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| Effective Date: 3.17.08 | | |

# Environment & Remediation Support Services

# Standard Operating Procedure

for **METEOROLOGICAL TOWER HOIST OPERATION**

**APPROVAL SIGNATURES:**

| Subject Matter Expert: | Organization | Signature | Date |
|---|---|---|---|
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Per telecon w/Paul 3.18.08

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## 1.0 PURPOSE AND SCOPE

The purpose of this procedure is to describe the requirements for operating the identified tower instrumentation hoist/winch systems (both powered and manual) for accessing the tower instrumentation for the Los Alamos National Laboratory (Laboratory or LANL) for the Environment & Remediation Support Services (ERSS). This procedure provides the background and describes the locations of all the meteorological towers. It describes the work processes to install, replace, or maintain the instruments after they are lowered according to this procedure.

This procedure applies to the individuals who operate these site operations that utilize hoists and winches to lower or raise the booms or tilt the towers. This procedure only applies to hoist operation and carriage removal.

## 2.0 BACKGROUND AND PRECAUTIONS

### 2.1 Background

The towers at TA6, TA49, TA53, and TA54 all have the same model TS2500 instrument hoist manufactured by Tower Systems, Inc. (TSI). The hoist (or winch, in some documents) system is used to raise instrument carriages to predetermined positions on the towers. The carriages ride on rails attached to one face of the tower and are lifted by the hoist's lifting cable.

Each carriage is clamped to the common lifting cable at a precise position so that the carriages all plug into their respective signal connectors simultaneously. In this way, the signals from the instruments are connected to the data logger located at ground level. When a carriage plugs into its respective connector a switch closure is detected by the hoist control and the hoist electric motor stops. The hoist control has an "override" switch and the carriage connectors have a limited spring-load that allows the operator to ensure that all the carriages are connected.

Conversely, when the instrument carriages are lowered to the ground for removal, there is a limit switch that stops the hoist when a carriage reaches the ground level. The override switch is used to adjust this ground level position to facilitate removal of the carriages. The carriage lowered to ground level must be removed before the next carriage can be lowered.

### 2.2 Precautions

Special attention to the status of the hoist control switch and breaker. Do not work on carriage with control switch in the ON position. Fully inspect all accessible parts of the hoist system before beginning this procedure. Use Form 1591, Monthly Inspection Record for Fixed Hoists.

## 3.0 EQUIPMENT AND TOOLS

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| • Safety shoes;<br>• Safety Glasses;<br>• Hard hat; | • Leather Work Gloves;<br>• Pager and Cell Phone; and<br>• Completed Form 1591, Monthly Inspection Record for Fixed Hoists. |

## 4.0 STEP-BY-STEP PROCESS DESCRIPTION

### 4.1 Lowering the Carriages for the TA-6, TA-49, TA-53, and TA-54 Towers

| | | |
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| Meteorological Instrument Technician | 1. | Loosen the two screws that secure the cover to the hoist control weather tight box. |
| | 2. | Open the hoist control box cover and push in the 20 amp circuit breaker that applies power to the hoist control box. |
| | 3. | Lift the mechanical switch guard and turn **ON** the winch control ON/OFF switch.<br>[NOTE: Because the carriage interlock switches are activated, the winch will not run.] |
| | 4. | Set the hoist UP/DOWN switch to the **DOWN** position. |
| | 5. | Activate the LIMIT OVERRIDE switch and the hoist will begin lowering the instrument carriages. |
| | 6. | **[CAUTION – Stay near the hoist control in case it is necessary to stop the hoist for any reason.]**<br>After 6" of travel, release the "override" switch and the hoist will continue to run. |
| | 7. | If for any reason it is necessary to stop the hoist, simply close the switch guard over the ON/OFF switch – this will shut off the switch and the hoist. |
| | 8. | During this period, with the hoist running, perform the following steps:<br>• Listen for strange sounds that might indicate a problem;<br>• Examine the lifting cable for damage as it moves past;<br>• Test the lower limit switch by pulling its arm down (the hoist should stop); and<br>• Let go of the limit switch and allow the carriage to come down and engage the bottom travel limit switch.<br>[NOTE: This is where it is considered PARKED.] |
| | 9. | With the bottom carriage at this PARKED position where it activated the BOTTOM TRAVEL LIMIT SWITCH, prepare for the removal of this carriage so that the next carriage may be lowered. |
| | 10. | Shut **OFF** the hoist control ON/OFF switch and pull **OUT** the 20 amp circuit breaker. |
| | 11. | Remove the carriage's bottom cable clamp that attaches the carriage to the lifting cable.<br>[NOTE: The carriage's top cable clamp will hold the carriage in position.] |

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| Meteorological Instrument Technician (Continued) | 12. | Install the "gap fillers" in the gap between the bottom of the rail system and the top of the hoist housing.<br><br>[NOTE: The gap fillers rest on the hoist housing and have a lock-bolt that engages the bottom of the two rails. The gap fillers are adjustable to provide a proper fit.] |
| | 13. | Connect a carriage signal jumper cable between the carriage's signal connector and the appropriate connector on the tower J-box.<br><br>[NOTE: The limit switch lamp, within the hoist control box, will illuminate indicating the jumper cable is properly plugged in. This connection activates the hoist control's limit switch system and will require activation of the override switch for any hoist movement. This jumper cable also connects all the carriage's instruments just as they are when the carriage plugs into its mating connector up the tower.] |
| | 14. | Push 20 amp breaker **IN**. |
| | 15. | Turn **ON** the hoist control ON/OFF switch and momentarily activate the OVERRIDE switch to move the carriage down onto the gap-filler. |
| | 16. | **[WARNING – If you fail to connect the carriage to the tower J-box with a jumper cable, then the hoist will run freely when the carriage clears the BOTTOM TRAVEL LIMIT SWITCH, the carriage will impact the hoist housing and there may be damage.]**<br><br>When the carriage clears the bottom of the tower-mounted rails, by approximately 2 inches, release the OVERRIDE switch. |
| | 17. | Turn **OFF** the hoist control ON/OFF switch. |
| | 18. | Pull 20 amp breaker **OUT**. |
| | 19. | Mark the carriage's position on the lifting cable so that the carriage may be reattached to this exact position. Steps 20 thru 22 explain in detail how to do this..<br><br>[NOTE: There is about 12" of lifting cable visible between the top and bottom cable clamp positions.] |
| | 20. | Use white spray to make this area more noticeable.<br><br>[NOTE: Since it has been spray-painted in the past, this may not be necessary.] |
| | 21. | Use a measuring tape and locate a point 6" down from the carriage's upper horizontal bracket. |
| | 22. | Using a black Sharpie™ pen, carefully mark the circumference of the cable so that the cable has a ring around it at this 6" position. |

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| Meteorological Instrument Technician (Continued) | 23. | Lock the carriage to each of the gap fillers with large cable ties. |
| | 24. | Remove the carriage's top cable clamp and disconnect the jumper cable.<br>[NOTE: The carriage is now free of the lifting cable and is cable-tied to the gap fillers.] |
| | 25. | Unlatch the gap fillers from the bottom of the tower's rail system. |
| | 26. | Stand beneath the carriage, with the carriage's boom tubing resting on your shoulders or two persons can lift it. |
| | 27. | Lift up the carriage assembly and move it away from the tower.<br>[NOTE: There are stands located near the tower that will receive the carriage assembly and hold it by engaging the gap fillers.] |
| | 28. | Push **IN** 20 amp breaker. |
| | 29. | Turn **ON** the ON/OFF switch and the hoist will bring the next carriage down to the BOTTOM TRAVEL LIMIT SWITCH. |
| | 30. | Repeat steps 7 through 27 for the remaining carriages except the top carriage.<br>[NOTE: The last, or top carriage, is not removed from the tower. The Meteorological Instrument Technician can perform required maintenance by accessing this carriage's instruments with a ladder.] |
| | 31. | Turn **OFF** the hoist control ON/OFF switch. |
| | 32. | Pull **OUT** 20 amp breaker. |

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## 4.2 Raising the Carriages for the TA-6, TA-49, TA-53, and TA-54 Towers

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| Meteorological Instrument Technician | 1. | Since the top carriage is not removed from the lifting cable, raise this carriage until the next carriage's position on the cable becomes visible above the hoist housing.<br>Steps 2 thru 9 explain in detail. |
| | 2. | Push **IN** the 20 amp breaker. |
| | 3. | Set the hoist UP/DOWN switch to the **UP** position. |
| | 4. | Turn **ON** the hoist control ON/OFF switch. |
| | 5. | Activate the LIMIT OVERRIDE switch and the hoist will begin raising the instrument carriage. |
| | 6. | **[CAUTION – stay near the controls and, if for any reason it is necessary to stop the hoist, close the switch guard over the ON/OFF switch. This will shut off the switch and the hoist.]**<br>After 6" of travel, release the OVERRIDE switch and the hoist will continue to run. |
| | 7. | Watch the lifting cable as it emerges from the hoist housing. |
| | 8. | During this period with the hoist running, perform the following steps:<br>• Stay near the hoist control in case it is necessary to stop the hoist for any reason;<br>• Listen for strange sounds that might indicate a problem; and<br>• Examine the lifting cable for damage as it moves past. |
| | 9. | When the white-painted part of the cable is visible, stop the hoist with the switch. |
| | 10. | Pull **OUT** the 20 amp breaker. |
| | 11. | Turn **OFF** the ON/OFF switch. |
| | 12. | Retrieve the next carriage from its stand and place it in the gap between the bottom of the tower's rail system and the top of the hoist housing. |

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| Meteorological Instrument Technician (Continued) | 13. | Engage the gap-filler lock bolts with the tower rails. |
| | 14. | Connect a carriage signal jumper cable between the carriage's signal connector and the appropriate connector on the tower J-box.<br>[NOTE: This connection activates the hoist control's limit switch system and will require activation of the "override" switch for any hoist movement. The limit control light for this carriage position will illuminate.] |
| | 15. | Push **IN** the 20 amp breaker. |
| | 16. | Turn **ON** the ON/OFF switch.<br>[NOTE: The hoist will not run because this carriage has activated the hoist control limit switch system.] |
| | 17. | Hold a measuring tape in the space between the top and bottom brackets of the carriage where the lifting cable is visible. |
| | 18. | Bump the OVERRIDE switch until the black mark on the lifting cable (made before the carriage was removed) aligns with the 6' mark on the measuring tape. |
| | 19. | Turn **OFF** the ON/OFF switch. |
| | 20. | Pull **OUT** the 20 amp breaker. |
| | 19. | Install the top cable clamp that attaches the carriage to the lifting cable. |
| | 20. | Cut the cable-ties that secure the carriage to the gap-fillers and remove the remnants. |
| | 21. | Turn **ON** the ON/OFF switch. |
| | 22. | Push **IN** the 20 amp breaker. |
| | 23. | With the jumper cable still connecting the carriage to the J-box, raise the carriage onto the tower rail system so that the gap filler may be removed.<br>[NOTE: The OVERRIDE switch must be used.] |
| | 24. | Turn **OFF** the ON/OFF switch. |
| | 25. | Pull **OUT** the 20 amp breaker. |

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| Meteorological Instrument Technician (Continued) | 26. | Remove the gap fillers. |
| | 27. | Install the bottom cable clamp that attaches the carriage to the lifting cable.<br>**[CAUTION – Be careful to re-install all the cable clamps on each carriage.]** |
| | 28. | If cable clamps are left-over after all the carriages have been raised, lower the carriages to locate the carriage which doesn't have all the required clamps. |
| | 29. | Perform a final inspection of the boom and instrumentation to account for all tools and parts. |
| | 30. | Disconnect the jumper cable that connects the carriage to the J-box. |
| | 31. | Turn **ON** the ON/OFF switch. |
| | 32. | Push **IN** the 20 amp breaker. |
| | 33. | Activate the "limit override" switch and the hoist will begin raising the instrument carriages. |
| | 34. | After about 6" of travel, the carriage will be clear of the bottom travel limit switch, at which point release the OVERRIDE switch and the hoist will continue to run. |
| | 35. | Repeat steps 6 through 34 for the remaining carriages. |
| | 36. | When all the carriages are lifted to their operating positions, a light for each level will illuminate in the hoist control box. |
| | 37. | If one or more of the lights have not illuminated, bump the carriages up with the OVERRIDE switch by momentarily depressing the switch.<br>[NOTE: The spring loaded connectors on each carriage only have about 2" of travel.] |
| | 38. | If a carriage is not properly positioned on the cable, re-position that carriage. |
| | 39. | To do that, lower and remove carriages until the miss-positioned carriage is accessible. |
| | 40. | Verify all the lights (corresponding to the number of carriages) are illuminated. |
| | 41. | Turn **OFF** the ON/OFF switch. |

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| Meteorological Instrument Technician (Continued) | 42. | Pull **OUT** the 20 amp breaker. |
| | 43. | Close the hoist control box cover and tighten the two screws. |

## 4.3 Lowering the MDCN Tower at TA 5-61

| | | |
|---|---|---|
| Meteorological Instrument Technician | 1. | Disconnect the guy cables that connect the top of the tower to the base to allow the tower to be tilted. |
| | 2. | Remove the bolt that pins the tower at the top of the tripod base. |
| | 3. | Feed out a small amount of the winch cable, and push the tower in the direction that it tilts to move it off the vertical position. |
| | 4. | Once the tower is starting to tilt or lean toward the proper direction, crank out the winch cable until the tower is lowered to the desired position. |

## 4.4 Raising the MDCN Tower at TA 5-61

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|---|---|---|
| Meteorological Instrument Technician | 1. | Raise the tower to a vertical position with the hand crank winch. |
| | 2. | When the vertical position is reached, re-install the bolt at the top of the tripod base that pins the tower in a vertical position. |
| | 3. | Re-connect the guy cables that connect the top of the tower to the base. |

## 4.5 Lowering the Tower at TA 41-64

| | | |
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| Meteorological Instrument Technician | 1. | Plug the power cord for the telescoping winch motor into the electrical outlet at the tower base. |
| | 2. | Retrieve the winch control key from the data logger shelter (ice chest). |
| | 3. | Insert the key in the winch control and activate the winch control. |
| | 4. | Depress the MOMENTARY ACTION switch and lower the tower until the BOTTOM LIMIT switch is activated. |
| | 5. | Un-plug the winch power cord. |
| | 6. | Disconnect the limit switches connectors from the winch control. |

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| Meteorological Instrument Technician (Continued) | 7. | **[WARNING - The <u>tower must be nested</u> or collapsed to its minimum height <u>before removing these bolts</u> – the tilt-over winch is not designed to tilt a fully extended tower.]**<br>Remove the large bolts that attach the bottom of the tower to the tower base support unit. |
| | 8. | Feed out a little slack in the cable from the hand crank tilt-over winch. |
| | 9. | Use a pry-bar to pry the tower away from the tower base to begin tilting the tower.<br>[NOTE: It may be necessary to feed out a little more slack and then pry on the tower once or twice more until the tower's weight shifts from the balanced vertical position.] |
| | 10. | Once the tower shifts from the balanced vertical position, continue cranking out the cable until the tower is near horizontal. |
| **4.6 Raising the Tower at TA 41-64** | | |
| Meteorological Instrument Technician | 1. | With the tilt-over winch, crank-in the cable to raise the tower back to a vertical position. |
| | 2. | As necessary, use a pry-bar to align the tower bolt flanges with the base unit bolt flanges. |
| | 3. | With the holes in the bolt flanges aligned, re-install all the bolts that connect the tower to the base unit. |
| | 4. | Reconnect the two limit switches to the winch control. |
| | 5. | Plug the winch power cord into the electrical outlet. |
| | 6. | Press (up) the momentary-action switch to raise the tower. |
| | 7. | While the tower is being raised, watch the instrument signal cables to ensure that cables do not get tangled. |
| | 8. | Raise the tower until the top limit switch is engaged or the sound from the winch motor changes indicating that the tower is full extended.<br>[NOTE: The instrument signal cable bundle will be taut at this point.] |
| | 9. | Unplug the winch power cord from the electrical outlet. |

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## 4.7 Records

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| Meteorological Instrument Technician | 1. | None. |

## 5.0 PROCESS FLOW CHART

Flow chart is to be included at a later date.

## 6.0 ATTACHMENTS

None.

## 7.0 REVISION HISTORY

Author: Paul Ortega

| **Revision No.** *[Enter current revision number, beginning with Rev.0]* | **Effective Date** *[DCC inserts effective date for revision]* | **Description of Changes** *[List specific changes made since the previous revision]* | **Type of Change** *[Technical (T) or Editorial (E)]* |
|---|---|---|---|
| 0 | 02/08/05 | New Document –ENV-MAQ-408 | |
| 1 | 03/08/06 | Updates to background and tower location section ENV-MAQ-408 | E |
| 0.0 | 12/13/06 | Reformatted and renumbered<br>New number: EP-ERSS-SOP-5100<br>Technical changes made to Step by Step Process descriptions | T |
| 1 | 11/14/07 | Refined Sep by Step process descriptions | T |
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