SAN DIEGO FIRE-RESCUE DEPARTMENT

BRUSH APPARATUS TASK BOOK

May 2019

TRAINEE NAME: _____

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BRUSH APPARATUS CERTIFICATION

MUST BE COMPLETED IN ITS ENTIRETY BEFORE AN APPARATUS CERTIFICATION WILL BE ISSUED.

Apparatus No: _____ @ Station: _____ Return certification to Station #: _____

Name (Print):_____Employee ID #: _____

Rank:_____ Station:_____Division: _____Battalion: _____

CDL#: _____ Exp: ____ / _____ / ____ Physical: ____ / ____ / ____ Exp: ____ / ____ / _____

Class: _____ Endorsement(s): _____ Restriction(s):_____

This trainee has, within six (**6**) months from the start date, satisfactorily completed a thirty (**30**) hour (minimum) training course in the operation of this vehicle, demonstrating the requisite knowledge and skills to effectively and safely operate this classification of apparatus.

NOTE: Total training hours required for certification will depend upon the trainee's skill level and **NOT** the minimum hourly requirement. However, Training time may **NOT** be reduced even if trainee is previously certified on other apparatus.

Dates of Training: From: _____ / _____ / _____ To: _____ / _____ / _____
Month Day Year Month Day Year

Trainee has documented the following training on the Driver Training Record (FD-902):

- ☐ A minimum of six (**6**) hours of driving on improved surfaces (On-Road)
- ☐ A minimum of twelve (**12**) hours of driving on unimproved surfaces (Off-Road)
- ☐ A minimum of six (**6**) hours (minimum) of pump operations, wildland drafting, hose lays and hydraulics, demonstrating the requisite knowledge and skills to successfully and effectively perform all pumping tasks associated with this apparatus.
- ☐ A minimum of two (**2**) hours of winch system and auxiliary equipment operation demonstrating the requisite knowledge and skills to successfully and effectively perform all operational tasks.
- ☐ A minimum of four (**4**) hours using all apparatus forms and performing apparatus and auxiliary equipment maintenance

Trainee Signature: _____

* Trainer: _____ _____
Print Name and Rank Signature

* Captain: _____ _____
Print Name and Rank Signature

* Battalion Chief:_____ _____
Print Name and Rank Signature

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* Your signature certifies that the above person has completed the certification program detailed in this booklet. This individual has completed the minimum number of training hours and demonstrated a driving and operating ability that is consistent with all department standards and procedures.

TRAINING DIVISION USE ONLY

Driver Training Officer Signature: _____

Training Chief Signature: _____

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TRAINING RECORD – BRUSH APPARATUS

Trainee Name:____**Page**____**of**____

MO/DY/YR	TIME	HRS	APP #	TASK	STA##	CAPTAIN NAME
(Example) 8/27/19	FROM: 0800 TO: 1200	4	2641	**(Example)** Driving (Document only one task at a time, ie. Driving, Pre-trip, pumping, Aerial Ops)	10	PRINT: Captain James Roberto SIGN: *James Roberto*
MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
	FROM: TO:					PRINT: SIGN:
MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
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MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
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MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
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MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
	FROM: TO:					PRINT: SIGN:
TOTAL HOURS THIS PAGE:						

*NOTE: Training hours shall be documented in Target Solutions daily and be limited to a **maximum** of six (**6**) hours per shift.

TRAINING RECORD – BRUSH APPARATUS

Trainee Name:____Page____of____

MO/DY/YR	TIME	HRS	APP #	TASK	STA##	CAPTAIN NAME
	FROM:					PRINT:
	TO:					SIGN:
MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
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MO/DY/YR	**TIME**	**HRS**	**APP #**	**TASK**	**STA#**	**CAPTAIN NAME**
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01
Overview

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1.1 INTRODUCTION

Task Book:

The San Diego Fire-Rescue Department Training Division has developed this Task Book to provide a training format and certification of the minimum skill level needed to successfully operate this apparatus as the driver and equipment operator. Each Task Book lists the job performance requirements for the specific certification in a format that allows a candidate to be trained and evaluated during the training sessions. To achieve certification, the applicant must successfully complete ALL task and job performance requirements listed in this Task Book.

Note: Before a certification can be issued, successful job performance of all sections must be observed and recorded by a qualified and approved trainer.

These job performance requirements serve as general guidelines. As such, they are not intended to replace specific sequences of apparatus or equipment operation that may be outlined by manufacturer specifications. Training shall follow department standard operating procedures. **IF** you are unsure about the safe operating principles and limitations of the specific make of your apparatus, refer to the manufacturer operation manual. When a conflict with department procedures and manufacturer specifications occur, manufacturer procedures will govern the task. **Err on the side of safety**. Trainers should have manufacturer specifications and department standard operational guidelines available. Should additional assistance be required, contact the Driver Training Officer at the Training Division for assistance. **DO NOT** contact the manufacturer directly.

There is a six-month time restriction from beginning a certification to the time of completion. If a trainee does not complete the certification in the six-month time limit, they must start the entire process over. The Training Division must receive the completed Task Book no later than thirty (30) days after completion of training.

Trainer:

1. Must be an Engineer or higher, certified on the apparatus and possess a current license with appropriate endorsement(s), before conducting any training.
2. Ensure that all information, dates, and hours are recorded accurately in this Task Book.

Trainee:

1. Must have a current applicable license or permit, with appropriate endorsement(s), in their possession and show it to the trainer at **each** training session.
   Note: Drivers must follow all restrictions on their license. Example: a 64 restriction (automatic transmission only) cannot drive a manual transmission apparatus.
2. Check to see that the trainer is certified for the apparatus you will be utilizing.
3. Complete driver's license information on the certification page(s).
4. When all Task Book information has been documented, obtain required signatures and forward the completed Task Book to the Driver Training Officer, at the Training Division.

The Driver Training Officer will review this Task Book to determine that all the information is complete and correct. The certification form will be removed and filed at Training, and the Task Book will be returned to the trainee for future reference.

A class "B" license with a tanker (N or X) endorsement is required to drive this apparatus.

1.2 INSTRUCTIONS

A. The trainer will check (☑) off each box after successful completion of the performance requirements by the trainee.

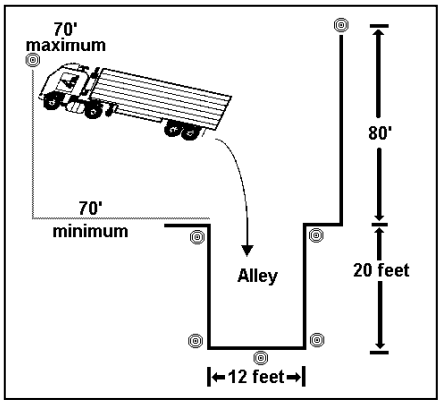
B. Sections with three boxes are to be initialed after each evolution is successfully completed.

* Driving skills can be demonstrated during normal driving after completion of practice training and basic skill demonstration in an approved practice area(s).

EXAMPLE:

1. *Alley Dock (backing into station)(DMV)
   Dock the vehicle from a 90-degree angle, in one movement, without touching any cones or stanchions, staying within all boundary lines, and stopping within three (3) feet of the dock or stop line. Pulling forward will result in a penalty.

JL	JL	JL



C. Trainee must complete a of minimum six (**6**) hours of driving on **improved surfaces (On-Road)** to include:

1. Normal street / traffic conditions
2. Multiple turns and lane changes
3. Highways/Freeways
4. Up / down hills requiring shifting
5. Railroad crossing
6. Underpass / low clearance areas
7. Maneuvers listed in the Driving Skills section

D. Trainee must complete a of minimum twelve (**12**) hours of driving on **unimproved surfaces (Off-Road)** to include:

1. Narrow dirt roads
2. Road surfaces of sand, loose dirt, green grass, mud, ruts, scrub
3. Blind intersections, hills, corners
4. Up / down hills requiring shifting
5. Slopes (**NOT** to **EXCEED 40%**)
6. Stopping and parking on hills
7. Low clearance areas
8. Four (4) Wheel Drive

E. Trainee must complete a minimum of six (**6**) hours of pump operations, wildland drafting, hose lays and hydraulics, demonstrating the requisite knowledge and skills to successfully and effectively perform all pumping tasks associated with this apparatus.

F. Trainee must complete a minimum of two (**2**) hours of winch system and auxiliary equipment operation demonstrating the requisite knowledge and skills to successfully and effectively perform all operational tasks.

G. Trainee must complete a minimum of four (**4**) hours using all apparatus forms and performing apparatus and auxiliary equipment maintenance

NOTE: Driving requirement(s) may be adjusted or eliminated if not in the available operation area

1.2 INSTRUCTIONS CONTINUED

H. Resources:
   1. Manufacturer's Maintenance and Operating Manuals
   2. San Diego Fire-Rescue Department Policies and Procedures
   3. California Vehicle Code and Department of Motor Vehicle Commercial Driver Handbook
   4. City of San Diego Driver / Operator Manual
   5. Target Solutions- RT-130 Wildland Refresher Module 4. https://www.youtube.com/watch?v=FLn3SNw3YaY&feature=youtu.be.
   6. Off Road Training Manual
   7. IFSTA Aircraft Rescue and Firefighting
   8. Ervin Fire Fighting Apparatus and Procedures (3rd edition)
   9. SDFD apparatus specification sheet
   10. Freightliner Business ClassM2 Driver/maintenance Manual https://dtnacontent-dtna.prd.freightliner.com/content/public/dtna-servicelit/TechLit-Homepage.html?make=freightliner
11. Kubota 902 Diesel Engine (Auxillary Pump Engine) https://data2.manualslib.com/pdf5/109/10856/1085567-kubota/z482e.pdf?0f2491dfcd570036c7cfdcc2aeed104a&take=binary

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02
Apparatus

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2.1 PREPARATION

A. Read the apparatus operation manual and ancillary equipment manuals completely
B. Articulate an understanding of all danger, warning, and caution notices stated in the apparatus operation manual

2.2 DESCRIPTION

A. Manufacturer _____
B. Apparatus Type _____
C. GVWR _____
D. Engine Manufacturer _____
E. Engine Cycles / Type _____
F. # of cylinders / CID _____ / _____
G. Governed speed _____ RPM
H. Max Horsepower _____ @ RPM _____
I. Max Torque _____ @ RPM _____
J. Transmission Type_____
K. Water Tank Capacity_____

2.3 SPECIFICATIONS

A. Height (clearance) _____ Width _____ Turning Diameter _____
B. Width (Body) _____ Width (Body, Equipment, & Mirrors) _____
C. Length _____ Chassis overhang – Front _____ Rear _____
D. Equipment overhang – Front _____ Rear _____
E. Angle of approach _____ Departure _____ Ground Clearance _____
F. Tire pressure – Front _____ Rear _____
G. Air brake can size – Front _____ Rear _____
H. Maximum stroke – Front _____ Rear _____
I. Clevis pin measurement (+ or - 1/16") – Front _____ Rear _____

2.4 VERIFICATION OF OPERATIONAL STATUS

A. Checks that parking brake is set
B. Performs Pre-trip inspection (FDM-7)
C. Perform air brake system test and brake measurements
LF _____ LR _____ RF _____ RR _____
D. Perform daily, weekly, and monthly assigned checks (FDM-8)
E. Knowledge of all forms that apply to this apparatus
F. **CHECKS THAT WATER AND FOAM TANKS ARE FULL**
G. Performs "Walk Around" prior to entering cab to drive
    1. Secure equipment
    2. Compartment doors closed
    3. Disconnect air and electrical cords
    4. Wheel blocks up and stowed
    5. Clear to proceed
H. Adjusts seat and mirrors
I. Checks that intercom and radios are operational and volume is correctly set

2.5 STARTING

A. Fastens seatbelt
B. Battery switch on "**BOTH**" and / or master ignition switch "**ON**"
C. Transmission in neutral
D. Ignition to "**ON**" position
E. Locates and checks gauges, switches, and controls
F. Observes dash indicator light system test for indicator light problems
G. Starts engine
H. If it doesn't start
    1. Repeat steps B thru G
    2. Maximum crank time 15-seconds, then rest 15-seconds. Repeat 3 times
    3. If it still does not start
        a. Call for repair
I. Runs engine at **Low Idle (600-800 RPM)** for two-minutes to lubricate engine and turbo charger
J. Check gauges (at 1000 RPM)

    WARNING - DO NOT operate vehicle if gauge readings are outside of normal range, high or low

    1. Oil pressure reading _____ PSI Normal reading should be _____ PSI
    2. Air pressure reading _____ PSI max Driving pressure range is _____ to _____ PSI
    3. Voltmeter reading _____ Volts Normal reading should be _____ Volts
    4. Ammeter reading _____ Amps Normal reading should be _____ Amps
    5. Engine temperature _____ F Normal operating temperature should be _____ F
    6. Transmission temperature _____ F Normal operating temperature should be _____ F
K. Check Jake Brake control switch "**ON**"

2.6 AIR BRAKE SYSTEMS

A. Describe operation of apparatus compressed air system
    1. Is air compressor belt or gear driven?
    2. Emergency brakes set automatically at _____ PSI
    3. Low air warning _____ PSI
    4. "Cut In" pressure _____ PSI
    5. "Cut Out" pressure _____ PSI
B. Parking-Brake (Spring-Brake)
    1. Describe the operation and function of the spring brake system
    2. Describe and demonstrate how to apply and release spring brakes correctly
        a. Releasing rear brake system automatically releases front brake system

☐ 2.7 SECONDARY BRAKING DEVICES

A. Jacobs Exhaust Retarder
   1. Describe theory of operation and normal switch position
   2. Demonstrates proper use during driving operations
   3. Turns off when pumping
   4. Procedure for wet or slippery conditions (Dry grass and loose soil are slippery surfaces)
      a. Switch position
      b. Use / non-use of Jacobs Exhaust Retarder)

☐ 2.8 AUXILIARY AND SAFETY SYSTEMS

A. Load Manager
   1. Purpose and function of Load Manager
   2. Explains significance of each indicator light (colors) _____, _____
   3. Normal operating position of the Load Manager switch along with the Master Light switch is that both switches are _____ (up / down)
   4. Which systems are controlled by the Load Manager?
   5. Order in which the Load Manager sheds systems
   6. How and when the Load Manager can be bypassed
   7. Possible consequences of bypassing the Load Manager
   8. Proper way to reset the Load Manager

B. Antilock Braking System (ABS)
   1. Describes ABS operation
   2. Describe location of ABS indicator light _____
   3. ABS prevents wheel _____
   4. Wheels effected _____
   5. Utilizes normal brake pedal pressure during stops (DO NOT PUMP BRAKE PEDAL)
   6. ABS warning light remains lit until _____ MPH (color) _____
   7. Reports malfunction if warning light stays on (color) _____
   8. Emergency Braking with Antilock Braking System (ABS)
      a. **USE IN EMERGENCY SITUATIONS ONLY**
      b. **STOMP** - the brake pedal to the floorboard
      c. **STAY** - on the brake pedal, do not let up
         i. Releasing the pedal resets the ABS computer, **INCREASING** the stopping distance
      d. **STEER** - around the hazard(s)
         i. The vehicle will handle well with ABS system working

2.9 MAINTENANCE PROCEDURES

A. Describes frequency and procedure to replace
    1. Coolant capacity _____ gallons % Mix _____
    2. Power steering fluid type _____
    3. Engine oil type _____ Engine oil capacity _____ gallons
    4. Transmission oil type _____ Transmission Oil capacity _____ gallons
    5. Fuel type _____
    6. Fuel capacity _____ gallons
    7. Differential oil type _____ Oil capacity _____ gallons
    8. Front hub oil type _____ Weight _____ lbs
B. Describes benefits of proper maintenance
C. Performs Monthly and Quarterly Apparatus Maintenance checks (FDM forms)
    1. Reviews maintenance manual for appropriate lubricants and chart of lubrication points
    2. Cleans and degreases apparatus
    3. Inspects apparatus for leaks, defects, rust, cracked or chafing hoses, and repaint needs
    4. Lubricates all grease points (zerk fittings) and other moving joints
    5. Cleans excessive grease from all fittings and surfaces
    6. Cleans and inspects all pump intake screens
    7. Performs intake relief valve(s) test(s) and maintenance
    8. Performs auxiliary equipment tests and maintenance
    9. Clean, inspect, and lubricate all winch components
D. Hood Tilt Procedure
    1. SAFETY considerations for hood tilt operation
        a. Engine may be running if the apparatus parking brakes and chock blocks are down and set
        b. Secure all loose materials in cab and close doors
        c. Check for apparatus equipment that may interfere with cab tilt and reposition
        d. Check for over-head obstructions
        e. Release side hood latches
        f. Use a ladder or step stool to safely reach the hood grip point to pull the hood up
    2. Demonstrates proper procedure for raising hood
    3. After raising hood, secure in the up position if conditions dictate
    4. Lowering hood
        a. Push off support stop
        b. Lower cab
        c. Insure side latches are properly secured
E. Explains VOGEL Lubrication System and the Engineer duties relative to the system
    1. Daily, visually checks (observes) “AUTO LUBE” self-check indicator on apparatus startup
        a. Light should blink three (3) times indicating system “OK”
        b. If light remains “ON”, there is a system fault
        c. Checks system grease level to see if system needs refill
        d. Reports all faults to the Repair Facility immediately
        e. System refill is only performed by the Repair Facility

2.9 MAINTENANCE PROCEDURES CONTINUED

2. Visually checks auto lube operation at the system lube points looking for excess grease on the apparatus or the ground indicating possible broken lube lines or loose connections
3. Monthly lubricates all grease points (zerk fittings) and other moving joints that are not part of the auto lubrication system
4. During pre-trip brake and undercarriage inspection, checks the system hose lines and connections for looseness, kinks, or other damage
5. **DOES NOT** store any equipment in the top well (where the auto lube unit is located) that in any way touches, or can possibly touch, the system wiring or lube hoses
6. Reviews maintenance manual for appropriate lubricants and chart of lubrication points

F. Performs daily, weekly, and monthly Husky Foam System tests and maintenance
1. Checks foam pump hydraulic oil level daily, fill with _____ weight non-detergent oil
2. Cleans foam strainer in line from foam tank weekly
3. Cleans water strainer in line to foam system weekly
4. Inspects wiring, hoses, and flowmeter connections for tightness, corrosion, leaks, and damage
5. Determines that foam pump has received appropriate semi-annual and annual service at the Repair Facility
    a. Reviews FDM-9 entries to determine last semi-annual meter calibration, sensor paddle wheel cleaning, and annual foam pump oil change from the Repair Facility
    b. Notifies Repair Facility using an FDM-7, if the system needs this maintenance
6. System calibration and default setting changes are to be performed only by repair facility personnel
7. The foam refill inlet and pump may be used to flush the entire foam system if required because of changing foam brands or types, or foam coagulation from lack of use or introduction of incorrect foam concentrate

G. Washing Instructions
1. Pierce maintenance manual section #4
2. Avoid using high water pressure, hot wash solutions, abrasive detergents, or rough cleaning materials or motions
3. Never wash in direct sunlight as the apparatus surface temperature may be to hot and gold leaf or other lettering may be damaged.
    a. Wax these areas only do not wash!
4. Use only vehicle washing soap such as 3M car wash soap PN_39000 or equivalent
5. Pre-wet all surfaces before applying soap solution
6. Use only soft materials and gentle cleaning motions to apply washing solution
7. Rinse thoroughly before washing solution can dry
8. Pressure wash ONLY the under-side of the apparatus
9. Dry all surfaces with a clean, soft, non-abrasive cloth or chamois

H. Avoid daily washing as it damages paint, wash only when dirty, wipe down with damp chamois or cloth to remove dust or dirt between washings

2.9 MAINTENANCE PROCEDURES CONTINUED

I. Apparatus Towing Instructions
    1. **NEVER** tow an automatic transmission equipped vehicle in neutral, remove the drive shaft to prevent transmission damage
    2. All towing operations and connections are the responsibility of the tow operator
    3. Chock vehicle tires while working on or around the vehicle
    4. Unload as much equipment as possible to reduce tow weight
    5. Drain apparatus water tank to reduce weight

J. Describes checks to be performed after any maintenance at any repair facility
    1. Clean and refuel apparatus as necessary
    2. Perform a complete inventory
    3. Perform a complete pre-trip inspection
    4. Check tire pressure before moving the apparatus and after driving 25 miles
    5. Perform a complete post trip inspection immediately upon return to the station and immediately report any problems noted

03
Incident Communications

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3.1 INCIDENT COMMUNICATIONS

A. Demonstrate Knowledge and ability to:
    1. Interpret dispatch information from a cell phone
    2. Explains and properly demonstrates Fire Department radio operating policies and procedures
        a. Uses correct radio terminology
    3. Explains and properly demonstrates Fire Department MDC policies and operating procedures
    4. Read maps (SDFD, Thomas Brothers, & topographic) and find locations
    5. Select appropriate Staging position
    6. Communicate with the Incident Commander as to:
        a. Staging location
        b. Operating location and amount of water for operations
        c. Judge safety of staged and operating positions
        d. Appropriate PPE for wildland or urban interface
    1. Ensure 800mhz and VHF Radio Fleet Maps is on apparatus and is the most current version. These are located at:
        - Fire-Rescue Department WebPortal-Operational- 800 Radio Fleetmap, VHF Mobile Radio Fleetmap, VHF Portable Radio Fleetmap.

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04
Driving

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4.1 DRIVING

A. Checks that crew is seated and seat belts are fastened
B. Foot on brake
C. Wears appropriate gear for road, weather, and operating conditions
D. Releases parking brake
E. Does not allow apparatus to roll back
F. Acceleration
    1. Applies light accelerator pressure to begin movement
    2. Eases off accelerator as desired speed is reached
    3. Avoids full throttle acceleration from a stop
    4. Consistent, smooth, and controlled
G. Braking
    1. Anticipates stops and roadway imperfections
    2. Slows down and brakes before roadway imperfections such as dips and drainage swales
    3. Correctly utilizes retarder system controls to slow vehicle
    4. Allows engine to act as a brake (down shift to achieve if necessary)
    5. Brakes into turn - Accelerates out of turn
    6. Leaves room to go around other vehicles or obstacles when stopped
    7. Consistent, smooth, and controlled
H. Operates engine in proper power range
    1. Maintain engine RPM in the lower 1/3 of the engine's power range for current operating conditions, which include the designated roadway speed limit
I. Operates vehicle with awareness of chassis length and chassis and equipment overhang
    1. Considers vehicle length when changing lanes
    2. Slows sufficiently at bumps and dips in roadway to prevent chassis from bottoming out
J. Chooses correct lane for driving conditions
K. Follows all Fire Department Policies, Procedures, and California Vehicle Code regulations
L. Turning
    1. Plans and adjusts for extended turning radius of vehicle
    2. Uses mirrors consistently during driving and maneuvering for positioning in turns and to monitor for possible hazards
        a. Correctly compensates for limited rear vision in apparatus mirror system
        b. Awareness of all vehicles and obstacles in possible turning areas
    3. Utilizes turn signals well in advance of maneuver(s) to alert others of intentions
    4. Preselects appropriate gear to slow and control apparatus before and during turns
    5. Starts and completes turn in proper lane
    6. Obeys speed signs on all roadway turns
    7. Proper hand position on steering wheel
    8. Does Not let steering wheel slip through hands
    9. Avoids turning steering wheel while stopped
M. **DO NOT** idle engine for long periods of time (**10 minutes or more**) as damage to turbo and injectors will occur from poor engine lubrication
        a. If idling for long periods is required by operations, increase RPM level to a minimum of **900 RPM (High Idle)** to cool and lubricate engine and turbocharger

4.2 DRIVING CAUTIONS

A. Understands and applies height and weight restrictions to operation of the apparatus
    1. High center of gravity
    2. Mass of water in motion (4,000+ lbs)
    3. Partially empty water / foam tanks increase vehicle instability due to sloshing of fluid
    4. Reduced braking ability due to heavy weight (_____ lbs GVWR)

B. **NO sharp turns at any speed above 10 mph**
    1. Preselects appropriate gear to slow apparatus for driving conditions and turns
    2. Does not brake hard while turning except at low speeds
    3. Checks the speedometer **BEFORE** making any turn
        a. **DO NOT** attempt to estimate the apparatus speed
    4. Remember, mass in motion will continue to move in the same direction
    5. The solid front 4 x 4 axle will affect the stability of the apparatus as the front wheels move up or down in response to holes, soft spots, rocks, other uneven surface features, or when the front end dips down from turning and / or brake application
        a. When one wheel moves down the other moves upward in response to this motion and the apparatus tips quickly to the side of the downward moving wheel, which then causes an exaggerated rocking motion that may roll the apparatus over
    6. When responding to emergencies, accelerate while driving straight, but downshift and brake before going into a turn or curve

4.3 BACKING

A. When and how to back (Refer to SDFD Ops Manual SI 1 Sec. 9 F.3, and City of San Diego Administrative Regulation 75.05 Backing Policy)
B. Use of emergency lights
C. Utilization of crew
    1. Use personnel to back apparatus at all-times (includes other responders)
    2. Utilize back-up horn control cable and signal button to assist in proper backing
    3. Stop immediately if backing personnel are lost from sight
    4. Ensures crew utilizes all backup warning devices
D. Communications with crew
    1. Remove communication headset to hear crew outside apparatus
    2. Ensures crew utilizes handheld backup buzzer
E. Sets up backing maneuver by proper positioning
F. Appropriate speed while backing
G. Demonstrates procedure when alone
H. Turning radius when backing is _____ feet
I. Avoids over steering while backing

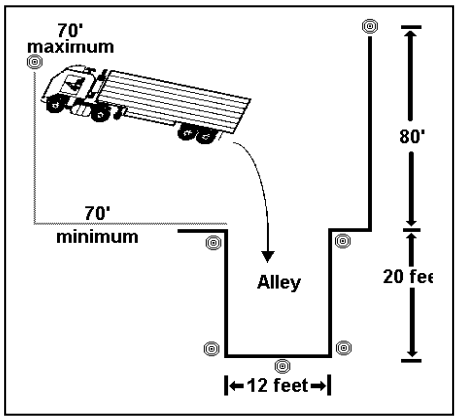
4.4 DRIVING SKILLS

A. Demonstrates the following driving skills / maneuvers:

Driving skills can be demonstrated during normal driving after completion of required practice training and basic skill demonstration in an approved practice area(s).

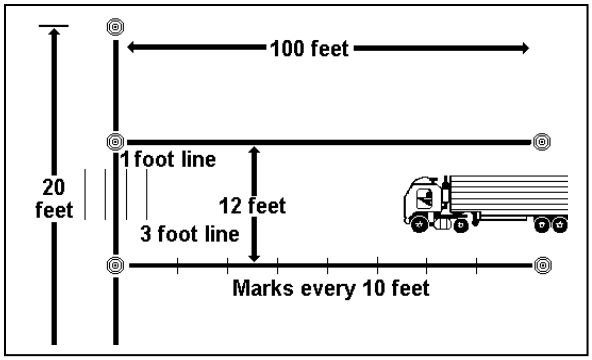
1. *<u>Alley Dock</u> (Backing into the station) <u>(DMV)</u>

Dock the vehicle from a 90-degree angle in one movement, without touching any cones or stanchions, staying within all boundary lines, and stopping within three (3) feet of the dock or stop line. Pulling forward will result in a penalty.



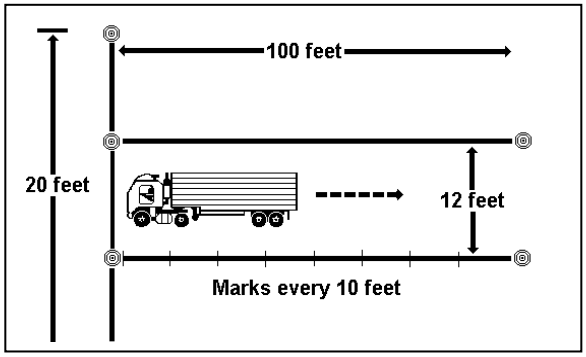
2. <u>Forward Stop</u> (Limit-line) <u>(DMV)</u>

Drive down a 12-foot-wide lane and stop when the driver estimates that the bumper is even with the stop line. Driver is allowed to make **one** stop only, to be within one (1) foot of the stop line.



3. <u>Straight Line Backing (DMV)</u>

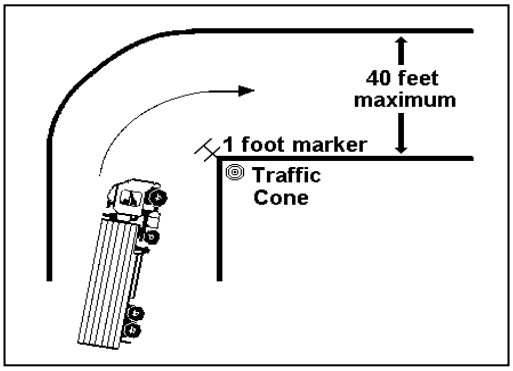
May be combined with forward stop (Limit Line). Drive in reverse in a 12-foot-wide lane without going outside the cones or boundary lines.



4.4 DRIVING SKILLS CONTINUED

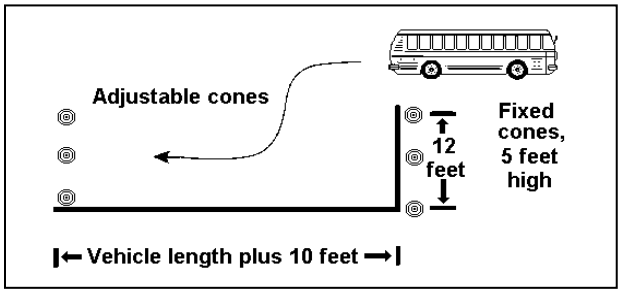
4. Measured Right Turn (DMV)

Make a right turn around a corner with the back axles of the vehicle within one (1) foot of the designated cone, **without** striking it. All turns will be started from and completed into lanes that do not exceed twelve (12) feet in width.



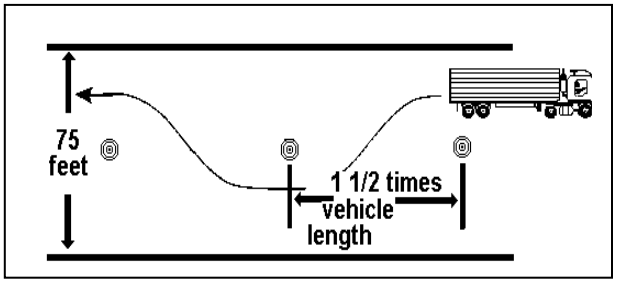
5. Parallel Parking (DMV)

Park in a designated area without striking any cones or boundary lines.



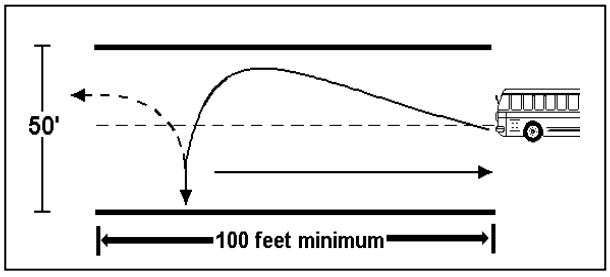
6. Serpentine

Maneuver vehicle both forward and in reverse around 3 cones in a serpentine manner without striking any cones and staying within the boundary lines.



7. Three-point U-turn

Driver turns the vehicle 180 degrees, staying inside the cones or boundary lines. There is no limitation on the number of maneuvers used to accomplish this task.



☐ 4.5 SHIFTING AUTOMATIC TRANSMISSIONS

A. Maintains engine speed in **power range** (**1600 - 2100 RPM**)

WARNING - DO NOT LUG OR OVER SPEED THE ENGINE

WARNING- DO NOT IDLE IN DRIVE FOR MORE THAN 5 MINUTES. EXTENDED IDLING IN DRIVE MAY CAUSE TRANSMISSION OVERHEATING AND DAMAGE. ALWAYS SELECT NEUTRAL IF TIME AT IDLE IS LONGER THAN 5 MINUTES.

B. Maintains and selects appropriate transmission gear for road, weather, and operating conditions to retain engine speed in power range
   1. The engine power range is the safest and most fuel-efficient rpm to operate the engine
   2. To reduce apparatus speeding incidents drive in the lowest possible gear that maintains the engine in the **lower 1/3 of the engine power range** at the posted speed limit

C. Manually selects lower gear when engine lugs or transmission cycles between gears
   1. Allison transmissions WILL NOT shift to a manually selected gear until the transmission is in the correct operating range, even if you incorrectly select a gear

D. DOES NOT descend a hill in a gear higher than that required to ascend the hill

E. Properly uses the MODE switch

☐ 4.6 CODE 3 OPERATIONS

A. Speed (Review Operations Manual SI 1 Sec 9.D)
   1. The AVL system keeps tracks of apparatus speed and location at all-times

B. Lights, siren, and Opticom

C. Intersection

D. Passing

E. Freeway

F. Railway Crossings

G. School Bus

Describe sequence of code light activation

☐ 4.7 UNIMPROVED/SEMI-IMPROVED SURFACES

A. Remember the GVWR of this apparatus is _____lbs

B. Remember the apparatus has a very high center of gravity _____inches

C. Remember the solid front axle will affect the stability of the apparatus as the front wheels move up or down in response to holes of other terrain variations causing exaggerated rocking motion

D. Operation on semi - improved surfaces (other than fully engineered surfaces) **MUST** be done with extreme care as structural stability of surface and underlying soil is unknown
   1. Soil or surfaces other than dedicated streets or highways have unknown load bearing capability
      a. Gravel roadways or parking areas
      b. Back country roads (private and fire), culverts, and bridges
      c. Paved surfaces other than dedicated streets
      d. Private drive ways
      e. Sidewalks
      f. Parking structures
      g. Adjacent to surfaces at the top of slopes
      h. Adjacent to surfaces or slopes above soil held in position by retaining walls
   2. Improved or engineered surfaces are load rated at **500 PSI**

4.7 UNIMPROVED/SEMI-IMPROVED SURFACES CONTINUED

E. Carefully inspects the apparatus, tires, and under carriage for damage after operation on an unimproved or semi-improved surface

F. Carefully inspect all tires and between dual tires to determine if rocks or other material is caught between the dual tires after all operations on any semi - improved surface

G. If you are driving in dusty conditions you may need to clean engine air filters daily.

4.8 OFF-ROAD

A. PREPARING FOR OFF-ROAD OPERATION - ALL WHEEL DRIVE

1. Use all wheel drive (4 WD or 6 WD) off-road only for part-time AWD 4x4 operation

B. IMPORTANT:

- *****Do not engage a Meritor MTC Series Transfer case when driving on normal highway conditions. Severe Personal injury and/or damage to components can result when the transfer case is misused*****
- *****The wheels must not slip during engagement of the steer axle driveline.*****
- **Steer axle engagement is limited to 20% or less of annual vehicle mileage.**
    a. **Never drive and turn on hard or improved roadway surfaces in all wheel drive** (4 WD), Always return to two-wheel drive (2 WD)
        i. Driving with the differential lock engaged may break driveline components such as axles and will damage tires

C. **<u>Engaging and Disengaging the Steer Axle (AWD)</u>**:

1. To engage the steer axle driveline, Stop the vehicle and place transmission in Neutral. Apply the parking brake. Press AWD switch, place in appropriate gear and release brake. An audible engagement may be heard.
    a. Occasionally, you may have to move the apparatus backward or forward slowly to aid in engaging or disengaging the transfer case by aligning the gears
2. To disengage the steer axle, stop the vehicle and place transmission in Neutral. Press the AWD switch. An audible disengagement may be heard. If the steer axle driveline does not disengage the steer axle driveline coupling may be in a bind. Turn the steering wheel back and forth while driving or briefly drive the vehicle in reverse.
3. Switch back to two-wheel drive (2 WD) just before returning to any hard roadway surface

Range	Disengaged Steer Axle		Engaged Steer Axle	
	Traction Conditions	Applicable Vehicle Speeds	Traction Conditions	Applicable Vehicle Speeds
HIGH RANGE	Most normal driving conditions (such as dry or wet pavement or mixed road surfaces) when moderate to high vehicle speeds are appropriate.	0 mph (0 km/h) to maximum vehicle speed	When more traction is needed at moderate to low vehicle speeds on dirt or gravel surface with shallow to moderate grades (8% maximum), icy or snow-covered roads, or hard-packed sand.	20 mph (32 km/h) or less
LO RANGE	Not applicable. Do not use LO RANGE unless the steer axle is engaged.		When maximum power and maximum traction is needed on steeper grades (15% maximum), deeply rutted tracks, deep mud or snow, extremely rocky surfaces, or soft, loamy sand.	15 mph (24 km/h) or less
IMPORTANT: Engaging the steer axle will increase the turning radius of the vehicle.				

Table 8.2, Operating Guidelines, Meritor MTC Transfer Cases

D. Shifting Between HIGH RANGE AND LO RANGE

4.8 OFF-ROAD CONTINUED

MTC Series transfer cases use an air cylinder to shift between HIGH RANGE and LOW RANGE. The dash mounted Lo Range and High Range switch operates this shift mechanism.

Shift between HIGH RANGE and LOW RANGE as follows:

1. Stop the vehicle.
2. Shift the Transmission to NEUTRAL.
3. Apply the parking brake.
4. Move the dash-mounted switch to the HIGH or LO RANGE position to pressurize the shift mechanism in the transfer case. An audible engagement may be heard (which is normal)
5. Shift the transmission to FIRST gear and apply light torque to test the engagement.
6. If the shifter does not engage when shifting from HIGH RANGE to LO RANGE, shift the transmission into REVERSE, then NEUTRAL, and apply light torque to engage the LO RANGE.

E. Engaging PTO

1. Stop the vehicle.
2. Shift the Transmission to NEUTRAL.
3. Apply the parking brake.
4. Select PTO switch to "ON"
5. "OK to PUMP" Light should come on
6. Place Transmission into gear for pump and roll "OK to Pump and Roll" light should come on.

F. SAFETY

1. **Defensive Driving**: The only defense against vehicle accidents and near misses is to learn to recognize hazards and the defenses against them.
2. **Drive Slowly**: The only way a driver can reduce an accident impact or increase reaction time is to drive slowly. Drive at a speed that permits full control of the vehicle. Use compression braking and gravity to slow the vehicle going uphill, and compression braking and low gear ratios going downhill. If you have to ride the brakes, you are in the wrong gear.
3. **Surface**: Backcountry service roads have a variety of surfaces. Dirt roads are the most common and dangerous because they are often deeply rutted and dusty. When wet, they become very slick or mud bogs.
4. **Road width**: Forest and other service roads, usually are designed to provide 12 feet of driving surface, as a minimum, and are classed as single-lane with turnouts. There are few places to readily park or turn around. Private roads may be smaller and have no turnaround or places to pull off necessitating backing out of the road. Consider investigating these roads on foot and backing into the road for a safe exit. When road width appears narrow, get out to see if you can pass safely. Use spotters at all-times.,
5. **Grade**: Grades vary from 3 to 15 percent with a few 18 percent or greater. Extreme grades cause difficulty in stopping and controlling a vehicle. Private roads may have steeper grades. Remember the effects of ruts, loose materials, unstable soils, and slick surfaces will affect drivability of the road.
6. **Other Road Users**: Forest, service, and private road users vary in experience and skill from those driving heavy industrial equipment to those driving sports cars and motorcycles. A few of them drive on the extreme right side of the road at all-times, regardless of direction of travel and often cut corners and /or disregard recommended speeds for particular hazards.

4.8 OFF-ROAD CONTINUED

7. **Sight Distance**: Blind curves, foliage, dust, sunlight flickering through the forest canopy all affect a driver's sight distance. The ability to see or be seen is greatly reduced when following, passing, or approaching other vehicles on these roads. When coming out of deep shade and facing directly into the sun, it can take as long as 10 seconds for eyes to adjust, slow down or pullover. This blinding effect also occurs when looking at headlights at night. To reduce the adverse effects do not look directly at the light source, look to the right or down and away from the light to minimize the exposure effects.
8. **Use Headlights**: Drive with headlights on high beam at all-times when operating in the I Zone and especially on Forest Service or private roads. Keep Windshields and Headlights Clean. Your chances to see and be seen are significantly enhanced by regularly cleaning the windshield, mirrors, headlights, and taillights. Do this often, even if it means making an unscheduled stop. Use the low beam on headlights in fog, within 500 ft of an approaching vehicle, or within 300 ft of the rear of any vehicle that you approach.
9. **Keep Right**: This is difficult because tracking surfaces and berms make it easier to travel the center of the road. Driving on the right affords the driver the greatest protection from head-on collisions.
10. **Keep Alert**: A driver must keep his mind alert to the multiple hazards of the road. This means keeping conversation to a minimum and eliminating distractions. Proper rest is the other key to staying alert.
11. **Sound Horn on Blind Corners**: Even if a driver cannot be seen, there is always the chance of being heard. A four (4) or five (5) second horn blast may be all an approaching driver needs to bring his attention to a blind curve ahead.
12. **Allow Following Distances**: This is especially critical in dusty conditions. When visibility is limited by dust or smoke, ** SLOW DOWN! When following another vehicle, stay 1 turnout behind or allow a 3 to 4 second time cushion.
13. **Turning Around**: When turning around, select a wide spot with a view of at least 500 feet in each direction. Back the rear of the vehicle toward the cutback. Avoid putting the front wheel too far out on the fill slope edge of the road to prevent soil collapse. Never make a U-turn at blind corners or back into traffic without a guide.
14. **Parking**: Park vehicles in locations that do not impede traffic flow. The first consideration is to park in a spot where the vehicle does not have to be backed up. If in doubt about the selected parting spot, get out and walk through it. Look for holes, signs of soil instability, rocks, or other debris that could damage tires or undercarriage. If there is any slope to the ground, chock tires. Before getting into the vehicle, walk around it to verify that there is no obstructions underneath. Always park the vehicle in a position ready to move out in the direction of the escape route or safety zone.
15. **Vehicle Condition and Suitability**: perform a pre-trip inspection daily and especially check the condition of the brakes before moving the vehicle. Wheel lug nuts are often overlooked; check them for tightness (daily on vehicles with dual rear wheels and monthly on other vehicles).

G. OFF ROAD DRIVING

REMEMBER: All wheel drive apparatus will **NOT** go everywhere, SO WHEN YOU GET STUCK YOU ARE REALLY STUCK! Your off-road driving ability depends upon your over-all driving skill, your ability to think clearly about off-road conditions, and your ability to act decisively

1. Steering
    a. Place hands at 10 and 2 O'clock position

4.8 OFF-ROAD CONTINUED

   b. Don't wrap thumbs around the steering wheel, as rocks, bumps, holes, etc. will cause the steering wheel to spin injuring the thumb(s)

2. Choose the appropriate gear for the traction conditions need for the transfer case and transmission when off hard or improved roadway surfaces.
   a. **DO NOT** exceed **20 mph** in four-wheel drive **HIGH RANGE**
   b. **DO NOT** exceed **15 mph** in four-wheel drive **LO RANGE**
   c. Stop and return to two-wheel drive (2 WD) when speed is to be increased above 20 mph
3. Always shift to the appropriate lower gear before any sharp turn, curve, or hill (up or down), so that both hands will be on the steering wheel.
   a. By shifting before turns and hills, you are able to apply power as needed to properly and safely maneuver the vehicle
4. Select a gear to **maintain engine RPM in lower 1/3 of the power range**
   a. The engine should not be running against the upper tachometer red line or below the lower tachometer red line (beginning of the power range)
      i. When the engine is below the lower tachometer redline you are not lugging the engine if it will accelerate easily
      ii. When going downhill, the momentum of the vehicle can cause the engine rpm to run higher than the governed speed causing engine damage and loss of control when an incorrect gear is selected
      iii. Before starting down a hill select the gear that you would have used to pull the hill or the lowest possible gear for conditions
   b. Keep RPM at least a **minimum of 300 RPM below governor limit** whenever possible
   c. Use low gears to achieve maximum compression braking, reduce engine RPM, and to reduce apparatus road speed
      i. D-1 or D-2 for automatic transmissions (**DO NOT** change into D1 while the apparatus is moving)
      ii. 1st and 2nd gear for manual transmissions
5. When driving up hill maintain a minimum of **1500 to 2000 RPM** to limit possibility of stalling the apparatus engine
   a. It is permissible to run the engine near the red line to maintain momentum when pulling a hill
6. Maintains steady speed when negotiating
   a. Soft ground
   b. Loose material of any kind
   c. Hard surface material encountered during four-wheel operations
7. On hard surfaces covered with loose material slow apparatus speed to prevent loss of traction
   a. Excessive speed will cause the apparatus wheels to bounce and break traction
   b. Excessive power or torque will also break traction
   c. Maintain RPM to prevent lugging the engine, select a lower gear if necessary
8. To prevent bogging down in soft sand, loose dirt, or mud move through _____Quickly____
9. Select safe routes
   a. Always assure yourself of a good, clear escape route and / or safety zone
   b. Slope limits:

4.8 OFF-ROAD CONTINUED

i. **DO NOT** select and operate on slopes that are **AT or BEYOND** the manufacturers recommended operating limits.
ii. **40 % maximum up or down slope**
iii. **25 % maximum side slope**
iv. Stable vs. unstable soils

c. **DO NOT** follow other vehicles closely; allow a minimum of a 3 to 4 second time cushion between vehicles, if climbing hill allow lead vehicle to clear top of hill before ascending.
d. Drives at speeds on back country roads that allow stopping within ½ the distance you can see down the road
e. Utilize existing roadways, trails, or natural terrain conditions whenever possible

10. Utilize personnel as spotters on unusual or soft terrain, at night, in poor visibility conditions, or when in unfamiliar territory or conditions, such as when cresting a hill that you cannot see over
11. Drive on inside of a roadway away from the edge of any unimproved or narrow roadway surface
    a. An unimproved roadway is any non-primary paved and engineered roadway such as gravel, dirt, thin asphalt, fire road, logging road, or dozer cut
12. **DO NOT** hang wheels over any embankment or allow wheels near to the edge of an embankment, ledge, or side slope to prevent collapse of the under lying soil causing a rollover or other loss of control
13. Accelerate and brake smoothly
    a. Use engine compression braking as primary braking method especially when descending a slope, as applying the brake will cause the apparatus to slide uncontrollably
14. Shift to an appropriate gear before a sharp curve or a hill (up or down)
15. Apply slight pressure to brakes when driving through water and test brakes after crossing water
16. Other safety considerations
    a. Be observant and look for road damage ahead and after passing over or through something
    b. Road berms and tall grass on the outside edge of the road may hide road damage or holes
    c. Watch for areas where the fill slope has sloughed off, cross only if there is sufficient safe width
    d. Reduce speeds when roads are wet; surfaces will be very slick and tires will slip on wet rocks
    e. Inspect washes across the roadbed for stability before driving across them
    f. Do not assume that because another vehicle has crossed a wash, sloughed area, or stream that it will be safe for your vehicle to also cross. Get out and look!
    g. Remove large rocks from the roadway, do not attempt to dodge them or to drive over them
    h. Share information with other drivers, companies, division supervisors, and safety officers
    i. **When there is DOUBT, DON'T do it**
    j. When you cannot see use spotters or get out and look!

H. SLOPES

1. Recognize slope and how to compute
    a. **DO NOT** confuse degrees of slope with percentage of slope
    b. Percent of slope is the number of feet of vertical rise or fall in 100 feet of horizontal travel
    c. A **100% slope**, 100 feet of rise in 100 feet of horizontal run, is expressed in degrees as a **45-degree slope**

4.8 OFF-ROAD CONTINUED

   d. A **40% slope** up or down is the climbing limitation for all brush apparatus, 40 feet of rise in 100 feet of horizontal travel
   e. Methods of determining slope
      i. Estimation with inclinometer on a compass, or by walking off distance and comparing the angle to a known height like a telephone pole, which is usually 40 feet high
      ii. Use a topographic map to measure the ground distance and contour lines

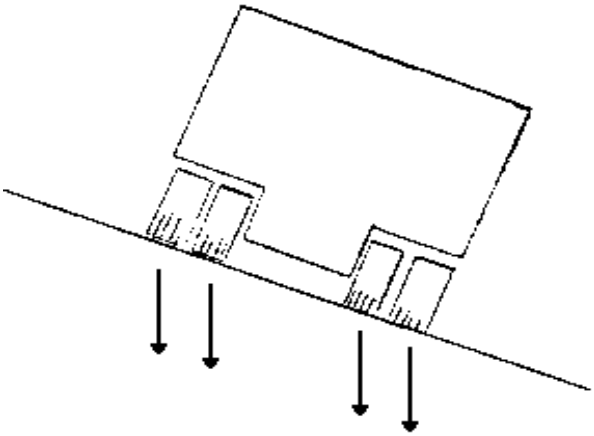
2. Knows other factors limiting operating ability
   a. _____Vehicle GVWR
   b. _____Soil and / or Roadway Conditions
   c. _____Terrain
3. Downshift before starting downhill
   a. Shift to lowest gear for conditions
   b. 40 % slope maximum decent limitation
   c. Proceed slowly and cautiously as steering and braking control are reduced
   d. Maintain drive engine rpm at the low end of the power range (1500 - 1600 rpm) for maximum retarder effect and apparatus control
   e. Never let engine rpm approach governed rpm limit, as loss of operating control will occur
4. Maintains engine RPM with in operating range (do not over speed or lug)
5. Utilizes compression braking
6. Maintains “rolling friction” on brakes at all-times on slopes
   a. Do not lock up brakes
      i. Tires will slide on most off-road surfaces (grass, leaves, duff, or loose materials) with brakes locked
      ii. Steering ability, braking, and retarder control are reduced or eliminated
7. Demonstrates knowledge of side hilling operation dangers
   a. Apparatus manufacturer limitation (_____ % slope) or 25% maximum side slope limitation
   b. Proceed slowly and cautiously to avoid sudden changes from rocks, dips, bumps, or slipping
   c. Keep wheels on the upper side of any sloped road
   d. Avoid side hilling whenever possible
8. Vehicle slides
   a. Turn wheels in direction of vehicle slide
   b. Use brakes sparingly or not at all until vehicle regains traction
9. Remember this apparatus has a very high center of gravity (_____ inches) that will affect stability on uneven terrain
10. A solid front 4 x 4 axle will affect the stability of the apparatus as the front wheels move up or down in response to holes, soft spots, rocks, other uneven surface features, or the front-end dips down from by applying the brakes, turning, or stopping

4.8 OFF-ROAD CONTINUED

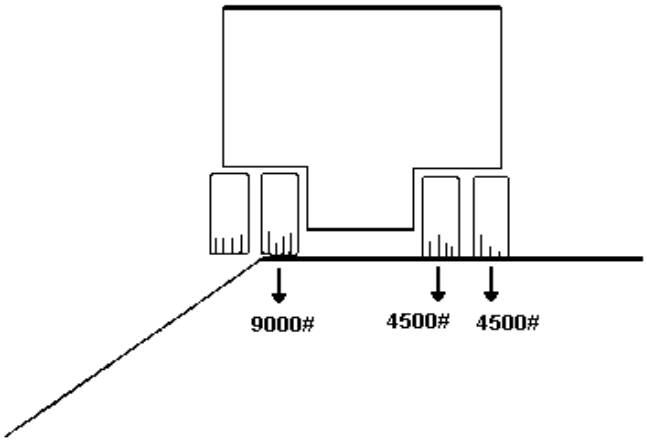
a. When one wheel moves down the other moves upward in response to this motion and the apparatus tips quickly to the side of the downward moving wheel which then causes an exaggerated rocking motion that may roll the apparatus over
    i. The front leaf springs add to the up and down movement of the wheels
b. This tipping force by itself, or when combined with the momentum of the water movement in the tank and the vehicle's weight, can result in the apparatus rolling over
c. The tipping effect will also occur on flat surfaces; including regular roadway surfaces, when operating the vehicle a speed to high or unsafe for stopping or turns

I. EFFECTS OF SOIL ON OPERATING CONDITIONS

1. The load bearing capacity of any soil is dependent upon its composition, density, and the amount of water present in it.
2. Wheel loads on soil will vary depending on the apparatus weight, load position such as water or equipment, and vehicle position relative to the soil surface
    a. Apparatus loading when side hilling

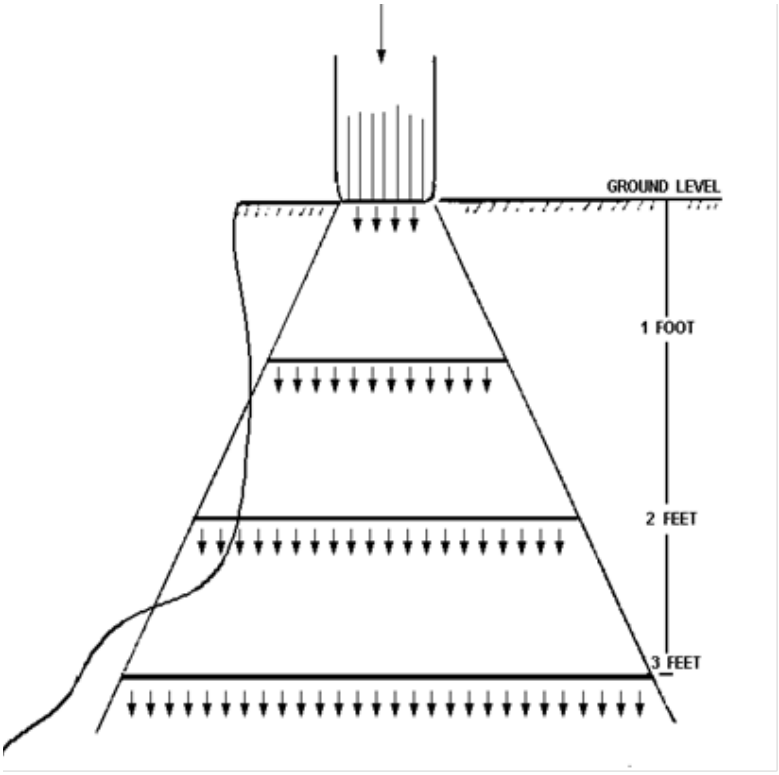


b. Apparatus loading when tire is over hanging

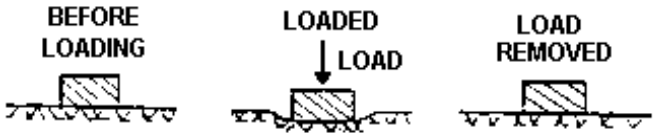


4.8 OFF-ROAD CONTINUED

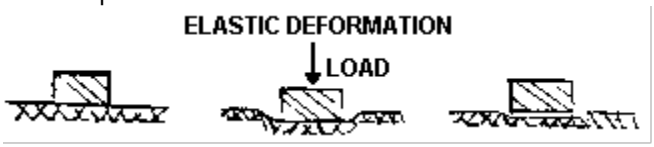
3. Wheel load effects will transfer to the soil as follows
    a. Soil pressure will decrease with distance from the load



4. Soil may deform under a load
    a. Normal soil reaction to loading



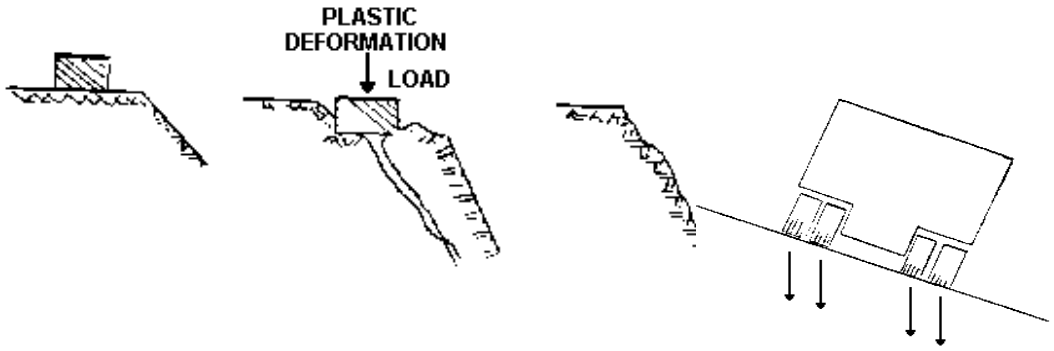
    b. Elastic Deformation
        i. Air voids in the soil are compressed under load but the soil recovers to the preloaded state
        ii. Repeated loads will cause soil fatigue and failure of the surface to return to the preloaded state



    c. Consolidation Deformation
        i. Air and water are expelled from the soil voids resulting in permanent vertical displacement (settlement)
        ii. Since vehicles tend to track in the same spot, rutting will result

4.8 OFF-ROAD CONTINUED

d. Plastic Deformation
    i. Plastic deformation occurs when a soil's load bearing capacity cannot handle the load imposed by a wheel(s) and the wheel(s) sinks into the soil, or when the supporting adjacent lateral soil gives way from this load, or when the adjacent soil contains voids, fractures, or sufficient water to collapse or liquefy under the imposed load
    ii. Roadway material is displaced by this form of loading
    iii. Upheaval or slope failure results



J. STOPPING
1. Always use engine compression to assist braking
    a. DO NOT speed shift down with a standard transmission
2. Uses proper brake technique for stopping, avoid wheel lockup when descending hills.
3. Places automatic transmission in park or leaves standard transmission in 1st or reverse gear
    a. Avoids parking on a hill or slope whenever possible
    b. When possible uses natural barriers, trees, rocks, berms, etc. as a parking aid
    c. Utilizes wheel blocks on rear wheels for best hold
    d. Allows apparatus to settle against wheel chocks before final application of parking brake
4. Stops on a hill are the same for standard or automatic transmissions
    a. For short stops, apply the brake with left foot to hold the apparatus and accelerate using right foot on the throttle
    b. For longer stops, set the parking brake and have operator remain in apparatus cab for control
        i. To begin movement, place transmission in appropriate gear, slowly apply throttle and release parking brake at the same time
5. Engine stops running on a hill
    a. If engine restarts use the short stop on a hill procedure
    b. If engine fails to start
        i. Driver will remain behind wheel at all times
        ii. All personnel are to immediately get off the apparatus
        iii. Set all chock blocks
        iv. Slowly allow apparatus to roll back against chock blocks without releasing all the air from the apparatus air brake system

4.8 OFF-ROAD CONTINUED

K. PARKING

1. Set parking brake(s)
2. Use original chock blocks provided with apparatus
3. Leave an automatic transmission in park
4. Roll up windows
5. When possible use natural barriers, trees, rocks, berms, etc. as a parking aid
6. Avoid parking on hills or slopes
    a. When a hill or slope parking situation cannot be avoided park across slope whenever possible
    b. When conditions dictate, leave someone in the cab behind the steering wheel
        i. Give clear instructions on what to do if apparatus should begin to move, all other personnel are to remain clear of the vehicle
7. Avoid blocking the road, protect your ride and pull to the side.
8. Avoid parking under power lines
9. Before leaving any apparatus, make sure it is in a safe area protected from fire, if not cut or prepare a safe area around the apparatus
    a. Select a parking area that is in a safety area and make sure that you have escape routes that have been investigated for proper use by personnel and / or the apparatus
    b. Advise all personnel of safety zones, escape routes, and deployment areas
    c. <u>Park the apparatus pointed in the direction of travel to the escape route or safety area</u>
10. Uses both wheel blocks on rear wheels for best holding ability
11. If vehicle is left running, set throttle at **fast idle 1000 - 1200 RPM** to:
    a. Aids in lubrication of turbo charger
    b. Prevents engine over heating
    c. Provides for crew safety by preventing engine stalling from smoke conditions

L. BACKING

1. Always use a backing guide
2. Position apparatus on the side of the road that presents the greatest hazard, usually the right side. Why? _____
3. Always walk around vehicle before movement and observe roadway and / or terrain, especially when alone
4. Communicate with backing guide before and during backing maneuver
5. Even though the is driver using a guide, the driver is still responsible for the vehicle's safe operation

M. RETURNING TO AN IMPROVED SURFACE

1. Pull to safe location
2. Set brake
3. Transmission in neutral
4. Shift transfer case to high range gear
5. Shift drive control to two-wheel drive (2WD). You may need to back up slightly to disengage transfer case/front axle.
6. Check undercarriage for damage, especially tie-rods, brake lines, and pump plumbing
7. Check vehicle body for damage and loose or improperly stowed equipment

4.8 OFF-ROAD CONTINUED

8. Check all tires for cuts, bruises, low air, rear dual tires for wedged rocks, all wheels and rims for damage, and all wheels for loose lug nuts
9. Wear cloves and eye protection to inspect and remove foreign objects
10. Remove wedged rocks with pry bar or a rope or chain looped around rock
11. Hook chain to an immovable object if necessary to get rock out
    a. Remove rock(s) by removing the outside dual if this is necessary or the safest method
    b. *** Remember to re-torque the lug nuts of the removed tire(s)

N. SERVICE ROADS

Driving on service roads is the most popular recreation activity in the backcountry and National and State Forests. Keep in mind that every backcountry road is designed to serve many uses and that you may encounter restrictive barriers or signs on some roads and trails as well as other types of vehicles (motorcycles, dune buggies, etc) and / or people doing other activities (hiking or camping). Visitor maps showing road closures or area restrictions are available at any Forest District Ranger or the Supervisors Office. Restrictions may be for one for more of the following reasons:

1. Wildlife Protection-*-The Forest Service and the Department of Fish, Wildlife and Parks cooperate to protect big game from disturbance on summer and winter ranges, and during calving season.
2. Watershed protection-*-some roads and trails must be restricted during wet weather to prevent surface damage and to protect nearby watersheds. Sediment reaching streams is a serious threat to fish.
3. Legal Mandates-*-Areas like wilderness have special protect by federal law. It is unlawful to operate any mechanized / motorized vehicles within a classified wilderness.
4. Private property
5. Heed the closed road signs and load limit signs especially on bridges.
6. Request permission from property owners and or operations division to use roads, building, equipment, or other facilities

Most of the service roads in wildland areas, and in most national forests are single lane roads, with turnouts. These roads were all originally designed and constructed to be logging roads, or for other limited access reasons. These roads are commonly steeper and windier than public highways, and most importantly, they were designed and constructed to be single lane roads. Usually you can see that there is only one set of wheel tracks in the road. This means that if someone is coming towards you, they are driving in the same set of tracks!

Drive at a speed where you can stop in ½ the distance that you can see down the road. That way, when you meet someone who just came out from around a blind corner, you can each stop before hitting the other vehicle. If you need all the distance you can see in order to stop, and the other vehicle is coming towards you at any speed at all, you might be in trouble. It is best to enjoy your journey through the forest, the scenery along the way, estimate the potential fire conditions, and develop deployment areas, escape routes and safety zones instead of rushing to your destination.

Stay to the right side of the road around blind corners. Usually the sharp blind corners have wide spots for the outside lane to use. These wide spots on the sharp corners are there on purpose! Make it your regular practice to swing wide around these corners in case someone is coming the other way. Remember that your heavy apparatus may not be supported by the soil at the roadway edge. These roads were built for limited traffic volumes. Today there are far more vehicles driving around in remote parts of the forest.

4.8 OFF-ROAD CONTINUED

Just because you have not seen another vehicle all day does not mean there is not one coming around the next corner.

Pay attention to the road as far ahead as you can and notice if there are any vehicles ahead of you or that you will be meeting soon. Mountain roads usually have many curves and frequently you can see part of the road ahead where you will soon be next; even when you cannot see around the next corner.

Turnouts are those wider spots that occur at varying intervals along one side of the road. The intention is that when two vehicles headed opposite directions meet, one of them is to pull into the nearest turnout and let the other go by. Usually it is the driver that has the turnouts on his right-hand side who should pull into the turnout and let the other vehicle go past. This is much safer and more pleasant than squeaking past the other vehicle with inches to spare. Remember soil stability

Pay attention to where the turnouts are and upon realizing that another vehicle is coming towards you, you should mentally assess the turnout opportunities. Are the turnouts on your side of the road? Can you see one between you and the oncoming vehicle? Is it close enough for you to get into before meeting the oncoming vehicle? Is it right beside your car, or did you just pass a nice big wide spot? One of the vehicles might have to back up! This was a normal practice at the time these roads were constructed, and the roads are just as narrow now as they were then.

Here are some other considerations as to which vehicle should pull over and let the other one go by. If the other vehicle is a semi-truck and you are driving a car or pick-up, pull over. If the other vehicle is pulling a trailer and you are not, pull over. If the other vehicle is pulling a heavy load up hill on a dirt or gravel road, please do not make him stop for you. If the other vehicle is some desperate soul careening down the hill with a load of firewood that is too heavy for his brakes, you should try to get out of the way. Accident prevention is better than winning a lawsuit, especially when you get hurt and the other driver does not have any money.

Another thing to know about driving on dirt roads on steep mountainsides is that the outside road shoulders are often soft (plastic deformation). You should try to not drive on the outside one or two feet of the road, especially during the spring, winter, any time the road is wet or slippery, or after a recent forest fire. Doing so can be like playing Russian roulette with rolling your vehicle down the mountainside.

During hunting season many roads that are otherwise open to the public are gated off. These gates are closed only to regulate hunting from vehicles. Remember, normal forest management and recreational activities do continue during hunting season. Please do not park in front of a closed gate, as there might be a need for forest employees or others to drive through that gate.

National Forests and most other government and private operations do not maintain forest or other service roads for winter travel. At times portions of these roads are plowed by private residents for access to their own homes, but this is not done with the general public in mind. The public is, however, allowed to decide for themselves when winter conditions have gotten severe enough to prevent driving on the roads. Some people, including hunters and backcountry ski aficionados have years of experience driving narrow mountain roads in winter conditions. They have suitable vehicles, tires, tire chains, and clothing and supplies in case they get stuck. Moreover, they are equipped to get their own vehicle unstuck, turned around, and going again. Someone else's tire tracks do not necessarily mean it is smart of you to keep going further up or down the road. Some local residents like to entertain themselves in the winter by driving up Forest Service roads until they get stuck in the snow. You can follow their tracks up the road until you come to the spot where they spent three hours digging out their pick-up and the road is covered with ruts going in every

4.8 OFF-ROAD CONTINUED

direction. Can you go further than they could? Are you prepared to back up ½ mile or more on a narrow snow-covered mountain road?

Road conditions can drastically change in the winter and early spring. What was a hard crust and easy to drive on in the morning may be soft and deep snow by afternoon. That morning hard pack may turn into wet ice on a sunny afternoon. Sometimes everything is fine as long as you keep going, but as soon as you decide to stop or try to turn around, you are stuck in the snow. Anybody who chooses to drive in the forest in the winter should be prepared to spend the night, and to be able to walk out if necessary. If you set out on a winter trip to some destination in the forest and find along the way that the road conditions are worse than you anticipated, you really should ask yourself just how badly you need to drive up that particular road. Possibly a change in plans or an alternate destination would be a prudent decision.

Roads that are snowmobile trails during winter are off limits to highway vehicles during the snow season. Besides the many safety reasons that such mixed traffic is illegal, driving a pick-up or SUV on packed snowmobile tracks can get you a long-ways into the back country before you finally get really, really stuck.

4.9 SECURING APPARATUS FROM DRIVING

A. Curbs wheel when on incline
B. Set parking brake(s)
C. Transmission in neutral
D. Check engine temperature (normal temp _____)
    1. For high temperature idle at _____ to _____ RPM until normal temperature achieved
    2. **DOES NOT** idle engine for long periods of time, as damage to turbocharger and injectors will occur
    3. When idling for long periods is required by any operation, increase the idle level to a minimum of **900 RPM (High Idle)** to cool and lubricate the engine and turbocharger
    4. Normal engine idle speed is _____ RPM
E. Control switches to "**OFF**" (1) Ignition (2) Master
F. Wheel block down or in station parking cradle (manufacturers supplied wheel blocks only)
G. Post trip vehicle inspection
    1. Air and fluid leaks
    2. Apparatus damage
    3. Equipment missing or damaged
    4. Resupply apparatus
    5. Clean apparatus/ Air Filter
    6. Plug in air and / or electrical lines

05
Pumping

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☐ 5.1 PUMP SYSTEM DESCRIPTION

A. Water Tank _____ gallons Foam tank(s) _____ gallons _____ gallons
B. Pump type _____ Output _____ gpm @ _____ rpm
C. Pump type _____ Output _____ gpm @ _____ rpm
D. Intakes # and sizes (Left)_____ (Rear) _____(Right)_____
E. Outlets # and sizes (Left)_____ (Rear) _____(Right)_____
F. Cross lay hose size / length (side)_____ (front) _____
G. Reel line(s) # ___ hose sizes / length _____/_____
H. Hose bed hose size(s)_____ Length(s) _____
I. Hose pack hose size _____ Pack Length _____
J. Number of packs _____ Total Length_____
K. Discharges that can flow foam #_____# _____# _____# _____# _____

☐ 5.2 STATIONARY PUMPING

A. Sets parking brake(s)
B. Emergency Lights "**ON**"
C. Turns Opticom "**OFF**"
D. Transmission in **Neutral**
E. Ensures engine is at idle speed
F. Engages pump PTO
G. Pump engaged light "**ON**"
H. Turns up radio volume
I. Takes Portable radio when exiting cab
J. Sets wheel blocks on Front or Rear wheels as necessitated by operations
    1. Forward and aft of wheel any for normal parking operations
    2. Wheel blocks in complete alignment with tire and square to tread
    3. May be set to the front or rear side of any wheel as off road or winch operations dictate
K. Operates Tank to Pump valve

☐ 5.3 PUMPING OFF THE TANK

A. Operates tank to pump valve. Why? _____
B. Checks number and type of lines deployed
C. Verbally and visually checks for Firefighter readiness and signal for water
    1. Returns signal properly
D. Opens discharge valve(s)
E. Throttles up to immediate pump pressure then applies calculated pressure
F. Visually checks that Firefighter has water flowing
G. Operates foam system if needed
H. Sets pressure relief device(s)

☐ 5.4 PUMPING OFF A HYDRANT

A. Operates tank to pump valve and performs immediate tasks as required
B. Secures supply line
C. Connects suction hose(s)
D. Opens intake valve(s)
E. Closes tank valve
F. Checks number and type of lines deployed
G. Checks hydrant pressure
H. Verbally and visually checks for Firefighter readiness and signal for water
    1. Returns signal properly
I. Opens discharge valve(s)
J. Throttles up to immediate pump pressure then applies calculated pressure
K. Visually checks that Firefighter has water flowing
L. Operates foam system if needed
M. Sets pressure relief device(s)

☐ 5.5 MOBILE PUMPING

A. Describes a proper mobile pumping operation
    1. Ensure apparatus has functioning safety line, **50 ft. minimum**, during **ALL** wildland operations
    2. Maintain water tank at a **minimum of 1/4 full** for apparatus and crew protection during fire-fighting operations
B. Set parking brake
C. Emergency lights "**ON**"
D. Turn Opticom "**OFF**"
E. Transmission in **NEUTRAL**
F. Disengages front axle before engaging pump PTO drive, if in four (4) Wheel Drive
    1. **DO NOT** use main pump when in four (4) Wheel Drive
    2. Use **ONLY** the auxiliary pump system when in four (4) Wheel Drive
    3. Mobile pumping with the main pump may **ONLY** be done when in two (2) Wheel Drive
G. Ensures engine is at idle speed
H. Engages pump PTO
I. Verify "OK TO PUMP" indicator light "**ON**"
J. Turns up radio volume
K. Exit cab to operate pump panel
L. Operates tank to pump valve
M. Supplies water to appropriate line(s)
N. Operates foam system
O. Sets relief valve to expected pressure before returning to cab
P. Open tank fill and / or recirculating valve to assure pump water is cooled during operations
Q. Returns to cab
    1. Fasten seat belt
    2. Release parking brake
    3. Ensure crew ready for mobile operations

5.5 MOBILE PUMPING CONTINUED

R. Selects appropriate drive gear
    1. Maintains foot on brake pedal for safety
S. Operates hand or foot throttle to obtain appropriate pump pressure and driving speed
    1. Shift to lower gear if necessary to obtain proper pump pressure
T. Slowly releases brake pedal, drives in low range, and maintains appropriate pump pressure
U. Demonstrates safe and functional driving speed and path for operations in off road conditions.
V. Does not operate in reverse
W. Insures firefighter safety during mobile pumping operations
X. Prior to pumping in a fixed position, sets parking brake, places transmission in neutral, and sets wheel blocks on Front or Rear wheels as necessitated by operations
    1. May be set to the front or rear side of any wheel as off road or winch operations dictate
Y. Securing from mobile operations
    1. Select safe location to park apparatus to restore systems and equipment to standby
    2. Set parking brake and wheel blocks
    3. Close all valves, reload all hose, and / or equipment, and account for all equipment
    4. Inspect apparatus for damage, close all compartment doors, and refill water supply

5.6 CONSIDERATIONS WHEN PUMPING

A. Sets discharge relief valve
B. Sets intake relief valve
C. Monitors water tank level
D. Monitors all Engineer panel gauges
E. Proper engine cooling – Maximum Temperature _____
F. Avoids pump cavitation
G. Closes all compartment doors
H. Secures all loose equipment
I. Removes kinks in hose lines and tighten connections
J. Emergency cooling procedures
K. Checks pump for over heating
L. Visually checks under apparatus for fluid leaks and other signs of potential failure
M. If pump is leaking water during pumping operations avoid over saturating dirt/soil around apparatus
N. **Ensures Fire Fighting Safety**

☐ 5.7 HOSELAYS

Trainee must produce effective fire-fighting streams utilizing correct procedures and hydraulics

A. Redline (off the tank)
B. 1 ½" Bumper connection (off the tank)
C. Manifold
D. Changeover lay
E. Priming
F. Relay
G. Tanker operations
H. Drafting
I. Internal Foam System
J. External foam Proportioner

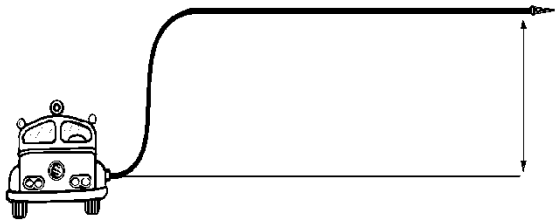
☐ 5.8 HYDRAULICS

A. Interior Attack 1 ¾" GPM _____ FLR _____
B. Exterior Attack 1 ¾" GPM _____ FLR _____
C. Interior Attack 200 ft 1 ¾" PP _____ PSI FLR _____
D. Exterior Attack 200 ft 1 ¾" PP _____ PSI FLR _____
E. Exterior Attack Bumper line 100 ft 1 ½" PP _____ PSI FLR _____
F. Hardline (Redline)
    1. 35 GPM PP _____ PSI
    2. 60 GPM PP _____ PSI
G. Initial Pump Pressure Handlines PP._____ PSI
H. Proportioners
    1. External pp._____ PSI
    2. Internal pp._____ PSI
I. Hand Held Straight Tips:
    1. ⅜" tip (1 ½" hose) NP _____ GPM _____ FLR _____
    2. ½" tip (1 ½" hose) NP _____ GPM _____ FLR _____
    3. ⅝" tip (1 ½" hose) NP _____ GPM _____ FLR _____
    4. ½" tip (1 ¾" hose) NP _____ GPM _____ FLR _____
    5. ⅝" tip (1 ¾" hose) NP _____ GPM _____ FLR _____
    6. ⅞" tip (1 ¾" hose) NP _____ GPM _____ FLR _____

5.8 HYDRAULICS CONTINUED

J. Calculate the Pump Pressure for 1000' of 1 ½" hose with a 3/8" smooth bore tip at 160' elevation

SHOW ALL YOUR WORK:



Pump Pressure = _____ PSI

5.8 HYDRAULICS CONTINUED

K. Using the Auxiliary pump on this brush apparatus, on flat terrain, what is the longest possible lay using 1 ½" hose with a 40 gpm SOF nozzle

SHOW ALL YOUR WORK:

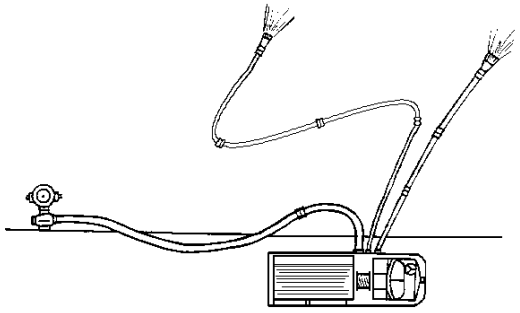
Pump Pressure = _____ PSI

Line Length _____ ft.

5.8 HYDRAULICS CONTINUED

L. Calculate the Pump Pressure and Gated Pressure for each line. **Line 1** is 450 feet of 1 ¾" hose with a 125 gpm fog nozzle. **Line 2** is 750 feet of 1 ½" hose with a 60 gpm fog nozzle

SHOW ALL YOUR WORK:



Pump Pressure = _____ PSI

Line 1 Gated Pressure = _____ PSI **Line 2** Gated Pressure = _____ PSI

☐ 5.9 PRESSURE RELIEF VALVE

A. Name / Type of relief valve _____
B. Normal setting _____ PSI
C. Properly sets relief valve
D. Relief valve maintenance

☐ 5.10 INTAKE RELIEF VALVE

A. Name / Type of relief valve _____
B. Location of valve _____

☐ 5.11 EMERGENCY COOLING

A. Manufacturer states begin use of engine cooler when the engine overheats
B. Engine cooling adds heat to the pump that must be dissipated by circulating water to a hose line, the water tank, or an outside water source
C. Recirculating valve works for both pump engines
D. Engine cooler valve only works on the main engine when in pump not the auxiliary pump engine
E. Checks for obstructions
F. Sheds load
G. Describes how the heat exchanger (engine cooler) operates
H. Explains how the pump over heat indicator and thermal relief valve work
I. Describe how the recirculating valve operates
J. Additional engine and pump cooling may be obtained by opening the tank fill valve to get additional water circulation, obtaining an outside water source, or flowing water through a line
K. **All cooling valves are to be in the off position until use is required**

☐ 5.12 CAVITATION

A. Describes and Recognizes cavitation
B. Describes causes of cavitation
C. Describes Corrections

☐ 5.13 PRIMING

A. Ensures engine is running, transmission is in proper drive gear, and pump is activated
B. Ensures a water supply is provided to the pump
C. Engages priming pump control (operate for 45 seconds maximum)
D. Observes fluid discharge from priming pump and listen for noise change indicating air removed from pump system
E. Throttles up slowly to priming operation speed (**1000 to 1300 RPM**).
F. Opens discharge to operating hose line
G. Secures priming control to "**OFF**" position when water flowing
H. Refills priming pump reservoir (if equipped) . Fluid type _____

5.14 DRAFTING

A. Equipment required for drafting operation
    1. Hard suctions and suction strainer
    2. Chaffing block to protect suction hose and bucket to protect strainer in debris ridden water
    3. Rope to secure strainer, bucket, and suctions together and into position for drafting operation
    4. Spanners to secure suctions and outlet caps
    5. Water basin for tanker to fill (construct or use portable water tank)
B. Position apparatus intake to allow best suction connection
    1. Face apparatus into wind, if possible, to assist cooling
C. Set parking brake
D. Place wheel blocks
E. Set up suctions to water source and apparatus
    1. All connections spanner tight and chaffing block in place
    2. Tie rope through strainer, tie to bucket if used, and around each section of drafting suction to allow for proper positioning of suction strainer in the water source
F. Shift into pump
G. Engage priming pump with engine at idle and advance rpm to priming operating speed
    1. When vacuum gauge reaches its highest level (usually 20-30seconds), releases primer control
H. Recognizes when vacuum has pulled water into pump
I. Opens discharge valve and advances engine rpm to proper pump pressure to fill tank or supply hose operations
    1. In case of failure, tighten all connections and ensure all valves are closed
J. Disengages priming pump
K. Perform draft from a water basin
    1. Sets up a portable apparatus water basin
    2. Set up water basin utilizing ladder, pike pole, and salvage covers
L. Properly secures from drafting operations and restores all equipment and systems

5.15 AUXILIARY PUMP SPECIFICATIONS

A. Manufacturer _____ Model _____
B. Engine Cycles / Type _____ Max Horsepower _____ @ RPM _____
C. # of cylinders / CID _____ / _____ Transmission Type _____
D. Pump type _____ Output _____ gpm @ _____ rpm @ _____ psi
E. Intake # and size _____
F. Outlet # and size _____

5.16 AUXILIARY PUMP OPERATION

A. Verify Master Control switch “ON” (Indicates power available to auxiliary devices)
B. Emergency Lights “ON”
C. Turn Opticom “OFF
D. Verify dump valve open to operate auxiliary pump system
E. Turn auxiliary pump ignition “ON” Indicator Light color _____
F. Start engine
G. Auxiliary engine Idle _____ RPM
H. Verify pump pressure on center console gauge, operate Prime button if necessary

5.16 AUXILIARY PUMP OPERATION CONTINUED

I. Operate Fast / Slow switch for proper pump pressure
J. Operate foam system to correct percentage for firefighting conditions
K. Frequently verify auxiliary engine system water temperature below boiling point when in operation
L. Check all gauges and warning devices operating correctly
M. Turn up Radio Volume
N. Set wheel blocks on Front or Rear wheels as necessitated by operations
    1. May be set to the front or rear side of any wheel as off road or winch operations dictate
    2. Use extreme caution placing wheel chocks during firefighting operations
O. Describes function of auxiliary pump switches, gauges, symbols, and indicator lights
    1. Location and operating sequence
    2. Explain the reason for low water shut down and how to accomplish shutdown
    3. Explain the reason for the operator must maintain **20 psi minimum** pump pressure?
P. Demonstrates proper pump engine starting and operating procedures
    1. Opens dump valve
    2. Starts engine
    3. Increases pump pressure to pressure for operating line(s)
    4. Open discharge valve(s)
    5. Calculates line flow and compares to pump capacity
    6. Demonstrates knowledge of manual pump primer location and correct priming procedure
Q. Pump cooling is accomplished by opening the recirculating valve on the main pump panel and / or the tank fill valve along with the dump valve to recirculate the water in the pump
    1. The auxiliary engine has no direct cooling feature
R. Securing secondary pump operations
    1. Throttle down completely and bleed off any system pump pressure
S. Restores all systems to correct standby positions

5.17 HUSKY FOAM SYSTEM

READ HUSKY FOAM SYSTEM MANUAL, REVIEW TRAINING CD, AND REVIEW POWERPOINT BEFORE ATTEMPTING TO OPERATE THE HUSKY FOAM SYSTEM

A. Husky Foam System supplies up to _____ gpm of foam at _____ PSI
B. Apparatus must be in pump, either main or auxiliary, to operate the foam system
C. Opens main pump water recirculating valve to assure that foam pump hydraulic oil will not overheat
D. Selects discharges for foam operation. Outlets available for foam are _____
E. Throttles up to immediate pump pressure then applies calculated pressure for lines deployed
F. Operates Foam System
    1. Turns foam system "**ON**"
    2. Press "Mode" switch to determine or change foam source or type
    3. Press "Enter" to accept foam source or type
    4. Press "up / down arrows" to select % of foam. Range _____ % to _____ %
G. Monitors foam and water supply availability
    1. Low foam warning will flash on the display screen when the foam tank is **25 % of full**
    2. Foam system will still operate until tank is empty
H. Shut down operations
    1. Turn off foam

5.17 HUSKY FOAM SYSTEM CONTINUED

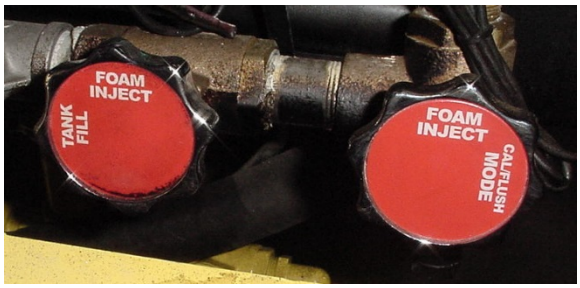
2. Flush foam system if completed with firefighting operations
3. Relieve line and system pressure after each use

I. Refills foam tank. Tank size (# gallons) _____ # gallons in reserve _____

J. Type of foam expansion nozzles available (size / GPM) _____

K. Performs Daily Husky Foam System tests

1. Checks foam concentrate tank fluid level
2. Checks the foam pump hydraulic fluid level
3. Checks that tank fill and calibrate valves are in the **foam inject** position (door lower right of pump panel)
4. Checks that the light under the flow label is illuminated and that the flowmeter states "0" when the system is turned "ON"
5. Opens apparatus pump tank fill to relieve any pressure on the system
6. Foam system calibration is a function ONLY performed by the repair facility



Foam System Control Valves

L. Explain demonstrate the function of each button and control screen position of the Husky Foam System Control Panel

M. Operates refill system correctly (called Foam Drafting by Husky)

REMEMBER: The Apparatus must be in pump and recirculating valve open to operate foam pump and provide proper foam pump hydraulic oil cooling

1. Although foam tank may be filled / refilled thru the opening on top of the apparatus it is not the best or recommended procedure
2. DO NOT mix Different foam types and brands, that are not normally compatible (i.e. Class "B"), may be used at an incident by using the refill (Foam Drafting) method without changing the foam in the foam tank and completely flushing the foam tank and system
3. Refill pump operation - Tank fill
    a. Attach pick-up hose and tube to the 1" foam inlet connection below the pump panel
        i. System has check valve to prevent foam from draining from the tank (check for proper operation)
    b. Obtain and open foam containers for refill operation and insert the pick-up tube
    c. Open foam inlet valve on the foam pump panel next to the pickup tube connection
    d. Turn Tank Fill / Foam Inject valve to the Tank Fill Position (see Foam System Control Valves Picture)
    e. Turn Foam System "ON"
    f. Press "Mode" until "Tank A Fill" appears in the display screen
    g. Press "Enter" to accept and begin fill operation
    h. Tank float switch should automatically shut off pump and stop tank fill operation when the tank is full, however be prepared to manually stop operation if tank overfills
    i. System display screen should automatically return to "Water Flow 0000 gpm" indicating ready to begin foam operations
    j. Adjust Tank Fill / Foam Inject valve back to the "Foam Inject" position
    k. Close foam fill valve on pump panel

5.17 HUSKY FOAM SYSTEM CONTINUED

l. Drain 1” pick-up tube and line
m. Remove pick-up tube and store
n. Manually pour any remaining or leftover foam concentrate into the foam tank
o. Secure water pump and bleed system pressures, if operations are completed

4. Refill pump operation - External Foam Source (Foam Drafting)
    a. Different foam types and brands, that are not normally compatible (i.e. Class “B”), may be used at an incident by using the refill (Foam Drafting) method without changing the foam in the foam tank
    b. Attach pick-up hose and tube to the 1" foam inlet connection below the pump panel
    c. System has check valve to prevent foam from draining from the tank (check for proper operation)
    d. Obtain and open foam containers for foam operation and insert the pick-up tube
    e. Open foam inlet valve on the foam pump panel next to the pickup tube connection
    f. Turn Foam System “ON”, if not already in operation
    g. Press “Mode” until name of desired foam source appears in the display screen (i.e. Draft Class B 3 %)
    h. Press “Enter” to accept and begin foam operation
    i. Press up or down to change foam percentage to appropriate amount
    j. Monitor foam container foam level, switch to new container just before empty to prevent air injection into system
    k. Pour any remaining foam into one container for later use in operations
    l. At completion of operations restore to Class “A” operation and flush system
    m. Turn off foam pump
        i. Close foam fill valve on pump panel
        ii. Drain 1” pick-up tube and line
        iii. Remove pick-up tube and store
5. Refill pump operation - System Flush
    a. Flushing is not required for the same brand and type foam
    b. Turn Foam System “ON”, if not already in operation
    c. Press “Mode” until “Class A Foam” appears in the display screen
    d. Press “Enter” to accept and begin flush operation and an automatic fifteen (15) second system flush will occur
    e. Flow water thru a hose line until foam appears in discharge water
    f. Press up or down to change foam percentage to appropriate amount
    g. Turn system off
    h. Secure water pump and bleed system pressures, if operations are completed

N. Describe and demonstrate corrective measures for foam pump hydraulic fluid over heat
O. Describe and demonstrate foam line strainer and water strainer maintenance
    1. Maintenance is to be performed weekly or when the twenty (20) hour maintenance warning occurs
P. Describe and demonstrate hydraulic filter maintenance
    1. Maintenance is to be performed weekly or when the twenty (20) hour maintenance warning occurs

5.18 SECURING APPARATUS FROM PUMPING OPERATIONS

A. Checks with officer for permission to shut down pump operations
B. Verbally and visually checks for Firefighter readiness and signal for shutdown
    1. Returns signal properly
C. Throttles down completely
D. Closes hand line discharges and bleeds down line pressures
E. Ensures water tank is full
F. Resets relief valves to normal position
G. Normal engine temperature _____ F, idles engine if necessary to cool down and / or continues with other engine cooling methods
H. Closes all open supply line intake and discharge valves and bleeds down line pressures
I. Transmission in neutral
J. PTO to “OFF” position
K. Shuts down engine and warning lights when operations safely allow
L. Relieves pressure on pump and foam system
M. Ensures all equipment accounted for and secured
N. Corrects hose list after loading hose and tagging any damaged hose
O. Performs walk around
    1. All equipment accounted for
    2. All equipment secured
    3. Compartment doors closed
    4. Wheel blocks up and stowed
    5. Clear to proceed

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06
Winch

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6.1 WINCH SPECIFICATIONS

A. Specifications:

1. Type _____ Make _____ Model _____
2. Power Source _____
3. Cable Type _____ Diameter ___ inches ____ mm - Length _____ ft
4. Working Load _____ lbs Minimum number of cable wraps around drum _____
5. Working Length _____ ft Breaking Strength _____ lbs
6. Warn Operators guide and basic guide to winching can be found @ S:\Training and Education\Driver Training\Warn Winch

B. Accessory winch equipment on the apparatus:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

6.2 WINCH SAFETY

NOTE: The term wire rope and cable are interchangeable when discussing winch operations

A. **WARNINGS:**

1. Observe all manufacturer danger, warning, and caution notices
2. Never, exceed manufacturers recommended capacities
    a. This winch is NOT designed pull "**THIS**" apparatus out of a situation where a forward force is needed to help the drive wheels over-come loss of traction or to move objects that do not exceed the winch rating. "**DO NOT**" pull other vehicles over the rated capacity of the winch with this winch!
3. Careless winch operation can result in serious injury or property damage
4. All personnel including winch crew and remote-control operator must remain outside the working area of the winch and wire rope (safety envelope) during any winching operation
    a. If the wire rope or any cable pulls loose or breaks under load, it can lash back with tremendous force
5. A drum-and-wire rope-winch is **NOT** a legal device for lifting or pulling personnel or equipment other than a vehicle with personnel in it
    a. Use this winch **ONLY** for moving heavy objects **not to exceed manufactures recommended capacities.**
    b. Do **NOT** attach cable to rescuers or victims
6. This type winch is designed for **straight pulls** on loads **ONLY**
7. **Never**, allow any wire rope (cable) to slide through anyone's hands even when wearing gloves

B. All personnel will wear appropriate PPE, (**ESPECIALLY HEAVY LEATHER GLOVES**) when operating the winch system, touching the wire rope, or other rigging cable in the operation, or working in the safety envelope surrounding the cable operation

1. The safety envelope is the total area encompassing ongoing work and where the cable may whip or lash to if it breaks or otherwise becomes unattached from the load

C. ENSURE that no other apparatus park around the operating area or that any firefighters work in the rescue safety envelope (hot zone) without PPE, safety rigging, and accountability control

6.2 WINCH SAFETY CONTINUED

D. Check for over-head obstructions:
    1. Power lines
    2. Building components
    3. Roadway components
    4. Trees, poles, towers, and guide wires

E. **DO NOT**, at any time, operate wire rope close to, around, or through any wires or cables
    1. Electricity, both static and generated, will arc to the winch cable and cause injury or damage
    2. Smoke, rain, nozzle spray, runoff water, and cable deformation can contribute to arc potential

F. Observe winch capacity and wire rope load limits
    1. **DO NOT** rely on memory; use load charts or tables
    2. The inclination of the cable is a **KEY** factor in determining load capacity
    3. Remember that angle and direction changes may increase cable loading
    4. Snatch blocks to improve pulling capacity are **NOT** permitted for use on this vehicle winch system as the winch mounting will not take the total load applied

G. **NEVER** scrape wire rope on or along the surface of any objective (tree, rock, dirt, roof, wall, balcony, window, or other surface)
    1. Provide friction pad, other protection, or reposition to eliminate any interference with the wire rope during operations
    2. Replace any cable or wire rope that is worn or frayed

H. **ONLY** the Command Officer MAY, at their discretion in a life-threatening emergency, override a safety protocol

    EXTREME CAUTION MUST BE USED WHEN A SAFETY PROTOCOL IS OVERRIDDEN

    1. Any winch device, wire rope, rigging cable, or other equipment used in any **NON-APPROVED** manner or damaged in an accident **SHALL** be placed out of service and the Repair Facility notified
    2. The apparatus may remain in-service but the winch device or equipment is out-of-service until repaired, inspected, and tested

6.3 APPARATUS STABILIZATION

A. **ALWAYS** place the transmission in **NEUTRAL** when utilizing the winch for any operation
B. **ALWAYS** ensure **ALL BRAKES** are correctly applied
C. **ALWAYS** place wheel blocks tightly against wheels
    1. On front wheels first
    2. Rear wheel(s) if blocks are available or position dictates
    3. Forward and aft of all wheels if possible
    4. Wheel blocks in complete alignment with tire
    5. Collapsible wheel blocks **MUST** be **LOCKED OPEN**
D. **ALWAYS** be aware of road the **CROWN** and **FALL LINE** of the roadway or other operating surface
    1. Position the apparatus to keep the wire rope (cable) extensions as close as possible to level, the centerline of the apparatus, and fall line of the surface being operated from for maximum wire rope (cable) reach and stability

6.4 RIGGING

A. **WARNINGS**:
   1. Never wrap the wire rope (cable) around any anchor point or other object, as this causes damage to the cable and reduces its tensile strength.
   2. Always, directly attach the cable hook to the anchor's fixed connection.
   3. When there is "NO" fixed connection, wrap a chain or strap around the anchor or object and attach the cable's hook to that chain or strap
   4. Always leave at least 5 cable wraps on the winch drum
   5. REMINDER, take your time when rigging and include a reasonable factor for safety
   6. Sloppy rigging can result in damage to the vehicle, equipment, and possible injury
   7. This winch is not rated for use as a hoist because it does not contain a secondary backup brake system

B. Describe and demonstrate the SAFE ENVELOPE of operation for this winch device
   1. Rewind wire rope straight into the fairlead not at an angle from either side

C. Standard Load capacity is determined with apparatus operating in the following conditions:
   1. Apparatus Engine must be running to assure adequate voltage to power unit, due to the:
      a. High amperage draw of the winch
      b. Maintaining battery charge
   2. Level ground
   3. Maximum winch capacity is _____ lbs

D. Understands dynamic and static loads and demonstrates caution when operating winch
   1. Shock loads impose stress loads several times greater than loads involved when the load is gradually applied and may cause IMMEDIATE cable or winch failure
      a. Avoid rapid and / or jerky movements with winch controls as these actions cause improper shock loads on the wire rope far exceeding the winch and wire rope ratings
      b. Utilize slow smooth control switch movements to take up any slack in the wire rope
   2. ALWAYS, be aware that strong winds WILL Affect load capacity and stability of any wire rope loads
      a. Winds MAY REQUIRE LOAD REDUCTION or DISCONTINUANCE of operations
   3. The smaller (closer to horizontal) the cable angle, the greater the load carrying capability of the cable and winch system

E. Describe types of winch loads and the effects on the cable, rigging, and operations
   1. Dead (Static)
   2. Live (Dynamic)
   3. Impact / Shock
   4. Torsional (twisting)
   5. Side

F. Describe the reasons for cable and / or winch failure and give example(s)
   1. Overloading
   2. Impact loads
   3. Torsional loads
   4. Mechanical damage
   5. Human failure
   6. Maintenance

6.5 STANDARD HAND SIGNALS

A. When facing vehicle or winch operator
    1. Thumb up - take cable in
    2. Thumb down - let cable out
    3. Palms of hands forward - stop
    4. Right hand thumb pointed right - turn apparatus wheels left, if moving apparatus
    5. Left hand thumb pointed left - turn apparatus wheels right, if moving apparatus

6.6 WINCH COMPONENTS

A. **Remote control power lead** is a control cable with a switch box that is utilized to operate the winch motor from inside the cab, or a safe location outside the cab, when plugged into its control receptacle
    1. The control switch is a spring loaded three (3) position toggle switch that automatically returns to the middle "OFF" position
        a. The middle position is the "OFF" position
        b. The forward position is the "POWER OUT" position
        c. The rearward position is the "POWER IN" position
    2. Before winching, inspect the remote-control power lead for cracks, pinched spots, frayed wire and loose connections

       WARNING: A damaged or shorted remote-control power lead could cause the winch motor to run as soon as it is plugged in
        a. When using the remote-control power lead inside the apparatus, always pass the lead wiring through a window to avoid pinching the lead wiring in the door
    3. While the remote-control power lead is plugged into the winch, **ALWAYS** keep clear of the winch drum and **fairlead area** (the point where the wire rope enters the winch drum) as well as the wire rope and all rigging
        a. DO NOT have the remote-control power lead plugged into the winch while spooling-out by hand (free spooling), rigging, or sitting idle
        b. Plug the remote-control power lead into the winch **ONLY** during actual winch operation
        c. Never handle the wire rope or rigging while anyone else is at the remote-control power lead or during any winching operation
    4. Always, store the remote-control power lead where it will not be damaged (clean dry area)
B. The **winch clutch** allows free movement of the automatic brake inner and outer brake plates and is operated by lifting the silver locking lever and turning the knob next to the winch drum assembly (also called a "Dog Clutch")
    1. Lift the silver locking lever and turn the knob "**COUNTER CLOCKWISE**" (away from you) to **disengage** the clutch
    2. Lift the silver locking lever and turn the knob "**CLOCKWISE**" (toward you) to **engage** the clutch
    3. If the cable does not free spool with the clutch disengaged, hold the inner brake plate firmly and rotate the outer brake plate counter clockwise by hand to release the brake
        a. Disconnect the remote-control power lead before performing this operation
        b. Pull the cable out smoothly
        c. Jerking the cable, as with any other sudden movement, increases the line spool out speed will cause the automatic brake to reset and lock up, even with the clutch disengaged

6.6 WINCH COMPONENTS CONTINUED

C. The **automatic brake** of the winch is applied against any load when the remote-control power switch is in the "NEUTRAL" or "OFF" position
    1. When powering "IN", the brake will hold the load as soon as the power switch is released (returned to the neutral position)
    2. When powering "OUT", the load will not stop as quickly
        a. Inertia in the gear train and winch motor armature can cause several feet of wire rope (cable) to spool out after the power switch is released (returned to the neutral position)
        b. The heavier the load, the faster the brake will activate
        c. Anticipate the point at which you wish to stop the load and try to stop sooner than necessary
            i. Use small jogs of the power switch to move the load to the correct position
    3. To release the automatic brake and allow free spooling out of the wire rope by hand
        a. Manually release the clutch
        b. Jogging the "POWER OUT" switch is considered unsafe
    4. When the brake is not loaded, the brake system should not have more than one (1) inch of free play when the inner brake plate is held stationary

D. The **battery** system provides power to the winch system
    1. Proper battery maintenance is essential to being able to operate the winch system
        a. Fully charged and maintained heavy duty batteries, isolated from the apparatus electrical system
        b. Clean and tight terminal and wiring connections
    2. Maintain engine at "**HIGH IDLE**" during all winch operations to maintain battery charge

E. The **winch drum and wire rope** must work correctly together for the winch system to function
    1. The wire rope MUST always spool off the bottom of the winch drum at the area where the mounting bolts attach to the apparatus; this area is called the fairlead
        a. The winch unit is usually mounted on top of a structure on the apparatus; reverse this information if the winch unit is mounted upside down underneath the frame structure
        b. The winch brake **WILL NOT** function if the cable spools off the top of the drum
        c. The rope spooling direction can accidentally be reversed by running the cable all the way out and spooling in with the control switch in the "Power Out" mode or by winding over a wire rope "bind" condition

F. A **winch motor** is rated only for intermittent cycles of use due to heat build-up in the DC motor thereby reducing the motor's run (operating) time
    1. **NEVER**, lug down **ANY** winch motor to a low motor RPM
        a. When the motor approaches stall speed, a very rapid heat build-up occurs which will cause permanent motor damage
    2. Running times of the winch motor vary with load and conditions
    3. To determine run time, you must occasionally check for motor heat build up
        a. **STOP WINCHING**
        b. Place back of hand on motor housing and check heat build up
        c. When it is uncomfortable to lay the back of our hand on the motor, shut down and allow motor to cool

WARNING: **DO NOT** touch wire rope, or other rigging, or enter the safety envelope during the cool down period

        d. The motor cool down period should be utilized to recharge the apparatus battery(s)

6.6 WINCH COMPONENTS CONTINUED

e. As a last resort, consider utilizing a snatch block to "Double Line" the cable and reduce the pull load and winch motor amperage draw if overheating is a problem
f. Repeat the Stop and Check procedure until the winch operation is complete

6.7 WINCH OPERATIONS

A. Operating steps
   1. Locate remote control power lead and other equipment needed for the winching operation
   2. Disengage winch drive clutch (Dog Clutch) to release the automatic brake:
      a. Lift up on chrome safety locking lever
      b. Turn knobbed lever away from you ("**COUNTER CLOCKWISE**") to **disengage** clutch
   3. Pull out about ten (10) feet of cable
   4. Locate and connect remote control power lead to winch system
      a. TEST remote control power lead switch position functions by spooling out ten (10) or more feet and operating the remote switches prior to setting up for the winch operation
      b. Place a light load on the winch system utilizing the procedure in step # 9
      c. Remove remote control power lead if hand deployment of cable is to be utilized
   5. Pull the desired amount of cable
      a. Return knobbed lever and chrome locking collar to original positions (turn "**CLOCKWISE**" toward you) to **engage** the clutch
   6. As an alternative, the desired amount of cable may also be "POWERED OUT"
      a. Personnel should apply a light load as they walk and pull the cable into position
   7. Properly and safely deploy cable to object or use position
   8. Operate winch remote control power lead appropriately to complete desired winching task
   9. **ALWAYS** place some load on the cable when rewinding the wire rope (cable) at the completion of operations to assure an even and tight load on the winch drum
      a. At times, it may be necessary to temporarily respool the cable under no load conditions after use
      b. The correct procedure is:
      c. Hold the remote power control lead in one hand and the cable in the other hand
      d. Start as far from the apparatus as the remote power lead wiring will allow
      e. Activate the "POWER ON" switch and walk the cable toward the winch until approximately four (4) feet away from the fairlead
      f. Stop rewind operation
      g. Repeat this process until reaching the last four (4) feet of the cable
      h. Utilize manual rewind procedure (step B 3) to complete the rewind operation
      i. Place the winch clutch (into the "DISENGAGED" position) and the Power Take Off in neutral when operations are completed

B. Only the winch operator may grant permission to Spool-out or Spool-in (rewind) the cable
   1. Personnel guiding the cable during Spool-out or Spool-in (rewind) operations MUST always stand away from the winch unit and keep one hand VISIBLE to the winch operator or apparatus driver during operations
   2. **ALWAYS STOP** the winch when anyone's hand is on the wire rope or hook and it is within four (4) feet of the winch fairlead (rollers at the winch drum entrance)

6.7 WINCH OPERATIONS CONTINUED

a. Keep hands and clothing clear of fairlead (rollers at the winch drum entrance) and ALL other moving parts to prevent injury
b. Manual rewind MUST be used to complete the rewind operation when down to the last four (4) feet of cable

REMINDER - This procedure is very important for **YOUR PERSONAL SAFETY** and to prevent damage to the wire rope by over tightening

3. Manual rewind procedure:
    a. Stop rewind operation
    b. Unplug the remote-control power lead
    c. Release the winch clutch
    d. Rotate the winch drum by hand to retrieve the remainder of the cable and stow the hook
    e. Re-engage winch clutch
4. Always spool-out as much cable as possible when preparing rigging
    a. Pick an anchor point as far away as practical
    b. This will minimize cable damage, such as mashing and kinking, caused by the top layer of cable pulling down into the bottom layers of cable when short pulls are made
    c. The greatest pulling power is available at the first layer of cable on the drum, decreasing with each successive layer of cable on the drum
        i. Never winch with less than five (**5**) wraps of wire rope (cable) around the winch drum
        ii. With less than five (**5**) wraps on the winch drum, the cable could break loose from the drum under heavy load
5. Always pull or retract with the winch system as straight as possible to minimize the build-up of wire rope on only one end of the winch drum
6. Always inspect and carefully rewind the wire rope after use
    a. The life of wire rope, cable, or other rigging is directly related to the maintenance and use it receives
    b. **ALWAYS** rewind wire rope under load (500 lbs minimum) to prevent future accidents or damage to the wire rope
    c. Mashed, pinched, or frayed areas severely reduce the original tensile strength
    d. **IMMEDIATELY** replace any wire rope or rigging when damaged for safety reasons
    e. **New wire rope on a new winch or any replacement wire rope MUST BE stretched and respooled under load (1000 lbs minimum) before using the winch**
        i. Failure to perform this operation will result in wire rope damage
7. When retrieving or spooling in wire rope be sure to distribute it evenly and tightly on the winch drum
    a. This prevents the top layers of the cable from being drawn into the bottom layers the cable and creating a “bind”
    b. Any “bind” occurring on the drum may damage to both the winch system and wire rope
    c. A “bound” wire rope will reel out only a short distance and will then reel back in, due to the locking nature of the “bind”, even though the remote control is held in the “out” position
    d. To remove a wire rope (cable) “bind”
        i. Connect the hook to a load
        ii. Alternately power “In” then “Out” on the remote control until the “bind” works free

6.7 WINCH OPERATIONS CONTINUED

iii. **NEVER, at any time put your hands anywhere near the winch DRUM when attempting to work a "bind" free**

☐ 6.8 SECURING FROM WINCH OPERATIONS

A. Checks with officer for permission to shut down operations
B. Notify assisting apparatus of operation(s) secession and "OK" to secure
C. Ensure personnel on winch line and other involved operations are returned to safe ground
D. Properly re-spool the wire rope (cable) onto the winch drum
    1. Apply light load to the cable
    2. Rewind wire rope so that it only enters at the bottom of the winch drum, NEVER at the top of the drum, as it is rolled onto the drum
E. Shift transmission into neutral
F. Shift PTO into road position
G. Ensure engine temperature normal @ _____ F
H. Performs walk around
    1. All equipment accounted for
    2. All equipment secured
    3. Compartment doors closed
    4. Wheel blocks up and stowed
    5. Clear to proceed

☐ 6.9 CARE AND MAINTENANCE

A. After each use:
    1. Inspect winch rope, hook, and slings. Frayed, kinked, or damaged winch rope must be replaced immediately. Damaged components must be replaced before operation.
    2. Keep winch, rope, and switch control free from contaminants. Use a clean rag or towel to remove any dirt and debris.
    3. Inspect remote control for damage. Store remote in a protected, clean dry area. Replace if damaged.
B. Every 90 Days:
    1. Check fasteners and make sure they are tight, replace damaged fasteners.
    2. Verify wiring connections are tight
    3. Verity there is no exposed/bare wiring, terminals, or cable insulation damage (chafing/cutting). Repair or replace damaged electrical cable.
    4. Inspect winch rope, hook, and slings. Frayed, kinked, cuts, knots, mashed or frayed portions, broken strands or damaged winch rope must be replaced immediately. Damaged components must be replaced before operation.
    5. Keep winch, rope, and switch control free from dirt, oil, grease, water, and other substances. Use a clean rag or towel to remove any dirt and debris.
    6. Run winch for a few minutes to lubricate the geartrain, which will warm the motor to dry out any moisture that may have built up over time from condensation.
    7. If winch drum continues to turn after controls are released, brake may need to be replaced.

07
Auxiliary Equipment

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A. Operates and maintains all fixed systems and equipment on the apparatus not specifically addressed in this standard
B. Operates and maintains all portable auxiliary equipment assigned to this class apparatus
    1. PERFORM Monthly Electrical Equipment Maintenance Check