CATERPILLAR®

Service Repair Manual

Models

320D LRR Excavator

Product: EXCAVATOR
Model: 320D LRR EXCAVATOR TAE
Configuration: 320D LRR Excavator TAE00001-UP (MACHINE) POWERED BY C6.4 Engine

Disassembly and Assembly
C6.4 Engine for Caterpillar Built Machines
Media Number -KENR8106-09 **Publication Date -01/10/2017** **Date Updated -18/10/2017**

i02747674

Inlet and Exhaust Valve Springs - Remove and Install

SMCS - 1108-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	9U-6195	Valve Spring Compressor	1
B	9U-6198	Crankshaft Turning Tool	1

Start By:

a. Remove the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Remove".

b. Remove the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The following procedure should be adopted in order to remove the valve springs when the cylinder head is installed to the engine.

Note: Ensure that the appropriate piston is at top dead center before the valve spring is removed. Failure to ensure that the piston is at top dead center may allow the valve to drop into the cylinder bore.

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

NOTICE

Plug the apertures for the push rods in the cylinder head in order to prevent the entry of loose parts into the engine.

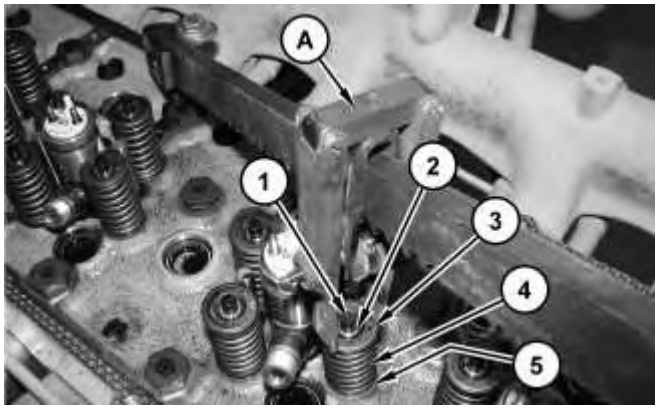

Illustration 1 g01376301

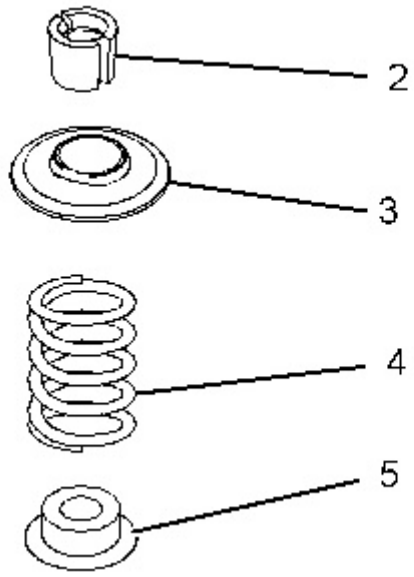

Illustration 2 g01376302

NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

1. Install Tooling (A) into position on the cylinder head in order to compress a valve spring (4) for the appropriate piston.
2. Use Tooling (A) in order to compress valve spring (4) and open valve (1) slightly.

   Note: Do not compress valve spring (4) so that valve spring retainer (3) touches valve stem seal (5).
3. Use Tooling (B) in order to rotate the crankshaft carefully, until the piston touches the valve.

   Note: Do not use excessive force to turn the crankshaft. The use of force can result in bent valve stems.
4. Continue to rotate the crankshaft and gradually release the pressure on Tooling (A) until the piston is at the top dead center position. The valve is now held in a position that allows valve spring (4) to be safely removed.

   Note: Valve springs must be replaced in pairs for the inlet valve or the exhaust valve of each cylinder. If all valve springs require replacement the procedure can be carried out on two cylinders at the same time. The procedure can be carried out on the following pairs of cylinders. 1 with 6, 2 with 5 and 3 with 4. Ensure that all of the valve springs are installed before changing from one pair of cylinders to another pair of cylinders.

NOTICE

Do not turn the crankshaft while the valve springs are removed.

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5. Apply sufficient pressure to Tooling (A) in order to allow removal of valve keepers (2).

   Note: Do not compress valve spring (4) so that valve spring retainer (3) touches valve stem seal (5).

   Remove valve keepers (2).

6. Slowly release the pressure on Tooling (A).
7. Remove valve spring retainer (3) and remove valve spring (4).
8. If necessary, remove valve stem seals (5).
9. Remove Tooling (A).

Note: The installation of each set of valve springs (4) must be completed before attempting to remove the next set of valve springs (4).

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	9U-6195	Valve Spring Compressor	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

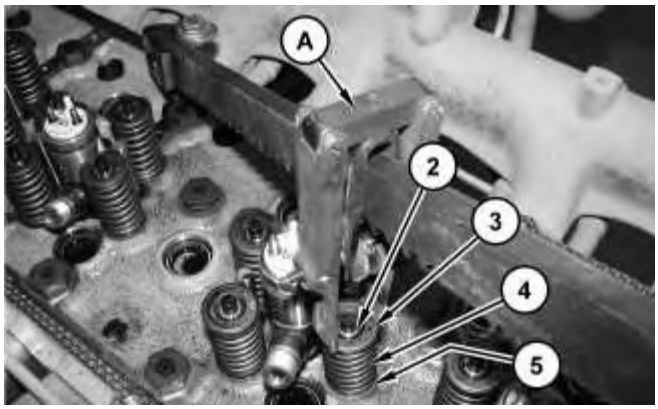

Illustration 3 g01376913

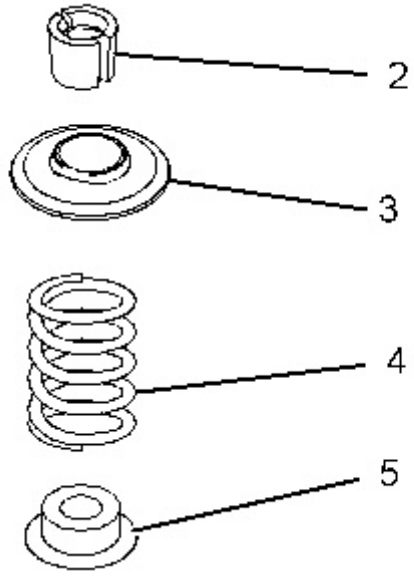

Illustration 4 g01376302

1. The outer face of the valve guides must be clean and dry before installing the valve stem seal (5). Install new valve stem seal (5) onto the valve guide.
2. Install valve spring (4) onto the cylinder head. Position valve spring retainer (3) on valve spring (4).
3. Install Tooling (A) in the appropriate position on the cylinder head in order to compress valve spring (4).

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

4. Apply sufficient pressure to Tooling (A) in order to install valve keepers (2). Do not compress valve spring (4) so that valve spring retainer (3) touches valve stem seal (5).

5. Carefully release the pressure on Tooling (A).

End By:

a. Install the valve mechanism cover base. Refer to Disassembly and Assembly, "Valve Mechanism Cover Base - Remove and Install".

b. Install the rocker shaft assembly. Refer to Disassembly and Assembly, "Rocker Shaft and Pushrod - Install".

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Disassembly and Assembly
C6.4 Engine for Caterpillar Built Machines
Media Number -KENR8106-09 **Publication Date -01/10/2017** **Date Updated -18/10/2017**

i06051426

Inlet and Exhaust Valves - Remove and Install

SMCS - 1105-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	8S-6691	Cylinder Head Repair Stand	1
B	9U-6195	Valve Spring Compressor Gp	1
C	5P-1720	Seal Pick	1

Start By:

a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Note the location and orientation of all components for assembly purposes.

1. Clean the bottom face of the cylinder head. Check the depth of the valves below the face of the cylinder head before the valve springs are removed. Refer to Specifications, "Cylinder Head Valves" for the correct dimensions.

2. Place a temporary identification mark on the heads of the valves in order to identify the correct position.

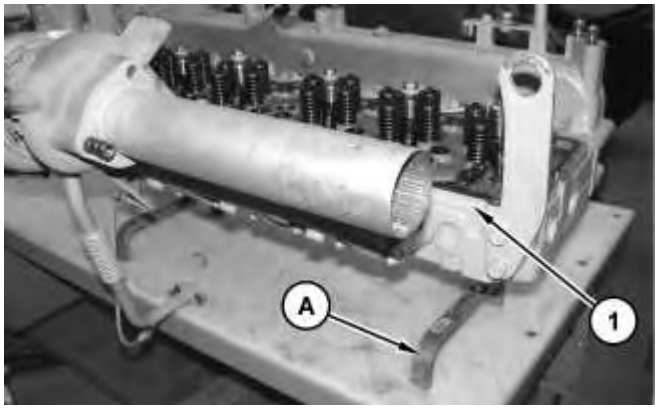

Illustration 1 g01376164

3. Use a suitable lifting device in order to position cylinder head (1) onto Tooling (A) with the valve springs upward. The weight of cylinder head (1) is approximately 113 kg (250 lb).

   Note: Ensure that cylinder head (1) is kept on a clean, soft surface in order to prevent damage to the machined face.

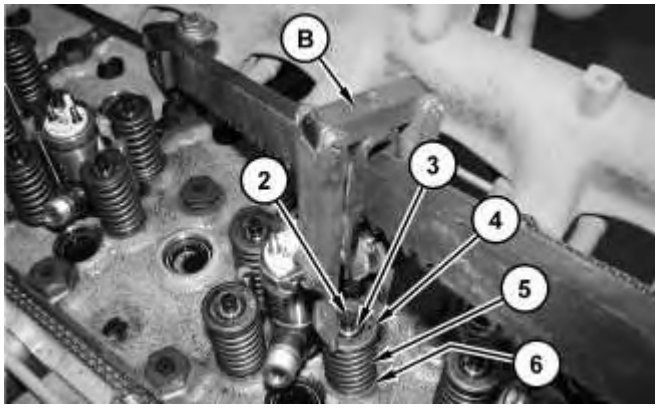

Illustration 2 g01376174

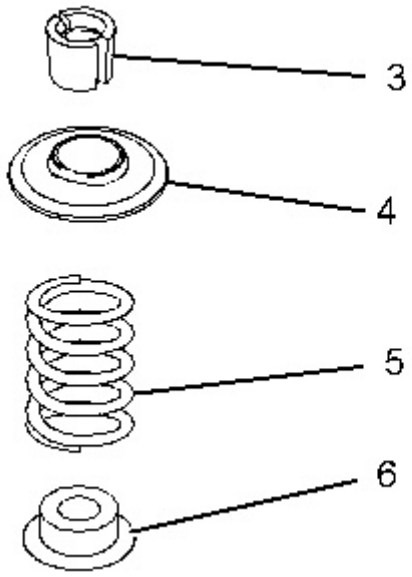

Illustration 3 g01376184

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

4. Install Tooling (B) on cylinder head (1) in order to compress valve spring (5).

NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

5. Apply sufficient pressure to Tooling (B) in order to remove valve keepers (3). Do not compress the spring so that valve spring retainer (4) touches valve stem seal (6).
6. Slowly release the pressure on Tooling (B).
7. Remove valve spring retainer (4). Remove valve spring (5). Remove valve (2).
8. Use Tooling (C) in order to remove valve stem seal (6).

9. Repeat Steps 4 through 7 for the remaining valves.

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	8S-6691	Cylinder Head Repair Stand	1
B	9U-6195	Valve Spring Compressor Gp	1
D	312-8755	Valve Stem Seal Installer	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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1. Clean all components of the cylinder head assembly. Ensure that all ports, all coolant passages, and all lubrication passages in the cylinder head are free from debris. Follow Steps 1.a through 1.d in order to inspect the components of the cylinder head assembly. Replace any components that are worn or damaged.

    a. Inspect the cylinder head for wear and for damage. Refer to Testing and Adjusting, "Cylinder Head Inspect".

    b. Inspect the valve seats for wear and for damage. Refer to Specifications, "Cylinder Head Valves" for further information.

    c. Inspect the valve guides for wear and for damage. Refer to Specifications, "Cylinder Head Valves" and Testing and Adjusting, "Valve Guide - Inspect" for further information.

    d. Inspect the valves for wear and for damage. Refer to Specifications, "Cylinder Head Valves ".

    e. Inspect valve springs (5) for damage and for the correct length. Refer to Specifications, "Cylinder Head Valves ".

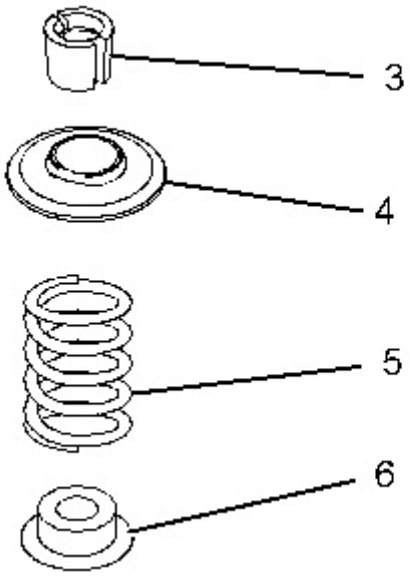

Illustration 4 g01376184

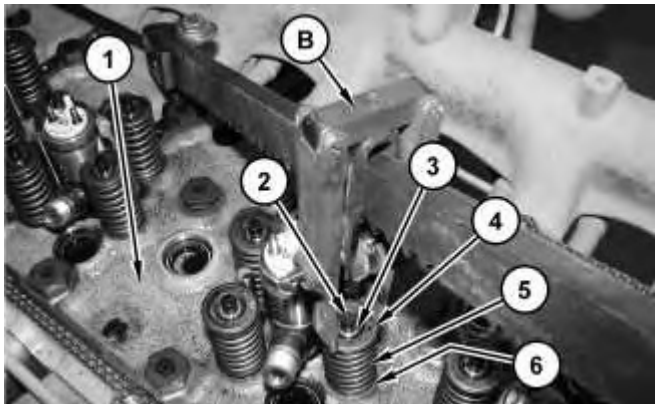

Illustration 5 g01376926

2. Lubricate the stem of valve (2) with clean engine oil. Install valve (2) in the appropriate position in the cylinder head.
3. The outer face of the valve guides must be clean and dry before installing the valve stem seal (6). Use Tooling (C) in order to install new valve stem seal (6) onto the valve guide.
4. Install valve spring (5) onto the cylinder head. Position valve spring retainer (4) on valve spring (5).
5. Install Tooling (B) in the appropriate position on cylinder head (1) in order to compress valve spring (5).

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

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6. Apply sufficient pressure to Tooling (B) in order to install valve keepers (3). Do not compress spring (5) so that valve spring retainer (4) touches valve stem seal (6).
7. Carefully release the pressure on Tooling (B).
8. Repeat Steps 2 through 7 for the remaining valves.

End By:

a. Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install".

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Disassembly and Assembly
C6.4 Engine for Caterpillar Built Machines
Media Number -KENR8106-09 **Publication Date -01/10/2017** **Date Updated -18/10/2017**

i04625003

Inlet and Exhaust Valve Guides - Remove and Install

SMCS - 1104-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	384-8861	Valve Guide Remover	1
B	138-7573	Link Bracket	4
C	1U-9200	Lever Puller Hoist	1
D	8S-6691	Cylinder Head Repair Stand	1

Start By:

A. Remove the inlet and exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".
B. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Note: Refer to Special Instructions, SMHS7953-00, "Use of Valve Seat Insert Puller Group" to aid with the removal of the inlet and exhaust valve seats.

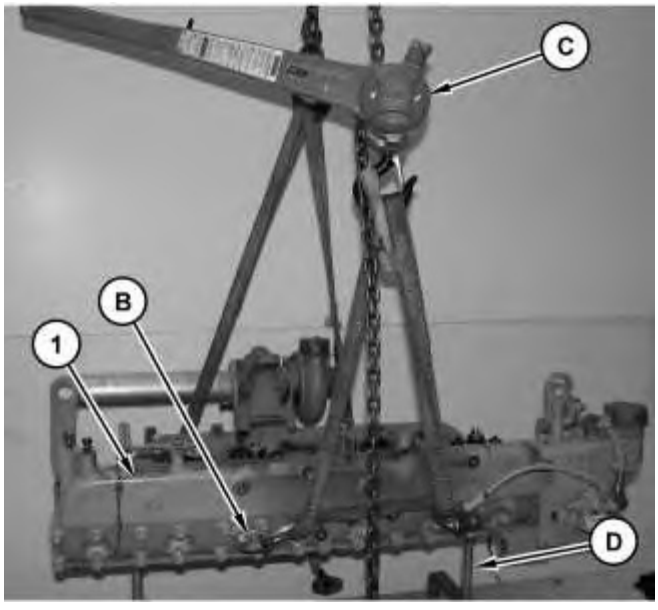

Illustration 1 g01377064

1. Attach Tooling (B) , Tooling (C) , and a suitable lifting device to cylinder head (1) . Use Tooling (B) , Tooling (C) , and the suitable lifting device in order to turn over cylinder head (1) by 180° onto Tooling (D) .

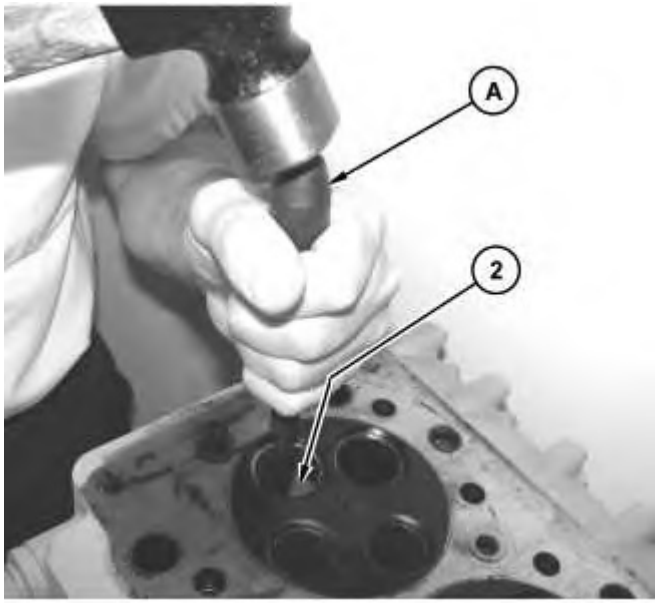

Illustration 2 g01377121

2. Use Tooling (A) in order to remove valve guides (2) (not shown).

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
E	384-8862	Valve Guide Installer	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

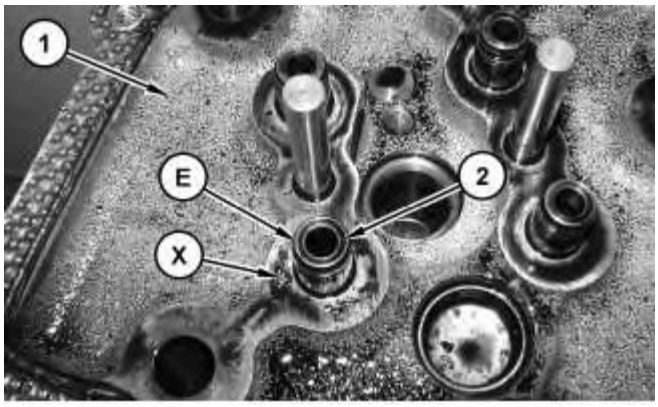

Illustration 3 g01377130

1. Lubricate the outside of valve guides (2) (not shown) with clean engine oil.
2. Use Tooling (E) in order to install new valve guides (2) . Install valve guide (2) so that valve guide (2) protrudes 16.000 mm (0.6299 inch) above Surface (X) of cylinder head (1) .

End By:

a. Install the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injector - Install".
b. Install the inlet and exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".

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Disassembly and Assembly
C6.4 Engine for Caterpillar Built Machines
Media Number -KENR8106-09 **Publication Date -01/10/2017** **Date Updated -18/10/2017**

i04625001

Inlet and Exhaust Valve Seat Inserts - Remove and Install

SMCS - 1103-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	166-7441	Valve Seat Extractor Tool	1
	6V-4194	Valve Seat Extractor (1)	1
	6V-4196	Valve Seat Extractor (1)	1
B	138-7573	Link Bracket	4
C	1U-9200	Lever Puller Hoist	1
D	8S-6691	Cylinder Head Repair Stand	1

(1) Component of the Valve Seat Extractor Tool Group.

Start By:

A. Remove the inlet and exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".
B. Remove the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injectors - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Refer to Special Instructions, SMHS7953-00, "Use of Valve Seat Insert Puller Group" to aid with the removal of the inlet and exhaust valve seats.

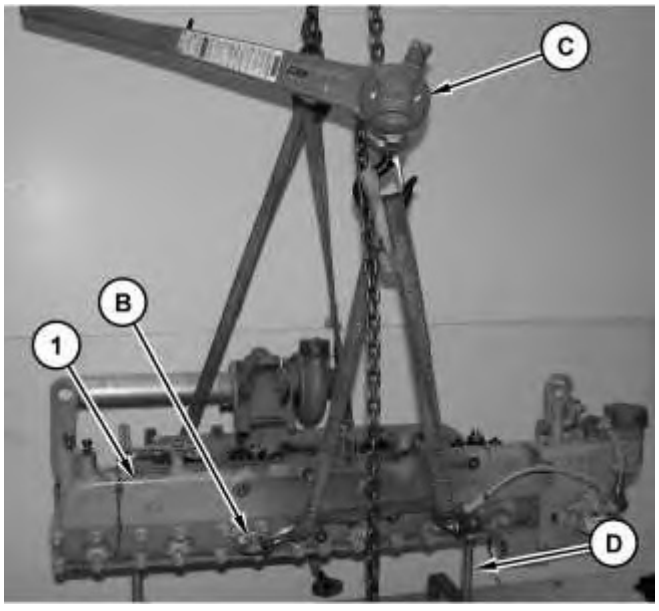

Illustration 1 g01377064

1. Attach Tooling (B) , Tooling (C) , and a suitable lifting device to cylinder head (1) . Use Tooling (B) , Tooling (C) , and the suitable lifting device in order to turn over cylinder head (1) by 180° onto Tooling (D) .

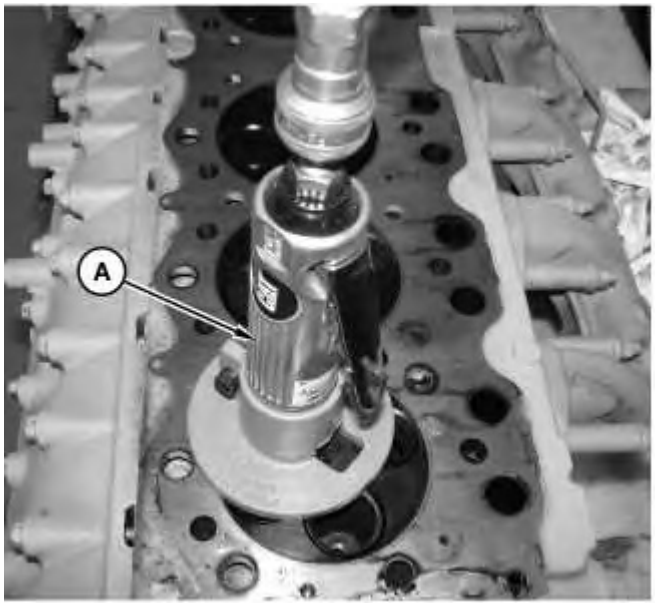

Illustration 2 g01376571

2. Use the valve seat grinder of Tooling (A) in order to notch the valve seat.

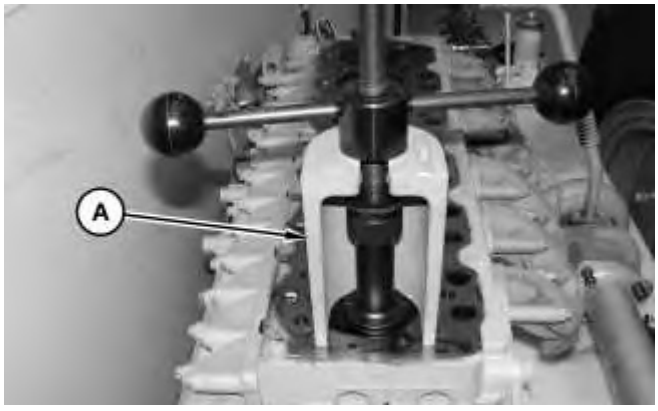

Illustration 3 g01376578

3. Use the valve seat extractor of Tooling (A) to remove the inlet and exhaust valve seats.
4. Clean the valve seat in the cylinder head. Remove any rough areas from the valve seat in the cylinder head.
5. Repeat Steps 2 through 4 for the remaining inlet valve seat inserts and exhaust valve seat inserts.

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
E	384-8859	Valve Seat Installer	1
F	384-8860	Valve Seat Installer	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

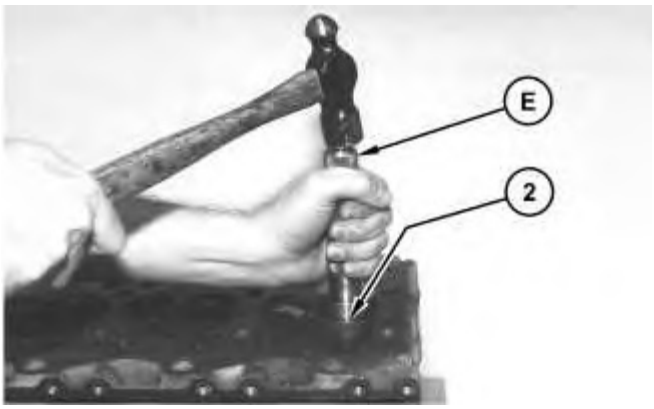

Illustration 4 g01377071

Typical Example

1. Lower the temperature of the new inlet valve seat inserts (2) . Use Tooling (E) in order to install a new inlet valve seat insert (2) (not shown) in the cylinder head.

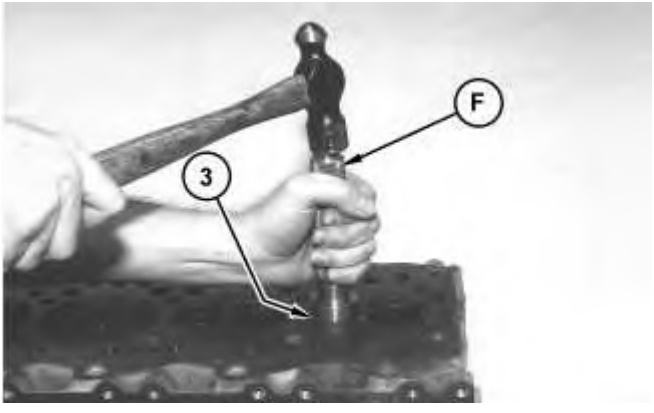

Illustration 5 g01376588

Typical Example

2. Lower the temperature of new exhaust valve seat inserts (3) . Use Tooling (E) and Tooling (F) in order to install the new exhaust valve seat insert (3) (not shown) in the cylinder head.

   Note: The temperature of exhaust valve seat insert (3) is lowered in order to ease the installation of exhaust valve seat insert (3) .

3. Repeat Step 1 and 2 for the remaining inlet valve seat inserts and exhaust valve seat inserts.

End By:

a. Install the inlet and exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".
b. Install the electronic unit injectors. Refer to Disassembly and Assembly, "Electronic Unit Injectors - Install".

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Disassembly and Assembly
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Media Number -KENR8106-09 **Publication Date -01/10/2017** **Date Updated -18/10/2017**

i02746253

Engine Oil Cooler - Remove

SMCS - 1378-011

Removal Procedure

Start By:

a. Remove the fuel injection pump. Refer to Disassembly and Assembly, "Fuel Injection Pump - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

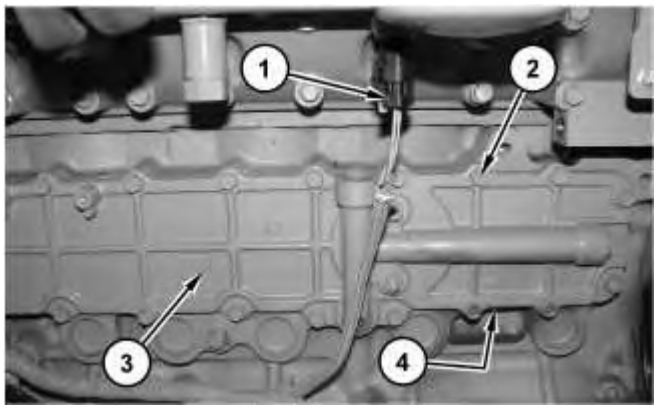

Illustration 1 g01375410

1. Disconnect harness assembly (1).
2. Remove bolts (2) and remove engine oil cooler (3). Remove gasket (4) (not shown) from the engine cylinder block.

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i02746254

Engine Oil Cooler - Disassemble

SMCS - 1378-015

Disassembly Procedure

Start By:

a. Remove the engine oil cooler. Refer to Disassembly and Assembly, "Engine Oil Cooler - Remove".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting, and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Note: Cleanliness is an important factor. Before you begin the disassembly procedure, the exterior of the components should be thoroughly cleaned. This will help to prevent dirt from entering the internal mechanism. Precision components can be damaged by contaminants or by dirt. Perform disassembly procedures on a clean work surface. Keep components covered and protected at all times.

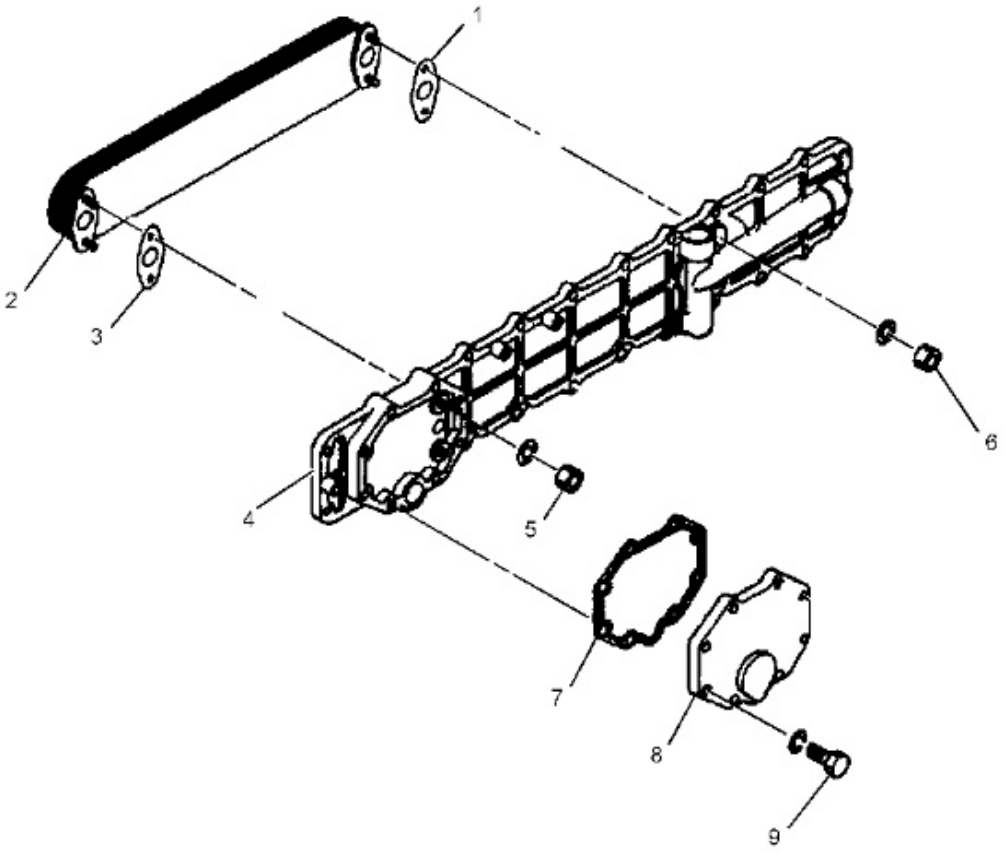

Illustration 1 g01375411

1. Remove bolts (9) and the washers. Remove cover (8) and gasket (7).
2. Remove nuts (5) and the washers from engine oil cooler cover (4). Remove nuts (6) and the washers from engine oil cooler cover (4).
3. Remove engine oil cooler core (2) from engine oil cooler cover (4). Remove gaskets (1) and (3).

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Thank you so much for reading

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Disassembly and Assembly
C6.4 Engine for Caterpillar Built Machines
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i02746255

Engine Oil Cooler - Assemble

SMCS - 1378-016

Assembly Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Cleanliness is an important factor. Before assembly, thoroughly clean all parts in cleaning fluid. Allow the parts to air dry. Do not use wiping cloths or rags to dry parts. Lint may be deposited on the parts which may cause trouble. Inspect all parts. If any parts are worn or damaged, use new parts for replacement. Dirt and other contaminants can damage the precision component. Perform assembly procedures on a clean work surface. Keep components covered and protected at all times.

Note: Check the gaskets for damage. Replace the components, if necessary.