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DISASTER PREPAREDNESS PLANNING AND
FACILITY CONTINGENCY OPERATIONS FOR
PUBLIC WORKS

BY

DAVID J. MAJOR

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A REPORT PRESENTED TO THE GRADUATE COMMITTEE
OF THE DEPARTMENT OF CIVIL ENGINEERING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF ENGINEERING

UNIVERSITY OF FLORIDA

FALL 1993

Approved for public release
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Dedication

To Mary, Matt and Baby-to-be:

I love you and thank you for the time, space and patience you set aside to allow me to complete this paper.

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CHAPTER 1 INTRODUCTION

Purpose and Objectives

A recent history study will reveal that war (Desert Storm), civil disturbance (LA riots, NYC World Trade Center Bombing), natural disasters (Typhoon Omar and Hurricanes Andrew and Iniki) and industrial catastrophes (Valdez Oil Spill) are all too often commonplace. These events cost millions to billions of dollars for facility and infrastructure repair and clean-up, countless loss of lives, damage to the environment and dislocation of families and businesses. Because of the unpredictability as to where and when a disaster will occur, sound fundamental facility and infrastructure preparedness planning and management must be conducted to reduce the effects of these incidents.

Common sense dictates that this document can not cover all the circumstances which public works departments will deal with or be subject to reply to during the preparation, assessment and recovery operations following a hostile action, natural disaster or man-caused disaster. It is intended to provide a starting point for military and civilian public works departments in developing an emergency operations doctrine to handle any predictable incidents based on factors such as their military mission, economical importance, geographical location, and personal and public safety. The organization, preparedness plans and facility contingency operations are essential for the public works staff to quickly react and minimize the life loss, property damage and environmental impact while sustaining operational and business services.

Potential Disaster Sources

Hostile Actions

Hostile actions have the basic objective of killing people, destroying facilities and infrastructure and reducing the operational capability of the civilian business sector or military operational function. Large civilian economical and information centers and military air and naval bases supporting combat or contingency operations present lucrative targets for such actions. Attacks may include one or a combination of full and limited scale conventional operations, chemical/biological operations, nuclear operations, terrorism and/or domestic violence. Not only can direct attacks on key operational facilities (i.e., runways, piers) be anticipated, but attacks on resources critical to the operation (i.e., utilities, lines of communication, transportation avenues) can be just as effective in negating operational capability. To successfully sustain the capability to generate combat or economical power despite attacks, a high degree of infrastructure operability must be achieved and maintained. This must include defending the area from attack, minimizing the effectiveness of the attacking force that penetrates the area, rapidly repairing any damage inflicted and continuing services despite the threat or occurrence of an incident.

Natural Disasters

The most unpredictable damage is caused by natural disasters. "Mother Nature" made 1992 the highest ranked year for catastrophic facility loss damages in the United States and its territories history. Table 1.1 provides a listing of natural disaster events for 1992. As evident in Table 1.1, there are very few areas of the country that have not been affected by one type or another of natural disaster.

Table 1.1. USAA CATASTROPHE HISTORY -- 1992

DATE	DESCRIPTION	DATE	DESCRIPTION
2/9	Glendale, CA FLOOD	7/2	Illinois/Indiana HAIL
3/3	Orlando, FL HAIL	7/5	New York HAIL
3/8	Kileen, TX HAIL	7/6	Central States HAIL
3/24	Orlando, FL HAIL	8/24	Florida/Louisiana HURRICANE ANDREW
3/28	San Antonio, TX HAIL	8/28	Guam TYPHOON OMAR
4/10	Kansas City, MO HAIL	9/5	Wichita, KS HAIL
4/19	Texas/Louisiana/Mississippi HAIL	9/11	Hawaii HURRICANE INIKI
4/28	Arlington, TX HAIL	10/3	Tampa, FL TORNADO
5/10	Oklahoma City, OK HAIL	10/7	Texas/Oklahoma TORNADOES
5/22	New Mexico/Texas HAIL	10/10	Mississippi TORNADO
6/6	Texas/Oklahoma HAIL	10/15	Texas HAIL
6/14	Illinois/Indiana HAIL	11/3	Shreveport, LA HAIL
6/19	Wichita, KS HAIL	11/12	Kentucky/Ohio/PA WINTER STORM
6/24	Col Springs, CO/Dallas, TX HAIL	11/21	Central States HAIL
6/24	Florida FLOODS	12/1	Alaska WINTER STORM
6/28	Big Bear, CA EARTHQUAKE	12/10	Northeast WINTER STORM

(USAA, 1992, 21)

The natural disasters which public works directors should be concerned with and aware of are:

- Hurricanes/Typhoons - Installations and civilian sectors located near the Gulf of Mexico, the Atlantic Ocean seaboard and Pacific islands are subject to hurricane/typhoon damage annually. Even those areas located inland may be subject to severe weather from tropical lows that support hurricanes as they move inland. Severe weather associated with hurricanes may include tornadoes, heavy rains and flooding.
- Tornadoes - Tornadoes may be classified as the most violent weather phenomena known and the top natural disaster killer in the United States. Although the damage is centralized by funneled shaped clouds 1/4 to 1/3 miles wide and 16 miles long, the rotating velocities of the winds may reach 500 mph. Tornadoes are severally difficult to provide any early warning of their occurrence. Severe weather associated with tornadoes may include hail storms, heavy rains and flooding.

- Floods - Floods are the most common and widespread of all natural hazards. Flooding may occur from any accumulation or rise in the water table. Flooding, caused by heavy rains, snow melts, tropical storms, hurricanes, and seismic activity, can effect areas located within the 100-year flood plane and all low lying areas. Severe weather associated with flooding may include snow storms, heavy rains, tornadoes, earthquakes and volcanic eruptions.
- Blizzards, Severe Cold and Snow Storms - Normally associated with the winter season, blizzards, severe cold and snow storms may bring many activities to a stand still by bringing transportation to a halt and disrupting utility services. Severe weather associated with winter storms may include flooding.
- Volcanic eruptions - Even though the east coast is not currently subject to volcanic eruptions, various portions of the country are subject to damage related from eruptions. Mount Saint Helens, in 1980, proved that even dormant or inactive volcanoes must be considered a potential disaster source. Severe weather associated with volcanic eruptions include flooding and global weather/cooling changes.
- Earthquakes - Earthquakes may occur on both coasts are subject to earthquakes and tremors associated with plate tectonics shifts. They are very unpredictable and have the potential to inflict the greatest loss of life and property. Severe conditions associated with earthquakes may include flooding and landslides.

Man-Caused Disasters

Other potential harm may be caused by man-made and technological disasters such as:

- Fire - Even though not all fires are man generated, the majority of fires start as a result of human action or ignorance. Fires may be grouped into two types; fires to facilities and infrastructure and fires to forests and grasslands.
- Explosions - Explosions present a danger as a result of blast force, flying debris, intense heat and fire they produced.
- Transportation Accidents - Aircraft, ship, and surface transportation to any major transportation means can cause temporary isolation to areas. Particular concern should be placed on accidents involving potential damage to environment and people from petroleum and hazardous material spills.
- Radiological Emergencies - Accidents involving nuclear power and weapons and hospital materials could cause various health and environmental problems.
- Hazardous Material/Waste Emergencies - Spills or existing site locations may be subject to all natural and man-made occurrences resulting in harm or potential dangers to people and the environment. Particular areas of concern should be gas and chemical leaks.

Public Works Organization

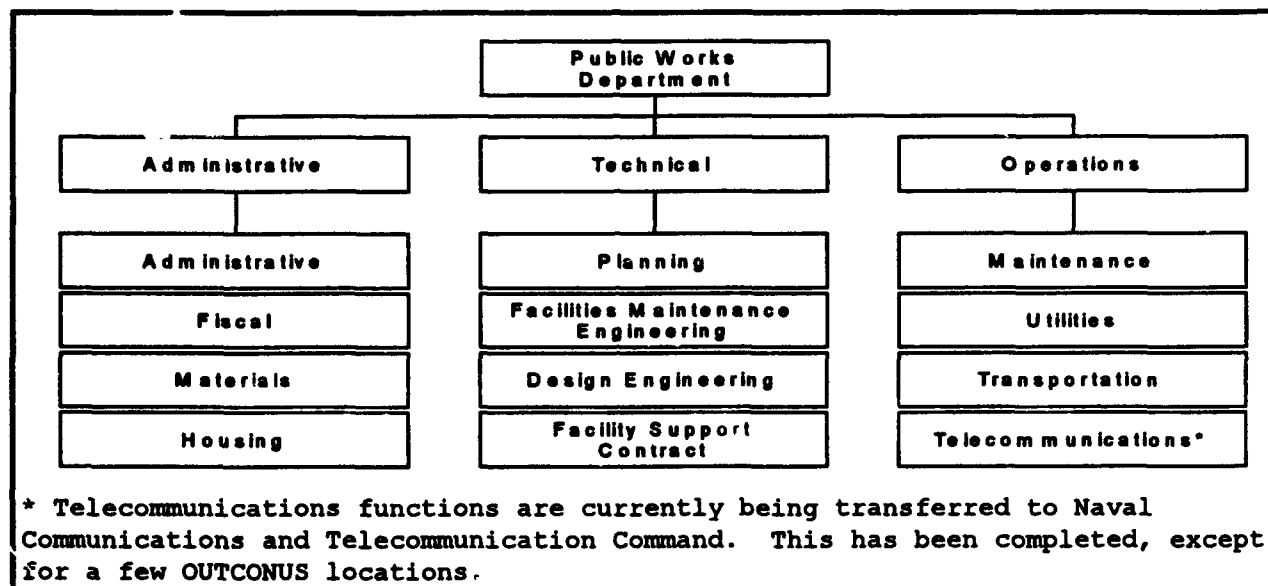
"Public Works are the physical structures and facilities that are developed or acquired by public agencies to house governmental functions and provide water, power, waste disposal, transportation, and similar services to the public..." (Burnett, 1986, 3)

The Burnett definition is a standard definition and listing of services which a public works department manages. A typical organization will consist of administrative, technical and operational divisions, Figure 1.1.

Administrative functions include general administrative, fiscal control,

material and housing support functions. Technical functions include master planning and real estate, facility maintenance, design engineering and contract support functions. Operational functions include maintenance, utility, transportation and telecommunication support functions.

Figure 1.1. Typical Public Works Organization



Emergency Operations and Organization Concepts

The unpredictability of disasters and the fact that public works service functions impact more areas than any other single organization, including fire and law enforcement, dictate the critical need for the director to establish an innovative response doctrine. The department might also be operating in an environment which the standard operating procedures may no longer apply. Therefore, a proper organization is critical to maintaining command and control and efficiently executing any contingency operation. As such, the public works director needs to develop a standing emergency organization as part of the overall department's operational plan. The organization needs to

be structured such that existing public works assets are utilized to the maximum extent possible to accomplish all phases of the repair effort while being flexible enough to work in close coordination with any and all construction and/or engineering forces which may deploy to the area.

Once a warning has been received or an accident has occurred, the public works manager must take immediate actions to minimize the effects of the impending incident and following such an event, restore facilities/infrastructures to full operating condition. These actions consist of three phases: survival, assessment and recovery operations, Figure 1.2.

Emergency Control Center (Chapter 2) The center is responsible for organizing and directing all facility and infrastructure operations. The ECC should act as the central point for damage inputs and directs the damage response based on the established priorities. The center has overall control of the survival, assessment and recovery operations.

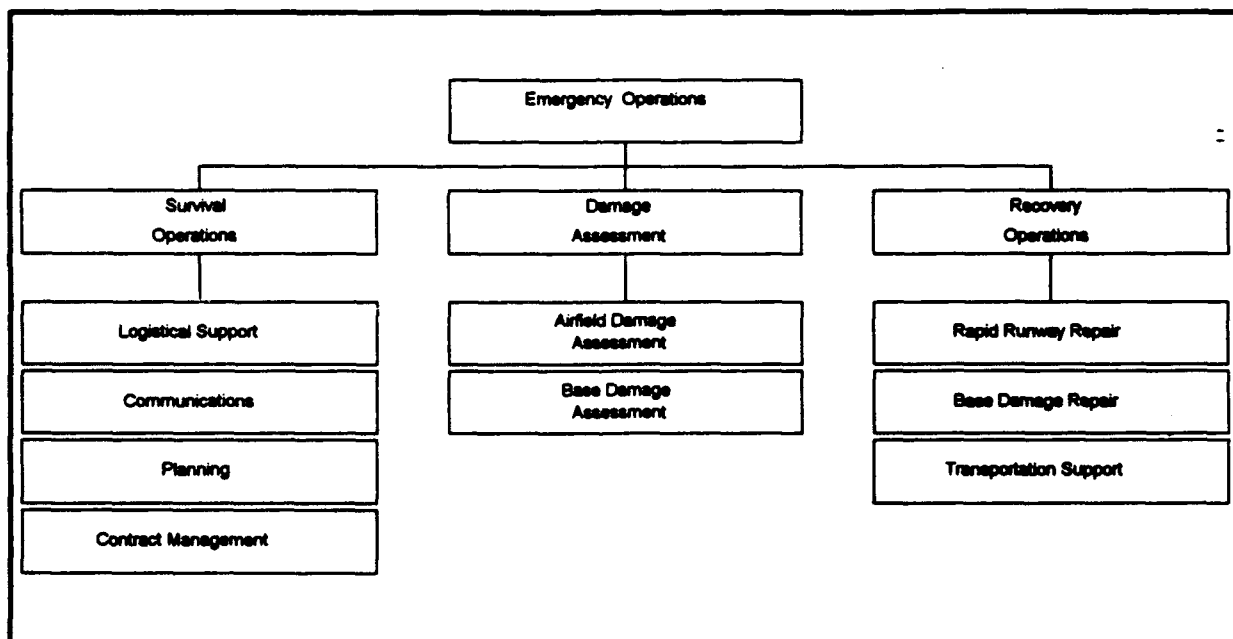
Survival Operations (Chapters 3,4) Survival operations are responsible for providing the logistical support, disaster preparedness planning and protection, communication and contract management necessary to support, protect and defend the specified area.

Damage Assessment (Chapter 5) Damage Assessment Teams (DATs) are responsible for providing the initial and continuing assessment of airfield and facility/utility structures and surfaces and repair estimates for airfield and facility repairs. Damage information will be relayed from the field to the ECC.

Recovery Operations (Chapters 7,8) Upon notification of damage, repairs parties will be dispatched to remediate damage and/or minimize the operational impact the damage has caused. The recovery operation maybe be broken down into rapid runway repair (RRR), base damage repair (BDR) and transportation

support (TS) operations. The RRR Organization is responsible for completing and maintaining all expedient and permanent repairs to airfield surfaces. The BDR Organization is responsible for completing the expedient repairs to all damaged base facilities other than the airfield pavements and maintaining operation of utility systems. The TS Organization is responsible for providing transportation support, vehicle dispatch and maintenance and repair services to the ECC organizational units.

Figure 1.2. Typical Emergency Operations Organization



CHAPTER 2 EMERGENCY COMMAND CENTER OPERATIONS

General Concept

The public works department should be converted into an emergency command center (ECC) to maintain command and control of the varying players involved in disaster/emergency operations for facility and utility services. The center will be established to oversee and direct all actions related to the support and repair of facility and infrastructure damage, support the construction and military augmentation forces and support and service the public. An alternate emergency command center (AECC) may be required for repetitive actions, security and command and control. The AECC is of particular importance in a hostile action situation. The center mission statement should include:

- a. maintain a 24-hour control center operation to provide continuous damage assessment and repair operation coordination;
- b. provide logistical support to all construction and engineering resources;
- c. maintain continuous communication within the organization and with higher authority concerning damage repair efforts;
- d. direct maintenance/construction efforts to minimize the vulnerability to damage;
- e. direct the individual Damage Assessment Teams (DAT) to reconnoiter and survey the airfield and station facilities to identify, locate, report, and assess the extent of damage;
- f. direct the efforts of the Rapid Runway Repair (RRR) Organization based on operational guidance provided by higher authority;

g. maintain base utility system operation or provide point contact and liaison to company owned utility system;

h. direct the efforts of the Base Damage Repair (BDR) Organization based on repair priorities and the availability of personnel, equipment, materials and funding;

i. direct the recall, dispatch, repair and maintenance of vehicle assets through the Transportation Support Organization.

Emergency Operations Phase Requirements

Emergency operations may be broken down into four phases; survival, assessment, recovery and restoration operations. The following is a listing of minimum Emergency Command Center phase requirements:

a. Survival Phase

(1) Muster organization. Brief all personnel on current situation. Review all operational plans and all associated instructions. Review dispersal and recall procedures.

(2) Establish ECC and AECC, if necessary. Inventory maps, RRR MOS Kit and status boards.

(3) Make all logistical arrangements.

(4) Set up and test communications (include coordination with explosive ordnance disposal (EOD) for ordnance removal support, fire department for fire fighting support and hospitals for emergency medical support).

(5) Issue personal protective gear and equipment, if necessary.

(6) Determine existing contract outcome. All existing contracts should be determined to be either completed, accelerated or terminated.

b. Assessment Phase, details provided in the damage assessment chapter, Chapter 5.

- (1) Establish assessment assignments and vantage points.

Dispatch damage assessment teams following incident.

- (2) Calculate and report Minimum Operating Strip (MOS) estimates and recommendations.

- (3) Prioritize and report repair accomplishment from damage assessment reports.

c. Recovery Phase, details provided in the recovery operations, Chapters 6 and 7.

- (1) Direct repair efforts.
- (2) Report damage and status updates.

d. Restoration Phase.

- (1) Submit final operational report.
- (2) Return to normal operations.

ECC Staff Organization

The ECC staff organization, Figure 2.1, will maintain a 24-hour watch in a centralized location. The staff provides administrative assistance to the ECC Watch Officer and other members of the ECC Team. Each staff section should consist, at a minimum, of the following:

ECC Watch Officer/Chief. The ECC Watch Officer/Chief is responsible for the overall supervision of the ECC staff and serves as the ECC OIC during the watch. The Watch Officer is responsible for maintaining control over all damage assessment and repair operations. The Watch Officer will dispatch and direct the DATs, determine the priority of repair actions based on operational guidance and technical advice, determine possible MOSs based on ADAT

information, dispatch and provide overall direction to the repair teams, and report the status of repair efforts to higher authority.

Administrative Watch Officer/Chief. The administrative watch officer/chief is responsible for the overall supervision and oversight of the logistical support required for all operations and report all logistical information and status updates.

MOS Watch Officer/Chief. The MOS Watch Officer/Chief is responsible for the direct supervision of the MOS staff members, review of all section incoming and outgoing communications, recommend and estimate minimum airfield operating strips, ensure the timely update of the status boards, and provide technical advice to the ECC Watch Officer and repair teams.

Facility Watch Officer/Chief. The Facility Watch Officer/Chief is responsible for the direct supervision of the facility staff members, review of all section incoming and outgoing communications, ensure the timely update of the BDR/Utility status boards, and provide technical advice to the ECC Watch Officer and repair/utility teams.

Communicator. The communicator is responsible for the direct supervision of the damage assessment teams (DATs), maintaining continuous communication with the DATs, the individual repair and support teams, and higher authority both by any and all means of communications available. The communicator will maintain a hard-copy log report of all communications.

Damage Plotter. The damage plotter(s) is responsible for plotting any reported damage on airfield and facility/utility maps in the ECC as directed by the respective Watch Officer/Chief. The damage plotter will work with the communicator to ensure a smooth flow of communication occurs within the control center.

Runners. The runners are responsible for shuttling messages and other information as directed by the Watch Officer or Watch Chief.

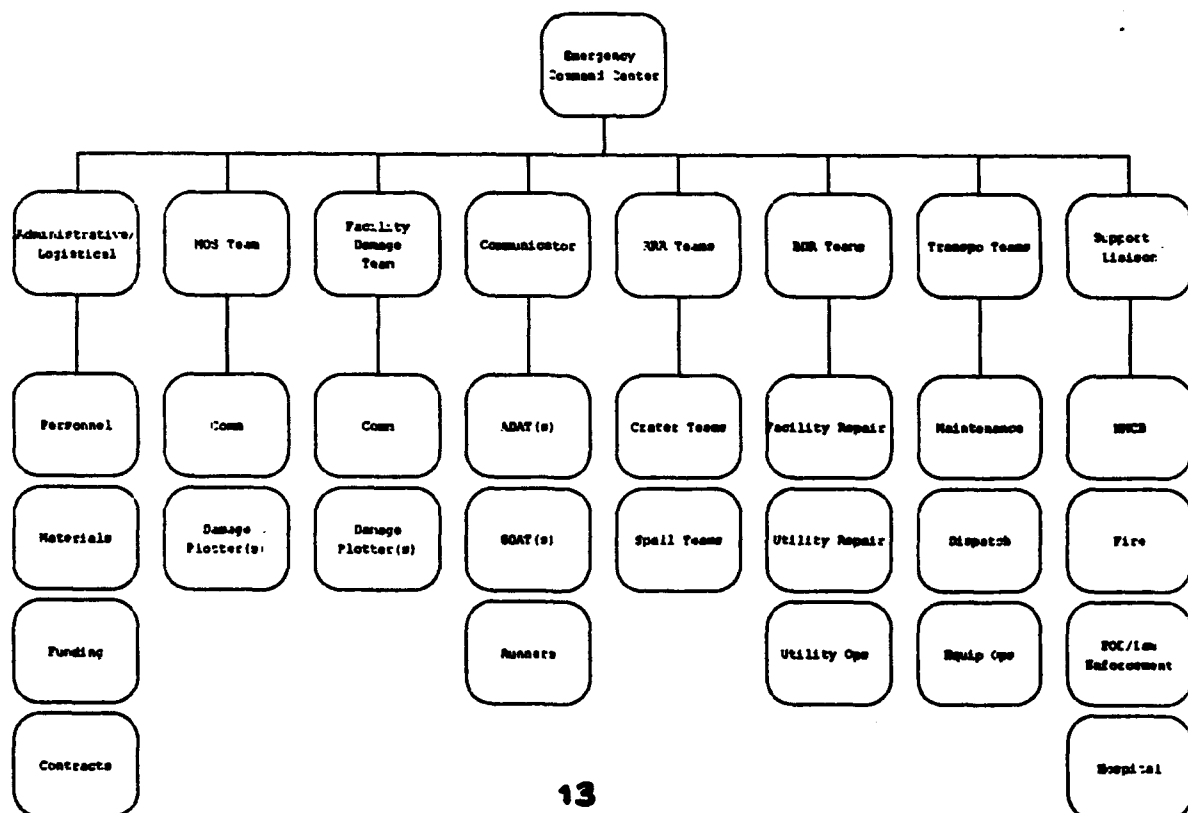
Support Organizations. All primary support organizations (NMCB, fire, law, hospital, air operations, etc.) should have a liaison member attached to the staff to provide the necessary coordination between organizations.

Rapid Runway Repair Organization. Repair teams responsible for the adequate repair of airfield pavement surfaces to launch and recover aircraft.

Base Damage Repair Organization. Repair team responsible for the adequate repair of all facilities and utilities to support overall mission.

Transportation Support Organization. The transportation support team is responsible to provide essential vehicles to conduct recovery operations, issue vehicles, provide vehicle maintenance and repair, refueling operations and heavy equipment support and operations.

Figure 2.1. Emergency Command Center Staff Organization



CHAPTER 3 COMMUNICATIONS

General Concept

An essential element of any organization is its means to communicate. The Emergency Command Center is no different and must have capability to communicate both internally with its damage assessment and repair crews and externally with other agencies and operational leaders. As a result, a detailed communications plan must be developed which has multi-dimensional communication link capabilities and methods and be expandable as augmenting construction assets are simulated into the organization. The plan is also important because communication capabilities may be disrupted by flying debris, weather related damages and are primary targets for hostile action. At a minimum, the plan should address all the following communications lines:

- a. Emergency Broadcast System
- b. Telephone/Fax/Beeper Systems
- c. Handheld Portable Radio Networks
- d. Military Affiliated Radio System
- e. Amateur Radio Service
- f. Citizen Band Radio Services
- g. Messengers
- h. Media Networks

Emergency Broadcast System

The Emergency Broadcast System (EBS) is a network of designated commercial radio stations operated on a voluntary basis under Federal Communications Commission (FCC) direction. Many of the stations may have emergency shelter capability. The stations programming includes links with

local and state government emergency centers and when activated will broadcast a common program of emergency information. In the event of an emergency, the station may be contacted and a message broadcast over the airwaves, based on message priority and content (i.e., recall, reporting requirements, etc.).

Even though many of the potential disaster sources cannot be foreseen, early warning systems via the EBS to alert the population of impending hostilities, natural disasters or man-caused disasters is essential. These early warnings and alerts allow both individuals and agencies to take the necessary steps in reducing the damage and injuries resulting from these incidents. Key governmental agency players include the Federal Emergency Management Agency (FEMA), Emergency Broadcast System Networks, National Weather Service, US. Geological Survey Earthquake Information Center, Nuclear Regulatory Agency, Environmental Protection Agency and military/civilian intelligence agencies. Appendix A provides key terms and warning signals commonly used.

Telephone/Fax/Beeper

The primary means of communication is by telephone line. Because of their element exposure and high use rate, telephone lines may be subject to damage and could be an unreliable communications source. Telephones are readily available and with the advent of the beeper and fax machines can be very powerful tools in the survival, assessment and recovery operations. A telephone, fax and beeper directory for the Emergency Command Center must be established.

Various military portable telephone communication systems (TA-312/PT and TA-1/PT) and switchboard (SB-22/PT) may be used over short distances. These lines should only be used under extreme field conditions and are not

recommended for use. Cellular phones may also be used but have varying degrees problems such as distance, obstacles, transmission loss and cost.

Hand-held/Portable Radio Networks

Another primary communications resource is the hand-held or portable radio networks used by most public works departments. All radios must be checked to ensure that they are compatible and can operate on the prescribed frequencies. This can be critical once augmenting personnel are incorporated into the ECC (i.e., Naval Mobile Construction Battalions normally carry PRC-77s, PRC-68s and/or PRC-104s radios). A directory should be established and show the anticipated radio networks to be encountered, including assigned radios, call signs, and frequencies.

At a minimum, the following organizations should be accounted for in the telephone/fax/beeper and radio network communications plans. To simplify the list and include all parties, all data should be placed in one data base, Table 3.1, printed within the plan and updated on a yearly basis. .

- (1) Personnel Recall, including head official numbers
- (2) Operation Center Listing
- (3) Military Engineering Commands, see Appendix B for list.
- (4) Emergency Management Offices (federal, state, local), see Appendix B for list.
- (5) Contractor Numbers, with specialization, see Appendix B for list.
- (6) Supplier Numbers, with specialization
- (7) Command Centers
- (8) Customer/Activity Numbers
- (9) Duty Offices
- (10) Military/National Guard/Coast Guard Installations
- (11) Environmental Protection Agency (federal, regional, state, local), see Appendix B for regional numbers.
- (12) Fire Departments
- (13) Emergency Medical Service
- (14) Law Enforcement
- (15) Public Affairs Offices
- (16) Radio Stations, including EBS station(s)
- (17) Television Stations
- (18) National Weather Service

Table 3.1. NASKEF BSRCC Directory (Partial Listing)

Type	Name	Number	Call Sign	Frequency	Pri
Public Works		X4898	BASE Alpha	MT5000 Net 1140	1
AF Light Vault	Kjartan	x4222	Lightning	MT5000 Net 1000	1
PWO	CDR Eckels	X2137	60	1140	1A
APWO	LT Belanger	X6123	60 Alpha	1140	1A
SHOPS ENG	LT Major	X6100	60 Bravo	1140/1000	1

(Major, 1992)

Military Affiliated Radio System (MARS)

Military Affiliated Radio System (MARS) is a Department of Defense supported amateur radio network capable of long-range voice communication.

Amateur Radio Service (HAMS)

Amateur Radio Service (HAMS) is a network of privately owned and operated amateur radios licensed by the FCC capable of long range two-way voice communication. Amateur radio operators are required to hold an FCC operator license and a station license. Personnel should be surveyed to find available HAMS licenses and those individuals requested to volunteer their equipment and expertise should they be required.

Citizen Band Radio Service (CBs)

Citizen Band (CB) Radio Service is a privately owned and operated amateur radios which are approved by the FCC capable of short-range two-way voice communication. No licenses are required to operate on the network. The service has may be of little use during an emergency because of the unrestricted access to the limited channels and the ability of high wattage base stations to overpower the frequency channels of other transmitters. Therefore, CBs should be used only as a last resort.

Messengers

Should both radio and land line communication fail, communication should be maintained using a messenger or runner system. This requires a great demand on manpower and reliance on clearly written instructions to the receiver and verbal instructions to the messenger.

Media Networks

Television and Radio services may be used to pass information to the public on damaged and hazardous areas. It is recommended that the department use affiliated Public Affairs Officers and/or media coordinators in all such broadcasts and contacts.

Reporting Requirements

There are no known civilian reporting requirements outside the declaration of disaster zones. However, military units are required to submit varying reports in support of disasters. Examples of reports are shown in Appendix C. Direct information on each should be directed to the report specified instruction.

OPREP- 3 Special Incident Reporting

There are two types of operational reports with the OPREP-3 category: OPREP-3 Pinnacle and OPREP-3 Navy Blue. The pinnacle reports are submitted for occurrences having national interest which may change or seriously change current operations or involve natural or man-made disasters (i.e., participation in disaster relief operations during major disasters). Navy Blue reports are submitted for incidents of military, political or press interest which are of high Navy vice national interest (i.e., assistance requested or rendered in connection with minor disasters of Naval interest).

Initial voice reporting is required within 5 minutes of proper notification and message reporting within 20 minutes. OPNAVINST 3100.6(series) and local requirements should be checked prior to initiating such operational reports.

Tempest Reports

There are three types of tempest reports: Tempest Rapid, Garden Plot, and Tempest Cider. Tempest Rapid reports are submitted for civil emergency reporting. Garden Plot reports are submitted for civil disturbance reporting. Tempest Cider reports are submitted for civil defense reporting. OPREP-3 reporting may be required along with tempest report. Voice and message reporting is required. DOD Directive 3025.1(series), OPNAVINST 3440.16(series) and local requirements should be checked prior to initiating any reports.

Availability of Forces for Civil Defense (FORSCOM Form 161-R)

Availability of forces reporting is required to provide the Army with a listing of DOD forces located within respective areas of responsibility which may be available to support the civil defense mission. Submission is required on an annual basis.

CHAPTER 4 DISASTER PREPAREDNESS PLANNING AND LOGISTICAL SUPPORT

General Concept

The objective of disaster preparedness planning (survival) operations is to minimize the vulnerability of the area to damage. The actions are based on protecting manpower, facilities, materials and equipment and organizing the available engineering forces to begin Emergency Command Center (ECC) operations, as soon as possible, after the incident occurs. The initial action is the development of a detailed, workable, and flexible plan. To achieve this, the public works organization may need to perform the following types of planning and logistical considerations:

- a. Manpower Planning and Logistical Support
- b. Facility Planning and Protection
- c. Utility Contingency Planning
- d. Waste Contingency Planning
- e. Contract Considerations
- f. Materials, Equipment and Storage
- g. Transportation Support Planning
- h. Dispersal Operation Planning
- i. Base Denial

Manpower Planning, Protection and Support

Because of the unpredictability of a disaster source striking your area, all plans should be based on a non-augmented manpower scheme. Manpower requirements should include all military, civilian and military ready reserves employed or assigned to the location. Additional manpower/engineering support for the military can be provided by local Naval Facilities Engineering

Commands by request, if available. Personnel offices may authorize a hiring overallowance through the recovery period.

Additional resources can only be provided if the governor issues a Declaration of State Disaster and formally requests that the President issue a Declaration of National Disaster. Once this process is completed, the Federal Emergency Management Agency (FEMA) can move to provide national resources for emergency response and recovery. There is legislation that authorizes the Army, Corps of Engineers, upon written request from the governor, to provide assistance for ten (10) days while awaiting a Presidential Declaration of National Disaster. Several policy changes are currently being discussed in Washington and vary from restructuring FEMA to eliminating FEMA and detailing the Department of Defense (DOD) the disaster recovery mission. A combination of the above would be recommended to allow DOD to provide immediate response with FEMA relieving once the quality of life services have been operationally restored.

Personnel Protection

Hostile attacks situations may include the use of chemical and biological weapons and/or anti-personnel munitions. As a result, the personnel in the recovery operation need to have protection from chemical and biological weapons as well as bomb fragments. Therefore, if the threat warrants, Chemical/Biological Suits and Flak Jackets should be distributed to personnel. Additional personal protection can be provided by issuing weapons, ammunition, and ammunition pouches.

Billeting/Shelters

Prior to the augmentation of troops it is assumed, a military non-combatant evacuation order (NEO) and/or civilian evacuation will have been enacted. The emergency command center should assist in the preparation of the

beddown reception plan. Primary troop beddown locations should be in family housing, bachelor quarter areas, local hotels and tent cities. All assigned augmenting forces should have predetermined beddown locations. A general map of billeting facilities currently available and listing of local housing, hotel, and motel locations with telephone numbers should be made to all personnel. The emergency command center will provide all housing support for construction/engineering forces.

The Red Cross, FEMA and local governments will also establish local shelters for dislocated personnel. Tent cities may also be required. This includes building, maintaining and servicing these emergency centers. Personnel should also be informed of their locations and support capabilities. Many shelters have limited space and amenities.

Messing Facilities

A local messing plan should be developed and utilized to mess all construction and engineering personnel. Half hour feeding schedules should be established with the ECC coordinating all food service requirements through the local supply and morale, welfare and recreation officials. Military "meals ready to eat" (MREs) may be viable messing source if sit down meals are not viable or available. Local maps and telephone numbers of military and civilian eating establishments should be provided to all personnel.

Facility Planning

The public works director should be responsible for the completion of all facility planning and requirements. The plan must closely coordinated with both higher authority plans, areas Master Plans, area Exterior Architecture Plans and the plans of deploying engineering units. It must be

remembered, that since no place is the same, each plan must be adjusted to local conditions, personnel and equipment availability.

Facility Requirements

A close examination of the existing facilities and infrastructure should be conducted to determine the short falls and the plan include the additional facility requirements. Additional facilities should be acquired using the following criteria and Table 4.1 (Joint Pub 4-04,1992,II-2-10):

Table 4.1. Military Construction Standards

Construction	Initial	Temporary
Site Preparation	Clearing and grading for facility sites, including drainage, revetments for POL, ammo storage and aircraft parking, aggregate for heavily used hardstands and soil stabilization.	Engineering site preparation including pavement for vehicle traffic areas and aircraft parking, building foundations and concrete floor slabs.
Housing,Dinning, Admin/Op Structures	Tents (may be wood frame and flooring).	Wood frame structures; relocatable structures.
Electricity	Tactical generators; high and low voltage distribution.	Non-tactical and/or high voltage distribution.
Water	Water points.	Limited distribution to hospitals, dining halls and other large users.
Cold Storage	Portable reefer with freezer units for medical, food service and maintenance storage.	Refrigeration installed in temporary structures.
Sanitation	Organic equipment, evaporative ponds, pit or burnout latrines, lagoons for hospitals and sewage lift stations.	Waterborne to austere treatment facility. Priority: Hospitals, dining halls, bath houses, decontamination sites and other hi-volume water users.
Airfield Pavement	Tactical surfacing including matting, aggregate and soil stabilization.	Conventional pavement.
Fuel Storage	Bladders	Bladders and steel tanks.

- a. Use existing or altering existing facilities which are owned, occupied or leased;
- b. Use relocatable buildings which are owned, occupied or leased;
- c. Acquire facilities from a commercial vendor. Real estate acquisitions include determining requirements; selecting property; acquiring

property; disposing of property; processing claims; and maintaining accurate records.

d. Construct facilities using the criteria provided in Table 4.1 which is a generic military construction standard for initial and temporary structures.

Facility Prioritization

The facility plan should detail the facility priority listing. Because of site specifications, location, requirements and mission differences there is no specific guidance on exact facility priority. Table 4.2 provides a good starting point in the development of the local facility priority listing.

Facility Hardening and Protection

Facilities hardening and protection may be required based on the disaster source threat. Hardening is best undertaken through permanent measures either during the facility's construction or during rehabilitation and usually involve the use of proper citing and reinforced concrete. However, as permanent hardening is costly and requires fund programming, the public works organization must be prepared to take expedient measures to harden facilities identified by the Area Commander or which may require additional protection from the hazard(s) expected. These expedient measures include the use of sandbags, earthen berm, and revetments, see Table 4.2.

a. Sandbags are normally considered an expedient method of hardening existing structures and their effectiveness depends on the type of fill material used.

b. Earthen berms can be constructed for existing facilities, but care need to be taken to ensure that the external walls of the facility can support the lateral load of the berm. If the berm is to be used as a retaining wall

to hold back water or other liquids, the structural integrity of the berms must be inspected regularly to ensure they are safe.

c. Revetments are generally used to protect parked aircraft and essential facilities from the effects of enemy ordnance. The type of revetment to be constructed depends on the facility to be protected, the layout of the aircraft parking areas, material availability, and the risk location of the area.

A hardened facility listing should be established and contain information on facility number, location, type of hardening and any other requirements. An additional listing should be prepared of facilities which will require hardening. This listing should include drawings for hardening requirements, engineering and material estimates and any other pertinent information which may assist the Emergency Command Center Officer-in-Charge in prioritizing the work.

Camouflage/Tone Down

An additional means to protect facilities is by camouflaging or toning down a facility. Camouflage and tone down is a means by which a facilities visual and thermal signatures are altered by making them more compatible with and less conspicuous on the natural landscape. The process includes and may be accomplished by using camouflage nets, natural materials, berms, or various painting schemes. As with facility hardening, tone down is best accomplished during facility construction. Similar to hardening a list of facilities which require tone down should be established and estimates prepared for the ECC. Summary of methods is shown in Table 4.3.

Airfield Protection

Airfield runways, taxiways and surfaces are key areas which when damaged can minimize the ability to project operations. Therefore, protection means

must be devised to ensure that the damage is negligible. Besides the methods shown in Tables 4.2 and 4.3, aircraft decoys may be constructed and dispersed to divert enemy attention away from principal facilities. Smoke screens may be used to obscure portions of the airfield. Liquid foam may also be placed on the runway to obscure runway or painting markers. Additional work which may be beneficial is the installation of a runway marking system of the tarmac area to assist the damage assessment team and pilots in determining the precise damaged areas.

Table 4.2. Facility Priority Listing and Hardening Requirements

Pri	Facility/Function	Threat Area		
		High	Low	Non
1	AIRCRAFT SHELTERS	SH	SH	SC
2	COMMAND AND CONTROL CENTERS	SH,CWP	SH,CWP	SP
3	COMMUNICATIONS/DATA	SH,CWP	SH,CWP	SP
4	OPERATION AND INTEL SUPPORT	SH,CWP	SH,CWP	SC
5	CRITICAL MAINTENANCE AREAS	SH,CWP	SH,CWP	SC
6	POL STORAGE & DISTRIBUTION	SH	SH	SC
7	MUNITIONS STORAGE, ASSEMBLY, AND LOADING	SH	SH	SC
8	UTILITY GENERATION AND DISTRIBUTION	SP	SP	SC
9	CRITICAL SUPPLY STORAGE	SH	SH	SC
10	CRITICAL SECURITY POINTS	SH,CWP	SP	SC
11	FIRE/CRASH FACILITY	SH,CWP	SP	SC
12	CRITICAL BASE RECOVERY AREAS	SH,CWP	SP	SC
13	COLLECTIVE PROTECTION	SH	SP	SC
14	MEDICAL TREATMENT	SP	SC	SC
15	OTHER MAINTENANCE AREAS	SP	SC	SC
16	DINING HALLS	SP	SC	SC
17	LIVING AREAS	SP	SC	SC
18	OTHER FACILITIES	SP	SC	SC
HD	HARDENED	Protected from effects of direct hit.		
SH	SEMIHARDENED	Protected from effects of specific sizes and types of weapons detonated at specific distances.		
SP	SPLINTER PROTECTION	Protected from weapons fragments, small arms fire and magnification of blast pressure reflected off vertical surfaces.		
SC	SITING CONSIDERED	No conventional hardening protection.		
CWP	CHEMICAL PROTECTION			

(AFESC, Volume 1: Pre-Disaster Planning, 3-35-37)

Table 4.3. Camouflage/Tone Down Methods

Method	Visible Function	Thermal Function	Applications	Type
Earthwork	Hide structures; change shape; blend into background	Change shape; hide structures; reduce thermal contrast; use with vegetation for blending	POL, ammo storage, aircraft shelters, command and control shelters, distinct areas of pavement	Permanent
Vegetation	Hide structure by screening; blend installation into surrounding field patterns; disrupt shadows	Hide structures by screening; blend installation into surrounding patterns; disrupt shadows; reduce solar radiation falling on adjacent buildings	Wide area patterning for areas adjacent to runways, taxiways; screen aircraft shelters & vert structures; negate shadows on bunkers and vertical structures.	Permanent
Water	No impact; could increase gloss; makes light surfaces dark and dark surfaces lighter.	Reduce contrast by cooling; blend into background by creating patterns to disrupt shape of target.	Paved areas; concrete structures; flat gravel roofs; large metal structures.	Expedient
Nets	Hide structures, blend by shape disruption; color matching to vegetation.	Hide structures near ambient temps; blend by shape disruption; create thermal patterns	Vertical walls of large structures; aircraft shelters; cover small structures.	Expedient
Coatings: Visual	Color matching background; pattern to blend complex background/disrupt shape	Little impact; dark colors may increase contrast by increasing solar absorption	All vertical walls; aircraft shelters; horizontal paved surfaces; towers and POL tanks	Permanent Expedient possible
Low Solar Absorption	As for visual coating with matching extended into near infrared	Some thermal contrast reduction on sunny days by reducing solar energy absorption	All vertical walls, aircraft shelters; paved surfaces; towers and POL tanks	Permanent Expedient possible
Low Emissivity	As for visual coating but color selection may be restricted	Reduce thermal contrast for warm and hot targets; create deliberate thermal patterns; disguise by generating false shapes, patterns	All vertical walls on heated structures with poor insulatio... hot surfaces and exhaust stacks; generator buildings; POL storage facilities	Permanent Expedient possible
Textured Surfaces	Good color match to grass; low gloss surface for tone down	Provides some thermal contrast reduction except for hours of high solar energy loads; better if used with water in daytime	Pave surfaces; roof tops; aircraft shelters	Permanent or Expedient
Mats	Tone down achieved by use with nets	Provide external insulation to reduce contrast	Vertical walls; large roofs of heated structures with poor insulation; exhaust vents	Expedient
Shields	Hides structures; color matching possible	Hide structures; some contrast reduction by screening target	Use similar to nets	Expedient Permanent possible

(AFESC, Volume 1: Pre-Disaster Planning, 3-30-31)

Utility Contingency Planning

Utility contingency planning is the most critical phase of the emergency recovery operation. It provides the bare requirements which must be supported to each and every facility under the direction of the public works director. If a supporting utility is provided by a private company, it is imperative that input is provided and included in the emergency operational plan. It is highly recommended that private utility directors and coordinators have a liaison support representative in the emergency command center to handle respective service request information, status updates and inquiries. At a minimum, power, heat, water, gas and wastewater contingency plans should be incorporated into the plan, see Appendix D for plans developed at Naval Air Station, Keflavik, Iceland.

Power Contingency Plan

In today's society, little, if anything, will operate without electricity. Therefore, the power contingency plan is critical to all military/civilian operations and personal quality of life. The plan should describe the normal commercial power supply and distribution system. Facility power sources, isolated generator plants and portable generator plants should be listed with wattage/voltage output capabilities, fuel capacity and fuel run times as back-up power sources. The fuel capacity and run times are key in that it allows the logistical personnel to front order fuel to keep the back-up power operational.

Electrical lines (feeders) should be prioritized based on mission critical facilities which they service, load requirement and potential service disruption. Service disruptions may be caused by line slap caused by the wind, arcing caused by heavy rains and/or salt built up on electrical

connections, lighting strikes, transformer losses, and/or line breaks cause by snow weight or flying debris.

All information should be built into a feeder/facility data base and updated as system requirement changes take place. Facility feeder diagrams, switch gear locations and generator operations should be included in package.

Heat Contingency Plan

Heat and hot water, although not a necessity in certain parts of the country, can be a major concern. Quality of life suffers significantly without it and additional facility damage can be incurred by freezing pipes bursting. The plan should include all hot water generating facilities, capacity, rate, temperature, pressure, line size and insulation qualities and pumping stations, if known. Facility requirements should also be established. Asbestos insulation should be expected on all hot water or steam lines, if not marked appropriately.

There are few commercial large transportable boilers available or in existence, especially on short notice. Small transportable "donkey" boilers should be procured to assist in heating only mission critical, food service and emergency shelter facilities.

Water Contingency Plan

Water is also a precious resource. All water must be treated to Safe Drinking Water Standards. Local health officials should be contacted to assure all water breaks are repaired and sanitized correctly. Most areas are supplied by commercial water and have many built in redundancies. Other systems have individuals wells to provide resources and treat their water. Additional wells may be considered. Water tanker trucks and 500 gallon water buffaloes should be listed or procured.

The planning document should show all water resources with associated line locations, sizes and valves. Storage tanks should also depicted with control system documentation, if available.

Gas Contingency Plan

Gas leaks can be extremely hazardous and may cause vast amounts of secondary damage if not repaired or shut off quickly. The planning document should show all gas resources with associated line locations, sizes and valves. If known, all working and non-working valves should be listed.

(NOTE: Appendix D does not provided for NASKEF Gas Contingency Plan. No pressurized gas system existed on station.)

Waste Water Contingency Plan

Waste water contamination of an area can lead to an outbreak of intestinal diseases such as typhoid, dysentery and diarrhea. Therefore, it is critical for health reasons that a waste water contingency plan be developed. Sanitary conditions must be maintained for a healthy environment, no matter how severe the damage. Contingency plan should include distribution location, line size, pumping station and lift station diagrams and power requirements along with any treatment facility specifications. Potential waste water holding areas should be identified in the plan also. The primary goal should be to keep waste water out of the water distribution system to avoid contamination.

The plan should list and specify location and availability and points of contact of local vendors of portable toilets and chemicals. Locations should also be identified for the installation of latrines on site. (NOTE: Appendix D does not provide for a NASKEF Waste Water Contingency Plan. The sewer system on base is an untreated direct flow system into the ocean.)

Waste Contingency Planning

Solid Waste Contingency Plan

Once a disaster does occur, vast amounts of solid waste is generated from the destruction of housing and environmental (primarily trees) systems. The solid waste must not only be moved to allow for area access but disposed of in proper landfills. A listing of area landfills with specifications on type and amount of material receipt allowed should be developed. Additional removal methods are by incineration on or off site or grinding and chipping material should be included in the planning process. Particular attention should be paid to any staging area and right of way requirements when establishing the contingency solid waste disposal plan. Solid waste should be inspected in order that no hazardous substances are disposed of by non-hazardous means.

Hazardous Waste Contingency Plan

A listing of all facilities that contain hazardous materials should be developed. No one should enter those buildings without the proper protection. Local safety, environmental and respective substance users should be coordinated with to ensure the safety of your personnel and the public.

A listing should also be prepared of manufacturers and transporters who treat, store and dispose of hazardous waste materials. It should be stressed that this list should contain the individual company's EPA identification number. Emergency plans required by law (Resource Conservation Recovery Act) should be available and updated. These plans should be incorporated into the overall emergency operations plan, if the site is located and overseen by local jurisdiction.

Contract Considerations

If a disaster does cause extensive damage to an area, existing contracts must be evaluated. The evaluation process must determine if the contract is to be completed, accelerated or terminated for convenience (i.e., the building is blown away). Recommendations vary as to what option should be selected. The underlining decision should be based on the importance each contract supplies to the mission and survivability of the area. Service and supply contracts should be viewed in the same manner as construction contracts.

An additional consideration will have to be made once repairs are being conducted as to whether the work should be completed "in-house" or contracted out. Contract support should be used based on time, personnel requirements, personnel technical skills, scope of work, contract methods available and fund availability.

Transportation Planning

Transportation modes and access routes to your area are critical for maintaining operations and survivability. This holds not only for receipt of manpower, materials and equipment but also evacuation routes for personnel should it be necessary.

Road System

A detail map and listing of pavement access routes should be provided. This will be the primary and most accessible personnel, material and equipment transportation mode. Road details should include construction details, if available; bridge information and details; any weather restriction (i.e., road closure during winter season); and any other details which may affect the system. A secondary use for the road systems may be as an expeditionary

runway or landing surface. Scandinavian countries use this method very effectively; however little documentation is available.

Airport Facilities

A listing of all available air transportation facilities should be developed to assist in personnel and flight operations. Data provided could assist in the recommendations provided for minimum operating strip recommendations. Table 4.4 provides an example. Although the information was not available in the table, additional information to the table development should include all aircraft navigational devices and any other pertinent information which may assist in logistical and operational decisions. Military use of civilian airports should only be done under approval or an emergency.

Table 4.4. Icelandic Air Transportation Facilities (Partial Listing)

Airport	MSL Elevation	Runway Length	NAV AIDS	Surface Type
AKUREYRI	6 FT	6365 FT	Not Available	ASPHALT/GRAVEL
HOFN	30 FT	3832 FT	Not Available	GRAVEL
REYKJAVIK	45 FT	5738 FT	Not Available	ASPHALT
KEFLAVIK	168 FT	10028 FT	Not Available	ASPHALT
VESTMANNAEYJAR	328 FT	3900 FT	Not Available	GRAVEL
SAUDARKROKUR	8 FT	6600 FT	Not Available	GRAVEL
ROAD SURFACES: ONLY AIR DROP	SEE ROAD MAP		Not Applicable	
FIELD SURFACE: ONLY AIR DROP	SEE BASE MAP		Not Applicable	

(Major, 1992)

Rail System

A detail map and listing of rail services should be provided. Rail service will be the secondary material and equipment transportation mode. Rail details should include construction details, if available; bridge information and details; any weather restriction (i.e. rail closure during winter season); and any other details which may affect the system.

Docking Facilities

A listing of all available water transportation facilities should be developed to assist in personnel and pier operations. Data provided could assist in the recommendations provided for equipment and fueling considerations. Table 4.5 provides an example. Additional information to the table development should include all pier and off-loading capabilities and any other pertinent information which may assist in logistical and operational decisions.

Table 4.5. Icelandic Ports

Port	Harbor		Piers	
	Entry Width	Depth (MWL)	Length	Depth
AKUREYRI	2464 FT	25-154 FT	2460 FT	25 FT
SEYDISFJORDUR	6500 FT	20-120 FT	480 FT	20 FT
HAFNARFJORDUR	485 FT	18-26 FT	UNAV	19 FT
REYKJAVIK	328 FT	20-23 FT	11000 FT	21 FT
KEFLAVIK	480 FT	20-45 FT	220 FT	36 FT
VESTMANNAEYJAR	439 FT	20-33 FT	672 FT	20 FT
STRAUMSVIK	650 FT	33-36 FT	780 FT	36 FT
GRUNDARTANGI	60-75 FT	423 FT	UNAV	48 FT
HVALFJORDUR	6000 FT	78-144 FT	200 FT	50 FT

(Major, 1992)

Material, Equipment and Storage

The amount and type of materials and equipment available is critical to the expedience with which the area can recover. A thorough listing of materials and stock items should be provided and on hand from Departmental Material Branch. Additional requirements based on the facility and personnel requirements will require immediate processing. A listing of all area and specialist material supply vendors should be completed in order that expedient material procurement can take place.

Studies and damage assessment based on the hostile action threat for rapid runway repair requirements should be conducted and in coordination with

Commander, Construction Battalions, Atlantic or Pacific, and the Naval Civil Engineering Laboratory (NCEL). Once the study has been conducted, prepositioning of Rapid Runway Repair material, equipment and storage areas should be funded and be brought to the sight. RRR material availability and equipment availability matrixes should be kept on file and updated as material and/or equipment is used or put out of service, see Tables 4.6 and 4.7 for examples.

Storage facilities must be considered when developing the equipment and material requirements. Various material and equipment can not be stored outside, require refrigeration or are hazardous in nature. All materials will have to be carefully containerized, checked and monitored closely.

Table 4.6. RRR MATERIAL AVAILABILITY MATRIX FORMAT

MATERIAL TYPE	STOCK	REQUIRED	SHORT FALL	ORDER NO
<u>CRUSHED STONE REPAIR:</u>				
Ballast Rock				
Stone Fill:				
Crushed Stone:				
<u>FOD COVER:</u>				
FRP Mats				
AM-2 Mats				
Precast Concrete Slabs				
<u>SPALL REPAIR</u>				
Regulated Set Cement:				
Pea Gravel:				
<u>REGULATED SET CONCRETE REPAIRS:</u>				
Regulated Set Cement:				
Sand:				
Aggregate:				
<u>HES CONCRETE: PERMANENT REPAIRS:</u>				
HES Cement:				
Sand:				
Aggregate:				

(COMCBPAC/COMCBLANT OPLAN 9000, 1990)

Table 4.7 RAPID RUNWAY CESE AVAILABILITY MATRIX

EQUIPMENT TYPE	STATION	CONTRACTOR	NMCB	REQUIRE	SHORT FALL
LOADERS					
DOZERS					
DUMPS					
GRADERS					
VIB ROLLER					
TRAILER					
TRACTOR					
2.5 T TRUCKS					
FUEL TRUCK					
WATER DIST					
SWEEPER					
MAG SWEEPER					
LIGHT PLANT					
COMPRESSOR					
FORKLIFT					
400 GPM PUMP					
CRETEMOBILE					
TOTALS:					

(COMCBPAC/COMCBPAC OPLAN 9000, 1990)

Dispersal Operations

Dispersal is the relocation of forces, equipment, or materials for the purpose of increasing survivability. Dispersal activities include identifying dispersal locations, assets and methods; loading vehicles with equipment, materials, and fuel; and organizing convoys to preposition civil engineering support equipment (CESE) and material at dispersal sites (COMCBLANT/COMCBPAC OPLAN 9000,1990,C-I-1/2) .

- a. CESE Guidance - Dispersal area should be 1,000 feet from runways/taxiways, parking aprons, hangars, POL facilities, command post, communication stations or ordnance areas. Utilize natural cover such as ditches and hillsides, improved by constructing berm, trenches and sandbags. Sites should be accessible in inclement weather and consider mud, snow and icy inclines prior to selecting sites.
- b. Personnel Guidance - Areas should be selected away from bomb impact

areas. Utilize natural cover improved by constructing trenches, bunkers, berms or under equipment.

c. Material Guidance - Preposition material near runway to minimize MOS repair time.

Base Denial

Denial plans should be established to make the area unusable to enemy or hostile factions. Denial plans include destroying utility systems, tearing up transportation modes and making facilities unsafe/unusable. The best way to accomplish this plan is by reversing the recovery contingency plans.

CHAPTER 5

DAMAGE ASSESSMENT

General Concept

Before any repairs can be accomplished following a disaster incident, it is essential that an effective damage assessment operation be completed. Damage repair teams must know what specific areas are damaged, the extent of the damage, and the approximate repair estimate. Initial damage reports may be made by airborne aircraft, flight line personnel, security police, fire department personnel and the public. An initial estimate of damage can be obtained by observations from good vantage points in specified areas. A more detailed assessment of damage requires the dispersal of damage assessment teams (DATs) to evaluate specific damage. A complete listing of facility repair priorities, following the guidance provided previously, must be established.

The area prioritization in general will be:

- a. Runways and taxiways, aircraft maintenance, reloading, sortie generation and refueling areas.
- b. Pier and port facility areas.
- c. Base command and control, and communications facilities.
- d. Key utility substations or facilities.
- e. Medical and decontamination facilities.
- f. POL storage and distribution facilities.
- g. Other logistical support facilities.

Damage Assessment Techniques

The damage assessment operation should be conducted in a two-phase evolution: initial reconnaissance and detailed damage assessment. In Phase I,

the DATs mobilize to conduct an initial gross assessment of damage from pre-designated or assigned areas of the station to quickly locate areas of damage and unexploded ordnance (UXOs). The results of this preliminary survey helps the ECC quickly direct the assessment teams to those areas requiring detailed damage assessment. In detailed damage assessment, Phase II, the DATs are dispatched or reassigned to areas requiring more detailed damage assessment via a route directed by the ECC.

Initial Damage Reconnaissance (Phase I) As stated, the purpose of Phase I, initial reconnaissance, is to quickly assess the environment to identify the areas of damage. Precise damage locations or extent is not expected because most of the Phase I observations may be made at some distance from the damaged area. The initial reconnaissance should be made from preselected observation posts by personnel trained in damage and pattern recognition. Examples of observation posts are the control tower, airbase point defense positions, aircraft shelters, airborne aircraft, or other specific points that provide facility vantage points. When hostilities/natural disaster are imminent, personnel should be assigned to the vicinity of all unmanned observation posts. After the incident, these individuals make visual observations and report the size and location of all damage as quickly and accurately as possible. Reporting procedures will depend on preincident instructions and available communications to the ECC.

Detailed Reconnaissance (Phase II). Phase II damage assessment may be extremely hazardous and time consuming, depending on the level of damage. DAT assignments should be made prior to the incident. To ensure the DATs survive the incident and are capable of deploying after the event has ended, the DATs should be dispersed to protected locations on the base before the event. Immediately after the incident, the ECC will relay damage assessment

instructions to each team. This message will most likely be transmitted via radio and will include initial reconnaissance information, assigned damage assessment routes, and any special instructions necessary to define the task.

DAT Reconnaissance Methods

Manual Damage Assessment. During manual damage assessment, the base is surveyed by DATs on foot. Team members will walk specified areas of the assigned area identifying and locating damage and unexploded ordnance (UXO). If possible, measurements are made by pacing distances from known locations, by estimating damages and by visually determining UXO identifying features. Although manual damage assessment is the most accurate damage assessment method, it is extremely time consuming and exposes team members to hazardous elements.

Vehicle Damage Assessment. Whereas manual damage assessment is a slow and potentially hazardous method, vehicular damage assessment offers increased speed and protection to the DAT. With vehicular damage assessment, an armored or hardened vehicle could be used to transport the team between damage and UXO locations which provides protection from hazards. These benefits are not provided without some cost to system effectiveness. Normal visibility from inside the vehicle is restricted and any vehicle hardening can further restrict visibility. This means that the DAT must locate and identify damage and UXOs from greater distances, possibly with binoculars. This limitation contributes to errors in reporting the size, position, and identification. The accuracy of this method will vary from person to person based on distance, weather conditions, time of observation (night or day) and other human factors, such as fatigue or fear. The best travel route will be along any pavement centerline. This route gives equal visibility and allows team

personnel to visually sweep the area with binoculars forward and to the sides of the vehicle. Obviously, a meandering path may have to be taken to avoid damage. Because the vehicle is used for protection, the team members should remain in the vehicle except for extreme cases where the level of damage has destroyed the reference system. In this case, the members would have to measure the distance from the closest remaining reference marker to assure the required accuracy.

Vertical Transportation. Whereas manual and vehicle damage assessment is accomplished from the ground, vertical transportation assessment is conducted from the air. When available, this method provides expedience but limits the accuracy of information without vertical reference points.

Types of Damage Assessment

Damage assessment activities can be separated into two distinct areas, airfield and facility damage assessment. Airfield damage assessment involves the assessment of damage to runway, taxiway, and aircraft parking apron surfaces. Facility damage assessment includes assessment of damage to all other remaining area facilities and utilities. Resources permitting, all damage assessment operations should be conducted simultaneously. To shorten flight/pier operations restoration time, the damage assessment operations and Explosive Ordnance Disposal (EOD)/UXO operations should be accomplished jointly. Thus, the airfield/pier damage assessment teams are organized to conduct ground assessments of UXO or bomb damage. As EOD personnel will have additional responsibilities other than damage assessment, the base damage assessment teams (BDAT) may not be directly supported by EOD.

Airfield Damage Assessment

Airfield damage assessment is the vital first step toward restoring an operational runway after an emergency. During damage assessment, the locations, types and quantity of UXO, and airfield damage are determined and reported to the ECC. The ECC uses this information to determine and estimate potential minimum operating strips (MOS). The potential MOS list with repair estimates are relayed to the operational command center which selects the minimum airfield operating strip (MAOS) that must be cleared and repaired in order to restore flight operations. The MAOS consists of the MOS and the supporting taxiways, access routes, and parking aprons needed to launch and recover aircraft. Since major airfield recovery tasks cannot be started until airfield damage assessment and MAOS selection are complete, speed and accuracy during damage assessment are essential.

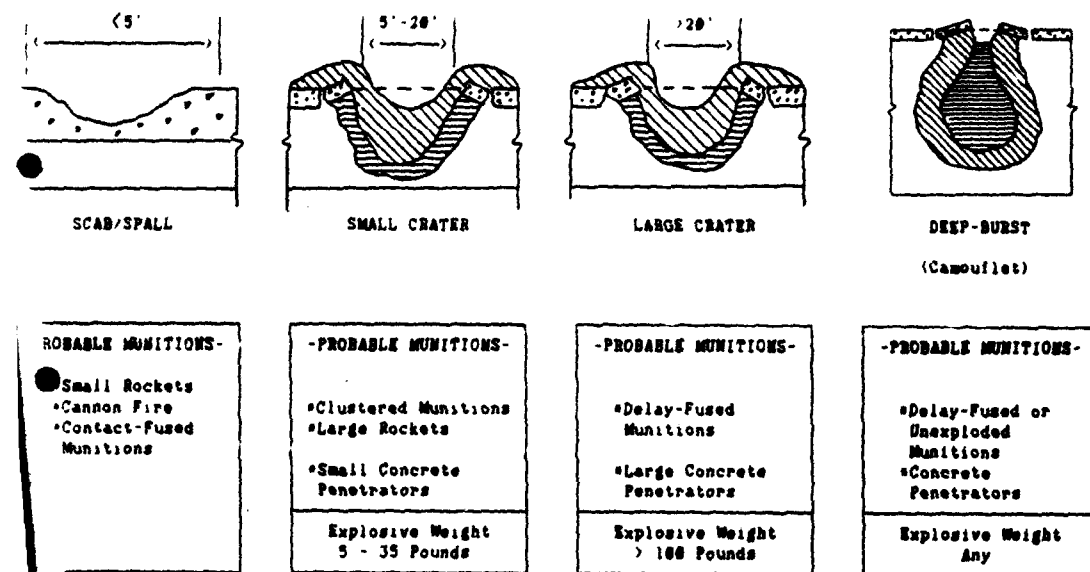
The airfield damage assessment teams (ADATs) should normally consist of one EOD technician and two Public Works/SEABEE representatives to aid the assessment, record information and communicate data to the ECC. The individual ADAT members should work together to locate and identify UXO and pavement damage, to include the location and size of craters, spall fields, and other runway damage. The EOD expertise is needed to accurately identify and classify UXO and oversee the activities of the ADAT in the hazardous UXO environment. The ranking member of the team will normally be the team leader. However, regardless of rank, the EOD technician takes charge and directs the team's movement through areas of UXO.

Pavement Damage Types

There are two types of airfield pavement damage which may occur as a result of an airfield attack. Pavement craters result from aircraft bomb

r missiles exploding damaging both the airfield pavement surface and the
 rface. Pavement spalling results from aircraft cannon fire, bomb
 nel, or exploding area denial mines damaging only the airfield pavement
 ce. Figure 5.1 provides typical pavement damage categories and probable
 ions which caused the damage.

Figure 5.1 Pavement Damage Categories (20th NCR, 1993, 1.3-8)



field Damage Reporting

the damage is assessed, it must be recorded and immediately
 to the ECC for damage plotting and MOS estimated and selected, see
 for details. The speed of reporting depends on the complete
 ing of the information being relayed and strict adherence to radio
 by the DAT personnel. Reported damage will be kept for
 n purposes when the DAT returns to the command center.

DMCBPAC OPLAN 9000, 1990).

identification code or call sign

me of report

nage assessment data

(1) Individual Damage Data Reporting. The format for reporting damage assessment data for individual craters, UXO, or spalls is:

T-YYYY-Z-MMM-D-000

(a) T is the type of damage being reported:

"C" - Crater

"X" - UXO

"S" - Spalls

(b) YYYY is the distance from the end of the runway/taxiway or other fixed point.

(c) Z denotes whether the damage is left or right of the surface centerline.

"R" - Right

"L" - Left

(d) MMM denotes the distance to the center of the damage from the centerline.

(e) D denotes the diameter of the crater or indicates the size of a crater with a UXO inside.

(f) 000 denotes the apparent diameter size of the crater.

(2) Area Data Damage Reporting. Spall damage and UXO damage may cover a large area, making the format for individual craters and spalls cumbersome and time consuming. The format for area damage is as follows:

T-YYYY1-Z1-MMM1-W-PPP1-F-YYYY2-Z2-MMM2-W-PPP2-N

(a) T denotes damage type, see above for codes.

(b) YYYY denotes distance down a surface area. YYYY1 denotes the distance for the starting point of the damage. YYYY2 denotes the distance for the ending point of the damage.

(c) Z denotes right or left of centerline. Z1 denotes the centerline starting point position. Z2 denotes the centerline ending point position.

(d) MMM denotes the distance from the centerline. MMM1 is the distance for the starting point. MMM2 is the distance for the

ending point. Note: if a width is called the distance used is to the center of the damage.

(e) W denotes the width.

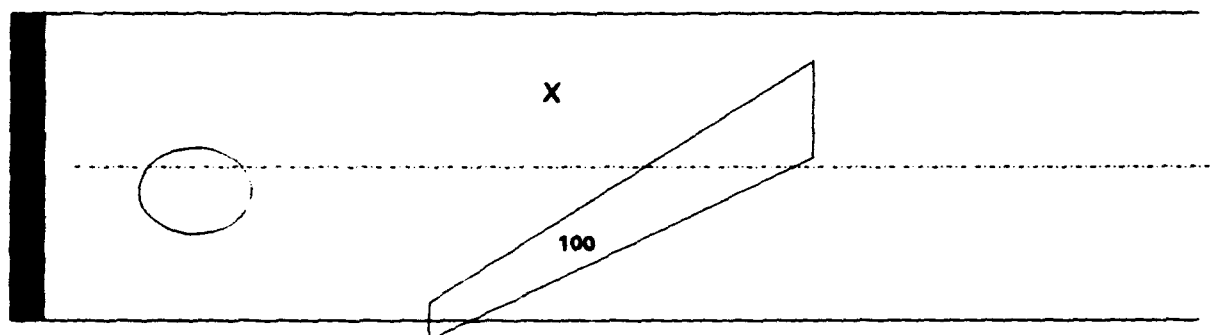
(f) PPP denotes the width in feet of the apparent damage. PPP1 indicates the width of the starting point. PPP2 indicates the width of the ending point.

(g) F denotes the beginning point of the information for the ending point of the damaged area.

(h) N denotes the number of estimated spalls or UXOs in the area.

An example is attached.

C	X	S	TYPE OF DAMAGE (C-CRATER, X-UXO, S-SPALL)
40	200	150	DISTANCE DOWN PAVEMENT
R	L	R	DIRECTION L OR R OF CENTER LINE
10	40	100	DISTANCE LEFT OR RIGHT
D		W	DIAMETER OR WIDTH
30		20	SIZE OF DIAMETER OR WIDTH
		F	FIELD IDENTIFIER
		300	DISTANCE DOWN PAVEMENT
		L	DIRECTION L OR R OF CENTER LINE
		40	DISTANCE LEFT OR RIGHT
		W	WIDTH
		60	SIZE OF DIAMETER OR WIDTH
		N	NUMBER IDENTIFIER
		100	NUMBER OF SPALLS OR UXOs



MOS Selection (COMCBPAC/COMCBPAC OPLAN 9000, 1990)

The minimum operating surface (MOS) is the smallest section of runway required for launching and recovering an aircraft. Based on the damage assessment after an attack of the air base, it is possible to select a section

of runway which requires the least apparent amount of time and effort to repair. The ECC may recommend possible MOS location alternative to the area command center but the area command center will determine its final location. Currently the minimum dimension of the MOS for fighter aircraft is approximately 50 feet by 5,000 feet long with 25 foot wide taxiways and for cargo aircraft 100 feet by 7,000 feet with 100 foot wide taxiways. The actual MOS length requirements are based on existing conditions and can be obtained from individual aircraft surface roughness charts.

A MOS may be located on the main runway, on a parallel taxiway, on an aircraft parking apron, or even on an alternate launch and recovery surface on or off base (i.e. wide, flat, straight roads). The MOS location can affect launch or recovery operations by restricting the flight approach of aircraft or by limiting air traffic control and access.

In order to get aircraft to and from a MOS, access routes are required. Access routes from aircraft shelters or parking areas to the MOS must be restored and maintained to the aircraft's minimum widths. The access route must be a smooth surface free of debris in order not to foul engines. AM-2 matting, FRP matting, or compacted crushed stone are excellent expedients which can serve to maintain and repair access routes.

The following should be considered when determining possible MOS alternatives:

a. The number and location of craters. The primary MOS should be selected in an area with as few bomb craters as possible to minimize the amount of work and time required to establish the MOS.

b. The amount, location, and severity of airfield pavement spalling. The primary MOS should be selected in an area with as few spalls as possible to minimize the amount of work and time required to establish the MOS.

c. The amount and location of UXO. The primary MOS should be selected in the area with the least amount of UXOs. As explosive ordnance disposal personnel are limited, UXOs may be a greater problem to the ECC operation than bomb craters or spalls. Therefore a more heavily damaged area may have to be selected over a less damaged one containing UXO if EOD assets are not available.

d. The amount of bomb crater and spall damage to taxiways and/or access routes to the MOS. Given several possible MOS locations with equivalent damage, the one with the least damaged access routes should be selected to minimize the total repair time of the primary MOS and access routes.

Airfield Pavement Repair Estimates

There are currently three different methods developed to determine MOS and repair times: manual, portable computer-assisted manual method, and automated method.

a. Manual Method. The manual method includes the use of 1"-100' airfield surface map, a crater template, aircraft surface roughness charts and various forms and charts to estimate repair time and quality, see Appendix E for MOS Selection Kit examples. The method is very time consuming but can be used with no electrical power. For this reason, it is recommended that this method be used as the primary method for assigning repair qualities and estimating repairs.

b. Portable Computer-Assisted Manual Method. Damage is plotted manually using crater template. A computer is used to assign repair qualities and estimates individual crater repair times. The system is still currently in the development and testing phase.

c. Automated Method. The automated method handles all plotting, repair quality and repair estimates. Data is entered directly into the computer and

information is generated on a digitized board with an associated plotter. The system is still in development.

Facility Damage Assessment

The concepts and principles used to conduct airfield damage assessment also apply to facility and infrastructure damage assessment. The specific make-up of the base DATs will depend on the type of facilities to be investigated, as well as the number of qualified personnel available. The BDATs are dispatched by the ECC to specific areas to evaluate the extent of the damage, make repair estimates, and assist in the coordination of recovery efforts and as the damage assessment is completed, assist in the repair operations. (Johnson, 1990)

The BDATs will inspect the highest priority facilities first. Following an attack or natural disaster, structures may be weakened, live electrical lines may be down, and gas lines may be ruptured releasing explosive vapors. These potentially hazardous conditions require that the BDATs be very careful in their initial evaluation. In many cases, the BDATs will be the first persons venturing into an area following an incident. Consequently, the teams must ensure that the area is safe before beginning assessment activities. For example, if a building looks unsound, the team should not enter to make more specific observations until a determination is made that the structure will not collapse. Broken electrical wires present another hazard that should be avoided by team members. Potentially life-threatening situations are reported immediately so that crews can be dispatched to isolate the danger. The BDATs next responsibility is to determine the feasibility of repairing the facility. Those facilities which are beyond repair should be considered for demolition.

If the structure or utility does not present an immediate danger, it may be left for destruction at a later time.

In general, the BDATs should have at least one utility and one structural representative. The BDATs should be manned by experienced, Public Works Department civilian/military personnel. The minimum number of persons necessary to evaluate damage, normally two, will be assigned to each team.

Facility Damage Reporting

The actual repair of damaged facilities usually cannot be started immediately upon its discovery; therefore, the determination of the damage extent as well as the personnel, materials, and equipment necessary to complete the repair can involve some time. It is most important for the BDATs to rapidly survey the damaged areas to determine the full extent of the damage to mission essential facilities and utilities. This information must be reported to the ECC in sufficient detail to allow the ECC OIC to evaluate and prioritize his technical support and repair team responses.

Facility/infrastructure data cards should be prepared and include the following information:

- a. Identification code or call sign
- b. Time of report
- c. Damage assessment data

(1) Structural Component Damage - Damage reported to exterior walls, frame (general), frame members and connections, roof and floors, etc.

(2) Non-structural Components and Building Systems - Damage reported to interior walls, partitions, stairs, mechanical supports, elevators, glass/glazing, plumbing, electrical, mechanical systems, etc.

(3) Site Component - Damage reported to trees, soil, paving, landscaping, walkways, parking areas, etc.

(4) Geological Problems Noted - Note any settlement, liquefaction, landslide, faulting or other foundation and geological problems.

(5) Degree of Damage - Determination of hazardous condition, repairability, habitability, safety, re-inspection, etc.

(6) Dollar Estimate of Damage - Estimation of percentage facility damage to the components and total damage.

(7) Supporting Documents - Provide supporting data such as photos, plans and sketches with a short narrative description.

Unexploded ordnance (UXO) that may influence operations must also be accurately located, reported, and recorded in sufficient detail for the ECC to determine the risk to operations. All UXOs within 300 feet of repair operations or aircraft operating surfaces must be identified. Holes of entry for subsurface UXO must also be reported. Report details should include:

- (1) Location
- (2) Size
- (3) Color
- (4) Fuse type and condition
- (5) Quantity
- (6) Shape
- (7) Distinctive markings

Base Repair Estimates

A very important tasking for the BDATs is the repair estimate. Repair estimates should include the required labor, materials, and equipment. The accuracy of these estimates will be crucial if the ECC is to do its best in

allocating limited repair personnel, material, equipment and funding resources.

CHAPTER 6 RAPID RUNWAY REPAIR ORGANIZATION

General Concept

The mission of the Rapid Runway Repair (RRR) operations is to repair adequate airfield pavement to launch or recover mission essential aircraft. Airfield pavement includes runways, taxiways, and aircraft parking aprons. In order for the Emergency Command Center (ECC) organization to direct its resources to the most critical requirements first, the following should be the established airfield repair priorities:

- a. Establishment of a primary minimum operating strip.
- b. Repair of adequate taxiway and aircraft parking apron pavement to allow aircraft access on or off the primary minimum operating strip (MOS), commonly known as the minimum airfield operating strip (MAOS).
- c. Establishment of secondary, redundant MOSs and MAOSs.
- d. Permanent repairs to the primary MOSs, secondary MOSs, taxiways and parking aprons.

RRR operations should be considered one of the prime missions of the ECC after an incident and thus should apply its full resources to accomplish the RRR mission. However, due to the limited amount heavy equipment and civil engineering support equipment (CESE) available, the ECC should be prepared to accomplish base damage repair simultaneously. After the RRR mission is complete, all of the center's available construction assets can be applied to the repair of non-airfield facilities.

Emergency Operations Phase Requirements

RRR operations can be broken down into several distinct phases with each phase containing several supplements. These phases are:

a. Survival Phase.

- (1) Review RRR Plan.
- (2) Coordinate with Air Operations and Fire Department for Airfield procedures and support.
- (3) Test communications.
- (4) Inspect stockpiles and local routes. Inventory quantity of material available and report inventory to ECC. Disperse materials, if time permits, and restock mineral products as close as possible to runways and taxiways.
- (5) Inventory FOD cover material. Advise ECC of current inventory.
- (6) Reconnoiter airfield complex. Install additional runway and taxiway markers to allow for easy damage assessment recording and reporting.
- (7) Construct MOS edge and "distance to go" markers.
- (8) Check or construct an expedient runway lighting system.
- (9) Prepare CESE for operations. Load and disperse equipment.
- (10) Disperse personnel.

b. Assessment Phase. See damage assessment chapter for details,
Chapter 5.

- (1) Conduct damage assessment
- (2) UXO Sweep/Explosive Ordnance Disposal
- (3) MOS Estimate/Selection/Layout

c. Recovery Phase.

- (1) RRRT Mobilization
- (2) Crater Repair Operations
- (3) Spall Repair Operations

- (4) Runway Clearing/Sweeping
- (5) MOS Marking
- (6) MOS Lighting
- (7) Installation of Mobile Arresting Gear

d. Airfield Restoration. This phase provides permanent repairs to airfield facilities. Permanent repairs should not be conducted until:

- (1) Primary and several secondary MOSs established.
- (2) Sufficient taxiway and parking apron is available.
- (3) Threat of airfield attack is no longer imminent.

RRR Organization

Proper organization is critical to maintaining command and control and efficiently executing RRR operations. Non-augmenting and augmented RRR organizations and plans must be developed. RRR training and exercises should be conducted to execute this organization. The organization should field as many hauling, runway clearing and crater repair crews as the on-site CESE, material and personnel will support. As a result, each member of the RRR organization should understand the entire RRR operation, organizational function and assigned task accomplishment.

Emergency Command Center (ECC) Oversees and directs the overall Station recovery actions including facilities operations.

NMCB RRR Command Center. Oversees and directs efforts of the Battalion/Detail RRR organization. Will report to or be part of the Station ECC per operational control direction.

Damage Assessment Team (DAT). Responsible for reconnoitering and surveying the airfield and station facilities to identify, locate, report, and assess the extent of attack damage. See Chapter 4 for detailed DAT process.

Minimum Operating Strip (MOS) Team. Responsible for plotting and recording DAT information and make recommendations and estimations to the ECC OIC at prospective MOSs.

RRR OIC/AOIC. Directs the in-the-field RRR operations.

Crater Repair Crews. Responsible for removing damaged pavement surrounding or in the crater and backfilling the crater. Includes engineering capability to determine actual crater diameter vice apparent crater diameter, as required.

Hauling Crew. Responsible for stockpile operations and hauling crushed stone or ballast rock fill for use in backfilling craters.

Runway Clearing Crews. Responsible for clearing and sweeping the runway of debris.

Crater Support Crew. Provides refueling and water distribution (for compaction) services to crater repair crews. Provides mechanic/equipment repair services to crater repair, hauling, and runway clearing crews.

Spall Repair Crews. Responsible for repairing bomb and cannon spall damage.

FOD Cover Crews. Responsible for installation of FRP mats, concrete slabs or regulated set/high early strength concrete utilizing a cretemobile. Personnel from other crews should be available to form or augment the FOD cover crews.

Minimum Operating Strip (MOS) Marking Crew. Marks the perimeter of the MOS to delineate from the rest of the runway.

MOS Lighting Crew. Sets up expedient airfield lighting system for the MOS and repairs the existing runway lighting system.

Mobile Aircraft Arresting System (MAAS) Crew. Installs and sets up a mobile aircraft arresting system.

The assignment of civil engineering support equipment (CESE) and other RRR equipment is dependent on availability, personnel and RRR organizational structure. A major constraining factor in the RRR organization is CESE availability. Table 6.1 provides the recommended CESE listing for NMCB air detachment or small detachment.

Table 6.1. NMCB Air Detachment or Small Detachment CESE

RRR CREW	CESE ASSIGNMENT	QUANTITY
RRR OIC/AOIC	3/4 T UTILITY TRUCK	1 EA
DAT	ARMORED VEHICLE	1 EA
HAULING CREW	5 T TRACTOR W/35 T TILT DECK ECC:060701/086231	1 EA
	10 T DUMP TRUCKS ECC:064401	2/CREW
	5.5 CY WHL LOADER ECC:453152	1 EA
RUNWAY CLEARING CREW	GRADER ECC:442001	1 EA
	TRACTOR/SWEEPER ECC:487501	1 EA
	MAGNETIC SWEEPER ECC:571011	1 EA
CRATER REPAIR CREW	LOADER ECC:453031/453152	1/CREW -
	DOZER ECC:485021	1/CREW
	COMPACTOR, VIBRATORY ECC:463523	1/CREW
	FLOODLIGHT TRAILER ECC:511022	1/CREW
	COMPRESSOR, 250 CFM ECC:313501	1/CREW
SPALL REPAIR CREW	2 1/2 T CARGO TRUCK	1/CREW
CRETEMOBILE CREW	UTILIZE CRATER REPAIR CREW CESE ECC:VARIOUS	
	CRETEMOBILE ECC:242501	1/CREW
	RT FORKLIFT OR CRANE	1/CREW
	FORKLIFT	1 EA
MOS LIGHTING CREW	2 1/2 T CARGO TRUCK ECC:036031	1/CREW
MOS MARKING CREW	2 1/2 T CARGO TRUCK ECC:036031	1/CREW
MAAS INSTALLATION CREW	5 T TRACTOR ECC:064512	1/CREW

(COMCBPAC/COMCELANT OPLAN 9000, 1990)

Damage Preparation

Crater Preparation

Crater repairs consist of clearing debris from the crater, removing damaged pavement, backfilling the crater and installing a Foreign Object Debris (FOD) cover. The debris clearing, pavement removal, and backfilling procedures are generally the same regardless of the FOD cover method utilized. Crater preparation is required prior to the installation of the FOD cover.

Each FOD cover method might require various preparation degrees and compaction. A typical preparation is as follows:

- a. Clearing debris from the airfield.
- b. Determining actual verses apparent crater diameter.
- c. Removal of upheaval pavement.
- d. Removal of large ejecta from inside the crater.
- e. Backfilling the crater with ballast rock, fill and clean ejecta.
- f. Backfilling the crater with crushed stone.
- g. Compacting the crushed stone.

Spall Preparation

Spalling creates large areas of the runway unusable due to the excessive surface roughness. Spall preparation is required prior to filling spall area.

- a. Clearing debris from the airfield.
- b. Removal of all water and/or ice in cavity.

Foreign Object Debris (FOD) Cover Methods

There is a debate over the optimum FOD cover to be utilized to repair aircraft road surfaces, because each FOD cover system has advantages and disadvantages. No optimum repair method exists and a "menu" approach is recommended to determine the repair method(s) to be used. The actual method combination will depend on the materials, personnel and CESE available, as well as the weather conditions. The methods described are only provided for a basic understanding of the method and installation procedures. The Naval Construction Training Center FOD Cover Instructional Course and the Air Force Engineering and Service Center Course materials provide information on a much greater detail.

Crushed Stone Without a FOD Cover, Figure 6.1

The FOD cover consists of compacted crushed stone over a compacted subbase. This method should only be used if none of the other FOD cover methods are feasible or time does not permit a more permanent repair to be conducted. "Crushed Stone" refers to a well graded, high quality crushed stone meeting gradation, hardness, and abrasion requirements of NAVFAC GUIDESPEC NFGS-02233, Graded Crushed Stone Aggregate Base Course for Flexible Pavement. Repair operations should take the following steps¹:

- (1) Clear debris and determine upheaval.
- (2) Remove upheaval after determination is made as to extent of damaged area.
- (3) Place geotextile fabric in the bottom of crater, if available. Begin fill procedures using stone fill or ejecta, not greater than 12 inches in size. Crater should be filled and compacted to approximately 18 inches below grade. Compaction should be completed with at least two or three passes of a bulldozer or grader.
- (4) Place a geotextile fabric, if available, on top of the debris or ballast rock to prevent water inflow into the aggregate fill and prevent the higher quality stone from settling into the ejecta or ballast rock.
- (5) Backfill in two 10-12 inch lifts using crushed stone.¹ Pack first lift to 95% and the second to 100% in accordance with ASTM D1557.
- (6) All excess material should be scraped off and the crater level should be flush with the surrounding pavement.

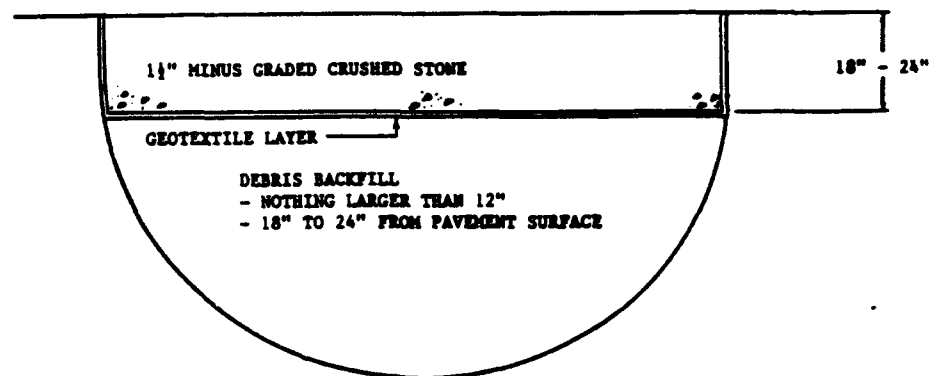
¹Repair sequence is established using 20th NCR Student Handbook, CBLANT/CBPAC OPLAN 9000 and experience in method placement from military tour in Iceland. Other subbase methods may be used, but will not be provided, see references for further details.

(7) Conduct a final surface roughness check to ensure that the surface does not exceed tolerances. If it is not within tolerances, the repair is unacceptable. Repair the unacceptable areas using the procedures outlined above.

(8) Sweep around the crater and continue sweeping the airfield until the pavement surface is free of all debris.

(9) A permanent repair using high early strength concrete should be made as soon as flight operations will allow. Until this takes place the patch should be inspected at a minimum of every 50 passes.

Figure 6.1 Crushed Stone FOD Repair

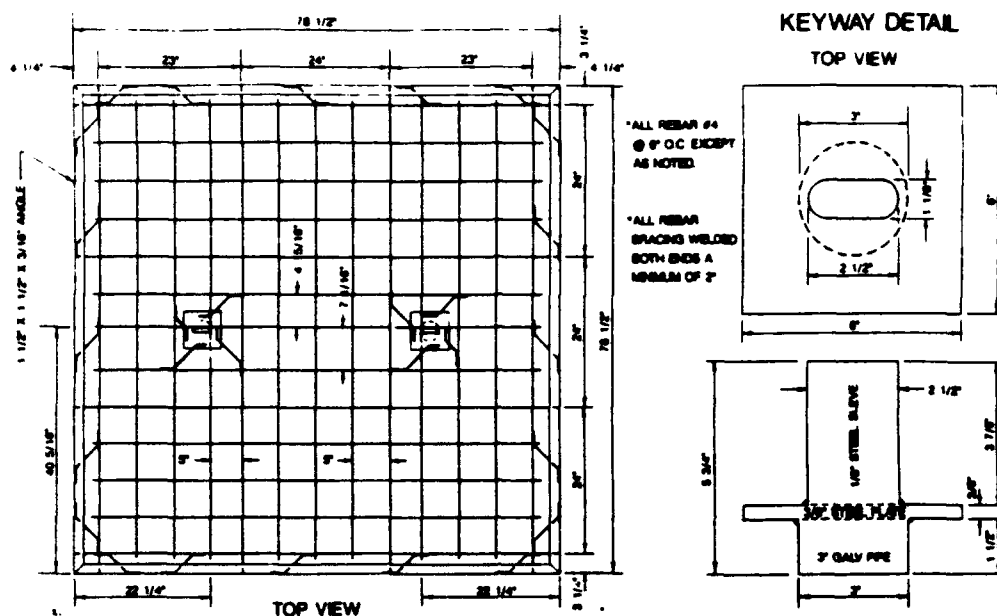


Precast Concrete Slabs, Figure 6.4

The precast concrete slab FOD cover method consists of precast concrete slabs (2m x 2m x 15cm) over a compacted stone subbase. The method is preferred by the United States Air Force, Europe. The advantages of this method include low cost and long shelf life. The disadvantages of this method include equipment and labor intensive.

The slabs are formed and poured prior to the attack and stored on-site. Concrete steel design diagram is shown in Figure 6.2.

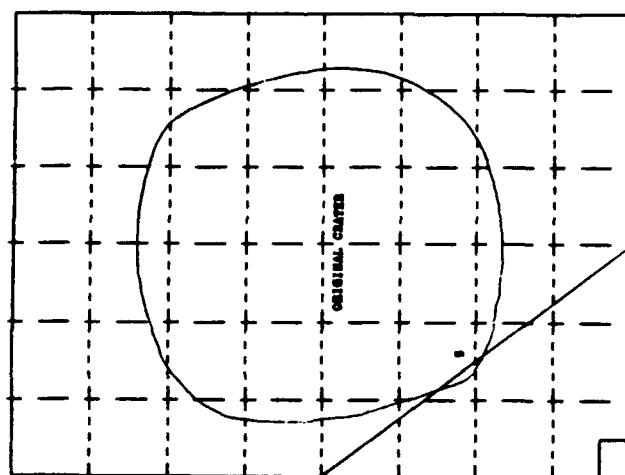
Figure 6.2 Precast Panel Form Plan and Details (20th NCR, 1993, 1.62-2)



Repair operations should take the following steps²:

- a. Clear debris and determine upheaval. Mark out for a whole number of slabs in order that no slabs will be required to be cut to install cover, see Figure 6.3.

Figure 6.3 Typical Mark Out and Removal Plan (20th NCR, 1993, 1.62-4)



²Repair sequence is established using 20th NCR Student Handbook, AFESC Volumes I and II, CBLANT/CBPAC OPLAN 9000 and experience in method placement from military tour in Iceland. Other subbase methods may be used, but will not be provided, see references for further details.

b. Remove the upheaval after determination is made as to extent of damaged area.

c. Place geotextile fabric in the bottom of crater, if available. Begin fill procedures using stone fill or ejecta, not greater than 12 inches in size. Crater should be filled and compacted to 10-12 inches below grade mark.

d. Place a geotextile fabric, if available, on top of the debris or ballast rock to prevent water inflow into the aggregate fill and prevent the higher quality stone from settling into the ejecta or ballast rock.

e. Backfill with 3/8 inch gravel or crushed stone (NAVFAC Guidespec NFGS-02233, Graded Crushed Stone for Flexible Pavement) to 4 to 5 inches thick. Pack lift to 100% in accordance with ASTM D1557.

f. Screed or skim crater to 5 1/2 inches below grade level. Level area with sand.

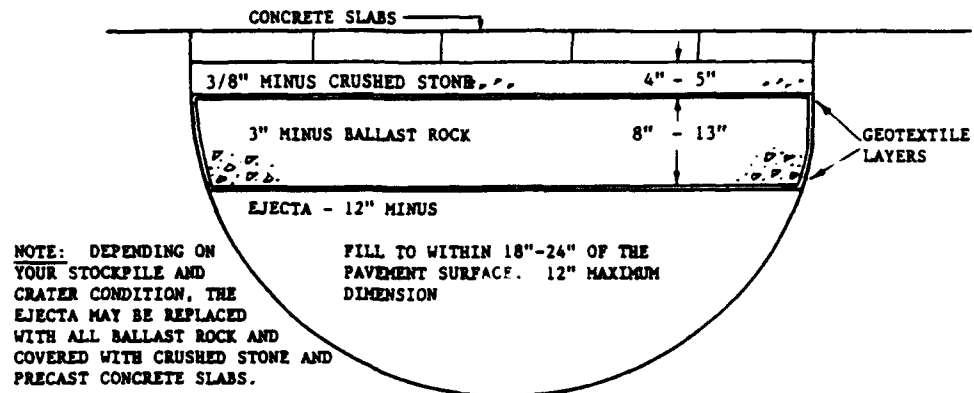
g. Place and install slabs using a screed beam or other lifting device using the slab built in key ways. Settle the slabs by rolling heavy equipment over them.

h. Conduct a final surface roughness check to ensure that the surface does not exceed tolerances. If it is not within tolerances, the repair is unacceptable. Repair the unacceptable areas by repeating procedures f and g outlined above. The final repair should look like Figure 6.4.

i. Sweep around the crater and continue sweeping the airfield until the pavement surface is free of all debris.

j. A permanent repair using high early strength concrete or asphaltic-concrete should be made as soon as flight operations will allow. Until this takes place the patch should be inspected at a minimum of every 50 passes for concrete failure and/or upheaval of slabs.

Figure 6.4 Precast Slab FOD Repair (20th NCR, 1993, pg 1..6-3)



Regulated Set Concrete Utilizing a Cretemobile, Figure 6.6

The regulated set concrete utilizing a cretemobile FOD cover method consists of a pore of regulated set or high early strength (HES) concrete using a cretemobile over a compacted stone base. The repair is a permanent repair. Table 6.2 provides the recommended HES mix design for airfield pavement repairs:

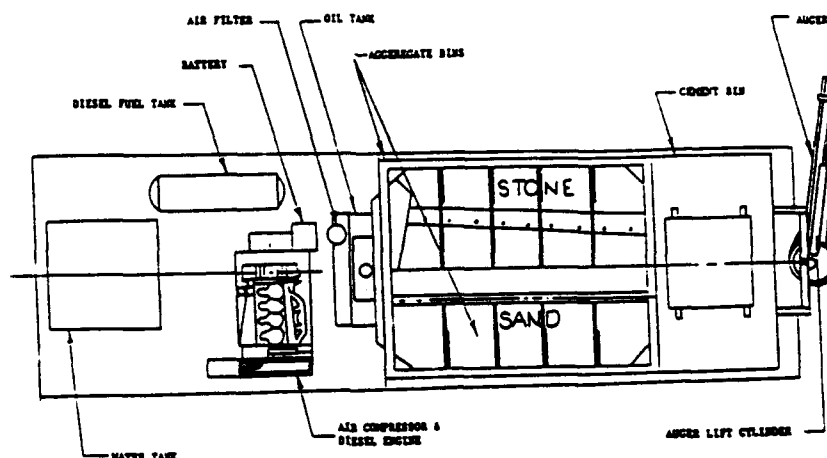
Table 6.2 Recommended HES Mix Design (CBPAC/CBLANT OPLAN 9000, 1990, C-VI-C-1/2)

ITEM	SPECIFICATION	AMOUNT/TYPE
CEMENT	ASTM C150 TYPE III	752 LBS (8 BAGS)
COARSE AGGREGATE	ASTM C33 NO. 57	1900 LBS SATURATED - SURFACE DRY ABSORPTION - 0.6 % SPGR - 2.62 UNIT WEIGHT - 107 LB/CF
FINE AGGREGATE	ASTM C33	916 LBS SATURATED - SURFACE DRY ABSORPTION - 0.6 % FM - 2.80 SPGR - 2.62
WATER	POTABLE	32.5 GALLONS
WATER REDUCER	ASTM C494 TYPE A,E,F,G	37.6 OZS - MASTER BUILDERS POZZOLITH LL960
ACCELERATOR	ASTM C494 TYPE C	120.0 OZS - MASTER BUILDERS POZZOLITH 122-HE
AIR ENTRAINER	ASTM C260	TEMPERATURE DEPENDENT - OPTIONAL

A cretemobile is a mobile concrete unit which carries unmixed materials (sand, cement, aggregate, water, additives) to the site where it mixes the

concrete to design specifications. The unit may be resupplied for continuous concrete manufacture, if necessary. A typical cretemobile is shown in Figure 6.5.

Figure 6.5 Top View of Cretemobile (20th NCR, 1993, 1.65-7)



Repair operations should take the following steps³:

- a. Clear debris and determine upheaval. Unlike the precast method, the only restriction for mark out is the extent of damage.
- b. Remove upheaval after determination is made as to extent of damaged area.
- c. Place geotextile fabric in the bottom of crater, if available. Begin fill procedures using stone fill or ejecta, not greater than 12 inches in size. Crater should be filled and compacted to the 18-24 inches below grade. Compaction should be completed with at least two or three passes of a bulldozer or grader.
- d. Place a geotextile fabric on top of the debris or ballast rock to prevent water inflow into the aggregate fill and prevent the higher quality

³Repair sequence is established using 20th NCR Student Handbook, CBLANT/CBPAC OPLAN 9000 and experience in method placement from military tour in Iceland. Other subbase methods may be used, but will not be provided, see references for further details.

stone from settling into the ejecta or ballast rock, if available.

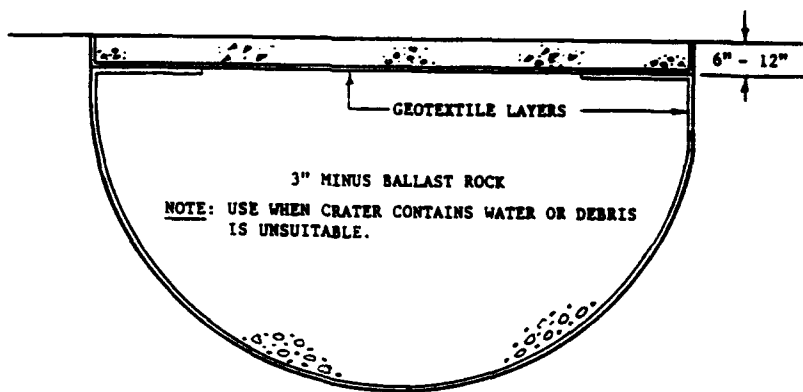
e. Backfill in using 10-12 inch lifts of either 3" minus ballast rock or crushed stone to 6-12 inches below grade. Compact last lift to 100%. Place a geotextile on top, if available.

f. Pour HES or Regulated Set Crete using the cretemobile. Finish concrete to meet surface roughness required. Figure 6 provides finished product appearance.

g. Sweep around the crater and continue sweeping the airfield until the pavement surface is free of all debris.

h. Even though the cretemobile method is a permanent repair the area should be inspected at a minimum of every 100 aircraft passes after the initial 50 passes.

Figure 6.6 RSC Utilizing a Cretemobile FOD Repair (20th NCR, 1993, 1..6-2)



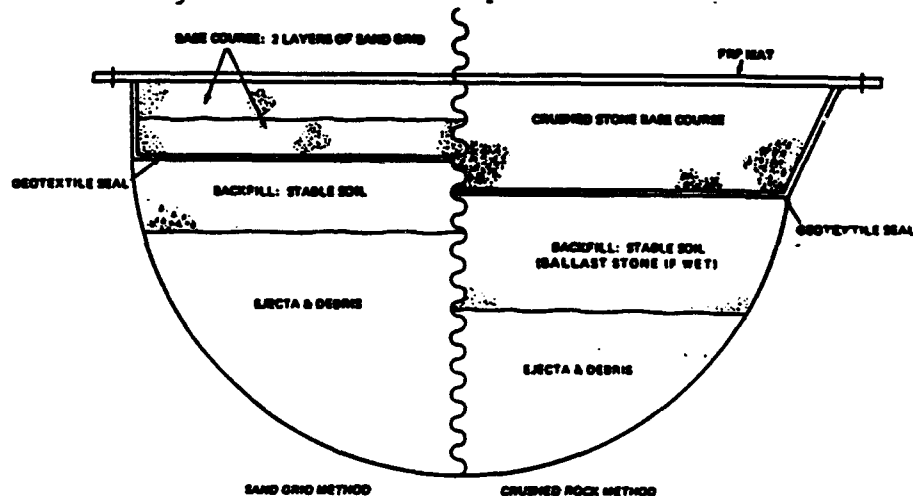
Fiber Reinforced Polyester (FRP) Matting, Figure 6.7

The FOD cover consists of fiber reinforced polyester matting over a compacted stone base. Repair operations should take the following steps⁴:

⁴Repair sequence is established using 20th NCR Student Handbook, AFESC Volumes I and II, and CBLANT/CBPAC OPLAN 9000. Other subbase methods such as sand grid, choked-ballast and cheap-ballast methods may be used, but will not be provided or presented. See References for further details.

- (1) Perform Steps 1-6 of Compacted Crushed Stone Method
- (2) Assemble mats adjacent to the site and tow to crater.
- (3) Cover crater and secure mats to surface.
- (4) Conduct a final surface roughness check to ensure that the surface does not exceed tolerances. If it is not within tolerances, the repair is unacceptable. Repair the unacceptable areas using the procedures outlined above.
- (8) Sweep around the crater and continue sweeping the airfield until the pavement surface is free of all debris.
- (9) A permanent repair using high early strength concrete should be made as soon as flight operations will allow. Until this takes place the patch should be inspected at a minimum of every 50 passes.

Figure 6.7 FRP FOD Repair



AM-2 Matting

The FOD cover consists of a steel matting over a compacted stone base. AM-2 matting is to be only used on taxiway, ramp areas and/or expeditionary airfields. It is unsuitable for use on runway repairs. The same placement methods used for FRP mats are used for AM-2 matting.

Spall Repair

The FOD cover to repair spalled areas is primarily a using rapid setting cements and pea gravel over existing runway surfaces. Current Naval Civil Engineering Laboratory (NCEL) recommendations to repair spall areas is to use a combination of rapid setting cements and pea gravel. Recommended rapid setting cements are⁵:

Regulated Set Cement (REG SET)

Magnesium Phosphate Cement (SET 45)

High Early Strength Type Cement (PYRAMENT)

The spall should be filled by a combination of pea gravel and cement grout. The spall must be floated or trowled to produce a smooth, flush repair surface. Ensure manufacturer's instructions are read prior to repairs, paying particular attention to temperature and weather constraints.

Airfield Marking

Airfield marking is the identification of the MOS. Marking procedures include the obliteration of existing marking which conflict and installing new markings on the MOS. Edge markers are used to identify the boundaries of the MOS. If possible, a centerline should be shown as a painted broken of the MOS. All existing runway markings that could cause confusion regarding the MOS location should be eliminated by painting over them. Distance-to-go markers should also be installed.

There currently is no standard MOS marking system. Once the system is developed, procured, and prepositioned, improvised systems will be utilized. Edge markers can be constructed of reflective painted, plywood structure,

⁵Repair method and recommendations are established using 20th NCR Student Handbook and CBLANT/CBPAC OPLAN 9000. See references for further details.

secured with sandbags. Distance-to-go markers will be similarly constructed. Improvised systems should be constructed during the survival phase if time and materials permit.

Runway Lighting Systems

Power must be supplied to the existing or expedient runway light system. The primary and back-up feeder for airfield lighting must be laid out and understood. Emergency back-up generators with one day fuel supply, at a minimum, should be part of the lighting system circuitry. Airfield lighting controls should be capable of being controlled from either the control tower or directly from the lighting vault. Portable generator capability should be calculated and supplied for any expedient lighting system.

It is likely that a section(s) of the distribution airfield lighting cable will be cut or disrupted. Repairs to the existing system by splicing around breaks should be attempted first for expedience. However, if the lighting system is extensively damaged, a new lighting system will have to be installed. Power should be supplied from either the lighting vault or emergency generators, whichever is more practical.

When the existing runway lighting system cannot be utilized because of damage, an expedient or emergency airfield lighting system must be deployed. There currently is no standardized system. Once the system is developed, procured, and prepositioned, an improvised system will have to be utilized.

Mobile Aircraft Arresting Systems

Mobile aircraft arresting systems (MAAS) are capable of being rapidly deployed and installed. The Navy is currently developing an improved MAAS.

The existing system, M-21, has limited mobility and requires frequent maintenance.⁶

⁶According to COMBLANT/COMCBPAC OPLAN 9000.

CHAPTER 6

BASE DAMAGE REPAIR AND TRANSPORTATION SUPPORT ORGANIZATION

General Concept

The mission of Base Damage Repair (BDR) operations is to operate utility systems and repair damaged mission-critical facilities and utility systems. The Transportation Support (TS) operations is to support recovery operations by vehicle dispatch, purchase and issue, refueling, material clearing and grounds maintenance operations. Unlike the rapid runway repair organization, BDR and TS operation are extension of services provided during normal operations. In order for the ECC organization to direct its resources to the most critical requirements first, the following should be the established facility/transportation repair priorities:

- a. Clearing emergency access routes.
- b. Support mass casualty and emergency shelter operations.
- c. Utilities restoration and emergency utility support.
- d. Facility dry-in.
- e. Debris removal and disposal.
- f. Facility restoration.

Emergency Operations Phase Requirements

BDR/TS operations can be broken down into several distinct phases with each phase containing several supplements.

a. Survival Phase.

(1) Review Utility contingency plans, facility priority list, and facility hardening/camouflage list. Begin work to reduce infrastructure damage per priorities established by the ECC.

- (2) Review contingency support plans.
- (3) Test communications. Coordinate with Fire Department for base fire fighting support.
- (4) Inspect material stockpiles and local routes. Inventory quantity of materials available and report inventory to ECC. Disperse materials and restock if possible and time permits.
- (5) Reconnoiter base complex.
- (6) Prepare CESE for operations. Load and disperse equipment.
- (7) Assist in evacuation of personnel.
- (8) Disperse personnel.

b. Assessment Phase.

- (1) Damage Assessment
- (2) UXO Sweep/Explosive Ordnance Disposal
- (3) In-house/Contract Decision.
- (4) Contract Documentation and approval.

c. Recovery Phase.

- (1) Clear access routes
- (1) BDRT Mobilization
- (2) Utilities Repair
- (3) Structural Repair
- (4) Emergency Contract Repair

d. Station Restoration. During this phase permanent repairs to station facilities and utility systems are made. Permanent repairs will be conducted per the facilities priority putting emphasis on critical operating facilities over all others.

BDR/TS Organization

Proper organization is critical to maintaining command and control and efficiently executing BDR/TS operations. Non-augmenting and augmented BDR organizations and plans must be developed. BDR training and exercises should be conducted to execute this organization. The organization should field utility operation crews and as many repair crews as the onsite manpower, materials and equipment will support. As a result, each member of the organization should understand the BDR/TS operation, organizational function and assigned task accomplishment.

Emergency Command Center (ECC) Oversees and directs the overall Station recovery actions including facilities operations.

NMCB Command Center Oversees and directs efforts of the Battalion/Detail organization. Will report to or be part of the Station Emergency Command Center.

Damage Assessment Team (DAT) Responsible for reconnoitering and surveying the airfield and station facilities to identify, locate, report, and assess the extent of attack damage.

Facility Assessment Team Responsible for plotting and recording DAT information and make recommendations/estimations to the ECC OIC at prospective facility repairs and utility systems status.

BDR OIC/AOIC. Directs the in-the-field facility repair operations.

Utility OIC/AOIC Directs the in-the-field utility repair operations.

Base Damage Repair Crews Responsible for repairing damaged facilities and utility systems. Includes engineering capability to determine actual damage vice apparent damage, as required.

Utility Operating Crew Responsible for operating the electrical, water, and heat plants on the station and outlying sites.

TS OIC/AOIC. Directs the in-the-field transportation support operations.

Transportation Assessment Team. Responsible for dispatch and tracking information of all transportation assets. Includes estimating equipment repairs.

Transportation Support Repair Crews. Responsible for operating heavy equipment in assistance to the repairs of damaged facilities and utility systems. Includes demolition capability, as required.

Transportation Equipment Repair Crews. Responsible for transportation equipment repairs.

Work Accomplishment Resources

Once the damage has been incurred to the facilities and the assessment process has established a damage assessment data base, the work must be prioritized for completion. The organization must determine who will accomplish the work required. The work can be completed by in-house work forces, augmenting forces, or by contract. The decision should be based on availability, expertise and time.

In-house Public Works Forces. The in-house work force will be the first forces on site to restore essential utility services, minimize facility damage and protect the public from hazards. It must be remembered that they are the local expertise and have the core knowledge of the existing facilities and infrastructure systems and condition of such systems. They also will remain to carry on the repairs and take equipment ownership after the emergency ends and augmenting troops leave the area.

Seabees/NCEL/NEESA. Forces should be used for expedient facility dry in, power restoration and mobile power sources and clearing operations.

Service Contracts. Existing service contracts may be expanded.

Maintenance service contracts listing should be developed for use. Types of contracts which should be used are roofing, ground maintenance, paving (road access clearing and waste removal), custodial (interior water cleanup), refuse collection and disposal. Small purchase contracts can take up some of the remaining work load.

Letter Contracts. Authority must be approved to use other than full and open competition. Primary use should be considered in roof dry in and repair, power poles. Bidders lists are prepared and work announcements posted. Following work commencement the scope and price were defined and negotiated.

Job Order Contracts. Job orders are cut to contractors similar to in-house job orders. The work is accomplished on a unit price per type job order.

Firm-fixed price Contracts. Larger contracts should still be conducted under firm-fixed price contracts. Large reroofing, paving, fencing and piling work is not recommended for use with the other contract methods.

Military Construction Contracts. Contracts should be used to replace facilities or major utility systems replacement.

Vehicle and Real Estate Leases. Vehicle and real estate leases may be required to obtain the necessary vehicles to support augmenting troops and real estate to support emergency shelters, material staging areas and augmentation beddown. Respective Naval Facilities Engineering Commands and/or local planning and real estate officials should be contacted for lease expertise.

Support Functions

The organization will be responsible for support of other higher authority support functions. These functions may include:

Mass Casualty. Various disaster sources may cause not only property damage but loss of life. The organization may be called upon to provide vehicle transportation, heavy equipment operators, establishing field hospitals, and emergency center support.

Threat Condition. Different threat conditions caused by hostile actions may require various actions by the organization to support law enforcement actions and personnel and facility safety. Appendix F provides an example of Public Works support plan for threat conditions.

Non-combatant Evacuation or Civilian Evacuation. Military or civilian evacuation may require various support ranging from transportation to setting up emergency evacuation centers.

Repair Actions

A minimum of temporary repairs should be made. It is realized that it is impossible not to make temporary repairs, but when the choice between a temporary repair and permanent repair is minor the permanent repair should always be chosen. This can be a key time saver to the organization, because the less amount of rework in an emergency operations situation the better the organization can priority remaining work without the added burden of doing work twice (parallel to everyday operations).

The manner by which repairs are made should also be discussed thoroughly. Repairing or restoring to previous condition may be building problems for the future. Examples include:

- a. Overhead utility lines should be considered to be place underground, if feasible. Many choices are based on current cost. However, if a hurricane hits your area on the average of every 10 years, the cost benefit analysis should show a definite cost savings by installing underground lines now. This

provides a greater service to the customer and decreases the chances of damage in the future.

b. Building reconstruction should use the most stringent building codes available. Building to substandard code or design requirements is placing undo burdine on the facility user, your maintenance personnel and have reduced lifetime expectancy. This is not to mention the cost of repairing the facility everytime above average weather conditions approach the area.

CHAPTER 7 CONCLUSION

This document is intended to provide a starting point for military and civilian public works departments in developing an emergency operations doctrine to handle any predictable incidents based on factors such as their mission, economical importance, geographical location, and personal and public safety. It deals with common circumstances which public works departments will be required to deal with or be subject to reply to during the preparation, assessment and recovery operations following a hostile action, natural disaster or man-caused disaster. The organization, preparedness plans and facility contingency operations are essential for the public works staff to quickly react and minimize the life loss, property damage and environmental impact while sustaining operational and business services.

If it done correctly, limited service operations are only disrupted in localized areas for short periods of time and the news coverage is about the personal losses. However, if it is done incorrectly, the city or base is without a major service (i.e., water distribution) for an extended period of time slowing and bogging down the repair efforts and the news coverage is about the lack of services provided to the area residents already suffering from the tragedy personally. Disaster preparedness can not and should not be taken lightly. All major infrastructure systems should be examined, requirements known and documented, back-up operating procedures established and incorporated into everyday operations. This system will provide the public works director with the knowledge and competence necessary to handle all emergencies and support higher authority when called upon to react. It is unreasonable to think that the document will provide the answers for every

problem, but it will provide a starting point for the assessment, recovery and restoration of infrastructure problems in a quick logical manner.

APPENDIX A
KEY TERMS AND WARNINGS

HOSTILE ACTION

Alarm System - A series of bells, sirens, whistles, horns or other devices used to warn of impending action or safety. Most alarm systems consist of the following conditions

All Clear - No impending threat.
Condition Yellow - Probable attack.
Condition Read - Imminent attack or attack in progress.
Condition Black - After attack.

Mission-Oriented Protective Posture (MOPP) Operations - MOPP levels are determined by the threat of chemical, nuclear, or biological weapons use by the enemy.

THREATCON ALPHA : A general warning of possible terrorist activity, the nature and extent of which are unpredictable.

THREATCON BRAVO : This condition is declared when there is increased and more predictable threat of terrorist activity even though no particular target is identified.

THREATCON CHARLIE : This condition is declared when an incident occurs or when intelligence is received indicating that some form of terrorist action against installations and personnel is imminent.

THREATCON DELTA : A terrorist attack has occurred or intelligence has been received that terrorist actions against a specific location is likely.

HURRICANES

Tropical Disturbance - First stage of unstable weather that may develop into a hurricane.

Tropical Depression - The tropical activity has a low pressure area that could become a hurricane. Highest wind speed is 38 mph.

Tropical Storm - Wind speed of 39-73 mph. Low pressure area is well-defined by rotating circulation.

Tropical Storm Watch - An announcement that a tropical storm poses a threat within 36 hours.

Tropical Storm Warning - Tropical storm is expected within 24 hours.

Hurricane - Once a tropical storm's constant wind speed reach reaches 74 mph.

Hurricane Watch - An announcement that a hurricane is expected within 36 hours.

Hurricane Warning - A hurricane is expected within 24 hours, however, because of uncertainty of hurricane path the time could be only hours.

CAT	WIND VELOCITY	BARO PRESSURE	STORM SURGE	DAMAGE
ONE	74-95 MPH	28.94" or more	4-5'	Minimal
TWO	96-110 MPH	28.5"-28.93"	6-8'	Moderate
THREE	110-130 MPH	27.91"-28.49"	9-12'	Extensive
FOUR	131-155 MPH	27.17"-27.90"	13-16'	Extreme
FIVE	OVER 155 MPH	Less than 27.17"	Over 18'	Catastrophic

Source: National Hurricane Center

TORNADO

Tornado Watch - Tornado, severe thunderstorms, or both are possible.

Tornado Warning - Tornado sighted.

WINTER STORM

Traveler's Advisory - An announcement issued when enough ice and snow are expected to hinder travel but the anticipated conditions are not serious enough to require warnings.

Freezing Rain - Forecast when expected rain is likely to freeze as soon as it strikes the ground, creating a coating of ice on roads and walkways.

Sleet - Small particles of ice mixed with rain.

Winter Storm Warning - Heavy snow, sleet or freezing rain are expected.

Winter Storm Watch - Severe winter weather possible.

Blizzard Warning - Heavy snow and winds of 35 mph or more are expected.

Severe Blizzard Warning - Very heavy snow is expected with winds over 45 mph, temperatures below 10 degrees and visibility reduced.

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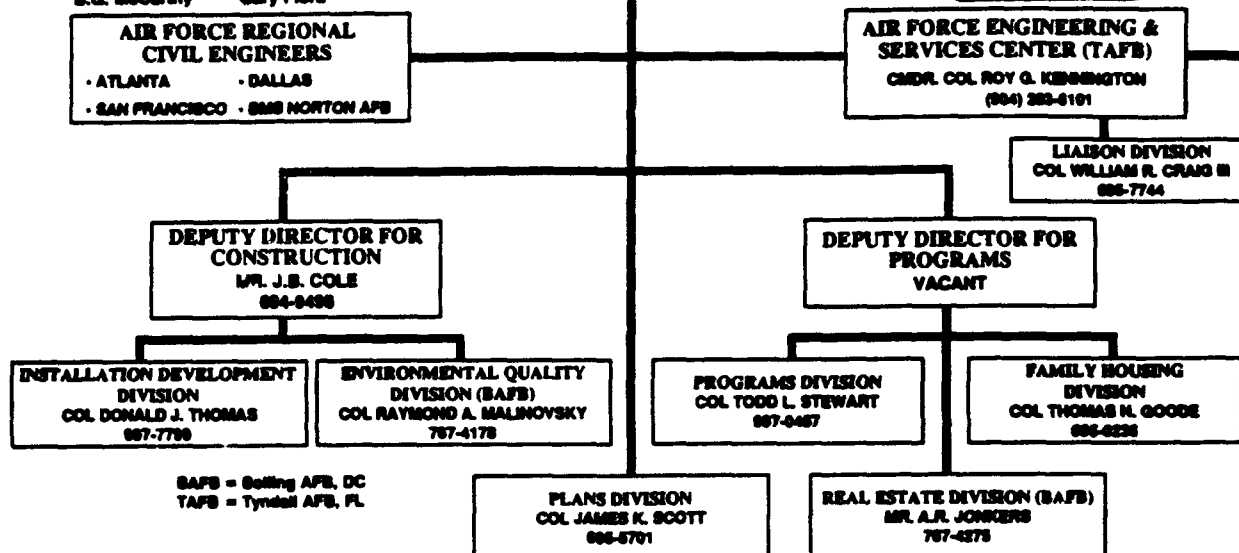
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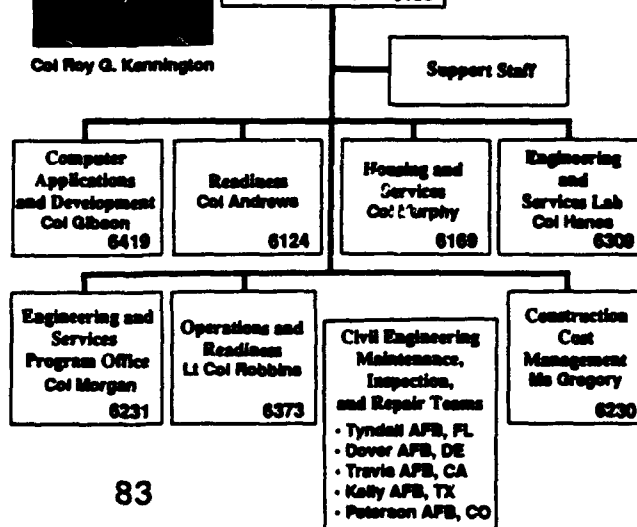
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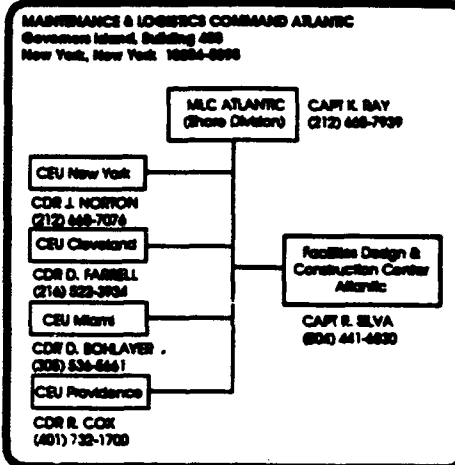
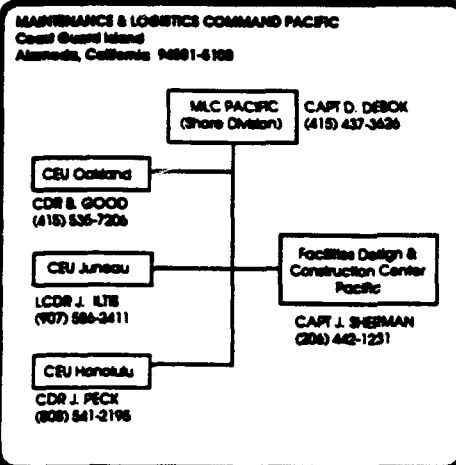
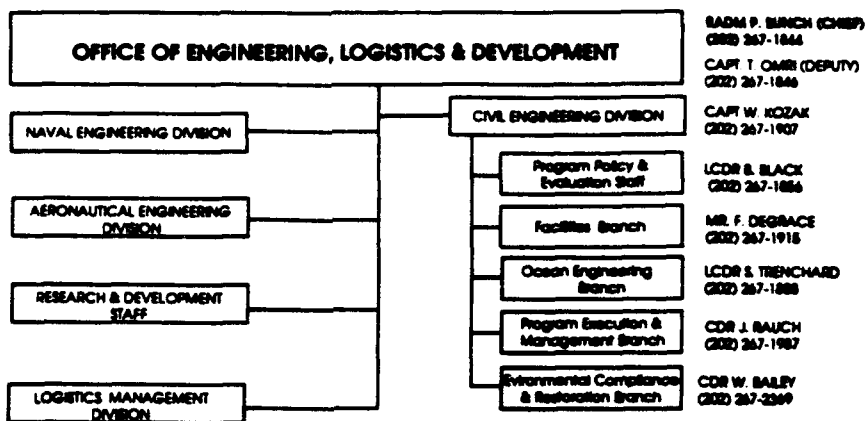
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AVIATION TRAINING CENTER MOBILE	MOBILE, AL.	CDR T. WISLOW	(205) 694-4176
RESERVE TRAINING CENTER YORKTOWN	YORKTOWN, VA.	CDR R. SPICER	(804) 696-2011
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Emergency Capability Listing (The Military Engineer, 1993)

Emergency Capability Listing

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Arizona

ALABAMA

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Blackburn & Associates, Inc.

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Mobile, AL 36616
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Phone: (205) 450-7295
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Capabilities: F H I 3 7 10

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Pelham, AL 35124
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Ehlers Services Inc.

Huntsville, AL 35805
Contact: Jack McIlrath
Phone: (205) 830-4100
FAX: (205) 830-1991
Capabilities: H I O R 5 8 10

Hayes, Sony, Matters & Matters, Inc.

Mobile, AL 36691
Contact: Donald M. Loper
Phone: (205) 343-9713
FAX: (205) 343-9717
Capabilities: F I T 3 5

ISSI Unexploded Ordnance, Inc.

Huntsville, AL 35805
Contact: Robert T. Fay, Sr.
Phone: (205) 536-4466
FAX: (205) 536-4959
Capabilities: H I K T 3 7 9 10

P.E. LaMoreaux & Associates, Inc.

Tuscaloosa, AL 35403
Contact: Robert W. Carwell
Phone: (205) 752-5543
FAX: (205) 752-4043
Capabilities: F H L O I 3 10

Law Companies Group, Inc.

Huntsville, AL 35801
Contact: G. Patrick Harris

Phone: (205) 535-9755
FAX: (205) 535-9756
Capabilities: E F H L I 3 10

Livingston Design Inc.

Birmingham, AL 35205
Contact: La Hayne Livingston
Phone: (205) 933-0833
FAX: (205) 933-6718
Capabilities: 3

Mid-South Testing, Inc.

Decatur, AL 35601
Contact: Ron Stroup or Vernon Lane
Phone: (205) 350-0846
FAX: (205) 350-9507
Capabilities: H O 3 10

Oglee Env. & Energy

Huntsville, AL 35805
Contact: Richard Grace
Phone: (205) 539-3016
FAX: (205) 539-3074
Capabilities: H O 3 10

Proctor/Davis/Ray Engineers, Inc.

Huntsville, AL 35801
Contact: James T. ("Tom") Cunningham
Phone: (205) 551-0222
FAX: (205) 551-0436
Capabilities: F T 3

Pugh, Wright & Assoc., Inc.

Decatur, AL 35602
Contact: Joel N. Pugh
Phone: (205) 353-3937
FAX: (205) 350-2285
Capabilities: F T 3

RUST International Corp.

Birmingham, AL 35242
Contact: Lawrence G. Michalove
Phone: (205) 995-7537
FAX: (205) 995-6740
Capabilities: T H 3 5 7 10

Shellock, Smith and Adams, Inc.

Montgomery, AL 36111
Contact: Roland H. Vaughan
Phone: (205) 263-6481
FAX: (205) 264-4509
Capabilities: I 2 3 12

Universal Construction Co., Inc.

Huntsville, AL 35824
Contact: J.R. Glover
Phone: (205) 461-0568
FAX: (205) 461-6731
Capabilities: F T 3 5

Wall, Haydel & Associates, Inc.

Mobile, AL 36609
Contact: George K. Chandler, PE
Phone: (205) 344-4744
FAX: (205) 344-4963
Capabilities: F H I O I 2 3 10

Weespe Corporation

Huntsville, AL 35801

Contact: Robert R. Weasels
Phone: (205) 539-6139
FAX: (205) 539-2011
Capabilities: F T 3 5 7

Ray F. Weston, Inc.

Auburn, AL 36830
Contact: Viah Varma
Phone: (205) 826-6100
FAX: (205) 826-8232
Capabilities: E F H I O 2 3 5 7 10

ALASKA

Alaska Division of Emergency Services

Fort Richardson, AK 99505-8670
Contact: Ervin Paul Martin
Phone: (907) 428-7000
FAX: (907) 428-7000

Anchorage Municipal Light & Power

Anchorage, AK 99501
Contact: Bob Price (Col., USAF, Ret.)
Phone: (907) 263-5275
FAX: (907) 276-2961
Capabilities: E I S 12

Coffman Engineers

Anchorage, AK 99501-3577
Contact: Harold Holts
Phone: (907) 276-6664
FAX: (907) 276-5042
Capabilities: E S 3

Damen & Moore

Anchorage, AK 99518
Contact: Michael L. Foster, PE
Phone: (907) 562-3366
FAX: (907) 562-1297
Capabilities: E H L O I 3 5 10

Dowl Engineers

Anchorage, AK 99503
Contact: William P. Hamm
Phone: (907) 562-2000
FAX: (907) 563-3953
Capabilities: E H L S I 3 5 10

Tryck, Nyman, Hayes, Inc.

Anchorage, AK 99501
Contact: Ted Trumblood
Phone: (907) 279-0543
FAX: (907) 276-7679
Capabilities: E F I 3

USKEL, INC.

Anchorage, AK 99503-2709
Contact: Lee von Schaben, Jr.
Phone: (907) 276-4245
FAX: (907) 258-4653
Capabilities: E F H 3 5

ARIZONA

Arizona Division of Emergency Services

Phoenix, AZ 85008
Contact: William D. Lockwood
Phone: (602) 231-6245
FAX: (602) 231-6231

ATL, Inc.

Phoenix, AZ 85017
Contact: David P. Hayes
Phone: (602) 241-1097
FAX: (602) 234-0699
Capabilities: E H I 3

Carnes Turley Scott, Inc.

Phoenix, AZ 85008
Contact: Elizabeth Scarnio
Phone: (602) 275-3999
FAX: (602) 392-0909
Capabilities: E F I 3 5

Callin Barr Associates

Tucson, AZ 85711
Contact: Fredric M. Funk
Phone: (602) 750-7474
FAX: (602) 750-7470
Capabilities: F I 2 3 4

Greiner, Inc.

Phoenix, AZ 85020
Contact: Ronald Ewing
Phone: (602) 275-5000
FAX: (602) 943-1891
Capabilities: F T I 3 5

Greiner, Inc.

Tucson, AZ 85705
Contact: Charles Larson, PE
Phone: (602) 887-1800
FAX: (602) 887-9438
Capabilities: F T I 3 5

Mathews Engineering & Architecture, Inc.

Phoenix, AZ 85008
Contact: William D. Mathews, PE
Phone: (602) 244-2664
FAX: (602) 275-3220
Capabilities: E F I 3 5 9

Moored Engineering, Inc.,

Consulting Electrical Engineers
Tucson, AZ 85719
Contact: Lawrence E. Moored
Phone: (602) 884-0045
FAX: (602) 884-0048
Capabilities: F I 3 12

Roberts/Dismore Associates

Phoenix, AZ 85008
Contact: Frank H. Roberts
Phone: (602) 275-6830
FAX: (602) 275-4331
Capabilities: E F I T 3 5

SEA Engineers, Inc.

Phoenix, AZ 85015

Emergency Capability Listing

Arizona

California

Contact: Tom Lewczycki
Phone: (602) 257-4699
FAX: (602) 257-0106
Capabilities: E F L T 1 3 5 12

SEC Donohue
Phoenix, AZ 85016
Contact: Larry Hanson
Phone: (602) 279-3541
FAX: (602) 279-1334
Capabilities: E F H L 1 3 10 12

SFC Engineering Company
Phoenix, AZ 85044
Contact: Fred Corey
Phone: (602) 438-2200
FAX: (602) 431-9562
Capabilities: E F L T 1 3

Sandt Corp.
Tucson, AZ 85714
Contact: John E. Carlson, Sr.
Phone: (602) 748-7555
FAX: (602) 750-6516
Capabilities: E F L 1 3

ARKANSAS

Office of Emergency Services
Conway, AR 72832
Contact: James Lee Witt
Phone: (501) 329-5401
FAX: (501) 327-8047

Garver & Garver, P.A.
Little Rock, AR 72203
Contact: Ken Wilson
Phone: (501) 376-3633
FAX: (501) 372-8042
Capabilities: 1 3

CALIFORNIA

Governor's Office of Emergency Services
Sacramento, CA 95832-1499
Contact: Richard Andrews, Ph.D.
Phone: (916) 427-4990
FAX: (916) 427-4215

Barrett Consulting Group
Menlo Park, CA 94028
Contact: William P. Simons
Phone: (415) 854-7090
FAX: (415) 854-7724
Capabilities: E F 1 3

Biselli & Karm/Greiner
Pleasanton, CA 94588
Contact: Richard Karm or Peim Ruggeri
Phone: (510) 463-2000
FAX: (510) 463-0510
Capabilities: E F L 1 3 5

Boyle Engineering Corp.
Newport Beach, CA 92658
Contact: Henry W. Haeseker
Phone: (714) 476-3400
FAX: (714) 721-7141
Capabilities: E F T 1 3

Braccia & Associates
Orinda, CA 94563
Contact: Anthony A. Braccia
Phone: (510) 254-8570
FAX: (510) 254-0295
Capabilities: E F 1 3 5 8

Michael Brandman Associates
Santa Ana, CA 92705
Contact: Thomas E. Smith, Jr., AICP
Phone: (714) 250-5555
FAX: (714) 250-5556
Capabilities: 1 3 5 10

Brown and Caldwell Consultants
San Diego, CA 92108
Contact: George Khoury
Phone: (619) 528-9090
FAX: (619) 528-9199
Capabilities: F H O 3 10

Brown and Caldwell Consultants
Sacramento, CA 95814
Contact: Perry Schaffer
Phone: (916) 444-0123
FAX: (916) 444-8437
Capabilities: H R 3 5 10 12

Brown & Root Services, Inc.
Santa Maria, CA 93437-0349
Contact: Vic Bouquet
Phone: (805) 346-2651
FAX: (805) 928-9737
Capabilities: E F L 3 5 7 12

Brugge & Piercy Associates
Sacramento, CA 95864
Contact: Robert O. Brugge
Phone: (916) 482-8940
Capabilities: E F L 3 4 5 12

BSI Consultants, Inc.
San Diego, CA 92127
Contact: Daniel York
Phone: (619) 451-6100
FAX: (619) 451-1694
Capabilities: E F L 1 3

John Carole Engineers
Walnut Creek, CA 94598
Contact: Carl Gentry
Phone: (510) 932-1710
FAX: (510) 930-0208
Capabilities: E F 3

Cash & Associates Engineers
Long Beach, CA 90801
Contact: Elliott H. Boone
Phone: (714) 895-2072
FAX: (714) 895-1291
Capabilities: E 3

J. C. Chang & Associates, Inc.
Torrance, CA 90501
Contact: Jerry C. Chang
Phone: (310) 212-7644
FAX: (310) 212-5272
Capabilities: E F H 1 1 2 3 5

Converse Consultants, Inland Empire
Redlands, CA 92374
Contact: Steven C. Helfrich
Phone: (714) 796-0544
FAX: (714) 796-7675
Capabilities: E H L 1 3 10

Dames & Moore
Sacramento, CA 95826
Contact: Kenneth A. Strom
Phone: (916) 387-8800
FAX: (916) 387-0802
Capabilities: E H L O 3 10

Degenkolb Associates, Engineers
San Francisco, CA 94104-1394
Contact: Thomas Wesser
Phone: (415) 392-6952
FAX: (415) 981-3157
Capabilities: E F I T 1 3 5

Delta Construction Co., Inc.
Sacramento, CA 95827
Contact: Norman R. Brown
Phone: (916) 364-0292
FAX: (916) 364-7641
Capabilities: 1 3

Dewante & Stewell
Sacramento, CA 95814
Contact: Randolph H. Dewante
Phone: (916) 447-3261
FAX: (916) 447-4649
Capabilities: E F 3

A. J. Diani Construction Co., Inc.
Santa Maria, CA 93454
Contact: Robert Diani
Phone: (805) 925-9533
FAX: (805) 922-9983
Capabilities: E F H O 1 3 5 10

Detra Construction Co., Inc.
Rio Vista, CA 94571
Contact: Doug Comstock
Phone: (707) 374-6339
FAX: (707) 374-6965
Capabilities: E F L T 1 3

Earth Technology Corporation
Long Beach, CA 90802
Contact: Steve Scott
Phone: (310) 495-4449
FAX: (310) 426-0666
Capabilities: E F H O 3 5 10

Engineering-Science, Inc.
Pasadena, CA 91124
Contact: Dr. A. W. Loven
Phone: (818) 440-6000
FAX: (818) 440-6195
Capabilities: E F H 1 3 10

Environmental Science & Engineering, Inc.
Concord, CA 94520
Contact: Chuck Biagi
Phone: (510) 685-4053
FAX: (510) 685-5323
Capabilities: H 3 8 10

GEOCON Inc.
San Diego, CA 92121-2974
Contact: David F. Leake
Phone: (619) 558-6900
FAX: (619) 558-6159
Capabilities: E H L 1 3 10

Geomatrix Consultants, Inc.
San Francisco, CA 94111
Contact: Karen Ball
Phone: (415) 434-9400
FAX: (415) 434-3216
Capabilities: E H L O 1 3

Ben C. Gerwick, Inc.
San Francisco, CA 94111
Contact: Paul E. Bach
Phone: (415) 398-8972
FAX: (415) 433-8789
Capabilities: E I L R 1 3 5 7

Global Associates
San Ramon, CA 94583
Contact: Charlie Lamb, Sr.
Phone: (510) 275-9010
FAX: (510) 275-9392
Capabilities: H O T 3 5 7 8

Greiner, Inc.
Santa Ana, CA 92705
Contact: Melford Picilla, PE
Phone: (714) 556-9260
FAX: (714) 755-0577
Capabilities: E F T 1 3 5

Hall & Foreman, Inc.
Tustin, CA 92680
Contact: Roger W. Watson, P.L.S.
Phone: (714) 544-3404
FAX: (714) 544-3155
Capabilities: E F L T 1 3 5 12

Harns-Kaldveer
Oakland, CA 94621
Contact: Peter Kaldveer
Phone: (510) 568-4001
FAX: (510) 568-2205
Capabilities: E H L O 3 5 10

Holmes & Narver, Inc.
Orange, CA 92668
Contact: Bruce R. Toro
Phone: (714) 567-2771
FAX: (714) 567-2649
Capabilities: E F H L 1 3 5 7

IT Corporation
Torrance, CA 90505
Contact: Jim Manover
Phone: (310) 378-9933
FAX: (310) 791-2587
Capabilities: H O 3 10

Emergency Capability Listing

California

California

Jaykim Engineers, Inc.
Sacramento, CA 95834
Contact: Roland Miller
Phone: (916) 924-6618
FAX: (916) 924-6670
Capabilities: E H I O 1 3 7 10

Jaykim Engineers, Inc.
Diamond, CA 91765
Contact: Roland Miller
Phone: (714) 861-3844
FAX: (714) 860-3170
Capabilities: E H I O 1 3 7 10

Johnson Western Granite Company
San Leandro, CA 94577
Contact: Larry Totten
Phone: (510) 568-8112
FAX: (510) 568-1601
Capabilities: E F I L 1 3 9 10

Keller & Gannon
San Francisco, CA 94103
Contact: Robert A. Falciani
Phone: (415) 621-1199
FAX: (415) 864-3681
Capabilities: E F H T 3 5 10 12

Kleinfelder, Inc.
Walnut Creek, CA 94596
Contact: Edward E. Rinne
Phone: (510) 938-5610
FAX: (510) 938-5419
Capabilities: H L O 1 3 5 10

Law/Crandall, Inc.
San Diego, CA 92121
Contact: John R. Theissen, G.E.
Phone: (619) 458-9379
FAX: (619) 458-0541
Capabilities: E F H L 3 5 10

Leach Mounce Architects
Ventura, CA 93003
Contact: Howard Leach
Phone: (805) 656-3522
FAX: (805) 658-1926
Capabilities: E F I L 3

Leedsbill-Herkenhoff, Inc.
San Diego, CA 92121
Contact: Charles R. Bras
Phone: (619) 455-7787
FAX: (619) 455-0029
Capabilities: E F 3 5

Leighton and Assoc., Inc.
Woodland Hills, CA 91367
Contact: Frederick Gebhardt
Phone: (818) 587-9470
FAX: (818) 587-9484
Capabilities: E F H L 3 5 10

Leighton and Assoc., Inc.
Irvine, CA 92714-4906
Contact: Dr. Jalal Vakili
Phone: (714) 250-1421
FAX: (714) 250-1114
Capabilities: E H L O 1 3 10 12

Libby Engineers
San Diego, CA 92120
Contact: James R. Libby
Phone: (619) 283-5424
FAX: (619) 284-3533
Capabilities: E F T 1 3

Lintvedt, McColl & Assoc.
La Mesa, CA 91941
Contact: Gary Lintvedt
Phone: (619) 460-3112
FAX: (619) 460-1539
Capabilities: E F L 1 3 5

The Mark Group, Construction Engineers, Inc.
Pleasant Hill, CA 94523
Contact: Philip Ruby
Phone: (510) 946-1055
FAX: (510) 946-9813
Capabilities: E H O 3 10

Metcalf & Eddy, Inc.
Redwood City, CA 94065
Contact: Roy Fedotoff
Phone: (415) 591-9300
FAX: (415) 591-3917
Capabilities: K F H T 3 5 10

Metcalf & Eddy, Inc.
San Diego, CA 92101
Contact: Charles Pound
Phone: (619) 233-7855
FAX: (619) 233-9780
Capabilities: K F H T 3 5 10

M&T Agra, Inc.
Anaheim, CA 92807
Contact: Brian Constant
Phone: (714) 779-2591
FAX: (714) 779-8377
Capabilities: E H L 3 5 10

O'Brien-Kretzberg & Assoc., Inc.
San Francisco, CA 94105
Contact: Terry Michons
Phone: (415) 777-0188
FAX: (415) 777-3023
Capabilities: E F L T 3 5 7

Panko Architects
San Mateo, CA 94402
Contact: Stanley E. Panko
Phone: (415) 571-9100
FAX: (415) 571-9302
Capabilities: E F I L 1 3 5 9

The Ralph M. Parsons Company
Pasadena, CA 91124
Contact: Charles H. Neubauer
Phone: (818) 440-2310
FAX: (818) 440-2703
Capabilities: E F I O 1 3 5 7

Perini Corporation
San Francisco, CA 94111-1422
Contact: John E. Perini
Phone: (415) 981-8880
FAX: (415) 392-7271
Capabilities: E F H I S

PRC Env. Mgmt., Inc.
San Francisco, CA 94105
Contact: Daniel T. Chow
Phone: (415) 543-4880
FAX: (415) 543-5480
Capabilities: H 3 10

Professional Service Industries, Inc.
San Francisco, CA 94549
Contact: Paul Bazilwich, Jr.
Phone: (510) 284-3070
FAX: (510) 284-3154
Capabilities: E F H I 1 3 5 10

Radian Corporation
Irvine, CA 92714
Contact: Richard R. Beauregard
Phone: (714) 261-8611
FAX: (714) 261-6505
Capabilities: H O R 3 5 10

Rutherford & Chokone, Consulting Engineers
San Francisco, CA 94107
Contact: Peter E. Bank
Phone: (415) 495-4222
FAX: (415) 546-7536
Capabilities: E 3

RWR-Pascoe Engineering, Inc.
Irvine, CA 92718
Contact: Lucian A. Pascoe
Phone: (714) 753-4777
FAX: (714) 753-1588
Capabilities: E F I 2 3 12

Sandlin, Humber, Jones
Salinas, CA 93901
Contact: Edward Oyama
Phone: (408) 757-2927
FAX: (408) 757-6876
Capabilities: E F L 1 3 5

Soil Stabilization Products Co.
Merced, CA 95340
Contact: George Randolph
Phone: (800) 523-9992
FAX: (209) 383-7849
Capabilities: E F L T 1 3 7 12

The Tanzmann Assoc.
Los Angeles, CA 90013-1820
Contact: Virginia Tanzmann, FAIA
Phone: (213) 625-1734
FAX: (213) 625-1804
Capabilities: E F I 3

3DI
Sacramento, CA 95814
Contact: Chuck Klenaker
Phone: (916) 447-7600
FAX: (916) 443-8906
Capabilities: E F I T 3 5

Travis, Vordango, Curry & Assoc.
San Diego, CA 92108
Contact: Kevin Canty
Phone: (619) 291-2800
FAX: (619) 291-0613
Capabilities: E F I 3

Tuder Engineering Company
Oakland, CA 94612
Contact: John Williams
Phone: (510) 419-6114
FAX: (510) 419-6110
Capabilities: E I 1 3 5 12

Tuder Engineering Company
Irvine, CA 92714
Contact: Donald J. Hoei
Phone: (714) 833-2176
FAX: (714) 833-8779
Capabilities: E F H L 1 3 9 10

URS Consultants, Inc.
Sacramento, CA 95834
Contact: Gary Jandegian
Phone: (916) 929-2346
FAX: (916) 929-7236
Capabilities: E F H T 1 3 5 10

URS Consultants, Inc.
San Francisco, CA 94111
Contact: R. Martin Casarochi
Phone: (415) 774-2700
FAX: (415) 398-1904
Capabilities: E F H T 1 3 5 10

Van Dell and Assoc., Inc.
Irvine, CA 92714
Contact: Terry Hartman
Phone: (714) 474-1400
FAX: (714) 261-8482
Capabilities: E F 1 3 5

Van Houten Consultants, Inc.
Petaluma, CA 92101
Contact: Gary E. Van Houten
Phone: (707) 762-1132
FAX: (707) 762-1179
Capabilities: E H L 3 10

Vankr Constr. Management, Inc.
San Diego, CA 92101
Contact: Wayne Goodermote
Phone: (619) 525-2072
FAX: (619) 231-2918
Capabilities: E 3

Vorner, Inc.
Alameda, CA 94501
Contact: Dan R. Ledford
Phone: (510) 748-4444
FAX: (510) 748-4441
Capabilities: H I O R 10

Ray F. Weston, Inc.
Woodland Hills, CA 91367
Contact: John Accordi
Phone: (818) 596-6900
FAX: (818) 596-6970
Capabilities: E F H I O 2 3 5 7 10

Winstler & Kelly, Consulting Engineers
San Francisco, CA 94105
Contact: Theodore H. Purcell
Phone: (415) 546-9900
FAX: (415) 546-9007
Capabilities: E F H L 1 3 9 12

Emergency Capability Listing

California

Florida

Woodward-Clyde Consultants
Oakland, CA 94607
Contact: Ulrich Luecher
Phone: (510) 874-3200
FAX: (510) 874-3268
Capabilities: E L O 3 5 10

Woodward-Clyde Consultants
San Diego, CA 92108-2901
Contact: Ed Gabrielson
Phone: (619) 294-9400
FAX: (619) 293-7920
Capabilities: E H L O 3 5 10

COLORADO

Office of Emergency Management
Golden, CO 80401-3997
Contact: Leonard A. Boules
Phone: (303) 273-1622
FAX: (303) 273-1795

Durrant Flickinger, Inc.
Colorado Springs, CO 80903
Contact: Tracy Nelson
Phone: (719) 633-3003
FAX: (719) 633-2265
Capabilities: E F I T 3 5

Durrant Flickinger, Inc.
Denver, CO 80209
Contact: Dennis L. Thompson
Phone: (303) 377-2900
FAX: (303) 377-0621
Capabilities: E F T 3

EMC Engineers, Inc.
Denver, CO 80227
Contact: Eric Young, PE
Phone: (303) 988-2951
FAX: (303) 988-2527
Capabilities: E F H T 3 5 10 12

GE Government Services
Fort Carson, CO 80913
Contact: J. E. McDavid
Phone: (719) 540-9460
FAX: (719) 527-9339
Capabilities: H O S 1 3 7 10

Global Associates-Falcon AFB
Falcon AFB, CO 80912-5000
Contact: Russ Grant
Phone: (719) 550-4970
FAX: (719) 683-3945
Capabilities: R S H 1 3 10 7 12

RBD, Inc. Engineering Consultants
Ft. Collins, CO 80525
Contact: Ted A. Borstad
Phone: (303) 226-4955
FAX: (303) 226-4971
Capabilities: F I 3

United Engineers & Constructors
Denver, CO 80217
Contact: Susan L. Massihzadeh, PE

Phone: (303) 843-2385
FAX: (303) 843-2034
Capabilities: E F H I 1 3 5 7

URS Consultants, Inc.
Englewood, CO 80111
Contact: John D. Chmelir
Phone: (303) 796-9700
FAX: (303) 796-2221
Capabilities: E F H T 1 3 5 10

Ray F. Weston, Inc.
Denver, CO 80228-1842
Contact: Mike Witt
Phone: (303) 980-6800
FAX: (303) 980-1622
Capabilities: E F H I O 2 3 5 7 10

Ray F. Weston, Inc.
Lakewood, CO 80228
Contact: Dr. Michael E. Witt
Phone: (303) 980-6800
FAX: (303) 980-1622
Capabilities: H 3 5 10

Wilson & Company
Colorado Springs, CO 80903
Contact: Ward K. Cooper
Phone: (719) 520-5800
FAX: (719) 520-0108
Capabilities: E F T 1 3

CONNECTICUT

Office of Emergency Management
Hartford, CT 06105
Contact: James S. Neale, III
Phone: (203) 546-3180/4338
FAX: (203) 247-0664

Grolner, Inc.
Wallingford, CT 06492
Contact: Stuart Stoiff, PE
Phone: (203) 265-6741
FAX: (203) 265-6748
Capabilities: F T 1 3 5

Storch Engineers
Rocky Hill, CT 06067
Contact: Michael D'Altizio
Phone: (203) 529-7727
FAX: (203) 721-7213
Capabilities: F H O 1 3 10

DIST. OF COLUMBIA

Office of Emergency Preparedness
Washington, DC 20009
Contact: Stephen E. Rickman
Phone: (202) 727-3150
FAX: (202) 673-2290

Frank E. Beall, Inc.
Washington, DC 20005

Contact: Mr. Dru J. Blaszcak
Phone: (202) 835-1203
FAX: (202) 835-1310
Capabilities: E F I T 3 5

Cancon
Washington, DC 20007
Contact: William C. Baker
Phone: (202) 337-6022
FAX: (202) 337-6029
Capabilities: E F 3

Marine Spill Response Corp.
Washington, DC 20005
Contact: Alan D. Broad
Phone: (202) 408-5900
FAX: (202) 371-0401
Capabilities: O 10 7 5 2

The Ralph M. Parsons Company
Washington, DC 20005
Contact: Robert M. Gogal
Phone: (202) 775-6010
FAX: (202) 775-6005
Capabilities: E F I O 1 3 5 7

RTKL Associates, Inc.
Washington, DC 20036
Contact: Rose M. Dela Vega
Phone: (202) 833-4400
FAX: (202) 887-5186
Capabilities: E F I T 3 5 12

JM Company Federal Systems
Washington, DC 20005
Contact: Russ Gault
Phone: (202) 331-6988
FAX: (202) 331-6901
Capabilities: E F H O 3 4 5 10

Waste Management Env. Svcs. Inc.
Washington, DC 20036
Contact: Paul Kavanagh
Phone: (202) 467-4480
FAX: (202) 872-8983
Capabilities: F H O R 1 3 10

Ray F. Weston, Inc.
Washington, DC 20024
Contact: Tim Datz
Phone: (202) 646-6856
FAX: (202) 646-6210
Capabilities: E F H I O 2 3 5 7 10

FLORIDA

Division of Emergency Management
Tallahassee, FL 32399
Contact: *Joe Mills 487-4410*
Phone: (904) 488-1900
FAX: (904) 488-6290

Aerial Cartographics of America
Orlando, FL 32809
Contact: Cornell Clapp
Phone: (407) 851-7880

FAX: (407) 855-8250
Capabilities: E F 5

Blaisland, Beach & Lee
Orlando, FL 32822
Contact: Doyle E. Cottrell, PE
Phone: (407) 856-5502
FAX: (407) 240-6320
Capabilities: F H I O 3 10

Bullock Tice Assoc. Architects, Inc.
Pensacola, FL 32501
Contact: John Tice
Phone: (904) 434-5444
FAX: (904) 432-5208
Capabilities: F H I R 3

Delta Research Corp.
Niceville, FL 32578
Contact: Leslie A. Ross
Phone: (904) 897-5380
FAX: (904) 897-5388
Capabilities: F 3 5

Earth Resources Corporation
Ocoee, FL 34761
Contact: Norman J. Abramson
Phone: (407) 877-0877
FAX: (407) 877-3622
Capabilities: H 1 3 10

ENPAC Corporation
Jacksonville, FL 32256
Contact: Chris Hilky
Phone: (904) 448-8670
FAX: (904) 448-8869
Capabilities: H 3 10

Env. Science & Engineering
Gainesville, FL 32602
Contact: George Anstee
Phone: (800) 874-7872
FAX: (904) 332-0507
Capabilities: H O 10

EOD World Services, Inc.
Ft. Walton, FL 32547
Contact: E. L. McDaniel
Phone: (904) 864-3454
FAX: (904) 864-1052
Capabilities: H 1 10

Gee & Jensen Engineers Architects Planners, Inc.
W. Palm Beach, FL 33409
Contact: Donald L. Godden
Phone: (407) 683-3301
FAX: (407) 697-3892
Capabilities: F T 1 3 5

Global Assoc.-Mayport Naval Complex
Mayport Naval Comp., FL 32228
Contact: Bill Schneider
Phone: (904) 247-0330
FAX: (904) 247-0502
Capabilities: E F I O 3 7 10 12

Grolner, Inc.
Tampa, FL 33607

Emergency Capability Listing

Florida

Contact: Fred Walker
Phone: (813) 286-1711
FAX: (813) 286-6587
Capabilities: F H L O 1 3 5 10

Hansen Lind Meyer Inc.
Orlando, FL 32803
Contact: Karen Saslaw
Phone: (407) 422-7061
FAX: (407) 422-7066
Capabilities: E F I T 3

H.G. Hardens & Son, Inc.
Panama City, FL 32404
Contact: Robert A. Hodges
Phone: (904) 874-1500
FAX: (904) 871-4669
Capabilities: F O I 3

Johnson Controls World Services Inc.
Cape Canaveral, FL 32920
Contact: Paul V. Roundy, III
Phone: (407) 784-7100
FAX: (407) 784-7146
Capabilities: E F H I 3 4 7 12

Law Companies Group
Pensacola, FL 32526
Contact: James Tucci
Phone: (904) 944-9772
FAX: (904) 944-9463
Capabilities: H O 3 10

Law Engineering, Inc.
Jacksonville, FL 32211
Contact: Jim Horton
Phone: (904) 396-5173
FAX: (904) 396-5703
Capabilities: H L O T 1 10 3 12

LIVS Associates
Coral Gables, FL 33134
Contact: Hector Vergara
Phone: (305) 443-2933
FAX: (305) 448-3748
Capabilities: E F I T 3

Metcalf & Eddy
Sunrise, FL 33325
Contact: W. Prentiss Taylor
Phone: (305) 846-8611
FAX: (305) 846-8885
Capabilities: E F H O 3 5 10 12

Morse Diesel
Marco Island, FL 33937
Contact: George Alter
Phone: (813) 642-0304
FAX: (813) 642-4086
Capabilities: E F T 1 3 5 6

Peet, Buckley, Schuh & Jernigan
Homestead, FL 33030
Contact: Robert S. Harris
Phone: (800) 733-7275
FAX: (305) 245-9208
Capabilities: F T H O 1 3 5 10

Reynolds, Smith and Hills, Inc.
Jacksonville, FL 32256
Contact: Henry Luke
Phone: (904) 279-2114
FAX: (904) 279-2491
Capabilities: F 1 3 5 10

C. Vargas & Associates, Ltd.
Jacksonville, FL 32211
Contact: Clark Vargas, PE
Phone: (904) 725-7131
FAX: (904) 725-4749
Capabilities: F H O 3 10

ZHA Inc.
Orlando, FL 32801
Contact: F. Donald Naegele
Phone: (407) 825-3587
FAX: (407) 825-3591
Capabilities: E F T 1 3

GEORGIA

Georgia Emergency Management Agency
Atlanta, GA 30316
Contact: Gary W. McConnell
Phone: (404) 624-7000
FAX: (404) 624-7205

Castell, Marks International
Atlanta, GA 30339
Contact: Christopher P. Soffe
Phone: (404) 951-2921
FAX: (404) 933-9508
Capabilities: E F I T 1 3 5 7

Heery International, Inc.
Atlanta, GA 30367
Contact: Richard D. Scharf
Phone: (404) 881-9880
FAX: (404) 875-1283
Capabilities: F I T 3 12

Hoffman & Company, Inc.
Smyrna, GA 30080
Contact: Irv Hoffman
Phone: (404) 435-2241
FAX: (404) 435-3017
Capabilities: F H L O 5 10

Lowe Engineers
Atlanta, GA 30328
Contact: William T. Bernson
Phone: (404) 399-6400
FAX: (404) 393-9406
Capabilities: F H O T 1 2 3 5

Niz, Mann and Associates
Atlanta, GA 30309
Contact: Stuart Aynsley
Phone: (404) 873-2300
FAX: (404) 892-5823
Capabilities: F I T 2 5

Southeastern Power Administration
Elberton, GA 30635
Contact: Jim Lloyd
Phone: (706) 283-9924
FAX: (706) 283-9928
Capabilities: F 12

Tremco, Inc.
Lilburn, GA 30226
Contact: Richard N. Garwood
Phone: (800) 899-8736
FAX: (404) 923-8053
Capabilities: F T 3 7

HAWAII

Department of Defense
Honolulu, HI 96816-4495
Contact: Ray C. Price, Sr.
Phone: (808) 734-2161
FAX: (808) 737-4150

Global Associates - Hickam AFB
Honolulu, HI 96820
Contact: Vieve Stubbs
Phone: (808) 422-4931
FAX: (808) 423-0070
Capabilities: E F H L 3 6 7 10

Jas. W. Glover
Hilo, HI 96720
Contact: Stanley T. Doi
Phone: (808) 935-0871
FAX: (808) 961-9237
Capabilities: E F L 1 3

Harding Lawson Associates
Aiea, HI 96701
Contact: George How
Phone: (808) 486-6009
FAX: (808) 486-7184
Capabilities: E F H L 1 3 10

Lincolne Scott & Kohless Inc.
Honolulu, HI 96813
Contact: Fred Kohless
Phone: (808) 536-1737
FAX: (808) 537-5829
Capabilities: E F H I 3 5 10 12

Maguire Group Inc.
Honolulu, HI 96814
Contact: K. Rappolt
Phone: (808) 949-2047
FAX: (808) 949-4804
Capabilities: E F 1 3

Parsons Hawaii
Honolulu, HI 96813
Contact: Lou Lopez
Phone: (808) 523-5464
FAX: (808) 545-7838
Capabilities: E F H I 1 3 5 7

IDAHO

Bureau of Disaster Services
Boise, ID 83728
Contact: Darrell G. Waller
Phone: (208) 334-3440
FAX: (208) 334-2322

CH2M HILL, Inc.
Boise, ID 83707
Contact: P. Dennis Smith
Phone: (208) 345-5310
FAX: (208) 345-5313
Capabilities: E F H O 1 3 10 12

Power Engineers, Inc.
Hailey, ID 83333
Contact: Tim Mason
Phone: (208) 788-3456
FAX: (208) 788-2082
Capabilities: E F O T 2 3 10 12

ILLINOIS

Illinois Emergency Management Agency
Springfield, IL 62706
Contact: John Plank
Phone: (217) 782-3700
FAX: (217) 782-2509

Berns, Cliney and Associates, P.C.
Urbana, IL 61801
Contact: Thomas B. Berns
Phone: (217) 348-1144
FAX: (217) 384-3355
Capabilities: F O T 1 3

Booker Associates, Inc.
Fairview Hts., IL 62208
Contact: Daniel D. Moses, PE
Phone: (618) 397-3000
FAX: (618) 397-9847
Capabilities: E F T 1 3 5

Caterpillar Inc.
Peoria, IL 61629
Contact: Jim McMillan
Phone: (309) 675-6938
FAX: (309) 675-6951
Capabilities: E L S T 1 3 4 12

Duffy & Associates, Engineers, Inc.
Champaign, IL 61820
Contact: W. C. Chensault, Jr.
Phone: (217) 352-4169
FAX: (217) 352-0085
Capabilities: F H I O 1 3 5 10

PGM Architects-Engineers
Oak Brook, IL 60521
Contact: Edward J. Rosenberger
Phone: (708) 574-8300
FAX: (708) 574-9292
Capabilities: E F 1 3

Emergency Capability Listing

Illinois

Hansen Engineers Inc.
Springfield, IL 62703
Contact: Sergio "Satch" Pecora
Phone: (217) 788-2450
FAX: (217) 788-2503
Capabilities: E F H L 1 2 3 10

Horner & Shifrin, Inc.
Belleville, IL 62223
Contact: Thomas G. Thompson
Phone: (618) 397-1065
FAX: (618) 397-1056
Capabilities: E F L T 1 3 5

Instraform Midwest Inc.
Lemont, IL 60439
Contact: Terry Soenen
Phone: (800) 633-6333
FAX: (608) 365-6786
Capabilities: E F H 3 9 10 12

KJWW Engineering Consultants
Rock Island, IL 61201
Contact: Vernon M. Wegerer
Phone: (309) 788-0673
FAX: (309) 786-5967
Capabilities: E I T 3

Lester B. Knight & Assoc., Inc.
Chicago, IL 60661
Contact: Stephen C. Mitchell
Phone: (312) 346-2100
FAX: (312) 346-9725
Capabilities: E F I 1 3 5 12

Kudrna & Associates, Ltd.
Chicago, IL 60606
Contact: Frank Kudrna
Phone: (312) 738-1522
FAX: (312) 738-9792
Capabilities: 1 3 7 10

Miserman, Stanley & Associates, P.C.
Rock Island, IL 61201
Contact: Kevin L. Koski
Phone: (309) 788-7644
FAX: (309) 788-7691
Capabilities: E F L T 1 3 5 7

Parsons De Leuw, Inc.
Chicago, IL 60661
Contact: Rod Beebe
Phone: (312) 930-5140
FAX: (312) 930-0018
Capabilities: E F I T 1 3

Stanley Consultants, Inc.
Chicago, IL 60631
Contact: Dale S. Duffala
Phone: (312) 693-9741
FAX: (312) 693-7690
Capabilities: H 3 4

Ray F. Weston, Inc.
Vernon Hills, IL 60061
Contact: Jack Thorsen
Phone: (708) 918-4102
FAX: (708) 918-4055
Capabilities: E F H I O 2 3 5 7 10

Wight & Company
Downers Grove, IL 60515
Contact: Michael E. Pyrz, PE
Phone: (708) 969-7000
FAX: (708) 969-7979
Capabilities: E H O T 1 3 5 10

IOWA

Iowa Emergency Mgmt. Division
Des Moines, IA 50319
Contact: Ellen M. Gordon
Phone: (515) 281-3231
FAX: (515) 281-7539

Durrant Construction Mgmt. Inc.
Dubuque, IA 52004
Contact: G.L. Guy, Greg Hutchinson
Phone: (319) 583-9131
FAX: (319) 583-9078
Capabilities: E F I T 3 5

Durrant Engineers, Inc.
Dubuque, IA 52004
Contact: Charles R. Marsden, PE
Phone: (319) 583-9131
FAX: (319) 557-9078
Capabilities: F I T 1 2 3 12

Indeco, Inc.
Bettendorf, IA 52722
Contact: Paul H. Schwartz
Phone: (319) 359-5451
FAX: (319) 359-4318
Capabilities: F H L T

The Schemmer Assoc., Inc., A.E.P.
Davenport, IA 58201
Contact: Dale Christensen
Phone: (319) 391-0885
FAX: (319) 391-8635
Capabilities: E F L T 1 3 5 7

Stanley Consultants, Inc.
Muscatine, IA 52761
Contact: Lynn Pruitt
Phone: (319) 264-6600
FAX: (319) 264-6658
Capabilities: E F H I 1 3 10 12

KANSAS

Division of Emergency Preparedness
Topeka, KS 66601
Contact: Dan E. Karr
Phone: (913) 266-1400
FAX: (913) 266-1129

CDM Federal Programs Corporation
Lenexa, KS 66214
Contact: William A. Koek, PE
Phone: (913) 492-8181
FAX: (913) 492-5619
Capabilities: H 10

Gossen Livingston Associates, Inc.
Wichita, KS 67202
Contact: Thomas R. Gossen, AIA/PE
Phone: (316) 265-9367
FAX: (316) 265-5646
Capabilities: I T 3

HTX International, Inc.
Manhattan, KS 66502
Contact: Eric T. Dillinger
Phone: (913) 537-4852
FAX: (913) 537-4307
Capabilities: 3 5 7

Kerr Conrad Graham Assoc., Inc.
Prairie Village, KS 66208
Contact: Albert Kerr
Phone: (913) 362-5833
FAX: (913) 362-0837
Capabilities: E F I T 1 3

Kouza Constr. Co., Inc.
Junction City, KS 66441
Contact: John A. Trygg
Phone: (913) 762-2995
FAX: (913) 762-5230
Capabilities: E F L S 1 3 6 7

Lutz, Daffy & Brain Consulting Engineers
Overland Park, KS 66202
Contact: Thomas F. Lutz, PE
Phone: (913) 831-0833
FAX: (913) 831-1569
Capabilities: E F I T 1 3 4 12

Smith & Boucher, Inc.
Overland Park, KS
Contact: Daniel P. O'Grady
Phone: (913) 345-2127
FAX: (913) 345-0617
Capabilities: 3 5

KENTUCKY

Kentucky Disaster and Emergency Services
Frankfort, KY 40601-6168
Contact: James M. Everett
Phone: (502) 564-8682
FAX: (502) 564-8614

Howard K. Bell Consulting Engineers, Inc.
Hopkinsville, KY 42241
Contact: Robert J. Cope, II
Phone: (502) 886-5466
FAX: (502) 886-5122
Capabilities: E F H 3 10 12

CTI Environmental
Louisville, KY 40299
Contact: Darroll L. Hawkins, PE
Phone: (502) 266-7655
FAX: (502) 266-7743
Capabilities: F H O 3 5 10

Fuller, Mossbarger, Scott & May Engineers, Inc.
Lexington, KY 40511-2011
Contact: W.A. Mossbarger
Phone: (606) 233-0574
FAX: (606) 254-4800
Capabilities: E F H L 1 3 10

Ogden Env. & Energy Services
Louisville, KY 40299
Contact: David Dries, PE
Phone: (502) 267-0700
FAX: (502) 267-5900
Capabilities: F H L O 3 5 10 12

PDR Engineers, Inc.
Lexington, KY 40503
Contact: Michael Cooper
Phone: (606) 223-8000
FAX: (606) 224-1025
Capabilities: E H L T 1 3 10 12

Procter/Davis/Ray Engineers Inc.
Louisville, KY 40202
Contact: David B. Servis
Phone: (502) 584-5555
FAX: (502) 584-5696
Capabilities: E L 1 2 3 5

R.R. Ronald & Associates
Louisville, KY 40203
Contact: Ronald Dechery
Phone: (502) 635-5291
FAX: (502) 636-0878
Capabilities: E F I L T 3 5 12

Watkins and Associates, Inc.
Lexington, KY 40504
Contact: James E. Maggard
Phone: (606) 278-4903
FAX: (606) 277-7903
Capabilities: F 1 3 5

LOUISIANA

Office of Emergency Preparedness
Baton Rouge, LA 70804-4217
Contact: Bill J. Croft
Phone: (504) 342-5470
FAX: (504) 342-5471

Berger Bernard & Thomas, Inc.
Baton Rouge, LA 70896
Contact: Emmett Mayer, Jr.
Phone: (504) 927-8323
FAX: (504) 924-6461
Capabilities: F 1 3 12

Brown & Butler, Inc.
Baton Rouge, LA 70806
Contact: Charles L. Costner
Phone: (504) 924-0235
FAX: (504) 926-1687
Capabilities: F 1 3 5

Burk-Klempeter, Inc.
New Orleans, LA 70119

Emergency Capability Listing

Louisiana

Contact: George C. Klempeter, Jr.
Phone: (504) 486-5901
FAX: (504) 488-1714
Capabilities: E F L T I 3 5

John E. Chance & Associates, Inc.
Lafayette, LA 70506
Contact: Wade Jumonville
Phone: (318) 268-3291
FAX: (318) 268-3272
Capabilities: 3

Getech, Inc.
Baton Rouge, LA 70810
Contact: Rhaoul A. Guillaume
Phone: (504) 766-5358
FAX: (504) 766-5879
Capabilities: F L T I 3

Frederic R. Harris, Inc.
New Orleans, LA 70113
Contact: Tony Brocato
Phone: (504) 529-4533
FAX: (504) 522-2085
Capabilities: E F I T I 3 12

IT Corporation
Port Allen, LA 70767
Contact: Bob Lewis
Phone: (504) 344-8530
FAX: (504) 343-8673
Capabilities: H I O 10

Medjiski & Masters, Inc.
New Orleans, LA 70130
Contact: W. B. Conway
Phone: (504) 524-4344
FAX: (504) 561-1229
Capabilities: E F I L I 3 5

Waldemar S. Nelson & Co., Inc.
New Orleans, LA 70130
Contact: Tom Wells
Phone: (504) 523-5281
FAX: (504) 523-4587
Capabilities: F H I O 3

NTB, Inc.
Shreveport, LA 71101
Contact: Albert J. Bergamini, PE
Phone: (318) 226-9199
FAX: (318) 221-1208
Capabilities: E F L T I 3 12

Parsons Brinckerhoff Quade & Douglas
Metairie, LA 70002
Contact: Dale K. McDaniel
Phone: (504) 830-0070
FAX: (504) 830-0071
Capabilities: E F T I 3 5

Presco
Lafayette, LA 70506
Contact: A.L. Reaux
Phone: (318) 233-9914
FAX: (318) 233-9916
Capabilities: F I 3

Pyburn & Odum, Inc.
Baton Rouge, LA 70820
Contact: Tom Iglehart, V.P.
Phone: (504) 766-6330
FAX: (504) 769-7680
Capabilities: F I 3 10

URS Consultants, Inc.
Metairie, LA 70002
Contact: Vincent Provinza
Phone: (504) 837-6326
FAX: (504) 831-8860
Capabilities: E F H O I 3 5 10

Walk, Haydel & Associates, Inc.
New Orleans, LA 70130
Contact: William E. Read
Phone: (504) 586-8111
FAX: (504) 522-0554
Capabilities: E F H I I 3 5 7

MAINE

Maine Emergency Mgmt. Agency
Augusta, ME 04333
Contact: David D. Brown
Phone: (207) 289-4000
FAX: (207) 289-4079

T.Y. Lin International
Falmouth, ME 04105
Contact: Henry Cygan
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FAX: (207) 781-4753
Capabilities: E F L S I 3 5

MARYLAND

Emergency Management Agency
Pikesville, MD 21208
Contact: David A. McMillan
Phone: (301) 486-4422
FAX: (301) 486-1867

Henry Adams, Inc.
Baltimore, MD 21204
Contact: Charles A. Meyer
Phone: (301) 296-6500
FAX: (301) 296-3156
Capabilities: E F I T 3 12

Allied Contractors, Inc.
Baltimore, MD 21202
Contact: J. Jay Pecora, PE
Phone: (301) 539-6727
FAX: (301) 332-4594
Capabilities: E F H L I 3 7 10

AWD Technologies, Inc.
Rockville, MD 20853
Contact: Alan J. Shepard
Phone: (301) 948-0040

FAX: (301) 948-6094
Capabilities: H O 3 5 10

Boyle Engineering Corporation
Landover, MD 20785-5326
Contact: Stephen J. Spano
Phone: (301) 925-2700
FAX: (301) 925-4783
Capabilities: 3

Century Engineering, Inc.
Towson, MD 21204
Contact: Richard O. Beall
Phone: (410) 823-8070
FAX: (410) 823-2184
Capabilities: E F H L I 3 5

Energy Systems Engineering, Inc.
Kensington, MD 20895
Contact: Jose A. Raig
Phone: (301) 946-6160
FAX: (301) 946-5746
Capabilities: F 3 12

Greiner, Inc.
Timonium, MD 21093
Contact: Ed Trojan, PE
Phone: (410) 561-0100
FAX: (410) 561-9649
Capabilities: F T I 3 5

KCI Technologies, Inc.
Baltimore, MD 21286
Contact: Jack Kinstlinger
Phone: (410) 321-5500
FAX: (410) 583-1760
Capabilities: E F H O I 3 10 12

Metcalf & Eddy
Chevy Chase, MD 20815
Contact: Marilyn C. Bracken
Phone: (301) 654-4965
FAX: (301) 652-0817
Capabilities: E F H O I 3 5 10

Purdum and Joschko
Baltimore, MD 21202
Contact: Cay G. Weinel, Jr.
Phone: (410) 837-0194
FAX: (410) 837-3431
Capabilities: F I 3

RJN Environmental Associates, Inc.
College Park, MD 20740
Contact: R. B. Fernandez, PE
Phone: (301) 864-5400
FAX: (301) 864-4908
Capabilities: E F I T 2 3 5 7

RTKL Associates, Inc.
Baltimore, MD 21202
Contact: Harold L. Adams, FAIA
Phone: (410) 528-8600
FAX: (410) 385-2455
Capabilities: E F I T 3 5 12

Rummel Klepper & Kahl
Baltimore, MD 21217
Contact: Robert J. Halbert, PE
Phone: (410) 728-2900

FAX: (410) 728-2992
Capabilities: F H 10

Scharf-Godfrey, Inc.
Bethesda, MD 20814
Contact: Robin S. Godfrey
Phone: (301) 657-8620
FAX: (301) 656-4217
Capabilities: 3 5

Sheladin Associates, Inc.
Rockville, MD 20850
Contact: Col. Paul J. Theuer
Phone: (301) 590-3939
FAX: (301) 948-7174
Capabilities: E F H L I 3 7 10

SSM/Spotts, Stevens & McCoy Inc.
Baltimore, MD 21286
Contact: John Hendrick, PE
Phone: (410) 494-0500
FAX: (410) 296-3580
Capabilities: H 10

Stoller Stagg & Assoc., A/E/P, Inc.
Lanham, MD 20706
Contact: Eugene J. Kazmierczak
Phone: (301) 864-0096
FAX: (301) 731-0751
Capabilities: E F T I 2 3

Wainwright Engineering, Inc.
Bethesda, MD 20814
Contact: Archie B. Wainwright
Phone: (301) 907-2877
FAX: (301) 907-2879
Capabilities: E F I O I 3 5 10

Wallace, Montgomery and Associates
Lutherville, MD 20193
Contact: John Wallace, PE
Phone: (410) 494-9093
FAX: (410) 825-5714
Capabilities: E F L T I 3 5

Whitney, Bailey, Cox & Magnani
Timonium, MD 21093
Contact: Alexander Whitney, Jr.
Phone: (301) 252-6060
FAX: (301) 561-1194
Capabilities: E F I T I 3

MASSACHUSETTS

Massachusetts Emergency Management Agency
Frammingham, MA 01701-8317
Contact: A. David Rodham
Phone: (508) 826-2300
FAX: (508) 826-2030

Architectural Resources Cambridge
Cambridge, MA 02138
Contact: Colin L.M. Smith, FAIA
Phone: (617) 547-2200

Emergency Capability Listing

Massachusetts

Mississippi

FAX: (617) 547-7222
Capabilities: 3

Bryant Associates, Inc.
Boston, MA 02114
Contact: Jack D. Bryant
Phone: (617) 248-0300
FAX: (617) 248-0212
Capabilities: E F I 3

The BSC Group
Boston, MA 02210
Contact: Charles A. Kalasuska, PE
Phone: (617) 330-5300
FAX: (617) 345-8008
Capabilities: F 3 5

Camp Dresser & McKee Inc.
Cambridge, MA 02142
Contact: Paul Sorensen
Phone: (617) 621-8181
FAX: (617) 577-7501
Capabilities: H 10

Cole & Goyette, Inc.
Cambridge, MA 02139
Contact: Hal Goyette
Phone: (617) 491-5662
FAX: (617) 492-0856
Capabilities: F T 3 4

Fay, Spofford & Thorndike, Inc.
Lexington, MA 02173
Contact: Robert Cason
Phone: (617) 863-8300
FAX: (617) 861-6915
Capabilities: F I L T 1 3 5 12

The Geotechnical Group, Inc.
Needham, MA 02194
Contact: Stan Murphy
Phone: (617) 449-6450
FAX: (617) 499-1283
Capabilities: E F H L 1 3 5 10

Howard Needles Tammen & Bergendoff
Boston, MA 02199
Contact: Gordon H. Slaney, Jr.
Phone: (617) 267-6710
FAX: (617) 236-1233
Capabilities: F I 3 5

Kiewit Construction Company
Southborough, MA 01772
Contact: Bob Hebel
Phone: (508) 485-1761
FAX: (508) 485-7499
Capabilities: E F L T I 3

Paul E.K. Lu & Associates
Belmont, MA 02178
Contact: Paul E.K. Lu
Phone: (617) 484-4022
FAX: (617) 484-4076
Capabilities: E S I 3

SAIC Engineering, Inc.
Lakeville, MA 02347
Contact: Paul King

Phone: (508) 946-3500
FAX: (508) 946-3509
Capabilities: H O R I 3 5 10

Sykes & Hennessy, Inc.
Cambridge, MA 02138
Contact: Joseph F. Manfredi
Phone: (617) 868-3500
FAX: (617) 868-8012
Capabilities: E F I 1 2 12

Universal Engineering Corporation
Boston, MA 02116
Contact: Stanley D. Elkerton
Phone: (617) 542-8216
FAX: (617) 423-0373
Capabilities: E F 3 5 10 12

Vanasse Hangen Brustlin, Inc.
Watertown, MA 02172
Contact: Charles C. Crevo
Phone: (617) 924-1770
FAX: (617) 924-2286
Capabilities: F I 3 5

Vollmer Associates
Boston, MA 02216
Contact: Edmund J. Condon
Phone: (617) 451-0044
FAX: (617) 451-3423
Capabilities: E F L I 3 5

Roy F. Weston, Inc.
Burlington, MA 01803
Contact: Steve Lewis
Phone: (617) 229-2050
FAX: (617) 229-0046
Capabilities: E F H I O 2 3 5 7 10

Weston & Sampson Engineers, Inc.
Peabody, MA 01960
Contact: John D. Jolla
Phone: (508) 532-1900
FAX: (508) 977-0100
Capabilities: H O 3 5 10

Marine Pollution Control
Detroit, MI 48209
Contact: Michael Pope
Phone: (313) 849-2333
FAX: (313) 849-1623
Capabilities: F H I O 4 10

NTH Consultants, Ltd.
Farmington Hills, MI 48331
Contact: Jerome C. Neyer
Phone: (313) 553-6300
FAX: (313) 489-0727
Capabilities: E H I O 1 3 10

Snell Environmental Group, Inc.
Lansing, MI 48906
Contact: Pratap Rajadhyaksha
Phone: (517) 374-6800
FAX: (517) 374-7390
Capabilities: E F H O 1 3 5 10

SSOE, Inc.
Troy, MI 48064
Contact: Phillip Holmblade
Phone: (313) 643-6222-271
FAX: (313) 643-6225
Capabilities: F I T 1 3 5 12

Testing Engrs. & Consultants, Inc.
Troy, MI 48063
Contact: Susan R. Arnes
Phone: (313) 588-6200
FAX: (313) 588-6232
Capabilities: H O 3 10

Waste Management
Livonia, MI 48152
Contact: Jeff Poole
Phone: (313) 462-6900
FAX: (313) 462-6284
Capabilities: E F I T 3 10

MINNESOTA

Department of Public Safety
St. Paul, MN 55155
Contact: James Franklin
Phone: (612) 296-2233
FAX: (612) 296-1499

BKBM
Minneapolis, MN 55401
Contact: Charles Bailou
Phone: (612) 333-7101
FAX: (612) 342-9482
Capabilities: I F S T I 2 3 5

Detector Electronics Corp.
Minneapolis, MN 55438
Contact: K. M. Klapmeyer
Phone: (612) 941-5665
FAX: (612) 829-8750
Capabilities: I 4

EL River Concrete Products, A Division of The Cretex Corp.
Minneapolis, MN 55427

Contact: Larry G. Koenig
Phone: (612) 545-7473
FAX: (612) 545-8399
Capabilities: F H L T I 3

Howard, Needles, Tammen & Bergendoff
Minneapolis, MN 55435
Contact: Richard D. Beckman
Phone: (612) 920-4666
FAX: (612) 920-0173
Capabilities: E F L T I 3 5

Al Johnson Construction Co.
Minneapolis, MN 55435
Contact: Douglas A. Johnson
Phone: (612) 831-8151
FAX: (612) 893-9215
Capabilities: E F L T I 3 12

Johnson Bros. Corporation
Litchfield, MN 55355
Contact: R.W. Johnson
Phone: (612) 693-2871
FAX: (612) 693-9192
Capabilities: E F L T I 3 5 10

Markhard
Minneapolis, MN 55401
Contact: Robert E. Swanson
Phone: (612) 420-9606
FAX: (612) 420-9584
Capabilities: E F O T 3 5

Schoell & Madsen, Inc.
Minnetonka, MN 55305
Contact: Thomas Schottenbauer
Phone: (612) 546-7601
FAX: (612) 546-9065
Capabilities: F T L I 3 10

Short-Elliott-Hendrickson, Inc.
St. Paul, MN 55110
Contact: Dave Filkins
Phone: (612) 490-2000
FAX: (612) 490-2150
Capabilities: F L O T I 3 5 10

MISSISSIPPI

Mississippi Emergency Management Agency
Jackson, MS 39296-4501
Contact: James E. Maher
Phone: (601) 352-9100
FAX: (601) 352-8314

JAYCOR
Vicksburg, MS 39180
Contact: Dr. Paul F. Minkar
Phone: (601) 634-6361
FAX: (601) 638-7738
Capabilities: E F I T I 3

Maptech Inc.
Jackson, MS 39206
Contact: Sam G. Posey

Emergency Capability Listing

Mississippi

New Jersey

Phone: (601) 981-0112
FAX: (601) 981-2867
Capabilities: E F I T 1 3 5

Neel-Schaffer, Inc.
Jackson, MS 39225
Contact: J. Gorman Schaffer
Phone: (601) 948-3071
FAX: (601) 948-3178
Capabilities: F I 3

Spencer Engineers, Inc.
Jackson, MS 39216
Contact: James Fitzpatrick
Phone: (601) 982-7766
FAX: (601) 982-7769
Capabilities: F T I 3

MISSOURI

State Emergency Management Agency
Jefferson City, MO 65102
Contact: Richard D. Ross
Phone: (314) 751-9779
FAX: (314) 624-7966

J.S. Alberici Construction Co., Inc.
St. Louis, MO 63121
Contact: Guy Jester
Phone: (314) 261-2611
FAX: (314) 261-4225
Capabilities: E F T

Kenneth Balk & Associates, Inc.
St. Louis, MO 63141
Contact: Gary N. Schmidt
Phone: (314) 576-2021
FAX: (314) 576-2075
Capabilities: E F I S 1 3 5 7

Black & Veatch
Kansas City, MO 64114
Contact: George J. Hirt
Phone: (913) 339-8305
FAX: (913) 339-8257
Capabilities: E F I T 1 3 5 12

Becker Associates, Inc.
St. Louis, MO 63101
Contact: T. Roger Peterson
Phone: (314) 421-1476
FAX: (314) 421-1741
Capabilities: F I 1 3

Boyd, Brown, Stude, & Cambern,
Chartered
Kansas City, MO 64112
Contact: John A. Boyd, Jr.
Phone: (816) 756-1484
FAX: (816) 756-0559
Capabilities: E F I T 1 3 5

Burns & McDonnell
St. Louis, MO 63127
Contact: Robert T. Berry
Phone: (314) 821-9016

FAX: (314) 821-5406
Capabilities: E F O T 3 7 12

Burns & McDonnell
Kansas City, MO 64130
Contact: Dave Ruf
Phone: (816) 333-4375
FAX: (816) 822-3413
Capabilities: E F H O 3 5 10 12

Bob Campbell & Co.
Kansas, MO 64111
Contact: Don H. Luellen
Phone: (816) 531-4144
FAX: (816) 531-8572
Capabilities: E F I T 3

Lee A. Daly Company
St. Louis, MO 63105
Contact: Guy C. Picardi
Phone: (314) 727-2700
FAX: (314) 727-3051
Capabilities: E I T 1 3 5 12

Engineering Design & Mgmt., Inc.
St. Louis, MO 63101
Contact: Bill Evers
Phone: (314) 231-5485
FAX: (314) 231-8167
Capabilities: E F I 3 12

Feth & Van Dyke and Associates
St. Louis, MO 63146
Contact: Richard Fernhall
Phone: (314) 434-5700
FAX: (314) 434-7071
Capabilities: 3 10 12

FRU-CON Engineering, Inc.
Ballwin, MO 63022
Contact: Kathleen Kresser
Phone: (314) 391-6700
FAX: (314) 391-4513
Capabilities: I T 3

Geotechnology, Inc.
St. Louis, MO 63146
Contact: W. Gary Simmons
Phone: (314) 997-7440
FAX: (314) 997-2067
Capabilities: E F H L 3 10

Law Companies
Kansas City, MO 64153
Contact: Arthur J. Whallon
Phone: (816) 891-9332
FAX: (816) 891-8644
Capabilities: E L O 3 5

Maseman Construction Co.
St. Louis, MO 63127
Contact: Paul C. Schnoebele
Phone: (314) 821-0042
FAX: (314) 821-0760
Capabilities: E F O T 1 3 5 7

O'Brien & Gere Engineers, Inc.
St. Louis, MO 63101
Contact: Deann L. Palmer

Phone: (314) 842-4550
FAX: (314) 842-3266
Capabilities: H O R S 3 7 10 12

Sverdrup Corporation
St. Louis, MO 63043
Contact: Gordon R. Pennington
Phone: (314) 436-7600
FAX: (314) 298-0045
Capabilities: E F H T 13 10 12

NEBRASKA

Nebraska Civil Defense Agency
Lincoln, NE 68508-1090
Contact: Richard L. Samm
Phone: (402) 473-1410
FAX: (402) 473-1433

Lee A. Daly
Omaha, NE 68114
Contact: James M. Ingram
Phone: (402) 391-8564
FAX: (402) 392-8111
Capabilities: E F T 3 5

Dames & Moore
Omaha, NE 68131
Contact: Dave Henney
Phone: (402) 498-8505
FAX: (402) 498-8532
Capabilities: F H O T 3 5 7 10

Farris Engineering
Omaha, NE 68154
Contact: Robert Lodes
Phone: (402) 330-5900
FAX: (402) 330-5902
Capabilities: E F I T 2 3 5 12

HGM Associates Inc.
Omaha, NE 68102
Contact: Ron Tekippe
Phone: (402) 346-7559
FAX: (402) 346-0224
Capabilities: F I 3

Johnson-Erickson-O'Brien
Wahoo, NE 68066
Contact: Michael L. Goertzen
Phone: (402) 443-4661
FAX: (402) 442-3508
Capabilities: F T 3

Kelly Industries, Inc.
Fremont, NE 68025
Contact: Steve Kniff
Phone: (800) 228-7230
FAX: (402) 727-1363
Capabilities: F I R T 6 7

Kiewit Construction Group, Inc.
Omaha, NE 68131
Contact: Don Wrieth
Phone: (402) 342-2052
FAX: (402) 271-2918
Capabilities: E F L T 1 2 3

Kirkham, Michael & Associates
Omaha, NE 68124
Contact: James Siebken
Phone: (402) 393-5630
FAX: (402) 393-5641
Capabilities: F T I 3

Lamp, Rynearson & Associates, Inc.
Omaha, NE 68154
Contact: Mike McMeekin
Phone: (402) 496-2498
FAX: (402) 496-2730
Capabilities: F L S T 3

Prochaska & Associates
Omaha, NE 68154
Contact: Donald F. Prochaska
Phone: (402) 334-0755
FAX: (402) 334-0868
Capabilities: F T I T 3 5 10 12

The Schumacher Associates Inc.
Omaha, NE 68132
Contact: Roger Wozny
Phone: (402) 493-4800
FAX: (402) 493-7951
Capabilities: E F H T 1 3 10 12

Terrason Consultants, Inc.
Omaha, NE 68130
Contact: John F. Hartwell
Phone: (402) 334-2202
FAX: (402) 330-7606
Capabilities: H 3 10

Woodward-Clyde Consultants
Omaha, NE 68154
Contact: Kenneth Ness
Phone: (402) 334-8181
FAX: (402) 334-1984
Capabilities: E H L O 3 5 10

NEW HAMPSHIRE

Governor's Office of Emerg. Mgmt.
Concord, NH 03302
Contact: George L. Iversen
Phone: (603) 271-2231
FAX: (603) 225-7341

Vannote-Hanger-Brustlin, Inc.
Bedford, NH 03110
Contact: Frank O'Callaghan
Phone: (603) 644-0888
FAX: (603) 644-2385
Capabilities: E F L T 1 3 5

NEW JERSEY

Office of Emergency Management
West Trenton, NJ 08628-0048
Contact: Carl A. Williams
Phone: (609) 538-6859
FAX: (609) 538-8345

Emergency Capability Listing

New Jersey

New York

Applied Engineering & Tech. P.C.
Princeton, NJ 08540
Contact: Harald Greve, PE
Phone: (609) 921-8999
FAX: (609) 921-0483
Capabilities: E F I L

Louis Berger International, Inc.
East Orange, NJ 07019
Contact: Gerald P. Shea
Phone: (201) 678-1960
FAX: (201) 672-4284
Capabilities: E F H O I 3 5 10

Burns and Roe Enterprises, Inc.
Oradell, NJ 07649
Contact: Wagih S. Andraos
Phone: (201) 265-2000-2923
FAX: (201) 967-0823
Capabilities: I 3 12

Foster Wheeler USA Corporation
Clinton, NJ 08809
Contact: Carsten Sibbern
Phone: (908) 730-4000
FAX: (908) 730-4460
Capabilities: H I O 3 5 10 12

Goodkind & O'Dea, Inc.
Rutherford, NJ 07070
Contact: Donald Goldberg, PE
Phone: (201) 438-6166
FAX: (201) 438-9168
Capabilities: E F H I 1 3 5 10

Killam Associates
Millburn, NJ 07041
Contact: James G. Coe
Phone: (908) 534-4700
FAX: (908) 534-2069
Capabilities: F H O 3

John C. Morris Associates, Inc.
Shrewsbury, NJ 07702
Contact: Lawrence P. Lehmann
Phone: (908) 576-8800
FAX: (908) 842-5753
Capabilities: F H I O 3 10 12

PBS Building Systems, Inc.
Shrewsbury, NJ 07701
Contact: Elizabeth Hall
Phone: (800) 635-1249
FAX: (908) 389-1809
Capabilities: E 3 6

URS Consultants, Inc.
Paramus, NJ 07652
Contact: Francis J. Geran
Phone: (201) 262-7000
FAX: (201) 262-9199
Capabilities: E F H T I 3 5 10

Vellmer Associates
Rochelle Park, NJ 07662
Contact: Charles S. DiMarco
Phone: (201) 587-9040
FAX: (201) 587-0444
Capabilities: E F H L I 3 5 10

NEW MEXICO

Emergency Management Bureau
Santa Fe, NM 87504
Contact: R. Keith Lough
Phone: (505) 827-9222
FAX: (505) 827-3456

Greiner, Inc.
Albuquerque, NM 87109
Contact: John F. Thomas
Phone: (505) 265-3999
FAX: (505) 345-8393
Capabilities: E F I L 3 4 12

Merrick & Co.
Los Alamos, NM 87544
Contact: Masoud Zarraby
Phone: (505) 662-2194
FAX: (505) 662-3851
Capabilities: F I L T 3 5 12

Scanlon & Assoc./KLH Engineering
Albuquerque, NM 87110
Contact: Kenneth H. Karison
Phone: (505) 265-6941
FAX: (505) 266-2003
Capabilities: E F H L I 3 5

NEW YORK

New York State Emergency Mgmt.
Albany, NY 12226-9000
Contact: (518) 457-2222
FAX: (518) 457-9930

Apollon Waterproofing & Restoration Corp.
Astoria, NY 11103
Contact: Michael P. Downes
Phone: (718) 728-8000
FAX: (718) 728-2565
Capabilities: E F I T I 3

Berger, Lehman Associates, P.C.
Rye, NY 10580
Contact: Lawrence H. Lehman
Phone: (914) 967-5800
FAX: (914) 967-5263
Capabilities: I 3

Bettigole, Andrews & Clark, Inc.
Buffalo, NY 14203
Contact: Lane K. Hardin
Phone: (716) 854-1181
FAX: (716) 854-1800
Capabilities: E F L I 3

E. H. Brunjes & Associates
New York, NY 10016
Contact: Edwin H. Brunjes
Phone: (212) 689-0408
FAX: (212) 689-3798
Capabilities: E F I 3 5 1

Leon D. DeMatta Constr. Corp.
Elmont, NY 11003
Contact: A.L. DeMatta
Phone: (516) 285-5500
FAX: (516) 285-6950
Capabilities: E F L S 3 5 7

Ehsaz Giacalone Associates, P.C.
Garden City, NY 11530
Contact: Russell D. Ehsaz
Phone: (516) 542-6300
FAX: (516) 542-9052
Capabilities: E F H T I 3 5 7 11

Fanning, Phillips & Molnar
Ronkonkoma, NY 11779
Contact: Gary A. Molnar, PE
Phone: (516) 737-6200
FAX: (516) 737-2410
Capabilities: F H I O I 3 4 10

Federman Construction Consultants
New York, NY 10016
Contact: Paula T. Federman
Phone: (212) 447-9444
FAX: (212) 447-9440
Capabilities: E F I I 3 5

Fogel & Associates, Inc.
New York, NY 10010
Contact: Irving M. Fogel
Phone: (212) 686-6500
FAX: (212) 684-1487
Capabilities: E F I 3 5

Goldman Copeland Associates, P.C.
New York, NY 10011
Contact: Martin J. Goldman
Phone: (212) 929-0480
FAX: (212) 929-7251
Capabilities: E F I O 3 4 5 12

Goodkind & O'Dea, Inc.
New York, NY 10003
Contact: Gary Newerth, Ph.D.
Phone: (212) 505-8585
FAX: (212) 228-6029
Capabilities: E F T I 3

Haines Lundberg Washler
New York, NY 10003
Contact: Robert A. Djerejian
Phone: (212) 353-4600
FAX: (212) 353-4666
Capabilities: 3

Hao-Padron Associates
New York, NY 10001
Contact: Dennis Padron
Phone: (212) 736-5466
FAX: (212) 629-4406
Capabilities: E F L O I 3

Hardesty & Hanover
New York, NY 10036
Contact: Henry W. Fischer
Phone: (212) 944-1150
FAX: (212) 391-0297
Capabilities: E F I 3

Henderson & Redwell Consulting Engrs.
Plainview, NY 11803
Contact: Russell S. Bodwell
Phone: (516) 935-8870
FAX: (516) 935-8760
Capabilities: 2

Hendrickson Bros., Inc.
Valley Stream, NY 11582
Contact: Milton A. Hendrickson
Phone: (516) 825-3249
FAX: (516) 825-3203
Capabilities: E F S I 3

Kittrell, Garlock and Associates
Las Vegas, NY 89103
Contact: Kathleen Richards
Phone: (702) 367-6900
FAX: (702) 367-2043
Capabilities: E F 3

Korva-DiResta Construction Co. Inc.
New York, NY 10017
Contact: Robert Welner
Phone: (212) 696-5454
FAX: (212) 696-5942
Capabilities: I 3

Lockwood Greene Engineers
New York, NY 10001
Contact: Carmine DiLullo
Phone: (212) 613-1601
FAX: (212) 613-1747
Capabilities: E F H I 3 5 7 12

Lockwood Kessler & Bartlett, Inc.
Syosset, NY 11791
Contact: John Lokstatis
Phone: (516) 938-0600
FAX: (516) 931-6344
Capabilities: E F O I 2 12

Mueser Rutledge Consulting Engrs.
New York, NY 10017
Contact: Warren H. Anderson
Phone: (212) 490-7110
FAX: (212) 953-5626
Capabilities: E F L T 3 5

O'Brien-Kratzberg
New York, NY 10036
Contact: George Fink
Phone: (212) 921-9898
FAX: (212) 391-4565
Capabilities: E F L T 3 5 7

Parsons Brinckerhoff Inc.
New York, NY 10119
Contact: James L. Lammie
Phone: (212) 465-5000
FAX: (212) 465-5096
Capabilities: E F I L I 3 12

Roberts-Gordon, Inc.
Buffalo, NY 14206
Contact: John G. Berkhoudt
Phone: (716) 852-4400
FAX: (716) 852-0854
Capabilities: F 3

Emergency Capability Listing

New York

Oklahoma

The Sear-Brown Group
Lake Success, NY 11042
Contact: James Noonan, PE
Phone: (516) 358-7270
FAX: (516) 358-2588
Capabilities: E F I 3

TAMS Consultants, Inc.
New York, NY 10017
Contact: G. Barrie Heinzenknecht
Phone: (212) 867-1777
FAX: (212) 697-6354
Capabilities: E F H L 1 2 5 10

Vollmer Associates
New York, NY 10010
Contact: Robert Samson
Phone: (212) 366-5600-112
FAX: (212) 366-5629
Capabilities: E F I 3

Lev Zetlin Associates, Inc.
New York, NY 10011
Contact: Joseph N. Zuliani
Phone: (212) 741-1300
FAX: (212) 675-4052
Capabilities: E F I T 1 3 5

NORTH CAROLINA

Division of Emergency Management
Raleigh, NC 27603-1335
Contact: Joseph F. Myers
Phone: (919) 733-3867
FAX: (919) 733-7554

Contractors & Engrs. Services, Inc.
Goldboro, NC 27530
Contact: John D. Grady
Phone: (919) 735-7355
FAX: (919) 736-1535
Capabilities: E H L O 1 3 10

Dear & Associates, P.A.
Charlotte, NC 28222
Contact: George A. Greene, PE
Phone: (704) 847-1525
FAX: (704) 845-2083
Capabilities: E F L T 1 2 3 12

J. A. Jones Construction
Charlotte, NC 28210
Contact: Norm Delbridge
Phone: (704) 569-2962
FAX: (704) 569-6548
Capabilities: E F R T 3 10

Northeast Construction Co.
Jacksonville, NC 28546
Contact: Stephen A. Strapac
Phone: (919) 353-3558
FAX: (919) 353-3005
Capabilities: E F T 3

RS&H Architects-Engineers-Planners, Inc.
Greensboro, NC 27407

Contact: Tom Stones
Phone: (919) 852-6152
FAX: (919) 855-3029
Capabilities: F I 1 3 5

Robert M. Stafford, Inc.
Charlotte, NC 28269
Contact: Thomas R. Anderson
Phone: (704) 875-0207
FAX: (704) 875-0408
Capabilities: E F T 5

NORTH DAKOTA

North Dakota Division of Emergency
Bismarck, ND 58502-5511
Contact: Ronald D. Affedit
Phone: (701) 224-2113
FAX: (701) 224-2119

Molstad Excavating Inc.
Grand Forks, ND 58201
Contact: Gary Molstad
Phone: (701) 746-5474
FAX: (701) 746-5475
Capabilities: F H S T

Peterson Construction Co., Inc.
Grand Forks, ND 58201
Contact: Clarence O. Peterson
Phone: (701) 746-6446
FAX: (701) 772-1763
Capabilities: F H S T 1 3 9 10

OHIO

Ohio Emergency Mgmt. Agency
Columbus, OH 43235-2712
Contact: Dale W. Shipley
Phone: (614) 889-7150
FAX: (614) 889-7183

Baker Concrete Construction Inc.
Monroe, OH 45050
Contact: Mike Schneider
Phone: (513) 539-4000
FAX: (513) 539-4380
Capabilities: I 3

Barge, Waggoner, Sumner, and Cannon
Dayton, OH 45342
Contact: C. R. "Chuck" Westhart
Phone: (513) 438-0378
FAX: (513) 438-0379
Capabilities: E F I T 1 3 5 10

Burgess & Niple, Limited
Columbus, OH 43220
Contact: Frank C. Agin
Phone: (614) 459-2050
FAX: (614) 451-1385
Capabilities: E F H T 1 2 3 10

Dedson-Lindblom Associates, Inc.
Columbus, OH 43229
Contact: A. James Siebert
Phone: (614) 848-4141
FAX: (614) 848-6712
Capabilities: E F H L 3 5 10

A.M. Kinney, Inc.
Cincinnati, OH 45219
Contact: Leonard T. Rudick
Phone: (513) 281-2900
FAX: (513) 281-1123
Capabilities: H I L T 2 5 7 10

T. Luckey Sons, Inc.
Harrison, OH 45030
Contact: Thomas A. Luckey
Phone: (513) 353-2655
FAX: (513) 535-2655
Capabilities: E L R 1 3 10

Frank Messer & Sons Const. Co.
Cincinnati, OH 45229
Contact: Edward H. Miller
Phone: (513) 242-1541
FAX: (513) 242-6467
Capabilities: E I T 3

Metcalf & Eddy, Inc.
Cleveland, OH 44122
Contact: Richard A. Bell
Phone: (216) 292-8191
FAX: (216) 292-5931
Capabilities: H I O R 1 3 10 12

Metcalf & Eddy, Inc.
Columbus, OH 43231
Contact: Chris Stotler
Phone: (614) 890-5501
FAX: (614) 890-0372
Capabilities: H X L O 1 3 7 10

MICAH Systems, Inc.
Fairborn, OH 45324
Contact: Thomas G. Batty
Phone: (513) 429-2991
FAX: (513) 429-2854
Capabilities: 5

MK-Ferguson Group
Cleveland, OH 44113
Contact: James J. Gajoch
Phone: (216) 523-5228
FAX: (216) 523-5228
Capabilities: E F H I 1 3 5 10

Montgomery County Engr. Office
Dayton, OH 45422
Contact: Rex A. Dickey
Phone: (513) 225-4889
FAX: (513) 497-7441
Capabilities: H S I 3

NBBJ
Columbus, OH 43215
Contact: Mark Perry
Phone: (614) 224-
FAX: (614) 224-0218
Capabilities: 3

QSource Engineering Inc.
Miamisburg, OH 45342
Contact: Don Main
Phone: (513) 866-4211
FAX: (513) 866-7893
Capabilities: H 3 10

S.E.M. Partners, Inc., Arch., Planners
Columbus, OH 43214
Contact: Jack Chapin
Phone: (614) 267-6369
FAX: (614) 267-0027
Capabilities: 3

Shaw, Weiss & De Naples
Dayton, OH 45402
Contact: George B. Shaw
Phone: (513) 443-0181
FAX: (513) 443-0982
Capabilities: H O 1 3 10

Spectra-Physics Laserplane, Inc.
Dayton, OH 45424
Contact: Jack A. Patton
Phone: (513) 233-8921
FAX: (513) 233-9004
Capabilities: E F 3

Wise Construction Company, Inc.
Dayton, OH 45427
Contact: David F. Abney, II
Phone: (513) 854-0281
FAX: (513) 837-4890
Capabilities: 2 3 9 11

OKLAHOMA

Oklahoma Department of Civil
Emergency Management
Oklahoma City, OK 73152
Contact: John F. Dahl
Phone: (405) 521-2481
FAX: (405) 521-4853

The Benham Group
Tulsa, OK 74135
Contact: W.B. Smith
Phone: (918) 492-1600, ext. 316
FAX: (918) 492-1031
Capabilities: F H E 3 5 10 12

Bruton Knowles & Love, Inc.
Tulsa, OK 74158
Contact: Robert O. Bruton
Phone: (918) 835-9588
FAX: (918) 835-9119
Capabilities: E F T 1 3

Jim Cooley Construction, Inc.
Oklahoma City, OK 73105
Contact: Robert Cooley
Phone: (405) 528-8093
FAX: (405) 521-0379
Capabilities: I S T 1

Design Drafting, Inc.
Oklahoma City, OK 73099

Emergency Capability Listing

Oklahoma

Contact: Lon Spencer
Phone: (405) 354-6679
FAX: (405) 354-4827
Capabilities: E F T I 3

FHC, Inc.

Tulsa, OK 74135-6374
Contact: Tony Dark, PE
Phone: (918) 663-7300
FAX: (918) 663-6269
Capabilities: E F T I 3

Pee & Associates, Inc.

Tulsa, OK 74147
Contact: Joe H. Pitts
Phone: (918) 665-8800
FAX: (918) 665-6076
Capabilities: K F L T I 3

Ross Associates, Inc.

Oklahoma City, OK 73112-1499
Contact: C. Leroy James, AIA
Phone: (405) 942-7337
FAX: (405) 948-1261
Capabilities: E F T 2 3 5

Roberts/Schornick & Associates, Inc.

Norman, OK 73072
Contact: Ken Senour
Phone: (405) 321-3895 ext. 163
FAX: (405) 364-1708
Capabilities: H O R 3 10

Standard Testing & Engineering

Oklahoma City, OK 73105
Contact: Mark Byrd
Phone: (405) 528-0541
FAX: (405) 528-0559
Capabilities: F H I T I 3 9 10

Willbros Butler Engineers, Inc.

Tulsa, OK 74136
Contact: Walt Lindemann
Phone: (918) 496-0400
FAX: (918) 491-9436
Capabilities: E F O T 3 5 7 12

OREGON

Emergency Management Division

Salem, OR 97310
Contact: Myra T. Lee
Phone: (503) 378-4124
FAX: (503) 588-1378

Cornforth Consultants, Inc.

Portland, OR 97223
Contact: Derek H. Cornforth
Phone: (503) 452-1100
FAX: (503) 452-1528
Capabilities: L E S 3

URS Consultants, Inc.

Portland, OR 97232
Contact: Thomas A. Hjort
Phone: (503) 238-7050

FAX: (503) 230-0477
Capabilities: E F H T I 3 5 10

Van Galik/Oliver, Inc.

Portland, OR 97034
Contact: Paul E. Oliver
Phone: (503) 635-3734
FAX: (503) 636-4178
Capabilities: E I 3

PENNSYLVANIA

Pennsylvania Emergency Management Agency

Harrisburg, PA 17105-3321
Contact: Joseph L. LaFleur
Phone: (717) 783-8016
FAX: (717) 783-7393

Benetec Associates

Camp Hill, PA 17011
Contact: Richard M. Miller
Phone: (717) 763-7391
FAX: (717) 763-7397
Capabilities: F H O 3 5

Brinjac, Kambic & Associates, Inc.

Harrisburg, PA 17102
Contact: Tom Finnerty
Phone: (717) 233-4502
FAX: (717) 233-0833
Capabilities: E F I T 3 12

Buchart-Horn, Inc.

York, PA 17405
Contact: Peta N. Richkiss
Phone: (717) 843-5561
FAX: (717) 845-3703
Capabilities: E F H O I 3 5 10

Capital Engineering Corp.

Dillsburg, PA 17019
Contact: Edward W. Boggs
Phone: (717) 432-9628
FAX: (717) 432-2781
Capabilities: F I L 3

Chester Environmental, Inc.

Cornapolis, PA 15108
Contact: Bruce A. Fletcher
Phone: (412) 269-5827
FAX: (412) 269-5749
Capabilities: 3 10

Conti Environmental, Inc.

Pittsburgh, PA 15205
Contact: Dennis Morgan
Phone: (412) 788-1313
FAX: (412) 788-6750
Capabilities: F H L O I 3 9 10

Day & Zimmerman, Inc.

Philadelphia, PA 19103
Contact: Edward J. McGinniss
Phone: (215) 299-8476
FAX: (215) 299-8344
Capabilities: E F I T I 3 5 7

Gannett Fleming, Inc.

Harrisburg, PA 17106-7100
Contact: Richard B. Ulp
Phone: (717) 763-7211
FAX: (717) 763-1808
Capabilities: F H L O I 3 5 10

IT Corporation

Mourneville, PA 15146
Contact: Jack Wright
Phone: (412) 372-7701
FAX: (412) 373-7135
Capabilities: H O 3 10

Pennoni Associates, Inc.

Philadelphia, PA 19130
Contact: Joseph V. Mullin, PE
Phone: (215) 561-0460
FAX: (215) 496-0063
Capabilities: F H O T I 3 10 12

Primavera Systems, Inc.

Bala Cynwyd, PA 19004-1576
Contact: Scott Deutch
Phone: (215) 667-8600
FAX: (215) 667-7894
Capabilities: 5

SSM/Spotts, Stevens & McCoy, Inc.

Reading, PA 19610
Phone: (215) 376-6581
FAX: (215) 376-6950
Capabilities: H 10

STV Group

Pottstown, PA 19464
Contact: Edward E. Gilvey
Phone: (215) 326-4600
FAX: (215) 326-2718
Capabilities: E F H I I 3 10

Roy F. Weston, Inc.

West Chester, PA 19380
Contact: Glenn Johnson
Phone: (215) 430-7501
FAX: (215) 430-3158
Capabilities: E F H I O 2 3 5 7 10

SOUTH CAROLINA

Emergency Preparedness Division

Columbia, SC 29201-3782
Contact: Paul R. Lunsford
Phone: (803) 734-8828
FAX: (803) 734-8862

Lockwood Greene Engineers, Inc.

Spartanburg, SC 29304
Contact: James M. Anderson
Phone: (800) 845-3302
FAX: (803) 599-0436
Capabilities: F H I R I 2 3 12

LSBP Architects, Ltd.

Charleston, SC 29401
Contact: Vito R. Pascullia
Phone: (803) 577-4444

FAX: (803) 722-4789
Capabilities: E F T 3

Stevens & Wilkinson, Inc.

Columbia, SC 29202
Contact: Karl S. Bowers
Phone: (803) 765-0320
FAX: (803) 254-6209
Capabilities: F I 2 3 6

SOUTH DAKOTA

Division of Emergency Management

Pierre, SD 57501-3060
Contact: Gary N. Whitney
Phone: (605) 773-3231
FAX: (605) 773-3588

Reamer Associates, Inc.

Rapid City, SD 57709
Contact: Tim Conner
Phone: (605) 343-0222
FAX: (605) 343-3477
Capabilities: E F L T I 3 5

TENNESSEE

Emergency Management Agency

Nashville, TN 37284
Contact: Larry E. Sutter
Phone: (615) 741-8881
FAX: (615) 242-9635

Allen & Hoshell

Memphis, TN 38112
Contact: Thomas E. Needham
Phone: (901) 327-8222
FAX: (901) 324-7154
Capabilities: E F H T 3 10 12

Berge, Waggoner, Sumner and Cannon, Inc.

Nashville, TN 37201
Contact: David L. Davidson
Phone: (615) 254-1500
FAX: (615) 255-6572
Capabilities: T E F H I 2 3 10

Calpan Corp., Service Contracts

Div./AEDC Operations
Arnold AFB, TN 37389-4300
Contact: J. N. Patterson
Phone: (615) 455-3101
FAX: (615) 393-3608
Capabilities: I H O 5

Continental Engineering, Inc.

Memphis, TN 38116
Contact: Gerald Lawson
Phone: (901) 345-3480
FAX: (901) 396-8735
Capabilities: E F H L I 3 5 10

Emergency Capability Listing

Tennessee

Ellers, Oakley, Chester & Rika, Inc.
Memphis, TN 38105
Contact:
Phone: (901) 526-7321
FAX: (901) 526-7329
Capabilities: I 3 4

EMPE, Inc.
Nashville, TN 37228
Contact: Barry Westbrook
Phone: (615) 255-9300
FAX: (615) 255-9345
Capabilities: H O 3 5 10

Environmental Protection Sys., Inc.
Brentwood, TN 37027
Contact: Russell Pitzer, PE
Phone: (615) 373-8021
FAX: (615) 373-7997
Capabilities: H I O 3 5 10

Espey, Huston & Assoc., Inc.
Nashville, TN 37214
Contact: Wayne R. Long
Phone: (615) 885-0298
FAX: (615) 391-4606
Capabilities: E F H O I 3 5 10

Gresham, Smith and Partners
Nashville, TN 37202
Contact: Robert L. Syler, PE
Phone: (615) 385-3310
FAX: (615) 269-8162
Capabilities: F H L S I 3 8 10

IT Corporation
Knoxville, TN 37923
Contact: Don Ewig
Phone: (615) 690-3211
FAX: (615) 690-3226
Capabilities: H O 3 10

Neel-Schaffer, Inc.
Nashville, TN 37210
Contact: Richard Riggins
Phone: (615) 254-4257
FAX: (615) 254-4261
Capabilities: F

PDR Engineers, Inc.
Memphis, TN 38103-5135
Contact: Frank Gianotti
Phone: (901) 523-9500
FAX: (901) 523-9502
Capabilities: E F H T I 3 5 12

Pickering Inc.
Memphis, TN 38104
Contact: Joe Emison
Phone: (901) 726-0810
FAX: (901) 272-6911
Capabilities: F H L I 3 5 10 12

Smith Seckman Reid, Inc.
Nashville, TN 37203
Contact: Stephen C. Lane
Phone: (615) 383-1113
FAX: (615) 386-8469
Capabilities: E F H T I 3 5 12

Structural Affiliates International, Inc.
Nashville, TN 37212
Contact: Robert P. Beall
Phone: (615) 269-0069
FAX: (615) 383-0911
Capabilities: E I 3

Sverdrup Corporation
Nashville, TN 37222
Contact: Alan Aront
Phone: (615) 331-9232
FAX: (615) 833-8328
Capabilities: E F H I 2 3 10

TEXAS

Division of Emergency Management
Austin, TX 78773
Contact: Tom Milwee
Phone: (512) 465-2138
FAX: (512) 465-2444

Aguire Associates, Inc.
Dallas, TX 75251
Contact: C. Earl Dedman, PE
Phone: (214) 788-1508
FAX: (214) 788-1583
Capabilities: E F I T I 3

Aviation Alliance, Inc.
Colleyville, TX 76034
Contact: Shirley A. Roberts, PE
Phone: (817) 498-0388
FAX: (817) 281-1867
Capabilities: F T I 3 5

Aviles Engineering Corporation
Houston, TX 77041
Contact: C. Henry Roth
Phone: (713) 895-7645
FAX: (713) 895-7943
Capabilities: F I 3

Wilfred Baker Engineering, Inc.
San Antonio, TX 78209-1128
Contact: Mr. Quentin A. Baker
Phone: (210) 824-5960
FAX: (210) 824-5964
Capabilities: I 3 10

Bender Associates
San Antonio, TX 78249
Contact: Ralph Bender, AIA, AICP
Phone: (210) 696-4116
FAX: (210) 697-3198
Capabilities: F 3

Blackley & Barfield, Inc.
Houston, TX 77008
Contact: B.T. White
Phone: (713) 869-4474
FAX: (713) 869-6702
Capabilities: F T I 3

Bridgefarmer & Associates, Inc.
Dallas, TX 75081

Contact: Glen G. Brown
Phone: (214) 231-8800
FAX: (214) 231-5900
Capabilities: F I 3

Carter & Burgess, Inc.
Fort Worth, TX 76102
Contact: Russell A. Karr, PE
Phone: (817) 335-2611
FAX: (817) 877-5646
Capabilities: F H T I 3 5

Dames & Moore
San Antonio, TX 78232
Contact: Gary Alkire
Phone: (512) 496-7911
FAX: (512) 496-1504
Capabilities: H O 3 10

Frees and Nichols, Consulting Engrs.
Fort Worth, TX 76109
Contact: Joe Paul Jones
Phone: (817) 336-7161
FAX: (817) 877-4267
Capabilities: F H I T I 2 3 5

Friberg Assoc. Inc., Cons. Engrs.
Fort Worth, TX 76113-2080
Contact: Bob Alexander
Phone: (817) 336-0543
FAX: (817) 429-0119
Capabilities: F I T 2 3 5 12

Gretner Engineering, Inc.
Irving, TX 75039
Contact: William Kallas, PE
Phone: (214) 869-1001
FAX: (214) 869-3111
Capabilities: E F T I 3 5

Gretner, Inc.
Fort Worth, TX 76155
Contact: L. Darrell Thompson, PE
Phone: (817) 545-0891
FAX: (817) 545-0534
Capabilities: F T I 3 5

Ground Technology, Inc.
Houston, TX 77081
Contact: Rama Acharya
Phone: (713) 664-0226
Capabilities: E F I 3

Hancomb Associates, Inc.
Dallas, TX 75248
Contact: Richard G. Jakus
Phone: (214) 458-9040
FAX: (214) 458-7271
Capabilities: E F I T I 3 5 7

HNTB Corporation
Dallas, TX 75240
Contact: Daniel F. Becker, PE
Phone: (214) 661-5626
FAX: (214) 661-5614
Capabilities: I 3

Jakes, Inc.
Houston, TX 77045
Contact: Lee George

Phone: (713) 728-8480
FAX: (713) 729-6553
Capabilities: F

Bernard Johnson Incorporated
Houston, TX 77042
Contact: Franklin B. Moon
Phone: (713) 977-7411
FAX: (713) 977-4781
Capabilities: F I 3 5 12

Rex K. Johnson Company
Lampasas, TX 76550
Contact: Rex K. Johnson
Phone: (512) 556-3684
FAX: (512) 556-5774
Capabilities: T F 3

Nathalyne A. Kennedy & Associates
Houston, TX 77081
Contact: Nathalyne A. Kennedy
Phone: (713) 988-0145
FAX: (713) 988-4624
Capabilities: F I 3

Macina, Boes, Copeland and Associates, Inc.
San Antonio, TX 78216
Contact: Sam Bladese
Phone: (210) 349-0151
FAX: (210) 349-9302
Capabilities: F 3

Frank W. Neal & Associates, Inc.
Fort Worth, TX 76104
Contact: Kenneth C. Burns
Phone: (817) 332-1944
FAX: (817) 336-8620
Capabilities: I 3

Parthill, Smith & Cooper, Inc.
Lubbock, TX 79412
Contact: Dennis W. Clayton
Phone: (806) 747-0161
FAX: (806) 747-7146
Capabilities: E F L T I 3

Alan Plummer and Associates, Inc.
Fort Worth, TX 76013-2506
Contact: James L. Albstetter, PE
Phone: (817) 332-4085
FAX: (817) 338-4626
Capabilities: I 0

Poe Engineers, Inc.
Fort Worth, TX 76120-1292
Contact: Wayne Barton
Phone: (817) 429-7870
FAX: (817) 446-1030
Capabilities: F H I T I 3 10

BN Reiffert & Associates
San Antonio, TX 78232
Contact: Bill Reiffert
Phone: (512) 366-9313
FAX: (512) 366-9318
Capabilities: E F I T I 3

RTKL Associates, Inc.
Dallas, TX 75201

Emergency Capability Listing

Texas

Contact: Joseph J. Scalabrin
Phone: (214) 871-8877
FAX: (214) 871-7023
Capabilities: E F I T J S 12

Sunland Engineering Company
Houston, TX 77042
Contact: Orlando J. Teran
Phone: (713) 952-5150
FAX: (713) 952-5188
Capabilities: E 3

Texas Industries, Inc.
Dallas, TX 75247
Contact: Rod S. Bond
Phone: (214) 647-3802
FAX: (214) 647-3877
Capabilities: E H L R 3 7 10

Vidaud + Associates Inc.
Dallas, TX 75240
Contact: William Vidaud, AIA
Phone: (214) 934-8890
FAX: (214) 458-2323
Capabilities: E F I T 1 2 3 8

Roy F. Weston, Inc.
Houston, TX
Contact: John DiFilippo
Phone: (713) 621-1620
FAX: (713) 621-6959
Capabilities: E F H I O 2 3 5 7 10

Ed A. Wilson, Inc.
Fort Worth, TX 76110
Contact: Mel Burdorf
Phone: (817) 926-0231
FAX: (817) 926-0691
Capabilities: F 3

H. B. Zachry Company
San Antonio, TX 78221
Contact: Bob Kalt
Phone: (210) 922-1213
FAX: (210) 927-8060
Capabilities: E F L T 1 3

UTAH

**Division of Comprehensive
Emergency Management**
Salt Lake City, UT 84114
Contact: Lorraine Frank
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FAX: (801) 538-3770

CH2M HILL
Salt Lake City, UT 84107
Contact: Michael Collins, PE
Phone: (801) 269-0110
FAX: (801) 269-1115
Capabilities: E F H O 1 3 10 12

Industrial Health Inc.
Salt Lake City, UT 84106
Contact: Donald E. Marano
Phone: (801) 466-2223

FAX: (801) 466-9616
Capabilities: E H O 3 5 8 10

Wasatch Environmental, Inc.
Salt Lake City, UT 84104
Contact: Tom Miller
Phone: (801) 972-8400
FAX: (801) 972-8459
Capabilities: H O 2 5 10

VIRGINIA

**State Co-ordinator, Office of
Emergency Services**
Richmond, VA 23225-6491
Contact: Addison E. Slayton, Jr.
Phone: (804) 674-2497
FAX: (804) 674-2490

Air Survey Corporation
Sterling, VA 20166-6702
Contact: John E. Combs
Phone: (703) 471-4510
FAX: (703) 471-6810
Capabilities: E F L 1 3

Alpha Corporation
Sterling, VA 20164
Contact: Edwin D. Heine, PE
Phone: (703) 709-2206
FAX: (703) 709-0643
Capabilities: E F L T 1 3

American Standard Inc.
Arlington, VA 22201
Contact: Michael Weise
Phone: (703) 525-4015
FAX: (703) 525-0327
Capabilities: E T 3 7

Atkinson Dredging Company
Chesapeake, VA 23301
Contact: Thomas J. Wright
Phone: (804) 482-2141
FAX: (804) 482-1682
Capabilities: F 3

Michael Baker Corp.
Alexandria, VA 22304
Contact: Thomas P. \oder
Phone: (703) 960-8800
FAX: (703) 960-9125
Capabilities: E F H L 1 3 5 10

BDM International
McLean, VA
Contact: Dr. Guy P. York
Phone: (904) 286-5677
FAX: (904) 286-5768
Capabilities: H 1 4 5 7 10

Bairley, Magianis & King, P.C.
Alexandria, VA 22314
Contact: H. (Skip) Magianis
Phone: (703) 548-0460
FAX: (703) 549-3324
Capabilities: E F 3 5

Bowman, Foster & Associates, P.C.
Virginia Beach, VA 23462
Contact: Ron Foster
Phone: (804) 499-5921
FAX: (804) 499-8128
Capabilities: F 3 12

Bechart-Horn, Inc.
Williamsburg, VA 23185
Contact: W. Ben Burton, PE
Phone: (804) 229-3359
FAX: (804) 220-3721
Capabilities: E F H O 1 3 5 10

CDM Federal Programs Corporation
Fairfax, VA 22033
Contact: Jonathan Curtis
Phone: (703) 968-0900
FAX: (703) 968-0915
Capabilities: H 10

Conner-Simpson Construction Co., Inc.
Fairfax, VA 22030
Contact: Jules D. Roberts
Phone: (703) 273-3311
FAX: (703) 934-5520
Capabilities: E F I T 3

Dowberry & Davis
Fairfax, VA 22031
Contact: William G. Fry
Phone: (703) 849-0321
FAX: (703) 849-0648
Capabilities: E F H T 1 3 5 10

DynCorp
Reston, VA 22091
Contact: K. W. Gooch
Phone: (703) 264-9213
FAX: (703) 264-9359
Capabilities: E F H O 3 5 10 12

Ecology and Environment, Inc.
Arlington, VA 22209
Contact: Tory Martinelli
Phone: (703) 522-6065
FAX: (703) 558-7950
Capabilities: H I O R 5 10

The Environmental Company, Inc.
Charlottesville, VA 22905
Contact: Jack E. Wilson, PE
Phone: (804) 295-4446
FAX: (804) 295-5535
Capabilities: E F H O 3 5 8 10

Env. Science & Engineering, Inc.
Herndon, VA
Contact: Jon Byronds
Phone: (703) 318-8900
FAX: (703) 318-0411
Capabilities: H O 10

Espey, Huston & Associates, Inc.
Williamsburg, VA 23185
Contact: Len Gregor
Phone: (804) 253-2858
FAX: (804) 253-5632
Capabilities: E F H T 3 10

Global Associates
McLean, VA 22102
Contact: Edwin P. Geesey
Phone: (703) 893-9890
FAX: (703) 893-0592
Capabilities: O H 3 5 7 8

**Global Associates (Global Phillips
Cartner)**
Williamsburg, VA 23187
Contact: Craig O. Moffatt
Phone: (804) 887-7402
FAX: (804) 887-0478
Capabilities: F H I O 7 10 12 4

Frederic R. Harris, Inc.
Fairfax, VA 22031
Contact: Michael J. McCarthy
Phone: (703) 641-5600
FAX: (703) 641-5649
Capabilities: E F O 1 3 5

Hayes, Sony, Mattern & Mattern, Inc.
Virginia Beach, VA 23462
Contact: Landon G. Carpenter
Phone: (804) 499-2391
FAX: (804) 490-1368
Capabilities: F H I O 1 2 3

Hertz Equipment Rental Corp.
Alexandria, VA 22305
Contact: Jim Beck
Phone: (703) 683-9138
FAX: (703) 683-9142
Capabilities: E F S T 1 3 10 12

Intergraph Corporation
Reston, VA 22091
Contact: Rich Grady
Phone: (703) 264-5600
FAX: (703) 264-7131
Capabilities: E F H O 1 3 5 10

ITT Federal Services Corp.
Hampton, VA 23666
Contact: Daryl Lead
Phone: (804) 766-1400
FAX: (804) 766-1400
Capabilities: H I O S 1 2 3 10

Law Engineering, Inc.
Chantilly, VA 22021
Contact: Joseph P. Klein, III
Phone: (703) 968-4700
FAX: (703) 968-4778
Capabilities: F L O 1 3 5 10

Law Engineering, Inc.
Chesapeake, VA 23320
Contact: Jack Spencer
Phone: (804) 436-2040
FAX: (804) 436-9653
Capabilities: E F H I 3 5 10

MIC Industries, Inc.
Reston, VA 22090
Contact: Forrest T. Gay, III
Phone: (703) 318-1900
FAX: (703) 318-9321
Capabilities: E F I T 6

Emergency Capability Listing

Virginia

Wisconsin

James M. Montgomery, Consulting Engineers
Herndon, VA 22070
Contact: Gerald B. Edwards, P.G.
Phone: (703) 478-3400
FAX: (703) 478-3375
Capabilities: H O 3 10

J.W. Morris, Ltd.
Arlington, VA 22203
Contact: J.W. Morris
Phone: (703) 525-4875
FAX: (703) 525-8324
Capabilities: F T S

Malcolm Pirnie, Inc.
Newport News, VA 23606
Contact: Dr. Bruce W. Schwenneker
Phone: (804) 873-8700
FAX: (804) 873-8723
Capabilities: L O R 3 10

Seema, Inc.
Hampton, VA 23666
Contact: Mahesh B. Shah, PE
Phone: (804) 865-0061
FAX: (804) 867-9338
Capabilities: 3

Shriver & Holland Associates
Norfolk, VA 23510
Contact: Donald L. Whitesell
Phone: (804) 627-4525
FAX: (804) 627-8228
Capabilities: 3

Talbot Group, Ltd.
Virginia Beach, VA 23452
Contact: Richard Bowie
Phone: (804) 340-0322
FAX: (804) 498-1043
Capabilities: E F H I 3 10

3D/International Inc.
Alexandria, VA 22314
Contact: Dick Cowan
Phone: (703) 683-6700
FAX: (703) 683-6701
Capabilities: F H 3 5 10

Tidewater Construction Corp.
Norfolk, VA 23501
Contact: J.E. Davis III
Phone: (804) 420-4140
FAX: (804) 420-3551
Capabilities: F I 3

Virtex Corporation
Norfolk, VA 23509
Contact: Robert H. Wells
Phone: (804) 857-5307
FAX: (804) 853-0599
Capabilities: F I S T 3 7

VW International, Inc.
Alexandria, VA 22306
Contact: James M. Aitkin
Phone: (703) 768-6265
FAX: (703) 768-6272
Capabilities: E I 4 5 7

Waterway Surveys and Engr., Ltd.
Virginia Beach, VA 23462
Contact: James W. Holton, Jr.
Phone: (804) 490-1691
FAX: (804) 490-1348
Capabilities: E F H L 3

R. Kenneth Weeks Engineers
Norfolk, VA 22320
Contact: R. Kenneth Weeks
Phone: (804) 625-0395
FAX: (804) 623-0389
Capabilities: E F O 3 5

Roy F. Weston, Inc.
Virginia Beach, VA 23462
Contact: Mr. Marving Farmer
Phone: (804) 473-9729
FAX: (804) 473-9744
Capabilities: H O 3 10

Wilber Smith Associates
Falls Church, VA 22042
Contact: Carlos C. Villarreal
Phone: (703) 573-3850
FAX: (703) 573-3854
Capabilities: F T I 3 5 7

Wiley & Wilson
Lynchburg, VA 24501
Contact: Albert L. Nichols, Jr.
Phone: (804) 947-1901
FAX: (804) 947-1264
Capabilities: F H O 3 5 10

WASHINGTON

Department of Emergency Management
Olympia, WA 98504-8346
Contact: Kate Heimbock
Phone: (206) 923-4981
FAX: (206) 438-7395

Applied Geotechnology Inc.
Bellevue, WA 98005
Contact: Don Bruggers, PE
Phone: (206) 453-8383
FAX: (206) 646-9523
Capabilities: E H L O 3 5 10

Dames & Moore
Seattle, WA 98121
Contact: Joseph Lamont, Jr.
Phone: (206) 728-0744
FAX: (206) 727-3369
Capabilities: E F L H 3 10

Ecology & Environment, Inc.
Seattle, WA 98104
Contact: Jeff Villnow
Phone: (206) 624-9537
FAX: (206) 621-9832
Capabilities: H O R 10

Global Associates
Yakima Firing Rang, WA 98901
Contact: Ray Olmstead
Phone: (509) 457-7685
FAX: (509) 457-0636
Capabilities: H I S 3 4 10 12

John Graham Assoc./DLR Group
Seattle, WA 98101
Contact: Robert L. Sundin
Phone: (206) 461-6000
FAX: (206) 461-6049
Capabilities: E F I T 3

Hammond, Collier & Wade-Livingstone
Seattle, WA 98103
Contact: Larry R. Wade
Phone: (206) 632-2664
FAX: (206) 632-0947
Capabilities: E F L 3

Harding Lawson Associates (HLA)
Seattle, WA 98101
Contact: Larry Tounil
Phone: (206) 622-0812
FAX: (206) 292-8619
Capabilities: F H O 3 5 10

Kramer, Chla, & Mayo, Inc.
Seattle, WA 98101
Contact: John McGleann
Phone: (206) 443-5329
FAX: (206) 443-5372
Capabilities: E F L I 3 5

Landan Associates, Inc.
Edmonds, WA 98020
Contact: John Baker
Phone: (206) 778-0907
FAX: (206) 778-6409
Capabilities: E H L I 2 10

McLaren Peterson Assoc., Inc.
Seattle, WA 98109-5129
Contact: Ron Martinson
Phone: (206) 622-4580
FAX: (206) 622-0422
Capabilities: E I L S I 3

Monaco Enterprises, Inc.
Spokane, WA 99216
Contact: Gene Monaco
Phone: (509) 926-6277
FAX: (509) 924-4980
Capabilities: H I 4 7

NBBJ Architects
Seattle, WA 98104
Contact: Dave Leptich
Phone: (206) 223-5555, ext. 5095
FAX: (206) 223-5018
Capabilities: E 3

Parsons, Brinckerhoff, Quade & Douglas, Inc.
Seattle, WA 98104
Contact: Robert J. Berg
Phone: (206) 382-5200

FAX: (206) 382-5222
Capabilities: E L F I 3 12

Peratovich, Nottingham and Drage, Inc.
Seattle, WA 98104
Contact: Jeffrey F. Gilman
Phone: (206) 624-1387
FAX: (206) 624-1388
Capabilities: E F L O I 3 5 7

The Schemmer Associates Inc.
Bellvue, WA 98006
Contact: James A. Schemmer, PE
Phone: (206) 643-6993
FAX: (206) 643-0595
Capabilities: E F H I I 3

Science Applications Intl. Corp.
Bothell, WA 98012
Contact: William Reynolds, Ph.D
Phone: (206) 485-5800
FAX: (206) 485-5566
Capabilities: H O R 3 5 7 10

SCM Consultants, Inc.
Kennewick, WA 99336
Contact: Leon Lindbloom, PE
Phone: (509) 783-1625
FAX: (509) 783-1861
Capabilities: E F H R I 3 5 10

Sparling, Inc.
Seattle, WA 98101
Contact: Robert B. Sparling, PE
Phone: (206) 667-0555
FAX: (206) 667-0510
Capabilities: 2 3 12

The Tsang Partnership
Tacoma, WA 98402
Contact: Jim Tsang
Phone: (206) 272-9383
FAX: (206) 383-8059
Capabilities: 3

URS Consultants, Inc.
Seattle, WA 98101
Contact: John E. Butts
Phone: (206) 623-1800
FAX: (206) 233-9570
Capabilities: E F H T I 3 5 10

WISCONSIN

Division of Emergency Government
Madison, WI 53707
Contact: Robert M. Thompson
Phone: (608) 266-3232
FAX: (608) 266-1569

Durrant Architects Inc.
Madison, WI 53704
Contact: Jerold W. Dommer, AIA
Phone: (608) 241-3340
FAX: (608) 241-1031
Capabilities: E F I T 3 5

Emergency Capability Listing

Wisconsin

International

Durrant Engineers, Inc.
Madison, WI 53704
Contact: William F. Batterman, PE
Phone: (608) 241-3340
FAX: (608) 241-1031
Capabilities: I T 1 2 3 12

Feth & Van Dyke
Green Bay, WI 54304
Contact: Ray Kopish
Phone: (414) 497-2500
FAX: (414) 497-8516
Capabilities: H 3 10

Meed & Hunt, Inc.
Madison, WI 53710
Contact: Mike Shimanski
Phone: (608) 273-6380
FAX: (608) 273-6391
Capabilities: F I S T 1 3 12

WEST VIRGINIA

Office of Emergency Services
Charleston, WV 25305
Contact: Carl L. Bradford
Phone: (304) 558-5390
FAX: (304) 344-4538

The Chester Engineers
Huntington, WV 25701
Contact: J. Gregory Menatti
Phone: (304) 525-0120

FAX: (304) 522-7615
Capabilities: H 10

Rocco Inc. DBA Five-R Company
Cheyenne, WY 82003
Contact: Ray S. Ferig
Phone: (307) 638-7566
FAX: (307) 638-7566
Capabilities: E F S T 1 3 7

INTERNATIONAL

Andrews Kent & Stone
Oxford, England
Contact: David Copeland
Phone: 865-240071
FAX: 865-248006
Capabilities: E F I L 1 3

DMJM Int'l. Dagami Facility
Tokyo, Japan
Contact: William G. Bryant
Phone: 427-55-0508
FAX: 427-58-2247
Capabilities: E F H O 1 3 5 10

Hannah Reed and Associates
Cambridge, England
Contact: G.M. Hannah
Phone: 223-882000
FAX: 223-881888
Capabilities: F L 1 3 5

J.B. Jones Architects, AIA, Inc.
Tamuning, Guam
Contact: Jack A. Jones, FAIA
Phone: 671-646-1101
FAX: 671-649-2728
Capabilities: E F I L 3 5

Kajitani Engineering Co., Inc.
Minato-Ku, Tokyo, Japan
Contact: Takeshi Fukazawa
Phone: 3-3478-3181, ext. 278
FAX: 3-3478-3380
Capabilities: E F L 3

Leadbetter Construction
Eynsham Oxford, UK
Contact: Robert Rendell
Phone: 865-880099
FAX: 865-883043
Capabilities: 3

L.U.B. Lurgi-Umwelt-Beratig
D-6000 Frankfurt, Germany
Contact: J.M. Mueller
Phone: 69-5808-3885
FAX: 69-5808-2745
Capabilities: H 10

The Oxford Architects Partnership
Oxford, OX1 5BS Great Britain
Contact: Alan Hobbs
Phone: 44-865-730033
FAX: 44-865-326822
Capabilities: 3

Samsung Heavy Industries Co., Ltd.
Seoul, Korea
Contact: Bon Kook, KOO
Phone: 822-728-6245
FAX: 822-728-6890
Capabilities: F I L S 1 3

Samwhan Corporation
Seoul, Korea
Contact: Yong-Kwon Choi
Phone: 822-740-2315
FAX: 822-744-0608
Capabilities: E F L T 1 2 3 12

Soletanche Pamyang Co.
Seoul, Korea
Contact: Francis Dupuis
Phone: 822-732-8194
FAX: 822-720-0360
Capabilities: F L 3

VBR (Vinnell, Brown & Root)
Ankara, Turkey
Contact: MG William Klein (Ret.)
Phone: 904-285-2060
FAX: 904-285-2061
Capabilities: H O S 3 4 5 10

Yalcin Teknik AS
Ankara, Turkey
Contact: Mr. Tuncan Ekin
Phone: 4467-0990
FAX: 4426-7779
Capabilities: E I L O 1 3 4

Explanation of Capability Codes

Each company in this directory selected up to four Experience and Support Codes from the following list:

Experience Codes

E.....Earthquakes
F.....Floods and Hurricanes
H.....Hazardous Materials
Discharge
I.....Explosions, Fires
L.....Landslides
O.....Oil Spills
R.....Radiation Leaks
S.....Snow Removal
T.....Tornadoes

Support Codes

- 1.....Transportation: highways, streets, bridges, railroads, airports, marine
- 2.....Communications: telecommunications assets
- 3.....Public Works & Engineering: restoration, engineering, planning, designing, construction, and demolition
- 4.....Fire Fighting: management, coordination, detection, and suppression
- 5.....Information and Planning: collection, evaluation, and processing
- 6.....Mass Care: shelter, feeding, first aid, information, and bulk distribution
- 7.....Resource Support: evaluation, location, procurement of material resources, stock surplus
- 8.....Health & Medical Services: public health response, triage, treatment, transportation, and evacuation of patients
- 9.....Urban Search & Rescue: immediate lifesaving response, use of specialized equipment and teams, coordination of federal aircraft
- 10.....Hazardous Materials: coordinate response to potential HAZMAT discharges; prevent/minimize/mitigate threats to public health, welfare, or the environment
- 11.....Food: obtain through loan, donation, or direct acquisition; arrange for transportation to staging areas
- 12.....Energy: Coordinate provision of emergency power and fuel to support response operations; assess energy system damage, energy supply, demand, and requirements to restore systems

EPA REGIONAL OFFICES (PREDESIGNATED OSCs)

<u>REGION</u>	<u>LOCATION</u>	<u>PHONE</u>
I	BOSTON, MA	(617) 223-7210
II	NEW YORK, NY	(212) 264-2525
III	PHILADELPHIA, PA	(215) 597-9814
IV	ATLANTA, GA	(404) 347-4727
V	CHICAGO, IL	(312) 353-2000
VI	DALLAS, TX	(214) 767-2600
VII	KANSAS CITY, MO	(816) 374-5493
VIII	DENVER, CO	(303) 844-3895
IX	SAN FRANCISCO, CA	(415) 974-8153
X	SEATTLE, WA	(206) 442-5810

APPENDIX C
SAMPLE OPERATIONAL REPORTS

1. OPREP-3 Pinnacle Example:

FLASH PRECEDENT

FROM:

TO: CNO WASHINGTON DC
NAVFACENGCOM ALEXANDRIA VA
NMCC WASHINGTON DC

INFO: NAVY JAG ALEXANDRIA VA
CNO OP ZERO ONE WASHINGTON DC
CDR USATWO ATLANTA GA
NAVOPINTCEN SUITLAND MD

SECRET (CLASSIFIED FOR ILLUSTRATION PURPOSES ONLY)

MSG/OPREP-3/ /001/FEB//

FLAGWORD/PINNACLE/-//

TIMELOC/ / /

GENTEXT/NATURAL DISASTER/6.5 MAGNITUDE EARTHQUAKE CALIFORNIA/ GEOGRAPHICAL
EXTENT OF EARTHQUAKE UNKNOWN//

APM/DAMAGE TO MILITARY INSTALLATIONS UNKNOWN/NAVY CASUALTIES UNKNOWN/MODERATE
DAMAGE TO CIVILIAN MUNICIPALITIES APPEARS EVIDENT//

RMKS/AMPLIFYING INFO TO FOLLOW/VOICE REPORT SENT /COMMANDING OFFICER

ESTIMATE: I ANTICIPATE ADVERSE IMPACT ON READINESS TO NAVAL INSTALLATIONS AND
CALL FOR ASSISTANCE FROM CIVILIAN AUTHORITIES//

DECL/OADR//

2. OPREP-3 Navy Blue Example:

IMMEDIATE PRECEDENT

FROM:

TO: CNO WASHINGTON DC
NAVFACENGCOM ALEXANDRIA VA
NMCC WASHINGTON DC

INFO: NAVY JAG ALEXANDRIA VA
CNO OP ZERO ONE WASHINGTON DC
CDR USATWO ATLANTA GA
NAVOPINTCEN SUITLAND MD

SECRET (CLASSIFIED FOR ILLUSTRATION PURPOSES ONLY)

MSG/OPREP-3/ /001/FEB//

FLAGWORD/NAVY BLUE/-//

TIMELOC/ / /

GENTEXT/NATURAL DISASTER/6.5 MAGNITUDE EARTHQUAKE CALIFORNIA/ GEOGRAPHICAL
EXTENT OF EARTHQUAKE UNKNOWN//

APM/DAMAGE TO MILITARY INSTALLATIONS UNKNOWN/NAVY CASUALTIES UNKNOWN/MODERATE
DAMAGE TO CIVILIAN MUNICIPALITIES APPEARS EVIDENT//

RMKS/AMPLIFYING INFO TO FOLLOW/VOICE REPORT SENT /COMMANDING OFFICER

ESTIMATE: I ANTICIPATE ADVERSE IMPACT ON READINESS TO NAVAL INSTALLATIONS AND
CALL FOR ASSISTANCE FROM CIVILIAN AUTHORITIES//

DECL/OADR//

3. Tempest Rapid - Civil Emergency Reporting Example:

PRECEDENCE: IMMEDIATE. (MINIMIZE CONSIDERED)

FROM:

TO: DA WASHINGTON DC/DAMO-ODS//
CDR USATWO (X ATLANTA GA)//AFKC-OP-OR//

INFO: CNO WASHINGTON DC//OP-64//
CMC WASHINGTON DC//POC//
NAVFACENGCOM ALEXANDRIA VA
Applicable Disaster Preparedness Group Coordinator

CLASSIFICATION: AS APPLICABLE

SUBJ: INITIAL/DAILY/INTERIM/REPORT, CIVIL EMERGENCY ASSISTANCE REC:DD-COMP
(AR) 114 (3440) (TEMPEST RAPID) XXX-II-XX-XXX

1. Nature of emergency, location, extent of damage and estimated duration.
2. Number of Navy-Marine Corps, other military and civilian personnel committed and nature of actions in which they are employed, if any.
3. Amount and types of Navy-Marine Corps equipment and supplies committed.
4. Degree to which civil agencies have committed their resources.
5. Source of request for assistance.
6. Number of casualties, injuries, and fatalities of both military and civilian personnel.
7. Acreage and location of real property committed.

4. Tempest Cider - Civil Defense Reporting Example:

PRECEDENCE: IMMEDIATE. (MINIMIZE CONSIDERED)

FROM:

TO: AREA COORDINATOR

INFO: CNO WASHINGTON DC//OP-64//
CMC WASHINGTON DC//POC//
NAVFACENGCOM ALEXANDRIA VA
Applicable Disaster Preparedness Group Coordinator

CLASSIFICATION: AS APPLICABLE

SUBJ: INITIAL/DAILY/REPORT, CIVIL DEFENSE (TEMPEST CIDER) REPORT AS OF ()
XXX-II-XX-XXX

1. Nature of emergency, location, extent of damage and estimated duration.
2. Number of Navy-Marine Corps, other military and civilian personnel committed and nature of actions in which they are employed, if any.
3. Amount and types of Navy-Marine Corps equipment and supplies committed.
4. Degree to which civil agencies have committed their resources.
5. Source of request for assistance.
6. Number of casualties, injuries, and fatalities of both military and civilian personnel.
7. Degree to which the Federal Emergency Management Agency (FEMA) and state and local authorities have assumed responsibilities and are operating in the affected area.

5. Garden Plot - Civil Disturbance Reporting Example:

PRECEDENCE: IMMEDIATE. (MINIMIZE CONSIDERED)

FROM:

TO: DA WASHINGTON DC/DAMO-ODS//
CDR USATWO (X ATLANTA GA)//AFKC-OP-OR//

INFO: CNO WASHINGTON DC//OP-64//
CMC WASHINGTON DC//POC//
NAVFACENGCOM ALEXANDRIA VA
Applicable Disaster Preparedness Group Coordinator

CLASSIFICATION: AS APPLICABLE

SUBJ: INITIAL/DAILY/INTERIM/REPORT, CIVIL DISTURBANCE, RCS:DD-COM P (AR) 1112
(3440) (GARDEN PLOT) XXX-II-XX-XXX

1. DOD Organization receiving request(s).
2. Place of the actual or anticipated civil disturbance.
3. Name and title of requesting official.
4. Date/time group of request for assistance.
5. Scope of the disturbance or the threat of such a disturbance existing at the time of the request.
6. Type, group, and quantities of assistance requested.
7. Purpose for which assistance was requested.
8. Number of control personnel (civil police) available for employment.
9. Anticipated impact on local community relations resulting from approval/disapproval of the request.
10. Statement as to whether the request was granted or denied and level at which the decision was made.
11. Reasons for denying or referring the request to higher headquarters.
12. If request is referred to higher headquarters, provide a recommendation and comments, as appropriate, for approval or denial based upon knowledge of the facts at hand.
13. If appropriate, provide additional information on emergency fire fighting assistance provided in civil disturbance situations.
14. Other pertinent information.

APPENDIX D
NASKEF UTILITY CONTINGENCY PLANS (PARTIAL LISTINGS)

(Source NASKEF OPLAN 9000 (DRAFT), July 1992)

POWER CONTINGENCY PLAN:

Commercial:

Power Source: Burfell Hydroelectric Plant
 Distribution: Reykjavik and Njardvik overhead lines
 Feeder: 66 KV line at 50 cycle
 Back-up: None

Base:

Power Source: Building 864
 Distribution: 14 circuits-overhead and inground lines
 Feeder: Rockville/West End - 13.5 KV/60 cycle
 Grindavik - 33 KV/60 cycle
 Base - (11) 4.16 KV/60 cycle
 Back-up : Diesel engines at Bldg 864
 Portable generators
 Distribution backfeed on 4.6KV circuits

Drawings: N62467- - : NASKEF FEEDER DRAWINGS (1"-500')
 FEEDER LINE DRAWINGS (1"-500')

Generator Operational Data: Available at site.

Facility Power Plants: (PARTIAL LISTING)

BLDG	LOCATION	NO GEN	OUTPUT	FUEL	TIME
864	BASE POWER PLANT	7	11.25 MW	75,000	6
1650	DYE-5 POWER PLANT	4	3.6 MW	34,000	20
2608	GRINDAVIK POWER PLANT	3	1.5 MW	20,000	10

Portable Emergency Generators: (PARTIAL LISTING)

TYPE	ECC	OUTPUT	LOCATION	FUEL	TIME
Onan	#51-178	5 KW	SHOP		
Libby	#51-15805	30 KW	SHOP		
Freemont	#6115-118-1243	60 KW	SHOP		
Detroit	#40B6910A	100 KW	1650/DYE-5		

Feeder Priority Listing: (PARTIAL LISTING)

FEEDER	BUILDINGS
3	WESTEND, TOWER, AIRFIELD LIGHTING
1	BLDG 831, 789, 790

Feeder/Facility Listing:

FACILITY			FEEDER NO			ELECTRICAL REQUIREMENTS			TRANS	EMERGENCY BACK	
NO	PRI	NAME	PRI	SEC	THIR D	PHASE	VOLT	AMPS	SIZE	GEN	CAP
44	4	NBS	6	13		SINGLE				N/A	

WATER CONTINGENCY PLAN

Commercial:

Source: Sudurnes Water Works: GJA Fissure
Distribution: Bldg 988 - 3x1365 gpm booster pumps thru under ground
lines
Treatment: Flourine and Chlorine
Power Source: Commercial
Pump Power: Commercial

Base:

Source: 11 Water wells and storage tanks via 750,000 gall
storage tank Bldg 516
500,000 gall elevated tank bldg 875
Distribution: Bldg 516 - 3x1400gpm booster pumps thru under ground
lines
Treatment: Fluorine and Chlorine
Power Source: Commercial with emerg gen back-up
Pump Power: Commercial

Drawings: Water Line Distribution System (1"-500')
Valve Location and Status Drawing (1"-500')

Water Wells

WELL	LOCATION	CAPACITY	DEPTH	POWER	FUEL	TIME
8	Bldg 177	145 GPM	163.0 FT			
9	Bldg T621	130 GPM	159.5 FT			
31	Bldg T2302	175 GPM	124.0 FT			

Isloated Water Wells

BLDG	LOCATION	CAPACITY	DEPTH	POWER	FUEL	TIME
1756		10 GPM	130 FT			
1793		20 GPM	156 FT			
1683		10 GPM	50 FT			

HEAT CONTINGENCY PLAN

Commercial: Source Svartsengi (Blue Lagoon)
 Distribution Above ground lines
 Type 24" insulated steel pipe
 Back-up None

Base: Source Pumping station at Fitjar
 Distribution Under ground lines
 Type 20"-2" insulated steel pipe
 Temp/Press 202 F/96 C at 60 lbs

Drawings: Steam Distribution/Valve Drawings

Base Sectors

AREA	MAX DOMESTIC HW (BTU/HR)	MAX HEATING (BTU/HR).	FLOW (L/M)
BASE - E	1,329,319	8,862,129	936
BASE - G	7,370,873	49,139,155	5166
BASE - H1	1,367,229	9,114,862	941
BASE - H2	1,004,904	6,699,360	699
TOTAL	24,666,494	164,443,295	17,288

Active Non-geothermal Units

BLDG	LOCATION	HAZ CODE	AMOUNT	TYPE	CAPACITY	FUEL	TIME
632	LAUNDRY		2	BOIL	6,694 BTU	3,000	3
1639	TORPEDO SHOP		1	BOIL	1,329 BTU	3,000	13
1680	NAVFAC		1	BOIL	7,000 BTU	25,000	20

Stand-by Boiler Units

BLDG	LOCATION	HAZ CODE	AMOUNT	TYPE	CAP	FUEL	TIME
710	HOSPITAL		2	BOIL	3,348 BTU	1,000	2
2578	H-1 OPS		1	BOIL	4,347 BTU		
781	COR CONTROL		1	BOIL		1,000	
271	CHILD CENTER			BOIL			
286	NATO SATCOM BLDG		1	BOIL		3,000	

Units Requiring Preparation

BLDG	LOCATION	HAZ CODE	AMOUNT	TYPE	CAP	FUEL	TIME
794	FLIGHT PODS	a	1	BOIL			
910	HIGH SCHOOL	a,f	2	BOIL			
782	AIR OPS BLDG	o		BOIL			

BOIL - BOILER HA - HOT AIR FURNACE CAPACITY - KBTU
 FLOW - LITERS/MIN FUEL - GALLONS TIME - REPAIR DAYS
 a - ASBESTOS CONTAM ROOM
 f - FUEL TANKS REMOVED
 o - MAJOR OVERHAUL

Facility Listing (NOT PROVIDED): A listing of all building heating and domestic hot water requirements is shown in Attachment A. The system can be isolated into sectors shown in paragraph a. It is possible, to connect a High Temperature - Hot Water (HTHW) Boiler to replace geothermal system in

applicable sectors. "Donkey" Boiler connection is possible in all buildings currently connected to geothermal system.

Appendix E
MOS Selection Kit

The normal MOS Selection Kit Contains the following charts and graphs

(AFESC, Volume II, Post-Disaster Procedures):

Airfield Complex Map (1"=500'), No example provided.

Airfield Runway Maps (1"=100'), No example provided.

Crater Template, No example provided.

Density Ratio Charts

MOS Selection Form

Aircraft Surface Roughness Selection Charts

Surface Roughness Charts

Crater Time Worksheets for Chemical and Nonchemical Environments

Spall Time Worksheets for Chemical and Nonchemical Environments

Density Ratio

Source: TO IF-4E-1
Date: 1 November 1970
Data Basis: Flight Test

GUIDE

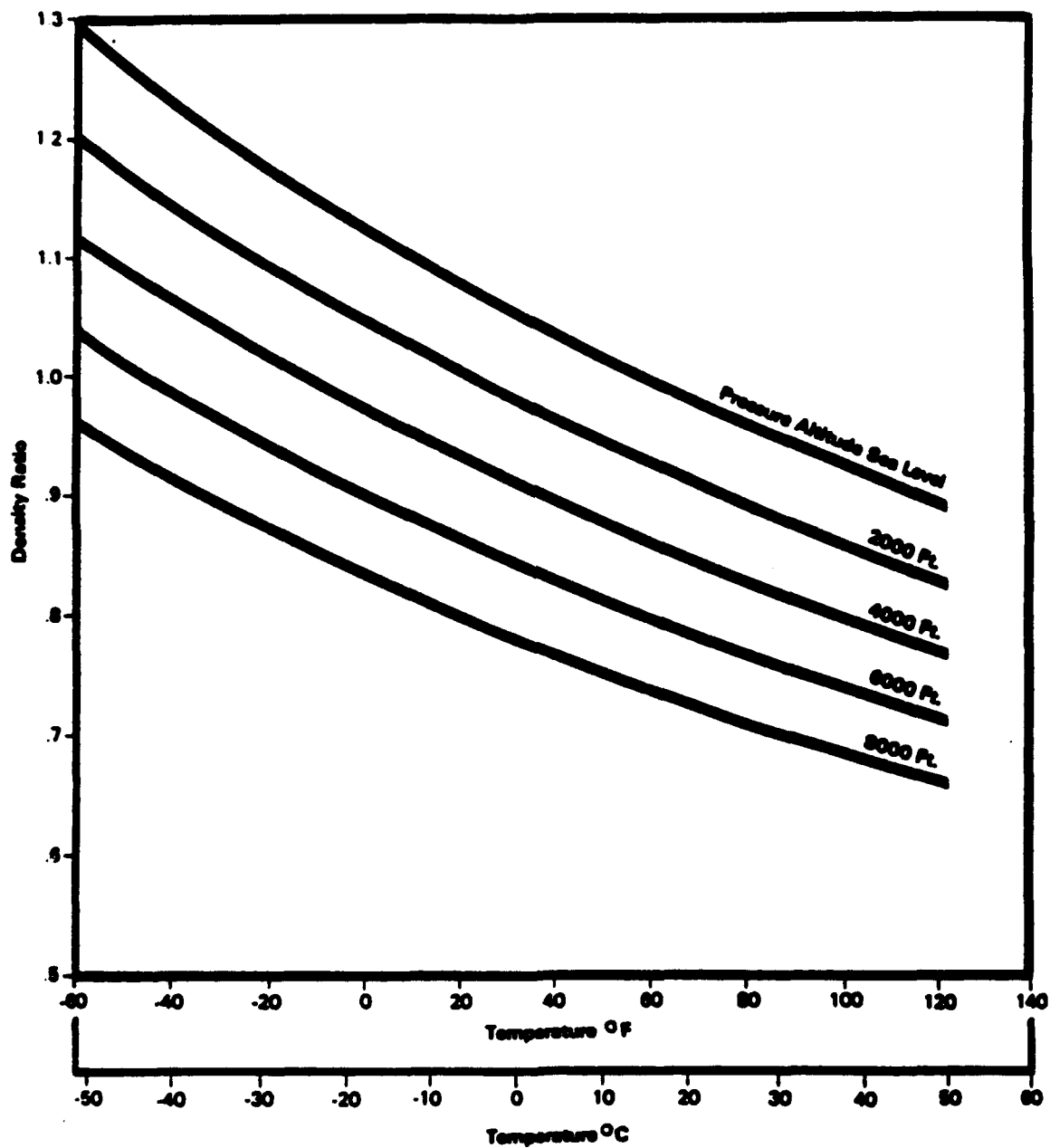
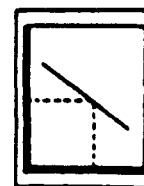


Figure B-3. Density Ratio Graph

Table B-2. Taxiway Criteria

AIRCRAFT	REPAIRED WIDTH (FEET)	CLEARED WIDTH (FEET)	SWEPT WIDTH (FEET)	90° TURN WIDTH (FEET)	180° TURN WIDTH (FEET)	MINIMUM CRATER SPACING* (FEET)
F-4	25	35	35	30	50	50
C-130	30	135	100	50	100	66
C-141	50	170	85	75	140	NONE
F-15	25					
F-16	25					
A-10	25					
A-7	25					
F-111	25					
C-5A	60					
DC-10	60					
DC-747	60					

*FOR MINIMUM SPACING INDICATED, 4.5-INCH REPAIR QUALITY WITH MAXIMUM TAXI SPEED OF 10 KNOTS IS ALLOWED. WHEN SPACING IS LESS, UPGRADE REPAIR QUALITY TO 3 INCHES OR REDUCE MAXIMUM TAXI SPEED TO 5 KNOTS.

Table B-3. F-4E

(TAKEOFF WEIGHT ≤ 57,000 POUNDS)
(LANDING WEIGHT ≤ 38,000 POUNDS)

F-4E

CHART NUMBER	OPERATION MODE				RUNWAY CONDITION			DENSITY RATIO		
	TAKEOFF	LANDING	EVACUATION	BARRIER	DRY	WET	ICY	0.9	1.0	1.1
101	X				X	X	X	X		
102	X				X	X	X		X	
103	X				X	X	X			X
104		X			X			X		
105		X			X				X	
106		X			X					X
107		X				X		X		
108		X				X			X	
109		X				X				X
110		X					X		X	X
111		X		X	X	X	X	X	X	X
112			X		X	X	X	X		
113			X		X	X	X		X	
114			X		X	X	X			X

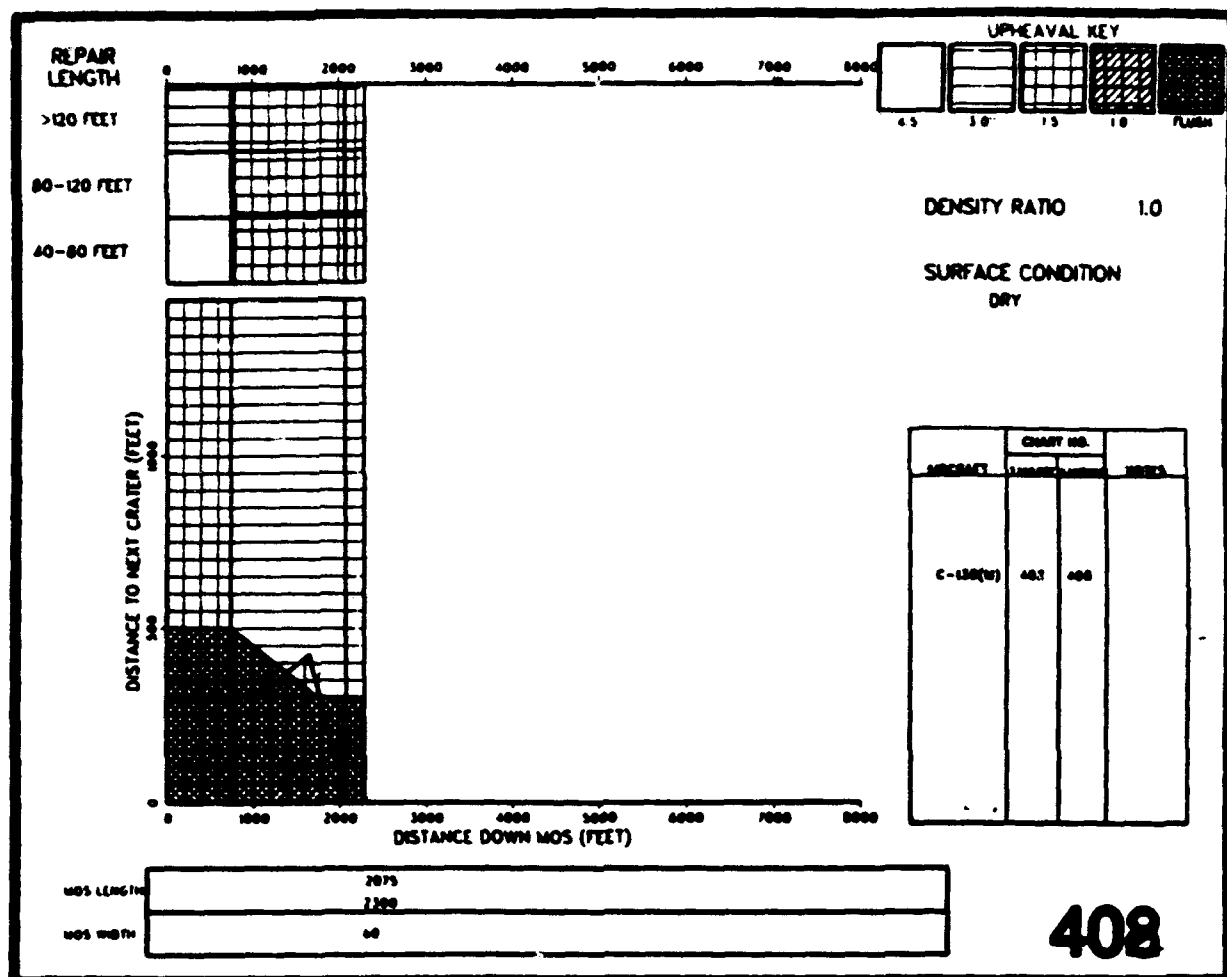


Figure 4-4. Surface Roughness Charts 408 and 408 (Overlaid)

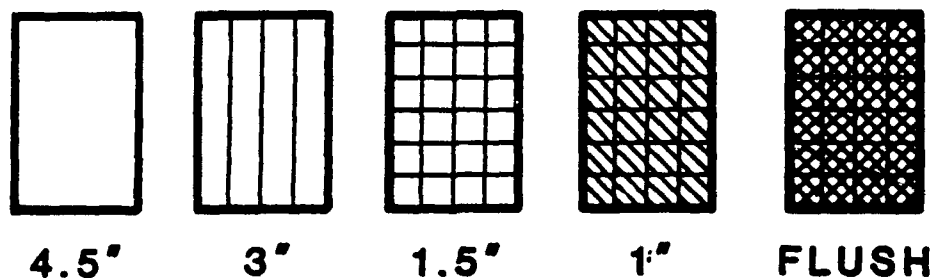


Figure 4-5. Upheaval Key

1,055, 1,600, and 4,290 feet. By observing the lowest repair quality for each zone, a repair quality of 1.5 inches or better is necessary to the left of the 1,055-foot mark, while

4.5 inches or better is needed to the right. This process helps you to choose an MOS that has no craters to repair in those zones which require a high repair quality (1 inch or flush).

RRR TIME WORKSHEET FOR NONCHEMICAL ENVIRONMENT

MOS IDENTIFICATION:

USE THE SMALLEST NUMBERS IN PARENTHESES FOR AS MANY WHOLE CRATERS AS THERE ARE REPAIR TEAMS.
 USE THE SECOND NUMBER FOR ALL OTHER WHOLE CRATERS.
 USE 3/4 OF THE SECOND NUMBER (x .75) FOR PARTIAL CRATERS.

		APPARENT DIAMETER					TIME (MINUTES)	
		10 FEET	20 FEET	30 FEET	40 FEET	50 FEET		
REPAIR QUALITY	0.0 INCH	TIME/REPAIR	(120) 60	(230) 140	(330) 210	(510) 255	(760) 275	
		NUMBER						
		SUBTOTAL						
	1.0 INCH	TIME/REPAIR	(100) 50	(165) 100	(235) 150	(385) 180	(540) 200	
		NUMBER						
		SUBTOTAL						
	1.5 INCHES	TIME/REPAIR	(95) 50	(135) 80	(305) 135	(480) 225	(545) 340	
		NUMBER						
		SUBTOTAL						
	3.0 INCHES	TIME/REPAIR	(80) 40	(105) 60	(250) 130	(365) 180	(470) 250	
		NUMBER						
		SUBTOTAL						
	4.5 INCHES	TIME/REPAIR	(80) 40	(90) 50	(225) 125	(315) 160	(380) 210	
		NUMBER						
		SUBTOTAL						
TOTAL CRATER REPAIR TIME =								
FROM SPALL TABLE								
DIVIDE BY NUMBER OF TEAMS RRR TIME =								

Figure B-8. RRR Time Worksheet for Nonchemical Environment

RRR TIME WORKSHEET FOR CHEMICAL ENVIRONMENT

MOS IDENTIFICATION:

USE THE SMALLEST NUMBERS IN PARENTHESES FOR AS MANY WHOLE CRATERS AS THERE ARE REPAIR TEAMS.
 USE THE SECOND NUMBER FOR ALL OTHER WHOLE CRATERS.
 USE 3/4 OF THE SECOND NUMBER (x .75) FOR PARTIAL CRATERS.

		APPARENT DIAMETER					TIME (MINUTES)	
		10 FEET	20 FEET	30 FEET	40 FEET	60 FEET		
REPAIR QUALITY	0.0 INCH	TIME/REPAIR	(155) 95	(315) 225	(460) 340	(670) 415	(930) 445	
		NUMBER						
		SUBTOTAL						
	1.0 INCH	TIME/REPAIR	(130) 80	(225) 160	(325) 240	(485) 290	(765) 325	
		NUMBER						
		SUBTOTAL						
	1.5 INCHES	TIME/REPAIR	(125) 80	(185) 130	(390) 220	(620) 365	(885) 550	
		NUMBER						
		SUBTOTAL						
	3.0 INCHES	TIME/REPAIR	(105) 65	(140) 95	(330) 210	(475) 290	(625) 405	
		NUMBER						
		SUBTOTAL						
	4.5 INCHES	TIME/REPAIR	(105) 65	(120) 80	(305) 205	(410) 255	(510) 330	
		NUMBER						
		SUBTOTAL						
TOTAL CRATER REPAIR TIME								
FROM SPALL TABLE								
DIVIDE BY NUMBER OF TEAMS								
RRR TIME =								

Figure B-9. RRR Time Worksheet for Chemical Environment

Table B-12. Spall Table for Nonchemical Environment

SPALL TABLE FOR NONCHEMICAL ENVIRONMENT

CRATER REPAIR TIME (MINUTES)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3071	3178	3281	3000
	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	3004	3108	3214	
	2800	2800	2800	2800	2800	2800	2800	2800	2800	2832	2937	3042	3147	2800
	2700	2700	2700	2700	2700	2700	2700	2700	2700	2788	2870	2978	3080	
	2600	2600	2600	2600	2600	2600	2600	2600	2600	2698	2803	2908	3013	2600
	2500	2500	2500	2500	2500	2500	2500	2527	2632	2737	2842	2947		
	2400	2400	2400	2400	2400	2400	2400	2480	2588	2670	2778	2880	2980	2400
	2300	2300	2300	2300	2300	2300	2300	2383	2488	2583	2708	2813		
	2200	2200	2200	2200	2200	2200	2221	2326	2431	2536	2641	2746	2846	2200
	2100	2100	2100	2100	2100	2100	2184	2288	2384	2488	2574	2679		
	2000	2000	2000	2000	2000	2000	2087	2192	2297	2402	2507	2612	2712	2000
	1900	1900	1900	1900	1900	1916	2021	2126	2231	2336	2441	2546		
	1800	1800	1800	1800	1800	1849	1964	2069	2164	2269	2374	2479	2579	1800
	1700	1700	1700	1700	1700	1782	1887	1992	2097	2202	2307	2412		
	1600	1600	1600	1600	1610	1715	1820	1925	2030	2136	2240	2345	2445	1600
	1500	1500	1500	1500	1543	1648	1753	1858	1963	2068	2173	2278		
	1400	1400	1400	1400	1478	1581	1686	1791	1896	2001	2106	2211	2311	1400
	1300	1300	1300	1308	1410	1515	1620	1725	1830	1935	2040	2146		
	1200	1200	1200	1238	1343	1448	1553	1658	1763	1868	1973	2078	2178	1200
	1100	1100	1100	1171	1276	1381	1486	1591	1696	1801	1906	2011		
	1000	1000	1000	1104	1209	1314	1419	1524	1629	1734	1839	1944	2044	1000
	900	900	932	1037	1142	1247	1352	1457	1562	1667	1772	1877		
	800	800	866	971	1076	1181	1286	1391	1496	1601	1706	1811	1911	800
	700	700	799	894	1009	1114	1219	1324	1429	1534	1639	1744		
	600	600	627	732	837	942	1047	1152	1257	1362	1467	1572	1677	600
	500	500	565	670	775	880	985	1090	1195	1300	1405	1510		
	400	400	483	598	703	808	913	1018	1123	1228	1333	1438	1543	400
	300	300	321	426	531	636	741	846	951	1056	1161	1266	1371	300
	200	200	255	360	465	570	675	780	885	990	1095	1200	1305	200
	100	100	188	293	398	503	608	713	818	923	1028	1133	1238	1343
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
		TOTAL NUMBER OF SPALLS												

Table B-13. Spall Table for Chemical Environment

SPALL TABLE FOR CHEMICAL ENVIRONMENT

CRATER REPAIR TIME (MINUTES)	4000	4300	4596	4897	5196	5494	5792	6091	6389	6688	6986	7285	7583	4000
		4200	4496	4797	5096	5394	5692	5991	6289	6588	6886	7185	7483	
	3600	4100	4396	4697	4996	5294	5592	5891	6189	6488	6786	7085	7383	3600
		4000	4296	4597	4896	5194	5492	5791	6089	6388	6686	6985	7283	
	3200	3800	4196	4497	4796	5094	5392	5691	5989	6288	6586	6885	7183	3200
		3600	4096	4397	4696	4994	5292	5591	5889	6188	6486	6785	7083	
	2800	3300	3696	3997	4296	4594	4892	5191	5489	5788	6086	6385	6683	2800
		3600	3896	4197	4496	4794	5092	5391	5689	5988	6286	6585	6883	
	2400	3000	3396	3697	3996	4294	4592	4891	5189	5488	5786	6085	6383	2400
		3200	3496	3797	4096	4394	4692	4991	5289	5588	5886	6185	6483	
	2000	2600	2996	3297	3596	3894	4192	4491	4789	5088	5386	5685	5983	2000
		2800	3096	3397	3696	3994	4292	4591	4889	5188	5486	5785	6083	
	1600	2200	2596	2897	3196	3494	3792	4091	4389	4688	4986	5285	5583	1600
		2400	2696	2997	3296	3594	3892	4191	4489	4788	5086	5385	5683	
	1200	1800	2196	2497	2796	3094	3392	3691	3989	4288	4586	4885	5183	1200
		1600	1896	2197	2496	2794	3092	3391	3689	3988	4286	4585	4883	
	800	1100	1396	1697	1996	2294	2592	2891	3189	3488	3786	4085	4383	800
		1000	1296	1597	1896	2194	2492	2791	3089	3388	3686	3985	4283	
	400	600	896	1197	1496	1794	2092	2391	2689	2988	3286	3585	3883	400
		800	1096	1397	1696	1994	2292	2591	2889	3188	3486	3785	4083	
	200	400	696	997	1296	1594	1892	2191	2489	2788	3086	3385	3683	200
	600	896	1197	1496	1794	2092	2391	2689	2988	3286	3585	3883		
	800	1096	1397	1696	1994	2292	2591	2889	3188	3486	3785	4083		
	1000	1296	1597	1896	2194	2492	2791	3089	3388	3686	3985	4283		
	1200	1496	1797	2096	2394	2692	2991	3289	3588	3886	4185	4483		
	1400	1696	1997	2296	2594	2892	3191	3489	3788	4086	4385	4683		
	1600	1896	2197	2496	2794	3092	3391	3689	3988	4286	4585	4883		
	1800	2096	2397	2696	2994	3292	3591	3889	4188	4486	4785	5083		
	2000	2296	2597	2896	3194	3492	3791	4089	4388	4686	4985	5283		
	2200	2496	2797	3096	3394	3692	3991	4289	4588	4886	5185	5483		
	2400	2696	2997	3296	3594	3892	4191	4489	4788	5086	5385	5683		
	2600	2896	3197	3496	3794	4092	4391	4689	4988	5286	5585	5883		
	2800	3096	3397	3696	3994	4292	4591	4889	5188	5486	5785	6083		
	3000	3296	3597	3896	4194	4492	4791	5089	5388	5686	5985	6283		
	3200	3496	3797	4096	4394	4692	4991	5289	5588	5886	6185	6483		
	3400	3696	3997	4296	4594	4892	5191	5489	5788	6086	6385	6683		
	3600	3896	4197	4496	4794	5092	5391	5689	5988	6286	6585	6883		
	3800	4096	4397	4696	4994	5292	5591	5889	6188	6486	6785	7083		
	4000	4296	4597	4896	5194	5492	5791	6089	6388	6686	6985	7283		
	4200	4496	4797	5096	5394	5692	5991	6289	6588	6886	7185	7483		
	4400	4696	4997	5296	5594	5892	6191	6489	6788	7086	7385	7683		
	4600	4896	5197	5496	5794	6092	6391	6689	6988	7286	7585	7883		
	4800	5096	5397	5696	5994	6292	6591	6889	7188	7486	7785	8083		
	5000	5296	5597	5896	6194	6492	6791	7089	7388	7686	7985	8283		
	5200	5496	5797	6096	6394	6692	6991	7289	7588	7886	8185	8483		
	5400	5696	5997	6296	6594	6892	7191	7489	7788	8086	8385	8683		
	5600	5896	6197	6496	6794	7092	7391	7689	7988	8286	8585	8883		
	5800	6096	6397	6696	6994	7292	7591	7889	8188	8486	8785	9083		
	6000	6296	6597	6896	7194	7492	7791	8089	8388	8686	8985	9283		
	6200	6496	6797	7096	7394	7692	7991	8289	8588	8886	9185	9483		
	6400	6696	6997	7296	7594	7892	8191	8489	8788	9086	9385	9683		
	6600	6896	7197	7496	7794	8092	8391	8689	8988	9286	9585	9883		
	6800	7096	7397	7696	7994	8292	8591	8889	9188	9486	9785	10083		
	7000	7296	7597	7896	8194	8492	8791	9089	9388	9686	9985	10283		
	7200	7496	7797	8096	8394	8692	8991	9289	9588	9886	10185	10483		
	7400	7696	7997	8296	8594	8892	9191	9489	9788	10086	10385	10683		
	7600	7896	8197	8496	8794	9092	9391	9689	9988	10286	10585	10883		
	7800	8096	8397	8696	8994	9292	9591	9889	10188	10486	10785	11083		
	8000	8296	8597	8896	9194	9492	9791	10089	10388	10686	10985	11283		
	8200	8496	8797	9096	9394	9692	9991	10289	10588	10886	11185	11483		
	8400	8696	8997	9296	9594	9892	10191	10489	10788	11086	11385	11683		
	8600	8896	9197	9496	9794	10092	10391	10689	10988	11286	11585	11883		
	8800	9096	9397	9696	9994	10292	10591	10889	11188	11486	11785	12083		
	9000	9296	9597	9896	10194	10492	10791	11089	11388	11686	11985	12283		
	9200	9496	9797	10096	10394	10692	10991	11289	11588	11886	12185	12483		
	9400	9696	9997	10296	10594	10892	11191	11489	11788	12086	12385	12683		
	9600	9896	10197	10496	10794	11092	11391	11689	11988	12286	12585	12883		
	9800	10096	10397	10696	10994	11292	11591	11889	12188	12486	12785	13083		
	10000	10296	10597	10896	11194	11492	11791	12089	12388	12686	12985	13283		
	10200	10496	10797	11096	11394	11692	11991	12289	12588	12886	13185	13483		
	10400	10696	10997	11296	11594	11892	12191	12489	12788	13086	13385	13683		
	10600	10896	11197	11496	11794	12092	12391	12689	12988	13286	13585	13883		
	10800	11096	11397	11696	11994	12292	12591	12889	13188	13486	13785	14083		
	11000	11296	11597	11896	12194	12492	12791	13089	13388	13686	13985	14283		
	11200	11496	11797	12096	12394	12692	12991	13289	13588	13886	14185	14483		
	11400	11696	11997	12296	12594	12892	13191	13489	13788	14086	14385	14683		
	11600	11896	12197	12496	12794	13092	13391	13689	13988	14286	14585	14883		
	11800	12096	12397	12696	12994	13292	13591	13889	14188	14486	14785	15083		
	12000	12296	12597	12896	13194	13492	13791	14089	14388	14686	14985	15283		
	12200	12496	12797	13096	13394	13692	13991	14289	14588	14886	15185	15483		
	12400	12696	12997	13296	13594	13892	14191	14489	14788	15086	15385	15683		
	12600	12896	13197	13496	13794	14092	14391	14689	14988	15286	15585	15883		
	12800	13096	13397	13696	13994	14292	14591	14889	15188	15486	15785	16083		
	13000	13296	13597	13896	14194	14492	14791	15089	15388	15686	15985	16283		
	13200	13496	13797	14096	14394	14692	14991	15289	15588	15886	16185	16483		
	13400	13696	13997	14296	14594	14892	15191	15489	15788	16086	16385	16683		
	13600	13896	14197	14496	14794	15092	15391	15689	15988	16286	16585	16883		
	13800	14096	14397	14696	14994	15292	15591	15889	16188	16486	16785	17083		
	14000	14296	14597	14896	15194	15492	15791	16089	16388	16686	16985	17283		
	14200	14496	14797	15096	15394	15692	15991	16289	16588	16886	17185	17483		
	14400	14696	14997	15296	15594	15892	16191	16489	16788	17086	17385	17683		
	14600	14896	15197	15496	15794	16092	16391	16689	16988	17286	17585	17883		
	14800	15096	15397	15696	15994	16292	16591	16889	17188	17486	17785	18083		
	15000	15296	15597	15896	16194	16492	16791	17089	17388	17686	17985	18283		
	15200	15496	15797	16096	16394	16692	16991	17289	17588	17886	18185	18483		
	15400	15696	15997	16296	16594	16892	17191	17489	17788	18086	18385	18683		
	15600	15896	16197	16496	16794	17092	17391	17689	17988	18286	18585	18883		
	15800	16096	16397	16696	16994	17292	17591	17889	18188	18486	18785	19083		
	16000	16296	16597	16896	17194	1								

Appendix F
NASKEF PUBLIC WORKS THREAT CONDITION SUPPORT PLAN

Ref: (a) NASKEFINST 5530.1C

1. The Commanding Officer, Naval Air Station, Keflavik is responsible for the security of the agreed area. The establishment of threat conditions provides a smooth transition from normal to expanded security.

2. Threat Conditions. Threat condition (THREATCONS) and measures which shall be considered for implementation are:

a. THREATCON ALPHA : A general warning of possible terrorist activity, the nature and extent of which are unpredictable.

1. Notify all officers, chief petty officers and division directors of the change in THREATCON. Brief all personnel of the THREATCON and initiate checklist completion. Remind personnel to be suspicious and inquisitive about strangers, particularly those carrying suitcases or other containers. Watch for unidentified vehicles on the NATO Base. Watch for abandoned parcels or suitcases and any unusual activity. Notify NAS Security of anything out of the ordinary.

2. Review building plans available to the PWD Duty Section and BSRCC and ensure they have access to a complete set for all facilities in case of evacuation of any area is required. Coordinate with PWD Engineering to obtain access to additional plans, if required. Current location of the PWO, APWO, Operations Officer and Transportation Officer should be known to the PWD Duty Section at all times. Review Recall Bill for accuracy.

3. Secure all buildings, rooms and storage areas not in regular use.

4. Increase security spot checks of vehicles.

5. Assist Security in limiting access points for vehicles and personnel, as needed.

6. As a deterrent, apply the following measures individually and randomly:

(a) Secure and regularly inspect all buildings, rooms and storage areas not in use.

(b) At the beginning and end of each workday, and at other regular and frequent intervals, inspect the interior and exterior of buildings in regular use for suspicious activities or packages.

7. Review Facility Contingency Plan and prepare to take actions to enhance security, survivability and recovery of key facilities. Review all plans, orders, personnel details and logistic requirements related to the introduction of higher THREATCONS. Review Mass Casualty and Bomb Threat procedures

8. Coordinate with NAS Security and AFI-DE for any heavy equipment assistance required.

9. Report to NAS Security when all appropriate actions have been initiated.

b. THREATCON BRAVO : This condition is declared when there is increased and more predictable threat of terrorist activity even though no particular target is identified.

1. Repeat Measure 1 and warn all personnel.

2. PWO, APWO, Operations Officer and Transportation are to be reachable at all times via telephone or radio.
3. Check plans for implementation of next THREATCON conditions.
4. Move all vehicles and large objects at least 25 meters from key base facilities. Assist where necessary in moving dumpsters and other large objects.
5. Secure and regularly inspect all buildings, rooms and storage areas not in daily use.
6. At the beginning and end of each workday, and at other regular and frequent intervals, inspect the interior and exterior of buildings in regular use for suspicious activities or packages.
7. Examine all mail.
8. Remove signs from all facilities.
9. Make staff and family members aware of the general situation to stop rumors and prevent unnecessary alarm.
10. Remind personnel traveling off-base to exercise additional care and ensure all personnel lock their vehicles when not in use or under their direct observation. All vehicles should be checked for unidentified objects before being operated. All military vehicles traveling on official business off or between agreed areas are required to phone Security upon departure and return.
11. Erect barriers to control traffic flow. Coordinate with Security on assistance required.
12. Report to NAS Security when all appropriate actions have been initiated.

c. THREATCON CHARLIE : This condition is declared when an incident occurs or when intelligence is received indicating that some form of terrorist action against installations and personnel is imminent.

1. Review and check all THREATCON ALPHA and BRAVO actions. Report all outstanding actions to Security.
2. All officers, chief petty officers and division directors will be on call. Augment PWD Duty Section, including one officer and chief, to ensure quick response to several simultaneous emergencies.
3. Limit access points to all critical facilities to one entrance only and control entry.
4. Man all critical facilities 24 hours per days. Conduct security checks of the exterior of all facilities every 30 minutes.
5. Coordinate with Security for obtaining security guards for critical facilities.
6. Cancel all regular bus runs, including school buses, and be prepared to provide additional support to base commands.
7. Check plans for the implementation of THREATCON DELTA.
8. Report to NAS Security when all appropriate actions have been initiated.

d. THREATCON DELTA : A terrorist attack has occurred or intelligence has been received that terrorist actions against a specific location is likely

1. Review and check all THREATCON conditions actions. Report all outstanding actions to Security.
2. Activate a BSRCC. Begin around the clock operations.
3. Require positive identification from all personnel entering facilities. Check all mail, briefcases, packages, etc, for explosives and weapons.

4. Ensure at least two personnel respond to each job. Maintain a continuous cheld on the location of all PWD personnel responding to trouble calls.

5. Suspend all minor, specific and PMI work and concentrate on emergency calls as much as possible. Minimize all administrative journeys and visits.

6. Report to NAS Security when all appropriate actions have been initiated.

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