

This change involved over 300 drawing changes and numerous specification changes which effected many facets of the project. This took time consumming effort to assure all changes were incorporated into shop drawings and that all vendors, suppliers, and subcontractors incorporated the changes. Thus the extent was quite wide for all facilities and hence accounts for numerous changes , the cost of which when added together accounts for the final cost.

d. FINAL COST: $985,825.00

MODIFICATION NUMBER 37

a. ORIGIN - COC No. 271

b. SCOPE: Utility pipe supports, silos. No acceleration

c. FACTORS AFFECTING FINAL COST:

This modification revised the supports, guides and anchors for the fuel and utilities systems in the Missile Sites. These changes resulted from interferences and inadequate supports to meet shock requirements. Numerous new type supports were added and numerous supports were revised in each Missile Silo. The original supports had been manufactured and delivered, and a significant amount had been installed at Complexes 1A and 1B. Where significant changes were made, many of the original supports had to be scrapped and new supports fabricated. Other supports required extensive revision in the field.

Also, some piping changes were made, some air lines were relocated and revisions in flexible hoses were made.

Due to the interferences encountered in installation of the supports and the fact that fabrication had been completed and some installation had been accomplished on the original supports, extreme difficulty was encountered in reaching bilateral settlement of this modification.

d. FINAL COST: $790,000.00

MODIFICATION NUMBER 49

a. ORIGIN - COC No. 350

b. SCOPE: This modification made extensive revisions to the communications system. A substantial increase in the scope of the communications was made by this change. Additional conduit, conductors and terminal boxes were required.

Amount of acceleration, impact and effect: None

c. FACTORS AFFECTING FINAL COST:

Numerous conduit which had already been purchased were enlarged thus resulting in restocking charges. The contractor's proposal contained excessive manhours and errors in computations while the Government's estimate had not included hightime for Missile Silo work, small tool costs or markup on engineering costs.

d. FINAL COST: $125,000.00

MODIFICATION NUMBER 50

a. ORIGIN - DE, U. S. Army Engineer District, CE, Omaha, Nebraska (prior to CEBMCO) Telegram No. 165, 11 May 1960, Directive to Proceed

b. SCOPE: Provided for one additional set of Powerhouse dome form s to preclude delays in completion of the facility. Amount of acceleration: $100,700.00. By nature of the change, the entire cost is considered as acceleration cost.

c. FACTORS AFFECTING FINAL COST:

There were no particular factors involving cost growth. The costs were due to (1) the extensive amount of form material and bracing required for a complete dome of a 40' diameter powerhouse. (2) The fact that these were spherically curved to fit the shape of the dome and would require extensive fabricating costs in comparison to flat forms. These factors justified the cost of $100,700.00

d. FINAL COST: $100,700.00

MODIFICATION NUMBER 54

a. ORIGIN - SATAF CO-ELL-55

b. SCOPE: Complete revision of electrical and minor revisions of the mechanical and structural anchorage devices throughout the project.

Amount of acceleration: $29,959.00

c. FACTORS AFFECTING FINAL COST:

This modification involved the complete revision of all electrical anchorage devices and minor revisions of mechanical and structural anchorage devices.

The electrical anchorage device, a simple one bolt strap cinch anchor, as allowed under the original contract was eliminated by the changed requirement which called for the use of a two bolt strap anchor with drilled epoxy resin seated anchor bolts. The revised requirements disallowed completely the use of cinch anchors below the minus fifty-five foot level in the Missile Silos and in all dome structures. Further, the revised requirements stipulated that for all eight inch slabs anchorage would be by drilling and bolting completely through the slab to hang all conduit, and all piping over two inches in diameter; and for all six inch slabs or less, all anchorage would be by drilling and bolting completely through the slab.

Minor exceptions to these restrictions on the use of anchorage devices were allowed in certain specific loca-

tions but for the most part, the anchorage for thousands of feet of conduit and numerous mechanical and structural items was revised. A substantial portion of the anchorage devices required on the slabs was already installed using cinch anchors when the requirements were revised.

d. FINAL COST: $312,770.00

MODIFICATION NUMBER 62

a. ORIGIN - SATAF CO-ELL 80, 81 and 82

b. SCOPE: This modification deleted an opening in the Powerhouse mezzanine floor; revised the installation procedures for the Antenna Silo doors; provided for opening and anchoring the Antenna Silo doors; and substituted 16 gage steel in lieu of 12 gage steel for cable tray covers.

Amount of acceleration, impact and effect: $7,835.00

c. FACTORS AFFECTING FINAL COST:

The principle feature of this change involved the revised procedure for installing the Antenna Silo doors. The installation of the shafts, pillow blocks, base plates and securing blocks were not included in the original contract but were added by this change. The precise layout and form work required to accomplish the added installation can be seen in that tolerances were as low as plus or minus 1/32 of an inch.

d. FINAL COST: $170,717.00

MODIFICATION NUMBER 71

a. ORIGIN - COC No. 271

b. SCOPE: PLS piping changes

Amount of acceleration, impact and effect: $131,024.00

c. FACTORS AFFECTING FINAL COST:

A complete redesign of the PLS piping in the Propellant Terminal and Missile Silo was made. Considerable progress had already been made in the fabrication of this piping under the original lay-out. This redesign required a temporary halt in fabrication operations and required the scrapping and reworking of several major stainless steel headers. Also, numerous spool drawings for several complete PLS lines were complete and had to be completely revised.

d. FINAL COST: $313,034.00

MODIFICATION NUMBER 73

a. ORIGIN - Commander AFBMD Letter of 26 July 1960 to LAFO

b. SCOPE: Expedite concrete and backfill launching area

Amount of acceleration, impact and effect: $691,399.00

c. FACTORS AFFECTING FINAL COST:

This modification provided for acceleration of all concrete work and backfill in the launcher areas to allow completion of work prior to 15 November 1960. This change necessitated mobilizing additional plant, form, etc., for the accelerated concrete pours; and accomplishment of setting forms, placing reinforcing steel and concrete on an accelerated overtime basis. Subsequent to placement of the concrete, additional excavation and backfill equipment had to be mobilized. Additional shifts and overtime were utilized to complete the work as specified.

d. FINAL COST: $697,399.00

MODIFICATION NUMBER 80

a. ORIGIN - CCC 271

b. SCOPE: Revisions of PLS pipe supports, "D" Tunnels

Amount of acceleration, impact and effect: $25,012.00

c. FACTORS AFFECTING FINAL COST:

This modification revised the Propellant Loading System pipe supports in Type "D" Tunnels.

A complete redesign of these PLS pipe supports was made. All of the original supports had been fabricated and delivered and installation had begun at Complexes 1A and 1B together with some piping at Complex 1B. Approximately one-half of the supports already installed had to be removed to effect changes and all of the original supports had to be revised and refabricated in the field. All supports had to be repainted. Eighteen new supports were added and approximately one hundred additional pounds of miscellaneous steel had to be welded to each of the original supports.

d. FINAL COST: $239,995.00

MODIFICATION NUMBER 82

a. ORIGIN - COC No. 271

b. SCOPE: Revised PLS pipe supports except "D" Tunnel supports

Amount of acceleration, impact and effect: $165,040.00

c. FACTORS AFFECTING FINAL COST:

This modification revised the Propellant Loading System pipe supports in the Missile Silos and Propellant Terminals.

A complete redesign of these PLS pipe support was made. All of the original supports had been fabricated and delivered. Since the new design was such a radical departure from the original design, a large majority of the supports had to be scrapped and new supports fabricated. Due to the nature of the supports and their attachments, only partial fabrication of the supports could be made in the shop with field fitting and completion of fabrication accomplished in the field.

There were 3,076 supports involved with a total of 393 different types of supports. Some supports were a combination of carbon steel, stainless steel and aluminum requiring numerous separate shop and field procedures for fabrication.

To preclude further delay in completion of the PLS piping, the original supports and temporary supports were utilized in proceeding with PLS pipe installation until the new supports were available. The original and temporary