Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
Excavator Removal Work Plan

Date submitted
11/25/2009

Submitted to whom
Leo Francendese

Concurrence

Received	Not Applicable	TVA
☒	☐	Mike Scott
☐	☒	Steve McCracken
☒	☐	Kathryn Nash
☐	☐	Dennis Yankee
☒	☐	Michelle Cagley
☐	☐	Tim Russ
☐	☐	_____

Received	Not Applicable	Jacobs
☐	☒	John Moebes
☐	☒	Julie Pfeffer
☒	☐	Jack Howard
☐	☐	_____
☐	☐	_____

Approvals

TVA Kathryn Nash Date 11/25/09

EPA [signature] Date 11/25/09.

cc:

- ☒ Anda Ray, TVA
- ☒ Barbara Scott, TDEC
- ☒ Leo Francendese, EPA
- ☒ Mike Scott, TVA
- ☒ Dennis Yankee, TVA
- ☒ Kathryn Nash, TVA
- ☒ Cynthia Anderson, TVA
- ☒ Steve McCracken, TVA
- ☒ EDM
- ☒ Julie Pfeffer, Jacobs
- ☒ David Stephenson, TVA
- ☒ Michelle Cagley, TVA
- ☒ Greg Signer, TVA
- ☒ KIF Incident Document Control
- ☒ Katie Kline, TVA
- ☒ Gretchen Wahl, Jacobs
- ☒ Dannena Bowman, EPA
- ☒ Jeff Gary, Jacobs

Excavator Removal from the Emory River Work Plan

1.0 Purpose

In order for dredging operations to proceed without delay, the excavator that was taken in to the river with the ash must be removed. It is currently located in the projected dredging path. This work plan addresses the methodology planned for its removal.

2.0 Design

There is no design for the removal operations.

3.0 Construction

The plan for removal of the submerged excavator will be to first mobilize a barge mounted crane to the site. A dive team will be present to perform all underwater rigging and will rig the crane equipment to the proper points identified by the excavator manufacturer. The crane will then lift the excavator from the water and crews will thoroughly wash the equipment prior to placing it on the barge. This barge will then take it to the South dock at the Kingston Fossil Plant where it will be offloaded onto a flatbed truck for transport to a TVA repair facility.

A finalized plan detailing the proposed rigging methods will be submitted as an addendum once it has been received.

Spill and Turbidity Control- Turbidity curtains will be in place surrounding the work area to control turbidity issues during work operations. Spill control booms will be used in the event of any breach of fluids during the excavator removal process.

4.0 Schedule

Upon approval of this plan, excavator removal work is currently scheduled to commence December 3, 2009. All operations should be complete within one week of the start date.

5.0 Waste Management

Any waste generated from decontamination procedures will be handled as stated in the decontamination plan.

6.0 Health and Safety

The activities in this work plan will follow the site-wide health and safety plan. Operations will be performed using TVA Diving Services following all TVA diving protocol. All personnel, vehicles, and equipment will be subject to decontamination requirements as listed in the site-wide health and safety plan prior to leaving the site.

WORK PACKAGE CONTENTS

Work Order/Short Code	
Outage/Project Number	
Responsible Organization/ Contact	Various
Performing Organization	ESS/ PSS
Work Package Description	Remove 325B cat excavator from Emory River
Location	Kingston – Emory River

Work Package Documents Included

Yes	No	
☒	☐	Step Text (Required)
☒	☐	Safety Analysis (Required)
☒	☐	Permit List / Hold Order Boundaries (Required)
☒	☐	Pre-Job Briefing Form (Required)
☒	☐	Environmental Analysis
☐	☒	Material List
☐	☒	Tools & Special Equipment
☒	☐	Drawings / Specifications / Manuals
☐	☒	Configuration Management
☐	☒	GSA
☐	☒	FME
☐	☒	TVA & Contractor Orientation / Access/ Quality Control
☐	☒	Other, Specify:

Submitted By: Clint Stults
Supervisor: Chris Hutt
Reviewed By:
Approved By:
Plant / Facility: Kingston
Date: 10/05/09

SCOPE: Lift Cat 325B excavator from water, place on barge, travel barge to work dock, place excavator on trailer.

I - STEP TEXT

1. IMPLEMENTATION

1.1. PRE-JOB

1.1.1. Walkdown job with customer.
1.1.2. Verify permit requirements as noted in permit section are met.
1.1.3. Review JSA and conduct a pre-Job Briefing (Minimum Daily).
1.1.4. All TVA procedures will be followed including 802,711 and 721.
1.1.5. Procure Manitowoc 4100 barge mounted crane, rigging, etc.
1.1.6. Maintain all oil containments

1.2. Support

1.2.1. Review any needed support from customer or vendors. Obtain as needed.
1.2.2. Assist environmental groups in any way possible

General:

1. Anytime the work package is found to have an error or to be incomplete, work will be stopped and the document corrected prior to re-start of the work. Contact the crane supervisor or planner/coordinator

2. Execution of the work shall be done in compliance with all applicable TVA Procedures including but not limited to the following:
    - Wear all required PPE
    - Wear full body harness when working more that 4' high
    - Each employee shall complete and possess daily a "Job Planning & Safety Assessment" card.
    - A hold back and blocking adequate to stop the machine shall be used at all times when traveling crawler cranes down an incline.
    - Passengers will not be allowed on any heavy equipment when traveling the equipment.

3. During execution of the work the work package step text and JSA shall be review and modified as necessary to facilitate continuous improvement of the entire package.

4. At the completion of the job the person in charge will complete the "Work Package Feedback Questionnaire" section of this work package and return the package along with proposed modifications to the Crane Crew Planner/Coordinator in Muscle Shoals.

5. For all work detailed below that requires rigging. Review work to determine the correct classification of rigging, Normal or Complex, Per TVA Procedure TSP 721A. Follow appropriate procedure and document on the appropriate rigging plan form. Training requirements for advanced rigger do not have to be met until January 1, 2010. The most experience rigger shall serve as the advanced rigger. The Rigging Program Coordinator may be contacted where additional expertise is needed.

Travel 4100 Manitowoc crane onto barge at Fleet Harbor (Muscle Shoals)

1.2.3. This step text is for traveling the crane onto the barge
1.2.4. Arrive on site for a safety orientation
1.2.5. Foreman completes JSA and pre-job briefing.
1.2.6. Crew completes Job Planning and Safety Assessment card (blue card).
1.2.7. All TVA procedures will be followed including 802, 711 and 721.
1.2.8. All Manufacture procedures will be followed.
1.2.9. Foreman ensures everyone understands the scope of work and that if they are told to do something not covered in the JSA or Pre-Job Briefing, or if they are to do something that is not wrote on their "blue card" that they are to stop and ask for further guidance and safety procedures from the foreman. Foreman understands that if he's in doubt he will contact his management.
1.2.10. The assembled crane will be walked down the sloped ramp (percent grade unknown due to the uncertainty of the water level at the time) with the assistance of a D-8 and D-6 Dozer. Rigging will be performed by certified riggers. The D-8 and D-6 dozer will be used as a holdback and help control the rate of descent. The operators should keep slight tension in the chokers to help keep stress off the crane undercarriage, especially when turning on an inclined slope. (**CAUTION**) when pre-staging and traveling the crane be aware of overhead power lines. Per TVA Procedure 802, clearance required for crane in transit is per feet minimum, see table below
1.2.11. The chokers (1-1/4" or larger) will connect from the under frame of the Manitowoc 4100 to the D-8 and D-6 dozer. (See attached drawing).
1.2.12. (Caution) When rigging under the blade of a bulldozer use extreme caution. A Device will be used to prevent the rigger from being crushed by the dozer blade. Crib or utilize another bulldozer blade at the edge will prevent the dozer blade from free falling and causing serious injury, crushing, or pinning the rigger.
1.2.13. A primary flagman and secondary safety observers will be present to aide in the process. All flagmen shall stay far away as possible during this procedure but close enough to give proper signals. Flagmen and grounds crew shall stay at a safe distance in case of broken chokers, chains, equipment, etc. No one shall be in front of the crane's direct path during travel on the incline. No riders will be allowed on the crane at anytime. Travel conditions for a 4100 Manitowoc uphill and downhill are provided (see folio drawings 1114-16,-114-19).
1.2.14. The crane will be positioned on the barge before shift change or leaving to go home due to the rise of water levels.
1.2.15. After crane is positioned on the barge crane mats, the crane will be lashed (boomed down) for water travel. Tied down across tracks to lugs welded on the barge.
1.2.16. The crane is equipped with a load cell which is calibrated annually.
1.2.17. All HED TVA cranes are load tested and inspected after erection.

1.1. TOWING FROM MUSCLE SHOALS TO KINGSTON

1.1.1. Build tow at Muscle Shoals.
1.1.2. Depart fleet harbor mile 259.4 up bound.
1.1.3. Locking Wheeler Lock. Two deckhands required.
1.1.4. Depart Wheeler Lock up bound
1.1.5. Locking Guntersville Two deckhands required.
1.1.6. Depart Guntersville up bound
1.1.7. Locking Nickajack, two deckhands required.
1.1.8. Depart Nickajack up bound
1.1.9. Figure ETA for Chickamauga. Have support personnel on sight for help with double locking. Lock is closed to navigation between the hours of 3am and 7 am Eastern time. Phone number for Chickamauga is 423-875-6230
1.1.10. Double locking a Chickamauga Lock. Support personal will be needed for double locking.
1.1.11. Building tow at Chickamauga after double locking. Depart up bound.
1.1.12. Figure ETA at Watts Bar Lock. Have support personal on sight for double locking. Phone number for Watts Bar Lock 423-334-3522
1.1.13. Double locking at Watts Bar. Support personal will be needed for this locking.
1.1.14. Building tow at Watts Bar. Depart up bound.
1.1.15. Call traffic at mile 567 Tn. River checking for any down bound traffic on the Clinch River around Kingston and the Steam Plant.
1.1.16. Arrive at Steam Plant mile 2.8 Clinch River and secure tow.
1.1.17. With river escorts travel work barges and crane to Emory river and set up at sunken excavator.

Decontamination Plan

The intent of this plan is to cover personnel and equipment decontamination during the excavator removal operation in the Emory River. This should cover all aspects of the ash removal from the excavator, personnel and other diver related equipment.

Personnel Decontamination

SWS will be prepared to decontaminate any personnel that may get ash on them during the removal and decontamination process. A 3/4 inch submersible pump (garden hose type) will be utilized to pump water from a poly tank for personnel decontamination. After all the gross ash has been removed from the personnel they will be required to do a follow up with phosphate free soap and water for final cleaning.

Equipment Decontamination

SWS will be prepared to decontaminate any equipment utilized during the removal operation. Any equipment used during the removal operation will be cleaned on the crane barge with the decon water going directly back into the Emory River within the turbidity curtains. SWS will have all of the appropriate equipment and materials on site to clean the divers gear and equipment. SWS personnel will work directly with the dive team to clean their equipment.

Excavator Decontamination

After the excavator is lifted above the water line a tag line will be attached to the excavator by standing on the side of the barge before the machine is lifted completely out of the water. The tag line will allow personnel to rotate the machine allowing the use of a trash pump with a fire hose type nozzle to spray the gross ash off of the machine minimizing the ash on the deck of the crane barge. In the event that SWS cannot do the gross cleaning using this method, visqueen will be placed on the deck of the barge and the machine will be placed on the deck to be cleaned. Once the gross ash has been removed from the machine it will be placed on the deck of the crane barge to do the finial decontamination. All belly pans will be removed to get the ash out of the motor compartment and undercarriage of the machine. The final phase will be to pressure wash the machine with the decontamination water going directly back into the Emory River inside the turbidity curtain. This phase will include washing the inside of the cab, undercarriage, engine compartment and the exterior of the machine. After this phase is completed the machine will be transported to the unloading point to be off loaded. Environmental personnel present on site will determine if the crane is clean enough to be removed from the exclusion zone.

During any phase of the decontamination process that any oils or fuel are noted work will be stopped and any impacted area will be addressed. The area with hydrocarbon contamination will be decontaminated by wiping the area down with absorbent pads and cleaned before continuing with the ash removal. SWS will work with Michelle Cagley to dispose of any waste generated during this process.

Assist in removing the Caterpillar 325b excavator

1.1.18. This step text is for assisting in removing the Cat 325b Excavator.

1.1.19. NOTE We have environmental personnel working to contain all oil and chemicals in the river, make sure all personnel are aware of TVA's safety procedures.

1.20. **Caution;** Make sure everyone understands the plan for the crane. (review JSA thoroughly)

.1.21. A pre-dive inspection will determine the condition of the excavator and the lifting points. (The dive team determined the excavator was upside down).

1.1.22. Proper Protective clothing will be worn by everyone involved including Kevlar lined leather gloves and steel toe footwear.

1.1.23. Divers will put in and pull boat out of south dock.

1.1.24. A final High Hazard lift plan will be completed before the crane is used.

1.1.25. The crane will be position so the edge of the barge is located 15 feet from the center of the sunken excavator.

.1.26. The work barge will have plastic to contain chemicals and sludge once the excavator is lifted. Also diapers and pig mat will be placed to absorb any petroleum products after the excavator is raised.

1.1.27. A turbidity curtain will be placed around the excavator by the divers to SWS requirements, anchor weights will help hold down the curtain.

1.1.28. A double layer of boom will be placed to catch any oily sheen from escaping down river.

1.1.29. A mechanic will be present to help aide in the containment and removal of fluids from the excavator. The mechanic will also help in placing the boom of the excavator.

1.1.30. The divers will be in full control and signaling the crane. (The divers will communicate with the crane operator by radio)

1.1.31. At the divers request the main load block with rigging will be lowered into the water and placed just above the sunken excavator.

1.32. A dive team will attach the rigging to the rear two lifting lugs. (Calculations below show the two lugs will support the load)

1.1.33. A high hazard lift plan will be completed before lifting. (one will be filled out before the lift for approval, also one will be filled out just before the lift which will be more in depth and will include water flow velocity, wind speed, etc. (lift plans are attached below using a barge list chart, calculations show a one degree list is present while removing the

excavator from the water. A two degree list is present while placing the excavator onto the trailer)

1.1.34. All divers will be clear of the excavator when the load is lifted.
1.1.35. We will attempt slowly to lift the excavator up until the bucket of the excavator is clear from the side of the barge. (The crane will be retrofitted with a load cell so the operator will know how much cable tension is present.

1.1.36. The operator will then swing the excavator over and place it in front of the crane in between the tracks. The excavator will be placed down at the front of its tracks and slowly lowered down until its setting in the normal position.

1.1.37. We plan on setting the excavator into an oil trap or sand box to prevent any contaminants from entering the river. While the excavator is on the crane barge we will check all fluid cavities for leaks and contaminants.
1.1.38. The excavator will be boomed down across the track to the barge.
1.1.39. SWS will drain the fluids from the excavator if needed.

1.1.40. After the excavator is secure on the barge we will then travel to south side of the plant near the work and staging area. This area is below the discharge of the plant and has a metal retaining wall. A large gravel parking lot is present which provides easy access for a truck and trailer.
1.1.41. We will then coordinate a drop deck trailer to back out to the edge of the water and place the trailer in the safe working radius of the crane.
1.1.42. Due to the water depths at the south side of the plant. and also the width of the channel we plan on swapping tow boats before traveling into the channel. We will use the smaller tug "May Lou" to push the barge and place it at the construction wall.

1.1.43. We will then have another job meeting and the driver will also be included before placing the excavator onto the truck. Even though the edge of the trailer is near the edge of the water, the axles of the trailer are away from the water and wall. A metal barrier is there tor added support.
1.1.44. A high hazard lift plan will be filed out before the excavator is moved.
1.1.45. The crane coordinator will monitor the level of the crane before and during the lift. Calculations attached below showing the crane will list 2 degrees during the process. To ensure our safety a 2 degree list plan is attached below.

1.1.46. All four lifting points will be used to place the excavator onto the trailer.
1.1.47. Once the excavator is lifted and placed over land we will keep the excavator slightly off the ground as we boom out, when we reach our radius we will pick up the excavator so the trailer will slightly clear it. The tractor trailer truck will be guided and flagged back. After the truck is in position we wi1llower the excavator down onto the trailer.
1.IA8. A drop zone will be marked and everyone will be clear of this area during the process.

1.1.49. The driver will have the overall say so on how he wants it placed on his trailer. Excavator will be boomed down per department of transportation requirements.

1.1.50. The excavator will be boomed down to the trailer before leaving.

1.1.51. After all environmental issues are checked off the excavator will be boomed down and sent to Watts Bar maintenance facility.

High Hazard Lift Plan

Section I - Category of High Hazard Lift *(Mark an "X" in the appropriate box)*

- ☐ Capacity or near capacity lift (≥90% of net capacity for mobile cranes) (=100% of capacity for overhead cranes)
- ☒ Abnormal lift conditions due to equipment, load, rigging, or facilities
- ☐ Lift using rigging, attachments, or methods not covered in OSHA, ASME, or Rigging Handbook requirements
- ☐ Severe weather conditions
- ☐ Lift in which failure could damage high value, long lead time procurement item or significantly impact plant operations
- ☐ Lifts near electrically energized power lines, equipment, and switchyards
- ☐ Lifts utilizing more than one crane/hook
- ☐ Personnel lift
- ☐ Lift over personnel
- ☐ Planned Engineered Lift

Section II - Lift Information

Type of Crane:	TVA No:
Manitowoc 4100 S-1	88362

Location:	Date:	Time:
Kingston, TN	11-24-2009	

Lift Description *(Attach drawings, photographs, rigging diagrams, special requirements, etc. as required)*:
Remove excavator from water 1° list

Section III - Overhead Cranes *(Overhead crane lifts complete this section - skip Section IV)*

E Stop Location Identified:	Crane Capacity:	Weight of Load:
Rigging Capacity for Lift:	Rigging Size:	

Section IV - Mobile Cranes *(Mobile crane lifts complete this section – skip Section III)*

Crane Configuration at Start of Lift: Barge mounted boom over track

Boom Length: 110'	Boom Angle: 68.1°	Load Radius: 45'

Load Chart Gross Crane Capacity at Start of Lift: 91,400 lbs.

Crane Configuration at End of Lift (Lowering):

Boom Length: 110'	Boom Angle: 76.3°	Load Radius: 30'

Load Chart Gross Crane Capacity at End of Lift (Lowering): 162,600 lbs.

High Hazard Lift Plan
(Continued)

1° list — Removing excavator from water

Section IV - Mobile Crane *(Continued)*

Deductions *(List weight of each applicable deduction below):*

Rigging:	1,000 lbs.
Main Load Block:	5800 lbs.
Headache Ball:	NA.
Boom Extension or Jib *(stowed or erected)*:	NA
Cable:	(2.34 lbs/ft) x (6 parts line) x (114 ft) = 1600 lbs
Man Basket:	NA
Auxiliary Equipment:	1200 lbs sheave
Total of all Deductions:	9600 lbs

Net Capacity of Crane *(Gross Load Chart Capacity Minus Sum of All Capacity Deductions):*

Start of Lift: 153,000 lbs	End of Lift: 81,800 lbs.

Load to be Lifted: 61,000 lb track hoe + 7000 lbs water + mud = 68,000 lbs.

Rigging Capacity: 2 parts 73,500 lbs.	Rigging Size: 3/4" alloy chains

☐ Rigging inspected prior to lift? New rigging stamped tested.

Parts of line needed: 6

Jib Length: NA	Jib Capacity: NA

Checklist for Crane Set Up *(Check those applicable)*

- ☐ Pre-operational inspection performed?
- ☐ Monthly and Annual inspections current?
- ☐ Crane Level?
- ☐ All outriggers fully extended?
- ☐ Wheel clear of ground?
- ☐ Required blocking or cribbing in place?
- ☐ Overhead clearance checked?
- ☐ Clearance to energized power lines or equipment adequate? ___ feet ___ voltage
- ☐ Weather conditions permit lift?
- ☐ Ground conditions adequate?

Signature – Second party verification of proper crane setup _____

Section V - Personnel Information

- ☑ Pre-Lift Planning Meeting Held *(All personnel involved in lift in attendance)?*
- ☑ Crane operator has current certification on this type crane and current medical exam?
- ☑ Rigger and signal person qualified?

Section VI - Approvals (Signatures)

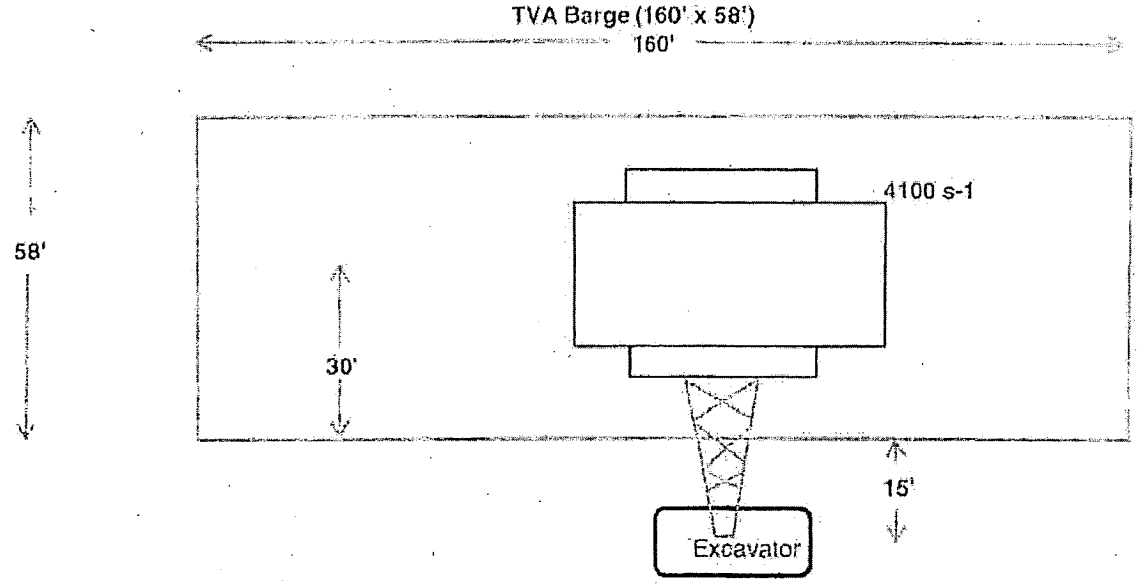
Crane Coordinator or Designated Representative: Clint Stults

TVA Certified Crane Operator:

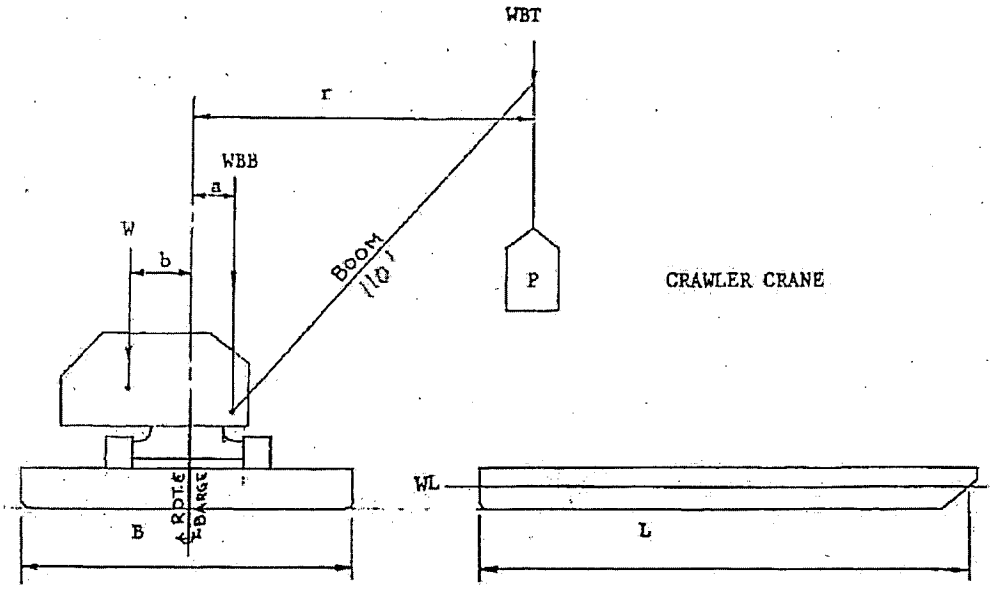
Responsible Supervisor/Person in Charge:

Note: Completed form must be retained by the crane coordinator for a period of at least 3 years.

Removing excavator from water



lifting from water



r	=	Distance from centerline of rotation to main load in feet
a	=	Distance from centerline of rotation to boom hinge pin in feet
b	=	Distance from centerline of rotation to center of gravity of crane in feet
W	=	Weight of crane
WBB	=	Weight of boom at boom hinge pin
WBT	=	Weight of boom at boom tip
P	=	Load, including weight of load block, weight ball, slings, jib, etc.

WL	=	Water line
L	=	Length of barge at WL in feet
B	=	Beam of barge in feet
*M	=	(W x b)-(WBB x a)-(WBT x r)-(P x r)
∠	=	Angle of barge heel in degrees

$$\angle = \frac{M}{L \times B^3 \times .063}$$

* (+) or (-) sign denotes direction of heel
(+) counter-clockwise (-) clockwise

r = 45'

a = 4'

b = 6.94'

W = 330,000 lbs
WBB = 12077
WBT = 13739
P = 80,000 lbs

$M = (330{,}000 \times 6.94') - (12{,}077 \times 4') - (13{,}739 \times 45) - (80{,}000 \times 45$

$M = -1{,}976{,}363$ ft lbs

$$\angle = \frac{-1{,}976{,}363}{160 \times 58^3 \times 0.063}$$

$\angle = -1.00$

Continued on next page

Lifting from water

TECHNICAL DATA – LIMITED DISTRIBUTION

August 20, 1975

Sample

BARGE HEEL DUE TO CRANE MOMENT

The following data is intended as a conservative approximation for calculating flat bottom barge heel with crane placed on centerline of barge. It is intended for guidance purposes only. The Manitowoc Engineering Co. cannot accept responsibility for the selection of barge in regard to size, structural ability to withstand crane loading, stability, etc. This responsibility must be placed in the hands of barge supplier or naval architect.

It should be noted that machine list, as defined by Manitowoc may not be the same as barge list (heel). For Manitowoc definition of machine list, see attached Product Bulletin No. 2.

Upon request, Manitowoc can provide a weight and center of gravity chart, which includes weight of various boom lengths, to aid in resolving the following formula.

Formula for determining barge heel due to crane moment.

HEEL — $\angle = \frac{M}{L \times B^3 \times .063} \approx -1.00$

TRIM — $\angle = \frac{M}{B \times L^3 \times .063} = \frac{-1,976,363}{(58 \times 160^3 \times 0.063)} \approx -0.132$

MACHINE LIST = .7(HEEL ∠) + .7(TRIM ∠)

$= 0.7(-1.00) + 0.7(-0.132)$

$= -0.792$

$\approx \frac{8}{10}$ths of a degree

use 1° list from chart

Appendix A

High Hazard Lift Plan

Section I - Category of High Hazard Lift *(Mark an "X" in the appropriate box)*

- ☐ Capacity or near capacity lift (≥90% of net capacity for mobile cranes) (=100% of capacity for overhead cranes)
- ☒ Abnormal lift conditions due to equipment, load, rigging, or facilities
- ☐ Lift using rigging, attachments, or methods not covered in OSHA, ASME, or Rigging Handbook requirements
- ☐ Severe weather conditions
- ☐ Lift in which failure could damage high value, long lead time procurement item or significantly impact plant operations
- ☐ Lifts near electrically energized power lines, equipment, and switchyards
- ☐ Lifts utilizing more than one crane/hook
- ☐ Personnel lift
- ☐ Lift over personnel
- ☐ Planned Engineered Lift

Section II - Lift Information

Type of Crane:	TVA No:
Manitowoc 4100 S-1	88362

Location:	Date:	Time:
Kingston, TN	11-24-2009	

Lift Description *(Attach drawings, photographs, rigging diagrams, special requirements, etc. as required):*

Placing excavator onto trailer

2° List

Section III - Overhead Cranes *(Overhead crane lifts complete this section - skip Section IV)*

Crane Capacity:	Weight of Load:
Rigging Capacity for Lift:	Rigging Size:

Section IV - Mobile Cranes *(Mobile crane lifts complete this section – skip Section III)*

Crane Configuration at Start of Lift:	Load in front of tracks	
Boom Length: 110'	Boom Angle: 76.3°	Load Radius: 30'
Load Chart Gross Crane Capacity at Start of Lift:	159,700 lbs	

Crane Configuration at End of Lift (Lowering):	Load in front of tracks	
Boom Length: 110'	Boom Angle: 65.3°	Load Radius: 50'
Load Chart Gross Crane Capacity at End of Lift (Lowering):	75,600 lbs	

Placing excavator onto trailer 2' Lift

High Hazard Lift Plan
(Continued)

Section IV - Mobile Crane *(Continued)*

Deductions *(List weight of each applicable deduction below):*

Rigging: 1000 lbs

Main Load Block: 5,800 lbs

Headache Ball: NA

Boom Extension or Jib *(stowed or erected):* NA

Cable: 1600 lbs.

Man Basket: NA

Auxiliary Equipment: Sheave 1200 lbs | Total Deductions: 9600 lbs

Net Capacity of Crane *(Gross Load Chart Capacity Minus Sum of All Capacity Deductions):*
Note: If any other point in the lift could result in a lower net capacity, then the net capacity for this point must also be calculated, recorded, and compared to the load to be lifted.

Start of Lift: 150,100 lbs | End of Lift: 68,900 lbs

Load to be Lifted: 61,100 lbs.

Rigging Capacity: 2 parts 73,500 lbs | Rigging Size: 3/4" alloy chains

☑ Rigging inspected prior to lift? New rigging, stamped, tested

Parts of line needed: 6

Jib Length: NA | Jib Capacity: NA

Checklist for Crane Set Up *(Check those applicable)*
- ☐ Pre-operational inspection performed?
- ☐ Monthly and Annual inspections current?
- ☐ Crane Level?
- ☐ All outriggers fully extended?
- ☐ Wheel clear of ground?
- ☐ Required blocking or cribbing in place?
- ☐ Overhead clearance checked?
- ☐ Clearance to energized power lines or equipment adequate? ___ feet ___ voltage
- ☐ Weather conditions permit lift?
- ☐ Ground conditions adequate?

Signature – Second party verification of proper crane setup _____

Section V - Personnel Information
- ☑ Pre-Lift Planning Meeting Held *(All personnel involved in lift in attendance)?*
- ☑ Crane operator has current certification on this type crane and current medical exam?
- ☑ Rigger and signal person qualified?

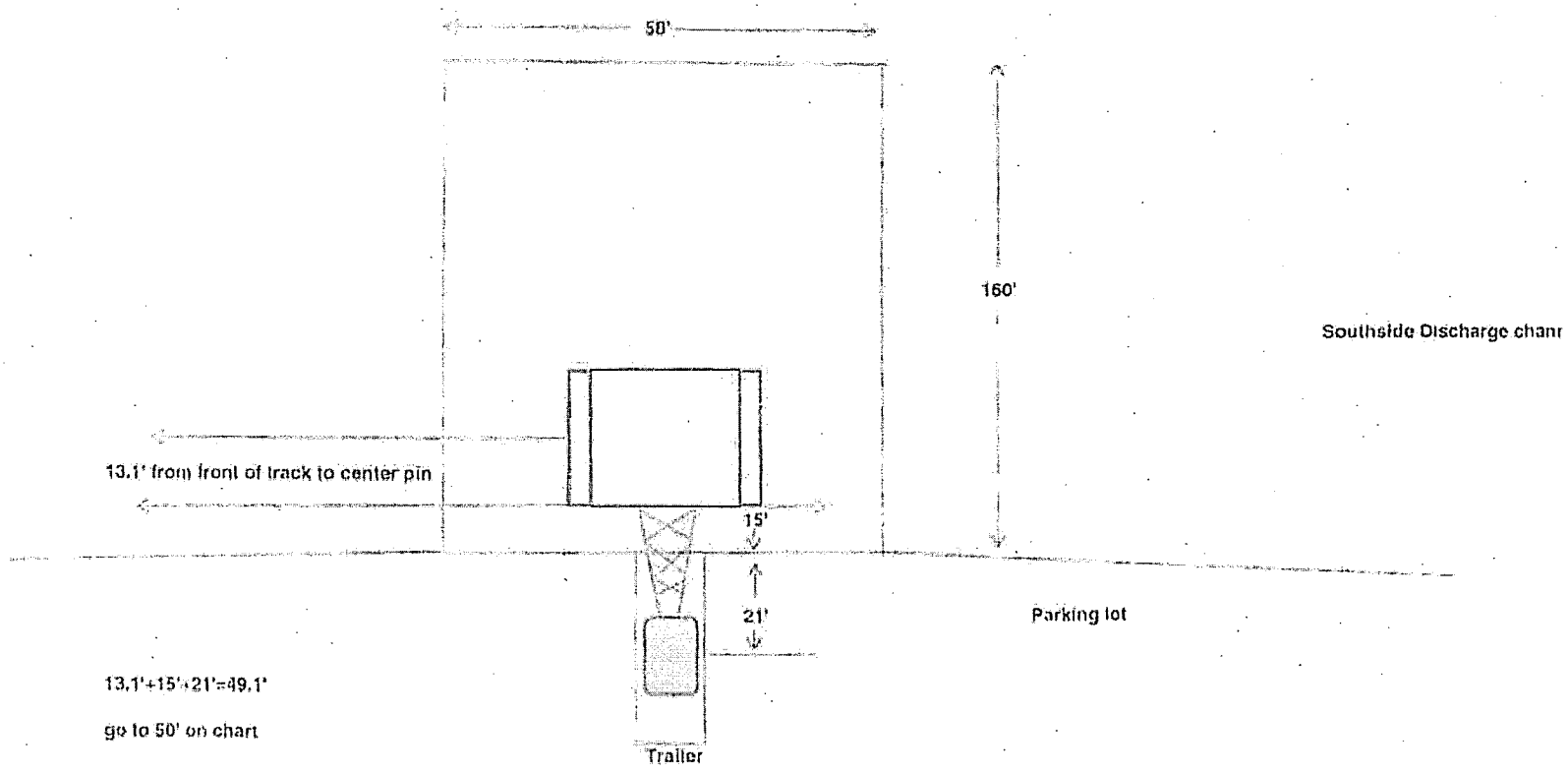
Section VI - Approvals (Signatures)

Crane Coordinator or Designated Representative: Clint Stults

TVA Certified Crane Operator:

Responsible Supervisor/Person in Charge:

Note: Completed form must be retained by the crane coordinator for a period of at least 3 years.


50'
160'
Southside Discharge chanr
13.1' from front of track to center pin
15'
21'
Parking lot
13.1'+15'+21'=49.1'
go to 50' on chart
Trailer

Placing excavator onto trailer

$B = 80 - 15 - \frac{138.1''}{12} - \frac{83.3''}{12} = 46.55'$

CUSTOMER FILL IN BLANK SPACES

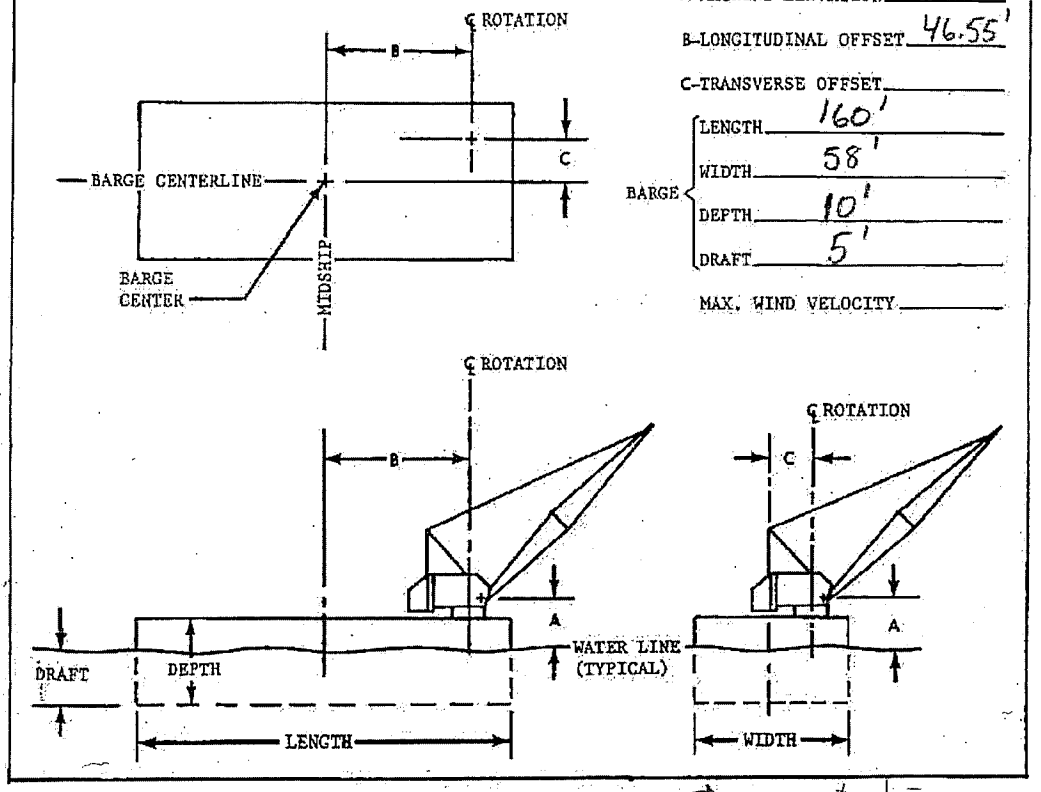
A-MACHINE ELEVATION 8.5'

B-LONGITUDINAL OFFSET 46.55'

C-TRANSVERSE OFFSET

BARGE: LENGTH 160', WIDTH 58', DEPTH 10', DRAFT 5'

MAX. WIND VELOCITY



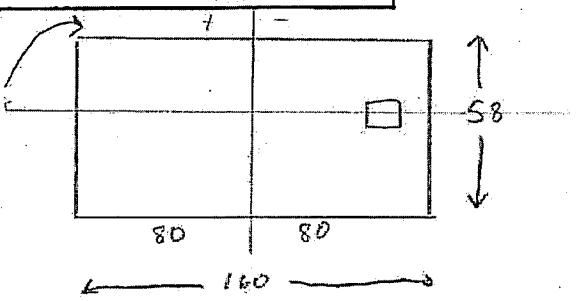
WBB = 12,077

WBT = 13,739

$M = (w \times b) - (WBB \times a) - (WBT \times r) - (P \times r)$

$b = -80 + 15' + \frac{138.1''}{12} + \frac{83.3''}{12} = -46.55'$

$a = -80 + 15' + \left(\frac{138\frac{3}{16}'' - 111\frac{1}{2}''}{12}\right) = -62.8'$



$r = b + \text{radius}$

$r = -46.55' + (-50') = -96.55'$

$m = (333{,}000 \times -46.55) - (12077 \times -62.8') - (13{,}739 \times -96.55) - (80{,}000 \times -96.55)$

$m = -5{,}692{,}213$ ft-lbs

Heel $\angle = \frac{m}{L \cdot B^3 \times 0.063} = \frac{-5{,}692{,}213}{160 \cdot 58^3 \cdot 0.063} \approx -2.89$

Trim $\angle = \frac{m}{B \cdot L^3 \times 0.063} = \frac{-5{,}692{,}213}{58 \cdot 160^3 \cdot 0.063} \approx -0.038$

Machine list $= 0.7 \times \text{Heel} + 0.7 \times \text{Trim}$

$= (0.7 \times -2.89) + (0.7 \times -0.038) = -2.04°$ degrees

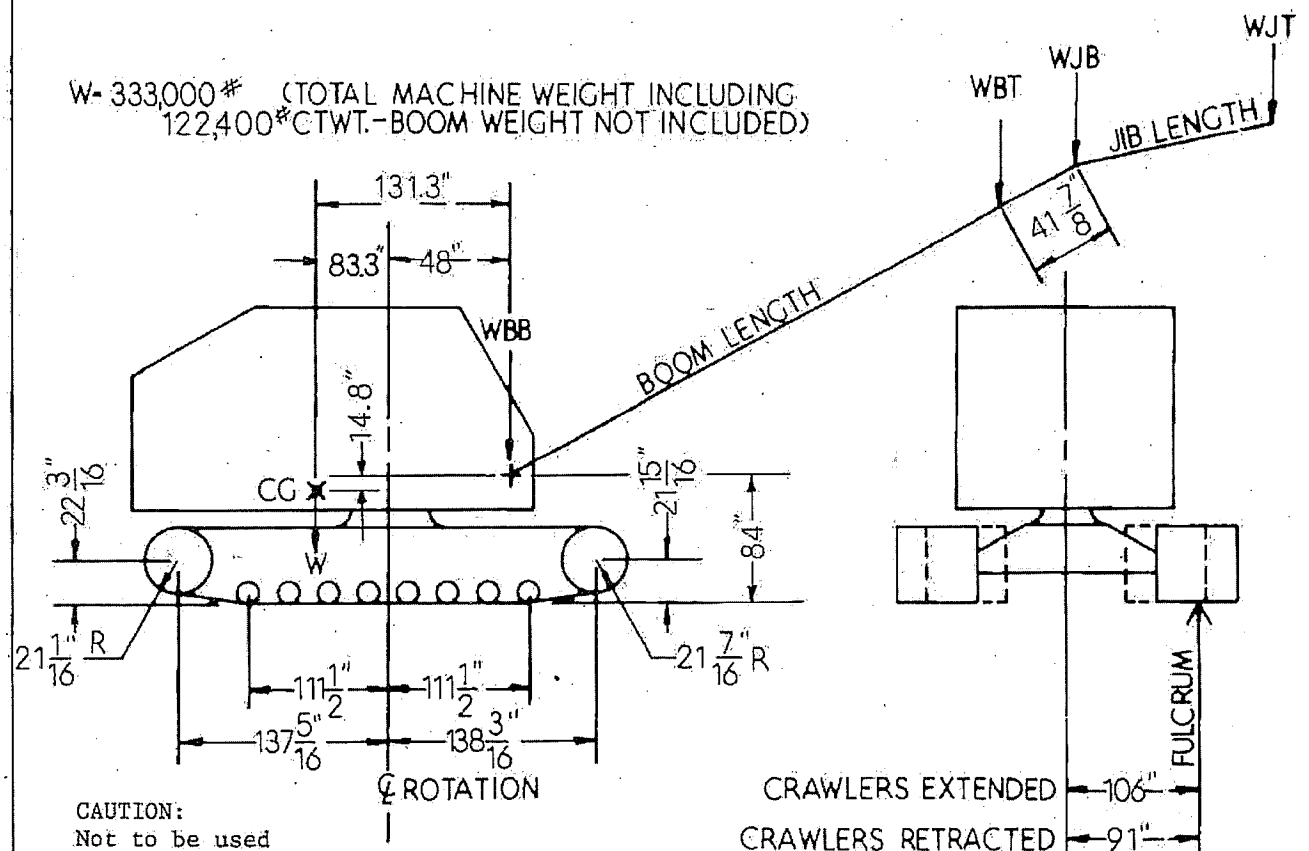
BOOM NO. 22A OPEN THROAT TOP		
BOOM LGTH.	WBB	WBT
70	8496	10597
80	9540	11456
90	10390	12229
100	11437	13085
110	12077	13739
120	13116	14603
130	13639	15059
140	14681	15921
150	15265	16633
160	16304	17497
170	16399	17886
180	17464	18722
190	18039	19444
200	19100	20285
210	19127	20744
220	20200	21563
230	20781	22289
240	21922	23046
250	21902	23554
260	22994	24363

BOOM NO. 22C OPEN THROAT TOP		
BOOM LENGTH	WBB	WBT
70	8622	10675
80	9672	11527
90	10530	12293
100	11585	13140
110	12234	13784
120	13282	14639
130	13815	15085
140	14866	15936
150	15461	16637
160	16511	17490
170	16616	17868
180	17692	18693
190	18278	19403
200	19349	20233
210	19388	20681
220	20480	21488
230	21063	22203
240	22215	22947
250	22207	23444
260	23310	24241

NO. 123 JIB WEIGHTS		
JIB LENGTH	WJB	WJT
30	2539	363
40	2680	695
50	2853	996
60	3041	1277

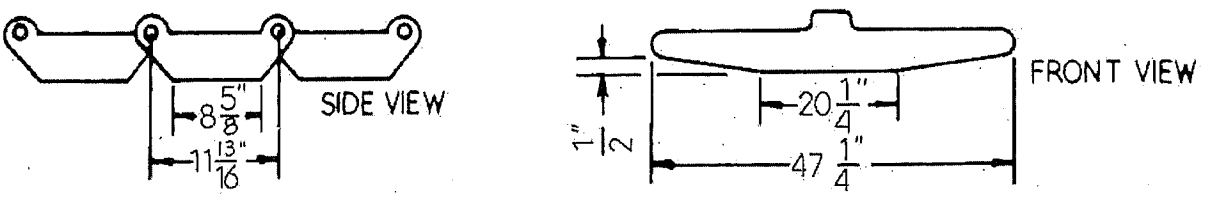
NOTE: Boom and jib weights do not include weight of load, load block, weight ball, slings, etc. They are for boom and jib only.

W- 333,000# (TOTAL MACHINE WEIGHT INCLUDING 122,400# CTWT.- BOOM WEIGHT NOT INCLUDED)



CAUTION:
Not to be used for crane rating purposes.

CRAWLER TREAD DETAILS



10-3-78 REVISED DATE	MANITOWOC ENGINEERING COMPANY			C.G.CHART	DATE 8-15-77
	DR.	CK.	MODEL	MODEL 4100 W & 4100W-S1	
				48" TREADS	CHART NO. T.S.-215

T.S.-215

MANITOWOC ENGINEERING CO.

Division of the Manitowoc Company, Inc. Manitowoc, Wisconsin 54220

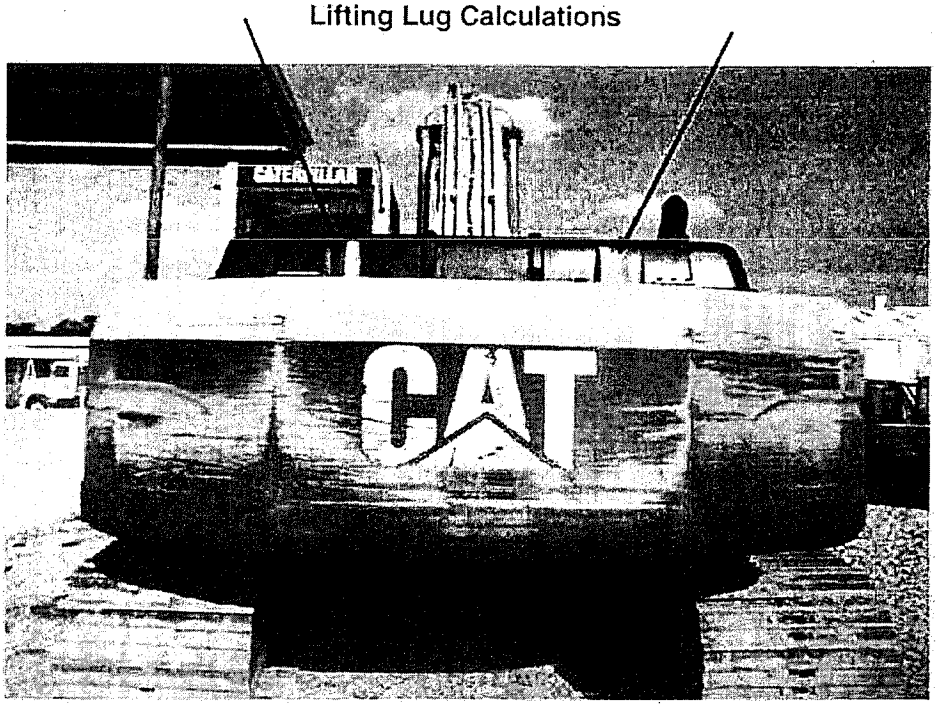
LIFTCRANE BOOM CAPACITIES — 4100W

4100W SERIES 1

BOOM NO. 22A OR NO. 22C WITH OPEN THROAT TOP
122,400 LB. COUNTERWEIGHT
26'6" CRAWLERS EXTENDED
CRAWLER MACHINE ON A BARGE
0 DEGREE THRU 3 DEGREE MACHINE LIST
NO TRAVEL - 360 DEGREE RATING

BOOM LGTH. FEET	OPER. RAD. FEET	BOOM ANG. DEG.	BOOM POINT ELEV. FEET	BOOM CAPACITY 0 DEGREE LIST POUNDS	BOOM CAPACITY 1 DEGREE LIST POUNDS	BOOM CAPACITY 2 DEGREE LIST POUNDS	BOOM CAPACITY 3 DEGREE LIST POUNDS	OPER. RAD. FEET
110	22	80.6	115.5	268,900				22
	24	79.5	115.2	232,200	227,800*	198,000*		24
	26	78.5	114.8	204,100	202,600	183,700*	163,300*	26
	28	77.4	114.4	181,800	180,500	170,900*	152,800*	28
	30	76.3	113.9	163,800	162,600	159,700*	143,600*	30
	32	75.3	113.4	148,800	147,800	146,600	135,300*	32
	34	74.2	112.8	136,300	135,300	134,200	127,900*	34
	36	73.1	112.2	125,600	124,700	123,600	121,500*	36
	38	72.0	111.6	116,300	115,500	114,500	113,600	38
	40	70.9	110.9	108,300	107,500	106,600	105,700	40
	45	68.1	109.1	92,000	91,400	90,600	89,800	45
	50	65.3	106.9	79,700	79,100	78,500	77,800	50
	55	62.4	104.5	70,100	69,600	69,000	68,400	55
	60	59.4	101.7	62,400	61,900	61,300	60,800	60
	65	56.3	98.5	56,000	55,500	55,100	54,600	65
	70	53.1	95.0	50,700	50,300	49,800	49,400	70
	75	49.8	91.0	46,100	45,800	45,400	44,900	75
	80	46.3	86.5	42,300	41,900	41,500	41,100	80
	85	42.6	81.4	38,900	38,500	38,200	37,800	85
	90	38.6	75.6	35,900	35,600	35,300	34,900	90
	95	34.2	68.8	33,300	33,000	32,700	32,400	95
	100	29.2	60.7	31,000	30,700	30,400	30,100	100
	105	23.3	50.6	28,900	28,600	28,300	28,100	105
	110	15.5	36.4	27,000	26,800	26,500	26,200	110
120	22	81.4	125.6	268,700				22
	24	80.4	125.3	232,000	223,900*			24
	26	79.4	125.0	203,900	202,400	178,500*		26
	28	78.5	124.6	181,600	180,300	166,500*	147,700*	28
	30	77.5	124.2	163,600	162,400	155,700*	138,900*	30
	32	76.5	123.7	148,600	147,500	146,000*	131,000*	32
	34	75.5	123.2	136,000	135,100	133,900	123,800*	34
	36	74.5	122.7	125,300	124,400	123,400	117,300*	36
	38	73.5	122.1	116,100	115,200	114,300	111,800*	38
	40	72.5	121.5	108,000	107,200	106,300	105,400	40
	45	70.0	119.8	91,800	91,100	90,300	89,500	45
	50	67.5	117.8	79,500	78,900	78,200	77,500	50
	55	64.8	115.6	69,800	69,300	68,700	68,100	55
	60	62.0	113.1	62,100	61,600	61,000	60,500	60

Lifting Lug Calculations



Lug thickness = 1.25"
Lug width at base = 7"
17 ton shackle pin diameter = 1.5"
Lug Material = A36 plate steel
Track hoe weight = 61,000 lbs + 7000lbs = 68,000 lbs mud and vacuum

ft = P/A = 34,000 lbs / (1.25" x 1.5") = 18,133 lb/in^2

FT allowable for A36 plate = 22,000 lb/in^2
22,000 > 18,133

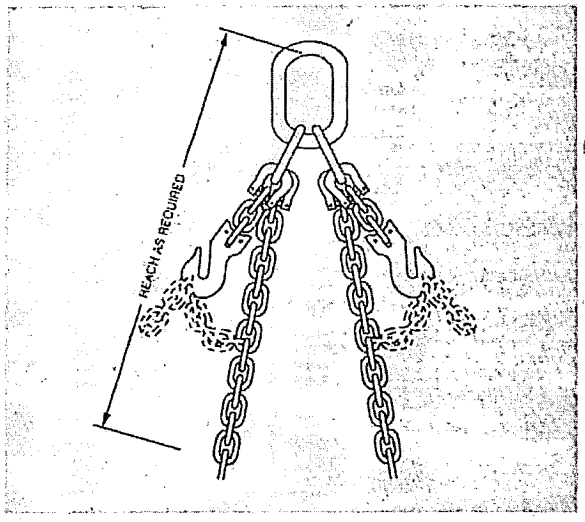
Welding Calculations, a solid welded lug on 4 sides 2x7.5" +2x1.5" consisting of a 3/8"fillet weld

Welding area = 7.5" + 7.5" + 1.5" + 1.5" = 18"
Welding volume = 18" X (3/8" x 3/8") = 2.53 in^3 at a bevel groove
Welding material = 7018 = 70,000 lbs/in^3
2.53 X 2 lugs = 5.06 in^3
70,000 lbs/in^3 X 5.06 in^3 = 354,200 lbs

354,200 lbs > 68,000 lbs

9/32	7	9,100	3/4	3	6
3/8	10	18,400	1	3-1/2	7
1/2	13	31,200	1-1/4	4	8
5/8	16	47,000	1-1/2	6	12
3/4	20	73,500	1-3/4	6	12
7/8	22	88,900	2	7	14
1	26	123,900	2-1/4	8	16
1-1/4	32	187,800	2-3/4	9	16

KUPLEX® II Mechanical Adjustable Double Loop Slings



chain 5.8 lbs per foot x 84 = 500

oval Rings 25.2 lbs each x 2 = 50

Connecting links 5 lbs x 4 x 2 = 40

Cradle hooks 10.2 x 4 = 41

Rigging weight 631

Specifications

Size of Chain		*Accoloy* Working Load Limits* Lbs. at 60°	Quad Assy. In.	Kuplok	Kupler No.	Grab Hook No.	Cut Chain Needed for 5' Reach
In.	mm						
9/32	7	9,100	9/32	9/32	K-20	K-72	4'-1"
3/8	10	18,400	3/8	3/8	K-21	K-73	3'-10"
1/2	13	31,200	1/2	1/2	K-22	K-75	3'-8"
5/8	16	47,000	5/8	5/8	K-23	K-76	3'-1"
3/4	20	73,500	3/4	3/4	K-24	K-77	2'-10"
7/8	22	88,900	7/8	7/8	K-25	K-78	2'-8"

* ⚠ WARNING Working Load Limits should not be exceeded. Do not point load hooks.

Using 2 Double loop Slings with adjustable hooks

1 set or 2 lines of the 4 part is good for 73,500 lb

TVA
KINGSTON FP

Submitted by:

UNDERWATER CONSTRUCTION CORPORATION
8494 Gulf View Drive
Soddy Daisy, TN 37379

UCC JOB # 10226.25

Services Performed:
Locate and identify the orientation of a 325B Excavator

Dive Crew:
Ross McMillan– Dive Supervisor
Randy Basinger - Diver
Brandon Camp - Diver
Brandon Burrnett – Tender/Diver
Ben Thorton – Tender/Diver

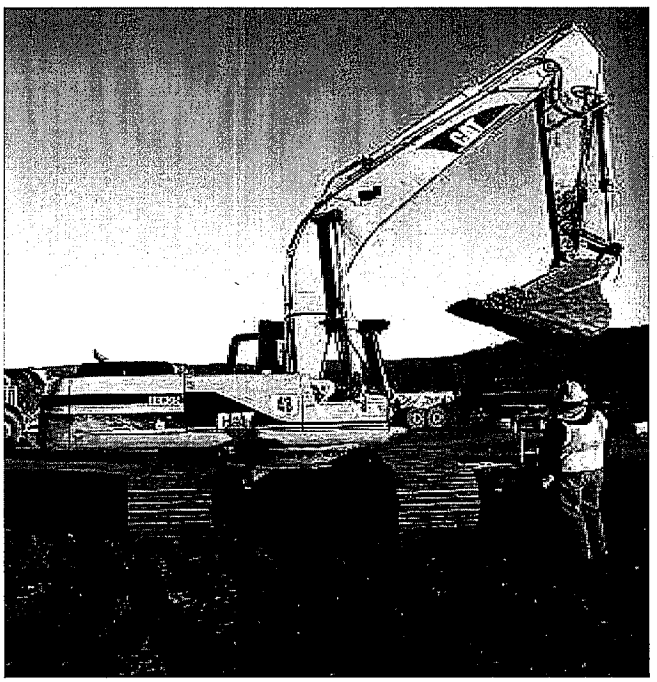
1-888-USA-DIVE
www.uccdive.com

UNDERWATER CONSTRUCTION CORPORATION

Kingston FP

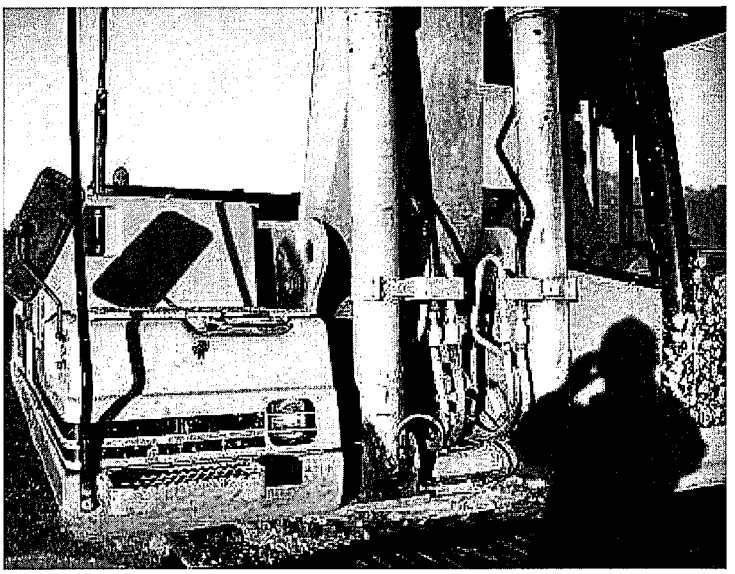
Dive Inspection Summary

On Thursday, Nov. 12th 2009, a five man dive crew arrived at the Kingston Fossil Plant to locate and determine the orientation of a 325B Excavator that had been swept into the channel during the ash spill. The "fact finding" inspection was conducted to answer questions about its orientation on the river bottom, is it intact and is there currently any fuel or hydraulic leaks that need to be addressed prior to its removal. The following picture is of the same model excavator that was swept into the river.

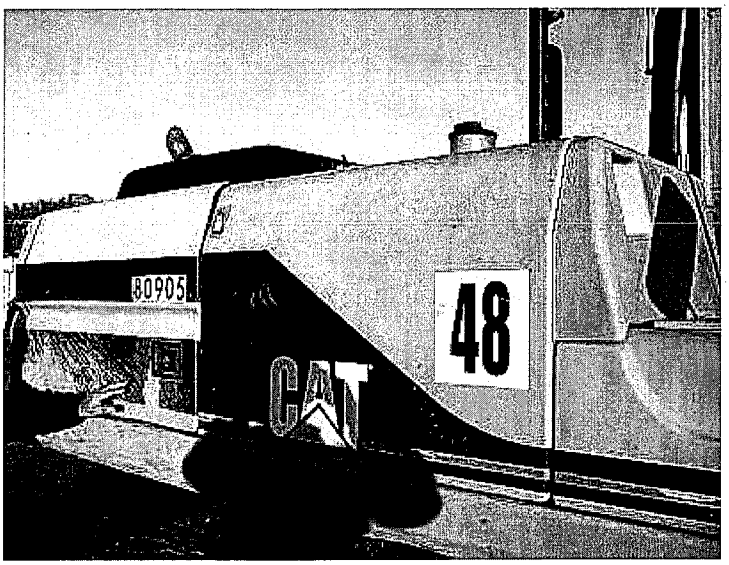


Once the excavator was located, approximately 75 yds from shore, it was determined that it was lying up-side down on hard packed ash. Due to zero visibility, the diver conducted the inspection by feel. It appeared that the upper or cab and boom section was running parallel to or inline with the tracks. The cab was missing one window and two others were broken however that was the extent of the damage besides a few gouges presumably made by the dredge.

The diver was able to locate the two lifting cylinders for the boom and followed them until they disappeared into the ash approximately at the same "height or elevation" as the top of the cab. The only lifting lug that the diver was able to access was the one farthest from the cab, shown in the picture below.



The diver then inspected the fuel and hydraulic tanks and found no damage or leaks in the area as seen below.



Next, the diver moved toward the back to locate the other two lifting lugs located behind the engine compartment. Due to the excavator being up-side down, these lugs were buried in the ash up to approximately the black paint line directly above the word CAT as seen in the picture below.

The area that the excavator now sits appears to have been dredged prior to it ending up in its current location. The bottom of the channal at the back of the excavator was 25' below the current water line. The cab is resting on bottom of the channel in 20' of water. The top of the tracks, which are now closest to the surface, was at a depth of 15' underwater. As can be seen in the picture above, there are two rectangular cut outs in the frame of the machine and are present on both sides.

REPORT of CALIBRATION

Asset ID:	E40262
Certificate No:	15404
Page 1 of 2	

Tennessee Valley Authority
Central Laboratories Services
Mailing Address: 1101 Market Street, PSC-1B-C, Chattanooga, TN 37402
Shipping Address: 4601 North Access Road, Bldg. A, Chattanooga, TN 37415
Phone: (423) 876-4318 Fax: (423) 876-4137

QA RECORD

Customer:
PSS TURBINE GROUP
127 RESERVATION RD. HWY 153
MUSCLE SHOALS, AL 35662

Instrument Information:

Description:	DIGITAL DYNAMOMETER
Manufacturer:	DILLON
Model:	EDXTREME 100K
Serial Number:	NONE
PO Number:	

Calibration Information:

Cal Date:	09/30/2009
Due Date:	03/30/2010
Interval:	6 Months
Cal Instruction:	502.03-001
As Found:	In Tolerance
As Left:	In Tolerance

Ambient Temperature: 72°F +/- 9°F **Ambient Humidity:** <=80% RH

This is to certify that all instrumentation, testing methods and personnel used comply with the requirements of the Central Laboratories Services (CLS) Quality Assurance Program which is designed to meet the requirements of ISO/IEC 17025, 10CFR50 Appendix B, ANSI N45.2-1971, and ANSI/NCSL Z540-1-1994. Standards used are traceable to the National Institute of Standards and Technology (NIST), officially recognized agencies, commercially accepted practices or natural physical constants. This report shall not be reproduced, except in full, without the written approval of CLS.

Technical Remarks:

Standards Utilized

TVA I.D.	Mfg.	Model No.	Description	Cal. Date	Due Date
502798	TINIUS OLSEN	SUPER-L	UNIVERSAL TEST MACHINE,120K	05/06/2009	11/06/2009

Calibrated by:	Ken Holt	**Approved By:**	Sam Bertram	09/30/2009
	Sr Metrology Tech		Calibration Supv.	Date

This report was electronically approved using Edison Mudcats Metrology Suite Ver. 2.2.1.

REPORT of CALIBRATION

Asset ID:	**E40262**
Certificate No:	**15404**
Page 2 of 2	

Tennessee Valley Authority
Central Laboratories Services

Test Results

TEST DESCRIPTION	Nominal Value	As Found	As Left	Out of Tol	CALIBRATION TOLERANCE	Specs
Tension	20000.0 lbf	19900.0	Same		19000.0 to 21000.0 lbf [TAR 10:1]	[± 1% F.S.{"Full Scale" = 100000 lbf}]
	40000.0 lbf	39800.0	Same		39000.0 to 41000.0 lbf [TAR 5.0:1]	[± 1% F.S.{"Full Scale" = 100000 lbf}]
	60000.0 lbf	59800.0	Same		59000.0 to 61000.0 lbf [TAR 3.3:1]	[± 1% F.S.{"Full Scale" = 100000 lbf}]
	80000.0 lbf	79800.0	Same		79000.0 to 81000.0 lbf [TAR 2.5:1]	[± 1% F.S.{"Full Scale" = 100000 lbf}]
	100000.0 lbf	99800.0	Same		99000.0 to 101000.0 lbf [TAR 2.0:1]	[± 1% F.S.{"Full Scale" = 100000 lbf}]