1. Introduction and Specifications

1.1 Introduction

The Service Manual is intended to provide technical information, component specifications, troubleshooting and removal, disassembly and reassembly procedures for most of the major components of the machine.

Certain components such as the engine, felling head, and fire suppression system are covered in individual manuals provided by the respective manufacturers. For specifications, parts listings and servicing procedures these manuals should be obtained to supplement the Service Manual.

When practical the Service Manual lists likely causes of malfunctions, offers test procedures to verify causes and then illustrates the steps for the adjustment or repair procedure(s).

Since it is never possible to anticipate all of the possible failure or malfunction scenarios, a concerted effort has been made to explain the function of, or method of operation, of many complex components. This information can be used to predict other causes of machine malfunction.

Troubleshooting must always be a multi step process. Use the following steps:

1. Know the operation of all machine systems.
2. Ask the operator about symptoms and when they occur.
3. Operate the machine yourself if practical.
4. List all possible causes.
5. Inspect the machine for obvious causes.
6. Eliminate the simple ones by checking oil, changing filters, etc.
7. Carry out diagnostic procedures like pressure, leakage and slippage testing to pinpoint the cause.

1.1 Introduction

When troubleshooting there is no substitute for knowledge of the machine systems. This Service Manual contains both hydraulic and electrical system schematics. They should be used to gain a working knowledge of flow paths.

Both sets of schematics are supported by component location charts or illustrations to assist in locating electrical and hydraulic components on the machine.

Specifications (Section 1.2), provide performance and mode of operation information that can be very useful in troubleshooting.

Disassembly and reassembly procedures are given for many major components. When possible, stacking order, clearance and torques are given. If a manufacturers' service manual is available, it should be given priority.

Reference to special equipment for testing and repair is limited, as most repair shops or local machine shops are well equipped to fabricate on an as-needed basis to reduce downtime.

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.
Battery terminals and posts contain lead or lead compounds, which are known to the State of California to cause cancer and birth defects. Wash hands after handling batteries.

1.2 Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

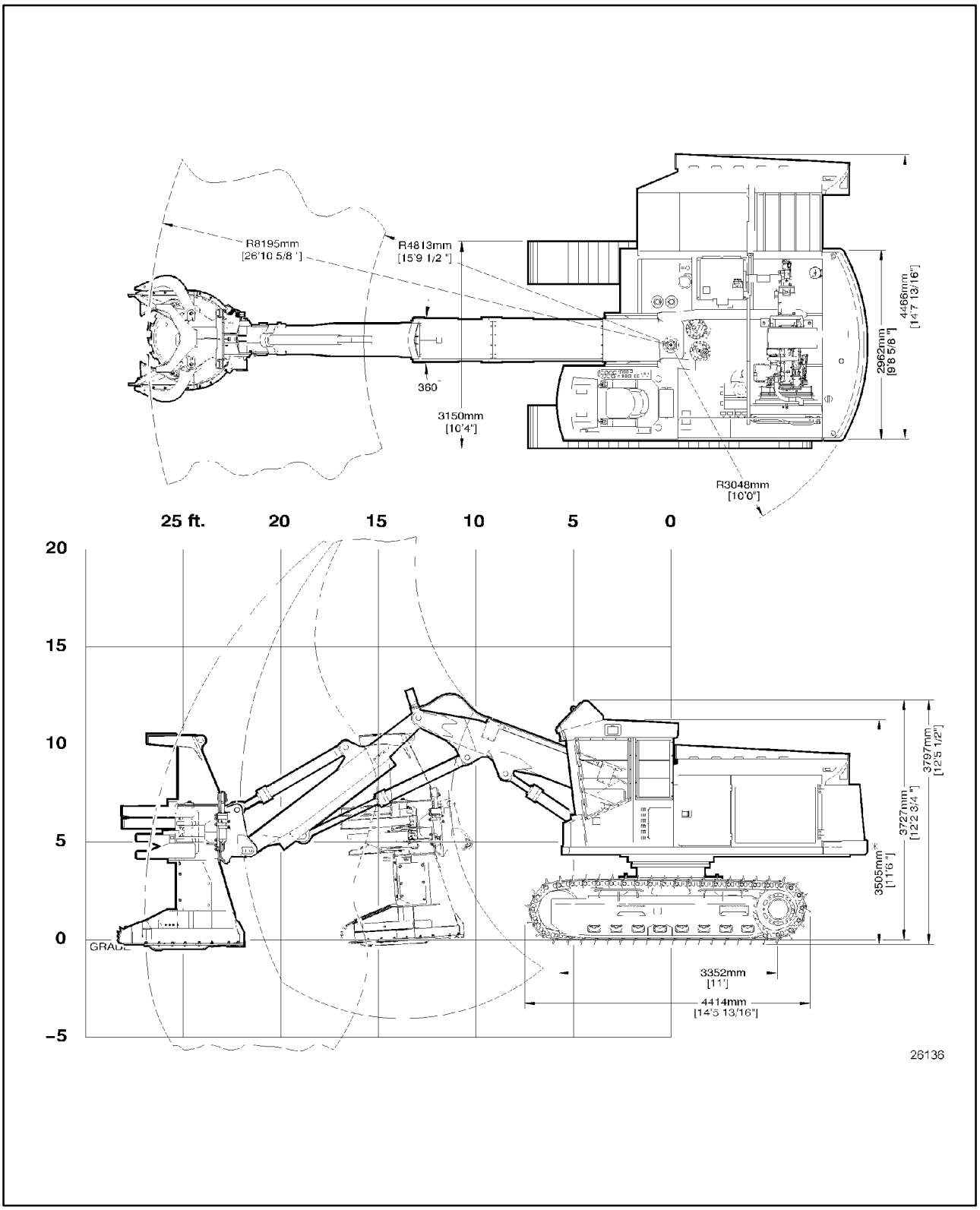
Live with safety: Read the safety messages in Section 2 of this manual and the cautions presented throughout the text of the manual.

This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

1.3 Machine Dimensions



1.4 Specifications

ENGINE:

Model	Cummins 6CTA8.3
No. of cylinders	6
Displacement	504 cu. in. (8.3 litres)
Bore/Stroke	4.49 x 5.32 in. (114 x 135 mm)
Rated Power	230 hp (174 kW) 2000 rpm
Rated Maximum Torque	720 lb ft (976 Nm) 1500 rpm
High Idle	2275 +/- 45 rpm
Low Idle	950 +/- 45 rpm

SWING DRIVE GEARBOX (2):

Type	Double Reduction Planetary
Ratio	31.0:1
Pinion	12 Tooth
Brake	Integral with swing gear
Brake Type	Wet - Spring Applied Hydraulic Released (SAHR)
Brake Release Pressure	507 - 550 psi (3.5 - 3.8 MPa)

FLEXIBLE COUPLING:

Type	Flex Drive	Must not put end thrust on engine crankshaft

AIR CLEANER:

Type	Dry, Two Stage Aspirated
Inlet	6 in. (153 mm)
Outlet	5 in. (127 mm)
Size	13 in. O.D. (355 mm)
Pre-cleaner	Aspirated

1.4 Specifications

ENGINE OIL FILTER:

Type	Spin - on cartridge

RADIATOR:

Core Type	7.0 fins/in. (178 fins/mm)
System Capacity	13.7 U.S. Gal. (52 litres)
System Pressure	15 psi (103 kPa)

SURGE TANK:

Capacity Rating	15 psi (103 KPa)
System Capacity	2.25 U.S. gal (8.5 litres)

FAN:

Type	6 blade (suction)
Diameter	30 in. (762 mm)
Projected Width	2.83 in.(72 mm)
Drive Ratio	1.00:1 - Direct drive off engine crankshaft

HYDRAULIC OIL COOLER:

Type	6 fins/in.(0.24 fins/mm) - 4 rows
Location	In front of engine radiator
Thermal Bypass	Below 120º - 140 ºF (49° - 60 ºC)
Full Oil Flow	140 ºF (60 ºC)
Pressure Bypass	50 psi (350 kPa)

1.4 Specifications

BRAKES:

Type	Multi disc, wet
Activated	(Integral) Spring Applied Hydraulic Release (SAHR)

EXHAUST:

Type	Silencer	With spark arrestor
Inlet Diameter	4 in. (102 mm)	

FUEL TANK:

Capacity	295 U.S. gal (1117 litres)	
Fill Opening	3.5 in. (89mm)	Strainer in opening
Level Sender	Variable Resistor	Full - 30 ohms Empty - 240 ohms

FUEL/WATER SEPARATOR:

Type	Replaceable Element - at fuel tank

FUEL FILTERS:

Type	Spin - on cartridge

HYDRAULIC FILL PUMP:

Type	Hand Operated Piston

ENCLOSURE OPEN PUMP:

Type	Piston-Hand operated
Selector Valve	Built in, Open-Neutral-Close
Pressure Relief	3045 psi (21 MPa)

1.4 Specifications

MAIN HYDRAULIC PUMP:

Type	Variable Displacement Axial Piston
Displacement	15.25 cu in/rev (250 cc/rev)
Operating Press	4930 psi (34.0 MPa)
Rotation	cw (looking at shaft)
Operating Delta P	348 psi (2.2 MPa)
Nominal Flow	126 U.S. gal (475 litres) @ 2000 rpm

SAW/ENCLOSURE PUMP:

Type	Variable Displacement Axial Piston
Displacement	2.44 cu.in./rev (40 cc/rev)
Operating Press	4420 psi (30.5 MPa)
Rotation	cw (looking at shaft)
Standby Pressure	435 psi (3.0 MPa)
Nominal Flow	20.1 U.S. gal (76 litres) @ 2000 rpm

CLAMP/WRIST PUMP:

Type	Variable Displacement Axial Piston
Displacement	3.66 cu.in./rev (60 cc/rev)
Operating Press	2540 psi (17.5 MPa)
Rotation	cw (looking at shaft)
Standby Pressure	435 psi (3.0 MPa)
Nominal Flow	31.7 U.S. gal (120 litres) @ 2000 rpm

SWING DRIVE MOTORS (2):

Type	Fixed Displacement Axial Piston
Displacement	2.75 cu in/rev (45 cc/rev)
Max. Operating Pressure	2900 psi (20.0 MPa)
Rotation	Bi-directional
Control	Main Valve Spool
Cross Line Relief	3335 psi (22.0 MPa)

1.4 Specifications

TRACK DRIVE MOTORS (2):

Type	Variable Displacement Axial Piston
Displacement	4.88 cu in/rev (80.0 cc/rev)
Operating Pressure	4930 psi (34.0 MPa)
Rotation	Bi-directional
Control	Main Valve Spools - foot pedals
Begin Of Regulation	3700 psi (25.5 MPa)
Cross Line Relief	5220 psi (36.0 MPa)
Brake Release Pressure	304 - 363 psi (2.1 - 2.5 MPa)

SAW AND ENCLOSURE VALVE:

Location	Top of saw pump
Solenoids	Enclosure (double acting)
	High pressure stand by
	Saw drive
Relief valves (3)	5510 psi (38.0 MPa)
	3045 psi (21.0 MPa)

PILOT HYDRAULIC VALVE:

Location	Top of hydraulic tank
Type	Electric over hydraulic, four functions
System Operating Pressure	525 psi (3.6 MPa)

JOYSTICK & FOOT PEDAL VALVES:

Quantity	2 each
Operating pressure	525 psi (3.6 MPa)
Operating voltage	24 volts

SWING DRIVE RELIEF VALVE:

Quantity	1
Relief Setting	3190 psi (22.0 MPa)

1.4 Specifications

MAIN HYDRAULIC VALVE:

Quantity	1
Type	Load sense, pressure/anti-saturation compensated
Pilot Relief Setting	525 psi (3.6 MPa)
LS Main Relief	4930 psi (34.0 MPa)
Swing Feed Reducer	2900 psi (20.0 MPa)
Boom Feed Reducer	3332 psi (23.0 MPa)
Unloader Relief Setting	3625 psi (25.0 MPa)
Clamp and Wrist	
Port Reliefs	Preset cartridges
Check Valve Setting	73 psi (0.5 MPa) and 131 psi (0.9 MPa)
Spool Limit Screws	Individually adjustable
Pilot Orifices	1.0 mm for swing; 0.6 mm for tracks and head functions
Delta P Valve	Factory preset

HYDRAULIC RETURN FILTER:

Quantity	2 (5/10 micron Beta 2/20)	
Location	Inside hydraulic tank	
Bypass valve	22 psi (15.2 kPa)	Warning light at 18 psi (12.4 kPa)

VALVE FILTER BYPASS:

Quantity	2
Location	Mounts in return filter
Bypass valve	22 psi (15.2 kPa)

SUCTION STRAINER:

Quantity	1 (100 mesh)	
Location	Inside hydraulic tank	
Capacity	250 U.S. gpm (946 l/min)	
Pressure at pump	2.5 - 3.0 psi (17.2 - 20.7 kPa)	Warning light at 2 psi (13.8 kPa)

1.4 Specifications

HYDRAULIC TANK:

Maximum Capacity	60 U.S. gal (227 litre)
Minimum Capacity	55 U.S. gal (207 litre)
Relief Pressure	15 psi (0.103 MPa)
Charge Pressure	10 psi (0.069 MPa)

HOIST & STICK CYLINDERS:

Quantity	2 (hoist), 1 (stick)
Bore	5.0 in. (127 mm)
Stroke	44.5 in. (1130 mm)
Rod diameter	3.5 in. (88.9 mm)
Collapsed length	67.3 in. (1709 mm)
Pin diameter	3.0 in. (76.2 mm)
Cushioned	Both ends

TILT CYLINDER:

Quantity	1
Bore	5.0 in. (127 mm)
Stroke	44.5 in. (1130 mm)
Rod diameter	3.0 in. (76.2 mm)
Collapsed length	67.3 in. (1709 mm)
Pin diameter	3.0 in. (76.2 mm)
Cushioned	Both ends

ENCLOSURE TILT CYLINDER:

Quantity	1
Bore	3.5 in. (90 mm)
Stroke	15.6 in. (397 mm)
Rod diameter	1.8 in. (45 mm)
Collapsed length	30.9 in. (786 mm)
Pin diameter	1.77 in. (45 mm)
Cushion	None

1.4 Specifications

CLAMP CYLINDER :

Clamp Cylinders (3.5“)

No. Cylinders	2
Retracted Length	23 in. (584 mm)
Extended Length	31.5 in. (800 mm)
Bore Diameter	3.5 in. (88.9 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Operating Pressure	3625 psi (250 bar)
Cushioning	Base End

Clamp Cylinders (4.0”)

No. Cylinders	2
Retracted Length	23 in. (584 mm)
Extended Length	31.5 in. (800 mm)
Bore Diameter	4.0 in. (101.6 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Operating Pressure	3000 psi (207 bar)
Cushioning	Base End

WRIST CYLINDER:

Wrist (3.5”)

No. Cylinders	2
Retracted	23 in (584 mm)
Extended	31.5 in. (31.5 mm)
Bore Diameter	3.5 in. (88.9 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Wrist Movement	+/- 15º
Wrist Speed	1.6 rpm

1.4 Specifications

HYDRAULIC SWIVEL (ROTARY MANIFOLD):

Location . . . . . At swing bearing
Oil Flow . . . . . 4 high pressure galleries
1 low pressure gallery . . . . . For Hi/Lo shift
. . . . . 1 case drain gallery

ALTERNATOR:

Amperage . . . . . 70 amp
Voltage . . . . . 24 volt . . . . . Charges @ 26 - 28 volts
Ground . . . . . Negative

STARTER:

Model 42MT
Voltage . . . . . 24 volt
Ground . . . . . Negative

BATTERY:

Quantity 2
Model . . . . . 4D - 1000
Capacity rating . . . . . 1000 CCA @0 ºF (-18 ºC)
Reserve . . . . . 300 minute
System voltage . . . . . 24 volts
Battery voltage . . . . . 12 volts, two connected in series

LIGHTS:

Voltage . . . . . 24 volt
Front Cab (3) . . . . . 140 watt
Side Cab . . . . . 140 watt
Enclosure(2) . . . . . 140 watt
Service (2) . . . . . 70 watt
Dome . . . . . 29 watt

1.4 Specifications

MOTORS:

A/C Heater	24 volt three speed control
Defroster Fan	24 volt three speed control

SWITCHES:

Master Disconnect	2 position sealed switch
Ignition	4 position switch
Battery/Converter Equalizer	24 - 12 VDC Equalizer
Output Current	10 amp continuous @ 12 volts
Maximum Current	20 amp intermittent @ 12 volts

AUTO GREASING SYSTEM:

Type	Piston	Electrically powered
Capacity		Low level activates warning
Timing	Adjustable	Continuous power for memory
Maximum pressure	3000 psi (20.7 MPa)	Activates warning Indicates problem location (See System Manual)

SWING BEARING:

Ring Gear (Internal)	104 Teeth
Ring Gear Diameter	46.77 in. (1188 mm)
Ball Diameter	1.75 in. (44.5 mm)

TRACK:

Shoe sizes	24, 30 or 36 inch (610, 762 or 914 mm)
Shoe types	Single, double or triple grouser
Track chain pitch	8.0 in. (203 mm)
Track shoe bolt	s3/4 - 16
Tightening Torque	220 +/- 40 lb ft (298 +/- 54 Nm) + 1/3 turn
Inspection Torque	420 lb ft (569 Nm)
Track Roller Bolt	s430 - 450 lb ft (590 - 610 Nm)

1.4 Specifications

TRACK DRIVE GEARBOX (2):

Type	Triple Reduction Planetary
Brake	Integral with gearbox
Brake Type	Wet - Spring Applied Hydraulic Released (SAHR)
Brake Release Pressure	304 - 363 psi (2.1 - 2.5 MPa)

ENGINE OIL PRESSURE:

Gauge	0 - 100 psi (0 - 0.69 MPa)
Sender	0 psi (0 MPa) - 240 ohm
	25 psi (0.172 MPa) - 153 ohm
	100 psi (0.69 MPa) - 33.5 ohm
Engine Anti-rotation	N.O., closes at 4 psi (0.0275 MPa)
Low Pressure Warning	N.O., closes at 15 psi (0.103 MPa)

HYDRAULIC OIL PRESSURE:

Pump Inlet Switch	N.O., closes at 2 psi (0.0138 MPa)
Oil Level Sender	N.O., closes for low level
Filter Bypass Switch	N.O., closes @ 18 psi (0.124 MPa)

ENGINE COOLANT TEMPERATURE:

Gauge	100 - 280 ºF (38 - 138 ºC)
Sender	195 ºF (90.3 ºC) - 123.8 ohm
	280 ºF (138 ºC) - 35.6 ohm
Switch	N.C., Opens at 210 ºF (99 ºC)

HYDRAULIC OIL TEMPERATURE:

Gauge	100 - 280 ºF (38 - 138 ºC)
Sender	195 ºF (90.3 ºC) - 123.8 ohm
	280 ºF (138 ºC) - 35.6 ohm
Switch	N.C., Opens at 210 ºF (99 ºC) - sounds alarm

1.4 Specifications

VOLTMETER:

Range . . . . . 20 - 32 Volts

HOURMETER:

Digital display . . . . . Activated when key is at ignition.

LOW COOLANT WARNING:

Coolant probe . . . . . Provides current path to ground when covered with coolant
Coolant Module . . . . . Amplifies signal to activate warning light

MACHINE WEIGHTS:

Total Weight . . . . . 65 000 lb (29 480 Kg)

Weight includes 24” Double Grouser, FS122 Felling Head, and 1/2 tank of fuel.

ATTACHMENTS:

FS122 Felling Head

1.5 Function Speeds

Hydraulic Speeds (2000 Engine rpm)

(853G Full Stroke)

Cylinder	Extend	Retract
Tilt	4.13 Seconds	3.93 Seconds
Stick	4.25 Seconds	4.25 Seconds
Hoist	3.35 Seconds	3.35 Seconds
Clamp	0.87 Seconds	0.65 Seconds
Wrist	2.92 Seconds	2.91 Seconds

Turntable Swing Speed

853G: 6.9 rpm

1.6 Travel Speeds

(@2000 Engine rpm)

High Range 2.5 mph (4.0 km/hr)

Low Range 1.3 mph (2.1 km/hr)

Note!
See Section 3.2.3 for travel speed adjustment procedure.

1.7 Torque Values

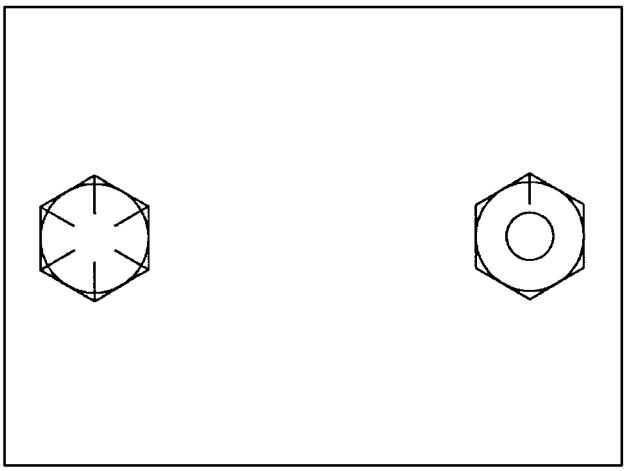
The following torque values are for use in general applications and where torque values are not otherwise specified.

1.7.1 Steel Fasteners

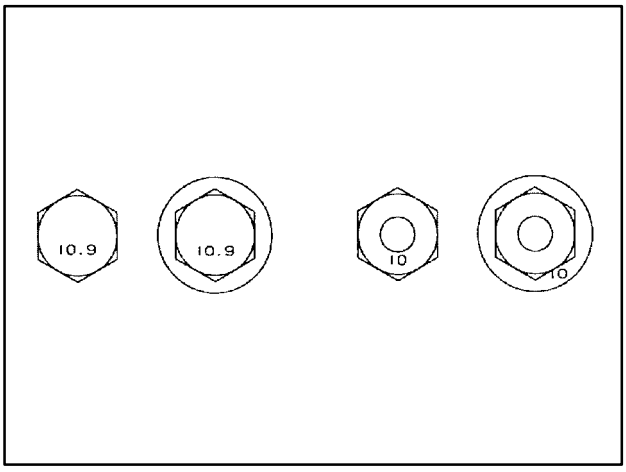
This Standard applies to steel cap screws engaged with steel female thread and is applicable for all thread pitches. Torque values for other materials are to be specified on the drawings where needed.

Fastener Markings

Grade 8 - Imperial



Class 10.9 - Metric



Class 12.9 - Metric