15.11.2 From the operator's standing position at a vertical control panel (greater than 45° from horizontal), (commonly referred to as a side mount), the throttle control shall be located not higher than 1830 mm (6 ft) nor lower than 1070 mm (3.6 ft) when all instruments are in full view. Measurement to be taken from the centre line of the control device.

15.11.3 From the operator's standing position at a horizontal control panel (less than or equal to 45° from horizontal), (commonly referred to as a top mount), the throttle control shall be located not higher than 1270 mm (4.2 ft) nor lower than 810 mm (2.7 ft) when all instruments are in full view. Measurement to be taken from the centre line of the control device.

15.11.4 If the operator's control panel is design to be from a seated position, all pump and engine controls must be clearly visible and within easy reach of the seated position.

15.12 INSTRUMENTATION

15.12.1 Pump Operator's Panel

REFERENCE 16.12.1 IN NFPA 1901-09

15.12.1.1 The *pump operator's panel*: shall have the following controls and instruments provided and installed as a group:

A Master pump intake pressure indicating device;

B Master pump discharge pressure-indicating device;

C Pumping engine tachometer;

D Pumping engine coolant temperature indicator;

E Pumping engine oil pressure indicator;

F Voltmeter;

G Pump pressure control(s);

H Pumping engine throttle;

I Primer control;

J Water tank-to-pump valve control;

K Water tank fill valve control; and

L Water tank level indicator.

15.12.1.2 The placement of the instruments and controls required by Clause 15.12.1.1 shall ensure that the pump operator is kept as far as practicable from all discharge and intake connections and shall be located where they are visible and operationally functional while the operator remains stationary.

15.12.1.3 Any instrumentation exposed to the elements shall be *weatherproof*.

15.12.1.4 Audible and visual warnings are required with the pumping engine oil pressure and engine-coolant temperature indicators.

15.12.1.5 All engine operation indicators on the *pump operator's panel* shall be in addition to those on the vehicle's instrument panel.

15.12.2 Master Pump Intake and Pressure-Indicating Devices

REFERENCE 16.12.2 IN NFPA 1901-09

15.12.2.1 The placement of the master pump intake and pump discharge pressure-indicating devices shall be as follows:

A Within 200 mm (8 in) of each other, edge to edge; and

B With the intake pressure-indicating device to the left of or below the pump discharge pressure indicating device.

15.12.2.2 The intake pressure-indicating device shall read from 100 *kPa* (30 in Hg) vacuum to at least 2000 *kPa* (290 *psi*) *gauge pressure*.

15.12.2.3 The discharge pressure-indicating device shall read from 0 *kPa* (0 *psi*) *gauge pressure* or lower to at least 2000 *kPa* (290 *psi*) *gauge pressure*.

15.12.2.4 A vacuum of 100 *kPa* (30 in Hg) shall not damage the pressure *gauges*.

15.12.2.5 Pressure-indicating devices shall be marked with *labels*, "Pump Discharge" for the discharge pressure-indicating device and "Pump Intake" for the intake pressure-indicating device.

15.12.2.6 For analog *gauges*, there shall be at least a 25 mm (1 in) diameter differential in viewing area between the individual discharge *gauges*, and the master *gauges* with the master *gauges* being the larger.

15.12.2.7 Analog *gauges* shall be accurate to a minimum of Grade 1A as defined in ASME B40.100, Pressure Gauges and Gauge Attachments, when the vacuum portion of the display covers an arc of 45° or less.

15.12.2.8 If an analog *gauge* has a vacuum display covering an arc greater than 120°, then the accuracy shall be at least 3.5 % for the entirety of the respective scales.

15.12.2.9 If an analog *gauge* has a vacuum display covering an arc greater than 120°, then the vacuum scale shall have graduation lines every 5 *kPa* (1 in. Hg); major and intermediate graduation lines shall be emphasized, and at least every 50 *kPa* (10 in. Hg) there shall be a figure.

15.12.2.10 The height of numerals for master *gauges* shall be a minimum of 6 mm (0.25 in).

15.12.2.11 These devices shall have graduation lines that shall show at least every 50 *kPa* (7.3 *psi*), with major and intermediate graduation lines emphasized and figures at least every 500 *kPa* (73 *psi*).

15.12.2.12 Analog pressure *gauges* shall be resistant to corrosion, condensation, and shock; shall be vibration and pressure pulsation dampened; and have internal mechanisms that are factory lubricated for the life of the *gauge*.

15.12.2.13 The requirements of Clauses 15.12.2.14 through 15.12.2.16 shall be met by any digital master pressure indicating devices used.

15.12.2.14 The heights of digits shall be at least 12 mm (0.47 in).

15.12.2.15 Pressure on digital pressure indicating devices shall be displayed in increments of not more than 70 *kPa* (10 *psi*).

15.12.2.16 The accuracy of digital master pressure indicating devices shall be ± 3 % over the full scale.

15.12.3 Discharge Outlet Instrumentation

REFERENCE 16.12.3 IN NFPA 1901-09

15.12.3.1 For each discharge outlet 38 mm (1.5 in) or larger in size, a pressure-indicating device shall be provided which shall be marked with a *label* to indicate the outlet to which it is connected.

15.12.3.2 A pressure-indicating device shall be provided for any discharge outlet equipped with a flowmeter.

15.12.3.3 The pressure-indicating device or flowmeter display shall be adjacent to the corresponding valve control with no more than a 150 mm (6 in) separation between the pressure-indicating device or flowmeter bezel and the valve control midpoint or centreline.

15.12.3.4 It is required that, if both a flowmeter and pressureindicating device are provided for an individual discharge outlet, the pressure indicating device shall be located within 150 mm (6 in) of the valve control midpoint or centreline, and the flowmeter display shall be adjacent to and within 50 mm (2 in) of the pressure indicating device bezel.

15.12.3.5 The connection of pressure-indicating devices shall be to the outlet side of the valve.

15.12.3.6 Flow display on flowmeters shall be in increments no greater than 40 L/min (9 *gpm* / 10.5 US-gpm).

15.12.3.7 The minimum accuracy where analog pressure *gauges* are used, is Grade B as defined in ASME B40.100, Pressure Gauges and Gauge Attachments.

15.12.3.8 The height of numerals for *gauges* shall be a minimum 4 mm (0.16 in).

15.12.3.9 These devices shall have graduation lines that shall show at least every 50 *kPa* (7.3 *psi*), with major and intermediate graduation lines emphasized and figures at least every 500 *kPa* (73 *psi*).

15.12.3.10 Analog pressure *gauges* shall be resistant to corrosion, condensation, and shock; shall be vibration and pressure pulsation dampened; and have internal mechanisms that are factory lubricated for the life of the *gauge*.

15.12.3.11 The requirements of Clauses 15.12.3.12 through 15.12.3.14 shall be met by any digital pressure indicating devices used.

15.12.3.12 The height of the digits shall be at least 6 mm (0.25 in).

15.12.3.13 Pressure on Digital pressure-indicating devices shall be displayed in increments of not more than 50 *kPa* (10 *psi*).

15.12.3.14 The accuracy of digital pressure-indicating devices shall be ± 3 % over the full scale.

15.12.3.15 When flowing the amount of water shown in Table 5 for the pipe size in which it is mounted, each flowmeter shall be calibrated to an accuracy of ± 5 %.

15.12.3.16 Each pressure-indicating device or flowmeter, and its respective display, shall be protected from accidental damage and excessive vibration.

15.12.3.17 The *pump operator's panel* shall provide connections for test *gauges*.

15.12.3.18 The test *gauge* shall be connected as follows:

A One connection to the discharge manifold of the pump; and

B the other connection to the intake side of the pump.

15.12.3.19 The test *gauge* connections shall be plugged, have a 6 mm (0.25 in) standard pipe thread, and shall be marked with a *label*.

15.13 TESTING

15.13.1 General

REFERENCE 16.13.1 IN NFPA 1901-09

15.13.1.1 The pump shall be tested after the pump and all its associated piping and equipment have been installed on the *fire fighting apparatus*.

15.13.1.2 As a minimum the tests shall consist of the pumping test (refer to Subsection 15.13.3, Pump Test), the pressure control system test (refer to Subsection 15.13.5, Pressure Control System Test), the priming device tests (refer to Subsection 15.13.6, Priming Device Tests), the vacuum test (refer to Subsection 15.13.7, Vacuum Test) and the *gauge* and flowmeter test (refer to Subsection 15.13.10, Gauge and Flowmeter Test).

15.13.1.3 The pumping engine overload test (refer to Subsection 15.13.4, Pumping Engine Overload Test) shall be conducted if the pump has a *rated capacity* of at least 3000 L/min (650 *gpm* / 750 US-gpm), but less than 12,000 L/min (2500 *gpm* / 3000 US-gpm).

15.13.1.4 The engine speed advancement *interlock* test (refer to Subsection 15.13.9, Engine Speed Advancement Interlock Test) shall be conducted if the *chassis* engine drives the pump.

15.13.1.5 The water tank-to-pump flow test (refer to Subsection 15.13.8, Water Tank-to-pump Flow Test) shall be included, if the *fire fighting apparatus* is equipped with a water tank.

15.13.2 Test Plate

REFERENCE 16.13.1.3 IN NFPA 1901-09

15.13.2.1 A test *plate* stating the rated discharges and pressures together with the speed of the engine as determined by the certification test for each unit, the position of the parallel/series pump as used, and the governed speed of the engine as stated by the engine *manufacturer* on a certified brake horsepower curve, shall be provided. This *plate* shall be located at the *pump operator's panel*.

15.13.2.2 Prior to shipping, the *plate* shall be completely stamped with all information at the factory and attached to the vehicle.

15.13.3 Pump Test

15.13.3.1 Test Conditions

REFERENCE 16.13.2.1 IN NFPA 1901-09

15.13.3.1.1 The selected test site shall be adjacent to a supply of clear water of at least 1.2 m (4 ft) in depth, and close enough to allow the suction strainer to be submerged at least 0.6 m (2 ft) below the surface of the water when connected to the pump by 6.1 m (20 ft) of *suction hose*.

15.13.3.1.2 Tests shall be carried out under the following conditions:

A Air temperature: -18 °C (0 °F) to +43 °C (109 °F) other than for indoor test facilities;

CAUTIONARY NOTE: Be aware that, depending on the climatic zone of operation, a lower temperature limit for application of the requirements may apply.

B Water temperature: 2 °C (36 °F) to 32 °C (90 °F);

C Barometric pressure: 98 *kPa* (14 *psi*), minimum (corrected to sea level); and

D The minimum lift distance shall be 1 m (3 ft) from the centre of pump intake to the surface of the water.

15.13.3.1.3 If the pump passes the tests and the tests need to be performed outside the air or water temperature ranges stated in Clause 15.13.3.1.2, the test results shall be acceptable.

15.13.3.1.4 During the tests, engine-driven accessories shall not be functionally disconnected or otherwise rendered inoperative.

15.13.3.1.5 The total continuous electrical loads excluding those loads associated with the equipment defined in Clause 15.13.3.1.6 shall be applied for the entire pumping portion of this test if the pump is driven by the *chassis* engine.

15.13.3.1.6 If the vehicle is equipped with a *fixed power source* driven by the same engine that drives the *fire pump*, it shall be running at a minimum of 50 % of its *rated capacity* throughout the pumping portion of the pump test.

15.13.3.1.7 Permitted: The following devices may be turned off or not operating during the pump test:

A *Aerial device* hydraulic pump;

B *Foam* pump;

C Hydraulically driven equipment (other than hydraulically driven *line voltage* generator);

D Winch;

E Windshield wipers;

F Four-way hazard flashers; and

G *Compressed Air Foam System (CAFS)* compressor.

15.13.3.1.8 During the tests, all structural enclosures, such as floorboards, gratings, grills, and heat shields, not furnished with a means for opening them in service shall be kept in place.

15.13.3.2 Equipment

15.13.3.2.1 Suction Hose

REFERENCE 16.13.2.2.1 IN NFPA 1901-09

15.13.3.2.1.1 The *suction hose* for the *rated capacity* of the pump shall be of the appropriate size (refer to Table 3).

15.13.3.2.1.2 A suction strainer and hose shall be used that will allow flow with total friction and entrance loss not greater than that specified in Table 1.

15.13.3.2.1.3 Required: sufficient fire hose to discharge the *rated capacity* of the pump to the nozzles or other flow measuring equipment without exceeding a flow velocity of 10 m/s (33 ft/s) [approximately 2000 L/min (430 *gpm* / 525 US-gpm) for 65 mm (2.5 in) hose].

15.13.3.2.1.4 Nozzles utilized shall be smoothbore with inside diameters ranging from 19 mm (0.75 in) to 65 mm (2.5 in).

15.13.3.2.2 Test Gauges

REFERENCE 16.13.2.2.4 IN NFPA 1901-09

15.13.3.2.2.1 Requirements for Grade A *gauges* as defined in ASME B40.100, Pressure Gauges and Gauge Attachments, shall be met for all test *gauges*, and shall be at least size 89 mm (3.5 in) per ASME B40.100.

15.13.3.2.2.2 As an alternate, a mercury manometer can be used in lieu of a pump intake *gauge*.

15.13.3.2.2.3 For a vacuum *gauge*, the pump intake *gauge* shall have a range of 100 *kPa* (30 in Hg) vacuum to 0 *kPa* (0 *psi*), or for a *compound gauge*, the pump intake *gauge* shall have a range of 100 *kPa* (30 in Hg) vacuum to a *gauge pressure* of 1000 *kPa* (145 *psi*).

15.13.3.2.2.4 The pressure range of the discharge pressure *gauge* shall be 0 *kPa* (0 *psi*) to 2800 *kPa* (400 *psi*).

15.13.3.2.2.5 The pressure range of pitot *gauges* shall be at least 0 *kPa* (0 *psi*) to 1100 *kPa* (160 *psi*).

15.13.3.2.2.6 In the month preceding the tests the following calibration shall be carried out:

A Calibrate all *gauges* using a dead weight *gauge* tester or a master *gauge* meeting the requirements for Grade 3A or 4A *gauges*, as defined in ASME B40.100, Pressure Gauges and Gauge Attachments, that has been calibrated within the preceding year.

15.13.3.2.2.7 A means for “snubbing”, such as needle valves to damp out rapid needle movements, shall be included for all test *gauge* connections.

15.13.3.2.2.8 The engine speed-measuring equipment shall consist of a revolution counter on a checking shaft outlet and a stop watch, a nonadjustable tachometer supplied from the engine or transmission electronics, or other engine speed-measuring means that is accurate to within ± 50 rpm of actual speed.

15.13.3.3 Procedure

REFERENCE 16.13.2.3 IN NFPA 1901-09

15.13.3.3.1 Prior to and after each pump test, the ambient air temperature, water temperature, vertical lift, elevation of test site, and atmospheric pressure (corrected to sea level) shall be determined and recorded.

15.13.3.3.2 REFERENCE 16.13.2.3.3 IN NFPA 1901-09

During the entire test, the transmission, pump, engine, and all parts of the *fire fighting apparatus* shall exhibit no undue heating, loss of power, or other *defect*.

15.13.3.3.3 The no-load governed speed of the engine shall be checked and recorded..

15.13.3.3.3.1 The *manufacturer* shall adjust the engine speed to within acceptable limits if the speed of the engine is not within 2 % of the rated no-load governed speed as recorded on the *manufacturer* engine curve.

15.13.3.3.4 *REFERENCE 16.13.2.3 IN NFPA 1901-09*

For apparatus with a *fire pump* rated from 3000 L/min (625 *gpm* / 750 US-gpm) but less than 12,000 L/min (2500 *gpm* / 3000 US-gpm), the following test shall be conducted:

Subject the pump to a 3 h pumping test from draft consisting of 2 h of continuous pumping at *rated capacity* at 1000 *kPa* (145 *psi*) net pump pressure, followed by 30 min of continuous pumping at 70 % of *rated capacity* at 1350 *kPa* (195 *psi*) net pump pressure and 30 min of continuous pumping at 50 % of *rated capacity* at 1700 *kPa* (247 *psi*) net pump pressure.

15.13.3.3.5 Unless it becomes necessary to clean the suction strainer, the pump shall not be stopped until after the 2 h test at *rated capacity*.

15.13.3.3.6 The pump may be stopped between tests in order to change the hose or nozzles, clean the strainer, or add fuel for the pump drive engine.

15.13.3.3.7 Recording of the capacity, discharge pressure, intake pressure, and engine speed, shall be taken at least every 15 min but not less than three times for each test sequence.

15.13.3.3.8 The calculation and recording of the average net pump pressure, shall be based on the average values for discharge and intake pressure.

15.13.3.3.9 For apparatus with a *fire pump* rated at 12,000 L/min (2500 gpm / 3000 US-gpm) the following test shall be conducted:

Subject the pump to a 3 h pumping test from draft consisting of 2 h of continuous pumping at *rated capacity* at 700 *kPa* (100 *psi*) net pump pressure, followed by 30 min of continuous pumping at 70 % of *rated capacity* at 1000 kPa (145 *psi*) net pump pressure and 30 min of continuous pumping at 50 % of *rated capacity* at 1350 *kPa* (195 *psi*) net pump pressure.

15.13.3.3.10 Unless it becomes necessary to clean the suction strainer, the pump shall not be stopped until after the 2 h test at *rated capacity*.

15.13.3.3.11 The pump may be stopped between tests in order to change the hose or nozzles, clean the strainer, or add fuel for the pump drive engine.

15.13.3.3.12 Recording of the capacity, discharge pressure, intake pressure, and engine speed, shall be taken at least every 15 min but not less than three times for each test sequence.

15.13.3.3.13 The calculation and recording of the average net pump pressure, shall be based on the average values for discharge and intake pressure.

15.13.3.3.14 For apparatus with a *fire pump* rated at less than 3000 L/min (625 *gpm* / 750 US-gpm) the following test shall be conducted:

Subject the pump to a 50 min pumping test from draft comprised of 30 min of continuous pumping at *rated capacity* at 1000 *kPa* (145 *psi*) net pump pressure, followed by 10 min of continuous pumping at 70 % of *rated capacity* at 1350 *kPa* (195 *psi*) net pump pressure, and 10 min of continuous pumping at 50 % of *rated capacity* at 1700 *kPa* (247 *psi*) net pump pressure.

15.13.3.3.15 Unless it becomes necessary to clean the suction strainer, the pump shall not be stopped until after the 30 min test at *rated capacity*.

15.13.3.3.16 The pump may be stopped between tests in order to change the hose or nozzles or clean the strainer.

15.13.3.3.17 Recording of the capacity, discharge pressure, intake pressure, and engine speed, shall be taken at least every 10 min but not less than three times for each test sequence.

15.13.3.3.18 The calculation and recording of the average net pump pressure, shall be based on the average values for discharge and intake pressure.

15.13.4 Pumping Engine Overload Test

REFERENCE 16.13.3 IN NFPA 1901-09

15.13.4.1 The *fire fighting apparatus* shall be subjected to an overload test consisting of pumping *rated capacity* at 1100 *kPa* (160 *psi*) net pump pressure for at least 10 min, if the pump has a *rated capacity* from 3000 L/min (625 *gpm* / 750 US-gpm), but less than 12,000 L/min 2500 *gpm* / 3000 US-gpm.

15.13.4.2 The test of Clause 15.13.4.1 shall be performed immediately after the pumping test of *rated capacity* at 1000 *kPa* (145 *psi*).

15.13.4.3 Recording of the capacity, discharge pressure, intake pressure, and engine speed shall be taken at least three times during the overload test.

15.13.5 Pressure Control System Test

REFERENCE 16.13.4 IN NFPA 1901-09

15.13.5.1 If the pump is rated at less than 12,000 L/min (2500 *gpm* / 3000 US-gpm), the pressure control system on the pump shall be tested as follows:

A Operate the pump at draft, delivering *rated capacity* at a discharge *gauge pressure* of 1000 *kPa* (145 *psi*);

B Set the pressure control system in accordance with the *manufacturer*'s instructions to maintain the discharge *gauge pressure* at 1000 *kPa* (145 *psi*) ± 5 %;

C The time for all discharge valves to close shall not be faster than 3 s and not slower than 10 s;

D The rise in discharge pressure shall not exceed 200 *kPa* (29 *psi*) and shall be recorded;

E The original conditions of pumping *rated capacity* at a discharge *gauge pressure* of 1000 *kPa* (145 *psi*) shall be re-established;

F The discharge pressure *gauge* shall be reduced to 620 *kPa* (90 *psi*) by throttling the engine fuel supply, with no change to the discharge valve settings, hose, or nozzles;

G Set the pressure control system in accordance with the *manufacturer*'s instructions to maintain the discharge *gauge pressure* at 620 *kPa* (90 *psi*) ± 5 %;

H The time for all discharge valves to close shall be not faster than 3 s and not slower than 10 s;

I The discharge pressure shall not rise in excess of 200 *kPa* (29 *psi*) and the rise shall be recorded;

J Operate the pump at draft, pumping 50 % of *rated capacity* at a discharge *gauge pressure* of 1700 *kPa* (247 *psi*);

K Set the pressure control system in accordance with the *manufacturer*'s instructions to maintain the discharge *gauge pressure* at 1700 *kPa* (247 *psi*) ± 5 %;

L The time for all discharge valves to close shall be not faster than 3 s and not slower than 10 s; and

M The discharge pressure shall not rise in excess of 200 *kPa* (29 *psi*) and the rise shall be recorded.

15.13.5.2 If the pumping system is rated at 12,000 L/min (2500 *gpm* / 3000 US-gpm) or greater, the pressure control system on the pump shall be tested as follows:

A Operate the pump at draft, delivering *rated capacity* at a discharge *gauge pressure* of 700 *kPa* (100 *psi*);

B Set the pressure control system in accordance with the *manufacturer's* instructions to maintain the discharge *gauge pressure* at 700 *kPa* (100 *psi*) ± 5 %;

C The time for all discharge valves to close shall not be faster than 3 s and not slower than 10 s;

D The rise in discharge pressure shall not exceed 200 *kPa* (29 *psi*) and shall be recorded;

E The original conditions of pumping *rated capacity* at a discharge *gauge pressure* of 1000 *kPa* (145 *psi*) shall be re-established;

F Operate the pump at draft, pumping 50 % of *rated capacity* at a discharge *gauge pressure* of 1350 *kPa* (195 *psi*);

G Set the pressure control system in accordance with the *manufacturer's* instructions to maintain the discharge *gauge pressure* at 1350 *kPa* (195 *psi*) ± 5 %;

H The time for all discharge valves to close shall be not faster than 3 s and not slower than 10 s; and

l The discharge pressure shall not rise in excess of 200 *kPa* (29 *psi*) and the rise shall be recorded.

15.13.6 Priming Device Tests

REFERENCE 16.13.5 IN NFPA 1901-09

15.13.6.1 With the *fire fighting apparatus* set up for the pumping test, the priming device shall be operated in accordance with the *manufacturer*'s instructions until the pump has been primed and is discharging water.

15.13.6.2 The priming device test shall be performed in connection with priming the pump for the pumping test.

15.13.6.3 Note the interval from the time the primer is started until the time the pump is discharging water.

15.13.6.4 If the *rated capacity* of the pump is less than 6000 L/min (1250 *gpm*/ 1500 US-gpm), the time required to prime the pump shall not exceed 30 s.

15.13.6.5 If the *rated capacity* of the pump is 6000 L/min (1250 *gpm*/ 1500 US-gpm) or more, the time required to prime the pump shall not exceed 45 s.

15.13.6.6 When the pump system includes an auxiliary 100 mm (4 in) or larger intake pipe having a volume of 0.03 m^3 (1 ft^3) or more, an additional 15 s shall be added to the timing requirements of Clauses 15.13.6.4 and 15.13.6.5.

15.13.6.6.1 The additional 15 s shall not apply to valved intake pipes such that when the valve is closed, the pipe volume between the *fire pump* and the valve is reduced to less than 0.03 m^3 (1 ft^3).

15.13.7 Vacuum Test

REFERENCE 16.13.6 IN NFPA 1901-09

15.13.7.1 The test shall subject the *interior* of the pump, with all intake valves open, all intakes capped or plugged, and all discharge caps removed, to a vacuum of 75 *kPa* (22 in Hg) by means of the pump priming device.

15.13.7.2 Above an altitude of 610 m (2000 ft), the vacuum attained shall be permitted to be less than 75 *kPa* (22 in Hg) by 3.4 *kPa* (1 in Hg) for each 305 m (1000 ft) of altitude above 600 m (1960 ft).

15.13.7.3 There shall not be a drop in vacuum of more than 34 *kPa* (10 in Hg) in 5 min.

15.13.7.4 The priming device shall not be used after the 5 min test period has begun.

15.13.7.5 During this test the engine shall not be operated at any speed greater than the governed speed.

15.13.8 Water Tank-to-pump Flow Test

15.13.8.1 General

REFERENCE 16.13.7.1 IN NFPA 1901-09

15.13.8.1.1 A water tank-to-pump flow test shall be conducted as follows:

A Fill the water tank until it overflows;

B Ensure all intakes to the pump are closed;

C Ensure the tank fill line and bypass cooling line are closed;

D Connect the hose lines and nozzles for discharging water at the rated tank-to-pump flow rate, to one or more discharge outlets;

E The discharge valves leading to the hose lines and nozzles and the tank-to-pump valve(s) shall be fully opened;

F Adjust the engine throttle until the required flow rate –0/+5 % is established (refer to Subsection 16.3.2, Tank-to-pump Flow Rate);

G Record the discharge pressure;

H Ensure the discharge valves are closed and the water tank is refilled;

I The bypass line may be opened temporarily, if needed, to keep the water temperature in the pump within acceptable limits;

J Fully reopen the discharge valves and note the time; and

K If necessary, adjust the engine throttle in order to maintain the discharge pressure recorded as noted in Clause 15.13.8.1.1G.

Note the time, then calculate and record the elapsed time in minutes from the opening of the discharge valves, when the discharge pressure drops by 70 *kPa* (10 *psi*) or more.

15.13.8.2 Volume Discharge Calculation

REFERENCE 16.13.7.2 IN NFPA 1901-09

15.13.8.2.1 The volume discharge calculation formula shall be as follows:

A Multiply the rate of discharge in litres per minute (*gpm*, if specified by the *purchaser*) times the time in minutes elapsed from the opening of the discharge valves until the discharge pressure drops by at least 70 *kPa* (10 *psi*).

15.13.8.2.2 Other means may be used to determine the volume of water pumped from the tank such as a totalizing flow meter, weighing the truck before and after, or refilling the tank using a totalizing flow meter.

15.13.8.2.3 Until 80 % of the *rated capacity* of the tank has been discharged the rated tank-to-pump flow rate shall be maintained.

15.13.9 Engine Speed Advancement Interlock Test

REFERENCE 16.13.8 IN NFPA 1901-09

15.13.9.1 The test shall verify that the engine speed control at the *pump operator's panel* cannot be advanced when either of the following conditions exist if the *fire fighting apparatus* is equipped with a stationary pump driven through *split shaft PTO*: