



ADT Shop Manual

ENGLISH

DA40-5

Doosan Infracore Norway





Shop Manual

DA40-5

Engilsh

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Manufacturer:

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N - 6440 Einesvågen - NORWAY

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General instructions

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Foreword

The Shop Manual is prepared as an aid to performing quality repairs by giving the service personnel an understanding of the dump truck, and showing the correct way perform repairs and make judgements.

Make sure that you understand the manual and use it at every available opportunity. The manual will also serve as a useful guide to office personnel and other persons who are involved with the dump truck in one way or another.

How to use the SHOP MANUAL:

The main index give an view of the chapters index page no.

The manual is divided into the following chapters:

Chapter 1:	Engine	Chapter 6:	Electric system
Chapter 2:	Transmission	Chapter 7:	Front frame
Chapter 3:	Drive line	Chapter 8:	Rear frame
Chapter 4:	Lubrication	Chapter 9:	Option
Chapter 5:	Hydraulic system	Chapter 10:	Error codes list

In the chapters index you will find the page no. for the description of each part.

Each part will describe:

Structure and function:

This section explains how the components are built and how they work.

Testing and adjusting:

This section explains checks to be made before and after performing repairs, as well as adjustments to be done at the completion of the checks and repairs.

Disassembly and assembly:

This section describes how to remove, install, disassemble, repair and assemble components, and the work order. Special tools are listed at the end of each chapter. The special tools are an excellent aid in the work shop. By using special tools, the job will be easier to perform and in some cases a special tool is required to carry out the work. List of all special tools for the complete truck are listed in the "Special Tool Guide".

Maintenance standard:

This section gives the judgement standards when inspecting disassembled parts.

Troubleshooting:

When a fault is detected, this section is used as before the practical fault finding starts. A skilled and trained mechanic together with the Shop Manual is the best combination for troubleshooting when repair instruction is needed.

At the end of each chapters are the main Troubleshooting

This manual is valid for the serial nos. listed on the first page.

Distributing and updating:

Subscribed Shop Manuals will automatically be updated at revisions.

This manual is originally produced by Doosan Infracore Norway AS, 6440 Elnesvågen, Norway, and must not be reproduced, translated or made available to a third party, fully or partly, without our written permission.

NOTE

Because of the different variants the parts and images which are contained in this book can be different from the current model of dump truck . For the spare parts please used the parts catalogue for current model.

Doosan ADT Payload Policy

Doosan ADT 10/10/20 Policy:

"Doosan's ADT payload overload policy, referred to as the "10/10/20" policy, states that "The mean (average) of the payload distribution shall not exceed the target payload and no more than 10% of payloads may exceed 1.1 times the truck target payload and no single payload shall ever exceed 1.2 times the target payload."

This will affect the warranty for our dealers and customer, and give clear direction on operation parameters

Torque limit table

This tables indicates standard torque limits in Nm for the various screw and bolt qualities and dimensions. The torques are valid for screws on the outside of the components.

Quality class: Dimension	8.8 M (Nm)	10.9 M (Nm)	12.9 M (Nm)
M 8	24	33	40
M 10	47	65	79
M 12	81	114	136
M 14	128	181	217
M 16	197	277	333
M 18	275	386	463
M 20	385	541	649
M 22	518	728	874
M 24	665	935	1120
M 27	961	1350	1620
M 30	1310	1840	2210
M 33	1770	2480	2980
M 36	2280	3210	3850

Quality class: Dimension	8.8 M (Nm)	10.9 M (Nm)	12.9 M (Nm)
3/8" UNC	38	54	68
7/16" UNC	61	87	108
1/2" UNC	93	131	163
9/16" UNC	133	187	234
5/8" UNC	183	259	323
3/4" UNC	322	455	568
7/8" UNC	516	729	909
1" UNC	772	1090	1360
1 1/8" UNC	1090	1550	1930
1 1/4" UNC	1530	2160	2690
1 3/8" UNC	2020	2850	3550
1 1/2" UNC	2650	3750	4680

Quality class: Dimension	8.8 M (Nm)	10.9 M (Nm)	12.9 M (Nm)
M 8 x 1	25	35	42
M 10 x 1,25	48	68	81
M 10 x 1	49	70	84
M 12 x 1,5	83	117	140
M 12 x 1,25	85	120	144
M 14 x 1,5	135	190	288
M 16 x 1,5	204	287	344
M 18 x 1,5	294	413	496
M 20 x 1,5	408	574	688
M 22 x 1,5	546	768	921
M 24 x 2	696	979	1170
M 27 x 2	1000	1410	1690
M 30 x 2	1390	1950	2340
M 33 x 2	1860	2610	3130
M 36 x 2	2350	3310	3970

Quality class: Dimension	8.8 M (Nm)	10.9 M (Nm)	12.9 M (Nm)
3/8" UNF	41	59	73
7/16" UNF	66	93	115
1/2" UNF	99	141	175
9/16" UNF	142	201	250
5/8" UNF	197	279	347
3/4" UNF	344	486	606
7/8" UNF	547	772	963
1" UNF	814	1150	1430
1 1/8" UNF	1170	1660	2060
1 1/4" UNF	1620	2290	2850
1 3/8" UNF	2170	3070	3820
1 1/2" UNF	2840	4000	5000

Bolt quality marking

Strength marking on screws consists of two numerals that may be separated by a point (.). The numerals indicate tensile and yield limits of material in N/mm².

- Numeral 1 denotes a hundredths of the tensile limit in N/mm².
- Numeral 1 x numeral 2 denotes a tenth of the yield limit in N/mm².

A bolt designated 8.8 thus has tensile limit 800 N/mm² and yield limit 640 N/mm².

Nut quality marking

The designation for nuts consists of one numeral. The numeral denotes that the nut is of equal strength to a bolt with the same first number.

A nut of strength class 8 is thus equally strong to a bolt of class 8.8.

Types of sealing-/locking compounds and lubricants

- Loctite 242/243: Middle strength (for locking of screws, bolts and nuts).
- Loctite 270/2701: High strength (for locking of screws, bolts and nuts).
- Loctite 603: High strength (for locking of bearings bushings, etc.).
- Loctite 638: Extra high strength (for locking of bearings, bushings, etc.).
- Loctite 574: Master gasket as floating gasket.
- Loctite 7063: For cleaning of surfaces prior to lubrication or glueing.
- Molycote 321R*: Anti-obstruction and running in lubricant.
- Würth 210/Loctite 8201: Anti-corrosion spray for electrical wires and components.

Safety in workshop

Purpose

This section is intended as general information about dangers of various types of workshop activities.

Follow the workshop manual

The workshop manual provides instructions about work methods and equipment that reduces the risk of accidents.

Mechanical skill

This is a very important factor. The Doosan-mechanic is skilled and well trained for his job. Without these qualities, risks are much greater and more difficult to anticipate.

Common sense

This characteristic should form the basis of activities in the workshop.

Negligence and carelessness cannot be allowed.

Work with a safety margin

Always expect that something can go wrong during the work.
Always work with a safety margin where there are risks.

Legislation and local rules

In most countries there are legislation and local practices that apply to safety at work. Follow them at all times.

Warnings (parts or packages)

Always read and follow warnings and instructions.
Do not trust your own knowledge of the risks. The properties of a part or the chemical composition of a product could have been changed during transit.

You have to know where the risks are

In this way you can avoid them. In many cases, risks are so obvious that you do not have to search for them, e.g. carbon monoxide - true it is invisible, but you know that it is lethal. Therefore protect yourself.

The hidden dangers

Dangers are found in all work environments and the most serious danger is in not being aware of them.

The three demands of safety

- * Knowledge: You have to know your job and also where the risks are.
- * Apprehension: You must be aware that you are exposed to risks, or at least to suspect that you are.
- * Caution: You have to protect yourself, do not take chances.

Incidents are warning signals

An incident is an unforeseen event without injury or damage.
The next time the consequence of the same event may be worse.
An incident demonstrates that there is a risk. Every incident must be taken as a warning signal - exactly as if there had been an accident or someone had been taken ill.

Look out

Do not trust others to point out the hazards. It is difficult to remember all pointers and exhortations. New and unexpected risks may also occur.

Therefore; **look out!**

As a guide, a number of examples follow. They are not to be regarded as a comprehensive listing.

Working on machine



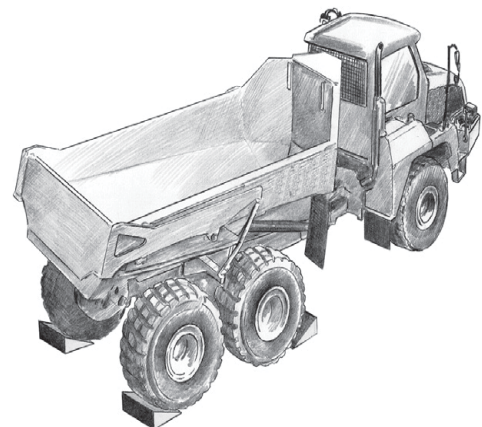
WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation and Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.



When performing maintenance operations on machine, prevent tripping and falling by keeping area around your feet clean and free of objects and debris. Always do the following:

- Do not spill oil or grease.
- Do not leave tools laying around.
- Watch your step when walking.
- Never jump down from machine. When getting on or off machine, use steps and handrails, and maintain a three-point contact (both feet and one hand or both hands and one foot) to support yourself.
- If job requires it, wear protective clothing.
- To prevent injury from slipping or falling, when working on hood or covers, never stand or walk on areas except areas equipped with nonslip pads.
- If it is necessary to work under raised equipment or the machine, support work equipment and machine securely with blocks and stands strong enough to support weight of work equipment and machine.
- Do not work under the machine if machine is lifted off ground and the machine is supported only with work equipment. If any control levers are moved, or there is damage to hydraulic system, work equipment or the machine will suddenly drop causing death or serious injury.
- Never service DOOSAN equipment without instructions.
- Always lower lift arm and attachment to ground before doing any maintenance.



- Use correct procedure to lift and support machine.
- Cleaning and maintenance are required daily.
- Welding or grinding painted parts must be done in well ventilated areas.
- Wear a dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Vent exhaust to outside when engine must be running for service.
- Exhaust system must be tightly sealed. Exhaust fumes are hazardous and can cause death or serious injury.
- Stop and allow engine to cool and clean engine of flammable materials before checking fluids.
- Never service or adjust machine with engine running unless instructed to do so in this manual.
- Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate skin or eyes.
- Never fill fuel tank while engine running, while smoking, or when near an open flame or sparks.
- Keep body, jewelry and clothing away from moving parts, electrical components, hot parts and exhaust.
- Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engine is running or tools are used. Use eye protection approved for welding.
- Lead-acid batteries produce flammable and explosive gases.
- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact.
- Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention from a physician familiar with this injury.
- The maintenance procedures which are given in this manual can be performed by the owner or operator without any specific technical training. Maintenance procedures which are not in this manual must be performed **ONLY BY QUALIFIED SERVICE PERSONNEL**. Always use genuine DOOSAN replacement parts.
- Only authorized personnel should service and repair the machine. Do not allow unauthorized personnel access to the machine or into work area.

- Lower work equipment and stop engine before performing maintenance.
- Park machine on firm, level ground.
- Turn starter switch to "ON" position and set pilot cutoff switch to "I" (ON) position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn button. If horn does not sound, the main power is shut off.)
- Put blocks against tire to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
 - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
 - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.
- When performing maintenance of engine that causes exposure to engine noise for long periods of time, wear hearing protection while working.
- If noise from the machine is too loud, it can cause temporary or permanent hearing loss and/or other problems.
- Do not smoke when you service an air conditioner or if refrigerant gas is present.
- Inhaling fumes either from a flame or gas from a cigarette that has contacted air conditioner refrigerant can cause death or serious injury.
- Never put maintenance fluids into glass containers. Drain all liquids into a suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for the proper procedure for placing equipment in servicing position.

Personal Protective Equipment (PPE)

Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment. Do not wear oily clothes. They are highly flammable. Do not forget that some risks to your health may not be immediately apparent.

Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries. Breathing masks and/or ear protection may be required. Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required. While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended functions.



Know Your Machine

Know how to operate your machine. Know the purpose of all controls, gauges, signals, indicators and monitor displays. Know the rated load capacity, speed range, braking and steering characteristics, turning radius and operating clearances. Keep in mind that rain, snow, ice, loose gravel, soft ground, slopes etc., can change operating capabilities of your machine.

Proper Work Tools and Attachments

Only use work tools and attachments that are recommended by DOOSAN for use on DOOSAN machines. When installing and using optional attachments, read instruction manual for attachment, and general information related to attachments in this manual. Because DOOSAN cannot anticipate, identify or test all attachments that owners may want to install on their machines, contact DOOSAN for written authorization and approval of attachments, and their compatibility with optional kits.



Vibration

When using vibrating tools e.g. chisel hammer, impact drill, impact nut runner, grinder injuries may be sustained by transition of tool vibrations to the hands.



Risks

Vibrations may cause vascular spasms (prickling and pain) in the surface veins. The fingers turn white, cold and senseless. Also nerves, muscles, bones, sinews and joints may be injured.

The risk of injury is believed to increase by smoking and also by low temperatures e.g. if the tools are cold or if the hands are exposed to chilling air.

The injuries become apparent especially when the fingers are cold, often when not working.

Vibration injuries are curable if taken care of in time.



Protective measures

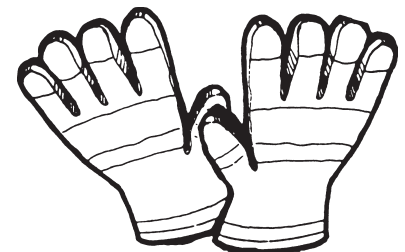
Use heavy gloves. Gloves provide some protection against vibrations and low temperatures.

Alternate between vibration-free and vibrating jobs to provide the body with a possibility to rest from vibrations.

By varying the work posture and grips, the body is not one-sidedly exposed to vibrations.

Avoid smoking before and during the work to help the blood circulation as much as possible.

If you notice any signs of vibration injury consult a doctor.



Protection against vibration

- Heavy gloves
- Alternate jobs
- Do not smoke before and during the work

Injurious noise

Rule of thumb:

Noise that is louder than 85 db (A) and that prevails for more than 8 hours is classed as injurious. (Some countries have other limits.) High frequency noise (high-pitched) is more injurious than low frequency noise (low-pitched) of the same amplitude.

Hearing protection may be needed when machine is operated with an open operator station for extended periods or in a noisy environment. See Operation and Maintenance Manual for sound levels for your machine.



Risks

Partial deafness, in difficult cases impaired hearing beyond cure.

It is impossible to train your tolerance to noise. You may believe that you are doing that if you notice less of the noise after some time.

IN THAT CASE YOU ARE REALLY IN DANGER !

Probably your sense of hearing is already impaired.



Protective measures

With noise absorbers on roof and walls and screens between work places it is easier to limit the propagation of noise. Against injurious noise you have to protect yourself with ear muffs. Ear muffs must be tested and approved.

Protection against noise:

- Use ear muff

Organic solvent

Organic solvents are mixtures of organic liquids (different from e.g. water) that dissolve grease, paint, varnish, wax, oil, glue, rubber etc.

Examples:

- | | |
|----------------------|-------------------------------------|
| - Petroleum spirits | -Toluen |
| - Trichlore ethylene | -Thinner |
| - Petrol | -Alcohols |
| - Xylen | -Plastics and
appertaining glues |



Risks

Solvents release fumes. Fumes may cause dizziness, loss of balance, headache and nausea. Fumes may also irritate the windpipe.

Solvent exposure may also lead to injury to the central nervous system. This may result in insomnia, depressions, nervousness, poor memory and a general sense of feeling tired.

When solvents come in direct contact with the skin, it will become dry and cracked. The risk of skin allergies increases and, additionally, there is a risk of a solvent causing dermatitis.

Many solvents are flammable.



Protective measures

As a first measure, arrange for ventilation that prevents fumes from mixing with the air you breath. Note that the ventilation has to be fire-proof if a solvent is flammable.

If a problem cannot be resolved with ventilation it is necessary to wear either a face mask or breathing protector with filter against dust and organic fumes.

Never leave tins with paint or solvent uncovered.

Use solvent with low content of aromatics. This reduces the risk.

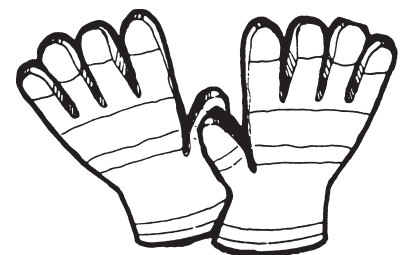
Ensure that solvents do not come into contact with the skin and do not use them as detergent.

Use plastic gloves when working. Gloves of certain materials can be penetrated by a solvent or even dissolved by such solvents. Make certain.



Protection against organic solvents:

- Fireproof ventilation
- Face mask or breathing protection with filter
- Replace caps/lids
- Use as harmless solvents as possible
- Avoid contact with the skin
- Do not wash the skin with solvent
- Use gloves



Fueling

Use caution when you are refueling a machine. Fuel is flammable and can catch fire if it is brought close to a flame. Stop engine and let it cool before adding fuel. Do not smoke while you are refueling a machine. Do not refuel a machine near flames or sparks. Fill fuel tank outdoors. Keep fuel and other fluid reservoir caps tight and do not start engine until caps have been secured. Store fuels and lubricants in properly marked containers away from unauthorized personnel.



Store oily rags and any flammable materials in protective containers. Static electricity can produce dangerous sparks at fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep tip of fuel nozzle in constant contact with neck of fuel filling nozzle, to provide a ground and prevent sparks. Always place plastic fuel containers on the ground before filling.



Fire and Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable and can cause a fire resulting in death or serious injury, and property damage. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause fire.

Inspect for and remove all flammable materials such as spilled fuel and oil, and debris from machine. Do not allow any flammable materials to accumulate on machine.

Always observe the following:

- Add fuel, oil, antifreeze and hydraulic fluid to machine only in a well ventilated area. Machine must be parked with controls, lights and switches turned "OFF." Engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark causing equipment must be extinguished, or turned "OFF" and kept well clear of machine.
- Dust that is generated from repairing or grinding nonmetallic hoods or nonmetallic fenders can be toxic, flammable and explosive. Repair these components in a well ventilated area away from flames or sparks and wear a dust mask when grinding painted parts.



Maintenance

The machine and some attachments have components that reach high temperatures under normal operating conditions. The primary source of high temperatures are the engine and exhaust system. If damaged or incorrectly maintained, the electrical system can be a source of arcs or sparks. Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean machine often to avoid this accumulation. Flammable debris in an engine compartment is a potential fire hazard. The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned. This is necessary to prevent fire hazards and overheating.



Operation

Do not use machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases. Do not operate machine near any flame. Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in case of a break in a line, hose, or seal. Exhaust shields must be correctly installed and maintained properly.

Electrical

Check all electrical wiring and connections for damage daily. Keep battery terminals clean and tight. Repair or replace any damaged parts or wires that are loose or frayed. Clean all electrical connections and tighten all electrical connections. Never check battery charge by placing a metal object across terminal posts. Use a voltmeter or a hydrometer. Battery gas can explode and can result in death or serious injury.

Follow procedures in this manual for connecting battery and for jump-starting. Do not jump-start or charge a frozen or damaged battery. Keep all flames and sparks away from batteries. Do not smoke in battery charging area. Improper jumper cable connections can cause an explosion that can result in death or serious injury. Refer to Operation and Maintenance Manual for proper procedure in this manual. Do not charge a frozen battery. This can cause an explosion. After market radios or other electric operated equipment in cabin must have a fuse in the electrical circuit.

Fire and explosion risks

Examples of flammable and explosive substances are:

- Oil
- Petrol
- Diesel fuel
- Organic solvents (varnish, plastic, detergents)
- Anti-corrosive
- Acetylene and other gas for welding and heating



Examples of reason for setting on fire:

- Welding, cutting
- Smoking
- Machine grinding
- Sparks caused by static electricity or electric equipment
- Heat generated in waste and rags soaked with certain types of oil and paint (linseed oil)
- Oxygen increases the risk of ignition. Containers, pipes and valves for oxygen therefore have to be free of oil and grease



Special cases:

- **Battery charging**
- When charging batteries the water content in the battery acid is split into oxygen and hydrogen. This makes a gas mixture that is very explosive. The risk is especially acute when using an auxiliary battery or a speed charging unit.
- When boost starting from another machine or vehicle do not allow two machines to touch. Wear safety goggles and gloves while battery connections are made.
- **Diesel fuel**

The flash point may have been lowered by mixing with petrol. Such a mixture is then explosive in normal room temperature. If diesel fuel is heated it is more explosive than petrol.



Protection against fire and explosion

- Store dangerous substances in approved containers and ensure that it is closed.
- Keep ignition sources removed from or completely screened from the dangerous substances.
- Ventilation, evacuation.

In case of Fire

If a fire occurs:

- Do not attempt to move machine or continue operations.
- Turn starter switch to "O" (OFF) position to stop engine.
- Use handrails and steps to get off machine.
- Immediately call for help or fire station.
- When using a fire extinguisher, always aim extinguisher at base of fire.
- If an optional fire extinguishing system is in place, be familiar with its operating procedures.



NOTE

Depending on job conditions, other procedures could be necessary if a fire occurs.

Fire Extinguisher and First-Aid Kit

(Emergency Medical Kit)

To be prepared in the event of a fire:

- Be sure that fire extinguishers have been provided and read labels to ensure that you know how to use them. It is recommended that an appropriately sized (2.27 kg [5 lb] or larger) multipurpose A/B/C fire extinguisher be mounted in cabin. Check and service fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Inspect fire extinguisher and service fire extinguisher regularly.
- Follow instructions on extinguisher instruction plate.
- Keep a first aid kit in storage compartment (Figure 15) and keep another kit at work site. Check kit periodically and keep it properly supplied.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department readily available.

