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

IN REPLY REFER TO

AGDA (M) (2 Jul 70) FOR OT UT 70B023

13 July 1970

SUBJECT: Senior Officer Debriefing Report: BG J. W. Morris, CG, 18th Engineer Brigade, Period 3 May 1969 to 3 May 1970 (U)

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1. Reference: AR 1-26, subject, Senior Officer Debriefing Program (U) dated 4 November 1966.
2. Transmitted herewith is the report of BG J. W. Morris, subject as above.
3. This report is provided to insure appropriate benefits are realized from the experiences of the author. The report should be reviewed in accordance with paragraphs 3 and 5, AR 1-26; however, it should not be interpreted as the official view of the Department of the Army, or of any agency of the Department of the Army.
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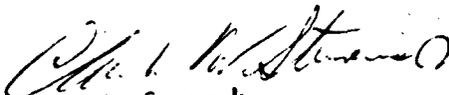
SUBJECT: Senior Officer Debriefing Report - BG J.W. Morris

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

1. Reference paragraph 6, AR 1-26.
2. Attached are three copies of the Senior Officer Debriefing Report prepared by BG J.W. Morris. The report covers the period 3 May 1969-3 May 1970, during which time BG Morris served as Commanding General, 18th Engineer Brigade, RVN.
3. BG Morris is recommended as a candidate guest speaker at appropriate service schools and joint colleges.

FOR THE COMMANDER:

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as (trip)  
2 cy wd HQ, DA

  
Capt. W. Stevens II  
Capt.  
Assistant Adjutant General

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## DEBRIEFING REPORT (RCS-CSFOR-74)

COUNTRY: Vietnam

DEBRIEF REPORT BY: Brigadier General J. W. Morris

DUTY ASSIGNMENT: 3 May 69 - 3 May 70: Cndr, 18th Engr Bde

INCLUSIVE DATES: 3 May 69 - 3 May 70

DATE OF REPORT: 15 Apr 70

### OUTLINE

I	Introduction	1
II	Background	1
III	Engineer Effort Relating to Regional Development and Nationbuilding	1
	A. LOC	1
	B. Vietnamese Training	3
	C. GVN Maintenance and Logistics Support of US Engineers	4
	D. Civic Action - Public Relations	5
IV	Programs in Support of US and Free World Forces	5
	A. General	5
	B. Tactical Operations	5
	C. Relocations	5
	D. Land Clearing	6
	E. Monsoon Activities	6
	F. Airfields	6
V	Selected Operational Items	6
	A. General	6
	B. The Engineer Organization	7
	C. Command and Control	7
	D. Personnel Turbulence	8
	E. Personnel	8
	F. Unit Organization	9
	G. Unit Drawdown and Consolidations	9
	H. Logistic - Maintenance Matters	11
	I. Competition for Engineer Effort	11
	J. Enemy Activities	11
VI	Summary, Lessons Learned, Recommendations	12

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COUNTRY: Vietnam

DEBRIEF REPORT BY: Brigadier General J. W. Norris

DUTY ASSIGNMENT: 3 May 69 - 3 May 70: Cmr, 18th Engr Bde

INCLUSIVE DATES: 3 May 69 - 3 May 70

DATE OF REPORT: 15 Apr 70

### I INTRODUCTION

The format of this debriefing report differs from that proposed by USARV regulation 1-3 so as to present more clearly the 18th Engineer Brigade activities in relation to the military, political, economic, and social situations during the past 12 months.

### II BACKGROUND

During the 12 months ending 3 May 1970 the application of Engineer effort in the I and II Corps Tactical Zones has changed significantly, in consonance with the policies to Vietnamize the military operations and to pacify and strengthen the economy and political structure of South Vietnam. During this period the proportion of total Engineer effort in support of US troop units has remained relatively constant. However, the specific tasks are considerably more related to relocating US units from forward areas being turned over to ARVN and to supporting US units in pacification and regional development of populated areas. At the same time, the major Engineer effort once assigned to base construction is now being expended to build a primary road system. Thus the 18th Brigade effort devoted to strengthening and developing the economic and political structure of South Vietnam increased many fold this past year to become our present major requirement. The discussions which follow will be divided into three major categories: support of regional development and nationhood; support of US and Free World Forces; other items of interest.

### III ENGINEER EFFORT RELATING TO REGIONAL DEVELOPMENT AND NATIONBUILDING

A. LOC: Perhaps the most impressive current Engineer program is the construction of a network of primary and secondary roads throughout I and II Corps Tactical Zones. Each of these will be discussed separately because of the important different purposes which each serves and the impact each has on the utilization of Engineer resources.

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1. The secondary road program is the simpler program and is easily supported by standard TOE equipment operated and supervised by personnel with techniques and skills normally found among an Engineer unit's TOE. These roads use locally available surface materials and are usually two lane or one full lane with turn outs and capable of carrying light traffic all year. These roads connect small villages and farming areas to the main highway arteries. As these roads have been built the surrounding areas are rapidly pacified and families return to begin a new life. The roads are having a dramatic effect on economic and political stability, including attitude toward US Forces. More and more frequently local people volunteer to help troops construct these roads and assist US Army Engineers in finding mines and booby traps. Once completed, these roads can normally be maintained by hand work of the residents along them.

2. The primary road program however, is a problem of much greater magnitude.

a. In the 18th Brigade area this program involves 1391 km of very high quality highways. Over 950 km are Priority I and the remainder Priority III roads. These standards, in turn, require the acquisition, operation, and maintenance of highly sophisticated production equipment and the development of management controls and techniques somewhat beyond those inherent to the organization of Engineer troop units. One of our biggest problems is producing road construction products which meet tight design specifications. Normally such skill levels are found among men with many years of continuous experience in these specialist fields. Troop units rarely have such talent. Another factor which complicates our task is the tactical environment. Normally a construction battalion is expected to operate at full strength against its mission in areas removed from enemy influence. In Vietnam, we must commit a portion of our work force to security of our equipment, base camps, and our work forces.

b. Programs and concepts for the most efficient layout and erection of industrial complexes, to include their 24 hour security from enemy activities were conceived, written and developed. Likewise, construction, quality control, and construction inspection programs to include the necessary test equipment were developed, organized, staffed, tested, and placed into operation by personnel in the Brigade and in the theatre. Finally, intense management procedures for reporting, control, and maintenance of critical low density high production items had to be programmed as was the training of enlisted operators of complex items of equipment not normally assigned to troop units. These programs should be of significant value in similar future missions. (See inclosure 1)

c. As of 30 April 1970 approximately 635 km of major highways will have been finished. This includes just over 200 km since 1 January 1970. Present plans are to complete the remaining 340 km of Priority I roads by 31 March 1971 and the Priority III roads one year later. The 200 km

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2  
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completed during the first four months of 1970 are over two-thirds of of the entire 1969 achievement (290 km) and are clear proof of improvements in equipment and management since the battalion effort now committed to LOC is at least one battalion less than a year ago. The most dramatic improvements have been in the "time-on-the-line" for low density items. Asphalt plants operate six of seven days as a rule. In March one plant was in operation 29 of 31 days and the other two days represented programmed maintenance. Breakdowns are reported up to Brigade immediately and if necessary to CG, USAECV (P). Parts and mechanics are "on-the-way" as required within minutes. Consequently, down time is minimized by this command wide support.

d. Quality control and inspection procedures have also been refined to provide positive design construction and completed product measures and compliance with standards and specifications. Control and inspection are performed by every echelon from Brigade to construction unit with inspection being by other than the builder. Tests are continuous and comprehensive now that adequate test sets are on hand and in the hands of qualified, Fort Belvoir trained technicians. Di with college backgrounds in soils or civil engineering are selected from the replacement stream to attend Brigade or Group schools to supplement the quality control staff.

2. In summary, placing the primary and secondary LOC Program on a well engineered and effectively managed basis was in itself a major undertaking. The value of the LOC Program became evident just as soon as road work began. Civilian type vehicles appeared in ever growing numbers and commerce moved over these main roads to the major cities throughout South Vietnam. At the same time military traffic moved more smoothly and more rapidly and unit cost to repair, operate, and replace road vehicles declined rapidly. All effects were not favorable, for with unfamiliar driving habits of local personnel, and the newness of heavy traffic have led to a major upswing in vehicle accidents and personal injuries involving US and Vietnamese personnel.

### B. Vietnamese Training:

#### 1. The training of ARVN Engineer troops:

A. The development of ARVN Engineers is an essential goal of the role of US Army Engineers in Vietnam. Major progress has continued during the past year. Basically, our efforts have been divided into three areas (The Brigade ARVN Affiliation Program, see inclosure 2):

(1) A continuing individual training program in equipment operation and individual crafts.

(2) Technical assistance by US personnel; ARVN units doing specific tasks.

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### (3) Joint projects where US and ARVN units work together.

b. The effect of continuing this program at a concentrated rate for the past year has brought the non-divisional Engineer units, combat and construction, to a state of high proficiency. Officers with service in the 18th Brigade were assigned as advisors to the ARVN Engineer units working in the I and II Corps Tactical Zones. Two projects clearly illustrate the capability of ARVN Engineers. The 3600 foot Tuy Hoa bridge being built by elements of the 20th ARVN Engineer Regiment is a steel pile, steel stringer and concrete decked bridge which when finished will be the longest in the Brigade area. To date, progress and quality are outstanding. The 61st Construction Battalion of the 6th ARVN Engineer Construction Group has begun work on 50 km of the LOC Program. Progress and quality have been excellent and equal to an American unit. In both cases the Americans are providing only limited technical advice and logistic support.

2. Divisional Engineer Units: There has been considerably less progress with Divisional Engineer units. The one exception is the 1st Engineer Battalion of the 1st ARVN Engineer Division. This excellent battalion has worked with 18th Engineer Brigade combat battalions in an excellent manner. The other divisional battalions are committed more to local projects within the division and do not seem to be available.

3. Local National Civilian Help: 18th Engineer Brigade units work from the same base camp for extended periods with local nationals who are being hired, trained, and effectively employed by the US units. Skills include all Engineer trades from heavy equipment operation and maintenance to individual crafts. The important point here is the willingness and ability of the local nationals to learn how to use complicated tools and equipment. Quarries, asphalt plants, and construction equipment operation are a few examples.

### 4. GVN Maintenance and Logistics Support of US Engineers:

1. The construction of the primary roads program has brought about a close working relation between the 18th Engineer Brigade and the Vietnam Railroad Service and Ministry of Public Works. Just recently the VRS has begun to haul crushed rock from Phan Rang west to Song Pha and from Phan Rang south to Xoi Moi. This is already a very efficient and helpful supplement to the LOC construction efforts of the 18th Engineer Brigade and should be encouraged. The national railroad is a very energetic and capable transportation organization.

2. The Minister of Public Works holds the key to long life of the highway system now being built. As roads are finished they are turned over to the Minister of Public Works for maintenance. In some areas this capability has been equal to the requirement; however, in the main the Ministry of Public Works appears not yet ready to maintain new roads in the condition received. Enemy activities as well as heavy usage will

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require a major increase in the MPV activity if the national highway system is to remain fully operational.

### D. Civic Action - Public Relations:

1. In addition to the well defined nation building programs, such as roads, there are numerous day to day contacts between US Engineers and the local population which aid in the development of South Vietnam. Specifically, Engineer units help build schools, improve irrigation, assist in church activities, and a myriad of other person to person good will activities at the local level. These types of actions do much to develop good will. On the other hand, our acts can easily injure our reputation and that of the Government of South Vietnam. Vehicle accidents are probably the most adverse public relations problem facing the 18th Brigade.

2. Local people, when made aware of the purpose of engineers activities in an area, often assist and advise us of enemy activities, mines, and booby traps. Consequently, strong public relations programs in advance of the arrival of construction forces has proven most beneficial. These programs have included leaflets, posters, public systems announcements designed to explain what the engineers will do, when they will do it, the dangers involved, and how the people can assist.

### IV PROGRAMS IN SUPPORT OF US AND FREE WORLD FORCES

A. General: As indicated above, the total effort in support of tactical forces during the period of this report remained relatively constant but the tasks to which this effort has been applied have changed in character. One of the most significant tactical customer efforts has been the construction of tactical roads. In most cases these tactical roads are also the secondary LOC Program, already discussed at length. Other areas of effort in support of US Free World Forces are presented in the following paragraphs.

B. Tactical Operations: While this is the primary and highest priority mission of the 18th Engineer Brigade, Engineer support of tactical operations has decreased in the past year. For example, the number of miles of mine sweep has steadily declined as the hard surface roads were completed and as American units adjusted their areas of operation, particularly in the II Corps Tactical Zone. Also the number of major operations seems to have declined. In any event, all requirements to support tactical requirements were fulfilled immediately and we must continue to do so.

C. Relocations: The largest requirement of Engineer effort to support tactical forces was needed to relocate major US elements either as a result of expanding the ARVN area of operation or the redeployment of US forces. Some new fire bases were needed, other facilities had

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to be dismantled for disposal and in some cases, older camps such as Camp Radcliffe were rehabilitated for the new missions. Dismantling and reconstruction of existing facilities requires equal or greater effort than new base construction and must be considered as a potentially heavy requirement for engineer effort.

### D. Land Clearing:

1. This work along major highways and in specific areas has continued to be a most popular form of engineer support. As of the end of the period the majority of initial land clearing had been completed. Only a small area remains in southern II Corps Tactical Zone. The future program appears to include mostly secondary growth. The most effective use of present land clearing equipment is likely to be reduced in future operations. One US land clearing company in each corps tactical zone should be sufficient beginning about 1 July 1970. For the long term this program is ideal for transfer to ARVN units.

2. Aside from support of Free World Military Forces, land clearing has served a significant role in regional development and nationhood. First, security and movement along the roads is significantly increased as the jungle is rolled back. Additionally the cut timber is harvested and the cleared land is converted to farming. The province chiefs have recently become interested in land clearing throughout the area.

E. Monsoon Activities: Annually the monsoons impact with surprising effect on the Engineer mission. The long periods of good weather prior to monsoons, the turn over of personnel, the heavy traffic now moving on the roads, and the enemy activities during the monsoon cause us to often underestimate the effect of monsoons on land transportation facilities. Wherever our major construction units were located along the highway we had little problem countering the effects of heavy rains. In other areas serious problems developed. All in all, there were many weeks when entire Brigade effort was devoted almost exclusively to keeping roads open by any expedient means. The key to success in this mission area is careful reconnaissance and preparation during good weather just prior to the monsoon.

F. Airfields: The airfields being used by Army aircraft in I and II Corps Tactical Zones are, in many cases, used well beyond their intended life. A major maintenance problem has developed. Those airfields which are to be retained are being identified and wherever possible are being rebuilt and resurfaced with asphalt and concrete in conjunction with the highway construction program. This program should be firm up at once.

### V. SELECTED OPERATIONAL ITEMS

A. General: The ability of the 18th Brigade to perform the primary missions discussed above is affected by a broad spectrum of organizational

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The single most important ingredient in achieving excellence in these areas is discipline. The units which emphasize the fundamentals of soldiering, police, military courtesy, personal appearance, formations, and regular inspections invariably had the best command indicators. These units also suffered fewer casualties from enemy ambush and stand-off attacks and consistently inflicted heavier casualties on the enemy.

D. Personnel Turbulence: While there have been logistic, maintenance, and organizational problems, which will be discussed in more detail, the single most serious problem facing the commander is personnel turbulence created by the one year tour. This turbulence is a fact of life so commanders must seek positive steps to minimize its effect on operations and mission accomplishment. Within the 18th Brigade the following have helped:

1. A well catalogued set of regulations.
2. Brigade goals as outlined above.
3. Repetitive training programs. Of particular value was the Brigade-wide monsoon training program conducted last September, with the objective of bringing everyone up to date on security, management, weapons, individual skills, and other similar subjects.
4. Brigade wide progress targets and incentives--"Operation Last Chance" (inclosure 2) is a current and most effective program that gives direction and continuity to the effort of units.

### E. Personnel:

1. The personnel assigned to the 18th Brigade have been outstanding. I believe the young officers and young soldiers are far and away the finest in any army. They are smart, eager to serve, and physically strong. They have been as good as the leadership provided. As in most units in Vietnam, the responsibility for executing engineer operations fall to the battalion commander and his men. We have asked a great deal more of our young officers, particularly the captains than their military experience would justify. Basically, the experience gap between battalion commander and his company commander is most significant and is particularly critical in the construction unit where highly sophisticated construction techniques and construction equipment are used daily. For these reasons, a particularly high premium is placed on leadership at the battalion command and senior NCO levels.

2. Some relief might have been provided had certain enlisted specialties been more readily available through the personnel system.

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Included in these are mechanics and specialized equipment operators such as asphalt pavers, rock crushers, and well drillers. A major aid would have been realized had paving crews and well drilling crews been trained in CONUS and sent to Vietnam as teams. The same can be said for engineer equipment maintenance officers. The substitute for not receiving such personnel has been on the job training. One very successful CONUS training program was the junior non-commissioned officer training. These young non-commissioned officers have invariably proven to be excellent leaders.

3. Almost all captains and majors are on their second tour and many on their third tour in Vietnam. The frequent family separations are causing some fine officers to leave the service.

F. Unit Organizations: The engineer units in the main are well organized and staffed for their mission. There are several changes which, in my judgment, would be improvements.

1. Engineer combat battalions would be more effective if manned with an organic third echelon maintenance capability similar to that in a construction battalion.

2. Several separate companies involve large and complex operations and heavy responsibilities. As a rule, only the most senior captains have been successful commanders of the light equipment, construction support, and land clearing companies. These units should be authorized a major as commander.

3. The LOC - MCA buy included compaction equipment many times more effective than the counterpart TOE items. The self-propelled segmented, vibratory and rubber wheeled compactors are so outstanding that they should be integrated into the construction battalion. The 6 cubic yard loader and the 12 cubic yard dump trucks would also improve capacities appreciably.

G. Unit Drawdown and Consolidations:

1. The drawdown of US units from Vietnam has not had a seriously adverse effect on the 18th Brigade mission accomplishments. Thus far we have given up units at an acceptable rate. A problem, however, appears possible in I Corps Tactical Zone as the Navy engineer are withdrawn. The Army has no construction battalion in that area. Tentatively, plans now exist to move some such effort if required.

2. As major US Army tactical elements leave the country, a surplus of base facilities is being generated. With the full commitment of construction battalions to the LOC Program for the next 12 months, a large program to dismantle existing US bases could be undertaken only at the expense of other work.

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3. Another effect of the withdrawal of the US forces has been the security of engineer troop units which still have mission requirements in the areas from which the US units were removed. Thus far such security has been provided by either ARVN or our own forces.

4. For future drawdowns Engineer combat battalions can be reduced along with major Army tactical units until a residual of four combat battalions remain. As for construction battalions, the LOC will require the full effort of four battalions into 1971 on Priority I roads and an additional 12-14 calendar months (up to 58 battalion months) of all Priority III roads. In other words, completion by 31 March 1972 of all Priority I and III routes in II Corps Tactical Zones will require four construction battalions over the entire period. Two construction battalions are required after LOC work is finished.

5. Most Engineer units have already departed the II Corps Tactical Zone highlands. Now, the Headquarters of the 18th Engineer Brigade is prepared to move to Cam Ranh Bay and should do so as soon as facilities are available and other than Engineer resources at Dong Ba Thin can be moved. Such relocations accompanied by a merger with the 35th Engineer Group would result in significant Engineer space savings and also eliminate a sizeable and costly post (Dong Ba Thin) from the active list.

### H. Logistic - Maintenance Matters:

1. The logistics-maintenance fields have been one of the major management challenges throughout the 18th Engineer Brigade and there is no reason to expect a change. Fundamentally, the maintenance system appears to be sound.

a. There now appears to be a growing shortage of fortification materials and certain construction items. We have, to date, been able to acquire adequate materials to do our jobs, however major projects such as Ben Hat and Bu Prang have consumed large quantities of fortification materials.

b. The maintenance and equipment resupply system has likewise been adequate, although there have been times when deadline of a specific item has had an adverse effect on production. In all these cases the supply system has acted strongly to reach a solution.

2. The engineer equipment density was materially increased with the acquisition of items with which to build the LOC Program. This purchase has been one of the most valuable assets now available to Engineer construction units. Our ability to do horizontal work has been doubled. Even so this added equipment has increased our total density without an increase in operators. From the long term viewpoint,

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the Engineer construction mission will be accomplished with assurance only if maintenance of ordnance and engineer equipment comes first ahead of production in the minds of commanders.

I. Competition for Engineer Effort: The heavy commitment to LOC and the continuing Combat/Operational Support taskings keep a backlog of about five month's work for each battalion. When essential operation support tasks occur they will be attended at the expense of the LOC for the 18th Brigade has felt, and continues to believe that support of the tactical forces in field operations is the primary mission. Restrictions on base construction and relocation troop units have caused commanders to classify typically base construction projects as Operation Support tasks. Where such taskings are identified their true priority and appropriate level of approval are established.

### J Enemy Activities:

1. Ambushes against US engineers have been sporadic but very well planned and precisely executed. Brigade units are most normally ambushed in the morning enroute to the job site. The reaction and success of the 18th Engineer Brigade units when ambushed have been consistently commendable in spite of the advantage to the enemy. These favorable results are products of repetitive, detailed training and daily prior-to-work checks of equipment, communications, reaction techniques and capabilities. Also of proven preventative value has been the careful reconnaissance of frequently travelled routes to identify and then neutralize, to the extent possible, probable ambush areas. Land clearing has been especially effective. Air cover over units enroute to work sites is also most valuable.

2. Mine warfare is the enemy's most potent weapon against engineer units and also a major contributant to our workload. There appears to be no reduction in the enemy's use of mines except in hard surfaced roads where the time to emplace and ease of detection are disadvantages to the enemy. Our ability to detect mines does not appear to have improved, while the enemy's use of mines continues to be most professional. Studies of enemy mine warfare tactics should be continued at all levels, as a basis for revising our own mine warfare doctrine and also as a means of improving our mine detection capabilities.

3. Stand-off attacks are consistent in certain areas. They do minimum damage and on the whole have only nuisance value. Living fighting bunkers and well revetted sea huts serve to protect the troops. Living fighting bunkers are quite expensive and are worth the expense only in areas subject to ground attack.

4. Sapper attacks against engineer facilities are relatively infrequent and during the past 12 months all attacks against engineer installations

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have been repulsed. Our only casualties to sappers have been at installations shared with others. As a general rule, engineer units do well on perimeter construction and defense--they should. Minimum standards have been prescribed and are required Brigade-wide. The most important requirement is to build perimeters as the first priority in new camps.

5. Finally, sniper attacks on work forces are becoming less frequent, and as a general observation, less effective. Even though snipers are relatively inaccurate, their harassment value is considerable.

### VI SUMMARY, LESSONS LEARNED, RECOMMENDATIONS

A. The primary and secondary road programs being pursued by the 18th Engineer Brigade are significant factors in the social, economic, political, and economy strength of the Government of South Vietnam. Their orderly completion is so essential to warrant special consideration in relieving engineer units from future drawdown of US forces from Vietnam.

B. Training and development of ARVN Engineers has progressed to the point where these troop units are fully capable of meeting all requirements normally placed on engineer combat and construction units.

C. Once completed the LOC will require constant maintenance and as of this time there is a definite deficit in the capability of the Ministry of Public Works to cope with these demands.

D. There is a noticeable gain in the attitude of local nationals toward US troops and particularly engineers. Friendliness and cooperation are in proportion to our efforts to inform local people of our plans and how they can assist us.

1. Engineer efforts in support of tactical operations of US forces, our primary mission, have declined.

2. Land clearing has served its maximum benefit, and these specialized units are beginning to be used in areas where their productivity is less than optimum.

3. Reconnaissance presently is necessary and underway to prepare for the impact of the monsoons.

4. A firm airfield upgraded program is needed.

5. The current USARV Engineer Command structure is a strong and effective concept that should be sustained.

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G. Two specific command and control techniques have proven to be most successful in molding and unifying the 18th Brigade into a strong, proud unit. These were Brigade-wide goals which served as general guidance and set the concept of our operations and a continuous Brigade-wide emphasis on discipline built on the fundamentals of good soldiering.

H. Personnel turbulence is the single most disruptive factor to the 18th Engineer Brigade. The impact of this turbulence can be reduced by specific command guidance on long range goals and a recurring training program.

I. Personnel have been plentiful and talented. While selected MOS's and skill levels have been in short supply, the performance of our men has been as good as the officer and non-commissioned officer leadership. The third tour to Vietnam is forcing young officers out of the Army.

J. The engineer combat battalion should be strengthened by adding an organic third echelon maintenance capability. Organizational improvement would result also from putting majors in command of certain separate companies and by adding MAC LOC compaction and haul equipment to the construction equipment list.

K. Future unit drawdowns must recognize the continuing need of all construction battalions through March 1971 if both Priority I roads are to be built and March 1972, if Priority III roads are to be built. At an early date, Headquarters, 18th Engineer Brigade should move, preferably to Cam Ranh Bay.

L. Maintenance and logistic activities are top priority, difficult, and continuing areas of emphasis. Scheduled maintenance must be supported in favor of daily production if we are to gain maximum long term results.

M. The heavy workload has developed a competition for engineer effort to serve various programs. In the final analysis, the combat and operational support requirements of field commanders must be served first.

N. Enemy activity continues to disrupt and harrass engineer work forces. Ambushes and mines are the most potent enemy actions. To date our efforts to neutralize ambushed have exceeded our success against mines. Enemy mine warfare techniques are worthy of continued study.

### VII CONCLUSION

I have been privileged to command the 18th Engineer Brigade. This is the assignment that gives full meaning to all previous years of service.

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The engineers in Vietnam have been faced with unusual burdens, challenges, and difficulties. They have performed with confidence, courage, and surely have risen to and exceeded the standards of their past heritage and have set new challenges for future engineers. All in all, the work of the engineers, as part of the Free World Team, is contributing steadily, visibly, and significantly to not only success in battle but to the essential aim of building a strong and self-sufficient nation in South Vietnam. The basic ingredient in these successes is the engineer soldier, for whom I have only the deepest respect and admiration. He is as anxious to go to his home as any, but he is also ready to remain and work to his best capacity so long as needed.

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as

  
J. W. MORRIS  
Brigadier General, USA  
Commanding

**CONFIDENTIAL**

DEPARTMENT OF THE ARMY  
HEADQUARTERS, 18TH ENGINEER BRIGADE  
APO 96377

AVBC-EP

REGULATION  
NUMBER 415-5

19 January 1970

CONSTRUCTION

Quality Control

1. PURPOSE: The purpose of this regulation is to prescribe a quality control program which will be included as a part of construction projects undertaken by units of this Brigade.

2. OBJECTIVE: The objective of this regulation is to develop a practical method for obtaining reasonable assurance that a structure or earthwork meets the essential standards for which it was designed.

3. DEFINITIONS:

a. Quality Control - The process by which construction is assured to be in accordance with certain minimum specifications.

b. Construction Inspection and Testing - The method by which a Quality Control Plan is implemented.

c. Specifications - A detailed narrative which defines those minimum construction criteria which must be met to produce a satisfactory product.

4. RESPONSIBILITIES:

a. The Commanding General, 18th Engineer Brigade is responsible for:

- (1) Publishing these construction specifications necessary to generally and uniformly define minimum acceptable construction criteria.
- (2) Monitoring construction to include on-site inspections and project review to assure that the requirements of this regulation are being accomplished.
- (3) Insuring that the Brigade Quality Control Plan is being implemented.

b. The Commanding Officer, Engineer Group is responsible for:

(1) Further developing these additional specifications as required for specific projects in accordance with Annex A and USACEV Engineering Bulletin #415-6. (will become USAECV (PROV) Engineer Bulletin #415-6 on 1 February 1970).

(2) Preparing a Quality Control Plan which will implement the Brigade Quality Control Plan, this regulation, and the USAECV Engineering Bulletin #415-6.

\*This regulation supersedes 18th Engr Bde Reg 415-5, 26 June 1969.

Incl 1

19 January 1970

- (3) Defining for the construction unit those portions of the Quality Control Plan that are applicable.
- (4) Establishing and implementing a system of inspection and review to insure that specifications are being met and pertinent regulations are complied with.
- (5) Insuring that one kilometer test section be constructed prior to total commitment of resources on all LCC construction projects initiated after 1 November 1969.

5. TEST AND INSPECTION RECORD:

a. In accordance with the Brigade Quality Control Plan, each echelon will conduct those tests and inspections which they are required to perform to insure compliance with Annex A. During the construction of roads, the type and frequency of tests shall be, as a minimum, according to the USMC/AV TB 415-6. Records of the tests results will be made a part of project files at each echelon and will be subject to periodic review. Deviations from criteria as specified in pertinent regulations must be approved by the Brigade Quality Control Officer.

b. Test Failures - In the event a test or inspection reveals a discrepancy from specification, the echelon responsible for conducting the test will dictate the corrective steps to be taken. It is advisable on quantitative results to establish a cautionary zone and a reject zone in order that adverse trends may be arrested before rejection becomes necessary.

6. IMPLEMENTATION: This regulation is effective as soon as practical upon receipt. Quality Control Plans will be required for all projects under construction or initiated after 15 September 1968. This regulation, USMC/AV TB 415-6, and CV Directive Number 415-6, supersede pertinent portions of LCC Criteria and Specifications pamphlet, dated 1 July 1969, published by this Headquarters.

7. CONSIDER:

FRANK E. RUGGLES  
CPT, LCC  
Adjutant

OFFICIAL:

WILLIAM D. VAN MORSE  
CPT, LCC  
Assistant Adjutant

Annex A Quality Control Requirements

DISTRIBUTION  
A

ANNEX A

QUALITY CONTROL REQUIREMENTS  
Acceptable Test Limits

The following is a list of acceptable test results for determining the suitability of the tested materials in design. Field Quality Control shall use these same criteria in classifying materials or workmanship as accepted or rejected unless directed otherwise by the Brigade.

2.\* Basic Soils Classifications: After gradation test, soils shall be classified by size as follows:

<u>Size Groups</u>	<u>Sieve size</u>	<u>Retained On</u>
Cobbles	-	3 inch
Gravels	3 inch	No. 4
Sands	No. 4	No. 200
Fines	No. 200	-

\* Further classification of soils will be based on the Unified Soils Classification System.

3. Subgrade & Select Fill

- a. Select fill will meet Elasticity Criteria of:  $LL \leq 35$ ,  $PI \leq 12$
- b. In cut, soil shall have an in place CER  $> 5$ .
- c. Soils having a maximum dry weight less than 95#/c.f. shall not be used as select fill.
- d. Select fill will be placed at 95% (cohesionless) and 90% (cohesive) of maximum Modified AASHO density at  $\pm 2\%$  F.C.
- e. Maximum lift thickness & minimum number of passes by given compaction equipment will be determined by a test strip, typically about 100cm x 7m, and made for each different type material.

4. Subbase.

- a. Subbase materials shall have no more than 20% passing #200 sieve. These are soils classified as coarse - grained soils.
- b. Subbase materials shall have, after placement, a CER greater than 20.
- c. Subbase materials shall be compacted to 100% if cohesionless and 95% if cohesive of Modified AASHO density at  $\pm 2\%$  F.C.
- d. Maximum LL of 30, Maximum PI of 8.
- e. Maximum lift thickness & minimum number of passes by given compaction equipment will be determined by a test strip, typically about 100cm x 7m, and made for each different type material.

5. Base Course.

a. Where best surfaces are planned, base course may consist of well graded materials having not more than 15% passing #200 sieve.

b. If an asphaltic concrete pavement is to be placed, the granular base course material shall meet the following gradation as specified in Table A, Tm 5-530: (or Table 7-3 Tm 5-330)

SIEVE designations	% passing each sieve (square openings) by weight				
	Maximum Aggregate Size *				
	3-inch	2-inch	1½-inch	1-inch	1-inch sand-clay
3-inch	100				
2-inch	65-100	100 70-100	100		
1-inch	45-75	55-85	70-100	100	100
¾-inch		50-80	60-90	70-100	
⅜-inch	30-60	40-70	45-75	50-80	
no. 4	25-50	30-60	30-60	35-65	
no. 10	20-40	20-50	20-50	20-50	65-90
no. 40	10-25	10-30	10-30	15-30	33-70
no. 200	3-10	5-15	5-15	5-15	8-25

\* Maximum size aggregate will not exceed ½ the design lift thickness.

c. Los Angeles abrasion test results shall show less than 50% wear.

d. Base material should have a Liquid Limit (LL) equal to or less than 25 and a Plastic Index equal to or less than 5.

e. Granular Base Course material shall meet the following minimum specification:

CBR

Class A, B, and E road = 80

Class C & D road = 50

f. Maximum lift thickness & minimum number of passes by given compaction equipment will be determined by a test strip, typically about 100m x 7m and made for each different type material.

6. Lime Stabilization:

a. Soils suitable for lime stabilization are silt-clay type soils. Normally 2-12% lime, by weight (determined by trial mixes), will be required.

b. Mixes considered must have a Liquid Limit over 25 and a Plastic Index over 6.

- c. The stabilized soil (after 14 days) should have a CBR of 20 or more and an unconfined compression greater than 100 psi.
- d. Do not use with granular soils.
- e. Maximum lift thickness & minimum number of passes by given compaction equipment will be determined by a test strip, typically about 100m x 7m and made for each different type material.
- f. Recommended curing time is 7 days with hydrated lime. (par 2-92, TM5-330)

7. Soil Cement:

- a. Recommended cement content for trial mixes should be from 4-14% cement by weight.
- b. Mixes should give a Liquid Limit under 40 and a Plastic Index less than 18.
- c. Unconfined compression (7 days): over 300 psi.
- d. Maximum lift thickness & minimum number of passes by given compaction equipment to be determined by test strip.
- e. Minimum recommended curing time: 24 - 72 hours.

8.\* Bituminous Stabilization.

- a. Not more than 30% of the soil concerned shall pass #200 sieve.
  - b. Liquid limit of mix shall be less than 30.
  - c. Plastic index of mix shall be less than 12.
  - d. Recommended asphalt cutbacks: MC & SC 250 - 800.
  - e. Recommended asphalt content is 3 - 10% by weight of mix. Percentage will be determined by trial mixes. (Modified Marshall Stability Test).
  - f. Soil moisture content must be less than 2% at time of placement.
  - g. Minimum stability should be 150 pounds.
  - h. Recommended curing time: 1 - 3 days.
- \* Not recommended for areas of heavy rainfall.

9. Asphaltic Materials

a. Preliminary Treatment

USE	TYPE	APPLICATION RATES
Prime Coat	MC-30, 70, 250 RC-70	.2 - .5 gal/s.y.
Tack Coat	RC-70, 250, 800, 3000	.05 - .25 gal/s.y.

b. Wearing Surface Material.

TYPE SURFACE	TYPE BINDER	APPLICATION RATE
Surface Treatment	RC-70, 250, 800	.1 Gal/s.y./100AGG/s.y.
Penetration Macadam	RC-250, 800	.6 Gal/s.y./1"CI.
Road mix	RC-250,800 MC-250, 800	.5 Gal/s.y./1"CI.
Asphalt Concrete	AP-3 (Penetration 85-100) AP-5 (Penetration 60-70)	Dependent on Marshall Stability method of design
Asphalt Stabilized Base (Stabilization plant-cold mix)	MC-800 RC-800	Dependent on Modified Marshall Stability Method of design

The type, grade and application rates are dependent on tightness and type of base, aggregate gradation, temperature and humidity. Actual application rates shall be determined by a test strip prior to application.

10. Bituminous Surface Treatments.

a. Surface treatment aggregate gradation will meet specifications in TM 5-337 page 21.

b. Plastic limit of fines shall be less than 10.

c. Los Angeles abrasion test results shall show less than 35 wear

d. Aggregates for a single surface treatment will be uniformly graded with a 3/4 inch maximum size. If a multiple surface treatment is placed initial application of rock shall not exceed 1" maximum size aggregate and subsequent aggregate layers will not exceed 1/2 the previous maximum size aggregate.

11. Asphalt Pavement.

A. Asphalt aggregate gradations shall meet specifications as outlined in table II, TM 5-337.

b. Design asphalt percentage will be determined by the Marshall Stability method of mix design and will meet the following specifications.

(1) Stability will not be less than 750 pounds at 75 blows or 500 pounds at 50 blows.

(2) Asphalt flow shall be more than 8 and less than 18.

(3) % of voids in total mix shall be more than 3 and less than 5.

c. Compact to 95% of maximum Marshall Stability design density.

d. Placement temperature will be a minimum of 235°F.

12. Concrete.

a. Aggregates shall meet the following gradations:

	<u>Coarse Agg.</u>		<u>Fine Agg.</u>
2½"	100% pass	3/8	100% pass
2"	95-100%	#4	95-100%
1"	35-70%	#8	80-100%
½"	10-30%	#16	50-85%
#4	0-5%	#30	25-60%
		#50	10-30%
		#100	2-10%

b. For highway slabs compressive strength shall be more than 2500 psi and modulus of rupture more than 600 psi; compressive strength for structures should be more than 3000 psi.

c. Minimum shear (pavements): 100 psi

d. Recommended slump range:

<u>Type Construction</u>	<u>Slump in inches</u>	
	max	min
Reinforced foundation walls and footing	5	2
Plain footing, Caissons, and substructure walls	4	1
Slabs, beams, and reinforced wall	6	3
Building Columns	6	3
Pavements	3	2
Heavy mass construction	3	1

e. Water-cement ratios for various types of construction and exposure conditions: See table on page 6.

13. Following is a partial list of references dealing with testing, quality control, and construction procedures:

- TM 5-330 Planning and Design of Roads, Air bases, and Heliports in the Theater of Operations Sept 68
- TM 5-530 Materials Testing Feb 66
- TM 5-537 Paving & Surfacing Operations Feb 66
- TM 5-331A Earthmoving, Compaction, Grading and Ditching Equipment Aug 68
- TM 5-331B Lifting, Loading, and Hauling Equipment May 68
- TM 5-331C Rock Crushers, Air Compressors, and Pneumatic Tools Nov 68
- TM 5-331D Asphalt and Concrete Equipment April 69
- TM 5-331E Engineer Special Purpose and Expedient Equipment Feb 69

Table: Water-Cement Ratios for Various Types of Construction and Exposure Conditions

Type or location of structure	Severe or moderate climate wide range of temperature, rain, (gal/sk)			Mild climate, rain or semi-arid; (gal/sk)		
	Thin Sections (a)	Moderate Sections (b)	Mass Section (c)	Thin Sections (a)	Moderate Sections (b)	Mass Section (c)
A. At the water line in hydraulic or waterfront structures or portions of such structures where complete saturation or intermittent saturation is possible, but not where the structure is continuously submerged in water-----	5	5½	6	5	5½	6
B. Portions of hydraulic or waterfront structures some distance from water line, but subject to frequent wetting by water-----	5½	6	6	5½	6½	7
C. Ordinary exposed structures, buildings and portions of bridges not coming under above groups-----	6	6½	7	6	7	7½
D. Complete continuous submergence in water-----	6	6½	7	6	6½	7
E. Concrete deposited through water-----	(d)	5½	5½	(d)	5½	5½
F. Pavement slabs directly on ground: Bearing slabs----- Base slabs-----	5½ 6½	5½ 6½	5½ 6½	6 7	6 7	6 7

G. Special case: For concrete not exposed to the weather, such as interiors of buildings and portions of structures entirely below ground, no exposure hazard is involved and water-cement ratios should be selected on the basis of the strength and workability requirements.

Notes.

- (a) Thin 6" - 8"
- (b) Moderate 9" - 24"
- (c) Mass-over 24"
- (d) These sections not practical for purposes intended.

## 1. ESTABLISHMENT OF INDUSTRIAL COMPLEXES

a. Problem: Sound construction management and security procedures and principles are not always being applied to the establishment of new industrial complexes. Our concept of security in establishing a plant to support a long range, primarily LOC, construction effort must differ from the tactical considerations involved in establishing a combat engineer or land clearing company base camp.

b. Factors: There are three prime factors that must be considered:

(1) Our Mission. A complex is established primarily to complete a job, not to establish our presence in a seige type defensive posture. To complete the job, all of our resources - men, materials, equipment, and time - must be managed properly so as to gain optimum output.

(2) Efficiency. To obtain optimum output we must operate high production industrial assets at maximum efficiency. Simply stated, this means that sound construction management and good engineering practice must be employed from start to finish:

(a) Early and thorough reconnaissance. A detailed site inspection, photographs, preparation of topo maps scaled to permit sound analysis, and, especially, a thorough geologic survey are prerequisites to planning. We must insure, through core sampling or drilling tests, that rock of suitable quality and sufficient quantity with reasonable access is in fact present in a location before a major effort is committed to development.

(b) Detailed engineering evaluation. This translates into optimum complex layout. Included in these notes are more detailed considerations for layout of rock crushing and asphalt plants. This equipment does not operate in isolation - the entire site must be designed to maximize equipment output: drainage, quarry and bench development, traffic patterns, haul roads, and product handling should be subjected to common sense engineering analysis.

(c) A sound development plan. Too often our complexes have been set up on the impressions of the first commander on the ground. Our junior officers are doing a fine job, but lack experience. The establishment of complexes so critical to our mission must be based on the most expert engineering guidance and experience that can be made available. To this end, group commanders are requested to submit complete plans for industrial complex development for Brigade approval 30 days prior to relocation of major items of equipment. The objective of this submission is to insure that a proposal receives complete review at all echelons before effort is committed.

(3) Security. A site layout must provide security for three of our resources - men, materials, and equipment. In a quarry, the materials remain invulnerable to damage by the enemy. The men, through fire and maneuver, can provide, to a certain degree, their own protection. Our high production industrial equipment remains most vulnerable to enemy action and, at the same time, is the most essential to mission accomplishment. To accomplish our mission, the priority for security in defense planning at industrial complexes must be to protect our high production equipment and not to the development of sophisticated personnel protection. Accordingly, the industrial complex must lie within the main defensive perimeter of the base camp.

(4) Security Concept.

(a) It is recognized that the requirement to organize a site for efficient operation may conflict with the requirement to secure industrial equipment. A suggested method of arriving at an acceptable solution:

(1) Plan a layout for optimum production efficiency.

(2) Plan a layout of the same complex for maximum equipment protection.

(3) Adjust between the two plans to develop the site organization that will provide the best production potential with strong protection for the critical equipment.

(b) To formulate defensive measures, the nature of the threat must be analyzed. Our experience to date indicates the threat to our industrial complexes will be largely from standoff attacks, and sapper actions, and, most infrequently, from direct attack in unit size. In terms of specifics, the defensive measures outlined below should be considered for each site:

(1) .. standoff screen of chain link fence to protect the asphalt and crushing equipment.

(2) Overhead cover to protect troop fighting positions from mortar attack.

(3) Tight individual defensive positions with good fields of planned fire.

(4) Interlocking defensive fires (FPF) with indirect fire concentrations blocking avenues and gaps.

(5) Good perimeter lighting.

(6) Well-placed tactical wire.

(7) Good observation.

(c) In practice, these measures, properly implemented, should improve our defensive capabilities and work to increase the security of the command.

## 2. ROCK CRUSHING PLANT DESIGN AND LAYOUT

a. Problems: Often errors are made in the initial design and layout of crusher installations, which have a significant effect on production capability. In plant design and layout, three major areas should be considered. They are equipment selection, site selection, and plant layout.

b. Equipment Selection: The selection of equipment for a rock processing facility should be done only after a thorough study and evaluation of four factors:

(1) The first factor which must be considered is the mission to be accomplished. The mission will indicate the size and amount of aggregate to be produced, and the time allotted to accomplish the task.

(2) Next, the equipment available for the facility should be determined. This analysis should include an assessment of the availability and competence of personnel operating the equipment.

(3) Having established the equipment available, the next step would be to determine the equipment required. This is done by determining the type and size of the raw material to be crushed, and the extent of processing required to produce the desired aggregate size. For example, if blast rock is the raw material, a primary jaw crusher will be required for the initial stage of reduction. However, if the raw material is smaller river run gravel, a secondary unit may be sufficient.

(4) The last step in the equipment selection phase of plant design and layout is to chart the flow of material through the plant. Flow charts assist in the determination of conveyor requirements, equipment configuration within the facility, and the amount and types of auxiliary equipment required for plant construction, and material loading and handling.

c. Site Selection: Special care should be devoted to the site selection phase since a rock processing facility is a rather permanent type of installation. Some of the critical considerations in selecting a quarry site will now be discussed.

(1) Security. Most rock crushing plants, because of their location in wide open areas, are particularly vulnerable to enemy harassment. Since selection of a relatively secure location is not always feasible, consideration must be given to the additional security requirements incurred by alternative sites.

(2) Quarry - crusher distance. The crushing equipment should be located as close to the quarry as possible. Of course, the minimum distance would be governed by the rock throw of the quarry blast. By locating the plant close to the quarry, maximum utilization of haul requirements can be utilized. Consideration must also be given to the development plan for the quarry to insure that the crusher plant is not located in the path of future quarry faces.

(3) Terrain. The terrain for the plant should provide good natural drainage and have a suitable load carrying capability to support heavy equipment with only minor earthwork improvement. Proper utilization of hillside or sloping locations may permit the use of gravity as an aid in moving material from a rock face to the crusher, from the crusher to a stockpile area, or from stockpiles to haul units.

(4) Space. The space required for a plant will depend upon the particular process. As a minimum, adequate space must be provided for moving material to the crusher, loading and feeding the crusher, stockpiling of finished products, loading of finished product, and storage of operating and maintenance supplies. Consideration should also be given to the area needed for future development of the plant.

(5) Access and haul roads. Haul roads should be kept as short as possible. In the operational area, a loop road for one-way traffic should be provided so that routes of empty and loaded trucks do not cross.

(6) Water. When aggregate washing operations will have to be planned, well drilling operations will have to be provided in those cases where the site cannot be located near an open source of water.

d. Plant Layout: The actual layout and erection of the plant are the culminating tasks in the plant design and layout process. Adequate time should be allocated to this phase of the operation, since once the plant is producing, there is seldom time to stop operations and remodel. The areas of primary concern in plant layout are as follows:

(1) Equipment configuration. In establishing the configuration of the plant, special attention should be given to creating a logical flow of material from the point where the raw material enters the plant to the point where the aggregate product leaves the plant. The physical environmental requirements of each piece of equipment, such as foundation requirements, and power requirements should be evaluated to insure that they are included during the construction phase.

(2) Drainage. Adequate drainage channels should be constructed during the initial earthworking stage of construction and constantly improved as the plant is built.

(3) Prevailing winds. Equipment should be oriented in such a manner that prevailing winds carry the rock dust generated by the processing machines away from the facility. Care should be taken to locate supporting equipment such as generators and water pumps, and facilities such as latrines, offices and maintenance shops out of the path of winds carrying the rock dust. Consideration must also be given to providing a source of clean air to the engines providing the power to the crusher.

(4) Materials handling and storage. Plans for the plant should include adequate materials handling devices to expedite the flow of material through the system and eliminate double handling.

(5) Safety. If the plant is to be operated during the hours of darkness, provisions should be made for a lighting system to provide sufficient light. Guard rails, safety ropes, and belts should be provided where necessary. Maximum speed limits should be posted for vehicular traffic within the plant and on the haul roads. Roads should be maintained constantly. In dry areas, a water truck should be used to wet down the roads to minimize dust. In wet areas, crushed rock should be placed on the roads to keep haul units from sliding off into ditches.

e. This completes the discussion of the salient features of rock crushing plant design and layout. No attempt has been made to cover every possible consideration; however, it was my intent to identify and discuss those factors with which unit commanders should be familiar with to best enable them to obtain maximum results.

### 3. ASPHALT PLANT LAYOUT

a. Although the operating efficiency of an asphalt plant and preliminary design and layout are not as critically related as in crusher complexes, there are several factors which can improve production.

(1) Quarry complex - Asphalt plant distance. By locating the asphalt plant as near as possible to the quarry operation, hauling requirements are greatly reduced in terms of vehicles required, travel time involved and minimization of double handling of asphalt aggregate. In many cases, this aggregate can be transported immediately from the crusher and stockpiled at the asphalt plant.

(2) Organization of Space. Adequate space should be provided around the equipment. This is required to provide access areas for maintenance and material handling.

(3) Materials handling and storage. Locations for aggregate stockpiles should be preplanned to maximize feeding efficiency. Means should be provided to prevent mixing of different sizes of aggregate and minimize segregation. Asphalt drums should be stored far enough away from the operation to prevent danger of equipment and personnel in case of fire, but close enough to allow for efficient handling.

(4) Drainage. Drainage is of particular importance since the Barber Green unit is operated electrically. As with crusher plants, adequate drainage should be provided during the initial development of the site and constantly upgraded as the plant is built.

(5) Road network. A traffic pattern should be preplanned to avoid conflict between the trucks hauling aggregate and the trucks hauling asphalt. One way traffic loops are generally most effective.

(6) Additional factors. Such as loading and dedrugging procedures can do much to improve the overall efficiency of the plant, but the techniques employed will vary with the capabilities of each unit.

b. In summary, much of the success of our quarry operations and asphalt plants is strictly dependent upon the planning of plant development. Additional time spent in this phase of the operation provides immeasurable dividends in the future.

## Command Management of the LOC Program

1. The accomplishment of the 18th Brigade LOC mission depends on the continued operation of a small number of high production items of special heavy equipment and on a strong quality control program. While the operation and direct supervision of these activities rests with the group and battalion commander, the Brigade Commander has developed a command management program which is intended to:

- a. Assist the group and battalion commanders.
- b. Insure that these critical equipment assets are properly secured and used to the greatest overall advantage.
- c. Insure that the work accomplished will satisfy fully the desired standards set forth in the design specifications.
- d. Make maximum use of the limited number of personnel with extensive highway construction experience.

### 2. Features of the Program.

a. Role of the Deputy Brigade Commander. The Brigade Commander has assigned to the Deputy Brigade Commander the responsibility of overseeing all matters pertaining to the Industrial Complexes.

b. Review of Layout of New Industrial Complexes. The Brigade staff reviews plans for industrial sites for efficient layout and adequacy of security.

c. Management Information System. The Brigade Management Information System has several features:

- (1) An up-to-date inventory of all key items of equipment is continually maintained.

(2) A spot reporting system has been established permitting the Brigade staff to keep abreast of the operational status of the key items of equipment.

(3) A current status chart is maintained on a daily basis for each industrial complex.

(4) The use of the reports rendered by the Quinton-Budlong contract personnel has been expanded by broadening the basis of distribution to include Group and Battalion commanders.

(5) Operations reports are submitted weekly to Brigade Headquarters, furnishing information on the quantities of crushed rock, asphalt produced, and roadway laid.

(6) A daily critical items list, which has two parts, one pertaining to items of equipment deadlined and the other to problem areas not involving items of equipment, is reviewed each day regarding actions completed and actions to be taken by members of the Brigade staff.

d. Daily Meetings. A meeting is conducted each day attended by the key members of the Brigade staff who are involved in the LOC program. Spot reports which have come in during the night are analyzed. The daily critical items list is reviewed. Consideration is also given to the allocation of resources, both in terms of meeting present emergencies and distributing assets which are to become available in the near future through the supply system. This meeting provides a daily forum for coordinating the various aspects of the LOC program.

e. Management of Maintenance and Supply.

(1) In the field of maintenance, a Brigade Regulation containing check lists for major items of equipment for the industrial complexes

has been published. Also, regarding the general maintenance support provided by the Vinnell Corporation, each week the Brigade Maintenance Officer visits the shops to determine status of repair and to reaffirm priorities.

(2) In the supply field, Groups are required to plan and program their requirements for asphalt products and construction materials. Additionally, the Brigade S-4 monitors and follows-up requisitions for repair parts, end items, and construction materials.

f. Quality Control Program. A quality control program has been established to achieve high quality production and construction. The program establishes responsibilities at each level to include the specific tests to be conducted. Conceptually, the battalion is the contractor. At this level, all means to accomplish the job, to include inspection and testing, are provided. The Group Headquarters is analogous to a District Office and the Brigade Headquarters to a Division Office.

g. Industrial Complex Assistance Team. To provide for field coverage, an assistance team has been organized.

(1) Purpose. The purpose of this team is to assist subordinate units engaged in the LOC program to ensure that our roads are constructed in accordance with established criteria and schedules. Attention is given to seven areas:

- (a) Site layout of quarry, crusher, and asphalt plants.
- (b) Adequacy of equipment in terms of type and quantity.
- (c) Safety of personnel
- (d) Maintenance of equipment.
- (e) Use of equipment.

(f) Construction methods.

(g) Quality control.

(2) Composition of Team. There are six members of the Industrial Complex Assistance Team: Deputy Brigade Commander, Brigade Maintenance Officer, Brigade Operations LOC Officer, Brigade Quality Control Officer, Brigade Representative of Quinton-Budlong Corporation, and the Brigade Representative of the Dynallectron Corporation.

3) Visits to Industrial Sites. Each site is visited by the team every 2-3 weeks. Upon arrival at a particular site, the team members are paired off with their counterparts to observe and to review quarry operations, rock crusher and asphalt plant operations, and maintenance construction methods to include earth work and paving operations, safety of personnel, supply and maintenance management, and quality control procedures and records. Problems are discussed in detail.

DEPARTMENT OF THE ARMY  
HEADQUARTERS, 18TH ENGINEER BRIGADE  
APO 96377

REGULATION  
NUMBER 350-2

28 March 1970

TRAINING

US-ARVN Affiliation and Training Program

1. PURPOSE: This regulation provides guidance, establishes goals, and prescribes responsibilities for the supervision, monitoring and reporting of the US-ARVN Affiliation program conducted by 18th Engineer Brigade.
2. APPLICABILITY: This regulation is applicable to all units assigned and attached to the 18th Engineer Brigade.
3. DEFINITIONS: The 18th Engineer Brigade US-ARVN Affiliation program is divided into three distinct areas of Affiliation.
  - a. Mutual Association is defined and categorized as follows:
    - (1) Personal visits to parallel commanders at all levels.
    - (2) Visits and tours of U.S. activities arranged for ARVN commanders.
    - (3) Professional meetings to discuss engineering problems and programs.
    - (4) Any gatherings of a social, athletic, or ceremonial nature.
  - b. Mutual Cooperation is defined and categorized as follows:
    - (1) Joint civic action programs.
    - (2) Joint ventures on construction projects.
    - (3) Exchange of tactical and engineering intelligence information.
    - (4) Exchange of equipment assets to complete essential projects.
    - (5) Assistance in the location and procurement of construction materials.
  - c. Training Assistance (OJT) - On-the-job training (OJT) is a process by which students or trainees acquire knowledge and skills through actual performance of duties under competent supervision in accordance with a planned program, i.e., a program of instruction (POI) with lesson plans. OJT is designed to teach new skills or upgrade current skill levels. OJT is further divided into three categories:
    - (1) Category one: Trainees are detailed to commute and report on a scheduled basis to a Brigade unit for OJT. Orders need not be issued and support

\*This regulation supercedes 18th Engr Bde Reg 350-2, dtd 6 January 1970

Incl 2

18th Engr Bde Reg 350-2

beyond the capability of the training unit is not required.

(2) Category two: Trainees are attached full time to a Brigade unit for a specified period of training. Upon completion of the OJT cycle, trainees will be returned to ARVN units for proper skill utilization. Orders may be published to validate the support rendered to sustain trainees.

(3) Category three: ARVN Engineer personnel are trained on-the job in their parent units by U. S. training teams. Upon completion of this training, the trainees will be utilized in the parent unit. Brigade units will arrange for billeting, transportation, and mess facilities for members of teams which they provide. Whenever feasible, ARVN will provide the interpreters required to support this training.

4. OBJECTIVES: The 18th Engineer Brigade and subordinate units will continue:

a. To influence the capabilities of ARVN Engineer units to the extent that:

(1) They will assume a greater portion of combat and construction engineering tasks in I and II CTZ's.

(2) They can more actively participate in the building of the South Vietnamese Republic upon the cessation of hostilities and the eventual redeployment of U. S. Engineer units.

b. To develop a strong working relationship with ARVN Engineer sister units.

c. To develop, through U. S. initiative, current and future training programs for ARVN Engineers.

d. To expand US-ARVN mutual cooperation programs when appropriate and demonstrate U. S. techniques in construction activities and job management.

5. POLICIES:

a. Initiative and aggressiveness are the keys to the success of the ARVN Affiliation program. It is not expected that ARVN units will come to us for assistance. Commanders at all levels will have to meet ARVN commanders to develop an imaginative and dynamic program which can be strictly controlled from start to completion. The success of the Group, Battalion and Company programs will be a command responsibility.

b. Categories of affiliation as specified in paragraph 3b through 3d above are submitted, through definition, as a guide to areas of common interest. This list is not all inclusive. Commanders at lower levels are encouraged to expand upon those areas; keeping in mind that in all cases, U. S.

18th Engr Bde Reg 350-2

programs must be compatible with the requirements and recommendations of the ARVN Commander concerned.

c. The ideal level of affiliation is at Group and Battalion levels where long range planning can best be achieved. The U. S. advisor to an ARVN Group or Battalion is the principal point of contact.

d. Joint projects present the most worthwhile means for furthering ARVN training and enhancing the possibilities for further mutual endeavors.

e. Commanders must exercise particular care to insure that assistance in the form of furnishing repair parts and/or construction materials to an ARVN unit does not jeopardize the development of a responsive ARVN supply system. Caution and sound judgment are required to balance this consideration against the demand to complete a project.

f. Competition between U. S. and ARVN units should be discouraged. The overriding objective of a commander's program is to achieve full cooperation and willing involvement from his sister units.

g. As much as possible, the sister unit concept will be used to develop affiliation plans. Annex A establishes the current sister unit plan. This plan will be revised in appropriate paragraphs of Group and Battalion unit move operations orders to insure continuous association.

h. All OJT provided by 18th Brigade units will be closely supervised to insure that training adheres to the approved program of instruction (PGI) and is of high quality.

#### 6. RESPONSIBILITIES:

a. The Deputy Commander, 18th Engineer Brigade, is designated the 18th Engineer Brigade ARVN Affiliation Officer. The Brigade ARVN Affiliation Officer is responsible for:

- (1) Developing planning guidance and policies for affiliation programs.
- (2) Reviewing, analyzing, and evaluating current affiliation programs.
- (3) Establishing uniform procedures for the collection and presentation of information pertaining to affiliation activities.

b. The Chief of Operations, 18th Engineer Brigade, exercised Brigade staff supervision over the ARVN Affiliation program. The Chief of Operations is responsible for:

- (1) Publishing approved guidance and policies for affiliation programs.
- (2) Coordinating with lateral and higher headquarters to identify projects as tasks suitable for ARVN participation.

18th Engr Bde Reg 350-2

(3) Recommending priorities for the allocation of critical materials and equipment to support affiliation training, projects, and the organization of new ARVN units.

(4) Maintaining documentary files pertaining to the ARVN Affiliation program.

c. The S-4, 18th Engineer Brigade, exercised Brigade staff supervision over the logistical support of the ARVN Affiliation program. The S-4 is responsible for preparing, coordinating and supervising the execution of logistical actions to support ARVN training, projects, and the organization of ARVN units.

d. Group commanders are responsible for submitting reports required by Paragraph 7.

e. Group and Battalion commanders are charged with implementation of the ARVN Affiliation program and are responsible for:

(1) Coordinating, through U. S. advisers, the development of firm affiliation programs with ARVN organizations located within their geographic areas of responsibility.

(2) Establishing guidelines and procedures for subordinate units in the conduct of ARVN Affiliation programs.

(3) Designating, by name, an ARVN Affiliation Officer at each Group and Battalion Headquarters to serve as a point of contact and coordination for ARVN Affiliation Programs. Due to the operational nature of this program, it is recommended that this officer be assigned to the Operations Section of the Headquarters.

f. ARVN Affiliation action officers are responsible for:

(1) Insuring that the US-ARVN Affiliation letter and pictorial files are properly maintained and contain all pertinent historical documents relating to the program.

(2) Initiating visits to the sister unit(s) NLT the 5th day of each month. An after action report of that visit including points discussed and significant accomplishments will be forwarded to this Headquarters NLT the 15th. This visit is the only documented visit required. A greater frequency of visits is encouraged and desirable.

(3) Preparing all reports required in paragraph 7 below accurately, concisely, and expeditiously.

#### 7. REPORTS:

a. Reports (RCS: MACT-20, RCS: MACT-21, and RCS: MACT-22) will be submitted in accordance with Annex B.

18th Engr Bde Reg 350-2

b. A Quarterly Affiliation Progress report (R/S: AVFC-OP-1) will be submitted to this Headquarters NLT the 10th day of April, July, October, and January for the period ending the last day of each quarter. Format is at Annex C.

8. REFERENCES:

- a. MACV Directive 350-16
- b. USARV Regulation 350-8

AVFC-OP

FOR THE COMMANDER:

OFFICIAL:

FRANK E. RUGGLES  
Major, AGC  
Adjutant

  
PAUL L. BORSSUCK  
1LT, CE  
Asst Adjutant

ANNEXES:

- A - Sister Unit Concept
- B - Reports: MACT-20, MACT-21, MACT-22
- C - Quarterly Affiliation Report Format

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- 2 - Senior Advisor 6th Engr Gp (ARVN)
- 2 - Senior Advisor 20th Engr Gp (ARVN)
- 2 - AVCC-10-B
- 2 - AVFA-CE
- 1 - DSA, I CTZ
- 1 - DSA, II CTZ

ANNEX A

Sister Unit Concept

1. GENERAL: The following prescribes the sister unit concept of affiliation. When necessary, changes to this concept will be requested and approved by this Headquarters. Group commanders are encouraged to develop a similar concept for specialized units in their command, i.e., dump truck, panel bridge, etc.

a. I Corps Tactical Zone - 45th Engineer Group

<u>U. S. Unit</u>	<u>ARVN Unit</u>
45th Engr Group Hq (Const)	10th Engr Gp Hq (C)
14th Engr Bn (C)	8th Engr Gp Hq (Const)
27th Engr Bn (C)	1st Engr Bn (Div)
39th Engr Bn (C)	101st Engr Bn (C)
	103rd Engr Bn (C)
	51st Engr Bn (Const)
	83rd Engr Bn (Const)
	102nd Engr Bn (Const)
	22nd Engr Bn (Const)
	2nd Engr Bn (Div)

b. Northern II Corps Tactical Zone - 937th Engineer Group

<u>U. S. Unit</u>	<u>ARVN Unit</u>
937th Engr Gp Hq (C)	6th Engr Gp Hq (Const)
20th Engr Bn (C)	20th Engr Gp Hq (C)
84th Engr Bn (Const)	202nd Engr Bn (C)
299th Engr Bn (C)	201st Engr Bn (C)
	22nd Engr Bn (Div)
	62nd Engr Bn (Const)

18th Engr Bde Reg 350-2  
Annex A (Cont)

c. Southern II Corps Tactical Zone - 35th Engineer Group

U. S. Unit

864th Engr Bn (Const)

577th Engr Bn (Const)

589th Engr Bn (Const)

ARVN Unit

23rd Engr Bn (Div)

63rd Engr Bn (Const)

203rd Engr Bn (C)

61st Engr Bn (Const)

ANNEX B

Reports

1. Units conducting OJT will submit an initial report within 18 hours following the start of a course of instruction. The report will be forwarded through command channels to this Headquarters, ATTN: AVBC-OP. This report is assigned control symbol MACT-20 (RCS: MACT-20) and will contain the following information:

OJT INITIAL REPORT

- a. Designation and location of unit conducting training.
- b. Course title/MOS.
- c. Start of training date/proposed training completion date, when applicable.
- d. Estimated duration of training.
- e. Number of students present at start of training.
- f. Problem areas, if any.
- g. Inclosure 1 will contain the FOI with lesser plans.

2. An after action report, reports control symbol MACT-21 (RCS: MACT-21) will be submitted by the unit conducting training through command channels to arrive at this Headquarters, ATTN: AVBC-OP, not later than 20 days following completion of a course of instruction and will contain the following information.

OJT AFTER ACTION REPORT

- a. Designation and location of unit conducting training.
- b. Course title/MOS.
- c. Start of training date/actual date training completed.
- d. Duration of training.
- e. Number of trainees started/number of trainees completed.
- f. Reason(s) for variance in e, above.
- g. Unresolved problem areas.
- h. Narrative statement of overall value to NVME and comments or recommendations deemed appropriate, e.g., Lessons Learned.

Annex B to Incl 2

18th Engr Bde Reg 350-2  
Annex B (Cont)

1. Pertinent photographs of training conducted with a brief description of each. Photographs will be sent in duplicate.

3. Reports of unacceptable standards of performance will be submitted when deemed necessary by the training unit commander. The report is assigned reports control symbol MACT-22 (RCS: MACT-22), and will contain the following information as a minimum.

UNSATISFACTORY PERFORMANCE REPORT

- a. Name, rank, and service number of individual.
- b. Parent unit.
- c. Description of trainee's unacceptable performance.
- d. Training unit commander's recommendation of action to be taken.
- e. Facts which the unit commander considers to have a bearing on the problem.

ANNEX C

Quarterly Affiliation Report Format

1. **GENERAL.** The Quarterly ARVN-Affiliation Report will be submitted through command channels to this Headquarters, ATTN: AVBC-OP, NLT the 10th day of January, April, July, and October. This report is assigned reports control symbol AVBC-OP-1 (RCS: AVBC-OP-1), and will contain the following information.

a. Narrative description of on-going, recently completed or currently projected Mutual Cooperation Projects (Incl 1 will contain appropriate pictures or color slides). Each project will be listed individually with scope.

b. Narrative description of mutual association activities.

c. Summary of training assistance courses presented during the quarter to include the following information: Date Training Began - Course Title - Unit Trained - Number Began - Number Completed - Date Completed.

d. Summary of projected Training Assistance for the current quarter to include the following: Date Training will Begin - Course Title - Unit Training - Unit to be Trained - Number to be Trained - Course Duration.

e. Name of Group and Battalion ARVN Affiliation Officer.

DEPARTMENT OF THE ARMY  
HEADQUARTERS, 18TH ENGINEER BRIGADE  
APO 96377

AVBC-OP

1 January 1970

SUBJECT: Operation Last Chance

SEE DISTRIBUTION

1. This letter establishes a program entitled Operation Last Chance in support of Brigade Goal #3. Operation Last Chance is intended to emphasize the singular importance of the 1970 construction season to the engineer mission in Vietnam. Our current strength and equipment posture will gradually decline during the next 12 months. Therefore, I feel a sense of urgency to develop a program which is thrust toward achieving maximum results with the resources now available and to be available in months immediately ahead. Key features of the program are to:

a. Continue our healthy attitude towards maintenance. We should not be trapped into sacrificing scheduled and routine maintenance. Short term or daily production records achieved at the expense of maintenance represent a losing investment.

b. Eliminate non-productive effort of men and equipment and limit effort on low priority tasks. Inclosure 1 lists some specifics which may be applicable to one or more of your units. As targets we should:

(1) Reduce overhead and supervision, as defined, to below 45% of total workforce. A Brigade-wide 1% increase in productive workforce is equal to 120 men or about one company equivalent effort.

(2) Reduce productive effort expended on 18th Bde projects below 10% in any unit and as near to 0% as possible.

(3) Effective 5 January, program all units on a 70 hour weekly work schedule including during operational maintenance and commander's time (5 hours) for mandatory training, chapel, etc. Motor stables and normal travel are not included. In isolated instances security and long travel distances will infringe on full 10 hours at the worksite, but we should seek ways and means to minimize the impact of these constraints. Some battalion size units are presently operating at 110% of the 65 hour on the job

Incl 3

AVBC-OP

SUBJECT: Operation Last Chance

schedule.

c. Manage and plan our work to increase effectiveness and efficiency. There are many ways to "build a better mousetrap". Imaginative analysis will reveal these opportunities and practical tests will prove their worth.

2. These features may seem stringent at first observation; however, all are being equalled or bettered by certain units in the Brigade. On close review you will note that, as is normally the case, the real challenge is for the unit leader. For this reason this program will be welcomed by and will identify the strong leader for he will soon:

a. Use his intelligence and ingenuity to develop plans and programs to increase efficiency and production without degrading required maintenance.

b. Recognize the urgency of fulfilling our mission.

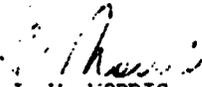
c. Instill a comparable sense of purpose in the attitude and performance of his men. Experience in Vietnam has proven time and again that the engineer soldier will respond to accomplish any task if informed, motivated, and most importantly, properly led.

3. In summary, the basic theme to be stressed in developing Operation Last Chance is that we must, during the next construction season, complete as much of our current mission as is possible. Our achievement during this next six months will to a large degree establish the final record of how well the engineer has met the challenge of Vietnam. If those of us presently in the 18th Brigade do our job well, the military, political, and economic strength of the Republic of South Vietnam will be improved significantly. If we fall short, those who have served, fought, and died in Vietnam, beside and before us will have been let down. I am confident that together we will rise to the challenge and by the end of 1970 will have assured the total fulfillment of the 18th Brigade mission in Vietnam.

4. This program and its implementation through Group, Battalion, and Company level will be the subject of future correspondence, and of presentations to be made at the Brigade Commanders Meeting on 28 January 1970.

1 Incl

as

  
J. W. MORRIS  
Brigadier General, USA  
Commanding

DISTRIBUTION:

A

## METHODS TO INCREASE PRODUCTION

### 1. GENERAL.

a. From recent studies completed by the Brigade Construction Operations Section, it appears that the Brigade may not be providing all possible available production effort to our customers. This analysis indicated that approximately 25% of the work accomplished has been expended on our own camps and compounds. Considering recent moves and adverse weather, this approximation may not represent an unreasonable diversion, but to meet current production schedules and complete our operational tasks, the effort devoted to our own facilities must be restricted to an absolute minimum.

b. Percentages are important. A 1% reduction in overhead as a percentage of total Brigade strength can free 120 men each day - the equivalent of one engineer company. In similar fashion, a small percentage increase in effective haul utilization can significantly increase our net LCC construction progress.

2. ORGANIZE FOR PRODUCTIVITY. Each unit has its unique tasks and its own situation which should be analyzed to streamline operations and increase productivity. The suggestions below are only broad guidelines:

#### a. PERSONNEL.

(1) Insure accurate preparation of the Enlisted Personnel Inventory Report (PIR) at battalion level, thus insuring proper replacement requisitioning at Brigade level. Improper preparation has caused the Brigade to under-requisition by as many as 300 per month in the past.

(2) Closely monitor senior NCO and officer requisitions, to insure they are submitted within the proper time frame.

(3) Concentrate on personnel management at Group and Battalion level to insure that qualified personnel, especially those with specialized construction skills, are assigned properly where they can best serve the Brigade.

(4) Create incentive by maintaining a rapid system of official and public recognition for exceptional performance. Achievement awards are particularly appropriate, but must be reserved for particularly meritorious achievement to avoid downgrading their value.

b. RECONNAISSANCE. Develop and utilize the reconnaissance section for the collection of engineer technical intelligence. Expand the traditional search for quarries and borrow pits to include the location and identification of construction materials. A recent survey for bituminous products turned up hidden assets which had remained unnoticed in a period of impending shortage.

#### c. MAINTENANCE.

Incl 1 to Incl 3

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(1) Schedule night maintenance to the maximum extent, especially on critical items of equipment.

(2) Exercise tight control on vehicle usage.

(3) Insist on preventive and scheduled maintenance. Remember, no one day of production is as important as a day or an hour of scheduled maintenance.

## d. OPERATIONS.

(1) Program and schedule on the basis of a seventy hour work week, with five hours as commander's time. The unit commander should be able to account for all activities during the 70 hour period.

(2) Place emphasis on planning procedures at all levels.

(3) Maximize personnel in productive effort while minimizing overhead. Consolidation of administrative and mess functions within a battalion is a consideration.

(4) Make maximum use of LN labor force.

(5) Tailor units for production - this appears particularly appropriate to vertical and horizontal functions on LOC work. Normal company organization and employment is likely to be too cellular and overly heavy in supervision.

(6) Establish high standards and objectives with numerous incentives for attaining them.

(7) Minimize time lost to the noon meal through use of C-rations distributed prior to work or feeding hot meals at the job site.

(8) Gear toward production in all phases of unit operation.

(9) Schedule make-up periods for lost time from rain.

(10) Plan ceremonies in free time rather than during work week.

(11) Consider the possibilities of LOC construction in areas where traffic is light on Sunday.

## e. SUPPLY.

(1) Requisition materials far in advance through long range planning and close coordination with the Operations Section.

(2) Pre-stock materials for projects - at the job site when possible.

(3) Do not commit valuable manpower effort on tasks until all essential materials are on hand or assured for timely receipt.

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