# Vehicle Practice

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**STABILITY TESTING OF AERIAL DEVICES & DIGGER/DERRICKS**

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Practice:

## 1.0 INTRODUCTION

This practice is to be used as a standard for the stability testing of all Class 4, 5, and 6 work vehicles used by Nova Scotia Power Inc. All new units must be tested after assembly before they are put into service and existing vehicles must be tested if they undergo any major additions or changes in configuration.

## 2.0 DEFINITIONS

**rated load capacity:** the maximum loads which can be lifted by an aerial device or derrick at specific boom elevations and extensions.

**stable:** the unit is considered stable if it can support the required test load in every position without overturning. A unit is not considered unstable until it reaches the point of overturning, ie. the lifting of outrigger(s) does not constitute an unstable unit.

## 3.0 REFERENCE CODES

The attached procedure is to be used in conjunction with:

3.1 CSA Standard C225-M88: "Vehicle-Mounted Aerial Devices"

3.2 ANSI A10.31: “Construction and Demolition Operations - Safety Requirements, Definitions and Specifications for Digger Derricks” (most current issue).

## 4.0 TEST LOAD DETERMINATION

### 4.1 Derrick/Diggers

(a) **Derrick/Diggers only:**

(i) Determine the capacity of the digger derrick from the hydraulic load capacity chart supplied by the manufacturer.
(ii) Multiply this load by 1.18 or as specified by the manufacturer.
(iii) Test on level ground with all booms horizontal (Section 6.0).

(b) **Derrick/Diggers Equipped with Bucket:**

(i) Perform the test as described in 4.1(a).
(ii) Perform the test as described in 4.2(a).

(c) **Derrick/Diggers Equipped with Bucket and Winch Control and/or Jib:**

(i) Perform the test as described in 4.1(a).
(ii) Perform the test as described in 4.2(b).

### 4.2 Aerial Devices

(a) **Without Material Handling Capability:**

(i) Multiply the bucket capacity (350 lbs per bucket) by 2.00.
(ii) Test on level ground and on a 5° slope with all booms horizontal or as specified by the manufacturer (Sections 6.0 & 7.0).

(b) **With Material Handling Capability:**

(i) Determine the capacity of the hydraulic equipment and the boom configuration from the applicable hydraulic load capacity chart supplied by the manufacturer.
(ii) Multiply this load by 2.00.
(iii) Test on level ground and on a 5° slope (Sections 6.0 & 7.0).

## 5.0 FIELD TEST PREPARATION

5.1 Ensure that the unit is tested on firm ground and that there is sufficient overhead and side clearance for the booms and loads.

5.2 The unit must be tested empty.

-Remove all non-permanent accessories, parts, etc.
-Ensure that fuel tank(s) are near empty or a maximum of 1/4 full.
-Ensure that all buckets are equipped with liners.

5.3 Ensure that the unit is equipped with a two-way level/angle indicator.

5.4 When the unit is in the test area, apply the brakes and engage the P.T.O.

5.5 Extend all outriggers until they firmly meet with the ground and no further.

5.6 For digger/derricks, ensure that digger, auger, and pole grabber (if equipped) are in their stored position and activate the top controls.

5.7 A forklift or other lifting device must be available to aid in the application and removal of test loads.

## 6.0 TEST ON LEVEL GROUND

6.1 Prepare unit for test (Section 5.0).

6.2 Using angle indicator, ensure the unit is at 0° with outriggers deployed.

6.3 Raise the lower boom from the boom rest, rotate the device to the location of the test weights, and extend the jib (if equipped) two feet or as specified by the manufacturer.

6.4 Ensure that bucket rotators are in their most forward position, if applicable.

6.5 Apply the test load to a sling around the bucket shaft(s), to the winch line, or both, as applicable.

6.6 Articulate booms as necessary to form the required boom configuration.

6.7 Raise the test load approximately two feet off the ground.

6.8 Rotate the load 360° at 1/4 of normal rotation speed to ensure booms will clear all vehicle and body structures.

6.9 If the unit becomes unstable in its least stable area: remove the load, extend the outriggers about two inches, and retest. If outrigger lift becomes excessive, 10-12 inches, refer to the Original Equipment Manufacturer for allowable specifications. When the unit is stable, the

extension resulting is the minimum extension of the outriggers. Record the minimum outrigger spread from the centerline of the tower to the centre of the foot pad pivot pins. Mark the points at which the outrigger legs emerge from the outrigger frame. Small holes (3/8") must be drilled through the neutral axis of each leg at the minimum extension marks and the legs must be painted green above the holes.

## 7.0 TEST ON 5° SLOPE

7.1 Block the outriggers and/or wheels as required to simulate a 5° slope using outrigger pads or equivalent as blocks. All available outriggers must be deployed at minimum extension during the blocking procedure. When blocking the front wheels, use the outrigger spread of the front outriggers to calculate the block heights. Also, if the front and rear outriggers are different, calculate block heights for both sets. The following formula is used to calculate heights:

**Height = Spread x tan(5°) = Spread x 0.0875**

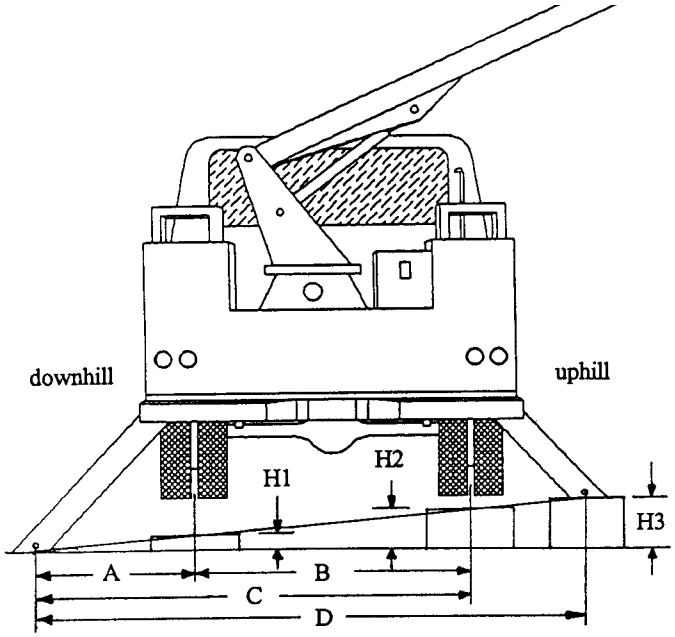



**Figure 7.1: Vehicle and Block Dimensions**

**where**:

A = distance between downhill outrigger foot pin & centre of downhill wheel
B = track width: distance between centre of wheels
C = distance between downhill outrigger foot pin & centre of uphill wheel
D = distance between outrigger foot pins when outriggers are at minimum extension
H1 = block height required for downhill wheel(s)
H2 = block height required for uphill wheel(s)
H3 = block height required for uphill outrigger(s)

**(a) Units Equipped With 2 Sets of Outriggers:**

(i) Block the outriggers on one side of the unit with a height H3 determined by:

**H3 = D x 0.0875**

(ii) Block the front wheels with heights H1 and H2 determined by:

**H1 = A x 0.0875**
**H2 = C x 0.0875**

**(b) Units Equipped With 1 Set of Outriggers:**

(i) Block the front wheels using heights H1 and H2 determined by:

**H1 = A x 0.0875**
**H2 = C x 0.0875**

A ramp must be used to drive the truck's front wheels onto the blocks.

(ii) Block the uphill outrigger with a height H3 determined by:

**H3 = D x 0.0875**

**(c) Units Equipped With 1 Set of A-Frame and 1 Set of Vertical Outriggers (VST 5000):**

(i) Block the A-Frame outrigger on one side of the unit using a height H3 determined by:

**H3 = D x 0.0875**

(ii) Block the Vertical outriggers using heights H4 and H5 determined by:

**H4 = E x 0.0875 (downhill)**
**H5 = F x 0.0875 (uphill)**

where: E = distance between downhill A-Frame outrigger and downhill Vertical outrigger
F = distance between downhill A-Frame outrigger and uphill Vertical outrigger

(iii) Block the front wheels using heights H1 and H2 determined by:

**H1 = A x 0.0875**
**H2 = C x 0.0875**

(d) **Units Without Outriggers:**

(i) Block the wheels on one side of the unit with a height H2 determined by:

**H2 = B x 0.0875**
**H1 = 0**

Ramps must be used to drive the vehicle onto the blocks.

7.2 Extend outriggers to minimum extension. Ensure the unit is at a 5° angle using the angle indicator.

7.3 Level the unit as much as possible by increasing the length of the outriggers on the downhill side.

7.4 Apply the test load to a sling around the bucket shaft(s), to the winch line, or both, as applicable.

7.5 Articulate booms as necessary to form the required boom configuration.

7.6 Raise the test load approximately two feet off the ground.

7.7 Rotate the load 360° at 1/4 of normal rotation speed to ensure booms will clear all vehicle and body structures.

7.8 If the unit becomes unstable, reduce the test load and retest until unit is stable. Digger/derrick test loads may be down-rated in specific sectors.

7.9 Repeat this test, now blocking the outriggers/wheels on the other side of the unit.

## 8.0 REPORTS/FINAL INSPECTION

8.1 A Stability Testing Record (Attachment 1) must be completed and forwarded to Fleet Technical Services.

8.2 A Stability Chart (Attachment 2) must be mounted on all Digger/Derricks since they have the ability to be down rated in specific sectors.

8.3 The unit must receive a final inspection to check for permanent deformation of any component of the aerial device/digger derrick.

## STABILITY TESTING RECORD FOR DERRICKS & AERIAL DEVICES

NOVA SCOTIA POWER An Emera Company

HOLDING WORK ORDER # _____ VEHICLE # _____

MAKE OF DERRICK/AERIAL DEVICE _____

MODEL OF DERRICK/AERIAL DEVICE _____

SERIAL NUMBER OF DERRICK/AERIAL DEVICE _____

DATE OF TEST _____ TESTED BY _____

**DERRICKS:**

- CORNERMOUNT ☐
- CENTREMOUNT OVER REAR AXLE ☐
- CENTREMOUNT BEHIND CAB ☐
- BUCKET-EQUIPPED ☐

**AERIAL DEVICES:**

- 1 BUCKET ☐
- 1 BUCKET (MATERIAL HANDLING) ☐
- 2 BUCKET (MATERIAL HANDLING) ☐
- EQUIPPED WITH 2 OUTRIGGERS ☐
- EQUIPPED WITH 4 OUTRIGGERS ☐

EXTENSION OF OUTRIGGERS FROM CENTRELINE OF TOWER DURING TESTING:

FRONT LEFT _____ in. FRONT RIGHT _____ in.
REAR LEFT _____ in. REAR RIGHT _____ in.

**NOTES:**

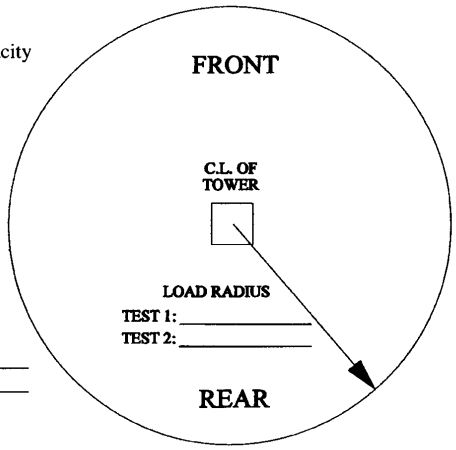
1) Refer to Vehicle Practice VP 03-13.
2) Only Digger/Derricks may be downrated in certain sectors. If an Aerial Device is unstable, the rated capacity must be reduced.
3) To illustrate downrated sectors, draw lines from the tower to the load radius circle showing the range of instability and record the test load used.
4) All tests performed on level ground and on a 5° slope except Digger/Derricks. Test 2 may or may not be applicable.
5) Test B or C may also need to be performed if Digger/Derrick is equipped with a bucket and/or jib.

**TEST LOADS:**

A. Digger/Derrick: 1.18(or manufacturer's recommendation) x Rated Capacity
TEST 1: _____ lbs (Level Ground Test only)

B. Non-Material Handling Aerial Device: 2 x Rated Bucket Capacity
TEST 1: _____ lbs

C. Material Handling Aerial Device: 2 x Rated Capacity
TEST 1: _____ lbs
TEST 2: _____ lbs




**BOOM CONFIGURATIONS:**

| | Lower Boom Angle | Upper Boom Angle |
|---|---|---|
| TEST 1: | _____ | _____ |
| TEST 2: | _____ | _____ |

COUNTERWEIGHT ADDED: _____ lbs

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