CEAW006300

Field Assembly Manual

830E-1AC

DUMP TRUCK

SERIAL NUMBERS **A30240 - A30261**

KOMATSU®

FOREWORD

This manual is provided to aid assemblers during field assembly of the standard Komatsu 830E-AC dump truck. Variations of design required for specific truck orders may require some modification of the general procedures outlined in this manual. Follow all safety notices, warnings, and cautions provided in this book when assembling the truck.

General assembly pictures and illustrations are used in this manual. At times the illustrations may not reflect the current production truck model.

This manual lists metric (SI) and U.S. standard dimensions throughout.

All location references to “front”, “rear”, “right”, or “left”, are given in respect to the operator's normal seated position.

It is recommended that all maintenance personnel read and understand the materials in the service manual before performing maintenance and/or operational checks on the assembled truck.

This alert symbol is used with the signal words, CAUTION, DANGER, and WARNING in this manual to alert the reader to hazards arising from improper operating and maintenance practices.

DANGER

DANGER Identifies a specific potential hazard which will result in either injury or death if proper precautions are not used.

WARNING

WARNING identifies a specific potential hazard which may result in either injury or death if proper precautions are not used.

CAUTION

CAUTION is used for general reminders of proper safety practices or to direct the reader's attention to avoid unsafe or improper practices which may result in damage to the equipment.

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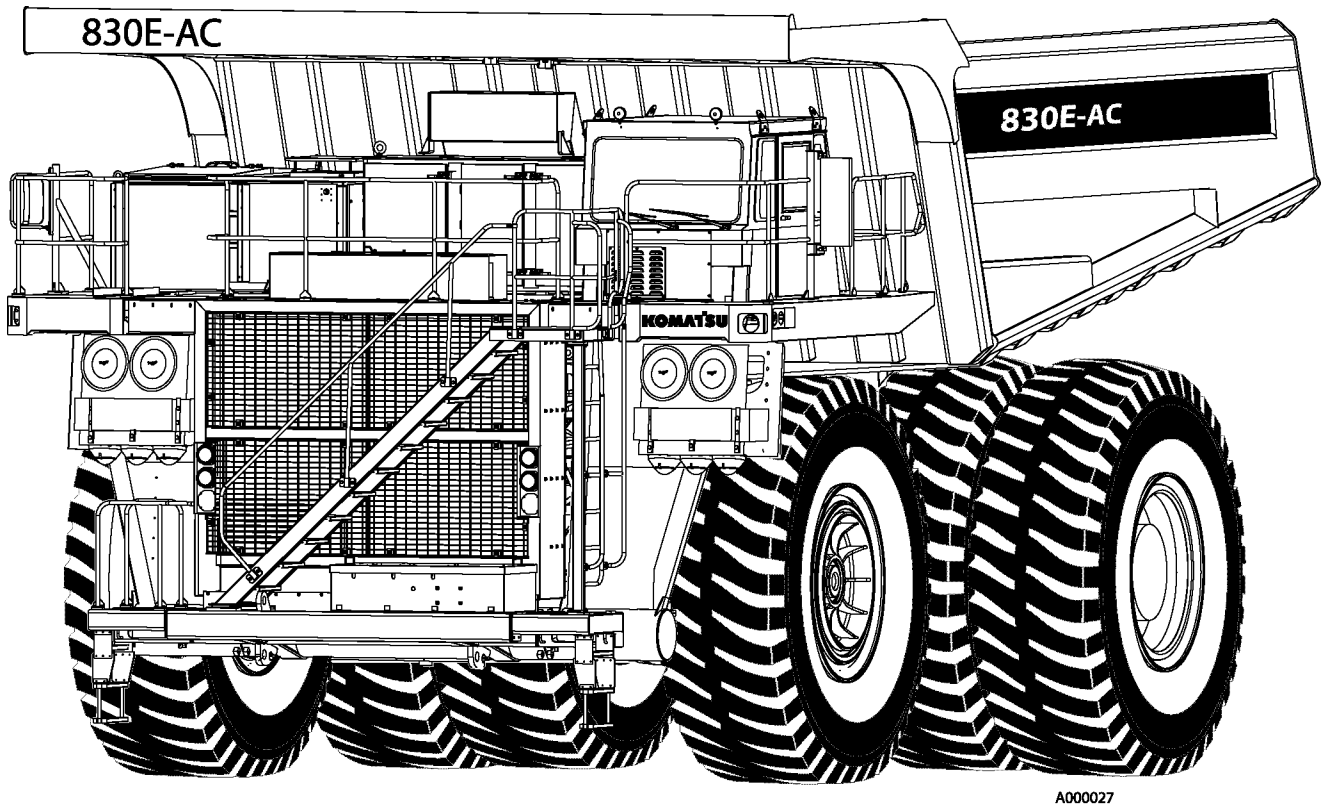


KOMATSU 830E-AC

SAFETY RULES, TOOLS & EQUIPMENT

SAFETY RULES

The following list of safety practices is intended for use by personnel during field assembly of the truck.

This list of safety rules is not intended to replace local safety rules or regulations and federal, state, or local laws. The safety precautions recommended here are general and must be used in conjunction with all prevailing local rules and regulations.

1. All personnel must be properly trained for the assembly process.
2. Wear safety equipment such as safety glasses, hard toe shoes and hard hats at all times during assembly.
3. Thoroughly inspect the assembly site. Remove weeds, debris and other flammable material.
4. Use only solid, hard wood for supports. When using metal support stands, place wood blocks between the support and the frame to prevent metal to metal contact.
5. Inspect all lifting devices. Refer to the manufacturer's specifications for correct capacities and safety procedures when lifting components.
6. Perform a daily inspection of all lifting cables and chains. Replace any questionable items. Use cables and chains that are properly rated for the load to be lifted.
7. DO NOT stand beneath a suspended load. Use of guy ropes are recommended for guiding and positioning a suspended load.
8. Maintain fire control equipment. Inspect fire extinguishers regularly to ensure they are fully charged and in good working condition.
9. Cap screws and/or nuts being replaced must be the same grade as originally supplied.

⚠CAUTION

Before welding, refer to Special Precautions When Servicing An AC Drive System Truck, in Section 4.

10. Disconnect the battery charging alternator lead wire before welding on the frame or its components.
11. When welding, connect the ground cable to the part being welded. DO NOT allow welding current to pass through bearings, engine, etc.
12. DO NOT weld the fuel tank or hydraulic tank unless the tanks have been properly purged and ventilated.
13. Use the proper tools for the job to be performed. Never improvise wrenches, screw drivers, sockets, etc. unless specified.
14. Lifting eyes and hooks must be fabricated from the proper materials and rated to lift the intended load.
15. When the weight of any component(s) or any assembly procedure is not known, contact your customer support manager for further information.

TOOLS AND EQUIPMENT FOR ASSEMBLY

The following equipment is recommended for field assembly of the truck.

1. Equipment and tool storage trailer with a lockable door. Approximately 12 x 2.5 m (40 x 8 ft)
2. Cranes
   a. Two, 45 metric ton (50 ton) cranes to remove the chassis from the freight trailer and place on cribbing. These cranes can also be used to lift the assembled body onto to the chassis.
   b. One, 109-136 metric tons (120-150 ton) crane. The crane is needed to turn the body over after completion of the underside welding. A 45 metric ton (50 ton) crane is also required for this task.
3. One fork lift - 6804 kg (15,000 lb) capacity, with high lift capability.
4. Two, 300 amp portable welding units and an oxy-acetylene cutting set.
5. One, propane torches for weld preheating.
6. Portable air compressor - 3.5 cmm (125 cfm) and 690 kPa (100 psi) capacity.

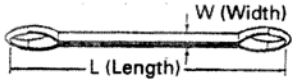
   Two, 15 m (50 ft) air hoses.
7. Metal stands and a sufficient amount of wood cribbing - sizes from 1.2 m x 30.5 cm x 30.5 cm (14 ft. x 12 in. x 12 in.) and 1.2 m x 15 cm x 15 cm (4 ft. x 6 in. x 6 in.) - such as railway cross ties
8. Tire handler - Wiggins/Iowa Mold Tooling.
9. Miscellaneous air tools
10. Ladders - 3.5 m (12 ft), 2.5 m (8 ft), & 2 m (6 ft)
11. Chains, lifting cables, slings:
    - Two, 4 point slings, 3 m (10 ft) in length
    - Two, 4 point slings, 2 m (6 ft) in length
    - Two, 1 m (4 ft) and two, 2 m (6 ft)
    - Two, 3 m (10 ft) nylon straps
    - Four lengths of 2.54 cm x 15 m (1 in. x 50 ft) of rope
12. Two, ratchet pullers - 2.7 metric ton (3 ton)
13. Two, ratchet pullers - 1.4 metric ton (1.5 ton)
14. Set of standard master mechanics hand tools.
    - Thread taps and dies of both inch and metric sizes.
    - Metric sockets and open end wrenches, 6mm to 36mm.
    - Inch sockets and open end wrenches up to 1 3/4 in.
    - Torque wrenches - 339 N·m (250 ft lb) with 18:1 multiplier. Torque wrenches - 339 N·m (600 ft lb) with 4:1 multiplier. Hydrotorque - 1 1/2 in. drive with capability of 5559 N·m (4100 ft lb) or greater.
    - Box wrench 1 3/8 in. (Snap-On p/n X440B) with 12 inch extension to tighten ROPS cap screws.
    - Sockets: 2 1/4 in. (Snap-On P/N J15036) and 2 5/8 in. (Snap-On P/N J15042) to tighten front suspension hardware.
15. Heavy duty 3/4 in. & 1 in. square drive impact wrench sets.
16. Impact sockets for 3/4 in. & 1 in. square drive tools.
17. Special tools (see list, following pages)
18. Two, hydraulic or pneumatic porta-power jacks, 4.5 and 9 metric ton (5 and 10 ton)
19. Various hooks and shackles
20. Miscellaneous: i.e. grinders, containers, rags.
21. Spreader bars for cab and decks.
22. Two ratchet hoists of 2.7 metric ton (3 ton) capacity.
23. Pry bars
24. Solvent - 38 liters (10 gal)
25. Paint remover - 19 liters (5 gal)
26. Rust preventive grease

LIFTING SLING GENERAL INFORMATION

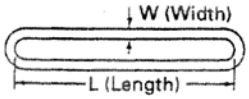
• Nominal Designation

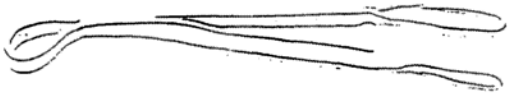
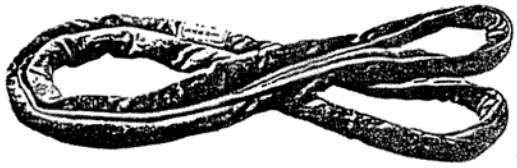
Product name – Type – Belt width – Length
(Example) Poly type – Type E – 50 mm x 3 m

<Type E>



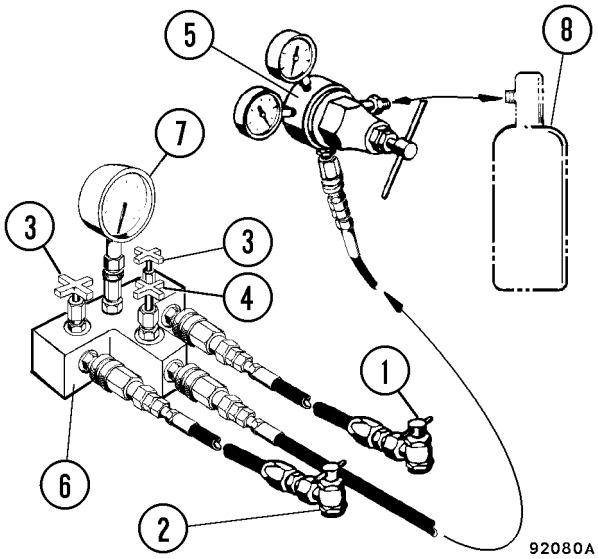
<Type N>



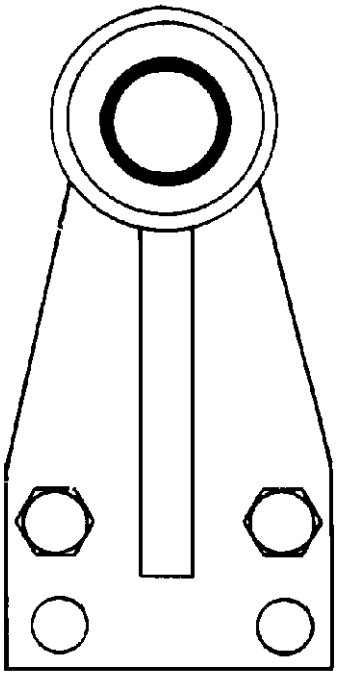
	Product Name (Material)	Belt width (mm)	Shape (Type E (I specification) and Type N (Endless specification) are available for all products.)	Color
Belt Sling (Available in any your desired length)	**Poly Type (P Type) (Polyester)** Class III for general use Features: Soft belt with little elongation and great wear resistance.	25 mm 40 mm 50 mm **75 mm** **100 mm** 150 mm 200 mm 300 mm		Light blue
	Limit Type (L Type) (Nylon and Polyester) Class III for general use Features: The disposal criterion can be found at a glance.	25 mm 35 mm 50 mm 75 mm 100 mm **150 mm** 200 mm 300 mm		Blue
	Just Type (J Type) (Nylon) Class III for general use Features: Great wear resistance	25 mm 35 mm **50 mm** **75 mm** 100 mm		Yellow
	Medical Type (M Type) for oxidation rinsing (Polypropylene) Class I for chemical Features: Great chemical resistance	**25 mm** **50 mm** **75 mm** **100 mm**		Off-white
Soft Sling	**SS Type (Nylon & Polyester)** Length: Available in any length between 0.5 m and 10 m	Working load (tf) 0.5 t 1.0 t **1.5 t** 2.0 t 3.0 t 5.0 t		Gray Violet Blue Green Yellow Red
	SS Type for heavy goods (Nylon & Polyester) Length: Available in any length between 2 m and 10 m	10 t 15 t 20 t 25 t		Blue

Part Number	Description	Use
EB1759	Nitrogen Charging Kit	Suspension & Accumulator Nitrogen Charging

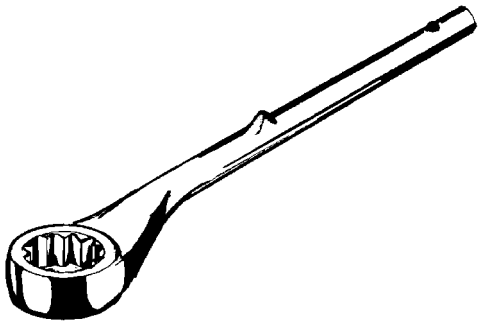
1. “T” Handle Valve
2. Charging Valve Adapter
3. Manifold Outlet Valves (from gauge)
4. Inlet Valve (from regulator)
5. Regulator Valve (Nitrogen Pressure)
6. Manifold
7. Charging Pressure Gauge (Suspensions)
8. Dry Nitrogen Gas



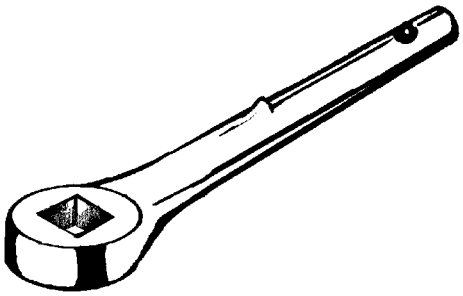
Part Number	Description	Use
EJ2627 (No longer available as complete unit)	Roller Assy.	Power Module Remove & Install
EJ2629	Roller Mount	
PC0706	Bearing	
TH9449	Bearing Retainer Ring	
TG1680	Roller Retainer Ring	
C1645	Cap screw 0.75 -10 NC x 2 1/4 in.	
C1542	Lockwasher 0.75 in.	
EH8686	Roller Ring	



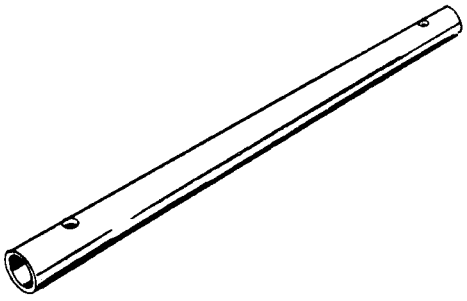
Part Number	Description	Use
TZ3535	Offset Box End Wrench, 1, 1/2 in.	Miscellaneous



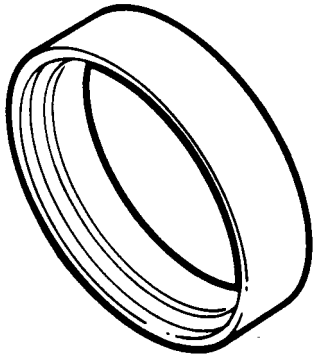
Part Number	Description	Use
TZ2734	3/4 in. Torque Adapter	Miscellaneous



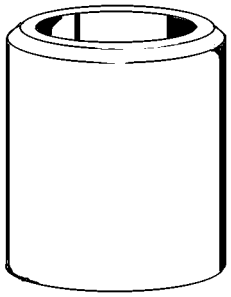
Part Number	Description	Use
TZ2733	Tubular Handle	Use with TZ2734 & TZ3535



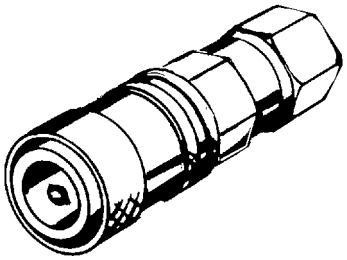
Part Number	Description	Use
TY2150	Seal Installation Tool	Front Face Seals



Part Number	Description	Use
TY4576	Sleeve Alignment Tool	Steering Linkage and Tie Rod
TZ0992	Sleeve Alignment Tool	Rear Suspension & Anti-Sway Bar

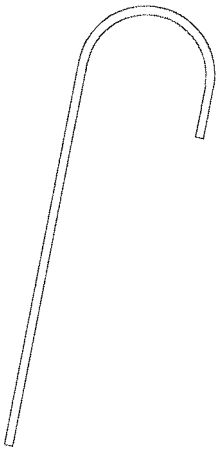


Part Number	Description	Use
PB6039	Hydraulic Coupling	Miscellaneous

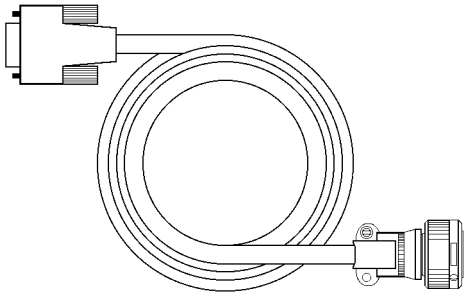


Part Number	Description	Use
PC2061	Belt Tension Tester	A/C Belt Tension

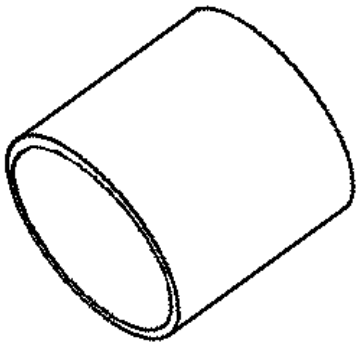
Part Number	Description	Use
EL8868	V-Belt Align-ment Tool	Aligning A/C pulleys



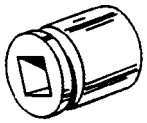
Part Number	Description	Use
PC2525	Harness	Payload Meter Download
AK4720	Software	Payload Meter Data Manager



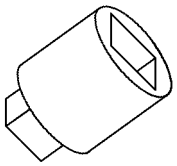
Part Number	Description	Use
EH7817	Alignment Tool	Upper Hoist Pin



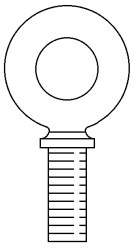
Part Number	Description	Use
TZ2100	Socket (1 7/8 in.)	Miscellaneous
TZ2726	Socket (1 1/8 in.)	
TZ2727	Socket (2 1/4 in.)	
TZ2728	Socket (2 3/4 in.)	
TZ2729	Socket (1 1/4 in.)	
TV7567	Socket (1 5/16 in.)	
PB6825	Impact Socket (1 5/8 in.)	



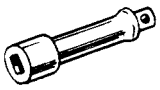
Part Number	Description	Use
TZ2730	Adapter (1-1 1/2 in.)	Socket adapter
TZ2731	Adapter (3/4-1 in.)	



Part Number	Description	Use
WA4826	Lifting Eye Bolt	Miscellaneous
TG1106		



Part Number	Description	Use
TV1186	Extension (3 1/2 in.)	Miscellaneous
TR0532	Extension (8 in.)	
TR0533	Extension (17 in.)	



	PLACE CHASSIS ON SUPPORT BLOCKS ARRANGE ALL PARTS	CLEAN SURFACES INSTALL DECK SUPPORTS	WELD DECK SUPPORTS INSTALL ROPS BEAMS	WELD DECK SUPPORTS SUB DECKS	HOIST CYLINDERS HYDRAULIC & FUEL TANKS	BRAKES TO WHEEL MOTORS WHEEL MOTOR AND CONNECTIONS	SPINDLES REAR AXLE CONNECTIONS
CHASSIS ASSEMBLY	DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAY SIX	DAY SEVEN
3 ASSEMBLERS							
2 ELECTRICIANS							
2 WELDERS							
2 CRANES		1 CRANE					
BODY ASSEMBLY							
3 WELDERS							

FAM00140

INSTALL CAB
DAY EIGHT
LH & RH DECKS
INSTALL CAB
DAY NINE
HYDRAULIC TANK
HOSES & HIGH
PRESSURE FILTERS
CAB PIPING
DAY TEN
WELD UPRIGHTS &
BUMPER EXTENSION
BATTERY BOX, OIL
RESERVE & LUBE
DAY ELEVEN
CONTROL CABINET
& CABLES
AUXILIARY BOX
DAY TWELVE
CONTROL CABINET
WIRING
INLET DUCTS
START ENGINE -
INITIAL CHECKS
DAY THIRTEEN
PREPARE BODY
FOR INSTALLATION
CHASSIS MUD FLAPS
DAY FOURTEEN
INSTALL BODY
CONNECT HOIST
CYLINDERS
DAY FIFTEEN
FINISH ASSEMBLY
& CHECKOUTS
INSPECTION &
PREDELIVERY
DAY SIXTEEN
2 CRANES
FAM00141

TRUCK COMPONENTS AND SPECIFICATIONS

Truck And Engine

The 830E-AC dump truck is an off-highway, rear dump truck with AC electric drive. The gross vehicle weight is 385 852 kg (850,650 lbs.). The engine is a Komatsu SDA16V160 rated @ 1865 kW (2500 hp).

Alternator (G.E. GTA-41)

The diesel engine drives an in-line alternator at engine speed. The alternator produces AC current which is rectified to DC within the main control cabinet. The rectified DC power is converted back to AC by groups of devices called "inverters", also within the main control cabinet. Each inverter consists of six "phase modules" under the control of a "gate drive unit" (GDU). The GDU controls the operation of each phase module.

Cooling air for the control / power group and wheel motors, as well as the alternator itself, is provided by dual fans mounted on the alternator shaft.

AC Induction Traction Motorized Wheels

The alternator output supplies electrical energy to the two wheel motors attached to the rear axle housing. The motorized wheels use three-phase AC induction motors with full-wave AC power.

The two wheel motors convert electrical energy back to mechanical energy through built-in gear trains within the wheel motor assembly. The direction of the wheel motors is controlled by the directional control lever located on the center console.

Suspension

Hydrair®II suspension cylinders located at each wheel provide a smooth and comfortable ride for the operator and dampens shock loads to the chassis during loading and operation.

Operator's Cab

The operator cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck. The cab provides wide visibility, with an integral 4-post ROPS/FOPS structure, and an advanced analog operator environment. It includes a tinted safety-glass windshield and power-operated side windows, a deluxe interior with a fully adjustable seat with lumbar support, a fully adjustable tilt/telescope steering wheel, controls mounted within easy reach of the operator, and an analog instrument panel which provides the operator with all instruments and gauges which are necessary to control and/or monitor the truck's operating systems.

Power Steering

The truck is equipped with a full time power steering system which provides positive steering control with minimum operator effort. The system includes nitrogen-charged accumulators which automatically provide emergency power if the steering hydraulic pressure is reduced below an established minimum.

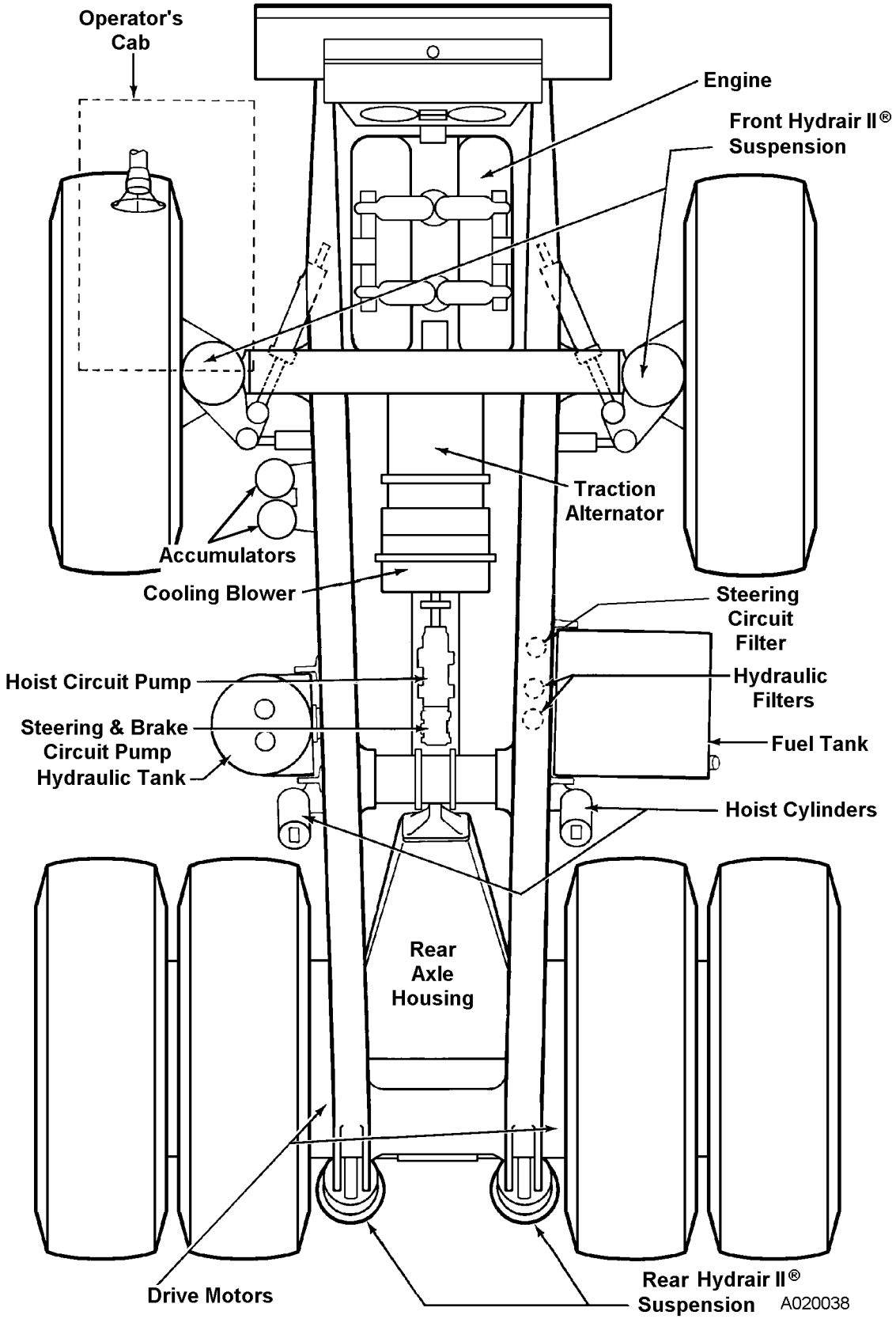
Dynamic Retarding

The dynamic retarding is used to slow the truck during normal operation or control speed coming down a grade. The dynamic retarding ability of the electric system is controlled by the operator through the activation of the retarder pedal in the operators cab and by setting the RSC (Retarder Speed Control). Dynamic retarding is automatically activated, if the truck speed goes to a preset overspeed setting.

Brake System

The braking system consists of an all hydraulic actuation system. Depressing the brake pedal actuates wheel-speed single disc front brakes and armature-speed dual disc rear brakes. The brakes can also be activated by operating a switch on the instrument panel. The brakes will be applied automatically if system pressure decreases below a preset minimum.

The parking brake is integral with the service brake caliper, and is spring-applied and hydraulically-released. The park brake is applied by moving the directional control lever to the PARK position.


Operator's Cab
Engine
Front Hydrair II®
Suspension
Traction Alternator
Accumulators
Cooling Blower
Steering Circuit Filter
Hydraulic Filters
Hoist Circuit Pump
Steering & Brake Circuit Pump
Hydraulic Tank
Fuel Tank
Hoist Cylinders
Rear Axle Housing
Drive Motors
Rear Hydrair II®
Suspension
A020038

SPECIFICATIONS

These specifications are for the standard Komatsu 830E-AC Truck. Customer options may change this listing.

ENGINE

Komatsu SDA16V160
(Optional SSDA16V160)
No. of Cylinders 16
Operating Cycle 4-Stroke
Rated Brake HP . . . . 1865 kW (2500 hp)@ 1900 rpm
Flywheel HP . . . . . 1761 kW (2360 hp) @ 1900 rpm
Weight* (Wet) 9 608 kg (21,182 lbs)

* Weight does not include Radiator, Sub-frame, or Alternator

AC ELECTRIC DRIVE SYSTEM

(AC/DC Current)

Alternator . . . . . General Electric GTA - 41

Dual Impeller, In-Line Blower 255 m^3/min (9000 cfm)
Motorized Wheels . . . . GEB25 AC Induction Traction Motors
Ratio 31.875:1
Maximum Speed* . . . . . 64.5 km/h (40 mph)
(*w/40.00-57 Tires and 31.875:1 gear train)

**NOTE: Wheel motor application depends upon GVW, haul road grade and length, rolling resistance, and other parameters. Komatsu & G.E. must analyze each job condition to assure proper application.*

DYNAMIC RETARDING

Electric Dynamic Retarding . . . . . Standard
Maximum Rating . . . . . 2983 kW (4000 hp)

24 VDC ELECTRIC SYSTEM

Batteries . . . . 4 x 8D 1450 CCA, 12 volt batteries in Series/Parallel w/Disconnect Switch
Alternator . . . . . 24 Volt, 260 Ampere Output
Lighting . . . . . 24 Volt
Cranking Motors (2) . . . . . 24 Volt

SERVICE CAPACITIES

	Liters. (U.S. Gal.)
Crankcase *	280.0. . . . . (74.0)
* Includes Lube Oil Filters	
Cooling System	568. . . . . (150)
Fuel	4542. . . . (1200)
Hydraulic System	946. . . . . (250)
Hydraulic Tank	901. . . . . (238)
Wheel Motor Gear Box (each)	38. . . . . (10)

HYDRAULIC SYSTEMS*

Pumps

Hoist . . . . . Tandem Gear Pump
Rated @ . . . . . 851 lpm (225 gpm) @ 1900 rpm and . . . . . 17 240 kPa (2,500 psi)
Steering/Brake . . . . . Pressure Compensating Piston
Rated @ . . . . . 246 lpm (65 gpm) @ 1900 rpm and . . . . . 18 961 kPa (2,750 psi)

System Relief Pressures

Hoist . . . . . 17 240 kPa (2,500 psi)
Steering/Brakes . . . . . 27 580 kPa (4,000 psi)
Hoist Cylinders (2) 3-Stage
Tank (Vertical/Cylindrical) . . . . . Non-Pressurized
Filtration . . . . . in-line replaceable elements
Suction . . . . . Single, Full Flow, 100 Mesh
Hoist & Steering . . . . . Full Flow, Dual In-Line, ... High Pressure Beta 12 Rating =200

*With Quick Disconnects for powering disabled truck and system diagnostics.

SERVICE BRAKES

Actuation . . . . . All Hydraulic
Front . . . . . Wheel Speed, Single Disc
Inboard Mounted . . . . . 3 Calipers
Disc Diameter, O.D. . . . . 1213 mm (47.75 in.)
Rear . . . . . Armature Speed, Dual Disc
Disc Diameter, O.D. . . . . 635 mm (25.00 in.)
Emergency Brake- . Automatically Applied (Standard)
Wheel Brake Lock . . . . . Manual Switch on Panel . . . . . (Loading and Dumping)

DISC PARKING BRAKE

Each Rear Wheel . . . . . Integral with Service Caliper . . . . . Spring Applied, Hydraulically Released

STEERING

Turning Circle - Front Wheel Track. . . 28.4 m (93 ft.)
Twin hydraulic cylinders with accumulator assist to provide constant rate steering. Emergency power steering automatically provided by accumulators.

DUMP BODY CAPACITIES AND DIMENSIONS

Standard, Heaped @ 2:1 (SAE) . . 147 m^3 (193 yd^3)
Struck . . . . . 117 m^3 (153 yd^3)
Loading Height Empty . . . . . 6.61 m (21 ft. 8 in.)
Dumping Angle 45
Non-heated body w/exhaust mufflers . . . . . Standard

TIRES

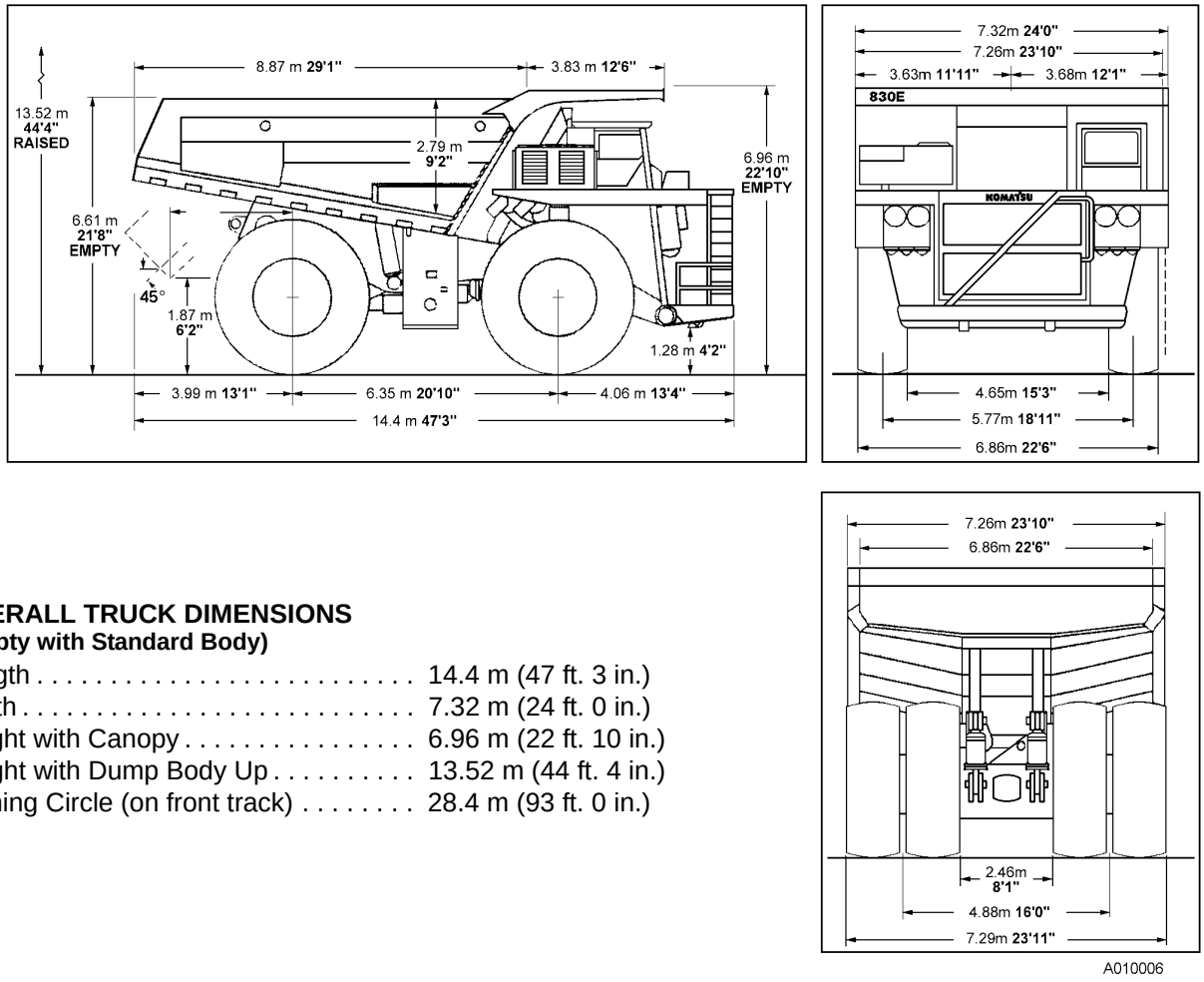
Radial Tires (standard) 40.00 R57
Optional Tires 46/90 R57
Rock Service, Deep Tread . . . . . Tubeless
Rims, standard 5 piece . . Rated to 827 kPa (120 psi)

WEIGHT DISTRIBUTION

Empty Vehicle . . . . Kilograms. . . . . (Pounds)		
Front Axle	82 747.	(182,426)
Rear Axle.	82 902.	(182,768)
Total (100% fuel)	165 649.	(365,194)
Standard Komatsu body	27 669.	(61,000)
Standard tire weight. . . .	21 081.	(46,476)

Loaded Vehicle . . . Kilograms. . . . . (Pounds)		
Front Axle	127 330.	(280,715)
Rear Axle.	258 522.	(569,935)
Total *	385 852.	(850,650)
Nominal Payload *. . . .	220 199.	(485,456)
. . . . .	(242 U.S. Ton)	

*Nominal payload is defined by Komatsu America Corporation's payload policy documentation. In general, the nominal payload must be adjusted for the specific vehicle configuration and site application. The figures above are provided for basic product description purposes. Please contact your Komatsu distributor for specific application requirements.



OVERALL TRUCK DIMENSIONS
(Empty with Standard Body)

Length . . . . . 14.4 m (47 ft. 3 in.)
Width . . . . . 7.32 m (24 ft. 0 in.)
Height with Canopy . . . . . 6.96 m (22 ft. 10 in.)
Height with Dump Body Up . . . . . 13.52 m (44 ft. 4 in.)
Turning Circle (on front track) . . . . . 28.4 m (93 ft. 0 in.)

MAJOR COMPONENT WEIGHTS

⚠WARNING

The condition of lifting slings, chains, and/or cables used for lifting components must be inspected before each use. Lifting equipment must be in good condition and rated for approximately two times the weight being lifted. DO NOT use worn or damaged lifting equipment. Serious injury and damage may result.

Optional equipment added onto the truck may cause an increase to the component weights listed in this chapter. Contact your customer support manager for concerns or questions about lifting truck components.

NOTE: All component weights are dry weights. The additional weight of coolant, fuel, and oil that may be in the components are not calculated into this list.

ITEM	KILOGRAMS	POUNDS
CHASSIS		
Wheel Rim	1,306	2,879
Tire	4,309	9,500
Rim & Tire	5,615	12,379
Main Frame	18,288	40,318
DECK AND DECK SUPPORT COMPONENTS		
Cab	2,177	4,800
RH Deck	604	1,331
LH Deck	711	1,568
Center Deck	215	474
Left Deck Support	490	1,080
Right Deck Support	222	489
LH Upright	668	1,472
RH Upright	530	1,169
LH Diagonal Beam (ROPS)	120	265
Diagonal Ladder	176	388
Vertical Ladder	35	77

ITEM	KILOGRAMS	POUNDS
POWER MODULE		
Air Intake Duct	191	421
Engine Sub-Frame	788	1,737
Air Cleaner Assembly (Double	154	340
Retard Grid Assembly	2,364	5,212
Electrical Control Cabinet	3,176	7,002
Auxiliary Control Cabinet	202	445
Traction Alternator	3,993	8,803
Engine (Komatsu SSDA16V160)	8,558	18,867
Radiator & Shroud	1,905	4,200
FLUID COMPONENTS		
Steering Accumulator	140	309
Hoist Cylinder	796	1,755
Steering Cylinder	126	278
Hydraulic Tank	325	717
Fuel Tank	1,711	3,772
FRONT AXLE COMPONENTS		
Spindle And Brake Assembly	3,216	7,090
Steering Arm	225	496
Front Suspension Cylinder	2,228	4,912
Tie Rod	165	364
REAR AXLE COMPONENTS		
Rear Suspension Cylinder	1,146	2,527
Pivot Eye Assembly	346	763
Rear Axle Housing w/Pivot Eye	5,086	11,213
Anti-Sway Bar	150	330
Wheel Motor & Service Brake Assembly	12,201	26,899

FIELD WELDING FOR ASSEMBLY OR REPAIR

When welding on Komatsu equipment, whether at initial field assembly or during normal maintenance repairs, special procedures must be followed.

Due to the continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributors for information on the latest revision.

The welding information contained in this chapter is general information that must be followed unless otherwise specified in a detailed repair procedure provided on an engineering drawing or a detailed specific repair procedure. Additional specific information, or detailed instructions can be obtained through your local Komatsu customer support manager.

WELDER QUALIFICATION AND TRAINING

The welding technique must be of the highest standard to produce the soundest weld possible. Only welders who have been trained and qualified for structural steel welding in all positions, in conformance with the American Welding Society (AWS) D1.1 or (AWS) D14.3 only, are allowed to perform the welding. The welding instructions for field assembly of Komatsu components are normally provided by engineering drawings. Additional detailed welding instructions for field repairs are provided in the field repair manual SEB14001. A full understanding of the AWS standard welding symbols is necessary to perform and inspect such field welds. Weld sizes specified on the drawings are intended to reflect minimum requirements.

WELD PROCEDURES

Electric arc welding, either the semi-automatic “MIG” (GMAW), Flux Core (FCAW), or “Stick” electrode welding (SMAW), are approved processes for field installation and maintenance welding. Welding of highly stressed structural members such as castings, torque tubes, top and bottom plates on the frame rails, and the curved intersection points of frames should be done with the specific detailed instructions from Komatsu Product Service. See Annex A for repair procedures. These repair procedures are detailed instructions for most high stressed structural members.

APPROVED CONSUMABLES

GMAW - LW102-15 or ER80S-D2

FCAW - E70T-5, E71T-8, or E71T8-NI1

SMAW - E7018-1, E8018-C1, or E8018-C3

WELD QUALITY REQUIREMENTS

1. Each weld must be homogeneous with low porosity, free from cracks, and slag inclusions.
2. Each weld must have complete fusion between the base metal and weld metal added by the electrode.
3. All welds must be reasonably smooth, without excessive deformity, and all craters filled. No cracks are permitted.
4. The toe of a weld to a stressed member must have a smooth transition. Excessive convexity in multi-pass fillet welds is not permitted. Excessive convexity produces high residual stress in the throat of the weld, and is not permitted.
5. Undercut in excess of 0.8 mm (0.03 in.) on critical welds must be reworked by the application of welding an additional cover pass. It is important that this pass is blended with the existing weld.

6. When welding in the vertical position, always weld using the vertical up technique. Large wash weld weaves should not be used when welding on truck frames. Properly applied multiple pass welding is the required procedure on truck frames.
7. Slag is to be removed from all weld beads, and must be completely removed before each pass in a multiple pass procedure. It is also required that all slag is removed and tie in all areas. Grind all welds where a weld crosses or intersects with another weld.

MATERIALS, CONTROLS, AND PRECAUTIONS

The steel used in the fabrication of all Komatsu equipment is of high strength low alloy (HSLA) material of different grades. The standard dump body main plates are made from abrasion resistant materials. These materials offer themselves very well to welding during fabrication, and repair.

The welding consumables are often supplied by Komatsu America Corp. with the new equipment as part of the field welding / assembly package. For field welding and repairs, the approved consumables as detailed, should be procured from a local, reliable supplier. Other highly specialized welding consumables are available but have limited use on Komatsu structural components. Approval is required from your Komatsu customer support manager.

Control of the welding area environment is essential for producing proper and sound welds. Essentially, five areas require attention and control.

1. Air Movement - Avoid areas where air movement from wind, drafts, or blowers is prevalent. This is particularly important when a shielding gas is being used as part of the welding process.
2. Low Ambient Temperature - DO NOT weld in temperatures below 50°F (10°C). At low temperature conditions, preheating of all welding joint work areas is required. See preheat and post heating requirements as detailed in Annex A.
3. Weld Cooling - Protect the weld area from a rapid cooling rate. Heat retardation may be accomplished through the use of heat lamps, torches, insulating blankets, etc.
4. Moisture - Any moisture on the steel surfaces to be welded must be removed before welding. Electrodes must be stored in sealed containers until needed. Electrodes must be kept in a warming oven at the work location until used to prevent any moisture absorption which might affect weld quality.
5. Foreign Materials - Any foreign substances (dirt, paint, rust, scale, and carbon deposits from cuttings) must be removed prior to welding. Clean all weld areas and surfaces with a grinder to ensure that all foreign materials have been removed.

WELD INSPECTION

All welding repairs are subject to inspection by a Komatsu appointed inspector or laboratory to insure quality. After the weld has been made it can be inspected by a number of non-destructive evaluation techniques. The inspections can include any of the methods listed below. All assembly welds and weld repairs that are deemed unacceptable by the inspector must be corrected at no additional cost to Komatsu. All weld repairs are also subject to additional inspection.

1. Visual Inspection - This is the process of looking for potential defects such as undersized welds that can be checked with weld gauges for, surface cracks, surface porosity, craters, and undercuts.

2. Dye Penetrant Inspection - This is an easily applied process which indicates cracks or surface conditions. The process is relatively inexpensive, but does not produce a permanent record except by normal photography.
3. Fluorescent Penetrant Inspection - Similar to dye penetrant inspection. This process uses a black (ultraviolet) light for increased efficiency and accuracy.
4. Magnetic Particle Inspection - This process requires special equipment that is usually more costly than the dye penetrant inspections. This process does not provide a permanent record except by normal photography.
5. Ultrasonic Inspection - This is a popular method of examining weld discontinuities. Specialized equipment and operator certification is required. With some equipment printed data is available of the test providing a permanent record. Also, operator records with equipment settings and test results are normally recorded.
6. X-Ray Inspection - This process provides a view of the weld and base materials but it is highly specialized. This procedure provides a permanent visual record, but is more expensive than most other inspection techniques.

RECORDS

Komatsu requires record keeping of all welding work. This information is valuable when personnel or job conditions change. The service and warranty departments of Komatsu must be provided with inspection reports and photographs of the weld area before, during, and after the repair. The photographs must be clear and close enough to show the weld joint preparation complete, with backer bars installed, etc. just prior to welding. These photos easily identify if the required preheating and post heating have been done with a three inch circumference around the weld repair area. Without this documentation, Komatsu will not cover any weld repair claim made under warranty. No exceptions will be made.

ANNEX A

The following are general repair procedures, which must be followed for all repair and rework of major load carrying members on Komatsu equipment.

1. The repair or rework area must be protected from wind and moisture during the entire procedure. If the repair work is to done outside additional precautions must be taken to protect the weld repair process from outside elements. All welding should be done at an ambient temperature of 10°C (50°F) or above.
2. Clean and grind the entire repair area to remove all rust, grease, oils, paint, and any other foreign materials likely to contaminate the weld.

3. Air arc the entire crack leaving a V-shape joint. The depth of the V (or U shaped) joint will be determined by the depth of the crack. The width to depth ratio should be approximately 1.25:1 and never less than 1:1. All cracks through the parent material will require a slightly wider root opening than the original, usually 6 mm (0.25 in.) to allow the installation of a backup strip. Backup strips are required for all cracks that have gone through the parent material and cannot be welded from both sides. If a weld repair allows access to both sides of the plate, no backup strip is required as long as complete weld penetration is achieved. If backup strips are not used, the surface profile on both sides must be ground smooth with no undercut. Documentation must support this repair. Photographs of surface condition are required by the service and warranty departments of Komatsu.
4. Use dye penetrant to ensure the cracks are completely removed.
5. After air arcing and inspections (Steps 3 & 4) all areas cut by the air arc should be cleaned thoroughly with a grinder to remove all possible carbon deposits and dye penetrant.
6. Fill gouges with weld and grind all surfaces smooth to avoid defects in the new weld.
7. Grind all surfaces to be welded so they are free of slag, rust, and any other foreign materials.
8. Preheat the entire weld joint area until the surrounding surface area reaches 150°C (300°F) at a distance of 76 mm (3 in.) from all areas to be welded.
9. All welds are to be made with approved consumables only. The SMAW (Stick) welding rod must be used within four hours after being removed from a new sealed container or from a 52°C (125°F) minimum drying oven. Any rod that exceeds this exposure time must be dried for one hour at 427°C (800°F) before being used. Keep all weld starts and stops to a minimum.
10. When the weld is complete, immediately (before the weldment cools) post heat the entire weld area to 150°C (300°F). Even if the area is over 150°C (300°F) heat must be applied to maintain this temperature for 15 minutes, and then allow it to cool slowly. In some cases this might require wrapping with insulation blankets.
11. Grind all butt-welded repairs smooth using 36 or finer grit grinding material. All grinding marks should be parallel to the direction of primary stress if possible (and if known).
12. Hammer peen the toes of repair fillet welds as detailed in Annex B, see attached.
13. Inspect repaired areas (for surface defects) using magnetic particle or dye penetrant inspection procedures.
14. If surface defects are found, remove all defects by grinding to a maximum depth of 1.5 mm (0.06 in.). Larger defects must be removed as per the above mentioned procedures. All spot welding also requires preheating and post heating.

ANNEX B

1.0 TOE HAMMER PEENING

Equipment:

1. Hand held pneumatic hammer
2. Adequate air supply
3. Adequate lighting
4. 6 mm (0.25 in.) diameter spherical tip bit
5. Protective clothing, gloves, includes eye, face, and ear protection.

Procedure

1. The toe of the weld should serve as a guide for the peening tool resulting in the area of deformation being approximately equally divided between the base material and the weld metal face to the specified depth and not to exceed 5 mm (0.19 in.) in width. Refer to Figure 4-1.

NOTE: Peening shall only be performed after weld acceptance by visual inspection.

2. The weld must have a smooth profile and the toe must have a good transition to the parent material (no overlap) before the peening operation is performed. Grinding the weld face and toe area is permitted to correct unacceptable conditions. Visual inspection/acceptance is to be done after peening with the appropriate radius and depth gauge.
3. Hold the hammer tool at approximately one half the included angle between the weld face and the parent material and perpendicular to the direction of travel. This will normally require approximately four passes of the peening tool with the pressure of near full operator weight being applied. The depth of the indentation must be between 0.6 mm to 0.8 mm (0.02 to 0.03 in.).

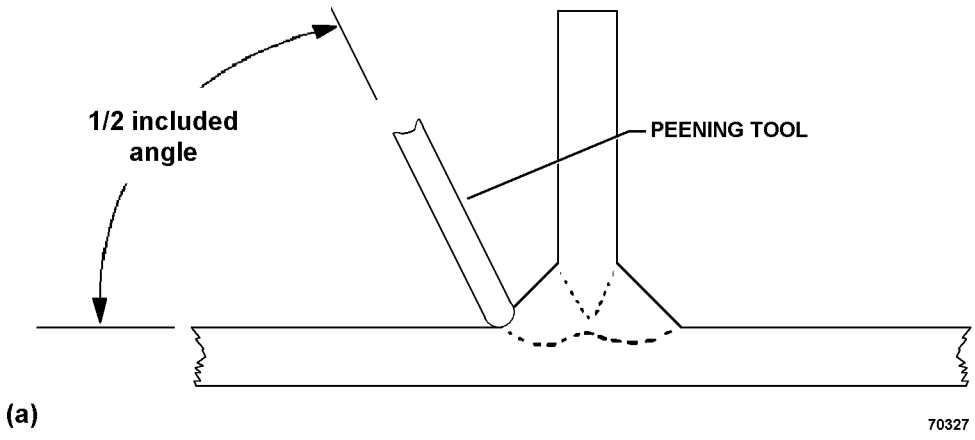
2.0 TOE GRINDING WITH A ROTARY BURR

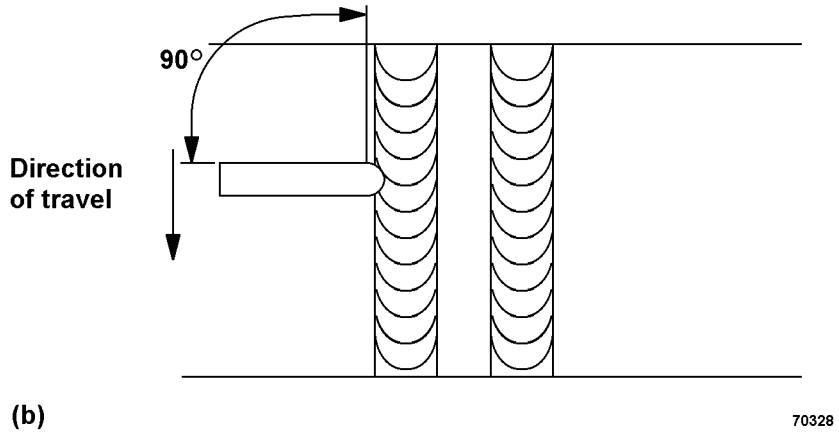
Equipment:

1. High speed rotary air tool (15,000-20,000 rpm)
2. Tungsten carbide rotary burr 13 mm (0.50 in.) diameter with 13 mm (0.50 in.) spherical tip
3. Adequate air supply
4. Adequate lighting
5. Protective clothing, gloves, includes eye, face, and ear protection

Procedure

1. The toe of the weld should serve as a guide for the burr tool resulting in the material removed being approximately equally divided between the base material and the weld metal face to the specified depth and not exceed 8 mm (0.31 in.) in width. Refer to Figure 4-2.
2. The weld must have a smooth profile and the toe must have a good transition to the parent material (no overlap) before the grinding operation is performed. Grinding the weld face and toe area is permitted to correct unacceptable conditions. Visual inspection/acceptance to be done after grinding with the appropriate radius and depth gauge.
3. The axis of the tool should be maintained at about 45° to the parent plate and inclined at about 45° to the direction of travel. The depth of the grinding must be between 0.8 mm to 1.0 mm (0.030 to 0.040 in.). The final surface must be clean, smooth and free of all traces of undercut or slag.





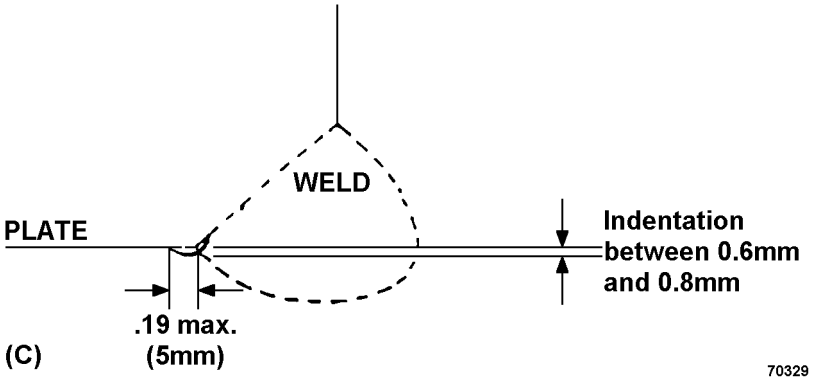


FIGURE 4-1. TOE HAMMER PEENING

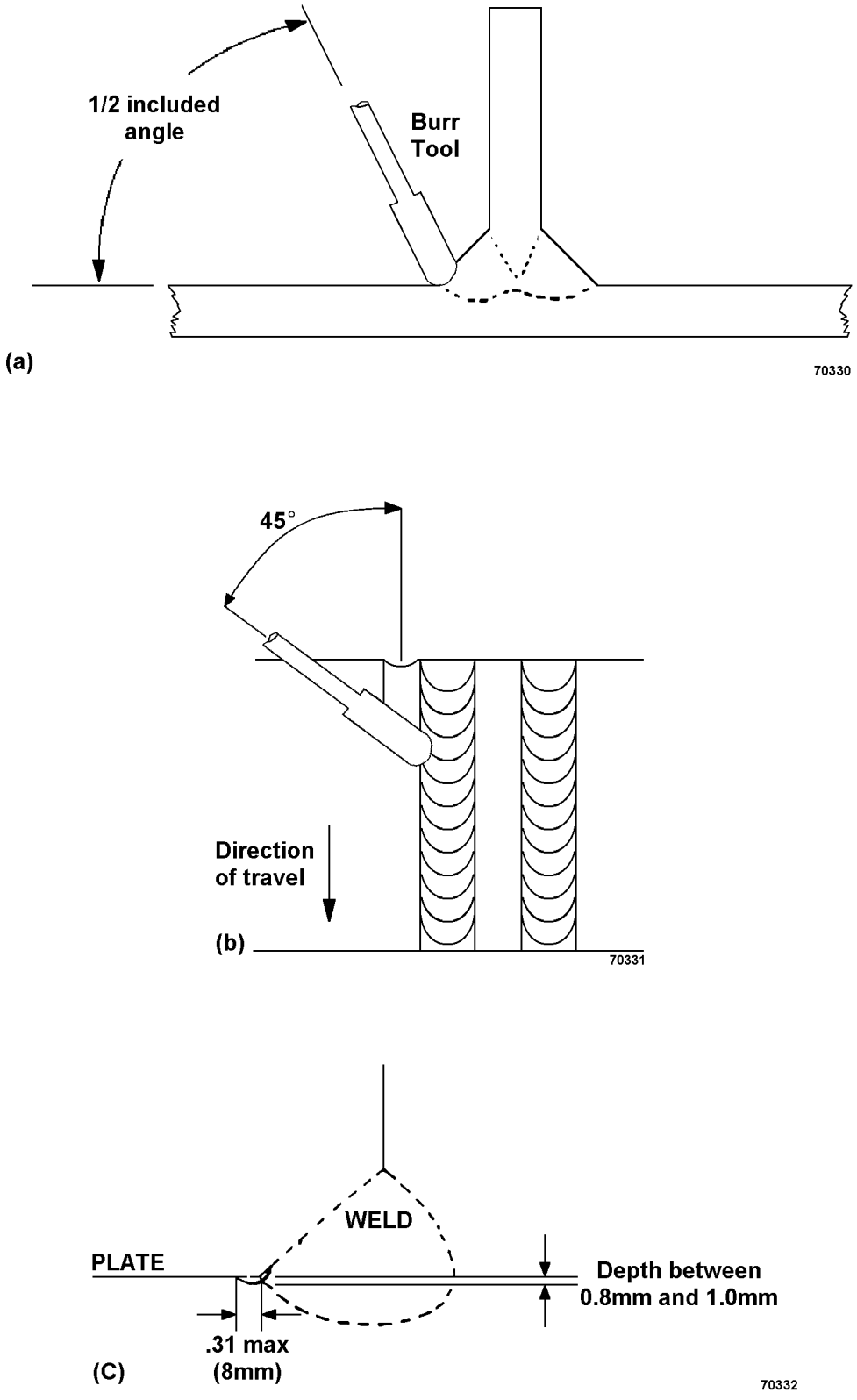


FIGURE 4-2. TOE GRINDING WITH A ROTARY BURR

BIBLIOGRAPHY

American Welding Society Bulletin No. D14.3-94/ D1.1 - Specification for Welding Earthmoving and Construction Equipment

Metals and How to Weld Them - James F. Lincoln Arc Welding Foundation. Cleveland, Ohio

Procedure Handbook of Arc Welding - Lincoln Electric Company, Cleveland, Ohio

American Welding Society - Welding Handbook

British Standard BS5135 - Metal Arc Welding of Carbon and Carbon-Manganese Steels

Welding Steels Without Hydrogen Cracking - The Welding Institute, F. R. Coe, Author

SPECIAL PRECAUTIONS WHEN SERVICING AN AC DRIVE SYSTEM TRUCK

Consult a qualified technician, specifically trained for servicing the AC drive system, before welding on the truck.

The following procedures must be followed to ensure the safety of maintenance personnel and to help prevent damage to the equipment.

⚠DANGER

Anytime the engine is on:

- ***Do not open any of the cabinet doors or remove any covers.***
- ***Do not use power cables for hand holds or foot steps.***
- ***Do not touch retarder grid elements.***

Before opening any cabinets or touching a grid element or a power cable, the engine and all warning lights must be off.

Engine Stop Procedure Prior To Maintenance

Perform the following procedure prior to maintenance to ensure that no hazardous voltages are present in the AC drive system.

1. Before turning off the engine, verify the status of all the drive system warning lights on the overhead display panel. Use the lamp test switch to verify that all lamps are functioning properly.
2. If all red drive system warning lights are off, turn the engine off.
3. After the engine has been off for at least five minutes, inspect the link voltage lights. The lights are located on the exterior of the main control cabinet and back wall of the operator's cab (DID panel). If all lights are off, the retarding grids, wheel motors, alternator, and power cables connecting these devices are safe to work on.