

Guidance on Major Inspections – for owners and service providers

This document is prepared in order to provide relevant information to owners and service providers considering undertaking a Major Inspection. It is in three parts:

Part 1 outlines the general requirements specified in AS2550.19 Safe use – Telescopic Handlers

Part 2 for owners considering a Major Inspection for their Telescopic Handlers (Telehandlers)

Part 3 for service providers outlining the necessary requirements when conducting a Major Inspection.

NOTE: AS2550.19 is considered a code of practice under relevant Work (Occupational) Health and Safety Law. It can be used as evidence of whether or not a duty or obligation imposed under the law has been complied with.

AS2550.19 may be used to establish what is reasonably practicable (in this context conducting a Major Inspection). In order to gain a complete understanding of the Major Inspection process, users are encouraged to read all 3 parts.

1 AS2550.19 GENERAL REQUIREMENTS

1.1 What is the purpose of a Major Inspection?

The purpose is to verify that the Telehandler is in a safe and serviceable condition and having regard to corrosion, fatigue and wear, be able to continue operating until the next scheduled Major Inspection. Although periodic inspections are conducted on a regular basis, such inspections do not involve a detailed inspection of items that are inaccessible when a Telehandler is assembled state, or more comprehensive inspections involving non-destructive testing on items that are subject to fatigue cracking.

1.2 Who can perform a Major Inspection?

A competent person can perform a Major Inspection. A competent person is defined as one who has the requisite training, qualifications and experience in order to perform the work required. A number of competent persons (e.g. plant mechanic, electrician, hydraulic fitter, NDE technician) will usually be required to perform a Major Inspection. One person would be assigned to oversee the Major Inspection. The competent person(s) must be familiar with the requirements specified in AS 2550.19 and AS10896.1.

1.3 When should a Major Inspection be conducted?

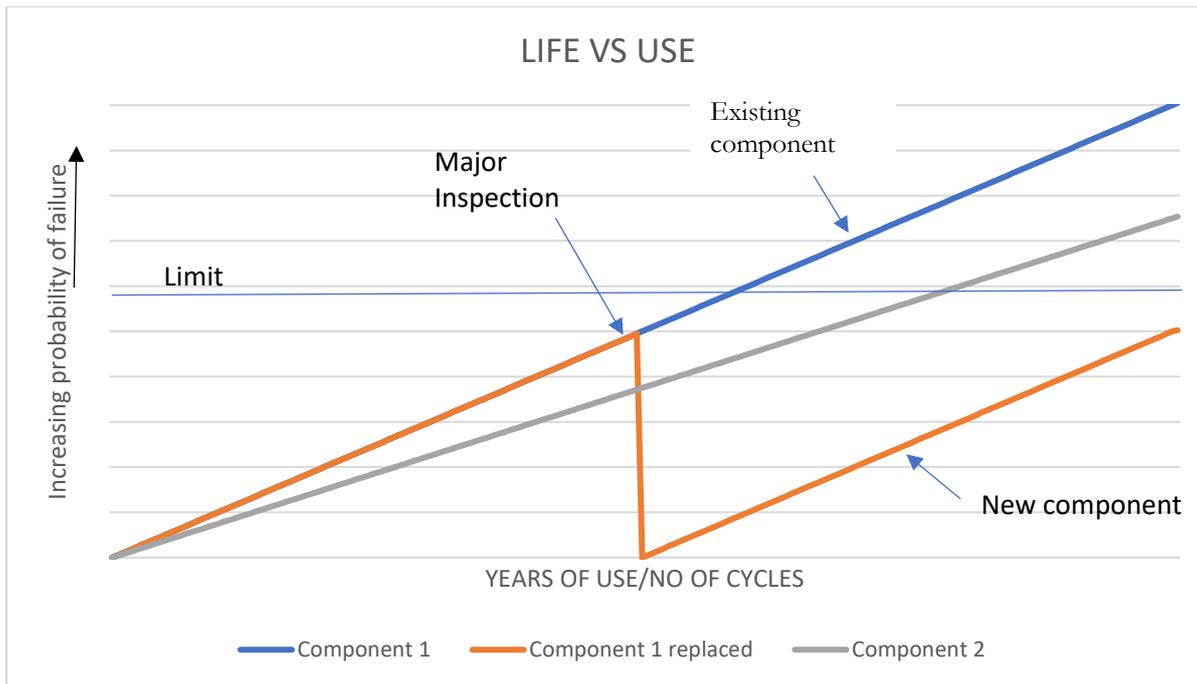
The standard requires a Major Inspection to be carried out after 10 years of use and every 5 years thereafter, or; When Telehandlers are to be re-commissioned if imported and that do not have previous continuous work records.

1.4 Why 10 years?

Telehandlers are designed for a minimum life of typically 10 years under normal use. As with any mechanical plant, components and systems will gradually deteriorate as the machine is used. The more use and the greater intensity of use will result in greater deterioration. After 10 years it can be expected that a Telehandler will be approaching the design limit on at least some components and the probability of failure will be increasing. The purpose of the inspection is to detect if any components are worn, or suffer from any defects that can result in a failure that could lead to uncontrolled motion or structural collapse.

1.5 Why every 5 years thereafter?

It should be appreciated that although a 10-year Major Inspection may confirm that a Telehandler is still sound, any existing component will continue to deteriorate and the probability of failure will continue to increase. Therefore, inspections should be conducted more frequently. If the component is replaced then the probability of failure begins as with any new component.



1.6 What must be considered?

1. Past state of loading and utilization as compared to the Telehandler classifications. How intensively has the Telehandler been used in the past?
2. Future intended state of loading, i.e. what proportion of the rated capacity will usually be experienced during use, and utilization (how frequently will it be used) as required by the user of the Telehandler.
3. The working environment that the Telehandler has experienced.
4. Transport and the effects of road travel that contribute to fatigue and wear and tear on the Telehandler
5. Structural, mechanical, electrical, instrumentation, control and operational anomalies.
6. Non-destructive testing of all nominated critical areas for evidence of cracking due to fatigue and excessive stress
7. Components/ systems whose maintenance records indicate repeated failures
8. Controls and emergency stop.
9. Braking systems.
10. Levelling systems.
11. Adequacy of safety instructions and manuals for operating and maintenance.
12. Manufacturer's safety upgrades.

The Major Inspection shall involve examination of those *critical components* identified by the manufacturer or a competent person. Where necessary, the Telehandler shall be stripped down and paint, grease and corrosion removed from *critical components* to allow a complete and thorough inspection. (A critical component is one where failure will result in a compromise to safety).

Some service providers and OEMs may have extensive records based on the design, results of previous inspections and failure analysis and may be able to limit the scope of an inspection on that basis. This could be supported by verifiable records relating to use and service history including previously replaced major components and/or inspections within the previous 12 months.

NOTE: It is not possible to use the design classification of the Telehandler alone as a basis for limiting a Major Inspection, and/or that the design of the Telehandler in general is such that a proper Major Inspection per this guidance is not necessary.

1.7 Wear, Fatigue and Corrosion.

1.7.1 Wear

Wear is caused when two components rub together, such as pins against bushes, or wire ropes running on sheaves. This results in deterioration in the rubbing surfaces or backlash that can cause increased shock loading in structural members or mechanical items, leading to accelerated deterioration. Wear is directly related to use.

1.7.2 Fatigue

Fatigue is caused by cyclic loading and is a phenomenon that reduces the strength of components. It is influenced by the magnitude of the load in the component, the presence of stress concentrations (typically due to the presence of welds or rapid changes in shape) and the number of cycles. It is also directly related to use. Different materials have different fatigue strengths – material such as aluminium have distinctively lower fatigue strength when compared to steel. Although high strength steels have good fatigue strength, they are less tolerant to fatigue cracks and can fail catastrophically due to the presence of small cracks when compared to lower strength steels. The principle role of NDT is to detect the presence of fatigue cracks.

1.7.3 Corrosion

Corrosion causes a loss of material which results in higher stress in the component. Corrosion is dependent on the time exposed to adverse environments. Components that are corroded will have a significantly reduced fatigue life.

1.8 Non-Destructive Examination

Non-destructive examination (NDE) or Testing (NDT) is a technique used as an aid to detecting cracking and other defects in structural/mechanical components. Not all defects can be observed by the naked eye. Different techniques exist that are designed to suit different materials, surface finishes, and components. The NDT technician should be able to advise on the optimum inspection technique for any particular case. All that an NDT inspection does is to **verify that a defect does or doesn't exist at the time of the inspection**. A clear NDT report **does not indicate that a defect will not occur in the future and it does not increase a components life**. Although welds form a large part of an NDE inspection it is not only welds that should be inspected. Areas that also require consideration are areas where there is a presence of stress and a stress concentration (sharp corners in plates, bolt holes etc).

2 FOR OWNERS

Although the standard details what is required in a Major Inspection it is beneficial for all parties if owners take some time to define what they expect. A Major Inspection should be conducted in three parts:

1. An initial assessment based on the Telehandlers service history, and any information available from the manufacturer. (Table 1) NOTE: If service history is incomplete or unknown, a more comprehensive inspection will be required.
2. A pre-inspection – sufficient to assess the overall condition of the unit and provide a quotation. Items to be considered are listed in Table 2. This should include an allowance for variations resulting from a detailed inspection conducted during the Major Inspection.
3. A Major Inspection and repair – sufficient to cover all items listed in the schedule. Items to be addressed are listed in Table 3.

The Service provider should provide a quote for the Major Inspection that includes the cost for the works listed in Table 3. The provider should also provide a recommendation as to the viability of the Major Inspection and any potential to upgrade the Telehandler to the latest requirements of AS10896.1.

It is important to note that a Major Inspection does not encompass everything – on the completion of a Major Inspection you will not get a new machine. Tables 1-3 provides a schedule of items that must be completed in a Major Inspection. Table 4 is a list of additional items that should be considered during a Major Inspection. Owners are encouraged to complete the schedule and provide it to the service provider beforehand.

NOTE: There is an obligation under WHS Acts and Regulations to eliminate risk or minimise risk as far as is reasonably practicable. This includes considering what is known, at any particular time about risks and ways of reducing risk. AS2550.19 and other industry and association publications will highlight risks associated with use, the latest edition of AS10896.1 specifies risk reduction methods that may be addressed by design. The OHS Act and Regulations has similar provisions. (See Appendix A for further information).

2.1 OEM specified component replacement

OEMs may specify a greater frequency for replacement of certain components (e.g. wire ropes). The owner must provide evidence that such components have been replaced at the specified interval, otherwise they must be replaced at the time of the Major Inspection.

2.2 Owner's manual and logbooks

The owner should provide an operating and maintenance manual and current logbook to enable the service provider to check for any outstanding or repeated issues. NOTE: If a manual and/or logbook is not supplied the service provider will be obliged to provide new ones at additional cost

(From time to time, new versions of owner manuals are available via manufacturer websites which have latest researched information about the Telehandler. The owner should check for latest versions at least once a year to keep up-to-date.)

2.3 Variations to a Major Inspection scope

On occasions owners may choose to vary the scope of a Major Inspection, for example by undertaking to perform some work or to replace components themselves in order to reduce cost. This should be discouraged as disputes can arise regarding potential liability. Any variation must be acknowledged in the schedule, and service providers must detail any outstanding works in their final Major Inspection report. Wherever possible components to be provided by the owner should be supplied to the service provider before completion of a Major Inspection.

The Service Provider is responsible for the Major Inspection and therefore should conduct the work themselves and engage specialist services as necessary. (e.g. Welding, fibreglass repairs, NDT and insulation testing). The Service Provider shall utilise suitably equipped premises to perform the Major Inspection.

2.4 Quotations

The service provider should provide the owner with a quotation that is based on their preliminary inspection. This should include a cost to cover all the mandatory items listed in the scope of work, an indicative cost for other items that may require replacement subject to a detailed inspection undertaken during the Major Inspection. Note that except for the simplest of Telehandlers it is generally not possible to provide a fixed cost to perform a complete Major Inspection.

2.5 Major Inspection Report

A Report must be provided on the completion of the Major Inspection detailing significant repairs, Visual and NDT inspection reports relating to critical components, components replaced, relevant tests performed (function, load, stability and insulation tests as applicable), confirmation of completion of all OEM safety bulletins and recommendations relating to any subsequent inspections.

3 FOR SERVICE PROVIDERS

3.1 Preliminary Inspection

Contact OEM detailing the model no and serial no for the following: Advice should be provided in writing:

- safety upgrades and technical service bulletins;

- currency of operating and service manuals; (if available, revised manuals should be provided). Note: The service provider may be able to determine the currency of manuals from the OEM website;

- Major Inspection recommendations.

In the assembled state:

Inspect and photograph unit to record defects including:

- leaks, cracks, damage and corrosion;

- pivot pin retention and signs of seizing;

- deterioration of walking/standing surfaces;

- missing, damaged guards and covers;

- unauthorised modifications.

Check all functions and emergency retrieval systems and instructions.

Conduct pressure and speed tests against OEM recommendations.

Conduct Load test and check hydraulic creep.

Conduct dynamic and parking brake tests.

Conduct slew bearing (axial clearance) test (if applicable).

Check oil levels in transmission components (drive hubs and gearboxes).

Check platform guardrails, gate(s) and access ways (vehicle mounted Telehandlers) including steps and guardrails.

For Vehicle Mounted Telehandlers supported on flexible suspension: Conduct Stability Test. (Note AS2550.19 requires a stability test every two years commencing from the fifth year.)

For Insulated Telehandlers:

- Conduct insulation resistance test

Check EDD currency (if applicable). Record any problems and provide owner a report and quotation.

3.2 Major Inspection

Dismantle the unit to the extent necessary to perform a comprehensive inspection of all critical components. (See Table 5 for a list of typical critical components).

NOTE: It is not possible to perform a Major Inspection without some dis-assembly of the unit as generally it is not possible to inspect pins and bushes or the interior of booms or other critical components.

It is not an acceptable practice to carry out a Major Inspection “in situ”.

Conduct NDE on critical items - NOTE: all areas tested should be identified on the NDE report. **A competent person must nominate and record the areas to be inspected.** (It is not sufficient or even correct to say “all welds”). The NDE technician may nominate suitable test methods, **but it should not be left to the NDE technician to nominate the areas requiring inspection.** Areas requiring repair should be re-tested. The NDE report should itemise the areas inspected and list any test restrictions (e.g. inaccessible areas). NDE should be confirmed by a visual inspection.

Check areas subject to corrosion, assess and record loss of material thickness and rectify. (This will require replacement of the affected components if excessive). All bare areas must be repainted to inhibit further corrosion. Note: Steel surfaces coated with Low voltage fibreglass cover are particularly susceptible to corrosion underneath the glass.

Inspect pivot pins and bushes for wear and proper retention.

Inspect hydraulic cylinders for wear, distortion, scoring of cylinder rods, leaks and security of load holding valves.

Dismantle and inspect brake assemblies (if applicable).

Inspect hydraulic pipes, hoses and fittings. Hoses with damage to the outer sheath, or weeping must be replaced. Damaged tubes must be replaced.

Inspect hydraulic manifolds, fix leaks as required.

Check wiring, electrical connectors and switching for damage.

Check security and operation of all limit switches.

Inspect ropes and/or chains against manufacturer’s instructions or AS2359 (for wire ropes). Record results. NOTE: OEMs may specify replacement.

Inspect lanyard attachment points particularly for signs of damage or corrosion.

Inspect EDD ropes (if applicable) – replace if out of date.

All slew ring fasteners (on both inner and outer rings) must be replaced at 10 years.

NOTES:

In order to conduct a comprehensive inspection, the Telehandler must be thoroughly cleaned.

All replacement parts must be of equivalent specification and should be sourced from the OEM.

3.3 Redundant Items or systems

Some Telehandlers are fitted with additional controls or devices that are no longer required or have been replaced with substitute systems. All redundant devices, including controls and labels that refer to them must be removed.

3.4 Re-assembly and Test

Following reassembly and appropriate adjustment the following tests must be undertaken:

Functional Test through all movements; checking interlocks, alarms and indicators. NOTE: all indicators and controls (including selector or isolating valves and switches) must be labelled to indicate their function and operation.

Test of emergency retrieval systems;

Load Test (including hydraulic creep);

Electrical insulation acceptance test (if applicable).

Owner: _____
 Telehandler Model No.: _____ Serial No.: _____
 Date of Commissioning: _____
 DOM: _____
 Registration No.: (if applicable) _____
 Design Registration No: (if applicable) _____

MANDATORY ITEMS

Table 1 Initial Assessment

Item	Description	Comment	
1.1	Description of past use and intended future use.	Supplied by owner	
1.2	Operating and maintenance manual and logbooks	Supplied by owner	
1.3	Manufacturer's Technical Service Bulletins and Safety Alerts must be sought and confirmed as complete and if not, must be carried out.		
1.4	Manufacturer's specific Major Inspection instructions must be incorporated in the Inspection.	NOTE: All items listed in the inspection schedule must be inspected and a report on their condition and recommended action should be provided.	
1.5	Major Inspection Report	To be provided at completion (See 2.5)	

Table 2 Pre-inspection (Mandatory)

2.1	Inspect and photograph unit to record defects.	All faults identified at that time should be referred to the owner together with recommendations regarding rectification.	
2.2	Check for leaks, cracks, damage and corrosion;		
2.3	Check for pivot pin retention and signs of seizing;		
2.4	Check missing, damaged guards and covers;		
2.5	Check for unauthorised modifications.		
2.6	Check all functions and emergency retrieval systems and instructions.	Check that instructions correctly convey the intended operation.	
2.7	Conduct pressure and speed tests against OEM recommendations.		
2.8	Functional test of all systems, a load test to assess hydraulic creep should be undertaken	AS2550.19 requires a stability test to be performed on vehicle mounted Telehandlers that are supported wholly or partly on flexible suspension.	

2.9	Conduct dynamic and parking brake tests.		
2.10	Conduct slew bearing (axial clearance) test (if applicable).		
2.11	Check oil levels in transmission components (drive hubs and gearboxes).		
2.12	Platform guardrails, gate(s) and accessways (vehicle mounted TelehandlerS) including steps and guardrails. Check slip resistance of walking/standing surfaces.		
2.13	Check EDD(s) condition/ currency (if applicable)		
2.14	Insulation resistance test	For insulated Telehandlers	

Table 3 Major Inspection (Mandatory requirements)

3.1	The Telehandler must be dismantled to the extent necessary to perform visual inspections on all items.	It is not possible to inspect the Telehandler in a fully assembled condition.	
3.2	NDT to be performed on all critical components.	It is not possible to carry out all NDT "in situ".	
3.3	Check areas subject to corrosion, assess and record loss of material thickness and rectify if excessive.	All bare areas must be repainted to inhibit further corrosion.	
3.4	Inspect pivot pins and bushes for wear and proper retention.		
3.5	Inspect brake assemblies.		
3.6	Worn Hydraulic hoses must be replaced. E.g. where the protective sheath has been worn through to expose the reinforcing braid.		
3.7	Inspect worn wiring harnesses and connections. Defective items to be repaired or replaced.		
3.8	Check security and operation of all limit switches, proximity switches and transducers.		
3.9	Inspect ropes and/or chains against manufacturer's instructions or AS2359 (for wire ropes).	Record results. NOTE: OEMs may specify replacement.	
3.10	Inspect lanyard attachment points particularly for signs of damage or corrosion.	Lanyard anchorages should be marked per AS10896.1	
3.11	Inspect EDD ropes (if applicable) – replace if out of date.		
3.12	All Slew ring bolts should be replaced. Upper and lower sets		
3.13	240V power outlets. Inspect for worn/damaged harness, connections and power outlets. Inspection by licenced electrician.	(If applicable)	
3.14	All illegible signs and decals must be replaced.		
3.15	All components must be replaced with OEM parts or equivalent.		

3.16	Critical High Strength fasteners that have been removed must be replaced.		
3.17	Functional Test of all controls and interlocks (including emergency retrieval systems)		
3.18	Load test		
3.19	Insulation acceptance test	(For insulated Telehandlers)	

TABLE 4 DISCRETIONARY ITEMS (Additional items nominated by the owner)

4.1	Optional Upgrades available from the Manufacturer	e.g. generation upgrades to control systems.	
4.2	Optional kits available from the Manufacturer	e.g. lighting kits, secondary guarding.	
4.3	Replacement of all hydraulic hoses	Note: Consideration should be given to replacement of hoses which are difficult to access after the Telehandler is assembled.	
4.4	Protection against falls in accordance with the WHS Regulations.	Usually applicable to vehicle mounted Telehandlers.	
4.5	Full/partial or no paint finish	Note: Areas subject to corrosion should be painted or treated with suitable protection.	
4.6	Replacement of all decals/signs		
4.7	Installation of new (replacement) items	e.g. DC emergency pumps, hydraulic pumps.	
4.8	Describe issues relating to performance faults or failures that have been experienced during use.	e.g. intermittent faults or symptoms that are revealed under certain conditions of operation (e.g. overheating on hot days).	
4.9	Recommendations from the service provider		

TABLE 5
CRITICAL ITEMS

5.1	Platform		
	Platform guardrailing and gate		
	Harness anchor points		
	Platform rotator and connections	Fasteners, distortion, cracking, wear.	
	Levelling systems (All components)	Distortion, cracking, wear.	
5.2	Pivot pins and bushes	Wear	
5.3	Boom Assemblies	Damage/distortion/corrosion	
	Welds around all pivot points	Cracking	
	Welds at cylinder/link connections to boom assemblies	Cracking	
	Rubbing surfaces for wear pads/ rollers	Excessive wear	
	Fibreglass/steel connections	Looseness, corrosion. (Insulated Telehandlers)	
	Fibreglass booms and inserts	Cracks, damage, surface defects (Insulated Telehandlers)	
5.4	Extension/Retraction Mechanisms		
	Chains, ropes, sheaves, rollers and pins.	Wear.	
5.5	Turntable & pedestal	Damage/distortion/corrosion	
	Weldments	Cracking	
	Cylinder/link connections	Cracking	
	Slew gearbox and brake	Wear/cracking	
	Pinion and slew ring gears	Cracking/ damage	
5.6	Outriggers		
	Damage/distortion/corrosion		
	Weldments	Cracking	
	Sliding surfaces	Wear	
	Footplates	Damage/cracking	
5.7	Subframe/chassis	Cracking	
	Connections and fasteners		
5.8	Drive hubs and wheels.		
	Steering	Wear/ distortion/damage	
	Stub axles	Cracking	
5.9	Hydraulic Cylinders		
	Barrel	Distortion, Cracking, leaks	
	Piston Rod	Damage, distortion, cracking	

APPENDIX A

AN OVERVIEW OF THE WHS ACT

Objective

The general requirement for managing a safe work environment is outlined in the WHS ACT. One of the objectives of the Act is to protect workers and other persons against harm to their health, safety and welfare through the elimination or minimisation of risks arising from work or from specified types of substances or plant

Management of risk

The Act requires a person who has a duty to ensure health and safety to:

- (a) eliminate risks to health and safety, so far as is reasonably practicable; and
- (b) if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks so far as is reasonably practicable.

The meaning of Reasonably practicable.

Reasonably practicable means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, taking into account and weighing up all relevant matters including—

- (a) the **likelihood** of the hazard or the risk concerned occurring; and
- (b) the **degree of harm** that might result from the hazard or the risk; and
- (c) what the person concerned knows, or **ought reasonably to know**, about—
 - i. the hazard or the risk; and
 - ii. ways of eliminating or minimising the risk; and
- (d) the **availability and suitability** of ways to eliminate or minimise the risk; and
- (e) after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

THE WHS REGULATIONS

The WHS regulations are subordinate to the Act and provide in more detail how the Act may be complied with.

Duties under the Regulations

The Regulations specify duties to:

- **Identify** hazards;
- Manage risks to health and safety by **eliminating** risks to health and safety so far as is reasonably practicable;

and if it is not reasonably practicable, to implement **the hierarchy of risk controls** as follows:

- substitute (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
- isolate the hazard from any person exposed to it;
- implement engineering controls.

If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls. (e.g. Work methods and procedures).

If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment.