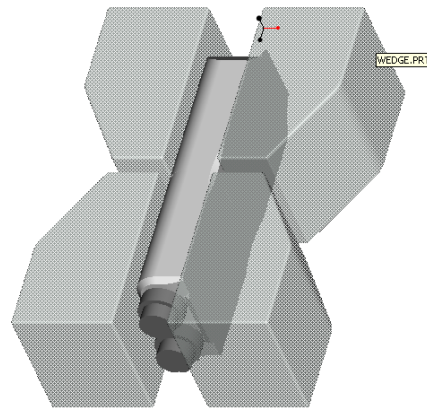
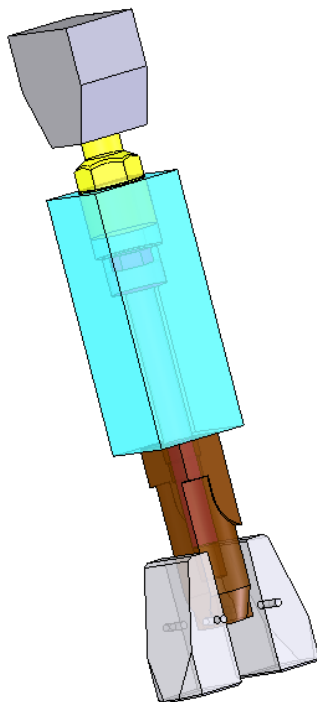




Bolted Joint Rig Test Development

Operation Manual



Alex V. Dugé
Ana Erb
Ronald Rolle
Cedric White

Introduction

The setup for the connecting rod test called for the two bolts on the side of the connecting rod to be isolated and cut out. The sample was then placed within four wedges within the MTS machine. For the main bearing cap setup, a section of the engine block containing the threaded bolt was isolated and machined down to fit within the wedges. The bolt was then put through a bolt-housing fixture and into the engine block. The top of the housing fixture was made so that an adapter could screw into it and then into the MTS block. The MTS block was then held on by the MTS wedge grips.

This manual gives step-by-step guidelines to setting up the connecting rod tests and the main bearing cap tests. Some safety precautions are also outlined; be sure to read through them and exercise them while running the test. Also, the MTS manual should also be available to you, be sure to read through the manual for further detail on how to run the software and collecting data. Figure 1 shows all the parts needed to run both tests.

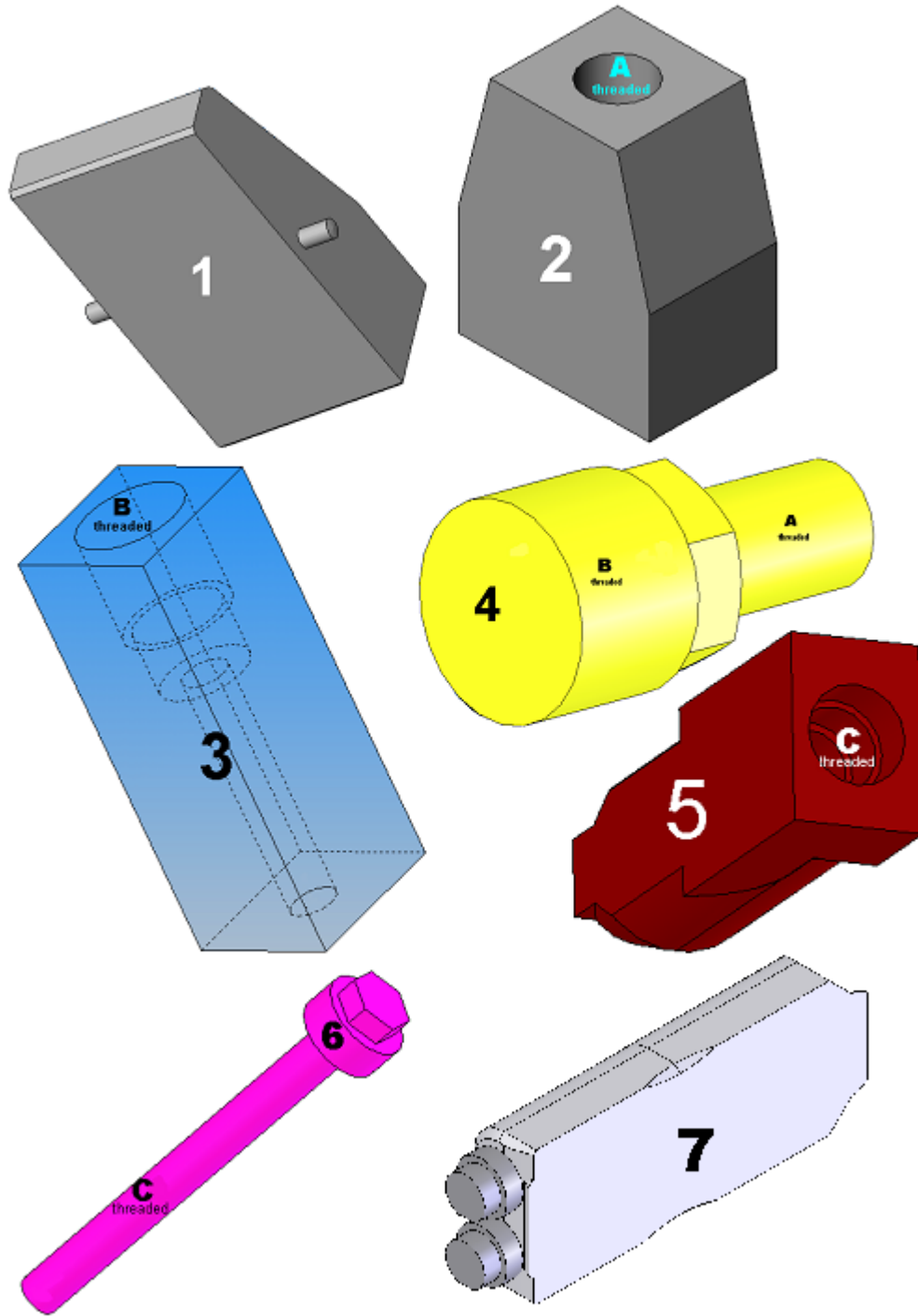


Figure 1: Parts

- (1) Wedge, (2) MTS holding block, (3) Housing, (4) adapter, (5) Engine block cutout, (6) Main bearing cap bolt, (7) Connecting rod sample

Main Bearing Cap

To assemble and test the main bearing cap fixture, follow the following procedures.

1. Insert bolt (6) into the housing (3)
2. Using a torque wrench, torque the bolt (6C) into the engine block cutout (5C) to the desired preload.
3. Screw adapter (4B) into the housing (3B) using a pipe wrench. Attach it tightly so it does not slip out during the test.
4. Screw the other end of the adapter (4A) to the MTS block (2A). Again, be sure to torque it tightly so it does not slip out.

The final assembly should look like the illustration in figure 2 below.

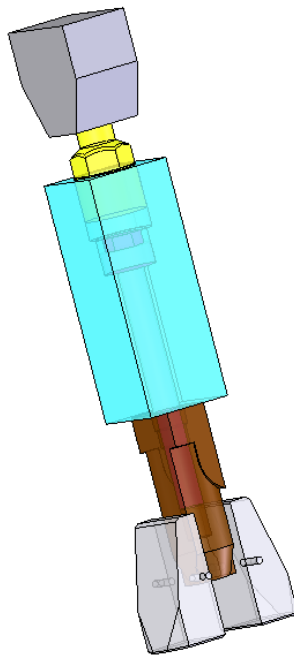


Figure 2: Set up for the main bearing cap fixture.

- Configure software for single axis fatigue testing

- Software
 - Function Generator
 - Test-Ware for data collection
 - Test Star controls the machine
- Assign and Calibrate the stroke hydraulically
- Turn on Hydraulic pump control on the Load Unit Control Panel (LUCM)
- Turn on Hydraulic Service Manifold (HSM)
- Switch to manual control
- Let Hydraulics warm up for about 15 minutes
- Release the top Hydraulic wedge grips
- Set the MTS holding block on the top wedge grip and zero out the weight
- Apply pressure (normal) to the MTS Block to tightly hold it in place
- Align the engine block specimen with the bottom wedge grip on the MTS machine
- Manually adjust the actuator to align wedges with the specimen
 - Make sure the Hydraulic pump unit is on stroke control
- Adjust normal pressure on the bottom wedge grips so they can tightly hold the specimen into place
- Now to start testing Open up the Function Generator and set the testing parameters.

Attn: Read the operation manual for both the software and the MTS machine
prior to testing.

Connecting Rod

To assemble and test the connecting rod fixture, follow the following procedures.

Connecting rod sample should already be assembled. All that is needed is for the bolts to be torqued to the proper amount. Figure 3 shows how the fixture looks when everything is put together.

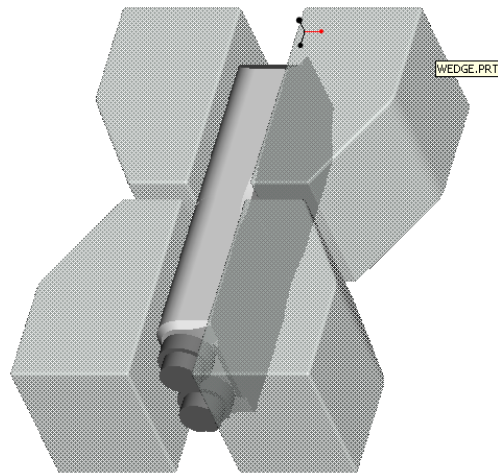


Figure 3: Set up for the connecting rod fixture

- Configure software for single axis fatigue testing
 - Software
 - Function Generator
 - Test-Ware for data collection
 - Test Star controls the machine
- Assign and Calibrate the stroke hydraulically
- Turn on Hydraulic pump control on the Load Unit Control Panel (LUCM)
- Turn on Hydraulic Service Manifold (HSM)
- Switch to manual control

- Let Hydraulics warm up for about 15 minutes
- Lower the crosshead for adequate spacing between the wedge-grips
- Release the top and bottom Hydraulic wedge-grips
- Set the wedges inside the top wedge-grip and use the springs to hold them into place
- Place the specimen in between the wedges
- Apply pressure (normal) to the wedges to tightly hold them in place
- Set the other two wedges inside the bottom wedge grip on the MTS machine
- Manually adjust the actuator to align wedges with the specimen
 - Make sure the Hydraulic pump unit is on stroke control
- Adjust normal pressure on the wedges so they can tightly hold the specimen into place
- Switch to computer control
- Now to start testing Open up the Function Generator and set the testing parameters.

Attn: Read the operation manual for both the software and the MTS machine
prior to testing.

Safety Precautions

- Do not operate the MTS machine alone if you are not familiar with the systems.
- Keep limbs clear of all moving components at all times
- Wear safety goggles when observing test
- Use fixture and wedges only in the MTS machines
- Do not alter fixture or wedges to fit in any other machines
- Do not force wedges into the MTS wedge grips
- Run at least one cycle to make sure test is properly setup
- Make sure all components are lined up properly prior to testing
- Know where emergency stop button is prior to setting up the test
- In case of emergency locate and press the emergency stop and call for help
- Do not attempt to remove MTS wedge grips without help or supervision
- Follow specified lab regulations and safety
- Do not adjust the MTS crosshead without help or supervision
- Before adjusting crosshead, make sure the hydraulics are on so they can hold it up