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SURFACE VEHICLE RECOMMENDED PRACTICE

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Clutch Installation and Release Linkage Requirements for Truck and Bus Application

Foreword—This document is presented in response to OEM requests for uniform installation parameters. It also identifies truck clutch release linkage performance standards required for successful clutch operation.

TABLE OF CONTENTS

1. ***Scope***—Although not limited to, these installations are normally used on trucks considered as Medium Duty (Class 6 and 7), as well as Heavy Duty (Class 8).

1.1 **Purpose**—This SAE Recommended Practice defines vehicle assembly plant clutch installation procedures, adjustment criteria, and clutch-release linkage performance parameters required to obtain optimum clutch operation and to promote standardization for pull type single- and twin-plate truck clutches.

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2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

The following publications define the existing clutch system design configuration used in trucks and busses:

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth, Warrendale, PA 15096-0001

SAE J373—Housing Internal Dimensions for Single and Two Plate Spring Loaded Clutches
SAE J617—Engine Flywheel Housings
SAE J1463—Pull Type Clutch—Transmission Installation Dimensions
SAE J1479—Automotive Pull Type Clutch Terminology
SAE J1731—Pilot Bearings for Truck and Bus Applications
SAE J1806—Clutch Dimensions for Truck and Bus Applications
SAE J1857—Flywheel Dimensions for Truck and Bus Applications

3. Definitions—The following specific terms as used in this document are defined as follows:

3.1 Alignment Tool—An arbor or shaft made to fit into the clutch disc splines and having a front pilot diameter made to fit closely in the flywheel pilot bearing.

3.2 Clutch Cover Assembly Guide Pins—Steel rods threaded to fit into the flywheel threaded clutch-mounting holes with a body diameter closely fitting within the cover assembly mounting screw holes and having a length longer than the normal clutch-mounting screws. The exposed end of the pins is rounded or chamfered and contains a screwdriver slot or similar feature to aid in their removal.

3.3 Clutch Shipping Blocks or Shipping Clips—Devices inserted into the clutch cover assembly by its' manufacturer to hold the pressure plate partially retracted to aid in its' installation. These shipping blocks or clips are to be reinstalled whenever the clutch is removed.

3.4 Heavy-Duty (Class 8) Trucks—A truck or tractor rated by the manufacturer and certified to the US federal government to be for operation at a gross vehicle weight or a gross combination weight of 14 969 kg (33 001 lbs) and over.

3.5 Lube Tube—A rubber hose with fittings at each end used to remotely locate a grease fitting away from the threaded hole it is usually inserted in.

3.6 Medium-Duty (Class 6 and 7) Trucks—A truck or tractor rated by the manufacturer and certified to the US federal government to be for operation at a gross vehicle weight or a gross combination weight of 8846 kg (19 501 lbs) to 14 969 kg (33 000 lbs).

3.7 OEM Original Equipment Manufacturer—The term used to identify a vehicle's manufacturer.

4. Technical Requirements

4.1 Pre-Installation Storage—Clutches received for vehicle builds should be:

a. Checked when received to assure shipping containers arrived intact and clean with identification labels attached and legible. There should be no evidence of water damage, rust, or contamination.
b. Stored in a location that will protect them from rust.
c. Stored in a location having a low probability of accidental physical damage to both the clutch and its' shipping container.
d. Stacked no higher than clutch manufacturers recommendations.
e. Stored such that identifying labels can be clearly read without moving containers.

4.2 In-Process Handling—Recommended procedures are:

a. To move clutches from the storage area to the installation area with proper equipment and care so as to prevent contamination and rough handling or droppage.
b. To remove the clutches carefully from the container and bring them to the engine's flywheel without rough handling or droppage.

4.3 Installation—A successful clutch system installation requires the following:

4.3.1 ENGINE FLYWHEEL PREPARATION:

a. Rust preventatives must be removed from the clutch friction surface, clutch damper cavity- and pilot-bearing cavity.
b. Pilot bearing must be installed using proper tooling and checked for a good press fit, correct seating, and free spinning operation.
c. For heavy-duty 14-in pot flywheels, the six intermediate plate drive pins must be installed using proper tooling and fixed in place with correctly installed set screws. Additionally, some types of clutches require three anti-rattle straps placed between the drive pins and correctly installed.

4.3.2 CLUTCH UNIT INSTALLATION:

a. Driven disc orientation must be confirmed as correct ("flywheel side" to flywheel).
b. Clutch lifting and handling equipment and procedures must be appropriate so as to avoid bending, damage, or droppage.
c. Clutch mating to flywheel must be accomplished using an appropriate clutch disc alignment tool and clutch cover assembly guide pins or support fixture to prevent pilot-bearing damage, while bringing the clutch unit into proper alignment with the flywheel mounting bolt holes.
d. Clutch-mounting bolts of the correct type, size, and length must be selected for the clutch unit being installed.
e. Clutch-mounting bolts are all to be hand started before final tightening is begun.
f. Heavy-duty flat flywheel clutches must be checked to insure the cover assembly is properly positioned to enter the flywheel pilot rim.
g. Clutch mounting bolts must be torqued in an alternating star pattern starting at the lower left-hand corner. Bolt torque requirements are:

   3/8 in size – 34 to 47 Nm (25 to 35 lbs/ft)
   7/16 in size – 54 to 68 Nm (40 to 50 lbs/ft)

h. Clutch shipping blocks (2) or shipping clips (4) must be removed from the clutch unit if they fail to fall out.
i. Some types of clutches require the intermediate plate separator pins to be set to the flywheel using a 6 mm (1/4 in) flat faced punch.

4.3.3 CLUTCH UNIT ADJUSTMENT:

a. Clutch adjusting fixture is attached to rear face of engine flywheel housing.
b. Using the adjusting fixture, the clutch release travel gap is checked and the clutch unit adjusted as required to obtain a release travel gap between the rear of the release bearing and the front of the transmission or input shaft brake of 12.7 mm to 14.3 mm (0.500 in to 0.562 in). Some clutch installations without an input shaft brake have a larger OEM specified release travel gap. For these vehicles, a special fixture or unique indicator setting are required to obtain the correct gap.
c. Some types of clutches for use without an input shaft brake do not use the adjusting fixture. Instead, they are adjusted to obtain a specific gap between the back of the clutch cover assembly and the front of the clutch-release bearing as specified by the clutch manufacturer. Appropriate approved gages or fixtures must be used to obtain the correct adjustment.
d. Some types of clutches require an adjustment locking procedure which must be accomplished per clutch manufacturers recommendations.
e. Clutch-driven discs must be checked to insure that they spin freely when the release bearing is pulled rearward to the release position.
f. Remove clutch disc alignment tool without damaging pilot bearing.
g. Installations with “lube tubes” for remote application of ball-bearing grease must have the tubes 100% pre-filled with a Lithium-base ball-bearing grease recommended by the clutch manufacturer.

4.3.4 TRANSMISSION PREPARATION—For this process, it is assumed that the correct transmission, clutch-release yoke, cross shafts, and external control lever have been selected for installation:

a. Inspect the transmission’s cross-shaft bushings and grease fittings to make sure they are properly oriented and not restricted.
b. Assemble the cross shafts through the cross-shaft bushings and into the correctly oriented release yoke being careful not to allow the cross shafts to protrude through the release yoke.
c. Torque release yoke bolts and external control lever mounting bolt to OEM specifications.
d. Release yoke/cross shaft and lever sub-assembly must be rotated to be sure there is freedom of movement and no binding.

4.3.5 TRANSMISSION INSTALLATION:

a. Engine flywheel housing rear face and bore surfaces must be visually inspected to be sure they are free of burrs, nicks, dirt, rust, or excessive paint.
b. Transmission clutch-housing front face and pilot surfaces must be visually inspected to be sure they are free of burrs, nicks, dirt, rust, or excessive paint.
c. Rotate the release yoke so the fork tips are pointing forward and are as high as possible.
d. Installations with an input shaft brake must have it installed on the shaft at this time and pushed as far rearward as possible.
e. Place the transmission in direct drive or overdrive.
f. Using appropriate lifting devices, bring the transmission into correct straight alignment with the engine and move it forward to insert the input shaft into the clutch-release bearing bore.
g. Continue to move the transmission forward with a minimum of angular movement (rocking) to avoid clutch damage while simultaneously rotating the release yoke fork tips down into the normal usage position. Some types of clutches can be damaged if the release yoke is not rotated down at this time.
h. Rotate the transmission output shaft as necessary to correctly align the transmission input shaft spline with the clutch-driven disc splines during the final phase of transmission insertion. Push the transmission fully forward until the clutch-housing pilot is seated against the flywheel housing bore. Rotate the transmission as necessary to align the mounting bolt holes.
i. Maintain transmission lifting support while the transmission mounting bolts are installed and tightened to OEM specification.
j. Release yoke/cross shaft and lever sub-assembly must be rotated to be sure there is freedom of movement and no binding.

4.3.6 CLUTCH RELEASE LINKAGE INSTALLATION AND SETTING—For this process, it is assumed that the correct system components have been selected for installation:

a. Some types of release linkages use rods which are adjustable for length with some to be adjusted to a pre-determined length prior to installation. Appropriate gages or fixtures must be used to verify correct rod length prior to installation and locking nut torque must be to OEM specification.
b. During linkage component installation, process instructions must be consulted to insure the components are installed in the correct locations with the correct orientation.
c. Some types of release systems have adjustable "stops" for the clutch pedal travel in the "up" position or the "down" position, or both. Appropriate gages or fixtures must be used to assist in making these adjustments.
d. Some types of release systems are composed of rigid mechanical components which do not include an automatic clutch wear compensating feature. These systems must be adjusted to provide a "free travel" gap between the release yoke fork tips and the release bearing housing contact point of 2.7 mm to 3.7 mm (0.105 in to 0.145 in). Appropriate gages or fixtures must be used in making the final release linkage setting adjustment to insure the free travel gap at the release-bearing is within specifications and that locking nut torque is to OEM specification.
e. Some types of release systems are composed of either rigid mechanical components, pneumatic devices, or hydraulic devices which do include an automatic clutch wear compensating feature. These systems operate without freeplay. Some of these systems require post-installation adjustments at the pedal, or transmission, or both. Appropriate gages or fixtures must be used to assist in making these adjustments. Hydraulic systems require 100% complete hydraulic fluid fill without fluid leakage and with correct reservoir fill levels. Appropriate OEM specified processes are required to assure compliance.
f. Clutch-release yoke cross-shaft bushings and often other components of the release system require lubrication. OEM specified process instructions and check lists should be used to insure all required grease points are correctly lubricated.
g. Installations with an input shaft brake must not engage the brake when the clutch pedal is 25.4 mm (1.00 in) or more above its fully depressed position. The input shaft brake must fully engage before the clutch pedal is fully depressed. The input shaft brake is fully engaged when a 0.25 mm (0.010 in) feeler gauge is held snugly between the input shaft brake and the clutch-release bearing.
h. Throughout the full clutch pedal operating range, all moving components of the clutch-release system must operate without any contact or interference with any other vehicle component.

4.3.7 END OF LINE INSPECTION:

a. A customer pre-delivery inspection of the vehicle should include operating the vehicle to evaluate overall performance and feel of the clutch system. Vehicle operators should be trained to critically evaluate correct clutch adjustment attributes such as:

   1. Adequate pedal free play (where appropriate)
   2. Absence of clutch drag
   3. Correct input shaft brake function (where appropriate)

b. Final line repair areas must have all the tools, gages, and fixtures to properly adjust all the elements of the clutch system along with up-to-date written procedures and qualified personnel.
c. Some clutches require special precautionary procedures during the dynamometer vehicle performance check. These procedures must be posted at each dynamometer station for easy reference.