DEPARTMENT OF THE ARMY
HEADQUARTERS, 84TH ENGINEER BATTALION (CONSTRUCTION)
APO San Francisco 96238

EGCC-CP 31 January 1970

SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 January 1970, RCS CSFOR-65 (R2)

THRU: Commanding Officer
937th Engineer Group (Combat)
APO 96318

Commanding General
18th Engineer Brigade
ATTN: AVBC-C
APO 96377

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

Commander In Chief
United States Army, Pacific
ATTN: GPOP-DT
APO 96558

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

FOR OT UT
701160

EGCC-OP
SUBJECT: Operational Report - Lessons Learned of the 84th Engineer Battalion (Construction) for the Period Ending 31 January 1970, RCS CSFOR-65 (R2)

1. Operations

a. Command: Assigned and attached units are listed in Inclosure 1.

b. Unit Operations:

(1) LOC Restoration of QL-1, Tuy An to Tuy Hoa: Construction progressed on this project in spite of a long monsoon season. Rain was recorded on 47 days of the 92 days in the quarter. Total rainfall was 25 inches. Twenty-seven thousand cubic yards of laterite were moved to complete sub-base on 1.5 KM of road; 46,076 cubic yards of 3" (-) were placed to complete base course on 11.8 KM of road; and 4849 tons of asphaltic concrete were used to complete pavement on 3.4 KM of road. The percent completion on this 25 KM project changed from 56% to 80%. Base course was crushed by the 225 TPH and 75 TPH Crushers of the 84th Engineer Battalion, which produced 52,800 CYS of 3" (-) during the quarter.

(2) LOC Restoration of QL-1 from Phu Tai to Binh Thanh: The sub-base was completed on the final 0.4KM long section of road in the Cu Mong pass by 16 December. To construct the sub-base on this short section of road 10,700 CYS of rock and laterite were blasted and dozed from the side of the mountain. The 84th Engineer Battalion responsibility for this project is complete. Base course and pavement are being placed by RMK under the direction of the OICC.

(3) Road Maintenance: Run-off from monsoon rains caused frequent and complete washouts of sections of road for which the Battalion has maintenance responsibility. This Battalion's AOR extends for 124.5 KM on QL-1 from Phu Tai to Vung Ro. During this last quarter over 3,000 CYS of fill material were used for washouts and potholes on QL-1. One bridge received extensive repairs and one 160' long M4T6 Float Bridge was constructed. Several culverts were replaced. This activity resulted in the diversion of 6548 man hours of Engineer effort from LOC Upgrade.

(4) Ammo Off-Loading Wharf: This important facility was completed in an atmosphere of extreme urgency generated by failure of the only previously existing ammunition off-load wharf in the Qui Nhon area. The scope of work required to complete the project included construction of a fire-fighting system and a lighting system, and completion of access roads and a hardstand area. The Hanjin Transportation Company was able to begin using the facility on 15 December 1969.

(5) Cold Storage Warehouse: Small leaks in the roof threatened to wet the refrigerator insulation below it. Action was necessary to make repairs before the monsoon rains caused a major problem. The roof was reinforced with additional purlins. By 15 November, 25,000 nails had been driven to create a waterproof facility. A 110 foot long loading dock was then added to the warehouse to supplement the existing loading dock.

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(6) MACV Advisor Facility, Tuy Hoa: This high priority project was constructed in a period of 47 days for MACV Advisor Team 28. The scope included one 20'x50' building and one 20'x80'building. The buildings have shoulder high revetment type concrete walls, hot and cold running water, and waterborn sewage.

(7) Protective Dolphins: Four Dolphins with 19 timber piles in each were constructed in front of the POL Jetty in Qui Nhon in order to protect the Jetty from being damaged by ships. This construction was accomplished during a two month period even though wind and waves seriously hampered pile driving.

(8) Bong Son Bridge: This 1634 foot, 26 pier, 28 foot wide structure will be the first modern two lane span on SONG LAI GIAN RIVER in the HOAI NHON area. It will replace two wooden decked, single lane bridges, and speed the flow of traffic along QL-1. Company "B" and 536th Engr Det. built a base camp near the bridge site. Bridge construction began in January 1970. The prefabrication yard where the reinforced concrete deck will be constructed was filled and leveled. River bed sand was pushed up with dozers to form a dam to divert the river flow to the northern channel. A construction causeway was built using a river sand foundation capped by select fill. Pile driving for the south abutment has begun.

(9) Vung Chua Mountain Access Road: The road was graded and crowned to remove ruts and eliminate washed out areas, and ditches were cut or cleaned where needed. Two culverts were implaced to improve drainage. 3" (-) base rock was spread and compacted for all weather wearing surface. Road construction is 90% complete.

(10) ROK Valley Revetments: Revetments are needed around the ROK Valley Power Plant to protect it from standoff attack. The revetments are to be built from corrugated metal roofing supported by wooden "A" type framework. 560' of framework has been constructed. Work is stopped due to the lack of corrugated metal.

(11) Land Clearing and Leveling: Land clearing and leveling was begun at the Ammo Base Depot to inprove security. An area 150 meters deep outside the outer perimeter fence must be cleared to eliminate possible cover and concealment. Approximately 20% of the area is cleared.

(12) Other Projects: In addition to work on major projects, engineer effort was used to accomplish a variety of routine tasks such as the construction of a helipad for the 6/32nd Arty Bn, the burial of a POL pipeline on Tuy Hoa AFB, and upgrade of perimeter defenses on all 84th Engr. Bn compounds. Moreover, technical, material, and equipment support was provided to many FWMF units to assist them with self-help projects.

c. Intelligence and Counterintelligence: Enemy activity varied from moderate to light. In one major incident, a command detonated mine, coupled with small arms fire, killed one man, wounded five, and destroyed a 2½ ton cargo truck. In 13 other scattered incidents, four men were wounded, and six pieces of equipment were damaged. The principal sources of intelligence have been the Capitol ROK Infantry Division, 22nd ARVN Division, 173rd Airborne Brigade, and MACV Advisors of Binh Dinh and Phu Yen Provinces.

d. Plans and Training: Detailed planning for execution of the Song Son Bridge project was completed. Preliminary plans for the upgrade of QL-19 from its eastern limit to the summit of the Mang Yang Pass were formulated. Sunday morning training classes emphasized Sapper Defense, Marijuana and Drug Addiction, and Characteristics and Uses of Claymore Mines. Instruction was given to other units of the 937th Group on MCA automatic welding equipment.

e. Personnel, Administration, Morale, and Discipline: During the past quarter 34 personnel were recommended for awards, 270 were promoted, and 53 voluntarily extended their tour in Vietnam. 70 percent of the Battalion's personnel are in the savings bond program. There were 7 congressional investigations and 18 complaints were registered with the Inspector General. There were 68 disciplinary actions which included 64 Article 15's and 5 Special Court Martials.

f. Logistics: During the past quarter, the S-4 Section gave logistical support to organic companies and attached units of the 84th Engr Bn (Const). The areas of logistical support include:

(1) Procurement and distribution of Class A rations for 900 personnel daily.

(2) Operation of two water points producing 45,000 gallons of potable water daily.

(3) Supply of Class II TOE equipment. An average of 100 equipment requisitions were processed weekly by the property book section. During the quarter 180 pieces of TOE and MCA equipment were acquired.

(4) Supply Class IV Construction Materials to all units for MCA funded projects. An average of 150 requisitions for construction materials were processed weekly by the S-4 Section.

(5) Re-supply of unit basic loads and demolitions through the Phu Tai ADD. An average of 10,000 pounds of dynamite were used monthly for quarry operations.

(6) Supplying materials for the following Self-Help Projects: Bridge 241, construction of ford on LTL-7B, Security Lighting for ROK Div. Hq, Security Lighting for ROK 1st Log Support Group, and 3 Sea Huts for the 26th ROK Regiment.

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g. Civic Action: A variety of civic action programs were undertaken by this Bn during the quarter. Voluntary contributions for orphanages amounted to $VN65,624. Fifteen man days of effort were used for civic action. Twelve feet of culvert material were given to a village so that its inhabitants could improve the road to the village. 930 bf of lumber was distributed for use of educational facilities. The 84th Engr Bn surgeon participated in several MEDCAP missions. A high point in the quarter occurred when the children from a local orphanage ate Christmas dinner with the men of the 84th Engr Bn.

h. ARVN Affiliation: A liason team has been supporting the 201st ARVN Engineer Bn in construction of a QL-1 bridge near Tuy Hoa. The team has provided contact with US specialists in supply, equipment, steel structure, concrete, and quality control. Problems in concrete prefabrication, pile driving, and steel work have been expedited by this team. Classes have been conducted to qualify ARVN soldiers in use of MCA Welders, 40 ton Cranes, and 29CM Scrapers. An average of five ARVN heavy equipment operators have been qualified each month. During the early part of the quarter when monsoon damage was at its peak, the 226 ARVN Panel Bridge Company and the 84th Engr Bn worked together to repair pot holes and washouts on QL-1. The 84th provided earthmoving equipment and supervision while the 226th supplied the haul capability with 20 each 2½ ton dump trucks.

2. Lessons Learned: Commanders Observations, Evaluations, & Recommendations

a. Personnel: None

b. Intelligence: None

c. Operations:

(1) Item: Loading an Asphalt Paving Machine

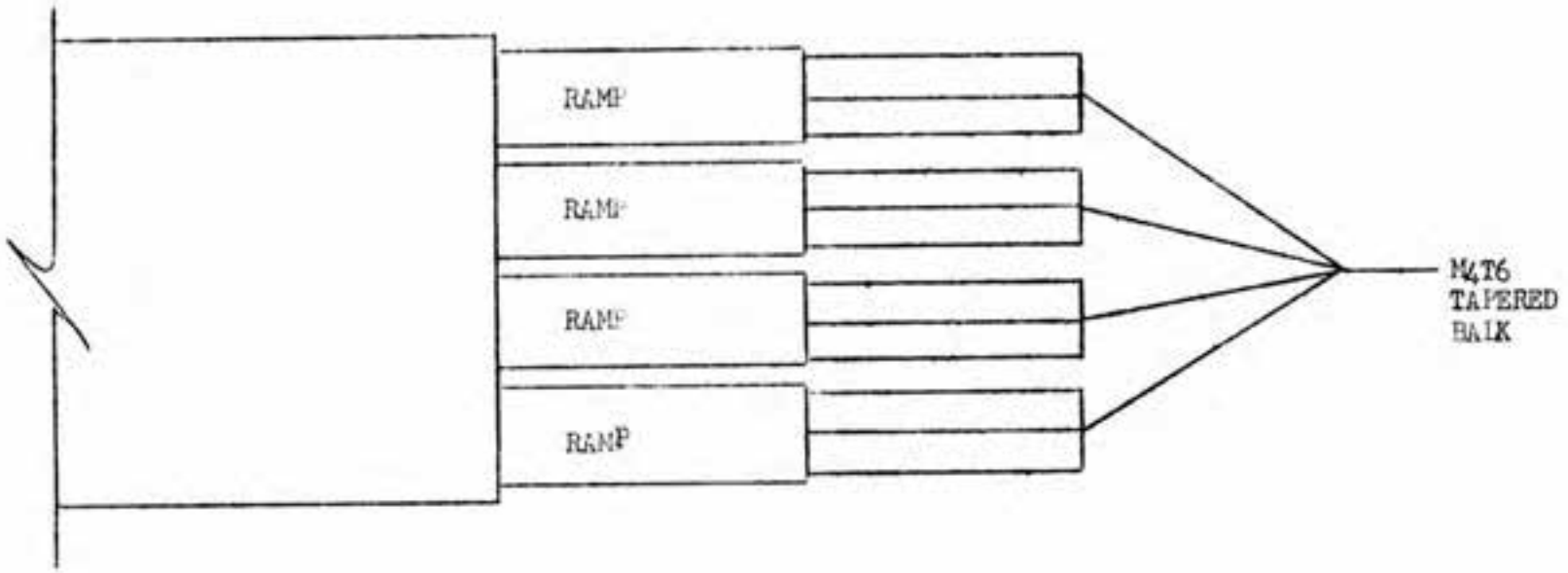
OBSERVATION: Manuevering an Asphalt Paving Machine onto a 25 ton low boy was difficult because of the steepness and narrowness of the ramps.

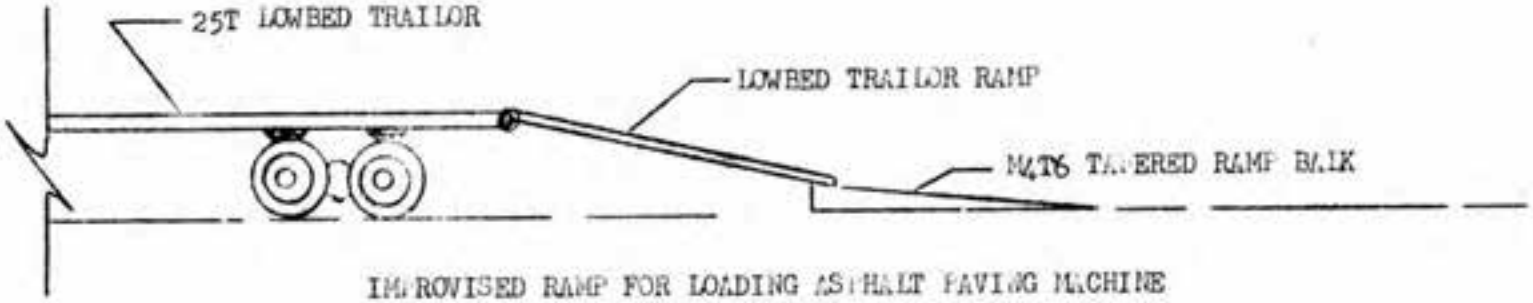
EVALUATION: A method was needed to facilitate loading of the Asphalt Paver.

RECOMMENDATION: Two ramps were added to make a total of four ramps. Two M4T6 tapered bulk were placed under the end of each ramp to reduce its slope (see figure #1). The paver was then easily driven onto the low boy.

(2) Item: Water Distributor

OBSERVATION: On a recent major road project, the 1000 gallon water distributor authorized by TC&E was found to have insufficient capacity to meet demands of water for proper compaction. This occurred because of a long haul distance and the rapid water evaporation in the southeast Asia climate.





IMPROVISED RAMP FOR LOADING ASPHALT PAVING MACHINE

FIG. 1

EVALUATION: A method had to be found to get more water onto the road.

RECOMMENDATION: A salvage 5000 gallon tank was available and was placed on a truck bed. A 3 inch gate valve was installed in the tank and a splash plate was attached to the tank. This was found to be an adequate water distributor for the project.

(3) Item: Prime Coat

OBSERVATION: After applying the prime coat in the asphaltic process, undesirable materials (eg pebbles, dust, and trash) often accumulate on the surface.

EVALUATION: Such materials are unacceptable and must be removed prior to paving.

RECOMMENDATION: The air stream from an air compressor is a useful tool in cleaning without disturbing the primed surface. The best method found was to start from the centerline and blow the debris to either side of the road.

(4) Item: Wharf Construction

OBSERVATION: An ammunition wharf was constructed with a sheet pile wall on the water tied in with angle iron braces to a second parallel sheet pile wall 60 feet to the rear. The angle iron braces ran through holes cut in the front wall and were welded to a whaler running about four feet above water level. A sand backfill was used behind the front wall. During monsoon storms, waves reached the level where the angle iron ran through the front wall. The sand backfill behind the wall was wet by the waves and seeped out through the thin cracks around the angle iron braces. The loss of sand was accelerated by water moving down through the not yet covered top of the wharf; cavities developed behind the wall.

EVALUATION: The cavities had to be filled and a method had to be found to prevent their recurrence.

RECOMMENDATION: The problem was solved by reducing the size of the larger holes in the wall by welding. Then all cracks were caulked with fiber and sealed with a rubberoid compound. This provided a joint that would allow movement of the angle iron without breaking the seal when the front wall was struck by barges. The cavities behind the wall were filled with sand, compacted with water. Seepage of water from above was ended when the final concrete was poured.

(5) Item: Driving Batter Piles

OBSERVATION: Pile driving leads were tilted at a batter of 1½" to 1' for driving batter piles. As the hammer moved down the leads it made the leads sag in the middle. This prevented the hammer from falling along a line coincident with the centerline of the pile which in turn moved the pile from the desired batter during driving.

EVALUATION: A method had to be found to reinforce the leads against bending.

RECOMMENDATION: A wire and turnbuckle bridge was constructed along the back of the leads to add rigidity. This is shown in Figure 2. Piles are now being driven at their proper batter.

(6) Item: Protection of Drainage Systems from Sediment Choking.

OBSERVATION: Land clearing is a very important phase of the security structure of compounds and installations throughout Vietnam. Usually a minimum of 150 meters is cleared around the outside of the perimeter. Along with land clearing, there is what might be called land leveling in which blind spots caused by large boulders, hills, gullies, and low spots are eliminated both inside and outside of the perimeter. When complete, land clearing, and leveling, removes all objects within a specific area behind which the enemy may conceal himself while attempting to breach the security of the compound or installation. Land clearing also presents a serious erosion problem.

EVALUATION: During the monsoon season many acre-feet of water fall on these cleared areas washing tons of soil and rock into the drainage ditches and channels in and around the compounds or installations. As the run-off water flows along the ditches and through the culverts the velocity of the water fluctuates considerably and stream conditions (shape, depth, width, roughness of bottom, etc.) are continuously changing, thus causing suspended soil and rock particles to be deposited on the stream bottom. In time these deposits fill up the ditches and culverts and seriously hamper drainage.

RECOMMENDATION: In one instance a relatively easy and effective means of eliminating this problem was to construct a few simple check-dams along all ditches flowing into and through the compound. The purpose of the check-dams was to decrease the velocity of the run-off water causing the stream to deposit the suspended particles at each check-dam. The check-dams were constructed of masonry. Timber, or reinforced concrete could also be used. They were located so that the accumulated deposits could be easily cleaned out from behind each check-dam with a front-loader, dozer, or clam shell. This resulted in most suspended soil and rock particles being deposited before they reached the drainage system in the compound.

(7) Item: Bunkers

OBSERVATION: The exterior layer of sandbags on a bunker deteriorates in approximately 6 months as a result of exposure to wind and rain.

EVALUATION: There are many bunkers in each Cantonment. Since sandbags cost 37 cents each, recurring bunker repair is costly financially as well as costly in manpower.

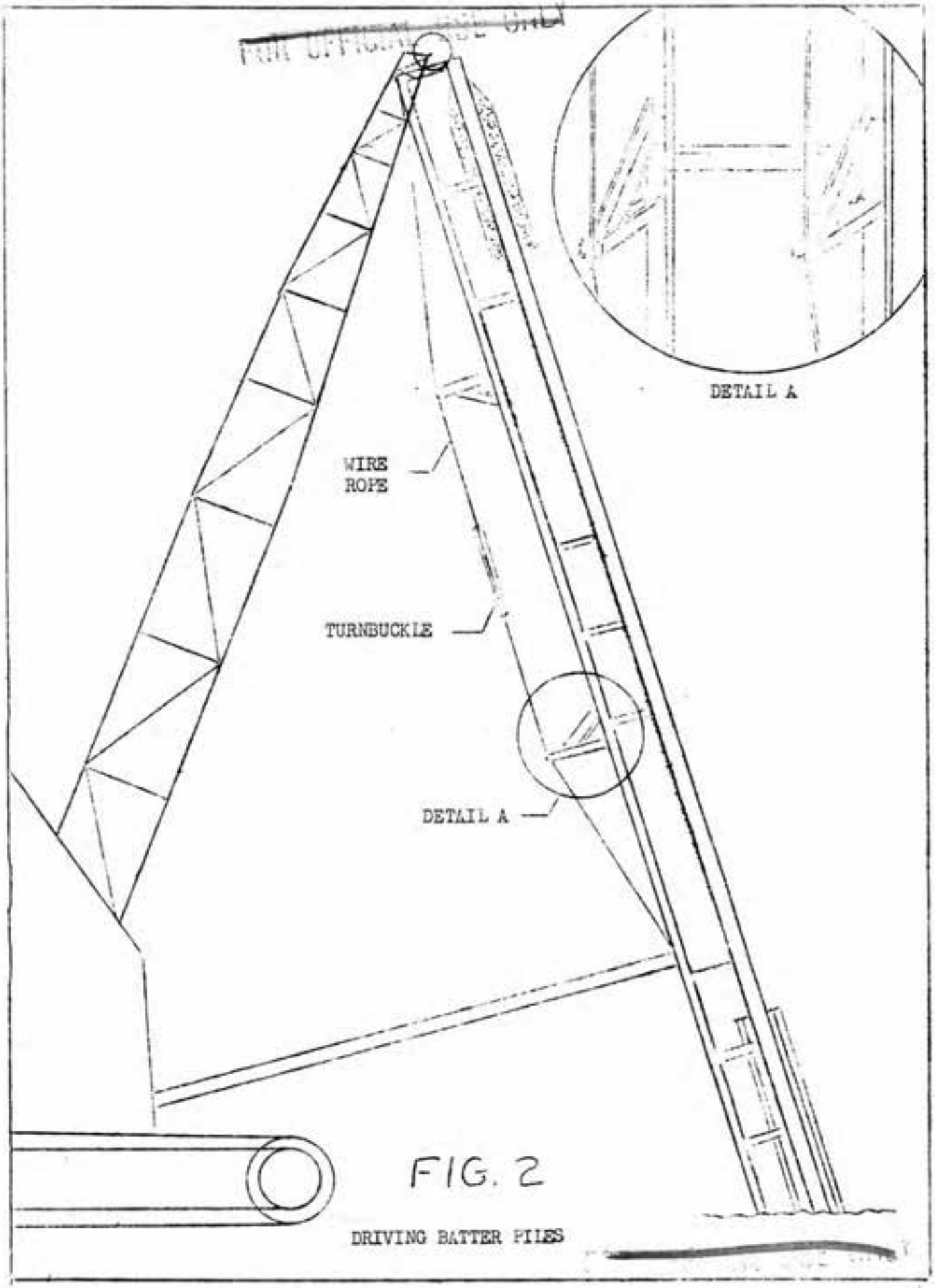


FIG. 2

DRIVING BATTER PILES

RECOMMENDATION: Chicken wire was placed over the exterior sand bags on each bunker and covered by a thin layer of concrete. This protects the sandbags from the elements and eliminates the requirement for constant bunker repair. Bunkers in this Battalion's Cantonement which were coated with such a concrete shell over a year ago, show little evidence of deterioration to date.

(8) Item: Foot Spikes

OBSERVATION: More obstacles were needed to upgrade our perimeter.

EVALUATION: When constructing perimeter defenses, it is important to use the imagination to construct obstacles for the enemy. If the enemy has footspikes, etc. to worry about it is less likely that his attempted breach of a perimeter will be successful.

RECOMMENDATION: Areas along compound perimeters were seeded with two kinds of home-made footspikes. Both types are simple to make. The first consists of 60d spikes embedded in small globs of concrete randonly spaced. The second is made by the utilization of 5 gallon oil cans. The tops and bottoms of the cans are removed and 2" strips are cut from the outside toward the center. The corners of the strips are bent upwards thus providing sharp protrusions. The cylindrical portion of the can is also cut into strips and these strips are bent outward and pointed corners are again bent upward to supply the cutting edge.

(9) Item: Perimeter Lighting System

OBSERVATION: Light wires between perimeter poles were constantly being shot in two.

EVALUATION: A method of protecting the wires had to be developed so that the perimeter lighting would not fail at critical times.

RECOMMENDATION: A relatively small investment of time and effort expended on the initial installment of the perimeter lighting system saves many man hours in subsequent maintenance time. All light cables should be burried in the ground. Then, the only repairs needed will be the replacement of light bulbs and, occasionally, a few light fixtures.

(10) Item: Expedient Revetments

OBSERVATION: The S-4 section of this Battalion had a large amount of large dimension bridge timber in its S-4 yard.

EVALUATION: This timber was a basic load for emergency construction of bridges. This material would not be needed until that time.

RECOMMENDATION: This material was stacked close to the sides of the S-4 buildings to act as a revetment. For extra stability iron pins were driven opposite each other on either side of the stack and tied together at the top over the stack.

FOR [redacted] ONLY

EGCC-CP
SUBJECT: Operational Report - Lessons Learned of the 84th Engineer Battalion (Construction) for the Period Ending 31 January 1970, RCS CSFOR-65 (R2)

d. Organization: None

e. Training: None

f. Logistics: None

g. Communications: None

h. Material: None

i. Other: None

RICHARD M. WELLS
LTC, CE
Commanding

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ASSIGNED AND ATTACHED UNITS OF THE 84TH ENGINEER BATTALION (CONSTRUCTION)

1. Headquarters and Headquarters Company, APO 96238

2. Company A, APO 96316

3. Company B, APO 96238

4. Company C, APO 96238

5. Company D, APO 96316

6. 536th Engr Det (PC), APO 96238

7. 497th Engr Co (PC) had a platoon minus attached to the Battalion from 27 September 1969 until 30 January 1970.

Inclosure 1

[redacted]

EGC-OP (25 Feb 70) 1st Ind
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Const), for the period ending 31 Jan 70, RCS CSFOR-65 (R2)

HQ, HEADQUARTERS, 937TH ENGINEER GROUP (COMBAT), APO 96318, 25 February 1970

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

The ORLL from the 84th Engr Bn (Const) for the period ending 31 Jan 70, is forwarded IAW USARV Reg 525-15.

C. E. ADAMS, JR.
COLONEL, CE
Commanding

[redacted]

VII-482F

DEPARTMENT OF THE ARMY
OFFICE OF THE ADJUTANT GENERAL
WASHINGTON, D.C. 20310

IN REPLY REFER TO

AGDA (M) (29 Sep 70) FOR OT UT 702156 5 October 1970

SUBJECT: Operational Report - Lessons Learned, Headquarters, 84th Engineer Battalion, for Period Ending 30 April 1970

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2. Information contained in this report is provided to insure appropriate benefits in the future from lessons learned during current operations and may be adapted for use in developing training material.

BY ORDER OF THE SECRETARY OF THE ARMY:

Kenneth G. Wickham

KENNETH G. WICKHAM
Major General, USA
The Adjutant General

1 Incl
as

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DEPARTMENT OF THE ARMY
HEADQUARTERS, 84TH ENGINEER BATTALION (CONSTRUCTION)
APO SAN FRANCISCO 96238

EOCC-OP 30 April 1970

SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970 RCS CSFOR-65 (R2)

THRU: Commanding Officer
937th Engineer Group (Combat)
APO 96226

Commanding General
18th Engineer Brigade
ATTN: AVBC-C
APO 96377

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

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

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

FOR OT UT
702156

(1)

Inclosure

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EGCC-OP
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970 RCS CSFOR-65

1. Operations

a. Command: Assigned and attached units are listed in Inclosure 1.

b. Unit Operations:

(1) Song Son Bridge:

This project, one of the most ambitious projects the 84th Engr Bn (Const) has undertaken in Vietnam, consists of the construction of a 1634.5 ft long bridge. During this quarter, the flow of water in the main channel of the Song Lai Giang River was diverted and a construction causeway was completed. 245 piles were driven to resistance for a total of 248 driven to date. A total of 312 piles are required for construction of the bridge. Fourteen of the 26 reinforced concrete pile caps required were cast in place. One abutment was completed and three spans of stringers were set in place.

(2) LOC Restoration of QL-1, Tuy An to Tuy Hoa: This 25 KM section of QL-1 was completed on 4 April 1970 after approximately a year of construction which began on 10 March 1969. During the last quarter, 1,400 CY of laterite were moved to complete 1.7 KM of sub-base; 17,522 CY of 3" (-) base rock were placed to complete basecourse on 2.1 KM of road; and 18,004 tons of asphaltic concrete were used to complete pavement on 16.3 KM of road. The completed 25 KM section was accepted and transferred to the Vietnamese Director General of Highways on 31 March. This project was supported by quarry and crusher complex operated at Chop Chai Mountain by the 84th Engineer Battalion.

(3) MACV, An Tuc This project was initiated on 23 Feb 1970 and completed on 22 April 1970. during this brief time period one construction platoon completed 15 rooms for living quarters, a dining room, a kitchen, an administration room, a tower with tank, a latrine with three water closets, three shower heads and three lavatories, a septic tank, and a tactical operation center.

(4) MACV, Hoai Nhon: The scope of this project includes the construction of a 40' x 16' billets, a 10' x 20' Shower/Latrine, a septic tank and leach field. During the last quarter, the billet, septic tank and leach field were completed. The latrine was partially completed. These buildings are constructed with revetment type concrete block walls.

(5) Ammunition Base Depot, Phu Tai: This project requires the accomplishment of two major tasks; land clearing around the perimeter of the ABD and repair of existing protective berms. New plans changing the scope of the projects were received after land clearing had begun but before repair work had begun. The using unit, the 184th Ordnance Battalion, received the directive to reduce the size of the ABD and change it's designation to an ASP. As a result the number of berms requiring upgrade or repair was reduced to 37, but the requirement to level 33 berms outside the new perimeter was generated. To date 23 of the 37 berms have been rebuilt and strengthen. Repair has been accomplished by first cutting the berms down 2 to 3 feet with a case model 450 light dozer, then rebuilding to the required 11 foot height by hauling, spreading and compacting successive 6 inches of fill. 96% of the land clearing is complete with all 33 berms leveled and a 150 meter cleared area cut around most of the perimeter.

(6) Construction of Revolutionary Development Route 505: Route 505 is being constructed in northern Binh Dinh Province to open the inaccessible areas to commercial traffic. 15,235 cubic yards of laterite have been hauled, graded and compacted to date to complete 11 kilometers of road. Completion of this part of the road has opended the villages of My Phu, Chanh Giao, and Thian Doa to traffic.

(7) Phu Hiep Airfield Upgrade and Resurfacing: The tasks necessary to upgrade this 4100 foot long airfield include removing the M8A1 matting surface, placing an additional 6 inch lift of cement stabalized sand on the existing basecourse, paving with asphaltic concrete, and marking it to specification. Work accomplished to date includes the removal of the M8A1 matting, placement of 6 inches lift of cement stabilized sand on 2800 feet of the total 4100 foot distance, and placement of asphaltic concrete on an equivalent of 390 linear feet.

(8) Repair of QL-19: In mid April, two companies of the 84th Engr Bn began repair of a 100 KM long section of QL-19 extending from QL-19's intersection with QL-1 to the Mang Giang pass. To date 11,734 CY of select fill have been placed to restore the shoulders on 17.5 KM of road. Potholes have been repaired along 7 kilometers of the road.

(9) POL Tank Repair, Qui Nhon: Two each 10,000 BBL POL tanks at Tank Farm #1 in Qui Nhon became unserviceable because of excessive leaking through the tank bottoms. Subsurface failure caused by disturbance of the area drainage system was suspected. The method of repair decided on included the construction of a concrete foundation under each tank and the placement of an interior concrete pad on the bottom of each tank to seal any leaks which may have resulted from corrosive action or warping of the tanks caused by settling. The berms around each tank were enlarged and filled with water to a depth (about 9 inches) which permitted the tanks to be floated from their original position. The berms were drained and allowed to dry. The sub-base was scarified, regraded and recompacted. Crushed rock was hauled to the area to construct a basecourse. A 12 inch reinforced concrete foundation slab was prepared for each tank. The berms were refilled with water to a depth (about 21 inches) which permitted the tanks to be floated onto the foundation pads. The berms were again drained. Interior concrete slabs were constructed on the bottom of each tank. Work remaining to be done includes caulking the interior joints and seams with mastic and coating the interior concrete slabs with epoxy sealing compound. A third tank which was perforated by hostile fire was repaired by bolting a steel patch sheet in place over the hole and coating the area around the patch with mastic.

(10) CP/SPT at Tuy Hoa, North Field: The purpose of this project was to prepare a facility to enable the forward air control team which support Phu Yen Province to operate from the airfield closest to Province Headquarters. The scope of work included the construction of revetments for two aircraft, the placement of an asphaltic concrete parking pad inside each revetment, building a HP rocket storage bunker, coating the existing runway with a non-skid compound, and removal of a chain link fence from the north end of the runway. All tasks were completed during this reporting period.

(11) Phu Hiep Tank Farm: Sand berms around six POL tanks evidenced significant erosion and their interiors became partially filled with drifting sand. Work accomplished included upgrading existing berms and stabilizing them with soil binder. Sand which had drifted inside the berms was excavated to insure the interior volume was sufficient to contain the contents of the tanks with a full one foot high freeboard to spare.

(12) LOC Maintenance and Repair: Extensive repairs were made on a 16 kilometer section of QL-1 between Vung Ro Bay and Phu Hiep in preparation for turnover. Shoulders , which were disturbed by the installation of a buried pipeline, were brought to grade, shaped, recompacted, and stabilized with liquid asphalt. Major surface failures were corrected by deliberate repair. At present, repairs are very near to being 100% complete and preparations have been made for the imminent transfer of maintenance responsibility on this portion of the road to the Vietnamese Ministry of Public Works.

(13) Headquarters, 937th Engineer Group (C), Phu Tai: In September 1969, when a 240-Bed POW Hospital being constructed by the 84th Engineer Battalion (Construction) was 75% completed, construction was suspended. The 84th Engineer Battalion was tasked to bring this facility to a standard acceptable for occupancy by Headquarters, 937th Engineer Group. Tasks accomplished included completion of water and electrical distribution systems; construction of revetments and bunkers ; construction of a helipad; completion of the mesh hall; and partitioning of several buildings for offices and living quarters. The 937th Engr Group moved to this facility in mid-March 1970.

c. Intelligence and Counter Intelligence: Enemy Activity was moderate during the quarter with an increase in activity over the previous quarter. In 18 scattered incidents, five men were wounded and 9 pieces of equipment were damaged. The principle sources of intelligence have been the capital ROK Infantry Division, 22nd ARVN Division , 173rd Airborne Brigade, MACV Advisors of Binh Dinh and Phu Yen Provinces, 4th Inf Div and 1st Field Force

d. Plans and Training: Plans and a timetable were made for the turnover of highways in the 84th Engr Bn AOR to theVietnamese Ministry of Public Works, RVN. Plans were made for the movement of two units of the 84th Engineer Battalion. In late February 70, A company moved from Tuy Hoa to Phu Tai, and in early April, D company moved from Tuy Hoa to An Khe. Sunday morning training classes emphasized safety, weapons familiarization, first aid, drug abuse, sapper defense, rules of engagement, and maintenance procedures.

d. Personnel, Administration, Morale, and Discipline: During the past quarter 84 personnel were recommended for awards. This represents an increase of 147% from last quarter. 308 EM were promoted to the next higher grade. 56 EM voluntarily extended their foreign service tour in the Republic of Vietnam. 67.2% of the Battalions strength is enrolled in the Savings Bond Program. There were 4 congressional investigations, and 11 complaints registered with the Inspector General. There were 117 disciplinary actions which included 106 Article 15's and 11 Special Court Martials.

f. Logistics: During the past quarter, the S-4 Section gave logistical support to organic companies and attached units of the 84th Engr Bn (Const). The areas of logistical support include:

(1) Procurement and distribution of Class A rations for 900 personnel daily.

(2) Operation of two water points producing 45,000 gallons of potable water daily.

(3) Supply of Class II TOE equipment. An average of 30 equipment requisitions were processed weekly by the Property Book Section. During the quarter, 50 pieces of TOE and MCA equipment were acquired.

(4) Supply Class IV Construction Materials to all units for MCA funded projects. An average of 150 requisitions for construction materials were processed weekly by the S-4 section.

(5) Re-supply of unit basic loads and demolitions through the Phu Tai Ammunition Base Depot. An Average of 10,000 pounds of dynamite were used monthly for quarry work until quarry operations were terminated on 8 March 1970.

(6) Supply material for the construction of QL-1 Bridge No 241, a class 4 steel &concrete highway bridge being constructed by the 201st ARVN Engineer Bn at Tuy Hoa. This project is currently 50% complete. When completed , it will be the largest bridge in Vietnam.

(7) Supply materials for the following Self-Help Projects. Security Lighting for ROK Div. HQ and Security Lighting for Log Support Gp.

g. Civic Action: During the past quarter, emphasis was shifted from civic action to ARVN affiliation because of the Vietnamization Program. During the past quarter, voluntary contributions for orphanages amounted to $VN 65,000. A bridge walkway on a highway bridge over the Song Lai Giang at Hong Son was repaired.

h. ARVN Affiliation: A liaison team has been working continuously with the 201st ARVN Engineer Bn in construction of a 3600 ft Bridge on QL-1 over the Song Da Rang River at Tuy Hoa . The team has provided contact with US specialists in supply , equipment , steel structure, concrete , and quality control work. Problem solving in concrete prefabrication, pile driving, and steel work has been expedited by this team. The CO 84th Engineer Battalion personally accompanied the CO, 201st Engr Bn on a liaison trip to the Hong Son Bridge worksite. This visit proved to be highly successful in that many construction techniques were shared, resulting in significant increases in efficiency of both battalions. During the quarter, dump trucks of the ARVN 226th Panel Bridge Company worked with C/84th in hauling fill to the Army Base Depot. The 22nd ARVN Engineer Bn and the 84th Engr Bn worked together to begin planning an additional 2 1/2 KM section of Revolutionary Development Road 505 in northern part of Binh Dinh Province.

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EGCC-OT
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970, RCS CSFOR-65

2. Lessons Learned: Commanders Observations, Evaluations, & Recommendations.

a. Personnel: None

b. Intelligence: None

(1) Item: Floating Tanks

50.45

OBSERVATION: 10,000 BBL POL Tanks which had been constructed during the early troop buildup in Vietnam are now leaking. Part of the cause was the poor foundation upon which the tanks had first been constructed. Repair would be useless until the tanks were placed on a firm foundation.

EVALUATION: A concrete pad was the only acceptable foundation for the area in which these tanks were located. The tanks had to be moved to the side so that this pad could be constructed. They were too old and rusted to be disassembled and too heavy to be moved by crane.

RECOMMENDATIONS: The bottom and sides of the tank were nearly water tight. Therefore the tanks would float, just as a glass will float upright in a basin of water. With this in mind, the berms encircling the tanks were extended on one side about 75 feet and filled with seawater. The tanks broke loose from their foundation after about 9 inches of water were pumped into the berm, and were pushed by manpower off their foundation to a temporary resting site. The water was drained from the berm and the concrete pad was placed at the original tank site. The berm was refilled with water and the tanks were moved on to their new foundation. Repair could then be accomplished.

(2) Item: U-Shaped Berms

50.50

OBSERVATION: A project at the Ammo Base Depot in Qui Nhon required the rebuilding of a number of U-shaped protective berms which had been badly eroded in past monsoon rains. Specifications required these berms to be at least 11' high with a minimum width of 3' at the top. Limited earth moving assets were available but repair had to be done quickly to return the berms to the desired protective strength before the next monsoon and to prevent enemy units from capitalizing on the weak existing state of the berms.

EVALUATION: A repair method had to be devised to make maximum use of all available TC&E assets. The height and narrow width of the berms dictated that each piece of equipment could be used on only certain parts of the berms. Compacting the berms was a particular problem because of the steep sloping sides.

RECOMMENDATION: The rear of the berm was effectively developed with 290 tractor scrapers. The 290 can manuvor on the rear of the berm and has sufficient distance to spread an evenly distributed load of earth. This procedure was acceptable for constructing the berm to a height of 7' after which 290 manuvering became difficult. The sides of the berm and the remainder of the rear were constructed using 5 ton dumps. 5 tons have the capability of backing up the steep sloped berms.

Compaction was accomplished by two methods. A self propelled, segmented compactor or towed vibratory compactor was found to provide maximum compaction at the center of the berm structure. Compaction of the sides of the berms was accomplished by use of a double barrelled sheeps foot roller. Unnecessary slippage material on the sides of the berms was removed by back blading the sides of the berm with a D7 dozer.

(3) Item: Removal of M8A1 Matting

50.08

OBSERVATION: A runway covered with M8A1 matting was to be resurfaced with asphaltic concrete. The matting was unserviceable and had to be removed by the fastest means available.

EVALUATION: Time was the only important commodity in the task of removing the matting. Disassembly of the matting was too difficult and time consuming, and was unnecessary since the matting was unserviceable.

RECOMMENDATION: The joint across the runway on every 5th section of matting was opened using a ripper tooth on the D7-E dozer. This broke the matting into sections which were then pulled off to the side of the runway by another D7-E dozer.

(4) Item: Leaking Pipes

50.14

OBSERVATION: Work was slowed on a recent MACV project for lack of plumbing supplies. Unions, elbows, and couplings were not available for the plumbing installation. An alternate method of connecting sections of pipe was needed to prevent serious delay of the project.

EVALUATION: The first solution was to weld the pipe. This method was good for connecting the pipe, but did not provide a water tight seal. An additional seal had to be found.

RECOMMENDATION: Mastic Sealing Compound, FSN 8030-598-4502, was used to provide the water tight seal. Each weld was covered with a thick layer of mastic. Polyethylene plastic was tied in place over the mastic to hold it to the weld while it set up. Curing time for the mastic was 24 hours. A test of the waterline after all welds were sealed showed that all joints were 100% water tight.

(5) Item: 20T Euclid Dump Truck

45.08
50.19

OBSERVATION: During the course of quarry operations by the 84th Engr Bn, we have encountered a recurring problem. Rocks were constantly being thrown up by the tires on 20T Euclid dump trucks, breaking the transmission housing.

EVALUATION: The transmission housing was in need of some type of protection.

RECOMMENDATION: This problem was eliminated by our Bn maintenance section. A steel plate was fabricated to cover the transmission housing and protect it from damage.

(6) Item: Patching

OBSERVATION: Jackhammers have been used to square off potholes for repair of asphalt roadways. This was acceptable for small potholes but was time consuming where large areas had to be prepared.

EVALUATION: The preparation of these larger areas tied up the air compressor and jackhammer for too long a time. A quicker, simpler means was needed.

RECOMMENDATIONS: The necessary preparation was effected using the scarifier mounted on a Westinghouse grader. One pass of a grader was sufficient to loosen large sections where the road surface had failed. This method proved useful on QL-1 in the Tuy Hoa area where seepage from a pipeline buried beneath the road had caused surface failures, and along the edge of the road where alligator cracks had developed.

(7) Item: Alignment of Anchor Bolts

OBSERVATION: A standard method incorporating the use of a transit and measuring tapes was used to properly align the anchor bolts in a pile cap. The anchor bolt is used to secure bearing plates to the pile cap. This process is very todious and time consuming.

EVALUATION: A more expedient method was needed which would not comprorise the accuracy of the original method.

RECOMMENDATION: A 2"x4" wooden template was constructed with holes drilled in the proper positions for the bolts. The anchor bolts were securely fastened in these holes and the template was attached to the pile cap form insuring that the anchor bolts would be properly positioned once the concrete was placed.

(8) Item: Curing Compound

OBSERVATION: When curing compound is applied to a concrete slab, it changes the texture of the slab so that it is no longer porous. If grout is to be applied, this surface must be scarified so that it will retain its original texture.

EVALUATION: Considerable time is required to prepare a concrete surface so that grout can be applied. Another method of curing the concrete would eliminate this loss of time.

RECOMMENDATION: Wet sand bags were used to cover the portions of the concrete slab where grout would later be applied. Additional time was required to complete this portion of the process, but the entire time involved was greatly reduced because it was no longer necessary to scarify the concrete slabs.

EGCC-CE
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970, RCS CSFOR-65

(9) Item: Drain Pipes

OBSERVATION: Four inch pipes were to be installed through an abutment and its wing walls to provide for the drainage of water through the abutment.

EVALUATION: A method was needed to secure these pipes in the forms so that, when the concrete was placed, they would not be jarred from their positions.

RECOMMENDATIONS: The pipes were welded to the rebar lattice of the abutment or, when necessary, to short pieces of rebar connected to the rebar lattice. This secured the pipes sufficiently for the placing of concrete.

(10) Item: Causeway

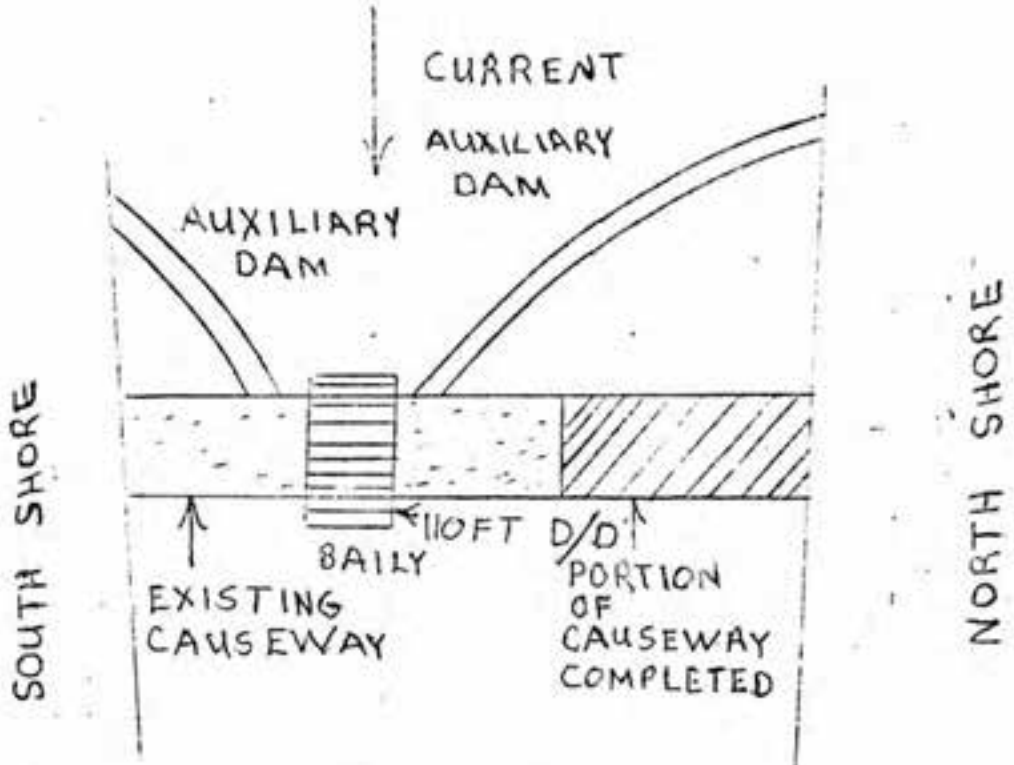
OBSERVATION: A causeway had been constructed 2/3 of the way across the Song Lei Giang River in Bong Son. This causeway was built to provide a working surface for construction tasks on the Bong Son Bridge. When the pile driving was nearly complete on the existing causeway, it was necessary to construct the remaining 1/3 of the causeway.

EVALUATION: Before constructing the final 1/3 of the causeway, a section in the middle of the existing causeway was removed and a 110 ft double double baily was placed over the gap. This gap would take the full flow of the river when the causeway was completed. Earthmoving was begun for the final 1/3 of the causeway and it was observed that much of the fill put in the gap was washed away by the current. This increased as the causeway lengthened because the narrowing channel increased the speed of the flowing water.

RECOMMENDATION: Before this became a major problem auxiliary dams were constructed by dozing sand from the river bed. One dam extended from a point upstream from the causeway on the north river bank to a point on the causeway near to and north of the baily bridge. The other dam extended from a point upstream from the causeway on the south river bank to a point on the causeway south of and near to the baily bridge. This is shown in the following diagram. These dams channeled the water into the gap which had been cut in the construction causeway. The final portion of the causeway was then easily completed.

(11) Item: Differential resistance encountered during pile driving operation.

OBSERVATION: Steel pile (14BF73) are being driven for the piers and abutment foundation. A 40 ton crane with 70 feet of boom, 63 feet of leads, prefabricated 32' catwalk, and a Model 180M diesel driven hammer rated at 7500 foot lbs are the equipment being used. Test boring samples were available indicating a conglomerate of coarse sand and sandy clay encountered from a depth of 40' to 70' with very little differentiation in the test hole hammer penetration resistance between 40' and 70'. Specifications for pile driving require a minimum resistance of something less than 0.1" of pile penetrating per blow of the 180 M hammer. (10 blows per inch)



CAUSEWAY

BONG SON BRIDGE

During pile driving operation on the near shore abutment, it became evident that there was a considerable amount of differential resistance encountered between the individual piles even though they were driven in the same general area. As an example of this one pile in the abutment foundation was driven to a depth of 100 feet and encountered a resistance of 11 blows per inch of penetration. The next pile was driven to a depth of 63 feet and encountered a resistance of 17 blows per inch of penetration. The 14BP73 pile come in 40' lengths and much time and effort is involved in splicing the 40' lengths together. It was determined that if it was possible to obtain the required resistance of something less than 0.1" of penetration per blow of the hammer at a shallower depth, the time and materials required for the pile portion of the substructure could be reduced by as much as 30%.

EVALUATION: The differential resistance encountered during pile driving operations can be explained by the fact that due to the high water table and the type of material which the piles are driven through, the piles do not take an immediate "set". The constant shock of the hammer driving the pile causes the material directly around the pile to attract water causing a lubricating effect. Since the bearing capacity and the required penetration resistance depend entirely upon friction bearing of the pile, this liquidified material tends to give a false reading. It was found that if a double length of pile was driven down to required depth and then allowed to set for a period of around 12 hours, a recheck of the penetration revealed that the resisting capacity of the soil was greatly increased due to the partial drying up of the material directly around the steel pile. In all cases it was found that a pile which had been allowed to set for a period would gain as much as 50% more resistance than the initial reading. It should be noted also that it is possible when rechecking the resistance to cause the pile to break loose from its "set" and consequently gave another low reading. The recheck should be held to a minimum to insure required bearing capacity (30 blows max).

RECOMMENDATION: When it becomes evident that at the end of a length of pile the resistance encountered is less than but is approaching the required bearing capacity, it is possible that a setting period could produce the necessary additional resistance to be within specifications without adding another length of pile. A rule of thumb which has been established at the Song San Bridge project is that if at the end of the second length of pile the resistance encounter is at least 2/3 of the required resistance, the pile should be allowed to "set". A recheck of the resistance after 12 hours shows that in all cases, the specifications for resistance are met.

d. Organization: none

e. Training: none

f. Logistics: none

g. Communications:

EOCC-OP
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970, RCS CSFOR-65

(12) Item: VRC-46 Radio on 3/4 ton truck

OBSERVATION: Some 3/4 ton trucks of this battalion have been used by command personnel in lieu of jeeps and as such had VRC-46 radios immediately behind the cab. The monsoon rains often caused these exposed radios to become inoperative.

EVALUATION: It was more desirable to have this radio mounted inside the truck. The radio then would not be exposed to the elements, would be less susceptable to vandalism, and would be easier to adjust.

RECOMMENDATION: With little time and effort, the radio was mounted slightly above the floor on the passenger side with the antenna attached beside the gasoline can. This resulted in longer operational use of the radio and better communications.

(13) Item: Modification of adapter card, SC-C-446213

OBSERVATION: The adapter card, SC-C-446213, would not fit properly into the KYB-6.

EVACUATION: The adapter card SC was defective when released by the manuafacturer. When this adapter card was produced, pin 12 was removed. For the adapter to fit properly, pin 11 must be removed.

RECOMMENDATION: Pin 11 was removed by a skilled Bn radio mechanic. This modification took approximately two hours. The adapter card worked properly after this modification.

h. Material: None

i. Other: None

Richard M. Wells

RICHARD M. WELLS
LTC, CE
Commanding

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EGC-OP (30 April 1970) 1st Ind
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Const), Period Ending 30 April 1970.

DA, HEADQUARTERS, 937TH ENGINEER GROUP (COMBAT), APO 96226, 25 May 1970

TO: Commanding General, 18th Engineer Brigade, ATTN: AVBC-C, APO 96337

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

1. In accordance with 18th Engineer Brigade Regulation 525-15, the ORLL from the 84th Engineer Battalion (Construction) for the period ending 30 April 1970 is hereby forwarded with the following comments.

a. Part II, Lessons Learned

(1) Para c, Operations Paragraph heading is missing from the report.

(2) Para c (1), Floating Tanks. It is believed that floating is a standard method of testing tanks for bottom leaks. The modification used to relocate the tanks for repair worked efficiently. The recommendation should be that bolted tanks should be placed only on concrete pads.

(3) Para c (6), Patching. This observation is not new or unique to standard construction procedure.

(4) Para c (7), Alignment of Anchor Bolts. This observation is not new or unique to standard construction procedure.

(5) Para c (8), Curing Compound. Use of the term "scarify" when applied to concrete slabs is incorrect. The slab surface has to be scored so that grout will bond. The use of wet sandbags or other covering is not a unique observation to construction practice in RVN.

(6) Para c (9), Drain Pipes. Observation is not new to standard construction practice.

(7) Para c (11), Differential Resistance Encountered during pile driving operation. This observation is not new to standard construction practice.

(8) Para g (13), Modification of Adapter Card, SC-C-446213. Problem appears to be a defect in manufacture. It is not known whether any more of the adapter cards were defective or whether this was an isolated instance.

(9) Most recommendations are written as summaries of what was done to solve a problem rather than as a recommended practice.

2. The report is considered to be an accurate representation of the battalion's activity for the period.

FOR THE COMMANDER:

13 [illegible]
CPT, CE
Adjutant

AVBC-CG (30 April 1970) 2nd Ind
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), Period Ending 30 April 1970

DA, HEADQUARTERS, 18TH ENGINEER BRIGADE, APO 96377 19 JUN 1970

TO: Commanding General, U.S. Army Vietnam, ATTN: AVHGC-DST, APO 96375

1. This Headquarters has reviewed the Operational Report-Lessons Learned for the 84th Engineer Battalion (Construction), as indorsed by the 937th Engineer Group (Combat). The report is considered to be an accurate account of the Battalion's activities during the reporting period.

2. This Headquarters concurs with the observations and recommendations of the Battalion and Group Commanders with the following additional comments:

a. Reference: Para 2(b)6. Patching. Nonconcur. Scarification is acceptable on large areas where the entire roadway width has to be repaired and on other large areas, however, a jack hammer must be used to cut edges adjacent to the pavement. The road grader will loosen the surrounding structure resulting in an adjacent failure. Care must be exercised removing the loose material prior to patching.

b. Reference: Para 2(b)10. Causeway. A simpler method would be to add blast rock as a rip-rap at ends of the causeway adjacent to stream.

c. Reference: Para 2(b)13. Modification of adapter card, SC-C-446213. The defect in the adapter card is not an isolated case and action taken was the correct course of action. The time required is not correct. To remove the contact pin takes a maximum of 10 Minutes.

H.C. SCHRADER
Brigadier General, USA
Commanding

CF:
CO, 937th Engr Gp
CO, 84th Engr Bn

AVHGC-DST (30 April 70) 3d Ind
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 30 April 1970 RCS CSFOR-65 (R2)

Headquarters, United States Army Vietnam, APO San Francisco 96375 7 JUL 1970

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

This Headquarters has reviewed the Operational Report-Lessons Learned for the quarterly period ending 30 April 1970 from Headquarters, 84th Engineer Battalion (Construction) and concurs with comments of indorsing headquarters.

FOR THE COMMANDER:

for D. J. Winter
CPT, AGC
Assistant Adjutant General

Cy furn:
18th Engr Bde
84th Engr Bn

GPOP-DT (30 Apr 70) 4th Ind
SUBJECT: Operational Report of HQ, 84th Engineer Battalion (Const) for Period Ending 30 April 1970, RCS CSFOR-65 (R2)

HQ, US Army, Pacific, APO San Francisco 96558 20 JUL 70

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

This headquarters concurs in subject report as indorsed.

FOR THE COMMANDER IN CHIEF:

D.D. CLINE
2LT, AGC
Asst AG

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5. AUTHOR(S) (First name, middle initial, last name)

CO, 84th Engineer Battalion

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DEPARTMENT OF THE ARMY
OFFICE OF THE ADJUTANT GENERAL
WASHINGTON, D.C. 20310

IN REPLY REFER TO

AGDA (M) (13 Jan 71) FOR OT UT 703088

18 January 1971

SUBJECT: Operational Report - Lessons Learned, Headquarters, 84th Engineer Battalion, Period Ending 31 July 1970

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2. Information contained in this report is provided to insure appropriate benefits in the future from lessons learned during current operations and may be adapted for use in developing training material.

BY ORDER OF THE SECRETARY OF THE ARMY:

Kenneth G. Wickham

KENNETH G. WICKHAM
Major General, USA
The Adjutant General

1 Incl
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DEPARTMENT OF THE ARMY
HEADQUARTERS, 84TH ENGINEER BATTALION (CONSTRUCTION)
APO SAN FRANCISCO 96238

EGCC-CP

31 July 1970

SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970 RCS CSFOR-65

THRU: Commanding Officer
937th Engineer Group (Combat)
APO 96226

Commanding General
18th Engineer Brigade
ATTN: AVBC-C
APO 96377

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

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

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

FOR OT UT
703088
Inclosure (1)

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EGCC-CP
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970 RCS CSFOR-65

1. Operations

a. Command: Assigned and attached units are listed in Inclosure 1.

b. Unit Operation:

(1) The Bong Son Bridge: One of the largest and most demanding projects ever undertaken by the 84th Engineer Battalion (Const) is the construction of the Bong Son Bridge. At the end of this reporting period, this project was approaching completion as the last deck slab was set in place. Two major tasks in the construction of the Bong Son Bridge were the fabrication of the deck slabs and the splicing of the stringers. Incorporated into the fabrication of the slabs was the assembly of reber cages to be used in the concrete. A total of 205 exterior cages and 95 interior cages were fabricated during the reporting period. This operation was accomplished by employing two 12 hour shifts enabling the task to be completed on 9 July 1970. By 15 July 1970 a total of 230 exterior and 115 interior deck slabs were cast. The fabrication process was mastered to the point that 3 spans of deck slabs were being cast each week. The second major task of the project, stringer splicing, became fully mobilized during this report period enabling all splicing to be completed by 20 July 1970. A total of 142 stringers were spliced. Sand blasting operations began on 5 July 1970 in preparation for the painting of the stringers and pier piles with red lead base paint. At the end of the reporting period 2 spans were finished and an additional 8 spans were sandblasted and ready for painting. Installation of the pier bracing system began on 8 July 1970 and at the end of this report period 13 piers were complete and 21 partially completed. One of the major contributing factors to the rapid completion of this project was the operation of the concrete batch plant. 1836 cubic yards of concrete were produced for the construction of pile caps, abutments, curbs, retaining walls, and riprap at the bridge abutments. A total of 15 caps were constructed, grouted, and had bearing plates installed during this report period. The final cap was completed on 10 June 1970. The far shore abutment construction was begun on 10 July 1969 and was completed on 26 July 1970. As with the near shore abutment, six separate formings and placements were required approximately 275 cubic yards of concrete. The installation of curbing began on 3 July 1970. The work moved along smoothly, and 26 spans of curbing, an average of 1½ spans a day, were completed. During May 1970 the near shore approach was constructed of 6450 cubic yards of fill material and 400 cubic yards of base course material. The near shore abutment approach way was stabilized using blast rock riprap. A retaining wall was constructed on the far shore approach way containing 35 cubic yards of concrete. Backfilling of the far shore approach way began on 5 July and was completed on 29 July 1970 using 3000 cubic yards of fill. The construction of the lighting system began on 13 July with the installation of 3/4" conduit. As of the end of this reporting period, 18 spans of the bridge have conduit with junction boxes ready for accepting the necessary wire.

(2) Revolutionary Development Roads: The 84th Engineer Battalion (Construction) in support of the 173rd Airborne's Pacification Program was assigned the task of up-grading Route 505 which links several coastal villages in the Phu My district with QL-1. Work was hampered at times due to heavy harassment from the Viet Cong. This was overcome with the help of the 173rd who provided security during the construction phase of the mission. During this period a total of 9775 CY of laterite was hauled, spread, and compacted to complete the subgrades for both Routes 505 and 84 on 4 July 1970. The extensive drainage construction necessary for these two routes was accomplished by the installation of the following culverts;

18" culvert - Three (3) each
24" culvert - Three (3) each
30" culvert - Four (4) each
36" culvert - Nine (9) each
48" culvert - Twenty one (21) each

A reinforced concrete ford is being constructed at one drainage site where a culvert would not be adequate. This portion of the project was begun on 10 July 1970 and is still under construction.

(3) MACV Hoai Nhon: On 9 February 1970 the 536th PC Det, 84th began construction of the MACV Facility. The scope of this project included the construction of one 40'x60' billet, a 10'x20' shower/latrine, a septic tank, and a leach field. These facilities had to be constructed within the limits of the existing MACV compound. The only site available within the compound was in a very confined area which had vertually no access roads leading to the main artery. The 536th overcame these limitations by using cranes from the Song Son Bridge project to lift construction materials into the site and by adjusting the construction plans so that the layout could be adjusted for this site. The project was completed on 30 May 1970.

(4) Ammunition Base Depot: Work in the AED located in Phu Tai was started in January 1970 and completed in mid June 1970. A "U" -shaped berm, 11 feet high with a 3'-6" top width was constructed around the pads to complete the 26 berms required for this project. These berms provide protection against blast and sympathetic detonation in the event ammunition on any pad explodes. The completed berms were stabilized with liquid asphalt applied with a 5000 gallon asphalt distributor especially fabricated by C Co, 84th Bn for the project.

(5) Major/Minor Repairs of QL-19: The 84th Engr Bn has the mission to repair QL-19 along the 100 KM sector between the Mang Giang Pass and its intersection with QL-1. The scope of work includes cutting and shaping ditches along the entire 100 KM length; bringing shoulders to proper grade and width using compacted select fill; stabilizing the shoulders with MC 70; repair of more than 350 potholes, installation of 26 drainage structures, and the complete rebuild of more than 14.5 KM of road that had completely failed.

The concept of operation for ditches, shoulders, and pothole work employs an earthmoving platoon and pothole crew from each of two companies; one starting at each end of the road and working toward the other. One company is tasked with all the drainage structures. The source of construction materials are:

a. Borrow pits established at convenient points along the route for select fill.

b. A 75 TPH crusher operated by the 299th Engr Bn at An Khe, and an RMK industrial site near the intersection of QL-1 and QL-19 for basecourse.

c. The RMK plant is the only source of asphalt.

Quality control on all construction materials is performed by the 84th Engr Bn materials testing laboratory. Since there is only one source of asphalt, and since it is located at the extreme eastern end of the assigned sector, the average one way haul distance is 50 KM. That factor coupled with the limited ability of the contractor to supply asphalt, identifies paving on rebuild sections as the critical task. The concept is to work rebuild from west to east in order to complete work in the highlands prior to the coming monsoon. That concept required modification since the road in the sector between the Mang Giang pass and An Khe pass experienced more rainfall than anticipated. The planning factor was 33% adverse weather days but the real experience factor was in excess of 50%. It became necessary to prepare sections for rebuild east of the An Khe pass in order to take advantage of good weather there when it rained west of the pass. Approximately 50% of the required work on this project was accomplished during this reporting period.

(6) Phu Hiep Airfield Upgrades and Resurfacing: During this period, 1600 linear feet of cement stabilized sand was prepared to complete the base course on runway and overruns. A total length of 3110 linear ft of runway was paved with asphaltic concrete to complete the resurfacing portion of the project. The overrun and shoulders were stabilized with MC-70, and an area 20' feet wide around the entire runway was sprayed with penaprime as a dust control measure. The runway was marked as requested by the user and the unserviceable matting was cleared from the work site. Work was completed on this project on 4 July 1970.

(7) Replacement of Culvert; Phu Tai: The final drainage structure was installed at the Ammo Base Depot on 15 July 1970. The scope of this project included the installation of two 48" culverts, each approximately thirty feet in length. In addition materials were supplied by the 84th Engr Bn (Const) for the installation of five 48" culverts of equivalent length which were installed by the 184th Ordnance.

(8) POL Tank Repair, Qui Nhon: A great deal of difficulty has been experienced in attempting to seal the leaks in these two POL tanks. Initially, concrete floors were constructed inside these tanks, but later tests proved additional measures would have to be taken to eliminate the leaks. Liners for both tanks were prefabricated from T-17 membrane and sealed with a mastic compound. Tests showed that leaks were still present in the floors of both tanks and additional leaks were present in the horizontal and vertical seams. After reapplication of the mastic compound and further tests, the mastic was found to be ineffective. 30 gallons of better mastic was obtained and used to seal tank 14. An additional 100 gallons of the same mastic was found and is presently being used to seal tank 15. At the close of this reporting period tank 14 was completely sealed with the exception of two minor leaks which were detected in the vertical seams near the top of the tank.

(9) Dog Kennels, Camp Humper: On 6 July 70, C Co, 84th Engr Bn began construction of a kennel complex that will eventually accomodate 70 dogs. The layout and excavation of the work site was completed. All corner poles establishing the framework of the pens were cemented in place, and the flooring for all the pen areas was poured. Forty interior walls were constructed and ten of them were completed with a stucco coating. A water tower and sewage lagoon were partially constructed. A protective berms and access road were near completion at the close of this reporting period.

(10) ROK Valley Revetment: This project involves the construction of a 13 foot high revetment around the power generating station. The walls of the structure are made of unserviceable M8A1 matting which was salvaged from the Phu Hiep Runway Resurfacing project and the interior is filled with sand. At the end of the reporting period, one entire side of the square shaped revetment was complete and the remaining three sides were approximately 70% complete. Problems resulting from the use of this M8A1 matting have caused a delay in the completion of this project. The configuration of the matting is such that, when emplaced, gaps occur at joints between individual pieces and between tiers. The revetment would not retain the sand until these gaps were eliminated. Attempts to close these gaps with cable were unsuccessful. At the end of this reporting period, the plan in effect required welding additional pieces of M8A1 matting over the gaps.

(11) Aircraft Maintenance Hangers, An Khe: The installation of the electrical facilities for two helicopter maintenance hangers located at Golf Airfield, An Khe was begun on 15 June 1970. This project involves the installation of 60 high bay floodlights and 132 low bay fluorescent lights in the existing Butler structure (75'x202'), necessary receptionals and exterior lighting in both buildings. The installation of the high bay lighting fixtures in the Butler Building and the installation of all the high bay lighting facilities in the Pascoe building was the only remaining work to be accomplished at the close of the report period.

(12) LOC Maintenance and Repair: The Phu Loa Culvert on QL-1 south of Tuy Hoa was repaired this quarter. The work included excavating both ends of the culvert so that 10'extensions could be installed. Concrete head walls and retaining walls were constructed at both ends of the culvert.

c. Intelligence and Counterintelligence: Enemy activity for the reporting period has been light. There have been 14 scattered incidents involving engineers reported: Five convoy ambushes, one work site ambush, three sniper incidents, two mortar attacks, one mining incident, one satchel charge incident and one sapper attack. Results of these incidents included three men wounded (MINOR); one ton ton vehicle, one asphalt spreader, one five ton dump, two five ton tractors, two generators and three 2½ tons damaged slightly; one five ton tractor damaged heavily; and one project delay incident. Principal sources of intelligence were Capitol ROK infantry division, 22nd ARVN Division, 173rd Airborne Brigade, and MACV Advisors of Binh Dinh, 4th Infantry Division, and IFFORCEV Intelligence summaries.

d. Plans and Training: Plans and schedules were made in detail for the repair of QL-19 and the construction of the Dog Kennels at Camp Humper, Phu Tai including the preparation of Gantt Charts, Progress Schedule Charts, and CPMS. Sunday morning CI classes emphasized safety, weapons familiarization, first aid, drug abuse, sapper defense, prevention of venereal desease, rules of engagement, and maintenance procedures.

e. Personnel Administration Morale, and Discipline: During the past quarter 125 men were recommended for awards. This represents an increase of 149% from last quarter. 237 EM were promoted to the next higher grade. 46 EM voluntarily extended their foreign service tour in the Republic of Vietnam. 65% of the Battalions strength is enrolled in the Savings Bond Program. There were 9 congressional investigations and 3 complaints registered with the Inspector General. There were 162 disciplinary actions to include 158 Article 15's and 4 Special Courts Martial.

f. Logistics: During the past quarter, the S-4 Section gave logistical support to organic companies and attached units of the 84th Engr Bn (Const). The areas of logistical support include;

(1) Procurement and distribution of Class A rations for 700 personnel daily.

(2) Operation of two water points producing 45,000 gallons of potable water daily.

(3) Supply of Class II TOE equipment. An average of 30 equipment requisitions were processed weekly by the Property Book Section. During the quarter, 50 pieces of TOE and MCA equipment were required.

(4) Supply Class IV Construction Materials to all units for MCA funded projects. An average of 100 requisitions for construction materials were processed weekly by the S-4 section.

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(5) Supply material for the construction of QL-19 Bridge No 241, a class A steel and concrete highway bridge being constructed by the 201st ARVN Engineer Bn at Tuy Hoa. This project is currently 50% complete. When completed, it will be the largest bridge in Vietnam.

g. Civic Action: During the past quarter, emphasis was shifted from civic action to ARVN Affiliation because of the Vietnamization Program. During the past quarter, voluntary contributions for orphanages amounted to $VN 41,226. Voluntary support was given by the 84th in the construction of the Holy Family Hospital, Qui Nhon.

h. ARVN Affiliation: A liaison Team has been working continuously with the 201st ARVN Engineer Bn in the construction of a 3600 ft Bridge on QL-1 over the Son Da Rang River at Tuy Hoa. The team has provided contact with US specialists in supply, equipment, steel structure, concrete, and quality control work. Problem solving in concrete prefabrication, pile driving, and steel work has been expedited by this team. The CO of the 84th Engr Bn (Const) met with the CO of the 201st Bn on several occasions at Bridge 241. The topic of their discussions included the outstanding requirements for materials and the deployment of critical equipment. The 84th Engr Bn, offered support in the removal of a 300' inoperative communications tower located at the Phu Yen province headquarters. This tower was a danger to the compound because it was being used as a mortar stick by the Viet Cong in stand off attacks. The personnel of the province were unable to devise a plan to remove the tower. When briefed of the problem, men of the 84th solved it by using demolitions to drop the tower while observing all safety precautions. Salvageable material was given to the ARVN. The 84th Engr Bn (Const) has begun a program to help the 62nd ARVN Engr Bn (Const) to develop its engineering capability. Initial organizational meetings were held to include a weekly Battalion Staff meeting which was attended by the CO of the 62nd ARVN Engr Bn (Const) and members of his staff. All staff officers of the 84th Engr Bn (Const) have met with their couterparts with the 62nd has been established. In addition a training program has been arranged to familiarize the operators with the various pieces of earth-moving equipment.

EOCC-OP
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970, RCS CSFOR-65

2. Lessons Learned: Commander's Observations, Evaluations, & Recommendations.

a. Personnel: None

b. Intelligence: None

c. Operations:

50.21/40.04 (1) Item: Shoulder Stabilization

OBSERVATION: Several kilometers of road shoulders had to be stabilized with MC-70. A TO&E asphalt distributor with a capacity of 800 gallons can only stabilize short lengths of shoulders before being refilled. This means a considerable loss of effort in turnaround time. Also, the TO&E distributor must travel on the shoulders while operating, thereby exposing the equipment to mines.

EVALUATION: An asphalt distributor had to be developed that would have a greater capacity and could stabilize shoulders without traveling over them.

RECOMMENDATION: A salvaged 5000 gal tanker was converted to an asphalt distributor. A spray bar was attached to the nozzle of the tankers standard pump. The spray bar was constructed of 2 inch pipe, 9'6" in length with 28 standard asphalt spray nozzles tapped into it. The spray bar was supported by a chain and could rotate through an arc of 90 degrees to the side of the tanker making it capable of avoiding all obstacles. The operator, positioned on a chair attached to the side of the tanker, could control the outlet valve on the spray bar.

50.15 (2) Item: POL Tank Repair

OBSERVATION: The 84th Engr Bn (Const) was assigned the task of repairing two POL tanks which were leaking due to deteriorating gaskets.

EVALUATION: Replacement of the gaskets was unfeasable at this time because new gaskets were unavailable. In addition the task would require considerable time, man power, and equipment without any assurance that the leaks would be eliminated.

A seal had to be developed that could be installed rapidly with the least amount of equipment and manpower. It must completely seal the tank without dismantling any portion of it.

RECOMMENDATION: A Bladder can be constructed inside POL tanks by cementing WX - 17 membrane with mastic FSN 5680-267-1668. Care must be used to insure that all edges are well sealed and have no wrinkles in them. The bladder can be attached to the sides using the same mastic. The mastic cures in 24 hours and the result is a lasting, leak free, tank impervious to all POL items.

(3) Item: Cutting Torches 10/50.16

OBSERVATION: Cutting torch set components have a high attrition rate when in constant use.

EVALUATION: A study of the attrition rate had to be made so that replacement parts could be ordered according to scheduled requirements.

RECOMMENDATION: For each torch set that is to be committed to a large steel cutting project, at least one cutting tip should be requisitioned for each three (3) weeks of expected use. Planning factors should include replacing gauges and regulators every two months. Barrel assemblies should be replaced every two to three months as should hoses.

50.05 (4) Item: Mixing Soil With a Rotary Tiller

OBSERVATION: When mixing cement with a rotary tiller, excess concrete accumulates on the teeth and rear housing.

EVALUATION: Some method had to be devised which would eliminate the formation of these concrete deposits.

RECOMMENDATION: A light coat of CE-10 oil should be sprayed on the rear housing and mixing drum. This keeps the concrete from hardening and forming such deposits.

50.21/50.08 (5) Item: Sand Cement Stabilization Operations

OBSERVATION: A recent project called for the preparation of cement stabilized sand for use as a base course. The stabilization operation was done by raking the cement evenly over the sand surface and mixing the components with a rotor tiller. As operations progressed, soft spots began to appear in several areas.

EVALUATION: The ratio of cement to sand had been taken directly from the manual. This percentage was based on the factors of constant sand depth, uniform distribution of cement at all points of the surface, and 100% mixing of all components. In operation, however, the sand depth often varied by an inch or more, the cement could not be raked equally at all points and the mixing was not always exactly 100% complete. Therefore, some areas contained less cement than allowable, while other areas were overly rich in cement.

RECOMMENDATION: It was much more desireable to have all areas rich in cement than to have some areas weak. Therefore, the bag spacing on the runway was decreased, thereby increasing the ratio of cement to sand. This produced a uniformly rich mixture and eliminated soft spots. The cement sand ratio taken from the manual is good for plant mixing or for ideal field conditions, but should be increased slightly for less than ideal field conditions.

EGCC-OP
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970 RCS CSFOR-65

50.06/40.04(6) Item: D-7E Cutting Edges

OBSERVATION: The cutting edge on a D-7E dozer is subject to a great deal of wear. Since this part is not always readily available through normal supply channels, this piece of equipment could remain idle for extended periods of time.

EVALUATION: A substitute had to be found that could take the place of worn out cutting edges.

RECOMMENDATION: With certain adaptions a 290M Scraper cutting edge could be used on a D-7E dozer. By cutting three to four inches from either side of the cutting edge, it will fit perfectly on a D-7E dozer.

RICHARD M. WELLS
COL. CE
Commanding

1 Incl
1. List of Units

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5 Copies to 937th Engr Gp (C)
3 Copies to 18th Engr Bde
3 Copies to USARV
2 Copies to USAMPAC

EGC-CP (31 Jul 70) 1st Ind
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970 RCS CSFOR-65

DA, Headquarters, 937th Engineer Group (Combat), APO 96226, 25 August 1970

TO: Assistant Chief of Staff for Force Development, Department of the Army (ACSFOR-DA), Washington, D.C. 20310
Commanding General, 18th Engineer Brigade, ATTN: AVBC-CG, APO 96377

1. The Operational Report - Lessons Learned from the 84th Engineer Battalion (Construction) is forwarded IAW 18th Engineer Brigade Regulation 525-15. Reporting period is 1 May through 31 July 1970.

2. This headquarters has reviewed paragraph 1, Operations: Significant Activities and considers it to be an accurate account of 84th Engineer Battalion (Construction) activities for the reporting period.

3. This headquarters concurs with all recommendations in paragraph 2 of basic letter. For clarification, the observation in paragraph 2. c. (4) should read "when mixing cement and soil with a rotary tiller, excess cement...".

4. The contents of this indorsement have been brought to the attention of the 84th Engineer Battalion (Construction).

James C. Donovan
JAMES C. DONOVAN
COL, CE
Commanding

AVBC-CG (31 July 1970) 2nd Ind 16 September 1970
SUBJECT: Operational Report - Lessons Learned, 84th Engineer Battalion (Construction), Period Ending 31 July 1970, RCS CSFOR-65 (R2)

DA, HEADQUARTERS, 18TH ENGINEER BRIGADE, APO 96377

TO: Commanding General, U.S. Army Vietnam, ATTN: AVHGC-DST, APO 96375

1. This headquarters has reviewed the Operational Report - Lessons Learned for the 84th Engineer Battalion (Construction), as indorsed by the 937th Engineer Group (Combat). The report is considered to be an accurate account of the Battalion's activities during the reporting period.

2. This headquarters concurs with the observations and recommendations of the Battalion and Group Commanders.

W. C. SCHRADER
Brigadier General, USA
Commanding

AVCC-[illegible] (31 Jul 70) 3rd Ind
SUBJECT: Operational Reports - Lessons Learned for 44th Engineer Battalion (Construction), for the Period Ending 31 July 1970, [illegible] CSFOR-65 (R2)

DA, HQ, US Army Engineer Command Vietnam (Prov), APO 96491

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

Subject report is under review in this Headquarters. Comments for inclusion in the Headquarters, USARV Endorsement to CINCUSARPAC will be forwarded to your headquarters by separate cover.

FOR THE COMMANDER:

[signature]

[illegible]
CPT, AGC
Assistant Adjutant

AVHDO-DO (31 Jul 70) 4th Ind
SUBJECT: Operational Report-Lessons Learned, 84th Engineer Battalion (Construction), for the period ending 31 July 1970 RCS CSFOR-65

Headquarters, United States Army Vietnam, APO San Francisco 96375 19 OCT 1970

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

1. This Headquarters has reviewed the Operational Report-Lessons Learned for the quarterly period ending 31 July 1970 from Headquarters, 84th Engineer Battalion (Construction) and comments of indorsing headquarters.

2. Reference item concerning "Sand Cement Stabilization Operations," page 9, paragraph 2c(5): nonconcur. Sand-cement ratio should be established by quality control personnel in accordance with standard tests. A limit should be placed on additional cement added to compensate for wind loss and incomplete mixing. Unit has been so advised. No action by DA or USARPAC is recommended.

50.11
50.18

FOR THE COMMANDER:

[redacted]
Assistant Adjutant General

Cy furn:
USAECV(P)
84th Engr Bn

GPOP-DT(31 Jul 70) 5th Ind
SUBJECT: Operational Report-Lessons Learned, HQ, 84th Engineer Battalion (Construction), for the Period Ending 31 July 1970, RCS CSFOR-65 (R2)

HQ, US Army, Pacific, APO San Francisco 96558 4 NOV 1970

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

This headquarters concurs in subject report as indorsed.

FOR THE COMMANDER IN CHIEF:

for G. R. McLAUGHLIN
COL, AGC
Adjutant General

ASSIGNED AND ATTACHED UNITS OF THE 84TH ENGINEER BATTALION (CONSTRUCTION)

1. Headquarters and Headquarters Company, APO 96238
2. Company A, APO 96226
3. Company B, APO 96238
4. Company C, APO 96238
5. Company D, APO 96294
6. 536th Engr Det (PC), APO 96238
7. 23rd Engr Det (WD) attached to 84th Engr Bn (Const) Effective 13 April 1970, APO 96226

Inclosure I

UNCLASSIFIED

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CO, 84th Engineer Battalion

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