

TB 43-0213

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

**CORROSION PREVENTION
AND CONTROL**

**INCLUDING RUSTPROOFING PROCEDURES
FOR
TACTICAL VEHICLES AND TRAILERS**

This technical bulletin supersedes TB 43-0213, 22 August 1983.

Approved for public release: distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

4 December 1990

WARNING SUMMARY

The following is a list of some of the WARNINGS that appear in this Technical Bulletin, as well as general safety precautions that are not related to any specific procedure and do not appear elsewhere in this publication. Rustproofing technicians must become familiar with all warnings and general safety precautions. Severe injury, health hazards, and death can be avoided by technicians who know and understand these warnings.

- High pressure spray can cause serious injury or death. Never put hands, or any other part of the body, in front of the rustproofing spray tool. Severe infection, blood poisoning, and gangrene requiring amputation of a limb can result from skin penetration of the rustproofing material under high pressure. Summon a physician immediately! Inform the physician that the material injected into the skin is a petroleum compound containing aliphatic petroleum naphtha with an effect similar to kerosene.
- Injection injuries can occur as a result of pinhole leaks, splits, or rupture in the hosing due to wear, damage, or misuse. Never use a damaged hose. Never attempt to contain sudden hose leaks with hands. Instead, stand clear of ruptures and shut down the pump. Always check hosing and couplings before use. If couplings disconnect during operation, never attempt to recouple with the pump still running. Never mend damaged hose with tape or any other device. Repaired hoses cannot effectively contain high pressure fluids and are extremely dangerous.
- Whenever the rustproofing procedure requires the use of a hoist, ensure that the hoist has the capacity to lift and secure the vehicle. Hoist used must be equipped with a safety bar or safety locking device. Operation of the safety bar or locking device should be checked daily.
- Open air compressors should have drive belts enclosed with a wire mesh screen. Air compressors used must be equipped with a safety valve in good working order,
- Silica exposure hazards exist whenever sand particles are injected into the air. Wet sandblasting lessens health risks, but care must be taken to ensure that applicators use the recommended protective equipment. Silica exposure due to failure to wear protective equipment can result in silicosis, a lung disease similar to emphysema.
- Drilling metals can be extremely dangerous. Wear proper eye protection and keep hands away from cutting tool. Sharp fragments may remain around the drilling area. Use extreme caution when touching these areas.
- DO NOT smoke in the work area. Airborne rustproofing material is flammable. Fire extinguishers must be readily available. Personnel must be familiar with the use of fire extinguishers. Fire extinguishers should be inspected on a regular basis and recharged as soon as possible after use.
- "No Smoking" signs must be prominently displayed in the rustproofing area. Phone numbers for the nearest fire department and ambulance service should be displayed near each phone.
- Rustproofing compound should never be stored in an area where the temperature is above 100 degrees F (38 degrees C). Dispose of empty drums immediately. Solvents must be stored in approved containers (metal cans with automatic safety lids). Excessive amounts of solvents should never be ordered and stored in the facility,
- Personnel must be aware of rustproofing materials and various solvent hazards before using such materials.
- Work areas must be kept clean to prevent accidents. All used rags should be stored in approved safety cans. Debris should not be allowed to accumulate on the work area floor as it will present tripping and fire hazards,
- Goggles or safety glasses and a protective mask should be worn during all phases of the rustproofing procedure. When processing the underside of the vehicle, use of goggles and a safety mask is essential to safety of personnel. Shoes with non-skid soles, an apron glove, and a long-sleeved shirt should also be worn.

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- Rustproofing work areas must be adequately ventilated. All personnel in immediate adjacent areas where rustproofing material is being sprayed should also wear an approved respirator mask.
- High pressure washers can discharge water and debris through vent holes in excess of 1200 psi (8274 kPa). High pressure washer operators must direct all personnel to stand clear of the vehicle during cleaning operations. Operators must wear eye protection to prevent serious injury from wash-back during cleaning operations.
- Electrical receptacles in work areas must be properly seated and grounded. Electrical cords used must be in good condition and provide grounding for the tool.
- Static electricity is created by a high velocity flow of fluid through the pump and hose. For this reason, the dispensing system must be properly grounded. If not, sparking may occur which can ignite fumes from solvents, dust, or other flammable substances. Spark ignition of flammable materials can result in an explosion and serious bodily injury. To prevent such hazards, ensure that the equipment is properly grounded.
- For first aid information, refer to FM 21-11.

TECHNICAL BULLETIN

NO. 43-0213

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 4 December 1990**DEPARTMENT OF THE ARMY TECHNICAL BULLETIN****CORROSION PREVENTION AND CONTROL
INCLUDING RUSTPROOFING PROCEDURES
FOR TACTICAL VEHICLES AND TRAILERS****REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended *Changes to Publications and Blank Forms*), or DA Form 2028-2, located in the back of this manual, direct to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000, A reply will be furnished to you.

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CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Purpose.

a. This technical bulletin (TB) provides an overview of the U.S. Army's Corrosion Prevention and Control (CPC) program, as well as specific instructions for rustproofing select tactical wheeled vehicles and trailers.

b. This technical bulletin defines types of corrosion as well as key corrosion prevention techniques and materials, material application instructions, and important application safety hazards. This bulletin describes rustproofing equipment available to using units. Equipment operation, maintenance, and troubleshooting procedures are also covered.

c. This technical bulletin is designed to provide a better understanding of rust, its causes, treatment, and prevention. It includes a detailed introduction to rustproofing materials, equipment, and application techniques. Finally, it contains vehicle specific instructions for rustproofing all tactical vehicles and trailers listed in Tables 1-1 and 1-2.

d. One additional objective of this technical bulletin is to provide rustproofers with the expertise necessary to adapt rustproofing techniques to other vehicles and trailers not specifically addressed in this TB.

1-2. Scope.

a. These instructions are applicable to all commands, units (including Army National Guard and Army Reserve), installations, and activities. Implementation of this bulletin by commanders is mandatory wherever corrosion prone or corrosion hazard environments dictate essentiality of corrosion prevention measures,

b. Saltwater coastal areas, high humidity regions, and all locations requiring use of halite (road salt) for snow and ice removal are prime areas for the applications of CPC measures. Areas prone to

industrial pollution, atmospheric pollution (smog), and acid rain are also prime areas for application.

1-3. Reporting of Equipment improvement Recommendations (EIRs).

EIRs can be submitted by anyone who is aware of an unsatisfactory condition, material, material application procedure, as well as with any unsatisfactory condition in the design or use of any of the rustproofing equipment described herein. It is not necessary to show a new design or to list a better way to perform a procedure. Rather, simply tell why a procedure is difficult. EIRs may be submitted on Standard Form 368 (*Quality Deficiency Report*). Mail directly to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-QRT, Warren, MI 48397-5000. A reply will be furnished directly to you,

1-4. Policies/Specifications.

a. Unit participation in the CPC Program is mandatory. At the very least, unit participation is limited to scheduled Preventive Maintenance Checks and Services (PMCS). This is because corrosion awareness and early preventive measures greatly reduce Army vehicle maintenance cost and extend the service life of all equipment.

b. The following regulation applies to the Corrosion Prevention and Control Program: AR 750-59, *Corrosion Prevention and Control*.

1-5. Vehicle Applications.

a. Table 1-1 lists all tactical vehicles with specific rustproofing instructions in this TB. This list is in simple alphanumeric order according to model number and provides the chapter(s) where each model's rustproofing instructions can be found.

b. Table 1-2 lists all trailers presented in this TB along with chapter references.

Table 1-1. Tactical Vehicle Rustproofing Instructions.

Model	Description	Vehicle Series	Chap	Model	Description	Vehicle Series	Chap
M34	Truck, Cargo, 2½-Ton	M44	7,8	M342	Truck, Dump, 2½-Ton	M44	7,9
M35	Truck, Cargo, 2½-Ton	M44	7,8	M342A2	Truck, Dump, 2½-Ton	M44	7,9
M35A1	Truck, Cargo, 2½-Ton	M44	7,8	M543	Truck, Wrecker, 5-Ton	M39	7
M35A2	Truck, Cargo, 2½-Ton	M44	7,8	M543A1	Truck, Wrecker, 5-Ton	M39	7
M35A2C	Truck, Cargo, 2½-Ton	M44	7,8	M543A2	Truck, Wrecker, 5-Ton	M39	7
M36A2	Truck, Cargo, 2½-Ton	M44	7,8	M718	Truck, Ambulance, ¼-Ton	M151	4
M49A1C	Truck, Fuel Tanker, 2½-Ton	M44	7,11	M718A1	Truck, Ambulance, ¼-Ton	M151	4
M49A2C	Truck, Fuel Tanker, 2½-Ton	M44	7,11	M756A2	Truck, Pipeline, 2½-Ton	M44	7
M49C	Truck, Fuel Tanker, 2½-Ton	M44	7,11	M764	Truck, Polesetting, 2½-Ton	M44	7
M50A1	Truck, Water Tanker, 2½-Ton	M44	7,10	M813A1	Truck, Cargo, 5-Ton	M809	7
M50A2	Truck, Water Tanker, 2½-Ton	M44	7,10	M814	Truck, Cargo, 5-Ton	M809	7
M50A3	Truck, Water Tanker, 2½-Ton	M44	7,10	M815	Truck, Bolster, Logging, 5-Ton	M809	7
M51	Truck, Dump, 5-Ton	M39	7,14	M816	Truck, Wrecker, 5-Ton	M809	7
M51A1	Truck, Dump, 5-Ton	M39	7,14	M817	Truck, Dump, 5-Ton	M809	7
M51A2	Truck, Dump, 5-Ton	M39	7,14	M818	Truck, Tractor, 5-Ton	M809	7
M52	Truck, Tractor, 5-Ton	M39	7	M819	Truck, Tractor-Wrecker, 5-Ton	M809	7
M52A2	Truck, Tractor, 5-Ton	M39	7	M820	Truck, Van, Expansible, 5-Ton	M809	7
M54	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M820A1	Truck, Van, Expansible, 5-Ton	M809	7
M54A1	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M820A2	Truck, Van, Expansible, 5-Ton	M809	7
M54A1C	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M821	Truck, Stake, Bridge, 5-Ton	M809	7
M54A2	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M825	Truck, Utility, ¼-Ton (w/106 Recoil)	M151	4
M54A2C	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M880	Truck, Cargo, 1¼-Ton	M880	5
M55	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M881	Truck, Cargo, 1¼-Ton	M880	5
M55A1	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M882	Truck, Cargo, 1¼-Ton	M880	5
M55A2	Truck, Cargo, 5-Ton (Dropside)	M39	7,13	M883	Truck, Cargo, 1¼-Ton	M880	5
M109	Truck, Van, 2½-Ton	M44	7,12	M884	Truck, Cargo, 1¼-Ton	M880	5
M109A2	Truck, Van, 2½-Ton	M44	7,12	M885	Truck, Cargo, 1¼-Ton	M880	5
M109A3	Truck, Van, 2½-Ton	M44	7,12	M886	Truck, Ambulance, 1¼-Ton	M880	5
M151	Truck, Utility, ¼-Ton	M151	4	M888	Truck, Telephone Maint., 1¼-Ton	M880	5
M151A1	Truck, Utility, ¼-Ton	M151	4	M890	Truck, Cargo, 1¼-Ton	M880	5
M151A1C	Truck, Utility, ¼-Ton	M151	4	M891	Truck, Cargo, 1¼-Ton	M880	5
M151A2	Truck, Utility, ¼-Ton	M151	4	M892	Truck, Cargo, 1¼-Ton	M880	5
M185A2	Truck, Van, 2½-Ton	M44	7	M893	Truck, Ambulance, 1¼-Ton	M880	5
M185A3	Truck, Van, 2½-Ton	M44	7	M911	Truck, Tractor, C-HET	M911	17
M275A1	Truck, Tractor, 2½-Ton	M44	7	M915	Truck, Tractor, Line Haul, HET	M915	18
M275A2	Truck, Tractor, 2½-Ton	M44	7	M916	Truck, Tractor, LET	M915	18
M291A1	Truck, Van, 5-Ton	M39	7	M917	Truck, Dump, 20-Ton	M915	18
M291A1D	Truck, Van, 5-Ton	M39	7	M918	Truck, Bituminous Distributor	M915	18
M291A2D	Truck, Van, 5-Ton	M39	7				

Table 1-1. Tactical Vehicle Rustproofing Instructions (Con't).

Model	Description	Vehicle Series	Chap	Model	Description	Vehicle Series	Chap
M919	Truck, Concrete Mixer	M915	18	M932	Truck, Tractor, 5-Ton	M939	7
M923	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M932A1	Truck, Tractor, 5-Ton	M939	7
M923A1	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M932A2	Truck, Tractor, 5-Ton	M939	7
M923A2	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M934	Truck, Van, 5-Ton	M939	7,15
M924	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M934A1	Truck, Van, 5-Ton	M939	7,15
M925	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M934A2	Truck, Van, 5-Ton	M939	7,15
M925A1	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M935	Truck, Van, 5-Ton	M939	7,15
M925A2	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M935A1	Truck, Van, 5-Ton	M939	7,15
M926	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M935A2	Truck, Van, 5-Ton	M939	7,15
M926A1	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M936	Truck, Wrecker, 5-Ton	M939	7,16
M926A2	Truck, Cargo, 5-Ton (Dropside)	M939	7,13	M936A1	Truck, Wrecker, 5-Ton	M939	7,16
M927	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M936A2	Truck, Wrecker, 5-Ton	M939	7,16
M927A1	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M977	Truck, Cargo, HEMTT	M977	19
M927A2	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M978	Truck, Tanker, HEMTT	M977	19
M928	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M983	Truck, Tractor, HEMTT	M977	19
M928A1	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M984	Truck, Wrecker, HEMTT	M977	19
M928A2	Truck, Cargo, 5-Ton (XLWB)	M939	7,13	M984E1	Truck, Wrecker, HEMTT	M977	19
M929	Truck, Dump, 5-Ton	M939	7,14	M985	Truck, Cargo, HEMTT	M977	19
M929A1	Truck, Dump, 5-Ton	M939	7,14	M985E1	Truck, Cargo, HEMTT	M977	19
M929A2	Truck, Dump, 5-Ton	M939	7,14	M1008	Truck, Cargo, 1½-Ton, CUCV	M1008	6
M930	Truck, Dump, 5-Ton	M939	7,14	M1008A1	Truck, Cargo, 1½-Ton, CUCV	M1008	6
M930A1	Truck, Dump, 5-Ton	M939	7,14	M1009	Truck, Utility, ¾-Ton, CUCV	M1008	6
M930A2	Truck, Dump, 5-Ton	M939	7,14	M1010	Truck, Ambulance, 1¼-Ton	M1008	6
M931	Truck, Tractor, 5-Ton	M939	7	M1028	Truck, Shelter, 1¼-Ton	M1008	6
M931A1	Truck, Tractor, 5-Ton	M939	7	M1031	Truck, Chassis, 1¼-Ton	M1008	6
M931A2	Truck, Tractor, 5-Ton	M939	7				

Table 1-2. Trailer Rustproofing Instructions.

Model	Description	Vehicle Series	Chap
M101	¾-Ton Trailer	-	21
M105	1½-Ton Cargo Trailer	-	22
M416	¼-Ton Trailer	-	20

1-6. Glossary.

Appendix F contains a Glossary of Terms that applies to the rustproofing process and various components of the vehicles discussed in this technical bulletin

1-7. Abbreviations.

ACGIH	– American Conference of Governmental Industrial Hygienists
CARC	– Chemical Agent Resistant Coatings
CONUS	– Continental United States
CPC	– Corrosion Prevention and Control
EIRs	– Equipment Improvement Recommendations
FRG	– Federal Republic of Germany
OEM	– Original Equipment Manufactured
PMCS	– Preventive Maintenance Checks and Services
QDR	– Quality Deficiency Report
ROK	– Republic of Korea
SF'T	– support
SUSP	– Suspension
XMBR	– Crossmember

SECTION II. DESCRIPTION AND DATA

1-8 General.

a. This section outlines the U.S. Army's Corrosion Prevention and Control (CPC) Program as well as the generic/specific approaches toward rustproofing being presented in this technical bulletin.

b. Special considerations and data regarding material hazards, toxic dosage levels, and toxic dosage ratings are also presented.

c. Finally, some common misunderstandings regarding rustproofing materials and applications are clarified.

1-9. The Problem.

a. Corrosion is formally defined as a process of dissolving or wearing away, especially of metals. The world itself is a highly corrosive environment in which the dissolution and wearing away of metals and other materials is a constant and on-going process.

b. *The fundamental source of corrosion is water in the form of rain, streams, dew, or humidity. One way or another, water touches upon every exposed and air-reachable surface on this planet.*

c. A second major source of corrosion is sunlight. More specifically, the sun's ultraviolet rays work to compromise or destroy organic materials such as rubber and paints.

d. Plant life also contributes to the problem of corrosion by producing gasses such as ammonia. Recently, scientists discovered that bogs, marshes, and other wetlands of this earth also give off large quantities of dimethyl sulfide and hydrogen sulfide. These gasses happen to be the main chemical ingredients of acid rain which was once believed to be produced solely by industrial pollutants.

e. Corrosion is a by-product of our own natural environment. It is also a natural process, nature's way of returning metals and other materials to their natural state.

f. Rusting is the most common form of corrosion in the world today. It causes an estimated \$176 billion worth of damage annually in the United States alone. U.S. Army vehicles, because of their intended uses and functions, are particularly susceptible to rusting. Such vehicles are expected to travel off-the-road and overland through streams and mire in order to accomplish their mission. The elements—rain, sun,

snow, heat, frost, and humidity—all contribute to the vulnerability of U.S. Army vehicles, as do mud, dust, and stones from the roads impacting on their undersides.

g. The potential for U.S. military losses due to corrosion is 11.4 percent of our national losses. Today this figure would exceed \$20 billion annually.

1-10. Corrosion Prevention and Control (CPC).

a. Corrosion Prevention and Control (CPC) is an Army-wide effort to improve vehicle readiness and to extend the service life of both current and future vehicle inventories. Reductions in Army maintenance requirements, vehicle downtimes, and the high costs of repairs are also important objectives of this program.

b. While rustproofing is a major emphasis of CPC, it is only one part of the overall CPC program which includes Army initiatives in the following areas:

(1) *Design.* Army Tank-Automotive procurement now places a greater emphasis on corrosion free design in all future vehicle buys. This includes eliminating or designing out rust-prone areas, such as pockets and sills in vehicle design, whenever possible as well as a design preference for corrosion free/corrosion resistant materials in the construction of new equipment. Army procurement design considerations also include the vehicle's manufacturing process and the stowage requirements of the vehicle. To influence design in these directions, the Army has produced a "Design Guide" for private industry that includes corrosion free design considerations, lessons learned, and material selection considerations. In addition, an accelerated corrosion test that compresses fifteen years of service life into a twelve month test period has been added to the Army's new equipment test and acceptance standards. This fact itself influences future vehicle designs within private industry.

(2) *Training.* CPC training efforts have been initiated toward a greater awareness of corrosion and corrosion prevention on the part of Army managers, private industry, and equipment users. This greater awareness is being accomplished by means of the design guide contract requirements, the Corrosion Prevention and Control Program Regulation (see paragraph 1-4), and through formal classroom training and updates to all vehicle specific Army technical manuals. Corrosion detection, for example, will soon be a standard semiannual inspection in the Preventive Maintenance Checks and Services (PMCS) tables for all tank-automotive equipment.

(3) *Management.* To ensure that CPC is emphasized during the deployment of hardware, the Army has undertaken a program to formalize CPC standards and requirements. All future ordinance contracts will be written to include CPC considerations and will be reinforced by a forthcoming Army regulation regarding corrosion resistant standards. Automotive representatives in the fields of Production Management, Engineering Item Quality Assurance, Procurement, Contracts, and Equipment Specialists are being called upon to ensure implementation of CPC in the evaluation, test, and selection of new equipment.

(4) *Maintenance.* The Army has expanded the Army Oil Analysis Program (AOAP) to include testing for the presence of iron oxides in the component oil samples. Also, a corrosion digest providing "lessons learned" as well as information resulting from Army research projects is being developed. Finally, units are being encouraged to submit Quality Deficiency Reports (QDRs) regarding corrosion prevention and control,

(5) *Technology.* Army research projects in corrosion prevention and control include new studies in the chemical transformation of rusted metal into a solid, alternative material. Development of a durable, multipurpose and corrosion resistant grease is also being reviewed by Army scientists and engineers along with an evaluation of improved diesel fuel stabilizers. Tests are also underway to evaluate the use of composite materials instead of rust-prone metals in some vehicle design applications. Double galvanized body designs are also under evaluation by the Army. The actual list of projects and programs underway is far more extensive, but the above does indicate some key technological directions the Army is taking to combat corrosion and extend the service life of Army equipment.

1-11. Special Tools.

a. There are several areas on tactical vehicles and trailers which cannot be cleaned even with repeated power washings. Nevertheless, such areas must be clean prior to rustproofing. Chisels, putty knives, masonry

drills, punches, and other tools may be readily available.

b. A looped scraper, for use in curved areas or hard-to-reach places, can be fabricated from standard shop stock. A straight-edge floor scraper to help clean up drippings that have pancaked on the shop floor can also be fabricated from available stock. Refer to Appendix E for instructions on the fabrication of these tools.

1-12. Material Hazards.

a. Extreme care must be taken whenever handling, mixing, and/or applying corrosion removing compounds or rustproofing material. Rustproofers must first become completely familiar with the peculiar properties and hazards of each compound before mixing and applying the compound to any surface. Refer to Chapter 2, Section III for a list of available compounds and their hazards.

b. Rustproofing materials themselves can become extremely dangerous if injected into the skin. Such an injury can occur if the rustproofing material comes into contact with the nozzle tip during the rustproofing operation. This can also accidentally occur if the rustproofing equipment develops any pinhole leak, split, or rupture due to wear, damage, or misuse. Never attempt to contain leaks with hands. In addition, if fittings disconnect during operation, never attempt to couple the hosing until after the pump is shut off. Never use a damaged hose or attempt to mend hosing with tape or any other device. Repaired hoses cannot contain high pressure fluids and are extremely dangerous. Injection injuries can result in severe infection, blood poisoning, and possibly, gangrene, which could lead to amputation.

c. In addition to injection injuries, toxic hazards exist from inhalation, ingestion, or skin contact with rustproofing materials. Refer to Table 1-3 for a list of materials and their associated hazards. Refer to Table 1-4 for toxic hazard ratings of rustproofing material. Refer to Table 1-5 for toxic dosage ratings.

Table 1-3. Corrosion Prevention Materials and Their Hazards.

Materials	Hazards	Preventive Actions
Rustproofing Material (Aliphatic Petroleum Naphtha)	<ul style="list-style-type: none"> Blood Poisoning if Injected Into skin Eye, Ear, Skin Irritant in Mist (Suspended in Air) Moderate Hazard if Swallowed Moderate to High Respiratory Hazard in Mist Flammable in Bulk Explosive in Mist (Open Flame/Static Electricity) 	<ul style="list-style-type: none"> Avoid Contact with Tip/Ruptures in Line Protective Mask, Glasses, Clothing, Gloves Keep Hands Away from Face/Keep Face Clean Protective Mask No Smoking/No Open Flame No Smoking/Ground Equipment Pump

Table 1-3. Corrosion Prevention Materials and Their Hazards (Con't).

Materials	Hazards	Preventive Actions
Corrosion Removing and Metal Conditioning Compound (Phosphoric Acid Base) (MIL-M-10578D, Type I) (MIL-M-10578D, Type II)	<ul style="list-style-type: none"> • Toxic Fumes • Fire/Explosive Hazard • Burns to Skin on Contact • Mix Hazards 	<ul style="list-style-type: none"> • Protective Clothing and Glasses • Mix and Apply Only in Well-ventilated Areas • Understand Mix Instructions Thoroughly • Apply by Applicator
Hydrochloric Acid with Inhibitor [MIL-A-13528 (ORD)]	<ul style="list-style-type: none"> • Toxic Fumes • Fire/Explosive Hazard • Burns 	<ul style="list-style-type: none"> • Protective Clothing and Glasses • Mix and Apply Only in Well-ventilated Areas • Understand Mix Instructions Thoroughly • Apply by Applicator

Table 1-4. Toxic Hazard Ratings of Rustproofing Material.

Kind of Hazard	Location	Duration	Rating
Irritant	Eyes, Skin, Ears, Mouth, Local Effects	Short or Prolonged	Slight
Ingestion (Swallowed)	Throat or Gastrointestinal System, Local Effects, and Manifested Effects on Other Body Systems Through Absorption	Single Dose	Moderate
Inhaled	Nose Mucous Membrane, Throat, Respiratory System, Local Effects, and Manifested Effects on Other Body Systems	Short Term	Slight

1-13. Toxic Dosages.

a. Rustproofing material is toxic. This means that it can be harmful to the human body. If properly handled and applied, the toxic hazard rating of rustproofing material is slight to moderate. The factors that determine the toxicity of rustproofing material are:

- The amount of the material suspended in the air (measured in parts per million).
- The duration of exposure (or the amount of time the rustproofer remains in the contaminated area).
- The size of the rustproofing materials' airborne particles.
- The individual's sensitivity to the rustproofing material.

The reaction of different people exposed to rustproofing material and application hazards 'may vary widely. Individuals subjected to the same duration and concentration may have reactions as unlike as no effect

whatsoever, to severe poisoning. The exact reason for this is unknown.

1-14. Toxic Hazard Ratings.

a. Toxic dosage is measured in threshold limits. These limits are set by the American Conference of Governmental Industrial Hygienists (ACGIH), and represent conditions under which a majority of workers can be repeatedly exposed to airborne concentrations of rustproofing material without a harmful effect.

b. The toxicity hazard itself is measured by each unit's Safety Office or Logistics Officer. It is measured in parts per million (ppm).

c. Table 1-5 indicates the threshold limits and their toxicity. This table provides acceptable standards that represent a time-weighted average concentration for a normal eight hour, five day work week. The threshold limit value for rustproofing material is 500 ppm. If airborne concentrations of the material exceed this limit during a normal work week, the operation must be shut down until the air is cleared.

Table 1-5. Airborne Concentration Threshold Limits for Rustproofing Material per Work Week.*

Toxicity (Danger)	Average Concentration (Parts Per Million)
Slight	0-100
Moderate	101-500
High	Over 500
* Standards Established by American Conference of Governmental Industrial Hygienists	

1-15. Safety Precautions.

a. Prevention. Prevention of toxic hazard related injuries depends upon good equipment maintenance. Understanding the nature of hazards and applying common sense safety precautions is also important.

b. Control of Hazards. The potential hazards of exposure to rustproofing compounds can be controlled in two ways: through proper medical/sanitation controls and through use of adequate facilities.

c. Medical/Sanitation Controls. Units with active rust prevention/rustproofing programs should implement a medical/sanitation control program through education of personnel, mandatory use of proper protection devices, and by an emphasis on personal hygiene.

(1) Education. All users within units should be fully informed of the potential harmful nature of rustproofing material. Good common sense must be used in the handling and the application of rustproofing material.

(2) Equipment Use/Safety Practices. Masks should only be relied upon when it is impossible to ensure adequate ventilation. Reliance on masks alone is only permissible when the exposure is short (only a few minutes) and infrequent (no more than 10-20 times daily). Eye protection is mandatory during all cleaning, drilling, and rustproofing operations.

(3) Personal Hygiene. Proper washing facilities, including hot water and mild cleaners, should be readily available to the rustproofer. Clean work clothes should be worn daily and insisted upon by supervisors for the safety of the rustproofer.

d. Facilities. Units with rust prevention/rustproofing programs should provide adequate facilities which include adequate ventilation of the work area (intake and exhaust) as well as enclosures to confine spray to

the specific work area as much as possible (see paragraph 3-2).

1-16. CARC Paints/Rustproofing Policy.

a. Paints now in use within the U.S. Army are called Chemical Agent Resistant Coatings (CARC). This is an aliphatic polyurethane organic film, a paint that cures to form a film so hard that it cannot be contaminated by chemical agents. The Army's tactical purpose for using CARC paints is to allow for a quick wash-off of contaminants in the event of an NBC attack.

b. There isn't a paint manufactured today, CARC included, that cannot be permeated or penetrated by water. This water will eventually cause the paint and its primer to crack, thereby exposing the under surface, bare metal, to still greater amounts of moisture. Water on a bare metal surface is the primary cause of corrosion. Rusting beneath the paint will result.

c. CARC paints are hard enough to forestall rust and to slow down its progress so that it can be repaired before any significant damage is done. However, CARC paints alone are not sufficient to stop corrosion on, beneath, or inside vehicles. If the service life of these vehicles is to be extended, greater protection in the form of rustproofing material must be provided, especially on the vehicle's undersides and its closed-in areas.

d. Rustproofing materials in use today are not chemical agent resistant. This means that the rustproofing material itself will become contaminated in the event the vehicle is exposed to an NBC attack. The use of CARC paints in rustproofed areas of a vehicle is incompatible with rustproofing policies. Given the current technology, this incompatibility cannot be avoided. The Army is in need of vehicles that will resist chemical agents, and fleets that will last through the years. To meet these needs, units must respond to both requirements and be prepared to wash off the contaminated rustproofing material with high pressure washers. The rustproofing material, of course, must be reapplied as soon as the situation permits. The exceptional circumstances of an NBC attack fully justify this approach as a working plan until such time as CARC-compatible rustproofing materials are developed and can be made available to units. Such materials are currently being researched by technicians.

e. One final matter regarding CARC paints and rustproofing policy is the difference between the Army's approach toward corrosion prevention and the approach taken by commercial firms. The maintenance approach used by the Army is as follows:

(1) The vehicle, or area of the vehicle to be rustproofed, must first be cleaned of all rust, dirt, oils, and chemical films.

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(2) The cleaned metal is then primed and painted in accordance with TM 43-0139, *Painting Instructions for Field Use* and TB 43-0209, *Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment and Materials Handling Equipment*, as appropriate. Painting here includes exterior surfaces as well as all accessible under surfaces such as the underbodies of dump trucks. Painting requirements do not include inaccessible areas such as boxed-in areas.

(3) Vehicles must be rustproofed as quickly as is practical after cleaning. Chapters 4 through 22 of this technical bulletin provide vehicle-specific rustproofing instructions.

f. The above procedures describe the Army's recommended approach to corrosion prevention. This differs from most commercial firms only with regard to painting. Commercial firms do not apply paint to readily accessible areas on the undersides of the vehicle. Rather, these areas are cleaned and immediately rustproofed. Army practices, however, are geared toward extending the service life of its vehicles for twenty years

or more. The paint is desired in order to provide an additional barrier between the bare metal and outside moisture, chemical films, and other corrosives.

1-17. Unit SOPs/Manhour Requirements.

a. This technical bulletin provides commanders with details of all policies, procedures, and resources available in order to implement an effective Corrosion Preventive and Control Program.

b. Specifics as they apply to the facilities and manpower resources of individual units cannot be properly addressed in this technical bulletin. Considerations of unit size, its personnel allowances, equipment allowances, location, facilities, mission, and local restrictions, if any, must become factors in the development of the unit's Standard Operating Procedures (SOP) for CPC. Each unit commander, therefore, is required to develop such an SOP and see that it is properly implemented. Manhour standards based upon the particular operation and resources of the unit should also be developed.

CHAPTER 2

CORROSION PREVENTION AND CONTROL

Section I. RUSTING – THE ELECTROCHEMICAL REACTION

2-1. What is Rust?

a. The flaky metal deposit known as rust is, in fact, metal returning to a more natural state. Metals such as iron or steel are not natural elements found in the earth's crust. Rather, they are man-made by-products resulting from the melting of ore in high temperature furnaces. This melting separates the iron particles from the ore. Once separated, the iron particles flow directly from the furnace into molds that shape them. The cooling and hardening of the iron begins immediately. What we call "steel" is produced in the same manner. Steel is iron mixed with other molten alloys during the furnace refining process.

b. The process described above requires the use of a large amount of energy in order to separate the iron particles from their ore and shape the molten metal into the desired form. As a result, these metals are in a high energy state after cooling (like a tightly wound spring forever straining to unwind), and would naturally like to return to a low energy state. This straining to return to a low energy state is the driving force behind corrosion. Rusting, therefore, is nature's way of returning metals to their natural state.

c. Rust is iron hydroxide. It is iron transformed by a natural process. This process is caused by the attraction of negatively charged electrons in the atoms of iron toward oxygen in water. Corrosion prevention technicians today refer to this natural process as the "Oxidation-Reduction Reaction" (see Figure 2-1).

d. The "Oxidation-Reduction Reaction" begins with water on a metal surface as a result of exposure of the metal to rain, snow, dew, or humidity. This moisture forms a film on the metal. Beneath this film is the metal itself which, as noted above, is a formed, man-made construction of earth minerals that have been stressed into a shape that better suits mankind's needs. That which was once an aggregate of iron ore in the earth's crust has now been molted from its ore and molded into a fender, stake pocket, or cargo bed.

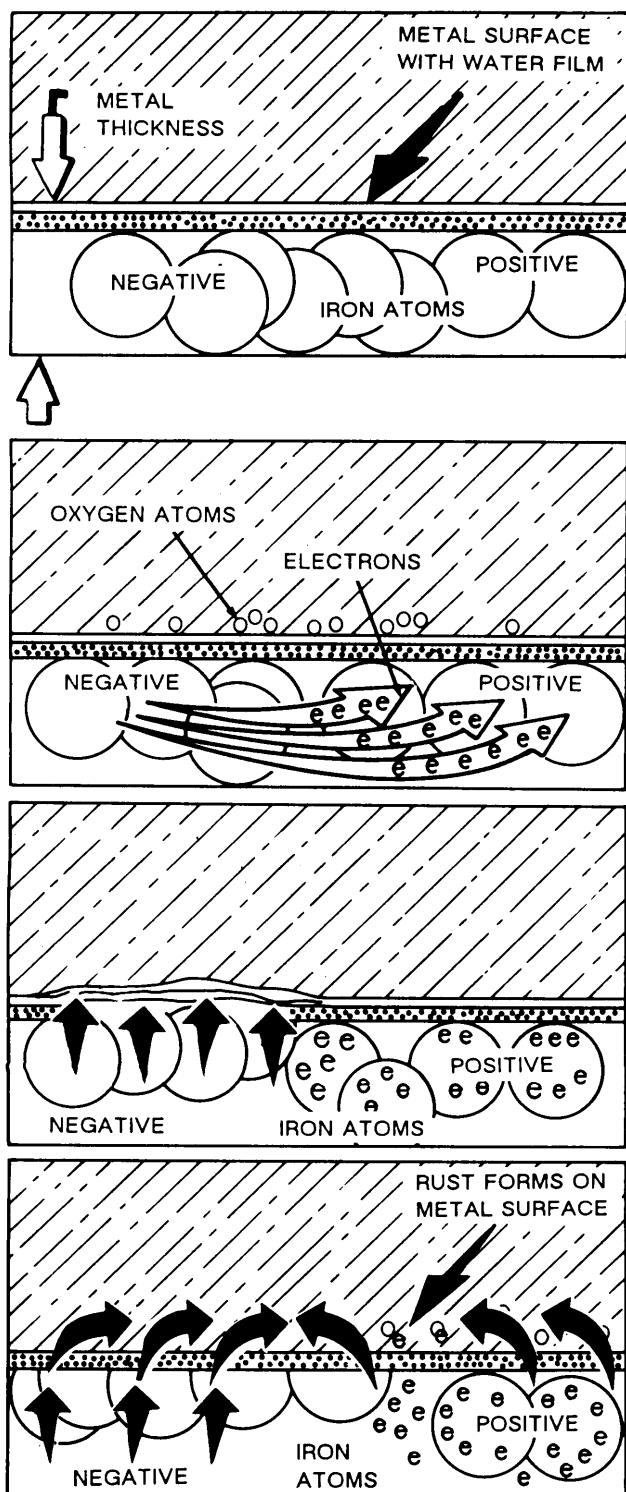
e. The smelting process that makes iron is imperfect and the resultant metal itself always contains impurities, some areas of the metal more so than others. In the

presence of a moisture film, which serves as a conductor, iron atoms in the purer areas of the metal create a positive electric pole while iron atoms in adjacent areas with more impurities become the opposite pole, a negative area. The result is similar to a simple electric battery with moisture serving as the electrolyte, and the stronger-weaker iron atoms becoming the positive and negative terminals of the circuit.

f. In the rusting process, iron atoms in the weaker, negative areas will split apart. These atoms give up or give off some of their electrons, which are subatomic particles found in all atoms. These lost electrons migrate through the metal toward the positive area. As a result of this loss, electron deficient iron atoms in the negative area gravitate toward the metal surface and dissolve in the film of moisture. This half of the "Oxidation-Reduction Reaction", or rusting process, is referred to as the "oxidation half". This half weakens the metal in all negative areas, but it does not cause rust. In order for actual rust to form, the second half of the "oxidation-reduction reaction" must complete the cycle.

g. The "reduction half" of the rusting process returns to the lost electrons migrating through the metal toward the positive area. These free electrons are picked up by oxygen atoms in the water film on the surface of the metal. On this surface, the products of the two reactions then combine to form a flaky, crusty third substance called iron hydroxide or rust. Stated another way, the dissolved electron deficient iron atoms that gravitated to the wet surface during the oxidation half of the process have now combined with electron charged oxygen atoms produced by the reduction half of the process. The result of all this is a transformation of iron atoms into iron hydroxide or rust.

h. The rusting process described above actually begins the moment moisture comes into contact with bare metal. This process is actually occurring at the atomic level; the results are not instantly apparent. While salt and dirt particles added to the moisture will accelerate the process, it still takes weeks, months, or years (depending upon the thickness of the metal) for the process to transform the iron or steel to an unserviceable state.



OXIDATION-REDUCTION REACTION

The corrosion process called "rusting"

It begins with water on a metal surface

It begins with moisture on metal. This moisture polarizes the iron atoms in the metal. Purer portions of the iron become positive areas. Those parts of the metal containing more impurities become negative areas.

The positive charged iron atoms begin to attract electrons from the weaker negatively charged iron atoms. These electrons are pulled from the negative iron atoms and migrate toward the positive areas.

At the same time, the weakened iron atoms in negative areas of the metal migrate toward the surface of the metal where they begin to dissolve into the moisture on the surface.

The electrons pulled into the positive areas of the metal now come into contact with the oxygen atoms found in the moisture on the metal surface. These oxygen atoms seize upon the electrons. In turn, the electron charged oxygen atoms now merge with the weakened iron atoms dissolving on the surface. This merging forms a new molecule - the molecule of iron-hydroxide, a crusty, flaky form of metal commonly known as rust.

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Figure 2-1. Oxidation-Reduction Reaction.

2-2. The Four Elements of Rusting.

a. Rusting of iron, steel, or any metal alloy is caused by the electrochemical reaction described in paragraph 2-1. This reaction is divided into four parts or elements:

- (1) A positive reaction.
- (2) A negative reaction.
- (3) A path for negative particles to flow.
- (4) A path for positive particles to flow.

b. In the explanation of the rusting process, the positive and negative polarization of the iron atoms constitute the first two elements. A path for positive and negative particles to flow is described in the "oxidation half" of the "Oxidation-Reduction Reaction." If any of these elements are interrupted, the circuit is broken and no rusting will occur.

c. The best means of breaking the rusting circuit is to bond a nonmetallic substance to the metal as a barrier between the metal and the environment. To some degree, paint accomplishes such a barrier. On well maintained exterior surfaces, paint will go a long way toward forestalling rust. But nothing can stop rusting altogether. Eventually, moisture will work its way to the metal even beneath rustproofing material.

d. With a greater awareness of rust, the rusting process, the stages of rust, and rustproofing procedures, the damage of this form of corrosion can be minimized within the Army to the point of zero impact upon the service life of any Army vehicle.

2-3. The Four Stages of Rust.

a. Rust has been categorized into four distinct stages. These stages of deterioration have been standardized within the Army in order to communicate the condition of the metal. The four stages apply to painted metal surfaces:

(1) *Stage 1 Rust (see Figure 2-2).* The painted surface is bubbly or the paint bubbles have broken to reveal rusty red, black, or white corrosion deposits on the metal surface. This may be accompanied by minor etching or pitting of the metal. In Stage 1 rust, no scale is present but the metal may have loose, powdery, or granular deposits on the surface. Base metal is sound.



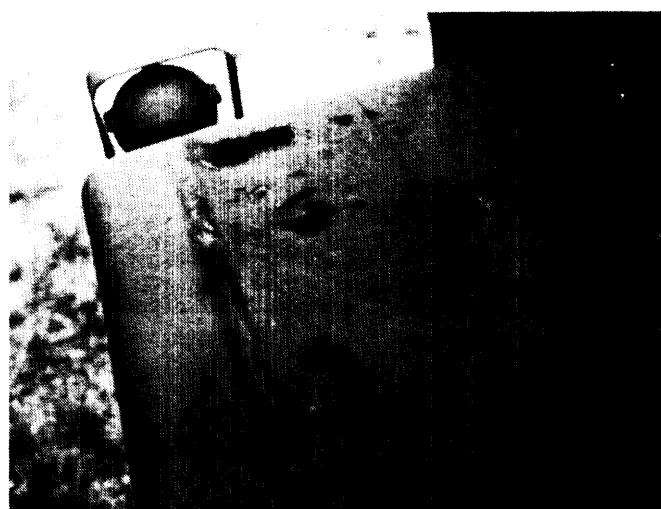
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Figure 2-2. Stage 1 Rust.

NOTE

One key to the Corrosion Prevention and Control Program is an update of all vehicle semiannual Preventive Maintenance Checks and Services (PMCS) to emphasize early detection and repair of rust damaged areas before the condition is allowed to advance beyond Stage 2 rust.

(2) *Stage 2 Rust (see Figure 2-3),* Powdered, granular, or scaled condition exists on the surface metal. Rusty red, black, or white corrosion deposits are present. Metal surface may be etched or pitted. Metal beneath the corroded area is still sound.



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Figure 2-3. Stage 2 Rust.

(3) *Stage 3 Rust* (see *Figure 2-4*). Surface conditions and corrosion deposits present are similar to Stage 2 except that metal in corroded area is unsound, and small pin holes may be present.

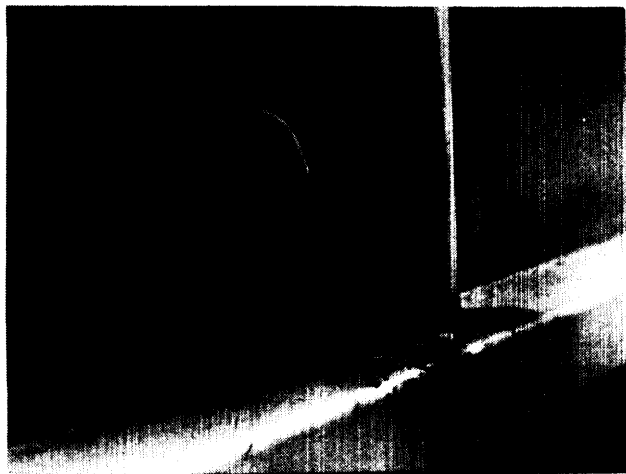


Figure 2-4. Stage 3 Rust.

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(4) *Stage 4 Rust* (see *Figure 2-5*). Corrosion has advanced to the point where the metal has been penetrated throughout. No metal remains at the point of severest corrosion. There are holes in the surface area or metal is completely missing along the edges.

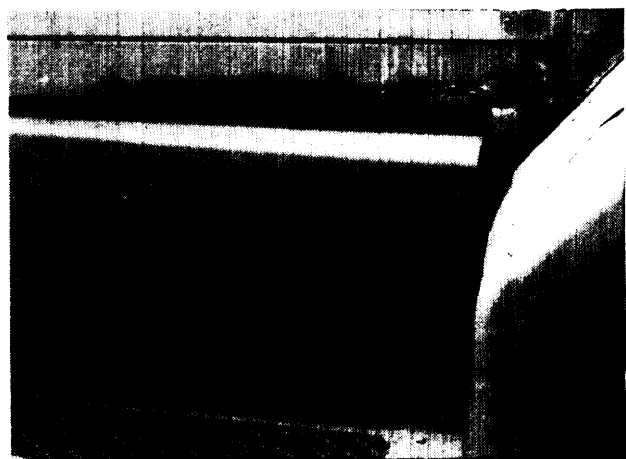


Figure 2-5. Stage 4 Rust.

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b. Stages of rust are determined by visual inspection as well as by knocking on the metal to determine metal soundness. Probes, spring-loaded punches, or similar devices should be used if the soundness of the metal is in doubt.

2-4. Arresting Rust/Repairing Rust Damage.

a. Stage 1 and Stage 2 rust can be readily repaired. With Stage 3 rust, the metal is unbound and must be cleared of rust and then reinforced, or the affected part must be replaced entirely. Areas showing Stage 4 rust are not repairable. Such parts must be replaced.

b. Rust in Stages 1 and 2 can be removed by use of an abrasive such as a sander, grinder, or wire brush, and/or by application of a rust removing compound. The best approach taken to remove rust depends greatly on the area being repaired as well as by such considerations as metal thickness or accessibility of the rusted area. A metal grinder, for example, would be incorrect for use on thin, short metal. Interior rust in long boxed-in areas close to rubber molding (such as the tube rails of a fold-down window) may require use of a wipe-off rust remover and swab as opposed to a wash-off rust remover. Common sense and an understanding of the tools and materials available must determine the best approach.

c. Whenever rust is located on a vehicle that cannot be immediately repaired, the rust area should at least be treated with rust arresting coating, MIL-R-10036, to prevent further corrosion. Refer to paragraph 2-20 for a description of this material, its application, and hazards.

d. Most Stage 1 and Stage 2 rust is localized and can be easily removed. Larger areas may require use of high pressure washers. If repair is to be done immediately, application of the rust arresting coating (MIL-R-10036) is not necessary. Sand, grind, brush, and/or chemically remove the rust from the metal. Maintenance personnel should be aware of all chemical materials available to assist in removing rust as well as any oils or chemicals on the metal. Paragraphs 2-19 through 2-28 provide a list of these materials.

e. Stage 2 and Stage 3 rust are very similar in appearance. What qualifies rust as Stage 3 depends to a great degree upon the thickness of the metal. Rust could appear as more advanced on the heavy-gaged metal of a cargo or dump body and yet be categorized as Stage 2. What may appear as minor rust on sheet metal may be Stage 3. The difference is in the soundness of the metal. Inspectors looking at the first example of the cargo or dump body may determine by probing and sounding that the metal beneath the rust is still sound. Such rust would be classified as Stage 2. These same inspectors may determine that the less visible rust on the sheet metal has made that metal unbound 'or unserviceable. The sheet metal rust, therefore, would be categorized as Stage 3.

f. Stage 3 and Stage 4 rust make the rusted part unserviceable. Repairing rust damage in such cases

requires replacement of the affected metal area. In some instances, such as in the M151 series 1/4-Ton trucks, rust repair kits are available. For the most part, however, maintenance personnel should refer to the vehicle-specific TM for replacement parts.

g. Stage 3 and Stage 4 rusted metal parts classified as unserviceable should be removed. Adjacent areas should be thoroughly cleaned of any rust, oils, or chemicals before replacement parts are installed.

NOTE

Army policy requires that all accessible under surfaces to be rustproofed must also be cleaned, primed, and painted. This additional barrier of paint will provide greater protection to the metal.

h. Once the metal has been thoroughly cleaned, exterior surfaces must be primed and painted (see TM 43-0139). All accessible under surfaces such as the underbodies of cargo and dump trucks should also be primed, painted, and allowed to dry before applying rustproofing material. Surfaces that are not readily accessible for painting, such as boxed-in areas, are rustproofed only.

i. After the affected surface has been prepared, refer to the vehicle-specific chapters of this technical bulletin for final rustproofing instructions (see Chapters 4 through 22).

2-5. Rust-Prone Areas.

a. This technical bulletin provides specific rustproofing instructions for most tactical vehicles as well as several commonly used trailers (see Tables 1-1 and 1-2). Application of rustproofing instructions can be applied to all vehicles. To assist in adapting such instructions, this paragraph provides a list of rust-prone areas that are found in the design of most vehicles. Users are encouraged to recognize such areas and understand why such areas are prone to rust. Finally, users are encouraged to apply the principles of rustproofing to all vehicles and trailers using this technical bulletin as a guide. The following are likely areas for rust development:

(1) *Channels* (see Figure 2-6). A channel is an open-ended design. It may be square or C-shaped, such as the rubrail support members of cargo and dump truck sides and tailgates, or an inverted U-shape found in the understructure of M191 series trucks. The

distinguishing design characteristic of a channel is that it is open-ended. Insides of all channels should be cleaned, treated and rustproofed. Exterior sides are cleaned, treated, primed and painted.

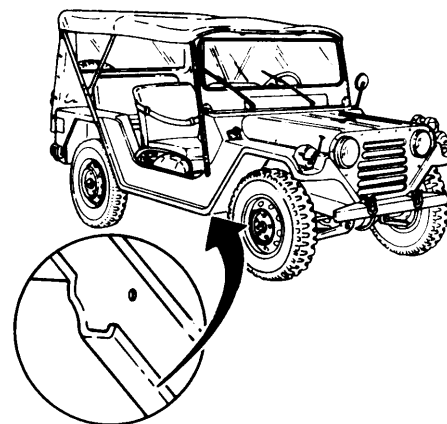


Figure 2-6. Channels.

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(2) *Rubrails* (see Figure 2-7). Rubrails are channels serving as both support members and as structural protection for the vehicle body. The horizontal crossmember trimming the tops of all cargo sides and tailgates are rubrails.

(3) *Stiffeners* (see Figure 2-7). Stiffeners are boxed-in or solid support members found in the tailgates of all cargo trucks. Stiffeners strengthen the component to which they are attached. Solid stiffeners as found on most 2 1/2-Ton cargo trucks present little difficulty regarding rust. Boxed-in stiffeners found on all 5-Ton trucks, however, are prone to trap moisture.

(4) *Pockets* (see Figure 2-8). Pockets are tube-like designs such as the stake pockets used to install the troop seat and side racks of cargo trucks. Pocket designs are typically fully open at the top of the tube. The bottom of the tube most often has a means of drainage from the tube. This is not always true or adequate, which makes pocket designs very vulnerable to rust as a result of trapped moisture.

(5) *Tube Rails* (see Figure 2-9). Tube rails such as window frames of fold-down type windows or the pillars of stationary windows are especially rust-prone due to the boxed-in design and the thin gage metal most often used in their construction.

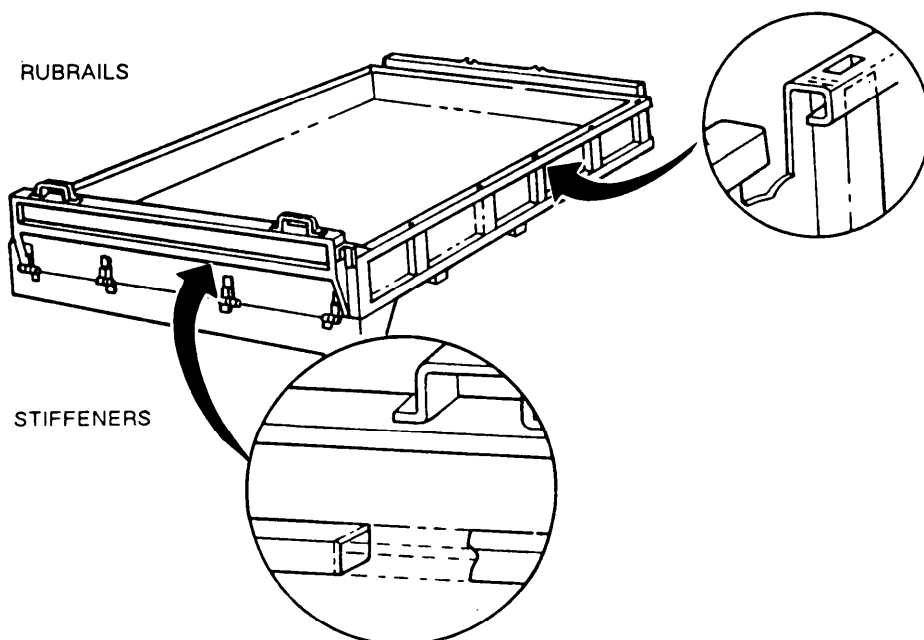


Figure 2-7. Rubrails and Stiffeners.

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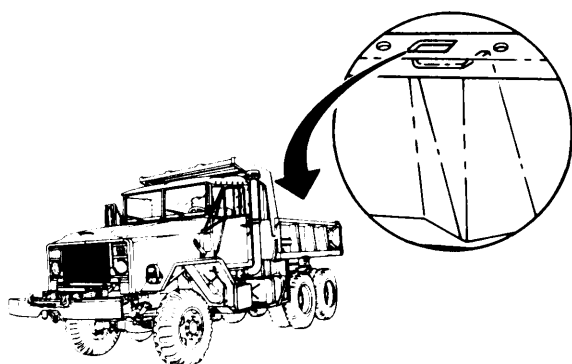


Figure 2-8. Pockets.

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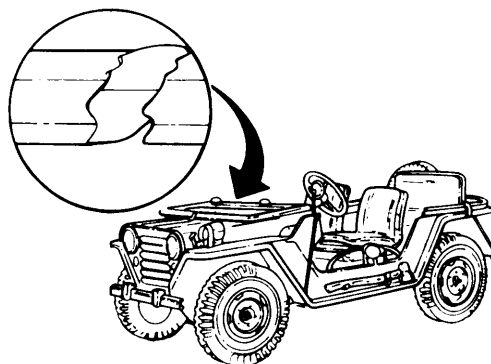


Figure 2-9. Tube Rails.

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(6) Sills (see Figure 2-10). Sills are horizontal panels beneath cab doors or along window frames of some vehicles. The horizontal framework beneath cargo and dump bodies are also sills. Sills may be boxed-in areas or open-ended horizontal frameworks. All sills are horizontal designs intended to bear the upright portions of the vehicle's frame. Corrosion protection of sill areas is essential.

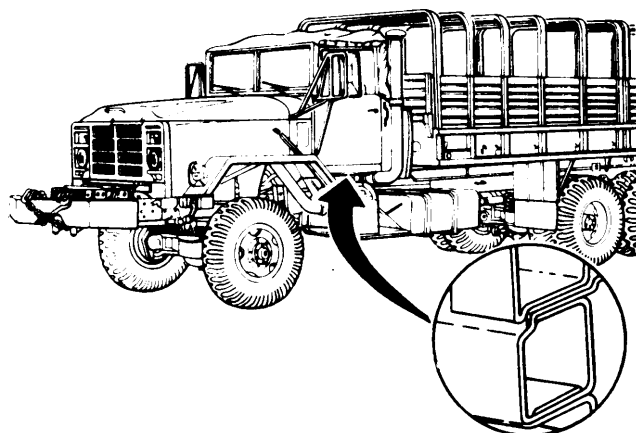
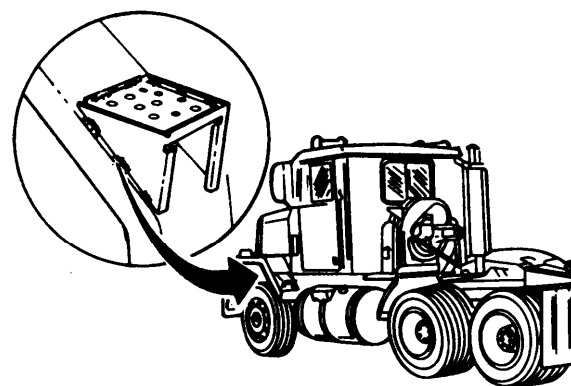


Figure 2-10. Sills.

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(7) Seams (see Figure 2-11). Seams are areas on the vehicle where separate pieces of metal come together. This is true whether the metals are welded together or simply in contact with one another. Aside from seams working as areas where moisture collects, the differing metals will tend to contain greater variations of impurities with respect to one another than those found in a single casting. This greater variation of impurities works to accelerate the metal polarizations and the resultant rusting process.

b. Sections in this TB on rust-prone areas, general preparation procedures, and all basic information on corrosion prevention equipment and materials may also be applied to nearly all vehicle rustproofing requirements. The additional objective of this TB, however, does require good judgement and common sense on the part of rustproofers. This is especially true with regard to drilling of access holes on heavy load-bearing areas of a vehicle. In such instances, comparable configurations within the vehicle-specific chapters of this TB provide the best guidance.



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Figure 2-11. Seams.

2-6. Preventive Maintenance for Rust-Prone Areas.

a. With regard to the entire vehicle, but especially rust-prone areas, several steps have been developed to aid in rust prevention:

(1) Operators should wash their equipment daily with fresh water when operating in areas where salt is used to melt snow, or in areas where there is a high salt concentration in the air.

(2) Fiber or rubber floor mats should be permanently removed from all tactical vehicles to prevent water from being trapped under mats. Such trapped water will cause floor pans to rust. All mats should be removed and floorboards should be cleaned, repaired if needed, and sprayed with nonslip flight deck covering compound, NSN 5610-00-782-5556.

(3) Drain holes, including drilled holes on the underside of vehicles, should be kept clean and open to prevent moisture accumulation.

(4) In areas with high salt concentration in the air, canvas covers should be placed on static vehicles in motor pools to reduce the amount of rain and mist entering crew and cargo compartments.

(S) Vehicles should be parked under shelter whenever available.

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(6) Vehicles and trailers treated with rustproofing materials should not be steam cleaned or cleaned with solvent. Such cleaning may damage or dissolve the protective rustproofing materials.

(7) When rust is found on equipment, the rusted area should be promptly treated to prevent further corrosion. Sand or grind the rusted area until rust is removed from the metal. Then treat metal with any of the metal conditioners and/or rust removers described in paragraphs 2-19 through 2-28 of this TB, if the surface will not be either painted or rustproofed immediately after cleaning. Spray cleaned metal with primer and CARC paints and/or rustproof cleaned metal, as appropriate.

(8) If possible, park trailers on a slope to allow drainage of water from the trailer. If operating a dump truck, tilt the dump bed before vehicle shutdown to allow drainage of excess water.

(9) Vehicles with areas of Stage 1 or Stage 2 rust should be cleaned of all existing rust. The cleaned area should also be treated immediately with any of the metal conditioners and/or rust removers described in paragraphs 2-19 through 2-28 of this TB. External surface areas should then be primed and painted.

b. The following is a list of common misunderstandings regarding rustproofing materials, applications, and techniques:

(1) "Rustproofing" and "undercoating" are not the same. Rustproofing is the application of a rust resistant and rust preventive material. This material is not undercoating. Undercoating is a tar-like, sound-deadening material usually sprayed on the underside of a vehicle at time of manufacture. The word also applies to the action of applying the tar-like material itself. Undercoating is sometimes used to refer to the application of primer paints on metal bodies prior to painting the final coat. In neither instance is undercoating to be confused with rustproofing or rustproofing materials.

(2) Rustproofing is not permanent. The material can be lost or destroyed. Tactical vehicles and trailers treated with rustproofing materials should not be steam cleaned or cleaned with solvents. Such cleaning may damage or dissolve the protective rustproofing materials.

(3) Rustproofing should never be applied over undercoating. In such instances, the material will be lost as the undercoating flakes and falls from the underside of the vehicle.

(4) Army policy requires that all accessible under surfaces to be rustproofed must be cleaned, primed, and painted. This policy differs from commercial practices. However, the additional barrier of paint will provide greater protection to the metal.

Section II. OTHER TYPES OF CORROSION

2-7. General.

a. Rust accounts for the majority of corrosion damage on U.S. Army vehicles, but other types of corrosion also limit the useful service life of equipment. Notable among these additional types of corrosion are galvanic corrosion, pitting, poultice, and the effect of the sun and ozone. These and other types of corrosion are discussed in this section.

b. Two additional types of destructive factors are mildew and acid rain. While neither can be defined as forms of corrosion, they both contribute to corrosion. Both are destructive to Army equipment and, therefore, fall within the objectives of the CPC Program. A better understanding of the causes and prevention of these factors will also assist in accomplishing the overall goal of this technical bulletin.

2-8. Galvanic Corrosion.

a. Whenever two different metals come in contact with each other, a potential exists for the corrosive destruction of the atomically weaker of the two metals. The further away these two metals are in terms of their atomic structure, the greater their potential for galvanic corrosion. Table 2-1 provides a list of common metal and metal alloys. In this table, carbon is the hardest of metals and magnesium alloys are atomically the weakest. The closer the different metals are to one another in this table, the less is the potential for galvanic corrosion. The actual galvanic corrosive process is similar to rusting to the degree that weaker metals become negative areas and lose electrons to the stronger positive atoms of the other metal.

b. The element carbon is included in the galvanic table of metals because this element is used to

strengthen some metal and is an agent in some lubricants. At the same time, carbon is highly cathodic to all metal alloys and is extremely corrosive when in contact with high potential end alloys as shown in Table 2-1.

c. Galvanic corrosion is sometimes desirable as in the case of galvanized steel. This is steel with a zinc coating. The zinc coating protects the steel by serving as a barrier between the shell and the corrosive world. The zinc coating also serves as a sacrificial metal due to the galvanic process whereby the natural corrosion process concentrates on the weaker zinc to the benefit of the steel. Maintenance technicians must keep galvanic corrosion in mind whenever replacing nuts, bolts, metal screws, clamps, etc. These items should always approximate the metals they will come in contact with on the vehicle.

2-9. Ozone and Ultraviolet Radiation.

a. Ozone is a blue, gaseous form of oxygen formed naturally in our atmosphere by the effects of lighting and/or by normal oxygen's exposure to ultraviolet radiation from the sun. From the high atmosphere where it is concentrated, the ozone falls to earth. Ozone is the primary enemy of tires and other rubber products. It destroys the two most important properties of rubber, its strength and elasticity. Ozone exposure dries out rubber so that it becomes brittle and easily worn through. Ozone oxygen atoms exist in greater quantities on hot, desert-like surfaces of the earth where their effects on tires, rubber seals, and other automotive products are most pronounced. Most Army tires and other rubber products are manufactured with ozone preservatives, but these qualities are lost with time and exposure. Commercial preservatives such as Armor All or Agemaster can be applied as required.

b. Ultraviolet radiation is a corrosive agent. Ultraviolet radiation is everywhere in the rays of the sun. Aside from contributing to the formation of ozone, ultraviolet radiation breaks down paints and resins. It also breaks down the polymer bonds or chemical structures of rubbers and plastics. With prolonged exposure to direct sunlight, these materials will lose their strength, dry out, and crack. If prolonged exposure to ultraviolet radiation cannot be avoided, provide a preventive maintenance watch on all such products and periodic replacement, as necessary. Rubber products may be protected using commercial preservatives. Shelter should also be used whenever possible to forestall the effects of ultraviolet radiation.

2-10. Pitting Corrosion.

a. Pitting occurs most commonly on aluminum and stainless steel products. It is a form of localized corrosion in which small areas of the metal corrode preferentially to the adjacent areas. This type of corrosion causes cavities or pits in the metal surface.

b. The cause of pitting corrosion is salt, either introduced through sea water or on the highway in winter months. To avoid pitting, clean the vehicle after exposure to salt as soon as is practical.

2-11. The Differential Aeration Effect.

a. Air carries moisture but also dries moisture from the surface of metals. Whenever the design of the vehicles is such that moisture can become trapped, while areas immediately surrounding the trapped moisture are ventilated and, therefore, quickly dried, the difference between the two metal areas (one dry/one moist) will set up an electrochemical cell. The result will be an intense acceleration of the rusting process and an intense, localized corrosion. This dynamic is called the "differential aeration effect" which can be translated into the phrase "result of differing ventilation".

b. Crevice corrosion in rocker panels is the most commonly cited example of the differential aeration effect. This dynamic is also responsible for poultice corrosion (see paragraph 2-12).

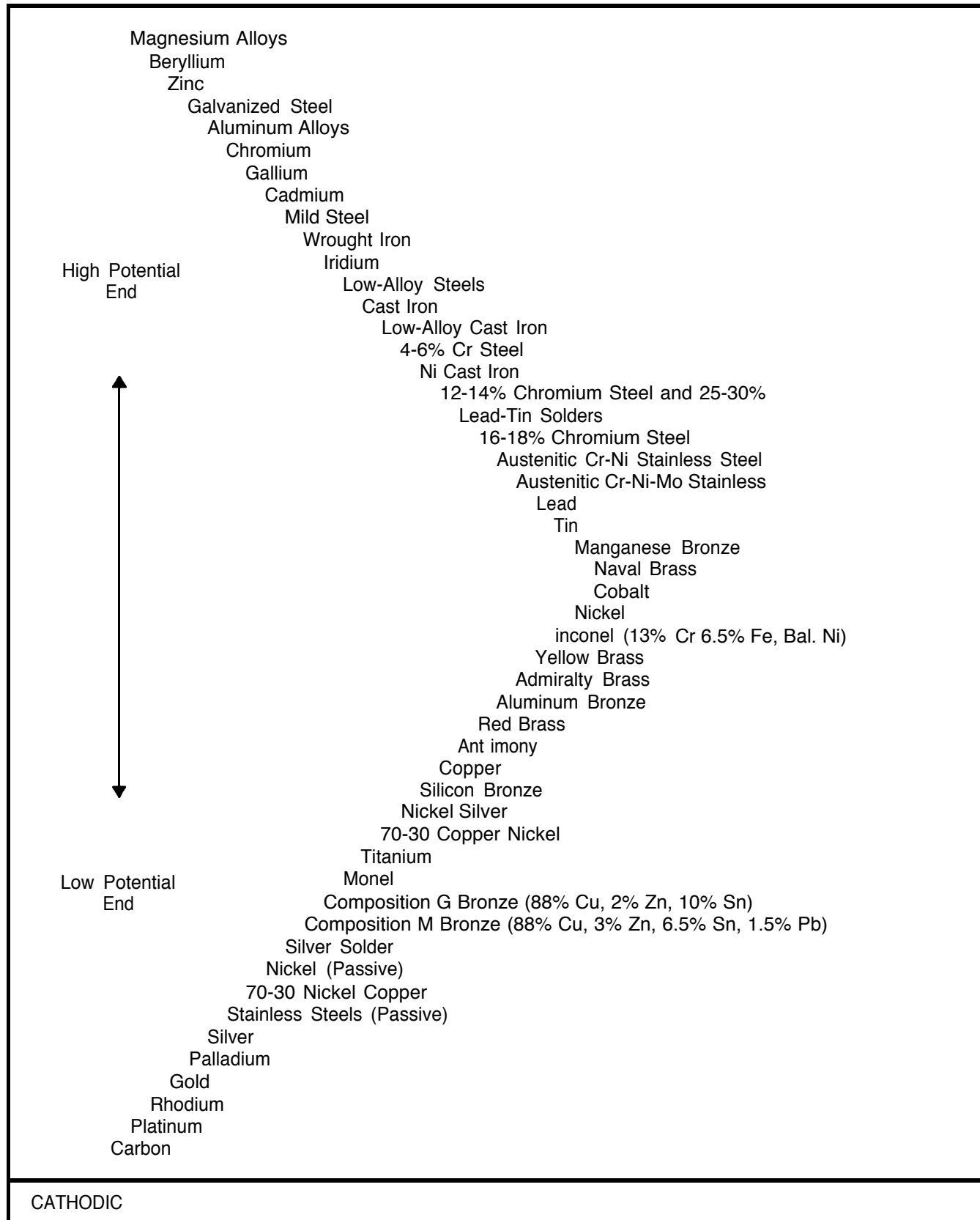
2-12. Poultice Corrosion.

Poultice corrosion is rust which occurs when deposits of mud or other debris hold stagnant moisture in contact with a metal surface. Because the mud or debris is moisture-laden, this condition accelerates the rusting process. As with pitting corrosion, the solution is to keep the vehicle as clean as possible at all times.

2-13. Crevice Corrosion.

Crevice corrosion is caused by a design problem that manufacturers are being asked to keep in mind during the planning of new vehicles. Crevice corrosion is intense accelerated rusting in joints and recesses. It is caused by the differential aeration effect outlined above. The solution for crevice corrosion is rustproofing of the joint or recess.

Table 2-1. The Galvanic Corrosion Potential of Different Metals.



2-14. Stress Corrosion Cracking.

Almost all rusting is a form of stress corrosion because man-made iron or steel is a stressed by-product of natural ores. Stress corrosion is most often associated with metals or rubbers under even greater stress due to the design application. Steel forced by loads into a bend is an example. If such steel is exposed further to rusting, it becomes structurally weaker. The result is a raising of the level of stress placed on the metal; the greater the stress, the more the corrosion acts upon the metal. In heavy metals such as steel, the effects of stress corrosion are one of the causes of metal fatigue. In other applications, stress corrosion will cause cracking along with an increase of stress and accelerated corrosion.

2-15. Fretting Corrosion.

This is a form of stress corrosion. It is caused by friction of the metal against other surfaces during transportation and handling, especially if the metal product is not well secured, thereby causing shifting during movement. The resultant friction may wear away at the metal's protective film. In the presence of moisture, it will also accelerate the corrosion process. The result will be pitting or stress corrosion induced cracks.

2-16. Mildew.

Although mildew is not strictly corrosion, it does contribute to corrosion in metals and is very destructive to other Army products. Mildew is a gradual deterioration of organic material such as canvas or tarpaulin caused by the growth of fungus on or in the material. This growth occurs if the canvas or tarpaulin is left

damp and unattended or left for prolonged periods in a damp shelter. Canvas is a heavy, coarse, and closely woven fabric of cotton, kemp, or flax. Tarp or tarpaulin is coarse linen. Both of these fabrics are organic materials and, as such, keeping them clean and allowing them to air out will prevent the formation of mildew.

2-17. Acid Rain.

a. Acid rain is commonly understood as the bombardment of the earth by chemical wastes from industry. It is viewed as a major problem in heavily populated and industrial areas. Wherever there are oil burning furnaces or chemical mills in use, there will be emissions which are felt to be the cause of acid rain. Acid rain is chiefly composed of dimethyl sulfide and hydrogen sulfide. The chemicals attack painted metal surfaces causing pitting and cracks. This is not a major corrosion factor, however, since scheduled cleaning of the affected vehicle will nullify the effects of the chemicals.

b. Acid rain is also caused by marshy areas such as swamps or bogs which naturally produce dimethyl sulfide and hydrogen sulfide through the decaying of matter. Again, the solution is to keep vehicles as clean as possible at all times.

2-18. Corrosion Caused by Oils, Chemicals, and Gases.

Corrosion can occur when metal comes in contact with various substances. This contact may occur during the repair, testing, or shipment of a vehicle. Tables 2-2 and 2-3 list corrosive solvents and their effect on metallic surfaces.

Table 2-2. The Corrosive Effects of Fuel Oil, Coolants, and Other Fluids.

Type of Fluid	Effect
Engine Fuel	Softening or swelling of some polymers.
Hydraulic Fluid	Lack of coating adhesion. Introduction of insulative films on electrical connector contactors.
Turbine Oil	Attack on neoprene and natural rubber.
Dielectric Coolant	Attack on organic seals.
Anti-icing Fluids	Increased condensation and attack on electrical wiring.
Aqueous Contaminants (Free Water, Urine, Condensation Desiccants)	Increased condensation causing "pooling" of fluid in bathtub areas. Corrosive attack of unprotected bimetallic couples. Introduction of insulative films on electrical connector contact surfaces.
Maintenance Fluids	Softening and/or reduced adhesion of some organic coatings.

Table 2-3. Corrosive Damage Potential During Tests, Service, or Storage.

Environment	Produced By	During	Attacks
Corrosive Liquids	Improper Cleaning Methods	Fabrication or Repair	Insulation, Components
Oil or Grease	Leakage	Storage or Rework	Cadmium, Paint
Pools of Water	Sump Areas (Poor Design)	Storage or Service	Everything
Diester Oils	Lubricants	Storage	Neoprenes, Plastics, Paint
Electrolyte (Corrosive)	Seal Leakage of Electrolytic Capacitors	Service	Circuit Components
High Temperature	Exothermic Cure of Encapsulant	Fabrication or Repair	Insulation, Components
High Temperature	Curing Oven	Fabrication or Repair	Insulation Components
High Temperature	Lack of Cooling or Short	Test or Service	Insulation, Components
Acid Residues	Incomplete Cleaning	Fabrication or Repair	Metals, Nonmetals
Ambient Atmosphere	Insufficient Packaging	Fabrication or Storage	Conductor Surfaces
Corrosive Gases	Sulfur in Paper	Fabrication or Storage	Silver
Corrosive Gases	Undercured Organics (Coatings)	Storage	Metals, Plastics
Corrosive Gases	Packing Materials	Storage	Cadmium, Other Metals
Corrosive Gases, Acid	Overheated Insulation	Test or Service	Metals
Corrosive Gases, Acid	Wood (Oak, Chestnut, Cedar)	Storage or Shipping	Metals
Corrosive Gases, Acid	Adhesives, Heat Sealing of Plastic Bags	Test or Service	Metals
Corrosive Gases, Ammonia	Propellant	Test or Service	Plastics, Copper

Section III. CORROSION REMOVING COMPOUNDS

2-19. General.

a. TM 9-247, *Materials Used For Cleaning, Pre - serving, Abrading and Cementing Ordinance Materiel*

and *Related Items Including Chemicals*, provides a list of commonly used chemicals for the maintenance of Army equipment.

b. Those materials that most closely relate to the Corrosion Prevention and Control Program are provided below.

2-20. Rust Arresting Coating (MIL-R-10036).

a. This is a clear liquid composed of drying and semi-drying oils and driers. This compound is diluted with a petroleum solvent to a brush or spray consistency.

b. The compound will set to touch in three hours and dry to a hard film in 24 hours. It is used on rusted metal and painted surfaces to arrest further corrosion.

2-21. Cleaning Compound Solvent: De-greasing and Self-Emulsifying (MIL-S-11090A).

a. This compound is a liquid solvent containing an emulsifying agent or agents. It is used to remove oils, greases, asphalts, tars, and preservative compounds from metallic and painted surfaces. It will not remove wax-type rust preventive compounds.

b. The solvent is used full strength and is applied by brush, swab, soak, or spray followed by rinsing with a jet of steam or water. If water must be avoided, rinse with dry cleaning solvent (P-S-661).

2-22. Corrosion Removing Compound: Alkaline Immersion (Oral JR-OME-PD-110A).

WARNING

Due to the large quantity of caustic soda (lye), do not add large amounts of the compound to the water at one time, since the reaction may generate enough heat to cause an eruption. Protective clothing and glasses should be worn when using or making this solution. In case of contact with skin or eyes, flush immediately and thoroughly with water for at least 20 minutes. Get medical attention.

a. This compound is a dry powder or fine granular material, or both, in combination with flake material. This compound is free from alkali metal cyanide.

b. It is used to remove rust and scale from iron and steel components such as engine blocks, cylinder heads, and miscellaneous engine parts. It can also be used to remove paint, heavy grease, oil, and phosphate coatings. This should be accomplished in a separate tank.

2-23. Corrosion Removing Compound: Hydrochloric Acid w/inhibitor (MIL-A-13528) (ORD).

WARNING

Phosphine, (hydrogen phosphide), a colorless, poisonous gas, forms very readily when any mineral acid reacts with metals or alloys containing phosphorus. Adequate ventilation must be provided since this gas is a dangerous fire, explosive, and toxic hazard. This acid causes burns. Avoid breathing vapors. In case of contact with skin or eyes, flush immediately and thoroughly with water for at least 20 minutes. Get medical attention.

a. This is an acid-pickling compound composed of hydrochloric (muriatic) acid and an inhibiting material that limits the action of the acid on the base metal after the rust has been removed.

b. The compound as issued is ready for use. It is used to remove heavy rust deposits from ferrous metal parts such as bomb fins, engine blocks, and small arms materiel. This compound does not change the dimensions of the parts materially, if properly applied.

2-24. Corrosion Removing Compound: Metal Conditioner and Rust Remover, Phosphoric-Acid Type.

WARNING

This compound contains a strong acid. Care must be taken to prevent contact with skin or eyes. Protective clothing and glasses should be worn when making up or using the solution. In case of contact, flush skin and affected areas immediately and thoroughly with water for at least 20 minutes. Get medical attention.

a. This compound is a clear, homogeneous, uninhibited phosphoric acid solution containing a

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wetting agent. This compound does not contain a grease solvent because it is a de-ruster for parts that have been precleaned.

b. This compound is used to remove rust from precleaned metal parts.

2-25. Corrosion Removing Compound: Metal Conditioner and Rust Remover, Wash-off Type (MIL-M-10578A, Type I).

WARNING

When diluting the compound, pour the compound into the water. Do not pour water into the compound. Phosphine, (hydrogen phosphide), a colorless, poisonous gas, forms very readily when any mineral acid reacts with metals or alloys containing phosphorus. Since this gas is a dangerous fire, explosive, and toxic hazard, adequate ventilation must be provided. The amount of phosphine released from the acid bath increases with an increase in temperature and concentration of acid. Compound contains a strong acid. Operators should wear protective clothing and glasses when making up or using this compound. If splashed on skin or eyes, flush immediately and thoroughly with water for at least 20 minutes. Get medical attention. Avoid prolonged breathing of vapors.

CAUTION

Do not use this compound on electrical wiring, coil steel springs, or other spring steels.

a. This compound is a concentrated, homogeneous, stable liquid, containing free orthophosphoric acid and water soluble, nontoxic, organic grease solvents.

b. This compound is used to remove rust and grease from ferrous metal surfaces, and provides a slight etching action for ferrous and nonferrous metals to promote the adhesion of paint or corrosive preventives.

2-26. Sodium Bichromate, Dihydrate: Technical, Granular (O-S-595).

This compound consists of red crystals that are soluble in water. It is used in the following applications:

a. As a component of low temperature bichromate finish solution for ferrous metals.

b. As a molten bath to produce black finish on corrosion resisting steel.

c. As a component of a chromate pickle solution used to clean traces of flux from magnesium alloy items after gas welding.

d. As a component of a chromate pickle bath for treating magnesium alloy sand mold, permanent mold, and die castings and wrought magnesium alloy parts to protect them against corrosion (see MIL-M-3171A).

e. As a component of a chrome pickle solution for treatment of magnesium alloy parts before painting (see MIL-M-3171A).

f. As a component of a galvanic anodizing solution that is used in Type IV treatment of magnesium alloy parts before painting (see MIL-M-3171A).

g. As a component of a neutralizing bath for treating magnesium alloy parts after Type V corrosion protective treatment and before painting.

2-27. Corrosion Removing Compound: Metal Conditioner and Rust Remover, Wipe-off Type (MIL-M-10578A, Type II).

WARNING

Pour the compound into the water. Do not pour the water into the compound. Phosphine, (hydrogen phosphide), a colorless, poisonous gas, forms very readily when any mineral acid reacts with metal or alloys containing phosphorus. Since this gas is a dangerous fire, explosive, and toxic hazard, adequate ventilation must be provided.

CAUTION

Do not apply this cleaner to electrical wiring, steel coil springs, or other spring steel. The treated surfaces must be painted or coated with corrosion preventive compound as soon as possible.

a. This compound is a dilute solution of orthophosphoric acid and water soluble, organic, nontoxic, grease solvents. The acid is in lesser proportion and the grease solvents in greater proportion than in the wash-off type.

b. It is used to remove light or medium grease and rust deposits from ferrous metals, or to condition ferrous, galvanized, brass, or aluminum surfaces for painting. The remaining film of gray-white iron phosphate conditions the surface for paint.

2-28. Detergent General Purpose: Powder (P-D-220D).

a. This is a cleaning agent in powder form consisting essentially of synthetic detergents. It is soluble in hard, soft, and salt water. It is free from objectionable odors,

contains no abrasives or fatty-acid soaps, and is not irritating to the skin.

b. It is used to remove grease, oil, and occupational soil from painted surfaces, and in general soil removal. It is applied with brush, cloth, or sponge.

CHAPTER 3

RUSTPROOFING EQUIPMENT/EQUIPMENT MAINTENANCE AND PRELIMINARY INSTRUCTIONS

Section I. RUSTPROOFING EQUIPMENT AND MATERIALS

3-1. General.

a. Implementation of this technical bulletin by commanders of military installations is authorized when the environment dictates preventive control. Saltwater coastal areas, high humidity regions, and locations requiring snow removal by halite/sodium chloride (rock salt) are prime candidates for application of this TB.

b. Installations establishing a rustproofing program must develop a Standard Operating Procedure (SOP) based on specific needs, local requirements, and equipment manpower resources peculiar to the installation (see paragraph 1-17). The assigned Corrosion Prevention and Control Officer must become familiar with the shop requirements as well as the material and equipment available through normal supply channels, or through local/direct purchase from the manufacturer.

c. Due to the toxic hazards and flammability of rustproofing material, coordination in establishing a rustproofing program must be made with the installation's Safety Officer or Logistics Officer. A training program emphasizing the hazards, shop safety practices, and first aid must also be established.

3-2. Minimum Shop Requirements.

A military rustproofing facility must comply with the following minimum requirements:

a. The shop must be equipped with a hoist of adequate capacity and with vehicle ramps.

b. The shop area should have ready access to compressed air and an electrical cable capable of 220-volt, three-phase capacity.

c. Vehicle wash areas must have a water supply of ten gallons of water per minute and adequate drainage for such volume.

d. Pallets, or similar ventilation platforms, must be provided in the work area for the drums of rustproofing compound to sit on. This is to prevent the transfer of cooler floor temperatures to the drum contents.

e. The work area must be well-ventilated and located away from flammable, explosive, or toxic material storage areas.

3-3. Parts/Materials Required.

a. Table 3-1 lists rustproofing compounds as well as their National Stock Numbers (NSN). These compounds are the only ones approved for application on U.S. Army fielded vehicles. Rustproofing compounds must be ordered by NSN through Federal Supply Service Bureau, 9001 Stateline Road, Kansas City, MO 64114.

b. Table 3-2 lists rustproofing equipment. Units must be familiar with the available equipment in order to determine which equipment best meets the peculiar needs of the unit. Requisitioning of this equipment will be accomplished through local or direct purchase from the manufacturer, except when an NSN is indicated.

Table 3-1. Rustproofing Compounds.

NSN	Item	Suppliers	Supplier Designation
8030-01-127-3684	Rustproofing Compound (16-gallon Drum)	Ashland Oil Co. Chrysler Corp. Lubrizol Corp. Tuffkote Dinol Inc. Wideger Chem. Corp. Ziebart International	TECTYL517 CS2675 785B TK1010U WC 2220 XL5-G
8030-01-127-3683	Rustproofing Compound (55-gallon Drum)	Ford Motor Co. Decar Chemical Co. Jenkin-Guerin Inc. Quaker State Oil	WC 2240 Dax Seal 7272 Anchor Tuflex RP 785-B Metal Gard 7000

Table 3-2. Rustproofing Equipment.

NSN	Part Numbers	Description	Quantity	Suppliers
	N/A TK2790 TK5010G TK5035G TK5031G TK5030G TK5050G TK5070G TK4020 TK4025 TK4022 TK4050 TK4082	Tuffkote High Pressure Power Wash System 55-gallon Pump, Complete 2-gun Setup 90° Tool 45° Ledge Tool 90° Straight Bent Tool Straight Tool 60-inch Cone Flex Tool Optional Equipment: Air Drill Cutter Blades Uni-bit Inspection Light Drum Warmer (55-gallon)	As Req'd	Tuffkote Dinol (Distributor for ARO) 13650 E. Ten Mile Road Warren, MI 48089
	8575	16-gallon Rustproofing Unit Including Pump, Air Regulator, Gage, Filter, Drum Cover, Band Dolly, Hose Assembly, Three Wands (Long/Rigid, Flexible, and 3½-inch Extension Wand), Spray Gun, and Three Orifices	As Req'd	Alemite Rustproofing Systems 1001 W. Arizona Ave. Denver, CO 80223
	N/A	Drum Heater	As Req'd	Electro Flex Inc. P.O. Box 88 Bloomfield, CT 06002
	N/A	High Pressure Washer Systems	As Req'd	Nu Process 13374 Farmington Rd. Livonia, MI 48150
	N/A	High Pressure Washer Systems	As Req'd	Landa Inc. 4920 NE 122nd St. Portland, OR 97230
6635-00-111-1054 5133-00-239-0785 4240-00-269-7912 5340-00-240-9228	790010 (07036) 271A60 BPFI-2 (99017)	Wet Film Thickness Gage ½-inch Common Drill Gloves (Oil/Chemical Resistant) Apron/Shop Coat/Coveralls ½-inch Drill Bit Face Shield ½-inch Hole Plugs	As Req'd	
	252-737 Vanguard 2104E 226-269 800-103 800-102 800-017 946-939 946-940	Rustproofing Kit (Includes All of the Following): High Pressure Washer Rustproofing Pump Wet Sandblasting Attachment (25-foot Base) Chemical Injector Spray Gun w/Quick Coupler Spray Tools: 60-inch Flex Hose, Cone Spray Tip 60-inch Rigid Wand With 90° Spray Tip	As Req'd	Graco Inc. P.O. Box 1441 Minneapolis, MN 55440

Table 3-2. Rustproofing Equipment (Con't).

NSN	Part Numbers	Description	Quantity	Suppliers
	946-941	60-inch Rigid Wand With Straight Spray Tip		
	946-951	15-inch Ledge Tool, 45° Bend		
		3 inches From Tip		
	946-943	12-inch Wand w/Flat Fan Tip		
	N/A	Ziebart Portable Pumping System Including 16-gallon Unit/ 55-gallon Unit	As Req'd	Ziebart Rustproofing Co. P.O. Box 1200 1290 E. Maple Rd Troy, MI 48099
	870100	Regulator Assembly		
	855000	Pump		
	855040	Pump/Filter/Sealant/Gun		
	871400	Inline Filter & Screen		
	871800	Adapter		
	871000	High Pressure Sealant Hose		
	871700	Filter to Hose Adapter		
	871200	Gun to Hose Swivel		
	860000	Gun		
	770600	Petcock Housing		
	771900	Couplers		
	N/A	Power Wash System		
	N/A	Drum Washer		
	N/A	Ziebart Wands:		
	503900	Long 90° Spray Tool		
	503700	90° Spray Tool		
	504200	Rocker Panel Curve		
	504100	Medium Curve		
	503400	Fan Tool		
	600235	Inspection Light		
	600233	Replacement Bulb		
	304015	Respirator		

3-4. Powerwash Equipment (Typical).

WARNING

High pressure spray can cause serious injury or death. Never put hand or fingers over the spray tip. Never point spray at another person. Never try to stop or deflect leaks with your hand. Ensure that all components of the wash system can withstand the pressures. Never exceed the rated pressure of the equipment. Even after shut-off, pressure will remain in the system and must be purged by triggering the gun. Inspect all parts of the system before use. If injection injury occurs, get immediate emergency medical care, even for a simple cut.

NOTE

Prior to use of powerwash equipment, refer to U.S. Government Safety Standards, General Standards Part 1910, and U.S. Government Construction Standards Part 1926, adopted under the Occupational Safety and Health Act.

a. Powerwash equipment is used to thoroughly clean a vehicle of all dust, grease, mud, and debris deposits before application of rustproofing material. Powerwash equipment available commercially may be air powered, hydraulic powered, gas powered, or electrical. Units available may also be portable or stationary.

WARNING

Silica exposure hazards exist whenever sand particles are injected into the air. Wet sandblasting lessens health risks, but care must be taken to ensure that applicators use the recommended protective equipment. Silica exposure due to failure to wear protective equipment can result in silicosis, a lung disease similar to emphysema.

NOTE

Sand is used to clean away corrosion from large areas of the vehicle. Sand itself is highly abrasive and will quickly wear the affected surface down to bare metal.

b. Sand injector kits for wet sandblasting of corroded surfaces can also be adapted for use with powerwash equipment. Wet sandblasting should never be implemented indoors nor without use of protective clothing, gloves, goggles, ear protection, and facial respirators.

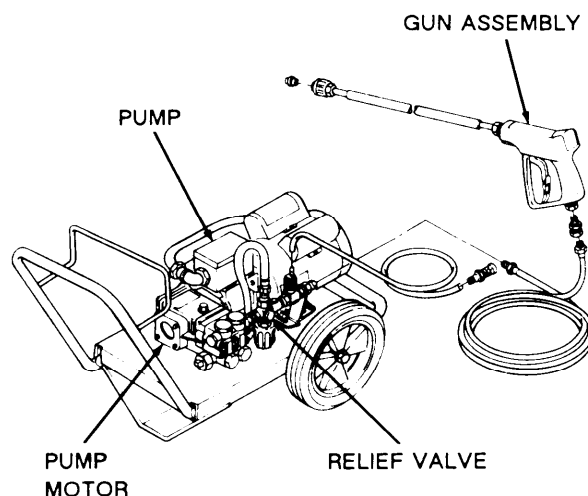
c. Commercial literature is available upon request from each of the suppliers of powerwash equipment listed in Table 3-2. This literature provides much valid and useful information with regard to equipment specifications, operation, and maintenance. CPC officers responsible for establishing a rustproofing program can use the commercial literature to determine which type of equipment best suits the operation, and to obtain maintenance information for the equipment of choice.

d. All powerwash equipment suppliers listed in Table 3-2 provide good products. This TB in no way endorses one product or supplier over another. Sample troubleshooting instructions provided in Table 3-3 are typical or representative of such equipment.

e. All powerwash equipment, regardless of size, power source, or portability, have common components (see Figure 3-1).

f. Figure 3-2 provides an overview of a typical portable powerwash equipment operation with remote power (electrical) and water source. The applicant is wearing the proper safety equipment and clothing and is

also using the sand injector kit for wet sandblasting of large corroded areas. In the application shown, the water source is hooked up to the pump. The power source operates the pump motor. Water is drawn by the pump and pressurized out to the gun assembly and wand. The sand injector kit is a simple tube device. One end of the tube is inserted into a container of dry sand. The opposite end of the tube is connected to the end of the wand. Pressure from the water shooting out the wand draws the sand up through the tube.

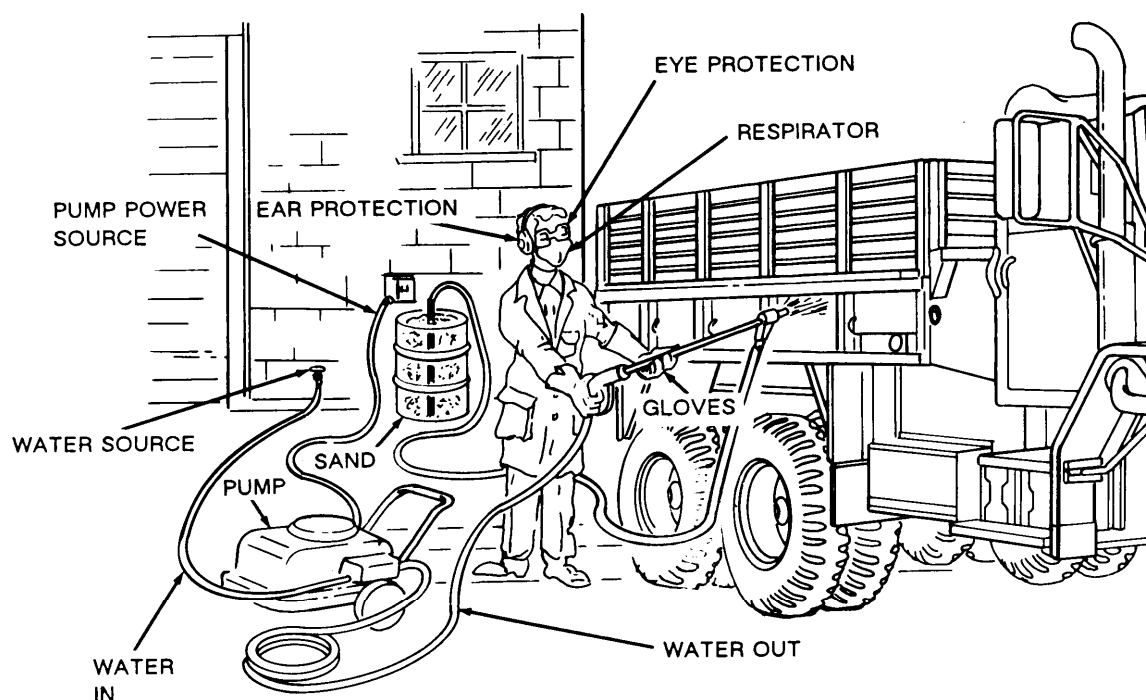


TA504753

Figure 3-1. Standard Powerwash Equipment.

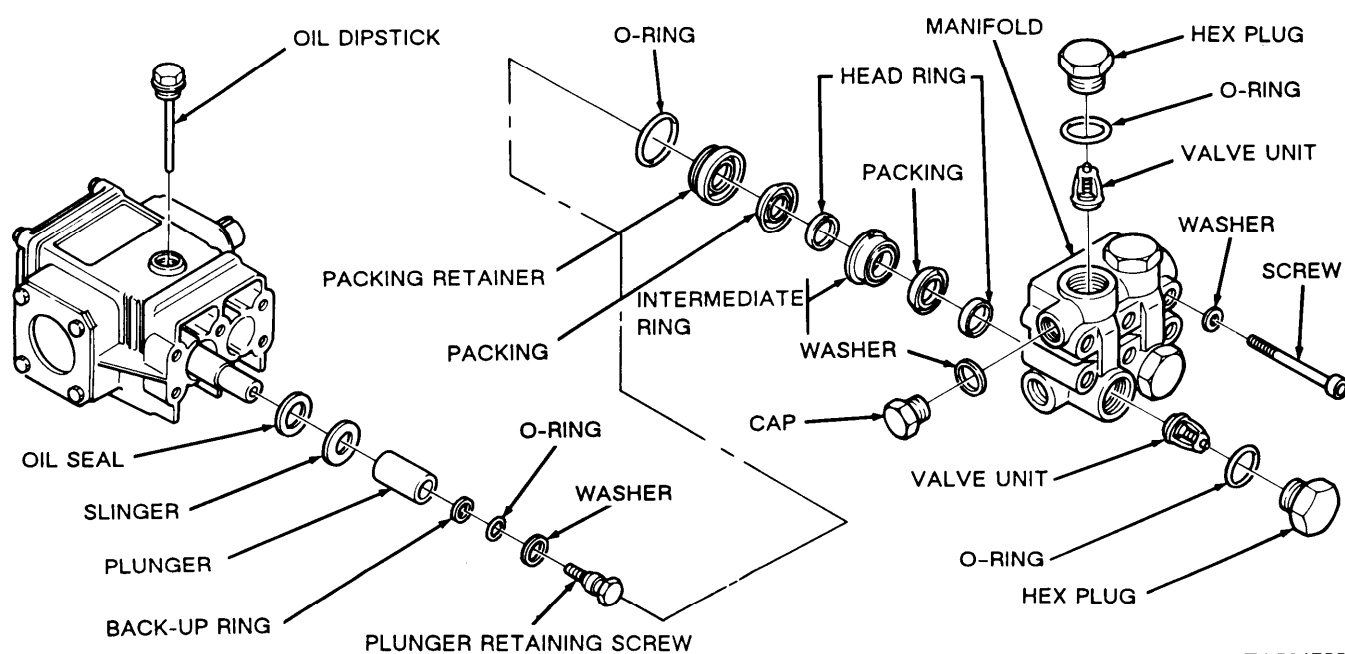
g. With the sand injector removed, the unit illustrated in Figure 3-2 becomes a simple washer used for cleaning the vehicle of dirt, oil, etc. The wand's nozzle should be held a foot or so from the surface being cleaned and sprayed at an angle to the surface in order to get underneath the grit. Stubborn deposits may require the application of a detergent (see paragraphs 2-21 and 2-28). Detergents should be applied to an area from the bottom up and rinsed away from the top down with the high pressure washer,

h. Table 3-3 provides troubleshooting instructions for a typical powerwash unit. Nomenclature used in this table is referenced to Figure 3-3 through Figure 3-6.



TA504754

Figure 3-2. Powerwash Operation (Typical).



TA504755

Figure 3-3. Pump Assembly (Typical).

3-5. Material Pumps (Typical).

a. Pumps used in the application of rustproofing material are high pressure, air driven motors that mount directly onto the rustproofing material drum. A complete unit consists of the air motor or pump itself as well as attaching air regulator, pressure gage, in-line air filters, a bleed-type master air valve, material filter, and grounding log.

b. Commercial literature is available upon request from each of the supplies of material pumps listed in Table 3-2, CPC officers will benefit from this literature when determining which pump best suits their operation. This literature also provides specific maintenance and repair instructions. Figure 3-7 illustrates a typical material pump. This figure is representative only and is not intended to endorse one product or supplier over another.

c. The air motor pump consists of the air motor and piston cylinder. The assembly rests on a drum topped

with the cylinder end immersed in the rustproofing material. The air regulator and pressure gage most often attaches directly into the motor lead. The regulator controls the air pressure going into the pump, thereby also controlling the pump speed.

WARNING

All material pump air lines must be purged of air pressure after operation. Failure to do so could cause the pump to cycle unexpectedly. Serious material injection injury could result.

d. To ensure the safe operation of the pump, an air bleed valve must be installed to purge the system of pressurized air after operation. This bleed valve may be built into the air regulator and gage, or may be a separate item, depending on the supplier.

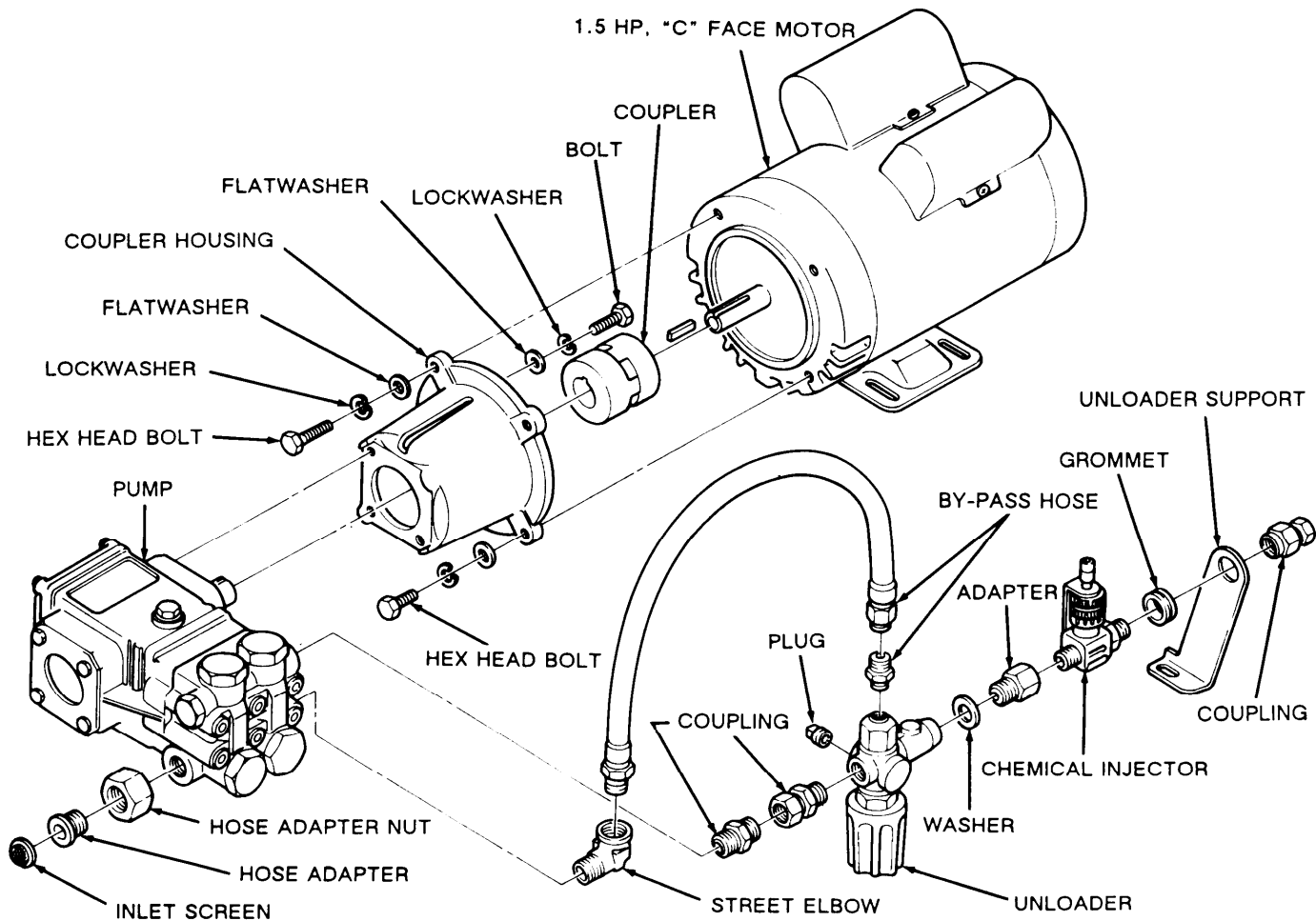


Figure 3-4. Pump Motor Assembly (Typical).

TA504756

e. The material pump system should also include an in-line air filter to remove dirt and moisture from the compressed air going into the pump, as well as an air line oiler which automatically lubricates the air motor during operation. These items are attached to the air lines going into the purge valve and air regulator, which are attached directly onto the pump. The compressed air source is a minimum shop requirement (see paragraph 3-2).

f. Grounding of the system during operation is essential due to the potential for a buildup of static electricity. During operation, the pump, the spray gun, and the object being rustproofed should each be well grounded to eliminate the fire/explosive hazard of static electricity in proximity to rustproofing material.

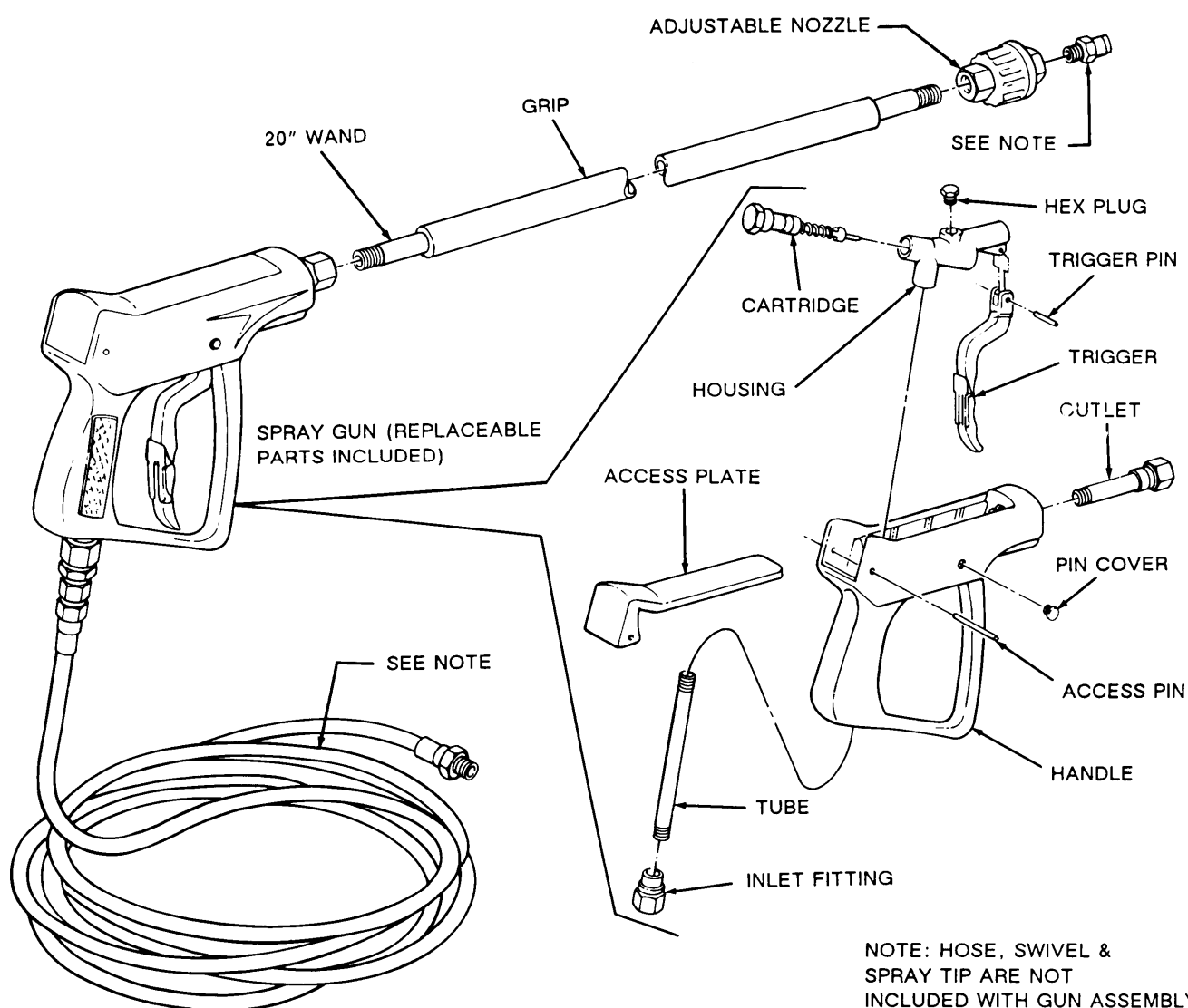


Figure 3-5. Powerwash Spray Gun (Typical).

TA504757

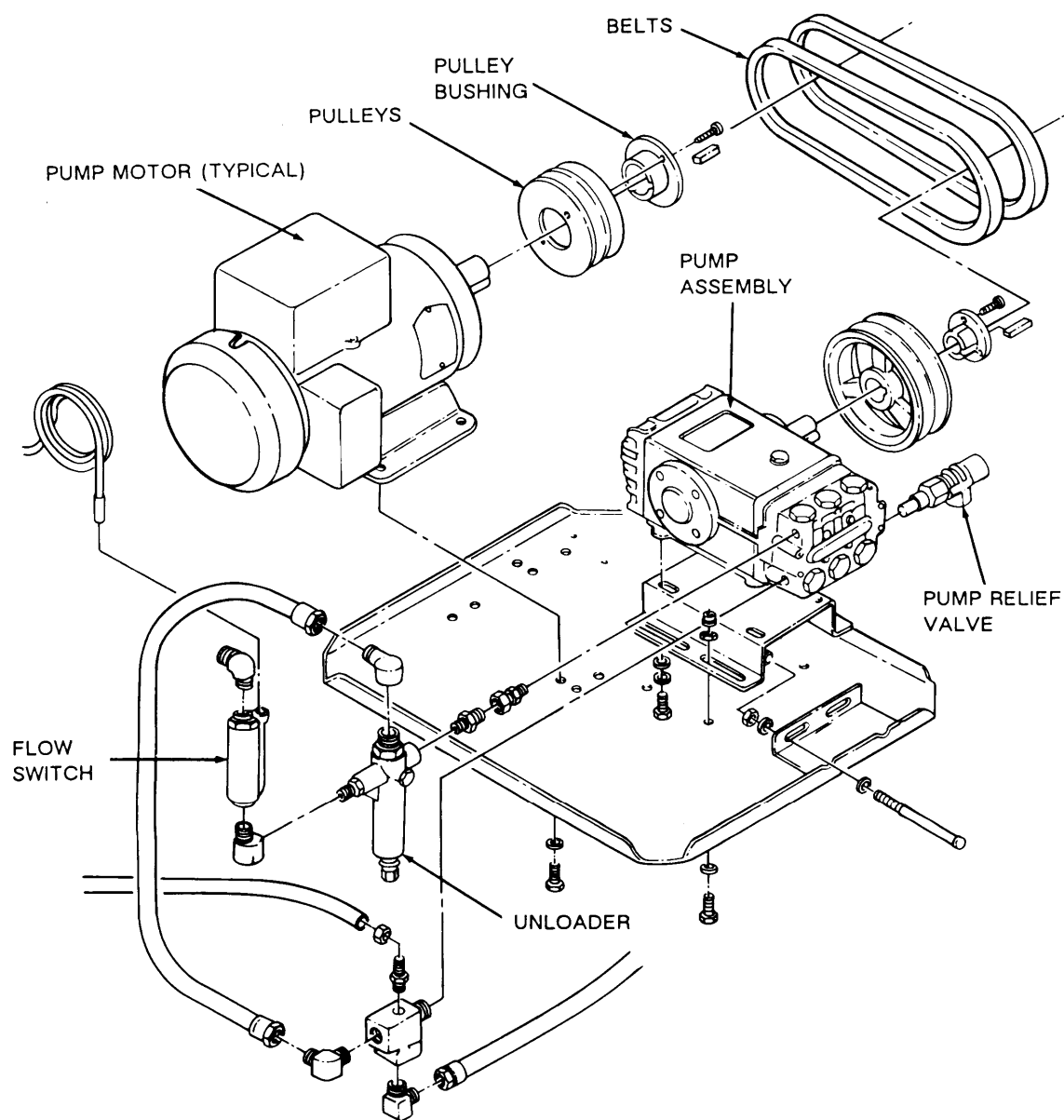
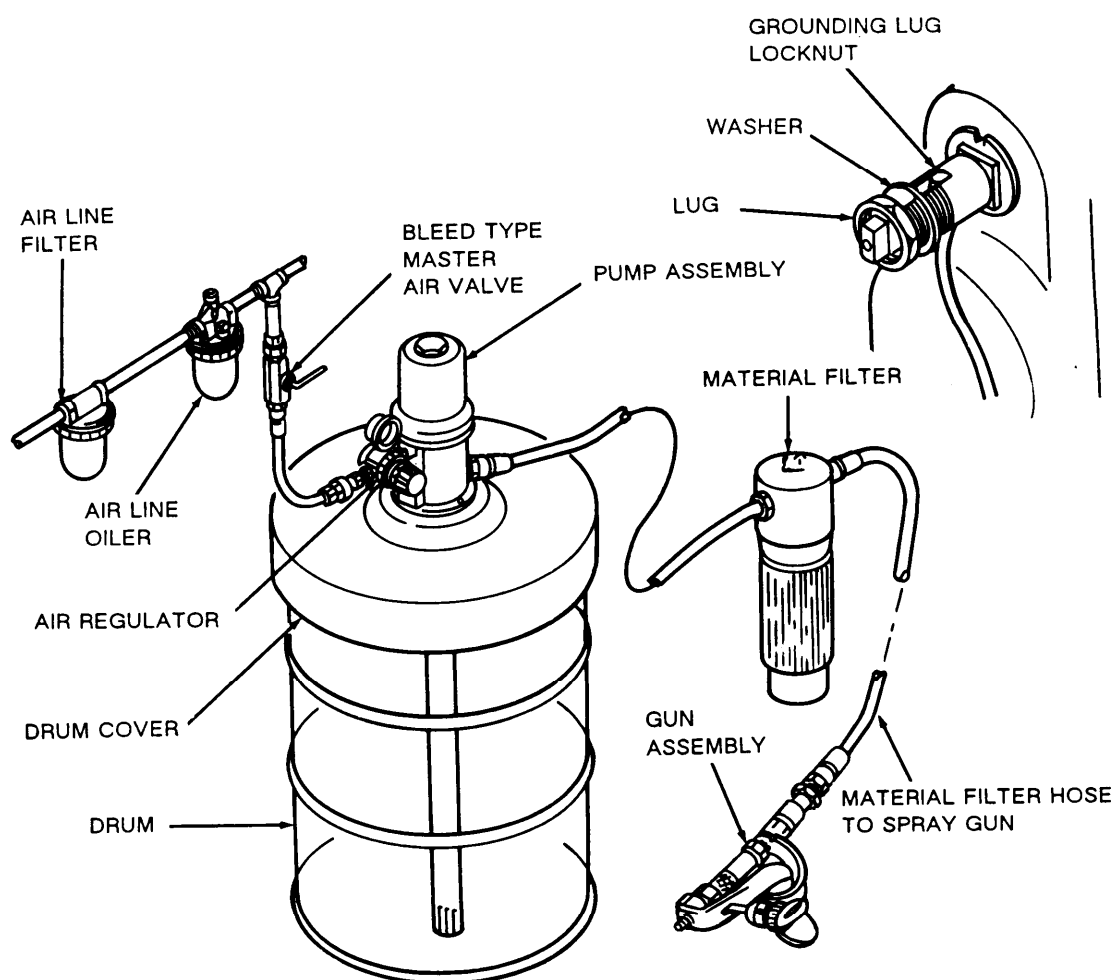


Figure 3-6. Powerwash Equipment Platform (Typical),

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TA504759

Figure 3-7. Rustproofing Material Pump and Attaching Hardware.

g. Depending on the model pump, the material filter may be built into the pump or attached to the output of the pump. This filter removes impurities from the material and protects the gun orifice from damage. Figure 3-8 and Figure 3-9 provide cutaway and exploded views of a representative pump. Table 3-4 contains troubleshooting instructions for a material pump.

3-6. General Maintenance Information for Material Pumps.

The following is a list of general maintenance procedures for material pumps:

- a. Oil pumps daily with 20W non-detergent oil.
- b. Clean foot filter each time a new drum of material is used.

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c. Clean material line filter every two weeks.

d. If slide valve freezes, use antifreeze through the air intake to thaw out. Ensure that it is frozen and not simply stuck because of lack of lubrication.

e. Never operate the pump at more than 100 psi (690 kPa). You will damage the piston within the pump shaft.

f. If pump fails to operate, do not strike pump with hammer, etc.

g. Never allow the pump to run dry. A dry pump will quickly accelerate to a high speed, possibly damaging itself.

h. Always flush the unit before material hardens in any part of the system. How often flushing occurs depends upon the material being used. Use the lowest possible pressure to flush. Ground spray gun against waste container.

i. After spraying, always turn off the air at its source and purge the line using the air bleed valve. Disconnect the air line coupler after the line has been cleared. At the output end, trigger the gun into a waste container to clear it of material under pressure. Engage the trigger safety and disconnect the material line at the filter. Clean gun and line.

NOTE

If the grounding wire was disconnected before servicing, be sure to reconnect it before operating the pump.

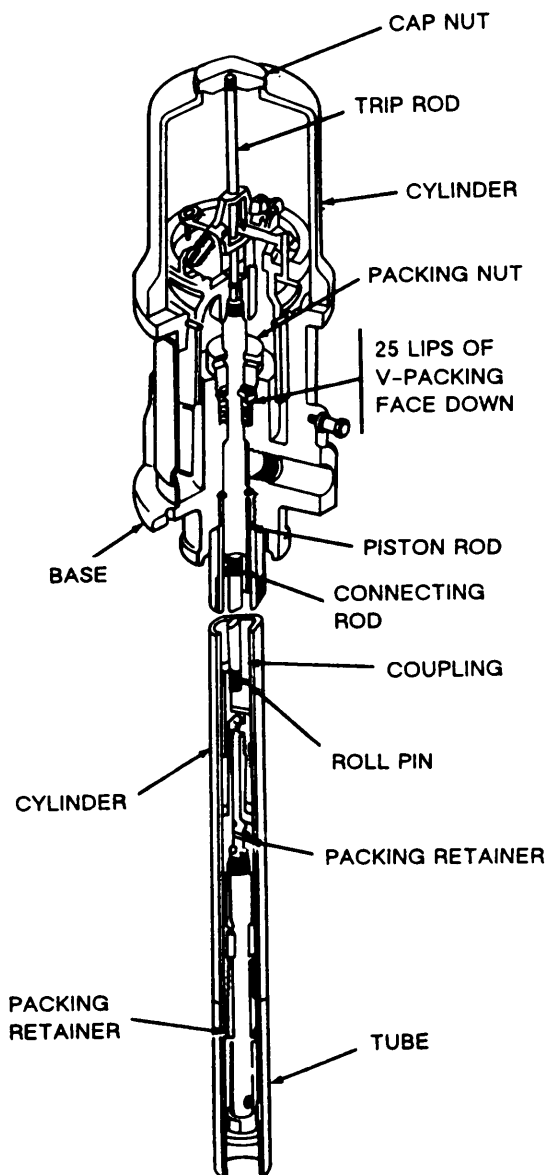


Figure 3-8. Typical Pump
(Cutaway View).

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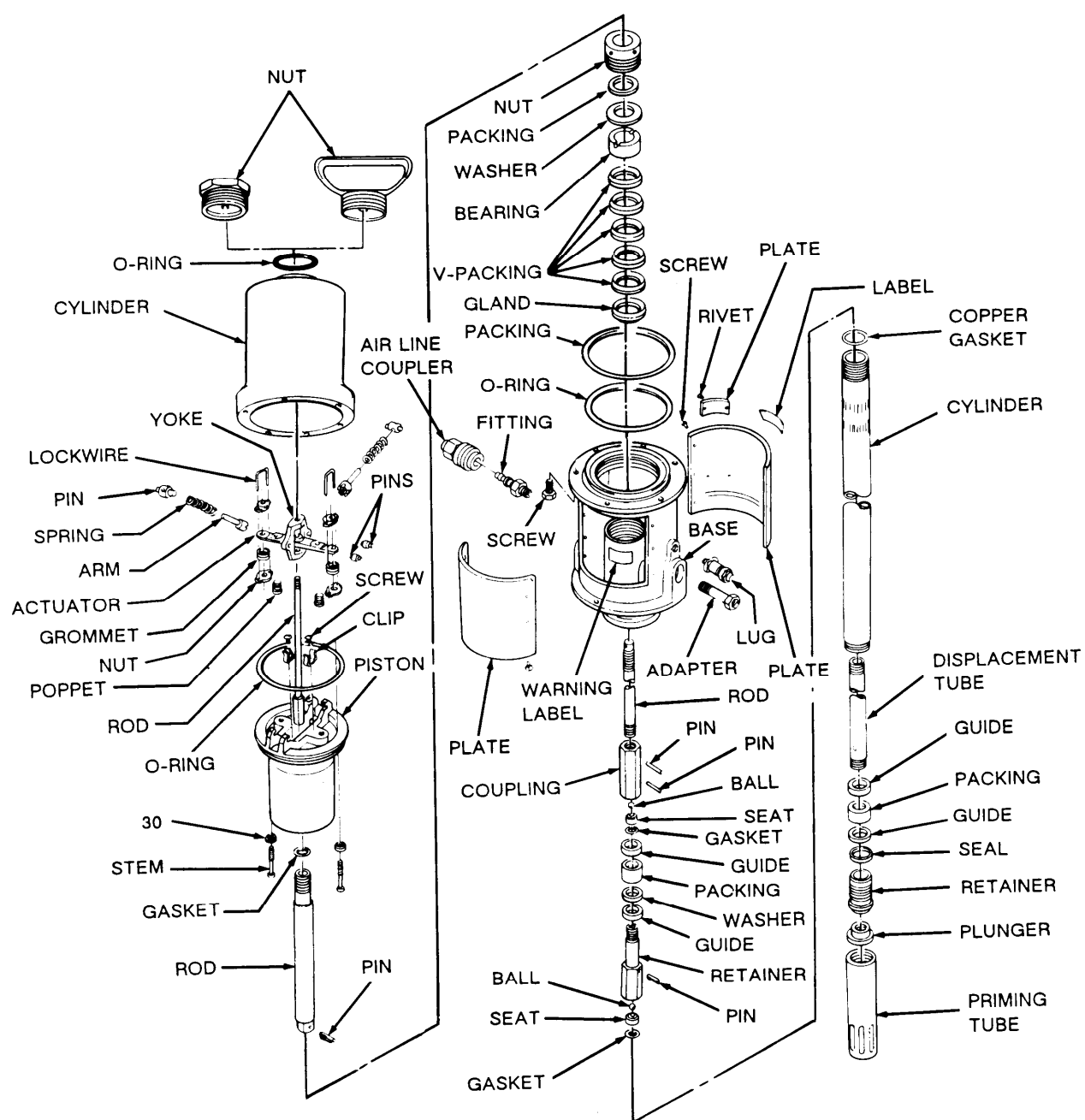


Figure 3-9. Typical Pump (Exploded View).

TA504761

3-7. Spray Guns.

WARNING

High pressure spray equipment can cause serious injury or death. Never put hand or fingers over spray tip. Never point spray gun at another person. Never try to stop or deflect leaks with your hand. Ensure that all components of the spray system can withstand the pressures. Never exceed the rated pressure of the equipment. Never alter or modify the equipment. Even after shut-off, pressures will remain in the material hose and gun and must be purged by grounding the gun to a waste container and triggering the gun. Never change wands, tips, or any accessories until after system is completely shut off and purged. Inspect all parts of the system before use. Ensure that all fittings are properly installed and tightened, and that hoses are not frayed or cracked. If injection injury occurs, even for a simple cut, get immediate emergency medical care. Inform emergency physicians that the material injected into the skin is a petroleum compound containing aliphatic petroleum naphtha with an effect similar to kerosene.

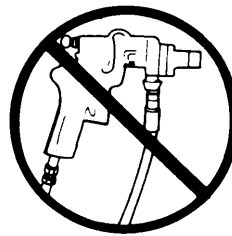
NOTE

Prior to use of high pressure spray equipment, refer to U.S. Government Safety Standards, General Standards Part 1910, and U.S. Government Construction Standards Part 1926, adopted under the Occupational Safety and Health Act.

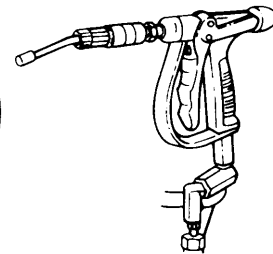
a. A rustproofing material spray gun is used to control and direct the spray of the material, or to stop the spray by releasing the trigger. These spray guns are used in combination with various wands that permit the technician to reach out-of-way places and to apply different spray patterns.

b. There are two types of material spray guns available on the market (see Figure 3-10):

(1) *Fogging Gun.* The fogging gun connects the air source directly to the gun along with the rustproofing material. The pressurized air and material converge within the gun where, when the trigger is pulled, they are ejected in a fine mist. This type of rustproofing application is called fogging and is NOT approved for use by U.S. Army installations.



FOGGING GUN



AIRLESS SPRAY GUN

Figure 3-10. Fogging and Airless Spray Guns.

TA504762

NOTE

Depending on the installation, the spray gun handle may be equipped with a Z swivel to provide greater maneuverability.

(2) *Airless Gun.* The airless type of spray gun system uses an air motor pump over the drum as discussed in paragraph 3-5. The material pressurized out of the pump, through the material filter, and into the gun is not mixed with air. As a result, the material ejected from the wand end is a pure concentration of rustproofing material.

Table 3-3. Troubleshooting Powerwash Equipment.

Problem	Probable Cause	Solution
Low Pressure.	Worn nozzle. Belt slippage. Air leak in inlet plumbing. Pressure gage inoperative or not registering accurately. Relief valve stuck, partially plugged, or improperly adjusted; valve seat worn. Inlet suction strainer clogged or improper size. Worn plunger cups. Abrasives in pumped fluid or severe cavitation. Inadequate water supply.	Replace nozzle with proper size. Tighten or replace; use correct belt. Disassemble, reseal, and assemble. Check with new gage; replace worn or damaged gage. Clean, adjust relief valve; check for worn and dirty valve seats. Kit available. Clean. Use adequate size. Check more frequently.
Pump runs extremely rough, pressure very low.	Fouled or dirty inlet or discharge valves. Worn inlet or discharge valves. Leaky discharge hose. Restricted inlet or air entering the inlet plumbing. Inlet restriction and/or air leaks. Damaged cup or stuck inlet or discharge valve. Worn inlet manifold seals.	Clean inlet and discharge valve assemblies. Replace worn valves, valve seats, and/or discharge hose. Install proper size inlet plumbing; check for air tight seal. Replace worn cup or cups, clean out foreign material, replace worn valves. Replace worn seals.
Cylinder O-rings blown next to discharge manifold.	Pressures in excess or rated psi (kPa). Warped manifold.	Check for plugged nozzle, closed valves, or improperly adjusted by-pass valve. Replace manifold.
Leakage at the cylinder O-rings at the discharge manifold and black, powdery substance in the area of the O-rings.	Loose cylinders. Cylinder motion caused by improper shimming of the discharge manifold.	Remove spacer shims on manifold studs. Do not remove too many shims or the manifold will be bowed when the manifold is tightened, causing looseness in the center cylinder.
Water leakage from under the inlet manifold.	Worn inlet manifold seals. Leaking sleeve O-ring.	Install new seals. If piston rod sleeves are scored, replace sleeves and sleeve O-rings. Replace O-rings.
Excessive play in the end of the crankcase pulley.	Worn main ball bearing from excessive tension to drive belt.	Replace ball bearing. Adjust belt tension. Check shaft shims.
Loud knocking noise in pump.	Pulley loose on crankshaft. Broken or worn bearing.	Check key and tighten setscrew. Replace bearings.
Frequent or premature failure to the inlet manifold seals.	Failure to oil the wick lubricators.	Replace inlet manifold seals and wick lubricators, saturating in oil before they are assembled into the manifold assembly. Oil each hole three drops once a month with pump running.

Table 3-3. Troubleshooting Powerwash Equipment (Con't).

Problem	Probable Cause	Solution
Short cuplife.	Scored rods or sleeves. Over pressure to inlet manifold. Damaged or worn chrome plating of the cylinders. Abrasive material in the fluid being pumped. Excessive pressure and/or temperature of fluid being pumped. Improper installation of cups.	Replace rods and sleeves. Reduce inlet pressure per instructions. Replace cylinders. Install proper filtration on pump inlet plumbing. Check pressures and fluid inlet temperature; ensure that they are within specified range. Properly install lip of new cup into groove on the piston. If not properly installed, the cup will be extruded past the piston. Piston will run eccentric; premature failure will result.
Strong surging at the inlet and low pressure on the discharge side.	Over pressure of pumps. Running pump dry. Front edge of piston sharp. Chrome plating of cylinders damaged causing excessive wear of cups. May be caused by pumping acid solution. Foreign particles in the inlet or discharge valve, or worn inlet and/or discharge valves.	Reduce pressure. Do not run pump without water. Replace with new piston. Install new cups and cylinders. Pump only fluids compatible with chrome. Check for smooth lap surfaces on inlet and discharge valve seats. Discharge and inlet valve seats may be lapped on a very fine oil stone. Damaged cups and discharge valves cannot be lapped but must be replaced.
Unloader cycling.	Worn piston seal. Loose cleanout port nut. Leak in discharge hose.	Replace seal. Tighten nut. Replace hose.
Water leaking from valve stem.	Loose stuffing box. Worn O-rings on valve stem.	Tighten stuffing box. Replace O-rings.
Short piston seal life.	Scored piston sleeve. Abrasives in water.	Replace piston sleeve. Flush with clean water.

Table 3-4. Troubleshooting Material Pumps.

Problem	Probable Cause	Solution
Pump continues to cycle after control valve is shut off.	Insufficient material supply. Foot screen filter obstructed. Leakage in material delivery hose, couplings, etc. Worn or damaged packings (piston packings and/or upper packings). Worn or damaged gaskets at either the top or bottom of the cylinder.	Add materials as necessary. Remove and clean. Repair leaks. Replace worn or damaged packings. Replace any worn or damaged gaskets.

Table 3-5. Troubleshooting Material Pumps (Con't).

Problem	Probable Cause	Solution
Pressure drop or erratic material delivery.	Excessively cold material.	Apply drum heater to heat material to between 72°F (22°C) and 80°F (27°C).
	Foot screen filter or in-line filter obstructed.	Clean or replace.
	Improperly installed or plugged tool filter (1010 tools).	Clean, repair, or replace.
	Faulty coupler.	Replace as necessary.
	Worn or damaged packings (piston packings and/or upper packings.)	Replace packings.
	Damaged or worn gaskets at the top and/or the bottom of the cylinder.	Replace gaskets.
Material delivery is erratic and pump operates with a fast upstroke.	Obstruction at the upper check ball (ball is not seating).	Clean or replace parts.
	Worn or damaged piston packings.	Replace packings.
Material delivery is erratic and pump operates with a fast downstroke.	Obstruction at the lower check ball (ball is not seating).	Clean or replace parts.
	Worn or damaged piston packings.	Replace packings.
Air leakage at upper unit.	Worn or damaged O-ring, gasket, or U-cup.	Replace parts.
	Stuck or frozen slide valve.	Free stuck slide valve (see paragraph 3-6).
Pump fails to start after air supply is connected.	Wrong inlet air supply pressure.	Repair or adjust air supply system to obtain an optimum pressure of 40 psi (276 kPa).
	Blocked material line.	Clear obstruction beginning at the tool and working back to the pump.
	Frozen or stuck slide valve.	Free stuck slide valve (see paragraph 3-6).

c. Commercial literature is available upon request from each of the suppliers of material spray guns, wands, and attaching hardware and hoses, as listed in Table 3-2. This available literature also provides specific maintenance and repair instructions. Figure 3-11 is an example of a typical spray gun system.

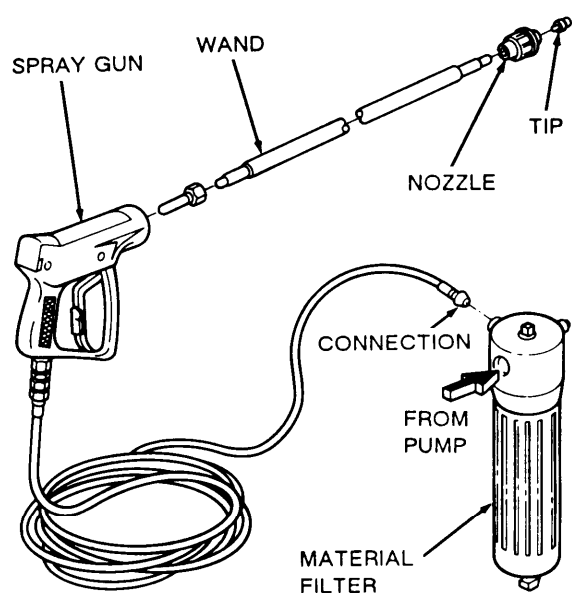
d. There are two ways of mounting material filters to the system (see Figure 3-12 and Figure 3-13). There is no difference in performance from one mounting position to another; however, with remote mounting, the added weight on the hose reduces the ease of handling and increases the chance of damaging the filter.

e. The following is a typical installation procedure for a rustproofing material spray gun system:

WARNING

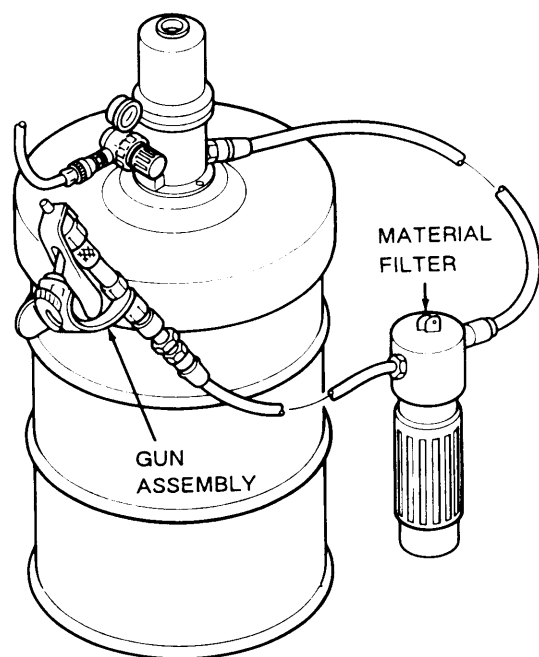
Make certain pump motor is turned off and all air lines have been purged of pressure before installing spray gun assembly.

(1) Connect the material filter to the output port of the air motor pump, directly or remotely, depending on the model.



TA504763

Figure 3-11. Typical Spray Gun System.



TA504764

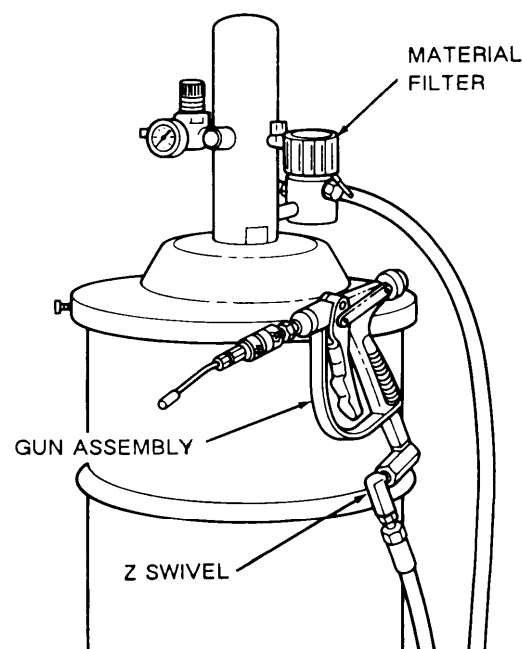
Figure 3-12. Material Filter (Remote Mounting).

NOTE

In some shop applications, it may be desirable to operate two spray guns from the same material pump. In such instances, a tee may be used at the outlet port of the material filter instead of a direct material hose connection. The multiple material hoses are then connected to the two outlet parts of the tee.

(2) Connect the material hose (black hose) to the outlet port of the material filter.

(3) Connect the opposite end of the material hose to the handle of the gun(s).



TA504765

Figure 3-13. Material Filter (Direct Mounting).

NOTE

Depending on the installation, the spray gun handle may be equipped with a Z swivel to provide greater maneuverability.

f. Once the spray gun system has been connected, refer to paragraph 3-8 for information concerning choice of wands, wand extensions, and assembly to the spray gun.

3-8. Choice of Wands/Positioning Orifice to Adjust Spray.

a. The following information is provided to give the technician a better understanding of the different types of spray tools available and the proper use of these tools when applying the rustproofing compound.

b. Technicians should become familiar with the different spray tools by actually using them and learning what kind of spray pattern each tool produces,

c. Several different types of spray wands are employed, each for a specific operation:

(1) A straight, rigid wand is used to spray the interior of a boxed section of a vehicle (see

Figure 3-14). It is a 12-inch (30.5 cm) long wand, with a 90 degree angle flat spray nozzle, having a 0.026-inch (0.66 mm) spray orifice. This wand assembly consists of a tip, nozzle, tube, nut, ferrule, coupling, filter assembly, and quick-disconnect plug. Due to extremely high operating pressures, it is important that all connections be properly tightened to prevent leakage of rustproofing material.

(2) To spray exterior underbody panels and framrail, the straight-through-nozzle wand is used (see Figure 3-15). This tube is 12 inches (30.5 cm) long and has a 45 degree angle, bent 1 1/2 inches (3.8 cm) from the nozzle end. The nozzle used with this wand is a straight-through, flat pattern type, with a 0.026-inch (0.66 mm) orifice.

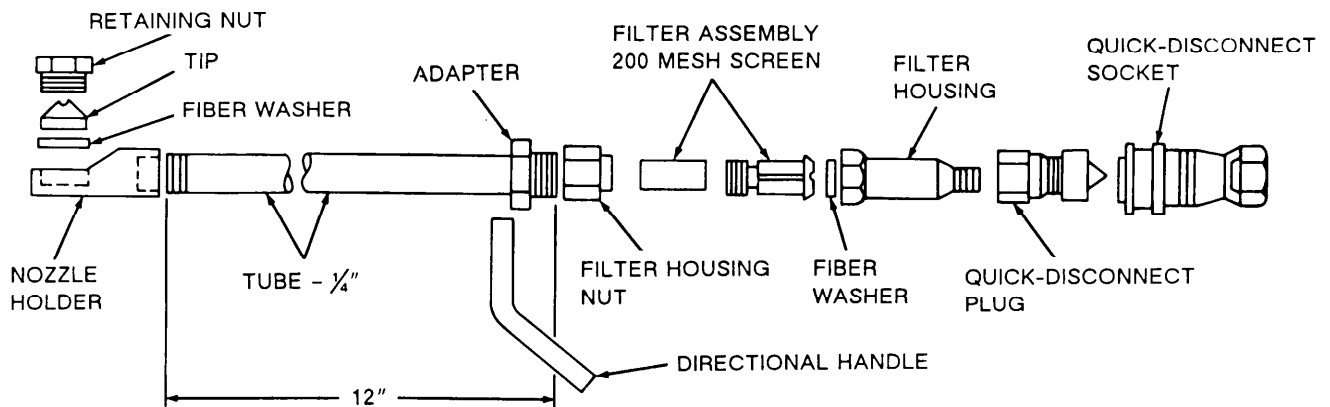


Figure 3-14. 12-Inch Straight Wand.

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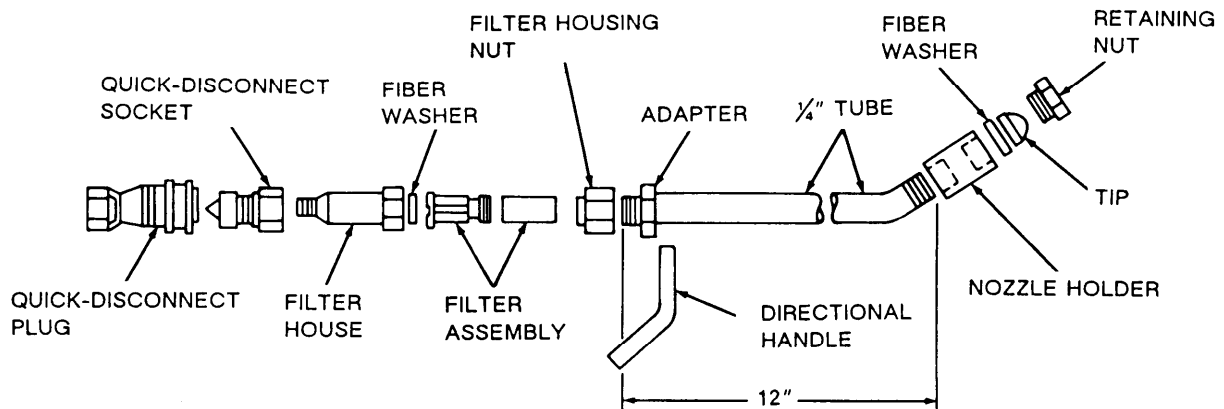


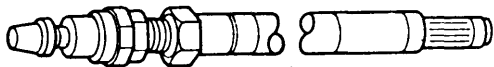
Figure 3-15. 12-Inch 45 Degree Wand.

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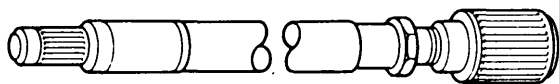
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(3) Another type is the flexible wand (see Figure 3-16, A). This wand is 72 inches (182.9 cm) long, and is used primarily for fog spraying rocker panels and enclosed curved sections.

(4) The rigid spray wand is 60 inches (152.4 cm) long, and is used for spraying door panels and other enclosed body areas (see Figure 3-16, B).



A. WAND ASSEMBLY FLEXIBLE TYPE - 72 INCHES LONG

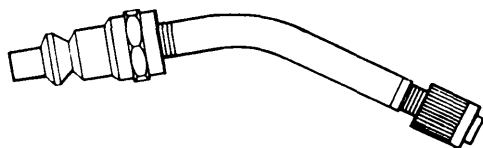


B. WAND ASSEMBLY RIGID TYPE - 60 INCHES LONG

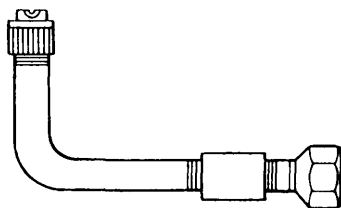
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Figure 3-16, Wands, Flexible/Rigid.

(5) The flat fan spray extension is an all-purpose spray wand (see Figure 3-17, C). Because of the slight bend and size, the handling of this equipment is less difficult than the rigid straight tube type; it can get into areas that other wands cannot.



C. WAND ASSEMBLY FLAT FAN TYPE



D. WAND ASSEMBLY 90 DEGREES

TA504769

Figure 3-17, Wand Extensions.

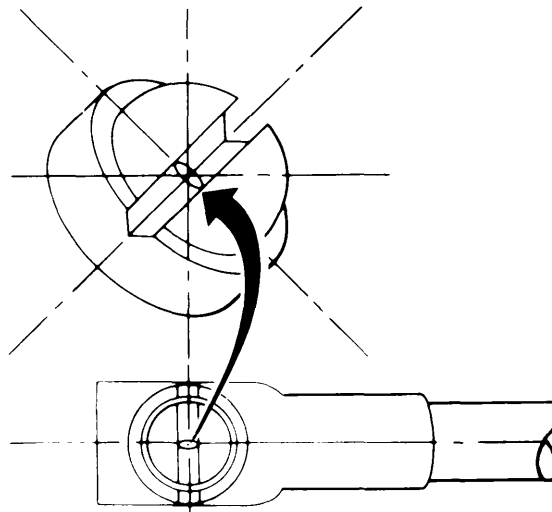
d. In order to deliver the correct spray pattern, the orifice in each tool must be properly installed (see Figure 3-18).

e. A carbide orifice is designed to deliver a fan-type spray that is wide, but thin (see Figure 3-19).

NOTE

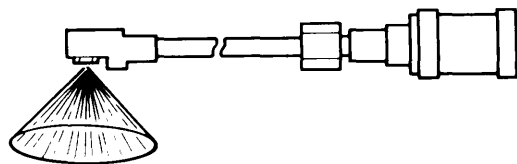
Ensure that the orifice is positioned properly, especially in a 90 degree spray tool, otherwise the results will be a thin line of material instead of a complete sweeping effect.

f. The correct position of the orifice in a 90 degree tool (see Figure 3-17, D) is shown in Figure 3-18. The orifice on the straight spray tool should be lined up with the directional handle of the tool itself.

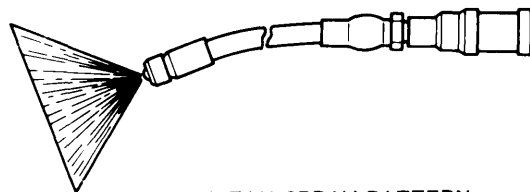


TA504770

Figure 3-18. Positioning Orifice.



CONE SPRAY PATTERN



FLAT OR FAN SPRAY PATTERN

TA504771

Figure 3-19. Spray Patterns.

g. Use the following procedure to adjust the nozzle tip pattern:

- (1) Loosen the tip retaining nut.
- (2) Rotate the tip until slot is in line with the wand directional handle.
- (3) Hold tip in this position and tighten retaining nut.

3-9. Operating Drum Heaters.

When the working area temperature drops below 50°F (10 °C), use of a drum heater is recommended.

b. The drum of rustproofing compound should be placed on a raised platform above the floor to prevent transfer of floor temperatures to drum contents.

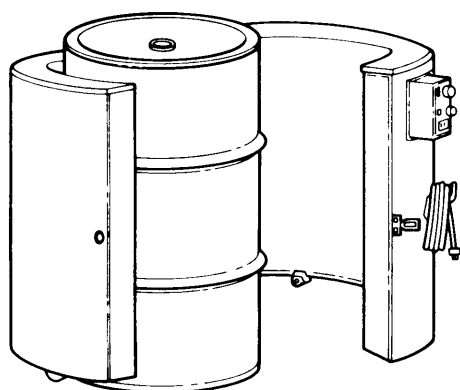
c. Heater should be placed around the drum approximately 12 hours prior to compound application. Before the rustproofing operation begins, recirculate the compound through the drum to ensure uniform temperatures. This will ensure that rustproofing materials are more fluid and easier to spray.

CAUTION

Belt-type heaters must not be used with plastic containers or containers with plastic liners. The plastic may melt and cause damage to the equipment and the vehicle.

d. There are two types of drum warmers, belt-type and full wrap (see Figure 3-20). The full wrap drum heater is much more efficient because it warms the material evenly and quickly,

FULL WRAP DRUM HEATER



BELT-TYPE DRUM HEATER

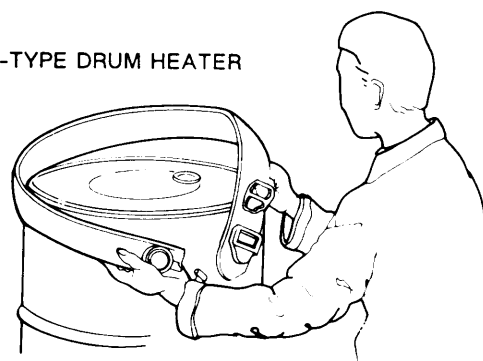


Figure 3-20. Drum Heaters.

TA504772

Section II. RUSTPROOFING APPLICATION TECHNIQUES

3-10. General Requirements/Safety Precautions,

a. *Battery.* The positive (red) terminal of a vehicle's battery must be covered to prevent grounding the battery through a spray tool.

b. *Front End.* It is sometimes necessary to remove headlight rims in order to spray coat the headlight buckets and associated hardware. If they are metal, be sure to paint the backside of the rims before they are replaced. Some late model commercial vehicles may have carburetor air intakes located inside one of the

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front fenders or on either side of the radiator. Ensure that no foreign material clogs these intakes.

c. Seat Belts. Seat belts which roll back into the rocker panel must be pulled out before processing. Use caution when processing this area so you don't coat the return rollers.

d. Hoses. Air and material hoses must kept clean. After cleaning, dry them off with a rag and coat them with silicone spray. This will help prevent sealant from sticking to them.

e. Pedals and Windshield Wiper Blades. Use rags to cover all of the pedals and the windshield wiper blades.

f. Disc Brakes. Conventional and disc brakes must never be sprayed. Ensure that you know the location of all brakes and use caution to avoid spraying them. Cover these areas prior to processing the underside.

g. Engine Compartment. When processing the engine compartment, do not get material on the transistor electrical systems, regulators, alternators, generators, radiators, horns, engine blocks, or electrical wiring. Avoid ignition resistors, windshield washer solvent reservoir, heater assemblies, and pollution control systems.

h. Firewall Exterior. Spray the complete firewall exterior with straight rigid cone spray tool, sweeping as required,

i. Window Channels. Because of rustproofing's adhesive qualities, avoid getting material into the window channels, doors, and tailgates. Material in these channels can cause two kinds of damage: the solvents in the material may affect the adhesion between the window channel and the channel liner, allowing the liner to fall off or stick to the window itself; or the material will prevent the window from being either lowered or raised. After processing, each window must be checked by raising and lowering it a few times. Windows must be in the up position after rustproofing.

j. Fenders. Do not neglect the exterior lower rear areas of both front and rear fenders on many vehicles. These are subject to abrasion due to debris being thrown upward by the tires. This abrasion can lead to surface corrosion.

k. Radiator Shutters. Many large trucks are equipped with moveable radiator shutters that open automatically or manually, according to engine temperature. When rustproofing vehicles so equipped do not coat the shutters, hinge areas, or electrical connections. Shutters which are sealed shut with rustproofing material can cause the engine to overheat.

l. Use of Hoists. Drive shafts can be bent when improperly placed on frame contact hoists. Special care must be used when placing all vehicles on lifts.

m. Front and Rear Soft Fascia. Many parts are made of plastic; excessive rustproofing will cause distortion and unsightly appearance due to swelling. Do not spray such areas.

n. Overspray. If overspray is immediately wiped off fenders, doors, etc., the final cleanup process will be easier.

o. Underbody. If the underside of a vehicle is processed last, the cleanup will be simplified by lowering the vehicle to chest level, and cleaning the lower body first. It is much easier to clean lower fenders, wheel covers, bumpers, grilles, and rocker panels with the vehicle at this level. Lower the vehicle to the floor and clean the top with solvent and powerwash equipment.

p. Hot Weather. To avoid excessive dripping in hot weather, note the following tips:

(1) Turn the pressure down on the pump until the spray pattern from the tools turns to a nonuniform or fingerlike pattern. Turn the pressure up until the spray pattern becomes uniform. You then have the proper spray pattern at the lowest pressure.

(2) Because material will drip more in hot weather, move tools quickly in order to apply the compound at the required thickness with complete coverage.

(3) If possible, put vehicles in the sun and allow them to drip for a few hours. Afterwards put them in the shade for a half hour to cool down.

q. Cold Weather. On cold days, material pumps can be prevented from freezing by injecting three or four spoonfuls of antifreeze (ethylene glycol) into the air intake.

r. Cleaning. After a vehicle has been rustproofed, it should never be steam cleaned. The heat from steam cleaning will loosen and remove the rustproofing compounds. High pressure washers using chemical detergents are adequate to meet all cleaning needs.

3-11. Vehicle Emission Control Precautions.

a. Emission control equipment is installed as an integral part of the anti-pollution package. Federal law prohibits covering or destroying the instruction placard, or interfering with the filter element on the emission control canister. The instruction placard and emission control canister are located in the engine compartment.

The placard can usually be found on the inner wheel housing or the radiator support shield, and the canister is usually located in the forward lower section of the engine compartment.

b. To comply with this federal law, the following procedure is recommended:

(1) Locate the emission control instruction placard and use masking tape to cover before spraying. Remove the tape after spraying the engine compartment,

(2) While processing the bottom side, locate emission control canister and tape or wrap a rag around the filtering element to prevent coating. The canister can be identified by its round, black, can-shaped appearance with two rubber hoses attached to it. The filter element is on the bottom side of the canister and is a foam or fiber type.

CAUTION

Do not apply rustproofing materials closer than 12 inches (30.5 cm) from the catalytic converter and heat shields. Wipe off any overspray prior to removing vehicles from hoist. Failure to do so will cause overheating and possible damage.

c. Catalytic converters are a mandatory requirement on vehicles weighing 6,000 pounds (2,724 kg) or less. These converters operate at extremely high

temperatures of 1,000°F (538°C) to 1,700°F (927°C), and could be a potential fire hazard. To eliminate the possibility of fires, heat shields have been installed between the bottom side of the floor and the converter to dissipate heat. Rustproofing must not be applied closer than 12 inches (30.5 cm) from the converter or heat shield.

3-12. General Cleanup Instructions.

NOTE

The more the vehicle is driven after rustproofing, the quicker it will set up.

a. After cleanup of a vehicle, leave doors ajar to allow material to drip on the pavement and not on the rockerpanels.

b. Overspray must be removed from the radiator, oil pan, transmission pan, clutch control rods, drive shaft, brakes, shock absorbers, and tires. Material left on the tires, wheels, or drive shaft may cause excessive vibration, resulting in costly damage. Material on the brake mechanism may render the brakes ineffective due to the lubricative properties of rustproofing compound.

c. Rustproofing compound will penetrate sound deadening material in doors and will prevent the material from drying out, cracking, peeling, etc. This can only happen if the sound deadening material is reasonably new.

Section III. VEHICLE PREPARATION

3-13. Precleaning the Vehicle,

a. Every vehicle must be clean and dry before rustproofing. The use of a high pressure washer will provide the best means of vehicle cleaning.

b. Direct the water spray at every area where dirt has accumulated. Inspect such areas as the fender lips, lower fender brace, top of frame members, etc., in order to ensure that the entire underside is clean. Particular attention should be given to the front fenders, since dirt is often packed around headlight housings and eyebrow areas.

c. It takes at least four hours to completely dry a vehicle under ideal conditions.

3-14. Inspections (Fielded Vehicles).

NOTE

If the rust is in Stage 1 of its development, it will be neutralized by rustproofing only if the area is properly processed. Refer to paragraph 2-3 for a definition of Stage 1 rust.

a. Using the inspection light, inspect the entire vehicle, paying particular attention to the areas where dirt and moisture collect. Any seam beginning to split or expand must be repaired, as well as metal surfaces that have begun to pit or flake.

b. Remove any vents or plugs that will enable you to see the interior of the sheet metal, where serious rust develops.

c. Begin at the front of the vehicle. Open hood and check the perimeter. Proceed to the top seams of the fenders, and eyebrows. Look through openings in fenders (where possible) to check as much of the front fender and wheel house seam as possible. Look down the frame and check for flaking. Check the battery box, radiator supports, and headlight hardware.

d. Proceed to the driver's side of the vehicle. This side of the vehicle will rust faster because oncoming traffic will splash salt-laden water and slush onto the vehicle. Check for bubbling and discolored paint, which in most cases is caused by rusting from the inside. If you find any rusted area on the outside of the vehicle, determine whether it is surface rust, due to a paint nick or a poor paint job, or if it is working its way out from the inside. Keep checking for any signs that may indicate that the vehicle has been repaired. If the area was properly repaired because it was damaged by an accident, it should not include the use of plastic fillers. In some instances, only an expert body man can recognize a proper repair job, so be extremely careful.

e. With the front door open, look through the door hinge opening and check the front fender, wheel house seam, and fender brace. The fender brace is the most critical area of the vehicle, and should be inspected from the inside and outside of the vehicle. If a seam has begun to discolor, it is an indication that the seam may begin to split. It must be repaired along with other rust damaged areas.

f. Check all seams on doors, doorjambs, and doglegs. Look for chipped or bubbling paint, or discoloration of the paint and splitting seams. If the paint is chipped, you have a surface rust problem. If the paint is bubbling, there is a chance that Stage 2 or 3 rust has developed. If there is good metal under it, it is probably because the metal wasn't prepared properly before painting, or because a small chip in the paint enabled impurities to get underneath the paint, corroding the metal. If you cannot find good metal under the bubbling paint, the rust has worked its way through the metal and must be repaired. If the seams have begun to split, Stages 3 and 4 rust have developed and must be repaired.

g. On most vehicles, if you roll the window down, you can look through the top of the door to inspect the outer skin. If this is not possible, the condition of the seams will give you a true indication of the condition of the door.

NOTE

On some vehicles, it will be necessary to remove the taillights or loosen an interior panel to properly inspect the quarter panel.

h. Inspect the rest of the quarter panel and wheel house seam, floor extensions, and the seams around taillights. Inspect the perimeter of the tailgate, particularly the rear or bottom seam where dirt and moisture settle.

i. Look through the wheelwell openings and check the condition of the underside (steel housings, floor pan, frame, etc.) If you feel that you cannot properly inspect the underside this way, put the vehicle up on a hoist and check.

3-15. General Drilling Instructions.

WARNING

Drilling metals can be extremely dangerous. Wear proper eye protection and keep hands away from cutting tool. Sharp fragments may remain around the drilled area. Use extreme caution when touching these areas.

CAUTION

When drilling holes using a conventional 1/2-inch (1.3 cm) drill bit, use caution not to damage components located behind hole locations.

a. If using a conventional 1/2-inch (1.3 cm) drill bit, place a short piece of 1/2-inch (1.3 cm) I.D. hose on the drill bit, approximately 1/2 inch (1.3 cm) from the tip. This will prevent possible damage to components located behind hole locations (see Figure 3-2 1).

b. Except when otherwise indicated, hole locations are approximate, and should be sight drilled. Rustproofing tools vary. Some hole locations may have to be adjusted to suit the spray patterns of those specific tools. All drilled access holes should be 1/2 inch (1.3 cm) in diameter. This will allow the entrance of a variety of tools.

c. All chips from drilled holes should be removed immediately.

d. Cutter blades are designed to cut most efficiently between 2100 and 3000 rpm. High speed drill motors will cause the blades to overheat and become work-hardened and brittle.

e. Cutter blades should be dipped in oil after every other vehicle is drilled. This will prolong their usefulness.

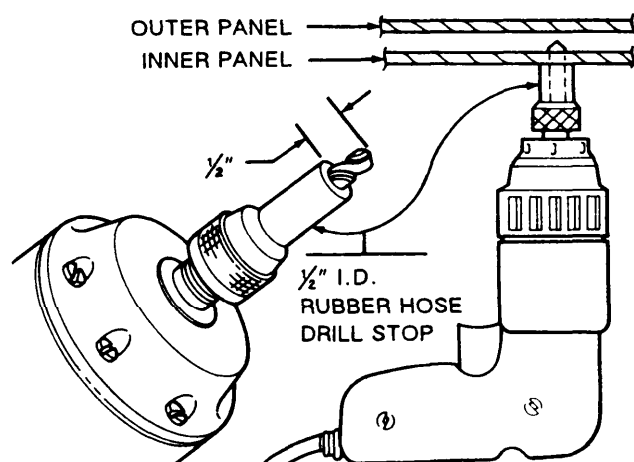


Figure 3-21. Drill Stop.

TA504773

CHAPTER 4

1/4-TON TRUCK: M151, M718, AND M825 SERIES

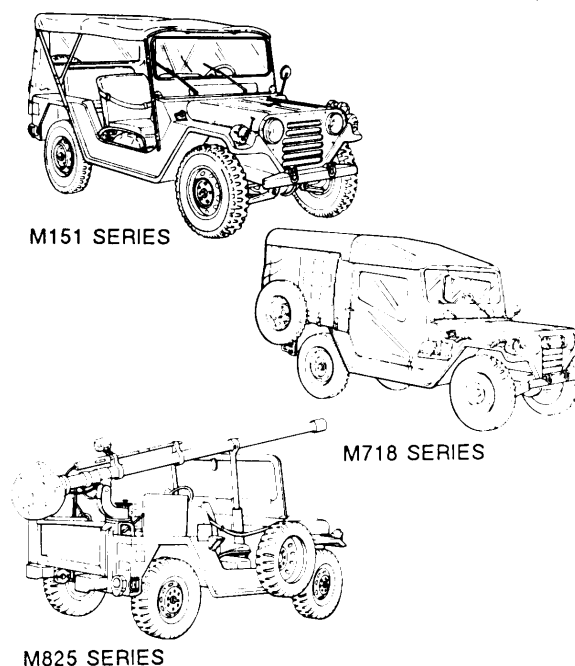
Section I. PRELIMINARY PROCEDURES

4-1. Component Removal.

a. Prior to rustproofing, the following components must be removed for access (see TM 9-2320-218-20 and TM 9-2320-218-34):

- (1) Spare tire and wheel assembly.
- (2) Release soft top rear panel tie-down straps, if equipped, and lay soft top panel over vehicle top.
- (3) Taillight assemblies (M151A2 Series only). Tape assemblies to bumperettes. Leave electrical leads connected.
- (4) Windshield frame-to-cowl seal.
- (5) Litter support and flange (M718A1 Series).
- (6) Gas tank.

b. The M151, M718, and M825 1/4-Ton Trucks referenced in this chapter are illustrated in Figure 4-1.



TA504774

Figure 4-1. M151, M718, and M825 Series Trucks.

Section II. DRILLING AND CLEANING PROCEDURES

4-2. Drilling Procedures.

NOTE

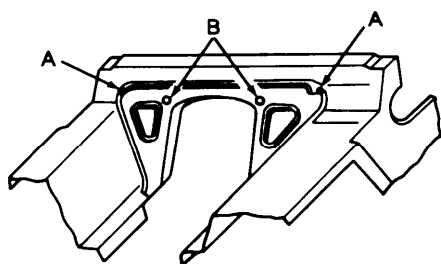
Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter,

a. *General.* Refer to paragraph 3-15 for general drilling instructions,

b. *Drilling Engine Compartment* (see Figure 4-2). Drill two holes A and B in each side of firewall. Holes A are drilled into the edge of the raised area of the firewall. Holes B are drilled directly into the firewall.

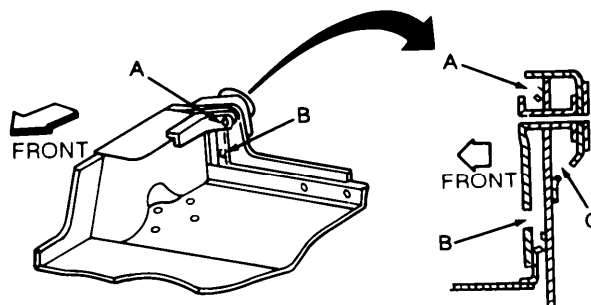
c. *Drilling Crew Compartment Inner Rails* (see Figure 4-3). Drill one hole A on each side of the crew compartment inner rails.

d. *Drilling Spare Tire Mounting Bracket* (see Figure 4-4). Locate by sight, and drill holes A, B, and C in spare tire carrier.



TA504775

Figure 4-2. Drilling Engine Compartment.



TA504777

Figure 4-4. Spare Tire Mounting Bracket.

e. *Drilling Windshield Frame* (see Figure 4-5).

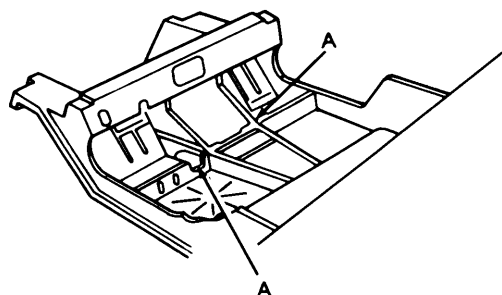
(1) Drill two holes A in the rear of windshield frame. Holes are to be drilled 7/16 inch (11 mm) from the top edge and 3 inches (7.6 cm) from each side edge.

NOTE

Drill holes B from underneath whenever possible.

(2) Drill a hole B in each side edge of windshield frame. Holes are to be drilled 1 1/2 inches (3.8 cm) from the top edge and 1/2 inch (13 mm) from the rear edge.

(3) Drill three holes C in the bottom edge of windshield frame. All holes are drilled 3/4 inch (19 mm) from the front edge of the windshield. One hole is drilled 1 1/2 inches (3.8 cm) toward the center from the hinges.



TA504776

Figure 4-3. Drilling Crew Compartment Inner Rails.

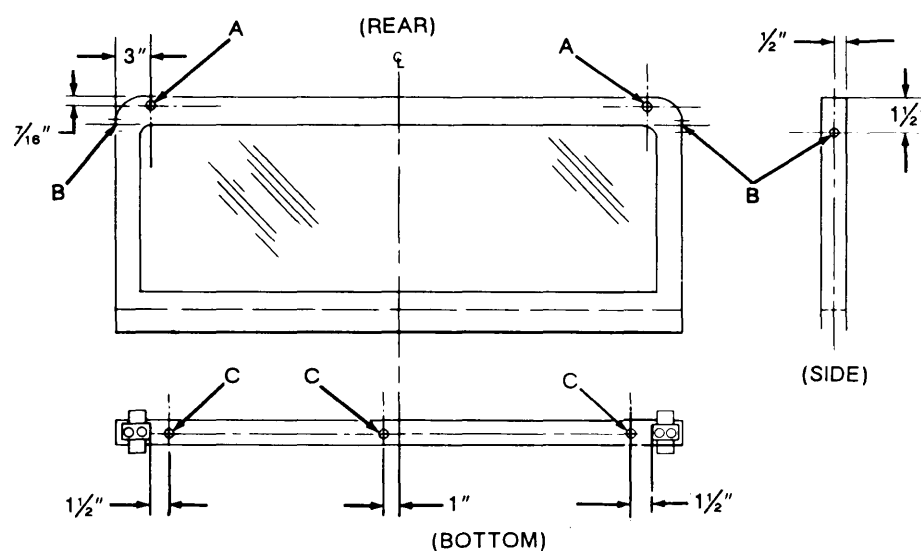


Figure 4-5. Drilling Windshield Frame,

f. Drilling Cargo Body Floor (M151 and M718A) (see Figure 4-6).

(1) Drill two holes A in cargo floor. Holes are to be drilled 13 3/16 inches (33.5 cm) from the floor plate weld seam and are to be sighted in line with the side walls of the fender wells,

(2) Drill two holes B in cargo floor. Holes are to be located 13 3/16 inches (33.5 cm) from floor plate weld seam and 3 1/2 inches (8.9 cm) from holes A.

(3) Drill two holes C. Holes are to be drilled 15 1/2 inches (39.4 cm) inside of the wheel wells, and 1 3/4 inches (4.4 cm) ahead of the floor plate weld seam,

(4) Drill two holes D in cargo floor. Holes are to be drilled in the center of the rear body reinforcement and 6 inches (15.2 cm) to either side of the body centerline.

g. Drilling Cargo Body Floor (M825 Only) (see Figure 4-7).

(1) Drill two holes A.

(2) Drill two holes B.

h. Drilling Underbody (M151 and M151A1) (see Figure 4-8).

(1) Drill all holes as shown.

(2) Holes D and F are drilled on the back side of the front crossmember.

(3) Holes A are drilled in the front bumper face for rustproofing the front framersails.

(4) Holes U are drilled in the rear face of the rear crossmember for rustproofing the rear framersails.

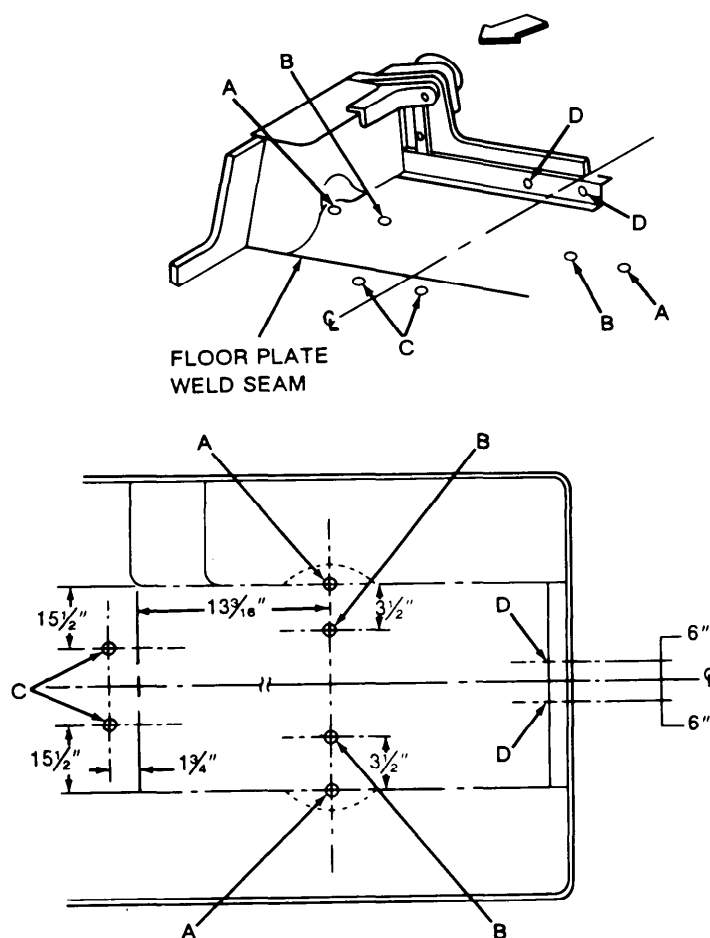


Figure 4-6. Drilling Cargo Body Floor (VI151 and M718A).

TA504779

i. Drilling Underbody (M151A2, M718A1 and M825) (see Figure 4-9).

4-3. Cleaning Procedures.

(1) Drill all holes as shown.

(2) Holes V and W will penetrate two layers of metal on the M151A2 and the M718A1. They will penetrate only one layer on the M825 due to the rear cargo reinforcement having been removed.

(3) Two holes X are visually located on the bottom surface of the rear crossmember, directly in line with the outer bolts for the rear bumper guards.

(4) Holes D and F are drilled in the rear facing edge of the front crossmember. They are drilled about 1 inch (2.5 cm) from the angles.

(5) Holes Y and Z are drilled at the bottom of the inner and outer suspension arm brackets.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

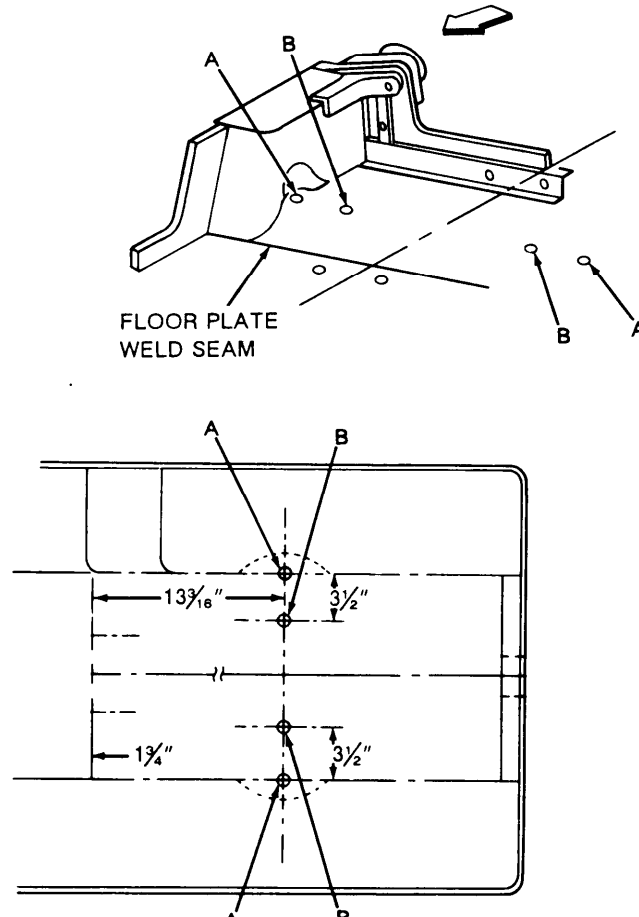
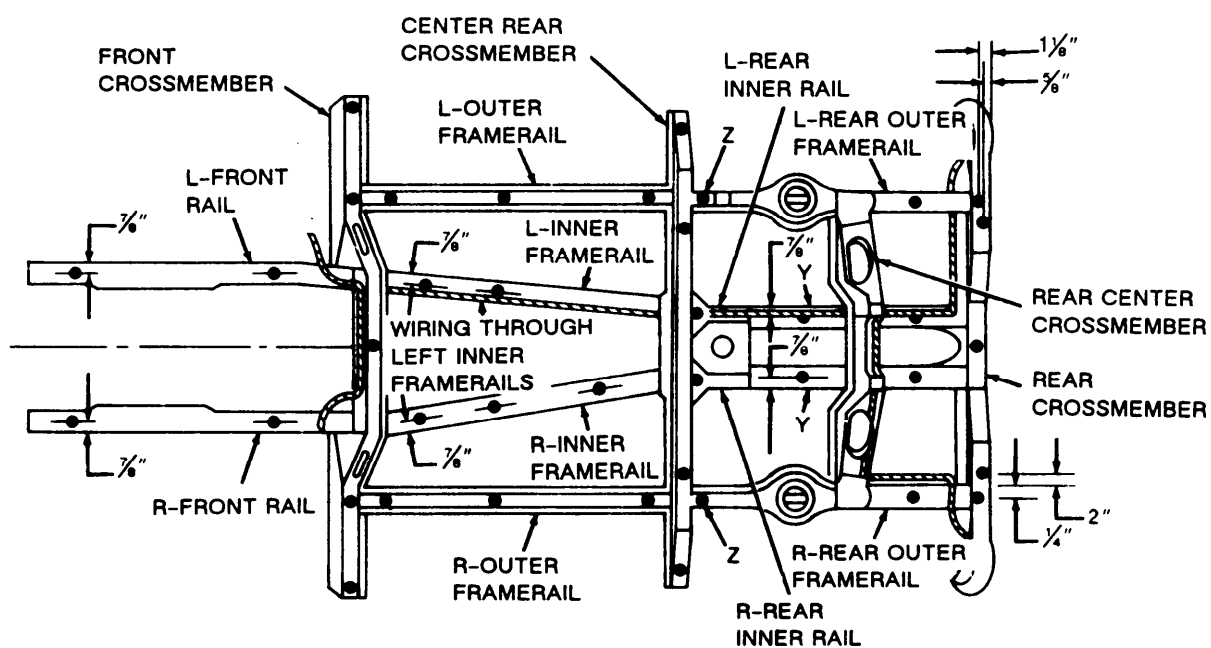
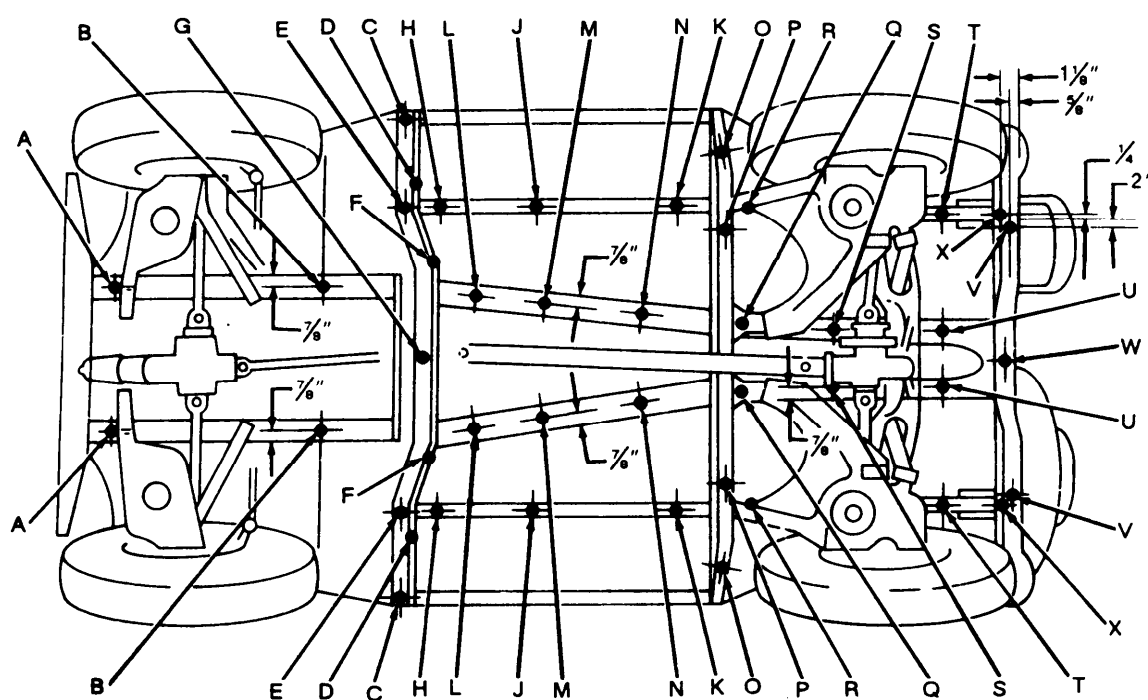


Figure 4-7. Drilling Cargo Body Floor (M825 Only).

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NOTE: I IS OMITTED INTENTIONALLY

Figure 4-9. Drilling Underbody (M151A2, M718A1, and M825),

TA504782

Section III. RUSTPROOFING PROCEDURES

4-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific body items, refer to Figure 4-10 through Figure 4-15.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made, due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Firewall (see Figure 4-10).*

(1) Insert flexible tool as far as possible into firewall holes A and B, then spray in all directions while slowly withdrawing tool. Enlarge holes to allow entrance of flexible tool, if necessary.

(2) Plug all holes.

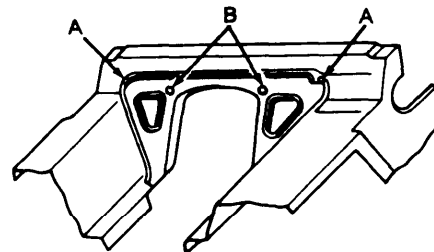


Figure 4-10. Rustproofing Firewall. TA504783

d. *Rustproofing Crew Compartment Rails (see Figure 4-11).*

(1) Insert 90 degree short tool into hole A of the inner rails as far as possible, then spray in all directions

(2) Plug all holes.

(3) Use short rigid tool to sprav the floor areas under the gas tank and all areas including the surrounding sills.

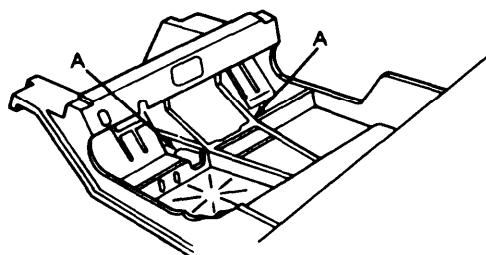


Figure 4-11. Rustproofing Crew Compartment Rails. TA504784

e. *Rustproofing Spare Tire Carrier (see Figure 4-4).* Insert 90 degree short tool into holes A, B, and C of the spare tire carrier, then spray in all directions.

f. Rustproofing Windshield Frame (see Figure 4-12).

NOTE

Only holes B and C are used on the M825 Series.

(1) Insert flexible tool into hole A of the upper frame and hole B of the side frame, then spray slowly while withdrawing the tool.

(2) Insert 90 degree short tool into holes C of the lower frame and spray in all directions.

(3) Plug all holes.

g. Rustproofing Cargo Body (see Figure 4-13).

(1) Insert 90 degree short tool into holes A,B, C, and D of the cargo bed and spray in all directions.

(2) Use the short rigid tool to spray all surfaces of the taillight openings.

(3) (M825 only). Insert 90 degree short tool in holes A and B and spray in all directions.

(4) Plug all holes.

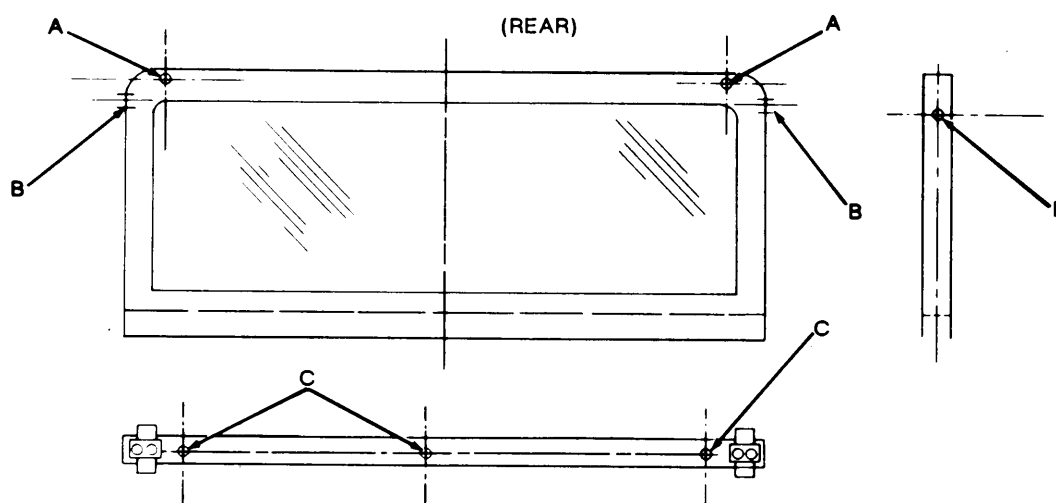


Figure 4-12. Rustproofing Windshield Frame.

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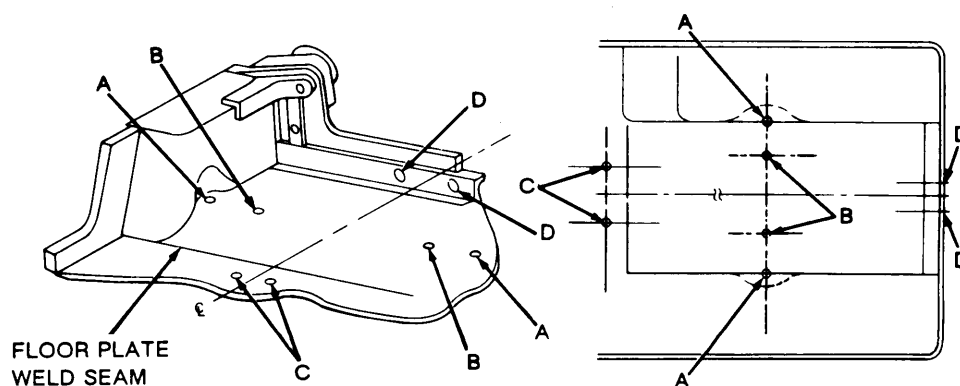


Figure 4-13. Rustproofing Cargo Body.

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h. Rustproofing Underbody (M151 and M151A1) (see Figure 4-14).

(1) Insert long rigid tool into the front framerail holes A as far as possible and spray while slowly withdrawing tool.

(2) Insert 90 degree short tool into the following areas of the underbody and spray the rustproofing compound in all directions:

- (a) Front framerails - holes B.
- (b) Front crossmember - holes C, D, E, F, and G.
- (c) Center outer framerails - holes H, J, and K.
- (d) Center inner framerails - holes L, M, and N.
- (e) Rear crossmember - holes O and P.
- (f) Rear framerails - holes Q, R, and S.
- (g) Rear sill - holes T.

(3) Insert long rigid tool as far as possible into the rear sill hole U, then slowly withdraw tool while spraying.

(4) Use short rigid tool to completely spray all exterior underbody surfaces.

(5) Plug underbody holes A, U, F, and D.

i. Rustproofing Underbody (M151A2, M718, and M825) (see Figure 4-15).

(1) Insert 90 degree short tool into the following areas of the underbody and spray the rustproofing compound in all directions:

- (a) Front framerails - holes A and B.
- (b) Front crossmember - holes C, D, E, F, and G.

(c) Center outer framerails - holes H, J, and K.

(d) Center inner framerails - holes L, M, and N.

(e) Rear crossmember - holes O, P, Q, and R.

(f) Rear framerails - holes S, U, and T.

(g) Rear sill - holes V, W, and X.

NOTE

Holes 1 are the spring openings.

(2) Insert long rigid tool into the rear suspension arm holes 1 as far as possible. Withdraw slowly while spraying in all directions.

NOTE

Holes 2 are the shock absorber openings.

(3) Insert long rigid tool into the rear suspension arm holes 2 as far as possible. Withdraw slowly while spraying in all directions.

(4) Use short rigid tool to completely spray the underbody.

(5) Plug front crossmember holes D and F.

NOTE

- **Holes Y are located in the sides of the frame members.**
- **Holes Z are located under the rear suspension arms.**

(6) Insert flexible tool into rear frame sills Y and rear framerails Z and spray in all directions.

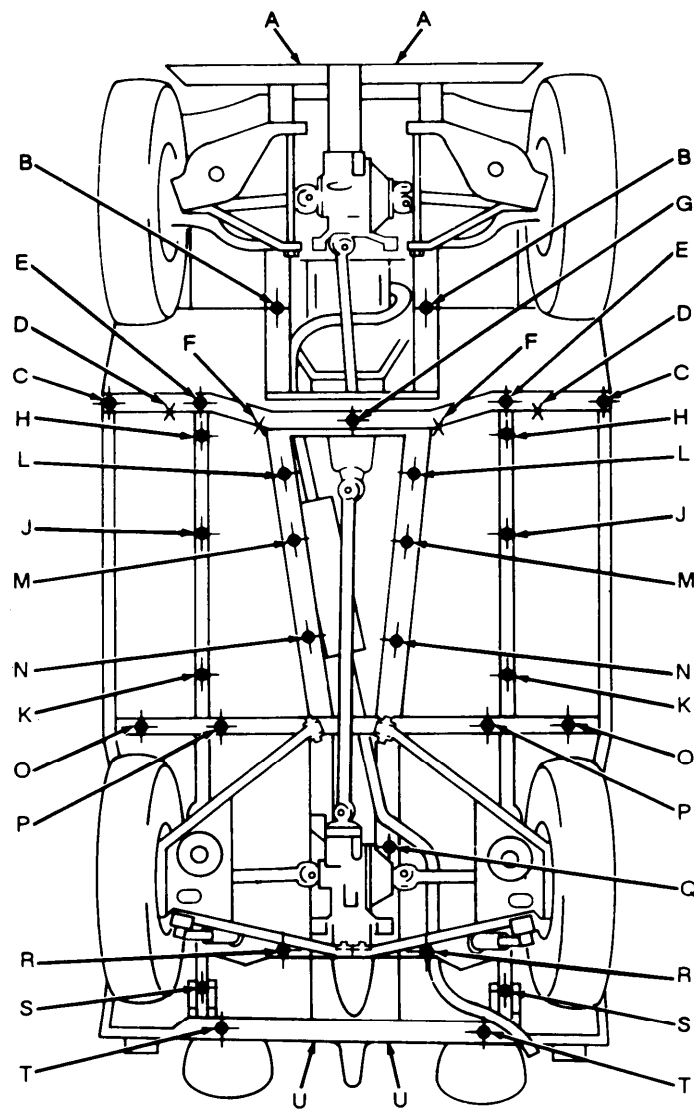
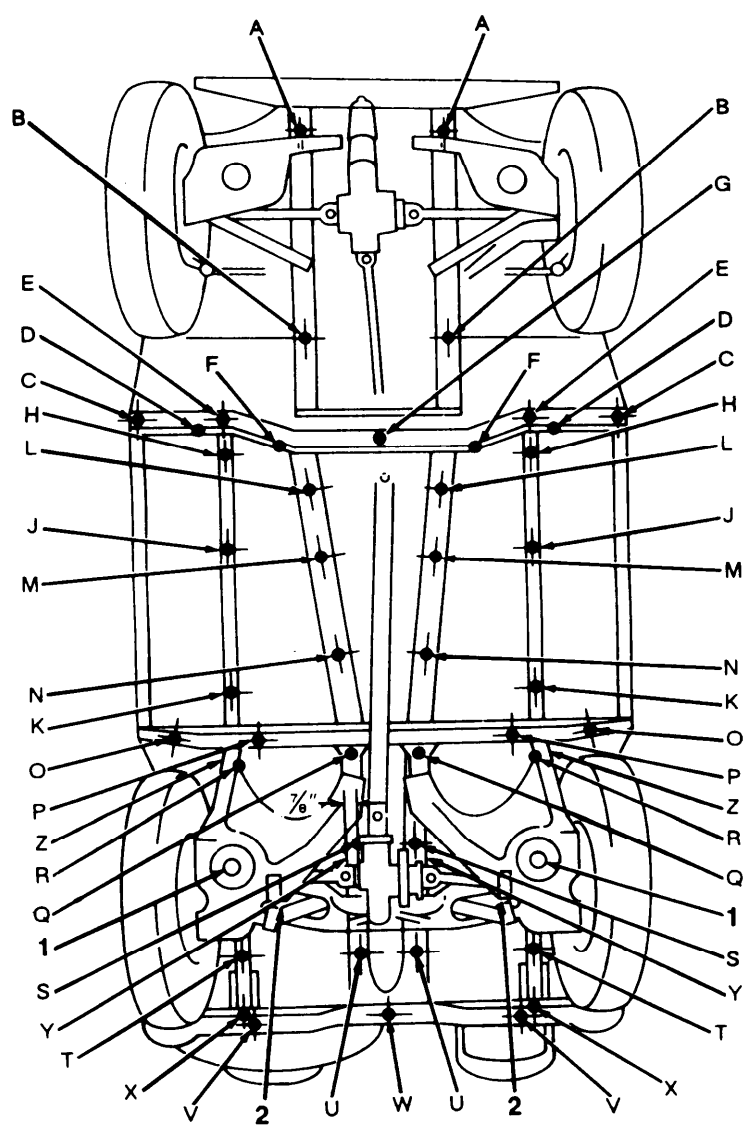


Figure 4-14. Rustproofing Underbody (M151 and M151A11).

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TA504788

Figure 4-15. Rustproofing Underbody (M151A2, M718A, and M825).

4-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 4-16). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will help with this process.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 4-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If

inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

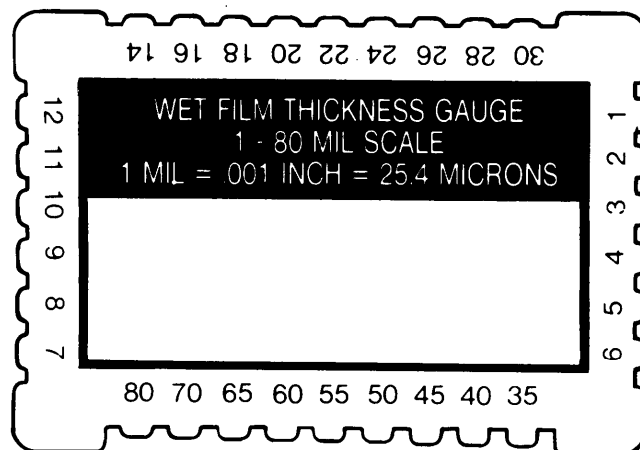


Figure 4-16. Film Thickness Gage, TA504789

4-6. Component Installation.

Install all components that were removed in paragraph 4-1 of this chapter (see TM 9-2320-218-20 and TM 9-2320-218-34).

CHAPTER 5

1 1/4-TON TRUCK: M880 AND M890 SERIES

Section 1. PRELIMINARY PROCEDURES

5-1. Component Removal.

CAUTION

Electric leads to light assemblies do not have to be disconnected. Tape the light assembly to body or cab to prevent damage.

NOTE

On cargo trucks with body mounting equipment (troop seats, cargo cover, S-250 shelter, radio rack, etc) remove equipment as required to allow for access to rustproofing points.

a. Prior to rustproofing, the following components must be removed for access (see TM 9-2320-266-20 and TM 9-2320-266-34):

- (1) Seat assembly.
- (2) Floor mat (discard).
- (3) Domelight assembly.
- (4) Both sunvisors.
- (5) Vent covers and control (left side),

(6) Both taillight assemblies.

(7) Both headlight assemblies.

(8) Both front parking light assemblies.

(9) Both front side marker lights.

(10) Both door window regulator handles, door handles, black plastic door trim liner, and clear plastic sheet from door.

(11) Rubber plugs inside rocker panels.

(12) Rubber plugs in floor board.

(13) Rubber plugs behind seat,

(14) Rubber plugs in kick panels.

(15) Spare tire and mounting bracket.

(16) Both doorjamb scuff plates.

(17) Remove both batteries for 24 volt system (if so equipped).

b. Figure 5-1 provides a reference illustration of the M880 and M890 1 1/4-Ton Trucks discussed in this chapter.

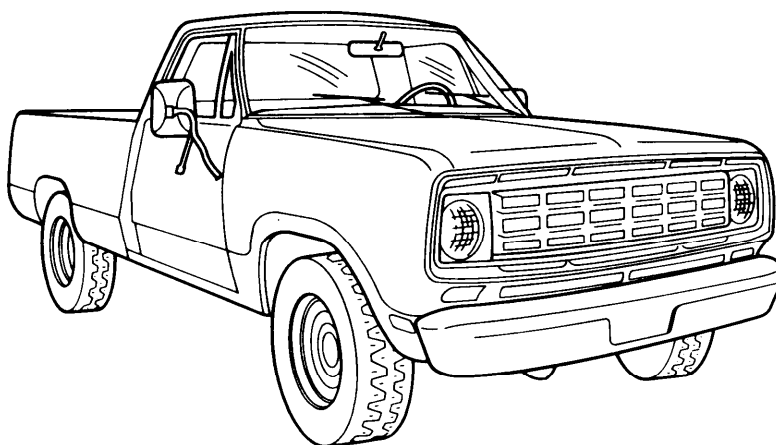


Figure 5-1. M880 and M890 1 1/4-Ton Trucks.

TA504790

Section II. DRILLING AND CLEANING PROCEDURES

5-2. Drilling Procedures.

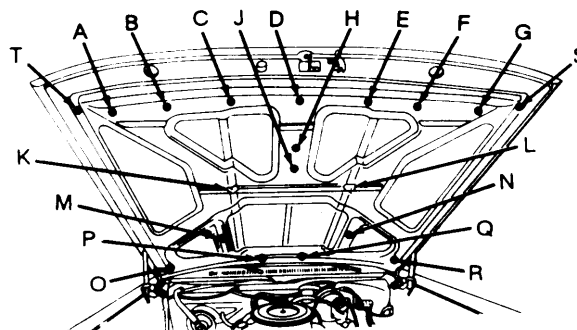
NOTE

- Unless otherwise indicated, all holes drilled should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.
- Drill holes at approximate locations indicated by the black dots.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

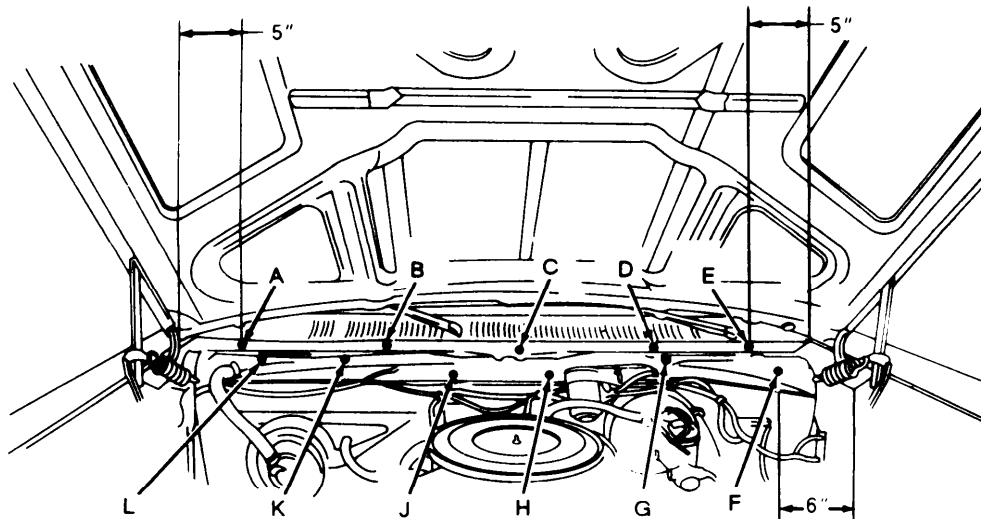
b. *Drilling Inner Hood Panel* (see Figure 5-2). On older models, drill 19 holes in the inner hood panel support. Later models will have existing holes which are located at points D, K, L, and R.

c. *Drilling Cowl* (see Figure 5-3). Drill 11 holes in cowl. Holes A and B should be 5 inches (12.7 cm) from the inside of fenders. Hole F should be 6 inches (15.2 cm) from the inside of the fender. All other holes are sight drilled.



TA504791

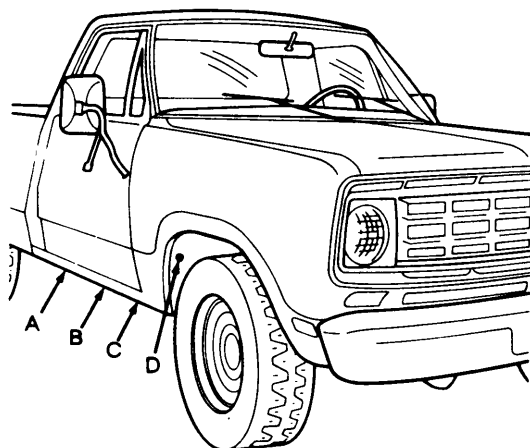
Figure 5-2. Drilling Inner Hood Panel.



TA504792

Figure 5-3. Drilling Cowl.

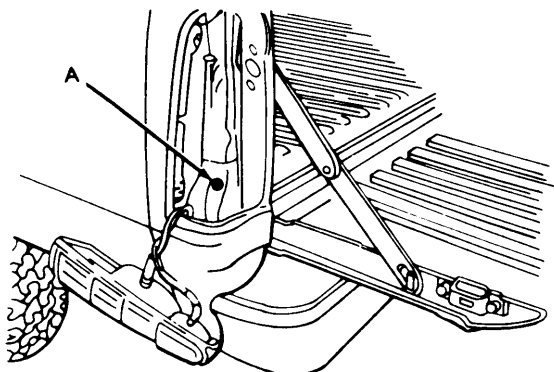
d. *Drilling Front Fenders and Rocker Panels* (see Figure 5-4). Drill four holes on each side. Holes A and B may be sight drilled. Hole C is drilled below the center of the fender support. Hole D can be sight drilled inside the fender well.



TA504793

Figure 5-4. Drilling Front Fenders and Rocker Panels.

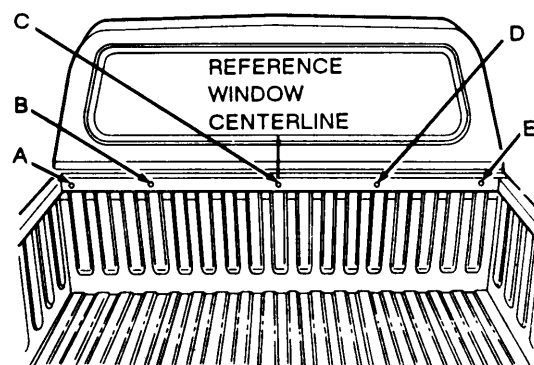
e. *Drilling Taillight Opening* (see Figure 5-5). Drill one hole A in each taillight opening. Holes are sight drilled.



TA504794

Figure 5-5. Drilling Taillight Opening.

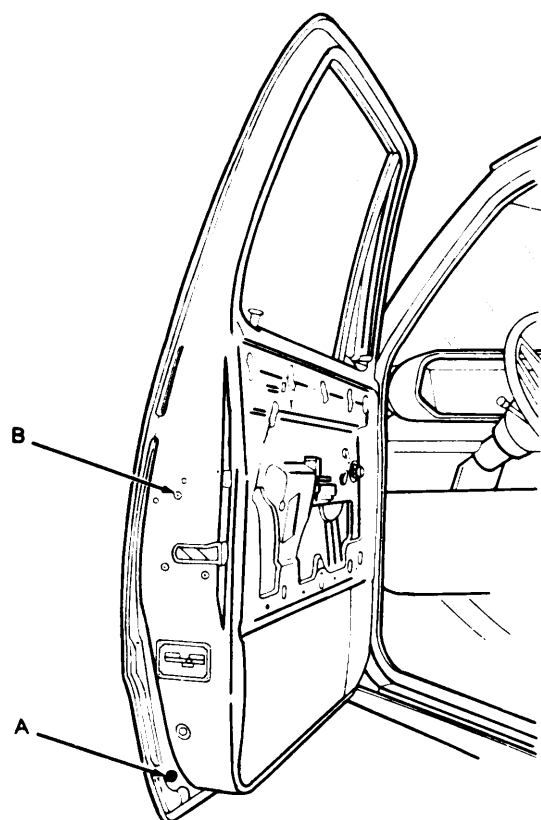
f. *Drilling Front Cargo Bed* (see Figure 5-6). Drill five holes in front of the cargo bed, Hole C is drilled first at the center of the bed. The remaining four holes are then spaced approximately 12 inches (30.5 cm) apart.



TA504795

Figure 5-6. Drilling Front Cargo Bed.

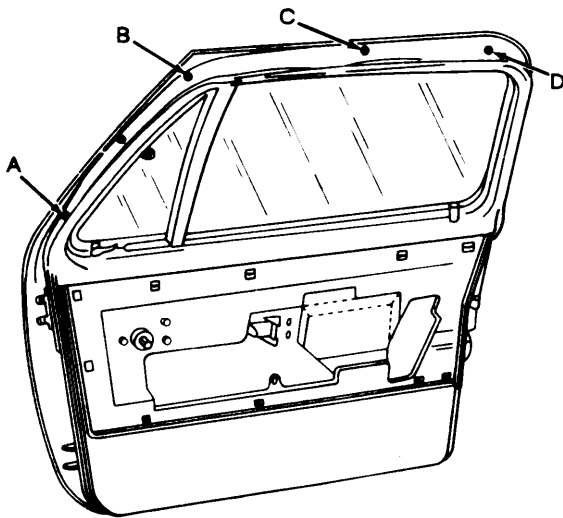
g. *Drilling Rear of Doors* (see Figure 5-7). Drill two holes A and B in each door. Holes are sight drilled.



TA504796

Figure 5-7. Drilling Rear of Doors.

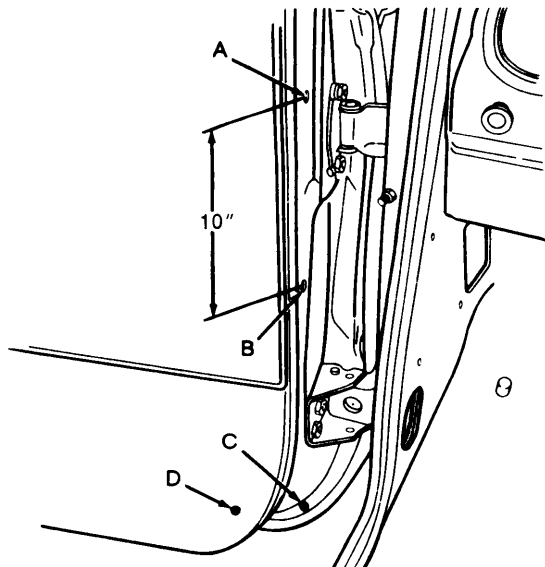
h. Drilling Top of Doors (see Figure 5-8). Drill four holes A, B, C, and D in the top of each door. Holes are sight drilled.



TA504797

Figure 5-8. Drilling Top of Doors.

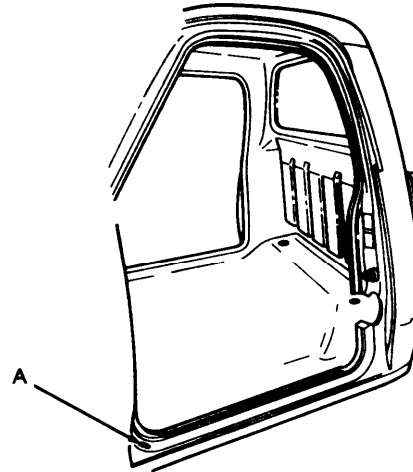
i. Drilling Front of Doors (see Figure 5-9). Drill four holes A, B, C, and D in the front of each door. Holes are to be sight drilled with holes A and B approximately 10 inches (25.4 cm) apart.



TA504798

Figure 5-9. Drilling Front of Doors.

j. Drilling Lower Front Doorjamb (see Figure 5-10). Drill one hole A in the lower front area of each doorjamb. The hole is to be sight drilled.



TA504799

Figure 5-10. Drilling Lower Front Doorjamb.

k. Drilling Roof and Top of Doorjamb (see Figure 5-11).

(1) Drill a total of 12 holes in the roof and the top of doorjamb on both sides.

(2) Holes A are drilled 3 1/4 inches (8.3 cm) to the rear of metal joint. Holes B are drilled 2 inches (5.1 cm) forward of metal joint. Holes C and D are drilled at 6-inch (15.2 cm) intervals forward of hole B.

(3) Holes E and H are drilled directly in line with headlined side creases and 1 3/4 inches (4.4 cm) from the front headlined crease.

(4) Holes F and G are drilled at approximately 13-inch (33 cm) intervals from holes E and H, and 1 3/4 inches (4.4 cm) from the front headlined crease.

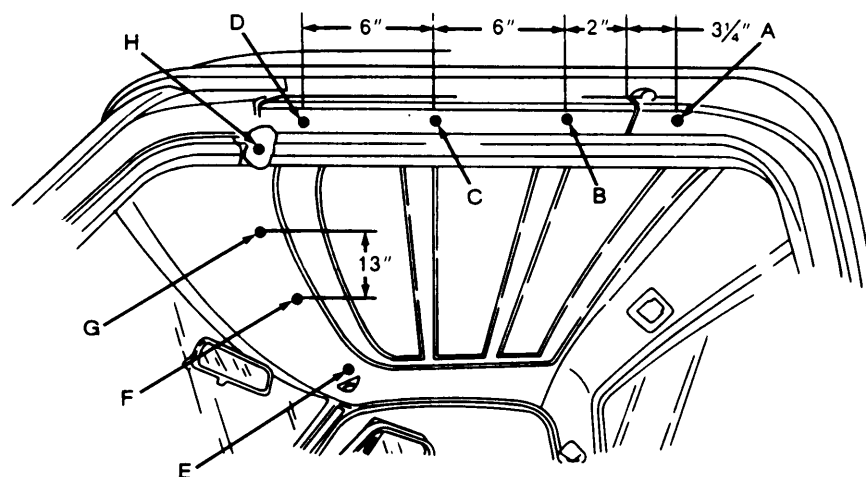
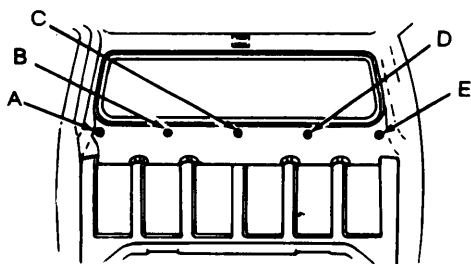


Figure 5-11. Drilling Roof and Top of Doorjamb.

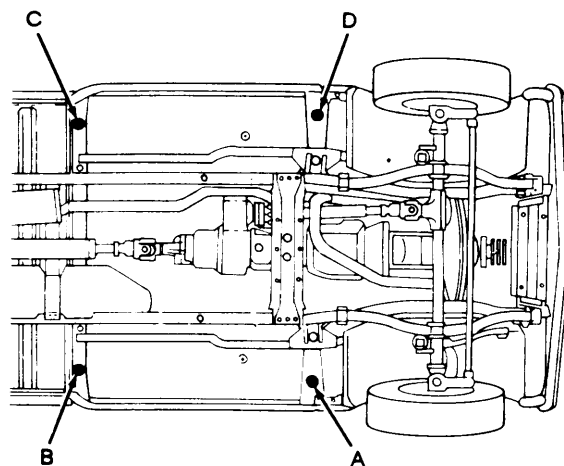
1. *Drilling Rear Window Frame* (see Figure 5-12). Drill five holes A, B, C, D, and E in rear window frame. Hole C is centered on the window frame. Holes A, B, D, and E are drilled at 12-inch (30.5 cm) intervals on both sides of hole C.



TA504801

Figure 5-12. Drilling Rear Window Frame.

m. *Drilling Body Support Channels* (see Figure 5-13), Drill four holes A, B, C, and D in body support channels. Holes are to be sight drilled.



TA504802

Figure 5-13. Drilling Body Support Channels.

5-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash interior of frame rail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Use inspection light where available. Allow painted areas time to dry before rustproofing.

Section III. RUSTPROOFING PROCEDURES

5-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific body items, refer to Figure 5-14 through 5-29.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Underbody (see Figure 5-14).*

(1) Insert 90 degree short tool into body support channel holes A, B, C, and D and spray in all directions.

(2) Insert 90 degree flexible tool in cargo bed channels as far as possible, then withdraw tool slowly while spraying.

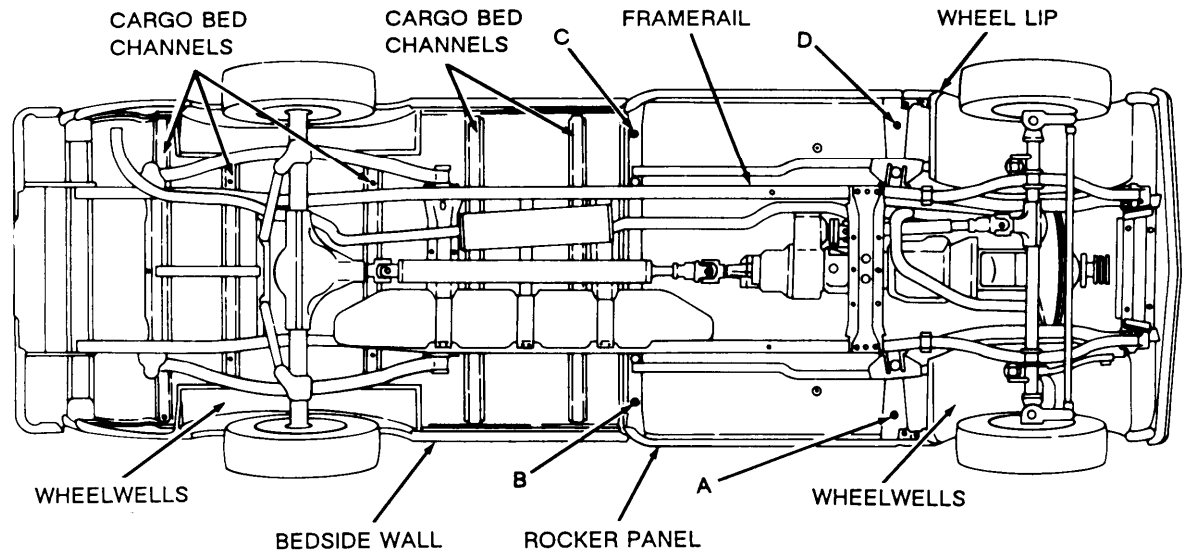


Figure 5-14. Rustproofing Underbody.

TA504803

(3) Use short rigid tool to spray all accessible areas of the complete underbody.

(4) Spray all inaccessible areas with a 90 degree short cone: framerails, bedside walls, wheel lips, and wheelwells.

d. *Rustproofing Cargo Body Walls* (see Figure 5-15). Insert 90 degree tool through openings in the inner cargo walls at areas A and B. Spray in all directions.

e. *Rustproofing Rocker Panels* (see Figure 5-16).

NOTE

Holes A, B, and C are located under the bottom edge of the vehicle.

(1) Insert 90 degree short tool in rocker panel holes A, B, C, and fender bottom well holes D.

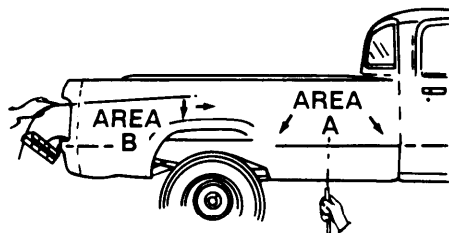


Figure 5-15. Rustproofing Cargo Body Walls.

TA504804

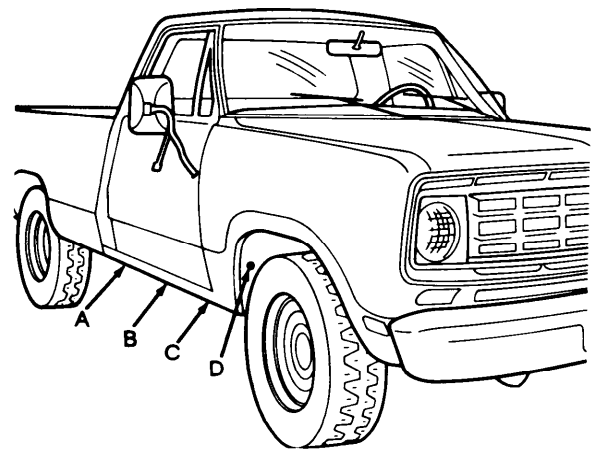


Figure 5-16. Rustproofing Rocker Panels

TA504805

TB 43-0213

(2) Spray in all directions.

(3) Plug holes D in fender bottom well.

f. Rustproofing Cowl (see Figure 5-17).

(1) Insert 90 degree tool into holes A through L in cowl and spray in all directions.

(2) Completely cover open seam M using short rigid tool; also coat cowl.

(3) Spray directly over holes A through L to cover areas that may have been missed by the 90 degree short tool.

g. Rustproofing Engine Compartment (see Figure 5-18).

(1) Use short rigid 90 degree tool to completely coat the following parts of the engine compartment:

- (a) Front of cab wall.
- (b) Rear of radiator wall.
- (c) Wheelwell top.
- (d) Inside of fender.
- (e) Bottom of front fender.
- (f) Bottom of rear fender.

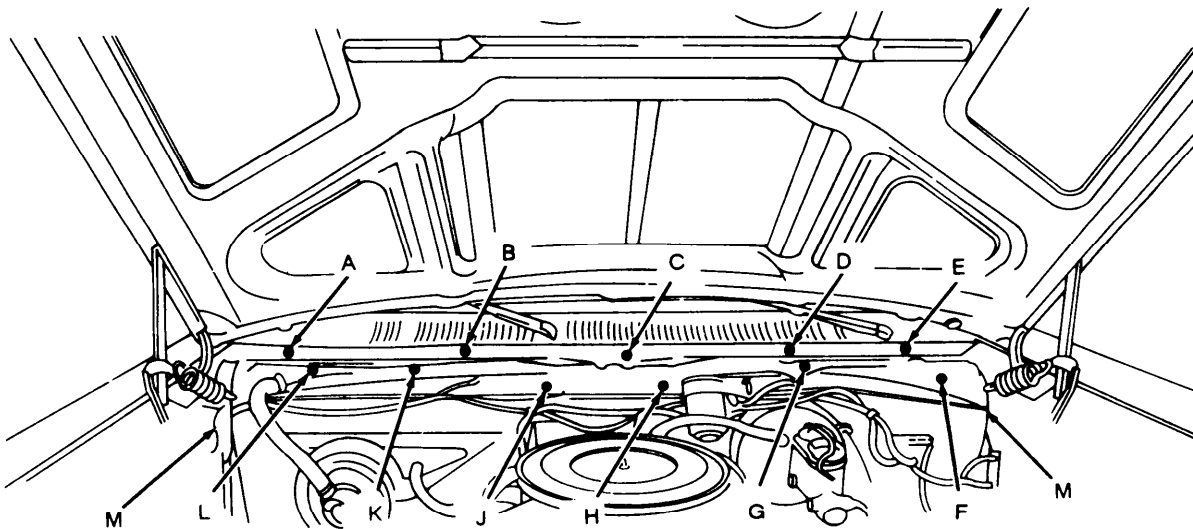


Figure 5-17. Rustproofing Cowl.

TA504806

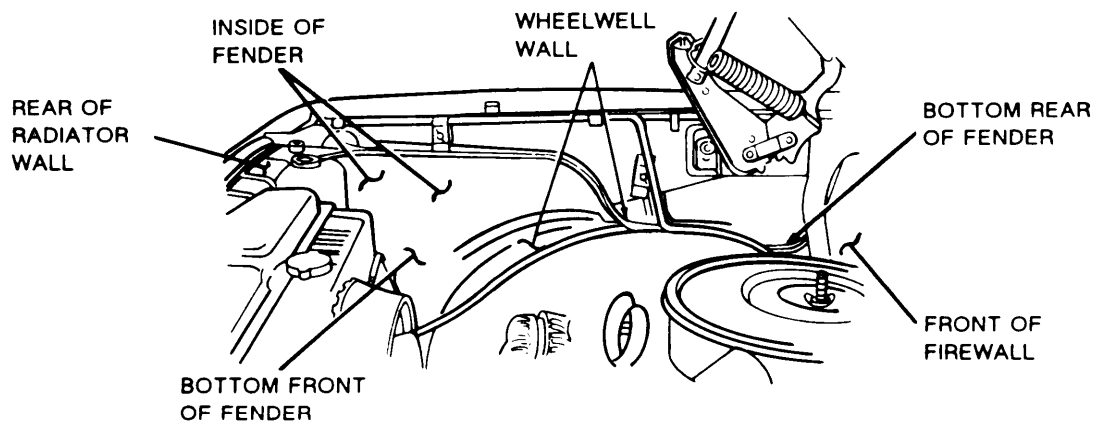


Figure 5-18. Rustproofing Engine Compartment.

TA504807

(2) Ensure that all seams, welds and corners are coated with rustproofing compound. Rustproof both sides of the engine compartment. Remove battery and rustproof battery tray of 24 volt system (if applicable). Cover all areas that are inaccessible with short rigid 90 degree tool.

h. Rustproofing Hood (see Figure 5-19).

(1) Insert 90 degree short tool into holes C, D, E, F, G, H, J, L, O, P, Q, and R and spray in all directions.

(2) Insert flexible tool as far as possible into holes A, B, T, S, N, M, U, and V, then withdraw tool slowly while spraying.

(3) Use short rigid tool to completely coat inner panel and spray over all holes to cover areas that may have been missed by the 90 degree short tool.

i. Rustproofing Grille (see Figure 5-20). Use 90 degree short tool to coat rear of grille, front of radiator wall, and rear of headlamp bezels.

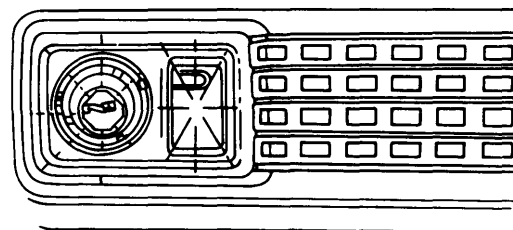


Figure 5-20. Rustproofing Grille.

TA504809

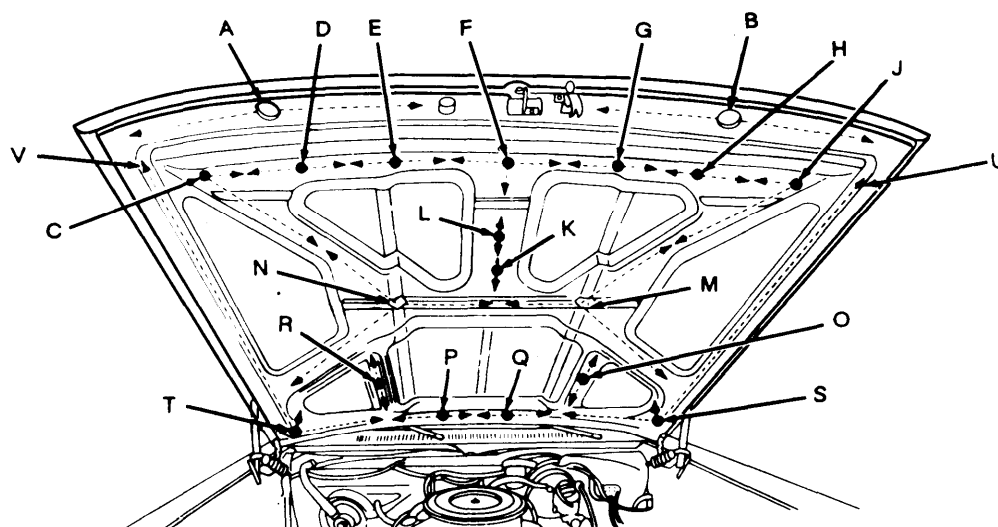
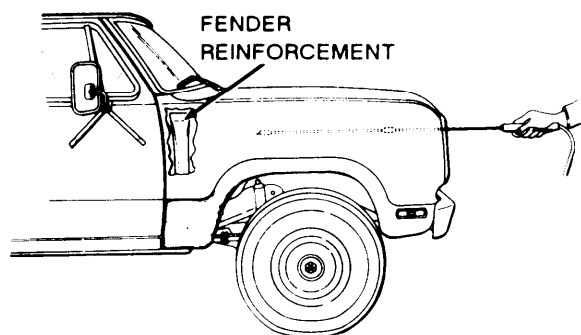


Figure 5-19. Rustproofing Hood.

TA504808

j. *Rustproofing Fenders* (see Figure 5-21). Insert 90 degree long tool as far as possible through the headlamp opening holes on front fenders. Withdraw tool while spraying in all directions. Be sure to coat between fender reinforcement and fender skin.



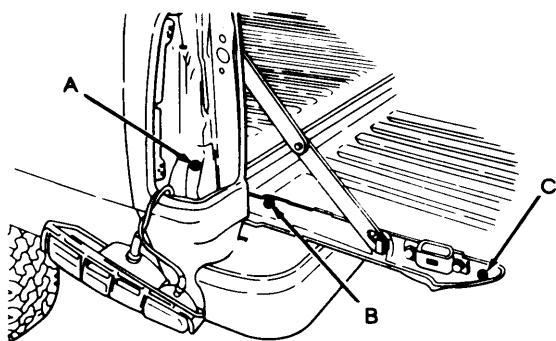
TA504810

Figure 5-21. Rustproofing Fenders.

k. *Rustproofing Rear Body and Tailgate* (see Figure 5-22).

(1) Insert 90 degree short tool in taillight lamp opening at the rear of the body as far as possible. Spray in all directions while slowly withdrawing tool.

(2) Insert 90 degree long tool in holes B and C in tailgate as far as possible. Spray in all directions while slowly withdrawing tool.



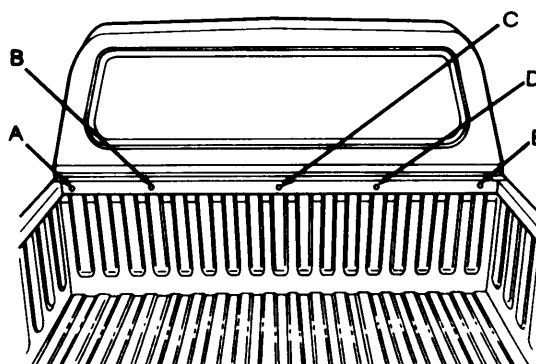
TA504811

Figure 5-22. Rustproofing Rear Body and Tailgate.

1. *Rustproofing Cargo Bed* (see Figure 5-23).

(1) Insert 90 degree short tool as far as possible into holes A through E in the cargo bed. Spray in all directions while slowly withdrawing tool.

(2) Insert short rigid tool into holes A through E and cover areas that may have been missed by the 90 degree tool.

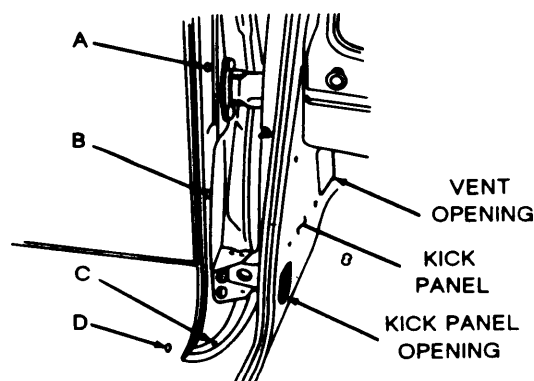


TA504812

Figure 5-23. Rustproofing Cargo Bed.

m. *Rustproofing Doorjamb* (see Figure 5-24).

(1) Insert 90 degree short tool in holes A, B, C, and D in doorjamb and kick-pad areas on the front door, and spray in all directions.



TA504813

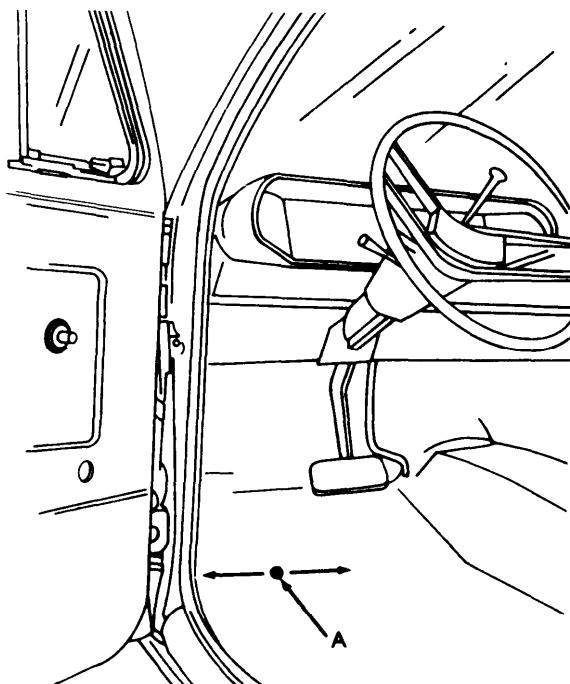
Figure 5-24. Rustproofing Doorjamb.

(2) Insert 90 degree short tool in kick panel and vent openings, and spray in all directions.

(3) Spray as much as possible of the doorjamb and rear of front fenders with short rigid tool.

(4) Plug holes A, B, C, and D.

n. Rustproofing Front Floor (see Figure 5-25).
Insert 90 degree short tool in hole A on front floor and spray in all directions.

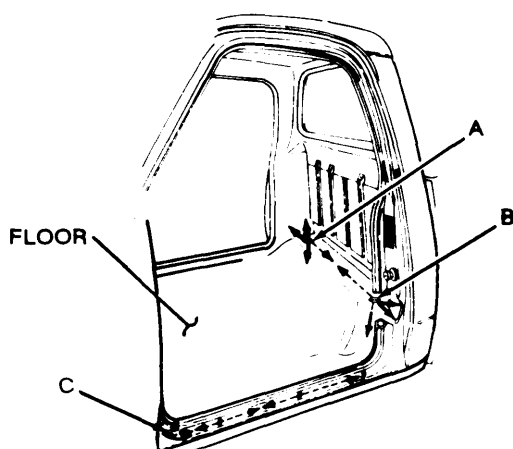


TA504814

Figure 5-25. Rustproofing Front Floor.

o. Rustproofing Rocker Panels and Rear Floor (see Figure 5-26).

(1) Insert 90 degree short tool into hole C in the rocker panel as far as possible, then spray in all directions while slowly withdrawing tool.



TA504815

Figure 5-26. Rustproofing Rocker Panels and Rear Floor.

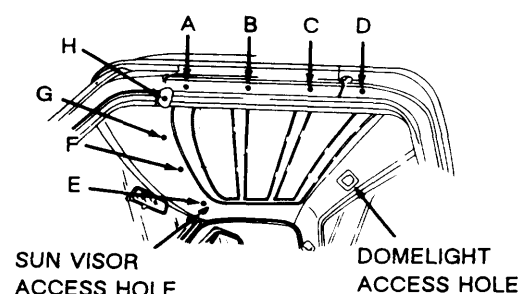
(2) Insert 90 degree short tool in holes A and B on the rear floor and spray in all directions.

(3) Plug hole C.

p. Rustproofing Roof and Doorjamb Tops (see Figure 5-27).

(1) Insert 90 degree short tool in top of doorjamb holes A, B, C, and D and in holes E, F, G, and H in roof, and spray in all directions.

(2) Insert 90 degree short tool in sunvisor access hole as far as possible and spray in all directions while slowly withdrawing tool.



TA604816

Figure 5-27. Rustproofing Roof and Doorjamb Tops.

(3) Insert flexible tool as far as possible into the domelight access hole in the roof and spray in all directions while slowly withdrawing tool. Do this step twice, once to the left and once to the right.

(4) Insert short rigid tool into all openings and holes A through H and spray all areas not covered by the 90 degree tool.

(5) Plug holes A through H.

q. Rustproofing Rear Window Frame (see Figure 5-28).

(1) Insert 90 degree short tool in rear window frame holes A, B, C, D, and E as far as possible, then spray in all directions while slowly withdrawing tool.

(2) Insert flexible tool in rear window frame holes F as far across as possible, then spray in all directions while slowly withdrawing tool.

(3) Plug holes A through E.

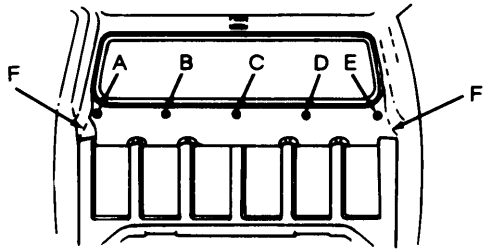


Figure 5-28. Rustproofing Rear Window Frame.

TA504817

r. Rustproofing Rear and Top of Door (see Figure 5-29).

(1) Insert 90 degree short tool in rear of door holes A and B, and holes in top of door C, D, E, F, and G as far as possible. Spray in all directions while slowly withdrawing tool.

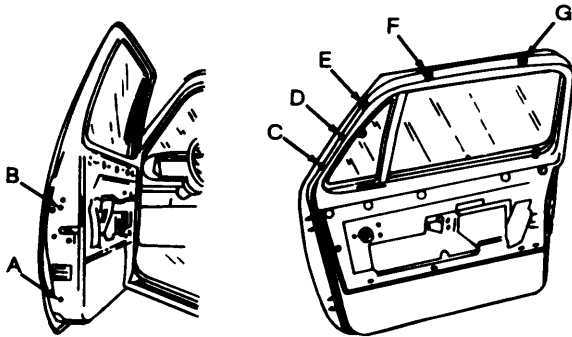


Figure 5-29. Rustproofing Rear and Top of Door.

TA504818

(2) Insert short rigid tool in holes C, D, E, F, and G in top of door and cover all areas not previously coated.

(3) Plug all holes.

5-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 5-30). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

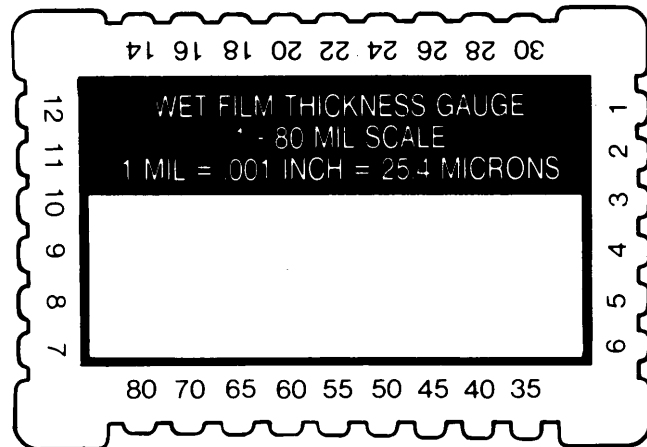


Figure 5-30. Film Thickness Gage.

TA504789

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 5-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

5-6. Component Installation.

Install all components that were removed in paragraph 5-1 of this chapter (see TM 9-2320-266-20 and TM 9-2320-266-34.)

CHAPTER 6

3/4-TON AND 1 1/4-TON TRUCK: M1008, M1008A1, M1009, M1010, M1028, AND M1031

Section I. PRELIMINARY PROCEDURES

6-1. Component Removal.

CAUTION

Electrical leads to light assemblies do not have to be disconnected. Tape the light assembly to body or cab to prevent damage.

NOTE

On cargo trucks with body mounting equipment or kits (troop seats, cargo covers, etc.) remove equipment as required to allow for access to rustproofing points.

a. Prior to rustproofing, place all windows in closed position. The following components must be removed for access (see TM 9-2320-289-20 and TM 9-2320-289-34) :

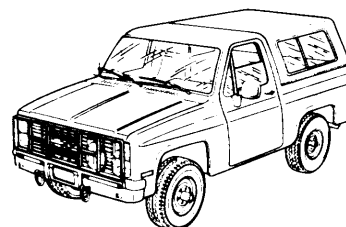
(1) Vent covers and controls (both sides).

(2) Spare tire and mounting bracket (all except M1009).

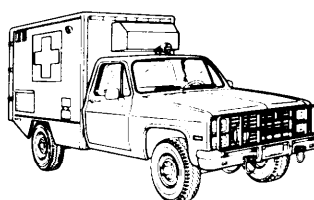
- (3) Fuel tank shield (all except M1009).
 - (4) Lower front fender mudguards left and right.
 - (5) Both sunvisors.
 - (6) Floor mat.
 - (a) After removing floor mat, discard padding and apply nonslip flight deck compound (NSN 5610-00-782-5556 1-gal. kit).
 - (b) Install rubber mat without padding.
 - (7) Both taillight assemblies.
 - (8) Rubber plugs in doors. Remove and retain 1-inch (2.5 cm) plug.
 - (9) Rubber plugs in doorjamb. Remove and discard 1/2-inch (1.3 cm) plug.
 - (10) Remove tailgate glass cover (M 1009 only).
- b. All 3/4- and 1 1/4-Ton Trucks discussed in this chapter are illustrated in Figure 6-1.



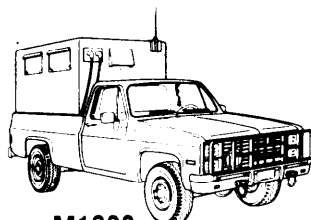
M1008/M1008A1



M1009



M1010



M1028



M1031

Figure 6-1. M1008, M1008A1, M1009, M1010, M1028, and M1031 Series Trucks.

TA504819

Section II. DRILLING AND CLEANING PROCEDURES

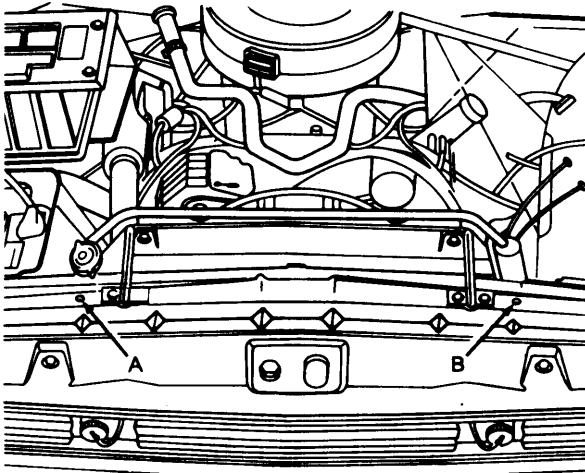
6-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter,

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

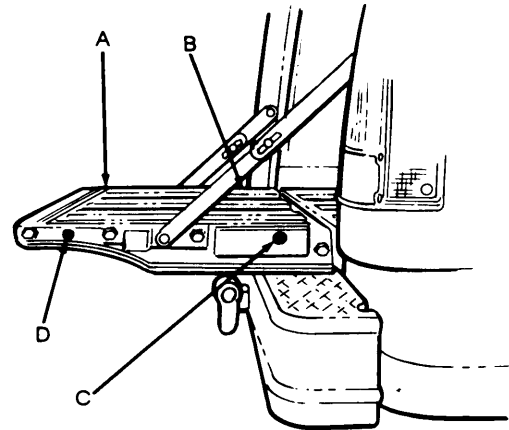
b. *Drilling Top Radiator Core Support* (see Figure 6-2). Enlarge existing holes A and B to 1/2 inch (1.3 cm).



TA504820

Figure 6-2. Drilling Top Radiator Core Support (M1008).

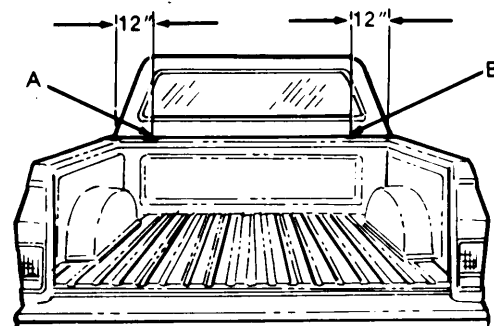
c. *Drilling Tailgate.* (Model M1008) (see Figure 6-3). Enlarge existing holes A, B, C, and D to 1/2 inch (1.3 cm).



TA504821

Figure 6-3. Drilling Tailgate.

d. *Drilling Front of Cargo Bed* (see Figure 6-4). Drill two holes A and B in front of cargo bed. Holes are to be drilled 12 inches (30.5 cm) in from side of cargo bed.



TA504822

Figure 6-4. Drilling Front of Cargo Bed.

e. *Drilling Rear of Doors (Typical)* (see Figure 6-5). Drill one hole A in each door 4 inches (10.2 cm) above top of door trim. Existing hole B can be used for lower door area.

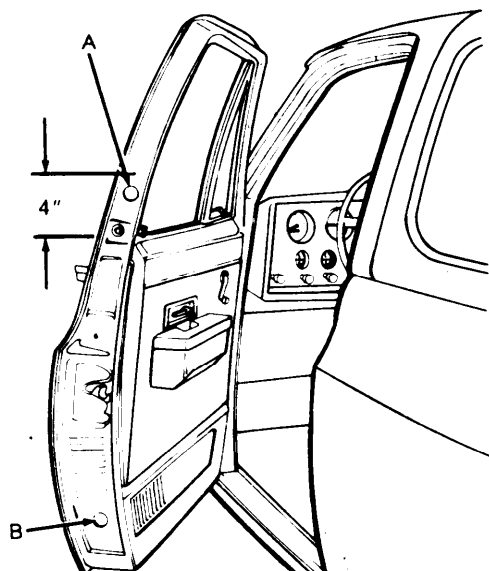


Figure 6-5. Drilling Rear of Doors (Typical).

TA504823

f. *Drilling Front Lower Door and Doorjamb (Typical)* (see Figure 6-6). Enlarge existing holes A in doorjamb to 1/2 inch (1.3 cm). Holes B are to be sight drilled at bottom front of doors.

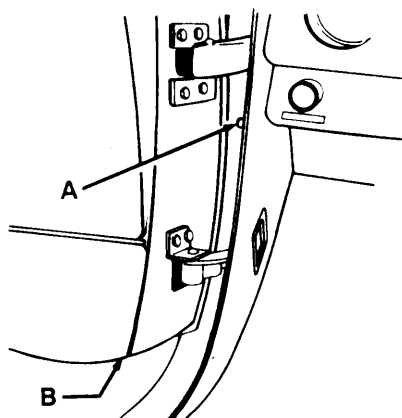


Figure 6-6. Drilling Front Lower Door and Doorjamb (Typical).

TA504824

g. *Drilling Rocker Panels (Typical)* (see Figure 6-7). Drill one hole A in rocker panels.

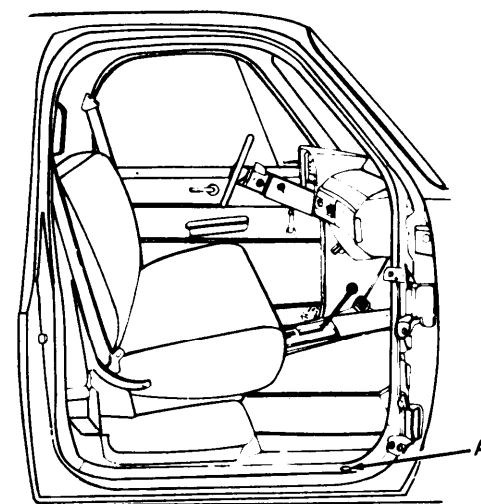


Figure 6-7. Drilling Rocker Panels (Typical),

TA504825

NOTE

In Figure 6-8, holes E, F, G, H, and I do not apply to the MI 009.

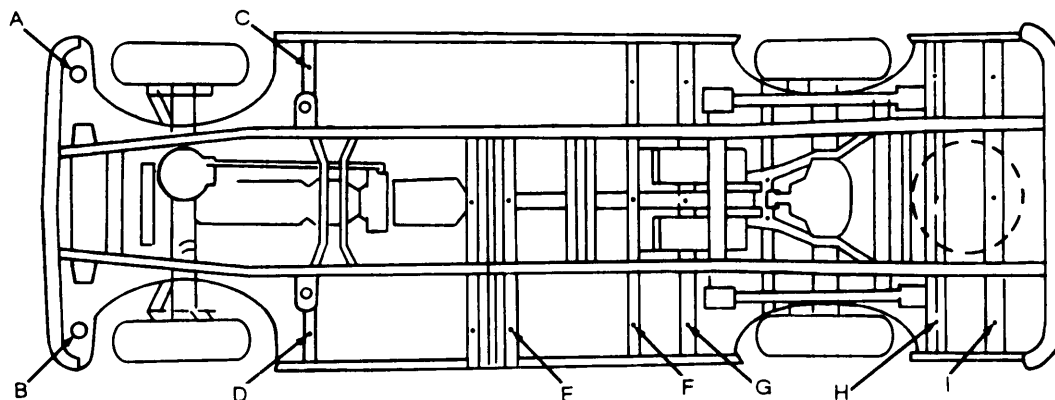
h. *Drilling Body Support Channels* (see Figure 6-8). Drill two holes A and B. Holes C, D, E, F, G, H, and I are existing holes which must be enlarged to 1/2 inch (1.3 cm). All other access holes are large enough to receive tools.

i. *Drilling Top of Doorjamb* (see Figure 6-9), Drill a total of four holes in the top of both doorjamb.

(1) Drill holes A 12 inches (30.5 cm) from top of doorjamb openings.

(2) Drill holes B 16 inches (40.6 cm) from holes A. Holes A and B cover all models.

(3) Model M 1009 only. Drill a total of four holes. Drill hole C even with rubber bumper, both doorjamb. Drill holes D and E 9 inches (22.9 cm) from seatbelt bolt.



TA504826

Figure 6-8. Drilling Body Support Channels.

6-3. Cleaning Procedures.

WARNING

When cleaning, do not discharge water in excess of 600 psi (4137 kPa) from high pressure equipment. Serious injury could result. Eye protection must be worn to prevent injury.

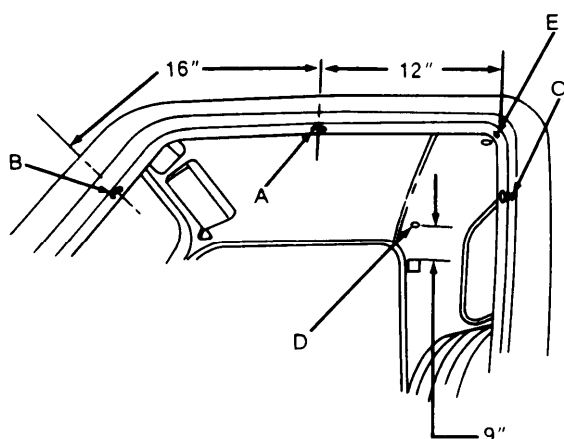
CAUTION

Steam cleaning will not be used.

a. Wash the interior of frame rail structures through drilled access holes to remove mud, dirt, etc. Use of high pressure washer will facilitate this process. Observe water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.



TA504827

Figure 6-9. Drilling Top of Doorjamb.

Section III. RUSTPROOFING PROCEDURES

6-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, backing plates, parking brake linkage, engine linkage, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be attained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific body items refer to Figure 6-10 through Figure 6-27.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to

obtain minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal structural members in even coats. An acceptable starting point to maintain an even spray pattern, is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound.

c. Rustproofing Underbody (M1008 Series) (see Figure 6-10).

(1) Insert flexible tool as far as possible into the ends of the body support channels A through F, and cargo bed channels G through R. Slowly withdraw tool while spraying.

(2) Use short rigid tool to complete spraying of all accessible areas of the underbody.

(3) Use 90 degree short tool to spray all those areas that were inaccessible with the cone spray tool, such as framerails, bed side walls, and wheel lips and wells.

(4) Use short rigid tool to spray the bottom side of the fuel tank and both sides of the fuel tank shield. Also spray all accessible areas of the radiator cowl underside.

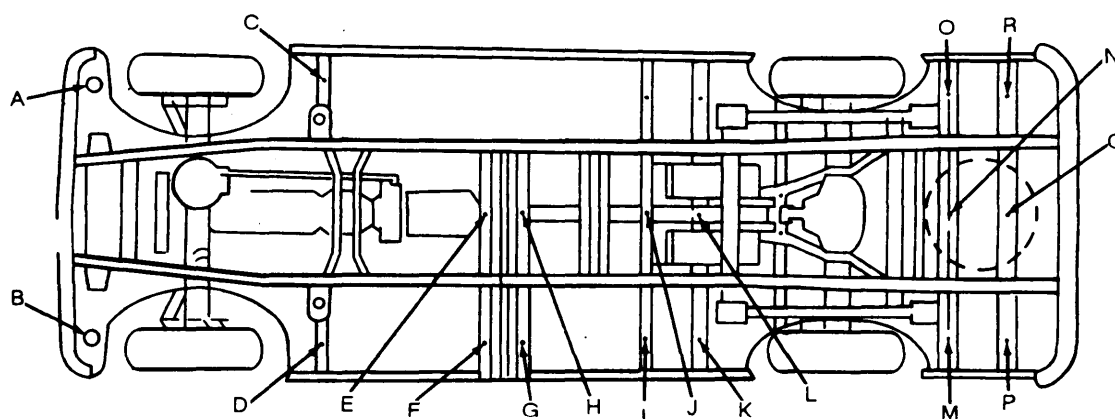


Figure 6-10. Rustproofing Underbody (M1008 Series).

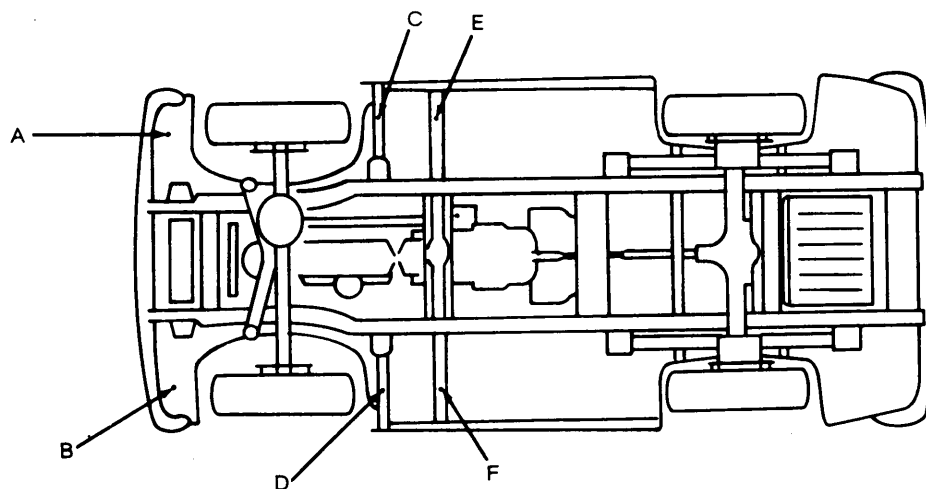
TA504828

d. Rustproofing Underbody (M1009) (see Figure 6-11).

(1) Insert flexible tool as far as possible into the ends of body support channels A through F and all

existing holes in the cargo bed channels. Slowly withdraw tool while spraying.

(2) Use short rigid tool to spray all accessible areas of the underbody.



TA504829

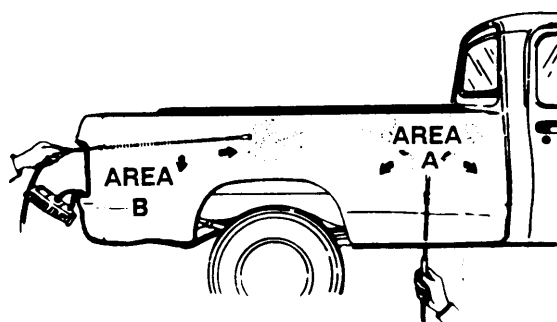
Figure 6-11. Rustproofing Underbody (M1009).

(3) Use 90 degree short tool to spray all those areas that were inaccessible with the cone spray tool, such as framerrails, bed rails, side walls, and wheel lips and wells.

(4) Use 90 degree short tool to spray the bottom side of the fuel tank and both sides of the fuel tank shield.

e. Rustproofing Cargo Body Walls (see Figure 6-12).

(1) Insert 90 degree long tool through openings in inner walls and spray in all directions in area A.



TA504830

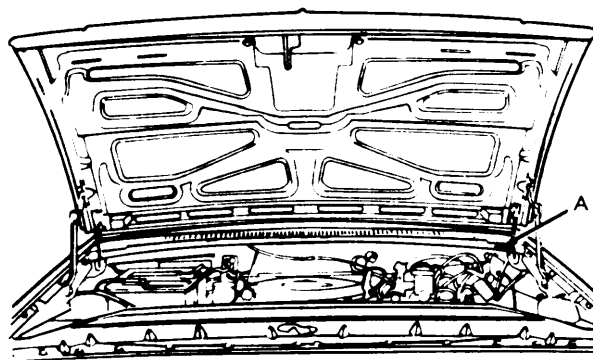
Figure 6-12. Rustproofing Cargo Body Walls.

(2) Insert 90 degree long tool into hole in taillight openings and spray in all directions in area B.

f. Rustproofing Cowl (see Figure 6-13).

(1) Insert flexible tool into the open seam of channel A of the cowl and spray in all directions.

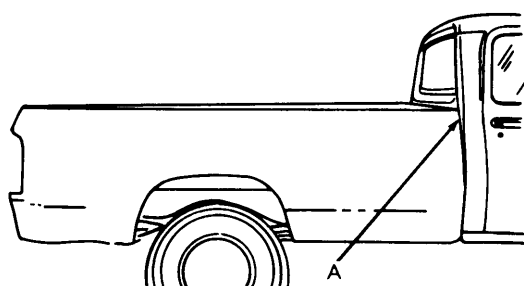
(2) Use 90 degree short tool to completely spray areas missed by the flexible tool.



TA504831

Figure 6-13. Rustproofing Cowl.

g. Rustproofing Between Cab and Cargo Body (M1008, M1008A1, and M1028) (see Figure 6-14). Insert long rigid tool between the bed and cab area A, and spray in all directions.



TA504832

Figure 6-14. Rustproofing Between Cab and Cargo Body (M1008, M1008AI, and M1028).

h. Rustproofing Engine Compartment (see Figure 6-15),

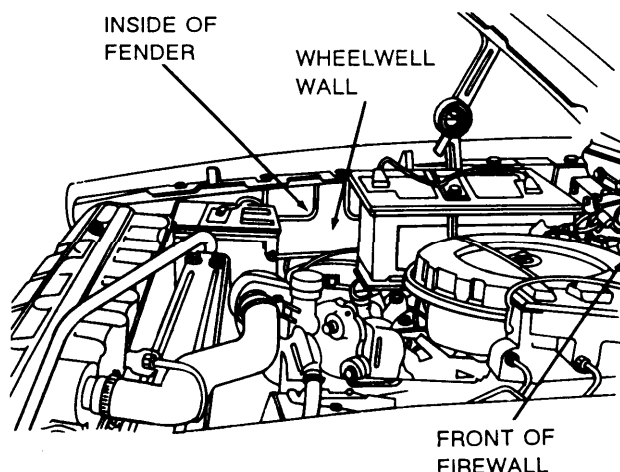
(1) Use short rigid tool to completely spray the following areas of the engine compartment:

- (a) Front of cab firewall.
- (b) Rear of the radiator wall.
- (c) The inside, bottom front, and bottom rear of the fender.

NOTE

Ensure that all seams, welds and corners of the engine compartment are covered.

(2) Use flexible tool to spray all areas inaccessible with the short rigid tool.



TA504833

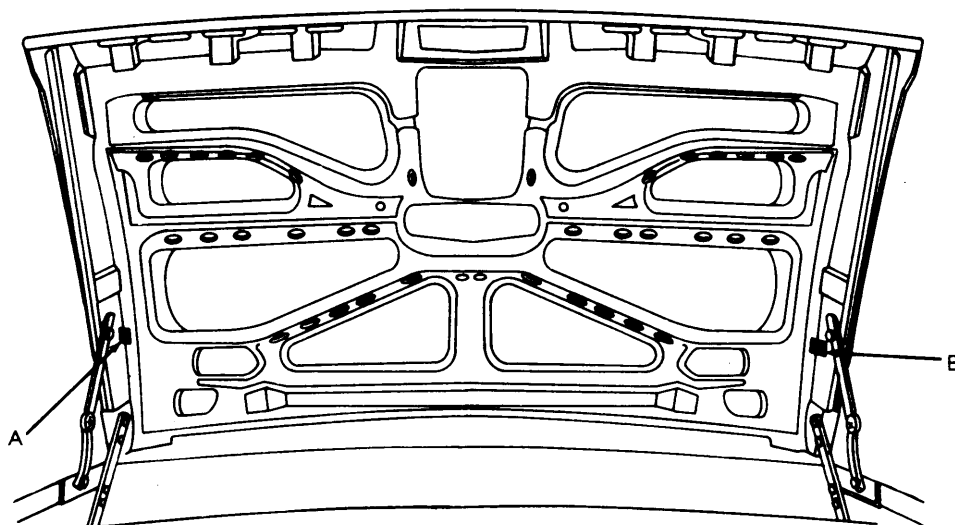
Figure 6-15. Rustproofing Engine Compartment.

i. Rustproofing Hood (see Figure 6-16).

(1) Insert flexible tool into the hood box channel A and B as far as possible, then slowly withdraw tool while spraying.

(2) Use short rigid tool to completely spray the inner panel of the hood.

(3) Use 90 degree short tool to spray in all existing holes of the inner hood and all areas missed by the flexible tool.



TA504834

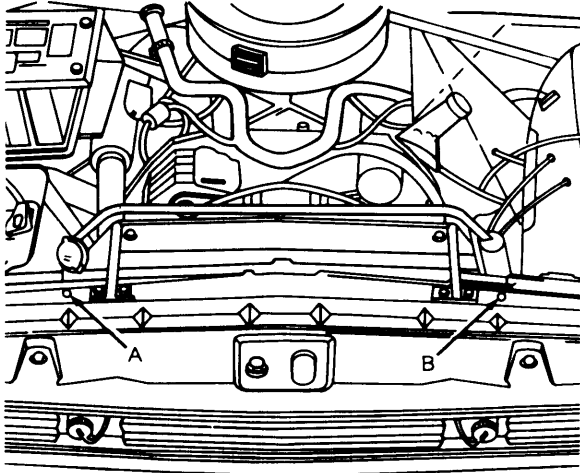
Figure 6-16. Rustproofing Hood.

TB 43-0213

j. *Rustproofing Radiator Core Support* (see Figure 6-17).

(1) Insert flexible tool into the ends of the top radiator core support holes A and B then slowly withdraw tool while spraying.

(2) Insert 90 degree short tool into holes A and B and spray areas missed by the flexible tool.



TA504835

Figure 6-17. Rustproofing Radiator Core Support.

k. *Rustproofing Fenders* (see Figure 6-18).

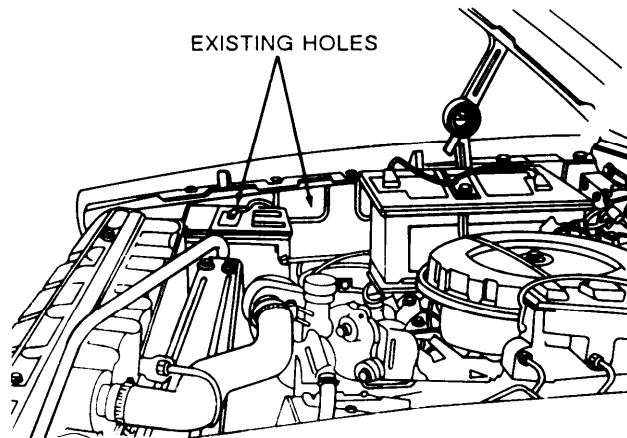
(1) Insert flexible tool as far as possible in all existing holes in the inner panel of the front fenders then withdraw tool while spraying in all directions. Be sure to spray between fender reinforcement and fender skin.

(2) Use 90 degree short tool to completely spray all areas missed by the flexible tool.

1. *Rustproofing Rocker Panels and Rear Cab Channels* (see Figure 6-19).

(1) Insert flexible tool into hole A as far as possible into the rocker panel, then spray in all directions while slowly withdrawing tool.

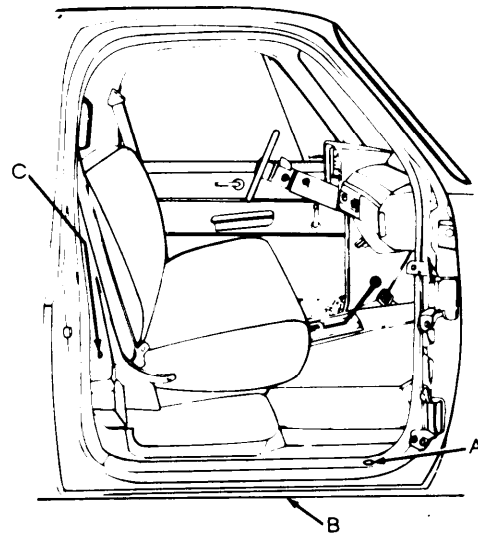
(2) Use short rigid tool to spray the under side of the rocker panel B.



TA504836

Figure 6-18. Rustproofing Fenders.

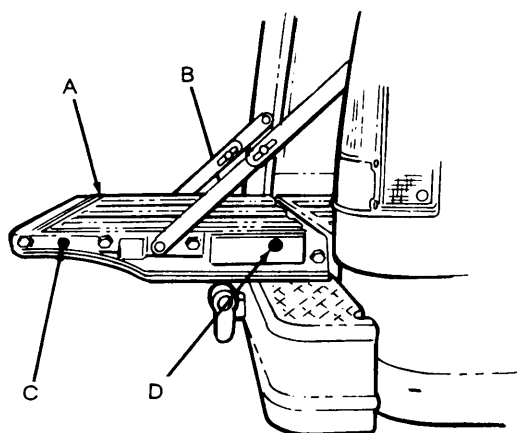
(3) Insert flexible tool into the rear cab channel C and spray in all directions. Plug hole after spraying.



TA504837

Figure 6-19. Rustproofing Rocker Panels and Rear Cab Channels.

m. *Rustproofing Tailgate (M1008)* (see Figure 6-20). Insert 90 degree long tool into tailgate holes A, B, C, and D as far as possible, then spray in all directions while slowly withdrawing tool.

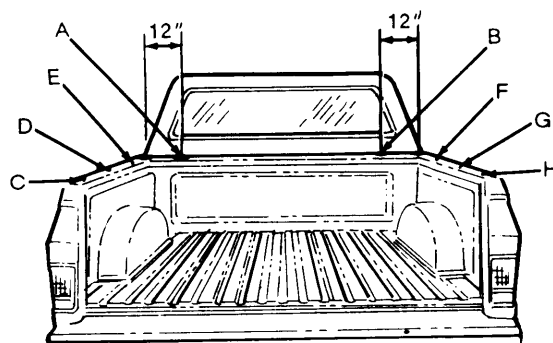


TA504838

Figure 6-20. Rustproofing Tailgate (M1008).

n. Rustproofing Cargo Bed (M1008) (see Figure 6-21).

(1) Insert flexible tool into holes A and B of the front top cargo bed as far as possible, then spray in all directions while withdrawing tool.

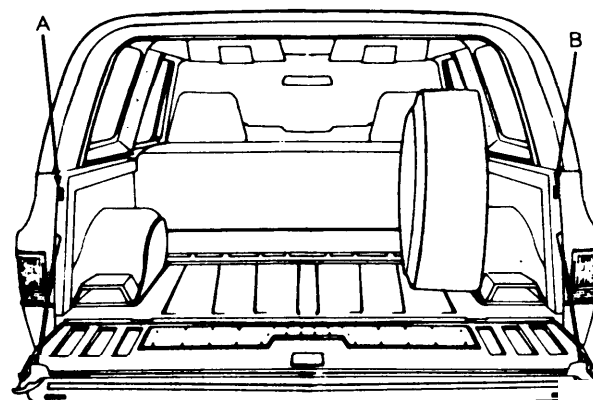


TA504839

Figure 6-21. Rustproofing Cargo Bed (M1008).

(2) Insert short rigid tool into holes C through H and spray in all directions while slowly withdrawing tool.

o. Rustproofing Cargo Body (M1009) (see Figure 6-22). Insert 90 degree short tool into holes A and B as far as possible, then spray in all directions while slowly withdrawing tool.



TA504840

Figure 6-22. Rustproofing Cargo Body (M1009).

p. Rustproofing Tailgate (M1009) (see Figure 6-23).

NOTE

Place window in the full up position and support the glass.

(1) Insert 90 degree short tool into areas A of the inner tailgate panel and spray in all directions while slowly withdrawing tool.

(2) Spray the inner side of the tailgate access cover with the same tool.

q. Rustproofing Lower Doorjamb, Doors, and Vent Openings (see Figure 6-24).

(1) Insert flexible tool into hole A of the front doorjamb and spray in all directions.

(2) Insert 90 degree short tool into the vent openings B and spray in all directions.

(3) Insert 90 degree short tool into hole C of the front lower side of the door and spray door hinge side.

(4) Use 90 degree long tool to spray the vent window frame side while slowly withdrawing tool.

(5) Insert short rigid tool into holes A and B and spray all areas missed by the 90 degree tool.

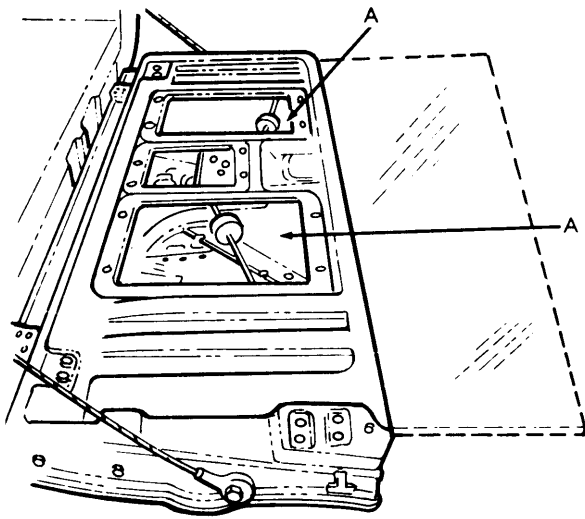


Figure 6-23. Rustproofing Tailgate (M1009),

TA504841

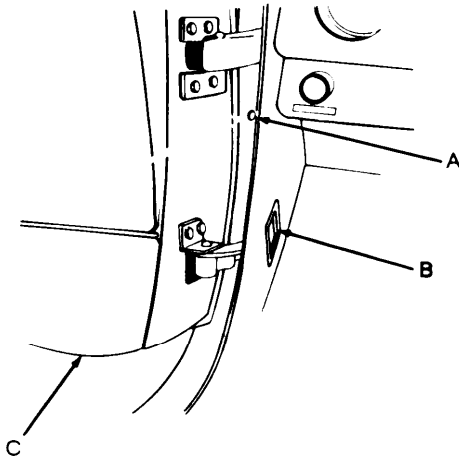


Figure 6-24. Rustproofing Lower Doorjamb, Doors, and Vent Openings.

TA504842

r. Rustproofing Roof and Doorjamb Top (see Figure 6-25).

(1) Insert flexible tool into holes A and B of the doorjamb and spray in all directions.

(2) Insert flexible tool into holes Canal D of the sunvisor openings as far as possible, then spray in all directions while slowly withdrawing tool.

(3) Insert 90 degree short tool into the sunvisor hole openings C and D as far as possible and spray in all directions. Do this step twice: once to the left and then to the right.

(4) Insert short rigid tool into all openings and holes in the roof and doorjamb and spray all areas missed by the 90 degree tool.

(5) For M1009 only. Insert flexible tool into hole E of the doorjamb and holes F and G of the roof, then spray in all directions.

(6) Plug holes A through G.

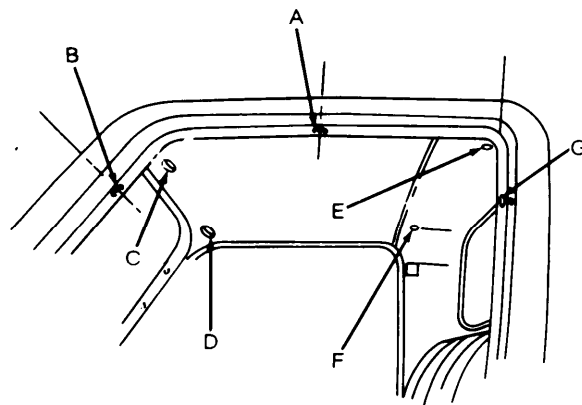


Figure 6-25. Rustproofing Roof and Doorjamb Top.

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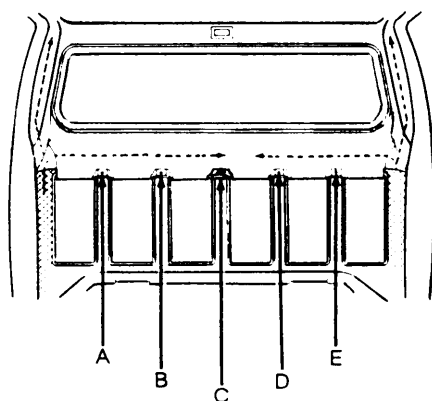
s. Rustproofing Rear Window Frame (see Figure 6-26).

(1) Insert flexible tool into the existing openings A through E of the rear window frame and spray while slowly withdrawing tool.

(2) Insert 90 degree short tool up and into the rear window frame channel and spray while slowly withdrawing tool.

thickness cannot be measured, inspect for completeness of coverage

(3) Check all drain holes to ensure that they are open.



TA504844

Figure 6-26. Rustproofing Rear Window Frame.

t. Rustproofing Rear and Top of Door (see Figure 6-27).

(1) Insert 90 degree long tool into the 1-inch (2.5 cm) hole A in bottom rear of door. Rotate spraying tool while slowly withdrawing from hole, spraying the lower 15 inches (38.1 cm) of the interior of the door.

(2) Insert flexible tool into hole B of the upper door channel and direct the tool up through the channel as far as possible, then spray while slowly withdrawing tool.

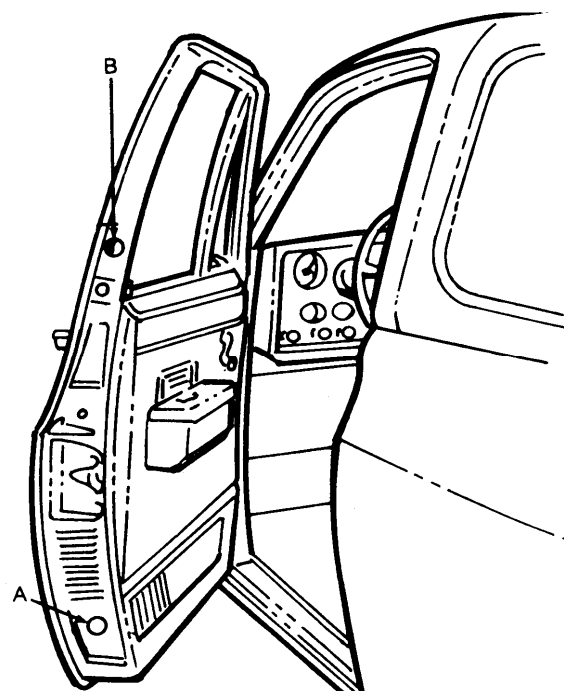
(3) Plug holes.

6-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely covered.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately covered.

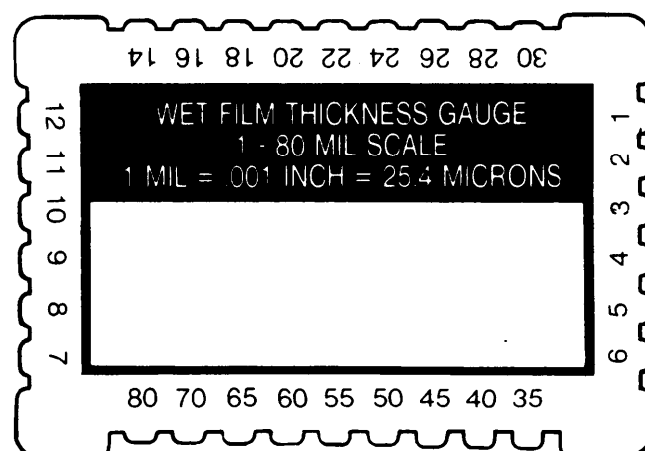
(2) Check wet film thickness with a wet film thickness gage (see Figure 6-28). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where wet



TA504845

Figure 6-27. Rustproofing Rear and Top of Door.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.



TA504789

Figure 6-28. Film Thickness Gage.

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(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 6-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

6-6. Component Installation.

Install all components that were removed in paragraph 6-1 (see TM 9-2320-289-20 and TM 9-2320-289-34).

CHAPTER 7

2 1/2-TON AND 5-TON TRUCKS: CABS (TYPICAL)

Section I. PRELIMINARY PROCEDURES

7-1. Component Removal.

a. Figure 7-1 provides a reference illustration of typical 2 1/2 and 5-Ton cabs.

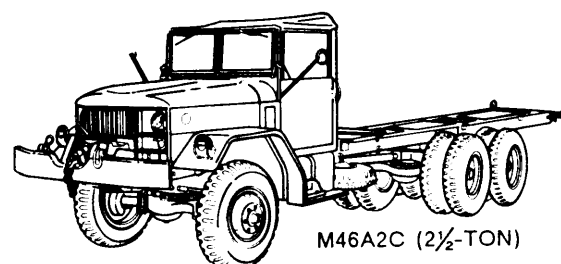
b. Due to the wide variety of special applications for 2 1/2- and 5-Ton vehicles, only the cabs will be discussed in this chapter. Typical variations of these trucks will be covered in succeeding chapters.

NOTE

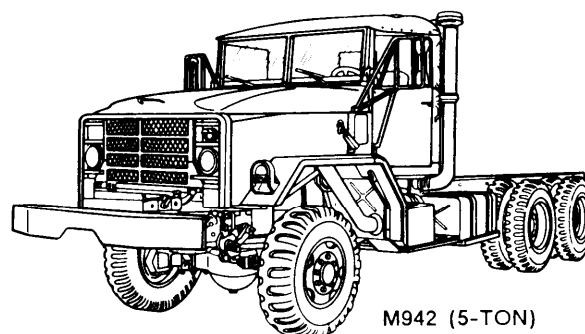
- Removal instructions for 2 1/2 Ton Series Trucks are in TM 9-2320-209-20 and TM 9-2320-209-34.
- Removal instructions for 5-Ton Series Trucks are in TM 9-2320-211-20 and TM 9-2320-211-34.

c. Prior to rustproofing, the following components must be removed to provide access:

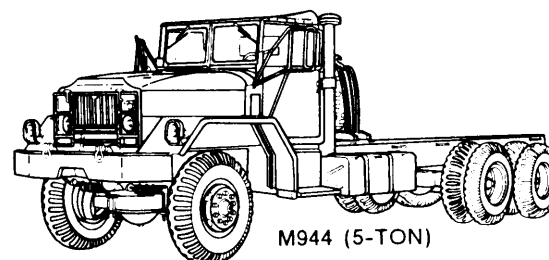
- (1) Raise windows to a fully closed position,
- (2) Remove the following components:
 - (a) Cab canvas.
 - (b) Side door panels.
 - (c) Seats.
 - (d) Center tunnel.
 - (e) Access cover to master cylinder.



M46A2C (2½-TON)



M942 (5-TON)



M944 (5-TON)

Figure 7-1. Typical 2 1/2 Ton and 5-Ton Trucks.

TA504846

Section II. DRILLING AND CLEANING PROCEDURES

7-2. Drilling Procedures.

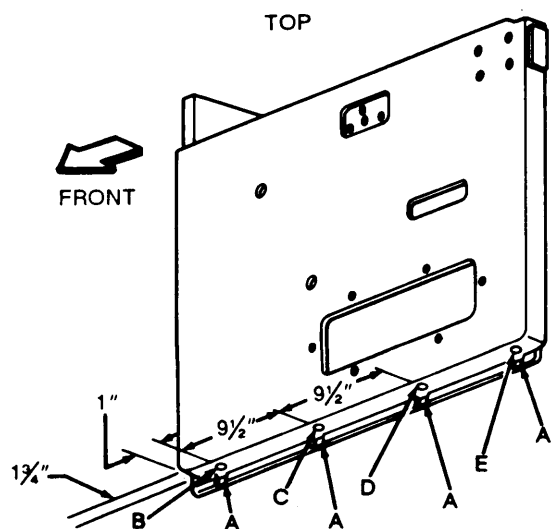
NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Cab Doors (see Figure 7-2).*

(1) Enlarge two holes C and D to 1/2 inch (1.3 cm) in the bottom of each door. Holes B and E are existing holes.

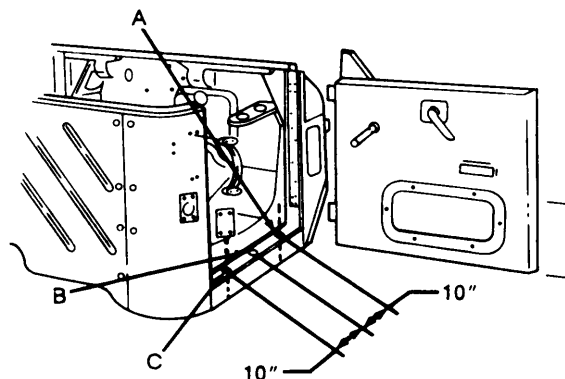


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Figure 7-2. Drilling Cab Doors.

(2) Cut four notches A in the bottom weatherstrip of each door. Notches should coincide with holes B, C, D, and E.

c. *Drilling Cab Sills (see Figure 7-3).* Drill three holes A, B, and C in each cab sill. Hole A is drilled 10 inches (25.4 cm) forward of hole B. Hole C is drilled 10 inches (25.4 cm) to the rear of hole B.

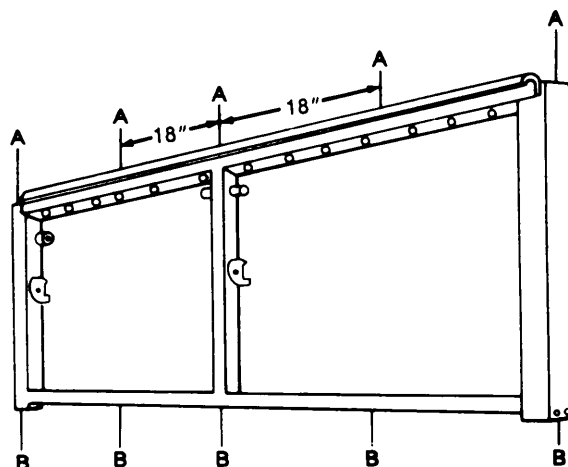


TA504848

Figure 7-3. Drilling Cab Sills.

d. *Drilling Windshield Frame (see Figure 7-4).* Drill a total of 10 holes in the windshield frame.

(1) Drill three holes A, one at the top of each vertical channel. At a distance of 18 inches (45.7 cm) to the left and the right of the center hole A, drill two more holes A.



TA504849

Figure 7-4. Drilling Windshield Frame.

(2) Fold the windshield down and drill five holes B on the bottom of the frame. Holes B are located to correspond with holes A.

e. *Drilling Cab Floor* (see Figure 7-5). Drill seven holes in cab floor:

(1) Drill holes D and C where support channels intersect. Penetrate two metal thicknesses.

(2) Holes F and G are drilled 9 inches (22.9 cm) forward of holes D and C. Penetrate two metal thicknesses.

(3) Hole E is drilled 7 inches (17.8 cm) to the left of hole D. Penetrate two metal thicknesses.

(4) Hole A is drilled 4 inches (10.2 cm) to the right of hole C. Penetrate two metal thicknesses.

(5) Hole B is drilled 9 1/2 inches (24.1 cm) to the right of hole C. Penetrate two metal thicknesses.

(6) Holes H and I are drilled 18 inches (45.8 cm) from the rear of holes C and D.

7-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

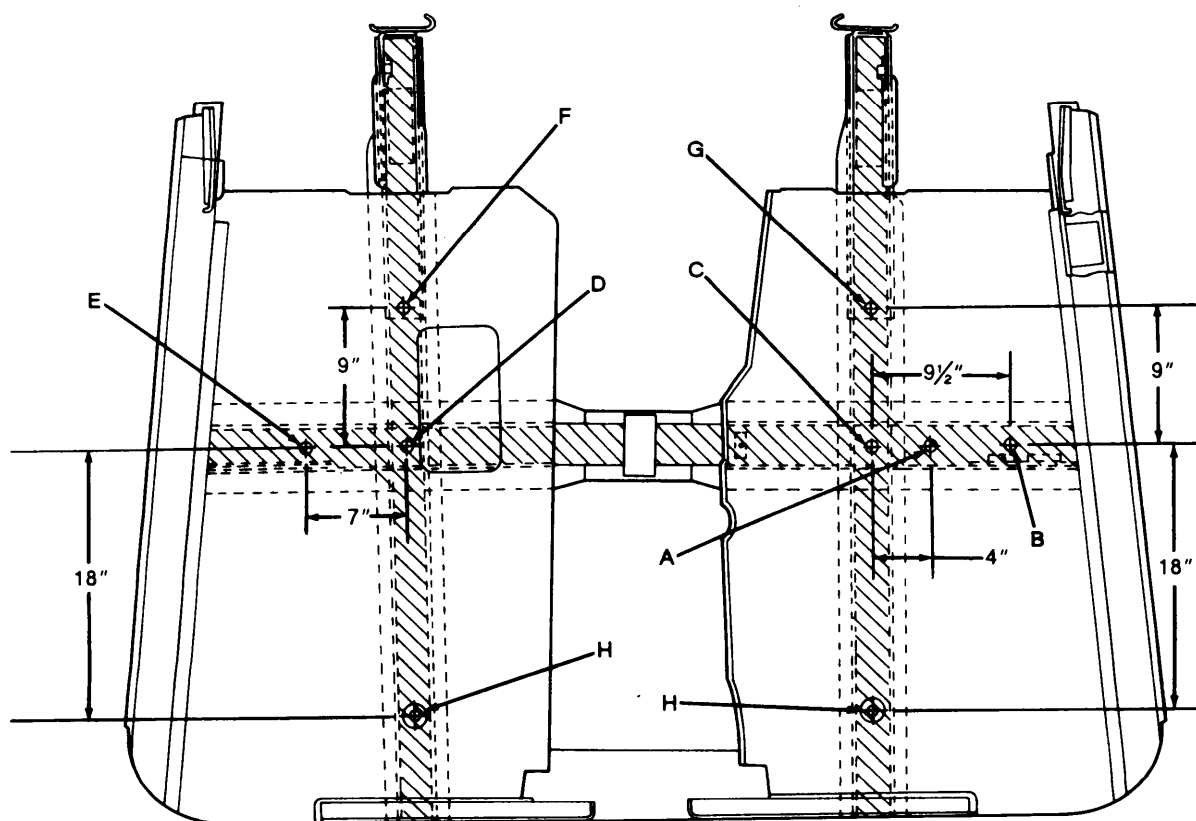


Figure 7-5. Drilling Cab Floor.

TA504850

Section III. RUSTPROOFING PROCEDURES

7-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkage, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific cab body items, refer to Figure 7-6 through Figure 7-9.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

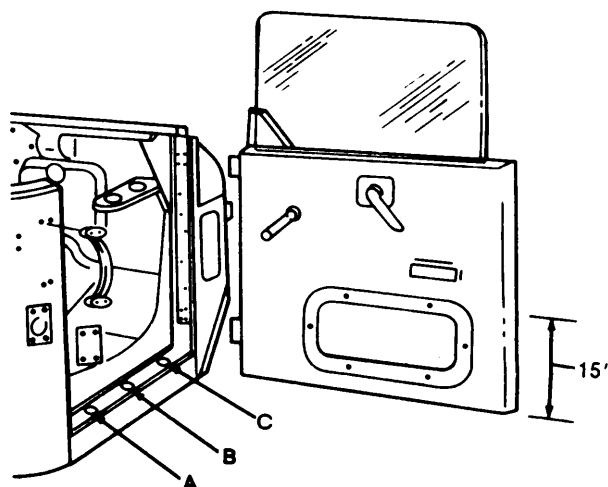
c. Rustproofing Cab Sills and Doors (see Figure 7-6).

(1) Insert 90 degree short tool into holes A, B, and C in the top of cab sill and spray in all directions.

CAUTION

Do not exceed 15 inches (38.1 cm), as the compound will foul the window mechanism.

(2) Use flexible 60 degree tool to apply rustproofing compound to the lower 15 inches (38.1 cm) of the inner panel of each door. Ensure that all drain holes in the bottom of the door are open after applying compound.



TA504851

Figure 7-6. Rustproofing Cab Sills and Doors.

d. Rustproofing Cab Floor (see Figure 7-7).

(1) Insert flexible tool as far as possible into holes C, D, F, G, and H of the cab floor. Spray while slowly withdrawing tool. Repeat this procedure until the rustproofing compound has been applied in all four directions.

(2) Insert 90 degree tool into holes A, B, and E and spray in all directions.

(3) Use 45 degree tool to apply rustproofing compound to seams and complete interior rear surface of cab floor.

(4) Coat entire underside of the cab floor using short rigid tool.

(5) Plug all holes except H.

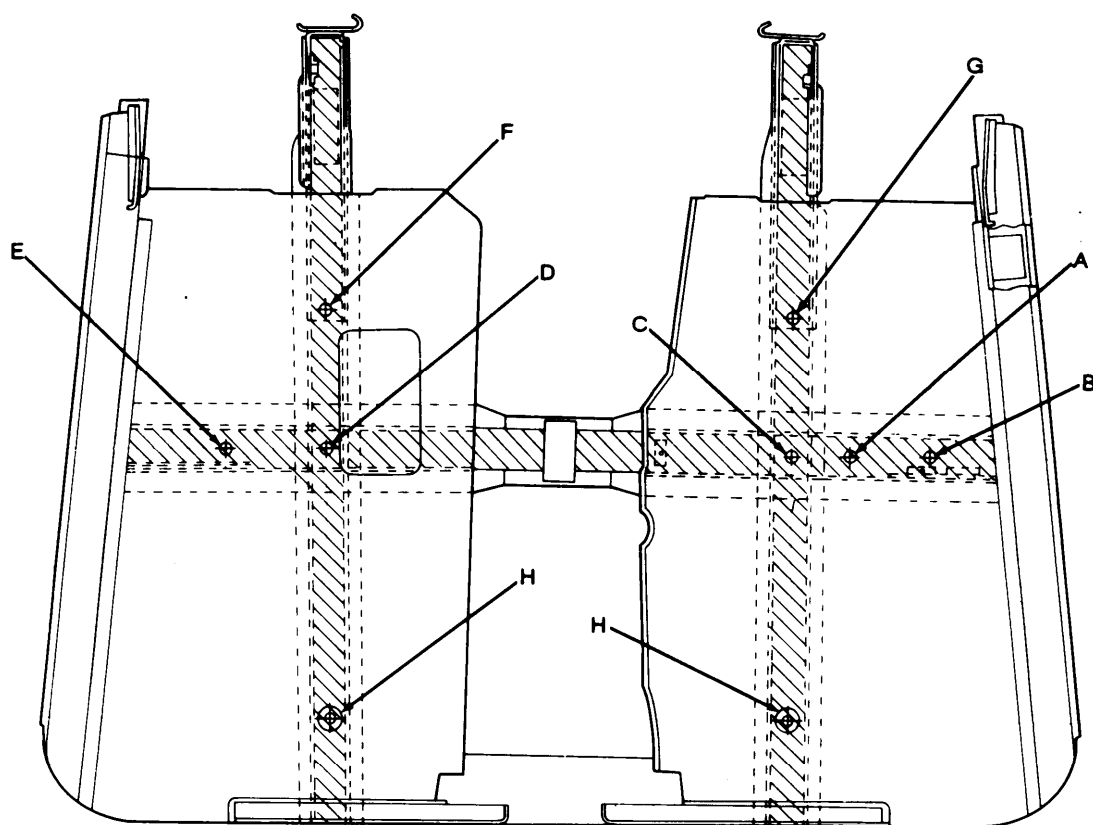


Figure 7-7. Rustproofing Cab Floor.

TA504852

e. Rustproofing Windshield Frame (see Figure 7-8).

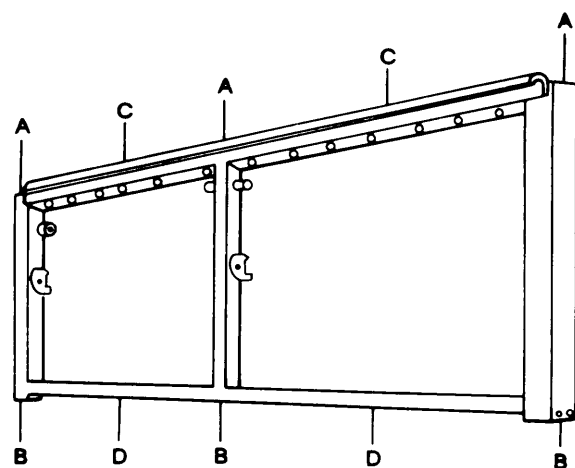
(1) Insert long rigid tool as far as it will go into each of the windshield vertical frame channels A. It may require two passes to ensure complete coverage.

(2) Lower windshield to a flat position to expose holes D, then insert 90 degree short tool in each hole of the horizontal frame channels and spray in all directions. Repeat the same procedure for holes C.

(3) Plug all holes A and C. Leave holes B and D open for drainage

f. Rustproofing Cowl, Hood and Dash Panel (see Figure 7-9).

(1) Use 45 degree tool to apply rustproofing compound to the complete cowl exterior seam. Completely coat the upper cowl panel and left- and right-hand interior cowl side panels through the fresh air panels.



TA504853

Figure 7-8. Rustproofing Windshield Frame.

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(2) Apply rustproofing compound to entire dash panel (engine side only). Do not coat the dash panel on the interior of the cab.

(3) Coat the complete underside of hood, hood side panels, and front end.

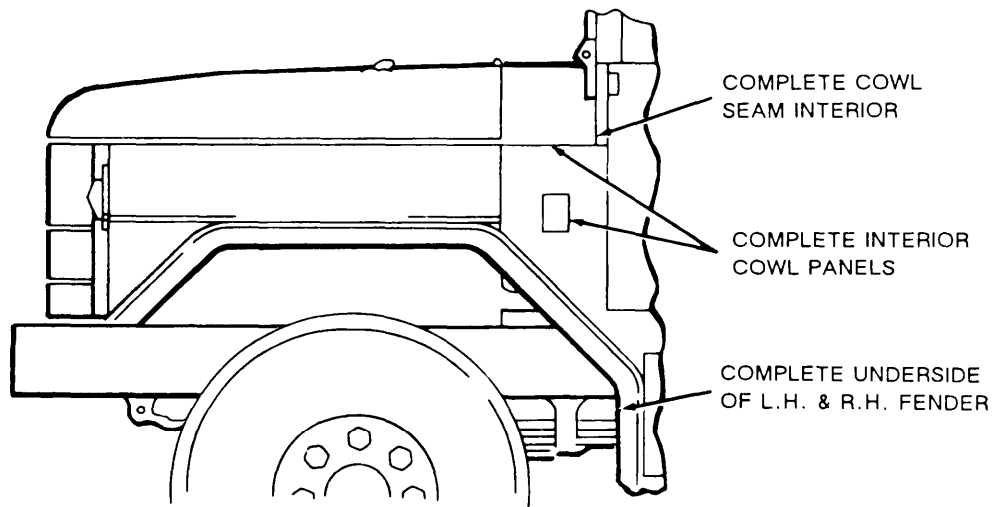


Figure 7-9. Rustproofing Cowl, Hood, and Dash Panel.

TA504854

7-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 7-10). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

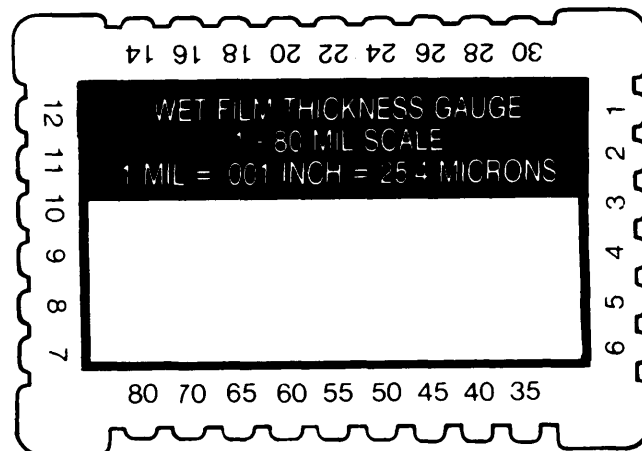


Figure 7-10. Film Thickness Gage.

TA504789

(4) Check all inspection and drilled access holes to ensure that compound coverage is adequate (see CAUTION, paragraph 7-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes,

7-6. Component Installation.

NOTE

- Installation instructions for 2 1/2-Ton Series Trucks are in TM 9-2320-209-20 and TM 9-2320-209-34.
- Installation instructions for 5-Ton Series Trucks are in TM 9-2320-211-20 and TM 9-2320-211-34.

Install all components that were removed in paragraph 7-1.

CHAPTER 8

2 1/2-TON CARGO BODY TRUCKS

Section I. PRELIMINARY PROCEDURES

8-1. Component Removal.

Remove cargo canvas and bows from cargo body trucks, as shown in Figure 8-1, if equipped (see TM 9-2320-209-20).

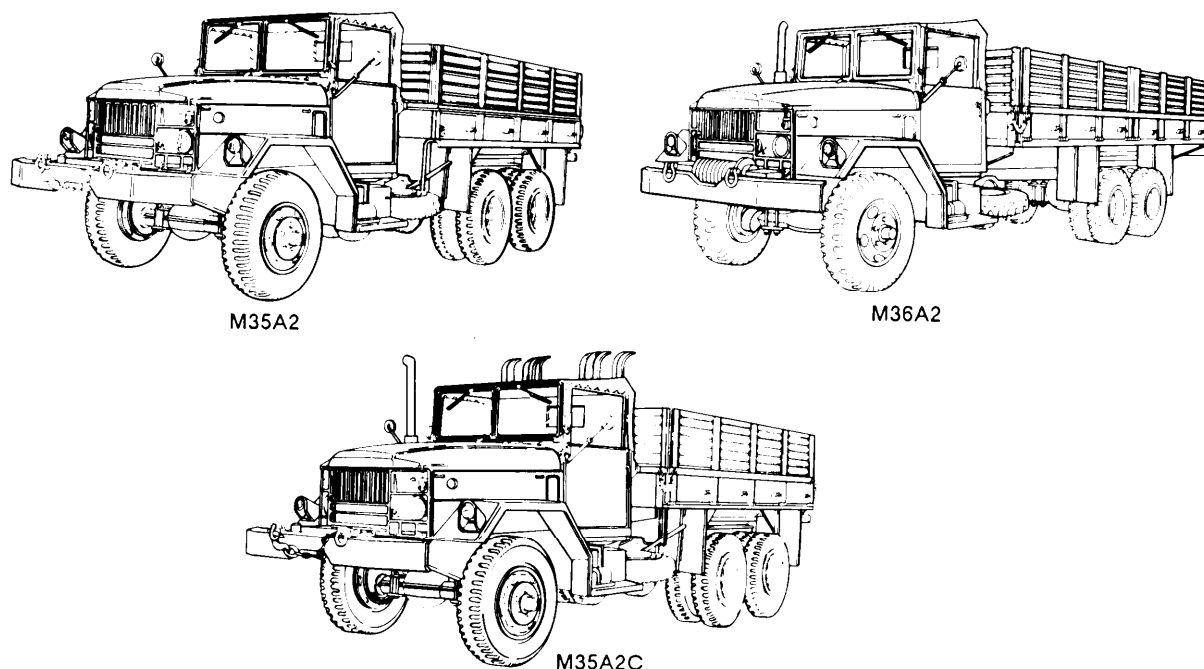


Figure 8-1. 2 1/2 Ton Cargo Body Trucks.

TA504855

Section II. DRILLING AND CLEANING PROCEDURES

8-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

NOTE

The M35A2C is the only cargo body configuration which requires drilling of the tailgate.

b. *Drilling Tailgate (M35A2C)* (see Figure 8-2). Drill four 1/2-inch (1.3 cm) holes A in the tailgate center stiffener. Holes are drilled 17 1/2 inches (44.5 cm) from one of two holes, B, which already exist.

8-3. Cleaning Procedures.

WARNING

When cleaning items, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

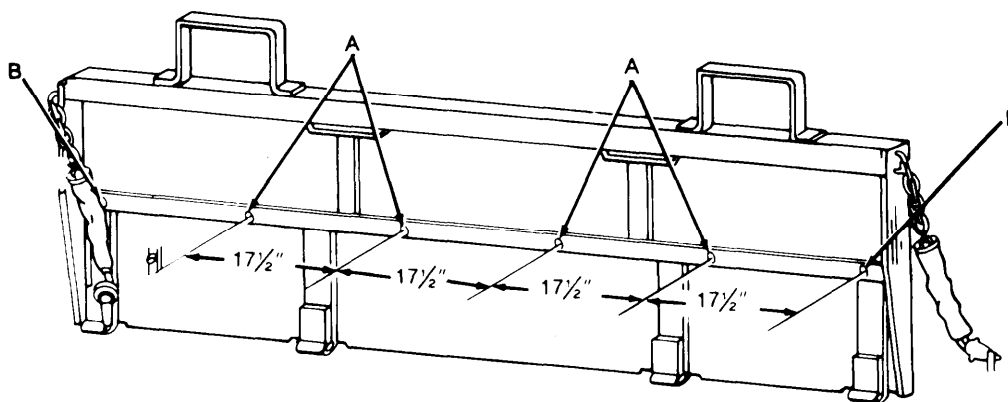
CAUTION

Steam cleaning will not be used.

a. Wash interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Paint and prime those areas showing bare metal. Allow painted areas time to dry before rustproofing.



TA504856

Figure 8-2, Drilling Tailgate (M3SA2C).

Section III. RUSTPROOFING PROCEDURES

8-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums~brake backing plates, parking brake linkage~shaft linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific cargo body items, refer to Figure 8-3 and Figure 8-4.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing

protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Tailgate (M35A2C) (see Figure 8-3). Insert 90 degree short tool into tailgate holes A and B and spray in all directions. Plug holes.

d. Rustproofing Cargo Body (see Figure 8-4).

(1) Insert long rigid tool into each stake pocket. Spray while slowly withdrawing tool. Two passes may be required to complete coverage of each pocket.

(2) Use 90 degree short tool to spray the interior surfaces of the rubrail (underneath the ledge), on sides, front, and tailgate.

(3) Use flexible tool to completely cover underbody of cargo bed.

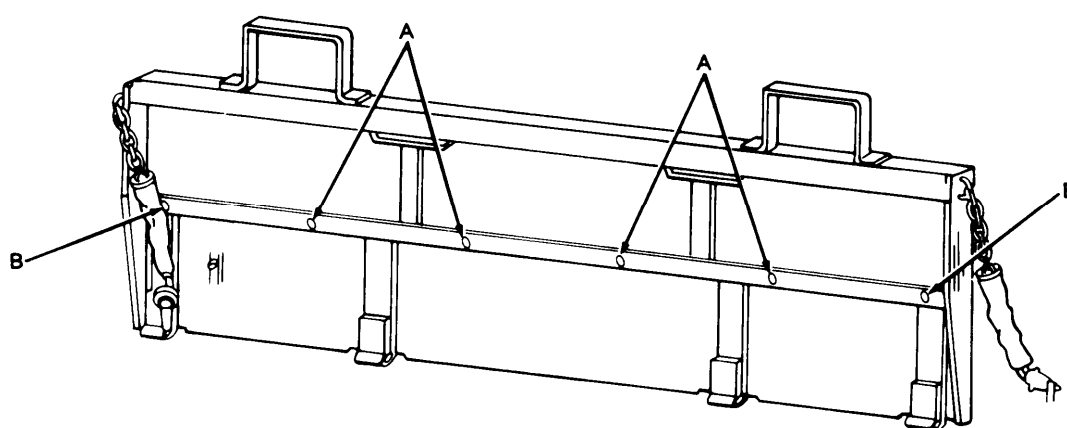


Figure 8-3. Rustproofing Tailgate (M352AC).

TA504857

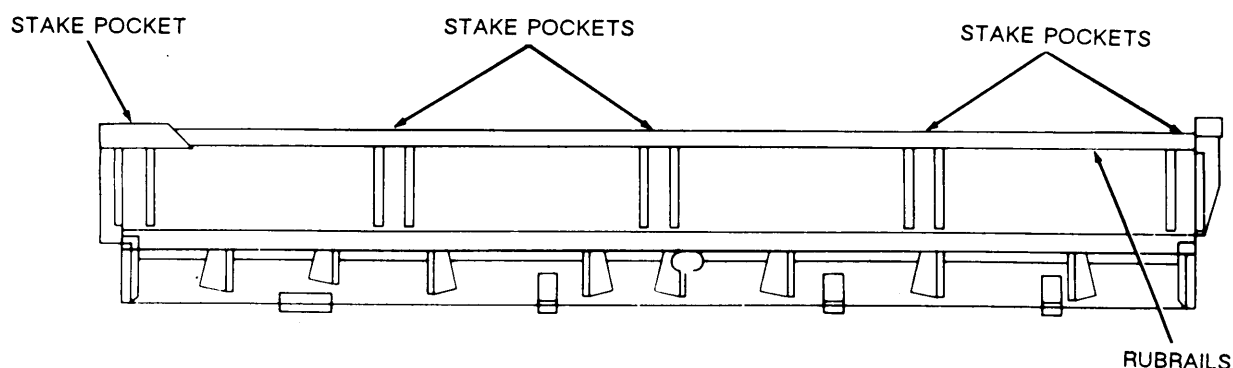


Figure 8-4. Rustproofing Cargo Body,

TA504858

8-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 8-5). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection and drilled access holes to ensure that compound coverage is adequate.

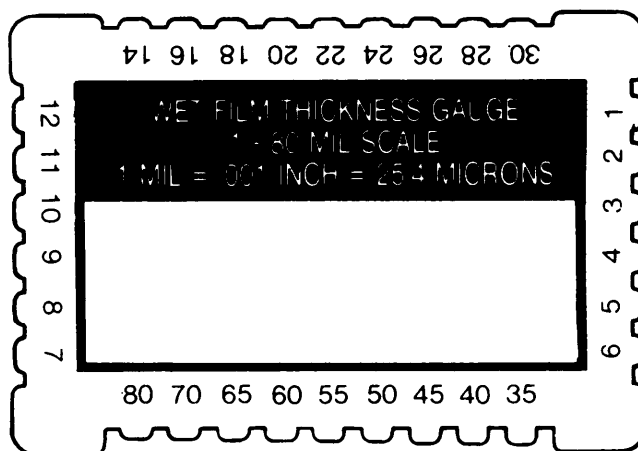
NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

8-6. Component Installation.

Install all the components that were removed in paragraph 8-1 (see TM 9-2320-209-20),



TA504789

Figure 8-5. Film Thickness Gage.

CHAPTER 9

2 1/2-TON TRUCKS: DUMP BODY AND TAILGATE

Section I. PRELIMINARY PROCEDURES

9-1. Component Removal.

a. Figure 9-1 provides a reference illustration for the 2 1/2Ton Dump Truck.

b. Before beginning any rustproofing procedures, remove the handles from the tailgate (see TM 9-2320-209-20).

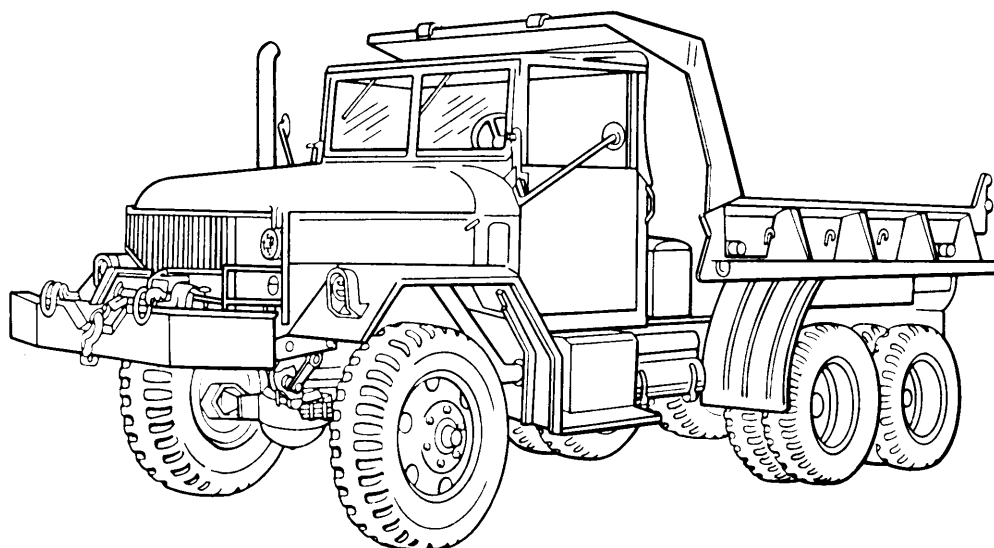


Figure 9-1. 2 1/2-Ton Dump Truck (M342A2),

TA504859

Section II. DRILLING AND CLEANING PROCEDURES

9-2. Drilling Procedures.

NOTE

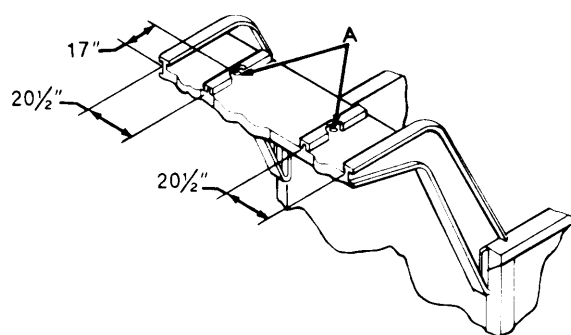
Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter,

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Cab Protector Braces* (see Figure 9-2).

(1) Raise the dump body enough to gain access to the underside of the cab protector.

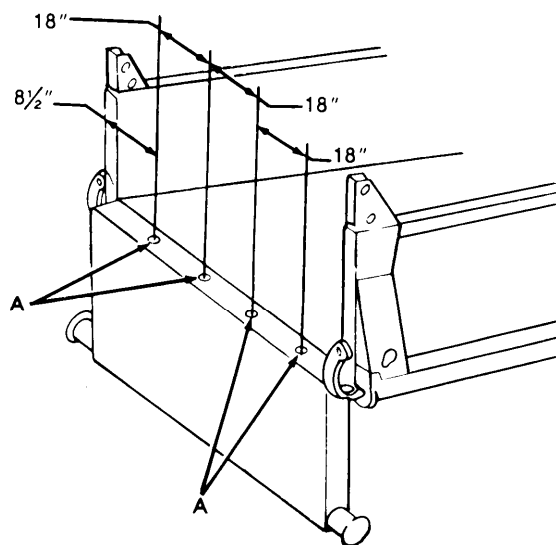
(2) Drill two holes A in cab protector braces from the underside. Holes are located by measuring 20 1/2 inches (52.1 cm) from the sides and 17 inches (43.2 cm) from the front.



TA504860

Figure 9-2. Drilling Cab Protector Braces.

c. *Drilling Tailgate Hinge Rod Stiffener* (see Figure 9-3), Drill four holes A along the bottom side of the tailgate hinge rod stiffener. The first hole is drilled 8 1/2 inches (21.6 cm) from either end. The other three holes are drilled 18 inches (45.7 cm) apart.



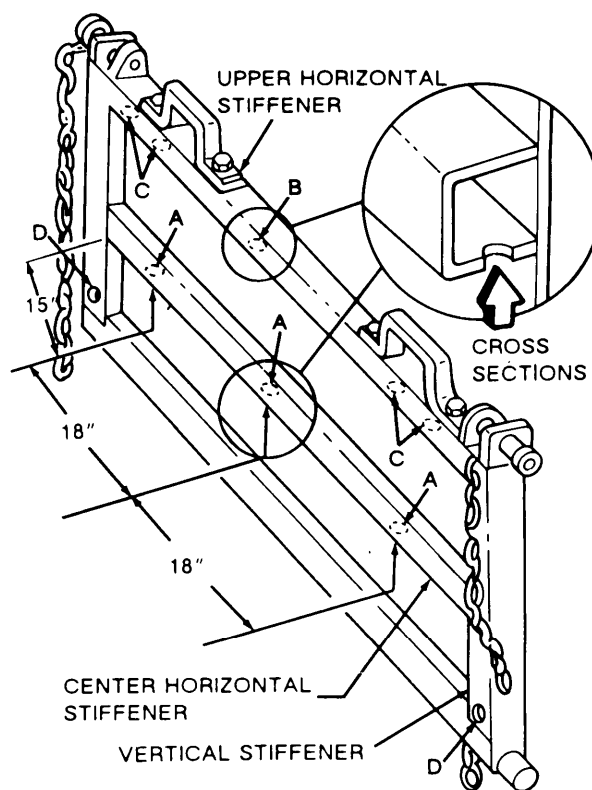
TA504861

Figure 9-3. Drilling Tailgate Hinge Rod Stiffener.

d. *Drilling Center Horizontal Stiffener* (see Figure 9-4). Drill three holes A in center horizontal stiffener. The first hole is drilled 15 inches (38.1 cm) from either edge. The remaining two holes are drilled 18 inches (45.7 cm) apart.

e. *Drilling Upper Horizontal Stiffener* (see Figure 9-4). Drill one hole B in the underside of the upper horizontal stiffener. Hole is centered between four holes C which already exist.

f. *Drilling Vertical Stiffeners* (see Figure 9-4). Drill one hole D in each vertical tailgate stiffener. Holes are drilled just above the hinge rod stiffener.



TA504862

Figure 9-4. Drilling Center, Horizontal, and Vertical Stiffeners.

g. *Drilling Top Side Rail* (see Figure 9-5).

(1) Drill eight holes A in the underside of each top side rail. The holes are located 3 inches (7.6 cm) to the left and right of the stake pocket gussets.

(2) Using a cutting torch, cut a 1 1/2-inch (3.8 cm) radius at the bottom of each stake pocket gusset. The radii are to be cut on both sides of each gusset.

h. *Drilling Underside of Side Lower Rail (Dump Body)* (see Figure 9-6). Six holes A should be enlarged to 1 1/2 inches (3.8 cm) using a cutting torch.

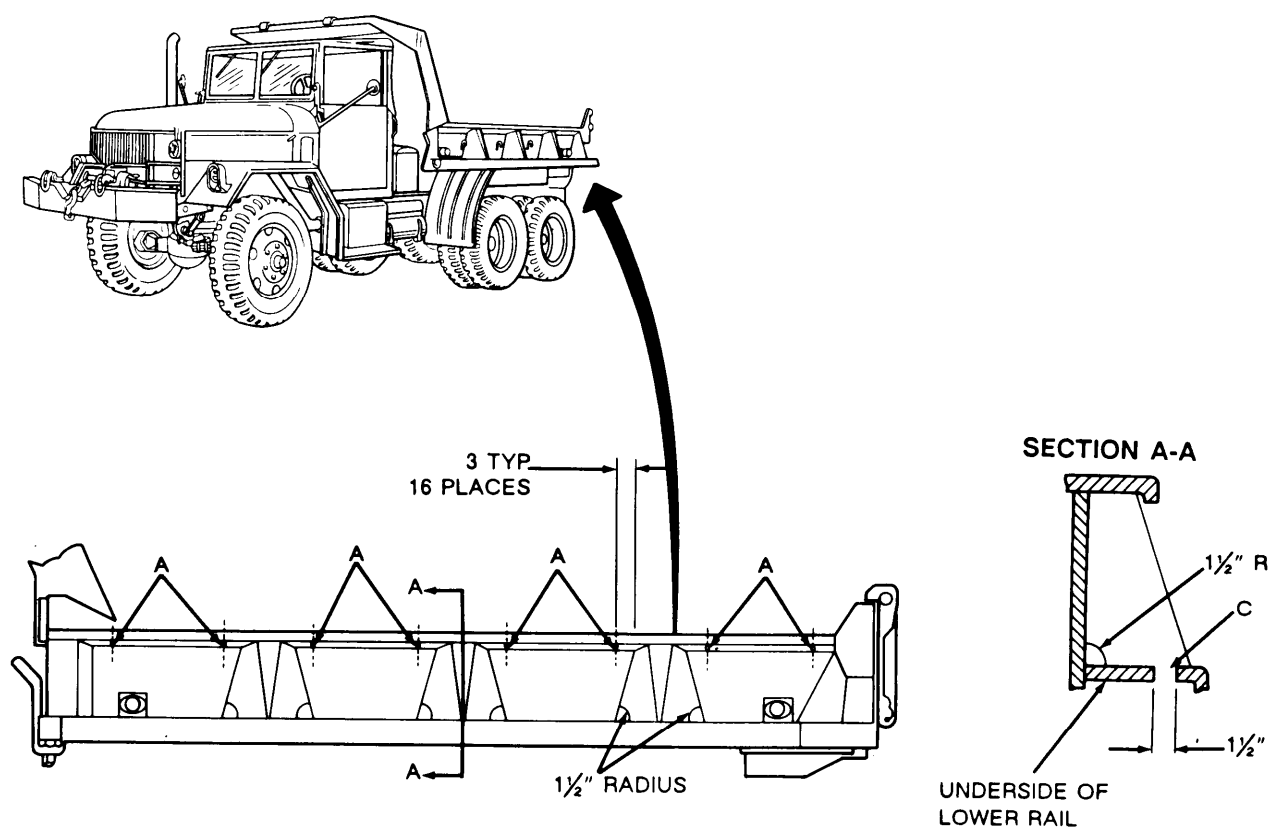


Figure 9-5. Drilling Top Side Rail and Cutting Stake Pockets.

TA504863

9-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine if it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable

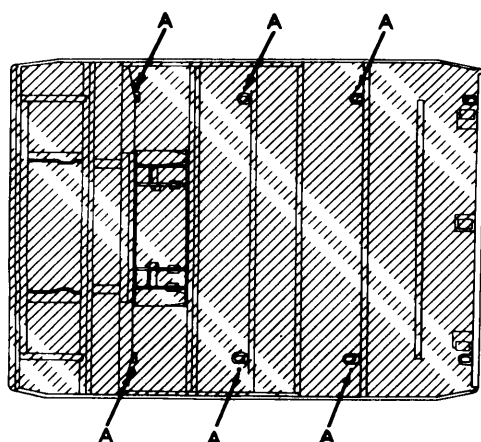


Figure 9-6. Underbody.

weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section III. RUSTPROOFING PROCEDURES

9-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific dump body and tailgate items, refer to Figure 9-6 through Figure 9-9.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing

protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Underbody (see Figure 9-6).*

(1) Insert long rigid tool in holes A as far as it will go through the bottom side of the lower side rail to coat stake pocket gussets. Withdraw tool slowly while applying rustproofing compound.

(2) Use short rigid tool to completely cover the underbody of the dump vehicles, including open access surfaces to side, cross, and longitudinal sills.

d. *Rustproofing Cab Protector Braces (see Figure 9-7).* Insert 90 degree short tool into holes A of the cab protector upper braces and spray in all directions.

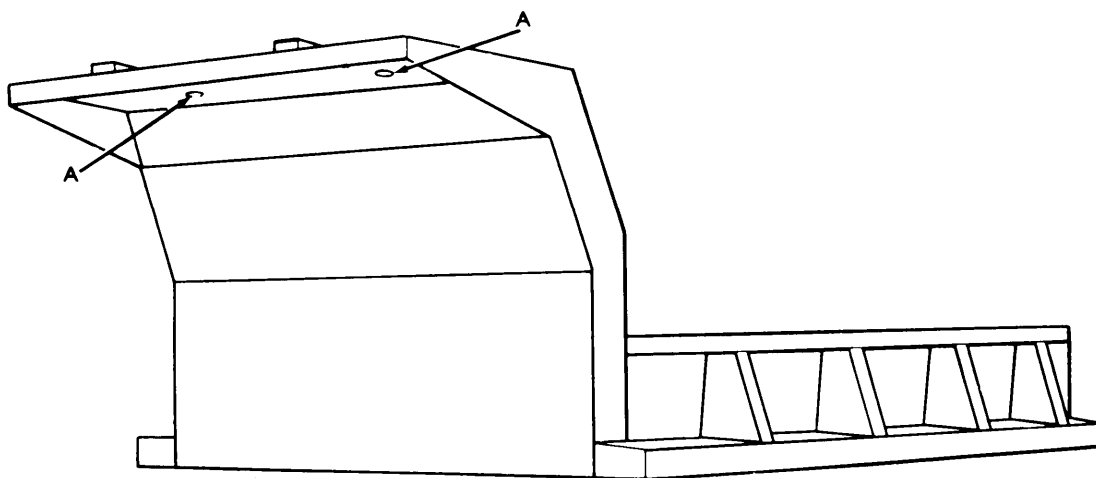


Figure 9-7. Rustproofing Cab Protector Braces.

TA504865

e. *Rustproofing Tailgate* (see Figure 9-8). Insert 90 degree short tool into holes A (vertical tailgate stiffeners), B (tailgate hinge rod channel), C (center horizontal stiffener), and D (upper horizontal stiffener). Spray in all directions.

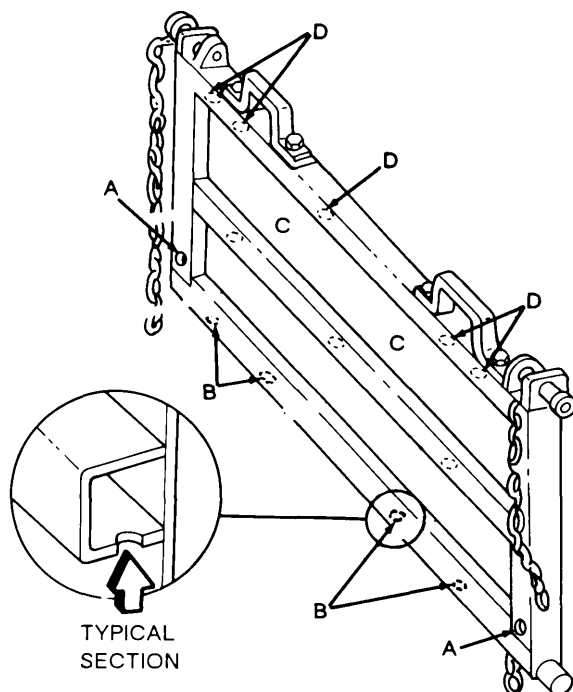


Figure 9-8. Rustproofing Tailgate.

TA504866

f. *Rustproofing Stake Pockets and Upper Side Rails* (see Figure 9-9),

(1) Insert 90 degree short tool into holes A and spray in all directions.

(2) Insert long rigid tool into the base of each stake pocket B. Spray while slowly withdrawing tool.

9-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 9-10). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 9-4).

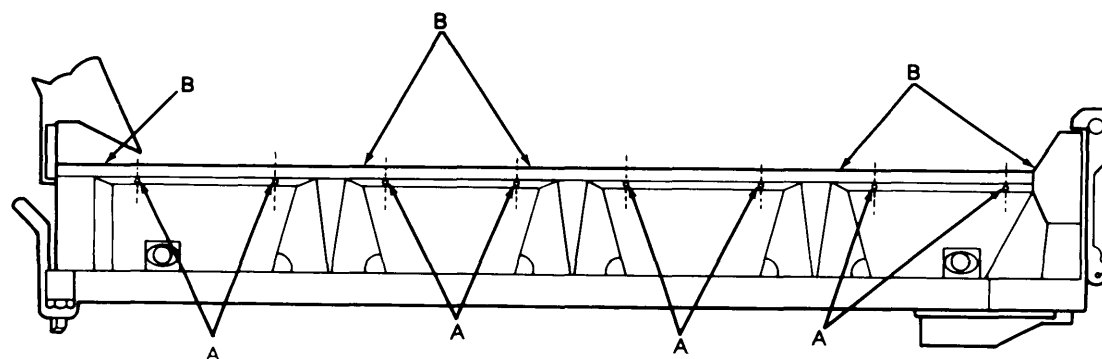
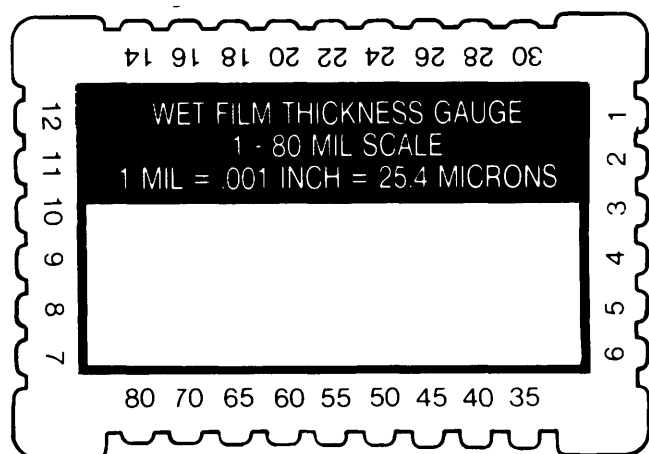


Figure 9-9. Rustproofing Stake Pockets and Upper Side Rails.

TA504867



TA504789

Figure 9-10. Film Thickness Gage.

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug all access holes.

9-6. Component Installation.

Install tailgate handles (see TM 9-2320-209-20).

CHAPTER 10

2 1/2-TON TRUCKS: WATER TANKERS

Section I. DRILLING AND CLEANING PROCEDURES

10-1. Drilling Procedures.

NOTE

- Figure 10-1 provides a reference illustration for the 2 1/2-Ton Water Tanker.
- Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Superstructure (see Figure 10-2).* Drill 10 holes A in bottom reinforcement structures. These should begin approximately 2 1/2 inches (6.4 cm) from the left end, and be spaced about 18 inches (45.7 cm) apart. There are two holes drilled at each interval. One is 1 inch (2.5 cm) from the front edge, and one is 1 inch (2.5 cm) from the rear edge.

c. *Drilling Bottom Center Supports (see Figure 10-2).* Drill one hole B in each bottom center support. The hole is drilled 14 inches (35.6 cm) from the outer end of each support.

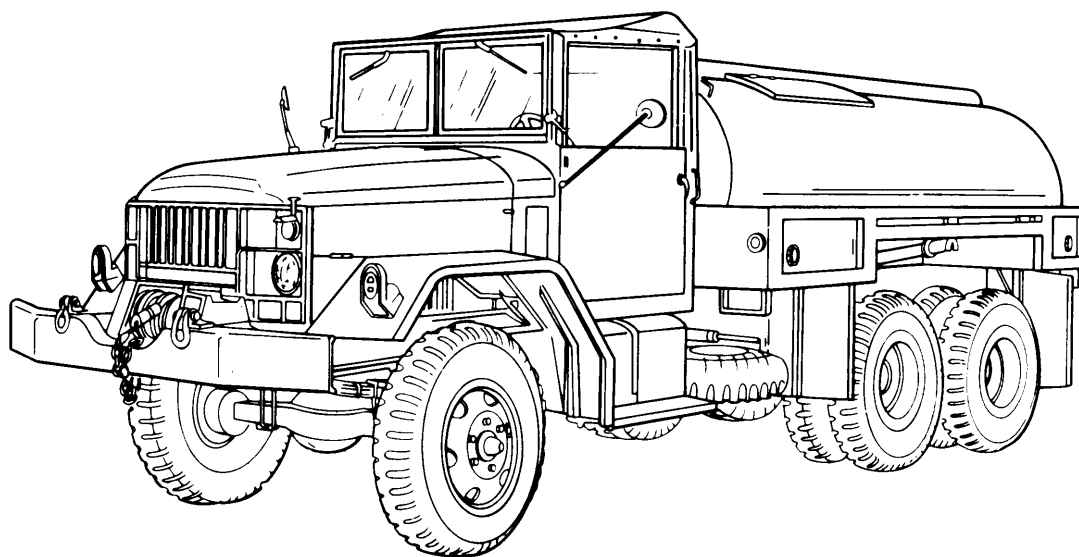


Figure 10-1. M50A2 Water Tanker.

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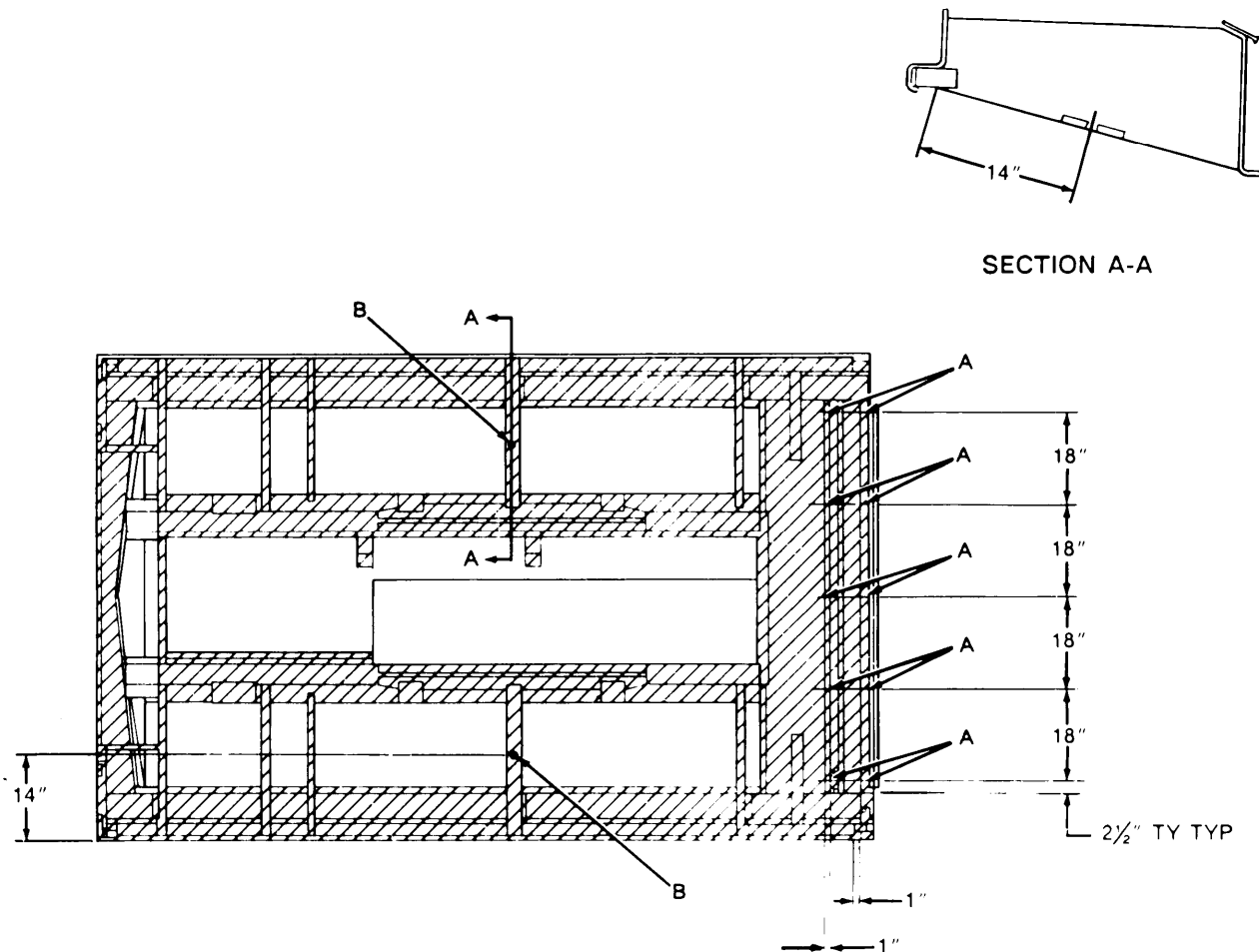


Figure 10-2. Drilling Underbody.

TA504869

10-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine if it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section II. RUSTPROOFING PROCEDURES

10-3. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific tanker body items, refer to Figure 10-3 and Figure 10-4.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made, due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 10-3).

(1) Insert 90 degree short tool in holes A and spray in all directions to coat the entire interior surface of the center supports.

(2) Insert the same tool into holes B and spray in all directions.

(3) Use short rigid tool to completely cover the underbody including all open access areas.

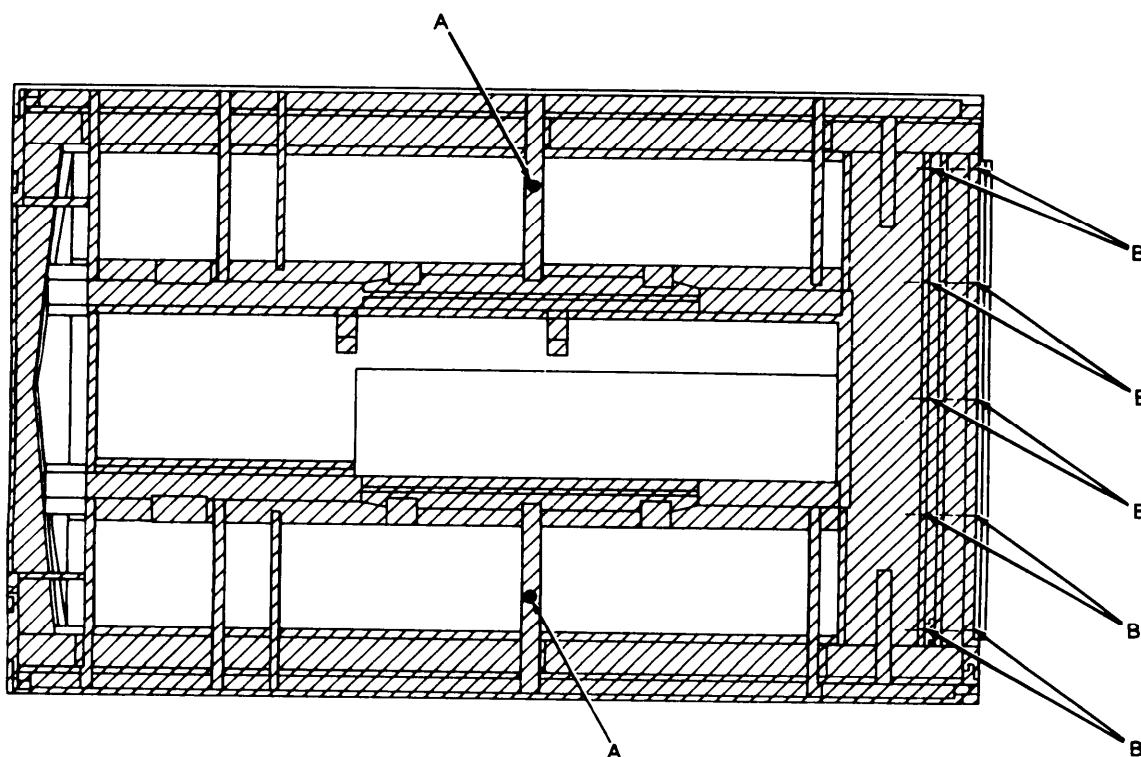


Figure 10-3. Rustproofing Underbody,

TA504870

TB 43-0213

d. *Rustproofing Stake Pockets* (see Figure 10-4). Insert the long rigid tool to the base of stake pockets A and withdraw slowly while coating the entire surface.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 10-3).

10-4. Rustproofing Inspection.

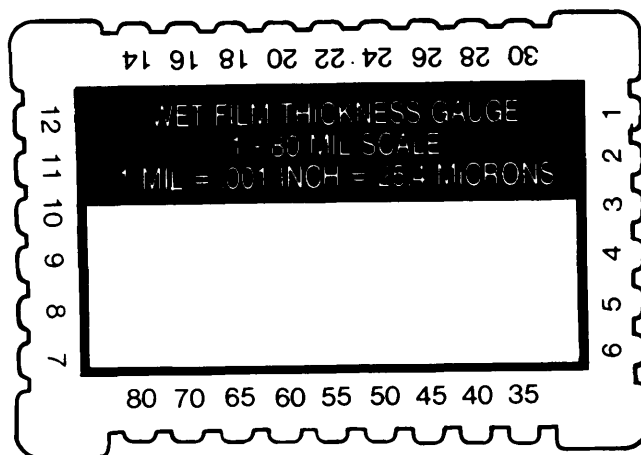
Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

b. Check wet film thickness with a wet film thickness gage (see Figure 10-5). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

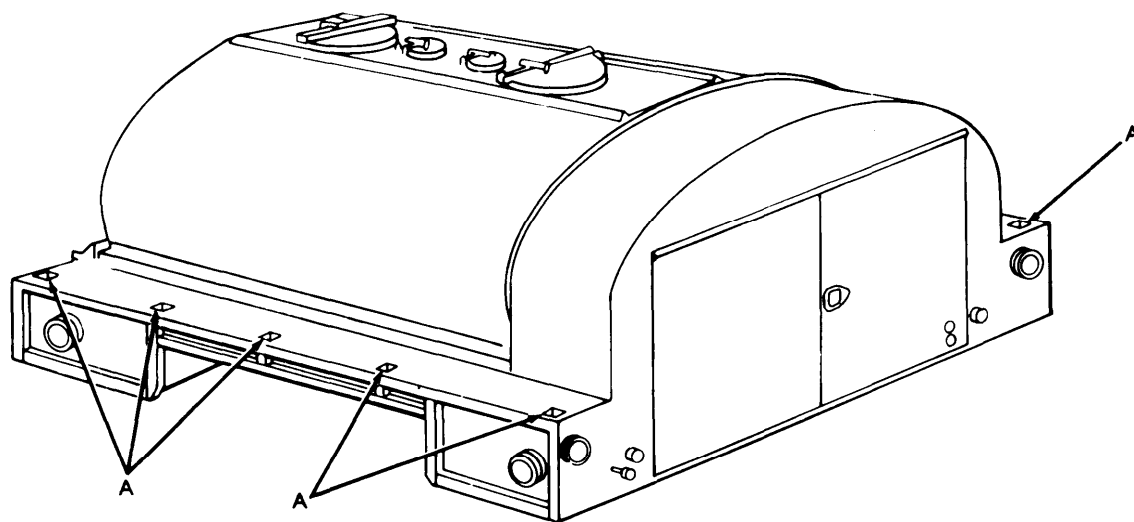
c. Check all drain holes to ensure that they are open.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.



TA504789

Figure 10-5. Film Thickness Gage.



TA504871

Figure 10-4. Rustproofing Stake Pockets.

CHAPTER 11

2 1/2-TON TRUCKS: FUEL TANKERS

Section I. DRILLING AND CLEANING PROCEDURES

11-1. Drilling Procedures.

NOTE

- Figure 11-1 provides a reference illustration for the 2 1/2-Ton Fuel Tanker.
- Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions,

b. *Drilling Center Support (see Figure 11-2).* Drill one hole A in each bottom center support. The hole is drilled 14 inches (35.6 cm) from the outer end of each support.

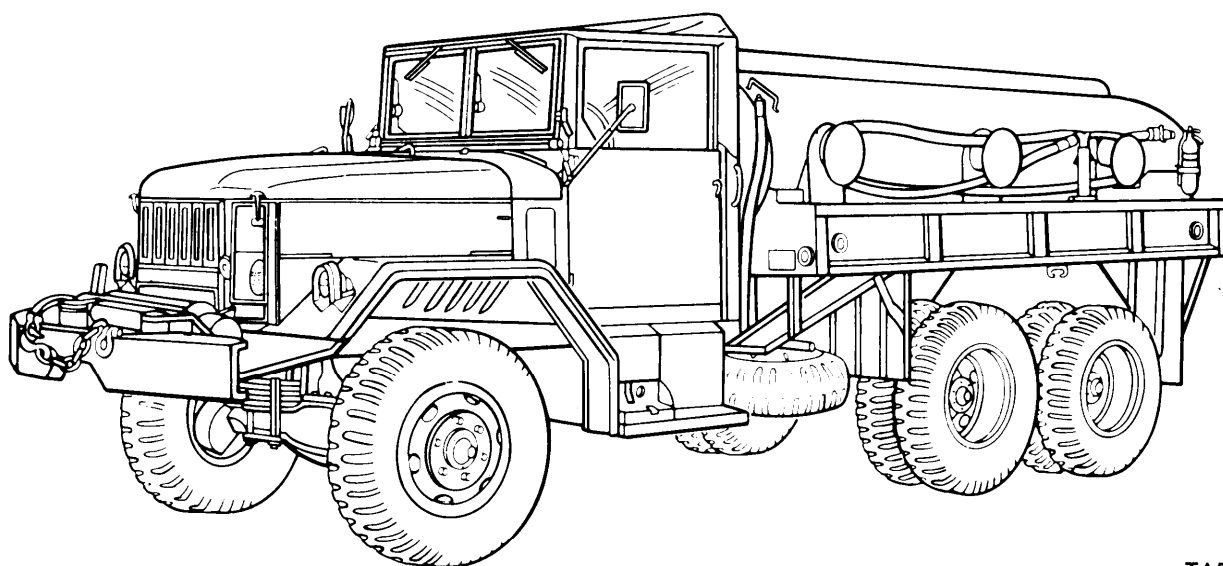
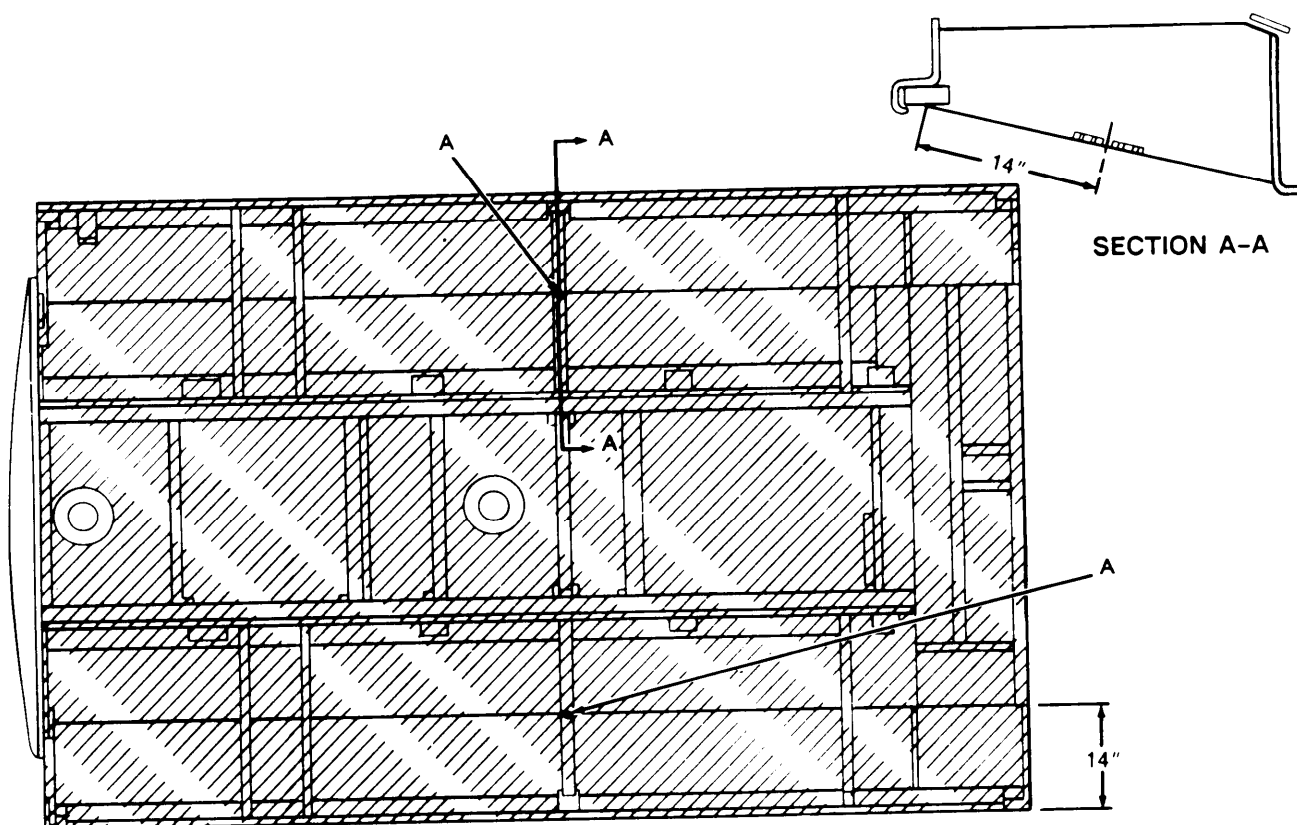


Figure 11-1. M49A2C Fuel Tanker.

TA504872



TA504873

Figure 11-2. Drilling Center Support.

11-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine if it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section II. RUSTPROOFING PROCEDURES

11-3. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary,

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.

- . For rustproofing procedures of specific tanker body items, refer to Figure 11-3 and Figure 11-4.

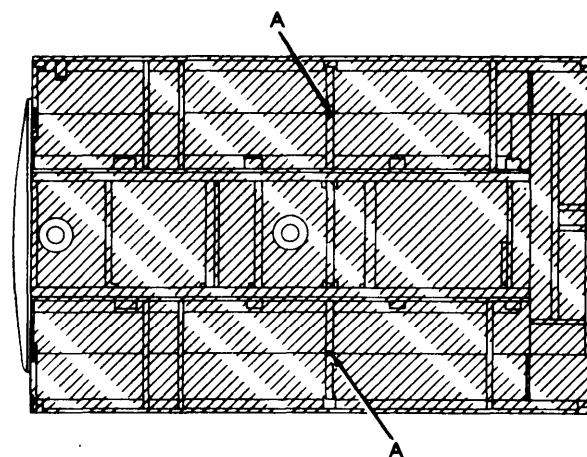
a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made, due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 11-3).

(1) Insert 90 degree short tool in holes A and coat boxed-in section of center support.

(2) Use short rigid tool to completely cover the underbody, including open access surfaces on side, cross, and longitudinal sills.



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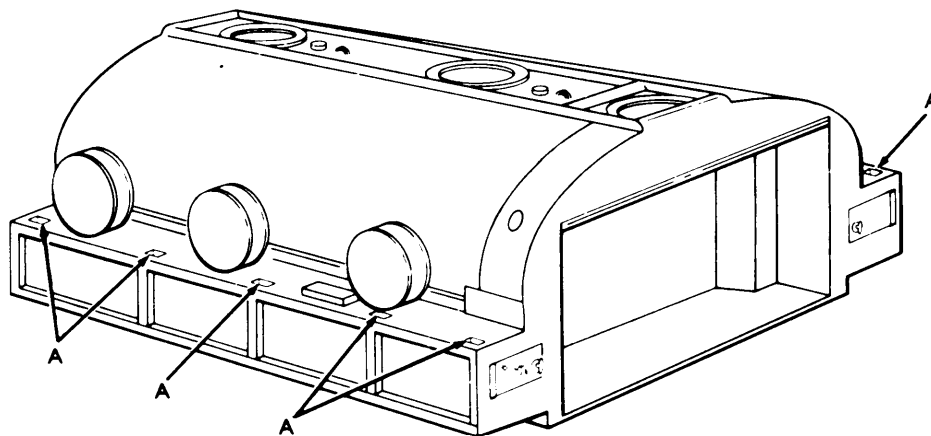
Figure 11-3. Rustproofing Underbody.

d. Rustproofing Stake Pockets (see Figure 11-4). Insert long rigid tool to the base of stake pockets A and withdraw slowly while coating the entire surface.

11-4. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.



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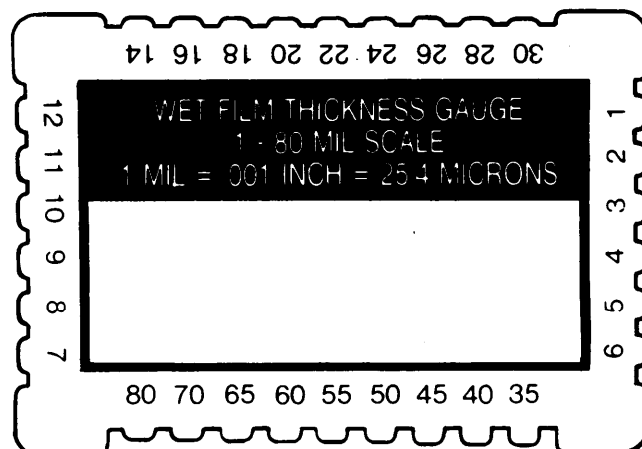
Figure 11-4. Rustproofing Stake Pockets.

b. Check wet film thickness with a wet film thickness gage (see Figure 11-5). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 11-3).



TA504789

Figure 11-5. Film Thickness Gage.

CHAPTER 12

2 1/2-TON TRUCKS: VAN BODY

Section I. CLEANING PROCEDURES

12-1. Cleaning Procedures.

a. This section covers cleaning procedures for typical 2 1/2-Ton van bodies. This section does not cover procedures for expansible van bodies. A typical 2 1/2-Ton van body truck is shown in Figure 12-1.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

b. Wash the framerail structures thoroughly to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation.

c. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

d. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

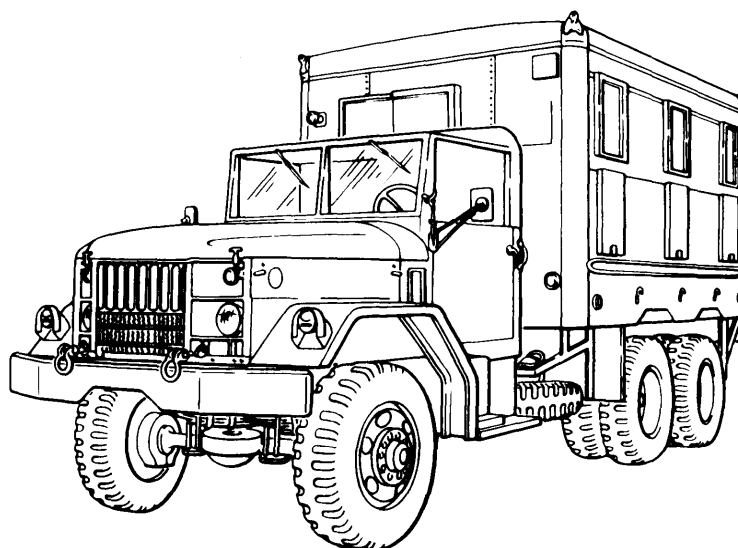


Figure 12-1. 2 1/2-Ton Van Body (Typical).

TA504876

Section II. RUSTPROOFING PROCEDURES

12-2. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

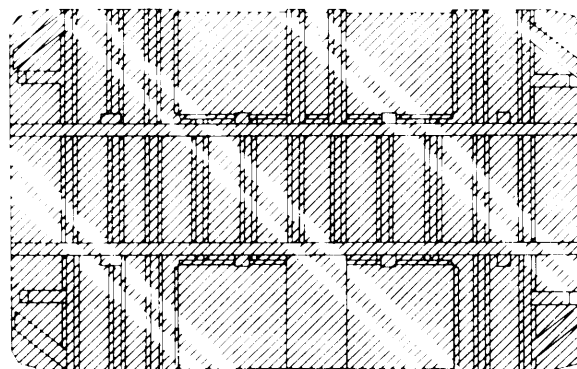
b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made, due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 12-2). Use short rigid tool to completely cover the vehicle underbody, including open access surfaces on side, cross, and longitudinal sills.

12-3. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

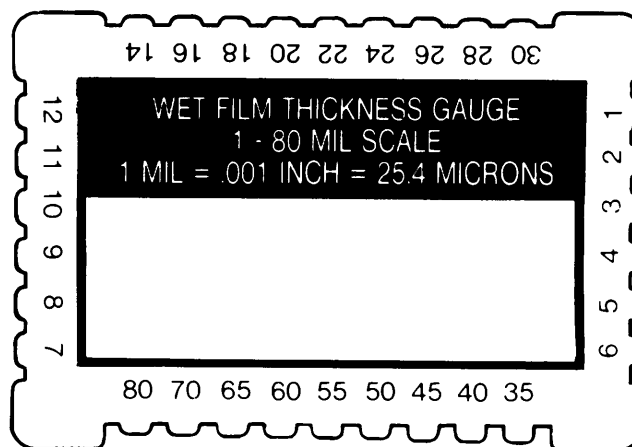


TA504877

Figure 12-2. Rustproofing Underbody.

b. Check wet film thickness with a wet film thickness gage (see Figure 12-3). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.



TA504789

Figure 12-3. Film Thickness Gage.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 12-2).

CHAPTER 13

5-TON TRUCKS: CARGO BODY

Section I. PRELIMINARY PROCEDURES

13-1. Component Removal.

a. Figure 13-1 provides a reference illustration for 5-Ton Cargo Body Trucks.

b. Remove cargo canvas and bows from cargo body, if equipped (see TM 9-2320-211-20).

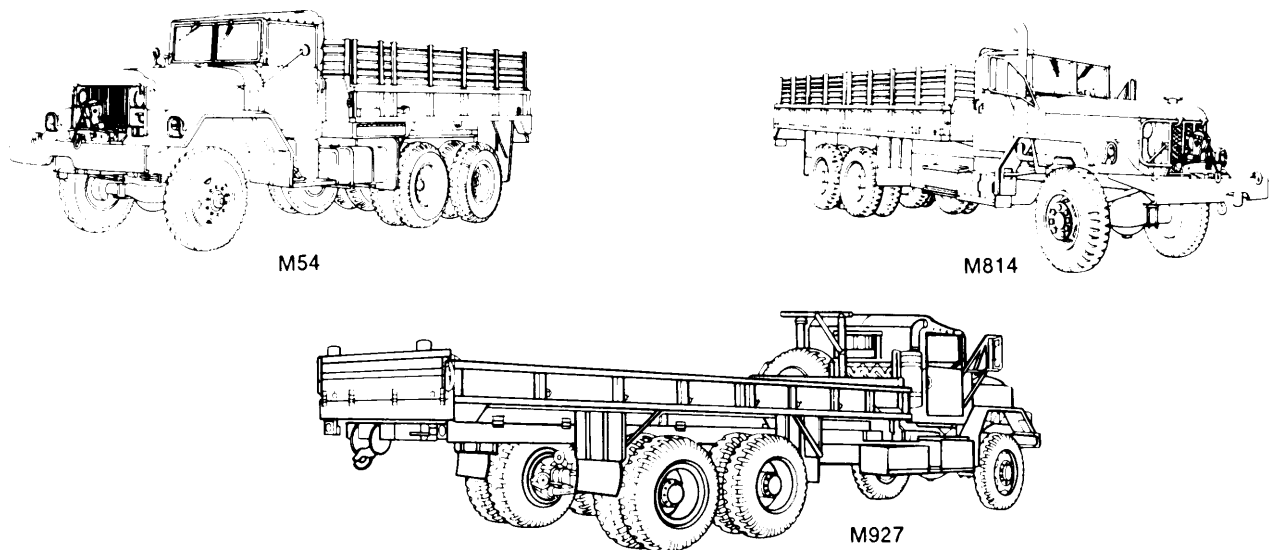


Figure 13-1. 5-Ton Cargo Bodies (Typical).

TA504878

Section II. DRILLING AND CLEANING PROCEDURES

13-2. Drilling Procedures.

NOTE

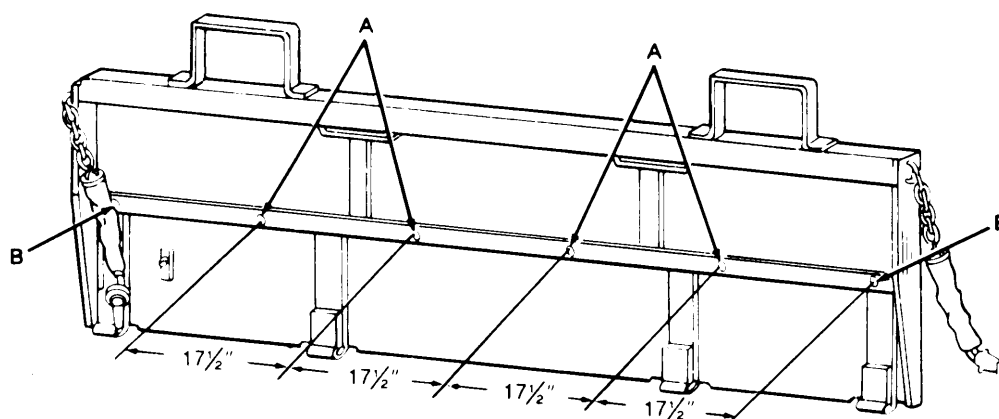
Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

NOTE

The dropside cargo body is the only configuration which requires drilling of the tailgate.

b. *Drilling Tailgate (Dropside Only)* (see Figure 13-2). Drill four holes A in the tailgate center stiffener. Holes are drilled 17 1/2 inches (44.5 cm) on center. The first hole A is drilled 17 1/2 inches (44.5 cm) from one of the two holes B which already exists.



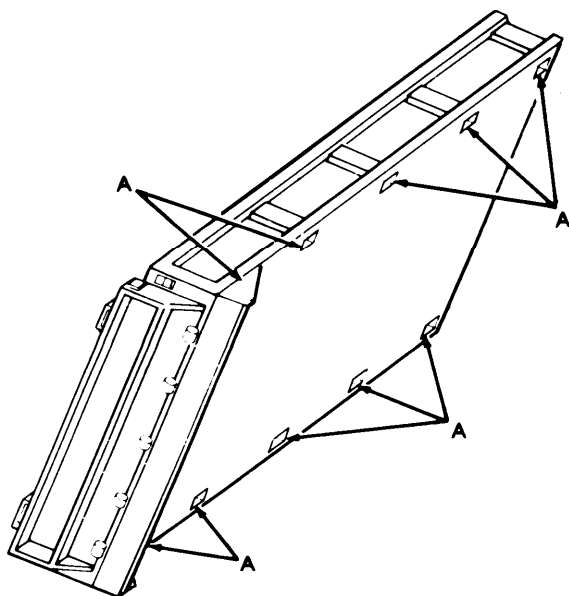
TA504879

Figure 13-2. Drilling Tailgate (Dropside Only).

NOTE

Holes A in stake pockets may already exist.

c. *Drilling Stake Pockets* (see Figure 13-3). Drill a 3/4-inch (19 mm) hole in the bottom of the 12 stake pockets.



TA504880

Figure 13-3. Drilling Stake Pockets.

d. *Drilling Underbody* (see Figure 13-4). Drill one hole A in cargo body. Hole A should be centered between holes B which already exist.

13-3. Cleaning Procedures.**WARNING**

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushed through the rails to determine when the structure is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

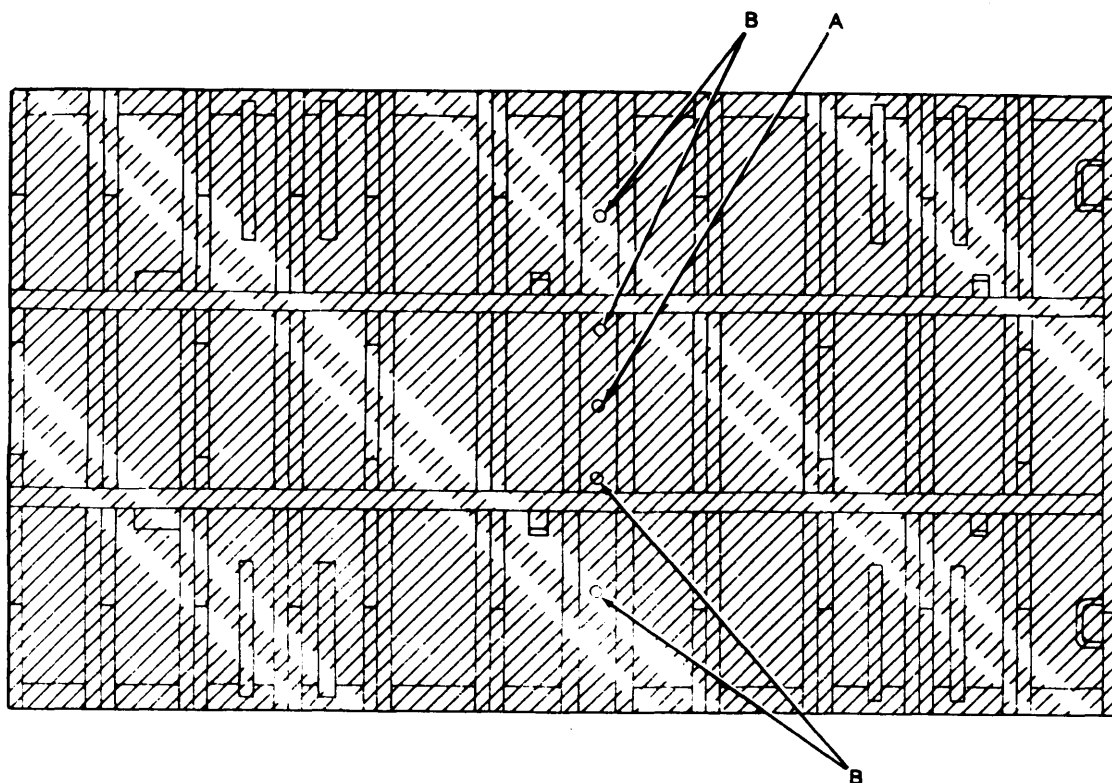


Figure 13-4. Underbody.

TA504881

Section III. RUSTPROOFING PROCEDURES

13-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shaft linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the

surface area is necessary at whatever thickness is obtainable.

- For rustproofing procedures of specific cargo body items, refer to Figure 13-5 through Figure 13-8.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound.

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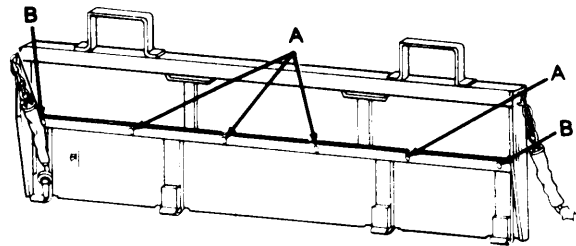
Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Tailgate* (see Figure 13-5). Insert 90 degree short tool into tailgate holes A and B and spray in all directions.

d. *Rustproofing Stake Pockets and Rubrail* (see Figure 13-6).

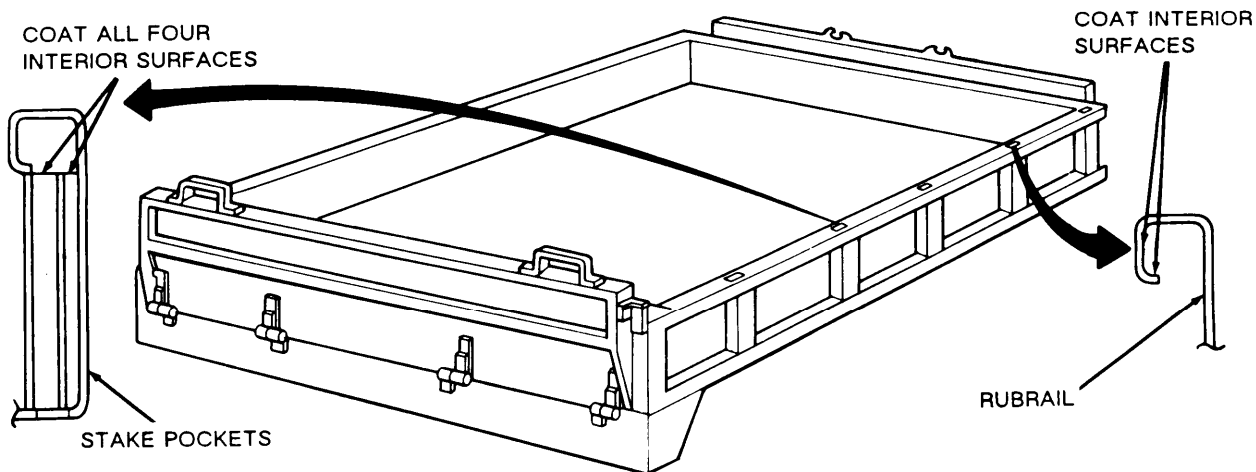
(1) Insert long rigid tool into the base of each stake pocket hole and spray while slowly withdrawing tool.

(2) Use 90 degree short tool to spray the interior surfaces of the rubrail (underneath the ledge), side, front, and tailgate. Cover these surfaces with an even coat.



TA504882

Figure 13-5. Rustproofing Tailgate.



TA504883

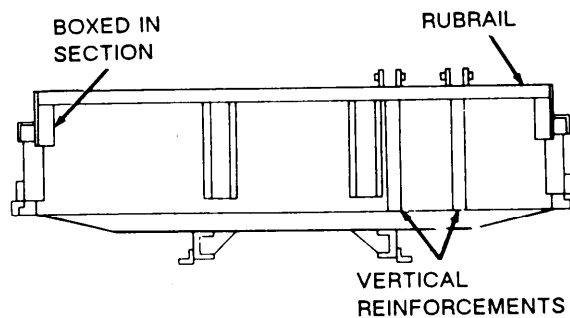
Figure 13-6. Rustproofing Stake Pockets and Rubrail.

e. *Rustproofing Front Panel* (see Figure 13-7). Insert 90 degree long tool into ends of vertical reinforcements and spray in all directions while slowly withdrawing tool.

f. *Rustproofing Underbody* (see Figure 13-4).

(1) Insert 90 degree short rigid tool into holes A and B in cargo body bottom and spray in all directions.

(2) Use short rigid tool to completely cover the bottom of the cargo body, including the open access surfaces of the side and cross longitudinal sills.



TA504884

Figure 13-7. Rustproofing Front Panel.

13-5. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

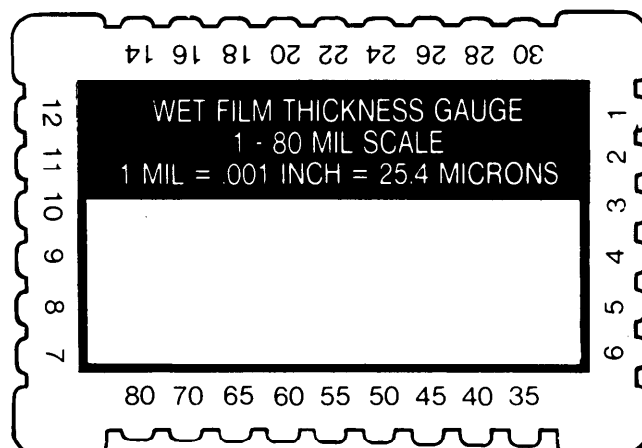
a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

b. Check wet film thickness with a wet film thickness gage (see Figure 13-8). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 13-4).



TA504789

Figure 13-8. Film Thickness Gage.

13-6. Component Installation.

Install cargo canvas and bows, if removed (see TM 9-2320-211-20).

CHAPTER 14

5-TON TRUCKS: DUMP BODY AND TAILGATE

Section I. PRELIMINARY PROCEDURES

14-1. Component Removal.

a. Figure 14-1 provides a reference illustration for a typical 5-Ton Dump Truck,

b. Prior to rustproofing, remove handles from the top of the tailgate (see TM 9-2320-211-20).

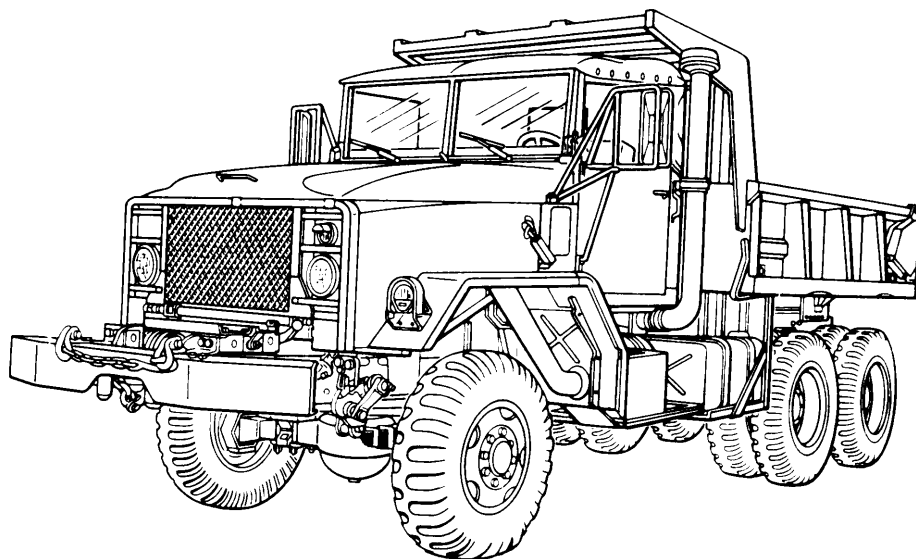


Figure 14-1, 5-Ton Dump Truck (M930).

TA504885

Section II. DRILLING AND CLEANING PROCEDURES

14-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

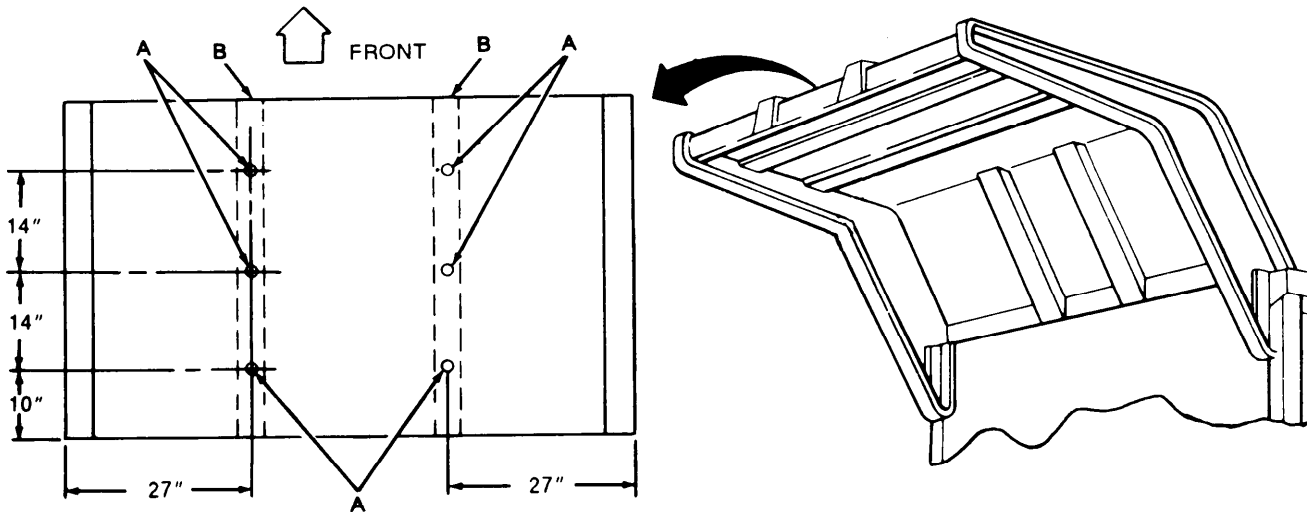
a. *General.* Refer to paragraph 3-15 for general drilling instructions,

b. *Drilling Cab Protector Upper Braces* (see Figure 14-2).

(1) Tilt dump body up enough to gain access to the underside of the cab protector.

(2) Drill three holes A in the underside of each upper cab protector brace. The first hole is located 10 inches (25.4 cm) from the rear. The second and third holes are located 14 inches (35.6 cm) on center.

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TA504886

Figure 14-2. Drilling Cab Protector Upper Braces.

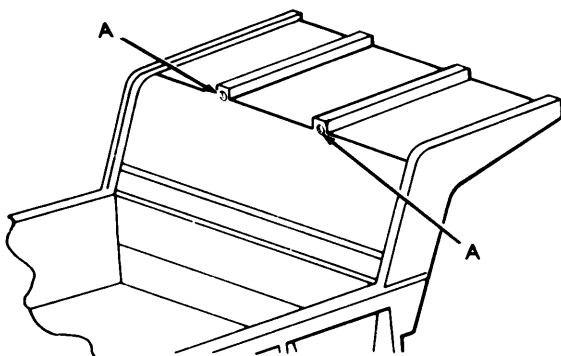
NOTE

Steps 3 and 4 are for U.S. Marine Corps applications only.

(3) Drill hole B in the front of each upper cab protector brace.

(4) Drills 1 1/2-inch (3.8 cm) hole A in the rear of each upper cab protector brace (see Figure 14-3).

c. *Drilling Cab Protector Cross Reinforcements* (see Figure 14-4). Drill five 3/4-inch (19mm) holes A in each cab protector cross reinforcement. The first hole is drilled 7 inches (17.8 cm) from the end. The next four holes are drilled 17 inches (43.2 cm) on center.



TA504887

Figure 14-3. Drilling Rear of Cab Protector Upper Braces.

d. *Drilling Tailgate Hinge Rod Channel* (see Figure 14-5). Drill three holes A in tailgate hinge rod channel. One hole should be centered on each section of the channel. All holes should be 15/16 inch (24 mm) from the inside of the tailgate.

e. *Drilling Tailgate Center Horizontal Stiffener* (see Figure 14-6). Drill five holes A in center horizontal stiffener. The first hole is drilled 5 1/4 inches (13.3 cm) from the end. Four more holes are drilled 18 inches (45.7 cm) on center.

f. *Drilling Tailgate Upper Horizontal Stiffener* (see Figure 14-7). Drill one hole A in upper horizontal stiffener, 18 inches (45.7 cm) from existing hole B.

g. *Drilling Tailgate Vertical Stiffener* (see Figure 14-8). Drill one hole A in each vertical stiffener. The holes are drilled 1 1/2 inches (3.8 cm) from the edge and just above the hinge rod channel.

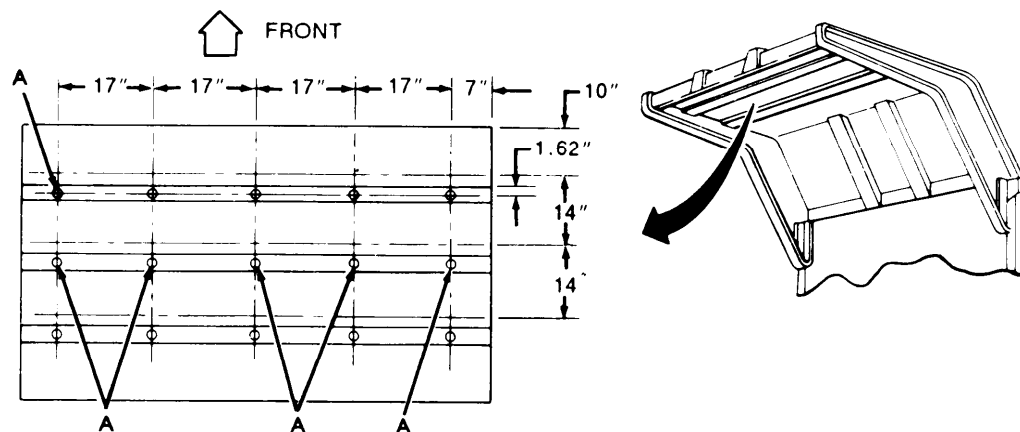


Figure 14-4. Drilling Cab Protector Cross Reinforcements.

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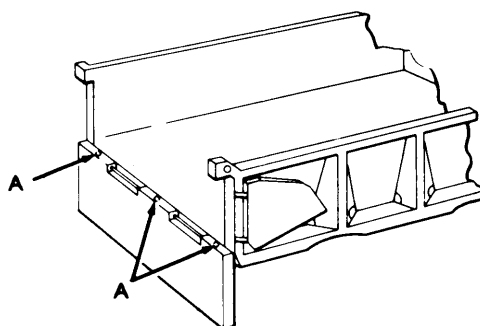


Figure 14-5. Drilling Tailgate Hinge Rod Channel.

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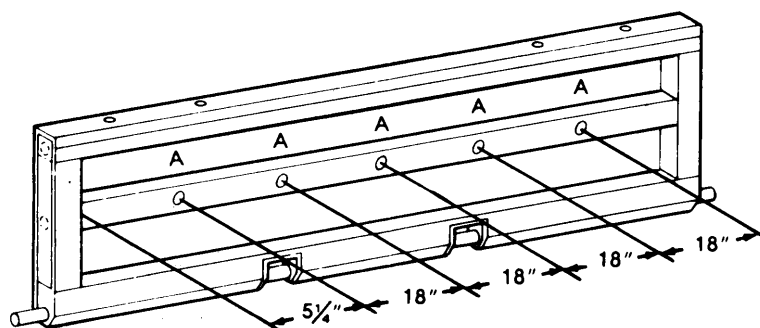
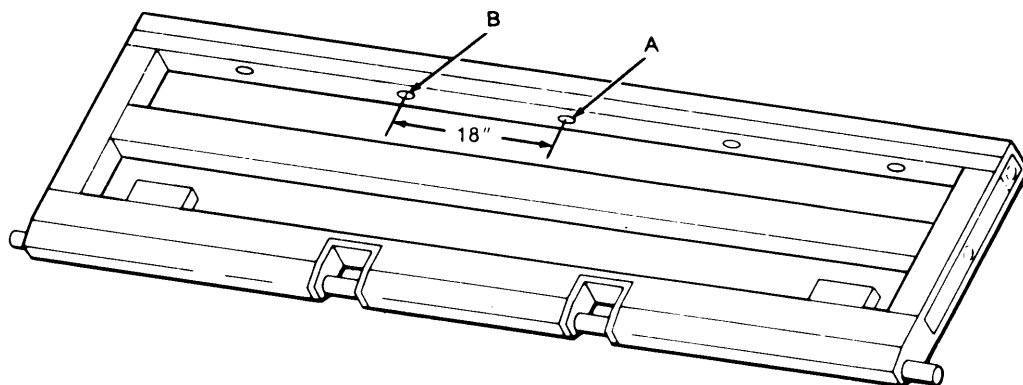


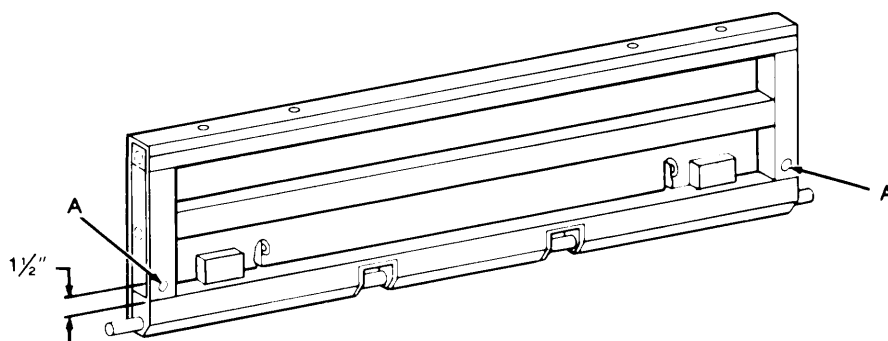
Figure 14-6. Drilling Tailgate Center Horizontal Stiffener.

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TA504891

Figure 14-7. Drilling Tailgate Upper Horizontal Stiffener.



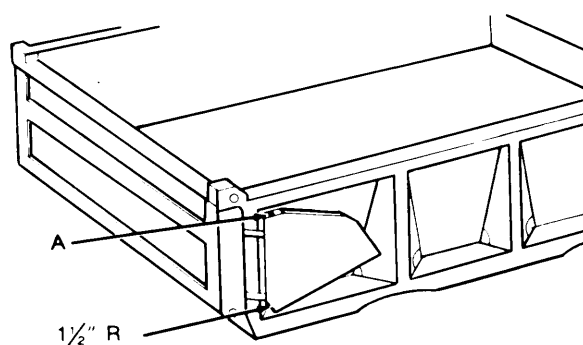
TA504892

Figure 14-8. Drilling Tailgate Vertical Stiffener.

h. Drilling and Cutting Tailgate Wings (see Figure 14-9).

(1) Drill a hole A in the top of the tailgate wings.

(2) Cut a 1 1/2-inch (3.8 cm) half-moon radius on tailgate wing.



TA504893

Figure 14-9. Drilling and Cutting Tailgate Wings.

i. *Drilling Top Side Rails* (see Figure 14-10), Drill six holes A in the underside of each top side rail on the dump body. The holes are on a centerline that is located 1 5/8 inch (4 cm) from the outer edge of the rail, The holes are centered 1 inch (2.5 cm) to the front and the rear of the stake pocket gussets.

j. *Cutting Bottom of Stake Pockets* (see Figure 14-11). Using a cutting torch, cut out a 1 1/2-inch (3.8 cm) radius at the bottom of each stake pocket gusset. The radii are to be cut on both sides of the gusset. Repeat steps on opposite side of vehicle.

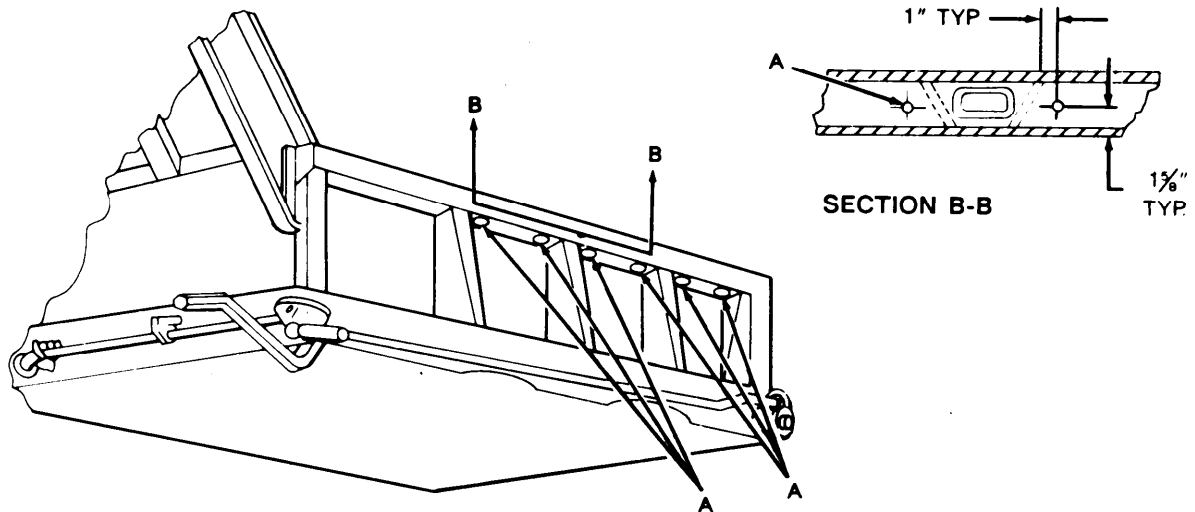


Figure 14-10. Drilling Top Side Rails.

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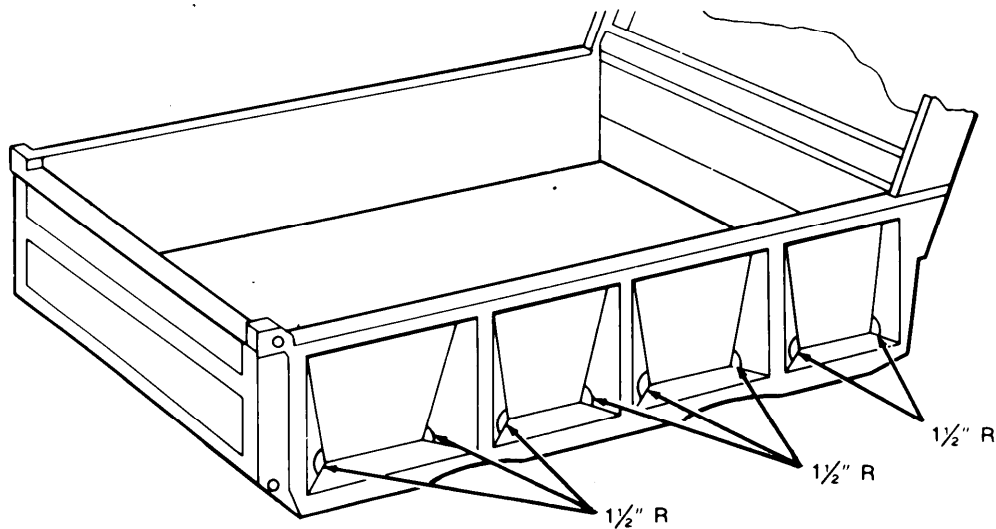


Figure 14-11. Cutting Bottom of Stake Pockets.

TA504895

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k. *Drilling Bottom of Dump Body (see Figure 14-12).* Enlarge six existing holes A to a diameter of 1 1/2 inches (3.8 cm).

14-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this process. Observe the water flushing through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

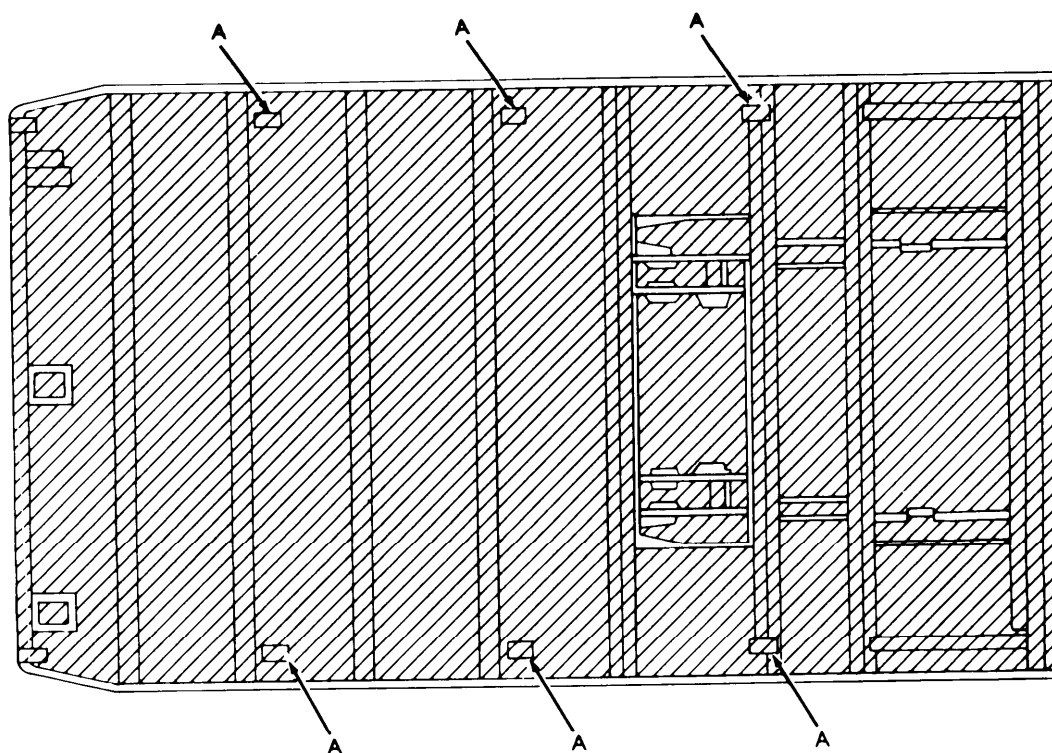


Figure 14-12. Bottom of Dump Body.

TA504896

Section III. RUSTPROOFING PROCEDURES

14-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake-drums, brake backing plates, parking brake linkage, shaft linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific dump body items, refer to Figure 14-12 through Figure 14-17.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach this thickness,

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 14-12). Insert short rigid tool into tailgate underbody holes A. Completely cover the underbody of dump vehicle,

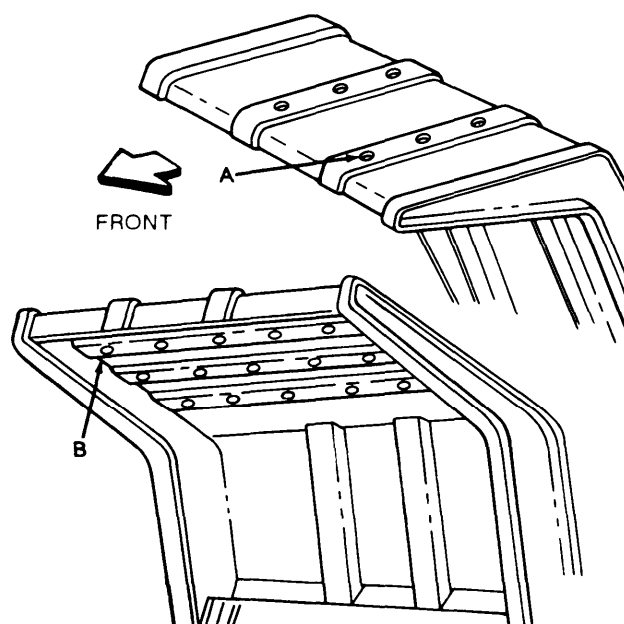
including open access surfaces to side, cross, and longitudinal-sills.

d. Rustproofing Cab Protector (see Figure 14-13).

(1) Insert 90 degree short tool in holes A and spray in all directions.

(2) Insert 90 degree short tool in holes B of cab protector cross reinforcements and spray in all directions.

(3) Plug holes A (U.S. Marine Corps vehicles only).



TA504897

Figure 14-13. Rustproofing Cab Protector.

e. Rustproofing Tailgate (see Figure 14-14).

(1) Insert 90 degree short tool into holes A of vertical tailgate, holes B of tailgate hinge rod channel, holes C of center horizontal stiffener, and holes D of upper horizontal stiffener. Spray in all directions.

(2) plug holes A, B, and C.

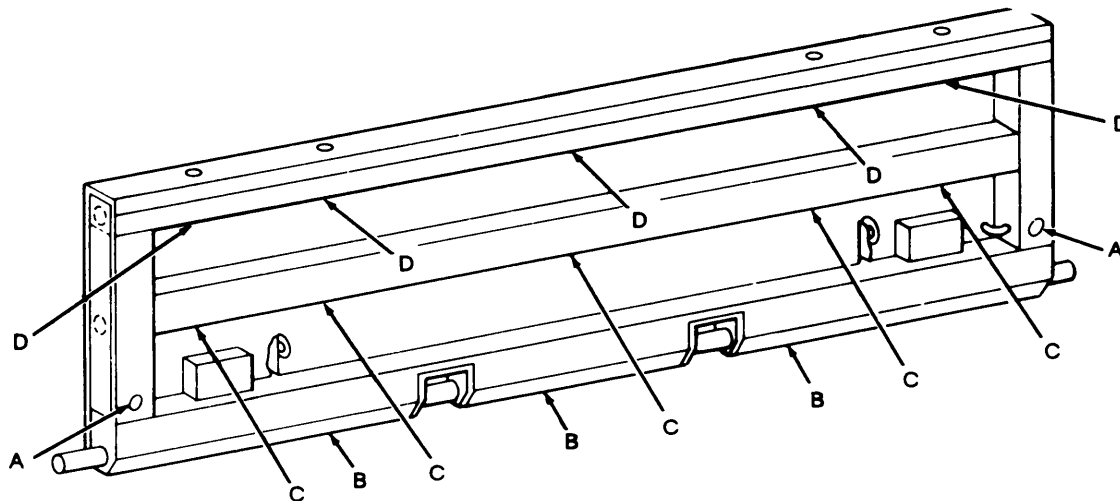


Figure 14-14. Rustproofing Tailgate.

TA504898

f. Rustproofing Lower Side Rail (see Figure 14-15). Insert 90 degree short rigid tool into openings A and holes B in lower side rail. Spray in all directions.

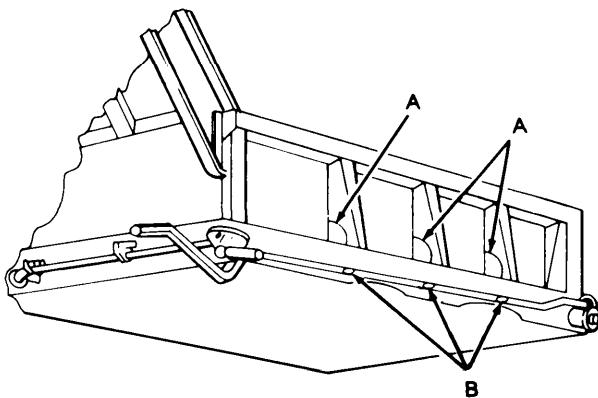


Figure 14-15. Rustproofing Lower Side Rail.

TA504899

g. Rustproofing Side Rail and Stake Pockets (see Figure 14-16).

(1) Insert 90 degree short tool into holes A located in upper side rail. Spray in all directions.

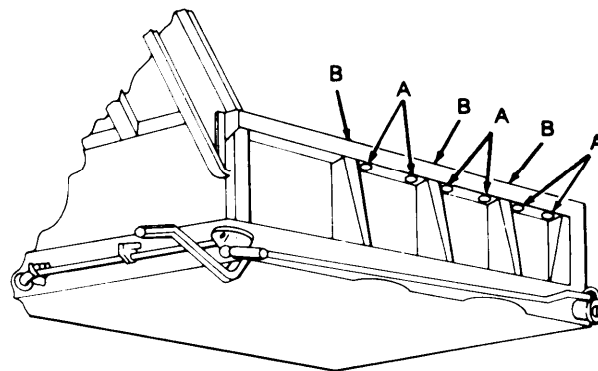


Figure 14-16. Rustproofing Side Rail and Stake Pockets.

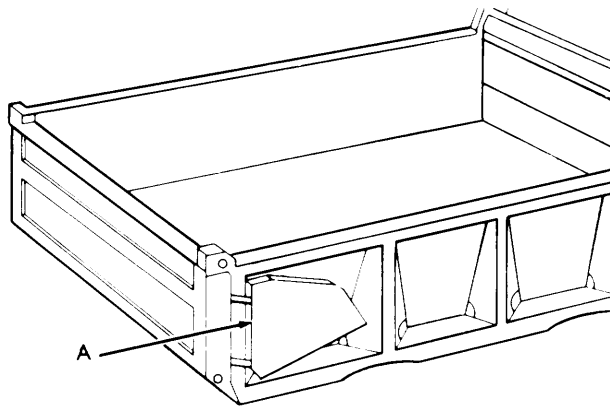
TA504900

(2) Insert long rigid tool into base of stake pockets B. Spray while withdrawing tool.

h. Rustproofing Tailgate Wings (see Figure 14-17).

(1) Insert 90 degree short tool into hole A of wing top and spray in all directions.

(2) Plug hole A.



TA504901
Figure 14-17. Rustproofing Tailgate Wings.

14-5. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

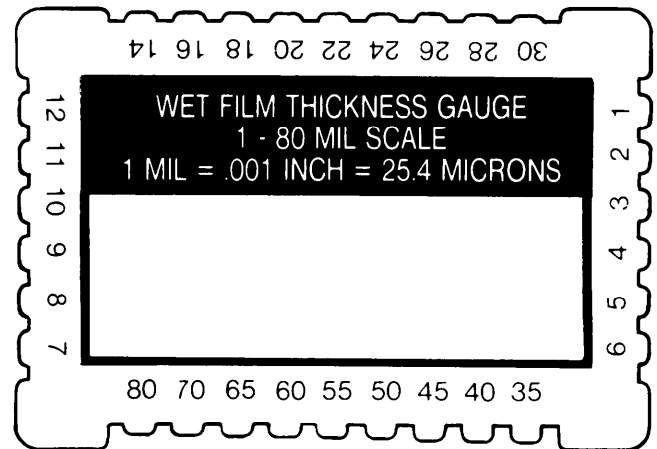
a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

b. Check wet film thickness with a wet film thickness gage (see Figure 14-18). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 14-4).



TA504789
Figure 14-18. Film Thickness Gage

14-6. Component Installation.

Install handles to top of tailgate (see TM 9-2320-211-20).

CHAPTER 15

5-TON TRUCKS: EXPANSIBLE VAN BODY

Section I. DRILLING AND CLEANING PROCEDURES

15-1. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. General. This section covers drilling and cleaning instructions for typical expansible van bodies. For other van body types, refer to chapter 12. Refer to paragraph 3-15 for general drilling instructions.

b. Drilling Bottom Side Rails (see Figure 15-1). Drill eight holes A in each bottom side rail. The

following will provide placement measurements for holes being drilled:

(1) Drill one hole 18 inches (45.7 cm) from the front edge.

(2) Drill three more holes 18 inches (45.7 cm) apart.

(3) Drill one more hole 114 inches (289.6 cm) from front edge.

(4) Drill another hole 18 inches (45.7 cm) from the rear edge of the body,

(5) Drill two more holes 18 inches (45.7 cm) apart.

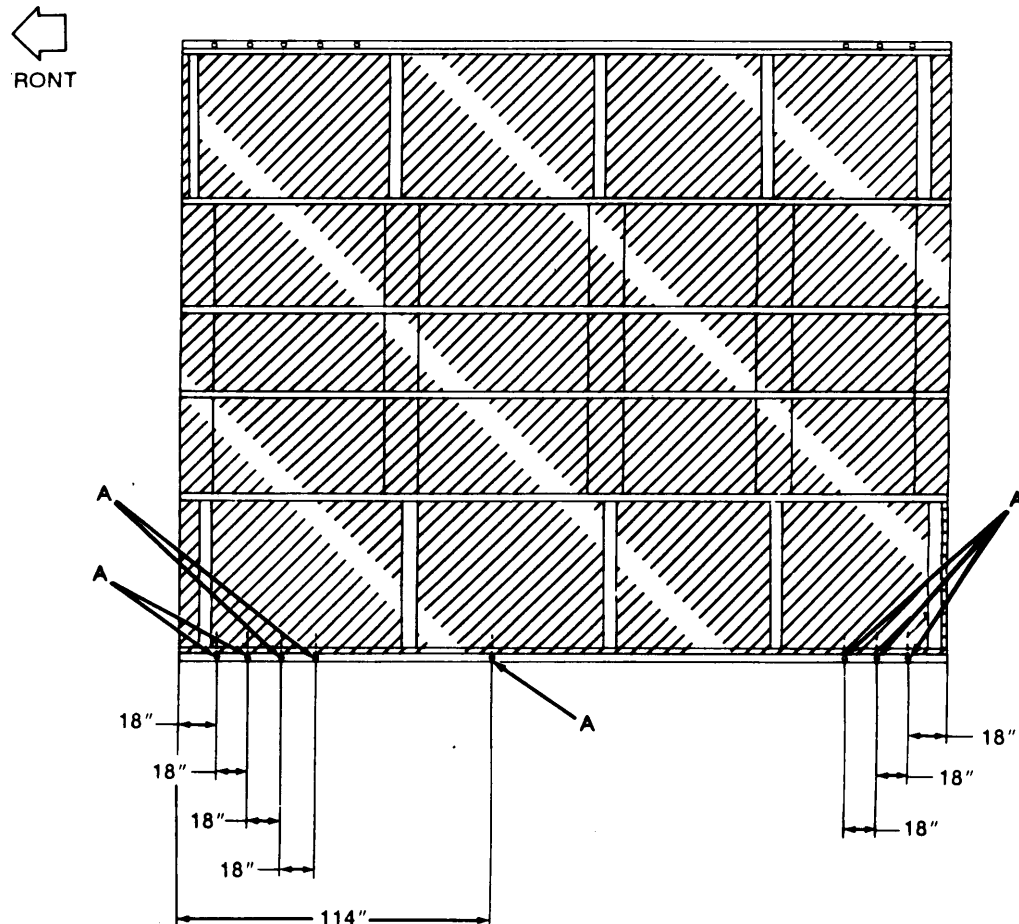


Figure 15-1. Drilling Bottom Side Rails.

TA504902

15-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section II. RUSTPROOFING PROCEDURES

15-3. Rustproofing Procedures.

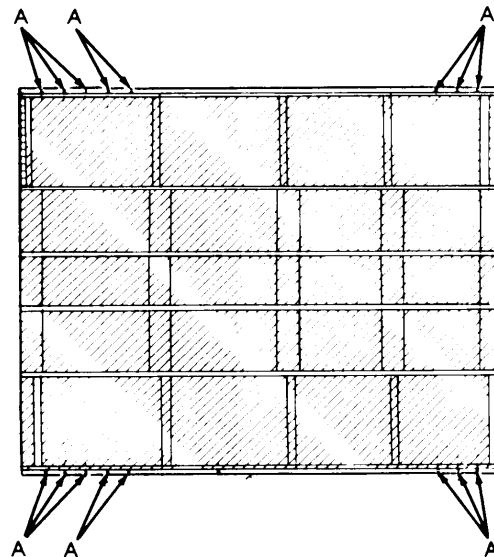
CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific van body items, refer to Figure 15-2.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.



TA504903

Figure 15-2. Rustproofing Van Underbody.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Van Underbody,

(1) Insert 90 degree short tool into holes A of side rails and spray in all directions.

(2) Use short rigid tool to completely cover the underbody of van, including open access surfaces to side, cross, and longitudinal sills.

Use of a high intensity inspection light will enhance this process.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 15-3).

15-4. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated,

b. Check wet film thickness with a wet film thickness gage (see Figure 15-3). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate,

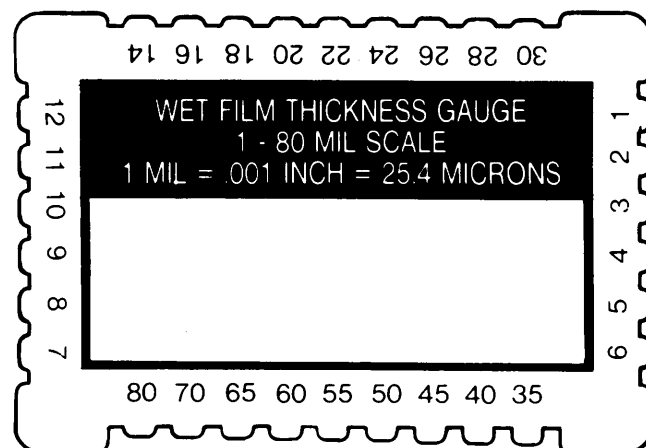


Figure 15-3. Film Thickness Gage

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CHAPTER 16

5-TON TRUCKS: WRECKER BODY

Section I. DRILLING AND CLEANING PROCEDURES

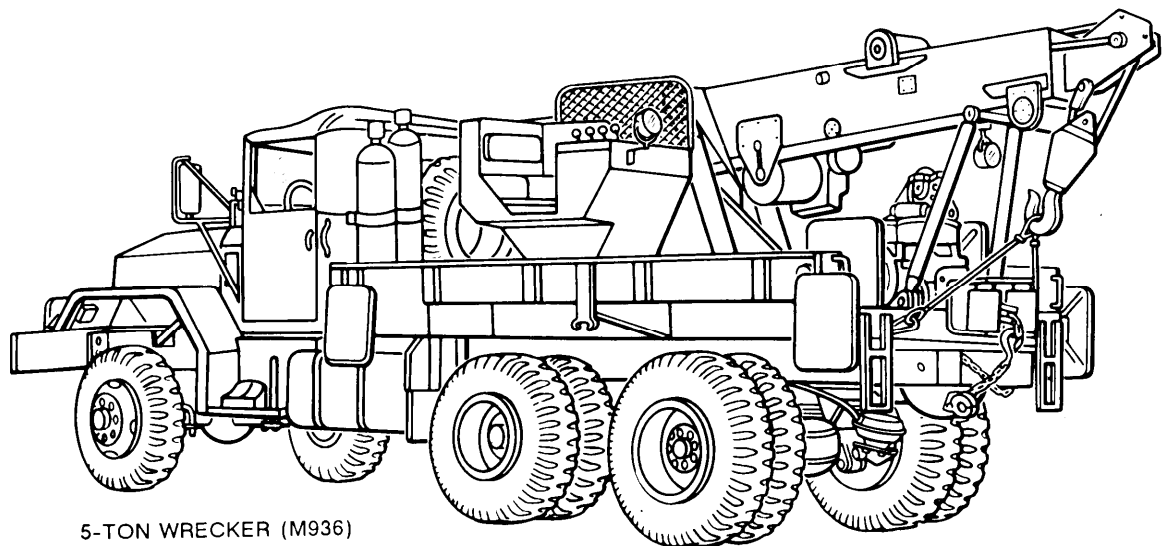
16-1. Drilling Procedures.

NOTE

The 5-Ton Wrecker discussed in this chapter is illustrated in Figure 16-1.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Underbody (see Figure 16-2).* Drill one 1/2-inch (1.3 cm) hole A in each side support. Hole should be drilled 18 inches (45.7 cm) from the outer end of the support. Holes B already exist.



5-TON WRECKER (M936)

Figure 16-1. 5-Ton Wrecker (A4936).

TA504904

16-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

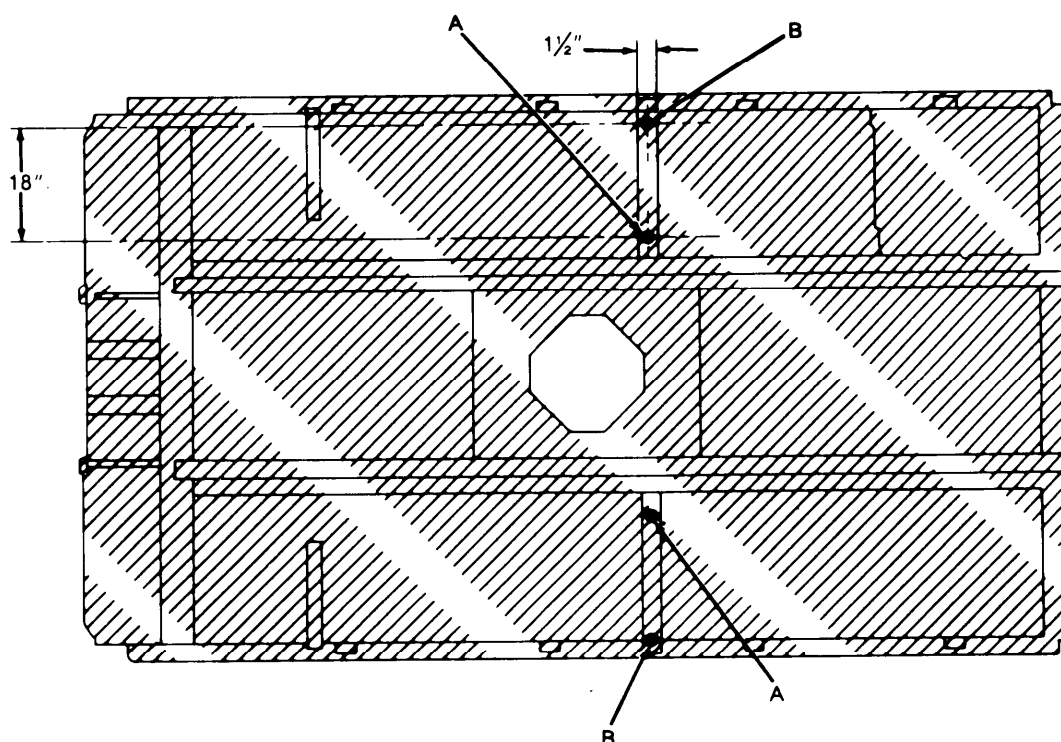


Figure 16-2. Drilling Underbody,

TA504905

Section II. RUSTPROOFING PROCEDURES

16-3. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brake-drums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the

surface area is necessary at whatever thickness is obtainable.

- For rustproofing procedures of specific wrecker body items, refer to Figure 16-3 and Figure 16-4.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach this thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound.

Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 16-3).

(1) Insert 90 degree short tool into holes A and B of side supports and spray in all directions.

(2) Use short rigid tool to completely cover the underbody of the wrecker, including open access surfaces to side, cross, and longitudinal sills.

d. Rustproofing Stake Pockets (see Figure 16-4).

Insert long rigid tool into base of stake pockets A and spray in all directions as tool is withdrawn.

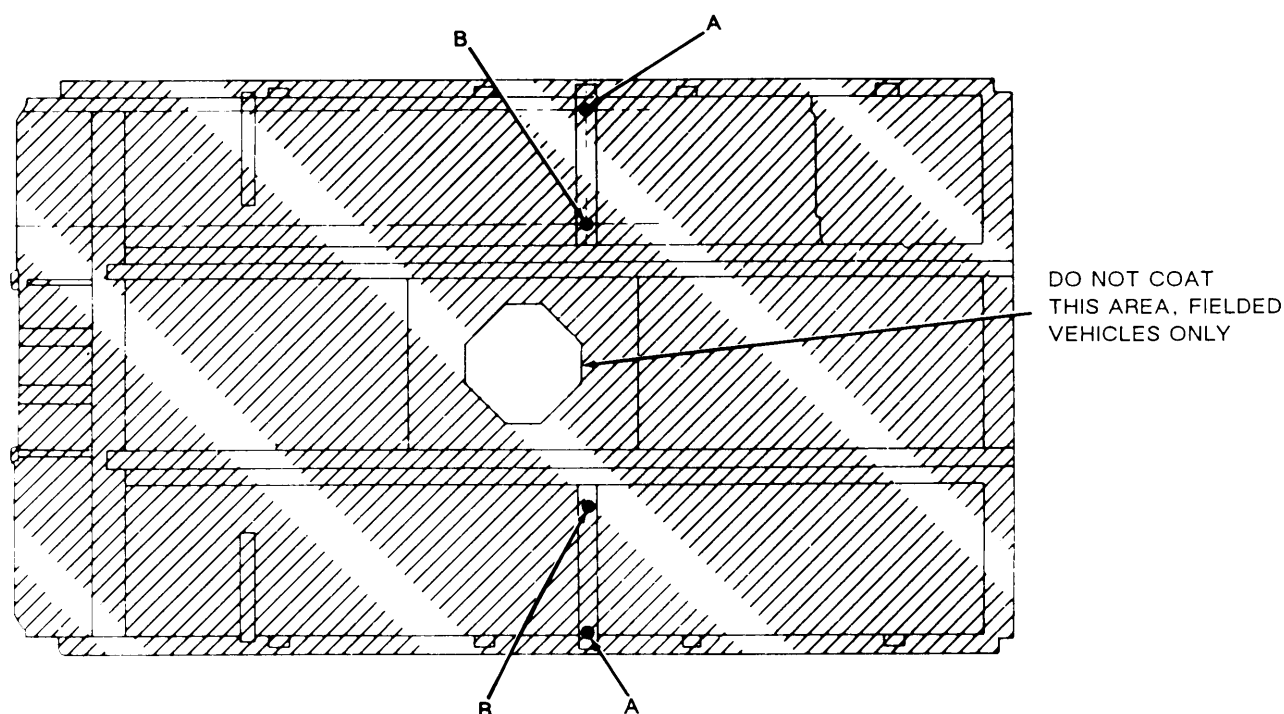


Figure 16-3. Rustproofing Underbody.

TA504906

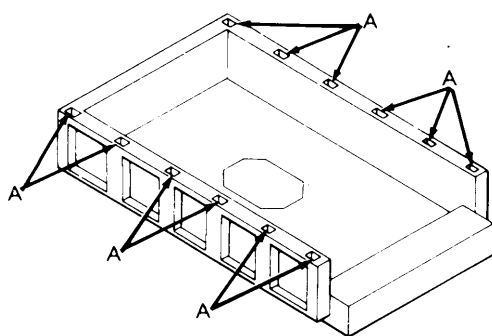
16-4. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

b. Check wet film thickness with a wet film thickness gage (see Figure 16-5). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check all drain holes to ensure that they are open.



TA504907

Figure 16-4. Rustproofing Stake Pockets.

TB 43-0213

d. Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

e. Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 16-3).

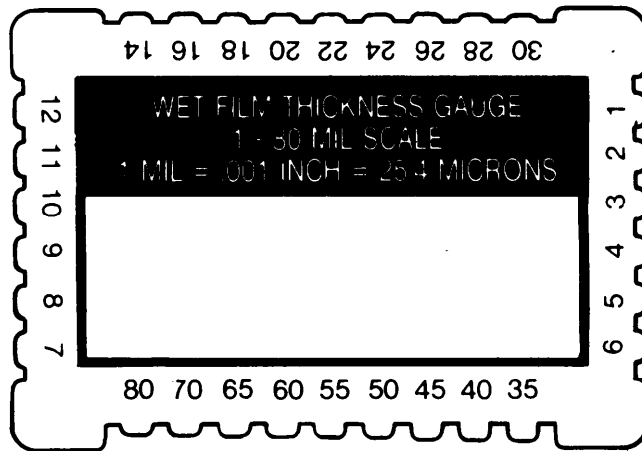


Figure 16-5. Film Thickness Gage. TA504789

CHAPTER 17

M911 SERIES TRACTOR

Section I. PRELIMINARY PROCEDURES

17-1. Component Removal.

a. The M911 Series Tractor discussed in this chapter is illustrated in Figure 17-1.

b. Prior to rustproofing, remove the following components from the M911 Series Tractor (see TM 9-2320-270-20):

- (1) Cab headline panel.
- (2) Steel door trim panels,
- (3) Batteries.
- (4) Side engine panels.

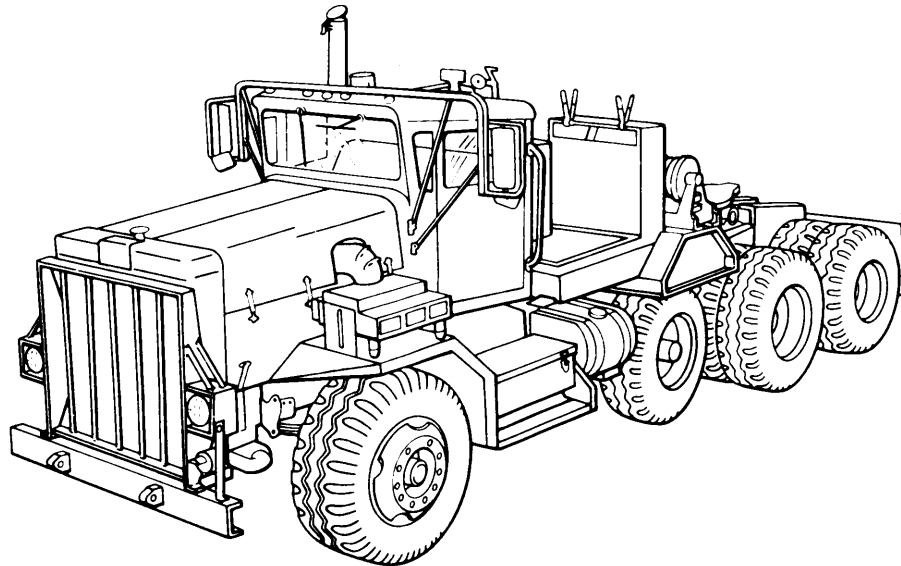


Figure 17-1. M911 Series Tractor.

TA504908

Section II. DRILLING AND CLEANING PROCEDURES

17-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Front Cowl (see Figure 17-2).* Drill two holes A in the top and the side of the cowl. Holes should be sight drilled. Repeat for other side.

c. *Drilling Rear Cab Braces (see Figure 17-3).* Drill four holes A in cab braces on each side. Holes should be sight drilled.

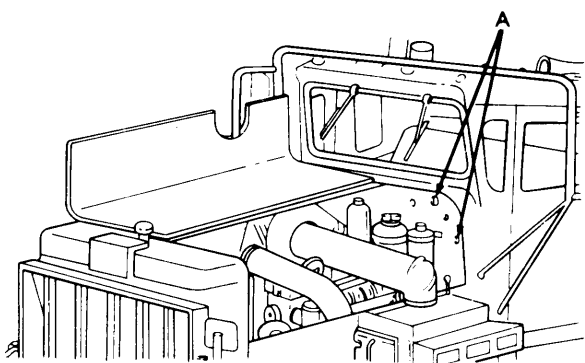


Figure 17-2. Drilling Front Cowl. TA504909

17-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

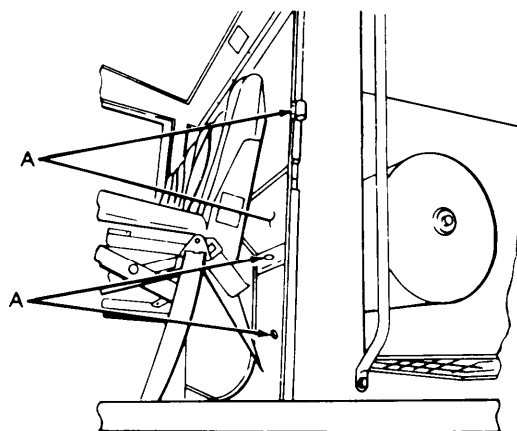


Figure 17-3. Drilling Rear Cab Braces. TA504910

Section III. RUSTPROOFING PROCEDURES

17-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

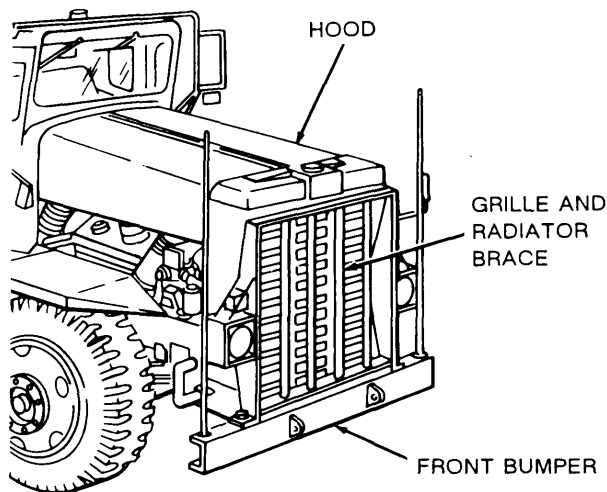
- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific tractor items, refer to Figure 17-4 through Figure 17-12.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing pro-

tection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Hood, Grille, and Bumper (see Figure 17-4). Use 90 degree short tool to completely coat the rear side of the grille and radiator brace, the inside of the front bumper, and the inner panel of the hood.



TA504911

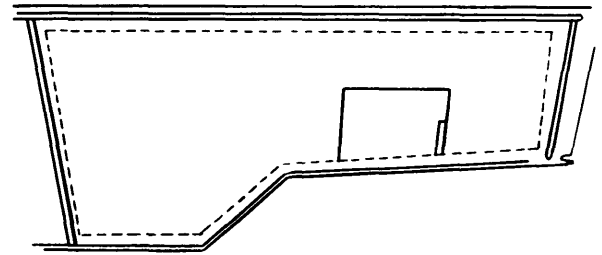
Figure 17-4. Rustproofing Hood, Grille, and Bumper.

d. Rustproofing Engine Side Panels (see Figure 17-5). Use short rigid tool to completely coat the rear side of engine side panels.

e. Rustproofing Front Fenders (see Figure 17-6),

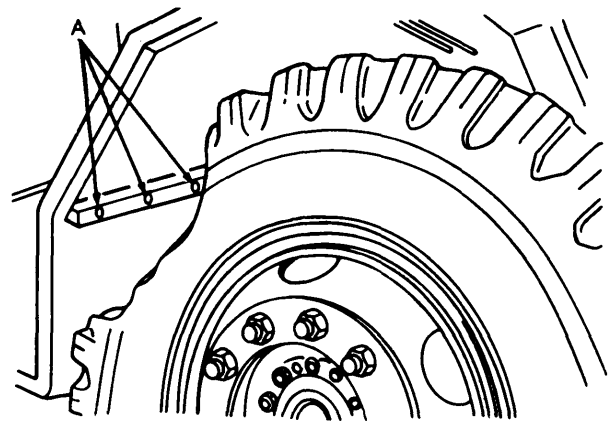
(1) Insert 90 degree short tool in holes A in front fender supports, then loosen top fender bolts to spray between fenders and supports.

(2) Use the same tool to completely coat the underside of the fender, including all supports.



TA504912

Figure 17-5. Rustproofing Engine Side Panels.

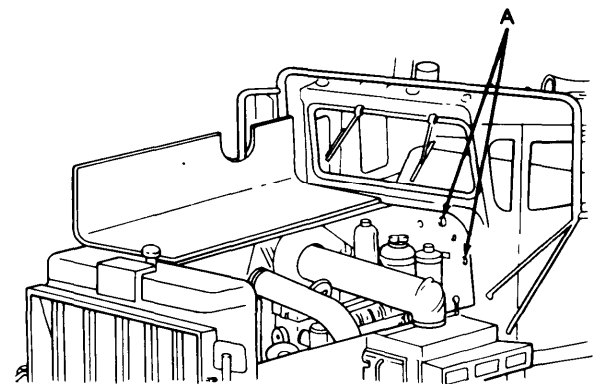


TA504913

Figure 17-6. Rustproofing Front Fenders,

f. Rustproofing Cowl (see Figure 17-7).

(1) Insert 90 degree short tool into holes A and spray cowl in all directions.



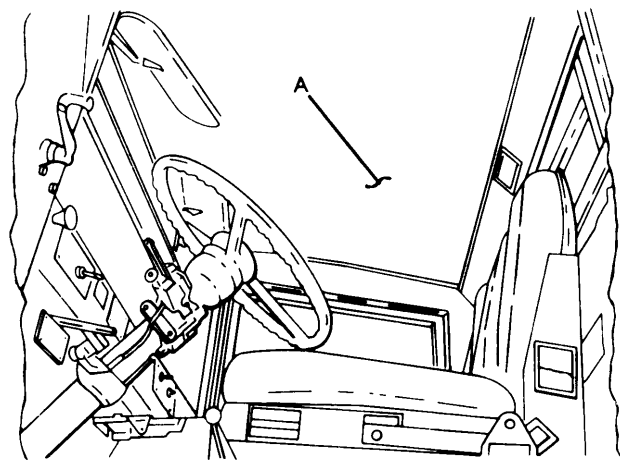
TA504914

Figure 17-7. Rustproofing Cowl.

TB 43-0213

(2) Use the same tool to completely coat the back side of the cowl side panels. Gain access to the cowl side panels by inserting the tool under the dashboard on the inside of the cab and spraying forward to the left, right, up, and down.

g. *Rustproofing Roof* (see Figure 17-8). Use short rigid tool to completely coat roof inner panel A, including all supports.



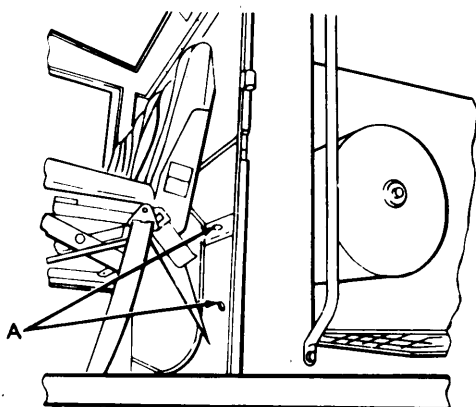
TA504915

Figure 17-8. Rustproofing Roof.

h. *Rustproofing Lower and Rear Door Frame* (see Figure 17-9).

(1) Insert flexible tool into existing opening in the rear pillar as far as possible, then spray in all directions while slowly withdrawing tool.

(2) Use 90 degree short tool to completely coat the underside of the lower door frame.



TA504916

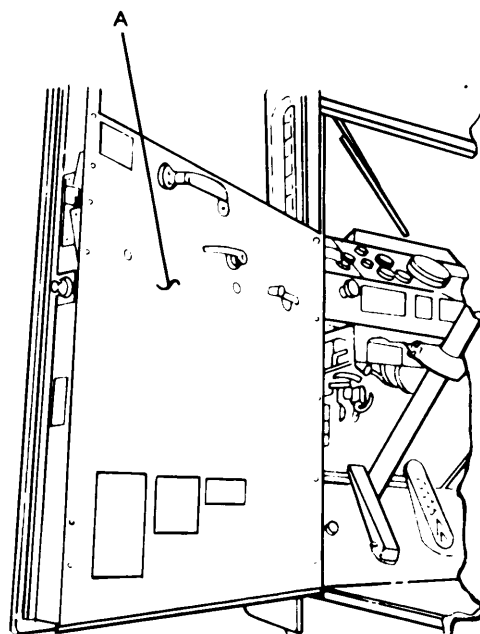
Figure 17-9. Rustproofing Lower and Rear Door Frame.

(3) Insert 90 degree tool in holes A in the rear cab braces and spray in all directions.

CAUTION

Roll up windows. Do not coat any part of the window mechanisms while spraying.

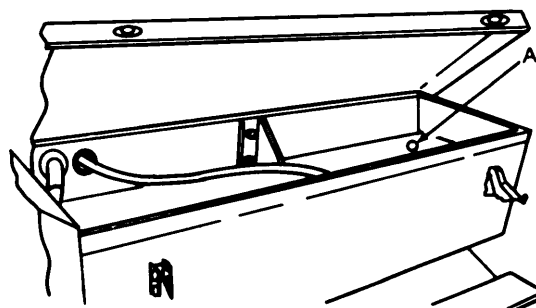
i. *Rustproofing Doors* (see Figure 17-10). Insert 90 degree short tool through existing openings in the inside door panel A and completely coat inner panels of doors.



TA504917

Figure 17-10. Rustproofing Doors.

j. *Rustproofing Battery Box* (see Figure 17-11). Use the 90 degree short tool with the cone spray tip to coat the interior of the battery box A, including cover.



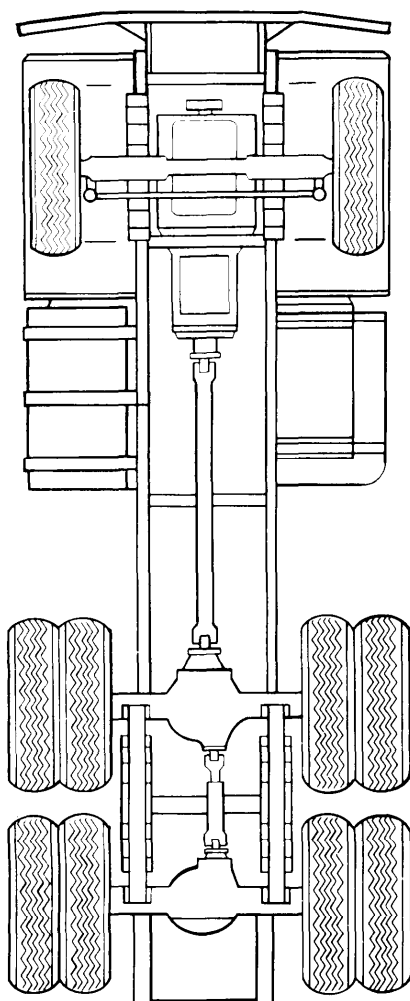
TA504918

Figure 17-11. Rustproofing Battery Box.

k. *Rustproofing Underbody (Typical)* (see Figure 17-12).

(1) Use short rigid tool to completely coat the underbody.

(2) Use 90 degree short tool to coat any areas inaccessible with the straight tool. These areas include frame channels and around rear fender flanges.



TA504919

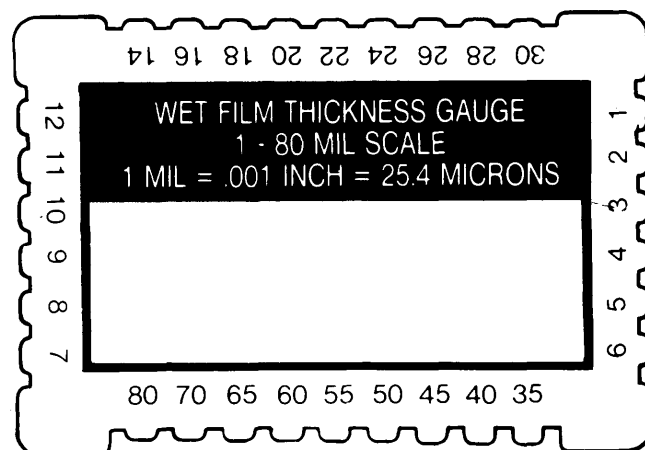
Figure 17-12. Rustproofing Underbody.

17-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 17-13). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.



TA504789

Figure 17-13. Film Thickness Gauge.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 17-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

17-6. Component Installation.

Install all components that were removed in paragraph 17-1 (see TM 9-2320-270-20).

CHAPTER 18

M915 SERIES TRACTOR

Section I. PRELIMINARY PROCEDURES

18-1. Component Removal.

a. The M915 Series Tractor discussed in this chapter is illustrated in Figure 18-1.

b. Prior to rustproofing, remove the following components (see TM 9-2320-273-20):

(1) Cab headline panel.

(2) Door trim panels.

(3) Firewall insulation.

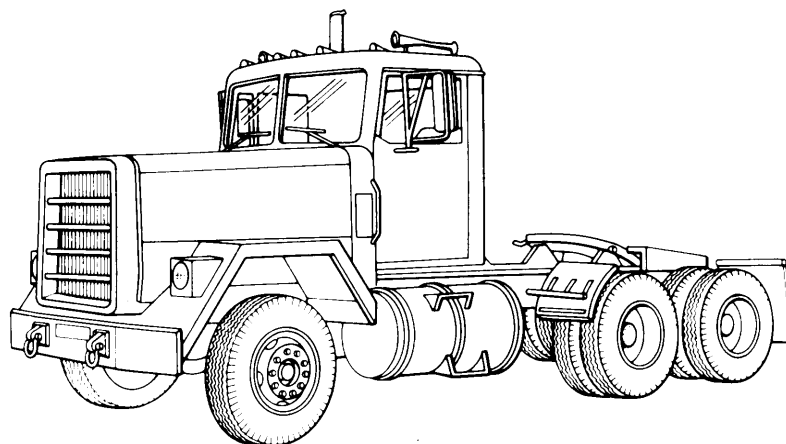


Figure 18-1. M915 Series Tractor.

TA504920

Section II. DRILLING AND CLEANING PROCEDURES

18-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Headlamps* (see Figure 18-2). Drill two holes A in each headlamp housing.

c. *Drilling Inner Fender Braces* (see Figure 18-2). Drill four holes B in each inner fender brace.

d. *Drilling Door Frames* (see Figure 18-3). Drill 10 holes A in each door frame.

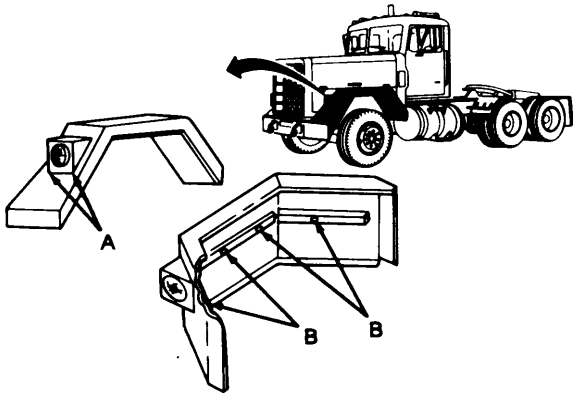


Figure 18-2. Drilling Headlamps and Inner Fender Braces. TA504921

18-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

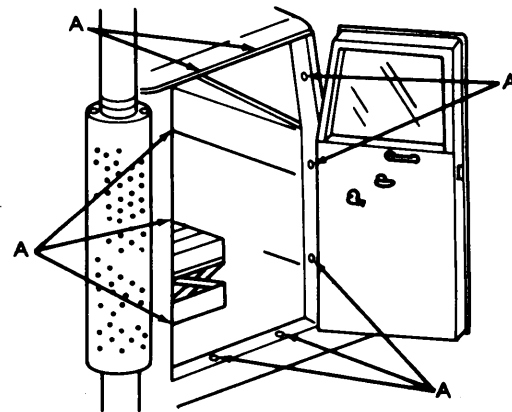


Figure 18-3. Drilling Door Frames. TA504922

Section III. RUSTPROOFING PROCEDURES

18-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

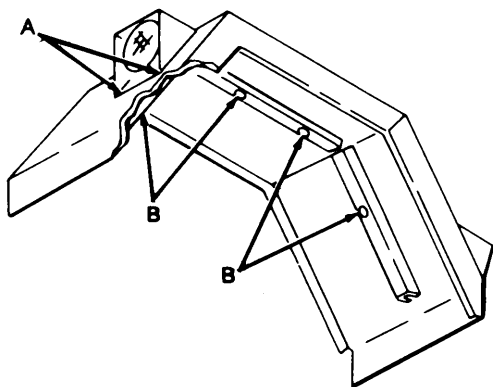
- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific tractor items, refer to Figure 18-4 through Figure 18-9.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing

protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Headlamps and Fenders (see Figure 18-4).



(1) Insert 90 degree short tool into holes A of headlamps and spray in all directions.

(2) Use the same tool to completely cover the underside of the fenders, then insert the tool into fender brace holes B and spray in all directions.

d. Rustproofing Engine Compartment (see Figure 18-5).

(1) Use 90 degree short tool to completely cover the inside of the hood, the radiator brace, and the engine compartment side panels.

(2) Insert flexible short tool into the hood brace ends as far as possible, then spray slowly while withdrawing tool.

(3) Use 90 degree short tool to completely cover the firewall.

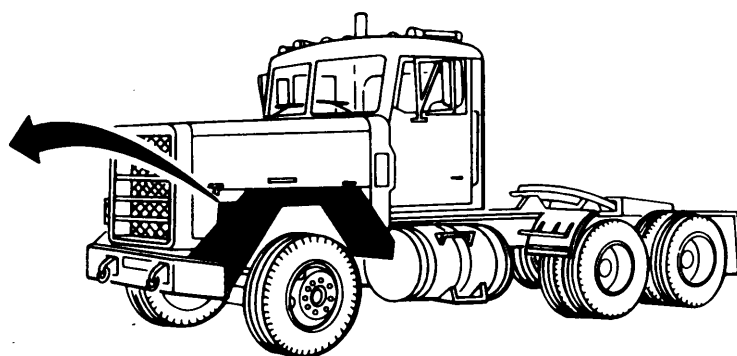


Figure 18-4. Rustproofing Headlamps and Fenders.

TA504923

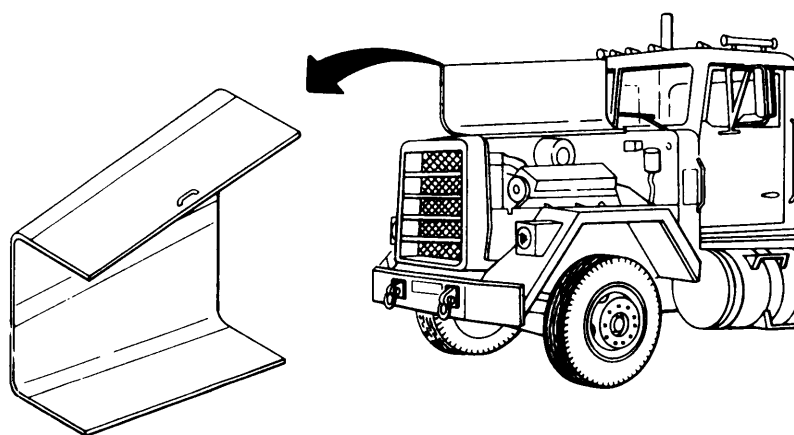


Figure 18-5. Rustproofing Engine Compartment.

TA504924

e. Rustproofing Cowl (see Figure 18-6).

(1) Use 90 degree short tool to completely cover the inside area of the cowl vent.

(2) Use short rigid tool to completely cover the inside of the cowl. Gain access from under the instrument panel,

f. Rustproofing Roof (see Figure 18-7).

(1) Insert 90 degree short tool into holes A in the roof panel and spray in all directions.

(2) Use the same tool to completely cover roof boxed sections.

g. Rustproofing Door Frames (see Figure 18-3). Insert 90 degree short tool into holes A in door frame and spray in all directions. Plug all holes.

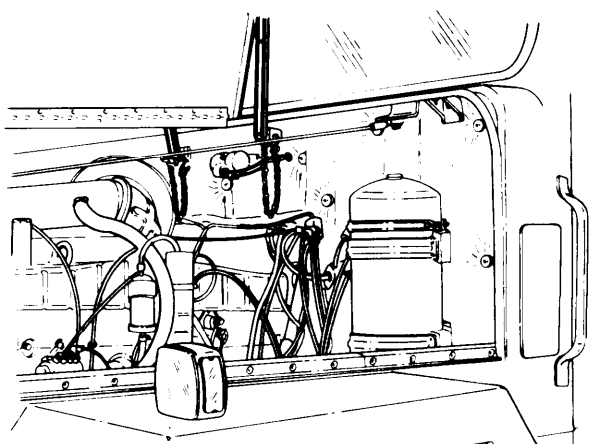


Figure 18-6. Rustproofing Cowl.

TA504925

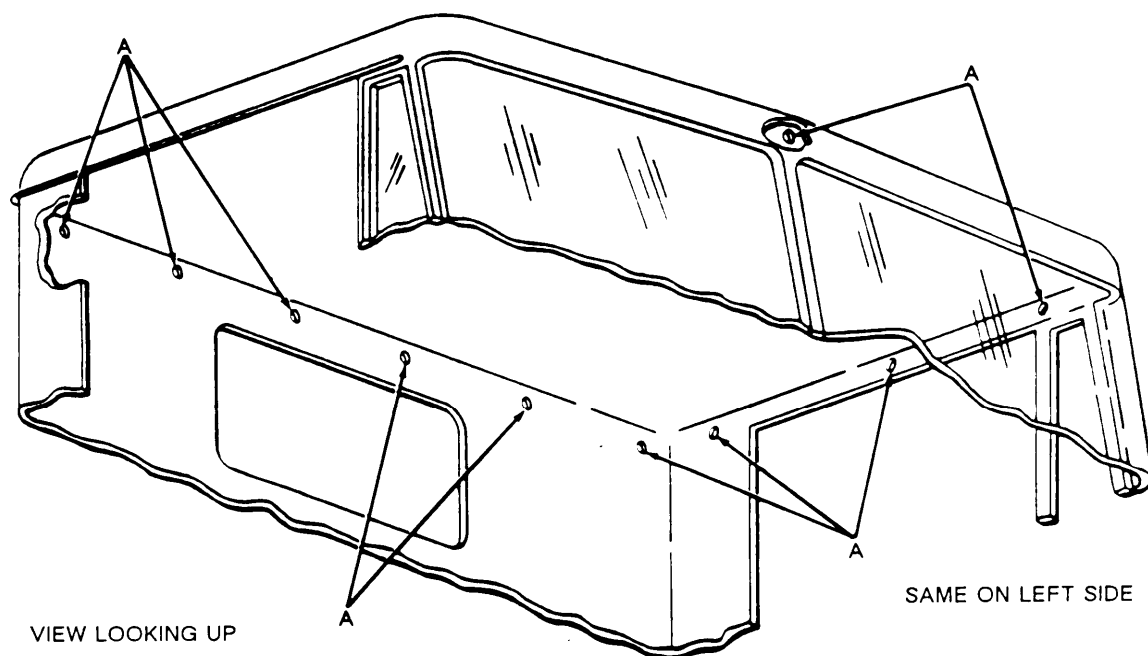


Figure 18-7. Rustproofing Roof.

TA504926

h. Rustproofing Doors (see Figure 18-8). Roll window up, then insert 90 degree short tool through existing holes A in inner door panel openings and spray in all directions.

i. Rustproofing Underbody (Typical) (see Figure 18-9).

(1) Use short rigid tool to completely coat the

underbody.

(2) Use 90 degree short tool to cover all areas of the underbody that are inaccessible with the short rigid tool. These areas include the inside of frame channels and the body perimeter siderails.

(3) Use the same tool to coat entire rear side of the front bumper.

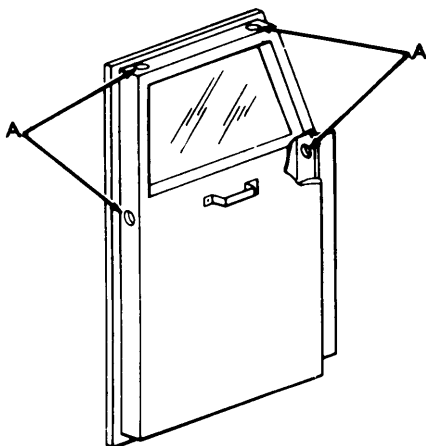


Figure 18-8. Rustproofing Doors.

TA504927

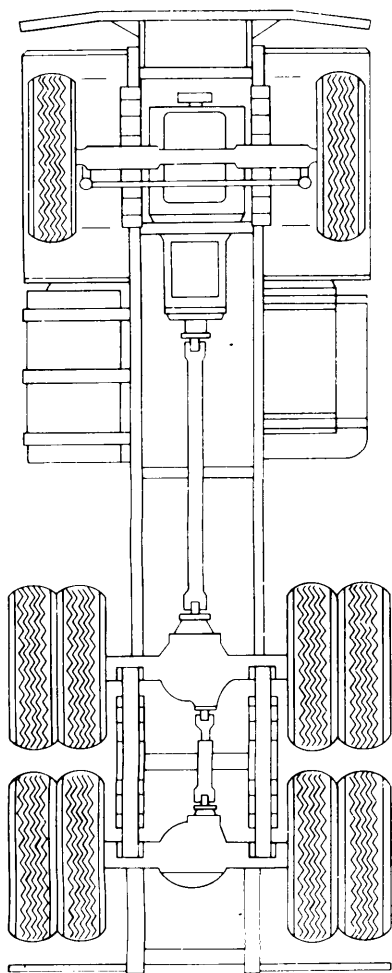


Figure 18-9. Rustproofing Underbody.

TA504928

18-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 18-10). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

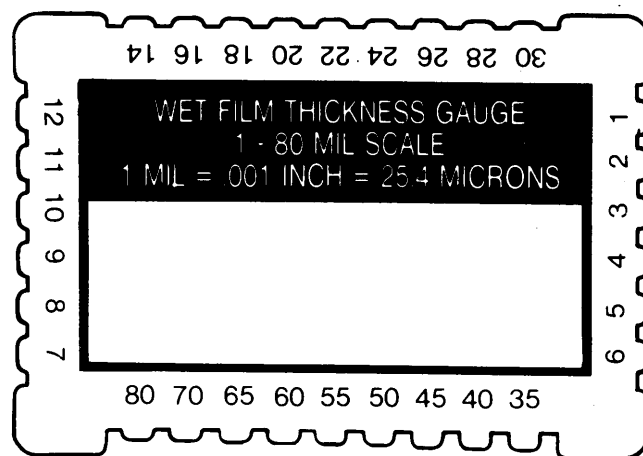


Figure 18-10. Film Thickness Gage.

TA504789

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate. Use of a high intensity inspection light will enhance this process.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 18-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

18-6. Component Installation.

Install all components that were removed in paragraph 18-1 (see TM 9-2320-273-20).

CHAPTER 19

M977, M978, M983, M984, AND M985 SERIES TRUCKS (HEMTT)

Section I. PRELIMINARY PROCEDURES

19-1. Component Removal.

a. The HEMTT Trucks discussed in this chapter are illustrated in Figure 19-1.

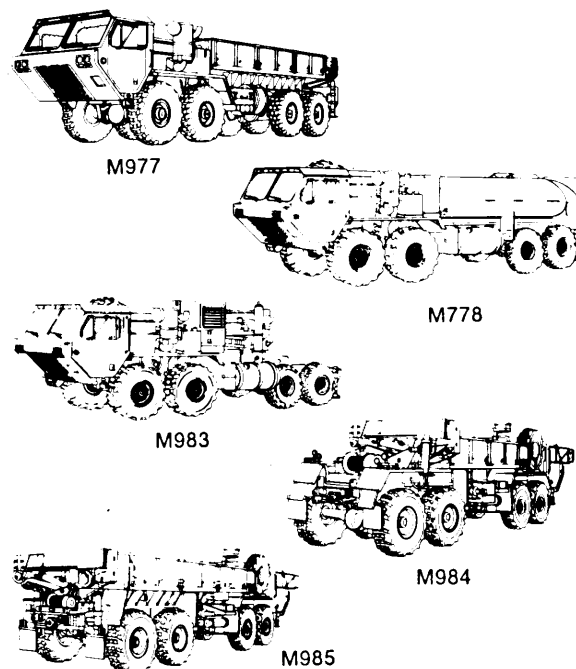
b. Raise door windows to fully closed position. Prior to rustproofing, the following components must be removed for access (see TM 9-2320-279-10 and TM 9-2320-279-34):

(1) Door panels access covers,

(2) Domelight.

c. *M977 and M985 Series Cargo Bodies.* Remove cargo canvas and bows, if equipped (see TM 9-2320 - 279-10).

d. *M978, M983 and M984 Truck Bodies.* There are no requirements for component removal on the bodies of these vehicles.



TA504929
Figure 19-1. HEMTT Vehicles.

Section II. DRILLING AND CLEANING PROCEDURES

19-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

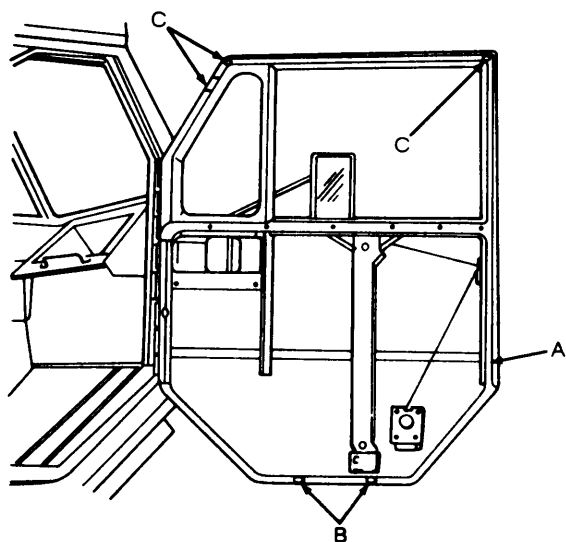
a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Doors (Typical)* (see Figure 19-2).

(1) Drill doors if necessary. Six holes A, B, and C may already exist. Drill holes A on inside of door box channel.

(2) Drill holes B on bottom of door. Holes B on bottom of door must go completely through box channel for drainage.

(3) Drill holes C as close to edge of door as possible.

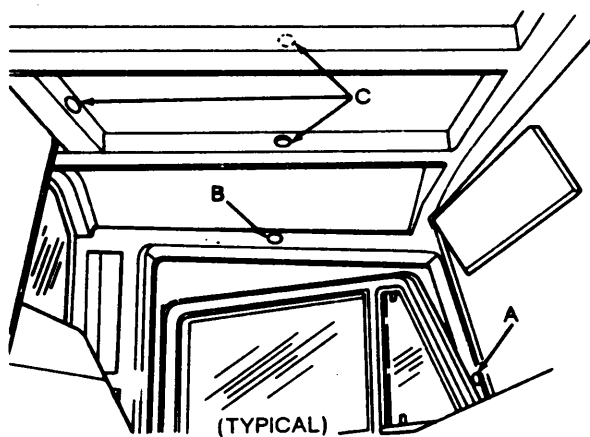


TA504930

Figure 19-2. Drilling Doors (Typical).

c. *Drilling Door Headers (Typical)* (see Figure 19-3). Drill door headers if necessary. Holes A may already exist.

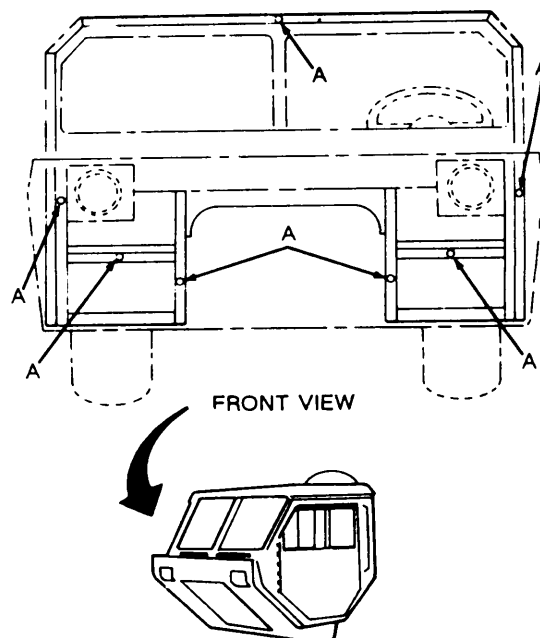
d. *Drilling Roof Supports (Typical)* (see Figure 19-3). Drill roof supports if necessary. Holes B and C may already exist.



TA504931

Figure 19-3. Drilling Door Headers and Roof Supports (Typical).

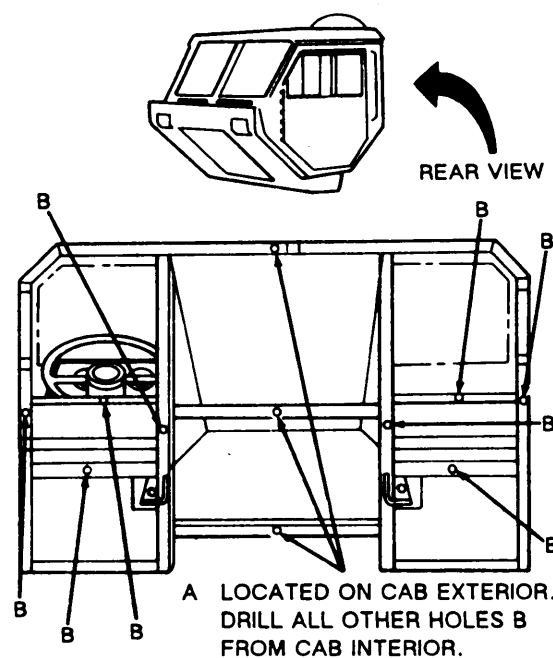
e. *Drilling Cab Frame Interior (Front View)* (see Figure 19-4). Drill cab frame if necessary. Seven holes A may already exist.



TA504932

Figure 19-4. Drilling Cab Frame Interior (Front View).

f. *Drilling Cab Frame Interior (Rear View)* (see Figure 19-5). Drill cab frame if necessary. Eleven holes A and B may already exist.

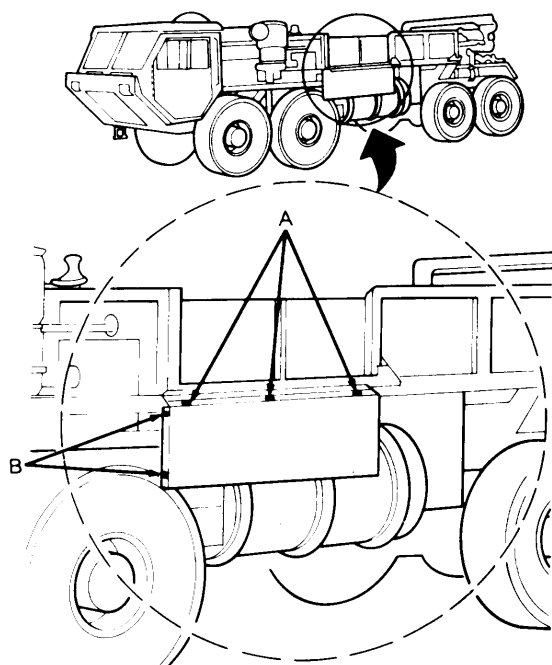


TA504933

Figure 19-5. Drilling Cab Frame Interior (Rear View).

g. *Drilling Tubular Cargo Side Panels (M984)* (see Figure 19-6).

- (1) Open cargo side panel.
- (2) Drill three holes A on bottom of panels, Holes A may already exist.
- (3) Drill two holes B.



TA504934

Figure 19-6. *Drilling Tubular Cargo Side Panels (M984).*

h. M977, M978, M983, and M985 Series Bodies, There are no drilling procedures specified for these bodies. Holes are either predrilled or not required.

19-3. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of framerail structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section III RUSTPROOFING PROCEDURES

19-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission, transfer case, cylinders, pumps, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages, or air intake systems. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific vehicle items, refer to Figure 19-7 through Figure 19-14.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing

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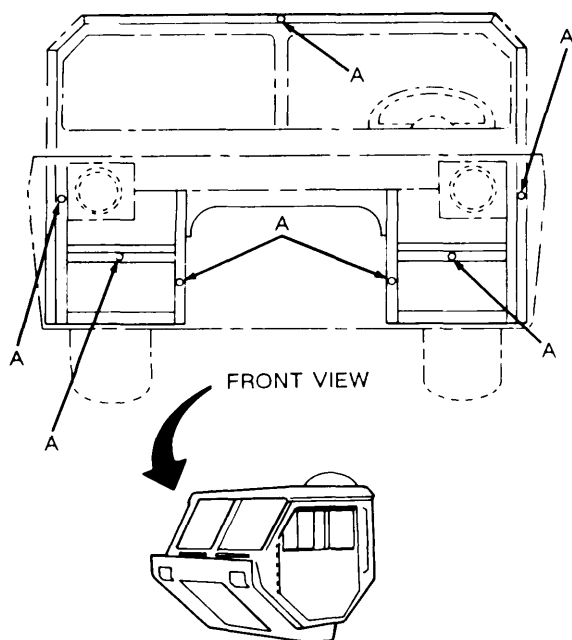
protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Cab Interior (Front View) (see Figure 19-7).

(1) Insert flexible tool into access holes A of the front box channels as far as it will go, then spray while slowly withdrawing tool. Insert the tool in the opposite direction and repeat the above procedure.

(2) Insert 90 degree short tool in each hole A of the front box channels and spray over all areas missed by the flexible tool.



TA504935

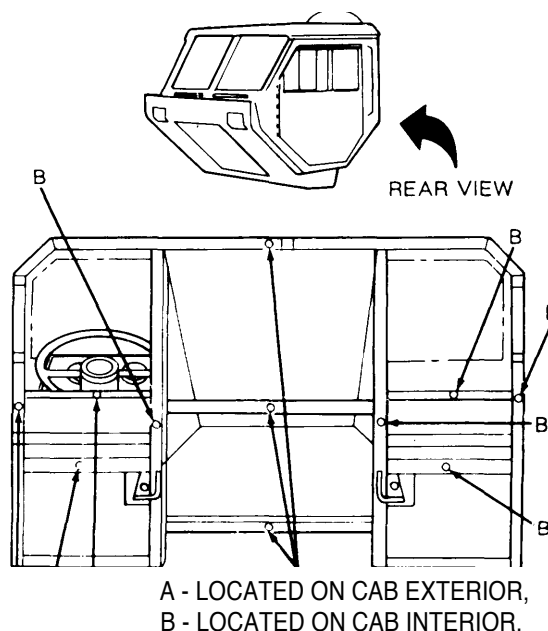
Figure 19-7. Rustproofing Cab Interior (Front View).

d. Rustproofing Cub Interior (Rear View) (see Figure 19-8).

(1) Insert flexible tool into access holes A and B of the front box channels as far as it will go, then spray

while slowly withdrawing tool. Insert the tool in the opposite direction and repeat the above procedure.

(2) Insert 90 degree short tool in each hole A and B of the front box channels and spray over all areas missed by the flexible tool.



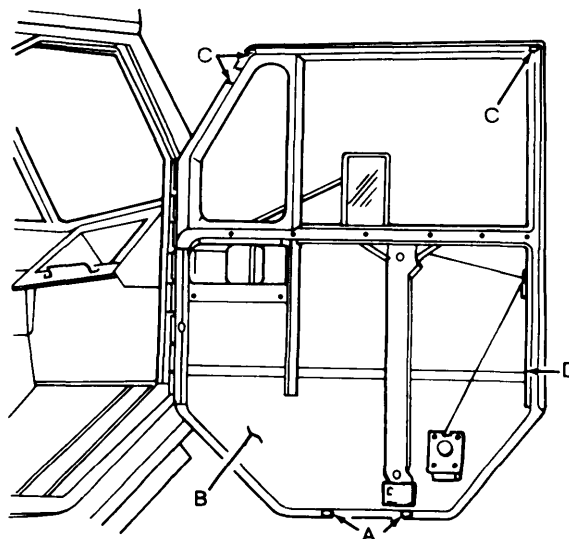
A - LOCATED ON CAB EXTERIOR,
B - LOCATED ON CAB INTERIOR.

TA504936

Figure 19-8. Rustproofing Cab Interior (Rear View).

e. Rustproofing Doors (Typical) (see Figure 19-9).

(1) Insert flexible tool into holes A, C, and D of door box channels as far as it will go, then spray while slowly withdrawing tool.



TA504937

Figure 19-9. Rustproofing Doors (Typical).

(2) Use 90 degree short tool to spray overall areas missed by flexible tool.

(3) Spray inner door panels, after rolling windows up to a fully closed position. Use a short rigid tool to completely cover the inside of the inner door panel B. Caution should be taken not to spray compound on window mechanism.

(4) Use the short rigid tool to spray the inner side of the door access cover.

f. Rustproofing Roof Center Support and Complete Doorjamb Opening (Typical) (see Figure 19-10).

(1) Insert flexible tool into access hole A in the front doorjamb as far as it will go, then spray while slowly withdrawing tool.

(2) Insert flexible tool into access hole B in the top doorjamb as far as it will go, then spray while slowly withdrawing tool.

(3) Insert flexible tool into access holes C in the roof center support as far as it will go, then spray while slowly withdrawing tool.

g. Rustproofing Engine Cover Support Tubes, Cab Angle Braces and Fenders, Supports and Stiffeners (see Figure 19-11).

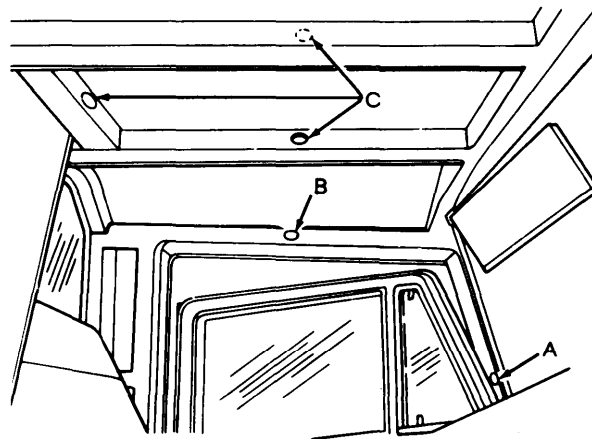
(1) Use short rigid tool at cab angle braces to spray the entire underside of the cab floor. Insert the 90 degree short tool in each hole A and spray in each direction.

(2) Insert short rigid tool as far as it will go into each of the supports and stiffener B. It may require two passes to ensure complete coverage.

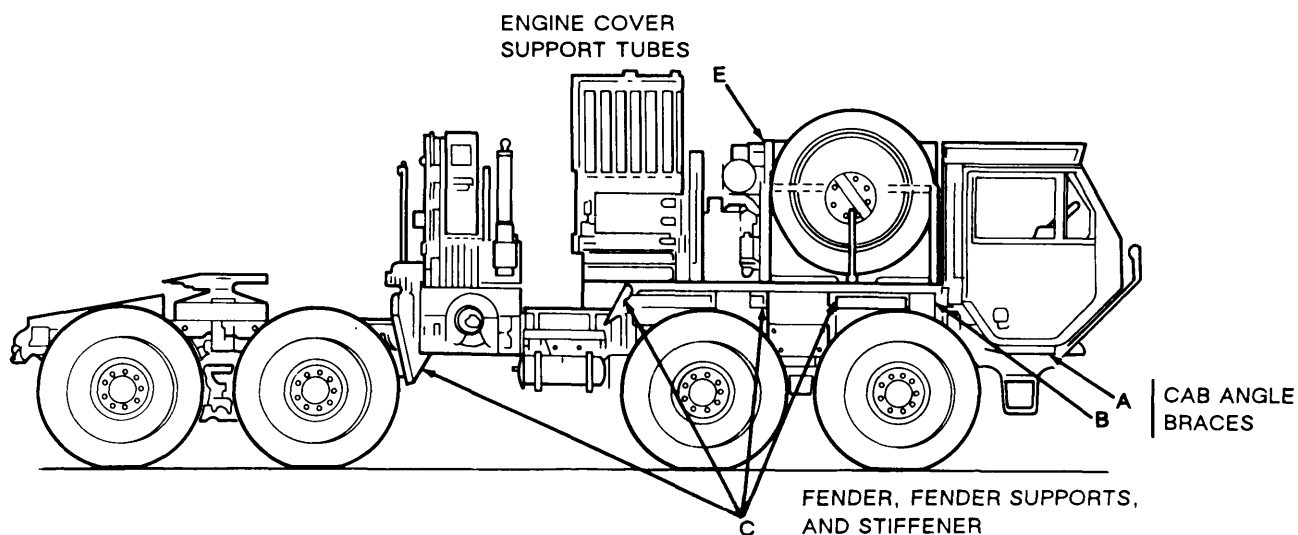
(3) Use long rigid tool to spray the entire side of the rear fenders C.

(4) (M983 Only). Use the short rigid tool to spray the entire underside of the rear fenders D,

(5) Insert flexible tool as far as it will go into the engine cover support tubes E, then slowly withdraw the tool while spraying.



TA504938
Figure 19-10. Rustproofing Roof Center Support and Complete Doorjamb Opening (Typical),



TA504939
Figure 19-11. Rustproofing Engine Cover Support Tubes, Cab Angle Braces and Fenders, Supports and Stiffeners.

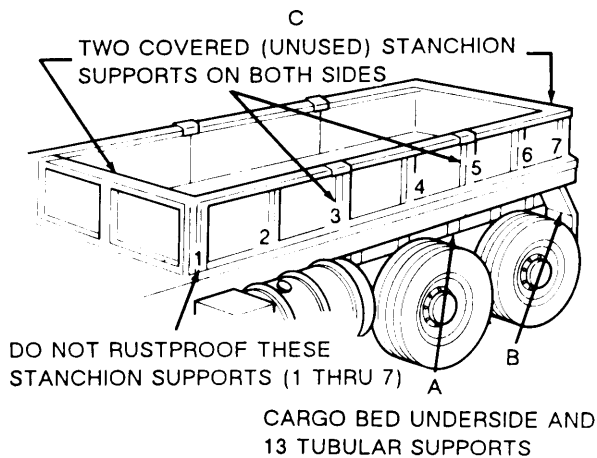
TB 43-0213

h. Rustproofing Cargo Body (M977 and M985) (see Figure 19-12).

(1) Use long rigid tool to completely spray the bottom of the cargo body A including the 13 tubular supports.

(2) Use short rigid tool to cover areas missed by the long rigid tool. Also completely cover the underside of the rear fenders B.

(3) Insert 90 degree short rigid tool into covered (unused) stanchions, front and rear headboards C, and spray in all directions.

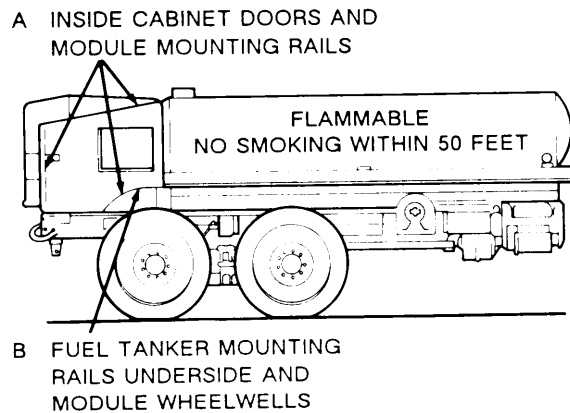


TA504940
Figure 19-12. Rustproofing Cargo Body (M977 and M985).

i. Rustproofing M978 Tanker Body (see Figure 19-13).

(1) Insert short rigid tool into the inside cabinet door mounting rails A and spray all door mounting rails.

(2) Use the same tool to completely spray the underside of the wheelwells B.



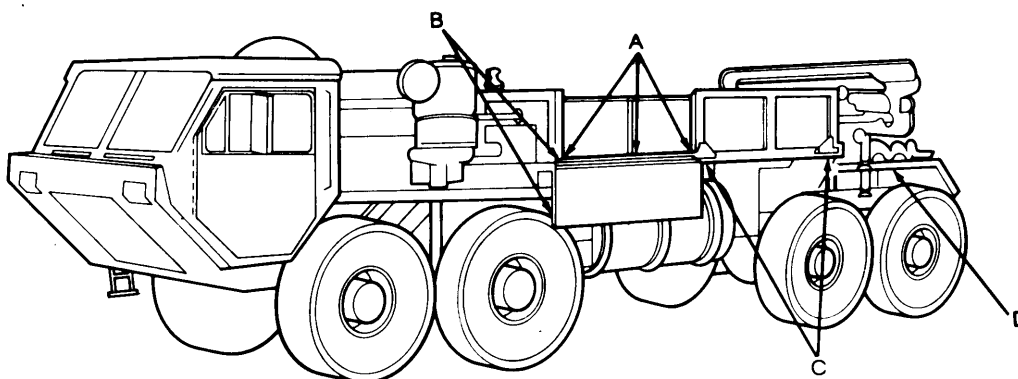
TA504941
Figure 19-13. Rustproofing M978 Tanker Body.

j. Rustproofing M984 Recovery Body (see Figure 19-14).

(1) Insert flexible tool into the cargo side panels A and B and spray while slowly withdrawing tool.

(2) Use 90 degree long tool to completely spray the bottom of the cargo bed C.

(3) Use short rigid tool to completely cover the underside of the rear fenders D.



TA504942
Figure 19-14. Rustproofing M984 Recovery Body.

19-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 19-15). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 19-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

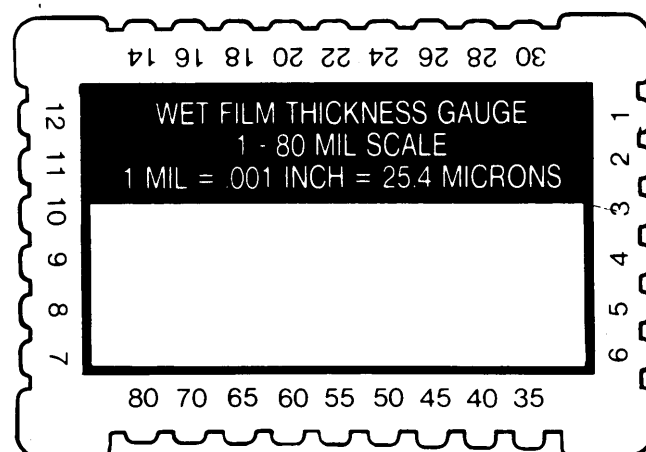


Figure 19-15. Film Thickness Gage. TA504789

19-6. Compound Installation.

Install all components that were removed in paragraph 19-1 (see TM 9-2320-279-10 and TM 9-2320-279-34).

CHAPTER 20

M966, M997, M998, M1036, M1038, M1045, M1046, M1025, M1026, M1043, M1044, M1037, M1042, M1035 SERIES TRUCKS (HMMWV)

Section I. PRELIMINARY PROCEDURES

20-1. Component Removal.

a. The HMMWV Trucks discussed in this chapter are illustrated in Figure 20-1.

b. Prior to rustproofing, the following components must be removed for access, if equipped. (See TM 9-2320-280-20 and TM 9-2320-280-34):

- (1). Batteries and Battery Trays
- (2). Doors
- (3). Soft Top Canvas (M998, M1038, M1035 Models Only)
- (4). Engine Air Cannister
- (5). Windshield Washer Container

- (6). Horn Assembly
- (7). Floor Mats and Side Pads
- (8). Seats (Except Driver's Seat for all Models)
- (9). Fuel Tank
- (10). Pioneer Tool Rack
- (11). Artic Winterization Kit (Applicable Models)
- (12). Weapon Assembly Tray (Applicable Models)
- (13). Blanket Straps (M966, M1036, M1045, M1046 Models)
- (14). Headlight Dimmer Switch
- (15). Cargo Shell Door Seal Protectors (Applicable Models)
- (16). Headlight Shield Deflectors

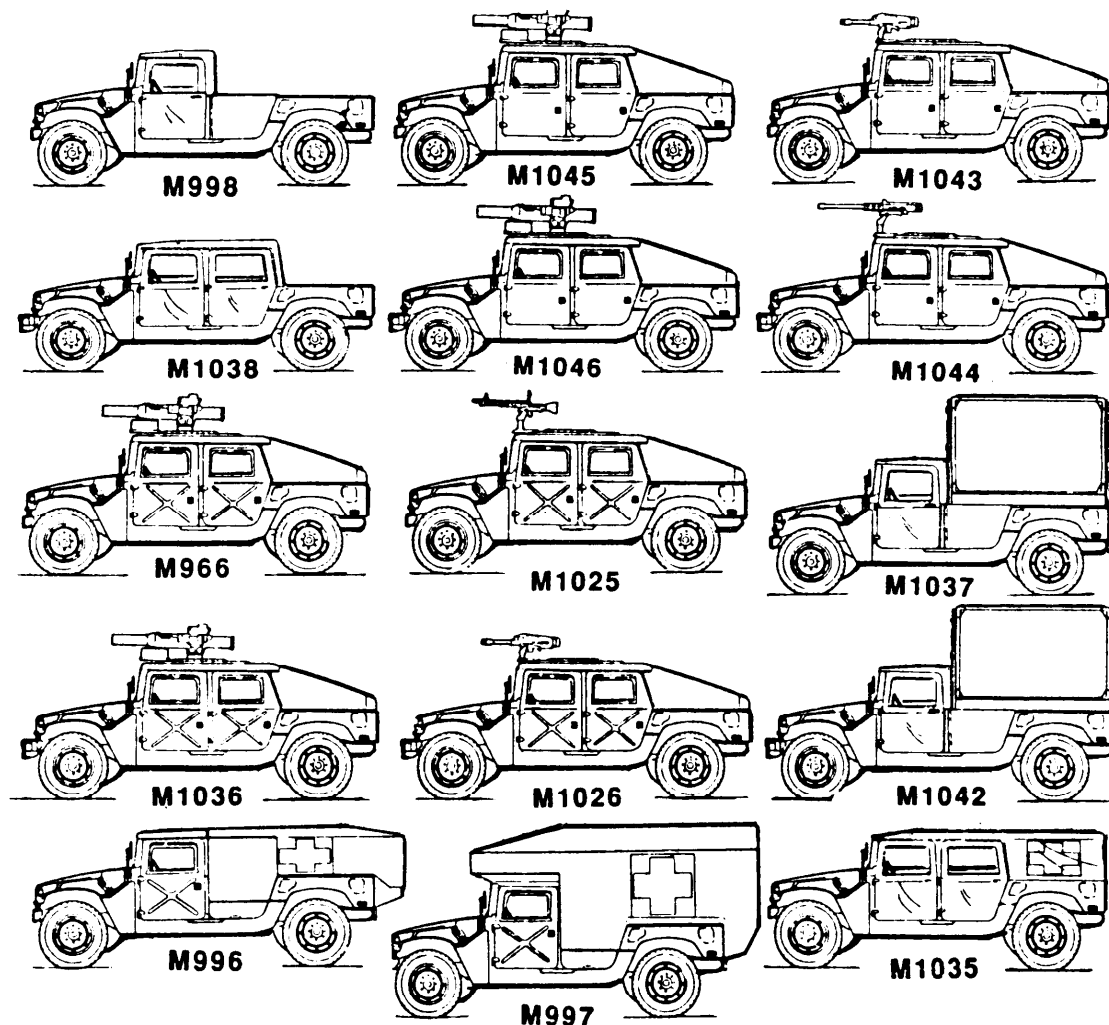


Figure 20-1. Typical HMMWV Trucks.

Section II. DRILLING AND CLEANING PROCEDURES

20-2. Drilling Procedures.

NOTE

Unless otherwise indicated, all holes drilled should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.

Drill holes at approximate locations indicated by the black dots.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Underbody (see Figure 20-2).*

(1). Drill a 5/16 inch hole in the left and right front frame (A and D). Holes should be drilled 6 inches from last bolt on body mount.

(2). Drill a 5/16 inch hole in the left and right rear frame (B and C). Holes should be drilled 8 inches from transmission crossmember mounting bracket.

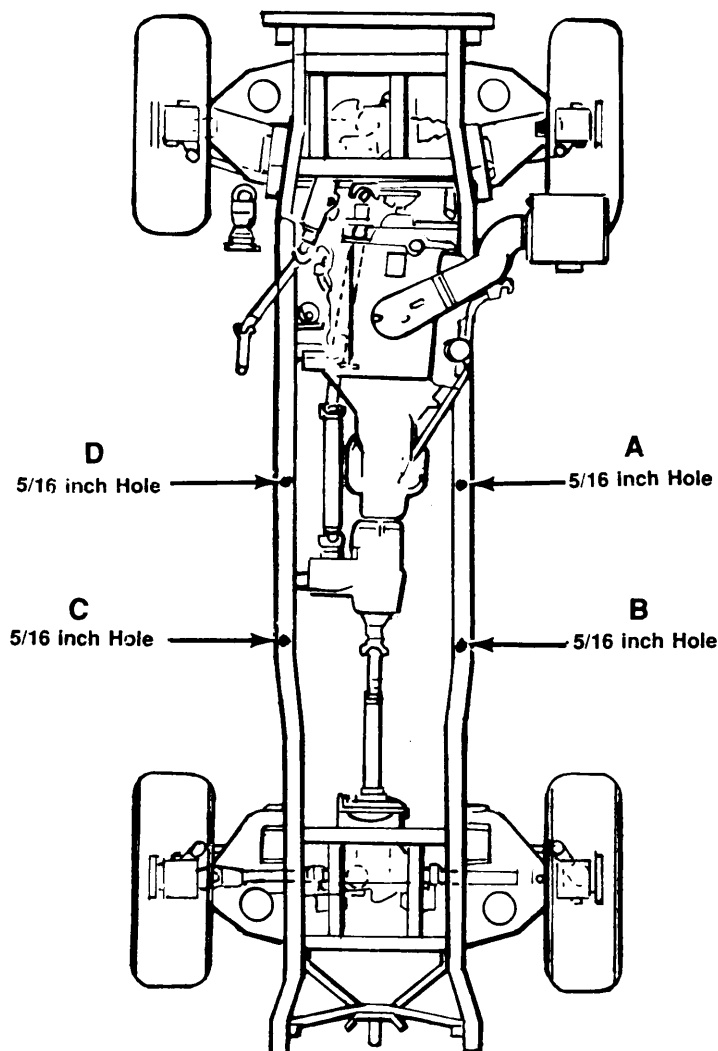


Figure 20-2. Drilling Underbody.

c. Drilling Tailgate (All Models) (see Figure 20-3). Drill two 1/2 Holes (A and B) on left side of tailgate.

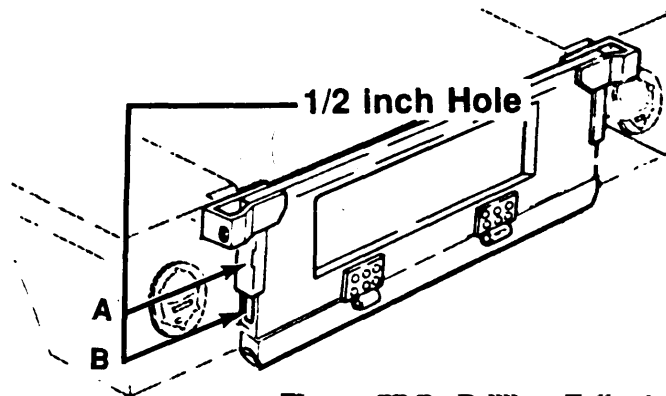


Figure 20-3. Drilling Tailgate.

d. Drilling Weapon Station Tray Assembly (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-4)

(1) Drill two holes D and E in Channel C. Hole D should be 12 inches from the end of the opening in Channel C. Hole E should be 12 inches from Hole D.

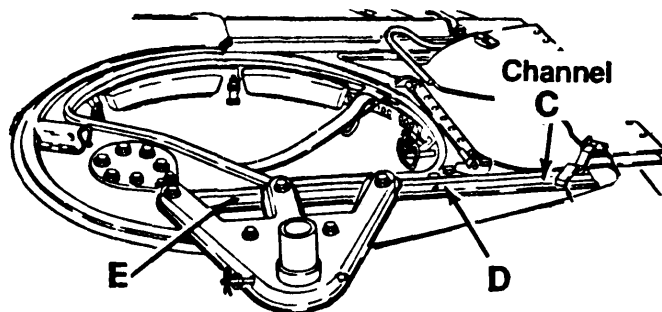


Figure 20-4. Drilling Weapon Station Tray Assembly.

20-3. Cleaning Procedures

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of framerail structures through drilled access holes, to remove mud, dirt, and rust. Use of a high pressure washer will

facilitate this operation. Observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section III. RUSTPROOFING PROCEDURES

20-4. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, transmission transfer case, cylinders, pump, valves, prop shaft, exhaust system, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, shift linkage, tires, electrical components, engine linkages or air intake systems. Cover all areas with paper and tape as necessary.

NOTE

There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry thickness. If needed, the vehicle can be resprayed to reach the proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste the compound by causing overspray and excessively thick coatings.

c. *Rustproofing Frame and Underbody (see Figure 20-5).*

(1) Insert flexible wand tool into existing framerail hole (A) as far as possible toward the

rear of vehicle. Spray in all directions while slowly withdrawing tool.

(2) Insert flexible wand tool into existing framerail hole (B) as far as possible toward rear of the vehicle and spray in all directions while slowly withdrawing tool.

(3) Insert flexible wand tool into existing framerail hole (A) as far as possible toward the front of the vehicle. Spray in all directions while slowly withdrawing tool.

(4) Insert flexible wand tool into existing framerail hole (C) as far as possible toward the front of the vehicle. Spray in all directions while slowly withdrawing tool.

(5) Insert flexible wand tool into existing framerail hole (D) as far as possible toward the front of the vehicle and spray in all directions while slowly withdrawing flexible wand tool.

(6) Insert flexible wand tool into existing framerail hole (E) as far as possible toward the rear of the vehicle. Spray in all directions while slowly withdrawing tool.

(7) Insert flexible wand tool into existing framerail hole (F) as far as possible toward the rear of the vehicle. Spray in all directions while slowly withdrawing tool.

(8) Insert flexible wand tool into existing framerail hole (E) as far as possible toward the front of the vehicle. Spray in all directions while slowly withdrawing tool.

(9) Insert flexible wand tool into existing framerail hole (G) as far as possible toward the front of the vehicle. Spray in all directions while slowly withdrawing tool.

(10) Insert flexible wand tool into existing framerail hole (H) as far as possible toward the front of the vehicle. Spray in all directions while slowly withdrawing tool.

(11) Use flexible tool to completely cover all exterior underbody surfaces.

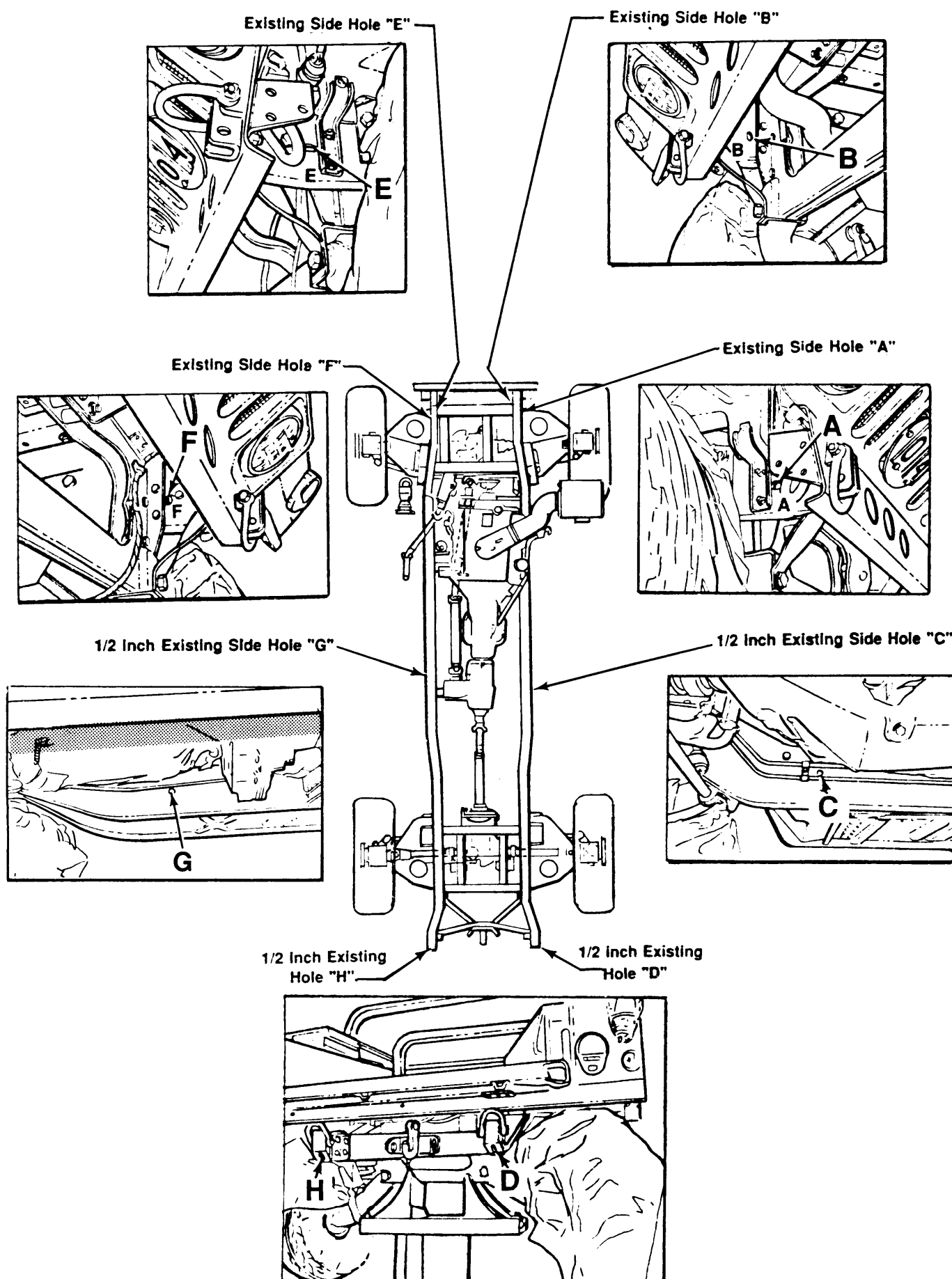


Figure 20-5. Rustproofing Frame and Underbod

d. Body Panel Side Rails (All Models see Figure 20-6).

(1) Insert flexible wand tool as far as possible toward rear of the vehicle at points (A) on left and right of vehicle. Spray in all directions while slowly withdrawing tool.

(2) Insert flexible wand tool as far as possible toward front of vehicle at points (B) on left and right of vehicle. Spray in all directions while slowly withdrawing tool.

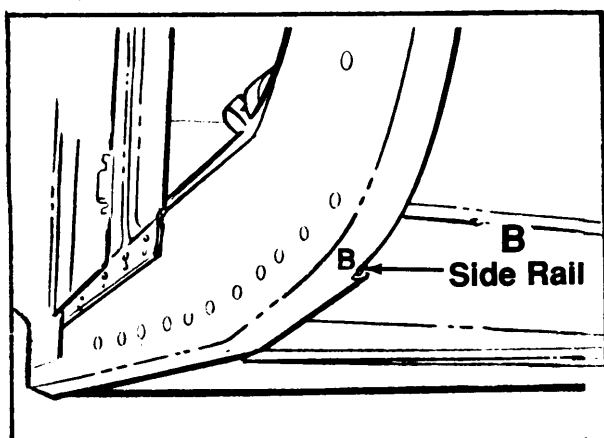
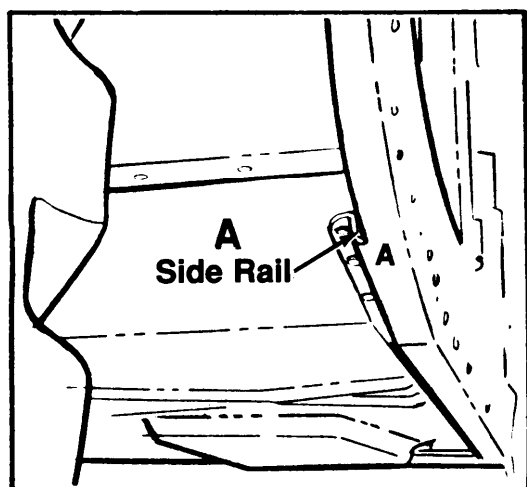


Figure 20-6. Body Panel Side Rails.

e. Rustproofing Floorboards and Battery Boxes (All Models except Ambulances; see Figure 20-7).

(1) Using flexible wand tool, spray all floorboards including stowage and battery box tray areas.

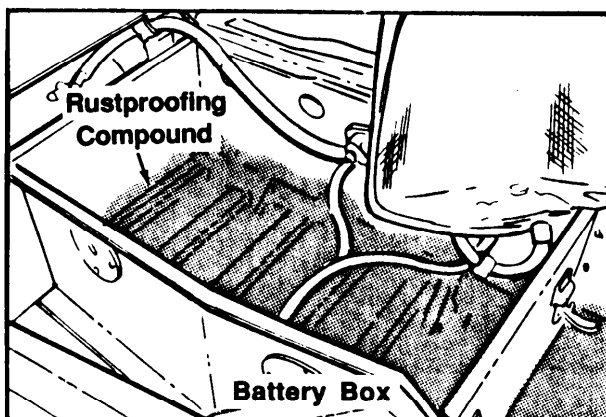
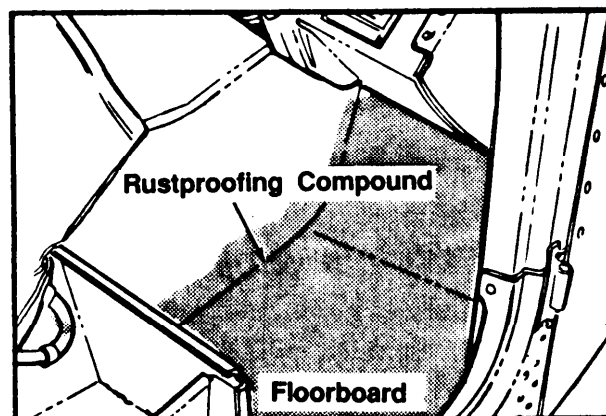


Figure 20-7. Rustproofing Floorboards and Battery Boxes.

f. Rustproofing Tailgate (All Models; see Figure 20-8).

(1) Insert rigid wand assembly tool into hole A then B as far as possible and spray in all directions. Using directional handle, rotate (in a circular manner) while slowly withdrawing tool.

NOTE

Leave tailgate in horizontal position for 24 hours.

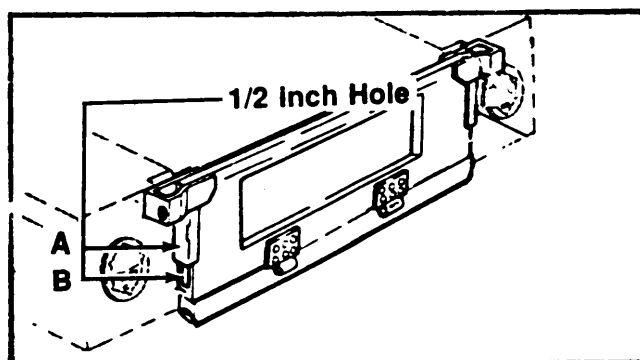


Figure 20-8. Rustproofing Tailgate.

g. *Rustproofing Cargo Shell Door (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-9).*

NOTE

Cover Four Latch Mechanisms Before Rustproofing

(1) Insert flexible tool and rustproof through openings A, B, C, D, E., F, and G.. Spray in all directions while slowly withdrawing tool.

(2) Insert flexible tool into two channels behind door insulation. Spray in all directions while slowly withdrawing tool.

(3) Spray Cargo Shell Door seal protectors,

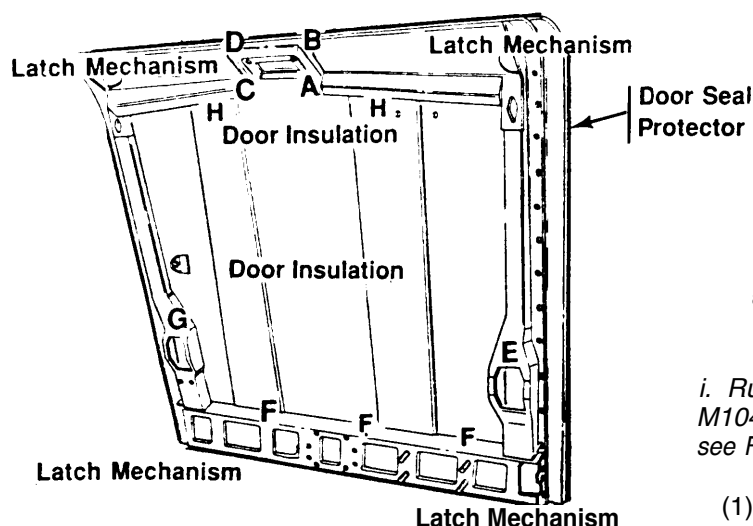


Figure 20-9. Rustproofing Cargo Shell Door (M996, M1046, M1036, M1025, M1026, M1043 and M1044 Models).

h. *Rustproofing Roof Seams, Channels and Support Tubes (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-10).*

CAUTION

Tape Openings in Channels Before Applying Rustproofing Compound

(1) Insert flexible tool into hole A and spray in all directions.

(2) Insert flexible wand tool into Support Tube as far as possible at point (B). Spray in all directions while slowly withdrawing tool. (Repeat on Passenger's Side).

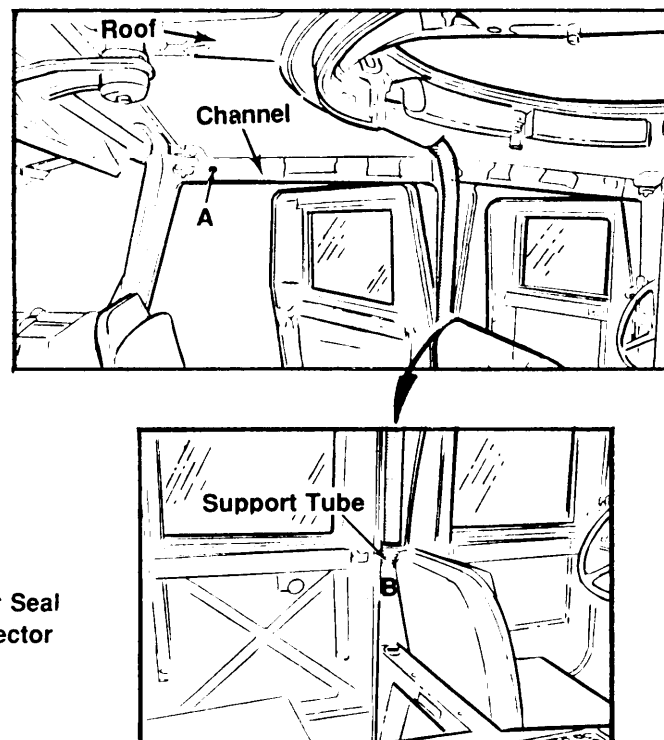


Figure 20-10. Rustproofing Roof Seams, Channels and Support Tubes (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models).

i. *Rustproofing Armament Pintle (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-11).*

(1) Using flexible tool, spray in three holes A.

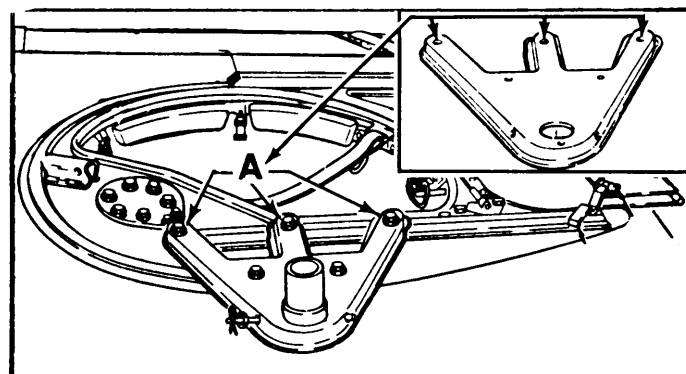


Figure 20-11. Rustproofing Armament Pintle (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models).

j. *Rustproofing Weapon Station Tray Assembly (Topside) (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-12).*

(1). Insert flexible tool into holes A, B, C, D and E. Spray in all directions while slowly withdrawing tool,

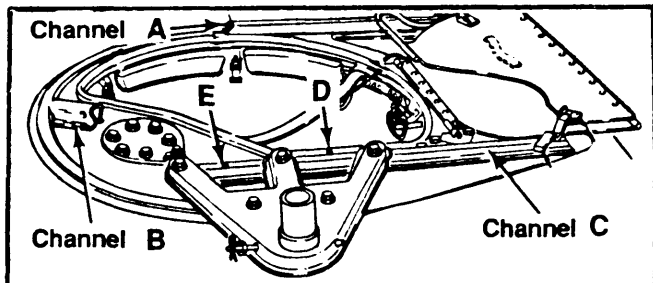


Figure 20-12. Rustproofing Weapon Station Tray Assembly (Topside) (M996, M1036, M1046, M1025, M1026, M1043, and M1044).

k. *Rustproofing Cargo Shell Assemblies (M996, M1036, M1046, M1025, M1026, M1043 and M1044 Models see Figure 20-13).*

NOTE

Cargo Shell Door Should Be Opened

(1) Using flexible tool, coat back, side pannels and all seams of Cargo Shell Mounting Components.

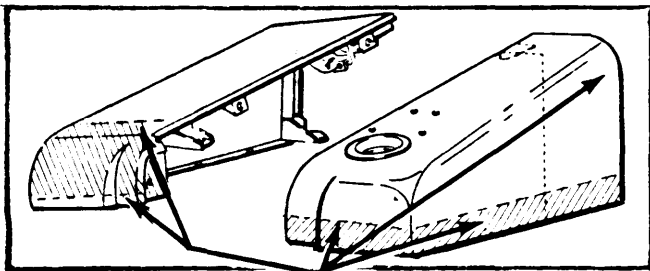


Figure 20-13. Rustproofing Cargo Shell Assemblies (M996, M1036, M1046, M1025, M1026, M1043, and M1044).

l. *Rustproofing Headlight Shield Deflectors see Figure 20-14).*

(1). Spray both sides of Headlight Shield Deflector.

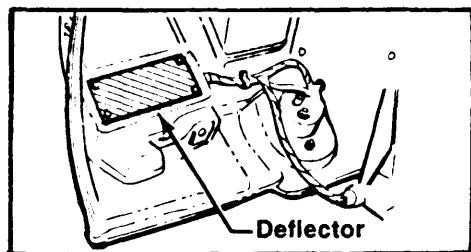


Figure 20-14. Rustproofing Headlight Shield Deflectors

20-5. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely covered.

(1) Check seams, welds, corners and boxed areas to ensure they are adequately covered.

(2) Check wet film thickness with a wet film thickness gage (see Figure 20-15). A wet film thickness of 10 mils is required. In area where a wet film thickness cannot be obtained or where wet thickness cannot be measured, inspect for completeness of coverage.

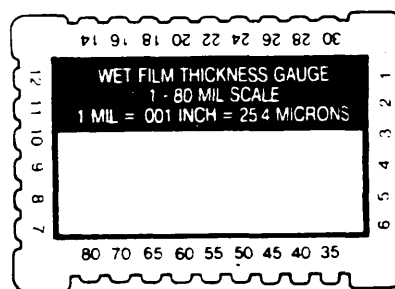


Figure 20-15. Wet Film Thickness Gage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see **CAUTION**, paragraph 20-4).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

20-6. Component Installation.

Install all components that were removed in paragraph 20-1 (see TM 9-2320-280-20 and TM 9-2320-280-34).

CHAPTER 21

1/4-TON TRAILER: M416 SERIES

Section I. CLEANING PROCEDURES

21-1. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the framerail structures thoroughly to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section II. RUSTPROOFING PROCEDURES

21-2. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, rubber bump stops, brakedrums, brake backing plates, parking brake linkage, tires, and electrical components. Cover all areas with paper where necessary.

NOTE

There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If

needed, the vehicle can be resprayed to reach proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Underbody (see Figure 21-1).*

(1) Use short rigid tool to completely cover the trailer underbody, including all open areas.

(2) Use 90 degree short tool to completely cover the inside of the trailer fenders.

(3) Insert long rigid tool into the front of the closed section of the drawbar as far as possible, then slowly withdraw tool while spraying.

(4) Use short rigid tool to completely cover the inside portions of all siderails and crossmembers.

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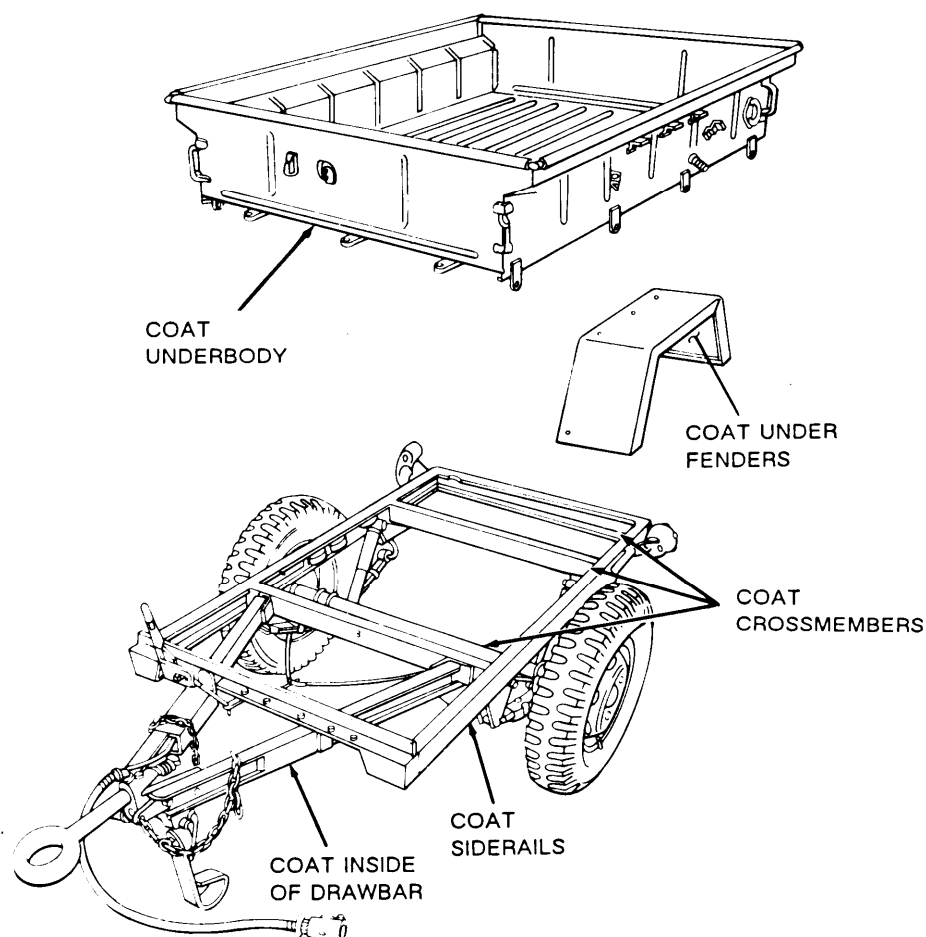


Figure 21-1. Rustproofing Underbody.

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21-3. Rustproofing Inspection.

Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

a. Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

b. Check wet film thickness with a wet film thickness gage (see Figure 21-2). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

c. Check vehicle to ensure that no compound has been applied to prohibited areas (see **CAUTION**, paragraph 21-2).

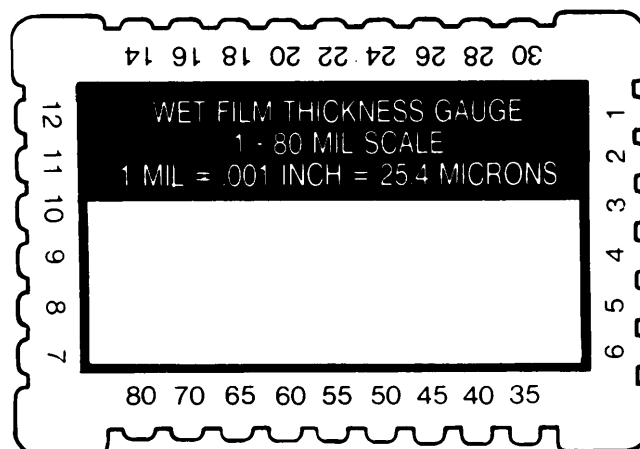


Figure 21-2. Film Thickness Gage.

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CHAPTER 22

3/4-TON TRAILER: M101 SERIES

Section I. DRILLING AND CLEANING PROCEDURES

22-1. Drilling Procedures.

NOTE

- Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.
- The M101 Series Trailer discussed in this chapter is illustrated in Figure 22-1.

a. *General.* Refer to paragraph 3-15 for general drilling instructions.

b. *Drilling Frame* (see Figure 22-2). Drill three holes A in center framerail. The first hole is drilled in a centered position. The other two holes are drilled 6 inches (15.2 cm) from the outside of the framerails.

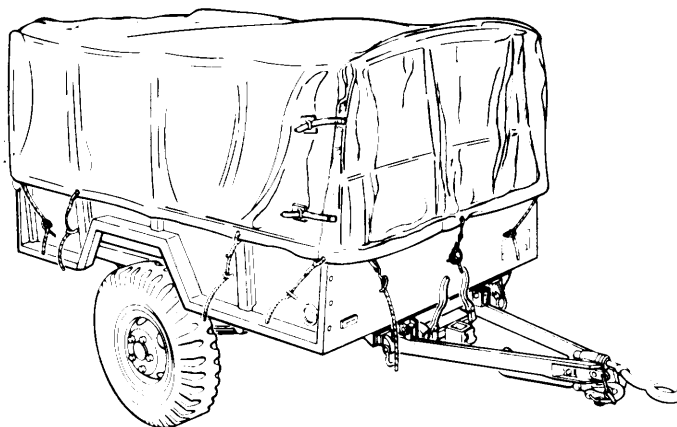


Figure 22-1. M101 3/4-Ton Trailer.

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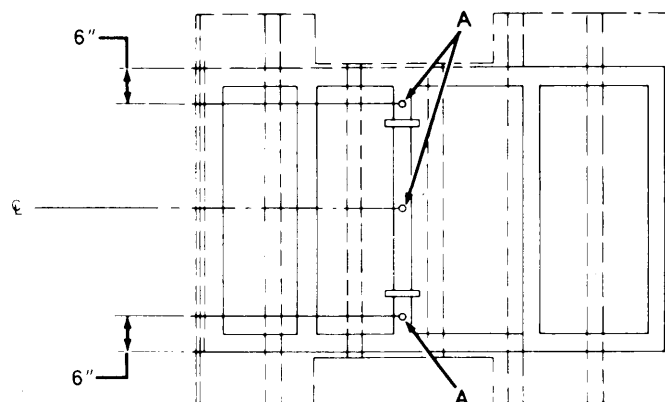


Figure 22-2. Drilling Frame.

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c. *Drilling Body Support Channels* (see Figure 22-3). Drill six holes A in underbody. Holes are drilled on each end of channels 1, 2, and 5 at a distance of 2 inches (5.1 cm) from the ends. Louver holes to allow easy access to rustproofing tool.

d. *Drilling Tailgate* (see Figure 22-4). Drill two holes A in each tailgate vertical stiffener. The first hole is drilled 6 inches (15.2 cm) from the top. The second hole is drilled 6 inches (15.2 cm) below the first hole.

22-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury

could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

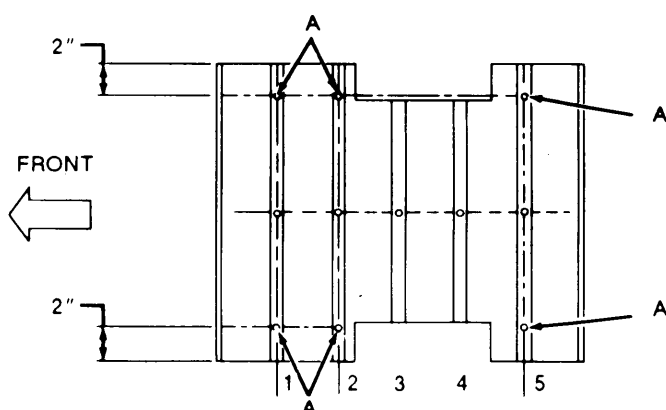


Figure 22-3. Drilling Body Support Channels.

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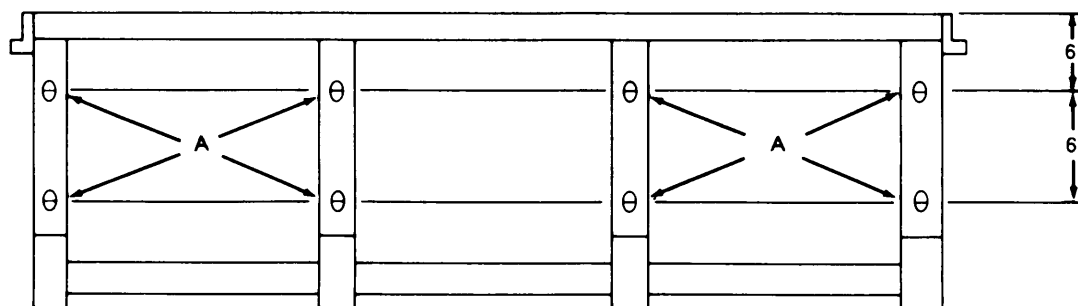


Figure 22-4. Drilling Tailgate.

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Section II. RUSTPROOFING PROCEDURES

22-3. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, rubber bump stops, brake drums, brake backing plates, parking brake linkage, tires, or electrical components. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific trailer items, refer to Figure 22-5 through Figure 22-8.

a. Dry Film Thickness Requirements. A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

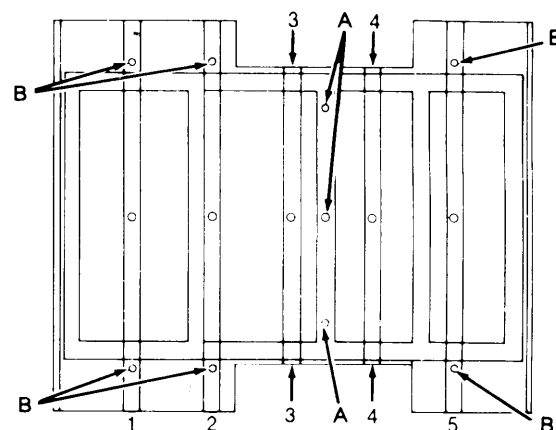
b. Spraying Pressure. The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. Rustproofing Underbody (see Figure 22-5).

(1) Insert 90 degree short tool into center framerail holes A and spray in all directions.

(2) Insert flexible tool into body support channel holes B as far as possible, then withdraw tool slowly while spraying.

(3) Insert flexible tool into both ends of body channels 3 and 4 as far as possible, then withdraw tool slowly while spraying.



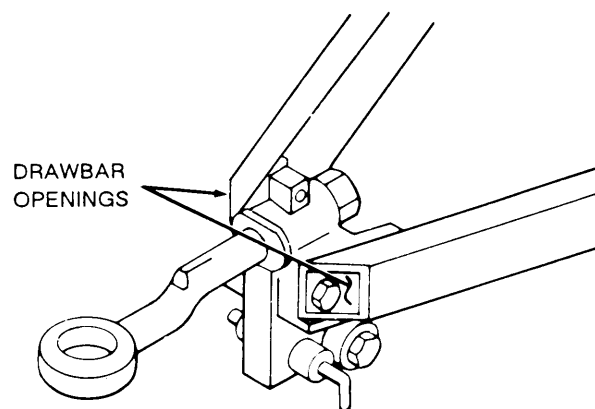
TA504948

Figure 22-5. Rustproofing Underbody.

(4) Use short rigid tool to cover the entire underbody.

(5) Use 90 degree short tool to cover all inaccessible areas. These areas include under fenders, inside open frame and body channels.

d. Rustproofing Drawbars (see Figure 22-6). Insert flexible tool as far as possible into front of the drawbar openings, then withdraw tool slowly while spraying.



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Figure 22-6. Rustproofing Drawbars.

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e. Rustproofing Tailgate (see Figure 22-7).

(1) Insert 90 degree short tool into vertical stiffener holes A and spray in all directions. Plug holes.

(2) Insert flexible tool into hole B on the right and left side of the bottom horizontal stiffener as far as possible, then withdraw tool slowly while spraying.

(3) Use the 90 degree short tool to completely cover the underside of the upper horizontal stiffener.

f. Rustproofing Rubrails and Stake Pockets (see Figure 22-8).

(1) Insert long rigid tool into the stake pockets

as far as possible, then withdraw tool slowly while spraying.

(2) Use 90 degree short tool to completely cover the undersides of the rubrails.

22-4. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

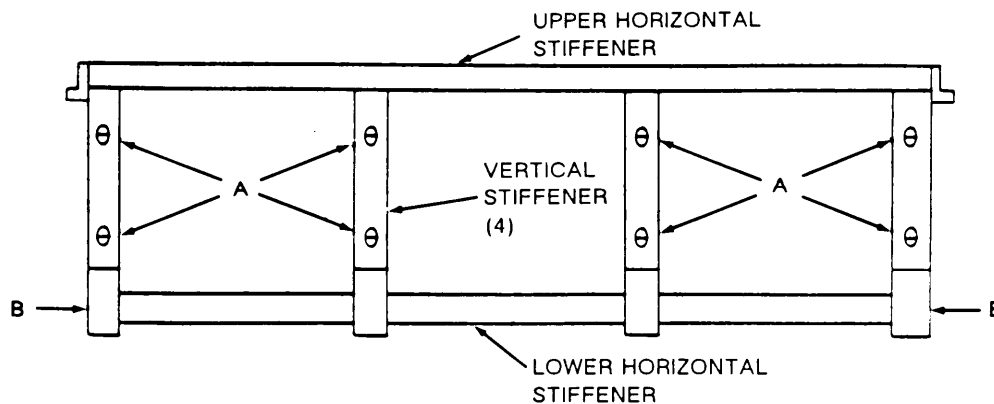


Figure 22-7. Rustproofing Tailgate.

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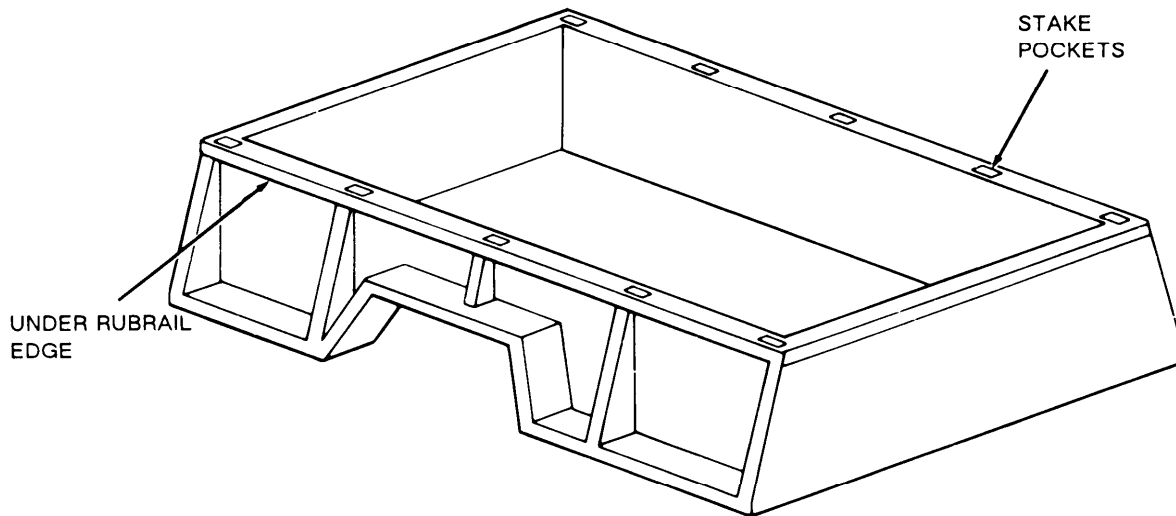


Figure 22-8. Rustproofing Rubrails and Stake Pockets.

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(2) Check wet film thickness with a wet film thickness gage (see Figure 22-9). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 22-3).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.

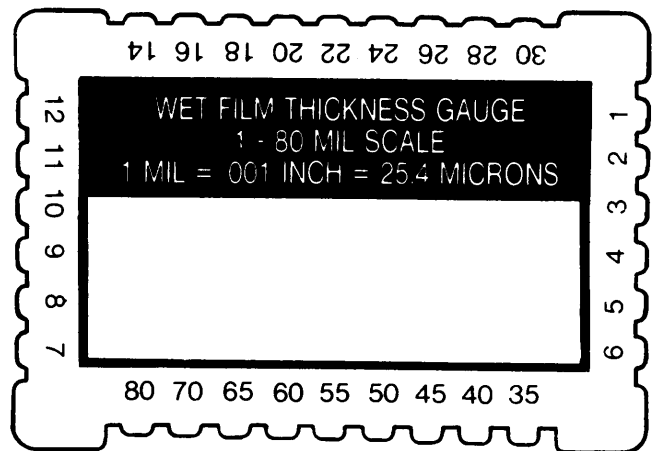


Figure 22-9. *Film Thickness Gage.* TA504789

CHAPTER 23

1 1/2-TON CARGO TRAILER: M105 SERIES

Section I. DRILLING AND CLEANING PROCEDURES

23-1. Drilling Procedures.

NOTE

- Unless otherwise indicated, all holes should be sight drilled and should be 1/2 inch (1.3 cm) in diameter.
- The M105 Series Cargo Trailer discussed in this chapter is illustrated in Figure 22-1.

a. General. Refer to paragraph 3-15 for general drilling instructions.

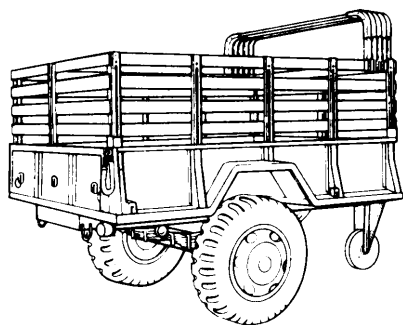


Figure 23-1. M105 Cargo Trailer. TA504952

b, Drilling Underbody (see Figure 23-2). Drill two holes A in each body support channels 1, 2, 3, 4, 9, 10, and 11. The holes are drilled 6 inches (15.2 cm) from the ends of the channels. Louver holes to allow easy entry of tools.

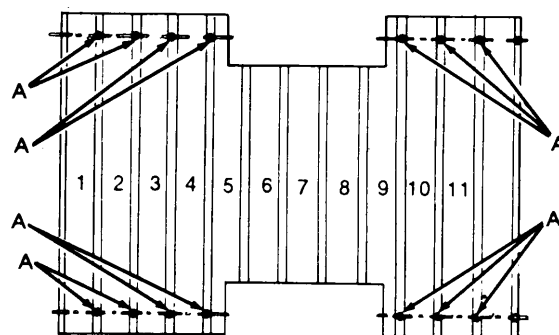


Figure 23-2. Underbody. TA504953

c. Drilling Tailgate (see Figure 23-3). Drill seven holes in tailgate:

- (1) Two holes A are drilled at each end of the upper horizontal stiffener.
- (2) Two holes B are drilled at each end of the center horizontal stiffener.
- (3) Three holes C are drilled in the bottom of each section of the hinge rod channel.

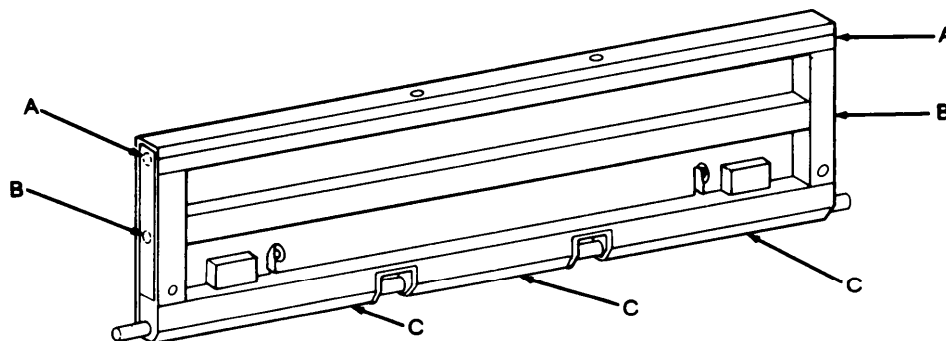


Figure 23-3. Drilling Tailgate. TA504954

23-2. Cleaning Procedures.

WARNING

When cleaning, water may be discharged in excess of 1200 psi (8274 kPa) from high pressure water equipment. Serious injury could result. Eye protection must be worn to prevent injury.

CAUTION

Steam cleaning will not be used.

a. Wash the interior of structures through drilled access holes to remove mud, dirt, and rust. Use of a high pressure washer will facilitate this operation. Observe the water flushed through the rails to determine when it is clean.

b. Allow at least four hours for vehicle drying. Additional drying time may be required if unfavorable weather conditions exist. Compressed air may be used to speed up the drying process.

c. Prime and paint those areas showing bare metal. Allow painted areas time to dry before rustproofing.

Section II. RUSTPROOFING PROCEDURES

23-3. Rustproofing Procedures.

CAUTION

Do not spray any portion of moving components, rubber bump stops, brake drums, brake backing plates, parking brake linkage, tires, or electrical components. Cover all areas with paper where necessary.

NOTE

- There are areas where a 10 mil wet film thickness cannot be obtained without wasting a large amount of compound. In those areas, complete coverage of the surface area is necessary at whatever thickness is obtainable.
- For rustproofing procedures of specific cargo trailer items, refer to Figure 23-2 through Figure 23-5.

a. *Dry Film Thickness Requirements.* A five mil dry film thickness is required for adequate rustproofing protection. A 10 mil wet film thickness is required to obtain a minimum five mil dry film thickness. If needed, the vehicle can be resprayed to reach proper thickness.

b. *Spraying Pressure.* The rustproofing compound should be applied to sheet metal and structural members in even coats. Spraying pressure should be as

low as possible while maintaining an even spray pattern. An acceptable starting point is 40 psi (276 kPa), but adjustments may have to be made due to temperature changes and differences in rustproofing compound. Using too much pressure will waste compound by causing overspray and excessively thick coatings.

c. *Rustproofing Underbody (see Figure 23-2).*

(1) Insert flexible tool as far as possible into all body support channel holes A. Spray while slowly withdrawing the tool.

(2) Insert flexible tool into the ends of body support channels 5, 6, 7, and 8 as far as possible, then slowly withdraw tool while spraying.

(3) Use short rigid tool to completely cover the underbody.

(4) Use the 90 degree short tool with the cone-spray tip to cover all inaccessible areas. These areas include inside of frame channels and fenders.

d. *Rustproofing Tailgate (see Figure 23-4)*

(1) Insert long rigid tool into holes A and B of the tailgate horizontal stiffeners as far as possible, then slowly withdraw tool while spraying.

(2) Insert 90 degree short tool into holes A and B and spray in all directions.

(3) Insert 90 degree short tool into holes C and spray in all directions.

e. *Rustproofing Rubrails and Stake Pockets* (see Figure 23-5).

(1) Insert long rigid tool into the stake pockets

as far as possible, then withdraw tool slowly while spraying.

(2) Use 90 degree short tool to completely cover the undersides of the rubrails.

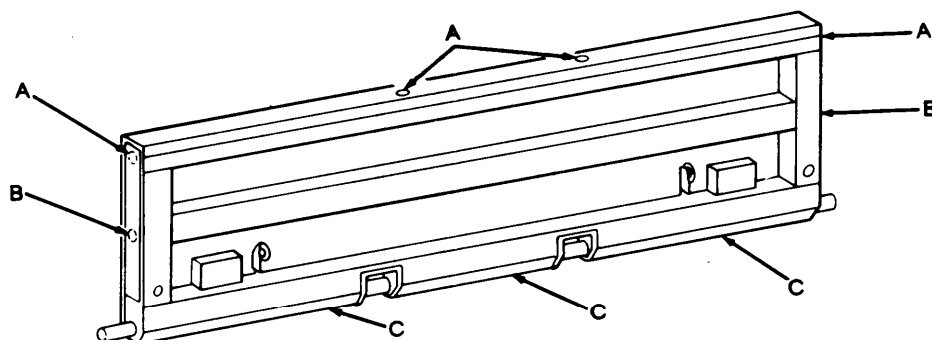


Figure 23-4. Rustproofing Tailgate.

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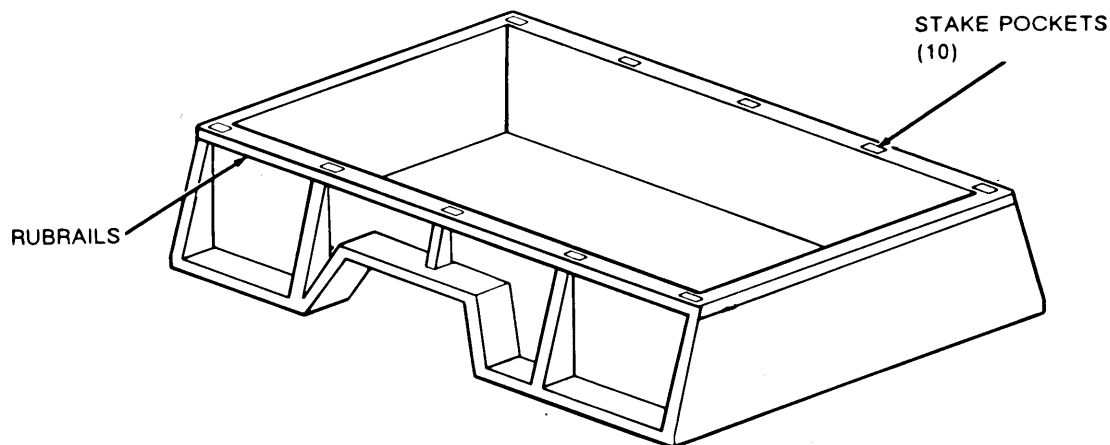


Figure 23-5. Rustproofing Rubrails and Stake Pockets.

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23-4. Rustproofing Inspection.

a. Check the vehicle to ensure that all areas requiring rustproofing compound have been properly and completely coated.

(1) Check seams, welds, corners, and boxed areas to ensure that they are adequately coated.

(2) Check wet film thickness with a wet film thickness gage (see Figure 23-6). A wet film thickness of 10 mils is required. In areas where a wet film thickness of 10 mils cannot be obtained or where thickness cannot be measured, inspect for completeness of coverage.

(3) Check all drain holes to ensure that they are open.

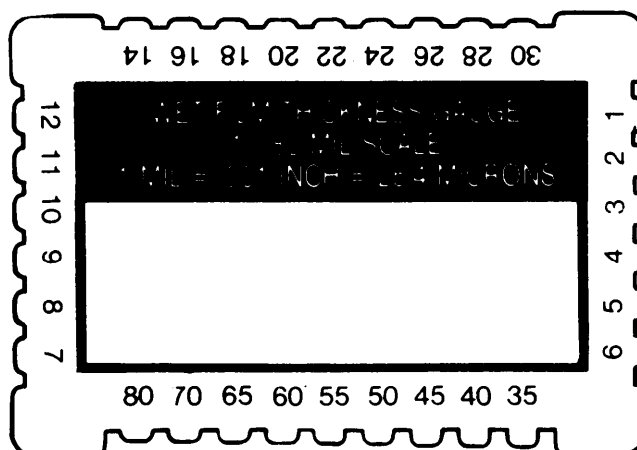
(4) Check all inspection holes and drilled access holes to ensure that compound coverage is adequate.

(5) Check vehicle to ensure that no compound has been applied to prohibited areas (see CAUTION, paragraph 23-3).

NOTE

Plugging of access holes may be delayed until after vehicle inspection, if inspection occurs immediately after rustproofing. If inspection is delayed too long, rustproofing compound may drip from access holes.

b. Plug access holes.



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Figure 23-6. Film Thickness Gage.

APPENDIX A REFERENCES

A-1. Scope.

a. This appendix lists all forms, technical manuals, field manuals, technical bulletins, policy statements, regulations, and specifications referenced in this technical bulletin.

b. Paragraph A-5 provides a list of related specifications not directly cited in the text. This additional list is provided for the information and record of facilities procuring rustproofing services or establishing a rustproofing operation.

c. This appendix excludes specific vehicle TM references found within the individual rustproofing procedures. Such references are for purposes of component removal and installation only. As such, they are not specifically related to the subject matter of this technical bulletin.

A-2. Forms.

Product Quality Deficiency Report	SF 368
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Recommended Changes to Publications and Blank Forms.	DA Form 2028

A-3. Related Manuals/Technical Bulletins.

Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment and Materials Handling Equipment	TB 43-0209
First Aid for Soldiers	FM 21-11
Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordinance Materiel and Related Material Including Chemicals	TM 9-247
Metal Body Repair and Related Operations	FM 43-2
Operator's Manual for Welding Theory and Application	TM 9-237
Painting Instructions for Field Use	TM 43-0139

A-4. Policies/Specifications.

Corrosion Prevention and Control (CPC)	AR 750-XXX
Materiel Deterioration Prevention and Control	AMC-R-702-24

A-5. Related Specifications.

Rust Arresting Coating (for Treatment of Rusted Metal)	MIL-R-10036E
Rustproofing of Commercial (Non-Tactical) Vehicles	FED-STD-297D

APPENDIX B CORROSION AREAS

B-1. General.

a. This appendix provides recommended vehicle wash intervals based on the severity of the corrosive environment. Shaded maps show major U.S. Army vehicle concentrations in the following locations:

- (1) Alaska.
- (2) Continental United States (CONUS).
- (3) Federal Republic of Germany (FRG).
- (4) Hawaii.
- (5) Panama.
- (6) Puerto Rico.
- (7) Republic of Korea (ROK).

b. Intervals listed in Table B-1 are the minimum recommended wash intervals. These intervals should be adjusted with regard to availability of vehicles, personnel, and washrack facilities. Washrack facilities may have seasonal limitations. However, in an effort to control and prevent corrosion, measures must be taken to keep vehicles as free of corrosive contaminants as possible,

B-2. Wash Intervals/Corrosion Areas.

Table B-1 provides recommended vehicle wash intervals based on the severity of the corrosive environment in which they operate. The severity of the corrosion areas are indicated by the maps that follow Table B-1.

NOTE

Highly corrosive environments, as indicated by the maps, include “severe” and “extremely severe” corrosive regions. A highly corrosive environment does not refer only to areas where the use of road salts or other chemical de-icers is common; high humidity areas, and/or areas with a high concentration of salt in the air are also considered to be highly corrosive.

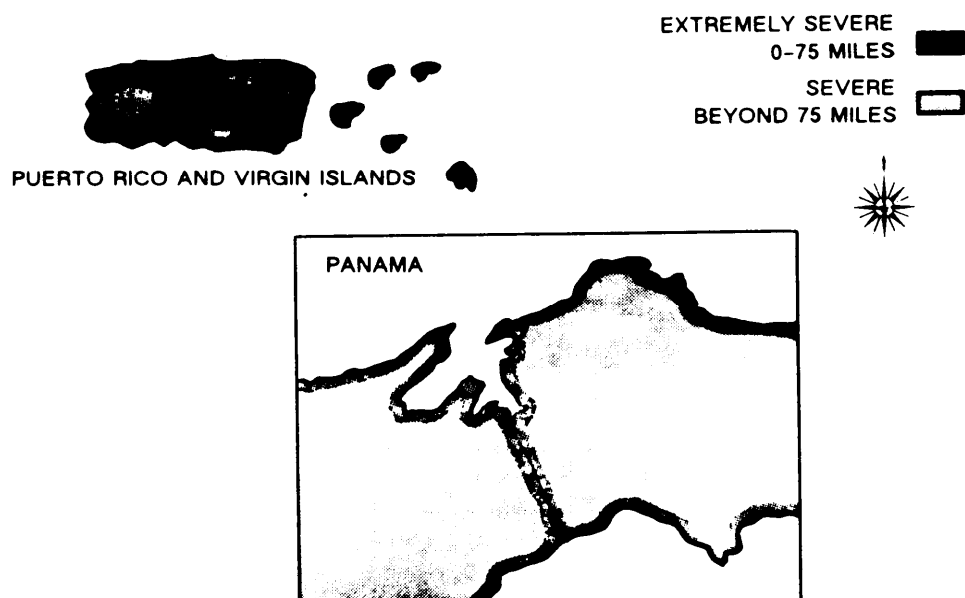
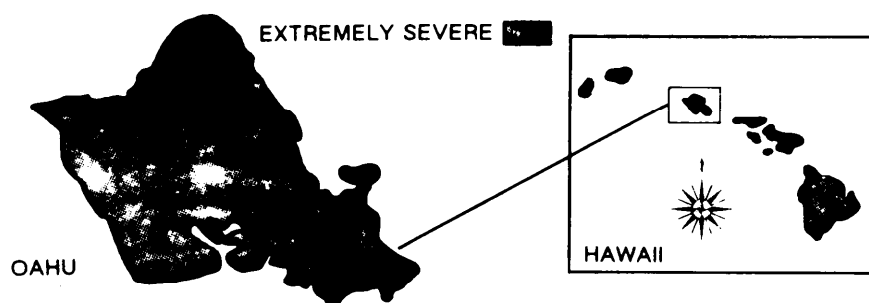
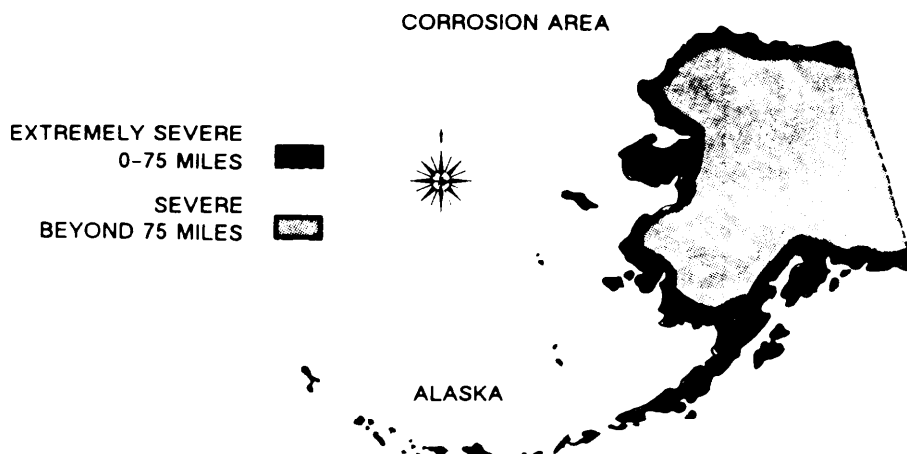
Table B-1. Recommended Wash Intervals by Severity of Corrosion Area.

Ranking	Wash Intervals
Extremely Severe*	Every 5 Days
Severe**	Every 15 Days
Moderate	Every 25 Days

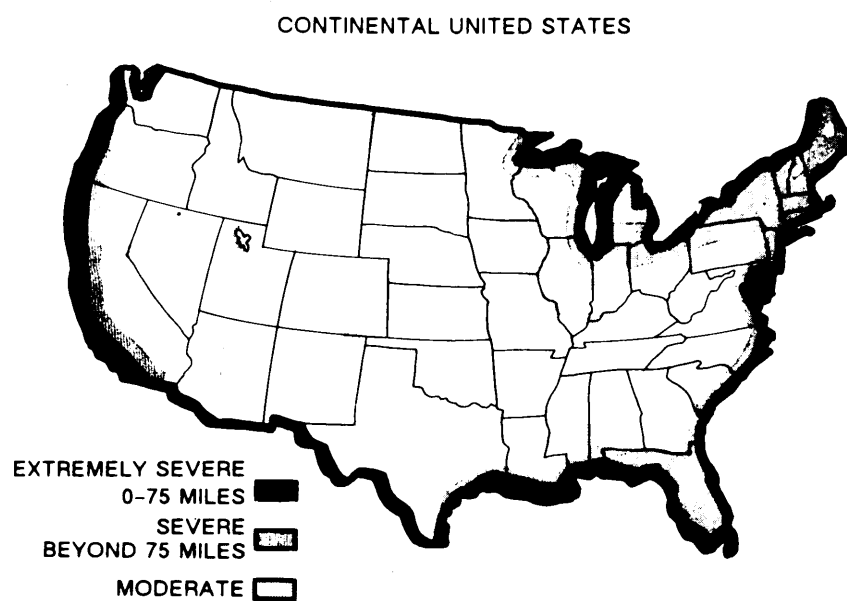
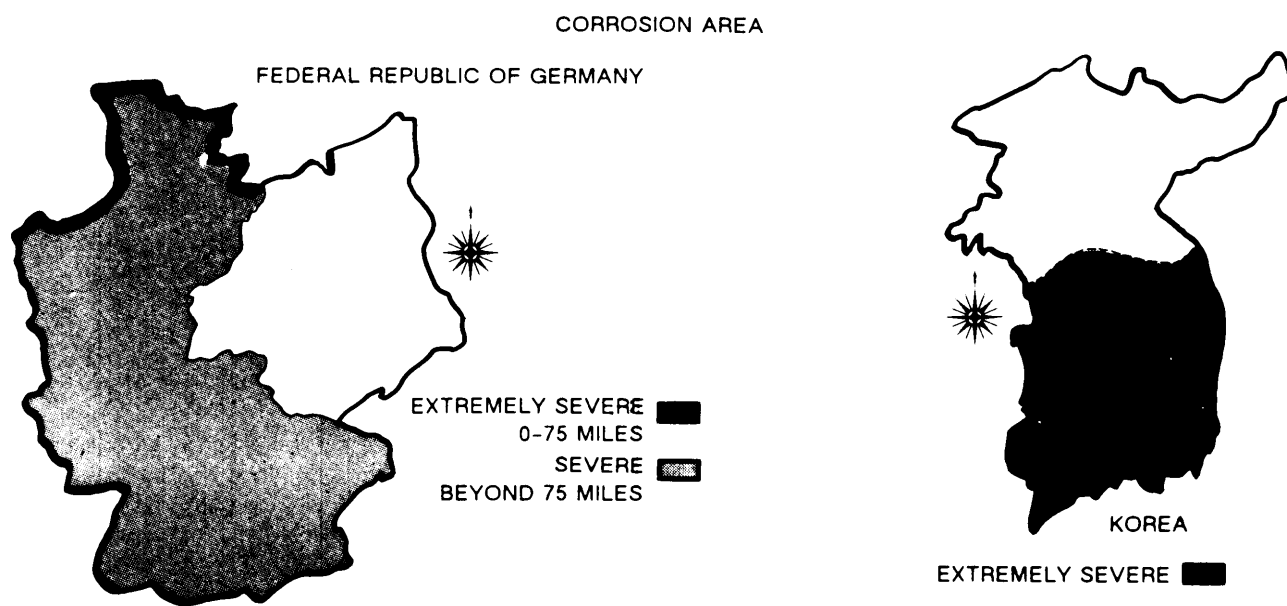
* Within 0-75 miles of coastal area.

** Beyond 75 miles from coastal area.

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APPENDIX C

RUST REPAIR PARTS/REPAIR KITS

C-1. Purpose.

This appendix provides a list in Table C-1 of vehicle components and National stock numbers to aid in the ordering of rust repair parts/repair kits.

Table C-1. Rust Repair Parts/Repair Kits.

Vehicle Series	Nomenclature	National Stock Number
1/4-Ton Truck Series	Window, Vehicular	2510-00-176-9146
	Hood, Engine Compartment	2510-00-177-7871
	Frame Section, Structural, Vehicular	2510-01-104-4383
1 1/4-Ton Gama Goat	Hood, Engine Compartment	2815-01-024-9564
	Tailgate, Vehicle Body	2510-00-088-4125
1 1/4-Ton M880 Series Trucks	Housing, Front Fender	2510-00-270-6244
	Tailgate, Vehicle Body	2510-01-033-2612
2 1/2- and 5-Ton Trucks	Cab Assembly, Motor	2510-00-417-2808'
	Body, Cargo Truck, Extra Long 20-foot Bed	2510-00-409-7971 *
	Hood, Engine Compartment	2510-00-983-6917
	Fender, Vehicular (Right)	2510-00-134-4636
	Fender, Vehicular (Left)	2510-00-134-4643
	Door, Vehicular (Right)	2510-00-737-3294
	Door, Vehicular (Left)	2510-00-737-3293
	Panel, Body, Vehicular	2510-00-400-7083
	Panel, Hood, Vehicular	2510-00-208-7535
	Running Board, Vehicular	2510-00-753-9215
Cargo Trailer Boxes	Body, Cargo Trailer (M416)	2510-01-111-7096
	Body, Cargo Trailer (M101)	2510-01-111-7095
	Body, Cargo Trailer (M105)	2510-01-111-7097

*12 Months Lead Time.

APPENDIX D

RUST REPAIR AND BODY REPLACEMENT INSTRUCTIONS FOR M151 , M718, AND M825 SERIES TRUCKS

Section I. FABRICATION OF TURNING FIXTURE AND TURNING VEHICLE OVER

D-1. Construction of Front and Rear Turning Fixtures.

a. Front Turning Fixture (see Figure D-1). Construct a front turning fixture in accordance with requirements described in Figure D-2.

b. Rear Turning Fixture (see Figure D-1). Construct a rear turning fixture in accordance with requirements described in Figure D-3.

D-2. Turning Vehicle Over.

a. Drain fuel tank, then run engine until all fuel in the carburetor and fuel lines has been expended.

b. Remove fuel tank, windshield, batteries, air filter, spare tire, and soft top. Secure the bow assembly to the body (see TM 9-2320-218-20-1-1).

c. Drain engine oil, transmission fluid, windshield washer fluid, and differential fluid from both differentials. Tap vent hole in master cylinder. Drain the steering gear box on M151 series vehicles (see TM 9-2320 - 218-20-1-2).

d. When applicable, remove the following:

(1) Extension and litter racks.

(2) Radio mounts and antennas.

(3) Machine gun mount.

(4) Crew seats (M151A1C and M825).

e. Remove front lifting eyes. Use existing hardware to install front turning fixture (see Figure D-1).

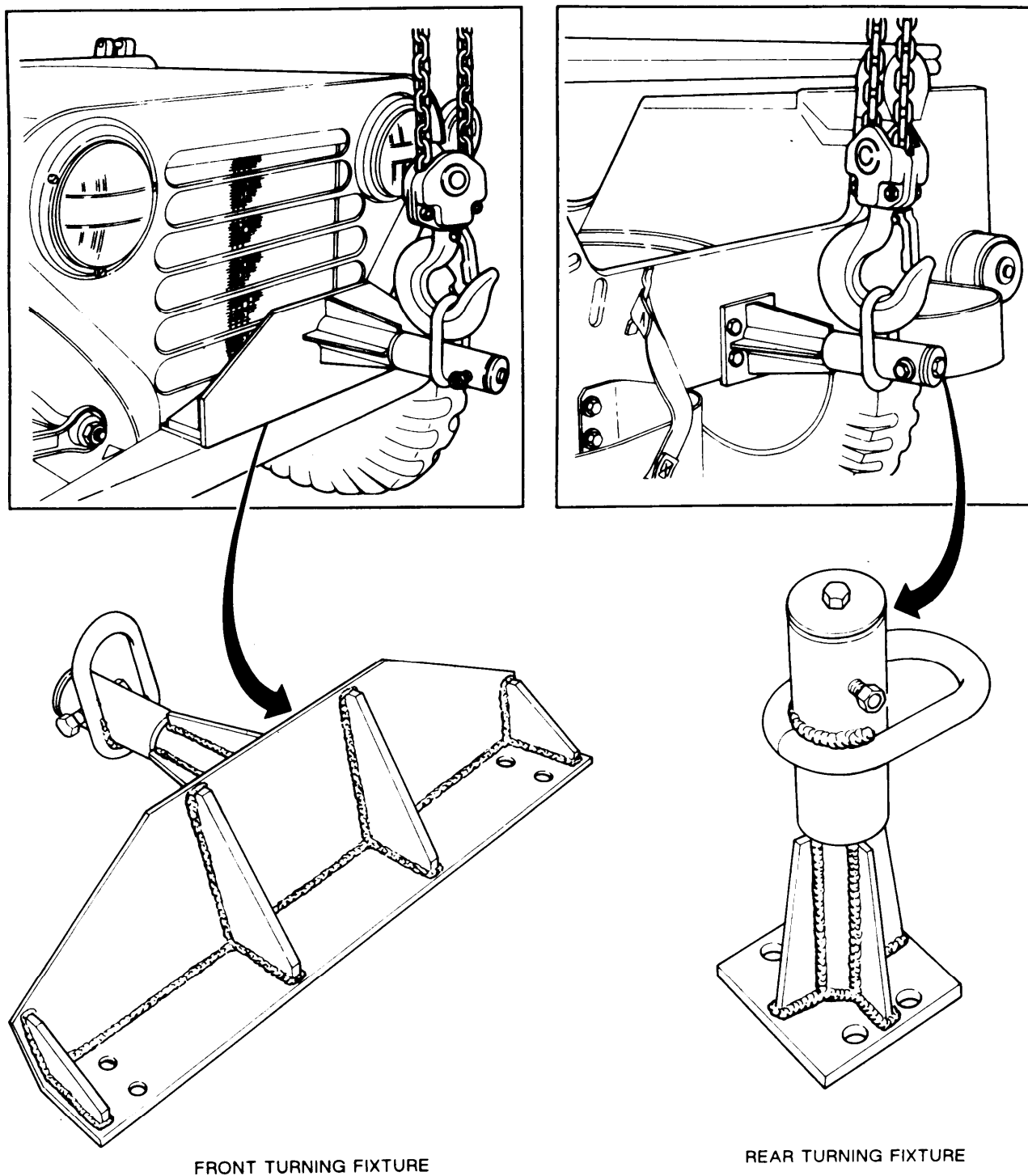
f. Remove pintle. Use existing hardware to install rear turning fixture (see Figure D-1).

g. Attach chain falls to lifting eyes of front and rear turning fixtures (see Figure D-1). Raise vehicle a minimum of 36 inches (91.4 cm) measured from floor to bottom of front and rear tires.

h. Remove retaining bolts from turning fixtures. Position four people at each corner of vehicle and rotate vehicle 180 degrees, bottom side up. Replace retaining bolts in turning fixtures.

i. Lower vehicle onto two support stands. The front support stand should be approximately 14 inches (35.6 cm) high by 40 inches (101.6 cm) long. The rear support stand should be approximately 20 inches (50.8 cm) high by 56 inches (142.2 cm) long (see Figure D-4).

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*Figure D-1. Fabricated Turning Fixtures.*

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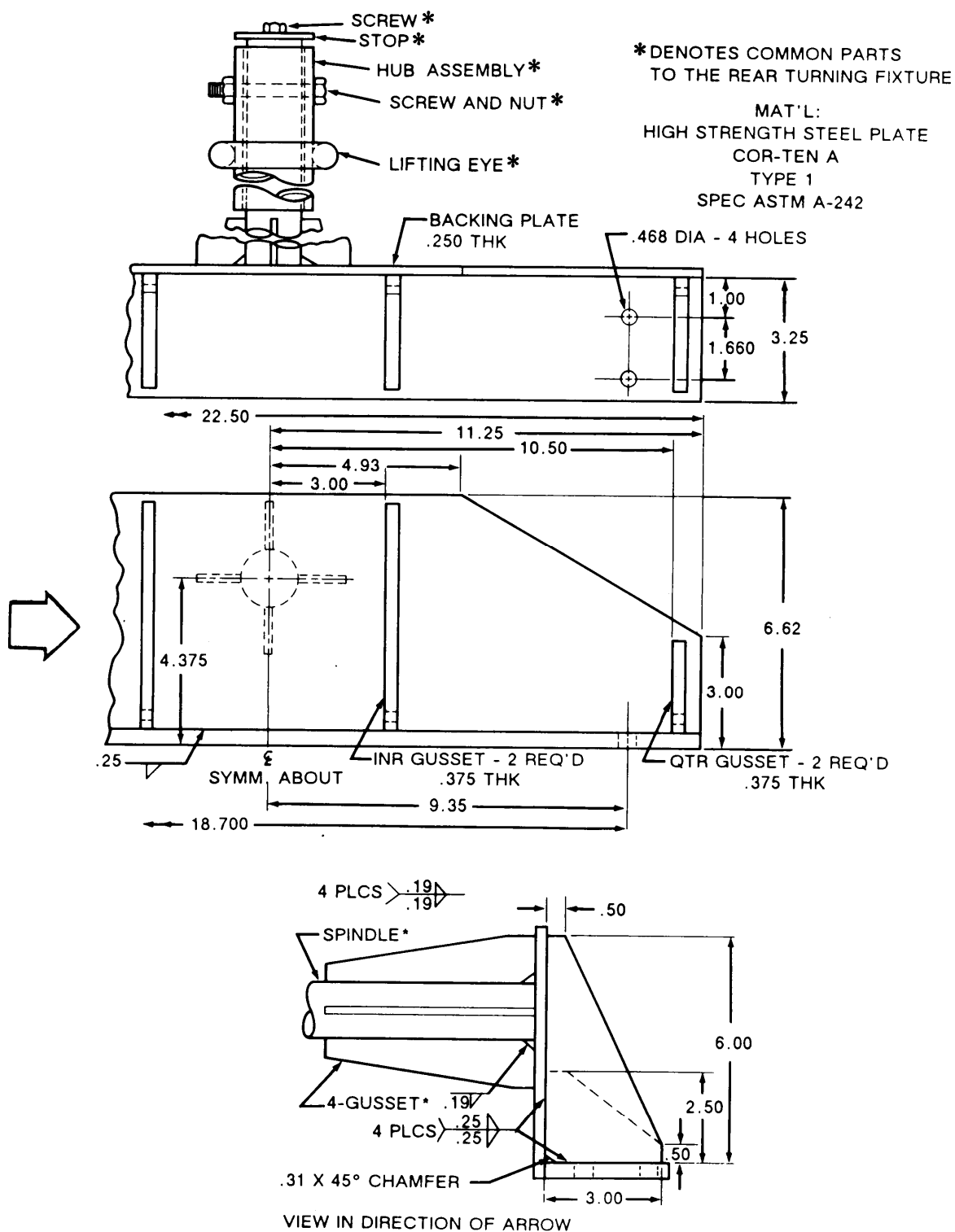


Figure D-2. Construction of Front Turning Fixture.

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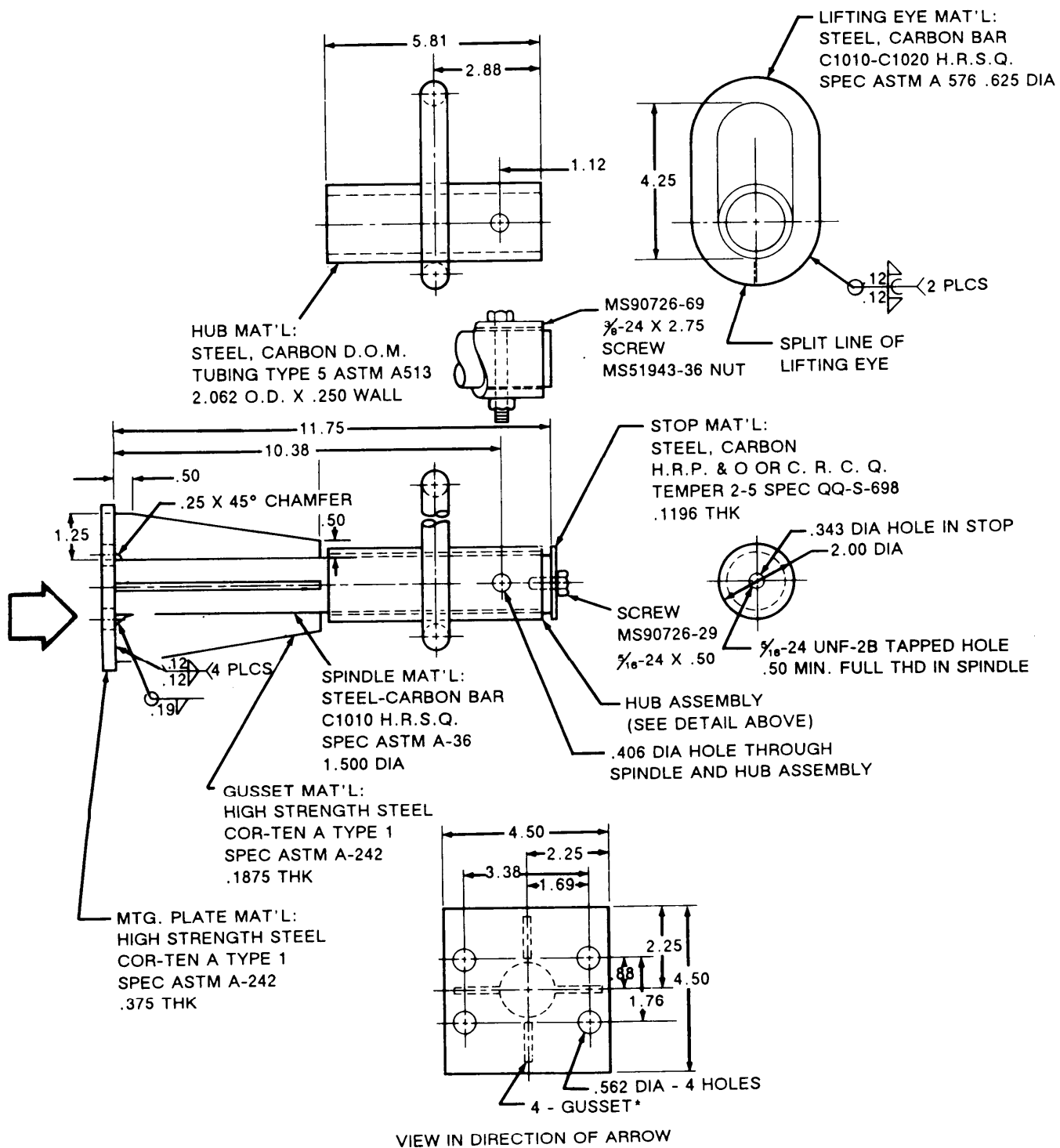


Figure D-3. Construction of Rear Turning Fixture.

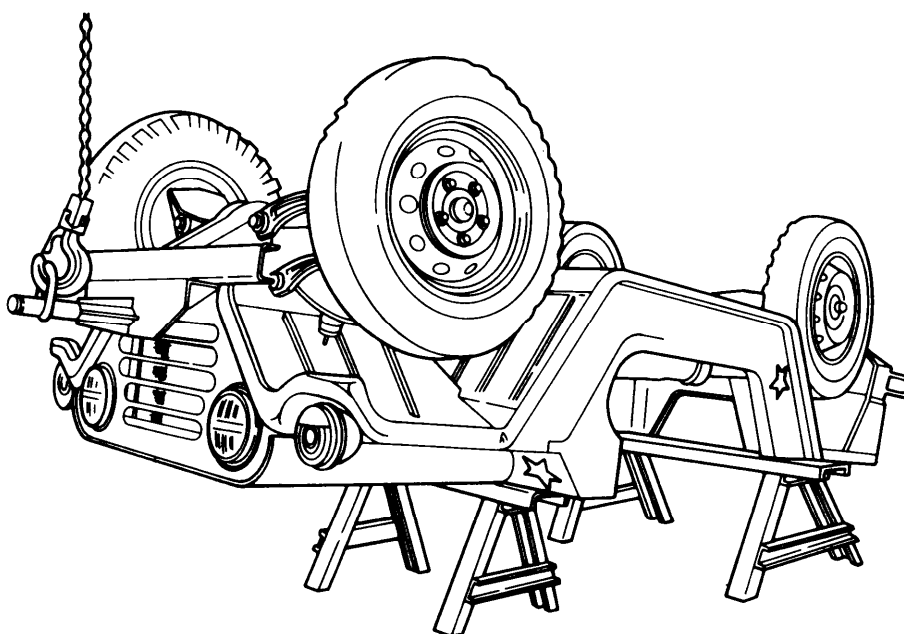


Figure D-4. Vehicle Lowered to Stand.

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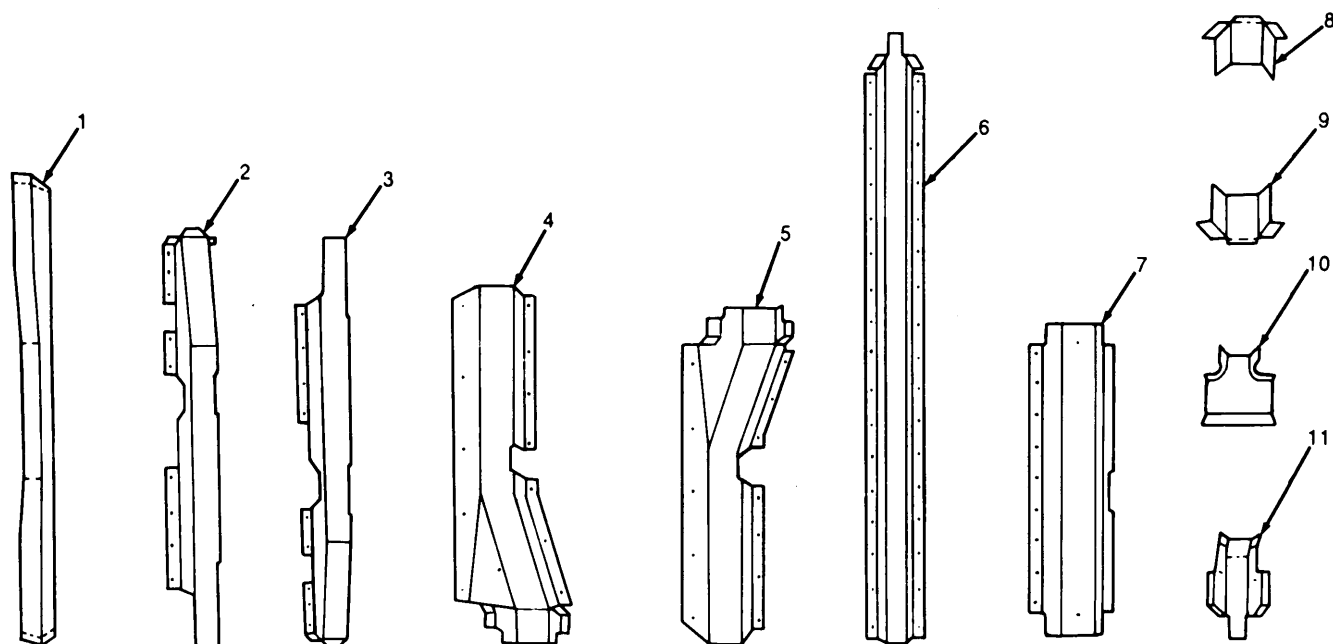
Section II. REPAIRING RUST DAMAGE

D-3. Materiel Requirements.

Table D-1 lists the underbody caps that are provided with the underbody corrosion repair kit, NSN 2510-01-104-4383 (see Figure D-5).

Table D-1. Underbody Corrosion Repair Kit.

Item	Part No.	Quantity	Description
1	12275196	1	CAP - SILL REAR CROSS CTR
2	12275197-1	1	CAP ASSY - X/MBR REAR SUSP SUPT FRT-LH
3	12275197-2	1	CAP ASSY - X/MBR REAR SUSP SUPT FRT-RH
4	12302501	1	CAP - X/MBR ENGINE REAR SUPT-LH
5	12302500	1	CAP - X/MBR ENGINE REAR SUPT-RH
6	12275199	2	CAP - RAIL OUTER CENTER
7	12275198	1	CAP - X/MBR ENGINE REAR SUPT CENTER
8	12275194-1	1	EXT CAP X/MBR ENGINE REAR SUPT-LH
9	12275194-2	1	EXT CAP X/MBR ENGINE REAR SUPT-RH
10	12275193	2	EXT - RAIL OUTER CENTER TO CAP X/MBR ENGINE REAR SUPT
11	12275195	2	E)(T - RAIL OUTER CENTER TO CAP X/MBR REAR SUSP SUPT FRT

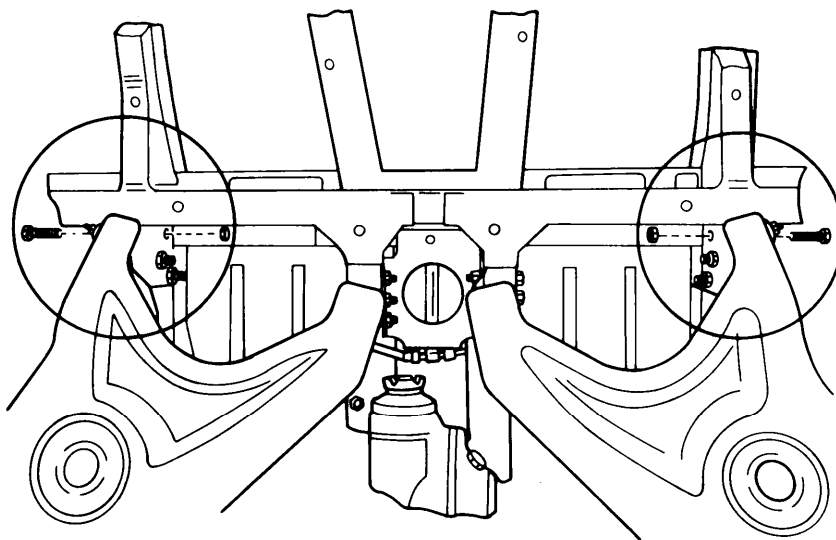


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Figure D-5. Caps (M151 Underbody Repair Kit).

D-4. Underbody Component Removal.

- a. Remove rear drive shaft. Then remove rear exhaust system from muffler and underbody (see TM 9-2320-218-20-1-1).
- b. Remove two rear control arm bolts (see Figure D-6).



TA504964

Figure D-6. Removing Control Arm Bolts.

D-5. Inspection of Underbody.

NOTE

- . Corrosion damage in areas marked X is repairable if caps supplied for those areas cover rusted-out sections, and plug weld holes are located over solid metal.
- . To repair rust damaged vehicles in areas marked X, order body replacement kit #B1230250-6 (M151A2 only).

a. Inspect underside of vehicle for corrosion damage (see Figure D-7). Pay special attention to areas marked X, in which corrosion commonly occurs. These areas are critical, high-load areas. Excessive corrosion damage in these areas (corrosion which has penetrated entirely through metal) will render a vehicle nonrepairable.

NOTE

Body patches can be welded to body to accomplish repair. The resultant patch must, however, be as strong or stronger than the original material it is replacing,

b. Probe underside of vehicle with a punch and hammer, Locate badly corroded areas, and determine if vehicle meets required criteria for repair.

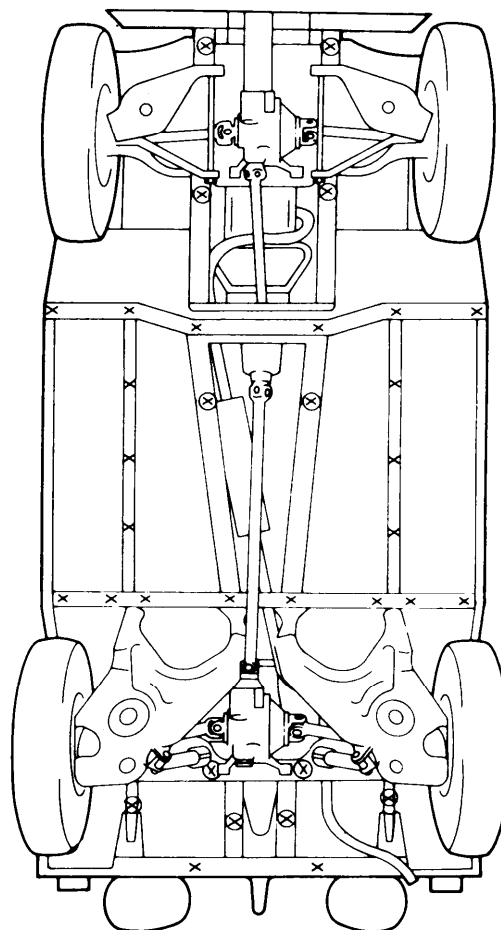


Figure D-7. Underbody.

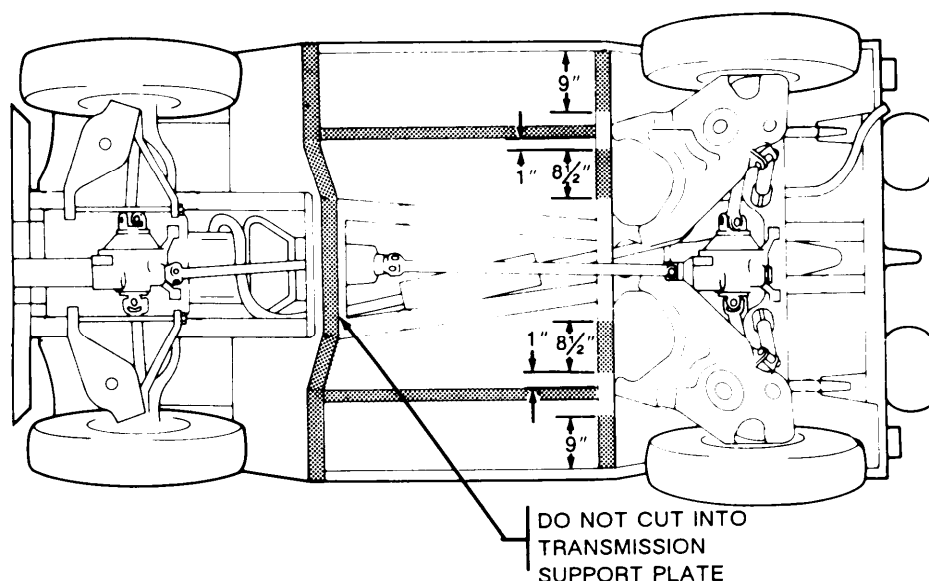
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CAUTION**Do not cut into transmission support plate.**

c. Use a cutting wheel or torch to remove all crossmember sections from the underbody (see shaded areas in Figure D-8).

d. Repair all rusted-out areas to seal underbody structures and to prepare for installation of underbody caps. Use metal patches and welding techniques described in FM 43-2 and TM 9-237. For MIG welding, use Mill Model 10A, or equivalent, set at 30.5 open circuit volts and 5½-inches (14.0 cm) feed with 1/16 inch (0.80 mm) diameter wire. When electric arc welding, use 1/8-inch (2.4 mm) AWS7018 rods per MIL-E-222000/1,

e. Use a wire wheel or equivalent to remove all paint, rust, and other foreign matter from underbody structure in areas where plug welding and fillet welding will take place.



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Figure D-8. Crossmember Removal.

f. Rust repair to crossmembers requires the use of the underbody corrosion repair kit, NSN 2510-01-104-4384 (see Figure D-9).

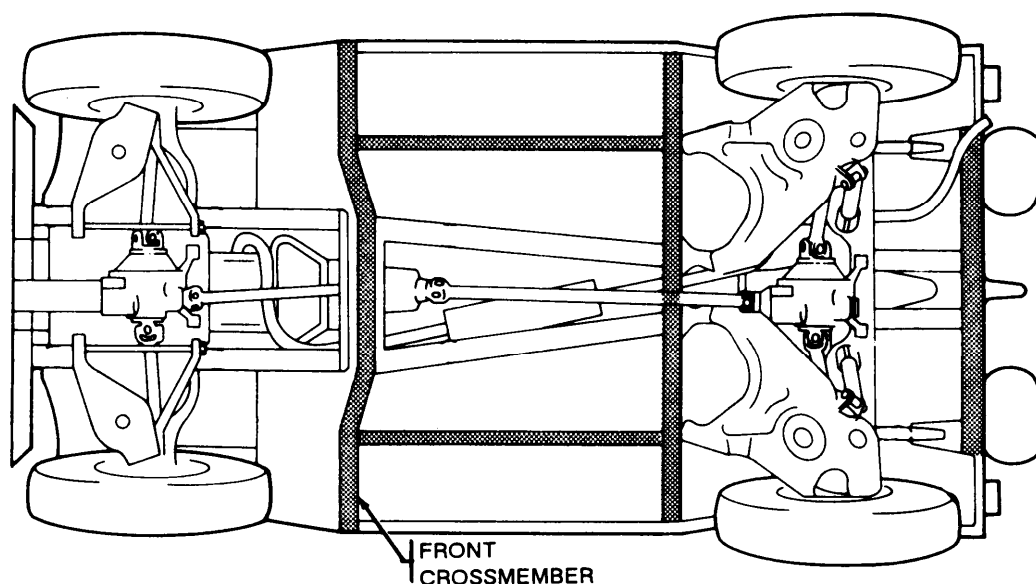


Figure D-9. Corrosion Repair Kit (NSN 2510-01-104-4383).

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g. Rust repair to secondary crossmembers requires the use of the body replacement kit, NSN 2510-01-194-4384 (see Figure D-10).

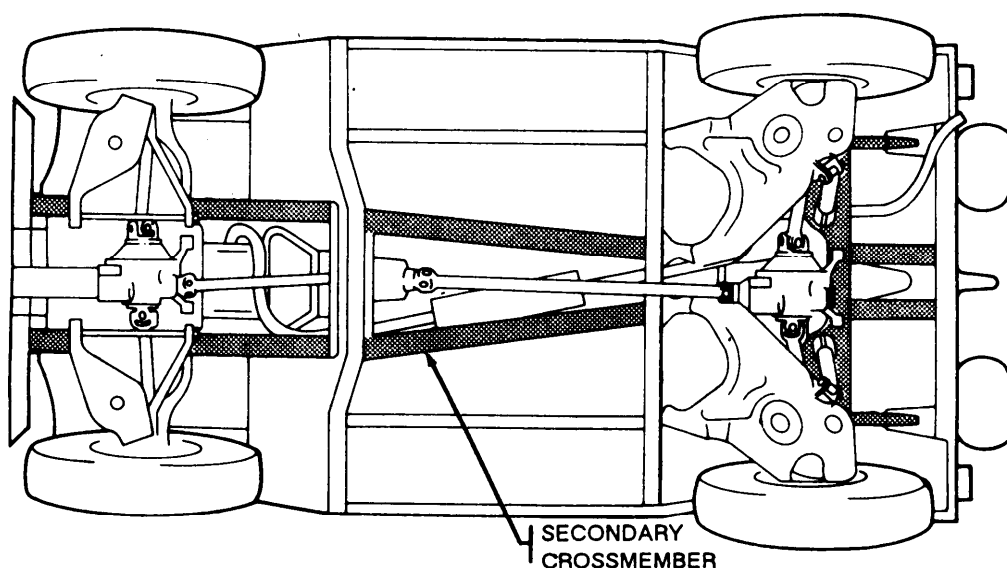


Figure D-10. Body Replacement Kit (NSN 2510-01-104-4384).

D-6. Underbody Cap Modifications.

a. Cutoff 1 inch (2.5 cm) of material from each end of rear cross sill cap, for M151A2 series vehicle application (see Item 1 of Figure D-5). Place underbody cap over rear cross sill and cut out a recess in cap to accommodate rear tail pipe hanger bracket. Ensure that clearance holes for ear bumperette attaching bolts are centered properly.

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b. Modify underbody cap when they are to be installed on M151A2 series vehicles (see Figure D-11).

c. Further modifications to the rear cross sill cap (Item 1 of Figure D-5) and the underbody caps (Items 2 and 3 of Figure D-5) may be necessary to permit proper installation on the M151A1 and M151A2 vehicles (see Figure D-12).

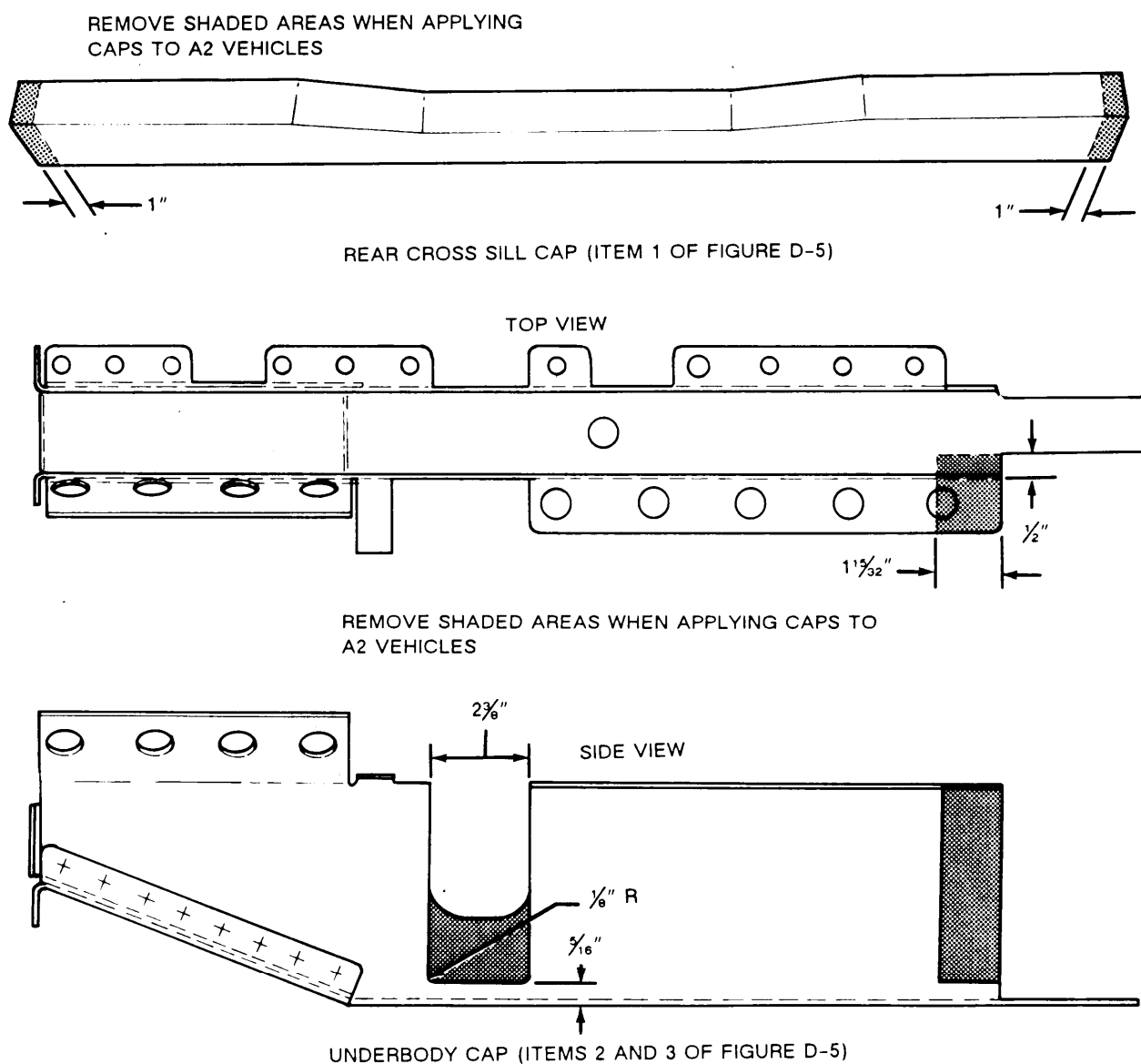


Figure D-11. Modifying Rear Cross Sill Cap and Underbody Cap.

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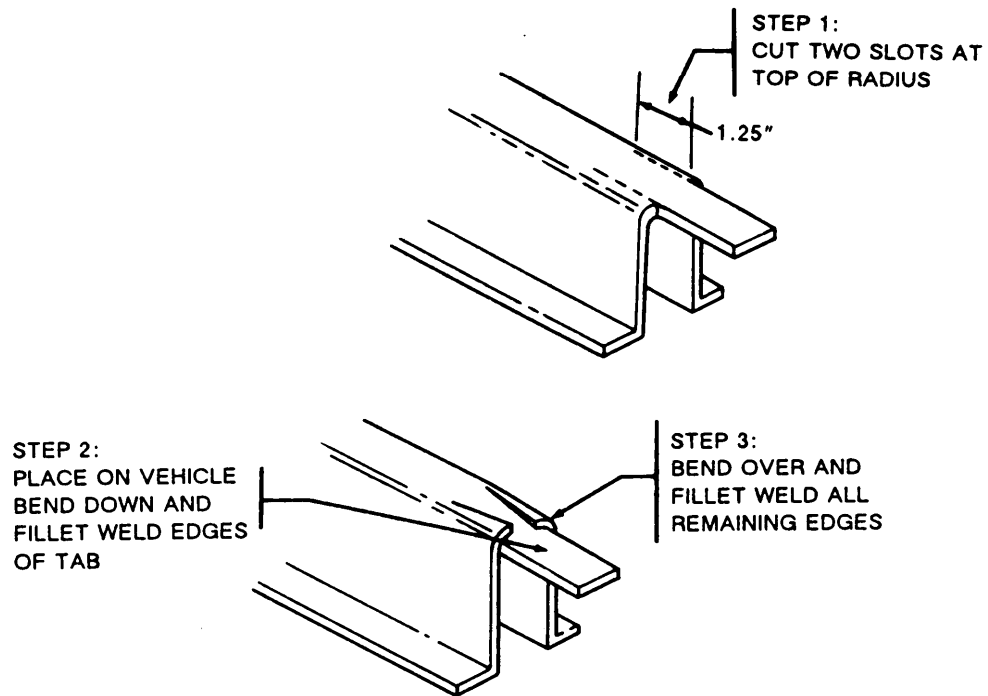


Figure D-12. Installation Modifications to Items 2 and 3 of Figure D-5.

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D-7. Welding Techniques.

For MIG welding, use Miller Model 10A, or equivalent, set at 30.5 open circuit volts and 5½-inches (14.0 cm) feed with 1/16 inch (0.80 mm) diameter wire. When electric arc welding, use 1/8 inch (2.4 mm) AWS7018 rods per MIL-E-2200/1. Use techniques described in FM 43-2 and TM 9-237. Refer to Figure D-13 for examples of fillet and plug welding of underbody caps.

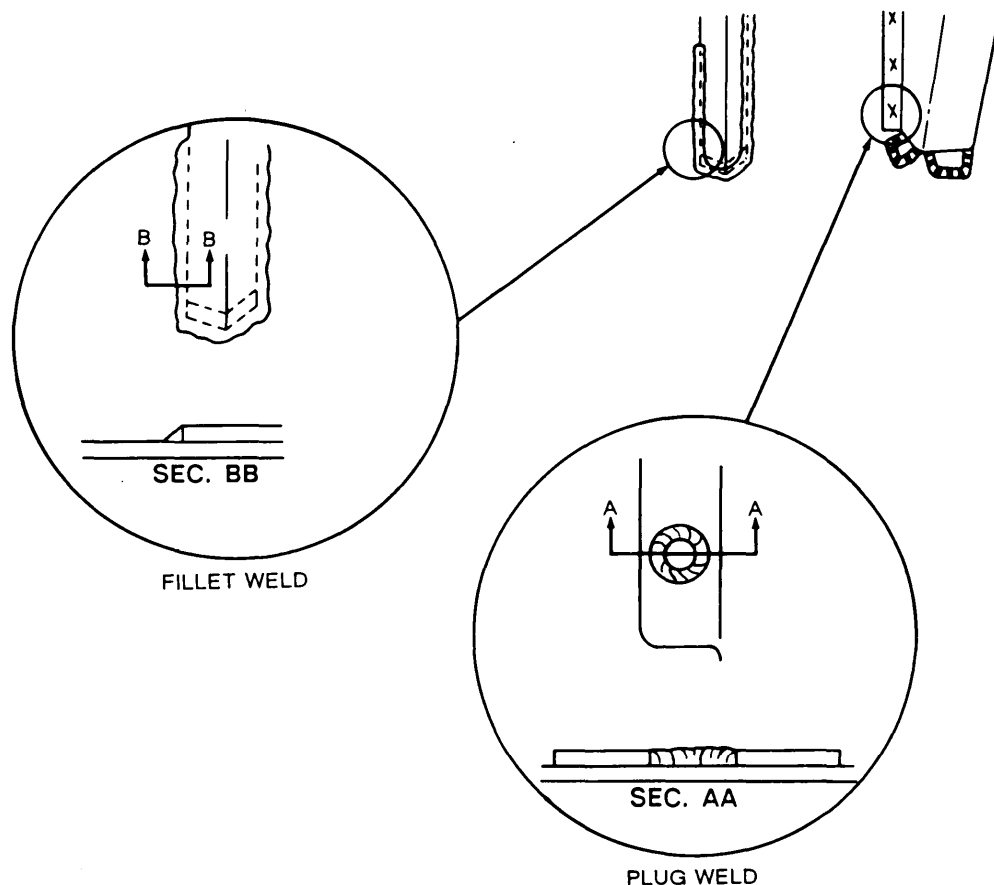


Figure D-13. Welding Examples.

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D-8. Installation of Repair Caps.

CAUTION

Repair caps must be installed in exact item number sequence in order to maintain correct flange overlap at all junctions.

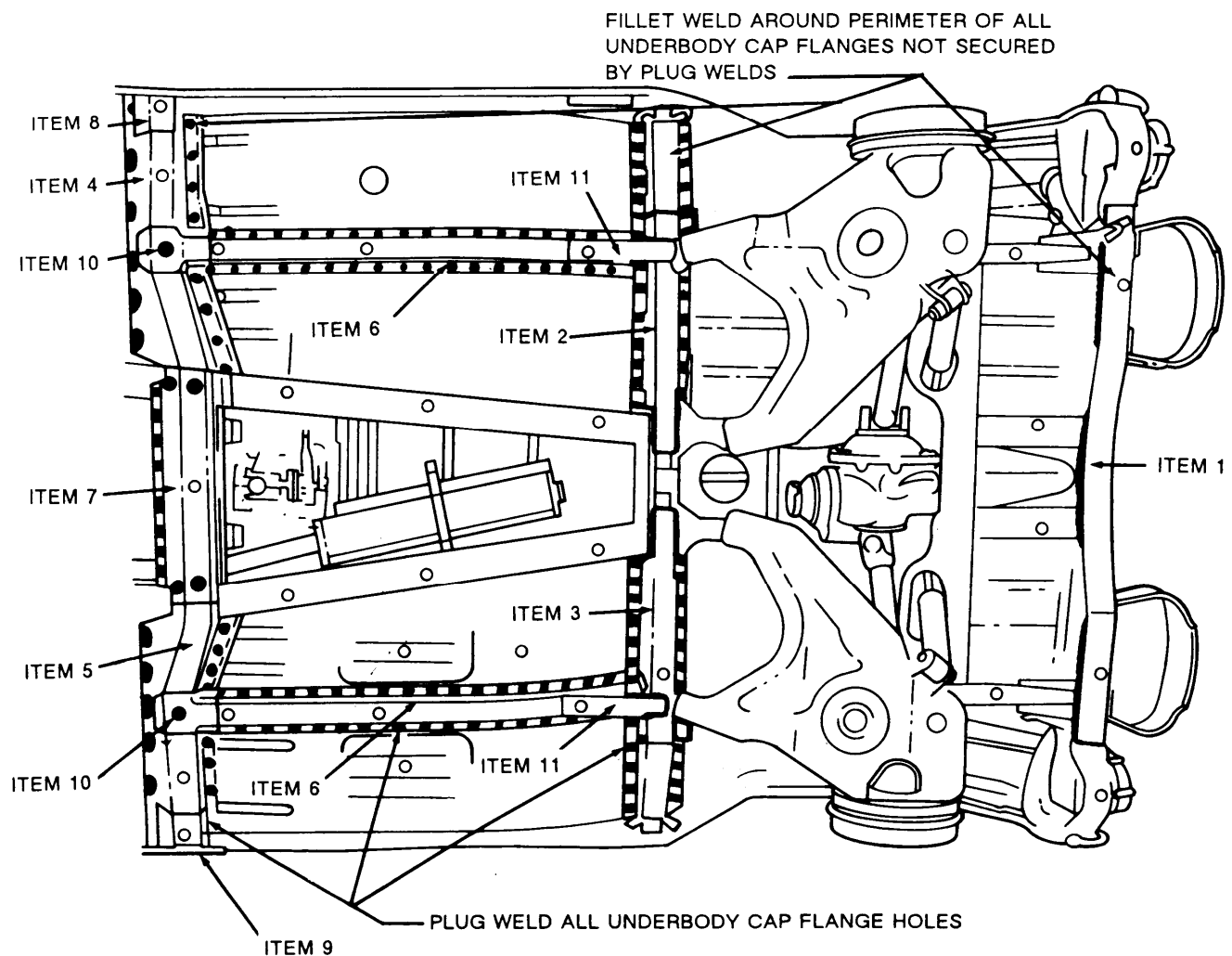
a. Position underbody cap over rear sill so that bumperette bolt clearance holes are properly located. Clamp in place and fillet weld as shown (see Item 1 of Figure D-14).

b. Position underbody caps over rear suspension crossmember so all welding surfaces are in contact with underbody surfaces. Plug weld and fillet weld as shown (see Items 2 and 3 of Figure D-14).

c. Position underbody caps over rear engine support crossmember so that inboard end of cap fits as close as possible to main underbody rail. Plug weld and fillet weld as shown (see Items 4 and 5 of Figure D-14).

d. Position two underbody caps over outer center rails. Plug weld and fillet weld as shown (see Item 6 of Figure D-14).

Position underbody cap over the center rear engine support crossmember. Plug weld and fillet weld as shown (see Item 7 of Figure D-14).



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Figure D-14. Installing Repair Caps.

f. Position items 8 and 9 of Figure D-14 over rear engine support crossmember and body surface. Adjust flanges as necessary. Clamp in place and fillet weld around the perimeter of all flanges as shown.

g. Position two underbody caps over junction at rear engine support crossmember and outer center rails. Ensure that all welding surfaces are making contact. It may be necessary to use a ball-peen hammer to reform underbody cap to conform to the depression in rear engine support crossmember cap. Clamp in place and fillet weld around perimeter as shown (see Item 10 of Figure D-14).

h. Position two underbody caps over junction at outer center cross rails and rear suspension support crossmembers. Clamp in place and fillet weld around perimeter as shown (see Item 11 of Figure D-14).

i. Clean, prime, and paint all exposed underbody metal surfaces.

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D-9. Underbody Component Installation.

- a. Install all parts and assemblies removed in paragraph D-4.
- b. Reverse the procedures described in paragraph D-2 to upright and lower vehicle to floor.
- c. Remove rear turning fixture and install pintle.
- d. Remove front turning fixture and install front lifting eyes.
- e. Thoroughly clean metal surfaces of gas tank cavity and apply a coat of rustproofing compound as specified in Chapter 4 of this technical bulletin.
- f. Install all parts and assemblies removed in paragraph D-2.
- g. Replace all fluids removed in paragraph D-2 (see LO 9-2320-218-12).

CAUTION

Follow the starting procedure in step h to eliminate the possibility of “hydrostatic lock.”

- h. Before starting engine, remove spark plugs and engage starter for 5-10 seconds. Install spark plugs.

D-10. Preventive Maintenance.

- a. Rustproof vehicle (see Chapter 4 of this technical bulletin).
- b. Perform preventive maintenance checks and services described in TM 9-2320-218-10 and TM 9-2320-218-20-1-1.

Section III. INSTALLATION INSTRUCTIONS FOR BODY REPLACEMENT KIT (NSN 2510-01-104-4384)

D-11. Purpose.

- a. The purpose of these instructions is to provide a procedure for replacing body assemblies in the restoration of M151A2 series vehicles.
- b. This procedure is to be used when rust damage is too severe to accomplish restoration by installing the underbody corrosion repair kit, NSN 2520-01-104-4383.

D-12. Materiel Requirements.

- a. Table D-2 lists materiel that is provided with the body replacement kit, NSN 2510-01-104-4384. Using the figure and item numbers listed below, refer to TM 9-2320-218-34P for parts identification and location
- b. Serviceable parts and components will be removed from vehicle and installed on the new body. Part and components not in the body replacement kit that are determined unserviceable will be replaced from stock.

Table D-2. Body Replacement Kit.

Part No.	Nomenclature	Quantity	Figure	Item	Application
11639700	Body	1	—	—	Vehicle
MS35338-47	Washer, lock	8	1	2	Engine Mounts
MS90726-88	Screw	4	1	3	
MS27183-16	Flatwasher	2	1	4	
7703461	Grommet, Supply Line	1	29	9	Fuel Tank
11681689	Clip, Fuel Line	2	29	18	
423437	Screw Assembly	2	29	17	
7345121	Grommet, Vent Line	1	29	19	
7331368	Gasket	2 —	33 —	1 —	Exhaust Manifold
MS27183-12	Flatwasher	3	33	6	Exhaust System
MS51922-9	Nut, Self-Locking	3	33	7	
MS35751-41	Bolt	3	33	9	
7331366	Gasket	3	33	10	
5704853	Parts Kit, Clamp	1	33	—	
8754761	Tubing, Drain	2	60	40	Battery Tray
MS35489-20	Grommet, Rubber	2	62	3	Front Wiring Harness
7331198	Grommet, Rubber	1	62	7	
MS51928-10	Clip, Spring	5	62	9*	
MS51928-5	Clip, Spring	3	62	17*	
MS21333-102	Clamp, Loop	3	62	20	
MS21333-96	Clamp, Loop	1	62	23	
MS45904-68	Washer, lock	2	63	28	Front Wiring Harness
8724497	Washer	5	See view 2A SH 3 (ref to dwg pkg in kit)	—	Front End of Rear Wiring Harness
8724495	Shell, Female Electrical	5		—	
MS90726-102	Screw	4	See view 2A SH 3 (ref to dwg pkg in kit)	—	Front Suspension Mounting Hardware
MS90276-86	Screw	2		—	
MS90726-98	Screw	2		—	
MS51988-10	Nut	8		—	
7046648	Washer	8		—	
MS35489-19	Grommet, Rubber	4	64	1	Rear Wiring Harness
MS51928-3	Clip, Spring	8	64	2	
11599002	Grommet, Plastic	2	64	4	
MS51928-8	Clip, Spring	3	64	5	
MS21333-71	Clamp, Loop	1	64	10	
MS35489-8	Grommet, Rubber	1	64	17	
7728831	Clamp, Loop	1	64	21	

*Do not remove old clips from the firewall. New clips must be used to secure wiring harness to new body.

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Table D-2. Body Replacement Kit (Con't).

Part No.	Nomenclature	Quantity	Figure	Item	Application
MS35335-33	Washer, lock	5	65	11	Trailer Receptacle
MS35206-281	Screw, Machine	4	65	10	
MS51967-2	Nut	1	65	13	
MS90726-90	Capscrew	3	76	8	Rear Differential
MS51988-10	Nut, Self-Locking	3	76	29	
MS51928-3	Clip, Spring	3	83	8	Brake Line
MS90727-95	Capscrew	12	88	1	Rear Suspension
MS51988-10	Locknut	12	88	4	
MS35692-37	Nut, Slotted	6	91	10	Steering Linkage
MS90727-98	Capscrew	4	94	3	Front Bumper Lifting Eye
MS35338-47	Washer, lock	4	94	5	
MS51968-11	Nut	4	94	6	
MS90727-94	Screw, Self-Tapping	8	94	15	Rear Bumperette
MS90725-61	Capscrew	8	96	10	Lifting Eye
MS51899-7	Locknut	8	96	12	
MS51922-9	Locknut	8	103	26	Windshield
MS90725-33	Bolt, Machine	6	103	28	
MS90725-35	Bolt, Machine	2	103	29	
7331373	Gasket	1	105	4	Transmission Cover
7331372	Gasket	1	105	7	
5703326	Kit, Boot & Seal	1	KIT	-	Transmission Cover Plate
11663067-1	Reflector	5	122	3	Side Reflectors
11663067	Reflector	2	122	1	
MS24665-134	Cotter Pin	2	125	2	Windshield Wiper Motor
MS35335-33	Lockwasher	4	125	4	
MS35206-280	Screw, Machine	2	125	5	
MS90725-6	Capscrew	2	125	12	
11644889	Gasket, Motor	1	125	13	
MS90725-42	Bolt, Machine	2	125	18	
MS45904-73	Washer, lock	2	125	19	
11644876	Bushing, Sleeve	2	125	20	
MS35489-9	Grommet, Rubber	1	126	7	Windshield Washer
MS35489-14	Grommet, Rubber	1	126	14	

D-13. Torque Values.

a. Body attaching parts listed in Table D-3 are to be tightened to the torque values given. Refer to Figure D-15 through Figure D-18 for the location of these parts and assemblies.

Table D-3. Specific Torque Values.

IFigure	Number	Items	Torque
D-15	1	Idler arm bracket to frame bolts.	25-30 lb.-ft. (34-41 N•m)
D-15	2	Front suspension ball joint mounting bolts.	35-45 lb.-ft. (47-61 N•m)
D-16	3	Rear suspension bracket to body bolts.	40-55 lb.-ft. (54-75 N•m)
D-16	4	Front and rear propeller shaft bolts.	15-20 lb.-ft. (20-27 N•m)
D-16	5	Rear suspension arm pivot bolts.	65-70 lb.-ft. (88-95 N•m)
D-17	6	Front suspension upper control arm mounting bolts.	70-90 lb.-ft. (95-122 N•m)
D-17	7	Front suspension crossmember bolt.	27-37 lb.-ft. (37-50 N•m)
D-17	8	Front suspension front lower control arm bolts.	40-55 lb.-ft. (54-75 N•m)
D-17	9	Front suspension rear lower control arm mounting bolts.	45-65 lb.-ft. (61-88 N•m)
D-17	10	Front and rear differential mounting bolts.	30-40 lb.-ft. (41-54 N•m)
D-18	11	Steering gear to column shaft flange coupling bolts.	26-34 lb.-ft. (35-46 N•m)
D-18	12	Pitman arm to steering gear mounting nut.	80-110 lb.-ft. (108-149 N•m)
D-18	13	Steering gear mounting bolts.	24-36 lb.-ft. (33-49 N•m)

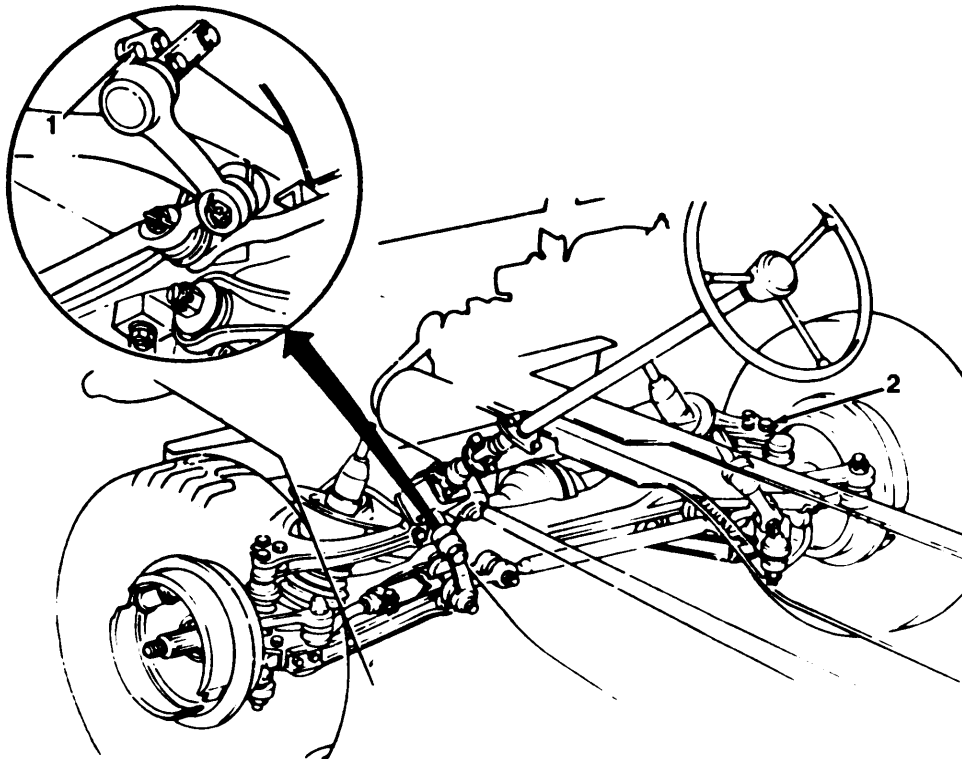
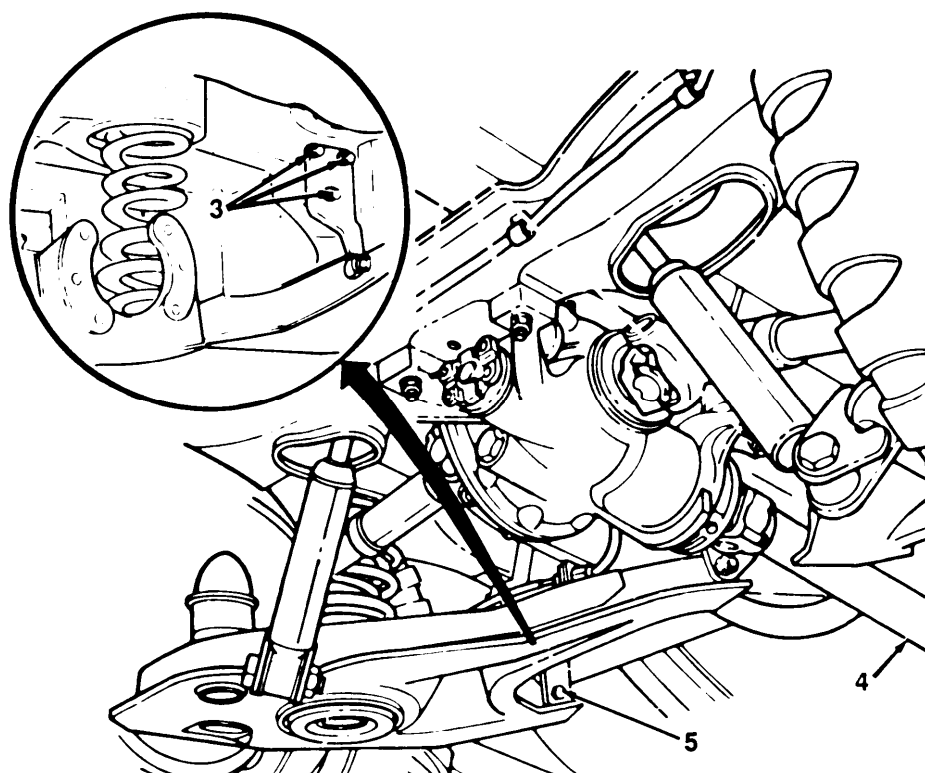


Figure D-15. Idler Arm and Front Suspension.

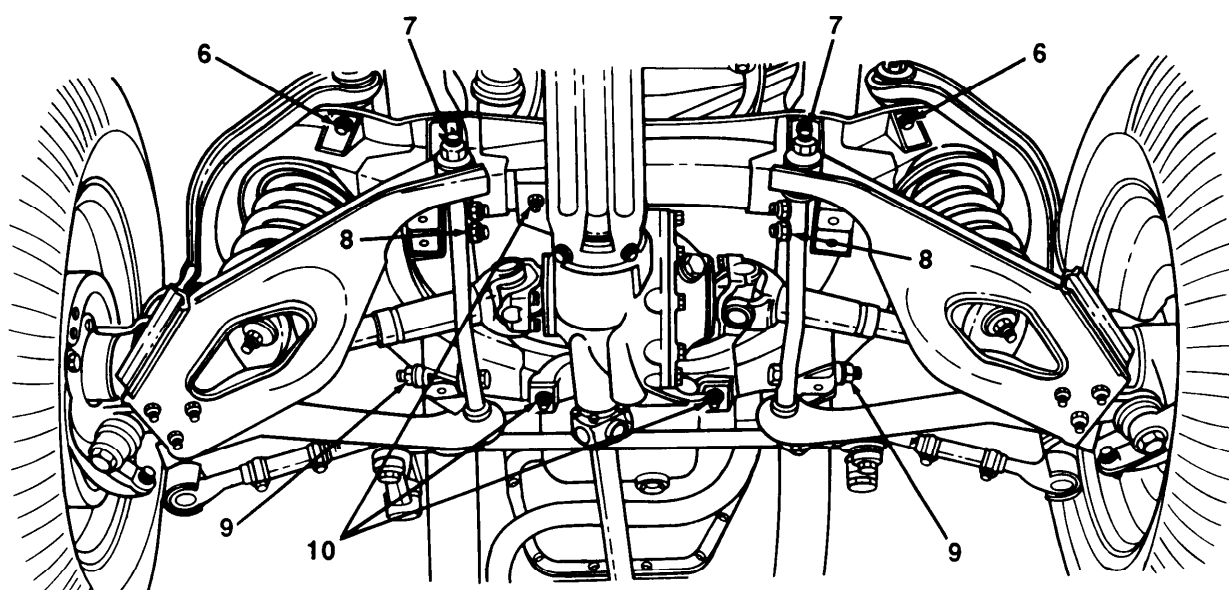
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Figure D-16. Rear Suspension and Front and Rear Propeller Shaft.



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Figure D-17. Front Suspension.

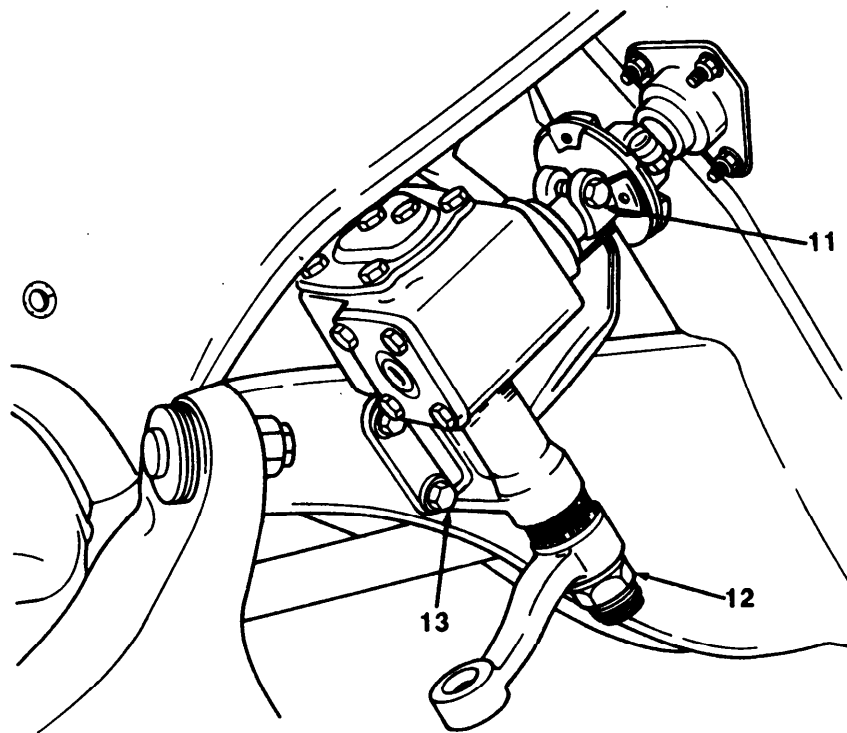

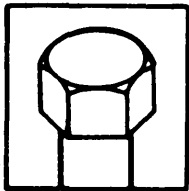
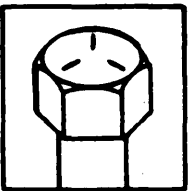
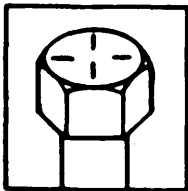
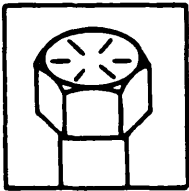


Figure D-18. Steering Gear.

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b. Use standard torque values provided in Table D-4 unless otherwise specified in the applicable technical manual or in Table D-3.

Table D-4. Standard Torque Values.

USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
	To 1/2-69,000 (4850.7000)	To 3/4 - 120,000 (8436.0000)	To 5/8 - 140,000 (9842.0000)	150,000 (10545.0000)
CAPSCREW DIAMETER AND MINIMUM TENSILE STRENGTH PSI (KG/SQ CM)	To 3/4 -64,000 (4499.2000)	To 1-115,000 (8084.5000)	To 3/4 - 133,000 (9349.9000)	
	To 1-55,000 (3866.5000)			
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE GRADE NUMBER	1 or 2	5	6 or 7	8
CAPSCREW HEAD MARKINGS				
Manufacturer's marks may vary. These are all SAE Grade 5 (3-line).				
    				
CAPSCREW BODY SIZE (INCHES)-(THREAD)	TORQUE FT-LB (N•M)	TORQUE FT-LB (N•M)	TORQUE FT-LB (N•M)	TORQUE FT-LB (N•M)
1/4-20	5 (7)	8 (11)	10 (14)	12 (16)
-28	6 (8)	10 (14)		14 (19)
5/16-18	11 (15)	17 (23)	19 (26)	24 (33)
-24	13 (18)	19 (26)		27 (37)
3/8-16	18 (24)	31 (42)	34 (46)	44 (60)
-24	20 (27)	35 (47)		49 (66)
7/16-14	28 (38)	49 (66)	55 (75)	70 (95)
-20	30 (41)	55 (75)		78 (106)
1/2-13	39 (53)	75 (102)	85 (115)	105 (142)
-20	41 (56)	85 (115)		120 (163)
9/16-12	51 (69)	110 (149)	120 (163)	155 (210)
-18	55 (75)	120 (163)		170 (231)
5/8-11	83 (113)	150 (203)	167 (226)	210 (285)
-18	95 (129)	170 (231)		240 (325)
3/4-10	105 (142)	270 (366)	280 (380)	375 (509)
-16	115 (156)	295 (400)		420 (570)
7/8-9	160 (217)	395 (536)	440 (597)	605 (820)
-14	175 (237)	435 (590)		675 (915)
1-8	235 (319)	590 (800)	660 (895)	910 (1234)
-14	250 (339)	660 (895)		990 (1342)

CAUTION: Capscrews threaded into aluminum may require reductions in torque of 30% or more, unless inserts are used.

NOTE: Do not use above values in place of those specified in the engine groups of this manual; special attention should be observed in case of SAE Grade 6, 7, and 8 capscrews.

1. Always use the torque values listed above when specific specifications are not available.
2. The above is based on use of clean and dry threads.
3. Reduce torque by 10% when engine oil is used as a lubricant.
4. Reduce torque by 20% if new plated capscrews are used.

D-14. Body Replacement Procedures.

- a. Remove components of special purpose kits from old body (see TM 9-2320-218-34-1).
- b. Remove soft top and bows, windshield and hinges, hood and front grille, data and instruction plates, all reflectors, seat belts, and seat and frame assemblies (see TM 9-2320-218-20-1-1).
- c. Position vehicle on four support stands and new body on four support stands (see Figure D-19 and Figure D-20).

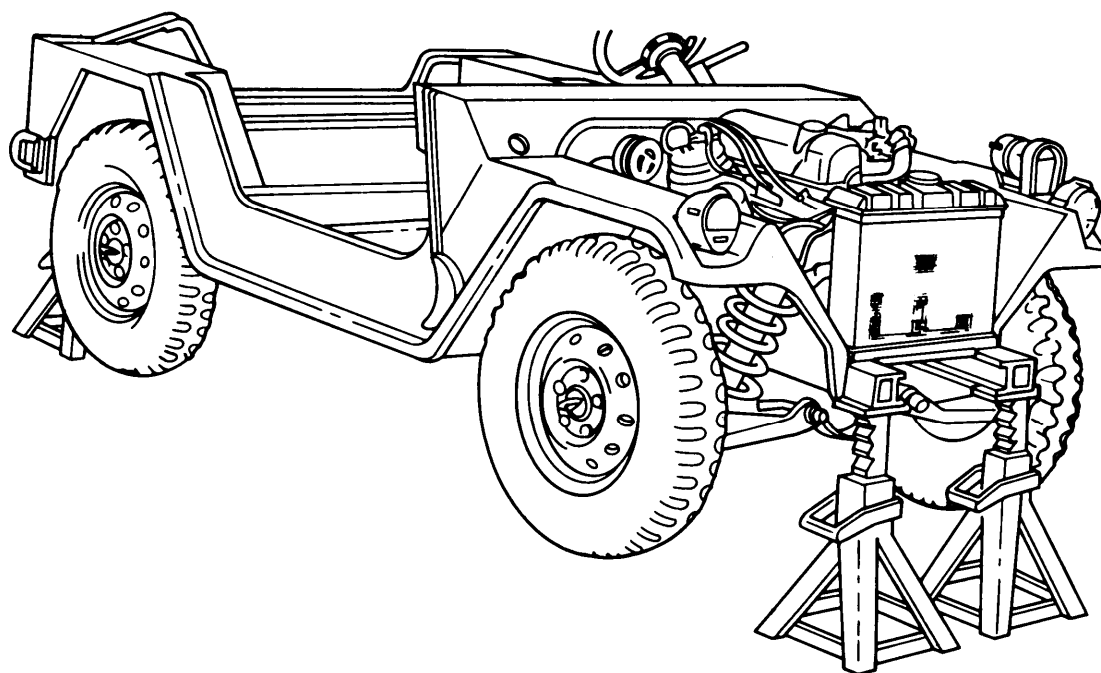


Figure D-19. Positioning Vehicle on Support Stand.

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- d. Drain fuel tank and lines (see TM 9-2320-218-20-1-1).
- e. Remove mirrors, wheels, rear shock absorbers, batteries, battery cables, battery box, and transmission cover plate (see TM 9-2320-218-20-1-1).
- f. Remove front and rear suspension, propeller shafts, and steering gear and column from old body and install on new body (see TM 9-2320-218-34-1). Tighten all mounting hardware to torque values shown in-Table D-3.
- g. Remove transmission, shift lever, handbrake assembly, and handbrake lever from old body and install on new body (see TM 9-2320-218-34-1).
- h. Remove drive train (engine, transmission, and transfer assembly) from old body and install on new body (see TM 9-2320-218-34-1).
- i. Remove exhaust system from old body and install on new body (see TM 9-2320-218-20).
- j. Remove instrument panel and switches, accelerator, throttle and choke controls, starter switch and bracket, and all light assemblies from old body and install on new body (see TM 9-2320-218-20-1-1).
- k. Remove flasher unit, trailer receptacle, and front and rear wiring harnesses from old body and install on new body (see TM 9-2320-218-20-1-2).

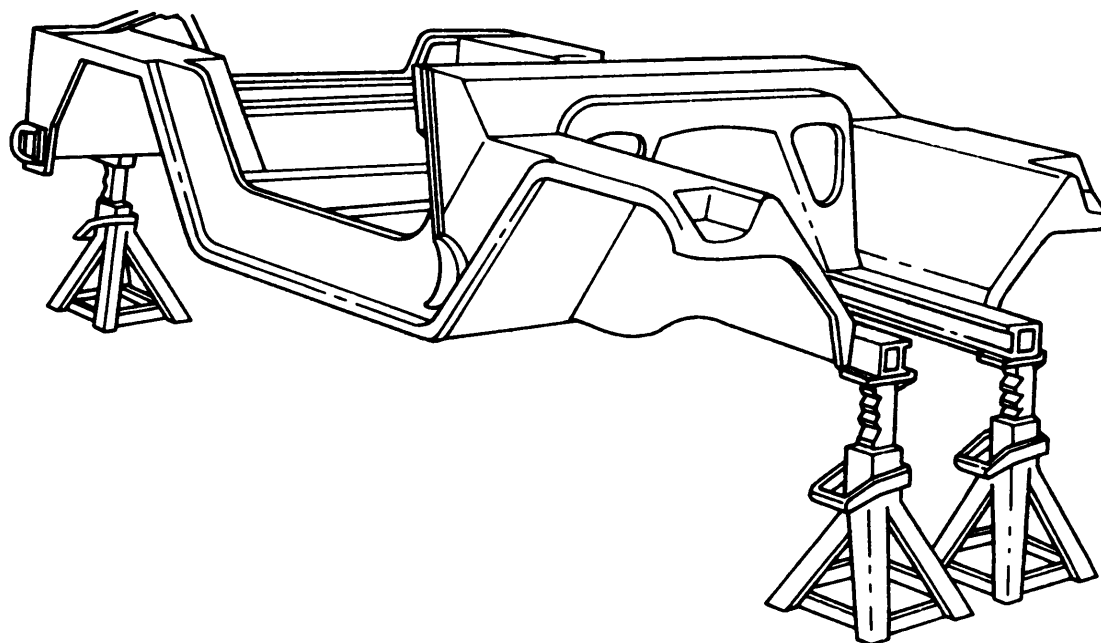


Figure D-20. Positioning Body on Support Stand.

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- l.* Remove clutch pedal, brake pedal, master cylinder, and brake lines from old body and install on new body (see TM 9-2320-218-20-1-1).
- m.* Remove fuel tank and fuel lines from old body (see TM 9-2320-218-20-1-1).
- n.* Apply rustproofing compound to fuel tank cavity in new body (see Chapter 4 of this technical bulletin).
- o.* Install fuel tank and fuel lines on new body (see TM 9-2320-218-20-1-1).
- p.* Remove all remaining underhood components from old body and install on new body (see TM 9-2320-218-20-1-1).
- q.* Remove front and rear bumpers, hood latches, grab handle, and fuel can mounting bracket from old body and install on new body (see TM 9-2320-218-20-1-2).
- r.* Remove all remaining body components from old body and install on new body (see TM 9-2320-218-20-1-2).
- s.* Install rear shock absorbers, battery box, batteries, battery cables, and transmission cover plate on new body (see TM 9-2320-218-20-1-1).
- t.* Install front grille and hood, windshield and hinges, seat and frame assemblies, and mirrors on new body (see TM 9-2320-218-20-1-1).
- u.* Install components of special purpose kits on new body (see TM 9-2320-218-34-1).
- v.* Rustproof vehicle (see Chapter 4 of this technical bulletin).
- w.* Paint vehicle (see TM 43-0139).
- x.* Install all reflectors, data and instruction plates, and wheels (see TM 9-2320-218-20-1-2).
- y.* Lower vehicle from support stands.

z. Install soft top and bows (see TM 9-2320-218-20-1-2).

aa. Return all unused materiel to stock.

D-15. Preparing Vehicle for Service.

a. Aline front wheels and adjust headlights (see TM 9-2320-218-34-1).

b. Perform the preventive maintenance checks and services described in TM 9-2320-218-10 and TM 9-2320-218-20-1-1.

c. Return vehicle to service.

APPENDIX E FABRICATED TOOLS

Section I. STRAIGHT-EDGE FLOOR SCRAPER

NOTE

All dimensions given in Section I are in standard units.

E-1. General.

a. After rustproofing a vehicle, the rustproofing compound may drip onto the shop floor creating “pancakes” of compound. The process of removing these can be time consuming, even with powerwash equipment and detergents. The most effective way to clean the shop floor is to scrape, then wash the surface down.

b. The straight-edge floor scraper can also be used on certain vehicles, such as the 5-Ton Tractor Truck. This vehicle has a hitch platform on the underside which may require scraping to ensure proper function.

c. A 1¼-inch putty knife can be found in the standard shop tool kit and a 4-inch putty knife can be obtained from the supply activity. These tools may serve as a suitable alternative or as a supplement to the fabricated scraper.

E-2. Materials Required.

a. Handle. Use suitable materials or available stock including broken broom handles or worn squeegee handles.

b, Blade. One 13 to 14-inch length of 3/32 by 2-inch sheet metal. Order from supply activity or obtain from weld shop.

c. Support Arms. Two 8-inch lengths of 1/6 by 7/8-inch steel are required. These can be obtained from general stock at the nearest weld shop or by ordering item from supply activity.

d. Screws. Four 1/4-inch screws.

e. Nuts. Four 1/4-inch nuts.

f. Flatwashers. Eight 1/4-inch hole flatwashers.

E-3. Drilling Procedures (See Figure E-1).

WARNING

Drill holes on the flat side of handle to avoid injury or damage to handle.

a. Handle. Cut a flat surface on one side of the wooden handle that will allow for level contact of blade and support arms. After flat surface is cut, drill a 1/4-inch hole A, 1/2 inch from the end of the handle. Drill a second 1/4-inch hole B that is 4 1/2 to 4 5/8 inches from the hole A.

b. Blade. Drill one 1/4-inch hole C in the middle of the blade 3/8 inch from the bottom side. Drill two 1/4-inch holes D on each end of the blade, 9/6 inch from their respective sides and half way between the top and bottom edges.

c. Support Arms. Drill two 1/4-inch holes E in each of the two support arms. Holes should be centered and 9/16 inches away from the ends.

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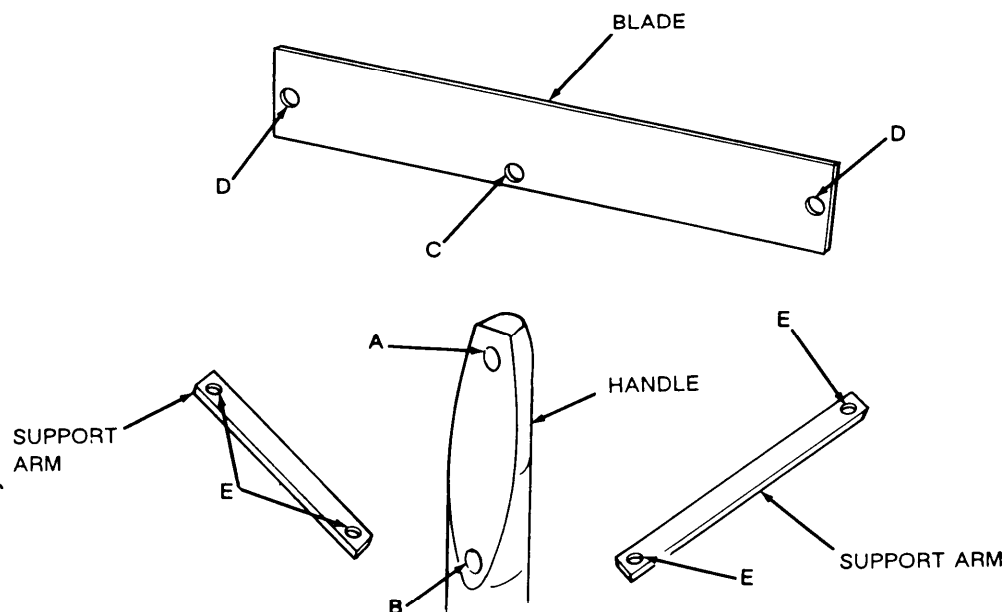


Figure E-1. Straight-Edge Floor Scraper.

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E-4. Assembly Instructions (See Figure E-1.)

a. *Support Arms to Handle*, Position one end of both support arms over hole B in handle and install screw, two flatwashers, and nut.

NOTE

Center hole C on blade should be positioned so that scraping edge faces outward.

b. *Blade to Handle*. Position center blade hole C over handle hole A and install screw, two flatwashers, and nut.

c. *Support Arms to Blade*. Position free ends of support arms on each side of blade. Install two screws, four flatwashers, and two nuts.

Section II. LOOPED SCRAPER**WARNING**

Wear protective gloves to avoid injury during fabrication of looped scraper. Material has sharp edges which may cause serious injury to personnel.

NOTE

All dimensions given in Section II are in standard units.

E-5. General.

There are many curved areas underneath a tactical vehicle where a straight-edge scraper or putty knife cannot reach. The looped scraper will work well on both convex and concave curves.

E-6. Materials Required.

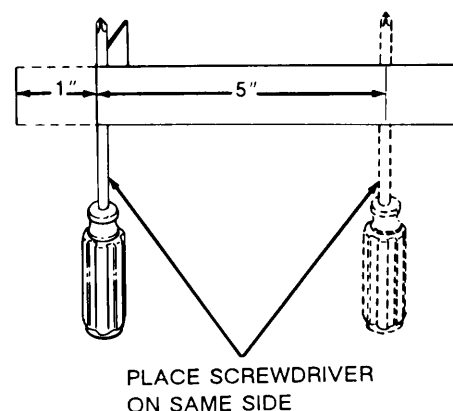
- a. 24 inches of metal pallet strapping.
- b. 9-inch piece of 1/8 by 7/8~inch steel plate.
- c. Two 1/4~inch rivets.
- d. Brown paper.
- e. 9-inch piece of split rubber tubing.

E-7. Bending Procedures.

- a. Marking. Mark one end of 24-inch strapping "small loop or A". Mark the other end "large loop or B".
- b. *Bending Loops* (see Figure E-2).

(1) Measure and mark a line 1 inch from the end marked "small loop or A". Measure and mark another line 5 inches from the first mark. Place a screwdriver shaft over the 1-inch mark and bend the 1-inch portion to a 90 degree angle. Use the same technique to bend the 5-inch portion to a 90 degree angle from the remaining strap.

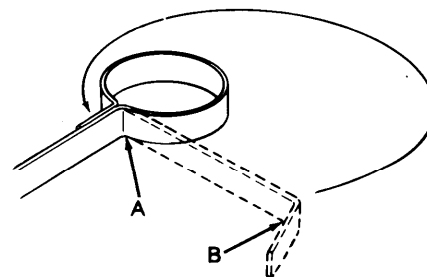
(2) Measure and mark a line 1 inch from the end of strapping marked "large loop or B". Measure and mark another line 8 inches from the first mark. Use a screwdriver shaft to bend to 90 degree angles as in step (1) above.



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Figure E-2. Bending Loops.

c. *Shaping Loops* (see Figure E-3). Bring folds A and B together on "small loop or A" end. After shaping loop to desired form, secure attaching ends of loop in a suitable vise or tape ends together until ready for drilling. Follow this procedure for "large loop or B" end as well.



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Figure E-3. Shaping Loops.

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E-8. Drilling Procedures (See Figure E-4).

a. Ensure that inside portion of loop is even and flush. Mark and punch a 1/4-inch hole in the center of the 1-inch portion and punch through to the 9-inch portion. Follow the procedure for the large loop end as well.

b. Drill two 1/4-inch holes in the 9-inch metal plate 3/8 inches from the ends.

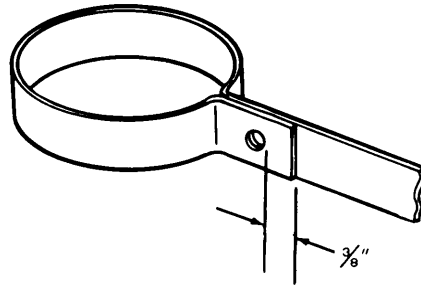


Figure E-4. Drilling Scraper.

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E-9. Assembly Instructions.

a. Position metal plate in 9-inch strapping so that all holes are in a line. Use a hand pop-rivet tool to rivet the scraper with 1/4-inch rivets.

b. Wrap center portion of looped scraper with 9-inch wide brown paper until it will provide a tight fit for the rubber tubing.

c. Place split rubber tubing over center portion of looped scraper.

d. Continue to shape loop ends to desired form.

APPENDIX F

GLOSSARY OF TERMS

The following is an alphabetical list of terms found in this technical bulletin. Many of these terms describe design configurations found on Army vehicles. Others refer to aspects of corrosion discussed in the introductory chapters of this technical bulletin.

“A” Pillar	Front windshield pillar at door opening.
Access Plug	Plastic or rubber plug used to fill holes in sheet metal.
Acid Rain	High concentrations of chemical contaminants in the atmosphere which are driven to earth by natural rainfall. Occurs mostly in heavy industrial areas.
Active Metal	Describes a metal, such as iron or steel, that is especially susceptible to corrosion.
Additive	A compound added to a fuel or lubricant to prevent corrosion, gum formation, varnishing, sludge, and/or knocking.
Baffle	A hidden obstruction, usually made of sheet metal, used as a support in the design of a vehicle, or to prevent water or dirt from entering the area.
Belt Line	An imaginary line on a vehicle, usually in reference to a line along the bottom of a vehicle's window, or up to and including the rubrail of cargo trucks.
Box Section	Any area in a vehicle design that is totally or almost totally enclosed.
Chalking	The breakdown of an organic coating to a powdery, chalky residue.
Channel	In vehicle design, an open support member found as U-shaped or A-shaped half circle cross sections.
Corrosion	The process of dissolving or wearing away.
cowl	That part of a vehicle located between the front windshield and the rear of the hood.
Crevice Corrosion	Corrosion occurring in a crevice formed by two or more sections of same or different metals.
Dogleg	The arc-like section of a vehicle's rear support pillar located in from the rear wheel house.
Doorjamb	See Pillar.
Door Skin	The outer sheet metal of a door.
Electrolyte	A chemical substance which contains electrically charged particles capable of maintaining or holding an electric current.
Exfoliation	The breaking away of surface material into flakes or layers.
Eyebrow	Slang term for the extension of the front fender over vehicle headlights.
Fender Brace	See Fender Support.
Fender Cap	The cap at the end of some fender designs used to either finish the fender or to extend it.

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Fender Lip	That part of a fender that is curled under at the wheel opening.
Fender Reinforcement	Horizontal strip along the inside of the front fender near the top.
Fender Support	Vertical support and reinforcement at rear of front fender.
Firewall	The forward, lower wall of a vehicle cab. This wall is located above the area of the vehicle operator's foot controls and extends from fender to fender, and from cowl to floor pan.
Flange	A rim, edge, or collar made of metal and used to strengthen an object, hold it in place, or attach it to another object.
Framerail	One of the two main lengthwise members that make up the frame of a vehicle.
Front Shield	Shield under the front bumper of a vehicle used to deflect stones.
Galvanic Corrosion	Corrosion usually resulting from differing metals of greater/lesser purity which are in contact with one another. The great variance in metal purity works to polarize the metal. In the presence of moisture, this greater polarity begins to tear down the atomic structure of the weaker of the two metals.
Galvanize	To coat iron with zinc, at time of manufacture, in order to increase the resistance of the iron to rust.
Hat Section	A hat-shaped channel usually found on the underside of a vehicle.
Header Panel	The area above the front grille of some vehicles.
Headlight Bucket	Shield behind headlight to which socket and headlight adjustments are attached.
Headlight Rim	Trim around headlight and adjustment screws.
Hinge Box	The vehicle cab's support pillar to which the door is hinged.
Hinge Pillar	See Hinge Box
Impact Bars	Reinforcements located inside doors and used to resist impact on the sides.
Inhibitor	Chemical substance or mixture which, when added to a solution, decreases corrosion.
Inorganic Coatings	Coatings (usually paint) applied to a surface by electrical/magnetic means, i.e., electro-deposition. Examples are chrome plating, anodic coatings, conversion coatings, phosphate coatings, and oxide coatings.
Inspection Cover	A cover easily removed in order to allow visual or physical access to an enclosed area of the vehicle.
Local Cell	A localized area on a vehicle where rust is occurring. An area on the vehicle that contains all the elements of rust creation.
Lock Striker Plate	That area of the cab pillar post where the door lock strikes and latches when the door is closed.
OEM	An automotive term meaning "Original Equipment Manufactured".
Orificio	The hole in the nozzle of a rustproofing spray wand.
Oxidation	The process of electrons combining with atoms of oxygen.

Pillar	In automotive design, a pillar is any upright support.
Rear Quarter Panel	Panel or area located on the vehicle side, from the rear wheelwell to the end of the vehicle.
Rocker Panel	Part of some vehicle bodies, designed as a distinct assembly, located beneath the doors.
Rubrail	A raised strip running lengthwise on some vehicles such as a cargo truck tailgate. Designed to come in contact with the vehicle when the tailgate is opened. Any rail on the side or rear of a vehicle designed to absorb shock.
Rust	Iron hydroxide, sometimes referred to as “hydrated ferric oxide”.
Rusting	The electro-chemical process by which iron or other metals transform into iron hydroxide or rust.
Shock Tower	The upper reinforcing member to which a shock absorber is bolted.
Sill	Any flat surface or horizontal structure that bears an upright structure, especially the base of a window or threshold of a structured doorway.
Skin	Slang term referring to the outer metal of a vehicle. Sheet metal or “thin skins” refer to all tactical vehicles and trailers/armor. “Thick skins” refer to most combat vehicles.
Skuff Plate	A metal trim cover over a sill panel designed to help resist wear.
Stake Pockets	Rectangular openings to accommodate stakes on some truck beds.
Stress Corrosion Cracking	Cracking of metal as a result of constant structural stress on a corroding area.
Sweep	To move a rustproofing spray tool back and forth across an area while spraying.
Trough	A water control channel usually located at edges of doors, deck lid openings, and the cowl-to-firewall seam.
Undercoating	Applications of a primer coat. Also the application of a tar-like material on the underside of a vehicle to serve as a sound deadener.
Upper Radiator Brace	Brace between the front fenders which supports the upper part of the vehicle’s radiator.
Wand	The tool used to apply rustproofing material.
Weather Sheet	A plastic or oil paper covering that seals out water or dust from interior trim panels.

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By Order of the Secretary of the Army:

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TEAR ALONG PERFORATED LINE

THE METRIC SYSTEM AND EQUIVALENTS**LINEAR MEASURE**

1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches
 1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches
 1 Kilometer=1000 Meters=0.621 Miles

WEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
 1 Kilogram=1000 Grams=2.2 Lb
 1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
 1 Liter=1000 Milliliters=33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
 1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet
 1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
 1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

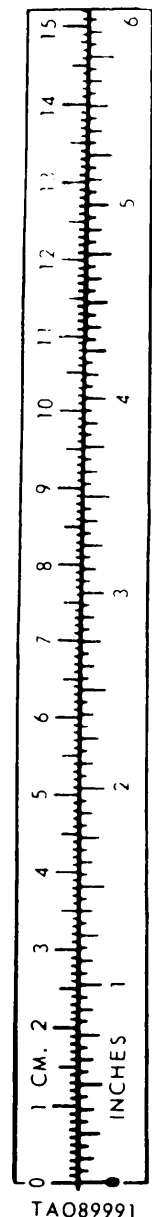
TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



(FOR REFERENCE ONLY)

PIN: 039914-000