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IN REPLY REFER TO
 AGAM-P (M) (17 May 68) FOR OT RD 681134

22 May 1968

AD822967

SUBJECT: Operational Report - Lessons Learned, Headquarters, 34th Engineer Group (Const), Period Ending 31 January 1968 (U)

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BY ORDER OF THE SECRETARY OF THE ARMY:

Kenneth G. Wickham

KENNETH G. WICKHAM
 Major General, USA
 The Adjutant General

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DEPARTMENT OF THE ARMY
Headquarters 34th Engineer Group (Const)
APO San Francisco 96291

EGF-CO

1 February 1968

SUBJECT: Operational Report - Lessons Learned (RCS CSFOR-65) for
Quarterly Period Ending 31 January 1968

THRU: Commanding General
20th Engineer Brigade
ATTN: AVBI-OPN
APO 96491

Commanding General
US Army Engineer Command Vietnam (P)
ATTN: AVCC-P&O
APO 96491

Commanding General
US Army Vietnam
ATTN: AVHGC-DH
APO 96375

Commander-in-Chief
US Army, Pacific
ATTN: GPOP-OT
APO 96588

TO: Assistant Chief of Staff for Force Development
Department of the Army (ACSFOR DA)
Washington, D.C. 20310

Section 1, Significant Organization or Unit Activities.

1. Command:

a. During the reporting period, Headquarters 34th Engineer
Group (Const) remained located at Vung Tau, Vietnam (YS 295465). The

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major activities of the Group included: Combat Support to Second Field Force Vietnam (II FFORCEV) and IV ARVN Corps, road and bridge upgrading (LOCs), providing minimum essential requirements (MER) to incoming helicopter companies, quarry operations and base construction.

b. The Group continued to be commanded by Colonel Joe M. Palmer.

c. Organizational Structure: (1) On 1 Nov 67, the Tree Crusher Detachment (Provisional) was attached to the 34th Engr Gp and further attached to 93d Engr Bn (Const) for operation, support and field evaluation. The two Le Tourneau Transphibian Tactical Tree Crushers were tested and a normal report submitted in Dec 67. They will continue with the battalion for further evaluation in the 3d and 4th quarters of FY 68.

(2) One plt of the 41st Engr Co (PC), 159th Engr Gp (Const), which was in DS of the 34th Engr Gp for the construction of the Dong Tam Port, completed the project on 5 Jan 68 and returned to its parent organization in Long Binh.

(3) The diving section, 41st Engr Co (PC), was placed in support of the 34th Gp's construction of the Cau Muong Bridge on 15 Dec 67. It is working there in conjunction with the 536th Engr Det (PC).

(4) On 4 Jan 68, Company A of the 27th Engr Bn (Cbt) was placed OPCON to the 79th Engr Gp (Const) with the primary mission of supporting the 3d Brigade of the 101st Infantry Division (Abn).

(5) On 14 Nov 67, the 94th Engr Det (Qry) (from the 27th Engr Bn); on 1 Dec 67, the 67th Engr Co (DT) (from the 93d Engr Bn); and on 15 Jan 68, the 156th Engr Det (WD) (from the 27th Engr Bn) were attached to the 36th Engr Bn (Const).

(6) The 34th Engr Gp organization chart as of 31 Jan 68 is attached as inclosure 1.

d. Area of Responsibility: The Group area of responsibility was changed slightly by the expansion of the 159th Engr Gp AOR in the Long Binh - Bien Hoa area. Inclosure 2 graphically portrays the current Group area.

2. Personnel, Administration, Morale and Discipline:

a. At the end of the reporting period, the personnel strength was:

	<u>O</u>	<u>WO</u>	<u>EM</u>	<u>TOTAL</u>
AUTH	212	37	5378	5627
ASGD	220	31	4982	5233

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b. During the reporting period the enlisted strength took a sharp downward trend with few replacements arriving from CONOS until mid January. On 11 Jan 68 the enlisted strength was 4743, or 88.1% of authorized. The shortage of junior NCOs and senior specialists in grades E5 and E6 has been a continuing handicap throughout the period. On 31 Jan 68, only 55%, or 874 of 1543 authorized E5s and E6s were assigned.

c. While the Group has continued to have officers in excess of TO&E assigned, this apparent advantage has been somewhat negated in these respects:

(1) Additional officers not authorized by TOE are required. Pending MTOE actions should improve this situation.

(2) A shortage of Corps of Engineer captains has resulted in 20 captain positions being filled by lieutenants.

(3) Lieutenants are required to fill Warrant Officer positions which have remained vacant during the period.

(4) Of 142 lieutenants assigned, only one is Regular Army. Additionally, very few of the assigned lieutenants have indicated intentions of pursuing military careers. The recent change of DA policy to promote to grade O3 with two years active duty is expected to have a beneficial influence on encouraging many towards military careers who were previously undecided.

d. The transfer of 620 enlisted personnel was accomplished during November and December between Group units to correct rotational hump problems. At the end of the report period no significant rotational hump problems existed in the Group.

e. During the period, 277 personnel extended their foreign service tours. A high state of morale, dedication to purpose, and continued feeling of job accomplishment have contributed to this high extension rate.

f. An average of 783 Local National Permanent Hire personnel were employed on projects throughout the Group area. Additionally, an average of 336 Local National Daily Hire unskilled personnel were employed on more menial tasks. The average daily wage has been 276\$VN for Permanent Hire personnel, and 164\$VN for Daily Hires. Additional emphasis has been placed on training these personnel to assume more demanding duties, such as vehicle and quarry equipment operators. Their utilization remains as an extremely valuable resource, and further exploitation is anticipated in other areas of Group operations.

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g. Personnel organic to the Aviation Section, Para 7, TOE 5-112E, were authorized by GO 246, HQ, USARPAC, 13 Nov 67. Requisitions for both enlisted and officer personnel were submitted by this HQ upon receipt of the authority. To date none of these personnel have been assigned.

h. No unusual disciplinary problems developed or were experienced during the reporting period.

i. The 34th Engineer Group received an Annual General Inspection conducted by HQ, USAECV(P) during the period 8 - 9 Jan 68. The Group received an overall satisfactory rating.

3. Intelligence and Counter Intelligence:

Nearly all intelligence concerning enemy activity was obtained from II FFORCEV PERINTREP and INTSUM and the USARV Weekly Combat Intelligence and Security Review. This was supplemented by intelligence obtained by direct liaison between battalions and the local tactical unit having area responsibility. Engineer reconnaissance of LOC's and planned project sites continued to be performed on an as-needed basis.

4. Plans, Operations and Training:

a. Operational Support:

(1) During the period, 30% of the total Group effort was expended on operational support missions. There continued to be three basic types of operational support missions:

(a) Direct support of combat operations.

(b) Deliberate construction to support future operations.

(c) Miscellaneous troop and equipment support to MACV and II FFORCEV units for construction and maintenance of existing roads, airfields and other facilities.

(2) Operation Enterprise: This operation, conducted by the 9th Inf Div, continued in Long An Province just south of Saigon. The 86th Engr Bn (Cbt) continued to provide engineer effort consisting of installing and repairing artillery firing pads, rock hauling, and maintenance of MSRs and access roads. Movement of rock by barge for fill material and LOC maintenance continued to be a major part of the engineer support to the operation. Work at specific locations included:

(a) Tan An: A barge unloading facility continued in operation at this location.

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(b) Ben Luc: Four artillery firing pads for a 54th Artillery Group 175mm and 8 inch composite artillery battery were constructed. The pads were constructed in accordance with a design specially adapted to spread the impact load on the Delta clay base.

(c) Tan Tru: Six artillery firing pads were constructed for 105mm howitzers. Two firing pads for 155mm howitzers are presently being constructed for use by 9th Division Artillery.

(3) Operation Santa Fe: In this operation, elements of the 86th Engr Bn (Cbt), 27th Engr Bn (Cbt), 617th Engr Co (PB) and the 67th Engr Co (DP) supported the 9th Inf Div.

(a) Land Clearing: The 86th Engr Bn Land Clearing Team cleared jungle along Route QL 1 east from Gia Ray to the II - III Corps boundary and along selected trails south of Route QL 1, in and near the May Tao Secret Zone. Clearing was done along Route TL 2B while the road was being opened from the QL 1 junction to Ham Tan for the first time in several years. Numerous fire support bases were also cleared. The operation was initiated on 1 Nov 67 and terminated 4 Jan 68. A total of 6,442 acres of jungle were cleared. A portion of the Land Clearing Team returned on 18 Jan 68 to clear an additional 427 acres for fire support bases in support of the 18th ARVN Division.

(b) Road Upgrading: Engineer effort consisted of road maintenance, road upgrading, and tactical bridge emplacement. The 27th Engr Bn (Cbt) supported the operation by upgrading and maintaining approximately 50 KM of QL 1 from Xuan Loc to the Long Khanh-Binh Tuy Province boundary. The 617th Engr Co (PB) supported the operation initially by hauling laterite and rock for the road repairs. Beginning 2 Dec 67, and continuing through 16 Dec 67, the 617th Engr Co (PB), in conjunction with the 15th Engr Bn (9th Inf Div) emplaced 1280' of Bailey Bridge. The 86th Engr Bn (Cbt) also contributed to the LOC effort by constructing two timber trestle bridges in the May Tao Secret Zone and performing maintenance of the tactical road network in conjunction with the 15th Engr Bn.

(4) Operation Manchester: This operation is presently being conducted by the 86th Engr Bn (Cbt) in support of the 101st Airborne Division in AO Manchester north of Tan Uyen. The operation began 23 Jan 68 and thus far 511 acres of jungle have been cleared.

(5) Operation Rooster: This operation started 24 Jan 68 with half of the 86th Engr Bn (Cbt) Land Clearing Team in support of the 199th Infantry Brigade. Twenty three hundred acres will be cleared around the Bien Hoa - Long Binh complex. Seven hundred and ninety five acres have been cleared to date.

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(6) Tactical Tree Crusher Operations: On 1 Nov 67, the Tree Crusher Detachment was attached to the 93d Engr Bn (Const) for tactical employment and evaluation. The detachment consists of two Le Tournou Transphibian Tactical Tree Crushers and supporting men and equipment. The tree crusher is a highly mobile vehicle approximately 60' long, 25' high, 32' wide, and weighs 97½ tons. During the period, the tree crushers cleared 550 acres in and around Long Thanh North, 450 acres in the An Loi Woods southwest of Long Thanh North and 508 acres in the Nhon Trach on the northern edge of the Rung Sat. The Tree Crusher Detachment worked in support of the 9th Inf Div.

(7) Airfields: During the period, the 34th Engr Gp worked on six deliberate operational support airfields.

(a) Xuan Loc Airfield: This airfield is presently being upgraded from Type II, C-123 capability to Type III, C-130 capability. The runway is complete and plans are underway to construct a parking apron for three C-130 aircraft. The construction of the parking apron has been complicated due to location of existing facilities near the airfield. The airfield has a laterite base, surface sealed with asphalt with MSA1 turnarounds on both ends.

(b) Ham Tan Airfield: The 36th Engr Bn (Const) assumed the mission of repairing the runway surface and constructing a parking apron for a Type III, C-130 airfield from the 27th Engr Bn (Cbt). The parking apron has a laterite base and a DBST is being applied. Repair of the single bituminous surface treatment on the runway is in progress.

(c) Long Giao Airfield: The existing O-1/C-7 strip was converted to a taxiway and a Type II, C-123 runway was constructed parallel to it. The 27th Engr Bn (Cbt) completed the runway during this period. It has a laterite base surfaced with a DBST.

(d) An Loi Airfield: The existing 4,000 foot PSP runway had deteriorated. The PSP was removed and an MSA1 mat runway overlaying an asphalt-sand base was constructed. The airfield was completed by the 27th Engr Bn (Cbt) during this period.

(e) Long Hai Airfield: The 86th Engr Bn (Cbt) is upgrading a 1,500 foot sand-cement runway to a Type II, C-123 airfield. The new runway consists of asphalt stabilized sand overlaid with MSA1 matting. Twelve hundred feet have been completed to date.

(f) Can Tho Airfield: A deteriorated PSP runway is being replaced by a runway consisting of asphalt stabilized sand overlaid with MSA1 matting. The new, Type III, C-130 airfield is being constructed by the 69th Engr Bn (Const).

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(g) Vi Thanh Airfield: Plans have been completed to upgrade this airfield to Type III, C-130 capability. Construction will begin in the near future.

(h) Ben Tre and Luscombe Airfield: Both of these airfields are in the planning phase for upgrading to C-130 capability.

(8) Cau Muong Bridge: Most of the substructure bracing for the bridge was completed during the period. Work in progress consists of finishing the bracing and capping the piles. The 86th Engr Bn (Cbt) supported by the 536th Engr Det (PC) is responsible for this 350' Eiffel Bridge rehabilitation project which was described in detail in previous reports.

(9) Miscellaneous construction and maintenance projects in support of MACV and II FFORCEV units include:

(a) Ham Tan: An aircraft logistical area, consisting of a refueling point and 14 helipads, was constructed by elements of the 36th Engr Bn (Const). Work is in progress to complete the rehabilitation of a 300 meter access road. Rains during the early part of this period hampered rehabilitation of the road. Presently a single bituminous surface treatment is being placed.

(b) Long Hai: Elements of the 86th Engr Bn (Cbt) continue to provide technical assistance to the 5th Special Forces in building construction.

(c) Nui Chua Chan: Elements of the 27th Engr Bn (Cbt) are completing the installation of a water system and finishing the construction of a mess hall for this signal facility on a mountaintop.

(d) VC Hill, Vung Tau: Elements of the 36th Engr Bn (Const) removed four abandoned masonry gun emplacements in support of the 1st Signal Brigade. The emplacements were obstructing "line of sight" communications to the Delta.

(e) Nui Dat: Elements of the 36th Engr Bn (Const) peneprimed 60,000 square yards of helipad area in support of the 1st Australian Task Force.

(f) An Thoi: Elements of the 36th Engr Bn (Const) rehabilitated a junk fleet pier and are installing protective dolphins. This project is in support of MACV, Market Time Operations.

(g) Soc Trang: Elements of the 69th Engr Bn (Const) constructed a 500' airfield overrun with T-17 membrane.

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(h) Tanh Linh: Elements of the 27th Engr Bn (cvt) made emergency repairs to a C-123 airfield. All of the equipment was airlifted (CH-54) to and from the project site which is inaccessible by road.

(i) Can Tho: Elements of the 69th Engr Bn (Const) are constructing a perimeter road of rice paddy clay around the Can Tho Airfield. Fifty nine hundred feet of roadway has been constructed to date.

(j). Fire Support Base Bravo: Elements of the 27th Engr Bn (Cvt) constructed defensive berms, built latrines and showers, and gave technical assistance to the 1st Bn, 83d Artillery in the construction of a position for a battery of heavy artillery.

(k) Route QL 1: Elements of the 27th Engr Bn (Cvt) cleared jungle for three RF/PF outposts along Route QL 1 between Gia Ray and the Long Khanh-Binh Tuy Province boundary.

b. Bailey Bridge Removal: A program has been developed for the removal and replacement of 17 Bailey Bridges. During this period three of these bridges were removed. They are being replaced with permanent bridges and/or causeways and the tactical bridging returned to depot stocks.

c. Lines of Communication (LOC): Deliberate road restoration to quality standards and emergency road repair continued. During the period, 21% of the total Group effort was expended on LOC's. Work accomplished included:

(1) Operation Long Haul (Route QL 15 - Bear Cat to Ba Ria): Elements of the 86th Engr Bn (Cvt) continued to upgrade this route to MACV standards. Numerous emergency repairs have been required as a result of interdiction to allow a continuous flow of traffic along the route. The widening of the first 10 miles to a full 40' width has been completed and paving will begin in February.

(2) Route QL 15 (Ba Ria to Vung Tau): Elements of the 36th Engr Bn (Const) are upgrading the route to MACV standards. Work accomplished during this period included widening stretches of the road, placing a DBST on the 415 foot Gau Cay Khe Causeway, and constructing two smaller causeways.

(3) Route QL 1: Elements of the 27th Engr Bn (Cvt) are currently upgrading this route to MACV standards from the QL 20 junction to the Long Khanh-Binh Tuy Province boundary. Work accomplished this period included clearing, widening, shaping and overall repair of QL 1 from Xuan Loc to the Province boundary.

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(4) Route QL 4: The upgrading of QL 4 to MACV standards is still in the planning phase. The 69th Engr Bn (Const) is presently furnishing dump truck support to the Ministry of Public Works for the rehabilitation of QL 4 between Vinh Long and Can Tho. Numerous emergency repairs have been made along QL 4 by elements of the 69th Engr Bn (Const) and the 86th Engr Bn (Cbt).

d. Base Construction:

(1) During the reporting period, elements of the 34th Engr Gp continued base construction at the following 13 locations: Ba Ria, Bear Cat, Can Tho, Dong Tam, Gia Ray, Ham Tan, Long Giao, Long Thanh North, Phu Quoc Island, Soc Trang, Vinh Long, Vung Tau and Xuan Loc. At these widely dispersed locations in the III and IV Corps areas, units of this Group were actively engaged in construction of cantonment facilities for approximately 47,000 men. In addition to this large cantonment construction program, units of the Group constructed airfield facilities, ammo supply points, communications facilities, logistical storage facilities, POL storage tanks, port facilities and utilities systems.

(2) Construction of a permanent C-130 airfield and related supporting facilities continues at Long Thanh North. A 5,000 foot bituminous concrete runway which is nearing completion will relieve some of the air traffic at Tan Son Nhut Air Base. The scope of this project requires the effort of a construction battalion.

(3) Some significant statistics to illustrate the magnitude of the Group's construction effort during the reporting period are as follows:

- (a) Total CY of concrete placed 16,291.
- (b) Total SF of wood frame buildings completed 272,194.
- (c) Total SF of wood hutments (billets) completed
555,804.
- (d) Total SF of pre-engineered buildings completed
48,840.
- (e) Total SY of hardstand constructed 1,190,301.
- (f) Total CY of fill hauled 1,079,399.
- (g) Tons of rock produced 326,506.

(4) Uncompleted RMK - BRJ contract projects previously assigned to the Group for completion are still active. Basic problems indicated during the last reporting period still exist. Non-availability

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of some construction materials has delayed completion of these projects. Problems of material shortages are compounded by the fact that many items are non-standard in the Army supply system.

(5) The Vinnell Corporation project of installing power ships and primary and secondary electric distribution systems in Vung Tau was completed in November 1967. The power source consists of two T2A tankers which are moored in Vung Tau Harbor. Currently, Vinnell is in the initial phase of installing a 9,000 KW power plant at Bear Cat and primary and secondary electric distribution systems at Bear Cat and Long Thanh North. Work accomplished to date has been the site preparation for the power plant. The project is scheduled for completion in March 1969.

(6) Elements of the 34th Group continue to monitor contract dredging within the Group's area of responsibility. Dredging for hydraulic fill to create the 600 acre Dong Tam Base for the 9th Inf Div has been completed. Approximately 11 million cubic meters of hydraulic fill were pumped to create the required real estate for Dong Tam. Dredging at Vinh Long was initiated in November. Approximately 0.8 million cubic meters of hydraulic fill have been pumped to provide additional usable area for airfield facilities and cantonment expansion. During this period dredging at Can Tho (Sink Thuy) started. Approximately 1.3 million cubic meters of hydraulic fill will be pumped to develop real estate for a civilian war casualty hospital and a logistical complex to serve the Delta.

(7) Installation master planning is an area in which this Group is actively involved. The assigned battalions assist their respective base development boards and installation commanders in the preparation of master plans. The battalions submit monthly updated base development reports which reflect completed and current construction as well as current requirements. The monthly update reports are combined to form a consolidated Group base development and master planning file for each installation in the Group's area of responsibility. With this data, it is possible to forecast and prepare future requirements for engineer effort and materials.

e. Design and Construction Engineering:

(1) During the reporting period the engineering section continued to encounter and solve the problems of construction on the unstable soils of the Delta. The advent of the dry season has increased the volume of horizontal construction and with it the requirement for close inspection of earthwork to insure stability during the coming monsoons. The increase in construction has also brought a great volume of plans to the engineering section for review. These have included bridges, roads, drainage facilities, and airfields. The engineering section has provided design suggestions and materials information in the course of its reviews to continually upgrade the standard of construction within the Group.

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(2) The engineer section has received its concrete test set but still has not received its vital TO&E Asphalt Test Set. The Group is becoming heavily involved in asphalt construction of all types and the shortage of this test equipment seriously hampers the section's ability to adequately evaluate the quality of construction. This shortage of test equipment is more serious in light of the fact that the subordinate Combat Battalions, which are not authorized organic testing equipment, are heavily engaged in road construction and sand-asphalt stabilization. These units depend entirely on the Group Headquarters for testing support and thus the testing on any one project is limited to that essential for minimum quality control.

(3) During the reporting period the engineering section has devoted a large percentage of its soil testing and survey capability to support of subordinate units. One of the assigned soils analysts has been in the field almost continuously traveling from project to project supporting the extensive LOC upgrading program and the construction of airfields. The engineering section has provided survey support continuously during construction to four major airfield projects at Phu Quoc Island, Vinh Long, Long Hai and Xuan Loc. In addition, extensive survey support was given the LOC program to include bridge site profiles and alignment control. A topographic survey was conducted at Dong Tam Base to provide information on the contractor supplied fill for the North 400 acres.

(4) The need for adequate bearing capacity for roads, airfields and buildings constructed in the Delta has involved the engineering section in an extensive research program for clay-lime stabilization. With the assistance of the 559th Engineer Detachment (Terrain) a testing program (Project CLIME) has been set up in Can Tho to make field evaluations of lime stabilization on the Delta clay soils. The results thus far have been extremely favorable with CBR's of 20+ being obtained at about 6% lime for subbase material and CBR's of 80+ being obtained for base material using 6% lime and 8% portland cement. The ability to attain high bearing capacities with the addition of relatively small amounts of chemicals and cement will be extremely valuable to Delta horizontal construction since the logistical support of all Delta construction is a major factor in determining feasibility. The testing at Can Tho is presently being expanded to include the use of lime stabilization on selected stretches of route QL-4 and other selected secondary roads in the Delta. It is felt that the final results of this testing will have an important effect on future horizontal construction in the Delta. An interim report on this project was provided to CG, USAECV(P) on 7 December 1967 by the 559th Engineer Detachment (Terrain). (Interim Report Project # 759-A-4 (Lime and Lime Cement Stabilization of Delta Clays)).

(5) One of the most serious design problems faced by the engineering section has been the provisions of a suitable stabilized

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seating course under MSA1 matting used on the many airfields under construction within the Group. It was determined that the previous system of providing a bituminous seal coat with a simple sand seating layer was inadequate since the seal coat was easily broken thus allowing water to penetrate and initiate a base failure. Under the channelized wheel loading of landing aircraft the seating layer compacts and displaces slightly causing the seal coat to fatigue and crack. During the monsoon season, the daily rain provides water to the depressions and the trapped water seeps through the broken seal coat into the base soil. The resulting slurry is then pumped out by the aircraft traffic thus producing the base failure. (For details on the mode of failure predicted from the original service tests see USAEWES T.R. 3-507, Engineering Tests of T10 Steel Airplane Landing Mat (modified M8), Dust Alleviation Type, June 1959). To counteract this problem a sand-asphalt seating layer, a maximum of two inches thick was designed to provide a flexible, stabilized seat. To optimize the design, it was necessary to develop stability criteria to get the best asphalt content for each type of sand used. Test specimens were made with varied asphalt contents and unconfined compression tests were made on these samples with available soil test equipment. The results appeared to differ from actual field experience so additional research led to the fabrication of equipment to utilize the Hubbard-Field stability testing procedure developed for sand-asphalt mixes. Modification of the procedure to account for the blending temperatures used in the field and the effect of sun drying on the mixture were incorporated and the test briquets, at various asphalt contents, were tested in the fabricated apparatus. The resultant stability vs asphalt content curves have provided close correlation with field experience. The institution of this testing has provided close control of the sand-asphalt seating layers providing a stable, waterproof seating layer under the MSA1 mat runways. A typical airfield design is attached as inclosure 3. Metal mat airfields in III - IV CTZ which should be surveyed in subsequent years to determine field performance include:

<u>LOCATION</u>	<u>MAT</u>	<u>OPEN</u>	<u>UNIT</u>	<u>BASE</u>	<u>SEAT-SEAL</u>
Cu Chi	AM2	Spring 67	554 EB	Laterite	Sand Over Penepriime
Lai Khe	MX19	Spring 67	1 EB	Laterite	Penepriime
Prek Loc	MSA1	Spring 67	168 EB	Silt-Clay	Penepriime
Vinh Long	MSA1	Sep 67	27 EB	Sand-Cement	Sand
An Thoi	MSA1	Dec 67	27 EB	Sand	Sand-Asphalt Mix
Long Hai	MSA1	Feb 68	86 EB	Sand	Sand-Asphalt Mix
Can Tho	MSA1	Apr 68	69 EB	Clay-Cobbles	Sand-Asphalt Mix
Vi Thanh	MSA1	May 68	69 EB	Clay-Cobbles	Sand-Asphalt Mix

(6) The engineering section has been involved in the design of many structures during the reporting period. These include a standard

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urinal, a 60' highway bridge, an airfield passenger terminal, port facilities and advisor housing for Phu Quoc Island, protective bunkers, the superstructure for Cau Muong Chuoi Bridge and the Ben Tre Airfield. Additionally, there is presently under design a 40' x 200' Medical Supply Warehouse, a Vietnamese School (Civic Action), a 150' highway bridge, mine barriers for Cau Muong Chuoi Bridge and a standard Battalion Headquarters building. Designs for many other structures were also provided by modification of previous designs to suit special applications.

(7) The engineering section continued the design of the Cau Muong Chuoi Bridge with the redesign of the pile caps and superstructure to accommodate variations in the spacing of the piers as constructed. The three Eiffel spans to be used for the main part of the superstructure are 30 meters long and therefore variations in the gap to be spanned require that the end bearings be offset to correctly support the trusses. This required the design of a cantilever abutment cap at one end of the bridge where the span was over 30 meters. The construction material shortages previously encountered have been overcome and construction is progressing on schedule.

(8) The engineering section is presently involved in the design of some seven barge off-loading facilities in the Delta area. Design is complicated by the lack of port construction resources which necessitates the design of port structures that can be constructed completely with land based equipment.

f. Training: During the reporting period there were four training programs which affected the Group.

(1) Personnel from Group units began attending the 18th Engr Bde Engineer Equipment School located in Dong Ba Thin. Courses of instruction are given in the operation and maintenance of the D7E dozer, 290M tractor, Cat 12 grader, and the 20 ton crane. Each class is 10 days long and the school will continue through 31 March 1968.

(2) Units of the Group conducted a program of training selected cadre personnel of the 303d ARVN Engr Bn. The 86th Engr Bn (Cbt) organized the program and the cadre was instructed in virtually all phases of combat engineering. The training was complicated by a lack of interpreters. However, the training was believed to be effective and worthwhile for the ARVN engineers.

(3) Newly arrived 34th Engr Gp replacements stationed within the Vung Tau Special Zone received replacement training given by the 53d General Support Group. Classes were given on VC tactics, mines, booby traps, field sanitation, convoy procedures, immediate action drills, and weapons familiarization. These classes are held once every month for all local replacements.

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(4) A maintenance training program was conducted within the Group by representatives from the US Army Tank Automotive Center and the US Army Mobility Equipment Command giving operator's and supervisors training on multifuel engines, the 290M tractor, and Euclid 20 ton dump trucks. Instruction on PLL was also given. Personnel of the 27th Engr Bn (Cbt), 36th Engr Bn (Const), 86th Engr Bn (Cbt) and 591st Engr Co (LE), and hired local nationals participated in the training program.

5. Logistics:

a. During the report period, rock requirements in the Delta increased significantly with the addition of a requirement to support LOC and Revolutionary Development Programs in the Delta. Firm requirements were established by MACV to ship 38,000 tons of rock per month to the Delta from Vung Tau. In view of the fact that during the previous eight month period, with the assigned barge fleet, only 50,000 tons had been moved, a recommendation was made to higher HQ that the responsibility for moving rock be assigned to 1st Log Cmd who controlled the majority of assets required to move the rock. The transfer of responsibility was effective on 15 Jan with the 34th Engr Gp retaining responsibility for loading barges at Vung Tau and off-loading them at Dong Tam and Tan An while the Transportation Management Agency (TMA) was assigned the responsibility for all movement of the barges to and from the Delta and to and from loading/off-loading sites. First shipments after the transfer of responsibilities were accomplished 18 Jan and approximately 2000 tons have been moved to date. Currently, the transfer of the loading and unloading responsibilities to 1st Log Cmd is being considered.

b. Considerable effort was expended by HQ, 34th Engr Gp in an attempt to obtain the TO&E asphalt paving equipment of the 544th Engr Co (CS). As reported in last quarter's ORLL, this unit arrived in-country without its TO&E Asphalt Plant, 5-8 Ton Rollers, 9-14 Ton Roller and paving machines; all of which are required for asphalt paving operations. Although the plant was received and the paving machine shortages filled by lateral transfer action within the 20th Engr Bde, the 5-8 and 9-14 ton rollers have not been received. In addition, units that have been in country for a year or more still have TO&E shortages that, to a certain extent, adversely affect their mission capability. As an example - the 573d Float Bridge Company, which arrived in country in Feb 67, is still short 9 of its TO&E bridge erection boats. Although they have been reported by all available (Periodic Logistics Reports, ORLL's, Command Letters, etc) means, critical TO&E shortages remain unfilled.

c. The 34th Engr Gp operates three major rock quarries; one in Gia Ray and two in Vung Tau. To produce the required 118,000 tons of rock per month from these quarries, a number of items of equipment above TO&E

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authorization are required, ie, 11 track drills, 7 - 600 CFM compressors (does not include 4 RMK compressors on hand) and three 40 ton cranes. Although three additional drills have been received, the remaining additional equipment is urgently needed. Efforts by this and higher HQ to fill the remaining shortages have been unsuccessful.

d. During the past three months, units of the 34th Engr Gp have continued their efforts to more accurately forecast material requirements for construction projects. These actions have resulted in timely response from supporting depots and a significant reduction in the frequency of construction delays caused by critical shortages of materials such as corrugated roofing, cement, electrical and plumbing fixtures.

e. A thorough and detailed review of procedures for the control and monitoring of MCA Construction costs was conducted. Procedures were found to be adequate; however, 34th Engr Gp Reg 415-4 (Requisitioning and Accounting for Materials) was updated and republished to provide additional guidance to subordinate and customer units and to insure that O&M and MCA construction materials are applied to the projects for which they are requisitioned.

f. In accordance with instructions contained in HQ, 6th Army General Order 199, the 34th Engr Gp deployed to Vietnam less its organic aviation section. USARPAC GO 246, dated 13 Nov 67, reinstated the aviation section and all equipment has been requisitioned with the exception of the three UH1D Helicopters. As these aircraft are DA controlled, guidance has been requested from higher HQ as to proper requisitioning procedures.

g. Maintenance:

(1) The Group has enjoyed a steady downward trend to the deadline rate of all items of equipment during this reporting period. Goals of 7.0% for critical items and 3.5% overall have been established compared to 10.0% and 5.0% respectively established by USARV. During two thirds of the reporting period the Group overall goal has been maintained and the critical items percentage has fluctuated within 1% of the Group goal. This downward trend has been the direct result of increased command emphasis on operator maintenance and training, and obtaining repair parts through the use of MRE action, PDO yards, cannibalization points and organic units. The acquisition of parts through other than normal supply channels detracts from the unit's maintenance supervision capability. However, this reduction is justified when the supply system does not have adequate repair parts.

(2) The 544th Engr Co (CS) received its authorized asphalt plant and is preparing for paving operations. No PLL or Technical

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Manuals other than the manufacturer's manuals were received with the plant. As a result the PLL has been established using manufacturer's parts numbers only. Without adequate PLL on hand it will be impossible to sustain operation of the plant.

(3) The PLL for the 94th Engr Det (Quarry) 225 TPH Rock Crusher was on a separate contract and scheduled to arrive in-country during the month of November 1967. To date coordination with USAECV(P) through 20th Engr Bde has not resulted in the location of the PLL.

6. Force Development:

a. The transphibian tree crushers were attached to the 93d Engr Bn (Const) primarily because of the crushers' dependence on heavy maintenance support which can be provided by the 3d Echelon Maintenance platoon of Company A. In addition, the 93d Engr Bn is located near the 9th Inf Div which has operational control of the crushers.

b. Action was taken throughout the period to reassemble the 27th Engr Bn (Cbt) in the vicinity of its base at Blackhorse to make it more responsive to immediate combat support missions. A platoon from the 36th Engr Bn (Const) assumed the construction missions at Ham Tan freeing a platoon of the 27th Engr Bn. Company A, 36th Engr Bn assumed responsibility for the Gia Ray quarry releasing Company C, 27th Engr Bn to concentrate on the LOC upgrading of QL1. Two platoons of Company C, 36th Engr Bn were tasked with the remaining combat support and base construction missions on Phu Quoc Island. This permitted Company B, 27th Engr Bn to return to Blackhorse upon completion of the C-130 airfield on 24 Jan 68. Upon completion of the C-130 airfield at Vinh Leng in Dec 67, those elements also returned to Blackhorse. The end of the reporting period finds A/27th at Phuoc Vinh (OPCON to 79th Engr Gp) in a direct combat support role, B/27th at Blackhorse working on base construction, C/27th at Gia Ray working on QL1 (LOC), and D/27th at Blackhorse working on ITL 2 (LOC). Hence, the battalion which was most spread out at the beginning of the period - from Ham Tan to Phu Quoc - is now reconsolidated and undergoing individual (maintenance, weapons qualification, etc) and unit refresher training.

c. During the period all of the 34th Engr Gp quarries were placed under control of one battalion. The 36th Engr Bn (Const) now has responsibility for Gia Ray (A/36th), the blast rock quarry at Ba Ria (67th Engr Co (DT)), the two Vung Tau quarries (B/36th, 544th Engr Co (CS)), and the blast rock quarry on Phu Quoc Island (C/36th). Expertise in quarry operations is rapidly being developed within the battalion.

d. Although now attached to the 36th Engr Bn (Const), the 67th Engr Co (DT) remains in general support of the Group. Two

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sections are in direct support of the 27th Engr Bn (Cbt) at Gia Ray and two sections are in direct support of the 86th Engr Bn (Cbt) at Bear Cat. All elements of the company are presently working on LCCs.

e. The 156th Engr Det (WD) continues to drill wells on Phu Quoc Island. Attachment to the 36th Engr Bn (Const) coincided with the arrival of elements of the 36th Engr Bn on the island and the departure of B/27th.

f. The Group Force Structure remains well balanced to accomplish its assigned missions with the exception of shortages in port construction capability. The only organic port construction asset is the 536th Engr Det (PC) which presently has upwards of three years of scheduled work.

7. Command Management:

a. The lack of sufficient aviation support continues to hamper efficient command and control. This is compounded by the widely separated missions, not only within the Group as a whole, but also within the individual battalions.

b. Intensive emphasis has been placed throughout the reporting period on management and accounting of MCA construction projects. Detailed analyses have been made at Gp HQ on the Project Data Requests (PDRs) and battalion production and capability reports. Each base construction project has been reviewed item by item to validate and purify the scope, funding and cost accounting. All completed projects have been turned over to the Post Engineer on DA Form 1354. A copy of the Jan 68 Group management analysis is attached as inclosure 4.

8. 536th Engineer Detachment (Port Construction):

a. Command: CPT John P. Carey continues to command this unit.

b. Personnel: During this reporting period the unit's enlisted strength decreased from 58 to 46. Although the loss of personnel has not affected the current missions of the unit, it is expected that future projects will be hampered due to lack of supervisory personnel trained in the operation and maintenance of the equipment within the unit.

c. Operations:

(1) During this quarter the unit continued its support of the 86th Engr Bn (Cbt) in construction of the Cau Muong Chuoi Bridge.

(a) The unit fabricated 16 pile sleeves to be utilized in the underwater bracing system.

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(b) One hundred and fifteen of 159 pieces of underwater bracing have been emplaced to date by the unit's divers with the support of the 41st Port Construction Company divers.

(c) All piles have been cut to grade and prepared to receive caps.

(d) All above water bracing has been completed.

(2) Support of other units:

(a) The unit heavy equipment section supported 19 different units on 70 different occasions.

(b) The unit LCM supported six different units on 29 different occasions.

d. Organization:

(1) On 15 Nov 67 the unit received GO # 195, HQ USARPAC, dated 16 Oct 67, reorganizing the unit under TOE 5-129E dated 31 Dec 66. Although the TOE states that no changes were made to the TOE structure, 13 discrepancies involving unit designation and personnel and equipment authorizations were noted.

(2) Change 3 to TOE 5-129E for the Port Construction Company upgraded the position of Senior Harbor Craft Operator from E-5 (61B40) to E-6 (61B40). This detachment's TOE still calls for E-5 (61B40) to fill this position. This unit's Senior Harbor Craft Operator slots should also be upgraded to E-6.

9. 573d Engineer Company (Float Bridge):

a. Command: 1LT Paul B. Cassell Jr. continues to command the company.

b. Personnel: In the infusion program, this unit has infused with personnel from the following units:

- (1) 500th Engineer Company (PB)
- (2) 86th Engineer Battalion (Cbt)
- (3) 26th Engineer Battalion

c. Operations:

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(1) During the reporting period the 573d continued the assigned mission of hauling supplies to the 27th Engr Bn located at Long Giao RVN, the 93d Engr Bn located at Long Thanh North, the 86th Engr Bn located at Long Thanh, and the 36th Engr Bn at Vung Tau.

(2) Also during this period the unit supported the 617th Engr Co (PB) in Operation Santa Fe by hauling panel bridge from Long Binh to a field location.

(3) Other support operations include conveying equipment to Newport for the 26th Engr Bn, moving Company B, 93d Engr Bn to Dong Tam, and returning Company B, 27th Engr Bn to Long Giao. Also, two convoys were made with supplies to Long Hai in support of Company D, 86th Engr Bn.

(4) A total of 25,309 tons, of engineer construction equipment, explosives, and ammunition have been hauled 251,304 miles in 7,029 truck days for the Battalions, and separate companies of the 34th Engr Gp (Const) since 1 Apr 67.

(5) On the 14th, 15th, and 16th of October 1967 the 573d Engr Co (PB) crated and packed one set of Bridge Floating Aluminum Highway deck bulk superstructure on pontoon floats (minus erection set), to be transported to Saigon Newport docks for further shipment to 3d Marine Division 7th Engineer Battalion APO 96337. (Total pieces 932, weight 179,960, cube 8,327 feet).

(6) From 26 Nov 67 to 11 Dec 67 this unit gave instruction to the 303d ARVN Engr Bn, (8 men per week), in construction of a four float M4T6 raft, four pontoon light tactical raft, foot bridge, and installation of dead men, anchor cables and anchor towers. Instruction also was given in the 15 man boat, and the two man reconnaissance boat. The correct procedure for loading and off-loading bridge trucks was the final phase of training for each team. The major problem encountered in training was the lack of interpreters; thus reducing the effectiveness of the training somewhat. The unit used its Local National employees to provide minimum essential translation.

d. Inspector General: This unit was scheduled for an annual Inspector General inspection on 26 Jan 68. However, the scheduled inspection has been postponed indefinitely.

10. 617th Engineer Company (Panel Bridge):

a. Command: CPT Reginald N. Dean continues to command this unit.

b. Operations: During the quarter, the unit continued its primary mission of bridge support and its secondary mission of hauling with its five-ton dump trucks.

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(1) The trucks traveled approximately 83,600 miles during this period.

(2) The unit hauled 12,500 cu yd of laterite, 8,200 cu yd of crushed rock and 1,500 cu yd of sand in support of Group operations during the quarter.

(3) From 2 Dec 67 to 15 Dec 67, the unit delivered and assisted in construction of 1280 ft of Bailey Bridge in support of the 15th Engr Bn (Cbt), 9th Inf Div on Operation Santa Fe.

(a) Bridge summary:

<u>SITE NO.</u>	<u>LENGTH AND TYPE</u>	<u>CLASSIFICATION</u>	<u>COORDINATES</u>	<u>REMARKS</u>
1.	220' DS	50/55	YT 840991	Two Piers
2.	60' DS	65/65	YT 847998	
3.	160' TS	70	YT 874997	With Pier
4.	70' DS	60/60	YT 897989	
5.	90' TS	65/65	YT 929981	
6.	By Pass - no bridge required		YT 955969	
7.	70' DS	60/60	YT 992977	
8.	170' DS	35	ZT 074997	Classification of sites 8 & 9 due to piers.
9.	150' DS	35	ZT 079999	
10.	70' DS	60/60	ZT 103996	
11.	50' DS	75/70	ZT 148001	
12.	170' DS	35	YS 982862	Classification due to pier construction.
Total 1280'				

(b) Sites 1, 8 and 9 had a multiple pier configuration. To support the Bailey Bridge over the piers, a device was constructed using two transoms welded together and laid across the pier. This permitted the bridges to be constructed with a minimum of lost time.

c. Training:

(1) During operation Santa Fe training was given to NCOs from A, B and E Cos of the 15th Engr Bn prior to construction of the bridges. This provided them with sufficient refresher training to permit rapid construction during the actual operation.

(2) ARVN Engineers from the 303d Engr Bn were given instruction during and after Santa Fe. Eight officer and NCO cadre personnel went through a week long training cycle. Four training cycles were conducted with very fine results.

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(3) 46th Engr Bn (Const) and the 93d Engr Bn (Const) both received refresher training prior to commencing the Bailey Bridge removal and replacement program.

d. Logistics: Bailey Bridge is in adequate supply. Unit has 800' of DS in its bridge park.

Section 2, Part I, Observations (Lessons Learned).

- 1. Personnel: None.
- 2. Operations:

SAND-ASPHALT SEAT

Item: Sand Asphalt Seating Layer for M8A1 Matting.

Discussion: With the use of a sand-asphalt seating layer under M8A1 matting, proper laboratory techniques need to be developed to assist in the design of the sand-asphalt mixture. The strength and density of sand-asphalt vary greatly with the percent of asphalt and the type of sand included in the mix. Laboratory tests must be indicative of results attainable with TO&E engineer construction equipment. Modification of the Hubbard-Field stability testing procedure to reflect blending temperatures of sun dried sand and distributor heated asphalt (175°) has provided a basis for evaluation of strength performance of various asphalt contents in the blended test briquets. These briquets are oven cured 24 hours at 140°F and load tested. Density determination is made with the failed specimens. Plots of stability (in pounds) and density (in LBS/CF) versus percent asphalt assist in determining the optimum asphalt content of the seating layer used under M8A1 airfield surfacing.

Observation: Modification of the Hubbard-Field stability testing procedure to duplicate field conditions allows laboratory tests to accurately predict the field performance of sand-asphalt mixes.

FLEXURAL STRENGTH OF WOOD

Item: Allowable Flexural Stress of Construction Grade Lumber in Vietnam.

Discussion: In designing structural members of wood construction, an allowable working flexural stress must be assigned to the lumber used. Tests were conducted on several specimens of construction grade Douglas Fir to determine the allowable stress. Test results on 2" x 4" and 4" x 4" stock indicated that an allowable flexural stress of 1500 psi (extreme fiber bending) will provide at least a safety factor of 2 over the modulus of rupture.

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Observation: Using an allowable flexural stress of 1500 psi for design of structural members using construction grade Douglas Fir will provide a safety factor of 2 over the modulus of rupture.

STORAGE OF CONSTRUCTION DRAWINGS

Item: An Economical Practical Engineering Drawing Filing Rack.

Discussion: This headquarters has amassed a total of over 3000 engineering drawings of all types since arrival in country in March 1967. Originally, all drawings were kept on stick files, however, as the number increased, the stick files occupied too much floor space and an alternate solution had to be found. The requirement was for a workable file that occupied a minimum of floor space and a minimum construction effort. The design chosen was centered around the two piece cardboard tubes used to ship 2.75" rockets. These tubes have been readily available from local aviation units. The tube is approximately 3½" in diameter and comes in various lengths. The 41 inch length was chosen due to its availability and compatibility with sheet sizes encountered by this headquarters. Each tube holds approximately 25 sheets and the tubes are indexed to a card file for easy reference. The drawings are filed two ways, by facilities as defined in AR 415-28, and by locations. The latter is used for base development plans, airfields, port facilities and other similar drawings keyed to a specific location. Each card lists the drawing by title and in addition contains the number of sheets, the tube number, whether a sepia or print is on file, the originating unit and the drawing number. A rack made from 2" x 4" stock and 3/16" masonite was fabricated to hold the tubes. Tubes slide in and out of 3½" holes horizontally. The 3½" holes were cut in the masonite with a circle cutter. The whole assembly occupies 16 SF of floor space and holds 198 tubes or a maximum of 4950 sheets. It is anticipated this will be sufficient for future needs of this headquarters. A sample file card and a sketch of the tube rack are included as inclosures 5 and 6 respectively.

Observation: This drawing filing system has not only proven economical but also practical and easy to use. Additionally it allows storage of all drawings within the drafting room.

STABILIZATION OF SAND BERMS

Item: Stabilization of Ammunition Supply Point Berms Constructed of Sand.

Discussion: The stabilization of a fine sand when used in the construction of ASP berms presents a serious problem as it is not possible to put mixing equipment on the berms and the use of hand labor to mix

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portland cement into the sand to produce a sand-cement surface is generally prohibited by time. The use of membranes is expensive, grass cannot be started during the dry season and straight asphaltic materials only form a surface crust that is easily broken and weathered away. A solution was found in using a mixture of half peneprime (asphaltic dust palliative) and half diesel fuel which was thin enough to penetrate 1½ to 2 inches into the sand. That was followed by an application of full strength peneprime. This mixture was easily sprayed onto the surface and produced a stabilized layer that has proved durable under heavy winds.

Observation: Fine sand berms can be stabilized from wind erosion by the application of a mixture of 50% peneprime and 50% diesel fuel followed by the application of full strength peneprime.

3. Logistics:

TRANSPORTATION

Item: Movement of Bulk Construction Material.

Discussion: Upon arrival in country, the 34th Engr Gp was assigned the responsibility of moving bulk material, rock, sand etc, from Vung Tau to the Mekong Delta. A loading site was constructed at Vung Tau and off-loading sites constructed at two locations in the Delta. Although the Group was assigned barges; tugs, LCMS's and security were required from other agencies. During a 9 month period, approximately 50,000 tons of bulk material were moved to the Delta. Continuous and extensive coordination with numerous supporting agencies was required to move every barge. Difficulties encountered were numerous and stemmed primarily from the fact that the 34th Engr Gp did not control the majority of the assets required to effectively and efficiently operate the system.

Observation: A responsive system for moving materials cannot be established unless the agency responsible for moving the materials commands the necessary operational assets.

MAINTENANCE FOR LAND CLEARING PLATOON

Item: Extensive maintenance time required to maintain Land Clearing Platoon.

Discussion: Because of the type of work being performed by the Land Clearing Platoon, considerably more maintenance is required than on normal D7E full track tractors. Since the maintenance section organic to the platoon is not adequate, the Group has assigned a

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maintenance warrant officer and additional mechanics. In addition the DSU has been directed by 1st Log Cnd to provide a 3d echelon maintenance support team. This team has proven to be a great asset.

Observation: Continued emphasis must be placed on the maintenance of the Land Clearing Dozers. A minimum of ten days down time for maintenance is a must to accomplish the monumental task required as outlined in inclosure 7.

MODIFICATION OF D7E LAND CLEARING DOZERS

Item: Modification's to D7E Land Clearing Dozers have been required for work in heavy jungle.

Discussion: The work in dense jungle has created the problem of repeated puncturing of radiator cores by large branches and bamboo. The dozers have also sustained damage to the lower radiator pan and oil pan caused by running over tree stumps and during the over turning of the large sized trees encountered. The cabs provided with the Eome plow did not provide adequate protection to the operator when operating in areas with trees up to 36" in diameter. Reinforcing kits for these areas have been ordered.

Observation: Extensive field modifications to reinforce the radiator and lower engine guards were required to protect the radiator core, lower radiator pan and oil pan. Heavy reinforcing of the cab is required for operations where large trees are encountered.

Section 2, Part II, Recommendations.

1. Personnel: None
2. Operations: None
3. Training and Organization:
 - a. The authorized TOE aircraft be allocated to this headquarters.
 - b. A Fort Construction Company be assigned to the Group.
4. Intelligence: None
5. Logistics:
 - a. A unit not deploy to Vietnam with equipment shortages that will preclude accomplishment of any of its primary missions.

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b. Action be taken to fill the 573d Engr's TO&E shortage of nine bridge erection boats.

c. New equipment not be introduced into the theatre until adequate repair part support is available. (Chicago Pneumatic Track Drills, D-9 Dozers, and 225 TPH Rock Crushers).

6. Others: None

Joe M Palmer

JOE M PALMER
Colonel, CE
Commanding

7 Incl

- 1. Gp Organization Chart
- 2. Gp Sector Map
- 3. Vi Thanh Airfield Design
- 4. Management Analysis
- 5. Sample File Card
- 6. Tube Rack Sketch
- 7. LCT Maintenance Report

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AVBI-OS(1 Feb 68) 1st Ind
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DA, HEADQUARTERS, 20TH ENGINEER BRIGADE, APO 96491 23 February 1968

Commanding General, US Army Engineer Command Vietnam (Prov), ATTN:
AVCC-P&O, APO 96491

1. Forwarded for your information and action in accordance with USAECV(P)
Regulation 1-19, dated 15 April 1967.

2. This headquarters concurs with the ORLL submitted by the 34th
Engineer Group, modified by the following comments:

a. Section 1, paragraph 2 b and c: The shortage of enlisted per-
sonnel and captains is a brigade-wide problem. The shortage of captains
is particularly severe and there appears to be no relief of this problem
in the foreseeable future.

b. Section 1, paragraph 4 e(4): In anticipation of the success of
this construction technique, requirements for lime are being programmed
for the next 15 months.

c. Section 2, Part I "Stabilization of Land Berms": This is also
a good way to achieve palliation of flat, silty areas subject to wind
erosion, such as heliports. Another way to aid penetration of your
bituminous material is to pre-dampen the soil with water.

d. Section 2, Part I, Paragraph 3 "Movement of Bulk Construction
Material": This problem was recognized, and the agency responsible for
moving the material (TMA) now commands the necessary assets.

e. Section 2 Part I "Extensive Maintenance Time Required for Land
Clearing Team": A ten-day maintenance stand-down for every 30 days of
operation is the guidance proposal for all land clearing operations.

f. Section 2, Part I "Modification of D-7E Land Clearing Dozers":
A special reinforced guard has been developed by the Caterpillar Corp-
oration to alleviate the problem of damage to the undercarriage.
These reinforced guards have been shipped from CONUS, but have not yet
arrived in country.

g. Section 2, Part II, Paragraph 3 a: Do not concur. It is acknowl-
edged that aircraft allocations are usually insufficient to meet the needs
of group headquarters, but this is a brigade-wide problem. Because of
current aircraft density and a shortage of maintenance personnel,
brigade requirements dictate a centralization of aircraft assets at
this level and allocation within the brigade by priorities established
at the brigade headquarters. MTOE action has been proposed which gives
each construction group 4 each OH6 helicopters and 1 each UH-1 helicopter.

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30

AVBI-OS (1 Feb 68) 1st Ind

23 February 1968

SUBJECT: Operational Report - Lessons Learned (RCS-CSFOR-65) for
Quarterly Period Ending 31 January 1968

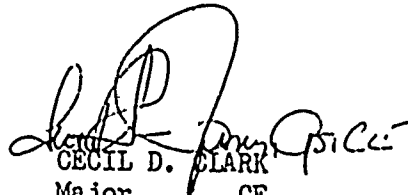
h. Section 2, Part II, Paragraph 3b: On 15 February 1968, this headquarters submitted its second request through channels for additional port construction capability. The Port Construction Detachment presently assigned the 34th Engineer Group has a backlog of almost 2 years work.

i. Section 2, Part II, Paragraph 5a: Concur.

j. Section 2, Part II, Paragraph 5b: The 573rd Engineer Company (FB) has been severely hampered in the accomplishment of its mission by lack of bridge boats. Boats are on hand at Sharpe General Depot and Command letters have been sent forward in an attempt to expedite issue of these boats to the 573rd Engineer Company.

k. Section 2, Part II, Paragraph 5c: Repair parts are shipped when new equipment is sent to RVN, but they are frequently shipped separately and often sent late, are lost or misordered. Recommend that repair parts for new equipment be shipped with the equipment.

FOR THE COMMANDER:


CECIL D. CLARK
Major CE
Adjutant

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31

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MAR 2 1968

AVCC-P&O (1 Feb 68) 2nd Ind
SUBJECT: Operational Report - Lessons Learned For 34th Engr Gp

HEADQUARTERS, UNITED STATES ARMY ENGINEER COMMAND
VIETNAM (PROV), APO 96491

TO: Commanding General, United States Army Vietnam, ATTN: AVHCC-DST
APO 96375

1. The attached ORLL, submitted by the 34th Engr Gp, has been reviewed by this headquarters and is considered adequate.

2. Section 1, para 5c, page 14: Concur. Emergency MTOE action was submitted to Department of the Army increasing units TOE allowance for compressors and track drills. Current MTOF action includes increases in authorization for 40T Cranes.

FOR THE COMMANDER:

John T. Troutman 1LT, AGC
RICHARD B. BIRD
Captain, AGC
Assistant Adjutant General

PROTECTIVE MARKING CANCELLED
19 Jan 1970

FOR OFFICIAL USE ONLY

AVHGC-DST (1 Feb 68) 3d Ind (FOUO) CPT Arnold/ms/LBN 4485
SUBJECT: Operational Report - Lessons Learned (RCS CSFOR-65) for Quarterly
Period Ending 31 January 1968

HEADQUARTERS, US ARMY VIETNAM, APO San Francisco 96375 1 5 APR 1968

TO: Commander in Chief, United States Army, Pacific, ATTN: GOP-DT,
APO 96558

1. This headquarters has reviewed the Operational Report-Lessons Learned for the quarterly period ending 31 January 1968 from Headquarters, 34th Engineer Group as indorsed.

2. Pertinent comments follow:

a. Reference item concerning logistics, page 14, paragraph 5b; and page 24, paragraph 5a: Concur. Rollers, 5-8 and 9-14 ton, have been unavailable for many months, but are now being released from production in CONUS. Action is being taken to assure that unit requisitions are valid. If so, rollers should soon be available for issue.

b. Reference item concerning port construction company, page 24, paragraph 3b. The USARV Engineer continually monitors the distribution of engineer resources to insure compatability with workload. Port construction resources in-country are limited and at present are distributed to accomplish established priority projects. If priorities change, distribution of resources will change accordingly.

c. Reference item concerning shortage of boats, page 25, paragraph 5b; and 1st Indorsement, paragraph 2j: Concur. 573d Engineer has valid requisitions for the boat. Depot document numbers have been provided to 1st Logistical Command by USARV Engineer, with a request for follow-up and expedited shipment. The major reason for delay in shipment is the expressed desire of USARV Engineer that shipment be delayed until adequate repair parts can be shipped with the boats.

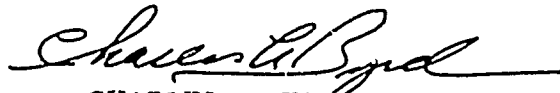
d. Reference item concerning new equipment, page 25, paragraph 5c; and 1st Indorsement, paragraph 2k: Concur. New equipment being introduced into the theater is currently being accompanied with repair parts. This special handling consists of assembling the end item and the support list package at a CONUS depot designated by AMC. When 90% of the non-TASL support list items reach 90% fill, the assembling CONUS depot will report to USARV that the items are ready for shipment. USARV will authorize the assembling CONUS depot to ship the end items and the support list package concurrently under escort to RVN.

3. A copy of this indorsement will be furnished to the reporting unit through channels.

33

AVHGC-DST (1 Feb 68) 3d Ind
SUBJECT: Operational Report - Lessons Learned (RCS CSFOR-65) for Quarterly
Period Ending 31 January 1968

FOR THE COMMANDER:



CHARLES A. BYRD
Major, AGC
Assistant Adjutant General

Copies furnished:
HQ 34th Engr Gp
HQ USAECV (P)

34

GFCP-DT (1 Feb 68) 4th Ind


SUBJECT: Operational Report of HQ, 34th Engr Gp (Const) for Period
Ending 31 January 1968, RCS CSFOR-65 (R1)

HQ, US Army, Pacific, APO San Francisco 96558 1 MAY 1968

TO: Assistant Chief of Staff for Force Development, Department of the
Army, Washington, D. C. 20310

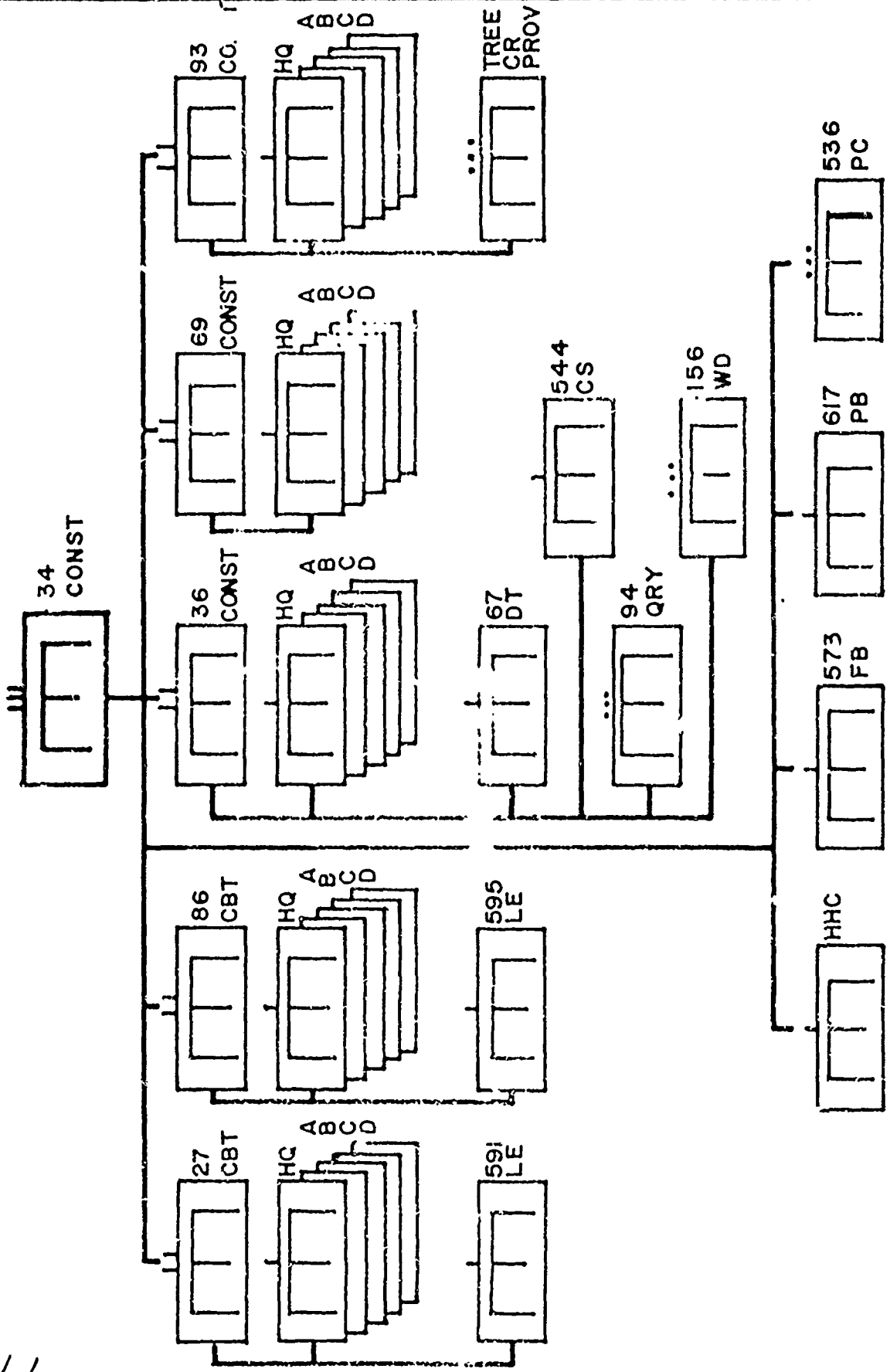
1. This headquarters has evaluated subject report and forwarding indorsements and concurs in the report as indorsed.
2. Reference 2d Indorsement, paragraph 2. This headquarters cannot identify the specific actions initiated for compressors and track drills; however, increases in equipment were proposed in the Standardization Program Phase II. These MTOEs are currently pending DA approval.
3. This headquarters is not aware of current (26 March 1968) MTOE action to increase authorization for 40 ton cranes.

FOR THE COMMANDER IN CHIEF:



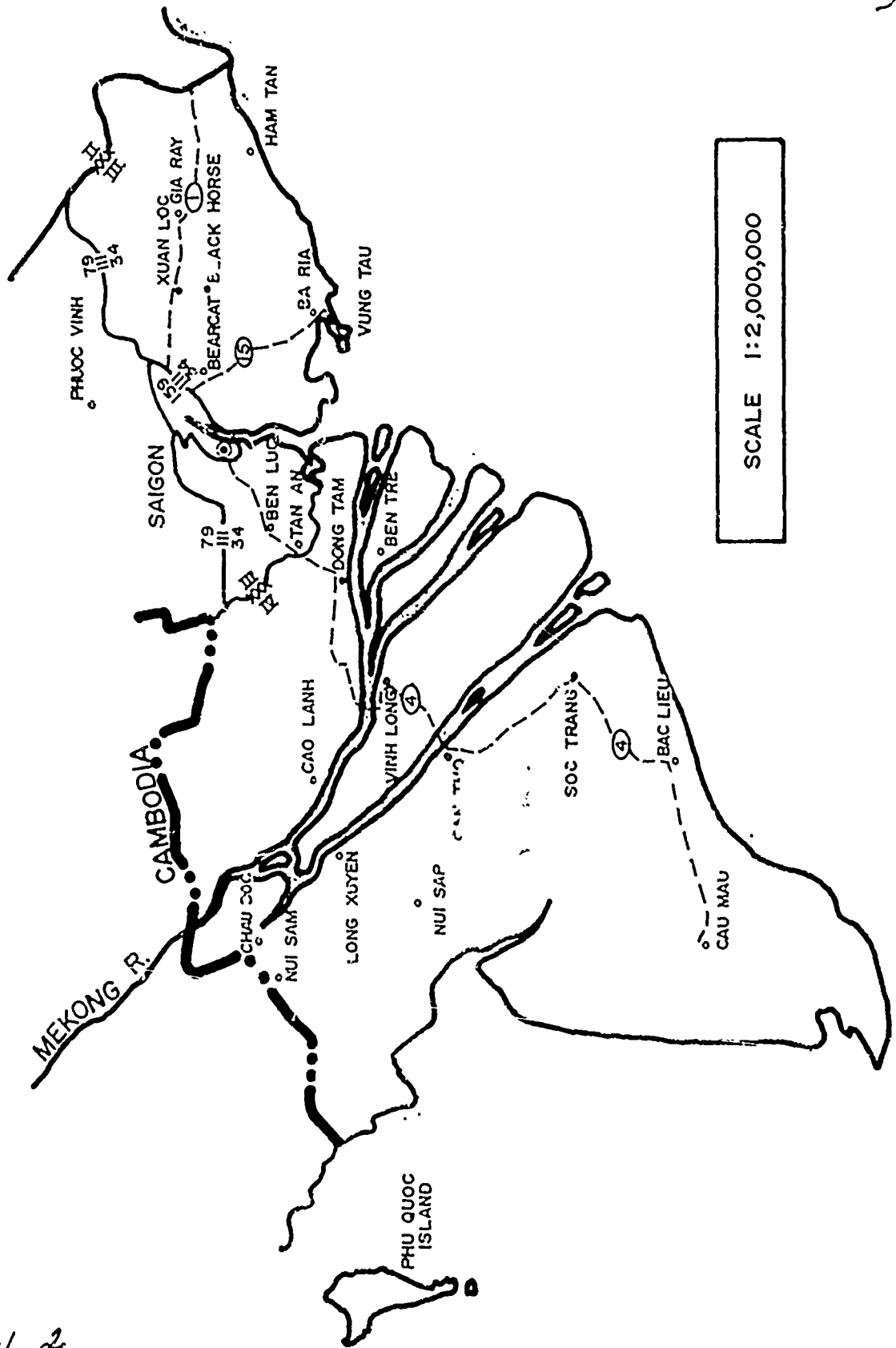
C.L. SHORTT
CPT, AGC
Asst AG

ORGANIZATION



Incl 1

34TH ENGR GP SECTOR



SCALE 1:2,000,000

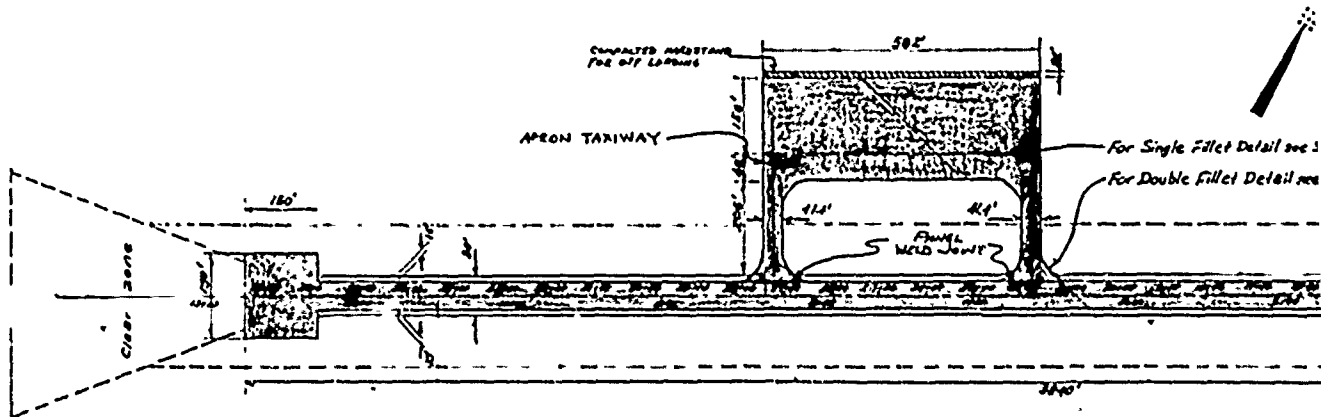
36

1 FEB 68

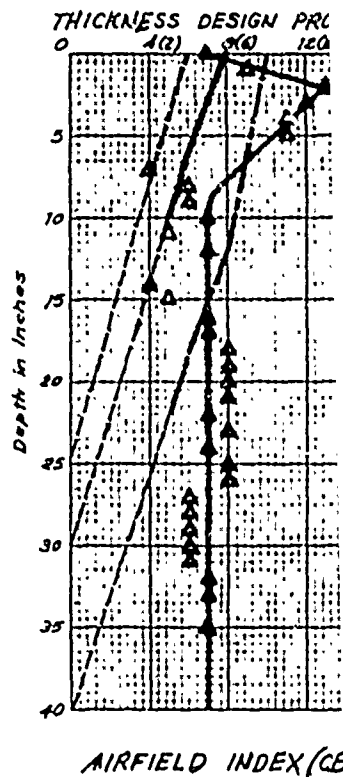
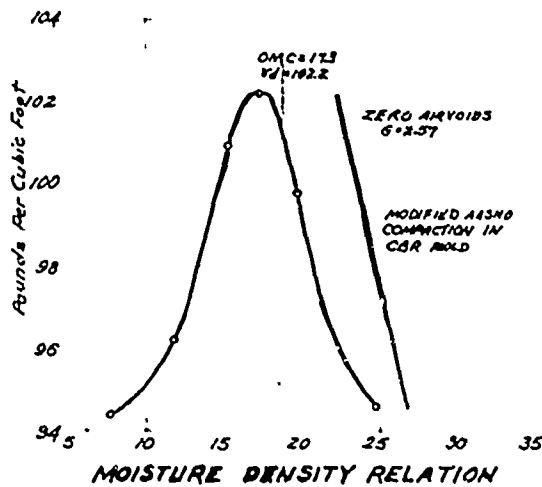
Incl 2

33

Incl 3



Page 3



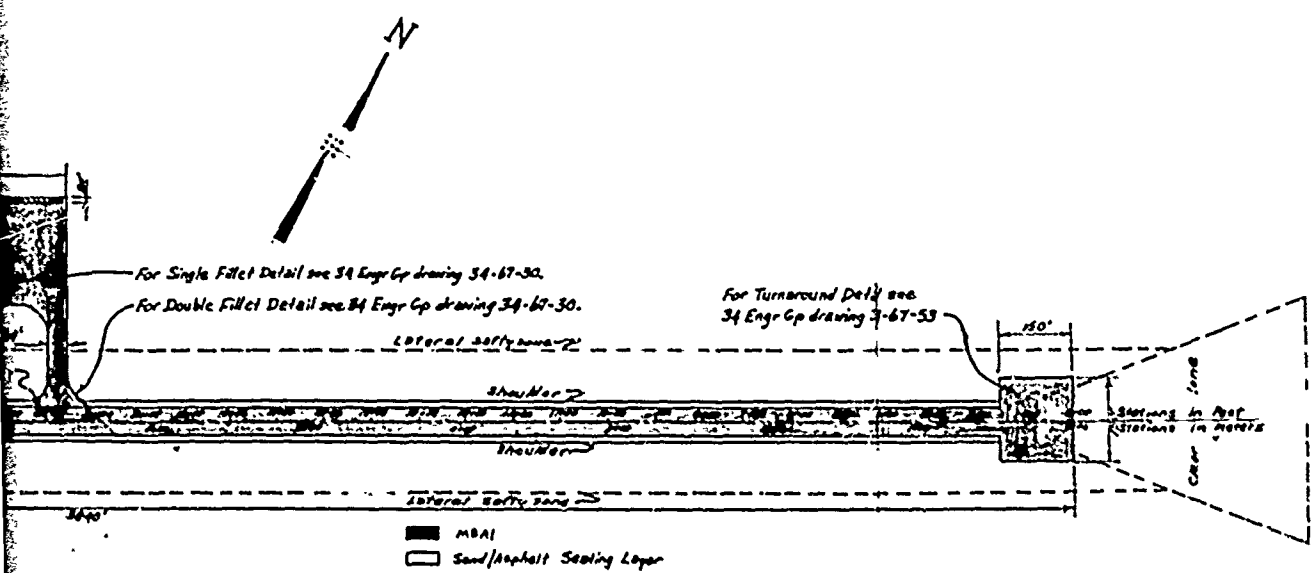
LAB SOAKED CBR TEST RESULTS

Boring No.	B 2	B 2
Molding water content, %	23.5	20.8
Initial dry density, PCF	97.8	100.5
Percent swell	7.24	3.3
Dry density after swelling	86.8	90.7
Soaking time, days	1	1
Soaked water content, %	25-35	26-36
CBR, %	3.6	5.5

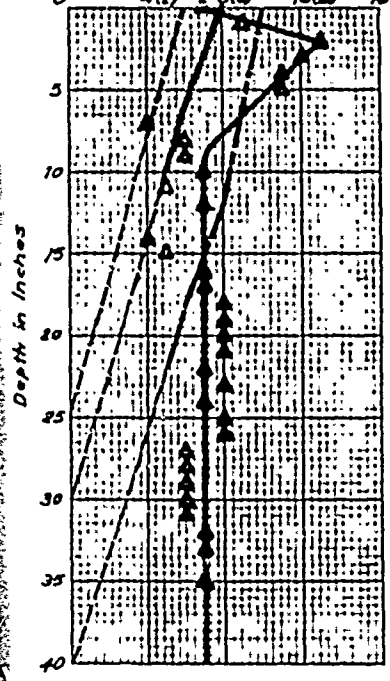
2. 10% waste factor and 20% bulking factor added to sand requirement
 1. For typical runway laying patterns and anchorage patterns, see
 34 Engr Gp drawing no. 34-67-30.

NOTES:

A

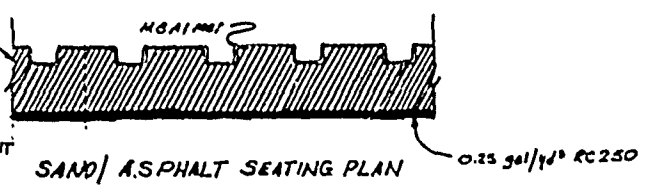


THICKNESS DESIGN PROCEDURE

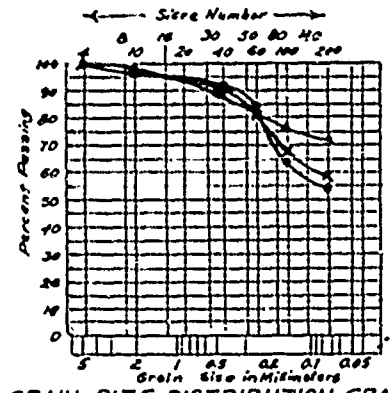


AIRFIELD INDEX (CBR)

- SAND/ASPHALT SEATING LAYER
- PRIME SURFACE WITH RC250 AT 0.25 GAL/YD²
- SEATING LAYER DEPTH TO BE MINIMUM OF 1.5" AND A MAX OF 2.0"
- RC250 TO BE ADDED TO SAND AT 0.50 GAL/YD²/INCH OF DEPTH. THIS REPRESENTS AN ASPHALT CONTENT OF 6% FIELD AND LAB TESTED TO BE APPROXIMATE OPTIMUM.
- SAND/ASPHALT TO BE ROAD MIXED AND CURED BEFORE PLACING.
- SEATING LAYER TO BE ROLLED TO SMOOTH SURFACE BEFORE PLACING MBI MATTING.



- LEGEND**
- Design Curve (Heavy) - Dotted line
 - Design Curve (Light) - Dashed line
 - Design Curve (Normal) - Solid line
 - Strength-Depth Profile - Line with triangles
 - B-3 Field Data - Triangles



GRAIN SIZE DISTRIBUTION GRAPH

27 Dec	Runway & BOM	MAJ KRESS	22 OCT 67	BOM, SUGT detl, addl notes 1-2
DATE	REVISION	APPROVED	DATE	REVISION

BOM

FSN	ITEM	UNIT	QTY	UNIT	TOTAL
54X 112 053	MAZI	BN	1570	2.27	3554.9
54X 131 171	ASPH	OCM	1172	1300	1523,600
54X 223 001	LM	201	2AF	1470	275,400
54X 223 001	SAND	2P 5	3,509		
54X 223 001	RC250	EA	91	100	9,100
54X 223 001	RC250	EA	100	25	2,500
54X 223 001	RC250	EA	100	25	2,500
54X 223 001	RC250	EA	100	25	2,500

U.S. ARMY-34th ENGR GP (CONST)
 APO SAN FRANCISCO 96291

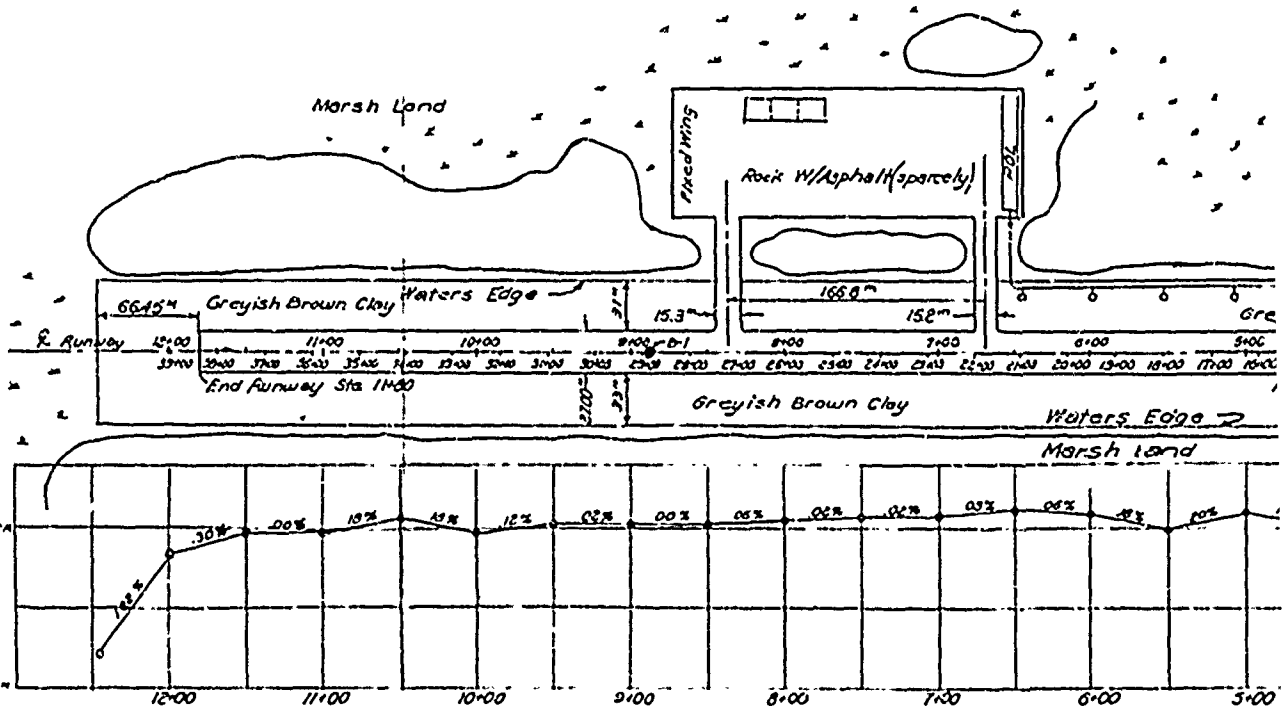
ANALYSIS & DESIGN
VI THANH AIRFIELD (NEW)
WR 536821-VA4-225

DESIGNED DATE DORRIS 20 JUN 67	SIGNATURE TITLE DATE
DRAWN DATE TITUS 20 JUN 67	
TRACED DATE TITUS 20 JUN 67	SIGNATURE TITLE DATE
CHECKED DATE DORRIS 20 JUN 67	
APPROVED/REVIEWED DORRIS 20 JUN 67	SCALE: 1"=2000
SIGNATURE/TITLE DATE	PROJ NO 34 67 125 63
	DRAWING NO 34-67-10
	SHEET 2 OF 6 SHEETS

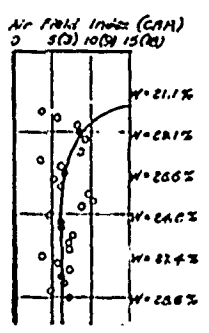
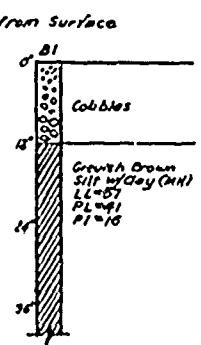
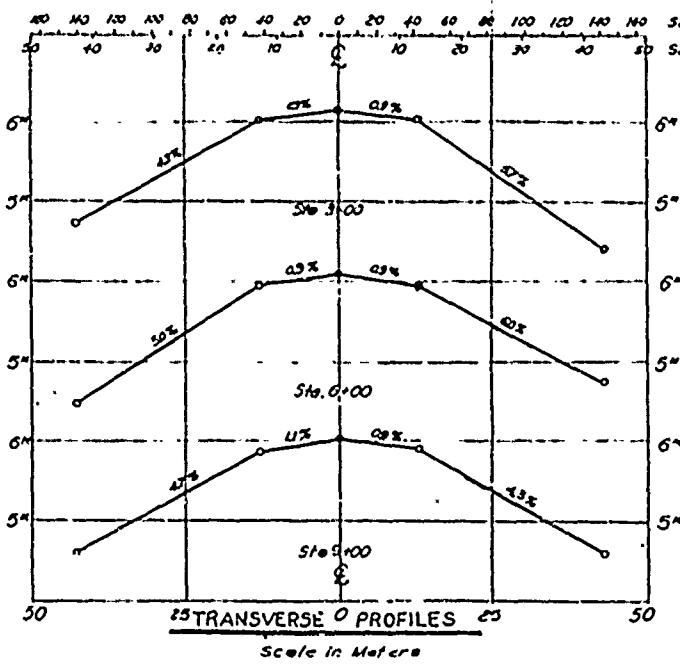
* bulking factor added to sand requirement, patterns and anchorage patterns, see 34-67-30.

B

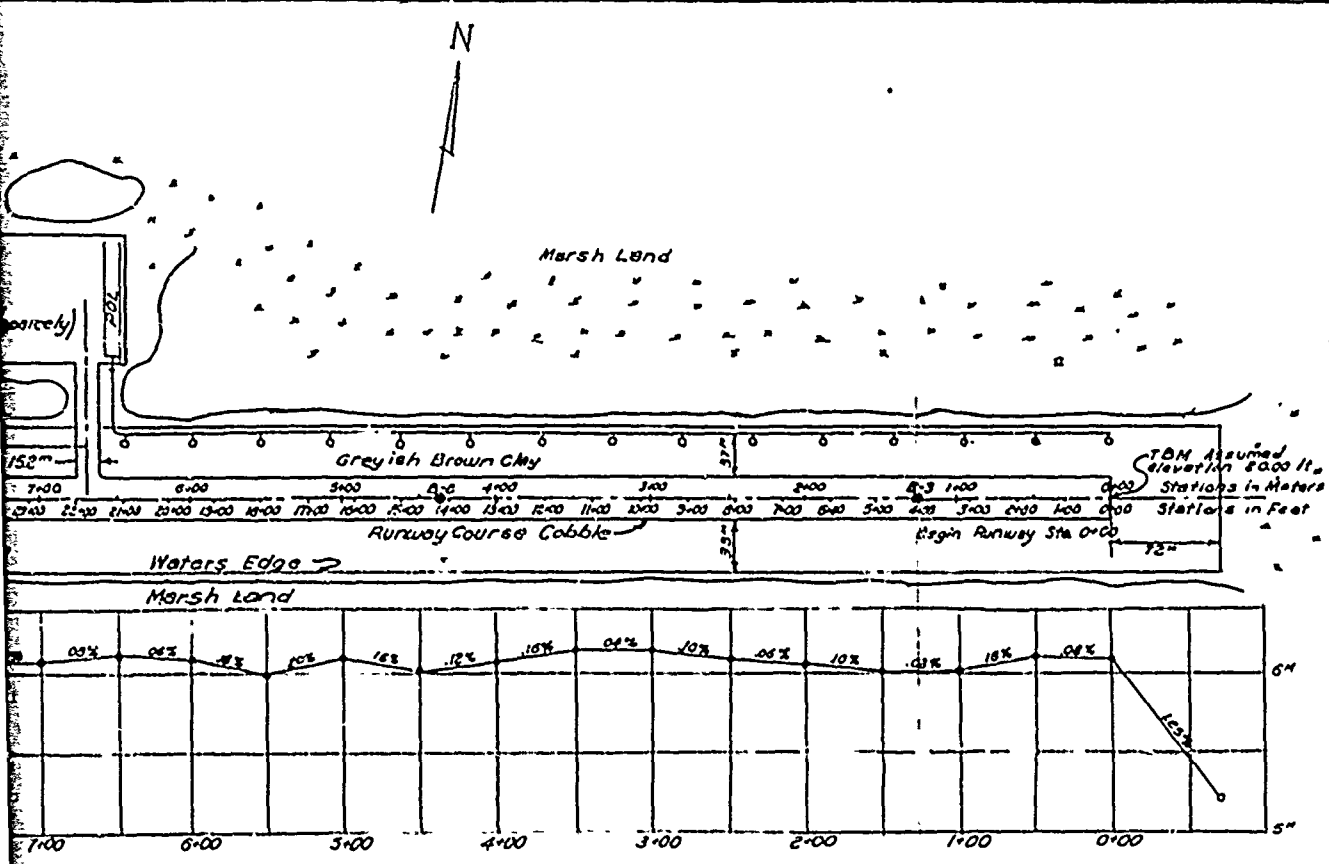
PAGE 35



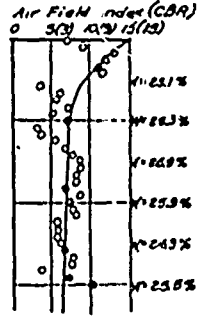
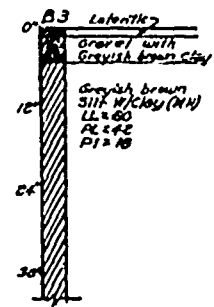
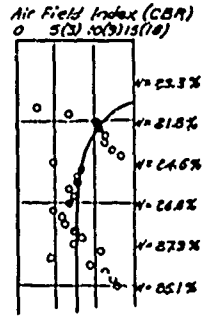
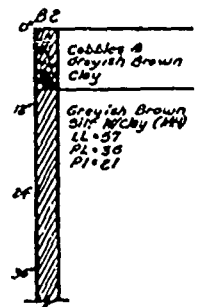
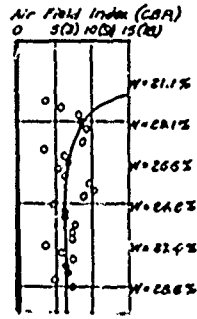
PLAN & PROFILE
 Horizontal Scale: 1:2000
 Vertical Scale: 1:20
 Scale in Meters



+



PLAN & PROFILE
 Horizontal Scale: 1"=200'
 Vertical Scale: 1"=20'
 Scale in Meters

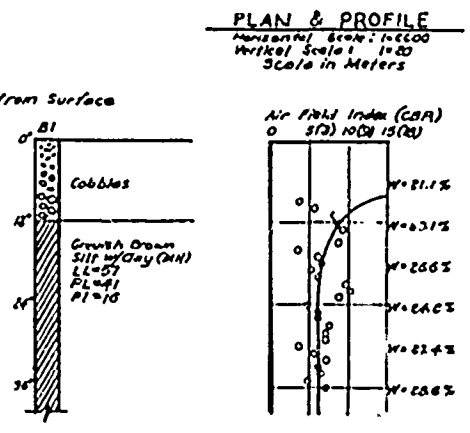
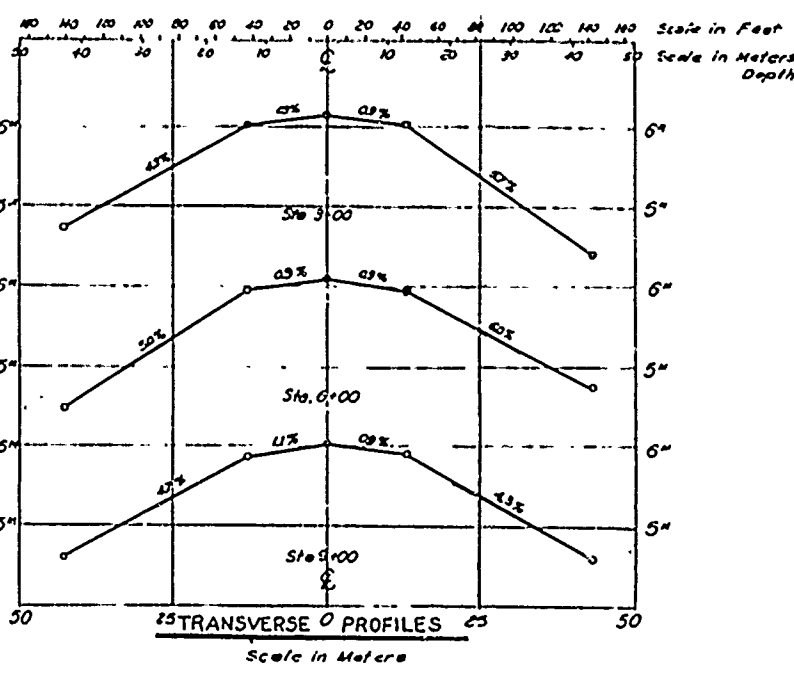
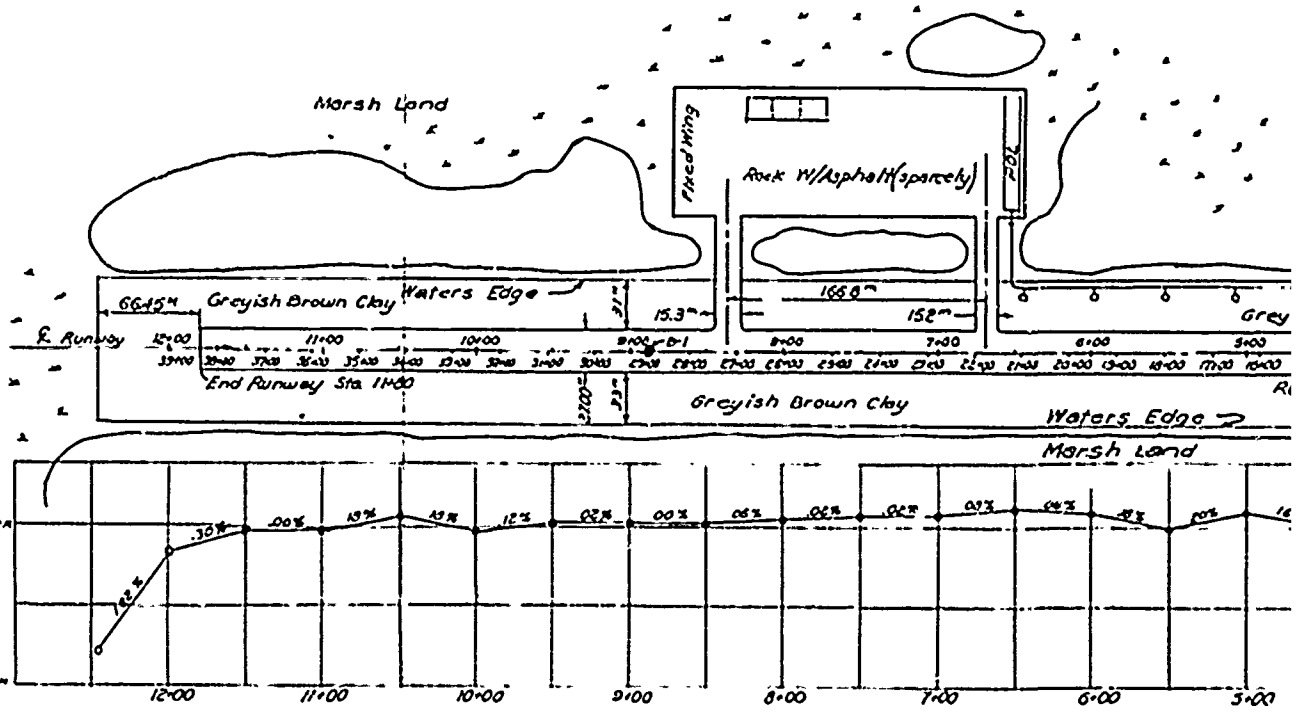


LOGS OF TEST BORINGS
 (Measured from Surface)

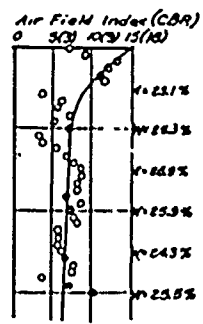
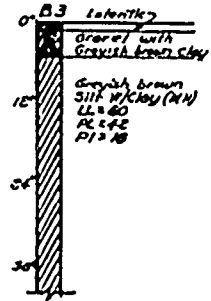
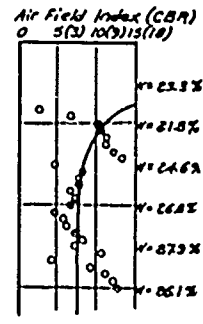
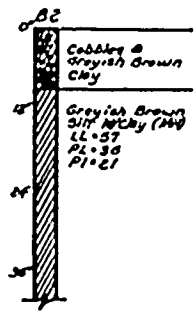
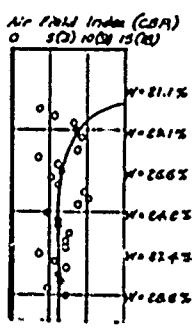
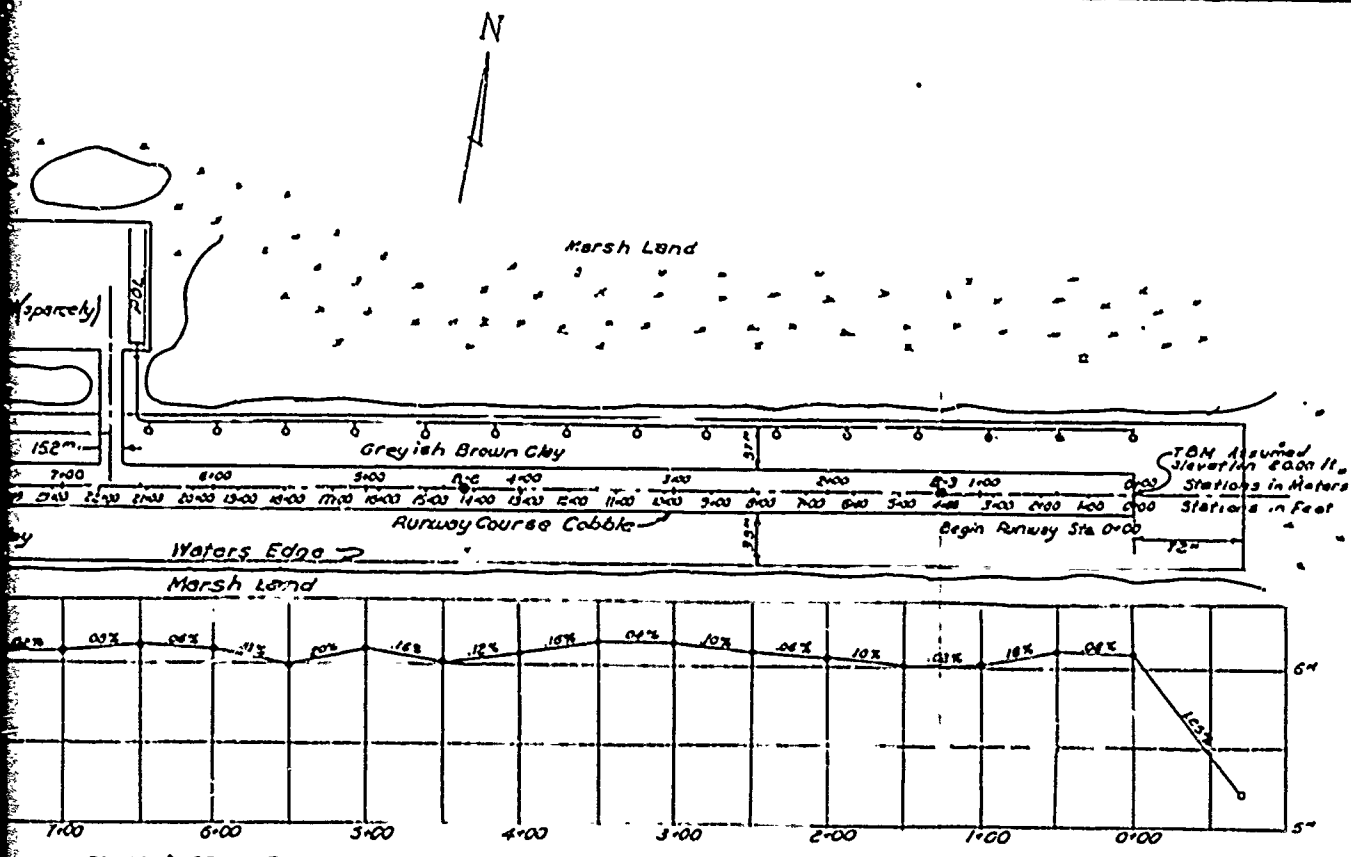
B

U.S. ARMY-34th ENGR GP (CONST) APO SAN FRANCISCO 96291			
DESIGNED DATE FRANK 12/24/67	SURVEY VI THANH AIRFIELD (NEW) WR 536821 - VA4-225		
DRAWN DATE TITUS sp + CO, NING 67			
TRACED DATE TITUS sp + CO, NING 67			
CHECKED DATE FRANK 20/JUN/67			
APPROVED/REVIEWED Signature: [Signature] DATE: 24 JUN 67	SUBMITTED/REVIEWED/APPROVED SIGNATURE TITLE DATE SCALE: 1"=200' PROJ NO 34-67/765 69 DRAWING NO 34-67-10 SHEET 1 OF 2 SHEETS		

PAGE 35



A



LOGS OF TEST BORINGS
 (Measured from Surface)

B

U.S. ARMY-34th ENGR GP (CONST)			
APO SAN FRANCISCO 96291			
DESIGNED DATE FRANK 12 MAY 67	SURVEY VI THANH		
DRAWN DATE TITUS sp + CO JUN 67	AIRFIELD (NEW)		
TRACED DATE TITUS sp + CO JUN 67	WR 536821-VA4-225		
CHECKED DATE FRANK 20 JUN 67	SUBMITTED/REVIEWED/APPROVED		
		SIGNATURE	DATE
APPROVED/REVIEWED S-3 24 Jun 67	SCALE: 1:2000		PROJ NO 34-67-765 69
SIGNATURE/TITLE	DATE	DRAWING NO 34-67-10 SHEET ... OF ... SHEETS	

4

REPORTING PERIOD 14 Dec 67 to 13 Jan 68

	27th Engr Bn	36th Engr Bn	69th Engr Bn	86th Engr Bn	93d Engr Bn	Goal
Authorized Strength	794	905	905	794	905	
(1) Battalion TOE	225	374	25	250	31	
(2) Attachments	49	45	0	21	29	
(4) Total average authorized strength	970	1234	930	1023	907	
Average Assigned Strength	857	1134	816	920	823	
Percent of authorized strength	88%	92%	88%	90%	91%	
Average Present for Duty Strength	790	994	801	803	776	
Percent of average assigned strength	92%	88%	98%	87%	94%	90% +
PERS. UNAL DISPOSITION:						
a. Overhead						
(1) Administrative	339	400	371	219	329	
(2) Security	48	85	41	85	39	
(3) Total overhead	387	485	412	304	368	
(4) Percent of average present for duty strength	49%	49%	51%	38%	47%	

1. STRENGTH DATA:

- a. Authorized Strength
 - (1) Battalion TOE
 - (2) Attachments
 - (3) Detachments
 - (4) Total average authorized strength
- b. Average Assigned Strength
 - Percent of authorized strength
- c. Average Present for Duty Strength
 - Percent of average assigned strength

2. PERS. UNAL DISPOSITION:

- a. Overhead
 - (1) Administrative
 - (2) Security
 - (3) Total overhead
 - (4) Percent of average present for duty strength

b. Average Available Daily Engineer Work Force

- (1) Percent of average present for duty strength
- (2) Average number of manhours per man per reporting period

(10hrs/day x 27 days/reporting pd) 27th Bn.
 (9hrs/day x 27 days/reporting pd) 36th Bn
 (10hrs/day x 27 days/reporting pd) 69th Bn
 (10hrs/day x 26.5days/reporting pd) 86th Bn
 (10hrs/day x 25 days/reporting pd) 93d Bn

- (3) Total available engineer man hours this reporting period

c. Average Local National Work Force

- (1) Average number of LN employed per day
- (2) Average number of LN manhours per man per reporting period

(7 hrs/day x 25 days/reporting pd) 27th Bn
 (8 hrs/day x 25 days/reporting pd) 36th Bn
 (9 hrs/day x 25 days/reporting pd) 69th Bn
 (7 hrs/day x 25 days/reporting pd) 86th Bn
 (8 hrs/day x 24 days/reporting pd) 93d Bn

- (3) Total available LN manhours this reporting period

	27th Engr Bn	36th Engr Bn	69th Engr Bn	86th Engr Bn	93d Engr Bn	Goal
	403	509	389	499	408	
	51%	51%	49%	62%	53%	55%+
	270	243	270	265	250	
	108810	123678	105030	132235	102000	
	114	106	140	99	142	
	175	200	225	175	192	
	19950	21200	31500	17325	27264	

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	27th Engr Bn	36th Engr Bn	69th Engr Bn	86th Engr Bn	93d Engr Bn	Goal
	85605	114024	104728	132235	93472	
	79%	92%	100%	100%	92%	
	40%	47%	48%	62%	48%	
	19291	21309	31468	16825	26956	
	97%	101%	100%	97%	99%	
	None	None	None	None	None	
	18840	12690	None	None	8168	
	17%	10%	N/A	N/A	8%	
	9%	5%	N/A	N/A	4%	
	4365	+3036	302	None	360	
	4%	2%	0.3%	N/A	0.4%	+ 5%
	2%	1%	0.1%	N/A	0.2%	-

d. Total Engineer Manhours Expended on Projects (Obtained from PDR)

- (1) Percent of available engineer manhour.
- (2) Percent of present for duty strength

e. Total Local National Manhours Expended on Projects (Obtained from PDR)

Percent of available LN manhours

f. Reported Lost Time (weather, material shortages, movement, etc)

- (1) Local National manhours
- (2) Engineer manhours

(a) Percent of available engineer manhours

(b) Percent of present for duty strength

g. Unaccounted for Engineer Manhours

- (1) Percent of available engineer manhours
- (2) Percent of present for duty strength

3. PROJECTION OF ENGINEER MANHOURS AVAILABLE AND SCHEDULED FOR PROJECTS DURING PERIOD 14 JAN TO 13 FEB 68
- a. Projected Average Present for Duty Manhours Available (Estimated 28 Working Days)
- b. Scheduled Engineer Manhours for Projects Next Reporting Period (Obtained from PDR)
- c. Percent of Scheduled Manhours of Projected Manhours available
4. PERCENT OF ENGINEER EFFORT REPORTED AS BATTALION TASKS
5. EQUIPMENT HOURS EXPENDED
6. EFFICIENCY FACTOR (Project MH + Accounted for lost MH) (Project for duty MH - Security MH)

	27th Engr Bn	36th Engr Bn	69th Engr Bn	86th Engr Bn	93d Engr Bn	Goal
	221200	250488	224280	224840	217280	
	107670	136754	149430	111480	119470	●
	49%	55%	67%	50%	55%	60%+
	6%	5%	7%	1.9%	11%	10%
	20859	33535	22523	44248	62282	
	52%	57%	51%	69%	55%	60%+

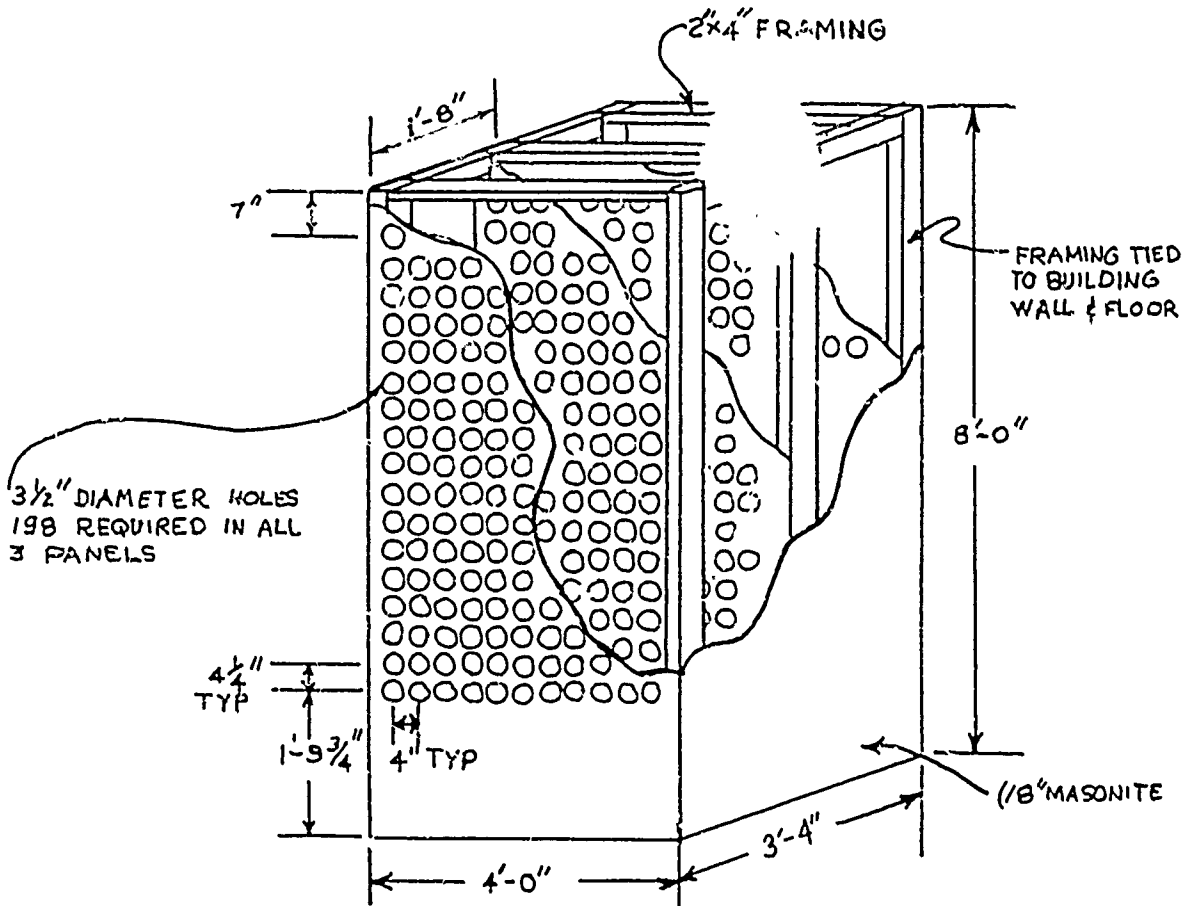
45

DRAWING FILE CARD

<u>STANDARD EM QUARTERS</u> Sh 3 Tube BIL-04	722.10
OICC Dwg 1,157,537 thru 1,157,539 1 sepia (use with OICC Std Details)	

Incl 5

40



34TH ENGP GP ENGR DRAWING
FILING RACK

Incl 6

41

47

DEPARTMENT OF THE ARMY
HEADQUARTERS, 86TH ENGINEER BATTALION (COMBAT) (ARMY)
APO San Francisco 96370

EGFD-ADJ

12 November 1967

SUBJECT: After Action Report - LCT Maintenance Standdown

TO: Commanding Officer
34th Engr Gp (Const)
APO 96291

1. General. The 86th Engr Bn Land Clearing Team conducted a maintenance standdown during the period 21 Oct to 31 Oct. The maintenance operation was under the direct supervision of the company commander, Company A, 86th Engr Bn supported by Battalion maintenance and direct support maintenance teams.

2. Task Organization:

- Cc A, 86th Engr Bn (-)
- 1 Maint Tech (WO), 86th Engr Bn
- 1 Engr Maint NCO, 86th Engr Bn
- LCT, 86th Engr Bn
- 1 DS Contact Team - 140th Maint Co
- 1 Contact Team, 86th Engr Bn
- 1 Welder - 15th Engr Bn
- 2 Welders - 93rd Engr Bn
- 2 Welders - 86th Engr Bn
- 5 Engr Mechanics - 86th Engr Bn
- 1 Wrecker Operator - 86th Engr Bn

3. Execution. Personnel were divided to provide two 10 hour maintenance shifts. Equipment operators were used to assist mechanics. A total of 80 people consisting of mechanics, operators and welders were utilized totaling 7000 expended man hours. The standdown was divided into projects consisting of:

a. Washing and Cleaning: This work was started upon return to Bear Cat on 21 October. Two (2) dozer operators and one (1) mechanic to operate equipment (1 Air Compressor and 2 water pumps) were utilized. A total of 156 man hours were expended in preparing 26 dozers for maintenance.

Incl 7.

42

EGFD-ADJ

10 December 1967

SUBJECT: After Action Report - LCT Maintenance Standdown

44

b. Technical Inspection: This project was also started on the 21st of October. Four (4) teams of two (2) men each were utilized in inspecting the 26 dozers. These teams were headed by personnel from the 590th and 140th Direct Support Company and one (1) mechanic from the Land Clearing Team. Fifty-two (52) man-hours were spent inspecting the dozers.

c. Belly Pan Cleaning: This project was started on the 22nd of October using three (3) teams of four (4) men on each team. An average of five (5) man hours were required to remove, clean, and replace each belly pan. A Total of 520 man-hours were required to accomplish this task.

d. Radiator Cleaning: Removing, cleaning, and replacing radiators was started on the 22nd of October. A total of 156 man-hours was required to complete the radiator project. During the project all thermostats and mounting gaskets were replaced. Three (3) new radiators were replaced and four (4) were repaired. All radiator guards were also removed for reinforcement and repair.

e. Fuel System: The fuel system project was started on the 22nd of October. This was completed by a night crew of 1 NCO and 8 operators. This project consisted of draining the complete fuel system, cleaning the fuel tank and replacing all filters. A total of 154 man-hours was required to complete the project.

f. Lubrication: This project was also assigned to the night crew upon completion of the fuel project. All housings were drained and oil filters were replaced. This project was completed expending 120 man-hours.

g. Welding: This project was completed by 6 welders on the day shift and 3 on the night shift. All cabs were removed and reinforced with 3" pipe, rock crusher screen was installed, and radiator guards were reinforced. Twenty (20) hours was required to reinforce, mount screens, and install modified cab braces on each dozer. Ten (10) hours was required to reinforce and straighten grills and other required frame work. Two (2) dozers were received from the 185th Maintenance Bn as a float for machines in the Direct Support Shop. These machines were also serviced and cabs were mounted for field operations. This required extensive welding. A total of 880 man-hours was required to complete the welding project.

h. Electrical System: Each dozer was checked, batteries replaced (21 Each), five (5) generators and regulators and 3 starters were replaced. Ninety man-hours were expended on this project.

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i. 2980 man-hours were spent by operators performing 1st Echelon maintenance on all organizational equipment.

j. 16 ~~Rome~~ ^{Hamelite} grinders were serviced and repaired. The operation expended 100 man-hours.

k. Final Inspection: Each operator and assistant was assigned to their dozer to replace broken blades, lubricate and adjust tracks, and sharpen Rome Plow Blades. Contact teams from the 140th and 590th with Land Clearing Team mechanics checked all completed maintenance and made adjustments where required. This project required 624 man-hours.

4. Additional Accomplishments:

a. Each individual was given $\frac{1}{2}$ day off to attend to his personal needs. All personnel were processed thru the battalion surgeon, S-1 and S-4. Shots were updated as needed and medical assistance provided. The battalion S-4 exchanged clothing and equipment as required. Underwear, socks and fatigues were provided. Personal affairs, allotment changes and other personnel matters were accomplished. A total of 763 man-hours were expended in accomplishing these functions.

b. Parts fabrication required expending 350 man-hours, 200 hours were spent securing parts and supplies.

c. Annex A is a list of work accomplished during the standdown.

5. Problem Areas:

a. Few repair parts were made available through normal supply channels. Some items were procured from other troop units but most were manufactured by the 86th Engr Bn Maintenance Section. Annex B is a list of repair parts obtained through channels.

b. Insufficient time was available to give the members of the Land Clearing Team adequate time off to attend to personal affairs and rest and relaxation.

c. The heavy commitment of the Battalion Maintenance section in support of the maintenance standdown detracted from the maintenance posture of the remainder of the battalion. The PILL of the battalion was depleted for both ordnance and D7E parts.

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6. Recommendations:

a. Each member of the LCT be given a 3 day pass during each standdown period.


b. The 86th Lngt En vigorously continues to develop an adequate PLL for the LCT.

c. A minimum of 2 hours per day be allocated to maintenance during jungle cutting operations

FOR THE COMMANDER:

/S/JAMES B BLESON
/T/JAMES B BLESON
1LT, CE
Adjutant

A TRUE COPY


HARRY D ORBISON
Major, CE
Maintenance Officer

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ANNEX A

Work performed during standdown:

- a. Removed, cleaned and replaced 26 ea Belly Pans.
- b. Removed, cleaned and replaced 26 ea radiators, Bottom Pans, and grills.
- c. Remove 29 cabs and modified with 3" pipe and rock crusher screen.
- d. Modified 29 ea cab braces from cab to radiator.
- e. Replaced 6 ea Home Plows.
- f. Turned ram on 28 dozers so ram tubes would be on the bottom.
- g. Prefabricated 7 ea radiator caps.
- h. Fabricated 4 ea diesel tank caps.
- i. Sharpened 26 blades.
- j. Replaced 24 ea hydraulic hoses.
- k. Prefabricated 12 ea radiator grills.
- l. Exhaust stacks modified.
- m. Cleaned fuel system and changed filters.
- n. Cleaned oil system and changed filters.
- o. Removed extra battery box, repaired and replaced four accessory boxes.
- p. Replaced 22 ea thermostats.
- q. Removed all batteries, repaired and replaced box.
- r. Replaced 6 ea starters.
- s. Replaced 19 ea hydraulic ram pipes.
- t. Replaced 4 ea generators.
- u. Replaced 3 ea regulators.
- v. Replaced 10 set radiator fan belts.
- w. Replaced all missing body bolts.
- x. Repaired and serviced 16 Homelite blade grinders.

ANNEX A to Incl 7 46

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