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FINAL REPORT

EMERGENCY MEDICAL NEEDS OF COAL MINES

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Prepared for:

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Safety and Health
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PREFACE

This study has been made under a contract, (Number CDC-210-76-0180), with the National Institute for Occupational Safety and Health, (NIOSH). The recommendations set forth in this report are intended to provide NIOSH with information that will enable that agency to develop standards for emergency medical resource requirements for underground coal mines. The standards set by NIOSH will be promulgated and enforced by the Mining Enforcement and Safety Administration, (MESA).

The Orkand Corporation wishes to acknowledge the contributions of the individuals and organizations who participated in and contributed to this study. We wish to thank Mr. Nick Fannick, Dr. Marilyn Hutchison and Mr. Jim Warren of the National Institute for Occupational Safety and Health for their continued assistance and guidance throughout the project. We would also like to express our appreciation to the Consolidation Coal Corporation, Southern Utah Fuel Company, and Bethlehem Steel Corporation for allowing members of The Orkand Corporation staff to visit their mines and confer with some of their employees on the subject of emergency medical resources in undergound coal mines.

We would especially like to thank the members of the Panel on Emergency Medical Services in Underground Coal Mines, without whose assistance this project could not have been completed. They provided extensive input into the development of recommendations (presented in Chapter III) pertaining to the emergency medical needs of underground coal miners. The Orkand Corporation however, accepts full responsibility for these recommendations and any errors or ommissions that they may contain. Our appreciation to the Consolidation Coal Corporation and Southern Utah

Fuel Company is expressed once again for enabling Dr. Woodrow W. Massad and Mr. Dennis Huntsmann, respectively, to attend the meeting of this panel that was held. The names of the individuals who sat on this panel are included in Appendix A.

The principle investigator for this study is Mr. Elliott R. Pickar. Mr. Robert M. Clinkscale served as Corporate Officer-in-Charge of the study. Mr. Peter Kauffman of Management Engineers Incorporated played a major role throughout this project as a consultant to The Orkand Corporation. His efforts and contributions are greatly appreciated. Data processing services were provided by United Computing Systems, Inc. Their contributions to an especially difficult task are likewise greatly appreciated.

Other staff members of The Orkand Corporation contributing to this study are Ms. Bea Page, R.N., Ms. Jane Kinsman, and Ms. Pamela Haynes.

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I. GLOSSARY OF TERMS

CARDIOPULMONARY RESUSCITATION (CPR) - Cardiopulmonary resuscitation is the combination of artificial respiration and manual artifical circulation that is recommended for use in case of cardiac arrest. It requires special training in the recognition of cardiac arrest and in the performance of CPR. Instruction includes manikin practice in performing both individually and as part of a team. Periodic retraining is required unless resuers have repeated experience in the application of CPR.[1]

EMERGENCY MEDICAL CARE - Any level of medical care that is provided under an emergency condition by a trained individual. Emergency medical care training inclues First Aid, Emergency Medical Technician (EMT), and EMT-Paramedic Training.

EMERGENCY MEDICAL CARE ATTENDANT - An individual who has undergone one of the training courses noted above, a physician, physician's assistant, nurse, or any other individual trained in emergency care techniques.

EMERGENCY MEDICAL SERVICES SYSTEM (EMSS) - A system which provides for the arrangement of personnel, facilities, and equipment for the effective and coordinated delivery of health

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[1] American Red Cross, Standard First Aid and Safety, (Garden City, New York: Doubleday & Company, Inc., 1973), 84.

care services under emergency conditions. Such a system may be developed at many levels, such as a specified geographic region or for a smaller population such as the employees of an underground coal mine.[2]

EMERGENCY MEDICAL SERVICES SYSTEM (EMSS) GRANTEE - The recipient of an EMSS grant under P.L. 93-154, The Emergency Medical Services Systems Act of 1973 and P.L. 94-573, The Emergency Medical Services Ammendments of 1976. Under these two acts, grants are provided for studying the feasibility of and planning the establishment of an EMSS, establishing and planning the initial operation of an EMSS, expanding and improving the EMSS, and supporting research in emergency medical research techniques, methods, devices, and delivery.

EMERGENCY MEDICAL SERVICES SYSTEM (EMSS) - OPERATING AGENCY - The agency responsible for implementing the EMSS program in an area. In many cases, this agency will be the EMSS grantee. In some cases, however, the grantee and operating agency will be different. For example, a state may be the recipient of federal funds, while the program may be implemented at a county or multi-county level by a county health department acting as the operating agency.

EMERGENCY MEDICAL TECHNICIAL (EMT) - Persons trained in emergency medical care in accordance with standards prescribed by the Department of Transportation (DHEW Publ. No. 1071-C-4, April, 1970), or an equivalent training program. This allied health person provides emergency medical services according to his level of training and experience.[3]

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[2]U.S. Department of Health Education and Welfare, Public Health Service, Health Services Administration, Emergency Medical Services Systems Program Guidelines, Rockville, Maryland, (U.S. Government Printing Office, 1973), 2.

[3]Ibid

EMERGENCY MEDICAL TECHNICIAN - PARAMEDIC - Persons trained for advanced life support services to include sophisticated trauma, cardiac care, and other critical care elements for interventive treatment, shock therapy, drug administration, and cardiac rhythm detection control.[4]

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[4] Ibid

II. INTRODUCTION

BACKGROUND

The "Federal Coal Mine Health and Safety Act of 1969" (P.L. 91-173) assigns to the Secretary of Health Education and Welfare the responsibility for developing and revising, as may be appropriate, health standards for the protection of the lives and the prevention of occupational diseases of miners. The National Institute for Occupational Safety and Health (NIOSH) must, in accordance with this requirement of P.L. 91-173, set such health standards and transmit them to the Mining Enforcement and Safety Administration (MESA) of the Department of the Interior. MESA has responsibility for their promulgation, and enforcement.

One part of health standards referenced in the Coal Mine Health and Safety Act deals with Emergency Medical Requirements. The high frequency rate of injuries occurring in underground coal mines evidence the importance of maintaining high standards for emergency medical services. For these reasons and because of the rapidly changing technology and practice of emergency medicine, NIOSH is preparing to revise those sections of the currently enforced regulation addressing the emergency medical resource and training needs of coal miners.[1]

Current regulations specify the requirements for providing emergency medical resources and miner training with which all coal mine operators must comply. These requirements specify that each operator shall:

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[1]Refer to Appendix A for excerpts from the Code of Federal Regulations, Title 30, that deal with this topic.

- Make arrangements for emergency medical assistance and transportation for injured persons;

- Conduct first aid and refresher training courses for selected supervisory personnel;

- Make first aid and refresher training courses available to all miners; and

- Maintain a supply of first aid equipment and supplies as specified in the regulations.

In addition to the regulations that are currently being enforced, MESA has recently proposed a set of regulations[2] (also included in Appendix A) that would require mine operators to provide first aid and CPR instruction to all coal miners. While the current Title 30 regulations only require that instruction in first aid be given to selected supervisory personnel and merely be made available to all others, these proposed regulations provide for the compulsory training of all miners in both first aid and CPR. The instruction required under the proposed regulations would comprise ten hours of first aid and four hours of CPR training. All inexperienced miners would be required to complete this training prior to being assigned to their work duties. In addition, all miners would, under the proposed regulations, be required to take five hours refresher training in first aid and CPR annually. These regulations proposed by MESA deal with training only. Equipment and supplies are not addressed in them.

STUDY OBJECTIVES

The primary objectives of the study which is the subject of this report are the identification of:

- The types of first aid equipment that are necessary in providing for medical emergencies at underground coal mines;

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[2]These regulations were proposed in the "Federal Register", Volume 41, No. 147 - Thursday July 29, 1976. Responses to these proposed regulations may be found in the "Federal Register", Volume 42, No. 80 - Tuesday April 26, 1977.

- The types of training that should be given to miners to ensure the ready availability of trained personnel able to provide emergency medical care to individuals injured in underground coal mines; and

- The appropriate relationships between the emergency medical service of the mining operation (EMS) and the existing community or area-wide EMS or other health care systems.

In order to promote the availability of the necessary capabilities for handling medical emergencies occurring in underground coal mines it is essential that these three components of an EMS system (i.e., equipment, training, and relationships with existing EMS systems) be effectively maintained. The overall objective of this study is to make recommendations to NIOSH regarding emergency medical resource requirements that should be addressed by the Federal Regulations governing all underground coal mines.

The remainder of this report is divided into two chapters. Chapter II describes the specific methodology that was used for evaluating the emergency medical service resource requirements at underground coal mines. The final chapter of this report, Chapter III, presents recommended standards vis-a-vis emergency medical resource requirements at undergound coal mines. Four appendices to the report are also included. They are:

- Appendix A - Current and Proposed Regulations Addressing Emergency Medical Services for Underground Coal Mines;

- Appendix B - States Surveyed to Identify and Obtain State Laws and Regulations Addressing Emergency Medical Services for Underground Coal Mines;

- Appendix C - Individuals Participating in the Panel Meeting on Emergency Medical Services for Underground Coal Mines; and

- Appendix D - Analysis of MESA Accident and Injury Data.
- Appendix E - List of EMSS grantees
- Appendix F - Department of Transportation Ambulance Design Criteria
- Appendix G - American College of Surgeons, Essential Equipment for Ambulances

III. METHODOLOGY

INTRODUCTION

The methodology employed in identifying the emergency medical resource requirements of underground coal mines was directed at completing four major tasks. They are:

- Identify and review current State and Federal regulations governing the emergency medical resource requirements of underground coal mines;
- Conduct visits to underground coal mines;
- Organize and conduct a meeting of experts in the subjects of emergency medical care and coal mine health and safety;
- Process and analyze MESA accident and injury data for the four year period 1972-1975.

A description of each of these tasks is discussed below.

REVIEW OF CURRENT FEDERAL AND STATE REGULATIONS

In addition to the review of current and proposed Federal regulations, an effort was made to review state regulations on the provision of emergency medical services in underground coal mines. A survey of 18 states having active underground coal mines was undertaken. A list of the States surveyed and the agencies within the State government that were contacted are included in Appendix B.

A letter requesting information on programs, legislation, and regulations for emergency medical services in underground coal mines was mailed to each of the 18 agencies that were contacted. Each agency was asked to send copies of existing or proposed legislation and regulations pertaining to the provision of EMS resources at underground coal mines.

The survey was conducted during the initial months of the project (July-September 1976). In May 1977 selected States whose legislation or regulations governing EMS resources had been identified as having undergone some changes during the intervening time period were recontacted.

The results of the queries that were made during the initial and follow-up contacts may be summarized as follows:

- 18 states having underground coal mines were surveyed. After follow-up contacts were made, all 18 of these states responded.
- 14[1] of these 18 states reported enforcement of Title 30 regulations or regulations for the provision of emergency medical services in underground coal mines that were essentially the same as these Federal regulations
- The Colorado Division of Mines reported that in addition to enforcing the Title 30 regulations they require all miners to take 10 hours initial first aid training and five hour refresher training every year thereafter.
- The Illinois Department of Mines and Minerals requires that a miner, as a prerequisite of receiving a certificate of competency, take a course in first aid. A miner working at the face of the mine must receive a certificate of competency within 12 months after becoming eligible to receive it (12 months after beginning work there).

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[1]These 14 States are: Alabama, Arkansas, Indiana, Kentucky, Maryland, Montana, New Mexico, Ohio, Oklahoma, Tennessee, Utah, Virginia, Washington, and Wyoming.

- The State of Pennnsylvania in July, 1976 enacted a law that requires that at least one emergency medical technician shall be on duty at a mine at any time when miners in that mine are engaged in the extraction, production, or preparation of coal. It further requires that a sufficient number of such personnel be employed on their regular mining duties in locations that assure that no miner cannot be reached within a reasonable time by an EMT regardless of their location in the mine. The law also specifies that at least one EMT-paramedic, registered nurse, physician, or phyisican's assistant shall be on call and available to reach the entrance of the mine within 30 minutes, at any time miners at the mine are engaged in the extraction, production or preparation of coal. These requirements are made only of mines employing 20 or more persons on a shift. Lower levels of availability of EMTs through ambulance services, or in some other manner for mines employing less than 20 persons per shift are allowed.

- The State of West Virginia has recently enacted a law (S.B. 285) that requires that at least one emergency medical technician, paramedic, or physician's assistant be employed at a mine for each 70 employees engaged in the extraction, production or preparation of coal. Such emergency medical personnel shall be available, engaged in their regular mining duties, at any time when miners at the mine are engaged in the extraction, production or preparation of coal and shall be accessible to all working miners within a reasonable time.

- The Virginia legislature is currently considering an amendment to their existing law that would require the availability of a sufficient number of working miners trained as EMTs at underground coal mines.

Conclusions

With the exceptions of the four states (Pennsylvania, West Virginia, Colorado, and Illinois) noted previously, all states responding to the survey either incorporated the Title 30 regulations into their state regulations or relied upon the Title

30 regulations alone. Most State requirements, including those of the four that had more stringent requirements regarding emergency medical personnel or first aid training, implicitly or explicitly referenced the list of medical equipment or supplies as well as the requirements for relationships with available health providers that are included in the Title 30 regulations.

Of the three states (Pennsylvania, West Virginia, and Virginia) that either have, or are contemplating requirements for EMTs at underground coal mines, all would require the EMT to be employed at their regular duties at the mine. Two of the states (Pennsylvania and Virginia) require the such EMTs be available "in sufficient numbers" to ensure that an injured miner can be reached "within a reasonable time". The West Virginia law, however, requires that one emergency medical personnel, (i.e., an EMT, paramedic, or physician's assistant), shall be employed at a mine for every seventy employees, or any part thereof, who are engaged in the production, preparation or extraction of coal. This standard, as far as can be determined, was not based upon any study of EMT need or response time in an underground coal mine.

Because of the diverse physical layouts of mines and distance between working sections, the sufficiency of any set ratio of emergency care personnel to miners is likely to vary from mine to mine. Consequently, some feel that time standards e.g., Pennsylvania's, "within a reasonable time" are more appropriate requirements than EMT to miner ratios. However, such general standards as are specified in the Pennsylvania law are open to interpretation and judgement on the part of the mine operator. More specific standards may be difficult to enforce and are likely to be controversial.

Many of the agencies responding to the survey indicated that they recognized the importance of making adequate emergency medical services available to coal miners. However, they relied heavily upon the current Federal regulations for guidance as to the types of resources that should be required. Many states anticipated the promulgation of more stringent Federal regulations.

SITE VISITS

On-site visitations were made to each of the following three mines:

- Consolidation Coal Company
  Mathies Mine
  Washington County, Pennsylvania
  Seam height - 68"

- Bethlehem Steel Corporation
  Mine 22
  Jenkins, Kentucky
  Seam height - 42"

- Southern Utah Fuel Company
  Mine 1
  Salina, Utah
  Seam height - 170"

The primary objectives of conducting these visits were: to view the mine environment as it affects the provision of emergency medical care in coal mines; to identify any special resources that were made available at the mines that were visited; to obtain further information on any state laws or regulations governing emergency medical services in coal mines; and to discuss with knowledgeable individuals at the mines, their views on providing emergency medical care at underground coal mines.

The mine visits afforded an opportunity to learn how the regulations promulgated and enforced by MESA were actually implemented at the mines. But equally as important, it allowed a number of individuals responsible for the medical and/or health and safety programs of underground coal mines the opportunity to express their views on how the current regulations pertaining to emergency medical training, equipment and supplies should be changed to improve the quality of emergency medical care that could be provided to miners in underground coal mines. Many of the suggestions received, if implemented, would have the effect of requiring mine operators to provide a greater level of resources than is currently mandated under Title 30 regulations. Some of these suggestions are included among those that are

presented in Chapter IV. Individuals who displayed an exceptional understanding of the emergency medical resource and training requirements of coal miners were invited to discuss these views at a panel meeting that was organized for this purpose. This panel meeting is discussed in the next section of this chapter.

The following are some major findings that were made of the mines visited:

- All mines complied with MESA regulations governing equipment and personnel.

- Two of the three mines had programs whereby mine personnel (including supervisory, office, and production personnel) were trained as Emergency Medical Technicians and formed a nucleus around which those mines' emergency medical programs were built. EMT training of miners was voluntary at both mines and resulted, at one of the mines, from the initiative of a group of employees that desired to have this training.

- Personnel at both mines where EMT programs were available felt that while the availability of EMTs at the mines was most useful, both to insure the availability of well-trained personnel at the mine site, and to promote interest in emergency medical care among other miners, the first line of defense necessary to insure the ready availability of personnel who can care for the immediate needs of the injured miner is training of all miners in first aid.

- Personnel at both mines where EMT programs were available felt that unless the EMT was involved in some other activity that would give him the opportunity to practice his skills (e.g., a volunteer ambulance attendent), it would be unlikely that he would be able to retain them at a high level of proficiency over a long period of time. They felt that the opportunity that such an EMT would have to use his skills (including the use of emergency equipment) would be minimal if he limited himself to treating injured coal miners.

PANEL ON EMERGENCY MEDICAL SERVICES IN UNDERGROUND COAL MINES

A meeting of a panel that included experts in emergency medical care and coal mine health and safety was convened to discuss the three topics that are being addressed by this study, namely:

- Emergency medical training for coal miners;
- Emergency medical equipment and supplies necessary in underground coal mines; and
- Relationships between coal mine operations and existing providers of emergency medical care.

The participants in this meeting and the organizations with which they are affiliated are shown in Appendix C.

In addressing these subjects, participants were asked to draw upon their knowledge and experience as well as certain statistical information on accidents and injuries in underground coal mines that were provided to them. The panel focused upon a number of related questions including the following:

- Training
  - How should training be provided?
  - What levels of training should be given?
  - Who should be trained?
- Equipment and Supplies
  - What equipment and supplies should be kept at underground coal mines?
  - Where should these equipment and supplies be maintained?
  - How should they be stored?
  - What standards for their inspection and replenishment should be required?

- Relationships Between Coal Mine Operators And Providers of Emergency Medical Care

  - What steps can mine operators take to best insure the availability of adequate medical care once the injured miner is evacuated from the mine?

In addressing these and other questions and the issues that surround them, the panel was able to reach a general consensus on a variety of factors that are of major concern in providing emergency medical care to underground coal miners. The specific recommendations that emerged from the panel meeting are presented in Chapter III of this report.

DATA ANALYSIS

Before the emergency medical resource requirements for underground coal mines can be specified, the types of injuries that are incurred by miners must be identified. An analysis of accident and injury data maintained by MESA was undertaken to achieve this goal. This data analysis was undertaken in an effort to form a basis for identifying:

- The types of first aid equipment and supplies which are necessary in medical emergency situations at underground coal mines;

- The types and levels of resources that should be made available to injured coal miners through the existing EMS system in order to provide adequate care to coal miners in need of emergency care; and

- The types of first aid training necessary to insure that adequate care may be provided to disabled miners while still underground and while in transport from the mine.

The data employed in this analysis were obtained from the MESA coal accident and injury record file. This file is generated from the standard MESA accident and injury report (form No. 3000-1) that is submitted, by the mine operator, in compliance with the mandatory reporting requirements for accidents and injuries occurring in coal mining operations.

Only a subset of the data contained in MESA's coal accident and injury record file were included in the data analysis. Certain accident and injury records not pertinent to the study being undertaken, were deleted from the files. These were records of:

- Accidents that did not result in any injuries;
- Injuries occurring in a disaster situation (i.e., where more than five deaths result from an accident);
- Accidents and injuries occurring in anthracite mines;
- Accidents and injuries occurring in surface mines; and
- Accidents and injuries occurring in surface operations at underground coal mines.

Included in Appendix D is a set of tabulations and cross tabulations of data showing the nature of injuries occurring in underground coal mines during 1972 through 1975.[2] The seven tables in Appendix D are as follows:

- Table D-1 - Total number of injuries by nature of injury;
- Table D-2 - Nature of injury by part of body;
- Table D-3 - Nature of injury by location;
- Table D-4 - Nature of injury by severity classification and location
- Table D-5 - Percent of injuries by cause;
- Table D-6 - Percent of injuries by severity classification;
- Table D-7 - Percent of injuries and percent of mines by mine size-average monthly manhours.

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[2]The entire data bases for 1972, 1973, and 1974 were used in the analyses of data for these years. A 70% sampling of records was employed in the analysis of the 1975 data.

Data for table D-7 were obtained from MESA's coal address record file as well as from the accident and injury record file discussed previously.

Findings

The data analysis yielded a number of findings that are relevant to this study. These findings are presented in the five sections below:

Most Frequent Types of Injuries. Five injury classifications comprised more than 90% of all reported injuries and illnesses in the four year period being studied. These classifications and the average percentage of all injuries that they represented over the four year period are:

- Bruises - 37%
- Sprains/Strains - 24%
- Cuts/Lacerations - 16%
- Fracture/Chip - 10%
- Multiple Injuries - 5%

While the number of reported injuries decreased markedly over the four year period, the percent of injuries in each of these classifications did not change as drastically. As can be seen from Table D-1, the percent of injuries that were bruises decreased about 7% over the four year period (from 40% to 33%), the percent of injuries that were fractures and chips increased about the same amount (from 7%-14%). One might speculate from this fact and the fact that total number of reported injuries were substantially fewer in 1974 and 1975 than they were in 1972 and 1973 that some of the less severe injuries have in more recent years gone unreported while the more severe injuries were in the later years still subject to a level of reporting that is about the same as they had always been. The level of reporting of injuries will be addressed in a discussion of severity presented later in this section.

Part of Body Affected. As is shown in Table D-2, the distribution of injuries according to part of body affected shows that there are significant numbers of injuries affecting all body parts. However, injuries to the lower arm (bruises, cuts and laceration, and fractures and chips) and trunk (primarily bruses and sprains and strains) constitute the majority of all injuries.

Site of Occurrence of Injuries. Approximately 25% of all accidents occurred off section in each of the four years that were under study. The types of injuries that were reported as occurring on and off section were generally similiar. The major differences (as can be seen in Table D-3) were that the percentage of reported injuries categorized as bruises was greater for the on section category than the off section category by a difference of 3% to 5%. The percentage of reported injuries categorized as sprains and strains that were sustained off section exceeded that on section by a difference of 4% to 6%. This may be attributed, at least in part, to the different types of work that are undertaken on and off section, the decreased level of supervision provided off section, and the fact that miners working off section are less likely to be working in teams than are the miners working on section.

Severity of Injuries. An interesting finding that may be made in reviewing Table D-6, is that over the four year period under study, the percent of injuries categorized in the fatal/permanent disability and temporary total disability classifications has increased 13%. The percent of injuries categorized in the two lesser severity classifications has decreased by about the same amount. Over this same time period the total number of reported injuries has decreased by almost 50%. These observations tend to sustantiate the speculation that the reporting of less severe injuries is decreasing. It should be noted, however, that no information learned through the three site visits made would substantiate this speculation. Mine operators interviewed reported no major changes in accident reporting methods.

The data presented in Table D-6, show little difference in the severity of injuries that are sustained on or off section. This finding as well as the fact that a significant portion of all injuries are sustained by miners working off section may indicate that medical supplies and emergency care expertise should be equally accessible to all miners regardless of the location of their work station.

Percent of Injuries by Size of Mine. Table D-7 displays data on the percent of total injuries occurring in mines categorized by their size according to the average number of manhours expended monthly. Data on the percent of total manhours expended in mines of each size category are also presented. The information found in Table D-7, indicates that there is little difference in the frequency of injuries occurring among mines of different size classification.

IV. RECOMMENDATIONS

PURPOSE

One of the primary objectives of the study that is the subject of this report, is the determination of the types of emergency medical resources required at underground coal mine operations. The three components of the emergency medical services system that are specifically addressed in the recommendations presented in this chapter of the report are:

- Equipment;
- Personnel and training; and
- Interface of the mine operation's EMS system with the existing community and area-wide EMS system

A discussion of recommendations in each of these three areas follows.

EQUIPMENT

Recommendations for the supplies component of the EMS system are divided into five areas:

- Recommended equipment;
- Storage locations for equipment;
- Methods of storing equipment;
- Inspections of equipment;
- The treatment of equipment in the regulations.

These recommendations are presented below.

Recommended Equipment

The following supply of equipment should be maintained by each operator of an underground coal mine and kept in locations recommended in a later section of this chapter:

- One stretcher--a scoop stretcher is desirable. Stretchers in low coal mines should be equipped with runners to lessen the burden of evacuating the injured miner from the mine;
- One broken back board;
- Twelve triangular bandages;
- Eight 4 inch bandages;
- Eight 6 inch bandages;
- Twelve 2 inch bandages;
- Twelve rolls 6 inch Kerlex (or similar) bandages;
- Twelve rolls 4 inch Kerlex (or similar) bandages;
- One box of assorted sizes adhesive bandages;
- Four cloth blankets;
- One rubber blanket;
- Two 1 gallon containers of distilled water;
- Necessary components of arm and leg splints--inflatable splints that are inflated by mouth are desirable. Such inflatable splints should have printed on them instructions for their use as well as warnings to check for pressure changes in the splint as the injured miner is being removed from the mine.
- Three cervical collars--one each--small, medium, and large sizes.

- Oxygen with mask or airway;
- One nasal or oral pharyngeal airway; and
- One pair heavy duty scissors.

This equipment may be administered in any emergency situation by an individual having first aid training. Other equipment and supplies such as pain killers or defibrillators are not deemed to be necessary in most emergency situations occurring underground nor may they be used by personnel who are likely to be available underground, including in many states, the EMT. Such specialized equipment, and supplies can frequently be administered by higher level personnel or under the supervision of a physician. Allowable treatments by the various types of medical personnel will vary from state to state.

Storage Locations for Equipment

It is recommended that a supply of the first aid equipment listed in the immediately preceding section be maintained in the following locations:

- On each working section; and
- In a first aid room dedicated to the treatment of medical emergencies. This first aid room should be located at the surface of the mine and within a reasonable distance of the mine portal.

In addition, because of the significant percentage of injuries occurring off section, it is recommended that miners working off section carry first aid supplies along with them. A supply of equipment such as that which is included in the 24 unit kit recommended by the American Red Cross is suggested. The ARC 24 unit kit includes the following equipment:[1]

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[1]While the recommended American Red Cross 24 unit first aid kit includes one tourniquet, this piece of equipment is purposely being excluded here while tourniquets had at one time been standard first aid supply, they are no longer recommended as such by many knowledgeable groups and individuals, including The American College of Surgeons. By not including a tourniquet, thereby forcing the improvisation of one, if the need arises, it is hoped that its indiscriminate use and resulting complications will be minimized.

24 Unit First Aid Kit

- 2 units - 1" Adhesive Compress
- 2 units - 2" Bandage Compress
- 2 units - 3" Bandage Compress
- 2 units - 4" Bandage Compress
- 1 unit - 3"x3" Plain Gauze Pads
- 2 units - Gauze Roller Bandage
- 1 unit - Eye Dressing Packet
- 4 units - Plain Absorbent Gauze - 1/2 square yard
- 3 units - Plain Absorbent Gauze - 24"x72"
- 4 units - Triangular Bandages
- 1 unit - Scissors - Tweezers

Methods of Storing Equipment

The following recommendation for storing the previously specified first aid equipment are made:

- All equipment shall be stored in suitable, sanitary, dust proof, moisture proof containers that are accessible to all miners;

- Such containers shall be identified by a red cross made with reflective paint or tape;

- All containers shall be sealed with a special tape, supplied by MESA, in such a way so that it will be noticeably broken, and not able to be resealed, whenever the container is opened. Such seals should not hamper the ability of miners to gain access to the equipment during emergencies.

- An inventory card showing the quantity and location of each type of equipment should be maintained in the container and used for taking inventory of the first aid equipment during inspections.

- A log card on which all inspections are noted should be fastened to the outside of the container.

Inspections of Equipment

In order to insure the ready availability of first aid equipment whenever it is needed, it is recommended that:

- Bi-monthly inspections of the first aid equipment be undertaken;

- Bi-weekly inspections of the storage container seal shall be undertaken;
- An individual or group of individuals be assigned to these duties and be responsible for these inspections;
- At each bi-monthly inspection of the first aid equipment, the responsible individuals shall:
  - Open each first aid container;
  - Take inventory of its contents;
  - Replenish any necessary equipment;
  - Note on the inventory card any replenishments made;
  - Sign and date the inventory card;
  - Replace the inventory card in the container; and
  - Seal the container with the special tape alluded to earlier, noting the inspection date on a log card fastened to the outside of the container.
- At each bi-weekly inspection of the seal on the storage container, the responsible individuals shall check the seal to insure that it is not broken. If it is not broken, then the date of the seal inspection and signature of the inspecter should be noted on the log card fastened to the container.
- Whenever the seal on the container is broken an inspection meeting the requirements noted above, should be immediately undertaken.

Treatment of Equipment and Supplies in the Regulations

Because of rapidly changing medical technology and practice of emergency medicine, the desired supply of first aid equipment is likely to change over relatively short periods of time. Listing the required supply of equipment in the regulations, as is currently done, will make more difficult and prolong the process of updating that list.

Therefore, it is recommended that the regulations promulgated by MESA not include the list itself. Rather, the regulations should reference a list of equipment that is approved by MESA and require that each mine operator provide the equipment included in that MESA approved list.

This list of equipment should be regularly reviewed by NIOSH. Provisions made for updating the list and notifying the mining operators of any changes should be developed and implemented. Mining operators should be allowed a reasonable period of time in which to comply with the list of equipment that is updated by NIOSH.

PERSONNEL AND TRAINING

Individuals who will provide emergency medical care in underground coal mines must possess the skills that are necessary to undertake the following three activities:

- Assessment of the nature of the injury and the immediate medical requirements of the injured miner;
- Stabilization of the injured miner; in particular stopping bleeding, maintaining an airway to allow the patient to breathe, attending shock, and splinting fractures or dislocations; and
- Transport of the miner from the scene of the accident to the surface of the mine, to a first aid room at the mine site, or if no emergency transportation service is available, to an appropriate provider of medical care (e.g., hospital, clinic, physician).

It is important that the individuals who possess such skills be able to respond to medical emergencies as soon after their onset as is possible.

The analysis of MESA accident and injury data shows that the vast majority of the injuries that occur in underground coal mines are likely to require the skills of persons having good basic first aid skills (see Table D-1 in Appendix D). Higher level skills would be required only infrequently. The alternative

of requiring higher skill level training (such as EMT) is not recommended. Specifically, the following reasons are offered for not requiring that miners be generally trained to levels above first aid training, such as in EMT or cardiopulmonary resuscitation (CPR) techniques.

- The MESA accident and injury data indicate that emergency treatment for the types of injuries occurring in underground coal mines can be properly handled by an individual having good basic first aid training.

- Without certain equipment and supplies[2] the EMT can provide little more than first aid to the injured miner. Because of storage and security problems, these equipment could not properly be stored underground. Since they would not be immediately available in responding to a medical emergency their usefulness and therefore the added effectiveness of an EMT would be greatly reduced.

- Unless an EMT is able to regularly practice his skills, his ability to retain the knowledge learned in EMT training and maintain his skills are markedly reduced. Unless a miner trained as an EMT is involved in some other activity where he could practice his skills (e.g., as a volunteer ambulance attendant), he is unlikely to be able to provide improved care over a person with good first aid training. Refresher training for an EMT who does not regularly practice his skills would have to be extensive and be taken frequently if minimal EMT skills were to be maintained.

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[2]State laws which dictate the equipment, medications, etc. that the EMT is allowed to use vary substantially. In some states, unless the EMT is under the supervision of medical personel, unless the EMT is under the supervision of medical personnel, he is allowed to provide a little more than basic first aid to the injured patient.

- CPR skills, like EMT skills, are subject to low levels of retention and poor CPR technique unless they are regularly practiced. Improper application of CPR techniques can cause substantial harm to the patient.

Thus, although a number of states have developed, or are in the process of developing, regulations that would require certain numbers of EMTs in an underground coal mine, our analyses indicate that the immediate availability of personnel trained in first aid is more essential to providing emergency medical care to coal miners than providing limited numbers of more highly trained individuals. Those miners that do have very severe injuries are likely to benefit more from immediate stabilization (to stop bleeding, maintain an airway, etc.) than a delayed response by an EMT who is not available at the scene of the injury when it occurs.[3] The availability of EMTs at locations throughout the mine might provide some additional benefits in the case of the infrequent occurrences of very severe injuries, but only if the EMT maintains his skills by practicing them regularly. Thus, the recommendations that follow address the importance of training all miners in basic first aid. In order to increase the availability of more highly trained and experienced individuals in the event that they are needed, miners should be encouraged to take higher levels of training. However, only those individuals who are interested in and capable of taking such higher levels of training and are serious enough about pursuing other activities that will allow them to maintain their skills should do so. The experience of such individuals in providing care to seriously injured patients is equally as important as their training. For serious injuries, appropriate linkages with surface areawide EMS resources is believed to be a better approach than attempting to overcome the shortcomings of using underground EMTs.

Recommendations - Personnel and Training

A first aid level training course that focuses on the following subjects should be provided to all underground coal miners:

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[3]Because of the nature of higher level training such as EMT, it would be desirable to train only those individuals having the ability to and interest in taking such training. This would necessarily mean that many fewer miners could be trained as EMTs than could be trained in first aid.

- Bleeding;
- Breathing;
- Fractures;
- Shock; and
- Transportation

A 14-hour course covering these topics will enable the trained miner to properly undertake the three activities that are likely to be required of him in an emergency situation: assessment of the nature of injuring and immediate medical requirements; stabilization of the injured miner; and transportation of the miner to the surface of the mine. A course such as the MESA first aid course, which is presently being updated, should serve as the curriculum for this training. Such a course should include an introduction to cardiopulmonary resuscitation (CPR), but would not require a full course in CPR techniques for the reason specified previously. Only those miners who have a sincere interest and aptitude for taking CPR and have a good understanding of first aid techniques should be trained in CPR.

In addition to the initial 14-hour course, it is also recommended that a minimum of five hours of refresher training be given to all coal miners at least bienially. The course of instruction of this refresher training may include review of previously covered topics or instruction in others that had not previously been addressed in the training courses taken by miners. The curriculum of this course should be flexible to allow for variable levels of retention and therefore, the differing abilities and needs of all miners at the time refresher training is given.

Levels of emergency medical care training higher than the first aid level which is being recommended should not be made mandatory for any miner. However, as part of their first aid training, all miners should be made aware of such other types of training (e.g., EMT and CPR), what they involve, and how they may be obtained. Miners having an interest in the first aid training and an aptitude for and interest in taking higher levels of training should be encouraged to do so. Because the benefits of such training over first aid training are not great unless they are practiced on a regular basis, only these miners who are serious enough to pursue other activities that will allow them to do so should pursue these higher levels of training.

In order to encourage and give incentive to underground coal miners to take these higher levels of training, the mine operator should work with local hospitals, physicians, EMS grantees, universities and other organizations that are capable of providing such training. Such courses, conducted by the mine operator, or under the auspices of the mine operator, in conjunction with organizations such as those listed above, should be made available to all coal miners. Further discussion of how training of miners in emergency medical care may be provided by the mine operator is included i the next section of this chapter.

In order to improve the quality of training provided to miners, the instruction manuals currently provided through MESA should be reviewed and revised to reflect recent changes in medical practice. In addition, guidelines for instructing miners in first aid should be provided in order to promote improved instruction techniques. Procedures for testing miners after they have been instructed in first aid techniques to evaluate both their understanding of the subject and the quality of the instruction that was provided would be most useful as would be procedures for pretesting miners prior to giving instruction in refresher training. The purpose of this pretesting is the determination of the topics that should be covered in the refresher training program.

INTERFACE WITH EXISTING EMERGENCY MEDICAL SERVICES (EMS) SYSTEMS

The preceding sections of this chapter addressed the types of resources that should be made available at the underground coal mine to provide for the immediate emergency medical needs of injured miners. Provisions must also be made to insure the availability of and accessibility of medical care providers of other services that may be required by the injured coal miner. These include the services of the following providers:

- Ambulance companies;
- Physicians;

- Hospitals, including diagnostic services, inpatient general care, special care units (e.g., for trauma, spinal cord injuries, burns, acute coronary care); and

- Medical clinics

In recent years there has been increasing emphasis nationwide on developing organized regional emergency medical service (EMS) systems. As defined in the Emergency Medical Services Systems Act of 1973, an EMS system is one that "provides for the arrangement of personnel, facilities, and equipment for the effective and coordinated delivery in an appropriate geographical area of health care services under emergency conditions".[4] With the assistance of grants awarded by the Division of Emergency Medical Services of the Department of Health Education and Welfare, over 80 regional or statewide EMS systems have been established throughout the country and are in the process of planning, establishing, operating, expanding or improving the emergency medical service systems in the areas under their jurisdiction. Interfaces with existing EMS systems serving the area of the coal mine must be established. Since the basis of the proposed EMS system at the coal mine will be the ready availability of individuals having good first aid training, provisions for higher levels of EMS personnel (such as the EMT or EMT paramedic) must be made through other sources. Thus, in order to gain access to such personnel as well as to other EMS facilities and resources (e.g., hospitals and ambulances), appropriate relationships with the existing EMS system must be developed.

Regional emergency medical services systems, where they exist, should be the focal point for any interfaces between the mine operator and the providers of any emergency medical services that may be needed. Appendix E contains a list of current Federal EMSS grantees. This list may be used by the mine operator to identify whether there is a regional EMS system having jurisdiction over its area. If no organization

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[4] P.L. 93-154, Emergency Medical Services Systems Act of 1973, Section 1201.

responsible for the development and operation of such a system is on this list, the mine operator should investigate whether a local EMS system, not funded through Federal grants, does exist in the area. In those areas where an organized regional EMS system does not exist, it may be necessary to coordinate activities directly with the health care providers themselves. Making arrangements directly with health care providers in those areas having organized EMS systems may also be necessary, if such arrangements cannot be made through the operating agency of the EMS system. Initial contacts with the regional organization should be made so that resource availability in the area can be assessed and health care providers with whom the mine operator can make arrangements for providing emergency medical assistance for injured miners can be identified.

The remainder of this chapter discusses the types of inter-relationships and arrangements that should exist between the mine operator and providers of emergency medical care. It focuses on the following subjects:

- Training;
- Communications'
- Transportation'
- Facilities and Personnel;
- Information and Education;
- Disaster Linkages; and
- Evaluation.

The mine operator should develop a plan for relating with the area EMS system that addresses these subjects.

Training

Emergency medical care readiness at the underground coal mine should be achieved, as was previously discussed, through the training of underground coal miners in first aid. Other courses in emergency medical care should be made available to miners interested in taking them. While, in many cases, the instructors for these courses will be mine employees (e.g.,) the mine safety directors) it, may, at times, be necessary to seek instructors from other sources. This will be especially true for small mine operations that cannot support an instructor or for higher level courses (e.g., EMT training course).

The EMS system operating agency, local universities, or health providers could assist the mine opeator in providing miner training in emergency medical care training. Naturally, the training course instructors and curricula should comply with any requirements for certification or content that are enforced by MESA.

Communications

Each operator of an underground coal mine must establish and maintain a plan for communicating with health care providers that are likely to be sources of care for the injured miner. These include:

- Emergency transportation services;
- Nearby hospitals;
- Hospitals with special care units:
  - trauma unit
  - burn unit
  - acute coronary care unit
- Licensed physicians; and
- Medical clinics

These plans should include the following information:

- Name of provider;
- Method of communication with provider:
  - include telephone number if telephonic communiciation
  - inlcude radio frequency and station call leters if radio commuication
- Special services or qualifications of the provider. This may include:
  - special care units available
  - areas of service for emergency transportation services
  - physician specialities
  - other

- Time from the mine site to the provider (where applicable); and

- Alternative means of contacting the provider (e.g., sherrif, police department, fire department, central emergency access member)

Because of the potential importance of immediate notification and response of these providers to an emergency, it is important that the information outlined above be kept in a location that is accessible at all times when miners are engaged in the production, extraction or preparation of coal or the development or maintenance of mine shafts or slopes. As a minimum this information should be readily available to the individuals at the surface of the mine, who are in two way voice communication with miners underground.

Transportation

The mine operator should develop a memorandum of understanding with one or more transportation services that are able to provide transportation services to the mine at any time in which miners are engaged in the production, extraction, or preparation of coal or the development or maintenance of mine shafts or slopes. This memorandum of understanding should specify the types of equipment and personnel resources that are employed by the transportation services and will be used in response to emergencies at the mine. It should also specify the agreement of the transportation service to provide the necessary services to the mine.

Wherever it is possible to do so, memoranda of understanding should be made only with transportation services whose equipment meets the ambulance design criteria of the U.S. Department of Transportation and the standards for essential equipment for ambulances of the American College of Surgeons. These standards are included in Appendices F and G respectively. Where no ambulance services meets all these standards, an attempt should be made to utilize that ambulance service that most closely meets these standards.

Facilities and Personnel

Memoranda of understanding should be established with facilities and personnel that can provide emergency medical assistance for any person injured at the mine. In addition to establishing memoranda of understanding with nearby physicians, hospitals, medical clinics, etc., memoranda of understanding should be developed with hospitals having specialized care facilities, such as burn, trauma, and acute coronary care units and physician specialists that may not be available in the area immediately surrounding the mine site.

The purpose of these memoranda is to promote the accessibility of the miner to higher levels of medical care than are available through resources available at the mine. They should include, at a minimum, the following information:

- An agreement on the part of the facility or physician to provide the necessary emergency medical care and, if it is available and required, continued care after the patient's immediate medical needs are fulfilled;
- Specification of any special qualifications or resources possessed by the facility or personnel;
- Any special requirements for notifying the facility or physician of the impending arrival of an injured patient to their facilities;
- Any arrangements made for sending physician, EMT paramedic, or other personnel to the mine site to assist in emergency situations there; and
- Any limitations in the services that can be provided (e.g., hours of operation).

Information and Education

The mine operator shall work with the local or regional EMS system and/or area health care providers to educate and inform the employees at the mine of any development or initiatives related to the provision of emergency medical services. This may include the promulgation of information on:

- Available training programs;
- The implementation of central EMS telephone access numbers (e.g., 911)
- Accident prevention programs;
- Other emergency medical service programs being implemented in the area.

In this way, the mine operator can serve to aid the EMS system or local health providers in achieving their goals of keeping the general public informed about the EMS system available to them.

Disaster Linkages

In the event of disasters, the mine operator and the EMS system may be able to mutually aid each other. In the event of a disater at the mine, resources available at the mine may be insufficient either in terms of numbers or skills. Thus, resources available through the EMS system may be required. In the event of a disaster in a nearby community, the large number of trained personnel available at the mine may prove to be a most valuable resource for the community.

The mine operator and the organization responsible for disaster planning in the area (e.g., civil defense, local hospital, or the EMS system operating agency) should establish a mutual aid agreement whereby both parties agree to assist each other as is necessary in the event that the need to do so arises. Protocols for how assistance should be requested should be established in this agreement.

Evaluation

Periodically, all parties involved in the provision of emergency medical care at underground coal mines should evaluate their performance to determine whether any changes in their protocols or procedures are required. Among the individuals and organizations that should be involved in such an evaluation are ambulance services, physicians, hospitals, and clinics with whom

memoranda of understanding are established; miners; representatives of the EMS system operating agency; and instructors of the training cources that are provided to miners. The evaluation that is conducted should focus upon a number of factors, including:

- The relationships between the mine operator and the organizations and individuals involved in the provision of emergency medical care at the mine;
- The emergency medical care that is provided at the mines by miners trained in first aid and other levels of
- The emergency medical services provided to miners by ambulance service, hospitals, physicians, or other providers of emergency medical care services at the mine; and
- The training courses that are provided to the mine employees.

The goals of this evaluation should be the identification of any problems that exist and the improvement of the emergency medical care that is afforded to underground coal miners.

APPENDIX A

Excerpts from Code of Federal Regulations - Title 30 Part 75

Excerpts from Proposed Amendments to Code of Federal Regulations - Title 30 Part 75

The following are sections from the Code of Federal Regulations and proposed amendments to those regulations. They include the guidelines concerning first-aid training of coal mine personnel; minimum equipment requirements, and location of equipment.

Code of Federal Regulations
Title 30 Part 75

§ 75.1713 Emergency medical assistance; first-aid.

[STATUTORY PROVISIONS]

Each operator shall make arrangements in advance for obtaining emergency medical assistance and transportation for injured persons. Emergency communications shall be provided to the nearest point of assistance. Selected agents of the operator shall be trained in first-aid and first-aid training shall be made available to all miners. Each coal mine shall have an adequate supply of first-aid equipment located on the surface, at the bottom of shafts and slopes, and at other strategic locations near the working faces. In fulfilling each of the requirements of this section, the operator shall meet at least minimum requirements prescribed by the Secretary of Health, Education, and Welfare.

§ 75.1713–1 Arrangements for emergency medical assistance and transportation for injured persons; agreements; reporting requirements; posting requirements.

(a) Each operator of an underground coal mine shall make arrangements with a licensed physician, medical service, medical clinic, or hospital to provide 24-hour emergency medical assistance for any person injured at the mine.

(b) Each operator of an underground coal mine shall make arrangements with an ambulance service, or otherwise provide, for 24-hour emergency transportation for any person injured at the mine.

(c) Each operator shall, on or before December 30, 1970, report to the District Manager for the district in which the mine is located the name, title and address of the physician, medical service, medical clinic, hospital or ambulance service with whom arrangements have been made, or otherwise provided, in accordance with the provisions of paragraphs (a) and (b) of this § 75.1713–1.

(d) Each operator shall, within 10 days after any change of the arrangements required to be reported under the provisions of this § 75.1713–1, report such changes to the District Manager. If such changes involve a substitution of persons, the operator shall provide the name, title, and address of the person substituted together with the name and address of the medical service, medical clinic, hospital, or ambulance service with which such person or persons are associated.

(e) Each operator shall, immediately after making an arrangement required under the provisions of paragraphs (a) and (b) of this § 75.1713–1, or immediately after any change of such arrangement, post at appropriate places at the mine the names, titles, addresses, and telephone numbers of all persons or services currently available under such arrangements to provide medical assistance and transportation at the mine.

§ 75.1713–2 Emergency communications; requirements.

(a) Each operator of an underground coal mine shall establish and maintain a communication system from the mine to the nearest point of medical assistance for use in an emergency.

(b) The emergency communication system required to be maintained under paragraph (a) of this § 75.1713–2 may be established by telephone or radio transmission or by any other means of prompt communication to any facility (for example, the local sheriff, the State highway patrol, or local hospital) which has available the means of communication with the person or persons providing emergency medical assistance or transportation in accordance with the provisions of § 75.1713–1.

§ 75.1713–3 First-aid training; supervisory employees.

On or before December 30, 1970, each operator of an underground coal mine shall conduct first-aid training courses for selected supervisory employees at the mine, and report in writing to the District Manager the names and job titles of all supervisory employees so trained. Thereafter, each operator shall, within 60 days after the selection of a new supervisory employee to be trained, report in writing to the District Manager the name and job title of such employee and the date on which such employee satisfactorily completed a first-aid training course.

§ 75.1713–4 First-aid training program; availability of instruction to all miners.

On or before June 30, 1971, each operator of an underground coal mine shall make available to all miners employed in the mine a course of instruction in first-aid conducted by the operator or under the auspices of the operator, and such a course of instruction shall be made available to newly employed miners within 6 months after the date of employment.

§ 75.1713–5 First-aid training program; retraining of supervisory employees; availability to all miners.

Beginning January 1, 1971, each operator of an underground coal mine shall conduct refresher first-aid training courses each calendar year for all selected supervisory employees, and make available refresher first-aid training courses to all miners employed in the mine.

§ 75.1713–6 First-aid training program; minimum requirements.

(a) All first-aid training programs required under the provisions of §§ 75.1713–[illegible] and 75.1713–4 shall include 10 class hours of training in a course of instruction similar to that outlined in "First Aid, A Bureau of Mines Instruction Manual."

(b) Refresher first-aid training programs required under the provisions of § 75.1713–5 shall include five class hours of refresher training in a course of instruction similar to that outlined in "First Aid, A Bureau of Mines Instruction Manual."

§ 75.1713–7 First-aid equipment; location; minimum requirements.

(a) Each operator of an underground coal mine shall maintain a supply of the first-aid equipment set forth in paragraph (b) of this § 75.1713–7 at each of the following locations:

(1) At the mine dispatcher's office or other appropriate work area on the surface in close proximity to the mine entry;

(2) At the bottom of each regularly traveled slope or shaft; however, where the bottom of such slope or shaft is not more than 1,000 feet from the surface, such first-aid supplies may be maintained on the surface at the entrance to the mine; and

(3) At a point in each working section not more than 500 feet outby the active working face or faces.

(b) The first-aid equipment required to be maintained under the provisions of paragraph (a) of this § 75.1713–7 shall include at least the following:

(1) One stretcher;

(2) One broken-back board. (If a splint stretcher combination is used it will satisfy the requirements of both (1) and (2)).

(3) 24 triangular bandages (15 if a splint-stretcher combination is used).

(4) Eight 4-inch bandage compresses;

(5) Eight 2-inch bandage compresses.

(6) Twelve 1-inch adhesive compresses;

(7) One follie;

(8) Two cloth blankets;

(9) One rubber blanket or equivalent substitute.

(10) Two tourniquets;

(11) One 1-ounce bottle of aromatic spirits of ammonia or 1 dozen ammonia ampules.

(12) The necessary complements of arm and leg splints or two each inflatable plastic arm and leg splints.

(c) All first-aid supplies required to be maintained under the provisions of paragraphs (a) and (b) of this § 75.1713–7 shall be stored in suitable, sanitary, dust tight, moisture proof containers and such supplies shall be accessible to the miners.

Proposed Amendments to Code of Federal Regulations Title 30 Part 75

§ 75.2004 Training of inexperienced miners; minimum courses of instruction; hours of instruction.

To Include

(10) *First-aid and cardiopulmonary resuscitation—14 hours:* The course and instruction shall consist of a ten-hour course in first-aid methods and a four-hours course in cardiopulmonary resuscitation.

§ 75.2007 Annual training of miners; minimum courses of instruction; hours of instruction.

To Include

(5) *First-aid and cardiopulmonary resuscitation—5 hours:* Instruction and review of first-aid methods including cardiopulmonary resuscitation.

APPENDIX B

LIST OF STATES SURVEYED

ALABAMA

Division of Safety and Inspection
Department of Industrial Relations
Birmingham, Alabama

ARKANSAS

Arkansas Department of Labor
Division of Mines
Fort Smith, Arkansas

COLORADO

Division of Mines
Department of Natural Resources
Denver, Colorado

ILLINOIS

Department of Mines and Minerals
Springfield, Illinois

INDIANA

Bureau of Mines and Mining
Indianapolis, Indiana

KENTUCKY

Commissioner
Department of Mines and Minerals
Lexington, Kentucky

MARYLAND

Department of Labor and Industry
Baltimore, Maryland

MONTANA

Bureau of Safety and Health
Division of Worker's Compensation
Helena, Montana

NEW MEXICO

State Inspector of Mines
Albuquerque, New Mexico

OHIO

Ohio Division of Mines
Columbus, Ohio

OKLAHOMA

Chief Mine Inspector
Department of Mines
Oklahoma City, Oklahoma

PENNSYLVANIA

Department of Environmental Resources
Office of Deep Mine Safety
Harrisburg, Pennsylvania

TENNESSEE

Tennessee Division of Mines
Department of Labor
Knoxville, Tennessee

UTAH

Industrial Commission and
Utah Labor Relations Board
Salt Lake City, Utah

VIRGINIA

Department of Labor and Industry
Division of Mines and Quarries
Big Stone Gap, Virginia

WASHINGTON

State of Washington
Department of Labor and Industries
Olympia, Washington

WEST VIRGINIA

Department of Mines
Charleston, West Virginia

WYOMING

State Inspector of Mines
Rock Springs, Wyoming

APPENDIX C

LIST OF PARTICIPANTS IN THE PANEL MEETING ON EMERGENCY MEDICAL SERVICES IN UNDERGROUND COAL MINES

1. Ms. Linda Byers
   Education and Training Division
   Mining Enforcement and Safety Administration

2. Mr. Nick Fannick
   National Institute for Occupational
   Safety and Health

3. Mr. Dennis Huntsmann
   Southern Utah Fuel Company

4. Dr. Marilyn Hutchison
   National Institute for Occupational
   Safety and Health

5. Mr. Peter Kauffman
   Management Engineers Incorporated

6. Dr. Woodrow W. Massad
   Consolidation Coal Company

7. Dr. T. Crawford McAslan
   Maryland Institute for Emergency
   Medicine

8. Ms. Bea Page, R.N.
   The Orkand Corporation

9. Mr. Elliott Pickar
   The Orkand Corporation

10. Dr. Richard E. Piccirillo
    Appalachian Laboratory for Occupational
    Safety and Health

11. Mr. James E. Warren
    National Institute for Occupational
    Safety and Health

APPENDIX D

ANALYSIS OF MESA COAL ACCIDENT AND INJURY RECORDS 1972 - 1975

Table D-1 - Total Number of Injuries by Nature of Injury

Table D-1 presents a tabulation of the number of injuries occurring in underground coal mines according to nature of the injury sustained. The number of injuries in each category is shown for each year between 1972 and 1975. The figure in parentheses shown in each cell represents the percentage (rounded to the nearest percentage point) of that year's reported injuries (column totals) that were classified in the nature of injury category. In this table and all other tables, percentages of less than ½ of one percent are not shown.

The abbreviated nature of injury categories shown in this and other tables included in this chapter correspond to the nature of injury categories of the "American Standard Method" of recording basic facts relating to the nature and occurrence of work injuries. Exhibit D-1, presents a detailed listing of the categories specified by the American Standard Method.

Table D-2 - Nature of Injury by Part of Body

Table D-2 is made up of four table shells, one for each year. The categories shown along the stub of this table are with one exception, the same[1] as those shown along the stub of Table D-1. (Refer to Exhibit D-1 for an expanded description of these categories.) The categories shown along the spread of Table D-2 represent an aggregation of the part of body categories presented in the "American Standard Method". Exhibit D-2 details those categories and shows the correspondence between them and the ones shown along the spread of Table D-2.

Table D-3 - Nature of Injury by Location

Table D-3 presents a cross-tabulation of the number of injuries against the location of the site where these injuries were sustained. The percentages shown in parentheses represent the percentages of all injuries within a location category that were classified in the nature of injury category (i.e., percentages of column totals).

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[1]The one exception is the exclusion of pneumoconiosis from this table.

Injuries that were not classified according to nature of injury as well as those not identifying the location of the injury were excluded from this table.

On section is defined as being that area between the face of the mine (i.e., the solid surface of coal being mined) and the point at which coal is transferred from shuttle cars to a conveyor belt or other hurlage system for transport outside the mine. This area generally extends for no more than 500 feet. Off section is defined as being all other areas beyond those included in areas considered to be on section.

Table D-4 - Nature of Injury by Severity Classification and Location

Table D-4 presents the same data as those which were presented in Table D-3, but in addition, categorizes all injuries into four severity classifications. They are as follows:

- Fatal/Total disability
- Temporary total disability
- Temporary partial disability
- No lost time

Exhibit D-3 shows the MESA severity classifications and their correspondence to the four classifications noted above. The percentages shown in each cell represent the percentages of accidents of each type and location classification that are categorized within each severity classification (i.e., percentages of row totals).

Table D-5 - Percent of Injuries by Cause

Injuries reported in the coal accident injury records are classified according to their primary cause. Exhibit D-4 shows the classifications used by MESA and how they correspond to the four categories shown along the stub of Table D-4. This table shows the percentage of injuries in each year that were attributable to each "cause" classification.

Table D-6 - Percent of Injuries by Severity Class

Table D-6 is a summary table showing the percent of all injuries sustained in each year that were categorized within each severity classification. The same severity classifications shown in Table D-4 and explained in Exhibit D-3 are shown in this table.

Table D-7 - Percent of Injuries and Percent of Mines by Mine Size - Average Monthly Manhours

The percentage of total injuries sustained in mines of various size classifications (as defined by the average number of manhours expended monthly in their underground mining operations) is shown in Table D-7. Also shown for each mine size classification is the approximate percent of total manhours for all mines that are expended in mines of each classification size. This table should allow some assessment of whether the rate of accidents differs among mines of different sizes.

Exhibit D-1

Nature of Injury Classification

Abbreviated Classification	American Standard Method Classification
Amputation	Amputation or Enucleation.
Burn - Heat	Burn or scald. The effect of contact with hot substances. Does not include chemical burns, effects of radiation, sunburn, systemic disability such as heat stroke, friction burns, etc.
Burn - Chemical	Burns, chemical. Tissue damage resulting from the corrosive action of chemicals, chemical compounds, fumes, etc. (acids, alkalies).
Burn - Electrical	Burn from electric arc.
Bruises	Bruises, Contusions, Intact with the skin surface.
Cuts, Lacerations	Cuts, lacerations, punctures, open wounds.
Dislocation	Dislocation.
Electrical Shock	Electrical shock, electrocution.
Fracture, Chip	Fracture, Chip.
Hernia Rupture	Hernia, rupture. Includes both inguinal and noninguinal hernias.
Scratches	Scratches, abrasions, superficial wounds.
Sprains, Strains	Sprains, strains, ruptured discs, whiplash, twists.
Multiple Injuries	Multiple injuries.
Pneumoconiosis	Pneumoconiosis: A general term referring to a pathological condition caused by the action of fine dust or other fine particulate matter in the lungs. (Includes asbestosis, anthracosis, coal workers, pneumoconiosis, silicosis, and other pneumoconiosis not elsewhere classified.)

Abbreviated Classification	American Standard Method Classification
Other Miscellaneous	A total of 12 categories comprising less than 1% of all injuries were included in this category. They are as follows: • Asphyxia, strangulation, drowning, smoke inhalation. • Concussion, Brain, Cerebral. • Contagious or infectious diseases. Anthrax, Brucellosis, Tuberculosis. • Dermatitis. Rash, skin or tissue inflammation, including boils, etc. Generally resulting from direct contact with irritants or sensitizing chemicals such as drugs, oils, biologic agents, plants, woods, or metals, which may be in the form of solids, pastes, liquids, or vapors and which may be contacted in the pure state or in compounds or in combination with other materials. Does not include skin or tissue damage resulting from the corrosive action of chemicals, burns from contact with hot substances, effects of exposure to radiation, effects of exposure to low temperature or inflammation or irritation resulting from friction or impact. • Freezing, frostbite, and other effects of exposure to low temperatures. • Hearing loss or impairment. • Heat stroke, sunstroke, heat cramps, heat exhaustion, and other effects of environmental heat. Does not include sunburn or other effects of radiation. • Inflammation or irritation of the joints, tendons, or muscles, includes bursitis, synovitis, tenosynovitis, etc. Does not include strains, sprains or dislocation of muscles or tendons, or their after effects.

Exhibit D-1 — Cont.

Abbreviated Classification	American Standard Method Classification
Other Miscellaneous — Cont.	• Poisoning, systemic—A systemic morbid condition resulting from the inhalation, ingestion, or skin absorption of a toxic substance affecting the functioning of the metabolic system, the nervous system, the circulatory system, the digestive system, the respiratory system, the excretory system, the musulo-skeletal system, etc. Includes chemical or drug poisoning, metal poisoning, organic diseases, and venomous reptile and insect bites. Does not include effects of radiation, pneumoconiosis, corrosive effects of chemicals; skin surface irritations, septicemia or infected wounds. • Radiation effects: All forms of damage to tissue, bones, or body fluids, including: - Burn from electric arc, not contact - Laser burn - Lung cancer, ionizing radiation - Sunburn - Other radiation effects, not elsewhere classified • Heart attacks. • Cerebral hemorrhage, not concussion.

Exhibit D-2

Part of Body

Abbreviated Classification	American Standard Method Classifications
Head	Head, Brain, Ear, Face, Scalp, Skull, or any combination of these parts
Eye	Eye
Trunk	Trunk, Abdomen (includes internal organs), Back (includes muscles, spine, and spinal cord), Chest (includes ribs, breast bone, and internal organs of the chest) Hips (includes pelvis, pelvic organs, and buttocks), Shoulders or any combination of these parts
Upper Arm	Arms, Upper Arm, Elbow, Forearm, or any combination of these parts
Lower Arm	Wrist, Hand (not wrist or fingers), Fingers or any combination of these parts
Upper Leg	Legs (above ankle), Thigh, knee, ankle, or any combination of these parts
Lower Leg	Foot, toes, any combination of these parts
Multiple Parts	Multiple parts (applies when more than one major body part has been affected, such as an arm and a leg)
Body System	Body System (applies when the function of an entire body system has been affected without specific injury to any other part, as in the case of poisoning, corrosive action affecting internal organs, damage to nerve centers, etc. Does not apply when the systemic damage results from an external injury affecting an external part such as a back injury which includes damage to the nerves of the spinal cord).

Exhibit D-3

Severity Classifications

Abbreivated Classifications	MESA Classifications
Fatal/Permanent Disability	Fatal Permanent Total Disability. The loss of, or loss of use of, both or any two of the following: Hands, arms, legs, feet, or eyes; or any other nonfatal injury which permanently and totally incapacitates the injured person from following any gainful occupation. Permanent Partial Disability. Any nonfatal injury which permanently but only partially disables a worker. Includes the total or partial loss or loss of use of an arm, a hand, a leg, a finger(s), an eye, hearing, etc., even though no time was lost. Amputations.
Temporary Total Disability	Temporary Total Disability. Any nonfatal injury which does not result in permanent impairment, but which renders the injured person unable to perform a regularly established job which is open and available to him during the entire time interval corresponding to the hours of his regular shift on any one or more days (including Sundays, days off, or plant shutdown) subsequent to the day of injury.
Temporary Partial Disability	Lost Workdays, but without Disabling Injury Days Lost. For example: The employee was assigned a temporary job, or the employee worked at a permanent job less than full time, or the employee worked at a permanently assigned job but could not perform all duties normally assigned to it. Or the employee was transferred to another job or terminated with or without lost workdays.
No Lost Time	No Lost Time Injuries. For example: A minor cut is bandaged and worker returns to his job on the same shift.

Exhibit D-4

Cause of Injury Classification

Abbreviated Classification	MESA Classification
Induced by the unique environment of the mine	Fall of roof, back, hanging wall, overhead, or brow Pressure bumps or bursts Fall of face, wall, breast, side, footwall, and pillar Inrush of Water Explosions of gas, coal, or other dust Suffocation Mine fires and suffocation from fires Ignition of gas or dust
Induced by Some external agent	Sliding or falling material or objects Handling materials Handtools Haulage Explosives Electricity Machinery Miscellaneous
Other Accidents involving only injured miner	Slips or falls of persons Stooping or kneeling on sharp or loose objects Striking or bumping against projects Lifting and pulling
Occupational Illness	Occupational skin diseases Dust diseases of the lung Respiratory diseases Poisoning Disorders (toxic materials) Disorders (repeated trauma) All other occupational diseases

Table D-1

Total Number of Injuries by Nature of Injury 1972-1975

Nature of Injury	1972	1973	1974	1975
Amputation	127 (1%)	113 (1%)	102 (1%)	123 (1%)
Burn-Heat	211 (1%)	153 (1%)	53 (1%)	106 (1%)
Burn - Chemical	58	33	26	40
Burn - Electrical	319 (2%)	166 (1%)	1	—
Bruises	7,518 (40%)	6,540 (38%)	3,405 (35%)	3,982 (33%)
Cuts, Lacerations	2,850 (15%)	2,661 (15%)	1,531 (16%)	2,093 (17%)
Dislocation	73	69	44	47
Electrical Shock	59	42	16	54
Fracture, Chip	1,373 (7%)	1,421 (8%)	1,212 (12%)	1,708 (14%)
Hernia, Rupture	78 (1%)	89 (1%)	65 (1%)	68 (1%)
Scratches	253 (1%)	172 (1%)	111 (1%)	131 (1%)
Sprains, Strains	4,056 (22%)	3,966 (23%)	2,436 (25%)	2,978 (25%)
Multiple Injuries	1,152 (6%)	799 (5%)	448 (5%)	559 (5%)
Pneumoconiosis Silicosis	392 (2%)	909 (5%)	277 (3%)	123 (1%)
Other Miscellaneous	95 (1%)	82	56 (1%)	105 (1%)
TOTAL	18,614	17,215	9,783	12,117

Table D-2A

Nature of Injury by Part of Body
1972

Nature of Injury	Part of Body									
	Face and Head	Eye	Trunk	Upper Arm	Lower Arm	Upper Leg	Lower Leg	Multiple Parts	Body System	TOTAL
Amputation	1	3	0	4	108	5	4	2	0	127 (1%)
Burn - Heat	26	41	1	20	85	8	7	20	0	208 (1%)
Burn - Chemical	2	38	6	2	6	2	0	2	0	58
Burn - Electrical	19	190	0	13	57	2	0	37	0	318 (2%)
Bruises	451	92	1,365	528	1,978	1,384	1,207	476	0	7,481 (41%)
Cuts, Lacerations	644	176	28	120	1,374	234	236	32	0	2,844 (16%)
Dislocation	3	0	39	5	15	8	3	0	0	73
Electrical Shock	0	1	2	5	4	1	1	13	16	43 (0%)
Fracture, Chip	102	0	220	89	464	178	284	33	0	1,370 (8%)
Hernia, Rupture	0	0	78	0	0	0	0	0	0	78
Scratches	43	45	28	20	61	38	4	13	0	252 (1%)
Sprains, Strains	221	0	2,683	34	162	395	392	95	0	4,042 (22%)
Multiple Injuries	154	23	93	78	287	144	53	313	0	1,145 (6%)
Other Miscellaneous	18	5	8	0	3	28	1	4	27	94 (1%)
TOTAL	1,684 (9%)	614 (3%)	4,551 (25%)	978 (5%)	4,604 (25%)	2,427 (13%)	2,192 (12%)	1,040 (6%)	43	18,133 (100%)

Table D-2B

Nature of Injury by Part of Body
1973

Nature of Injury	Part of Body									
	Face and Head	Eye	Trunk	Upper Arm	Lower Arm	Upper Leg	Lower Leg	Multiple Parts	Body System	TOTAL
Amputation	0	0	1	4	90	7	8	1	2	113 (1%)
Burn - Heat	27	19	2	16	68	2	3	16	0	153 (1%)
Burn - Chemical	7	8	3	1	6	5	1	2	0	33
Burn - Electrical	15	87	0	4	35	2	0	23	0	166 (1%)
Bruises	378	107	1,280	479	1,681	1,220	964	405	0	6,514 (40%)
Cuts, Lacerations	590	141	40	128	1,273	221	227	34	0	2,654 (16%)
Dislocation	2	0	42	5	10	9	1	0	0	69
Electrical Shock	1	0	1	0	1	0	0	8	26	37
Fracture, Chip	121	0	174	115	473	169	337	30	0	1,419 (9%)
Hernia, Rupture	0	0	89	0	0	0	0	0	0	89 (1%)
Scratches	36	38	15	15	34	20	3	11	0	172 (1%)
Sprains, Strains	244	0	2,624	74	160	401	340	106	0	3,949 (24%)
Multiple Injuries	95	14	80	42	192	91	41	243	0	798 (5%)
Other Miscellaneous	18	2	10	2	3	12	1	2	31	81 (0%)
TOTAL	1,534 (9%)	416 (3%)	4,361 (27%)	885 (5%)	4,026 (25%)	2,159 (13%)	1,926 (12%)	881 (5%)	59	16,247 (100%)

Table D-2C

Nature of Injury by Part of Body
1974

Nature of Injury	Part of Body									
	Face and Head	Eye	Trunk	Upper Arm	Lower Arm	Upper Leg	Lower Leg	Multiple Parts	Body System	TOTAL
Amputation	0	2	0	3	84	3	9	1	0	102 (1%)
Burn - Heat	11	8	2	4	20	1	1	6	0	53 (1%)
Burn - Chemical	2	19	1	1	1	2	0	0	0	26
Burn - Electrical	0	1	0	0	0	0	0	0	0	1
Bruises	181	37	662	222	822	685	552	224	0	3,385 (36%)
Cuts, Lacerations	325	98	17	70	740	136	112	30	0	1,528 (16%)
Dislocation	2	0	21	1	11	8	1	0	0	44
Electrical Shock	0	0	0	2	1	0	0	0	13	16
Fracture, Chip	102	0	153	90	416	152	274	24	0	1,211 (13%)
Hernia, Rupture	0	0	65	0	0	0	0	0	0	65 (1%)
Scratches	7	31	20	11	20	15	2	5	0	111 (1%)
Sprains, Strains	121	0	1,644	37	91	263	216	53	0	2,425 (26%)
Multiple Injuries	59	4	45	20	87	36	19	177	0	447 (5%)
Other Miscellaneous	20	0	3	2	1	20	0	1	9	56 (1%)
TOTAL	830 (9%)	200 (2%)	2,633 (28%)	463 (5%)	2,294 (24%)	1,321 (14%)	1,186 (13%)	521 (6%)	22	9,470 (100%)

Table D-2D

Nature of Injury by Part of Body
1975

Nature of Injury	Part of Body									
	Face and Head	Eye	Trunk	Upper Arm	Lower Arm	Upper Leg	Lower Leg	Multiple Parts	Body System	TOTAL
Amputation	1	1	0	3	102	7	8	0	0	122 (1%)
Burn - Heat	15	3	4	8	40	3	4	26	0	103 (1%)
Burn - Chemical	0	8	3	4	4	15	3	1	0	38
Burn - Electrical	0	0	0	0	0	0	0	0	0	0
Bruises	258	43	860	264	876	731	657	280	0	3,969 (33%)
Cuts, Lacerations	466	116	35	109	1,042	138	149	28	0	2,083 (17%)
Dislocation	1	0	21	3	18	1	1	1	0	46
Electrical Shock	0	0	0	1	3	0	0	10	40	54
Fracture, Chip	121	1	224	109	648	177	396	26	0	1,702 (14%)
Hernia, Rupture	0	0	68	0	0	0	0	0	0	68 (1%)
Scratches	18	32	13	6	24	24	3	13	0	133 (1%)
Strains, Sprains	211	0	1,934	54	42	286	300	82	0	2,959 (25%)
Multiple Injuries	60	1	50	29	82	49	25	261	0	557 (5%)
Other Miscellaneous	32	6	11	4	8	14	0	4	22	101 (1%)
TOTAL	1,183 (10%)	211 (2%)	3,223 (27%)	594 (5%)	2,939 (25%)	1,445 (12%)	1,546 (13%)	732 (6%)	62 (1%)	11,935 (100%)

Table D-3

Nature of Injury by Location
1972-1975

Nature of Injury	1972			1973			1974			1975		
	On-Section	Off-Section	TOTAL	On-Section	Off-Section	TOTAL	On-Section	Off-Section	TOTAL	On-Section	Off-Section	TOTAL
Amputation	95 (1%)	31 (1%)	126 (1%)	79 (1%)	34 (1%)	113 (1%)	74 (1%)	28 (1%)	102 (1%)	100 (1%)	22 (1%)	122 (1%)
Burn - Heat	149 (1%)	57 (1%)	206 (1%)	119 (1%)	34 (1%)	153 (1%)	38 (1%)	15 (1%)	53 (1%)	75 (1%)	31 (1%)	106 (1%)
Burn - Chemical	40	16	56	17	15	32	16	10	26	31	10	41
Burn - Electrical	192 (1%)	127 (3%)	319 (2%)	115 (1%)	51 (1%)	166 (1%)	1	0	1	0	0	0
Bruises	5,785 (41%)	1,715 (38%)	7,500 (40%)	5,056 (39%)	1,460 (35%)	6,516 (38%)	2,662 (36%)	743 (31%)	3,405 (35%)	3,037 (34%)	937 (31%)	3,974 (33%)
Cuts, Lacerations	2,202 (16%)	641 (14%)	2,843 (15%)	2,016 (16%)	636 (15%)	2,652 (15%)	1,159 (16%)	372 (16%)	1,531 (16%)	1,574 (17%)	509 (17%)	2,083 (17%)
Dislocation	42	30 (1%)	72	49	20	69	32	12 (1%)	44	35	13	48
Electrical Shock	47	12	59	35	7	42	10	6	16	45	8	53
Fracture, Chip	1,064 (8%)	303 (7%)	1,367 (7%)	1,093 (8%)	323 (8%)	1,416 (8%)	931 (13%)	281 (12%)	1,212 (12%)	1,288 (14%)	411 (13%)	1,699 (14%)
Hernia, Rupture	56	22	78	66 (1%)	22 (1%)	88 (1%)	45 (1%)	20 (1%)	65 (1%)	54 (1%)	14	68 (1%)
Scratches	197 (1%)	54 (1%)	251 (1%)	119 (1%)	51 (1%)	170 (1%)	87 (1%)	24 (1%)	111 (1%)	99 (1%)	32 (1%)	131 (1%)
Sprains, Strains	2,922 (21%)	1,123 (25%)	4,045 (22%)	2,881 (22%)	1,070 (26%)	3,951 (23%)	1,733 (23%)	703 (29%)	2,436 (25%)	2,099 (23%)	874 (28%)	2,973 (25%)
Multiple Injuries	909 (6%)	242 (5%)	1,151 (6%)	609 (5%)	185 (4%)	794 (5%)	348 (5%)	100 (4%)	448 (5%)	428 (5%)	127 (4%)	555 (5%)
Pneumoconiosis Silicosis	300 (2%)	91 (2%)	391 (2%)	655 (5%)	254 (6%)	909 (5%)	215 (3%)	62 (3%)	277 (3%)	71 (1%)	52 (2%)	123 (1%)
Other Miscellaneous	76 (1%)	21	97 (1%)	56	26 (1%)	82	39 (1%)	17 (1%)	56 (1%)	73 (1%)	32 (1%)	105 (1%)
TOTAL	14,076	4,485	18,561	12,965	4,188	17,153	7,390	2,393	9,783	9,009	3,072	12,081

Table D-4A

Nature of Injury by Severity Classification and Location
1972

Nature of Injury	On-Section				Off-Section				Total			
	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time
Amputation	95 (100%)	0	0	0	30 (97%)	0	0	1 (3%)	125 (99%)	0	0	1 (1%)
Burn - Heat	0	61 (41%)	0	88 (59%)	0	18 (32%)	2 (4%)	37 (65%)	0	79 (38%)	2 (1%)	125 (61%)
Burn - Chemical	0	10 (25%)	0	30 (75%)	0	6 (38%)	0	10 (63%)	0	16 (29%)	0	40 (71%)
Burn - Electrical	0	77 (40%)	3 (2%)	112 (58%)	0	50 (39%)	0	77 (61%)	0	127 (40%)	3 (1%)	189 (59%)
Bruises	46 (1%)	2,404 (42%)	66 (1%)	3,269 (57%)	17 (1%)	659 (38%)	18 (1%)	1,021 (60%)	63 (1%)	3,063 (41%)	84 (1%)	4,290 (57%)
Cuts, Lacerations	4	760 (35%)	31 (1%)	1,407 (64%)	3	211 (33%)	5 (1%)	422 (66%)	7	971 (34%)	36 (1%)	1,829 (64%)
Dislocation	0	34 (81%)	2 (5%)	6 (14%)	0	18 (60%)	0	12 (40%)	0	52 (72%)	2 (3%)	18 (25%)
Electrical Shock	1 (2%)	29 (62%)	0	17 (36%)	1 (8%)	6 (50%)	0	5 (42%)	2 (3%)	35 (59%)	0	22 (37%)
Fracture, Chip	13 (1%)	794 (75%)	54 (5%)	203 (19%)	4 (1%)	214 (71%)	8 (3%)	77 (25%)	17 (1%)	1,008 (74%)	62 (5%)	280 (20%)
Hernia, Rupture	0	44 (79%)	1 (2%)	11 (20%)	0	22 (100%)	0	0	0	66 (85%)	1 (1%)	11 (14%)
Scratches	0	56 (28%)	3 (2%)	138 (70%)	0	13 (24%)	3 (6%)	38 (70%)	0	69 (27%)	6 (2%)	176 (70%)
Sprains, Strains	0	1,565 (54%)	55 (2%)	1,302 (45%)	0	587 (52%)	21 (2%)	515 (46%)	0	2,152 (53%)	76 (2%)	1,817 (45%)
Multiple Injuries	25 (3%)	446 (49%)	20 (2%)	418 (46%)	5 (2%)	117 (48%)	6 (2%)	114 (47%)	30 (3%)	563 (49%)	26 (2%)	532 (46%)
Other Miscellaneous	4 (5%)	45 (61%)	2 (3%)	23 (31%)	3 (14%)	9 (43%)	0	9 (43%)	7 (7%)	54 (57%)	2 (2%)	32 (34%)
TOTAL CLASSIFIED	188 (1%)	6,325 (46%)	237 (2%)	7,024 (51%)	63 (1%)	1,930 (44%)	63 (1%)	2,338 (53%)	251 (1%)	8,255 (45%)	300 (2%)	9,362 (52%)

Table D-4B

Nature of Injury by Severity Classification and Location
1973

Nature of Injury	On-Section				Off-Section				Total			
	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time
Amputation	77 (97%)	1 (1%)	0	1 (1%)	33 (97%)	0	0	1 (3%)	110 (97%)	1 (1%)	0	2 (2%)
Burn - Heat	0	45 (38%)	1 (1%)	73 (61%)	0	18 (53%)	0	10 (47%)	0	63 (41%)	1 (1%)	89 (58%)
Burn - Chemical	0	8 (47%)	0	9 (53%)	0	6 (40%)	0	9 (60%)	0	14 (44%)	0	18 (56%)
Burn - Electrical	0	60 (52%)	1 (1%)	54 (47%)	0	27 (53%)	2 (4%)	22 (43%)	0	87 (52%)	3 (2%)	76 (46%)
Bruises	44 (1%)	2,173 (43%)	108 (2%)	2,731 (54%)	14 (1%)	565 (39%)	33 (2%)	848 (58%)	58 (1%)	2,738 (42%)	141 (2%)	3,579 (55%)
Cuts, Lacerations	3	713 (35%)	40 (2%)	1,260 (63%)	1	191 (30%)	17 (3%)	427 (67%)	4	904 (34%)	57 (2%)	1,687 (64%)
Dislocation	0	37 (76%)	2 (4%)	10 (20%)	0	17 (85%)	0	3 (15%)	0	54 (78%)	2 (3%)	13 (19%)
Electrical Shock	4 (11%)	15 (43%)	0	16 (46%)	0	6 (86%)	0	1 (14%)	4 (10%)	21 (50%)	0	17 (40%)
Fracture, Chip	14 (1%)	812 (74%)	69 (6%)	198 (18%)	9 (3%)	211 (65%)	18 (6%)	85 (26%)	23 (2%)	1,023 (72%)	87 (6%)	283 (20%)
Hernia, Rupture	0	44 (67%)	0	22 (33%)	0	18 (82%)	0	4 (18%)	0	62 (70%)	0	26 (30%)
Scratches	0	44 (37%)	2 (2%)	73 (61%)	0	6 (12%)	2 (4%)	43 (84%)	0	50 (29%)	4 (2%)	116 (68%)
Sprains, Strains	1	1,539 (53%)	86 (3%)	1,255 (44%)	0	521 (48%)	61 (6%)	488 (45%)	1	2,060 (52%)	147 (4%)	1,743 (44%)
Multiple Injuries	12 (2%)	340 (56%)	26 (4%)	231 (38%)	4 (2%)	98 (53%)	11 (6%)	72 (39%)	16 (2%)	438 (55%)	37 (5%)	303 (38%)
Other Miscellaneous	4 (7%)	35 (63%)	1 (2%)	16 (29%)	5 (19%)	7 (27%)	2 (8%)	12 (46%)	9 (11%)	42 (51%)	3 (4%)	28 (34%)
TOTAL CLASSIFIED	159 (1%)	5,866 (48%)	336 (3%)	5,949 (48%)	66 (2%)	1,691 (43%)	146 (4%)	2,031 (52%)	225 (1%)	7,557 (47%)	482 (3%)	7,980 (49%)

Table D-4C

Nature of Injury by Severity Classification and Location
1974

Nature of Injury	On-Section				Off-Section				Total			
	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time
Amputation	74 (100%)	0	0	0	28 (100%)	0	0	0	102 (100%)	0	0	0
Burn - Heat	0	12 (32%)	1 (3%)	25 (66%)	1 (7%)	4 (27%)	0	10 (67%)	1 (2%)	16 (30%)	1 (2%)	35 (66%)
Burn - Chemical	0	7 (44%)	0	9 (56%)	0	6 (60%)	1 (10%)	3 (30%)	0	13 (50%)	1 (4%)	12 (46%)
Burn - Electrical	0	0	0	1 (100%)	0	0	0	0	0	0	0	1 (100%)
Bruises	20 (1%)	1,404 (53%)	86 (3%)	1,152 (43%)	2	327 (45%)	39 (5%)	360 (50%)	22 (1%)	1,731 (51%)	125 (4%)	1,512 (45%)
Cuts, Lacerations	0	522 (45%)	30 (3%)	607 (52%)	0	179 (50%)	16 (4%)	166 (46%)	0	701 (46%)	46 (3%)	773 (51%)
Dislocation	0	22 (69%)	1 (3%)	9 (28%)	0	9 (75%)	1 (8%)	2 (17%)	0	31 (70%)	2 (5%)	11 (25%)
Electrical Shock	2 (20%)	5 (50%)	2 (20%)	1 (10%)	1 (17%)	2 (33%)	0	3 (50%)	3 (19%)	7 (44%)	2 (13%)	4 (25%)
Fracture, Chip	12 (1%)	679 (75%)	62 (7%)	160 (17%)	4 (1%)	199 (72%)	27 (10%)	47 (17%)	16 (1%)	896 (74%)	89 (7%)	207 (17%)
Hernia, Rupture	0	36 (82%)	0	8 (18%)	0	15 (75%)	2 (10%)	3 (15%)	0	51 (80%)	2 (3%)	11 (17%)
Scratches	0	42 (48%)	2 (2%)	43 (49%)	0	7 (30%)	2 (9%)	14 (61%)	0	49 (45%)	4 (4%)	57 (52%)
Sprains, Strains	0	1,079 (62%)	90 (5%)	563 (33%)	0	414 (60%)	58 (8%)	215 (31%)	0	1,493 (62%)	148 (6%)	778 (32%)
Multiple Injuries	26 (7%)	204 (59%)	19 (5%)	99 (28%)	12 (13%)	54 (56%)	9 (9%)	21 (22%)	38 (9%)	258 (58%)	28 (6%)	120 (27%)
Other Miscellaneous	1 (3%)	27 (69%)	2 (5%)	9 (23%)	0	10 (59%)	0	7 (41%)	1 (2%)	37 (66%)	2 (4%)	16 (29%)
TOTAL CLASSIFIED	135 (2%)	4,057 (57%)	295 (4%)	2,686 (37%)	48 (2%)	1,226 (54%)	155 (7%)	851 (37%)	183 (2%)	5,283 (56%)	450 (5%)	3,537 (37%)

Table D-4D

Nature of Injury by Severity Classification and Location
1975

Nature of Injury	On-Section				Off-Section				Total			
	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time	Fatal/ Permanent Disability	Temporary Total Disability	Temporary Partial Disability	No Lost Time
Amputation	91 (90%)	8 (8%)	1 (1%)	0	20 (88%)	3 (12%)	0	0	110 (90%)	11 (9%)	1 (1%)	0
Burn - Heat	0	45 (39%)	0	31 (41%)	0	14 (45%)	0	17 (55%)	0	59 (55%)	0	47 (45%)
Burn - Chemical	0	17 (55%)	0	14 (45%)	0	3 (29%)	0	7 (71%)	0	20 (48%)	0	21 (52%)
Burn - Electrical	0	0	0	0	0	0	0	0	0	0	0	0
Bruises	10	1,647 (54%)	146 (5%)	1,231 (41%)	3	413 (44%)	77 (8%)	445 (47%)	13	2,059 (52%)	223 (6%)	1,676 (42%)
Cuts, Lacerations	0	680 (43%)	61 (4%)	832 (53%)	0	185 (36%)	28 (5%)	296 (58%)	0	866 (42%)	89 (4%)	1,128 (54%)
Dislocation	0	24 (68%)	1 (4%)	10 (28%)	0	8 (67%)	1 (11%)	3 (22%)	0	32 (68%)	3 (6%)	13 (26%)
Electrical Shock	8 (19%)	22 (50%)	4 (9%)	10 (22%)	3 (33%)	1 (17%)	0	4 (50)	11 (21%)	24 (45%)	4 (8%)	14 (26%)
Fracture, Chip	15 (1%)	954 (74%)	98 (8%)	222 (17%)	3	280 (69%)	38 (10%)	91 (22%)	18 (1%)	1,234 (73%)	135 (8%)	312 (18%)
Hernia, Rupture	0	52 (97%)	0	1 (3%)	0	8 (60%)	1 (10%)	4 (30%)	0	60 (90%)	1 (2%)	6 (8%)
Scratches	0	35 (35%)	1 (1%)	63 (63%)	0	14 (43%)	3 (9%)	15 (48%)	0	49 (37%)	4 (3%)	78 (60%)
Sprains, Strains	0	1,361 (65%)	170 (8%)	563 (27%)	0	552 (63%)	100 (12%)	220 (25%)	0	1,913 (64%)	271 (9%)	784 (26%)
Multiple Injuries	59 (14%)	254 (59%)	24 (6%)	92 (21%)	10 (8%)	81 (64%)	13 (10%)	24 (19%)	68 (12%)	335 (60%)	36 (7%)	116 (21%)
Other Miscellaneous	13 (18%)	38 (53%)	1 (2%)	20 (27%)	3 (9%)	15 (48%)	4 (13%)	10 (30%)	15 (15%)	53 (51%)	6 (5%)	29 (28%)
TOTAL CLASSIFIED	196 (2%)	5,137 (58%)	507 (6%)	3,089 (35%)	40 (1%)	1,577 (52%)	265 (9%)	1,136 (38%)	235 (2%)	6,715 (56%)	773 (6%)	4,224 (35%)

Table D-5

Percent of Injuries by Cause
by Year

Cause	Year			
	1972	1973	1974	1975
Induced by the Unique Environment of Mines	14%	13%	14%	15%
Induced by Some External Agent	45%	45%	46%	43%
Other Accident Involving Only Injured Miner	39%	38%	37%	41%
Occupational Illness	2%	5%	2%	1%

Table D-6

Percent of Injuries
by
Severity Class

Cause	Year			
	1972	1973	1974	1975
Fatal/Permanent Disability	1%	1%	2%	2%
Temporary Total Disability	45%	46%	55%	57%
Temporary Partial Disability	2%	3%	4%	6%
No Lost Time	52%	50%	39%	36%

Table D-7

Percent of Injuries
and
Percent of Mines
by
Mine Size — Average Monthly Manhours

Average Monthly Manhours	1972		1973		1974		1975	
	Percent Injuries	Percent Manhours	Percent Injuries	Percent Manhours	Percent Injuries	Percent Manhours	Percent Injuries	Percent Manhours
0 - 999		1%		1%	1%	1%		1%
1,000 - 9,999	11%	17%	11%	16%	17%	16%	12%	15%
10,000 - 19,999	15%	15%	15%	13%	17%	15%	16%	15%
20,000 - 29,999	13%	12%	15%	14%	17%	16%	13%	13%
30,000 - 39,999	16%	15%	16%	12%	12%	11%	14%	11%
40,000 - 49,999	13%	11%	12%	12%	11%	12%	11%	8%
50,000 - 59,999	9%	8%	15%	11%	13%	11%	10%	9%
60,000 - 69,999	7%	8%	6%	7%	5%	6%	8%	9%
70,000 - 79,999	8%	7%	4%	7%	4%	7%	10%	9%
80,000 - 89,999	2%	3%	4%	3%	2%	3%	3%	4%
90,000 - 99,999	1%	1%	2%	1%		1%	2%	4%
100,000 -	4%	3%	1%	2%		2%	1%	2%

APPENDIX E

FISCAL YEAR 1977 GRANTS EMERGENCY MEDICAL SERVICES SYSTEMS ACT

P.L. 93-154
P.L. 94-573

The following is a list of EMS grant awards under P.L. 93-154 and P.L. 94-573. This list, organized by State, identifies the recipients of grants under sections 1202, 1203, and 1204 of the Emergency Medical Services Systems Act of 1973 and the 1976 amendments to that act. This list may be used by coal mine operators as a means of identifying the individual or organization to contact so that they may coordinate with regional EMS activities.

The purposes of grants provided for under the EMSS act are as follows:

- Section 1202 Grants - for undertaking projects which include both (1) studying the feasibility of establishing (through expansion or improvement of existing services or otherwise) and operating an emergency medical services system; and (2) planning the establishment and operation of such a system;

- Section 1203 Grants - projects for the establishment and initial operation of emergency medical services systems. Grants and contracts for these activities could be used for the modernization of facilities for emergency medical services systems and other costs of establishment and initial operation;

- Section 1204 Grants - for undertaking projects for the expansion and improvement of emergency medical services systems, including the acquisition of equipment and facilities, the modernization of facilities, and other projects to expand and improve emergency medical services systems.

ALABAMA

Alabama Department of Public Health
Division of EMS
Bureau of Facilities Construction
Montgomery, Alabama 36104

$740,050

Maxwell Lee Warren (205) 832-3935

Section 1203

To implement a first year effort in establishing Basic Life Support Services for: Southeast Alabama EMS Region, Dothan (18 Counties); Birmingham Regional EMS Systems (6 Counties) and North Alabama EMS Systems, Decatur (14 Counties).

Alabama Department of Public Health
Division of EMS
Bureau of Facilities Construction
Montgomery Alabama 36104

$235,044

Maxwell Lee Warren (205) 832-3935

Section 1204

To implement a first year effort in establishing Advanced Life Support Services for the City of Tuscaloosa, Tuscaloosa and Hale Counties which consists of 65% of total population for the 7 County EMS Region.

ALASKA

Alaska Department of Health & Social Services
Emergency Medical Services, Office of Comprehensive Planning
Pouch H
Juneau, Alaska 99801

$698,000

Section 1203

To support the establishment of Basic Life Support Systems in the Southeast (Juneau) and Nana (Kotzebue) EMS Regions of the state.

ARIZONA

Arizona Department of Public Safety (Northern Arizona)
EMS Division
P. O. Box 6638
Phoenix, Arizona 85005

$370,200

William Wade (602) 774-1894

Section 1203

To establish and implement a basic life support Emergency Medical Services System with the Northern Arizona Council of Governments, Flagstaff, Arizona, which will serve the counties of Yavapai, Conconino, Navajo, and Apache (except the Navajo Nation).

Arizona Department of Public Safety (Central Arizona)
EMS Division
P. O. Box 6638
Phoenix, Arizona 85005

$645,704

Howard Adams (602) 263-5277

Section 1203

To establish and implement a basic life support Emergency Medical Service System for the Central Arizona Emergency Medical System counties of Gila, Maricopa, Pinal and the San Carlos Reservation in Graham County.

CALIFORNIA

Orange County, Office of EMS
211 W. Santa Ana Blvd.
Santa Ana, California 92701

$60,000

Michael J. Williams (714) 834-6447

Section 1202

To conduct a planning and feasibility study of an EMS Regional System.

CALIFORNIA

Inland Counties EMS
3575 11th Street Mall
P. O. Box 1370
Riverside, California 92501

$477,378

Robert J. Perlstein (714) 787-6325

Section 1203

To establish and implement a basic life support Emergency Medical Services System for the counties of Riverside, San Bernardino, Inyo, and Mono.

Santa Clara Co. Health Department
Office of EMS
2220 Mcorpark Avenue
San Jose, California 95128

$520,805

Milton J. Silberberg, R.N. (408) 297-1636

Section 1203

To continue in the development and implementation of an Emergency Medical Services System.

COLORADO

Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

$600,675

James C. McShane, Dr. H., MPH (303) 388-6111, Ext. 301

Section 1203

Establish and initiate an Emergency Medical Services Basic Life Support System in Council of Governments Regions 4, 6, 7, 8, & 13.

COLORADO

Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

$188,103

James C. McShane, Dr. H., MPH (303) 388-6111, Ext. 301

Section 1204

Improve and expand Emergency Medical Services from Basic Life Support to an Advanced Life Support System in Council of Governments Region II.

CONNECTICUT

Connecticut State Department of Health
79 Elm Street
Hartford, Connecticut 06115

$400,000

Dennis Kerrigan (603) 566-2197

Section 1203

Initial implementation of EMS system for EMS Region 3 in Eastern Connecticut, which geographically includes approximately one-third of Eastern Connecticut.

DELAWARE

Delaware Department of Health and Social Services
Division of Public Health
Jesse C. Cooper Building
Dover, Delaware 19901

$181,000

Charles Nabb (302) 678-4710

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support System in the State of Delaware.

FLORIDA

Florida Department of Health & Rehabilitatives Services
Division of Health
1323 Winwood Blvd.
Tallahassee, Florida 32301

$430,000

William H. Hamlin (904) 487-1617

Section 1204

To implement a first year effort in establishing Advanced Life Support Services in the Florida Panhandle EMS Region, Tallahassee which is comprised of 18 counties.

GEORGIA

District 7, Georgia Department of Human Resources
P. O. Box 2299
Columbus, Georgia 31902

$34,413

Hart S. Odom, M.D. (404) 327-1541

Section 1202

Plan for a Basic Life Support system in in the 14 counties surrounding the Columbus area.

Clarke County Board of Health
468 Milledge Avenue
Athens, Georgia 30601

$27,500

George O. Thomasson, M.D. (404) 542-8766

Section 1202

Plan for a Basic Life Support System in the 9 counties surrounding the Athens area.

GEORGIA

Richmond County Board of Health
1001 Bailie Drive
Augusta, Georgia 30902

$27,500

Maurice G. Patton, M.D. (404) 724-8802

Section 1202

Plan for a Basic Life Support System in the 13 counties surrounding the Augusta area.

Department of Human Resources
Emergency Health Section
618 Ponce de Leon Avenue, N.E.
Atlanta, Georgia 30308

$353,944

Milton Trippe (404) 894-5170

Section 1203

The Southwest Georgia EMS, Inc. under contract with the State will implement a Basic Life Support System in 10 of the 27 counties surrounding Albany.

HAWAII

City and County of Honolulu
1455 S. Beretania Street
Honolulu, Hawaii 96813

$784,810

William L. Dang, M.D. (808) 538-9011

Section 1204

To improve and expand their Emergency Medical Services program to include advance life support for the Island of Oahu.

IDAHO

Idaho Department of Health and Welfare
Emergency Medical Services Bureau
Statehouse
Boise, Idaho 83720

$503,000

Paul B. Anderson (208) 384-2125

Section 1204

To support the completion of an Advanced Life Support system in Southwest Idaho (including the cities of Boise and Twin Falls).

ILLINOIS

Illinois Department of Public Health
Division of Emergency Medical Services
535 West Jefferson
Springfield, Illinois 62761

$600,000

Mohammad Akhter, M.D. (217) 782-5278

Section 1204

To expand and improve an EMS Regional System composed of 16 counties in the Peoria area.

INDIANA

Central Indiana EMS Council, Inc.
211 North Delaware Street, Suite 202
Indianapolis, Indiana 46204

$57,500

William T. Habig (317) 871-2128

Section 1202

For feasibility and planning of an EMS Regional System composed of 8 counties.

INDIANA

Lutheran Hospital
3024 Fairfield Avenue
Fort Wayne, Indiana 46807

$450,000

Paul Arnold (219) 745-0541, Ext. 243 or 246

Section 1203

The establishment and initial operation of an EMS Regional System composed of 9 counties

IOWA

Iowa State Department of Health
Lucas State Office Building
Des Moines, Iowa 50319

$150,000

Robert J. Carson (515) 281-4962

Section 1202

To study the feasibility of establishing and operating an EMS system, and planning the establishment and operation of such systems in four Iowa EMS regions.

Iowa State Department of Health
Lucas State Office Building
Des Moines, Iowa 50319

$300,000

Robert J. Carson (515) 281-4962

Section 1203

Establishment and initial operation of an EMS System in Souix-Lakes EMS region, Northwestern Iowa.

KANSAS

Kansas State Department of Health & Environment
Building 321, Forbes Field
Topeka, Kansas 66620

$375,000

J. Thomas Adams (913) 862-9360, Ext. 573

Section 1203

Establishment and initial operation of an EMS system in two EMS regions of Western Kansas.

KENTUCKY

Department of Human Resources
EMS Branch
275 East Main Street
Frankfort, Kentucky 40601

$165,107

Roland Dallaire (502) 564-7996

Section 1203

Complete a Basic Life Support system in the 43 counties surrounding the Lexington area.

Department of Human Resources
EMS Branch
275 East Main Street
Frankfort, Kentucky 40601

$666,289

Roland Dallaire (502) 564-7996

Section 1204

Begin Advanced Life Support system in Bowling Green (10 counties) and Campbelleville (10 counties) as will as begin paramedic training in these EMS Regions.

LOUISIANA

Louisiana Department of Health & Human Resources
333 Laural Street, Suite 653
Baton Rouge, Louisiana 70801

$50,000

Jack Edwards (504) 389-2288

Section 1202

For feasibility and planning of one EMS Regional System.

Louisiana Department of Health & Human Resources
333 Laural Street, Suite 635

$250,000

Jack Edwards (504) 829-2288

Section 1203

To establish and implement a basic life support system in one EMS Region.

MAINE

Maine Department of Health, State of Maine
Department of Human Services (Southern Maine Region)
Augusta, Maine 04330

$400,000

Farnham Folsom (207) 289-2411
H. Alan Hume, M.D. (207) 622-7566

Section 1203

Initial implementation of EMS system for Southern Maine which Inlcudes Greater Portland and Maine Medical Center.

MAINE

Maine Department of Health, State of Maine
Department of Human Services (Tri County Region)
Augusta, Maine 04330

$300,000

Farnham Folsom (207) 289-2411
H. Alan Hume, M.D (207) 622-7566

Section 1203

Initial implementation of EMS system for EMS Region 2 which includes Lewiston and Auburn.

Maine Department of Health, State of Maine
Department of Human Services (Kennebec Valley Region)
Augusta, Maine 04330

$400,000

Farnham Folsom (207) 289-2411
H. Alan Hume, M.D. (207) 622-7566

Section 1204

Expansion of a current Basic Life Support system for a portion of EMS Region 3.

MASSACHUSETTS

Massachusetts Health Research Institute
600 Washington Street
Boston, Massachusetts 02111

$450,000

Linda Leddy (617) 542-8785

Section 1203

Continued implementation for EMS areas 7, 8, 32 East and 41 impacting in EMS region II, IV, V.

MICHIGAN

Michigan Department of Public Health
Division of Emergency Medical Services
P. O. Box 30035
3500 North Logan Street
Lansing, Michigan 48909

$833,721

Wayne McKenna (517) 373-1406

Section 1203

The establishment and initial operation of an EMS Regional System composed of 7 counties in the Detroit area.

Michigan Department of Public Health
Division of Emergency Medical Services
P. O. Box 30035
3500 North Logan Street
Lansing, Michigan 48909

$400,000

Wayne McKenna (517) 373-1406

Section 1204

To expand and improve an EMS Regional System composed of 14 counties in the Saginaw area.

MINNESOTA

Minnesota Department of Health
Emergency Medical Services Section
717 Delaware Street, S.E.
Minneapolis, Minnesota 55440

$1,021,279

James Stoffels (612) 776-5281

Section 1203

The establishment and initial operation of two separate EMS Regional Systems composed of 16 counties.

MISSISSIPPI

Mississippi State Board of Health
Division of EMS
P. O. Box 1700
Jackson, Mississippi 39205

$322, 843

Wade N. Spruill Jr. (601) 982-6608

Section 1204

Southeast Mississippi Air Ambulance District will implement the first phase of an Advanced Life Support program for the seven counties surrounding Hattiesburg.

MISSOURI

Missouri State Department of Social Services
P. O. Box 570
Jefferson City, Missouri 65101

$550,000

Kenneth Cole (314) 751-2713, Ext. 239

Section 1203

Establishment and initial operation of an EMS system in three EMS regions.

Mid-America Regional Council
20 West 9th Street
Kansas City, Missouri 64105

$300,000

Russell G. Jones, Jr. (816) 474-4240

Section 1204

Expansion and improvement of the EMS system in this 21 county bi-state EMS region.

MONTANA

Montana Department of Health and Environmental Sciences
State of Montana
Helena, Montana 59601

$325,350

Drew Dawson (406) 449-3895

Section 1203

Establish and initiate an Emergency Medical Services Basic Life Support System in the Counties of Glacier, Toole, Pondera, Chateau, and Cascade.

NEBRASKA

Nebraska State Department of Health
301 Centennial Mall, South
P. O. Box 95007
Lincoln, Nebraska 68509

$375,000

Richard Meyer (402) 471-2158

Section 1203

Establishment and initial operation of an EMS system in two EMS regions.

Nebraska State Department of Health
301 Centennial Mall, South
P. O. Box 95007
Lincoln, Nebraska 68509

$500,000

Richard Meyer (402) 471-2158

Section 1204

Expansion and improvement of EMS systems in two EMS regions.

NEVADA

Clark County Health District
EMS Office
625 Shadow Lane, P.O. Box 4426
Las Vegas, Nevada

$501,103

Karl Munninger (702) 385-1291

Section 1203

To establish and implement a Basic Life Support Emergency Medical Services System for Clark County and surrounding communities.

NEW HAMPSHIRE

Dartmouth Medical School
Department of Community Medicine
Hanover, New Hampshire 03755

$400,000

Michael Zubkoff, Ph.D. (603) 646-3422

Section 1204

Expansion of a current Basic Life Support system for a portion of EMS region three.

NEW JERSEY

New Jersey State Department of Health
Division of Emergency Medical Services
P. O. Box 1540
Trenton, New Jersey 08625

$900,000

Joanne Finley, M.D., M.P.H. (609) 292-7837

Section 1203

To develop an EMS Communications and Management Capability.

NEW MEXICO

New Mexico Department of Health & Social Services
P. O. Box 2348
Santa Fe, New Mexico 87503

$120,000

Truman Hopkins (505) 827-3201, Ext. 447

Section 1202

For feasibility and planning of three EMS Regional Systems.

NEW YORK

New York City Health & Hospitals Corporation
125 Worth Street
New York, New York 10013

$995,000

Jack Koretsky (212) 233-5462

Section 1203

To develop and EMS Management capability and to refine their present communications system.

NORTH CAROLINA

Department of Human Resources
Office of Emergency Medical Services
P. O. Box 12200
Raleigh, North Carolina 27605

$118,589

Thomas Harmalink (919) 733-2285

Section 1202

To conduct feasibility studies and plan for the implementation of Basic Life Support Service Systems for: EMS Region I-Ashville (26 counties); EMS Region 4, Raleigh/Durham (11 Counties); and EMS Region 6, Greenville (29 Counties).

NORTH CAROLINA

Department of Human Resources
Office of EMS, Division of Facility Services
P. O. Box 1220
Raleigh, North Carolina 27605

$305,971

Thomas Harmelink (919) 733-2285

Section 1203

To implement a first year effort in establishing a Basic Life Support Service System for EMS Region 3, Charlotte which is comprised of 8 Counties.

OHIO

City of Cleveland
(CMED, Inc.)
1021 Euclid Avenue
Cleveland, Ohio 44115

$400,000

Earl J. Motzer (216) 696-6900

Section 1204

To expand and improve an EMS Regional System composed of 5 Counties.

Ohio Department of Health
450 E. Town Street
Columbus, Ohio 43216

$500,000

Martin Elekes (614) 466-5410

Section 1203

The establishment and initial operation of an EMS Regional System composed of 10 counties in the Dayton area.

OKLAHOMA

Oklahoma State Health Department
EMS Division
N.E. 10th & Stonewall
Oklahoma City, Oklahoma 73105

$440,000

Johnnie R. Godwin (405) 271-4062

Section 1203

Continue the development and establishment of one EMS Regional System

OREGON

Oregon State Health Division
Emergency Medical Services Section
P. O. Box 231
Portland, Oregon 97207

$502,000

Jerry B. Sleeper (503) 229-5586

Section 1203

To support the establishment of a Basic Life Support system in the Portland metropolitan area and five surrounding counties.

PENNSYLVANIA

Commonwealth of Pennsylvania
Pennsylvania Department of Health
Division of Emergency Health Services
P. O. Box 90
Harrisburg, Pennsylvania 17120

$130,352

William C. Dethlefs (717) 787-8741

Section 1202

Emergency Medical Services grant for the planning of a Basic Life Support system in the northwestern, central, and south-central regions of Pennsylvania.

PENNSYLVANIA

Eastern Pennsylvania Emergency Medical Services Council, Inc.
1401 North Cedar Crest Boulevard
Allentown, Pennsylvania 18104

$261,842

John S. Dettleff (215) 820-9212

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system in the eastern region of Pennsylvania

Emergency Medical Services of Northeastern Pennsylvania
Warm Building
Avoca, Pennsylvania 18641

$310,000

Richard K. Mangan (717) 655-6018

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system in the Northeastern region of Pennsylvania.

Southeastern Pennsylvania Emergency Health Services Council, Inc.
% Episcopal Hospital
Front Street and Lehigh Avenue
Philadelphia, Pennsylvania 19125

$631,000

Edgar L. Pennell, Jr., M.D. (215) RE9-0700

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system in the southeastern region of Pennsylvania, the counties of Delaware, Bucks, Chester Montgomery, and Philadelphia.

RHODE ISLAND

Rhode Island Department of Health
75 Davis Street
Providence, Rhode Island 02903

$450,000

Harold Pace (401) 277-2401

Section 1203

Continued implementation of Statewide EMS program.

SOUTH CAROLINA

South Carolina Department of Health & Environmental Control
Division of EMS
2600 Bull Street
Columbia, South Carolina 29191

$397,823

Albert M. Futrell (803) 758-8490

Section 1203

To complete a basic life support service for the Midland EMS Region (14 Counties) by: support of administrative staff; purchase of emergency department equipment to improve emergency care capability for rural hospitals; completion of medical communication network; upgrading of vehicles by the addition of life support equipment

South Carolina Department of Health & Environmental Control
Division of EMS
2600 Bull Street
Columbia, South Carolina 29191

$222,565

Albert M. Futrell (803) 758-8490

Section 1204

To continue the implementation of basic life support services for the Appalachian EMS Region, Greenville (7 Counties and to complement Advance Life Support Service for Cherokee, Union, Spartanburg and Greenville Counties by: supporting administrative staff; improving communications to provide for biomedical telemetry; providing advanced life support equipment for vehicles; conducting training programs for paramedics physicians, and nurses; conducting a comprehensive public education and information program.

TENNESSEE

Tennessee Department of Public Health
Division of EMS
364 Capitol Hill Building
301 Seventh Avenue, North
Nashville, Tennessee 37219

$391,562

Joseph E. Acker,III (615) 741-2745

Section 1203

Implement a Basic Life Support system in sixteen counties surrounding the Knoxville area (East Tennessee EMS Co-op, Inc.)

TEXAS

Texas Department of Health Resources
EMS Division
1100 West 49th Street
Austin, Texas 78756

$1,250,000

Harold Hopkins (512) 458-7259

Section 1203

To establish and implement a basic life support system in four EMS Regions.

Panhandle Regional Planning Commission
3rd & Polk Street, P.O. Box 9257
Amarillo, Texas 79105

$350,000

Betty O'Rourke (806) 372-3381

Section 1204

To improve and expand an EMS Regional System composed of 25 Counties.

TEXAS

Trinity Emergency Services Association, Inc
328 South Adams
Forth Worth, Texas 76104

$385,000

Alan Mickish, M.D. & Jim Finney, Ph.D. (817) 335-9911

Section 1204

To improve and expand an EMS Regional System composed of 8 Counties.

Texas Department of Health Resources
EMS Division
1100 West 49th Street
Austin, Texas 78756

$300,000

Harold Hopkins (512) 458-7259

Section 1204

To improve and expand one EMS Regional System.

Permian Basin Regional Planning Commission
Midland-Odessa Air Terminal
P. O. Box 6391
Midland, Texas 79701

$210,600

Dean Williams (915) 563-1061

Section 1204

To improve and expand an EMS Regional System composed of 17 Counties.

UTAH

Utah Division of Health
44 Medical Drive
Salt Lake City, Utah 84113

$568,277

Richard L. Warburton (801) 533-6435

Section 1204

Improve and expand Emergency Medical Services from Basic Life Support System to an Advance Life Support System in the northwest six counties or Utah EMS Region I.

VERMONT

Vermont State Health Department
115 Colchester Avenue
Burlington, Vermont 05401

$550,000

C. Earl Gettinger, Jr. (802) 862-5701

Section 1203

Initial implementation for EMS Regions 3 and 4 which covers the entire Southern Portion of Vermont

VIRGINIA

University of Virginia
Biomedical Engineering Department
Box 377, Medical Center
Charlottesville, Virginia 22901

$294,000

Earnst O. Attinger, M.D. (804) 924-5101

Section 1204

To implement an Advance Life Support System in the Thomas Jefferson region of Virginia.

VIRGINIA

Virginia State Department of Health
Bureau of Emergency Medical Services
109 Governor Street
Richmond, Virginia 23219

$19,648

Susan D. McHenry (804) 786-5188

Section 1202

Emergency Medical Services grant for the planning of a Basic Life Support system in the Rappahannock region of Virginia.

Virginia State Department of Health
Bureau of Emergency Medical Services
109 Governor Street
Richmond, Virginia 23219

$513,000

Susan D. McHenry (804) 786-5188

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system for State Operations and in the Western and Blue Ridge regions of Virginia.

Tidewater Emergency Medical Services Council, Inc.
11 Koger Executive Center, Suite 201
Norfolk, Virginia 23502

$250,802

Kent J. Weber (804) 461-1331

Section 1204

To implement an Advanced Life Support system in the Tidewater region of Virginia.

WASHINGTON

Washington State Department of Social & Health Services
Emergency Medical Services
Public Health Building, MS 1-2
Olympia, Washington 98501

$500,000

Jack Cvitanovic (206) 753-5892

Section 1203

To support the establishment of basic life support system in the Central, Southcentral and Northwest EMS Region of the state.

Washington State Department of Social & Health Services
Emergency Medical Services
Public Health Building, MS 1-2
Olympia, Washington 98501

$697,000

Jack Cvitanovic (206) 753-5892

Section 1204

To support the completion of advance life support systems in the West, East and Northcentral EMS Regions of the state.

WEST VIRGINIA

EMSOR 3/4, Inc.
815 Quarrier Street, Morrison Building, Room 309
Charleston, West Virginia 25301

$180,000

Carlos W. Dillon (304) 344-8315

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system in the central regiona of West Virginia.

WEST VIRGINIA

Appalachia Emergency Medical Services, Inc.
1139 Fourth Avenue, Professional Building
Huntington, West Virginia 25705

$231.356

Susan S. Carlson (304) 525-1212

Section 1203

Emergency Medical Services grant for the implementation of a Basic Life Support system in the appalachian region of West Virginia.

Region VI/VII Planning and Development Council
201 Deveny Building
Fairmont, West Virginia 26554

$247,000

Douglas M. LaFauci (304) 366-5693

Section 1204

To implement an Advanced Life Support system in the north-central region of West Virginia.

WISCONSIN

Northwest Areawide CHP Organization, Inc.
P. O. Box 368
Hayward, Wisconsin

$45,000

Melvin C. Pederson (715) 634-4897

Section 1202

For feasibility and planning of an EMS Regional System composed of 8 counties.

WISCONSIN

Southeastern Wisconsin HSA, Inc.
737 North Fifth Street
Milwaukee, Wisconsin 53203

$62,500

Russell E. Julian (414) 271-9788

Section 1202

For feasibility and planning of an EMS Regional System composed of 7 counties.

Wisconsin Department of Health
Division of Health Policy and Planning
110 East Main Street, Room 813
Madison Wisconsin 53703

$480,000

John Henkes (608) 366-0981

Section 1203

The establishment and initial operation of an EMS regional system composed of 9 counties in the Green Bay area.

WYOMING

Wyoming Department of Health and Social Services
State Office Building West
Cheynne, Wyoming 82002

$413, 434

Jimm Murray (307) 777-7356

Section 1203

Establish and initiate an Emergency Medical Services Basic Life Support system in the Counties of Sheridan, Campbell, Johnson, Crook, Weston, Niabrara and Converse.

WYOMING

Wyoming Department of Health and Social Services
State Office Building West
Cheyenne, Wyoming 82002

$83,561

Jimm Murray (307) 777-7356

Section 1202

Determine if it is feasible to implement a Basic Life Support System in the Counties of Park, Big Horn, Washakie, Hot Springs, Fremont, Sublette, Teton and Lincoln.

APPENDIX F

DEPARTMENT OF TRANSPROTATION AMBULANCE DESIGN CRITERIA

ambulance design criteria

U.S. Department of Transportation
National Highway Traffic Safety Administration

Prepared by the
Committee on Ambulance Design Criteria
In cooperation with the
National Research Council

First edition - May 1971
Revised - January 1973

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FOREWORD

In response to a request from the National Highway Safety Bureau (now the National Highway Traffic Safety Administration), the National Academy of Engineering, operating through the National Research Council, undertook a project to develop design and performance criteria for ambulances. A Committee of eminent physicians, ambulance operators, automotive engineers, and specialists in related fields was appointed to study the main issues and to develop the substantive material in this report.

Staff assistance was provided by the Highway Research Board of the NRC Division of Engineering, a unit whose long history has included much technical activity in the area of traffic and vehicle characteristics.

Additional staff support and fund administration were provided by the NRC Division of Medical Sciences, a unit whose background includes the development of medical criteria for emergency services and the development of guidelines for the training of ambulance personnel.

At the outset of the study in September 1968, members of the Committee were assigned to subcommittees to work in five areas of concern: (1) a comprehensive system description, (2) operational hardware and equipment, (3) vehicle standards, (4) communication equipment, and (5) environmental equipment.

The first Subcommittee worked out a logical and comprehensive classification framework within which criteria were to be developed by the remaining subcommittees. An important adjunct to the Committee work was a special ambulance exhibit held at Columbus, Ohio, in January 1969 to provide members of the Committee with first hand information on existing equipment. The Columbus meeting also provided a forum whereby project personnel could interact with more than one hundred conferees from industries and technologies that have concern for ambulance design. Special acknowledgment is made to the State of Ohio for the physical arrangements that were provided at Columbus, and to all those manufacturers who cooperated in the display of ambulances and medical equipment.

Each subcommittee developed specific criteria in its area of responsibility, then the Committee developed further the subcommittee conclusions to produce the basic material presented in Part II of this report. The criteria contained therein represent the Committee's recommended standards for all those elements that determine the adequacy, safety, and effectiveness of ambulances.

CONTENTS

PART I

PREFACE

Part I of this report provides historical and technical background and describes the resulting need for ambulance design and performance standards. The purpose and scope of the study are discussed in terms of vehicles, vehicle elements, and vehicle characteristics.

The Committee recognizes that few ambulances now in service can be modified to adopt all of the criteria proposed in this report. New ambulances should incorporate these criteria with minimal delay. Pending replacement of used and withdrawal of obsolete vehicles, ambulances now in use should be modified to the maximum extent that is physically feasible, while schedules are established to enable orderly procurement of vehicles which fully comply with the proposed design criteria.

A number of particular recommendations have been selected from the complete list in Part II and presented in Part I because of their special significance or importance.

BACKGROUND

Recent advances in emergency care of the victims of accidental injury and life-threatening disease require that ambulance attendants be trained to carry out measures on a par with the combat medical corpsman or the emergency department attendant, that more sophisticated equipment be used at the scene and during transport, and that the ambulance be designed not only to ensure safe and efficient transport and radio communication, but also to provide space for storage and ready accessibility to fixed and mobile equipment for safeguarding at the scene, rescue, optimal emergency care, and adequate room to actively treat any emergency which might arise during transport. These improved capabilities and the requirements for facilities to handle emergency cases require new concepts in ambulance design. The mass withdrawal of funeral directors from ambulance service creates a void at a time when manufacturers and operators are without guidelines for developing vehicles to replace the inadequate modified hearse and to meet more sophisticated standards. Training courses for ambulance personnel have been upgraded, resuscitation and communication equipment are being standardized and the medical criteria on which to base guidelines for improved ambulance design are being identified.

For decades the general public and the medical profession passively accepted employment of vehicles sufficient only to provide transportation of an individual in the recumbent position on a litter, with little or no equipment for emergency care, and manned by inadequately trained drivers or attendants. The hearse is still employed in some areas. Modifications following its general design have provided increased safety, comfort, and space for personnel and equipment, but rarely incorporate communication equipment, rescue tools, or sufficient space

for carrying out life support care at the scene or during transportation. In recent years station wagons, vans, and trucks have been adapted for use as ambulances and rescue vehicles. In general, these developments have followed the recommendations of national professional organizations on minimal equipment that should be carried, and concepts of emergency care taught in widely diversified and incomplete short courses of training of attendants.

Deficiencies in current ambulance services and recommendations on ways and means of upgrading and standardizing ambulances, equipment, and training are summarized in reports entitled "Accidental Death and Disability: The Neglected Disease of Modern Society," and "Report of a Task Force on Ambulance Services" published by committees of the Division of Medical Sciences, National Academy of Sciences — National Research Council, in 1966 and 1967. In early 1967, the NAS-NRC Committee on Emergency Medical Services undertook a number of steps to implement recommendations in these reports pertaining to ambulance services. That Committee proceeded on the concept that automotive design engineers must be provided with detailed information on the functions to be performed by ambulance attendants, the equipment necessary to their tasks, and the medical requirements necessary to optimal care and safe delivery of a patient to a hospital.

The Committee on Emergency Medical Services has thus published "Training of Ambulance Personnel and Others Responsible for Emergency Care of the Sick and Injured at the Scene and during Transport" which details the functions of ambulance drivers and attendants and identifies equipment and supplies that should be available for their use. The most recent report of that Committee is entitled "Medical Requirements for Ambulance Design and Equipment."

The most pressing needs expressed in this report are increased space for administration of cardiopulmonary resuscitation in transit, a ceiling height sufficient for adequate gravity flow of intravenous fluids, installed oxygen and suction devices, two-way radio communication, and storage room for equipment for optimal treatment and for rescue. While some of these needs have been met through the ingenuity of some ambulance manufacturers, it was apparent to the Committee on Ambulance Design Criteria, at the display of contemporary ambulances at the Columbus exhibit, that the manufacturers welcomed publication of nationally endorsed standards on which to further improve their products. The report "Medical Requirements for Ambulance Design and Equipment" thus served as the Committee's basic guideline in translating medical needs to engineering design criteria.

PURPOSE

The objectives of the Committee on Ambulance Design Criteria and the purpose of the present report are to determine and document performance and design criteria for an ambulance vehicle in sufficient detail that automotive designers can produce a vehicle suitable not only to present day practices, but also with adequate provision for future advances in equipment and administration of emergency care.

SCOPE

Three dimensions of the scope of this study are: the type of vehicle to which the criteria apply, vehicle elements or characteristics for which criteria are developed, and the scope of individual standards that are recommended for the vehicle elements and characteristics.

Vehicle scope is implied by the term ambulance, but it is necessary to state clearly what is meant by an ambulance. The Committee decided that a vehicle should not be termed an ambulance unless it is designed, built, equipped, and staffed to cope with medical emergencies outside the hospital. The following explicit definition appears in section 1.1 of Part II and is used here to define vehicle scope.

> The ambulance is defined as a vehicle for emergency care *which provides* a driver compartment, and a patient compartment which can accommodate two emergency medical technicians and two litter patients so positioned that at least one patient can be given intensive life-support during transit; *which carries equipment and supplies* for optimal emergency care at the scene as well as during transport, for two-way radio communication, for safeguarding personnel and patients under hazardous conditions, and for light rescue procedures; and *which is designed and constructed* to afford maximum safety and comfort, and to avoid aggravation of the patient's condition, exposure to complications, and threat to survival.

The military field ambulance was excluded from the Committee's recommendations because of its unique and specific usages. The Committee also excluded from consideration vehicles utilized for elective transport of non-emergency patients, for medium or heavy rescue procedures, or for specialized intensive care, such as mobile coronary-care units or mobile operating rooms that do not qualify in all respects to the defined criteria. For this reason, the Committee resolved that a single type of vehicle can fulfill the requirements of an emergency ambulance. Even though the vehicles mentioned above may incorporate all provisions of the established definition of the ambulance, the additional design criteria necessary to serve dual purposes are of a magnitude such as to require special studies.

Automotive vehicles generally have hundreds of elements or components, and for each there may be scores of design or performance characteristics. Thus it is not difficult to envision thousands of vehicle characteristics for which standards might be developed.

The scope of this study, however, includes only elements and characteristics that bear most directly on the safety and medical requirements of patients and ambulance personnel, e.g., those characteristics that distinguish the vehicle as an ambulance. Thus a number of vehicle components are not considered in this report.

In Part II of this report more than one hundred individual elements and characteristics are identified to cover areas such as size and space requirements, mechanical performance, electrical systems, vehicle iden-

tification, communications equipment, climate control, supplies, safety requirements, etc.

A criterion for any design or performance characteristic might range from broad generalities expressed in undefined terms to quite specific statements that are tantamount to specifications. Most of the individual criteria developed in this study fall in the center of this range; the Committee has aimed to provide standards that are neither meaningless through their ambiguity nor so specific that the designer will have no freedom for exercising further judgment and ingenuity. Criteria have been stated in more general terms in cases where the design element is less critical or where there is a lack of objective data on functional requirements. More specific criteria are stated for critical items on which the state of knowledge provides meaningful guidelines on the performance level that will be achieved by design conformance.

DESIGN CRITERIA OF SPECIAL SIGNIFICANCE

Explicit and complete recommendations of the Committee on Ambulance Design Criteria are found among the more than one hundred criteria presented in Part II of this report. It is not the purpose here to summarize all of Part II, but rather to identify some of the more significant criteria, and to highlight the principal implications that may be drawn from the complete set of Committee recommendations.

1. The patient compartment should be designed primarily for medical care in transit, including external cardiac compression (24),* and should be unencumbered by equipment not essential to patient care.

2. Regardless of local circumstances which may influence the extent to which optional equipment may be employed, the manufacturer's product should be sufficiently standardized to provide the space not only for required installed and portable equipment and supplies, but also for optional items now available and for adaptation to more advanced equipment that will become available.

3. Principal environmental requirements (20) for medical care include sustained environmental control (20.2.2) and ventilation (20.3.3) that minimizes contamination from outside air.

4. Communications requirements (19), include two-way radio (19.1.1), walkie-talkie (19.1.2), intercom (19.2), and public address (19.3).

5. External identification (7), lights (7.1), colors (7.2), and markings (7.3), should be standardized on a national basis.

6. Privacy and efficiency would be enhanced by the omission of windows (11) in the patient compartment.

7. Acceleration capability (3.2) should assure that the ambulance is

*Numbers in parentheses refer to specific sections in Part II.

capable of rapid response, that it can avoid hazardous situations by maintaining its position in traffic or move faster than traffic when advisable because of the patient's condition. The vehicle should be capable of smooth performance at maximum speed limits (3.4) on interstate highways. The criteria of maximum acceleration and speed specified in this report are designed to ensure performance consistent with ambulance operation in traffic patterns on interstate highways. These high performance capabilities should not be interpreted to condone unsafe operation at any time.

8. Depending upon whether the ambulance is built on a passenger car chassis or on a truck chassis, general Federal Motor Vehicle Safety Standards (18) for ambulances should be those applicable to the chassis employed.

NEEDED RESEARCH

There are some important vehicle characteristics for which definite standards cannot be recommended until further research has provided suitable objective data. Four such characteristics are identified as follows:

1. Color and Intensity of Identification Lights

   The Committee recommends blue color for flashing warning lights and alternating blue and white color for rotating roof mounted beacons. The reason for recommending blue is threefold;

   - First, the human eye detects blue more quickly than other colors, especially at twilight or dawn when natural colors are of the red and yellow hues.
   - Second, due to this visibility detection, it would quickly distinguish the ambulance as a life-saving emergency vehicle.
   - Third, blue will not be confused with traffic lights and common signs which are predominantly red, green or yellow.

   The exact shade or density of color and output intensity should be determined by research under test conditions. In many states police or state highway vehicles now use blue lights. While recognizing the difficulty of modifying statutes, the Committee is of the opinion that criteria for distinction of ambulances should be nationally uniform, and that restriction of blue lights to identification of ambulances is feasible and necessary.

2. Riding Quality and Stability

   It is clear that the ambulance should assure a smooth ride for patients, with due consideration of road conditions, but further studies are needed to arrive at a basis for deciding whether or not a given vehicle provides adequate riding quality and stability. There are no medical guidelines on which to quantify levels of

movement and vibration that may be deleterious to seriously ill or injured patients. Previous work has suggested that measures of vertical and lateral accelerations might be used, but the problem is complicated by the interactions of vehicle, driver, and roadway.

3. Noise and Vibration

Noise and vibration are undesirable in ambulances, but beyond the stipulation that their effects should be minimized, no definite standards can be given. It is recommended that human factors studies be made to determine acceptable levels for noise and vibration.

4. Vehicle Braking System

The vehicle braking system as recommended by the Committee should meet the minimum performance requirements established by Federal Motor Vehicle Safety Standards (FMVSS) 105, 106, and 116. However, it was the unanimous view of the experienced ambulance operators, who were members of the Committee, that the present braking system is the most common factor in vehicle maintenance due to the excessive braking requirements of ambulance operation. Therefore the Committee recommends that research be conducted to develop heavy-duty braking systems which can satisfy the unique braking requirements of ambulances. This braking system should also be unaffected by water encountered in fording operations.

PART II

PREFACE

Specific design criteria developed by the Committee are given in a system description format that has thirty-three classes. Any class may have subclasses and sub-subclasses – all coded in decimal notation.

An alphabetical index is provided to facilitate the location of particular vehicle elements or characteristics.

Although the Committee recognizes that adoption and enforcement of ambulance criteria are not within its scope, the Committee nevertheless has elected to emphasize the conviction of its recommendations through the use of verb forms such as "shall" and "must."

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SYSTEM DESCRIPTION OF AMBULANCE DESIGN AND PERFORMANCE CRITERIA

System Description -- Ambulance Design Criteria

1. SCOPE

This system description establishes the design and performance criteria for ambulance vehicles. All components that make up this system shall conform with the requirements stated herein.

1.1. Definition of Ambulance

The ambulance is defined as a vehicle for emergency care *which provides* a driver compartment and a patient compartment to accommodate two emergency medical technicians and two litter patients so positioned that at least one patient can be given intensive life-support during transit; *which carries equipment and supplies* for optimal emergency care at the scene as well as during transport, for two-way radio communication, for safeguarding personnel and patients under hazardous conditions, and for light rescue procedures; and *which is designed and constructed* to afford maximum safety and comfort, and to avoid aggravation of the patient's condition, exposure to complications, and threat to survival.

1.2 Objective

The objective is to detail the design and performance criteria essential to all ambulances except the military field ambulance.

2. APPLICABLE DOCUMENTS

The following documents form part of this description as specified herein. References to the formulation of the ambulance design criteria are listed in Appendix A.

2.1. Damon, A., Stoudt, H. W. and McFarland, R.A. The Human Body in Equipment Design. Cambridge, Mass., Harvard University Press. 1966.

2.2. Morgan, C. T., Cook, J. S., Chapanis, A. and Lund, M. W. Human Engineering Guide to Equipment Design. New York, McGraw-Hill Book Company. 1963.

2.3. National Academy of Sciences—National Research Council, Division of Medical Sciences, Committee on Emergency Medical Services. Medical Requirements for Ambulance Design and Equipment. Washington, D.C., September 1968. 24 pp.

2.4. Society of Automotive Engineers. SAE Recommended Practices, J Series. (Applicable items).

2.5. U.S. Army Human Engineering Laboratories, Aberdeen Proving Ground. Human Factors Engineering Design Standard for Wheeled Vehicles. U.S. Army HRL Std. S-6-66. Aberdeen, Maryland, September 1966.

2.6. U.S. Army Materiel Command Headquarters. Configuration Management, Army Programs, June 1965.

2.7. U.S. Department of Health, Education and Welfare. Weight, Height, and Selected Body Dimensions of Adults. National Center for Health Statistics Series 11, No. 8.

2.8. U.S. National Highway Traffic Safety Administration Federal Motor Vehicle Safety Standards (FMVSS).

3. PERFORMANCE CHARACTERISTICS

All requirements listed in the sub-paragraphs are minimum requirements based on the manufacturers' rated gross vehicle weight (GVW) or manufacturers' loaded vehicle weight. Performance criteria shall be achieved while operating under full air conditioning power requirement.

3.1. Vehicle Braking System — Service, Emergency, and Parking

The vehicle as delivered to the user shall be capable of the passenger car performance values required by (Federal Motor Vehicle Safety Standard) FMVSS 105; it shall also comply with the requirements of FMVSS 106 and 116.

3.2. Acceleration

The vehicle fully equipped and with full patient and technician load shall be capable of maintaining its position in traffic. It shall have a minimum average acceleration rate of 2 MPH per second for at least 30 seconds, to a maximum of 70 MPH. Test to be in accordance with Consumer Information Regulation 375.106 Acceleration and Passing Ability (Federal Register Vol. 34, No. 99, Pages 8115, 8116 dated May 23, 1969).

3.3. Gradeability

The fully loaded vehicle shall be able to stop and restart three (3) consecutive times during a six (6) minute period on a dry smooth concrete slope having a minimum grade of 30% without stalling or overheating. Test conditions to be in accordance with Consumer Information Regulation 375.106 Section "d vi" (conditions and procedures, vehicle, road and ambient conditions). Federal Register Vol. 34, No. 99, Page 8115 dated May 23, 1969.

3.4 Speed

The fully loaded vehicle shall be capable of a sustained speed of at least 70 MPH over dry, level, hard-surfaced roads. Test to be in accordance with Consumer Information Regulation 375.106 Acceleration and Passing Ability (Federal Register Vol. 34, No. 99, Pages 8115, 8116 dated May 23, 1969).

3.5. Fuel System

The fuel system should comply with FMVSS 301 regardless of type of vehicle.

3.5.1. Fuel Range

The vehicle fully equipped and fully loaded shall be capable of being operated for at least 150 miles at safe operating speeds, under encountered climatic conditions.

3.6. Emission Control

Air pollution produced by the vehicle must be below the level set by the Clean Air Act. It must comply with Department of Health, Education and Welfare Standards as established for the calendar year in which the motor vehicle is completed.

3.7. Maintenance

Maintenance activity must comply with the manufacturers' recommended practice. A complete shop manual must be provided with each vehicle.

Access to the engine shall be such as to permit maintenance with the minimum of interference from structure or related parts.

3.8. Fording

The vehicle shall be capable of shallow water fording up to 12 inches of water while keeping the patient compartment dry. The ignition system shall be of such design as to permit fording without danger of stalling.

4. PRIMARY FUNCTION AREAS (Performance Requirements)

4.1. Power Train

Units of the power train shall be compatible and matched to meet the performance criteria listed.

4.1.1. Engine

The horsepower and torque rating of the engine are determined by the performance (3.2, 3.3, 3.4).

4.1.1.1. Cooling System

The cooling system shall be of sufficient capacity to permit idling of the engine (including high idle at full air conditioning load) under an ambient of 95 degrees Fahrenheit, for a period of 1 hour, without overheating.

4.1.1.2. Starting System

The starting system shall be such as to assure restarting within the normal range of temperature in its operational geographic area. The starter shall be interlocked to be inoperative except when the transmission control is in "park" and/or "neutral" position. Refer to FMVSS 102 in regard to starter interlock.

4.1.1.3. Exhaust System

The exhaust system shall be designed to permit the engine to be idled on a standing vehicle with minimal exhaust fumes and contaminants entering the body interior.

4.1.2. Transmission

The transmission shall be matched in horsepower and torque capacity to the engine. The "gear splits" shall assure the performance criteria without overloading the engine. Position of the "selector" for the transmission shall comply with FMVSS 101 and 102.

4.1.3. Drive Line

The drive line shall be balanced and supported to perform throughout the design speed range without whipping or vibrating.

4.1.4. Differential

The differential shall be capable of transmitting the load imposed upon it by the preceding components of the power train. It shall have a gear ratio to assure obtaining the speed and performance criteria while staying within the engine's designed RPM range. A locking (limited slip) differential should be available as an option.

4.2. Suspension System (Springs and Shock Absorbers)

Shall be of sufficient capacity to support the full vehicle load and give stability while giving optimal comfort to the patients.

4.3. Steering System

The steering system shall be the manufacturer's recommended design and shall achieve the turning diameter specified in 5.5. Power steering should be available as an option.

4.4. Tachograph (optional)

A 24-hour recording-type tachograph shall be provided.

5. PHYSICAL CHARACTERISTICS

5.1. Length

While the minimum length of the patient compartment is 116 inches, the limitations of overall length of the vehicle are those imposed by the area in which it is to be used; however, for ease of maneuvering it should not exceed 22 feet over bumpers.

5.2. Width

The overall width of the vehicle shall not exceed 96 inches.

5.3. Height

The overall height of the vehicle with equipment but minus patients and technicians shall not exceed 115 inches, including roof-mounted equipment.

5.4. Ground Clearances

The lowest part of the vehicle when loaded to rated load condition shall be a minimum of 8 inches.

A higher clearance may be necessary in areas where off-highway travel is anticipated.

5.4.1. Angle of Approach

The vehicle shall have an angle of approach of not less than 16° when loaded to rated load condition. Angle of Approach is defined in Society of Automotive Engineers Standard SAE J 689, Approach, Departure, and Ramp Breakover Angles.

5.4.2. Ramp Breakover Angle

The vehicle shall have a ramp breakover angle of not less than 10° when loaded to rated load condition. Ramp breakover angle is defined in SAE Standard J 689.

5.4.3. Angle of Departure

The vehicle shall have an angle of departure of not less than 10° when loaded to rated load condition. Angle of Departure is defined in SAE Standard J 689.

5.5. Turning Diameter

Righthand and lefthand turning diameters of the vehicle shall not exceed 2.9' per foot of vehicle length. Turning diameter is defined and evaluated in SAE Standard J 659 "Turning Ability And Off Tracking." The turning diameter is to be measured at the body corners.

5.6. Tires and Rims

Tires are to be of puncture-resistant design and of optimal riding quality. Tires must be sized for fully equipped and loaded ambulance in accordance with FMVSS 109 and 110.

5.7. Four Wheel Drive

When geographical location dictates high mobility (off of surfaced roadway operations) an all-wheel drive configuration should be considered. If equipped on an optional basis, the vehicle must provide the capability of permitting the driver to engage–disengage the all-wheel drive from his seated position.

6. ELECTRICAL SYSTEM

The electrical system shall be to accepted automotive standards in design, workmanship, and materials. Wiring is to be made up into harnesses wherever possible. These are to be reasonably accessible for checking and maintenance. In any area where wiring would be exposed to the elements, it must be protected by weatherproof harness or loom. This loom is to be installed so as to eliminate the possible entrance of water which could cause damage through freeze-bursting. Wiring, in loom or otherwise, will not be accepted if in the area of "wheel wash" abrasion.

Wiring is to be protected by a rubber grommet or plastic bezel at any place where it may pass through, or over the edge of any metal panel, unless the hole or the edges of the metal are hemmed or flanged.

Wiring connectors and terminals shall be the manufacturer's recommended standard. Horizontal wiring shall be supported by insulated clips located and spaced to minimize "sag." Complete wiring diagrams for standard and for optional equipment shall be supplied with each vehicle. This should indicate the identification code of the wiring. Maximum size of the diagram shall be 8-1/2" x 11".

6.1. Generating System Capacity

The basic generating system shall be of a capacity capable of supplying the maximum of the built-in dc electrical requirements.

6.2. Supplementary Generating System Capacity

A supplemental generating system capable of three kilowatts at 120 volts, 60 cycle ac, shall be provided. The voltage and cycles should remain constant at all rpm's. This may be a combined unit with generating system in 6.1. (Refer to 19.4, 21.1, and 21.2 footnote (2) for partial listing of equipment requiring 120 volts.)

6.3. Battery

The battery shall have a minimum 70 ampere hour rating. It must be located in a ventilated area sealed off from the vehicle interior. It must be completely accessible for checking and/or removal.

6.4. Interior Lighting

6.4.1. Driver Compartment

Lighting shall be designed and located so that no glare is reflected from surrounding areas to the driver's eyes or his line of vision, from instrument panel, switch panel or other areas that may require illumination while the vehicle is in motion.

6.4.2. Patient Compartment

Illumination must be adequate throughout the compartment, and provide an intensity of 40 foot candles at the level of the patient for adequate observation of vital signs, such as skin color and pupillary reflex, and for care in transit. Lights should be controllable from the entrance door, the head of the patient, and the driver's compartment. Reduced lighting level may be provided by rheostat control of the compartment lighting or by a second system of low intensity lights.

6.5. Exterior Lights

Exterior lights other than warning lights (7.1) shall comply with the appropriate section of FMVSS 108.

6.6. Switches and Controls

All exterior light switches, and communication and siren controls are to be within normal reach of the driver and so mounted that identification and markings are clearly visible to the driver without excessive movement of his head or eyes from his normal driving area of vision forward or to the sides. Controls must comply with FMVSS 101.

Switches for patient compartment lighting; patient compartment heating, ventilation, and air conditioning; and exterior area lighting will be controlled by switches located

on the patient compartment switch panels. Switches on the patient compartment forward panel shall be easily accessible to the technician when seated at the patient's head and will control:

Interior lights
Heating (on or off) thermostatic control for temperature
Ventilation
Air-conditioning (on or off) thermostatic control for:
temperature
communications, See (19)

Switches on the patient compartment rear panel (by rear doors) will control:

Interior lights
Exterior area flood light
Communications, See (19)

All switches and controls in the patient compartment shall be plainly marked and clearly visible for the technician's identification.

6.6.1. Ignition Switch

Must comply with FMVSS 101, 102, and 114.

6.7. Electrical Outlets

6.7.1. Interior

One outlet at each patient's head area and one outlet at each patient's lower torso area, 120 volt current, for use of electric-powered medical equipment.

6.7.2. Exterior

Three (3) outlets on each side near the rear of the vehicle for 120 volt use. These must be weatherproof, twist lock, grounded type, for use of portable flood lights, electric-powered saw or other electric-powered tools.

6.8. Circuit Breakers

All circuits must be protected by automatic circuit breakers of proper capacity.

6.9. Suppression, Ignition, and Radio

The ignition system shall be suppressed to prevent interference with radio transmission and receiving.

6.10. Illumination Devices, Exterior

There shall be a body mounted flood light(s) over the rear door, mounted in a location to illuminate a half-circle area

as wide as the vehicle and to a point six (6) feet behind the vehicle on its center line. The light(s) shall be a fixed-beam design flood light for area illumination and shall have a total of 300 watts output. The switch shall be shielded and mounted inside on the switch panel near the rear door. Optional under-body flood lights connected to the headlight switch may be installed to illuminate the attendants' egress areas.

7. EXTERNAL IDENTIFICATION

7.1. Warning Lights

A rotating roof mounted beacon shall be provided incorporating four (4) bulbs with alternating lens colors, two (2) white and two (2) blue. The vehicle shall be equipped with four flashing roof lights on the upper body corners with an alternate-corner flashing pattern, two (2) on the front facing front and two (2) on the rear facing rear, blue in color(See page 5), and a minimum of 50 candlepower output each.

The above shall be in accord with SAE regulations J595b and J845.

7.2. Vehicle Color — Exterior

The color of the exterior surface of the vehicle shall be basically white in combination with Omaha orange (formulated without black) and black lettering.

7.3. Emblems and Markings

A cross of reflectorized Omaha orange on a square background of reflectorized white shall be on each side of the body, on the rear, and on the roof. The same shall be on the front if the vehicle design permits. The word "AMBULANCE" shall be under each cross, in black letters of not less than 3" in height. The word "AMBULANCE" in black letters shall be in mirror image on the front of the vehicle for mirror identification by drivers ahead.

Vehicle identification shall comply with FMVSS 115.

8. AMBULANCE BODY

Ambulance body shall be sufficient in size to transport two litter patients and two technicians with space around the patients to permit a technician to administer life supporting treatment to at least one patient during transit.

8.1. Inside Length of Patient Compartment

The compartment length shall provide a minimum of 25" clear space at the head and 15" at the foot of a 76" litter.

8.2. Inside Width of Patient Compartment

The compartment shall provide space for the technician to perform external cardiac compression on one of the patients when the technician is in a right-angle, kneeling position to the side of the patient, with 25" free or unobstructed space for lower legs and feet.

8.3. Inside Height of Patient Compartment

Inside height of patient compartment shall be a minimum dimension of 54", floor to ceiling. A height of 60" is preferable.

8.4. Driver's Compartment

Driver's compartment shall be of sufficient size to accommodate the 5 percentile to 95 percentile male driver with space to perform driving and control activities. It may also provide space for one seat to the right of the driver. Occupant safety standard shall comply with FMVSS 201.

8.4.1. Access

There shall be a door on each side of the vehicle in the driver's compartment.

8.4.2. Access to Patient Compartment

Access to the patient compartment from the driver's compartment without leaving the vehicle is desirable. If there is a door between the two compartments, it shall be secured on the driver's compartment side.

8.5. Bulkhead Between Driver and Patient Compartments

A bulkhead or partition shall be provided between the driver and patient compartments. This shall incorporate a shatterproof glass for visual check of conditions in the patient compartment by the driver. There shall be a means of voice communication between the driver and the technician. The visual aspects must be capable of being shielded to prevent light in the patient compartment producing glare that would interfere with the driver's forward vision. The glazing shall comply with FMVSS 205.

9. CONSTRUCTION

Construction shall be of sufficient strength to withstand impact forces as may be established by the Federal Motor Vehicle Safety Standards. As a minimum the patient shall be provided the same protection as the driver from side impact. The structure shall be sufficient in strength to support the entire vehicle on its roof with mi mum "crush." This will

require a static test procedure by which to establish limits similar to the School Bus Static Load Test Code, Standard No. 002.

9.1. Body Structure

All body joints shall be caulked or sealed. The entire underbody shall be undercoated to permit fording, as established in 3.8, to keep the patient compartment dry and to preclude the entrance of dust to the patient compartment when operated over dry unimproved or dirt roads.

9.1.1. Doors

There shall be a door on the right side of the patient compartment near the patient's head area of the compartment. The side door must permit a technician to position himself at the patient's head and quickly remove him from the side of the vehicle should the rear door become jammed.

All patient compartment doors shall incorporate a holding device to prevent the door closing unintentionally from wind or vibration. When doors are open the holding device shall not protrude into the access area.

9.1.2. Door Latches and Hinges

Door latches and hinges shall comply with FMVSS 206. When doors are open the hinges, latches, and doorchecks shall not protrude into the access area.

9.1.3. Steps

Steps shall be provided at door openings if the floor is more than 18" above the ground. If steps are required, the height from the ground to the first step should not be more than 15". Steps shall be of a design that will prevent the accumulation of mud, ice or snow. They shall have a non-skid surface for sure footing and a minimum of 8" tread. Steps may be of an "open grating" type provided they are so located that they are sealed off from the interior when the door is closed.

9.1.4. Floor

Floor shall be at the lowest level permitted by clearances. It shall be flat and unencumbered in the access and work area. Floor may be metal properly reinforced to eliminate "oil canning," and insulated against outside heat and cold. The floor may also be marine plywood provided the plywood is sufficient in thickness to rigidly take the loads imposed upon it. A combination of plywood over metal will be acceptable provided the

surfaces between are coated with a waterproof adhesive. There shall be no voids or pockets in the floor to side wall areas where water or moisture can become trapped to cause rusting and/or unsanitary conditions.

9.1.5. Floor Covering

Floor covering shall be applied to the top side of the floor surface. It shall be of a non-skid type and must withstand washing with soap and water or disinfectant without damage to the surface. All joints in the floor covering shall have the minimum void between matching edges and shall be cemented with a suitable water and chemical proof cement to eliminate the possibility of joints loosening or lifting.

To facilitate cleaning, a cove-type joint should be incorporated at the side walls where side panels and floor covering meet.

9.1.6. Interior Surfaces

All fasteners, latches, hinges, etc., shall be of a flush type design. When doors are open the hinges, latches, and door checks shall not protrude into the access area. All hangers or supports for equipment or other items must be flush with the surrounding surface when not in use. The interior of the vehicle shall be light in color. The finish of the entire patient compartment must be impervious to soap and water and disinfectants to permit washing and sanitizing.

9.1.7. Exterior Surfaces

Exterior surfaces shall be smooth, with appurtenances kept to a minimum. Necessary items should be flush-mounted where possible.

9.1.8. Windshield Assembly

Windshield assembly shall meet the requirements established by FMVSS 205 and 212.

10. SEATS

10.1. Seat – Driver

Driver's seat will have adjustment to accommodate the 5 percentile to 95 percentile adult male.

10.2. Seat – Technician

If second seat is provided in the driver's compartment it should accommodate the 5 percentile to 95 percentile adult male.

10.3. Seats – Technician's – In Patient Compartment

Two, fixed padded, 18" wide by 18" high; one fixed to bulkhead behind the driver, the other one may be bench type located on curb side of the vehicle. Space under the seats may be designed as storage compartments.

10.4. Safety Requirements – Seats

All seats shall meet appropriate section of FMVSS 207.

10.5. Safety Belts and Anchorage Requirements

Must comply with FMVSS 208, 209, and 210 where applicable.

11. WINDOWS, GLASS

Glazing materials, windows, and glass shall comply with FMVSS 205.

The patient's compartment shall not have windows except the glass viewing panel in the partition (8.5) and in the doors.

12. TOOL KIT -- VEHICLE MAINTENANCE

Space shall be provided to accommodate at least a wheel lug wrench and a jack (with capacity to raise one wheel of loaded vehicle).

13. SPARE TIRE

Space shall be provided to carry a spare wheel and tire. The spare shall be in a weather protected area or compartment accessible from outside the vehicle and easily available for quick replacement when needed. If in a compartment, the closure panel must be fitted with a suitable latch or lock. No loose or removable panels will be acceptable. The spare shall have a quick-action restraining device to eliminate rattles or thumping when in place. The jack and wheel lug wrench, listed in section 12. above, may be stored in the spare tire area or compartment.

14. MIRRORS

There shall be two exterior, rear-view mirrors, one mounted on the left side of the vehicle and one mounted on the right side. Location of mounting must be such as to provide maximum rear vision from the driver's seated position.

The field of view and mounting shall meet at least the requirements listed in FMVSS 111.

There shall be an interior rear-view mirror to provide the driver with a view of occurrences in the patient compartment.

15. WINDSHIELD

Material, installation, and application must comply with FMVSS 205 and 212.

15.1. Windshield Wipers and Washers

Windshield wipers and washers must comply with the regulations established by FMVSS 104.

15.2. Windshield Defrosting and Defogging

There must be a system provided to comply with the requirements established by FMVSS 103.

16. SUN VISORS

There shall be visors on the interior windshield header that are fully adjustable to minimize sun glare in the driver's eyes. These must comply with FMVSS 101, S3.1 (j), and FMVSS 201, S3.3 (S3.3.1 and S3.3.2).

17. PATIENT COMPARTMENT

Refer to items 1.1, 8.1, 8.2, and 8.3 for compartment capacity and size requirements.

17.1. Litter Fasteners

Crash-stable fasteners must be provided to secure litters to the floor or side walls. Litters must not be suspended by wall brackets or from the ceiling. Where a single patient may be centered in the area on the wheeled litter, additional attachments should be provided. Floor attachments shall be flush with the surrounding surface when not in use. Side wall attachments shall present a smooth surface when not in use.

17.2 Litter Restraint

If the litter is floor supported on its own support wheels, a means shall be provided to secure it in position under all conditions. These restraints shall permit quick attachment and detachment for quick transfer of patient.

17.3 Patient Restraint

A restraining device shall be provided to prevent longitudinal or transverse dislodgement of the patient during transit, or to restrain an unruly patient to prevent further injury or aggravation of his existing injury.

18. SAFETY REQUIREMENTS

A listing of applicable current Federal Motor Vehicle Safety

Standards may be found in Appendix B.

Each manufacturer involved in production of vehicles of composite design (e.g., body and chassis by different manufacturers), shall comply with the applicable FMVSS concerning his portion of the end product.

Final certification and labeling shall be the responsibility of the final manufacturer, as defined in the "Motor Vehicle Safety Act."

19. COMMUNICATIONS

Communications shall include two-way radio, intercom, public address, and optional telemetry equipment.

19.1. Two-Way Radio

19.1.1. Mobiles

Two-way radio mobile equipment shall be included which will provide a reliable system operating range of at least a 20-mile radius from the base station antenna. An RF power output of 25-50 watts will usually be required. The mobile installation shall provide microphones for transmitting at both the driver's position and in the patient's compartment. Selectable speaker outputs, singly and in combination, shall be provided at the driver's position, in the patient's compartment, and through the PA system.

19.1.2. Portable

Two-way radio portable equipment shall be included. The set shall comprise two units which are capable of providing reliable communication between each other and/or the mobile mounted unit over a range of at least 1250 feet. The units shall be designed to be conveniently carried by the technicians and to have weatherproof, high-impact housings.

19.2. Intercom

An intercommunication facility shall be provided between the driver's position and the patient compartment. The speaker/microphone unit in the patient compartment shall stand by in the "talk" mode. Any necessary talk/listen switching shall be done by the driver. The intercom amplifier shall be independent of the mobile radio equipment.

19.3. Siren—Public Address

Siren and public address systems shall be provided. If a combined electronic siren and public address system is provided, in siren operation, the power output shall be 100

watts. In voice operation the power output shall be 45 watts through exterior mounted speakers, at least one facing forward and one facing rearward.

The public address amplifier shall be independent of the mobile radio unit.

19.4. Telemetry Equipment

Space should be provided for installing optional physiological telemetry equipment. The estimated approximate space requirements for this equipment are 1.87 cubic feet, weight 50 pounds.

20. ENVIRONMENTAL EQUIPMENT

Environmental equipment shall be capable of maintaining inside temperature to a comfortable level in any extreme of ambient temperature within the geographic area of operation.

The various systems; heating, ventilation, and air conditioning shall be separate with one system in the driver's compartment and one system in the patient's compartment and shall be controlled within the compartment affected. The air system shall be of high-volume capacity with low-velocity delivery for minimum draft circulation.

20.1. Driver's Compartment

Driver's compartment shall have heating equipment and air conditioning equipment controlled by the driver for his personal comfort.

20.1.1. Heating

Shall be capable of heating the compartment to a temperature of 75°F within 15 minutes from a cold start and while driving in an ambient temperature of 0°F. It must be designed to recirculate inside air, also be capable of introducing 20% of outside air with minimum effect on inside temperature. Fresh air intake shall be located in the most practical contaminant-free air space on the vehicle.

20.1.2. Heating Control

Heating shall be manually controlled. Thermostatic control for the driver's compartment may be optional. The heater blower motors must be at least three (3) speed design. Switches and other control components must exceed in capacity the amperage and resistance requirements of the motors. Switches must be located on the switch panel within easy reach of the driver.

20.1.3. Ventilation

Ventilation for the driver may be achieved by degree of window and vent openings.

20.1.4. Ventilation Control

Ventilation control is not required except controls to open and close driver's compartment windows and vents.

20.1.5. Air Conditioning

Air conditioning shall have a capacity sufficient to lower the temperature in the driver's compartment to 75°F. within 15 minutes and maintain that temperature while operating in an ambient of 95°F. The unit must be designed to deliver 20% of fresh outside air of 95°F. ambient while holding the inside temperature specified. All parts, equipment, workmanship, etc., shall be in keeping with accepted air conditioning practices.

20.1.6. Air Conditioning Controls

The unit air delivery control may be manual or thermostatic. The reheat-type system is not required in the driver's compartment unit. Switches or other controls must be within easy reach of the driver in his normal driving position. Air delivery fan motor shall be at least three (3) speed design. Switches and other control components must exceed in capacity the amperage and resistance requirements of the motors.

20.2. Patient's Compartment

Patient's compartment shall have heating equipment, ventilation provisions, and air conditioning equipment. This equipment shall be thermostatically controlled for constant temperature level within plus or minus two (2) degrees. The thermostatic control is to be accessible to and controllable by the technician so that temperature alterations can be made to meet varying conditions.

20.2.1. Heating (combined with ventilation 20.2.3, and air conditioning 20.2.5).

Shall be capable of heating the compartment to a temperature of 75°F. within 15 minutes from a cold start and while driving in an ambient temperature of 0°F. It must be designed to recirculate inside air at the delivery volume of one (1) change per minute, also be capable of introducing 50% of outside air with minimum effect on inside temperature. Fresh air intake shall be located in the most contaminant-free air space on the vehicle. The heating air-circulation system must be combined with the air conditioning air-circulation system. Only in this way can the "reheat type" system be achieved.

20.2.2. Environmental Control

Heating shall be thermostatically controlled. The thermostat shall control both heating and air conditioning and shall be so designed as to give an even delivery of tempered air of a temperature necessary to maintain the desired interior comfort level. This tempered (heated and air conditioned air mixture) delivery is the "reheat type" system and eliminates the cycling delivery of heated (or ambient) air, then chilled air, to maintain a predetermined temperature.

The environmental control shall be accessible to and controllable by the technician so that changes can be made by him to meet varying conditions.

20.2.3. Ventilation

The patient's compartment shall be ventilated by the air delivery system of the environmental equipment.

20.2.4. Ventilation Control

Refer to Environmental Control 20.2.2.

It shall also be possible to separately control ventilation to provide a complete change of air within the patient compartment with outside air every two (2) minutes.

20.2.5. Air Conditioning (combined with heating 20.2.1. and ventilation 20.2.3.)

The patient's compartment shall be equipped with a unit capable of lowering the inside temperature to 75°F. within 15 minutes and maintain that temperature while operating in an ambient of 95°F. The unit is to be of the "reheat type" to eliminate chill cycling in maintaining the predetermined inside temperature. The unit must be of a capacity sufficient to permit introducing 50% outside air with minimum effect on inside temperature. Fresh air intake shall be located in the most contaminant-free air space on the vehicle. Air circulation in the patient compartment must be combined into one delivery system; heating, cooling, and ventilation.

The air conditioning unit shall incorporate a filter on the intake side of the evaporator unit; the filter shall be readily removable for cleaning. All parts, equipment, workmanship, etc. shall be in keeping with accepted air conditioning practices.

20.2.6 Air Conditioning Control

Refer to Environmental Control 20.2.2.

20.3. Insulation

The entire body; sides, ends, roof, floor, and patient compartment doors shall be insulated to minimize conduction of heat, cold, or external noise entering the vehicle interior. The insulation shall be vermin- and mildew-proof, fireproof, non-hygroscopic, non-settling type. Plywood floor when undercoated will be considered sufficient insulation for the floor area.

21. RESCUE EQUIPMENT

21.1. Equipment for Safeguarding Personnel

Estimated 8.0 cubic feet, 165 pound and 600-watt, 120-volt power requirement.

Weatherproof compartment space accessible from outside the patient compartment shall be provided for equipment for safeguarding of patients and technicians, controlling traffic and bystanders, and isolating and illuminating work areas. These items are:

- 12 flares, 30-minute illuminating, self-igniting type, of yellow color light,
- two flashlights, stand-up type, 6V, standard lantern battery powered,
- one fire extinguisher, type BC (dry power prefered). 5# size,
- two self-contained air masks[1] (not oxygen generating type), quick entry type (30 minutes),
- two portable floor lights, each 300W, 120V with stand; twist lock type, male connector with 100 ft. cords,
- two units, (one pair) portable radio (ref. 19.1.2),
- two pairs gauntlets, foam insulated, vinyl coated, fluorescent orange.

21.2. Equipment for Release from Entrapment or Confinement

Estimated minimal space requirement 10.0 cu. ft. Estimated minimal 255 pounds (does not include optional power saw).[2]

Weatherproof compartment space shall be provided outside the patient compartment for equipment for release from entrapment or confinement. These items are:

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(1) As determined by local hazards or ready availability from other sources. Estimated 100 pounds, 4.0 cubic feet.

(2) One, power saw, all-purpose, with masonry and steel cutting discs (optional).

one wrench 12", adjustable, open-end,

one screw driver, 12", regular blade,

one screw driver 12", Phillips type,

one hacksaw with 12 wire (carbide) blades,

one pliers 10", "vice grip,"

one hammer, 5#, 15" handle; one fire axe, butt, 24" handle; one wrecking bar 24"; separate, or as one combination tool,

one crowbar, 51", pinch point,

one bolt cutter, 39", jaw opening of 1-1/4",

one portable power jack and spreader tool, hand--powered, minimum 4-ton capacity,

one shovel, 49", pointed blade,

one double-action tin snip, hand, minimum 8",

two ropes, manila, 50' x 3/4" Dia.

21.3 Power Winch -- Optional

A mounted power winch, minimum 2-ton capacity, is recommended for vehicles serving areas where this item is not readily available. In addition to the cable, one 15' chain with one grab-hook and one running hook, to match the rated performance of the winch is recommended.

22. RESUSCITATION EQUIPMENT

22.1 Oxygen Installed*

An oxygen supply of at least 3,000 liters must be provided and be accessible for replacement, preferably from outside the patient compartment working space, weight 127.5 lbs., 2 cubic feet of space, length 48". The mounting and restraining means for the tank(s) must be crashworthy under all conditions.

The oxygen cylinder yoke must be accessible from inside the vehicle, preferably from the technician's seat at the vertex of the patient, and also from the site where the cylinder change is accomplished. Piped oxygen from the cylinder to the wall outlets is desirable. *One wall O_2 outlet minimum, but 2 are recommended.*

At least one O_2 wall outlet should be equipped with a plug-in flowmeter, humidifier, and delivery tube. If there is a second oxygen outlet, it will be used for plug-in devices not requiring humidification.

At the cylinder, there should be a reducing valve (from 2,000 lbs. per sq. inch cylinder pressure to 50 lbs. per sq. inch line pressure) with pressure gauge. The pressure gauge

*Integrity of the system should be ensured by daily inspection.

should preferably be visible to the attendant sitting at the vertex. There should be nearby, storage space for a wrench to be used during cylinder change.

22.1.1. Oxygen Portable*

A portable unit of 300 liter capacity located near a door for ready use outside the vehicle should be equipped with a yoke, pressure gauge, flowmeter (not gravity dependent), delivery tube and oxygen mask. The unit should be capable of delivering an oxygen flow of at least 10 liters/min. An extra 300-liter-capacity cylinder should be available.

22.1.2. Oxygen masks (with or without bags) should be semi-open, valveless transparent, disposable (or easy to clean and decontaminate), and in sizes for adults, children, and infants.

22.2. Suction — Piped

Installed suction should be powerful enough to provide an airflow of over 30 liters per minute at the end of the delivery tube and a vacuum of over 300 mm Hg to be reached within 4 seconds when the tube is clamped. The suction force should be controllable for use on children and intubated patients. The suction source must be reliable, e.g., from the automobile engine manifold, with a vacuum reservoir chamber in the line between vacuum source and wall outlet. The wall suction outlet should be of the plug-in type and located near the oxygen outlets, but far enough from those to permit easy handling of suction bottle and humidifier bottles. Into the wall suction outlet is plugged a reducing yoke and suction trap bottle of at least one liter capacity. A spare suction bottle is desirable and should be stored nearby. Both suction bottles, the one plugged into the wall and the spare one should be non-breakable. A suction tubing will lead from the suction bottle to the head of the patient on the wheeled stretcher as well as to the head of the patient on the bench (canvas stretcher).

There should be space near the patient's vertex for equipment to be used by the attendant sitting at the seat near the patient's vertex (e.g., shelf at stretcher height) for open storage of the following emergency items: bag-valve-mask unit with open-ended reservoir tube and O_2 delivery tube, O_2 bag mask inhalation unit, rigid pharyngeal suction tip, suction rinsing water bottle, pharyngeal tubes (airways), tongue blades, towels, pediatric mask for bag-valve-mask unit, spare sterile suction tips and catheters, Y connector for tracheal suctioning.

22.2.1. Suction — Portable

*Integrity of the system should be ensured by daily inspection.

The portable unit should provide vacuum and flow adequate for pharyngeal suction. The unit may be battery or foot powered. It should be fitted with a large bore, non-kinking suction tubing and a rigid pharyngeal suction tip.

23. BASIC SUPPLIES

Space for one pillow, two pillow cases, two spare sheets, four towels, six disposal emesis bags, two boxes disposable tissues, one stainless bed pan, one thermometer, disposable drinking cups, two sandbags, four blankets, one aneroid blood pressure manometer and cuff, one stethoscope.

24. EXTERNAL CARDIAC COMPRESSION

Space for the short backboard (Ref. 25) stored with a rolled sheet for insertion under the patient's shoulders, a head stabilizer device and two straps (Ref. 25)* for ready use in performing cardiopulmonary resuscitation. 8 pounds, 0.7 cubic feet.

25. IMMOBILIZATION OF FRACTURES

Space for one hinged, half-ring lower extremity traction splint, ring size of 9" and over-all length of 43", padded ankle-hitch or skin traction device; padded board splints for upper and lower extremities to include two 3" x 54", two 3" x 36", and two 3" x 15"; 24 triangular bandages; inflatable splints, two each, arm and leg size; and one short (Ref. 24) and one long backboard with three straps.* 20 pounds, 3.0 cubic feet.

26. WOUND DRESSING SUPPLIES

Space should be provided for 24 sterile gauze pads, 4" x 4"; 24 universal dressings, 8" x 30", packed flat (8" x 8"); one roll aluminum foil 18" x 25'; 12 soft-roller self-adhering bandages, 6" x 5 yds; two rolls adhesive tape, plain, 3"; one plastic bag of large safety pins; and two sterile burn sheets. 3 pounds 0.3 cubic feet.

27. SPECIAL EQUIPMENT FOR USE BY PHYSICIAN OR OTHERS TRAINED IN ITS USE

In anticipation of increasing participation by physicians at the scene of emergencies, and advanced training of greater number of technicians in the use of special equipment, design of the patient compartment must provide for adequate space for the following equipment: 96 pounds 6.0 cubic feet.

*Straps are 2" x 9'-0" of seat-belt material with slip-through buckle. Material must comply with FMVSS-209.

one tracheal intubation kit,

one pleural decompression set,

one drug-injection kit,

one tracheostomy or cricothyrotome set,

one portable cardioscope with external defibrillator,

one venous cutdown kit,

one mechanical external cardiac compression unit,

one minor surgical kit,

sterile urinary catheters.

28. EMERGENCY MEDICAL EQUIPMENT

Litters

Each ambulance shall be provided with one wheeled litter, one folding or adjustable litter, and a litter designed to carry a patient over stairways or other narrow areas. Space requirements in the patient compartment for the wheeled litter and folding or adjustable litter are based on sizes of the litters and access spaces necessary to patient care in transit. Overall dimensions are thus, width, two litters each 23" wide with space between adequate for performing cardiopulmonary resuscitation in the kneeling position; and length, 76" litters with 25" access space at the head and 15" access space at the foot. Additional space must be provided for storage of the litter used for narrow access areas, unless it is so designed as to serve both as the folding or adjustable litter and as the litter for stairways or other narrow areas.

29. INTRAVENOUS AGENT SUPPLIES

Spaces for four one-liter units, sterile, intravenous agents, preferably in plastic bags, such as isotonic saline solution, 5% dextrose in lactated Ringer's solution, 5% albumin, or dextran; and sterile, disposable intravenous administration sets and injection kits. 10 pounds, 0.8 cubic feet.

30. EMERGENCY CHILDBIRTH

Space for a kit containing sterile gloves, scissors, umbilical clamps or umbilical tape, sterile dressings and towels.

31. PORTABLE INCUBATOR

While a portable incubator is to be dispatched as required, space need not be allocated since this item would be secured to a litter near resuscitation equipment.

32. POISONING TREATMENT SUPPLIES

Space for Syrup of Ipecac, four ounces, one liter drinking water, and activated charcoal, one packet. Snakebite kits should be carried in the ambulance in areas where this need exists.

33. ARTIFICIAL VENTILATION SUPPLIES

Space for two bag-mask, hand-operated type units with masks in infant, child, and adult sizes; mouth airways, one each in child and adult sizes; oropharyngeal airways, six each in infant, child, and adult sizes; two mouth gags, commercial type or two or more tongue blades taped together, padded; one 6" bandage shears; and various sizes of 15mm male type tracheostomy adapters.

APPENDIX A

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APPENDIX B

BRIEF DESCRIPTION OF APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS

The Committee has considered the standards listed below as being applicable either in entirety or in part as described in the system description (Refer to Items 2.8 and 18.)

NUMBER 101

TITLE: Control Location, Identification, and Illumination

PURPOSE & SCOPE: This standard specifies the requirements for location and identification of certain driver controls to facilitate their selection and ensure their accessibility.

NUMBER 102

TITLE: Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect

PURPOSE & SCOPE: This standard specifies the requirement for the transmission shift lever sequence, a starter interlock, and for a braking effect of automatic transmissions, to reduce the likelihood of shifting errors, starter engagement with vehicle in drive position, and to provide supplemental braking at speeds below 25 miles per hour.

NUMBER 103

TITLE: Windshield Defrosting and Defogging Systems

PURPOSE & SCOPE: This standard specifies requirements for providing vision through the windshield during frosting and fogging conditions.

NUMBER 104

TITLE: Windshield Wiping and Washing Systems

PURPOSE & SCOPE: This standard specifies requirements for windshield wiping and washing systems.

NUMBER 105

TITLE: Hydraulic Brake Systems

PURPOSE & SCOPE: This standard specifies requirements for hydraulic service brake, emergency brake, and parking brake systems intended to ensure adequate braking performance under normal and emergency conditions.

NUMBER 106

TITLE: Hydraulic Brake Hoses

PURPOSE & SCOPE: This standard specifies requirements for hydraulic brake hoses that will reduce brake failures due to fluid leakage.

NUMBER 107

TITLE: Reflecting Surfaces

PURPOSE & SCOPE: This standard specifies reflecting surface requirements for certain vehicle components in the driver's field of view.

NUMBER 108

TITLE: Lamps, Reflective Devices, and Associated Equipment

PURPOSE & SCOPE: This standard specifies requirements for lamps, reflective devices and associated equipment, for signalling and to

enable safe operation in darkness and other conditions of reduced visibility.

NUMBER 109

TITLE: New Pneumatic Tires

PURPOSE & SCOPE: This standard specifies tire dimensions and laboratory test requirements for bead unseating resistance, strength, endurance, and high speed performance; defines tire load ratings; and specifies labeling requirements.

NUMBER 110

TITLE: Tire Selection and Rims

PURPOSE & SCOPE: This standard specifies requirements for the tire selection to prevent tire overloading.

NUMBER 111

TITLE: Rear View Mirrors

PURPOSE & SCOPE: This standard specifies requirements for rearview mirrors to provide the driver with a clear unobstructed view to the rear.

NUMBER 113

TITLE: Hood Latch System

PURPOSE & SCOPE: This standard establishes the requirements for providing a hood latch system or hood latch systems.

NUMBER 114

TITLE: Theft Protection

PURPOSE & SCOPE: This standard specifies requirements for theft protection to reduce the incidence of accidents resulting from unauthorized use.

NUMBER 115

TITLE: Vehicle Identification

PURPOSE & SCOPE: This standard specifies requirements for vehicle identification numbers to reduce the incidence of accidents resulting from unauthorized use.

NUMBER 116

TITLE: Specifications for Hydraulic Brake Fluids

PURPOSE & SCOPE: Specifications for hydraulic brake fluid for motor vehicles. Originated under authority of Public Law 87-637, and incorporated into the Federal Motor Vehicle Safety Standards by the Vehicle Safety Act of 1966.

NUMBER 201

TITLE: Occupant Protection in Interior Impact

PURPOSE & SCOPE: This standard specifies initial requirements to afford impact protection for occupants.

NUMBER 202

TITLE: Head Restraints

PURPOSE & SCOPE: This standard specifies requirements for head restraints to reduce the frequency and severity of neck injury in rear end and other collisions.

NUMBER 203

TITLE: Impact Protection for the Driver from Steering Control System

PURPOSE & SCOPE: This standard specifies requirements for steering control

systems that will minimize chest, neck, and facial injuries to the driver as a result of impact.

NUMBER 204

TITLE: Steering Control Rearward Displacement

PURPOSE & SCOPE: This standard specifies requirements limiting the rearward displacement of the steering control into the passenger compartment to reduce the likelihood of chest, neck, or head injury.

NUMBER 205

TITLE: Glazing Materials

PURPOSE & SCOPE: This standard specifies requirements for glazing materials to reduce lacerations to the face, scalp, and neck, and to minimize the possibility of occupants being thrown through the vehicle windows in collisions.

NUMBER 206

TITLE: Door Locks and Door Retention Components

PURPOSE & SCOPE: This standard specifies load requirements for door latch and hinge systems and lock requirements to minimize the likelihood of occupants being thrown from the vehicle as a result of impact.

NUMBER 207

TITLE: Anchorage of Seats

PURPOSE & SCOPE: This standard establishes requirements for seats, their attachment assemblies, and their installation to minimize the possibility of failure by forces acting on the seat as a result of vehicle impact.

NUMBER 208

TITLE: Occupant Crash Protection

PURPOSE & SCOPE: This standard establishes requirements for seat belt installations.

NUMBER 209

TITLE: Seat Belt Assemblies

PURPOSE & SCOPE: This standard specifies the requirements for seat belt assemblies.

NUMBER 210

TITLE: Seat Belt Assembly Anchorages

PURPOSE & SCOPE: This standard specifies the requirements for seat belt assembly anchorages to ensure proper location for effective occupant restraint and reduce the likelihood of failure in collisions.

NUMBER 211

TITLE: Wheel Nuts, Wheel Discs, and Hub Caps

PURPOSE & SCOPE: This standard precludes the use of wheel nuts, wheel discs, and hub caps that constitute a hazard to pedestrians and cyclists.

NUMBER 212

TITLE: Windshield Mounting

PURPOSE & SCOPE: This standard establishes windshield retention requirements for windshield mounting.

NUMBER 301
TITLE: Fuel Tanks, Fuel Tank Filler Pipes, and Fuel Tank Connections
PURPOSE & SCOPE: This standard specifies requirements for the integrity and security of fuel tanks, fuel tank filler pipes, and fuel tank connections to minimize fire hazard as a result of collision.

APPENDIX G

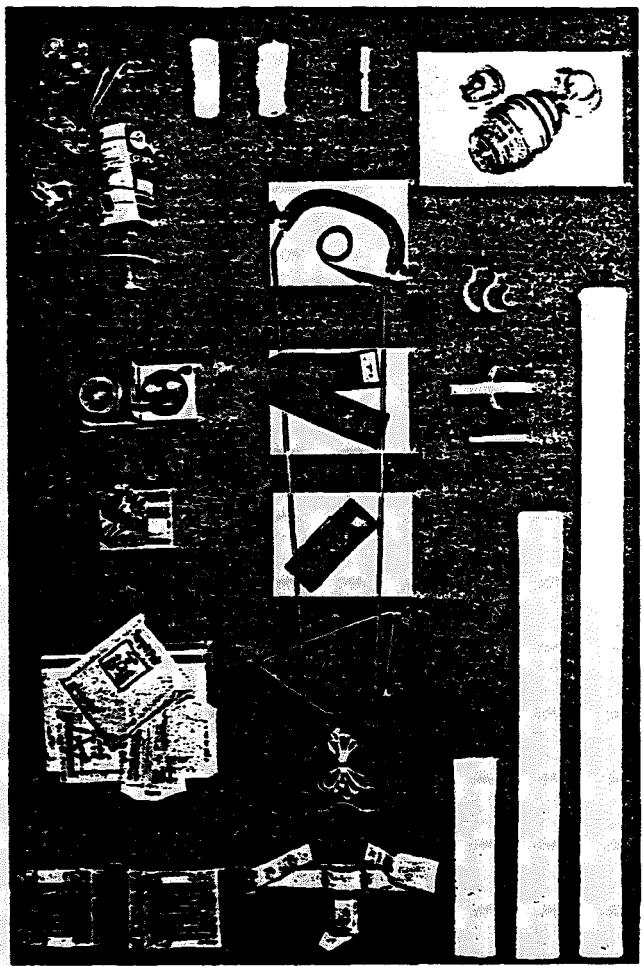
AMERICAN COLLEGE OF SURGEONS' ESSENTIAL EQUIPMENT FOR AMBULANCES

Essential equipment for ambulances

THE EQUIPMENT shown in the accompanying photographs is considered by the Committee on Trauma to be that which is essential if the emergency medical technician (ambulance attendant) is to provide adequate care for the critically ill and injured at the emergency scene and during transport to medical facilities.

These items are:

1. Portable suction apparatus with wide-bore tubing and rigid pharyngeal suction tip
2. Hand operated bag-mask ventilation unit with adult-, child-, and infant-size masks. Clear masks are preferable. Valves must operate in cold weather, and unit must be capable of use with oxygen supply
3. Oropharyngeal airways in adult, child, and infant sizes
4. Mouth-to-mouth artificial ventilation airways for adults and children
5. Portable oxygen equipment with adequate



Essential equipment for an ambulance shown here is (left from top down) oxygen; foot-powered suction pump; poison kit; obstetrics kit; inflatable splints; (center from top down) soft roller bandages and mouth gag; traction splint with slings, ankle hitch and traction strap; (right from top down) bag-mask resuscitator; oropharyngeal airways; two-way airways; padded boards.

tubing and semi-open, valveless, transparent masks in adult, child, and infant sizes

6. Mouth gags, either commercial or made of three tongue blades taped together and padded

7. Sterile intravenous agents, preferably in plastic bags, with administration kits

8. Universal dressings, approximately 10 inches by 36 inches, compactly folded and packaged in convenient size

9. Sterile gauze pads, 4 inches by 4 inches

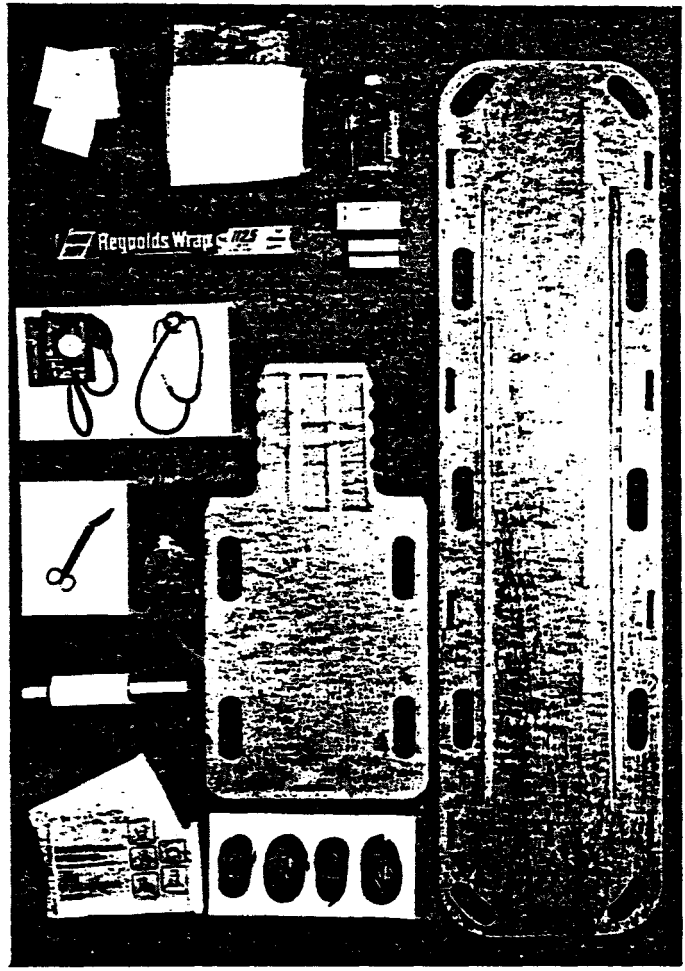
10. Soft roller self-adhering type bandages, 6 inches by 5 yards

11. Roll of aluminum foil, 18 inches by 25 feet, sterilized and wrapped

12. Two rolls of plain adhesive tape, 3 inches wide

13. Two sterile burn sheets

14. Hinged half-ring lower extremity traction



Shown here are (left from top down) gauze pads and burn sheets; aluminum foil; blood pressure manometer cuff and stethoscope; shears; safety pins; adhesive tape; universal dressing; (center from top down) infusion agents, tubing, needles; short and long spine boards; straps for boards.

splint (ring 9 inches in diameter, over-all length of splint 43 inches) with commercial limb-support slings, padded ankle hitch, and traction strap

15. Two or more padded boards, 4½ feet long by 3 inches wide, and two or more similarly padded boards, 3 feet long, of material comparable to four-ply wood for coaptation splinting of leg or thigh

16. Two or more 15-inch by 3-inch padded wooden splints for fractures of the forearm.

(By local option, similar splints of cardboard, plastic, wire ladder, or canvas slotted lace-on may be carried in place of the above 36-inch and 15-inch boards.)

17. Uncomplicated inflatable splints in addition to Item 16 above or as substitute for the short boards

18. Short and long spine boards with accessories

19. Triangular bandages

20. Large-size safety pins

21. Shears for bandages

22. Sterile obstetrical kit

23. Poison kit

24. Blood pressure manometer, cuff, and stethoscope

The foregoing is the second revision of what was formerly described as a "*minimal* equipment for ambulances" list which the Committee on Trauma established in 1961 and which, subsequently, became the standard for ambulance services throughout the United States and Canada. Its name has been changed to "*Essential* equipment for ambulances," thus giving it more meaning and avoiding the suggestion that it represents only the very least equipment with which an operator might equip his vehicle.

The present list contains seven new items—intravenous agents, blood pressure manometer, cuff and stethoscope, an obstetrical kit, a poison kit, inflatable splints, aluminum foil, and burn sheets.

The tourniquet and elastic bandages which were on the 1961 list are purposely omitted here. In thus forcing a technician to improvise a tourniquet, the Committee on Trauma hopes to make him think carefully before he uses one, thereby minimizing the indiscriminate use of same.

To eliminate the danger of deleterious pressure if improperly applied, elastic bandages have been replaced by soft roller-type bandages.

Of the seven new items, the intravenous agents are essential if the patient is to be treated for shock at the emergency scene and during transportation to medical facilities. Although the technique of infusion is a recommended part of the basic training program for technicians, the exact agents to be used and their use should be determined by the local physician and preferably via radio control.

The technique of blood pressure monitoring is readily acquired during the in-hospital sessions of the basic training program.

The obstetrical kit should contain a minimum of sterile gloves, scissors, umbilical cord clamps or tapes, sterile dressings, towels, and plastic bags. Satisfactory disposable units are available. Burn sheets may be used as drapes if necessary.

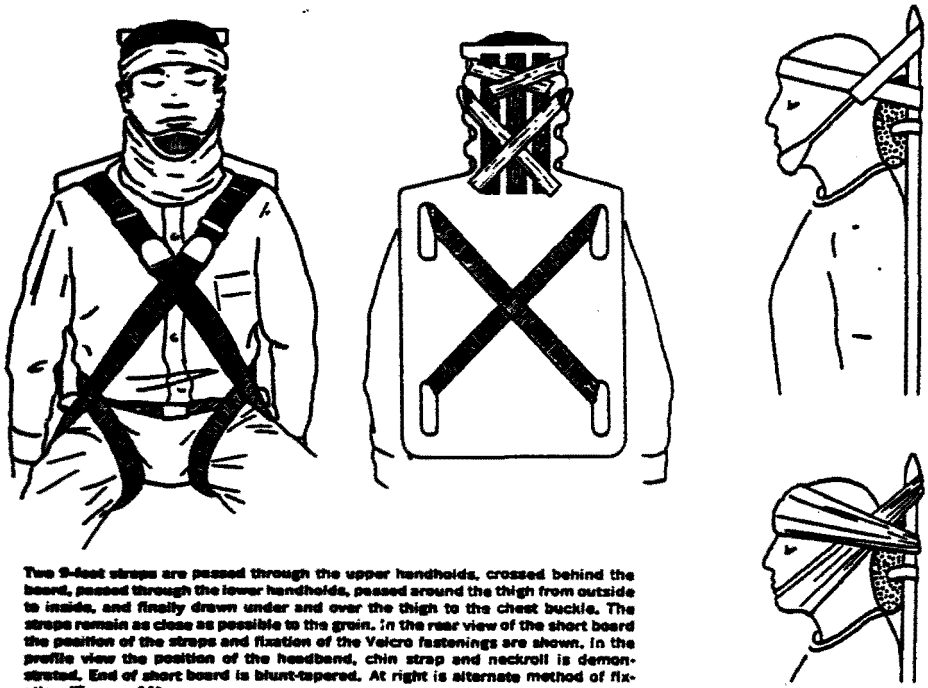
Consultants knowledgeable in the field of poisoning control recommend that syrup of Ipecac and activated charcoal be the contents of the poison kit. In the conscious patient, emptying of the stomach by vomiting is considered the optimum treatment in poisoning, except when poisoning is due to corrosives or petroleum products.

Uncomplicated inflatable splints are satisfactory for fractures at and below the knee and at and below the elbow. The hand and foot must be included, and the splint is to be inflated only by lung pressure. Pressure in the splint must be controlled, especially in situations where it is applied in cold weather and, shortly thereafter, the patient is transferred to a heated ambulance.

Aluminum foil is useful as an occlusive and nonadherent dressing.

An effective emergency incubator may be

The Subcommittee on Pre-hospital Emergency Services which on behalf of the Committee on Trauma developed the accompanying list of essential ambulance equipment consists of J. D. Farrington, Minocqua, Wisconsin, chairman; Robert H. Brown, Bethesda; Francis J. Cox, San Francisco; Walter A. Hoyt, Jr., Akron, Ohio; William R. MacAusland, Jr., Boston; Charles S. Neer II, New York; and Watts R. Webb, Syracuse.



Two 9-foot straps are passed through the upper handholds, crossed behind the board, passed through the lower handholds, passed around the thigh from outside to inside, and finally drawn under and over the thigh to the chest buckle. The straps remain as close as possible to the groin. In the rear view of the short board the position of the straps and fixation of the Velcro fastenings are shown. In the profile view the position of the headband, chin strap and neckroll is demonstrated. End of short board is blunt-tapered. At right is alternate method of fixation (E, page 11).

Equipment for the short board consists of headband, chin strap and neck roll.

Headband (Fig. 1), which measures 42 inches, has:

a. Padded section;
b. Thin webbing 2 inches wide;
c. Strip of looped or pile Velcro.

Fig. 1

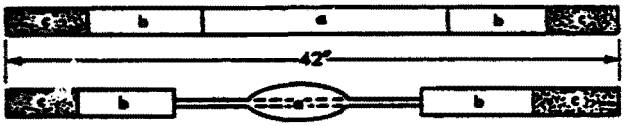


Fig. 2

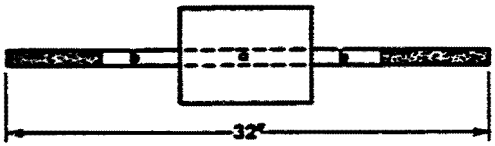


Fig. 3

Chin strap (Fig. 2), which measures 42 inches, has:

a. Regulation football chin strap;
b. Thin webbing 2 inches wide;
c. Strip of looped or pile Velcro.

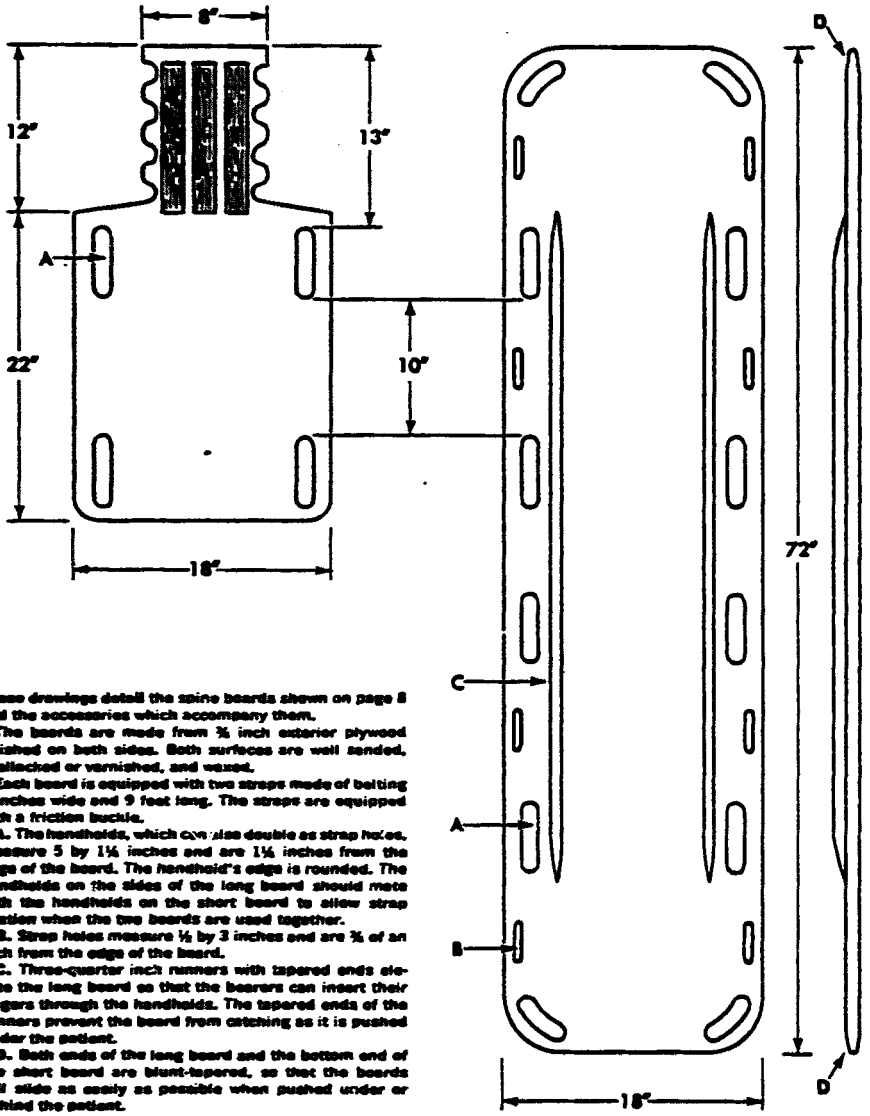
Neck roll (Fig. 3), which measures 32 inches, has:

a. Foam rubber roll 8 inches wide and 6 inches in diameter, covered for protection first with plastic, then stockinette, both disposable and easily replaceable;
b. Thin webbing 1-inch wide;
c. Strip of looped or pile Velcro.

Ends (looped or pile Velcro) of straps grab strips of Velcro with hook surface affixed to back of head piece on the short board.

The neck roll is seldom used. It is necessary in rare fracture-dislocations of the neck in which the head is fixed in an awkward position. A heavy folded towel will serve well as a substitute.

Velcro is a fastener. It consists of two strips of nylon tape—one covered with minute hooks, the other with minute loops forming a pile surface—which lock securely when pressed together, open when peeled apart.



These drawings detail the spine boards shown on page 8 and the accessories which accompany them.

The boards are made from ¾ inch exterior plywood finished on both sides. Both surfaces are well sanded, shellacked or varnished, and waxed.

Each board is equipped with two straps made of belting 2 inches wide and 9 feet long. The straps are equipped with a friction buckle.

A. The handholds, which can also double as strap holes, measure 5 by 1¼ inches and are 1¼ inches from the edge of the board. The handhold's edge is rounded. The handholds on the sides of the long board should mate with the handholds on the short board to allow strap fixation when the two boards are used together.

B. Strap holes measure ½ by 3 inches and are ¾ of an inch from the edge of the board.

C. Three-quarter inch runners with tapered ends elevate the long board so that the bearers can insert their fingers through the handholds. The tapered ends of the runners prevent the board from catching as it is pushed under the patient.

D. Both ends of the long board and the bottom end of the short board are blunt-tapered, so that the boards will slide as easily as possible when pushed under or behind the patient.

E. The edges of the head portion of the short board are serrated to allow an alternate method of fixation of the head. One or more 6-inch soft roller bandages are wrapped about the board, forehead and chin. The serrations prevent the bandage from slipping.

constructed by wrapping a premature infant in foil, leaving its face free.

Ordinary bed sheets—wrapped sterilized, and packaged in plastic bags—provide excellent dressings for burns of any magnitude.

The short and long spine boards are essential for safe removal of various injured patients, especially those with actual or suspected damage to the spine. Either board is also useful in providing a firm surface on the wheeled stretcher for performance of cardiopulmonary resuscitation. The straps of 2-inch belting should be at least 9 feet long and equipped with slip-through friction catches. While various kinds of short boards are in use, the one shown here is similar to that described by Louis C. Kossuth in the September 1966 *Journal of Trauma*.

Both spine boards have been modified as a result of extensive use. Drawings on pages 10 and 11 give details.

The Universal dressing unfolds to 10 inches by 18 inches or to 10 inches by 36 inches and affords adequate coverage for any wound. It may be used also as padding for splints. When two dressings are folded together lengthwise,

Hand operated bag-mask ventilation units *for ambulance use**

As evaluated by Emergency Care Research Institute, Philadelphia**

Name	One-year shelf life	Low-temperature operation 32° F. or below	Clear mask	Ease of cleaning	Comments
Resusci folding bag Mark II Laerdal Medical Corp.	good	good	yes	good	Oxygen reservoir supplied
PMR Puritan-Bennett Corp.	good	good	no	good	relatively heavy
AGA Revivator AGA Aktiebolag	good	good	no	poor	oxygen reservoir permanently attached; relatively fatiguing to operate
Hope Ohio Chemical & Surgical Equipment Company	good	valve freezes	no	good	with high oxygen flow, valve may lock in inspiratory position
Ambu Air-Shields, Inc.	fair	valve freezes	no	poor	valve may lock (see comments on Hope, above)
Air-Viva Bird Corp.	good	valve freezes, bag inoperable	yes	poor	10 to 20 per cent of expired air is rebreathed with each cycle
Pulmonator Corbin-Farnsworth, Inc.	good	bag inoperable	no	good	relatively fatiguing to operate; manufacturer states unit tested no longer produced
Porton Greiner Scientific Corp.	good	good	no	poor	mechanical defects cause large leaks to develop in folds of bellows
Clar Aire** Clar Aire Corp.					
Res-Q-Aire** Res-Q-Aire, Inc.					

*In "estimated order of preference," according to the Emergency Care Research Institute.

**These two units, Clar Aire and Res-Q-Aire, were listed by the Emergency Care Research Institute and described as "ineffective and dangerous; should be removed from service." In a letter to the editor of J.A.M.A (vol. 210, no. 7) Joel J. Nebel, M.D., Director of Research, E. C. R. I., drew attention to the widespread distribution of these two dangerous emergency respiration support units and urged all physicians, other health authorities, and health organizations to destroy all of the devices in their possession and to encourage others to follow suit. In the *EHS Memo* of December 30, 1969 is a report on the manually-operated emergency ventilation devices tested by the Emergency Care Research Institute.

they form an effective cervical collar which may be held in place either by safety pins or by wrapping with a soft roller bandage.

The Universal dressing is available commercially but is easily made locally by cutting bolts of standard "A.B.D." material into 36-inch lengths, folding these from each end to the center three times, and packaging each in a paper bag, the end of which is sealed by stapling. After sterilization, each packaged dressing is placed individually in a plastic bag which also contains a 6-inch soft roller bandage.

The hand operated bag-mask ventilation unit is superior to the mechanical resuscitator or pulmotor. It is simply constructed, it performs adequately, and the operator may make immediate pressure adjustments simply by changing his hand pressure. The unit is also much less costly than the mechanical resuscitator or pulmotor.

The major advantage of the bag-mask unit is that it permits the technician to direct attention to the patient rather than to apparatus.

For effective pharyngeal suction a minimum vacuum of 12 inches of mercury (20 inches optimal) and free air flow of over 30 liters per minute at the delivery tube, with rapid drawdown time, is required.

Some types of bag-mask ventilation units and portable suction apparatus, with a description of their characteristics, are named on opposite page and this page, respectively.

Litters, and safety and housekeeping equipment, are not specified, since it is assumed that these basic items, as well as *installed* suction and oxygen, will be carried.

In anticipation of more advanced training in the use of specialized equipment for greater numbers of technicians, and the occasional presence of physicians at the scene of emergencies, additional equipment may be carried in a sealed container, depending on local conditions and decisions.

These items are:

Tracheal intubation kit
Pleural decompression set
Drug injection kit
Venous cut-down kit
Minor surgery kit
Tracheostomy or cricothyrotome set
Urinary catheters
Portable cardioscope and defibrillator

Suction units for ambulance use*

Name and manufacturer	Vacuum in inches of mercury	Rate of air flow per minute
Vaculette Corbin-Farnsworth Inc.	25	17 liters
Laerdal suction unit Laerdal Medical Corp.	25	50 liters
Ambu foot-powered unit Air-Shields, Inc.	12	12 liters**

* Performance data supplied by manufacturer
**Approximately

Unless a rescue vehicle accompanies an ambulance on every accident call, certain access and extrication equipment should be carried. The time element in life-threatening problems is so critical that, if the technicians must await the arrival of such equipment, lives that could be saved will be lost.

Specifically, these items are:

One wrench, 12 inches, with adjustable open end
One screw driver, 12 inches, with regular blade
One screw driver, 12 inches, Phillips type
One hacksaw with 12 wire (carbide) blades
One pliers, 10-inch vise-grip
One 5-pound hammer with 15-inch handle
One fire axe butt with 24-inch handle
One 24-inch wrecking bar (bar and two preceding items can either be separate or combined as a forcible entry tool)
One crowbar, 51 inches, with pinch point
One bolt cutter with 1¼-inch jaw opening
One portable power jack and spreader tool
One shovel, 49 inches, with pointed blade
One double-action tin snip, minimum, of 8 inches
Two manila ropes, each 50 feet long and ¾ of an inch in diameter

A power winch is optional. A front-mounted winch, with a minimum capacity of two tons, is recommended, particularly in areas where it would not otherwise be readily available. In addition to rated cable, ambulance should carry a 15-foot rated chain with one grab hook and one running hook.