



BSE LEVEL 2 CERTIFICATION EXAM PREPARATION MATERIALS

The following material is provided to give you the best possible familiarity with the nature of the exam for BSE Level 2 Certification so that you can be as informed as possible in making your decision to take the exam, or as prepared as possible to pass it. For reasons that may be unforeseeable, details of the exam may change between when you receive this and when you take the exam. Every effort will be made to insure these changes do not affect the general difficulty and nature of the exam.

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TIME LIMITS AND GRADING SYSTEM

The time limit for the BSE Level 2 Certification Exam is four hours. The four hour time limit is considered to be at least one and a half times the time it would take experienced assemblers to do the same work in a non-exam situation at benches they were familiar with.

If you are concerned about your ability to do the exam in the time limit, it is recommended that use the **Exam equipment starting conditions** information to create a simulated exam in your shop.

When the exam is graded, each item will be assigned points. Full points are awarded if the item is performed perfectly. Partial points are awarded if the item is performed to a minimal acceptable standard. No points are awarded for items that are unacceptable. Items that are not completed will be counted the same as unacceptably completed items. For example, if the lateral true of the wheel has .5mm error or less, full points are awarded. If the lateral error is greater than .5mm and less than 1mm, then partial points would be awarded. If there was 1mm or more lateral error, no points would be awarded.

CRITERIA FOR SUCCESSFUL COMPLETION OF THE EXAM

Successful completion of the exam will be based on three criteria. The first criteria is that the total points awarded must be 70% or higher of the maximum total points on the hands-on portion of the exam. ***The second criteria is that you must perform to an acceptable standard on all items designated as critical items on the hands-on portion of the exam.*** Critical items are noted in the following exam directions. What determines that an item is a critical item is that it has the potential to create a safety hazard. For example: A properly secured pedal is torqued to a tightness of 25–30ft-lbs. Full points are awarded if the pedal is torqued to at least this torque. Pedals torqued to less than 25ft-lbs are a potential safety hazard that would develop over time. This is a critical item. One deficiency of this type result in automatic failure of the exam. The third criteria is that you must score 70% or higher on the written test.

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GENERAL OUTLINE OF THE BICYCLE LEVEL 2 CERTIFICATION EXAM:

The following items must be performed to the standards indicated in the **Exam Directions for the Bicycle Level 2 Certification exam**.

- Adjust an assembled conventional hub with quick release axle.
- Adjust an already assembled adjustable-cup bottom bracket.
- Install a left crank arm correctly (right is already installed).
- Install a left pedal correctly (right is already installed)
- Adjust an already installed threaded headset.
- Install, align and secure a stem in a road bike (quill stem in threaded fork).
- Position and secure already installed drop-style handlebars on a road bike.
- Position and secure brake levers on drop-style bars.
- Attach cable, adjust pads, adjust clearance and centering on an already installed dual-pivot brake.
- Adjust an already installed threadless headset.
- Align and secure a pair of Shimano MTB brake levers.
- Align and secure a pair of Shimano MTB shift levers.
- Size and install housing at the right shift lever and at the rear derailleur.
- Install a rear derailleur inner wire.
- Install, size and inspect a chain.
- Adjust the limit screws on an already-installed derailleur.
- Adjust the indexing on a rear derailleur.
- Adjust the position, limit screws, and cable of an already installed indexing front derailleur.
- Install, align, and secure a front wheel.
- Set up the cable and adjust the pads, clearance and centering for a Shimano V-brake (or equivalent brake by another manufacturer).
- Set up the cable and adjust the pads, clearance and centering for a Shimano BR-R550 (threaded-shoe-stud type) cantilever.
- Align and secure a seat attached to a common single-bolt integral clamp with serrated surfaces.
- Overhaul a Shimano freehub, removing and installing the cogs, replacing the freehub, assembling the hub and centering the axle (no adjustment).
- Overhaul a threaded headset, replacing bearing retainers with loose balls (no adjustment).
- Align rear dropouts on a frame.
- Size a threaded fork column accurately, including finish and bevel the cut.
- Replace a set of rear derailleur pulleys.
- True a wheel that has spokes that are under tension, and that has lateral, round, dish and tension errors.

EXAM EQUIPMENT FOR BICYCLE LEVEL 2 CERTIFICATION EXAM:

The exam equipment consists of the following items:

- a front wheel for the hub adjustment portion of the exam that is part of the road bike being used for the exam
- a complete road bike that will be used for bottom bracket adjustment, crankset installation, pedal installation, stem installation, handlebar alignment and security, Shimano STI control lever alignment and security, rear brake cable installation, rear dual-pivot brake adjustment, and headset adjustment (threaded-type).
- a complete mountain bike or hybrid bike that will be used for threadless headset adjustment, chain installation, control-lever alignment and security, rear-derailleur cable installation, front and rear derailleur adjustment, front wheel installation, Shimano V-brake (or equivalent) adjustment, Shimano cantilever brake adjustment, and seat alignment/security.
- A rear wheel with Shimano freehub and cogset.
- A frameset with an installed threaded headset, used also for dropout alignment.
- A threaded fork for resizing.
- A rear derailleur cage with and extra set of pulleys.
- a rear wheel for the wheel true portion of the exam that is not part of either bike being used for the exam

EXAM EQUIPMENT STARTING CONDITIONS (Road bike):

Front hub with the following conditions:

- both locknuts loose

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- adjustment not correct
- both locknuts are 17mm hex type and can be secured with a socket on a torque wrench

Adjustable-cup bottom bracket with the following conditions

- fixed cup fully secure
- incorrect adjustment (tight or loose)
- loose lockring

Crankset with the following conditions:

- left arm not installed, right is installed
- left pedal not installed, right is installed

Threaded-type headset on road bike with following conditions:

- pressed races all fully pressed in
- headset assembled (proper bearings and greased)
- adjustment too tight or loose by random amount
- locknut marginally secure

Road bike handlebar and stem with following conditions:

- stem not installed in bike
- handlebars installed to stem and handlebar-binder bolt greased and installed
- handlebar centering and rotation outside acceptable limits
- handlebar-binder bolt unacceptably loose

Shimano STI-type road-bike brake levers with following conditions:

- levers already mounted on handlebars (mounting bolt threads lubricated)
- levers mounted at differential height, both may be outside of acceptable height range
- levers rotated too far inward and not symmetrical
- brake cables not attached to levers

Rear brake cable with following conditions:

- inner wire not on bike
- three pieces of pre-cut and finished housing provided to select which one is acceptable length
- handlebars are untaped, aero-routed housing is to be attached to handlebars by Velcro strips already in place

Rear Shimano dual-pivot brake with following conditions:

- brake attached to frame, but not secure or centered
- pads attached to caliper, but not aligned or secured
- pad centering screw deliberately mis-adjusted

EXAM EQUIPMENT STARTING CONDITIONS (MTB/Hybrid bike):

Threadless-type headset with following conditions

- Fully assembled with stem in place (bars mounted in stem)
- Adjustment too loose
- Stem loose and improperly aligned

MTB/Hybrid control levers with the following conditions:

- control levers positioned too far in from grips
- control levers inadequately secured
- control lever rotational positions not symmetrical

Rear derailleur cable and housing with the following conditions:

- inner wire not installed in control lever (Shimano Rapidfire type)
- index-compatible and non-index compatible housings provided from which to select index-compatible housing
- housing provided to be cut to proper length
- housing end caps provided to be installed where necessary

Chain with the following conditions:

- not installed on bike
- chain is too long
- chain may have a tight link
- chain may have a link with unacceptable rivet installation

Rear derailleur with the following conditions:

- derailleur installed to correct torque on a properly aligned derailleur hanger
- B-screw or angle adjustment screw properly set
- outer limit screw at least one full turn too tight or too loose

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- inner limit screw at least one full turn too tight or too loose

Front derailleur with following conditions:

- derailleur is in operable, but not acceptable, condition to allow adjustment of rear derailleur without having to work on front derailleur first
- cable attached at derailleur and left shifter (housing length and finish acceptable)
- outer derailleur cage clears outer chainring teeth by more than 3mm
- incorrect derailleur rotational alignment (tail rotated out)
- outer limit screw too loose
- inner limit screw too loose

Front wheel with following conditions:

- not installed in bike
- quick-release mechanism installed but not correctly adjusted

Shimano LX-type V-brake (or equivalent) with following conditions:

- calipers correctly installed on pivot studs on front fork
- cable system (noodle, inner wire, housing) assembled and housing properly sized and finished, but not attached to lever or caliper
- pads attached to caliper arms, but not correctly adjusted
- centering screw misadjusted

Shimano BR-R550 cantilever brake with following conditions:

- calipers correctly installed on pivot studs on seat stays
- cable system (inner wire, housing) assembled and housing properly sized and finished, but not attached to lever or caliper
- Both lengths of link unit supplied (not attached) from which to select correct one
- pads detached from caliper arms, with alignment washers attached to pads
- centering screws misadjusted
- rear wheel already installed in final (acceptable position)

Seat installed with following conditions:

- seat clamp is serrated type that allows angle adjustments of approximately 2.5° per click
- seat will be at least 10° from flat position
- seat will be positioned at one limit of its fore and aft adjustment range
- seat clamp (single bolt integral clamp type) will be marginally loose

EXAM EQUIPMENT STARTING CONDITIONS (Rear wheel for hub overhaul):

- cogs installed
- extra freehub body supplied
- axle protrusions different by more than 1mm

EXAM EQUIPMENT STARTING CONDITIONS (headset overhaul/dropout alignment):

- Threaded headset correctly assembled with bearing retainers and correct washers.
- Dropouts misaligned to have gap error and offset error in the vertical plane and horizontal plane.

EXAM EQUIPMENT STARTING CONDITIONS (threaded fork for sizing):

- fork threads are cut perpendicular and are properly beveled

EXAM EQUIPMENT STARTING CONDITIONS (rear derailleur cage):

- derailleur cage is properly assembled with pulleys installed, a second set of pulleys is also provided to be installed.

EXAM EQUIPMENT STARTING CONDITIONS (Rear wheel for truing):

- lateral error greater than 1mm and less than 2mm
- radial error greater than 1mm and less than 2mm
- dish error (before lateral error was created) of more than 2mm and less than 4mm (measured at the rim with a dish tool)
- spoke tension between 40kgf and 70kgf

Tools available for exam

Each facility offering the exam has a slightly different setup and set of tools. It is recommended that you simulate the exam for yourself based on these preparation materials, and make a list of the tools you will be using. You can ask the facility where you will be testing for a list of tools that will be available. If the ones provided don't suit you, then you are free to bring additional tools to the exam.

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EXAM OVERVIEW

The B.S.E. Mechanic Certification is a timed exam with a four-hour duration. During that time, you will work on a road bike, a mountain bike, and a separate wheel (for truing). The equipment changes are clearly noted on the directions following this page. To pass the exam, you must score at least 70% of the maximum points, and not fail any of the **Critical Safety Items**. Skipped items cost the entire point value for the item, and skipping a **Critical Safety Item** is the same as failing it. At the end of the four hours, you must cease working on the bike. Any partially-completed item must be left as is. Wait at the bench for the examiner.

The directions on the following pages have three columns. See the example immediately below.

GENERAL DIRECTIONS	DESIRED OUTCOMES	VALUE/TIMES
02. Adjust the bottom bracket. Note: The fixed cup is already secure.	a. Lockring must be fully secure. b. Adjustment must have no knock (side-play or free-play). c. Adjustment must develop knock when adjustable cup is set and secured at a position 3mm looser at perimeter of adjustable cup.	5.5% of score 0:13 segment 0:31 elapsed
03. Prepare the left crank arm provided (on the bench) for installation, then install and secure it.	a. Crank-arm retaining bolt must be secure to minimum 350in.lbs. of torque.	1.7% of score 0:05 segment 0:36 elapsed

The first column is the **GENERAL DIRECTIONS** for each exam segment. Read these to get an overview of what you will be doing for each part of the exam.

The second column is **DESIRED OUTCOMES**, including all specifications, tolerances, and torques. Many of these specifications are usually up to an individual manufacturer to define, or up to an individual bicycle dealer to establish as policy. If you demonstrate the ability to meet the specifications provided in these exam directions, it establishes that you are reasonably able to meet whatever specifications are set by a manufacturer or individual bicycle dealer. You should do your best to meet each specification as closely as possible. Perfection, however, is not required to pass the test (with the exception of the **Critical Safety Items**). If you are reasonably close to a specification, in most cases you will get partial credit. There is no tolerance for being below a torque specification.

The third column is **VALUE/TIMES**. There are three pieces of information provided for each segment of the exam. The first item is a percentage that shows the portion of the total score that the segment represents. In the above example, it shows that adjusting the bottom bracket accounts for 5.5% of the total score, but that installing the left crank arm only accounts for 1.7% of the total score. Use this information to help yourself decide how important it may be to achieve close to perfection on an item, particularly if the item is not a **Critical Safety Item** and you are running a bit behind schedule. To help you decide if your pace is sufficient to complete the entire exam, two time values are provided. The first time, labeled "segment," gives the maximum time that the segment of the exam should take in order to complete the entire exam in exactly four hours. Of course, it is normal for some segments to take you longer than the average person and other segments to take you less than the average person. The second time, labeled "elapsed," is the maximum time elapsed from the beginning of the exam that will enable you to stay on a schedule to complete the exam in exactly four hours. In the direction example above, for item 03 (crank-arm installation), it shows the segment should take no more than 5 minutes to complete, and by the end of the segment no more than 36 minutes of the exam should have elapsed.

MISSING OR DAMAGED TOOLS OR PARTS: As soon as you feel that you may have a missing or damaged tool or part, **notify the examiner immediately!** Brief the examiner on the situation. The examiner will make a final determination on the spot if you are to receive an intervention by the examiner to correct the condition, and if you will receive time credit (to be written by the examiner and initialed at the end of the exam directions). If the examiner determines your claim is invalid, you will simply be instructed to continue.

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The following items are critical safety items. Occurrence of any one of the following conditions is automatic grounds for failing the exam, and the only recourse will be a complete retest!

The torque specifications in the following items are the hypothetical manufacturers' specifications for the equipment on the exam bicycles, and are not intended as guidelines for all equipment. In non-exam circumstances, always use manufacturer's actual recommendations as a guideline.

1. Crank arm installation: Crank retaining bolt is torqued to less than 350in-lbs.
2. Pedal installation: Pedal is torqued to less than 300in-lbs.
3. Quill stem installation: Minimum-Insert/Maximum-Height line shows.
4. Quill stem installation: Stem-binder bolt is torqued to less than 145in-lbs.
5. Drop bar align/secure: Handlebar-binder bolt is torqued to less than 205in-lbs (if 8mm bolt) or less than 120in-lbs (if 6mm bolt).
6. All brakes: Any brake pad being positioned any amount above the rim, or any brake pad positioned substantially below the rim's braking surface.
7. Dual-pivot brakes on road bike: Pad clearance of more than 2mm per side.
8. Threadless-stem: Stem-binder bolts are secured to less than 55in-lbs.
9. Chain installation: any chain rivet end that is left flush to outer link plate face, or rivet end that is left recessed in the outer link plate face.
10. V-brakes: Cable is attached to incompatible (non-V-brake) lever.
11. Mountain bike brakes: Either lever clears the grip by less than 1" (25mm) when the brake pads first contact the rim, before or after the examiner stresses the cable system.
12. Cantilevers and V-brakes: Brake pads (front and rear) lose original alignments after the examiner stresses the brake cable.
13. Wheel installation: Locknuts on wheel that is installed not fully engaging the inside faces of the dropouts.
14. Wheel installation: Quick-release lever not closed fully.
15. Wheel installation: The pressure required to close the lever begins at less than 70° from the fully closed position.
16. Cantilever brake: Cable is attached to an incompatible (V-brake) lever.
17. Seat alignment and security: Seat-clamp bolt is torqued to less than 120in-lbs.

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APPLICANT: _____ BENCH: _____ DATE: _____

READ AND SIGN THE FOLLOWING STATEMENT:

I understand the torque values provided in this exam are hypothetical examples of manufacturers' recommended torques, and that when working as a professional the correct procedure is to always use all manufacturers' recommended torques as a guideline, rather than duplicating the values used here regardless on the specific equipment being worked on. I further understand that there are many occasions when simple reliance on torque values may be inadequate, and that there are methods to check whether using a recommended torque has achieved the adequate security of certain parts.

Signature of certification applicant _____

GENERAL DIRECTIONS	DESIRED OUTCOMES	VALUE/TIMES
USE WHEEL ON BENCH: HUB ADJUSTMENT		
01. Adjust the quick-release hub bearings and leave the wheel properly secured in the road bike provided. The quick-release skewer must be secured in the same fashion as if the wheel were installed in the bike ready to ride. <i>If you find it convenient, you may wait until after headset adjustment to install the wheel in the road bike.</i>	<ul style="list-style-type: none"> a. Locknuts must be secure to minimum 120in-lbs of torque. b. Adjustment must have no knock (side-play or free-play) when skewer is fully secure. c. Adjustment must develop knock (side-play or free-play) when skewer is loosened 45° from fully secure. 	6.6% of score 0:16 segment 0:16 elapsed
ROAD BIKE: BOTTOM BRACKET, THREADED HEADSET, STEM, HANDLEBAR, CRANK ARM, PEDAL AND BRAKES		
02. Adjust the bottom bracket. Note: The fixed cup is already secure.	<ul style="list-style-type: none"> a. Lockring must be fully secure. b. Adjustment must have no knock (side-play or free-play). c. Adjustment must develop knock when adjustable cup is set and secured at a position 3mm looser at perimeter of adjustable cup. 	4.8% of score 0:11 segment 0:27 elapsed
03. Prepare the left crank arm provided (on the bench) for installation, then install and secure it.	<ul style="list-style-type: none"> a. Crank-arm retaining bolt must be secure to minimum 350in-lbs of torque. 	1.5% of score 0:04 segment 0:31 elapsed
04. Install the left pedal and secure it.	<ul style="list-style-type: none"> a. Pedal must be secure to minimum 300in-lbs of torque. 	1.5% of score 0:04 segment 0:35 elapsed
05. Adjust the headset.	<ul style="list-style-type: none"> a. Adjustment must have no knock (side-play or free-play). b. Adjustment must develop knock when adjustable cup is loosened 4mm at perimeter of adjustable cup. c. Locknut must be secure to minimum 300in-lbs of torque. 	6.3% of score 0:15 segment 0:50 elapsed
06. Install the stem and set the height and rotational alignment, then secure the stem-binder bolt.	<ul style="list-style-type: none"> a. Bars must be parallel to front axle or dropout tips, or stem in line with tire. b. Minimum Insert or Maximum Height mark must be just below top of locknut (no lower than necessary to hide mark). c. Stem binder bolt must be secure to minimum of 145in-lbs of torque. 	2.1% of score 0:05 segment 0:55 elapsed
07. Correctly position and secure the handlebars in the stem. The hypothetical manufacturer's torque specifications for this brand of stem are 120in-lbs for 6mm bolts (thread diameter), or 205in-lbs for 8mm bolts (thread diameter).	<ul style="list-style-type: none"> a. Bars must be centered in stem. b. Angles of reach and grip must differ by less than 5° (sloping in opposite directions). c. Handlebar-binder bolt must be secure to minimum 120in-lbs (for 6mm bolts) or minimum 205in-lbs (for 8mm bolts). 	2.1% of score 0:05 segment 1:00 elapsed
08. Set the brake levers at the proper height and rotational alignment, then secure them.	<ul style="list-style-type: none"> a. Tips of brake levers must be even with line extended from bottom side of handlebar. b. Brake lever heights must be equal. c. Brake lever body rotations must be symmetrical and not angled in or angled out. d. Lever mounting bolts must be secure to minimum 60in-lbs or torque. 	1.5% of score 0:03 segment 1:03 elapsed
09. Select the correct-length piece of housing from the three pieces provided (do not cut) and route it from the right lever to the rear brake. Use the housing selected for the following brake-setup procedure. Use the Velcro strips on the handlebar to secure the housing to the handlebar.	<ul style="list-style-type: none"> a. Housing loop from bars to frame must be routed to the side of the stem and head tube that creates the smoothest bend. b. Correct length is 1.5" longer than minimum length that will allow full rotation of the handlebar (to allow for a switching to a stem up to 40mm longer). c. Housing loop at rear caliper must be just long enough to permit straight entry into adjusting barrel on caliper. 	Combined with 10. (next page)

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GENERAL DIRECTIONS	DESIRED OUTCOMES	VALUE/TIMES
10. Secure the rear caliper to the frame and set the pad tangent alignments and heights. Attach the inner wire and cable to the brake lever and caliper. Adjust the brake-pad clearance and centering.	<p>NOTE: Examiner will put tire valve at brake when inspecting centering and clearance!</p> <ul style="list-style-type: none"> a. Pad tangent: top corners of pad must be equidistant from top edge of rim. b. Right-pad height: bottom edge of pad face must be even with bottom edge of rim's braking surface. c. Left-pad height: top edge of pad face must be even with top edge of rim's braking surface. d. Brake pads must reach rim simultaneously when brake is operated. e. Each brake pad must clear rim by 1.3–1.7mm when brake is released. f. Cable-pinch mechanism must not slip when lever is squeezed to handlebar and pad clearance must not change after high load is applied to the brake lever. 	5.1% of score 0:12 segment 1:15 elapsed
MTB: THREADLESS HEADSET CHAIN, DERAILEURS, FRONT AND REAR BRAKES, AND SADDLE SETUP		
11. Adjust the headset, maintaining correct stem alignment and security.	<ul style="list-style-type: none"> a. Stem must be aligned so bars are parallel to front axle or dropout tips, or stem is in line with tire. b. Stem binder bolts must be secure to minimum 55in-lbs. c. Adjustment must have no knock (side-play or free-play). d. Adjustment must not be obviously over tight. e. Top cap must not be deformed. 	2.7% of score 0:07 segment 1:22 elapsed
12. Set both brake levers' lateral positions, and align lever rotations. Secure levers.	<ul style="list-style-type: none"> a. Lateral position of lever must be as close to grip as possible. b. With bike in same position as it would be on the ground, the rotational position of levers must be an angle of 45° down from flat (both levers symmetrical). c. Brake lever binder bolts must be secure to 35in-lbs. 	2.1% of score 0:05 segment 1:27 elapsed
13. Set both shift levers' lateral positions, and align lever rotations. Secure levers.	<ul style="list-style-type: none"> a. Lateral position of lever set so release lever is as close to brake lever body as possible without interference. b. Both shift levers should be rotated to be at the same angle as the brake brake levers, and symmetrical to each other. c. Shift lever binder bolts must be secure to 35in-lbs. 	1.5% of score 0:04 segment 1:31 elapsed
14. Select the index-compatible housing from the two pieces provided, from it cut one piece to use from the control lever to the frame, and cut the remainder to use from the frame to the rear derailleur.	<ul style="list-style-type: none"> a. Index-compatible housing must be selected. b. Housing loop from the right shifter must be 1.5" longer than the shortest possible that would not interfere with a 180° handlebar rotation, and must not interfere with the other pieces of housing. c. Housing loop to rear derailleur must be sized so that when the derailleur body is parallel to the chain stay, the housing enters the derailleur's adjusting barrel straight (not pulling up or pushing down on adjusting barrel). 	3.0% of score 0:07 segment 1:38 elapsed
15. Use the housing pieces you just cut and end caps provided to install the rear-derailleur cable system.	<ul style="list-style-type: none"> a. End caps must be used wherever they will fit into stops. b. Pinch bolt must be secure to a minimum of 35in-lbs. c. Pinch-mechanism plate must be correctly oriented and inner wire must be correctly routed through pinch mechanism. 	
16. Install the chain provided and size it. Inspect the chain for all problems and eliminate any that are found.	<ul style="list-style-type: none"> a. Chain length must be as long as possible without creating a "too long" symptom in the rear-outer/front-inner gear combination, with no "too-short" chain symptom evident in the rear-inner/front-outer gear combination. b. Chain must have no tight links. c. Chain must have no partially installed rivets (must protrude both sides). 	4.8% of score 0:11 segment 1:49 elapsed
17. Adjust the inner and outer limit screws to the tightest good settings. NOTE: The B-screw is adjusted and the derailleur hanger is aligned.	<ul style="list-style-type: none"> a. Outer limit screw (H) must be set so that too-tight symptoms occur if screw is turned 1/4 turn in. b. Inner limit screw (L) must be set so that too-tight symptoms occur if screw is turned 1/4 turn in. 	4.1% of score 0:10 segment 1:57 elapsed
18. Stress the cable system and adjust the indexing so that it is at the tightest acceptable setting. Trim and finish the inner wire.	<ul style="list-style-type: none"> a. Cable tension must be set so that after stressing the cable system, too-tight indexing symptoms occur if the adjusting barrel is turned 1/4 turn out. b. Cable pinch mechanism must be secure to the point that the cable will not slip when the cable system is stressed. c. Inner wire must extend past the pinch mechanism 1.5-2". d. Inner wire must be capped. 	

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GENERAL DIRECTIONS	DESIRED OUTCOMES	VALUE/TIMES
19. Set the height and rotation of the front derailleur and secure it to the seat tube.	<ul style="list-style-type: none"> a. Derailleur height must be set so that the bottom edge of the outer cage plate clears the tallest outer chainring teeth by 2mm (plus or minus 1mm maximum error). b. Derailleur rotation must be set in a range from the point that the tail is not rotated inward relative to the nose when comparing the outer plate to the plane of the outer chainring, and the tail is not rotated outward relative to the nose when comparing the outer plate to the line of the chain in the outer/outer gear combo. Anywhere in this range that results in no rubs or over-shifts when the limit screws are properly set is acceptable. c. Mounting bolt must be secure to a minimum of 40in-lbs. 	5.7% of score 0:14 segment 2:13 elapsed
20. Set the front derailleur inner and outer limit screws.	<ul style="list-style-type: none"> a. Outer limit screw must be set so that chain (when in outermost position front and rear) clears the outer plate of the derailleur by .5–1.0mm at its closest. b. Inner limit screw must be as loose as necessary to eliminate any delay in the shift to the inner chainring unless this causes over-shift of the inner chainring, and the inner cage plate must clear in chain in the inner/inner gear combination by at least .5mm. 	
21. Stress the front derailleur cable, then adjust the indexing.	<ul style="list-style-type: none"> a. Cable tension must be set as tight as possible without resulting in a rub between the inner cage plate and the chain when in the rear-inner/front-middle gear combination. 	
22. Install, center, and properly secure the front wheel.	<ul style="list-style-type: none"> a. Rim must be centered between the brake pivot studs to less than 1mm difference (Note: examiner will use segment of wheel with valve stem when measuring the rim centering). b. Locknuts and quick-release must fully engage the dropouts. c. Quick-release lever must be fully closed, clamping force must begin 80°–100° before the fully-closed position, and the end of the lever must be adjacent to, but not overlapping, the fork blade. 	1.5% of score 0:04 segment 2:17 elapsed
23. Attach the front brake cable provided to the correct brake lever and the front brake caliper. Adjust all pad alignments, pad clearance, and pad centering.	<ul style="list-style-type: none"> a. Cable is attached to the V-brake compatible lever, does not interfere with the other cables, and is attached correctly to the caliper arm. b. Pad tangent: top corners of pad must be equidistant from top edge of rim. c. Pad height: top edge of pad face must be even with top edge of rim's braking surface. d. Vertical pad-face alignment: top and bottom edges of pads both contact rim. e. Pad toe: back ends of pads must clear rim by .5–1.5mm when front ends just touch and toe must be symmetrical. f. When pads first contact rim, minimum clearance from brake lever to grip must be 1" (25mm). g. Cable-guide tube must release easily from the bracket. NOTE: Examiner will put tire valve at brake when inspecting centering! h. Pad clearances on each side must differ by less than .5mm. i. Pads must be must be secure to a minimum torque of 50in-lbs. j. Pad clearance must not change after high load is applied to the brake lever. 	4.5% of score 0:10 segment 2:27 elapsed
24. Attach and route the brake cable from the correct lever to the rear caliper. Attach the cable to the caliper, then adjust all pad alignments, pad clearance, and pad centering.	<ul style="list-style-type: none"> a. Cable is attached to the non-V-brake compatible lever, does not interfere with the other cables, and is attached correctly to the caliper arm. b. Pads must be installed with convex washers adjacent to caliper arm and convex faces engaging concave faces of concave washers. Washer set up must be symmetrical on right and left sides, with correct pad installed on each side. c. Pad tangent: top corners of pad must be equidistant from top edge of rim. d. Pad height: top edge of pad face must be even with top edge of rim's braking surface. e. Vertical pad-face alignment: top and bottom edges of pads both contact rim. f. Pad toe: back ends of pads must clear rim by .5–1.5mm when front ends just touch, and toe is symmetrical. g. Angle between sides of link unit should be 105°–107° (with pads released). h. Primary wire must be routed correctly through the link-unit head. i. When pads first contact rim, minimum clearance from brake lever to grip must be 1" (25mm). j. Pad clearance should be 1.5mm per side, or 3mm combined. NOTE: Examiner will put tire valve at brake when inspecting centering! k. Pads clearance on each side must differ by less than .5mm. l. Pad clearance must not change after high load is applied to the brake lever. 	6.0% of score 0:15 segment 2:42 elapsed

BSE LEVEL 2 CERTIFICATION

	m. Pads are must be secure to a minimum of 70in-lbs.	
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BSE LEVEL 2 CERTIFICATION

GENERAL DIRECTIONS	DESIRED OUTCOMES	VALUE/TIMES
25. Position the saddle as level as possible, position it in the middle of its fore-and-aft adjustment range, then secure the saddle clamp.	<ul style="list-style-type: none"> a. Seat angle must be as close to flat as possible. b. Seat must be adjusted in the middle of its fore/aft range. c. Saddle clamp must be secure to minimum 120in-lbs. 	1.5% of score 0:03 segment 2:45 elapsed
USE WHEEL IN TRUING STAND: WHEEL TRUING		
26. True the lateral.	a. Lateral error (runout) must be .5mm or less (must be maintained through all the following wheel-true procedures).	2.4% of score 0:06 segment 2:51 elapsed
26. True the round (radial).	b. Radial (round) error (runout) must be .5mm or less (must be maintained through all the following wheel-true procedures).	2.7% of score 0:06 segment 2:57 elapsed
26. Correct the dish (centering) error.	c. Dish (centering) error must have either 2mm or less gap between one end of the dish tool and the rim (with other end of the tool contacting the rim), or 1mm or less gap between the dish tool's center indicator and the hub locknut face).	3.6% of score 0:09 segment 3:06 elapsed
26. Set the right-side average spoke tension.	d. Right-side average spoke tension must be 90–110kgf (kilograms of force). The dish, lateral, and radial tolerances must be maintained.	4.5% of score 0:11 segment 3:17 elapsed
26. Stress the wheel to stabilize the true.	e. Lateral error must change .2mm or less when examiner stresses wheel.	3.0% of score 0:07 segment 3:24 elapsed
USE REAR DERAILLEUR PARTS PROVIDED: PULLEY REPLACEMENT		
27. Remove pulleys from rear-derailleur cage assembly, and correctly install replacement pulleys.	<ul style="list-style-type: none"> a. Original pulleys must be removed. b. Cage plates must be assembled in correct orientation to each other. c. Pulleys must be in correct position. d. Bolts must be adequately secured. e. Pulleys must be rotating freely. 	1.5% of score 0:04 segment 3:28 elapsed
USE FORK PROVIDED: FORK COLUMN (STEERER TUBE) SIZING		
28. Reduce fork column (steerer) length by exactly 5mm, deburr cut, and taper starting thread.	<ul style="list-style-type: none"> a. Cut must be perpendicular to column axis. b. Length must be 5mm shorter (\pm.5mm) than original length. c. Burr must be removed from inside of hole. d. First thread must be adequately tapered with a file to facilitate easy race engagement. 	2.4% of score 0:06 segment 3:34 elapsed
USE FRAMESET PROVIDED: HEADSET BEARING REPLACEMENT AND DROPOUT ALIGNMENT		
29. Align rear dropouts so tool cylinders are on same axis. Do not align frame stays!	<ul style="list-style-type: none"> a. With tools installed fully into dropout slots, align so that cylinders are .5mm or less offset from each other. b. With tools installed fully into dropout slots, align so that when cylinders are adjusted to <i>just</i> contact each other, the gap between the cylinders 180° away from the point of contact is .5mm or less. 	2.1% of score 0:05 segment 3:39 elapsed
30. Remove ball retainers from headset and install loose balls. Do not adjust headset!	<ul style="list-style-type: none"> a. Retainers must be removed and correct-size bearings must be installed. b. Correct number of ball bearings must be installed and properly positioned in cups. c. Correct number of washers must be installed under locknut so that locknut lip does not contact top of fork column (steerer tube). d. Any specially-configured washers must be correctly positioned and oriented. 	3.0% of score 0:07 segment 3:46 elapsed
USE WHEEL SUPPLIED WITH EXTRA FREEHUB BODY: HUB OVERHAUL		
31. Overhaul hub and replace freehub body with other one provided. Do not adjust hub!	<ul style="list-style-type: none"> a. Freehub body must be replaced. b. Cogset must be correctly installed and secure. c. Axle parts must be reinstalled on original sides. d. Locknuts must face the same way as they did originally. e. Axle must be centered to less than .5mm difference in protrusion. 	6.0% of score 0:14 segment 4:00 elapsed

BSE LEVEL 2 CERTIFICATION



SAFETY RESPONSIBILITY STATEMENTS

REFLECTOR SAFETY

I understand that a properly assembled bicycle includes installation of the wheel, pedal, front and rear reflectors in proper alignment, and that installing these reflectors has the potential to save lives. Proper alignment means that front and rear reflectors must point straight forward and straight back, respectively, and that they must be as close to perpendicular to the ground as the design of the reflector allows. I understand that the CPSC requires that all new bicycles must be sold with a full set of reflectors installed, and that the only exceptions are for bikes used *exclusively* for competition or off-road purposes. Furthermore, I understand that these exceptions must be strictly adhered to. I will endeavor to see that every bicycle I work on is properly equipped with reflectors.

Signature _____ Date _____

DEFECTIVE AND DAMAGED EQUIPMENT

I understand that certain types of structural defect cannot be detected except by putting normal operating loads on the bike, and that the loads that occur during test-riding of the bike is one way to detect some of the defects that might not be detectable without a test ride.

Furthermore, I understand that bends, wrinkles, creases and cracks in materials can be the source of a catastrophic failure, and that in the process of working on a bicycle it is my responsibility as a professional to inspect for these potential sources of failure and bring them to the attention of my employer.

Signature _____ Date _____