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METHODS/LABOR STANDARDS
APPLICATION PROGRAM
PHASE IV

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NATIONAL SHIPBUILDING RESEARCH PROGRAM

THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS

SHIP PRODUCTION COMMITTEE

PANEL SP-8

NATIONAL STEEL AND SHIPBUILDING COMPANY

METHODS/LABOR STANDARDS APPLICATION PROGRAM - PHASE IV

FINAL REPORT

TASK ES-8-18

Submitted to:

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This project is managed and cost-shared by National Steel and Shipbuilding Company for the National Shipbuilding Research Program. The program is a cooperative effort of the Maritime Administration's Office of Advanced Ship Development, the U.S. Navy, the U.S. shipbuilding industry, and selected academic institutions.

FINAL REPORT

FOR

SNAME PANEL TASK ES 8-18

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JANUARY, 1985

PLOT PLAN

Code WM

Date JANUARY, 1985

Sign. BARB FAISON

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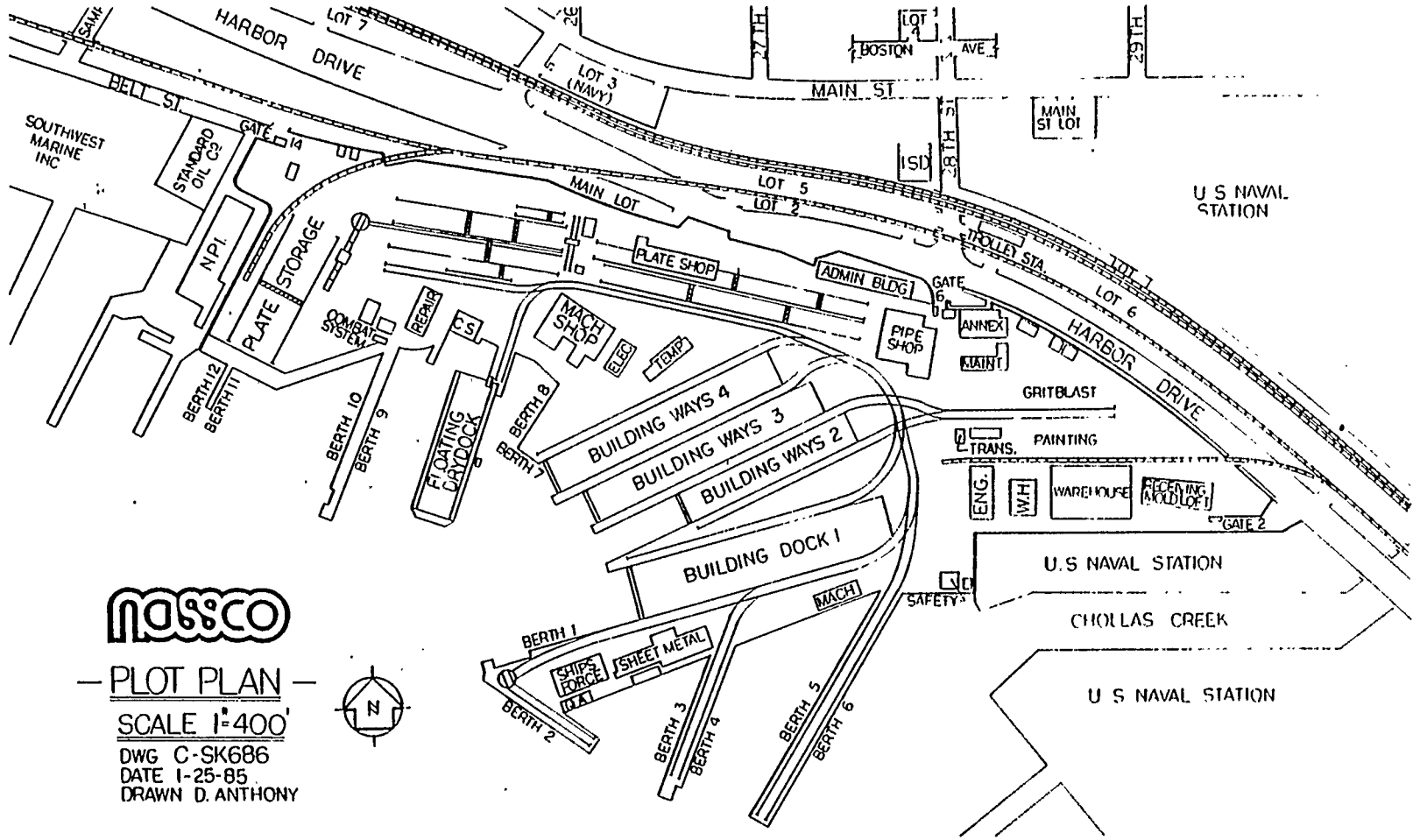

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2.1 CONSULT NASSCO'S GENERAL WORK MANAGEMENT MANUAL, SECTION 2, FOR STANDARD PRACTICES AND POLICIES,

NATIONAL STEEL AND SHIPBUILDING COMPANY IS THE LARGEST SHIPBUILDE ON THE WEST COAST. IT IS A WHOLLY-OWNED SUBSIDIARY OF MORRISON KNUDSEN COMPANY OF BOISE, IDAHO. FOR THE LAST TEN YEARS, NASSC HAS BEEN THE LEADING PRODUCER OF TANKERS FOR U. S. FLAG MERCHAN MARINE SERVICE DELIVERING OVER 40% (29 SHIPS) OF ALL NEW TANKER BUILT IN THE UNITED STATES. NASSCO IS ALSO A LEADING PRODUCE OF U. S. NAVY AUXILIARY AND AMPHIBIOUS SHIPS. SINCE 1969 NASSC HAS DELIVERED OR HAS CONTRACTED TO BUILD OR CONVERT 25 SHIP FOR U.S. NAVY SERVICE.

NASSCO IS A FULL SERVICE REPAIR AND CONVERSION YARD FOR THE COM MERCIAL AND U. S. NAVY MARKETS, HAVING ACCOMPLISHED HUNDRED OF OVERHAULS, RETROFITS, AND REPAIR JOBS ON ALL TYPES OF VESSEL INCLUDING NAVY COMBATANTS. A 1,000' x 176' GRAVING DOCK IS AVAIL ABLE FOR REPAIR WORK. A NEW 25,000 TON FLOATING DRYDOCK THA IS 620' IN LENGTH AND 170' WIDE WITH 140' CLEAR BETWEEN WINGWALLS IS NOW IN SERVICE.

IN ADDITION TO SHIP RELATED WORK, NASSCO PROVIDES STEEL FABRI CATION AND MACHINE SHOP SERVICES TO A WIDE VARIETY OF INDUSTRIA CUSTOMERS IN THE SOUTHERN CALIFORNIA AREA.

NASSCO'S PRESENT SNAME PANEL SP-8 PROJECT OF THE APPLICATIO OF ENGINEERED LABOR STANDARDS WITHIN SHIPYARDS HAS BEEN INDEE A TRUE RESEARCH AND DEVELOPMENT ENDEAVOR. OUR EFFORTS THIS YEA HAVE BEEN TOTALLY IN NASSCO'S MAINTENANCE DEPARTMENT WHICH CON SISTS OF 139 PERSONS OPERATING ON A BUDGET OF OVER $5,400,000 THE DEPARTMENT CONSISTS OF TWO MAJOR SECTIONS. ONE AREA IS ELEC TRICAL MAINTENANCE, AND THE OTHER IS MECHANICAL MAINTENANCE FURTHER DIVIDED IS MECHANICAL MAINTENANCE, WHICH SUPPORTS AL MECHANICAL EQUIPMENT, AS WELL AS TRANSPORTATION. WE HAVE CENTERE

OUR STUDY PARTICULARLY ON THE TRANSPORTATION MAINTENANCE AREA WHICH INCLUDES ALL ROLLING STOCK SUCH AS FORKLIFTS, SCOOTERS, MANLIFTS, TRUCKS, BUSES, AUTOMOBILES, AND CRANES.

"MAINTENANCE" REFERS TO ACTIVITIES THAT FIGHT DEFECTS IN EXISTING EQUIPMENT WITHOUT CHANGING THE DESIGN OF THE EQUIPMENT. MAINTENANCE ACTIVITIES COMPRISE LUBRICATION, CONSERVATION, LOOKING FOR DEFECTS, CLEANING, AND REPAIRING. MAINTENANCE IS A VERY CRITICAL COMPONENT OF OUR MANUFACTURING COMPANY. THE BASIC REASON FOR MAINTENANCE MANAGEMENT IS TO MAINTAIN AND IS TO PERFORM ESSENTIAL WORK WHILE CONTROLLING MAINTENANCE COSTS. WE ARE TRYING TO DO THIS BY INCREASING THE EFFECTIVE USE OF BUDGET AND PERSONNEL BY PROVIDING A MEANS FOR CONTINUOUS EVALUATION OF EQUIPMENT, MANPOWER REQUIREMENTS, AND, LAST BUT CERTAINLY NOT LEAST, ANALYSIS OF OPERATIONS AND PERFORMANCE.

ONE WAY FOR OUR TRANSPORTATION MAINTENANCE DEPARTMENT TO BECOME MORE EFFICIENT WAS BY INCREASING THE EFFECTIVENESS OF THE MAINTENANCE SUPERVISOR. TO DO THIS, HOWEVER, THE DEPARTMENT HAD TO SWITCH FROM THE USUAL PRACTICE OF BREAKDOWN MAINTENANCE (MAKING REPAIRS ONLY ON REPORTED DEFICIENCIES) TO PLANNED MAINTENANCE (PREVENTIVE AND CORRECTIVE MAINTENANCE WORK PERFORMED PRIOR TO BREAKDOWNS). ALSO, WE NEEDED THE USE OF A MAINTENANCE-MANAGEMENT CONTROL SYSTEM.

THE TERM "PREVENTIVE MAINTENANCE" MEANS "PERIODIC MAINTENANCE". EVEN THOUGH THE WORD "PREVENTIVE" TENDS TO DRAW ATTENTION TO THE GOAL OF THE ACTIVITY (PREVENTION) RATHER THAN TO THE ACTIVITY ITSELF (PERIODIC ACTION), WE EXCLUDE FROM THE DEFINITION OF PREVENTIVE MAINTENANCE ALL ACTIVITIES THAT ARE NOT CARRIED OUT ON A PERIODIC SCALE, EVEN WHEN THEY WOULD PREVENT OTHER DEFECTS AND ACCIDENTS.

WE HAVE BEEN OPERATING OUR TRANSPORTATION PREVENTIVE MAINTENANCE GROUP FOR THREE YEARS. IT HAS DECREASED THE NEED FOR NEW TRANSMISSIONS AND HYDRAULIC PUMPS BY 90%. IT KEEPS MOVING PARTS IN WORKING CONDITION. IT IS INEXPENSIVE MAINTENANCE. AT THE PRESENT TIME, WE HAVE NO CONTROL OVER WATER PUMPS, BUT WE WILL START DRAINING AND FLUSHING RADIATORS ON A REGULAR PREVENTIVE MAINTENANCE BASIS WITH THE INTENT OF CUTTING DOWN RADIATOR PROBLEMS AND REPAIR COSTS. TO FURTHER ILLUSTRATE THE VALUE OF PREVENTIVE MAINTENANCE, NOTE THE FOLLOWING. IT COST APPROXIMATELY $20 FOR A RADIATOR TO BE MAINTAINED WHILE IT COSTS $250 PLUS DOWN TIME TO REPLACE A RADIATOR.

ALSO, WE HAVE ATTEMPTED TO FURTHER IMPROVE OUR EFFICIENCY WITH THE USE OF A MAINTENANCE-MANAGEMENT CONTROL SYSTEM.

OUR SHIP PRODUCIBILITY RESEARCH PROGRAM TASK ES-8-L8 (PHASE IV) PROJECT IS ACTUALLY THREE PHASES. PHASE ONE WAS TESTING A MICRO-COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM. PHASE TWO, OUR PRIMARY AND MOST IMPORTANT TASK, IS THE TRANSFER OF LABOR STANDARD DATA ACROSS THE INDUSTRY. PHASE THREE WILL BE A MANUAL PERFORMANCE RATING REPORTING SYSTEM UTILIZING OUR ENGINEERED LABOR STANDARDS THAT ARE THE RESULT OF OUR DATA TRANSFER.

ALTHOUGH NASSCO HAD A SEMBLANCE OF A COMPUTERIZED MAINTENANCE MANAGEMENT CONTROL SYSTEM FOR APPROXIMATELY SIX YEARS ON THE COMPANY'S MAINFRAME COMPUTER, FOR SEVERAL REASONS IT APPEARS MORE ADVANTAGEOUS TO USE A PERSONAL DEPARTMENTAL SYSTEM. OUR CHIEF OF MAINTENANCE AND MANAGER OF INFORMATION SYSTEMS SEARCHED FOR SEVERAL MONTHS. THE COMPANY THAT THEY FOUND WAS J. B. SYSTEMS WHICH HAS THE MAINSAVER SYSTEM.

MAINSAVER IS AN OFF-THE-SHELF TURNKEY COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM. IT IS A PRODUCT WHICH IS A FUNCTIONAL TOOL FOR THE MAINTENANCE MANAGER. IT PROVIDES TOP MANAGEMENT WITH TIMELY AND COMPREHENSIVE REPORTS ON THE ACTIVITIES OF THE MAINTENANCE DEPARTMENT AND THE COST OF THOSE ACTIVITIES.

THERE ARE SEVERAL GOOD POINTS ABOUT THE MAINSAVER SYSTEM. THEY ARE:

1. IT IS AN ONLINE, DATABASE SYSTEM.
2. IT DOES NOT REQUIRE DATA PROCESSING PERSONNEL TO OPERATE THE SYSTEM, AND IS OPERATED BY THE MAINTENANCE PERSONNEL.
3. IT HAS THE CAPACITY TO CONTAIN THE MASTER EQUIPMENT LIST, THE INVENTORY LIST, THE PERSONNEL LIST AND THE PREVENTIVE MAINTENANCE REQUIREMENTS IN TERMS OF BOTH CALENDAR AND USAGE.
4. IT PRODUCES WORK ORDERS FROM BOTH PREVENTIVE MAINTENANCE REQUIREMENTS AND OTHER SCHEDULED WORK REQUESTS.
5. IT TRACKS AND REPORTS ON THE STATUS OF ALL OPEN WORK ORDERS.
6. IT ALLOWS MAINTENANCE MANAGEMENT TO FORECAST MANPOWER REQUIREMENTS FOR SCHEDULED AND PREVENTIVE MAINTENANCE FOR UP TO ONE YEAR.
7. IT CONTAINS ONLINE MAINTENANCE HISTORY BY EQUIPMENT FOR AT LEAST ONE YEAR.
8. IT TRACKS SPARE PARTS USAGE EQUIPMENT.
9. IT PRODUCES REORDER REPORTS TO BE USED BY PURCHASING TO ORDER SPARE PARTS AS NEEDED.
10. IT PROVIDES TOP MANAGEMENT WITH TIMELY AND MEANINGFUL REPORTS WHICH DESCRIBE THE ACTIVITIES AND COSTS INVOLVED IN RUNNING THE MAINTENANCE DEPARTMENT.
11. IT ALLOWS THE USER TO FORMULATE HIS OWN SPECIAL REPORTS.

12. IT PERMITS TELECOMMUNICATION LINKAGE BETWEEN THE MAINTENANCE COMPUTER AND THE COMPANY'S MAINFRAME.

IN SPITE OF THE MANY ADVANTAGES OF THE MAINSAVER SYSTEM, IT FAILED TO BLEND IN AND, THEREFORE, DID NOT WORK OUT SATISFACTORILY FOR US. THE PRINCIPLEPROBLEMS ENCOUNTERED WITH MAINSAVER WERE CAPACITY, AND MATCHING THE TURN KEY SYSTEM TO NASSCO'S EXISTING MAIN FRAME. TOO, IT WAS VERY INFLEXIBLE.

THE TIME NEEDED FOR EVERY SINGLE JOB OPERATION IN OUR MAINTENANCE TRANSPORTATION PREVENTIVE MAINTENANCE IS ESTIMATED FOR SEVERAL REASONS.

1. TO BE ABLE TO ESTABLISH WHETHER PREVENTIVE MAINTENANCE IS PROFITABLE.
2. TO BE ABLE TO HAVE THE NECESSARY PERSONNEL AVAILABLE.
3. TO BE ABLE TO ALLOCATE AN ADEQUATE DAY'S WORK TO PERSONNEL.
4. TO BE ABLE TO MAKE THE BEST USE OF LIMITED SHUTDOWN PERIODS.
5. TO HAVE A ROUGH MEASURE OF PERFORMANCE.

WE DO NOT USE THESE TIME ESTIMATES FOR WORK MEASUREMENT OR INCENTIVE SCHEMES. MANY OF OUR P. M. OPERATIONS CANNOT BE CHECKED CLOSELY ENOUGH. TOO, OUR WORKERS ARE EXPECTED TO DEAL WITH MINOR DEFECTS AS THEY ENCOUNTER THEM AND WITHOUT A SEPARATE ORDER HAVING TO BE ISSUED. WE DO NOT EXPECT OUR MAINTENANCE MEN TO HAVE A SEPARATE WORK ORDER FOR EVERY SINGLE INSTANCE THAT MAY OCCUR. THE PAPERWORK WOULD BE HORRENDOUS. IN PRACTICE, IT IS IMPOSSIBLE TO COVER BY PLANNING EVERY INSTANCE OF A JOB TASK.

THEREFORE, I HAVE DIFFERENTIATED, FOR MY PURPOSES, BETWEEN BASIC TIMES AND ALLOWANCE TIMES. BASIC TIMES ARE THE TIMES REQUIRED

TO CARRY OUT INDIVIDUAL TASKS AND ALLOWANCE TIMES COVER THE ACTIVITIES THAT OCCUR IRREGULARLY. WE DO NOT HAVE TIMES FOR SITUATIONS SUCH AS:

1. REPAIRS THAT ARE NOT CARRIED OUT WITH EACH INDIVIDUAL OPERATION.
2. ADDITIONAL JOBS ARISING FROM AN UNFORESEEN OR ABNORMAL CONDITION IN THE SHIPYARD.

OUR SNAME PANEL 8 TASK ES-8-L8 (PHASE IV) IS A THREE PHASE PROJECT.

PHASE 1. MAINSAVER - COMPUTERIZED MAINTENANCE MANAGEMENT

PHASE 2. TRANSFER OF ENGINEERED PERFORMANCE STANDARDS FOR PUBLIC WORKS MAINTENANCE INTO LABOR STANDARDS FOR NASSCO'S TRANSPORTATION MAINTENANCE GROUP

PHASE 3. MANUAL PERFORMANCE REPORTING FOR NASSCO'S TRANSPORTATION MAINTENANCE EMPLOYEES

THE MOST IMPORTANT PHASE OF OUR PROJECT PROVIDES FOR A DEMONSTRATION OF THE TRANSFERABILITY OF INDIRECT STANDARD DATA THAT CURRENTLY EXISTED OUTSIDE THE SHIPBUILDING INDUSTRY. WE ARE USING ENGINEERED PERFORMANCE STANDARDS WHICH ARE APPROXIMATELY 4,000 ELEMENTAL TIME STANDARDS DEVELOPED BY ENGINEERING FIELD DIVISION INDUSTRIAL ENGINEERS AND INDUSTRIAL ENGINEERING TECHNICIANS WHICH ARE THE FOUNDATION BLOCKS FOR THE NAVY'S ENGINEERED PERFORMANCE STANDARDS (EPS) FOR PUBLIC WORKS MAINTENANCE. THE MOST CRITICAL FACT THAT WE HAVE LEARNED IS THAT:

<u>HUMAN BEINGS ARE IMPORTANT TO PREVENTATIVE MAINTENANCE</u>

BECAUSE NEARLY ALL MAINTENANCE ACTIVITIES ARE HUMAN ACTIVITIES, ALMOST ENTIRELY CONTROLLED BY THE INDIVIDUALS CARRYING THEM OUT. UNLESS THESE INDIVIDUALS DO THE JOB AND DO THE JOB PROPERLY, EVEN THE MOST PERFECT PROCEDURE WILL NEVER ACHIEVE ANYTHING.

SAVINGS PER YEAR THAT HAVE BEEN GAINED DUE TO SP-8 PARTICIPATION.

$ 100,000 FOR FORKLIFT UP TIME GAINED

$ 40,000 FOR ELIMINATION OF CLERICAL POSITION

$ 30,000 FOR REDUCTION OF ISD SUPPORT REQUIRED

WE ANTICIPATE SAVINGS WELL OVER $1,000,000 AS OUR PREVENTIVE MAINTENANCE AND TRANSFERABILITY OF DATA PROJECT CONCLUDES.

TOOL LIST

1. DRIP PAN
2. SPINDLE WRENCH
3. FUNNEL
4. GALLON OIL CAN
5. HAND TOOLS
6. AIR POWER TOOLS: IMPACT WRENCH (GUN)

MATERIAL HANDLING

1. DRIVE VEHICLE TO AND FROM WORK AREA.
   NO CRANES
   NO FORK LIFTS

WHERE PM IS DONE

1. MOST DONE IN MAINTENANCE
   MAINTENANCE EMPLOYEES PICK UP EQUIPMENT THEMSELVES.

PARTS

1. NO PARTS BECAUSE NO REPAIR IS REQUIRED.

TWO MEN

1. TWO MEN ARE NOW PERFORMING THE WORK.

FOR NASSCO'S TRANSPORTATION MAINTENANCE GROUP

METHODS FOR ALL VEHICLES EXCEPT CRANES:

1. BRING VEHICLE TO SHOP.
2. GET MATERIALS READY (OIL, FILTERS, TOOLS) AND TRANSPORT OIL AND KEEP CLOSE TO THE UNIT TO BE SERVICED.
3. DRAIN OLD OIL AS REQUESTED (COULD BE ENGINE OIL, COULD BE HYDRAULIC OIL).
4. WHILE OIL IS DRAINING, REMOVE ALL FILTERS AS REQUIRED, USUALL FOUR FILTERS.
5. CHECK CONDITION OF BATTERY FOR WATER AND CHARGE. CHECK ALL. RESERVOIRS, BRAKE AND HYDRAULIC.
6. AFTER OIL IS DRAINED, PUT IN PLUGS.
7. FILL WITH OIL.
8. STEAM CLEAN AND LUBE.
9. DRIVE UNIT BACK TO ORIGINAL LOCATION.

GUIDELINE FOR TUNE-UP

1. CHECK TORQUE ON ALL HEAD BOLTS USING SPEC'S.
2. ADJUST VALVES,
3. TEST FUEL NOZZLES AND REPLACE IF FAULTY. REPLACE SEALS.
4. CHECK RACK SETTING.
5. INSPECT FUEL PUMP PLUNGER AND LIFTER YOKES FOR WEAR. ADJUST LIFTER YOKES TO COMPENSATE FOR WEAR IF NECESSARY.
6. PULL AIR/FILTER TO INSPECT TURBOCHARGER.
7. REPLACE VALVE COVER GASKETS IF LEAKAGE OCCURS.

HAMMERHEAD - GANTRY #l

Monthly: Using check point lists, inspect the followinG:

Ml. Reel Motors and Travel Motors
Reel motor connections
a. Feeder cable connections
c. Controller connections
d. Travel motor connections
e. Brake coil connections
f. Travel motor bearing oil
g. Travel brake connections

M2 . Engine Room
Hoist motor brushes and brake assembly
a. Swing motor brushes and brake assembly
c. Resistor bank connections
d. Switchboard connections

Quarterly: Using check point lists, inspect the following:

Q1. Reel and Travel Motors
a. SLiding contacts on cable reel
b. Brake adjustments
c. Record insulation resistance readings on:
1. Reel motor
2. Travel motors #l _____ #2 _____

Q2 . Main Collector Rings
a. Clean and inspect -

Q3 . Engine Room
Switchboard contractors
a. Record insulation resistance readings on:
1. Hoist motor: Primary _____ Secondary _____
2. Swing motor: Primary _____ Secondary _____
3. Trolley motor

Semi-Annual: Using check point lists, inspect the following:

S1. Reel and Travel Motors
Open and clean reel motor and controller
a. Clean travel motors with air and solvent

S2. Operator's Console
Open and clean controllers
b. Adjust contacts

S3. Engine Room
a. Open and clean hoist motor
b. Open and clean swing motor
c. Open and clean trolley motor
d. Clean main board

Hammerhead - Gantry #1

Annual: Using check point lists, inspect the following:

A1. Main Circuit Breaker

a. Test and calibrate circuit breaker

GANTRY #2

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging connections
- b. Test emergency stop button - record
- c. Brakes and coil connections

M2. Engine Platform
- a. Generator connections
- b. Electric meters
- c. Replace air filters

M3. Engine Room
- a. Switchboard connections & contactors
- b. Resistor Banks
- c. Ensure eddy current rings are in place
- d. Hoist and swing motor connections

M4. Boom Lights
- a. Check boom lights

M5. Slip Ring Platform
- a. Slip ring connections and wiring

Quarterly: Using check point lists, inspect the following:

Q1. Travel motors
- a. Clean grease and oil from motors
- b. Brakes
- c. Take and record insulation reading on travel motors

Q2. Engine Room
- a. Hoist motor brushes and slip rings
- b. Swing motor brushes and slip rings
- c. Take and record insulation readings on:
  1. Hoist motor
  2. Swing motor
- d. Switchboard connections and wiring

Q3. Operator's Console and Main Generator
- a. Clean controls
- b. Contacts and wiring
- c. Take and record insulation readings on main generator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
- a. Open and clean motors
- b. Slip rings

Gantry #2

S2. Engine Platform
- a. Pressure switch
- b. Compressor motor
- c. Voltage regulator
- d. Open and clean generator exciter and main windings

S3. Main Collector Rings
- a. Clean ring assembly
- b. Brushes, brush rigging and shoe
- c. Clean slip ring housing

S4. Engine Room
- a. Open and clean:
  1. Hoist motor
  2. Swing motor
  3. Control air compressor motor
  4. Control air compressor switch

S5. Boom
- a. Check condition of limit switches

Annual: Using check point lists, inspect the following:

A1. Test and calibrate circuit breaker

GANTRY #3

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging connections
- b. Test emergency stop button - record
- c. Brakes and coil connections

M2. Engine Pltaform
- a. Generator connections
- b. Electric meters
- c. Replace air filters

M3. Engine Room
- a. Switchboard connections & contractors
- b. Resistor Banks
  Ensure eddy current rings are in place
- c. Hoist and swing motor connections

M4. Boom Lights
- a. Check boom lights

M5. Slip Ring Platform
- a. Slip ring connections and wiring

Quarterly: Using check point lists, inspect the following:

Q1. Travel motors
- a. Clean grease and oil from motors
- b. Brakes
- c. Take and record insulation reading on travel motors

Q2. Engine Room
- a. Hoist motor brushes and slip rings
- b. Swing motor brushes and slip rings
- c. Take-and record insulation readings on:
  1. Hoist motor
  2. Swing motor
- d. Switchboard connections and wiring

Q3. Operator's Console and Main Generator
- a. Clean controls
- b. Contacts and wiring
- c. Take and record insulation readings on main generator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
- a. Open and clean motors
- b. Slip rings

Gantry #3

S2. Engine Platform
a. Pressure switch
b. Compressor motor
c. Voltage regulator
d. Open and clean generator exciter and main windings

S3. Main Collector Rings
a. Clean ring assembly
b. Brushes, brush rigging and shoe
c. Clean slip ring housing

S4. Engine Room
a. Open and clean:
1. Hoist motor
2. Swing motor
3. Control air compressor motor
4. Control air compressor switch

S5. Boom
a. Check condition of limit switches

Annual: Using check point lists, inspect the following:
A1. Test and calibrate circuit breaker

GANTRY #4

Monthly :

Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging connections
- b. Test emergency stop button - record
- c. Brakes and coil connections

M2. Engine Platform
- a. Generator connections
- b. Electric meters
- c. Replace air filters

M3. Engine Room
- a. Switchboard connections & contractors
- b. Resistor Banks
- c. Ensure eddy current rings are in place
- d. Hoist and swing-motor connections

M4. Boom Lights
- a. Check boom lights

M5. Slip Ring Platform
- a. Slip ring connections and wiring

Quarterly:

Using check point lists, inspect the following:

Q1. Travel motors
- a. Clean grease and oil from motors
- b. Brakes
- c. Take and record insulation reading on travel motors

Q2. Engine Room
- a. Hoist motor brushes and slip rings
- b. Swing motor brushes and slip rings
- c. Take and record insulation readings on:
  1. Hoist motor
  2. Swing motor
- d. Switchboard connections and wiring

Q3. Operator's Console and Main Generator
- a. Clean controls
- b. Contacts and wiring
- c. Take and record insulation readings on main generator

Semi-Annual:

Using check point ists, inspect the following:

S1. Travel Motors
- a. Open and clean motors
- b. Slip rings

Gantry #4

S2. Engine Platform
- a. Pressure switch
- b. Compressor motor
- c. Voltage regulator
- d. Open and clean generator exciter and main windings

S3. Main Collector Rings
- a. Clean ring assembly
- b. Brushes, brush rigging and shoe
- c. Clean slip ring housing

S4. Engine Room
- a. Open and clean:
  1. Hoist motor
  2. Swing motor
  3. Control air compressor motor
  4. Control air compressor switch

S5. Boom
- a. Check condition of limit switches

Annual: Using check point lists, inspect the following:

A1. Test and calibrate circuit breaker

GANTRY #5

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging connections
- b. Test emergency stop button - record
- c. Brakes and coil connections

M2. Engine Platform
- a. Generator connections
- b. Electric meters
- c. Replace air filters

M3. Engine Room
- a. Switchboard connections & contractors
- b. Resistor Banks
- c. Ensure eddy current rings are in place
- d. Hoist and swing motor connections

M4. Boom Lights
- a. Check boom lights

M5. Slip Ring Platform
- a. Slip ring connections and wiring

Quarterly: Using check point lists, inspect the following:

Q1. Travel motors
- a. Clean grease and oil from motors
- b. Brakes
- c. Take and record insulation reading on travel motors

Q2. Engine Room
- a. Hoist motor brushes and slip rings
- b. Swing motor brushes and slip rings
- c. Take and record insulation readings on:
  1. Hoist motor
  2. Swing motor
- d. Switchboard connections and wiring

Q3. Operator's Console and Main Generator
- a. Clean controls
- b. Contacts and wiring
- c. Take and record insulation readings on main generator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
- a. Open and clean motors
- b. Slip rings

Gantry #5

S2. Engine Platform
- a. Pressure switch
- b. Compressor. motor
- c. Voltage regulator
- d. Open and clean generator exciter and main windings

S3. Main Collector Rings
- a. Clean ring assembly
- b. Brushes, brush rigging and shoe
- c. Clean slip ring housing

S4. Engine Room
- a. Open and clean:
  1. Hoist motor
  2. Swing motor
  3. Control air compressor motor
  4. Control air compressor switch

S5. Boom
- a. Check condition of limit switches

Annual: Using check point lists, inspect the following:

Al. Test and calibrate circuit breaker

GANTRY #6

Monthly: Using check point lists, inspect the following travel motors:

M1.
- a. Brush rigging connections
- b. Brakes and coil connections
- c. Test emergency stop button - record

M2. Engine Platform
- a. Generator connections
- b. Electrical meters
- c. Replace generator air filter

M3. Slip Ring Platform
- a. Slip ring connections
- b. Travel control panel
- c. Resistor bank connections

M4. Engine Room
- a. Switchboard connections
- b. Resistor bank connections
- c. Hoist motor connections
- d. Swing motor connections

M5. Boom
- a. Check boom lights

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Brake assemblies -
- b. Clean grease and oil from motors
- c. Take and record insulation readings

Q2. Engine Platform
- Air compressor connections
- a. Take and record insulation readings on:
  1. Generator
  2. Compressor motor

Q3. Engine Room
- a. Brushes, brush holders, slip rings on:
  1. Hoist motor
  2. Swing motor
- b. Switchboard connections
- c. Circuit breaker panel connections
- d. Take and record insulation readings on:
  1. Hoist motor
  2. Swing motor
  3. Compressor motor

Q4. Operator's Console
- a. Control contacts, connections, and wiring
- b. Weight indicators

Gantry #6

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
- a. Open and clean travel motors
- b. Open and clean emergency stop buttons

S2. Engine Platform
- a. Inspect voltage regulator - clean
- b. Open and clean generator
- c. Open and clean compressor motor
- d. Open and clean pressure switch

S3. Slip Ring Platform
- a. Clean slip ring assembly
- b. Clean slip ring housing
- c. Clean travel controller
- d. Clean travel resistor bank

S4. Engine Room
- a. Clean hoist and swing panels
- b. Open and clean:
  1. Hoist motor
  2. Swing motor
  3. Compressor motor
  4. Pressure switch

S5. Operators Console
- a. Clean all contacts
- b. Clean control housing

Annual: Using check point lists, inspect the following:

A1. Main Circuit Breaker
- a. Test and calibrate circuit breaker

GANTRY #7

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging jumpers and brushes
- b. Test emergency stop buttons - record

M2. Engine Platform
- a. Generator connections
- b. Electrical meters
- c. Replace generator air filter

M3. Main Collector Ring
- a. Slip rings, shoes, springs and wiring

M4. Engine Room
- a. Switchboard
- b. Resistor banks
- c. TB-750 board and connections - clean

M5. Main Hoist Motor
- a. Brushes, slip rings

M6. Boom Lights
- a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Clean oil and grease from motors
- b. Brushes, brush rigging and slip rings
- c. Brake assemblies
- d. Take and record insulation resistance readings on motors

Q2. Engine Platform
- a. Take and record insulation resistance readings on:
  1. Generator main windings
  2. Compressor motor windings
- b. Using OHMMETER test and record insulation resistance readings on:
  1. Generator exciter windings

Q3. Engine Room
- a. Controllers
- b. Brushes, brush rigging and slip rings on:
  1. Hoist motor
  2. Swing motor
- c. Take and record insulation resistance readings on:
  1. Swing motor
- d. With OHMMETER take and record insulation resistance readings on:
  1. Hoist motor
- e. TB-750 controller

Gantry #7

Q4 . Operators Cab
a Operators console contacts and wiring
b. Test weight indicators

Semi-Annual: Using check point lists, inspect the following:
S1. Travel Motors
a. Clean with compressed air
b. Slip rings
S2. Engine Platform
a. Clean and inspect:
1. Air compressor motor
2. Pressure switch
S3 . Main Collector Rings
a. Clean rings and housing
b. Inspect shoes, springs, and wiring
S4. Engine Room
a. Clean:
1. Hoist motor
2. Swing motor
3. TB-750 controller
4. Air compressor motor and pressure switch
S5 . Operators Console
a. Clean controls and housing
S6 . Limit Switches
a. Condition and operation of switches

Annual: Using check point lists, inspect the following:
Al. Main Circuit Breaker
a. Test and calibrate circuit breaker

GANTRY #8

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brush rigging jumpers and brushes
- b. Test emergency stop buttons - record

M2. Engine Platform
- a. Generator connections
- b. Electrical meters
- c. Replace generator air filter

M3. Main Collector Ring
- a. Slip rings, shoes, springs and wiring

M4. Engine Room
- a. Switchboard
- b. Resistor banks
- c. TB-750 board and connections - clean

M5. Main Hoist Motor
- a. Brushes, slip rings

M6. Boom Lights
- a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Clean oil and grease from motors
- b. Brushes, brush rigging and slip rings
- c. Brake assemblies
- d. Take and record insulation resistance readings on motors

Q2. Engine Platform
- a. Take and record insulation resistance readings on:
  1. Generator main windings
  2. Compressor motor windings
- b. Using OHMMETER test and record insulation resistance readings on:
  1. Generator exciter windings

Q3. Engine Room
- a. Controllers
- b. Brushes, brush rigging and slip rings on:
  1. Hoist motor
  2. Swing motor
- c. Take and record insulation resistance readings on:
  1. Swing motor
- d. With OHMMETER take and record insulation resistance readings on:
  1. Hoist motor
- e. TB-750 controller

Gantry #8

Q4 . Operators Cab
a. Operators console contacts and wiring
b. Test weight indicators

Semi-Annual: Using check point lists, inspect the following:
S1. Travel Motors
a. Clean with compressed air
b. Slip rings
S2 . Engine Platform
a. Clean and inspect:
1. Air compressor motor
2. Pressure switch
S3. Main Collector Rings
a. Clean rings and housing
b. Inspect shoes, springs, and wiring
S4 . Engine Room
a. Clean:
1. Hoist motor
2. Swing motor
3. TB-750 controller
4. Air compressor motor and pressure switch
S5. Operators Console
a. Clean controls and housing
S6. Limit Switches
a. Condition and operation of switches

Annual: Using check point lists, inspect the following:
Al. Main Circuit Breaker
a. Test and calibrate circuit breaker

GANTRY #9

Monthly: Using check point lists; inspect the following:

M1. Travel Motors
- a. Brush rigging jumpers and brushes
- b. Test emergency stop buttons - record

M2. Engine Platform
- Generator connections
- a. Electrical meters
- c. Replace generator air filter

M3. Main Collector Ring
- a. Slip rings, shoes, springs and wiring

M4. Engine Room
- a. Switchboard
- b. Resistor banks
- c. TB-750 board and connections - clean

M5. Main Hoist Motor
- a. Brushes, slip rings

M6. Boom Lights
- a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Clean oil and grease from motors
- b. Brushes, brush rigging and slip rings
- c. Brake assemblies
- d. Take and record insulation resistance readings on motors

Q2. Engine Platform
- a. Take and record insulation resistance readings on:
  1. Generator main windings
  2. Compressor motor windings
- b. Using OHMMETER test and record insulation resistance readings on:
  1. Generator exciter windings

Q3. Engine Room
- a. Controllers
- b. Brushes, brush rigging and slip rings on:
  1. Hoist motor
  2. Swing motor
- c. Take and record insulation resistance readings on:
  1. Swing motor
- d. With OHMMETER take and record insulation resistance readings on:
  1. Hoist motor
- e. TB-750 controller

Gantry #9

Q4. Operators Cab
- a. Operators console contacts and wiring
- b. Test weight indicators

Semi-Annual: Using check point lists, inspect the followinq:

S1. Travel Motors
- a. Clean with compressed air
- b. Slip rings

S2. Engine Platform
- a. Clean and inspect:
  1. Air compressor motor
  2. Pressure switch

S3. Main Collector Rings
- a. Clean rings and housing
- b. Inspect shoes, springs, and wiring

S4. Engine Room
- a. Clean:
  1. Hoist motor
  2. Swing motor
  3. TB-750 controller
  4. Air compressor motor and pressure switch

S5. Operators Console
- a. Clean controls and housing

S6. Limit Switches
- a. Condition and operation of switches

Annual: Using check point lists, inspect the following:

Al. Main Circuit Breaker
- a. Test and calibrate circuit breaker

GANTRY #10

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brushes and connections
- b. Brake assemblies

M2. Engine Platform
- a. Generator connections
- b. Circuit breaker connections
- c. Electric meters
- d. Replace

M3. Main Collector Rings
- a. Connections and wiring

M4. Engine Room
- a. Switchboard
- b. Resistor banks
- c. M.G. set starter panel

M5. Boom Lights
- a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Clean brake assemblies and adjust
- b. Take and record insulation resistance readings on primaries and secondaries

Q2. Engine Platform
- a. Take and record insulation resistance on:
  1. Air compressor motor
  2. Generator main windings
  3. Use OHMMETER to read exciter from regulator leads

Q3. Engine Room
- a. Controllers
- b. Main switchboard
- c. M.G. starter panel

Q4. Main Motors, M.G. Sets
- a. Brushes, brush rigging springs on:
  1. Hoist motor
  2. Swing motor
  3. Boom motor
  4. M.G. set hoist
  5. M.G. set swing

Q5. Main Motors, M.G. Sets and Blowers
- a. Using OHMMETER take and record insulation resistance on:
  1. Hoist motor stator _____ rotor _____
  2. Swing motor stator _____ rotor _____

Gantry #l0

3. Loom motor stator _____ rotor _____
4. M.G. hoist generator field _____ armature _____
5. M.G. swing generator field _____ armature _____

Q6. M.G. Motors and Blowers
a. Using meggar take and record insulation resistance on:
1. Hoist M.G. motor
2. Swing M.G. motor
3. M.G. blower motor
4. Swing motor blower motor
5. Hoist motor blower motor
6. Boom motor blower motor

Q7. Operator's Console
a. Contacts and wiring
b. Test weight indicator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
a. Clean motors with air and solvent

S2. Engine Platform
a. Clean and inspect air compressor motor and pressure switch.
b. Voltage regulator wiring
c. Clean generator windings with air
d. Read generator's voltage

S3. Main Collector Rings :
a. Clean housing
b. Inspect brushes, shoes, springs and wiring

S4. Engine Room
a. Clean all motors and generators
b. Clean and inspect pressure switch for control air compressor
c. Clean main circuit breaker and panel housing

S5. Limit Switches
a. Check condition and operation of limit switches

Annual: Using check point *lists,* inspect the following:

Al. Circuit Breakers and Overloads
a. Test circuit breakers and overloads for proper trip settings

GANTRY #11

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brushes and connections
- b. Brake assemblies

M2. Engine Platform
- a. Generator connections
- b. Circuit breaker connections
- c. Electric meters
- d. Replace

M3. Main Collector Rings
- a. Connections and wiring

M4. Engine Room
- a. Switchboard
- b. Resistor banks
- c. M.G. set starter panel

M5. Boom Lights
- a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Clean brake assemblies and adjust
- b. Take and record insulation resistance readings on primaries and secondaries

Q2. Engine Platform
- a. Take and record insulation resistance on:
  1. Air compressor motor
  2. Generator main windings
  3. Use OHMMETER to read exciter from regulator leads

Q3. Engine Room
- a. Controllers
- b. Main switchboard
- c. M.G. starter panel

Q4. Main Motors, M.G. Sets
- a. Brushes, brush rigging springs on:
  1. Hoist motor
  2. Swing motor
  3. Boom motor
  4. M.G. set hoist
  5. M.G. set swing

Q5. Main Motors, M.G. Sets and Blowers
- a. Using OHMMETER take and record insulation resistance on:
  1. Hoist motor stator ____ rotor _____
  2. Swing motor stator _____ rotor _____

Gantry #11

3. Boom motor stator _____ rotor _____
4. M.G. hoist generator field _____ armature _____
5. M.G. swing generator field _____ armature _____

Q6. M.G. Motors and Blowers
a. Using meggar take and record insulation resistance on:
1. Hoist M.G. motor
2. Swing M.G.motor
3. M.G. blower motor
4. Swing motor blower motor
5. Hoist motor blower motor
6. Boom motor blower motor

Q7. Operator's Console
a. Contacts and wiring
b. Test weight indicator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
a. Clean motors with air and solvent

S2. Engine Platform
a. Clean and inspect air compressor motor and pressure switch
b. Voltage regulator wiring
c. Clean-generator windings with air
d. Read generator's voltage

S3. Main Collector Rings
a. Clean housing
b. Inspect brushes, shoes, springs and wiring

S4. Engine Room
a. Clean all motors and generators
b. Clean and inspect pressure switch for control air compressor
c. Clean main circuit breaker and panel housing

S5. Limit Switches
a. Check condition and operation of limit switches

Annual: Using check point lists, inspect the following:

Al. Circuit Breakers and Overloads
a. Test circuit breakers and overloads for proper trip settings

GANTRY #12

Monthly: Using check point lists, inspect the following:

M1. Travel Motors
- a. Brushes and brush rigging connections
- b. Balance resistor connections
- c. Motor connections

M2. Engine Platform
- a. Generator connections
- b. Replcae generator air filter

M3. Main Collector Rings
- a. Wiring and connections

M4. Engine Room
- a. Switchboard wiring and connections
- b. Insure blower motors are operating and check air ducts to hoist and boom hoist motors

M5. Operator's Console
- a. Connections and wiring

M6. Boom Lights
- a. Repair as necessary

Quaterly: Using check point lists, inspect the following:

Q1. Travel Motors
- a. Using MEGGAR record ROTOR insulation resistance
- b. Using OHMMETER record FIELD insulation resistance
- c. Brake assemblies

Q2. Travel Generators and Swing Generators
- a. Using MEGGAR record insulation resistance on:
  1. Air compressor motor
  2. Travel generator armature _____
  3. Swing generator armature _____
  4. Exciter armature
- b. Using OHMMETER record insulation resistance on:
  1. Travel field
  2. Swing field
  3. Exciter field
- c. Inspect brushes, commutator, brush riggin on:
  1. Swing generator
  2. Travel generator
  3. Exciter generator

Q3. Main Hoist and Boom Hoist
- a. Using OHMMETER record insulation resistance on:
  1. Main hoist generator armature _____
  2. Main hoist generator field _____
  3. Boom hoist generator armature _____
  4. Boom hoist generator field _____

Gantry #12

b. Inspect brushes, brush rigging and commutator on:
   1. Main hoist generator
   2. Boom hoist generator
   3. Exciter generator

c. Using OHMMETER record insulation resistance on:
   1. Swing motor field _____ _____NOTE #1
   2. Main hoist field _____
   3. Boom hoist field _____

Q4. Engine Room Controllers
   a. Inspect contacts, springs wiring

Q5. Operator's Cab
   a. Controller
   b. Weight Indicator

Semi-Annual: Using check point lists, inspect the following:

S1. Travel Motors
   a. Clean motors with air
   b. Clean balance resistors

S2. Engine Platform
   a. Clean compressor motor and pressure switch
   b. Voltage regulator
   c. Clean generators
   d. Clean travel overload panel

S3. Engine Room
   a. Clean motors and M.G. sets
   b. Clean switchboard and panels
   c. Clean resistor banks
   d. Clean main circuit breaker and housing

S4. Main Collector Rings
   a. Clean rings, shoes
   b. Clean housing

S5. Top of House
   a. Clean and tighten connections on dynamic lowering resistors

Annual: Using check point lists, inspect the following:

A1. Circuit Breakers
   a. Test circuit breakers for proper trip settings

D 353
CYLINDER HEAD
TORQUE SEQUENCE

1. TIGHTEN ALL NUTS BY NUMBER TO 180 ± 10 FT. LB.
2. TIGHTEN ALL NUTS BY NUMBER TO 300 ± 10 FT. LB.
3. TIGHTEN ALL NUTS BY NUMBER TO 300 ± 10 FT. LB.

1. INTAKE VALVE = .018 IN.
   EXHAUST VALVE = .030 IN.

2.
-TORQUE FOR FUEL PUMP BOLTS 32 ± 5 FT. LB.

3. TIMING DIMENSION FOR THE FUEL INJECTION PUMPS:
   ON ENGINE (PISTON AT TOP CENTER) 2.090 ± .002 IN.
4. TORQUE FOR NUT THAT HOLDS NOZZLES 105 ± 5 FT. LB.

ENGINE SPECIFICATIONS

Number of cylinders:
D379 and G379 8
D398 and G398 12

Bore and stroke ..... 6¼" x 8"

Firing order:
D379
Counterclockwise 1-8-5-4-7-2-3-6
Clockwise 1-4-5-2-7-6-3-8

D398
Counterclockwise 1-12-9-5-8-11-2-3-10-7-6
Clockwise 1-4-9-8-5-2-11-10-3-6-7-12

Balancer Gears (D379 and G379 Only)
Shaft diameter ..... 1.5996 - 1.6000 in.
Bearing bore ..... 1.6019 - 1.6025 in.
Bearing clearance ..... .0019 - .0029 in.
Permissible bearing clearance ..... .006 in.
End clearance ..... .0060 - .0135 in.
Permissible end clearance ..... .019 in.

Camshaft
Bearing journal diameter . 2.9660 - 2.9670 in.
Bearing clearance ..... .002 - .006 in.
Permissible bearing clearance ..... .009 in.
End clearance ..... .006 - .010 in.
Permissible end clearance ..... .020 in.
Gear retaining bolts, torque . 60 - 70 lb. ft.
Backlash between camshaft gear and crankshaft gear ..... .003 - .005 in.

Connecting Rod
Conn. rod bearing clearance .0043 - .0072 in.
Permissible bearing clearance ..... .012 in.
Center-to-center distance 17.990 - 18.0010 in.
Bore in piston pin bearing 2.4510 - 2.4516 in.
Conn. rod bolt nuts, torque ..... 250 lb. ft.
Conn. rod bolt torque (when equipped with serrated conn. rod)
Lubricate and tighten to ..... 40±4 lb. ft.
plus additional ..... 120°±5°
Side end clearance ..... .012 - .021 in.

Cylinder Head
Tighten nuts in sequence shown in illustration
Initial ..... 150 lb.
2nd ..... 250 lb.
3rd ..... 250 lb.

CYLINDER HEAD STUD NUT TIGHTENING SEQUENCE

Cylinder Liner (Use 6H4141 Adapter Plate for Removal)
Inside diameter ..... 6.250 - 6.252 in.
Permissible liner wear (increase in. diameter at top of ring travel) . . .020 in.
Counterbore dimension in block .498 - .500 in.
Liner flange thickness ..... .504- .506 in.

Flywheel
Run-out:
Permissible at outside diameter .006 in.
Permissible at face ..... .006 in.
Retaining bolts, torque . . . 345 - 405 lb. ft.

Flywheel Housing
Retaining bolts, torque
Inside housing ..... 118 - 1421b. ft.
All others ..... 60 - 70 lb. ft.

ENGINE SPECIFICATIONS (CONTINUED)

Crankshaft

Main journal diameter . . . . . 5.790 - 5.7500 in..
Permissible bearing clearance . . . . . .015 in.
End clearance . . . . . .08- .021 in.
Permissible end clearance . . . . . .035 in.
Main bearing stud nut torque
(earler) . . . . . 75 - 825 lb. ft.
(Later) 66 B891-up, 67 B313-up, 68 B763-up, 69B321-up, 72B133-up, 73B155-up, 75B141-up and 76B88-up . . . . . 200 lb. ft. plus additional 1/3 turn.
Connecting rod journal
diameter . . . . . 4.9990 - 5.0000 in.
Permissible journal wear . . . . . .010 in.
Permissible out-of-roundness (journal).006 in.

Cylinder Block

Main bearing original bore
dimension . . . . . 6.3720 - 6.3730 in.

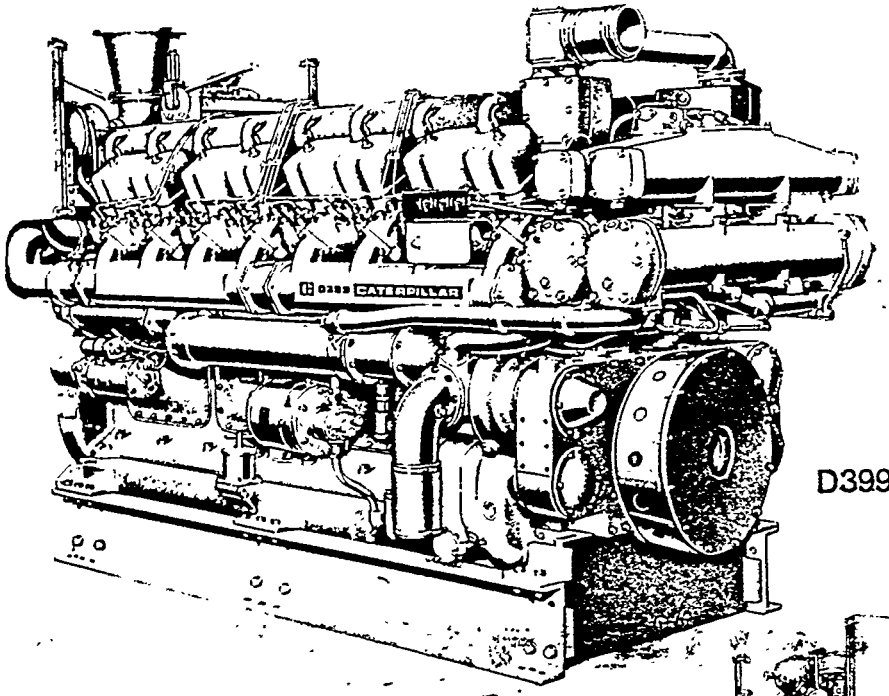
Front Accessory Drive

Main idler shaft diam. . . 2.9960 - 2.9970 ir
Main idler bearing bore . . . 3.000 - 3.001 ir
Main idler bearing clearance .0035 - .0055 ir
Permissible bearing clearance . . . . . .010 ir
Small idler gear shaft diameter
(two) . . . . . 1.9975 - 1.9985 ir
Small idler gear bearing bore
(two) . . . . . 2.00-2.001 ir
Sm. idler bearing clear.(two).0015 - .0035 ir
Permissible bearing clearance . . . .008 ir

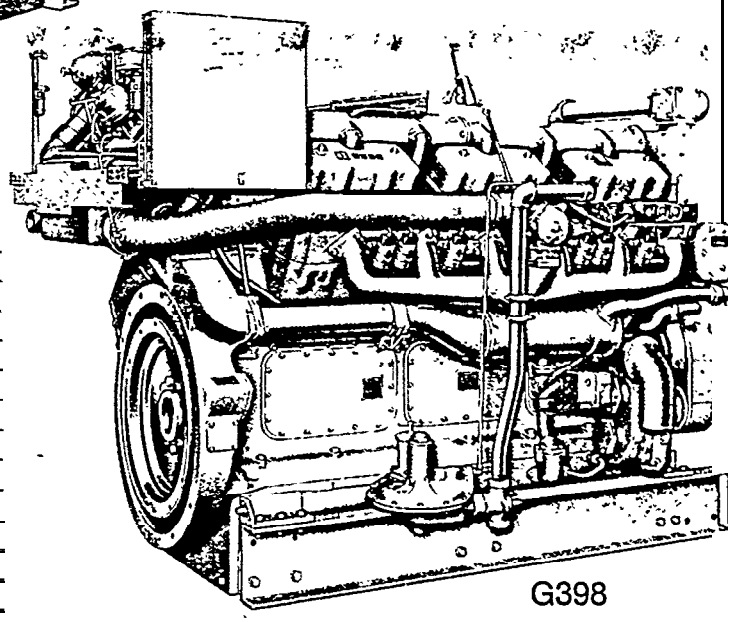
Fuel Injection Equipment

Fuel injection pump timing
(before top center) 12
Fuel injection pump lifter setting (on engine with piston at top dead center) . . . . . 2.0860 - 2.0940 ir

6.25" Bore Industrial Diesel and Natural Gas Engines



D399

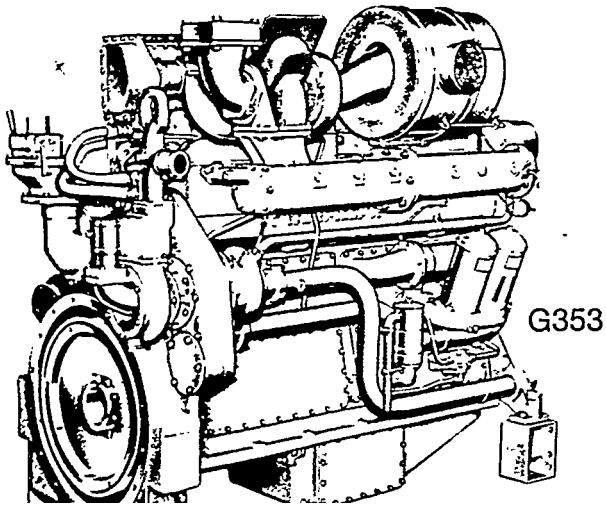


G398

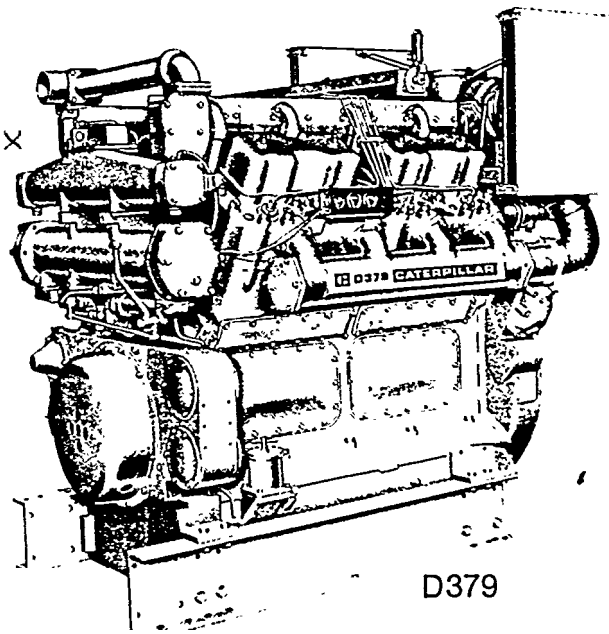
BRIEF SPECIFICATIONS... TURBOCHARGED AND AFTERCOOLED 6.25 IN. X 8 IN. INDUSTRIAL ENGINES

Diesel and Gas Model	No. of Cyl.	Horsepower • Intermitten • Continuous	RPM	Maximum Torque @ RPM	Displacement • Cubic In. • Liters	Weight • lbs. • kg.	Length • in. • mm.	Width • in. • mm.	Height • in. • mm.
D399	V16	1300	1300	—	3928	15,000	118	60	79
		1000	1200	4600 @ 960	64,5	6804	3007	1516	2002
D398B	V12	975	1300	—	2946	11,800	89	56	79
		750	1200	3510 @ 900	48,3	5350	2250	1425	2002
D379B	V8	650	1300	—	1964	9,000	67	56	75
		500	1200	2200 @ 1110	32,2	4080	1690	1425	1905
D353E	6	490	1300	—	1473	6,180	75	43	66
		375	1200	1700 @ 980	24,1	2803	1895	1100	1665
G399	V16	—	—	—	3928	15,400	118	66	79
		930	1200	4400 @ 940	64,5	6970	3007	1675	2002
G398A	V12	—	—	—	2946	12,500	89	61	73
		700	1200	3360 @ 750	48,3	5670	2250	1547	1849
G379A	V8	—	—	—	1964	9,200	67	62	73
		465	1200	2120 @ 900	32,2	4170	1692	1565	1849
G353D	6	—	—	—	1473	6,350	76	44	66
		350	1200	1680 @ 750	24,1	2880	1920	1105	1665

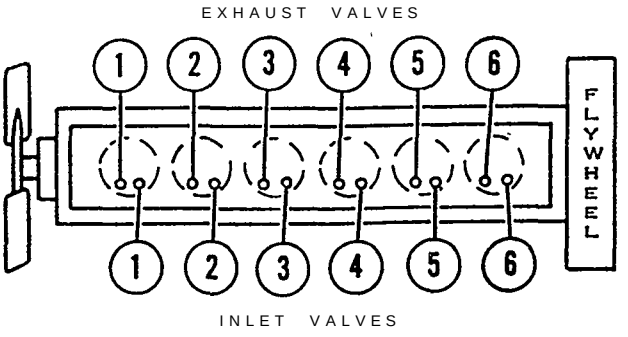
Ratings are without fan. All natural gas model outputs are for operation with 10:1 compression ratio and with 90° (32°C) water to aftercooler. See pages 22 and 23 for other ratings.



G353



D379



D353 ENGINES

8. With NO. 1 CYLINDER ON COMPRESSION STROKE, check the lash of the following valves; adjust if necessary.

NO. 1 CYLINDER ON COMPRESSION STROKE

VALVES	CYLINDERS	VALVE LASH (Inches) D342	D343	D353
Exhaust	1-3-5	.020	.030	.030
Inlet	1-2-4	.016	.018	.018

.020 Inch = 0,51 mm. .030 Inch = 0,76 mm.

.016 Inch = 0,41 mm. .018 Inch = 0,46 mm.

9. With NO. 1 CYLINDER ON EXHAUST STROK check the lash of the following valves; adjust if nece sary.

NO. 1. CYLINDER ON EXHAUST STROKE

VALVES	CYLINDERS	VALVE LASH (Inches) D342	D343	D353
Exhaust	2-4-6	.020	.030	.030
Inlet	3-5-6	.016	.018	.018

.020 inch = 0,51 mm. .030 inch = 0,76 mm.

.016 inch = 0,41 mm. .018 inch = 0,46 mm.

10. Bar the flywheel one revolution in the direction normal rotation and align the flywheel "TC 1" timi mark with the timing pointer.

11. Set the remaining valves as specified in the remainir chart.

Every 2000 Service Hours

When on compression stroke both inlet and exhaust valve rockers can be easily moved with finger pressure.

When on exhaust stroke only the inlet valve can be moved freely with finger pressure.

7. Check the No. 1 cylinder rockers for movement Determine if the piston is on COMPRESSION or HAUST STROKE.
rockers

Valve Setting Chart				
Valve Lash Clearance Adjustment - No. 1 Cylinder on Compression Stroke:				
Engine Rotation:	Exhaust Valves		Inlet Valves	
	Counterclockwise	Clockwise	Counterclockwise	Clockwise
D379	1-4-5-8	1-4-5-8	1-2-3-6	1-3-6-8
D398	1-4-5-6-9-12	1-4-5-8-9-12	1-3-6-7-10-12	1-3-4-6-7-12
D399	1-2-3-4-5-6-8-9	1-2-3-4-5-6-9-10	1-2-7-8-11-12-13-14	1-2-6-7-8-11-13-14

Valve Setting Chart				
Valve Lash Clearance Adjustment - No. 1 Cylinder on Exhaust Stroke:				
Engine Rotation:	Exhaust Valves		Inlet Valves	
	Counterclockwise	Clockwise	Counterclockwise	Clockwise
D379	2-3-6-7	2-3-6-7	4-5-7-8	2-4-5-7
D398	2-3-7-8-10-11	2-3-6-7-10-11	2-4-5-8-9-11	2-5-8-9-10-11
D399	7-10-11-12-13-14-15-16	7-8-11-12-13-14-15-16	3-4-5-6-9-10-15-16	3-4-5-9-10-12-15-16

8. Refer to the preceding table, and set only those valves specified in the appropriate table for No. 1 cylinder on compression stroke or exhaust stroke as determined in step 7.

9. Rotate the flywheel one revolution in the direction of normal rotation and align the flywheel "TC-1" timing mark.

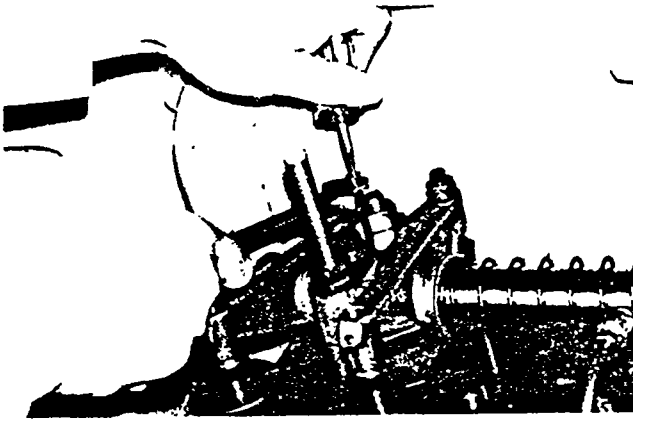
10. Inspect the movement of the rockers for cylinde No. 2.

11. Set the remaining valves as specified in the table.

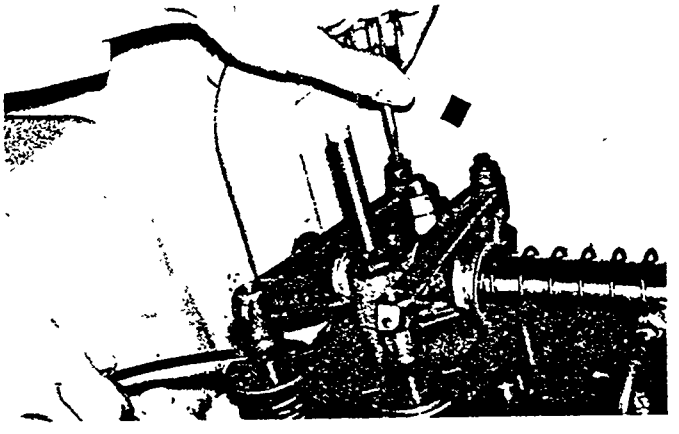
Adjusting Valve Lash

Valve Lash	
Inlet	.015 inch (0.38 mm)
Exhaust	.035 inch (0.89 mm)

When adjusting valve lash, engine must be stopped and cold.



1. Loosen the locknut on the adjusting screw.



2. Turn the adjusting screw to obtain the proper valve lash.

3. Hold the adjusting screw and tighten the locknut.

4. Recheck the valve lash.

㉘ Engine Valve Rótators

After checking all valve clearances, and before installing the valve cover:

1. Start the engine.

2. Move the governor control to the low idle position.

3. Watch the serrations on each valve retainer. E valve retainer should turn slightly each time the v closes.

CM 60 #1

WORK ORDER #8512-326 EQUIPMENT #10868

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS

CM 60 #2

WORK ORDER #8512-327 EQUIPMENT #10869

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS

CM 56

WORK ORDER #8512-325 EQUIPMENT #10101

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	2 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	8 HOURS

CM 150

WORK ORDER #8512-330 EQUIPMENT #538

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

CM 70

WORK ORDER #8512-328 EQUIPMENT #536

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

CM 160

WORK ORDER #8512-332 EQUIPMENT #541

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

CM 100

WORK ORDER #8512-329 EQUIPMENT #537

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS

FLAME PLANER

WORK ORDER #8512-331 EQUIPMENT #10875

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS

WHITNEY PLASMAL PUNCH

WORK ORDER #8511-417 EQUIPMENT #738

BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	16 HOURS
ANNUAL A-1	LABOR	16 HOURS

CLEERMAN DRILL

WORK ORDER #8511-404 EQUIPMENT #751

MONTHLY M-1	LABOR	8 HOURS
QUARTERLY Q-1	LABOR	4 HOURS
SEMI-ANNUAL SA-1	LABOR	16 HOURS

CINN. BRAKE PRESS

WORK ORDER #8511-406 EQUIPMENT #705

QUARTERLY Q-1	LABOR	4 HOURS

SHEET METAL MOLD LOFT

WORK ORDER #8511-080	DISC DRIVE # 1 & #2	EQUIPMENT #1420
WORK ORDER #8511-081	TAPE READER/PUNCH 1 & 2	EQUIPMENT #1421
WORK ORDER #8511-082	LINE PRINTER 1 & 2	EQUIPMENT #1422
WORK ORDER #8511-083	CRT TERMINAL 1 & 2	EQUIPMENT #1423

MONTHLY M-1	LABOR	8 HOURS
SEMI-ANNUAL SA-1	LABOR	16 HOURS

MOLD LOFT

WORK ORDER #8573-288	COMPUTER	EQUIPMENT #1402
WORK ORDER #8573-289	INTER POLAR	EQUIPMENT #1403
WORK ORDER #8573-290	TELETYPE #l	EQUIPMENT #1404
WORK ORDER #8573-291	TELETYPE #2	EQUIPMENT #1405
WORK ORDER #8573-292	TAPE PUNCH FACIT	EQUIPMENT #1406
WORK ORDER #8573-293	DRAFTING TABLE	EQUIPMENT #1407
WORK ORDER #8573-294	TAPE PUNCH REMEX	EQUIPMENT #1408
WORK ORDER #8573-295	TAPE PUNCH/READER REMEX	EQUIPMENT #1409

MONTHLY M-1		LABOR	16 HOURS
SEMI - ANNUAL	SA-1	LABOR	16 HOURS
ANNUAL	A-1	LABOR	8 HOURS
ANNUAL	A-2	LABOR	8 HOURS
ANNUAL	A-3	LABOR	16 HOURS
ANNUAL	A-4	LABOR	8 HOURS

ROLLS MACHINE

WORK ORDER #8512-397 EQUIPMENT #542

MONTHLY M - 1	LABOR	6 HOURS

PANEL LINE

WORK ORDER #8512-315	PANEL LINE	EQUIPMENT #534
WORK ORDER #8512-316	ESAB HEBE	EQUIPMENT #530
WORK ORDER #8512-317	STA 1 HYDRAULIC SYSTEM	EQUIPMENT #531
WORK ORDER #8512-318	STA 2 HYDRAULIC SYSTEM	EQUIPMENT #532

MONTHLY M-1	LABOR	8 HOURS
SEMI-ANNUAL SA-1	LABOR	8 HOURS
SEMI-ANNUAL SA-112	LABOR	8 HOURS
SEMI-ANNUAL SA-113	LABOR	8 HOURS

WHEELABRATOR

WORK ORDER #8512-378	WHEELABRATOR	EQUIPMENT #558
WORK ORDER #8512-379	PAINT BOOTH	EQUIPMENT #ll03
WORK ORDER #8512-380	BRUSH OFF SYSTEM	EQUIPMENT #556
WORK ORDER #8512-381	BAG HOUSE	EQUIPMENT #555

MONTHLY M - 1 LABOR 24 HOURS

FOUNDRY DIGITAL R E A D O U T

WORK ORDER #8504-365 EQUIPMENT #394

MONTHLY M - 1	LABOR	2 HOURS

SECTION 1

WORK ORDER #8512-304 TRANSFER CART T-1 EQUIPMENT #854
WORK ORDER #8512-378 R1, R2, R3, R4 & R5 EQUIPMENT #558

MONTHLY M-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

SECTION 2

WORK ORDER #8512-305	TRANSFER CART T-2	EQUIPMENT #855
WORK ORDER #8512-325	R20	EQUIPMENT #10101
WORK ORDER #8512-307	R22	EQUIPMENT #857
WORK ORDER #8512-311	T2 GATE	EQUIPMENT #861

MONTHLY M-1	8 HOURS
ANNUAL A-1	24 HOURS

SECTION 3

WORK ORDER #8512-300 COLLOCATOR C-1 EQUIPMENT #850

MONTHLY	M-1	LABOR	8 HOURS
ANNUAL	A-1	LABOR	24 HOURS

SECTION 4

WORK ORDER #8512-308	R - L 3	EQUIPMENT #858
WORK ORDER #8512-309	R - 1 4 , R - 1 5	EQUIPMENT #859
WORK ORDER #8512-331	BT 7	EQUIPMENT #10875
WORK ORDER #8512-325	R 2 1	EQUIPMENT #10101

MONTHLY M-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	8 HOURS

SECTION 5

WORK ORDER #8512-313 R16A	EQUIPMENT #871
WORK ORDER #8512-310 R16	EQUIPMENT #860
WORK ORDER #8512-314 R17	EQUIPMENT #872

MONTHLY M-1	LABOR	8 HOURS
ANNUALA-1	LABOR	

SECTION 6

WORK ORDER #8512-331	R19	EQUIPMENT #10875
WORK ORDER #8512-306	T-3	EQUIPMENT #856
WORK ORDER #8611-311	T-3 GATE	EQUIPMENT #861

MONTHLY M-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

CONVEYOR SYSTEM

WORK ORDER #8512-307 CONTROL TOWER EQUIPMENT #857

QUARTERLY Q-1	LABOR	8 HOURS

SECTION 7

WORK ORDER #8512-327	R6, R7, R8; BT1		EQUIPMENT #10869
WORK ORDER #8512-326	BT2		EQUIPMENT #10868
MONTHLY M-1		LABOR	8 HOURS
ANNAUL A-1		LABOR	24 HOURS

SECTIONS 8, 9 & 10

WORK ORDER #8512-302	DR1	EQUIPMENT #852
WORK ORDER #8512-303	DR2	EQUIPMENT #853
WORK ORDER #8512-312	C2 GATES	EQUIPMENT #862
WORK ORDER #8512-301	C 2	EQUIPMENT #851

MONTHLY	M-1	LABOR	8 HOURS
ANNUAL	A-1	LABOR	32 HOURS

GILBERT BORING MILL

WORK ORDER #8503-533 EQUIPMENT #1533

QUARTERLY Q-1	LABOR	8 HOURS
MONTHLY M - 1	LABOR	16 HOURS

WARNER 8 SWASSEY LATHE

WORK ORDER #8503-580 EQUIPMENT #580

QUARTERLY	Q-1	LABOR	8 HOURS
SEMI-ANNUAL	SA-1	L A B O R	16 HOURS

VERTICAL MACHINING CENTER

WORK ORDER #8503-588 EQUIPMENT #1588

MONTHLY M - 1	LABOR	8 HOURS
SEMI-ANNUAL SA-1	LABOR	16 HOURS

MACHINE SHOP MOLD LOFT

WORK ORDER #8503-090 DIGITAL PLOTTER	EQUIPMENT #1427
WORK ORDER #8503-091 TAPE PUNCH	EQUIPMENT #1428
WORK ORDER #8503-092 LINE PRINTER	EQUIPMENT #1429
WORK ORDER #8503-093 MICRO COMPUTER	EQUIPMENT #1430

MONTHLY M-1	LABOR	8 HOURS
SEMI-ANNUAL	LABOR	16 HOURS

NATIONAL STEEL & SHIPBUILDING COMPANY

EQUIPMENT Nº. _____

TYPE VEHICLE _____

DEPT. _____

_____

_____

[illegible] EQUIPMENT

CHECK LIST

SPECIAL REQUESTS

nASSCO

MODEL NUMBER _____

SERIAL NUMBER _____

DATE INSTALLED _____

DATE SERVICE STARTED _____

SERVICE RECORD GROUP 1 - 40-50 OPERATING HOURS	MONTH DAY
1. Clean Zerk Fittings and Lubricate	
2. Change Engine Oil	
3. Check Engine Oil	
4. Change Oil Filter Element	
5. Clean Air Cleaner — Add Oil	
6. Grease Inner Slides	
7. Check Battery — Add Water	
8. Clean Hydraulic Sump Cap	
9. Check Hydraulic Oil Level	
10. Drain & Fill Hydraulic Tank (Once a Year)	
11. Check Drive Axle and Transmission Lubricant	
12. Drain & Fill Transmission	
13. Oil — All Connecting Shafts and Levers	
14. Replace Fuel Strainer	
15. Check for Leaks — Gasoline — Oil — Water	
16. Steam Out Radiator Core	
17. Check Brakes — Master Cylinder	
18. Check and Clean Engine Vent Pipe	
19. Check Fan and Generator Belts	
20. Check Differential and Transmission Vent	
21. Lubricate Lift Chains with S.A.E. 10 — Brush Applied	
MECHANIC (Initials)	
ENGINE HOUR METER READING	

NATIONAL STEEL AND SHIPBUILDING COMPANY
HARBOR DRIVE & 28TH ST.
SAN DIEGO, CALIF. 92138

ENGINEERED PERFORMANCE STANDARDS

	Visual inspect part small	390.0 TMU
	Visual inspect part medium	464.4 TMU
	Visual inspect part large	1061.1 TMU
1058	Pour or drain oil per gallon from crank cases, gear boxes	.0079 Hours
1059	Prepare to wipe oil or grease on large part	1918.2 TMU
1060	Remove approx. 1 quar of 2130 oil from crank case of machine with 3/8 pint capacity hand suction gun	.0250 Hours
1097	Obtain Fork Truck and move to receive part	1502.7 TMU
1165	Apply grease to small part	176.2 TMU
1644	S w e e p	
1645	S w e e p	
1647	Pick up sweepings	
1656	Waste dispose of	
2058	Equipment adjustments or minor repairs	.0952 Hours
2147	Fill tank per gallon	.0027 Hours
2388	Turn switch on or off	128.8 TMU
2392	Start generator	426.3 TMU
2400	Open or close oil valve	72.5 TMU
2402	Turn coolant on and off	186.4 TMU
2572	Remove and lay aside parts per piece	
2594	Read dimension from blueprint	575.5 TMU
2601	Inspect work	.0084 Hours
2605	Check motor bearings for noise while operating	953.5 TMU
2606	Check motor bearing for temperature while operating	71.4 TMU
2610	Inspect, feel with fingers	59.2 TMU
2627	Fork lift, move 20 feet	.0029 Hours
2628	Fork lift, raise and lower 10 feet	.0115 Hours
2759	Hand carry motor components approv. 15 feet from work-bench to cleaning booth hydraulic press or test panels	.0095 Hours
2765	Get hand truck and place components on truck	.0089 Hours
2766	Pull hand truck with comp. approx. 15 feet	.0041 Hours
2847	Pick up part and move to assembly:	
	medium	184.4 TMU
	large	227.6 TMU
		250.7 TMU

Engineered Performance Standards
Page 2

2851	Turn part over small to medium	76.0 TMU
	large	110.8 TMU
2888	Get tool fromtool room	1024.4 TMU
2889	Get wrench to change blades - return wrench	422.9 TMU
2895	Get parts and tools from tool box	.0067 Hours
2897	Obtain screw and postion to wire	46.6 TMU
2901	Cloth, obtain or put away	52.1 TMU
2903	Pick up small particle off floor	122.6 TMU
2905	Towels, paper (2) obtain	65.2 TMU
2911	Pick up and lay aside file or stone	43.7 TMU
2921	- 2925 Get and aside tools	
2928	- 2936 Get and aside tool, electric tool, towel	
3008		
3147	Apply oil to bearing or part per application or per squirt	122.8 TMU
3148	Apply grease to medium part	250.3 TMU
3149	Lubricant apply grease with a paddle	104.6 TMU
3150	Spread oil with paint brush (small part)	91.4 TMU
3152	Bearing (motor), lubricate	236.3 TMU
3153	Cup (grease), screw down	153.6 TMU
3154	Remove and reinstall grease cup	503.5 TMU
3155	Gun (grease) attach to Zerk fitting and remove from fitting hand operated grease gun	148.3 TMU
3156	Pump grease gun handle once against major resistance or several times against minor resistance	.0010 Hours
3157	Oil - hole (no cover)	206.8 TMU
3158	Oil - hole (spring lid or ball cover)	229.4 TMU
3159	Pour 2 oz. oil	.0017 Hours
3160	Pour 24 oz. oil	.0074 Hours
3176	Lid, install on can	159.7 TMU
3180	Open and close tool case	95.7 TMU
3184	Remove gas tank cap on trimmer and replace	211.0 TMU
3195	Hand, wipe with cloth or paper towel	160.0 TMU
3194	Wash hands and/or tools in bucket of water	

Engineered Performance Standards
Page 3

3196	Dip rag in solvent and squeeze	244.2 TMU
3197	Clean small part before installing	414.0. TMU
3208	Wipe grease from finger	159.4 TMU
3209	Wipe rough surface	145.2 TMU
3210	Part, clean grooves/concave corners only	301.4 TMU
3212	Part, clean with rag, part on bench medium small	486.8 TMU 257.6 TMU
3214	Wipe large part, large fixture, machine column with towel	193.3 TMU
3230	Wipe oily threads or parts	182.1 TMU
3231	Wipe part (small) (large)	412.3 TMU 1510.4 TMU 3526.2 TMU
3241	Part small wipe with rag	50.0 TMU
3248	Adjust each jack to exact height under part	259.5 TMU
3273	Position small wrench to nut or bolt and remove after use	63.6 TMU
3289	Position part in a complex fixture	710.3 TMU
3293	Remove each part from simple fixture	39.0 TMU
3294	Remove each part from average fixture	56.9 TMU
3295	Remove part from complex fixture	239.6 TMU
3296	Remove part from centers	29.0 TMU
3304	Unfold drop cloths or fold	382.7 TMU
3305	Drag or position hose per occurrence	170.0 TMU
3311	Remove pins, gasket and scrap material and set aside	251.7 TMU
3358	Jack, place under rail and tighten, raise jack one stroke	144.9 TMU
3359	Handle, place in jack	75.2 TMU
3400	Kneeling on knee boards, move to next location	625.2 TMU
3402	Get and place nut on bolt and engage threads	86.8 TMU
3406	Nut, seat with wrench and remove wrench	191.3 TMU
3532	Pick up stepladder and put down	316.5 TMU
3533	Climb and descend tower	.0373 Hours
3534	Climb truck, ladder to tower, ladder and return	.0086 Hours
3561	Jack, adjust to approximate height	174.6 TMU

Engineered Performance Standards
Page 4

3739	Get our of pick up truck	.0016	Hours
3740	Get into pick up	.0030	Hours
3749	Move funnel into oil hole and remove -	85.5	TMU
3800	Obtain scale measure and aside	138.0	TMU
3802	Door (offic), unlock	143.4	TMU
3803	Unlock and open window	81.9	TMU
3804	Close and lock window	1516.9	TMU
3820	Open and close cabinet door	214.4	TMU
3821	Dispose of rags, paper, etc. in trash can located outside of building	2376.3	TMU
3822	Cleanup of the job location	.0718	Hours
3823	Empty scrap metal container and return		
3824	Wash hands	.0240	Hours
3835	Clean out tank (inside and out)	.0307	Hours
3837	Water, wash down job site (300 sq. feet)	.03	Hours
3842	Walk unobstructed or with load to 50 pounds per pace (walk 10 paces)	150.0	TMU
3843	Walk obstructed or with load over 50 pounds per 10 paces (walk 10 paces)	170.0	TMU
3855	Check out or in tool	2209.0	TMU
3861	Tool, small, obtain and place aside	64.3	TMU
3869	Get tool from carrying bag and give to stock clerk	204.4	TMU
3871	Obtain tool from clerk and place in carrying bag	195.7	TMU
3874	Pick up rag or tool and lay aside	120.5	TMU
3875	Obtain note pad from pocket and return	201.6	TMU
3884	Pick up rag or tool and lay aside	120.5	TMU
3889	Jack, get from under rail	100.5	TMU
3903	Carry heavy part from tool crib to truck location and return	635.3	TMU
3904	Load heavy tool onto truck and unload from truck	379.5	TMU
3905	Pick up supplies and/or equipment and lay aside	764.7	TMU
3908	Wind rope around motor wheet	.0025	Hours
3909	Button depress (doorbell or similar)	45.4	TMU
3910	Pull rope to start motor	.0008	Hours
3911	Shut motor	.0010	Hours

Engineered Performance Standards
Page 5

3912	Turn machine on or off	194.2	TMU
3913	Start or stop compressor	.0030	Hours
3915	Put work gloves on hands and remove.	.0048	Hours
3921	Check fuel, oil, cooling water and other gages before starting	.0113	Hours
3922	Check boom, operation, including brakes, clutches, governor control, lever and stop control upon starting, or lock housing, secure brakes, disengage clutch and raise boom upon securing	.0046	Hours
3923	Obtain and examine stub	276.0	TMU
3924	Fill out material “chit” and sign	1063.2	TMU
3925	Insert stock number on, or sign stub requisition	222.9	TMU
3926	Sign instruction sheet after job.	191.2	TMU
3927	Waiting time for air pressure to increase and decrease	.0209	Hours
3928	Pre-planning on average emergency/service call	.034	Hours
3932	Pick up carrying bag and set down		
3933	Move equipment or material sised at job site and move back after job	412.5	TMU
3935	Move heavier tools or equipment to truck location. Move from truck location to job site.	2009.8	TMU
3940	Part pick up and set down	180.4	TMU
3942	Slide or push heavy object near and return (2 Men) elapsed time	.0142	Hours
3944	Obtain hand box - replace	370.4	TMU
3945	Obtain tool box from shelf and return	438.8	TMU
3947	Move tools or material on job site	.0131	Hours
3948	Put hose in pick up (per section)	.0063	Hours
3950	Pick up material or tools O set down after moving them	251.4	TMU
3952	Hand crank gas starter motor for diesel (cold starting)	.0330	Hours
3953	Warm up diesel engine to rated operating temperature	.0719	Hours
3954	Crawler crane travel - 300 yards	.3410	Hours
3955	Wait on test per 6 minutes $\frac{6 \text{ Minutes}}{60 \text{ Min/hr}}$	.1000	Hours
3959	Water, flush inside of equipment	.0280	Hours
3960	Water, wash down inside of tank	.0225	Hours
3964	Phone, dial for transportation after completion of job	1119.0	TMU
3965	Remove or replace tarpaulin on material pile	734.7	TMU

3966	Tripod (with vise) set up to use	313.4 TMU
3968	Verbal instructions get from supervisor	.1211 Hours
4005	Dial supervisor on telephone	235.3 TMU
8034	Remove and reassemble ball, roller, or sleeve bearing from shaft and rotor or armature, wire brush, clean & inspect motor	.1592 Hours
4150	Jack, place under rail and tighten, raise jack each additional stroke	16.2 TMU
4105	Turn screw 360 degrees	24.0 TMU
4123	Wipe machine table, vise, surface gage, or square	80.8 TMU
4124	Position part or fixture against stop (each stop)	34.9 TMU
4125	Pick up and lay aside medium part	77.5 TMU
4126	Retighten vise by hand	34.1 TMU
4127	Measure, mark with pencil using a pattern (per sign)	219.0 TMU
4128	Vise, close and open vise on object	230.0 TMU
4129	Adjust vise as necesarry (open or close)	53.5 TMU
4131	Position tool to work	103.6 TMU

OPERATION SUMMARY

OPERATION CODE: 001

DATE: Dec 84 | PAGE: 1 OF 1

OPERATION No. | OPERATION: CLEAN ZERK Fittings and Lubricate

DEPARTMENT: MAINTENANCE | DIVISION: TRANSPORTATION

DIVISIONAL DEPARTMENT: PREVENTIVE MAINTENANCE | EQUIPMENT: ALL RAILING STOCK | ANALYST: Barb Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Turn(machine) on or off.	Occ	3912	194.2	2	388.4
2.	Move tools or materials on job site	Occ	3947	.0131/ft	1	1,310.
3.	Pick up rag or tool and lay aside	Occ	3874	120.5	5	602.5
4.	Put work gloves on hands & remove	Occ	3915	.0048	1	288
5.	Part. clean grooves/concave corners only	Occ	3210	301.4	10	3,014
6.	Gun(grease) attach to Zerk fitting and remove from fitting hand operated grease gun	Occ	3155	148.3	10	1,483
7	Apply oil to bearing or part per application or per Squirt	Occ	3147	122.8	10	1228
8	Bearing(motor), lubricate.	Occ	3152	236.3	1	236.3
9	Inspect work	Occ	2601	.0084/ft	1	5304
	Remove and reinstall grease cap	Occ	3154	503.5	1	503.5

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU: 14,357.7

TOTAL WITH ALLOWANCE 15 %: 16,511.4

STANDARD ALLOWED HOURS PER 1.65

OPERATION SUMMARY

OPERATION CODE 002

DATE 10-84 | PAGE 1 OF 1

OPERATION No. 2 | OPERATION CHANGE ENGINE OIL

DEPARTMENT MAINTENANCE | DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance | EQUIPMENT TRUCK, CAR, BUS, FORK LIFT | ANALYST Barb Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Inspect work	Occ.	2601	.0084	2	1680.0
2.	Open) a close oil valve	Occ.	2407	72.5	2	145.0
3.	Pour a drain) oil per gallon) in can	Occ.	1058	.0079	1	790.0
4.	Cloth, obtain or) put away	Occ.	2901	52.1	3	156.3
5.	(Wipe) large part, large fixture) machine) column) with towel	Occ.	3214	1933	2	386.6
6.	Hand, wipe with cloth or paper towel	Occ.	3195	160.0	3	480.0
7.	Move funnel into oil hole and remove	Occ.	3749	85.5	1	85.5
8.	Pour) 24 oz oil	Occ.	1058	.0074	1	740.0
9.	Turn machine) off to on to off	Occ.	3912	194.2	3	582.6
10	Sign) instruction) sheet after job	Occ.	3926	191.2	1	191.2

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU 5,237.2

TOTAL WITH ALLOWANCE 15 % 6,022.8

STANDARD ALLOWED HOURS PER .0602

OPERATION SUMMARY

OPERATION CODE 003

DATE 10-84 | PAGE 1 OF 1

OPERATION No. 3 | OPERATION CHECK ENGINE OIL

DEPARTMENT MAINTENANCE | DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance | EQUIPMENT TRUCK | ANALYST Bob Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Visual inspect large part	Occ.	—	1061.1	2	2122.2
2.	Remove and install grease cup	Occ.	3154	503.5	1	503.5
3.	Wipe oily threads or part.	Occ.	3230	182.1	2	364.2

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU 2989.9

TOTAL WITH ALLOWANCE 15 % 3438.4

STANDARD ALLOWED HOURS PER 0344

OPERATION SUMMARY

OPERATION CODE 004

DATE 11-84 | PAGE 1 OF 1

OPERATION No. 4 | OPERATION CHANGE OIL FILTER ELEMENT

DEPARTMENT MAINTENANCE | DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance | EQUIPMENT TRUCK, CAB, BUS | ANALYST Earl Mason

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1	Check out or in tool	Occ.	3855	2209.0	1	2209.0
2	Inspect, feel with fingers)	Occ	2610	59.2		
3	Remove and lay aside parts)	Piece)	—	—	—	—
4	(Position part against stop)	Occ	4124	34.9	1	34.9
5	Position tool to work	Occ.	4131	103.6	1	103.6
6	Wipe) machine table, (use pur-					
	chase gage or square)	Occ.	4123	80.8	2	161.6

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU	2509.1
TOTAL WITH ALLOWANCE 15 %	2885.5
STANDARD ALLOWED HOURS PER	.0289

OPERATION SUMMARY

OPERATION CODE 005

DATE Dec 84 | PAGE 1 OF 1

OPERATION No. 5 | OPERATION CLEAN AIR CLEANER - Add Oil

DEPARTMENT MAINTENANCE | DIVISION TRANSPORTATION

DIVISIONAL DEPARTMENT PREVENTIVE MAINTENANCE | EQUIPMENT ALL ROLLING STOCK | ANALYST Mark Hanson

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1	Turn Machine on or off	Occ	3912	194.2	2	388.4
2	Position small wrench to Nut or					
	bolt and remove after use	Occ	3273	63.6	1	63.6
3	Remove part from complex fixture	Occ	3295	239.6	1	239.6
4	Move tools or material on job site	Occ	3947	.0131/ft		1,572
5	Move funnel into oil hole					
	and remove	Occ	3749	85.5	1	85.5
6	Pour 24 oz. oil	Occ	3159	.0074/ft	4	1,776
7	Check fuel, oil, cooling other gages	Occ	3921	.0113/ft	2	1,356
8.	Wipe machine table, vise, gage	Occ	4123	80.8	4	323.2
9.	Put work gloves on hands + remove	Occ	2915	.0048/ft	2	576
10.	Dip rag in Solvent & squeeze	Occ	3196	244.2	3	732.6
11	Wipe large part, large fixture,					
	machine Column with towel	Occ	3214	193.3	5	966.5
12	Hand, wipe with cloth or paper towel	Occ	3195	160.0	5	800
13	Pick up small particle off floor	Occ	2903	122.6	2	245.2
14	Lid, install on can	Occ	3176	159.7	2	319.4

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU 9,444

TOTAL WITH ALLOWANCE 15 % 10,860.6

STANDARD ALLOWED HOURS PER 1.09

OPERATION SUMMARY

OPERATION CODE: 007

DATE: Oct 84 | PAGE: 1 OF 1

OPERATION No.: 7 | OPERATION: CHECK BATTERY - Add Water

DEPARTMENT: MAINTENANCE | DIVISION: Transportation

DIVISIONAL DEPARTMENT: Preventive Maintenance | EQUIPMENT: Tak Lift, Truck, Car, Bus | ANALYST:

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1	Turn) machine on & off	OCC	2388	128.8	2	257.6
2	Inspect work	Occ	2601	.0084hr	2	1,680.0
3	Put hose in pickup (per section)	SECTION	3948	.0063hr	12	7,560.0
4	Set+place nut on bolt+engage threads	NUT	3402	86.8	12	1,041.6
5	Water, flush) inside of equipment	Occ	3959	.0280hr	1	2,800.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU	13,339.2
TOTAL WITH ALLOWANCE 15%	15,340.1
STANDARD ALLOWED HOURS PER Occurence	.153

OPERATION SUMMARY

OPERATION CODE: 008

DATE: Nov. 84 | PAGE: 1 OF 1

OPERATION No.: 8 | OPERATION: CLEAN HYDRAULIC SUMP CAP

DEPARTMENT: MAINTENANCE | DIVISION: TRANSPORTATION

DIVISIONAL DEPARTMENT: PREVENTIVE MAINTENANCE | SECTION/GROUP: EQUIPMENT FORK LIFT, LIFTS, | ANALYST: Earl Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME THS	FREQ.	TOTAL THS
1	Turn Machine on or off	Occ.	3912.	194.2	2	388.4
2	Pour or Drain oil per gallon from					
	crank) cases), gear boxes)	Occ.	1058	.0079hrs	3	2,370
3	Inspect, feel with fingers)	Occ	2610	59.2	3	177.6
4	Open or close oil valve	Occ	2400	72.5	1	72.5
5	Fill tank) per gallon	Occ.	2147	.0032hrs	3	486
6	Pour 24 oz oil	Occ.	3166	.0074hrs	1	444
7	Wash hands) and/or tools) in bucket					
	of water	Occ.	3194	.0062hrs	1	372
8	CLEAN OUT tank (inside and out)	Occ	3835	.0307hrs	1	1,842
9	Fork lift raise or lower 10 feet	Occ	2628	.0115hrs	1	1,150

NATIONAL STEEL AND SHIPBUILDING COMPANY

NASSCO

TOTAL THS: 7302.5

TOTAL WITH ALLOWANCE..15..%

STANDARD ALLOWED HOURS PER .84: 8,397.9

OPERATION SUMMARY

OPERATION CODE 009

DATE 10-31-84 PAGE 1 OF 1

OPERATION No. 4 OPERATION CHECK HYDRAULIC OIL LEVEL

DEPARTMENT MAINTENANCE DIVISION Transportation

DIVISIONAL DEPARTMENT PREVENTIVE MAINTENANCE EQUIPMENT FORK LIFT ANALYST Earl Pearson

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TMU	FREQ.	TOTAL TMU
1	Turn switch on or off	Occ	2388	128.8	1	128.8
2	Cloth, obtain or put away	Occ	2901	52.1	2	104.2
3	Open or close oil valve	Occ	2400	72.5	2	145.0
4	Inspect Work	Occ	2601	.0084Hr	2	1,680.0
5	Remove and reinstall grease cup	Occ	3154	503.5	1	503.5
6	Part small wipe with rag	Occ	3241	50.0	1	50.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU 2,611.5

TOTAL WITH ALLOWANCE 15 % 3,003.2

STANDARD ALLOWED HOURS PER Occurence .030

OPERATION SUMMARY

OPERATION CODE: 010

DATE:

PAGE: 1 OF 1

OPERATION No.: 10

OPERATION: DRAIN & Fill Hydraulic Tank (ONCE a YEAR)

DEPARTMENT: MAINTENANCE

DIVISION: TRANSPORTATION

DIVISIONAL DEPARTMENT: PREVENTIVE

EQUIPMENT

ANALYST

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Turn machine on or off	Occ	3912	194.2	2	388.4
2.	Remove & lay aside parts	Piece	2572	250.7	4	1002.8
3.	Pour or DRAIN oil per gallon from crank case, gear box, etc	Occ	1058	.0079h	1	474
4.	Clean Tank inside & out	Occ	3835	.0307h	1	1,842
5	Pour 24 oz. oil	Occ	3160	.0074h	4	1,776
6	Position part in complex fixture	Occ	4124	34.9	10	349
7	Hand, Wipe with cloth or paper towel	Occ	3195	160.0	3	480
8.	Lid installs on can	Occ	3176	159.7	2	319.4

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU: 6,631.6

TOTAL WITH ALLOWANCE..15..%

STANDARD ALLOWED HOURS PER .763: 7,626.3

OPERATION SUMMARY

OPERATION CODE 013

DATE 10-84 PAGE 1 OF 1

OPERATION No. 13 OPERATION OIL ALL CONNECTING SHAFTS AND LEVERS

DEPARTMENT MAINTENANCE DIVISION Transportation

DIVISIONAL DEPARTMENT Preventive Maintenance EQUIPMENT FORK LIFT ANALYST Barb Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TMU	FREQ.	TOTAL TMU
1.	Remove and reassemble ball, roller or sleeve bearing from shaft and rotor or armature, wire brush, clean and inspect motor.	Occ.	8034	.1592	1	1592.0
2	Pick up and lay aside medium part	Part	4125	77.5	9	697.5
3.	Dip rag in solvent and squeeze	Occ	3196	244.2	10	2442.0
4.	Wipe machine table, rise, surface gage or square.	Occ.	4123	80.8	9	727.2
5	Oil hole (No cover)	Occ.	3157	206.8	5	1034.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU	20,820.7
TOTAL WITH ALLOWANCE 15 %	23,943.8
STANDARD ALLOWED HOURS PER	.2394

OPERATION SUMMARY

OPERATION CODE 814

DATE 10-84 PAGE 1 OF 1

OPERATION No. 14 OPERATION REPLACE FUEL STRAINER

DEPARTMENT MAINTENANCE DIVISION Transportation

DIVISIONAL DEPARTMENT PREVENTIVE Maintenance EQUIPMENT Fork Lift ANALYST Knapp Tolson

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Open & close tool case	Occ	3180	95.7	2	191.4
2.	Get parts & tool from tool box	Occ	2895	.0067h	2	804
3.	Turn part over (medium)	Occ	2851	76	4	304
4.	Remove gas tank cap (w/ Trimmer) Or replace	Occ	3184	211.0	1	211
5	(Position) Tool to work	Occ	4131	103.6	2	207.2
6	(Remove & reinstall) grease cup	Occ	3154	503.5	1	503.5
7	(Retighten) Vise by hand	Occ	4126	34.1	3	102.3
8	Turn screw 360° degrees	Occ	4105	24.0	10	240
9	Part, clean with rag medium	Occ	3214	193.3	2	386.6
10	Wash hands or tools in bucket of water	Occ	3194	.0062h	2	744

NATIONAL STEEL AND SHIPBUILDING COMPANY

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TOTAL TMU 2,950.7

TOTAL WITH ALLOWANCE 15 % 3

STANDARD ALLOWED HOURS PER .339 3,393.4

OPERATION SUMMARY

OPERATION CODE 015

DATE 11-84 | PAGE 1 OF 1

OPERATION No. 15 | OPERATION CHECK for LEAKS-Gasoline-Oil-WATER

DEPARTMENT MAINTENANCE | DIVISION TRANSPORTATION

DIVISIONAL DEPARTMENT PREVENTIVE MAINTENANCE | SECTION/GROUP Car, Bus, Fork Lift, Truck, Bus | ANALYST Bob Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1.	Check fuel, oil, cooling water, and other gages before starting	Occ	3921	.0113hr.	3	3,390.0
2.	Put work gloves on hands + remove	Occ	3915	.0048	3	1,440.0
3.	Wipe grease from finger	Occ	3208	159.4	2	318.8
4.	Wipe rough surface	Occ.	3209	145.2	2	290.4
5.	Kneeling on knee boards, move to next location	Occ.	3400	625.2	3	1,875.6
6.	Remove pins, gasket + scrap material and set aside	Occ.	3311	251.7	2	503.4
7.	Fill out material "chit" and sign	Occ	3924	1063.2	1	1063.2
8.	Obtain and examine stub	Occ	3923	276.0	1	276.0
9.	Inspect feel with fingers	Occ	2610	59.2	3	177.6
10.	Adjust Vise as necessary (open a close)	Occ.	4129	53.5	3	160.5
11.	Retighten vise by hand	Occ	4126	34.1	3	102.3
12.	Turn switch on or off	Occ	3912	194.2	2	388.4
13.	Move funnel into hole + remove	Occ.	3749	85.5	3	256.5

NATIONAL STEEL AND SHIPBUILDING COMPANY

TOTAL TMU 10,242.7

TOTAL WITH ALLOWANCE 15 % 11,779.1

STANDARD ALLOWED HOURS PER 1.2

OPERATION SUMMARY

OPERATION CODE: 619
DATE: 10-24
PAGE: 1 OF

OPERATION No.: 19
OPERATION: Check FAN AND GENERATOR BELTS
DEPARTMENT: MAINTENANCE
DIVISION: TRANSPORTATION
DIVISIONAL DEPARTMENT: PREVENTIVE MAINTENANCE
SECTION/GROUP: FORK LIFT
ANALYST: Gaston

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
2	Start generator	Occ.	2392	426.3	1	426.3
3	Check motor bearings for Noise while operating	"	2605	953.5	1	953.5
1	Turn switch on or off	"	2388	128.8	3	386.4
4	Inspect (feel with fingers)	"	2610	59.2	4	236.8
5	Equipment adjustments or minor repairs	"	2058	9520	1	9520.0

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU	11,523.0
TOTAL WITH ALLOWANCE 15%	13,251.5
STANDARD ALLOWED HOURS PER	.1325

OPERATION SUMMARY

OPERATION CODE: 021

DATE: Nov. 84 | PAGE: 1 OF 1

OPERATION No.: 21 | OPERATION: LUBRICATE LIFT CHAINS with S.A.E. 10- Brush Applied

DEPARTMENT: MAINTENANCE | DIVISION: TRANSPORTATION

DIVISIONAL DEPARTMENT: PREVENTIVE MAINTENANCE | SECTION/GROUP: FORK Lifts & CARRIERS | ANALYST: Bob Faison

LINE No.	DESCRIPTION	UNIT	REFERENCE	ELEMENT TIME TMU	FREQ.	TOTAL TMU
1	Turn (machine) on or off	Occ	3912	194.2	2	388.4
2	Wipe (machine table, rise, surface) gage, or square)	Occ.	4124	80.8	6	484.8
3.	Dispose of rags paper etc. in trash can located outside of building	Occ.	3821	2376.3	1	2376.3
4	Put work gloves on hands and remove	Occ	3915	.0048hrs	2	480.0
5	Spread oil with paint brush	Occ	3150	91.4	12	
*	1/ extra extension time for (small part)					1,096.8
6	Hand, wipe) with cloth or paper towel	Occ	3195	1601.0	12	1,920

NATIONAL STEEL AND SHIPBUILDING COMPANY

nassco

TOTAL TMU: 6,746.3

TOTAL WITH ALLOWANCE...15...%

STANDARD ALLOWED HOURS PER .776: 7,758.3

NATIONAL STEEL & SHIPBUILDING COMPANY

EQUIPMENT Nº. _____

TYPE VEHICLE _____

DEPT. _____

ROLLING EQUIPMENT

CHECK LIST

SPECIAL REQUESTS

NASSCO

MODEL NUMBER _____

SERIAL NUMBER _____

DATE INSTALLED _____

DATE SERVICE STARTED _____

SERVICE RECORD

GROUP 1 - 40-50 OPERATING HOURS

	MONTH / DAY
1. Clean Zerk Fittings and Lubricate	
2. Change Engine Oil	
3. Check Engine Oil	
4. Change Oil Filter Element	
5. Clean Air Cleaner — Add Oil	
6. Grease Inner Slides	
7. Check Battery — Add Water	
8. Clean Hydraulic Sump Cap	
9. Check Hydraulic Oil Level	
10. Drain & Fill Hydraulic Tank (Once a Year)	
11. Check Drive Axle and Transmission Lubricant	
12. Drain & Fill Transmission	
13. Oil — All Connecting Shafts and Levers	
14. Replace Fuel Strainer	
15. Check for Leaks — Gasoline — Oil — Water	
16. Steam Out Radiator Core	
17. Check Brakes — Master Cylinder	
18. Check and Clean Engine Vent Pipe	
19. Check Fan and Generator Belts	
20. Check Differential and Transmission Vent	
21. Lubricate Lift Chains with S.A.E. 10 — Brush Applied	
MECHANIC (Initials)	
ENGINE HOUR METER READING	

ENGINEERED PERFORMANCE STANDARDS FOR PUBLIC WORKS MAINTENANCE

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
.1	(ntinued)								Move ends over other hand	2	M2B	19.4	M2B		Move ends over other hand
									Release wire	2	RL1	4.0	RL1		Release wire
									Reach to new spot	2	R?B	17.2	R?B	2	Reach to new spot
									Grasp wire	2	G1A	4.0	G1A		Grasp wire
									Pull separated end		P?B	10.6	P?B		Pull separated end
									Apply pressure		AP1	16.2	AP1		Apply pressure
												2.0	RL1		Release wire
												15.8	R16B		Reach for wire cutters
												2.0	G1A		Grasp
												30.4	M13C	2	Move to protruding spot
												11.2	GP	2	Regrasp
												7.2	M?A	2	Close handles to cut
												64.8	AP1	4	Apply pressure
									Release wire	2	(RL1)	4.0	M?A	2	Spread handles to open
												15.8	M16B		Lay aside cutters
												2.0	RL1		Release cutters
												51.2	AP1W		Arise
												316.6			
	111 Move door into position (per door)			.0170	1	.0170	1	.01.0							
1	112 Nail, pre nail prior to assembly								Nail to position		M9C	11.8			
											GE				
											P16F	5.6			
												10.3	M'C		
												5.6	P16E		Position hammer
												55.4	M'B	6	Hammer up
											(RL1)	40.6	M'A	6	Hammer down
												159.3			
1	113 Pieces, position to for fastening								From work area to piece		R30B	25.8	R30B		From work area to piece
											G1A	2.0	G1A		
									To assembly area		M30B	24.3			
												30.7	M30C		To assembly area
									Hold assembly			55.2	[illegible]	2	
												52.4	AF0	2	
												80.0	ET	4	
												29.2	EF	4	
												277.6			
1	114 Nail set, with nail punch								Punch to nail		M9C	11.8			
									On nail head		P16E	16.2			
												14.6	M14B		Hammer over punch
												11.8	M9C		Hammer to punch
											M10B	12.2	M10B		
												66.6			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION – RIGHT HAND
516	(continued)											2.0	G1A		Grasp
												12.2	M10B		Pull free
												2.0	RL1		Release loop
												11.5	R10B		Reach to main rope
												2.0	G1A		Grasp
												24.3	M30B		Pull free
												2.0	RL1		Release
												262.3			
												x 2 (men)			
												524.6			
517	Object (heavy), slide on floor											17.2	TBC1	2	Step around part
											R20B	18.6	R20B		Reach to part
											G1A	10.0	G1A	5	Grasp part
											M10B35	141.5	M10B35	5	Push part
											RL1	10.0	RL1	5	Release
											R10A	54.8	R10A	4	Reach back
											G2	5.6	G2		Regrasp
											M10B35	29.5	M10B35		Push part
											RL1	2.0	RL1		
												295.2			
												x 2 (men)			
												590.4			
518	Obtain piece of framing lumber from pile											204.0	W12P0		To lumber pile
												17.0	S612C1		
												29.0	S		For piece on floor
											G1A	2.0	G1A		Grasp piece
											G2	5.6	G2		
											M2B20	13.0	M2B20		
												31.9	AS		Arise with piece
												2.0	RL1		
												12.9	R12B		Reach for better control of piece
											G2	5.6	G1A		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
344	(continued)											31.9	AKOK		
												2.0	G1A		
												16.2	AP1		
												4.6	M5B		Turn to underside
												5.6	D1B		
												15.8	M16B		Lay cable
												2.0	RL1		
												15.8	R16B		To auger
												2.0	G1A		
											M16B20	19.3	M16B20		Lift
												31.9	AKOK		
												74.4	TPC2	2	Turn around
												225.0	W15P		To tool box
											M16B20	19.3	M16B20		In tool box
												29.0	B		Lay down
											RL1	2.0	RL1		
												31.9	AB		
												74.4	TPC2	2	Turn around
												75.0	W5P		
												33.8	H4P2		Air on and off to bleed
												2.0	RL1		
												15.8	R16B		To disengage hose
												2332.2			
345	Turn air off and on and bleed tool								This motion pattern repeated following hook up of air tool			37.2	TPC2		Turn towards air valve
												60.0	W4P		To air valve
												21.5	R24B		To handle
												2.0	G1A		
												16.2	AP1		
												69.0	H4B	10	Close valve
												64.0	R4B	10	Close valve
												16.2	AP1		Tighten
												2.0	RL1		
												37.2	TPC2		Turn towards auger
												60.0	W4P		To auger
												29.0	K1K		
												15.8	R16B		To auger handle
												2.0	G1A		
												432.1			
												X 2			
												864.2			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		MCH VALUE OBSERVED	LPW VALUE OBSERVED						DESCRIPTION		NO	TH				
348	Drive bolt out												1.6	R16A	1/1	Reach to hammer
													.2	G1A	1/1	Grasp
													25.5	M30C		Move to bolt
													5.6	P1PS		Position to bolt
													70.7	M6B	3	Drive out
													10.3	M6A	3	
													71.9			
349	Pull bolt with bar												25.5	M30C		Move bar to bolt
													16.0	P1PSF		Position on bolt head
													5.6	GP		
												G3A	47.4	M16B	3	Pull bolt out
													21.0	AP2	9	
									Lay aside			M16B	15.0			
													131.5			
350	Pull 12d nails with hammer			.0097	1	.0097	1	.0097								
351	Pry off 6' to 8' molding			.0070	1	.0070	1	.0070								
352	Cut 1/4" bolts with hacksaw			.0096	1	.0096	1	.0096								

ELE-MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1051	Adjust exhaust line								Reach to line		R20B	18.6			
									Grasp		G1A	2.0			
									Move line to		AP1	16.2			
									Proper position	2	M4B	13.8			
									Regrasp to		G2	5.6			
									Position	2	P1SE	11.2			
									Release		RL1	2.0			
									To balance		R20E	16.7			
												86.1			
1053	Mill, mount, shell type mounting (center screw) 605-MSUMH01								Left hand may follow same motion pattern as right hand		M1C	18.7	M1C		Move cutter to spindle
											P5SE	43.0	P5SE		Move cutter on spindle
											M2C	5.2	M2C		Move cutter on spindle
											P5SSD	52.1	P5SSD		Position on key
											APB	16.2	APB		Push cutter on
									Regrasp cutter to hold		G2	5.6	RL1		Release cutter
												140.8			
1054	Mill, remove, shell type mounting (center screw) 605-MSUMR01								Reach to cutter		R20D	19.8			
									Grasp cutter		G1A	2.0			
												48.6	M6A	6	Tap with mallet
												53.4	M6B	6	To loosen cutter
												19.8	R20D		Reach to cutter
												2.0	G1A		Grasp cutter
									Work mill off		APB	16.2			
											M2B	4.6			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL PRO FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1054	(continued)											16.2	APP		Work mill off
												4.6	MPB		
									Disengage mill		DCE	7.5	DCE		Disengage mill
												130.7			
1055	Mill (face), mount, spindle mount (four screws)								Left hand follows			31.5	PPOC1S		Move mill to location under spindle
	605-MSUMM02								Motion pattern on			43.0	PSSE		Position mill on spindle
									Right hand			52.1	PSSSD		Position mill on keys
									Regrasp mill		GP	5.6			
												2.0	RL1		Release mill
												136.7			
1056	Mill (face), remove, spindle mount (four screws)											48.6	MGA	6	Tap mill
	605-MSUMR02											53.4	MPB	6	Loose
												102.0			
1057	Point, mark with marking instrument											5.2	MPC		Move scriber to work
												16.2	PPSE		Position scriber to scale
	U-BLOPM01											16.2	APB		Scribe point
												7.5	EF		Check mark
												4.6	MPB		Move scriber away
												43.7			
1058	Pour or drain oil per gallon from crank cases, gear boxes etc. of machinery and equipment	.0079	.0043	.0250	4	.0063	1	.0063							
1059	Prepare to wipe oil or grease on large part											290.0	B	10	To part
												18.2	M2OB		Rag to part
												319.0	AB	10	
												622.0	BSC2	20	
												290.0	S	10	Lower portions
												319.0	AS	10	
												1918.2			
1060	Remove approximately 1 quart of 2150 oil from crank case of machine with 3/8 pint capacity hand suction gun	.0250	.0110	.0405	3	.0165	1	.0165							
1061	Obtain wrapping paper, wrap and scotch tape--assembled size--12" long of 1-1/2" triangular wooden block								Reach to wrapping paper on shelf		R16B	15.8	R10B		Reach to assembly on bench
									Grasp		G1A	2.0	G1A		Grasp
									Move to work bench		M12B	13.4	M6B		Move to a position on paper preparatory to wrapping

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION – RIGHT HAND
1061	(continued)										G	[illegible]	RL1		Release [illegible]
									Pull paper over block		M B	[illegible]	R6P		Reach to paper [illegible] wrapping
									Regrasp		G	[illegible]	G1A		Grasp [illegible] wrapping
									Similar to right hand	[illegible]	R-B	[illegible]	M B	[illegible]	Move paper over the block
										2	G	11.	G		Regrasp
												[illegible]	RL1		Release paper and [illegible]
									Set end of paper to be taped		M B	[illegible]	RL B		Reach to tape
											[illegible]	[illegible]	G1A		Grasp
												[illegible]	APl	[illegible]	Apply pressure
										[illegible]		[illegible]	M B	2	Pull out [illegible] and tear off
									Set end of paper to be taped (opposite end)		[illegible]	[illegible]	P1.B		[illegible] wrapped [illegible]
											[illegible]	[illegible]	APl	[illegible]	Set [illegible] in place
												[illegible]	M B	[illegible]	Secure with finger
											F..	[illegible]	RL2	2	Release
												[illegible]			
1062	Bar (pinch), use (U-MTLBUO)											[illegible]	G		Regrasp pinch bar
												[illegible]	M C		Move to part
												[illegible]	P.SSE		Position to part
												[illegible]	APl		Push pinch bar
												[illegible]	M B		Under part
												[illegible]	G		Regrasp pinch bar
												[illegible]	A P		Raise
												[illegible]	[illegible]		Part
												[illegible]	[illegible]		Lower part
												[illegible]	G		Regrasp bar
												[illegible]	AP		Pull bar from
												[illegible]	M B		Under part
												[illegible]	D E		Disengage bar from part
												[illegible]			
1063	Move extra heavy part with sledge hammer and block											[illegible]	M 4C P		Move head to block
												[illegible]	M 4B P	[illegible]	Raise sledge
												[illegible]	M 6A	[illegible]	Strike block
												[illegible]	M 4B P		Lower sledge
												17.	SS[illegible]C1		Step to side
												[illegible]	EF	2	Examine work
												[illegible]	[illegible]		Move to new position
												[illegible]	M 5B P		Move hammer
												[illegible]	M 4C P		Move hammer to block
												[illegible]	M 4B P	[illegible]	Raise hammer
												[illegible]	M 6A P	[illegible]	Strike block
												[illegible]	M 4B P		Lower hammer
												[illegible]			

ELE-MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OPS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1095	Set circular saw teeth with hammer and block (per tooth)											[illegible]	M10B		Move hammer up
												[illegible]	RF		Position tooth
												10.0	M10A		Move hammer back
									Reach to blade	1	R6B	10.1			
									Grasp	1	G1A	[illegible]			
									Move blade	1	M6B	[illegible]	M6B		Move blade
									Regrasp	2	G	11.2			
												[illegible]	RL1		Release
												[illegible]			
1097	Obtain fork truck and move to receive part											[illegible]	TRC1	[illegible]	
												[illegible]	M10B	2	To and from truck
												[illegible]	TRC1	2	
									Reach to cab		R6CB	18.6	R6CB		Reach to cab
									Grasp handhold			2.0	G1A		Grasp handhold
												17.1	M12C		Step on rung
											AP2	100.5	M20B	1	Climb into cab
									Symbols and time values for fork truck operations from data developed by Naval Supply Systems Command			60.0	A		Start
												540.0	F40E		Run forward
												55.0	S0		Stop
												---	(F1.0		Position pallet on forks)
												60.0	A		Start
												85.2	F14E		Forward 14 feet
												31.1	T6B		Turn
												85.2	F14E		Forward 14 feet
												55.0	S0		Stop
												[illegible]	M40B		Raise forks
												[illegible]			
1098	Insert and remove master copy type in beveled copy holder (per letter)											[illegible]	R10C		Reach to copy type letter
												2.0	G1A		Grasp
												12.9	M10B		Move copy type to left hand
												[illegible]	RL1		Release copy type
									14.2 letters per set up			[illegible]	TRC1	5	Turn body 40°
														14	
												[illegible]	TRC1	5	Turn body 40°
														14	

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ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL PIG FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION RIGHT HAND
1102	(continued)											2.0	RL1		Release clutch
												30.0	W2F		Back to
												17.0	FF13E1		Machine
												124.8			
1103	Set to scribe piece with scriber										R12B	1..			Reach to scriber
											G1B	5.5			Grasp scriber
											G2	5.6			
												16..	M14C		Move scriber to work
												14.2	P2SE		Position scriber
												55.1			
1107	Jaw, remove from chuck, reverse and replace											12..	R12B		To wrench
												2.0	G1A		
	GOX-MSUJR01											15.2	M12C		To socket
												19.7	P2SSE		
												5.6	G2		
												222.8	16C8		Spin wrench to move 4
											G3	5.6	G2		
											M3B	5.7	M3B		Remove jaw
												9.4	T12C6		Rotate jaw
												6.7	M3C		Move jaw to chuck
											M3C	6.7	G3		Wrench to socket
												19.7	P2SSE		
												5.6	G2		
												222.8	16C8		Spin wrench
												14.6	M14B		Aside
												2.0	RL1		
												577.0			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1	1109 Sling, put around part or object 921-M4ISP01											10.7	M16C		Move sling
									Reach under part		R?B	22.?			
												13.4	M12B		Move sling under part
									Transfer sling to L.H.		G3	5.6	G3		Transfer sling to L.H.
									Draw sling under part		M20B	18.2	R?B		Reach to sling
													G1A		Grasp sling
									Move ends of sling together		M12B	13.4	M12B		Move ends of sling together
									Regrasp sling		G2	10.3	M6C		Move end to loop
												5.6	P1SE		Position end to loop
									Release loop		RL1	6.9	M4B		Move end through loop
									Reach to end of loop		R4B	6.4			
									Transfer to L.H.		G3	5.6	G3		Transfer to L.H.
									Hold			14.4	R14B		Reach to sling
												8.0	G1A	4	Position
												41.2	M?C	4	Sling
												8.0	RL1	4	On
												25.8	R6B	3	Part
									Draw sling tight		M18B	17.0			
												241.4			
1	1110 Sling, attach to hook 921-M4ISA01											10.1	R8B		Reach to sling
												2.0	G1A		Grasp sling
									Twist sling		T180B	9.4			
									Fold sling		M6A	8.1			
									Regrasp folded sling		G2	5.6	RL1		Release sling
												12.9	R12B		Reach to hook
												2.0	G1A		Grasp hook
												13.4	M12B		Move hook toward sling
									Move sling to hook		M6C	10.3			
									Position loop on hook		P1SE	5.6			
									Move loop on hook		M6B	8.9			
									Regrasp hook and sling		G2	5.6			
									Draw sling tight		M12A	12.9			Release sling
												105.8			
1	1111 Sling, remove from hook 921-M4ISR02											17.2	R18B		Reach to top strand
												2.0	G1A		Grasp top strand
												6.9	M4B		Move top strand off hook
												2.0	RL1		Release top strand
												6.4	R4B		Reach to second strand
												2.0	G1A		Grasp second strand
												6.9	M4B		Move second strand off hook
												2.0	RL1		Release second strand
												45.4			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1112	Scribe 90° arc with trammel (one man--36" radius)											42.0	SRP2C		Step toward and move trammel to mark
									To trammel near point		R6A	7.0			
											G1A	2.0			
									Position point to punch mark		P4C	4.0			
											P2SE	14.0			
												7.3	EF		Check position
									Grasp for holding		GP	2.0			
												2.0	R6		To scribing end of trammel
												42.0	SRP2C		
												12.9	R12B		
												2.0	G1A		
												12.9	M4C		
												14.0	P2SE		
												50.7	M10C		Scribe arc
												18.6	TDC1		Reposition body
												27.9	M2C		Complete arc
												2.0	GP		
											M2B	9.7	M2B		
												18.6	TDC1		Return to work
												42.0	SRP2C		
												327.3			
1115	Pick up and lay aside tool (wrench, hammer, maul, pinch bar, etc.)											17.2	R12B		Reach to tool
												3.5	G1B		Grasp
												14.9	M14B		Move to use
												14.6	M14B		Lay wrench aside
												2.0	RL1		
												15.5	R18E		Reach to balance
												67.4			
1116	Tap each key in table slot											13.5	M10C		Move maul to 1st key
												18.6	M4A	3	Tap 1st key

ELE MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1116	(continued)											20.7 52.5	M4B	3	In slot
1117	Wrench, place on and remove from draw bar lock nut 605-RSNP01								Move wrench to draw bar Position wrench on locknut Move onto nut Move off nut Disengage wrench and nut		M3CC P2SSD M4B M4B D0E	10.7 25.4 9.0 9.0 7.5 67.5			
1118	Set protractor or bevel square								To protractor To center of beach Grasp away from blade		R14B G1B M14B G2	14.4 3.5 14.6 5.6			
												9.6 3.5 16.2 9.9 2.0 5.5 3.5 9.0 16.2 7.3 2.0 7.3 7.3 3.5 9.9 16.2 2.0 7.3 20.0	M6B G1B AP1 M1B RL1 R3E G1B M4C P2SF EF RL1 EF R3D G1B M1B AP1 RL1 EF ET 32/16		To locknut Loosen locknut Remove hand To blade Move blade to correct setting Check setting Remove hand Again check setting to locknut Tighten locknut Remove hand Check setting Check angle of blade
									Lay aside Remove hand		M16B RL1 R10E	15.8 2.0 10.5 208.4			
1119	Position framing square to straight edge											21.5 3.5 5.6 18.2 42.9 19.2 15.2 7.3	R24B G1B G2 M20B SS20C2 M20A ET 16/16 RF		To square Pick up and regrasp square To work Move against straight edge Look back to square Identify

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL PIG FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1119	(continued)											14.2	ET $\frac{16}{16}$		Look back to square
												9.0	M4C		Move to position
												15.2	ET $\frac{16}{16}$		Again look to point
												7.5	EF		Check alignment with square
												14.2	P2SE		Position square to point
												7.5	EF		Check alignment
												2.0	RL1		Remove hand
												16.7	R20E		
												121.5			
1120	Wrench, place on and remove from nut of thurston chuck 605-BSUWP02								Move wrench to end of mill		M4C	11.8	M4C		Move wrench to end of mill
									Position wrench to end of mill		P1SE	5.6			
									Move wrench to nut		M4C	8.0	M4C		
									Position wrench to nut		P1SE	5.6			Hold
									Position wrench to hex		P2SSE	14.7			
									Release wrench		RL1	2.0			
									Reach to wrench handle		R10B	11.5			
									Grasp wrench		G5	5.6	G5		Transfer wrench handle to L.H.
									Hold						
									Move wrench off nut		M4BR	11.6			
									Clear cutter with wrench		D1E	4.0			
									Move wrench to R.H.		M12AB	18.2	R12A		Reach to handle of wrench
									Transfer wrench to R.H.		G5	5.6	G5		Transfer wrench to to R.H.
												104.2			
1121	Nut (thurston chuck), loosen or tighten with mallet 605-MSUN101								Hold			5.6	P1SE		Position mallet to wrench
												41.4	M4B10	3	Move maul away from wrench
												38.7	M4A10	3	Strike wrench
												85.7			
1122	Wrench, place on and remove from arbor nut 605-BSUWP03											37.2	TBCP		Turn to end of arbor
												22.1	M20C		Move wrench to nut
												19.7	P2SSE		Position wrench on nut
												2.9	M1B		Move wrench off nut
												4.0	D1E		Disengage wrench off nut
												18.2	M20B		Move wrench aside
												18.6	TBC1		Turn to machine
												122.7			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1129	Use dividers for stepping off points											6.0	M4C		Move to next point
												21.8	P2SD		
												15.6	EF		
												8.0	M4C		Scribe arc
												52.4			
1130	Weight (speed), attach or detach to/from lawnmower								Bend and reach		B	22.0			
									To weight chain		B2CP				
									" "		G1A	2.0			
	639-HCHWA01								To cutter arm		M30C	30.7			
									Weight to cutter arm		P1SE	5.6			
									Weight chain		RL1	2.0			
									Arise		AB	31.9			
									U-TEIWFAA			1.0			
												104.2			
1131	Part, large, clean with rag, additional square feet, part on floor											80.4	M12B	6	Wipe one square foot
	U-BCLPC04														
1132	Part, large, clean with rag, 1st square foot, part on floor										(M12B)	18.2	M20B		Rag to part
											G1A	2.0			
												80.4	M12B	6	Wipe one square foot
	U-BCLPC05										RL1	2.0			
												102.6			
1133	Prepare to use wire brush or scraper--part on floor														Obtain tool
												29.0	B		To work
											R1BB	18.2	M20B		Both hands
											G1A	2.0			
											M16B	15.8	M16B		Tool to part Use tool
											RL1	2.0			
												18.2	M20B		Away tool
												31.9	AB		
												117.1			
1134	Surface, clean with wire brush, one square foot									14	AFB	228.8	AFB	14	
										14	M4B	124.6	M6B	14	
										14	M4B	124.6	M6B	14	
	U-BCLSC05											478.0			
1135	Surface, clean with scraper, smooth surface, unobstructed											127.2	AFA	12	Pressure at beginning of scrape
												160.8	M12B	12	Scrape
												160.8	M12B	12	Return
	U-BCLSC01											448.8			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL AND FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1136	Surface, clean with scraper, rough surface, obstructed											500.8	AFA	48	Pressure
												331.2	M4B	48	Scrape
												331.2	M4B	48	Return
												1171.2			
	U-BCLSC04														
1137	Lever, turn on and off (air valve or similar)											37.2	R20B	2	Reach to lever
												4.0	G1A	2	Grasp lever
												32.4	AFB	2	
	U-HACLT01											24.4	M10B	2	Turn lever
												4.0	RL1	2	
												102.0			
1138	Surface, clean with air											160.0	M5B	20	Move hose back and forth
	U-BCLSC06														
1139	Tool (electric power), unwind cord and connect plug								L.H. hold power tool			10.1	R8B		Reach to plug
												2.0	G1A		Grasp plug
												5.7	M3B		
	U-HTPTU01											16.2	AFB		
												5.6	G2		Free plug
												7.5	D2E		
												6.9	M4B		
												2.0	RL1		
												8.6	R6B		
												2.0	G1A		Unwind cord
												100.0	M12Bm	10	
												5.6	G2		Regrasp plug
												22.1	M2OC		Move socket
												19.7	P2SSE		Plug in
												2.0	RL1		Release plug
												216.0			
1140	Tool (electric power), disconnect plug and wind cord											18.6	R20B		Reach to plug
												2.0	G1A		Grasp
												7.5	D2E		Unplug
	U-HTPTD01											2.0	RL1		Plug
												18.6	R20B		To cord
												2.0	G1A		Grasp
												100.0	M12Bm	10	Wind around body
												5.6	G2		Cord
												6.9	M4B		Plug thru HDL
												2.0	RL1		Cord
												8.6	R6B		Reach to plug
												2.0	G1A		Grasp
												8.0	M4C		Move plug to wire
												5.6	G2		Plug
												32.4	AFB	2	Push in under cord
												5.6	G2		Plug
												2.5	M4A		Pull tight
												2.0	RL1		Plug
												6.4	R4B		To tool

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1148	Wrench (impact), position to bolt or nut								To bolt or nut		M10C5	16.5	M10C5		Move wrench to bolt or nut
	U-BTPWP01										P2SSD	25.3	P2SSD		
									Release socket		RL1	2.0			
									Reach to barrel		R6B	8.6			
									Grasp		G1A	2.0			
												54.4			
1149	Obtain small wrench or screwdriver, position to nut or bolt and return to floor											18.6	TBC1		Walk to tool
												30.0	W2P		
												29.0	B		
												7.3	G4A		Grasp tool
												31.9	AB		
												30.0	W2P		Walk to work
												18.6	TBC1		
												22.1	M2OC		Move tool to work
												25.3	P2SSD		Position on work
												4.0	D1E		Remove tool from bolt
												12.2	M10B		Lift tool
												29.0	B		
												2.0	RL1		Release tool on floor
												31.9	AB		
												291.9			
1150	Wrench (large), position to nut or bolt														
	6XX-WTLWP01											2.0	G1A		Grasp handle
												5.6	G2		
									Reach to wrench		R10B	18.0	M8B15		Lift head
									Grasp wrench		G1A	2.0			
									Pull		APA	10.6	APA		Pull to lift
											M2OC				
											7.5	25.6	M2OC		
													7.5		Move wrench
											P2SSD	25.3	P2SSD		Position wrench
												17.7	M14B5		Lift handle
									Release work		RL1	2.0			
									Reach to head of wrench		R12B	12.9			
									Grasp head of wrench		G1A	2.0			
									Lift		M12B				
											7.5	16.4	M12B		
													7.5		Lift wrench
												7.5	D2E		Remove
											M12B				
											7.5	16.4	M12B		
													7.5		Move to bench

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1150	(continued)								Release		RL1	2.0 166.0	RL1		
1151	Wrench, adjust, large open end 6XX-BTLMA01								Release handle		RL1	2.0			
									Reach to thumb screw		R6A	7.0			
									Grasp	15	G1A	30.0			
									Turn	15	M1B	43.5			
									Release	15	RL1	30.0			
									Reach back	14	R1A	35.0			
									Press when necessary	3	APA	31.8 179.3			
1157	Part (small), remove from machine and aside to floor 6XX-MOSRP01											18.6	R20B		Reach to part
												3.5	G1B		Grasp part
												4.0	D1E		Remove from machine
												12.2	M10B		Move out of machine
												18.6	TBC1		Walk to
												15.0	W1P		bin
												2.0	RL1		Release part
												18.6	TBC1		Walk to
												15.0	W1P		machine
												101.3			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
1158	Obtain small part and position											18.6	TBC1		Walk to part
												30.0	W2P		
												29.0	B		Bend down
												14.6	G4A	2	Grasp part from box
												17.8	M6B	2	Lift part
												14.6	EF	2	Examine part
												8.9	M6B	2	Toss unwanted part back
												31.9	AB		Arise
												30.0	W2P		Walk to work
												18.6	TBC1		
												22.1	M20C		Move part to work
												19.7	P2SSE		Position part
												13.8	M2B	3	
												6.0	RL1	3	Engage
												8.0	R2A	2	
												4.0	G1A	2	
												287.6			
1159	Part, move into or out of position with hammer														
	600-MTLPM01											18.6	R20B		
												2.0	G1A		
												15.1	M10B5		Lift hammer
												25.6	M20C5		
												47.5	M4B5	5	Hit piece
												43.3	M4A5	5	Hit piece
												15.1	M10B5		
												2.0	RL1		
												169.2			
1160	Part (medium), remove from machine and aside to floor										R24B	21.5	R24B		Reach to part
											G1A	2.0	G1A		Grasp part
											M2B15	11.0	M2B15		Lift part
											M20B15	26.9	M20B15		Slide part out
	6XX-MOHRP02											4.0	D1E		Remove from machine
												21.3	M12B15		Move from machine
												37.2	TBC2		Turn around
												45.0	W3P		Walk to open area
												29.0	B		Bend
									Release part		RL1	2.0			
												17.7	M2C30		Lower part
												2.0	RL1		Release part
												31.9	AB		Arise
												18.6	TBC1		Return
												45.0	W3P		to work
												315.1			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1161	Obtain medium size part and position											18.6	TBC1		Walk to part
												45.0	W3P		
												29.0	B		Bend
												3.5	G1B		Grasp
												16.9	M2B30		Lift end
									Grasp under edge		G1A	2.0			
									Pull up part		AP15	5.6	AP15		Pull up part
												31.9	AB		Arise with part
												37.2	TBC2		Turn to machine
												45.0	W3P		Walk to machine
												34.1	SSC2		Step into position
											M12C15	23.4	M12C15		Move to position
									Position one end		P2SSD	25.3			
												7.6	ET15/30		Look to other end
												25.3	P2SSD		Position other end
											M4C15	15.0	M4C15		Lower piece
												5.6	P1SE		Align on end
												7.6	ET15/30		Look to other end
									Align other end		P1SE	5.6			
									Release		RL1	2.0	RL1		Release
												386.2			
1162	Part (medium), clean before installing														
	6XX-MCLCP01														
										3	M6B15	48.0	M6B15		Move part in and out
											T12C8	6.8	T12C8		
												2.0	RL1		Turn part and reverse grasp
												9.4	T18C8		
												2.0	G1A		
										3	M6B15	48.0	M6B15	3	Dip and move part in solvent
											M10B15	19.9	M10B15		Set down part
									Release part		RL1	2.0			
									Reach to rag		M30B	25.8			
									Grasp rag		G1A	2.0			
									Move rag to part		M30B	24.3			
									Grasp part in rag		G1A	2.0			
									Clean part--both sides	34	M6B	360.4			
												8.5	T90M		
												2.0	RL1		
												9.4	T18C8		Turn part over
												2.0	G1A		
												8.5	T90M		
									Move rag to pocket		M30C	30.7			
											P2SE	16.2			
											RL1	2.0			
												651.9			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		MEN VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1163	Part (small), adjust position											18.6	TBC1		Walk to
												15.0	W1P		tools
	6XX-MT1AP01											11.5	R10B		Reach to hammer
												2.0	G1A		Grasp hammer
									Reach to punch		R10B	11.5			
									Grasp punch		G1A	2.0			
									Lift punch		M10B	12.2	M10B		Lift
												18.6	TBC1		Walk to
												15.0	W1P		work
									Move punch to part		M10C	13.5			
									Position punch to part		P1SE	5.6			
												51.8	M3B	3	Raise hammer
												29.1	M3A	3	Strike punch
									Move punch aside		M20B	18.2	M20B		Move hammer aside
											RL1	2.0	RL1		Release
												206.6			
1164	Part (medium), adjust position											18.6	TBC1		Walk to tools
												30.0	W2F		
	6XX-MT1AP02											11.5	R10B		Reach to hammer
												2.0	G1A		Grasp hammer
									Reach to bar		R10B	11.5			
									Grasp bar		G1A	2.0			
									Lift bar		M10B	12.2	M10B		Lift
												18.6	TBC1		Walk to work
												30.0	W2F		
									Move bar to part		M10C	13.5			
									Position bar to part		P1SE	5.6			
												106.0	M3B	10	Raise hammer
												97.0	M3A	10	Strike bar
									Move bar aside		M20B	18.2	M20B		Move hammer a
									Release		RL1	2.0	RL1		Release
												378.7			
1165	Apply grease to small part											18.6	TBC1		Walk to grease
												15.0	W1P		
												18.6	R20B		Reach to grease
												2.0	G1A		Pick up grease
												18.2	M20B		
												18.6	TBC1		Walk to part
												15.0	W1P		
												27.6	MAB	4	Rub grease on part
									Turn part over		T1SOS	9.4			
											02	5.6			
												27.6	MAB	4	Rub grease on part
												176.2			
1167	Attach clasp to overhead beam for chain hoist, OF REMOTE								Release ladder		RL1	2.0			
									Reach to clasp		R24A	26.8	M24A10		Move clasp to L.H.

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1167	(continued)										G1A	2.0			
												5.6	G2		Regrasp clasp
									Open 2 halves of clasp		M2B	4.6			
									Move clasp to beam		M30C10	38.0	M30C10		Move clasp to beam
											M3A	4.9	M3A		Hook clasp over beam
									Move left side of beam		M2C	5.2			
									Move back		M2B	4.6			
												5.6	G2		Regrasp nut
												72.5	M1B	25	
												50.0	RL1	25	Loosen nut or
												60.0	R1A	24	turn nut on
												48.0	G1A	24	
												5.6	G2		
									Move halves of clasp apart		M3B	5.7			
									Remove bolt		D2E	7.5			
									Move half of clasp to beam		M2C	5.2			(Allowed for in occurrences for loosen nut)
									Position clasp		P1SE	5.6			
									Position bolt in hole		P1SD	11.2			
									Regrasp bolt		G2	5.6	G2		Regrasp nut
												5.2	M2C		Move to bolt
												11.2	P1SD		Position nut
									Release bolt		RL1	2.0			
												396.6			
1168	Attach chain hoist to clasp or remove											29.0	B		Set clasp on ladder
											P2SD	21.8	P2SD		rung
												2.0	RL1		Release
												12.9	R12B		Reach underneath
												2.0	G1A		Grasp
									Release hook		RL1	2.0			
									Reach under hoist		R12B	12.9			
									Grasp		G1A	2.0			
									Lift		AP40	14.3	AP40		
												31.9	AB		Arise
											M10C40	33.7	M10C40		Move to clasp
											P2SD	21.8	P2SD		Position hook in ring
											M2B40	20.9	M2B40		Move onto ring
											RL1	2.0	RL1		Release
											R24E	19.2	R24E		Reach hands back
												228.4			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1172	Position wood blocks to receive large part											37.2	TBC1	2	Walk to block
												150.0	W5P	2	
												58.0	B	2	Bend
												7.0	G1B	2	Grasp
												10.5	M1B5	2	blocks
												11.2	G2	2	
												63.8	AB	2	Arise
												300.0	W20P		Walk to storage area
												29.0	B		Bend down

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1172	(continued)											21.5	M20B5		Place one block
												2.0	RL1		Release
									Move other block		M12B5	16.4			
									Release		RL1	2.0			
												31.9	AB		
												300.0	W20P		
												18.6	TBC1		
												1059.1			
1173	Position large part on fork truck											37.2	TBC1	2	Step around part
											R10B	11.5	R10B		Reach to part
											G1A	2.0	G1A		Grasp part
											M24C25	41.7	M24C25		Push part
									Release chain		~~RL1~~		G1A		Wait--part lowered
									Reach to chain fall	5	mR30A	126.6	mM30Bm	6	Pull chain down
									Grasp chain		~~G1A~~		RL1		Release chain
									Pull chain down	5	mM30Bm	105.5	(mR30A)	6	Reach to chain
												324.5			
1174	Position large part											21.5	R24B		Reach to part
												2.0	G1A		Grasp part
											M6C25	22.3	M6C25		Move part
												16.2	P2SE		Position
										5	mR30A	105.5	mM30Bm	5	Pull hoist chain
									Pull hoist chain	5	mM30Bm	105.5	mR30A	5	
									Release chain		~~RL1~~		~~G1A~~		Grasp chain
												21.5	R24B		Reach to pin
												2.0	G1A		Grasp pin
												25.5	M24C		Move to part
												5.6	P1SE		Position in one part
												6.7	M3C		Move into part
												11.2	P1SD		Position in 2nd hole
												16.2	AP1		Press to align parts
												5.7	M3B		Move into place
												2.0	RL1		Release
									Reach to pin		R24B	21.5			
									Grasp		G1A	2.0			
									Pull free		M3B	10.6			
											D2E	7.5			
									Move to pocket		M24C	25.5			
									Position		P1SE	5.6			
									Release		RL1	2.0			
												444.1			
1175	Remove sling from large part											21.5	R24B		Reach to chain
												2.0	G1A		Grasp chain
										5	(mR30A)	105.5	mM30Bm	5	Lower hook slightly
												2.0	RL1		Release chain
											R12B	12.9	R12B		Reach to rope
											G1A	2.0	G1A		Grasp
												10.6	M3B		Move sling off hook
									Release hook		RL1	2.0			
									Reach to loop		R8B	10.1			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1175	(continued)								Grasp loop		G1A	2.0			
									Pull		AP1	16.2			
									Free loop		M6B	8.9			
												2.0	RL1		Release sling
												8.6	R6B		Reach to loop
												2.0	G1A		Grasp
												12.2	M10B		Pull free
												2.0	RL1		Release loop
												11.5	R10B		Reach to main rope
												2.0	G1A		Grasp main rope
												24.3	M30B		Pull free
												2.0	RL1		Release
												262.3			
1176	Scribe 90° arc with two man trammel (per man)											34.0	W2PO		Helper to work
												18.6	TBC1		
												69.4	KBK		Kneel down
												29.0	B		Bend forward
												22.1	M20C		Position trammel
												47.8	P3NSE		point to center point
												7.3	EF		Check position
												5.6	G2		Regrasp and hold
												10.3	M6C		Craftsman positions
												21.0	P2NSE		trammel point
												44.2	M20C	2	Scribe with trammel
												28.6	LM12	2	Crawl forward
												5.6	G2		Regrip
												12.2	M10B		Remove from work
												31.9	AB		Stand up
												76.7	AKBK		
												34.0	W2PO		Return to bench
												498.3			
1177	Move part aside on fork truck and move truck aside								Symbols and time values for fork truck operations from data developed by the Naval Supply Systems Command			180.0	D6ON1M		Lower pallet and forks
												41.6	A1M		Start
												40.0	R10IM		Back up 10 feet
												91.7	TRL		Turn
												40.0	R10IM		Move backwards
												55.0	S1M		Stop and start
												41.6	A1M		
												40.0	F10AM		Move forward
												91.7	TFR		Turn
												20.0	F5IM		Move forward
												55.0	S01M		Stop
												60.0	D12M		Lower part to floor
												50.0	A		Start
												38.0	R10E		Back up 10 feet
												91.7	TFL		Turn
												33.0	S0		Stop
												50.0	A		Start
												171.0	F45E		Move forward
												33.0	S0		Stop
												1417.0			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL-ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1178	Place skid or pallet on forks of truck											18.6	TBC1		Walk to pallet
												75.0	W5P		
												29.0	S		Stoop
												2.0	G1A		Grasp
												16.2	AP1		Pick up pallet
												31.9	A8		
												18.6	TBC1		
												60.0	W4P		Walk to truck
												18.6	TBC1		
												28.4	M20C10		Move pallet to truck
												14.7	P1SSD		Position pallet on forks
												17.4	M10B10		Move pallet on forks
												2.0	RL1		Release
												15.1	R20A		Reach to end of pallet
												2.0	G1A		Grasp
												28.8	M24A10		Push onto forks
												2.0	RL1		Release
												378.3			
1179	Obtain fork truck, obtain large part from stand and move to work											37.2	TBC1	2	
												300.0	W10P	2	To and from truck
												37.2	TBC1	2	
												18.6	R2OB		Reach to cab
												2.0	G1A		Grasp handhold
												19.1	LM16		Step on rung
												100.5	LM2B	3	Climb into cab
												50.0	A		Start
												342.0	F9OE		Run forward
												33.0	S		Stop
												---	(E1.C2		Position pallet on forks)
												50.0	A		Start
												53.2	F1AE		Forward 1½ feet
												91.7	TTR		Turn
												53.2	F1AE		Forward 1½ feet
												33.0	S0		Stop
												262.0	U6ON		Raise forks
												133.0	LME		Into pallet
												57.6	U12IN		Up 12"
												40.0	R10IN		Back up
												91.7	TTR		Turn
												41.6	A1N		Start forward
												33.0	S01N		Stop
												1921.6			
1183	Roller, filling wheels with water, per 1800 sq. ft.	.0531	.0398	.9305	20	.0465	1.00	.0465							
1184	Move machine roller onto area and away			.0300	1	.0300	1	.0300							
1185	Cultivate shrubs without flowers, 3' x 10'	.017	.008	.145	12	.012	1.05	.0130							

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1564	Rotate boom 90° - 100-ton floating crane			.0110	1	.0110	.755	.0083							
1565	Rotate boom 75° - 60-ton floating crane	.0098	.0072	.0754	9	.0084	.755	.0063							
1566	Boom up or down - 100-ton floating crane (per foot)			.0009	1	.0009	.755	.0007							
1568	Equipment, heavy, floating-moor or unmoor by tug	.3231	.2227	1.6374	6	.2729	.755	.2061							
1569	Equipment, heavy, floating-move by tug (per mile)	8.5 knots/hr 8.4 x 1.125 = 9.6 Mi/Hr $\frac{1}{9.6}$ = .104 Hr/Mi					.755	.0793							
1570	Air drill; counterbore 4 inch diameter x 4 inches deep in timber	.0340	.0210	.2680	10	.0268	1.0	.0268							
1571	Air drill 1-1/8 inch diameter hole through 12" x 12" timber	.0110	.0075	.1824	20	.0091	1.0	.0091							
1572	Air drill; 2-1/4 inch diameter hole through three 12" x 12" timbers	.0850	.0650	.3770	5	.0754	1.0	.0754							
1573	Air drill; ream 1-5/16 inch diameter hole through 1-1/8 inch diameter hole through four 12" x 12" timbers	.1700	.0980	.6020	5	.1204	1.0	.1204							
1574	Lower No. 2 hook loaded or unloaded - 100-ton floating crane (per foot)	$\frac{.0320}{70'}$	$\frac{.0261}{70'}$	$\frac{.1162}{300'}$	5	.0004	.755	.0003							
1575	Raise or lower No. 1 hook loaded or unloaded - 100-T floating crane (per foot)	$\frac{.1120}{120'}$	$\frac{.0716}{85'}$	$\frac{.2966}{315'}$	6	.0009	.755	.0007							
1576	Raise No. 2 hook loaded or unloaded - 100-ton floating crane (per foot)	$\frac{.0690}{80'}$	$\frac{.0575}{80'}$	$\frac{.2179}{320'}$	4	.0007	.755	.0005							
1577	Raise or lower No. 1 hook loaded or unloaded - 60-ton floating crane (per foot)	$\frac{.0340}{60'}$	$\frac{.0248}{60'}$	$\frac{.2340}{480'}$	8	.0005	.755	.0004							
1578	Heavy; position to pile and remove from.										02 M12B	5.6 13.4	02 M12B		Handle Spike into pile

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1633	Set up and take down step ladder (up to 12 ft. length)											29.0	S		Step to ladder
									Grasp side		G1A	2.0	G1A		Grasp side
												9.0	M1B15		Lift off floor
												31.9	A8		Arise
									Regrasp side			5.6	G2		Regrasp side
									Turn ladder vertical		M2OB15	26.8	M2OB15		Turn ladder vertical
									Release		RL1	5.6	G2		Regrasp side
									Reach to back of ladder		R12B	12.9			
									Grasp back		G1A	2.0			
									Pull out back		M2OB10	24.1			
									Release		RL1	2.0			
												40.7	S81BC2		Side step for balance
									Reach to back		R2OB	18.6			
									Grasp back		G1A	2.0			
									Pull out to limit		M2OB10	24.1			
									Release		RL1	2.0			
									Reach to braces	2	R2OB	37.2			
									Grasp braces	2	G1A	4.0			
									Pull down braces	2	M12B	26.8			
									Press braces in place	2	AP1	32.4			
									Release	2	RL1	4.0			
									Reach to shelf		R24B	21.5			
									Grasp shelf		G1A	2.0			
									Pull shelf down		M1OB	12.2			
									Pull tight		AP1	16.2			
									Release		RL1	2.0			Release
									Drop hand to side		R35E	26.5	R15E		Drop hand to side
									Reach to shelf		R24B	21.5	R16B		Reach to front of ladder
									Grasp shelf		G5	2.0	G1A		Grasp side
											(AP1	16.2			
									Push shelf up		(M3B	10.6			
									Release		R1P	.0			
									Reach to braces	2	R2OB	37.2			
									Grasp braces	2	G5	.0			
									Apply pressure	2	AP1	32.4			
									Push up	2	M1OB	24.4			
									Release	2	RL2	.0			
									Reach to back		R15B	17.2			
									Grasp		G1A	2.0			
									Fold toward front		M2OB10	24.1			
									Regrasp		G2	40.7	S81BC2		Side step for balance
									Fold shut		M2OB10	24.1			
									Release		RL1	2.0			
									Reach to top of ladder		R2OB	18.6			
									Grasp		G1A	2.0			
									Turn down		M2OB10	24.1	M2OB10		Turn down
									Release		RL1	2.0			
												19.9	M1OB15		Lower to floor
												29.0	S)		

ELE. SHEET NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1637	(continued)											11.5	R10B		To handle
												2.0	G1A		Handle
												80.4	M12B	6	Move handle in
												33.6	G2	6	1/2 rev. motions
												16.2	AP1		
												169.4			
1638	Wet mop floor - any type (100 sq. ft.) 32 oz. mop														
									Hold mop by handle			102.0	W6F0		Hold mop by handle
											(M2CB15	26.9	M2CB15		Walk with mop
											(GP		GP		Lay mop on floor,
											(TBC1	18.6	TBC1		Flat side down
											(GP		RSt		Get in position to mop
												12.9	R12B		Ge: new hold on
									Regrasp near end of handle		G2	5.6	(G1A)		Mop about 18"
										8	R11	16.0			Down from mop handle
										8	R6B	80.8			
										8	G1A	16.0			
										8	AP1	129.6	AP1	8	Swing mop in strokes
										8	(M12B15	260.8	M2CB15	8	of about 6 or 7 ft.
											(S8C1		S8C1	8	
										8	G2	44.8	G2	8	Regrasp mop handle
										8	S8C1	136.0	S8C1	8	Continue mop stroke
										8	TBC1	148.8	TBC1	8	Reverse direction of mop
													MAP	8	Step back
												998.8			
1639	Vacuum debris container, unhook from sweeper frame.	.0086	.0080	.0250	3	.0083	1.0	.0083							
1640	Vacuum debris container fasten to frame.	.0099	.0095	.0292	3	.0097	1.1	.0107							
1641	Vacuum debris container lift out, empty on floor and replace.	.0275	.0250	.0779	3	.0260	1.0	.0260							
1642	Pick up debris with shovel and broom, dispose in barrel.	.0550	.0510	.1575	3	.0525	1.0	.0525							
1643	Shovel and broom, obtain and replace.	.0345	.0265	.1285	4	.0321	.9	.0289							
1644	Machine sweep aisles including right and left turns into other aisles, per 4,000 square feet.	.1321	.1316	.3961	3	.1320	1.0	.1320							
1645	Debris, sweep into aisles from under storage areas fencing. Operator dismounts.	.0268	.0170	.0858	4	.0215	.85	.0183							

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1646	Move aside small item of office furniture (2 ft.)								Reach for furniture item		R20B	18.6			
									Grasp		G1A	2.0			
												34.1	B0C2		Sidestep
													M20B		Move furniture item
												17.0	W1FO		Move furniture item
												15.0	W1P		Return
											RL1	2.0			
												88.7			
1647	Pick up sweepings and dispose											180.0	W12P		
												15.8	R16B		To dust pan or shovel
												2.0	G1A		Grasp handle
												5.7	MOB		Off floor
									To handle of broom		R12B	204.0	W12PO		To pile of sweepings
											G1A	2.0			
												87.0	B	3	Stoop to pile of sweepings
												56.6	M10B	3	Dust pan to sweepings
									Broom	3	G2	16.8	G2	3	Dust pan
												95.7	AB	3	Arise from stoop
												72.9	M5CB	3	Dust pan to container
												19.5	T6CM	3	Empty dust pan
												72.9	M5CB	3	Toward floor
													M6BT	3	Turn scoop of pan
												14.6	M14B		
													M6BT		
												2.0	RL1		Release dust pan
												9.5	M2E		Hand aside
												656.6			
1648	Vacuum rug, move 3 chairs, per 100 square feet.	.0500	.0150	.1140	6	.0190	1.0	.0190							
1649	Vacuum rug, move 6 chairs, per 100 square feet.	.0400	.0250	.1200	4	.0300	1.0	.0300							
1650	Vacuum rug, move 10 chairs, per 100 square feet.	.0633	.0484	.3420	6	.0570	.8	.0456							
1651	Waste, Obtain Paper to Wrap											18.6	TBC1		Turn
												45.0	W3P		To newspaper
									To cut edge of paper		R15B	15.1			
									Edge		G1B	3.5			
									Paper to front of body		M15A	15.2	R20A		To newspaper
												3.5	G1B		Grasp cut edge
									Unfold to 14-3/4" x 23-1/2"		M15B	17.0	M15B		Unfold to 14-3/4" x 23-1/2"
												2.0	RL1		Let go
												15.8	R16B		Reach to top edge
												3.5	G1B		Grasp
									Release		RL1	2.0			

ELE. ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
1654	(continued)														
									Grasp		mR22B	17.3	W1P		Walk to vacuum
											G1A	2.0	RL1		Release
												2.0	G1A		Grasp spring ring
												8.0	M4C		Move ring to hook on handle
												5.6	P1SE		Hook ring
									Release bag			29.0	KOK		Kneel to attach
									Hold head of vacuum		RL1		RL1		Bottom of dust bag
											G5	12.9	R12B		Reach to flange
												2.0	G1A		Get hold of flange
												6.7	M3C		Move bottom of flange to vacuum socket
												9.1	P1SSE		Insert flange into socket
												2.0	M2A		Secure top of flange to vacuum head
												0	G5		Put thumb on clasp
												10.6	AF2		Lock clasp
													MAM		
									Let go head of vacuum		R12	31.9	AKOK		Stand up
													RL1		Release
												157.7			
1655	Waste, wrap														
												18.6	TBC1		Turn to wrap waste
												15.0	W1P		Walk to newspaper
												29.0	KOK		Kneel to wrap
									Reach for left edge of paper		18R	17.2	R15B		Reach for right edge of paper
												3.5	G1B		Pick up right edge
									Pick up left edge		G1B	18.2	M20B		Fold paper in
									Fold paper in		M20B	3.5			
									Regrasp		G2	18.2			
												5.6	RL1		Release
												23.0	R10B	2	Reach to top/bottom of paper
												7.0	G1B	2	Pick up edge
									Regrasp		G2	26.8	M12B	2	Fold in
												11.2	RL1	2	Let go
												10.1	R6B		Reach for wrapped package
									Release		RL1	2.0	G1A		Grasp
												31.9	AKOK		Stand up
												18.6	TBC1		Turn
												259.4			
1656	Waste, dispose of														
												180.0	W12P		Walk to dust bin
									Reach to hinged cover		mR17B	18.6	TBC1		Turn
									Push cover open		M3B	10.6			
												12.8	mM12B5		Insert package
												2.0	RL1		Release package
									Release cover		RL1	11.8	R12E		Hand away
									Hand away		A12E	18.6	TBC1		Turn
												180.0	W12P		Walk back to work area
												434.8			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RG.	LH	TMU	RH	RG.	DESCRIPTION - RIGHT HAND
2055	Excavate earth (average depth 9") using grader, bulldozer and front end loader per 1350 cu. ft.	1.5983	1.3774	29.2516	20	1.4626	1.11	1.6235							
2056	Load earth into truck with front end loader per 1350 cu. ft.	1.2764	.9968	21.9447	20	1.0972	1.11	1.2179							
2057	Roll earth with 3-wheel roller per 1800 sq. ft.	.2597	.2289	4.7520	20	.2376	1.06	.2518							
2058	Equipment, adjustments or minor repairs to, per 1350 cu. ft.	.1041	.0904	1.9054	20	.0952	1.00	.0952							
2059	Equipment, fueling and servicing per 1350 cu. ft.	.1286	.1189	2.5390	20	.1269	1.00	.1269							
2060	Open or close pipe wrench														
									Reach to screw		R4A	5.6	G2		Regrasp wrench handle
									Grasp screw with thumb	8	G1A	6.1			
									Turn screw	8	MFB	16.0			
									Release screw	8	RL1	16.0			
									Reach back to screw	7	RFA	16.0			
												14.0			
												73.7			
2061	Preliminary tighten or loosen with pipe wrench								Grasp pipe or vise		G1A	2.0			
												127.2	AP2	12	Pull wrench handle
												146.4	M10B	12	down to turn 3 threads
												67.2	G2	12	Return to starting
												146.4	M10B	12	point
												489.2			
2062	Wrench, adjust, monkey or crescent											11.2	G2	2	Regrasp wrench at neck
												10.0	R1A	4	Reach to screw
	U-BTLMA01											0.0	G5	4	Contact screw
												11.6	M1B	4	Move adjustment
												0.0	RL2	4	Release screw
												13.5	M10C		Move wrench to work
												19.7	P2SSE		Try wrench on work
												5.0	R1A	2	
												0.0	G5	2	Make final screw
												5.8	M1B	2	adjustment
												0.0	RL2	2	
												76.8			
2063	Final tighten or loosen with wrench											48.6	AP1	3	Start last 3 motions
												6.0	MFB	3	Tighten
												32.4	AP1	2	Final tighten
												87.0			
2064	Remove wrench from work and set aside								Release pipe		RL1	2.0			
									Reach to head of wrench		R6B	8.6			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL AND FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2064	(continued)								Grasp wrench		G1A	2.0			
									Lift wrench		M10B	12.2	M10B		Lift wrench handle
									Release		(RL1)	18.6	TBC1		Return to bench
												30.0	W2P		
												12.2	M10B		Set wrench down
												2.0	RL1		
												87.6			
2065	Wipe excess dope from joint or fitting											18.6	R20B		Obtain wipe cloth
												2.0	G1A		From rear pocket
												4.0	D1E		
									Reach to pipe		(M10B)	27.3	M26C		Move cloth to pipe
									Grasp		(G1A)	5.6	F1SE		Position on pipe
												36.8	M2B	6	Wipe dope from
									Release grasp		RL1	11.2	G2	2	threads
												2.0			
												5.6	G2		Regrasp cloth
												21.8	M26B		Move to pocket
												10.6	AP2		Push into pocket
												2.0	RL1		Release
												147.5			
2066	Tighten nut with adjustable open end wrench											5.6	G2		Regrasp wrench handle
												61.0	M10B	5	Move handle down
												16.0	D1E	4	Wrench off nut
												54.0	M10C	4	Lift wrench
												36.4	P1SSE	4	Reposition wrench
												48.6	AP1	3	Pull tight
												221.6			
2067	Obtain pipe, position and engage threads											18.6	TBC1		
												15.0	W1P		Move to pipe
												29.0	B		
									Reach to pipe		M10B	11.5	M10B		Reach to pipe
									Grasp		G1A	2.0	G1A		Grasp
									Lift pipe		M10B10	13.9	M10B10		Lift pipe
												31.9	AB		
												18.6	TBC1		Return to work
												15.0	W1P		
									Assisting motions		M10C10	18.9	M10C10		Move pipe to position
											P2SD	21.8	P2SD		Position end
									Regrasp pipe		G2	5.6	G2		Regrasp pipe
									Position pipe		P2SD	21.8	P2SD		Position pipe to threads
										3	M1B10	21.3	M1B10	3	
									Assisting motions	3	G2	16.8	G2	3	Engage threads
											RL1	2.0	RL1		
												263.7			
2068	Align rear end of long pipe (over 4' in length)								Regrasp held pipe		G2	5.6	G2		Regrasp held pipe
												20.0	ET		Look at rear end
												17.2	M4C20		Lift or lower end
												16.2	P2SE		Align
												7.3	EF		Check alignment
												66.3			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	THU	RH	NO	DESCRIPTION – RIGHT HAND
2145	Tighten large fitting or flange by hand								Assisting motions	14 14 14 14	R8A G1A M8B5 RL1	110.6 28.0 187.6 28.0 354.2	R8A G1A M8B5 RL1	14 14 14 14	Tighten fitting or flange by hand
2146	Remove large pipe or pin wrench from work and set aside								Reach to head of wrench Lift wrench Remove wrench Move to bench Release		R12B G1A M12B10 D2E M20B10 RL1	12.9 2.0 17.4 18.8 7.5 18.6 30.0 29.0 24.1 2.0 31.9 194.2	G2 M10B10 D2E TBC1 W2P B M20B10 RL1 AB		Regrasp handle Lift handle Remove wrench Turn and walk Move wrench aside Release Arise
2147	Fill tank/per gallon	.0029	.0024	.0216	8	.0027	1.0	.0027							
2148	Drain tank/per gallon	.0055	.0045	.0391	8	.0049	1.0	.0049							
2149	Clean bell cover	.0210	.0115	.0755	5	.0151	1.0	.0151							
2150	Unwind and rewind water hose or electric cord from hydraulic motor carrier	.0285	.0255	.0540	2	.0270	1.0	.0270							
2151	Cork hydrant outlet with hammer and chisel	.0460	.0395	.1255	3	.0418	1.0	.0418							
2152	Climbing in and out of trap door opening from and to ladder								Edge of opening Raise foot to edge Step up from rung Climb down thru ceiling opening For support For support Edge of opening Regrasp Release For support		G1A LM12 W-P R8B R2B G1A G2 RL1 R12B G1A AP1	12.9 2.0 14.3 2.0 21.5 2.0 14.3 31.9 29.0 11.5 2.0 4.0 2.0 5.6 2.0 12.9 2.0 2.0 12.9 2.0 16.2	R12B G1A LM12 RL1 R24B G1A AB RL1 S R10B G1A G2 RL1 R12B G1A 		For support Edge of opening Raise foot to edge Edge For support Edge of opening Arise Stoop down For support Edge of opening Regrasp Release For support Grasp

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2388	Turn switch on or off											34.1	GS12C2		Step to switch
												29.0	B		Bend
												8.7	R10A		Reach to handle
												2.0	G1A		Grasp
												16.2	AP1		Pull switch down
												4.9	M3A		or up
												2.0	RL1		Release
												31.9	AB		Straighten up
												128.8			
2389	Turn light on or off											17.0	W1P0		To light
												25.8	R30B		To switch
												2.0	G1A		
												10.6	AP2		
												5.4	T90S		Turn switch
												2.0	RL1		
												22.9	R30E		Lower hand
												17.0	W1P0		
												102.7			
2390	Start gas trimmer										(B12B)	14.6	M14B		Rope to starter
											G5	0			
									Engage choke		M1A	2.9			
											RL2	0			
										2	R6B	17.2	(G2)	2	Rope
									To knot	2	G1A	4.0			
										2	M4C	16.0			
									Engage in slot	2	P13E	11.2			
									Knot		(RL1)	83.0	3C5	2	Rope around crank
												12.8	R4B	2	To wood handle
												4.0	G1A	2	
												86.0	M24B	4	Pull rope starter
											R6B	8.6			
											G5	0			
									Disengage choke		M1A	2.5			
											RL2	0			
												262.8			
2391	Turn off gas trimmer											13.6	R15E		To button
												8.4	R4C		To button
												5.6	P15E		To button
												0	G5		Grasp button
												10.6	AP2		Grasp button
												0	RL2		Release button
												38.2			
2392	Start generator											45.0	W3P		
												28.7	LM24		Brace self
												29.0	B		To choke
									To choke		R5B	7.8			
											G1A	2.0			
											MfB	2.0			
											(RL1)	8.6	R6B		To knob of rope starter
												2.0	G1A		Starter

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
2392	(continued)											102.6	M3B	18	Engage starter
												145.8	M30B	6	Start generator
												2.0	RL1		Starter
												12.9	R12B		To choke
												2.0	G1A		
												2.0	MfA		Choke
												2.0	RL1		
												31.9	AB		
												426.3			
2393	Turn off generator											45.0	M3P		To button
												29.0	B		To button
												8.0	M4C		
												5.6	P1SE		Button
												0	G5		To button
												10.6	AP2		Button
												0	RL		Button
												31.9	AB		
												130.1			
2394	Tool, start (drill or similar w/trigger switch)											6.1	R4C		To start switch
												0.0	G5		Start switch
	U-MACTS01											16.2	AP8		Start switch
												0.0	RL2		Start switch
												22.3			
2395	Turn on and off buffing machine								Move to "On" position		AP1	16.2			
											M2B	2.9			
											RL2	-			
									Move to "Off" position		M2B	2.9			
											RL2				
												22.0			
2396	Turn switch off or on - branch lighting circuit											18.6	R20B		To panel door latch
												3.5	G1B		
												16.2	AP1		Pull
												15.8	M16B		Open door
												2.0	RL1		
												16.7	R20E		Drop arm
												15.2	ET $\frac{18}{18}$		Locate switch
												21.9	EF	3	
												17.2	R18B		
												-	G5		
												2.9	M2B		Turn on or off
												-	RL2		
												15.8	R16B		To door
												-	G5		
												15.8	M16B		Close door
												16.2	AP1		
												0	RL2		
												177.8			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2397	Start and turn off electric trimmer											6.4	R4C		To starter switch
												3	G5		Starter switch
												5.6	P1SE		Starter switch
												10.6	AP?		Starter switch
												0	RL2		Starter switch
												22.6			Start
												22.6			Turn off
												45.2			
2398	Turn on and light gas								Reach to lighter		R18B	17.2			
									Grasp lighter		G1B	21.3	R24B		Reach to valve
									Move lighter to burner		M12B	13.4	G1A		
												10.6	AP2		Turn on gas
									Light gas		M?B	3.5	T4SB		
									Lighter aside		M10B	17.0	G1D		
									Release lighter		G1D	19.2	R24E		Remove hand
									Reach away		R18E	15.5			
												117.9			
2400	Open or close oil valve											25.8	R30B		Reach to oil valve
												2.0	G1A		Grasp handle
												16.2	AP1		Press to open
												3.6	M2A		Turn valve
												2.0	RL1		Release
												22.9	R30E		Return to position
												72.5			
2401	Open or close ram jack release valve											29.0	B		
									To pump housing		R10B	12.9	R12B		To valve nut
									Housing		G1A	3.5	G1B		Nut
												16.2	AP1		Loosen or tighten nut
												41.4	M2B	9	Turn nut 1/3 turn
												18.0	RL1	9	Nut
												32.0	M2A	8	To new location
												16.0	G1A	8	Nut
											RL1	31.9	AB		
												200.9			
2402	Turn coolant on and off											26.2	R20A	2	Reach to valve
												4.0	G1A	2	Grasp
												9.2	M2B	2	Turn valve
												4.0	RL1	2	Release
												8.0	R2B	2	Reach hand to get
												4.0	G1A	2	New grasp
												9.2	M2B	2	Turn valve

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
2571	(continued)														
									Assisting motions		D2D	10.1	R6D		Reach to bottom of die
											M20C	11.8	D2D		Remove die from spud
												22.1	M20C		Lift die out carefully
												29.0	B		Bend
									Assisting motions		M14C	16.9	M14C		Move under machine
											P2SSD	25.3	P2SSD		Position die in slot
												16.2	AP1		Close die assembly
												8.1	M6A		
									Release		RL1	2.0	RL1		Release
												186.4			
2572	Remove and lay aside parts per piece			.0005	1	.0005	1	.0005							
2573	Remove circle attachments and lay aside										R12B	12.9	R12B		
											G1A	2.0	G1A		Attachment
									Same as right hand		M3B10	10.2	M3B10		
											D3D	34.7	D3D		
												18.6	TBC1		
												51.0	W3P0		Side of machine
											M20B10	29.5	M20B10		
											RL1	2.0	RL1		Attachment
												160.9			
2574	Remove die from machine											12.9	R12B		Reach bolt
												4.0	G1A	2	Grasp bolt
												4.0	MFB	2	
												4.0	RFB	2	Unscrew bolt
												4.0	RL1	2	Release bolt
												5.3	R3B		Reach die
												7.3	G1C1		Grasp die
									Reach die		R14B	14.4	(MFB)		Move die up
									Grasp die		G5	.0			
												5.6	G2		Regrasp die
												2.9	M3B		Move die out
									Move die aside		M12B	13.4	(RL1)		Release die
									Release die		(RL1)	11.8	R12E		Reach aside
									Reach aside		R12E	11.8			
												101.4			
2575	Remove punch from machine								Reach punch		R18B	17.2	R18B		Reach nut
									Grasp punch		G1A	2.0			
												4.0	G1A	2	Grasp nut
												4.0	MFB	2	Unscrew nut
												4.0	RFB	2	
												4.0	RL1	2	Release nut
									Move punch aside		(M12B)	15.5	R18E		Reach aside
									Release punch		RL1	2.0			
									Reach aside		R12E	11.8			
												64.5			
2576	Remove and replace shield from notch cutter											11.5	R10B		Reach to shield
												2.0	G1A		Lift up
												6.9	M4B		

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
2578	(continued)								Position belt		P1SSD	14.7	P1SSD		Position belt
									Regrasp belt		G2	5.6	G2		Regrasp belt
									Move belt on rollers	3	M2B	13.8	M2B	3	Move belt on rollers
									Release belt		RL1	2.0	RL1		Release belt
									Move hand to machine		R6B	8.6	R6B		Move hand to belt release
												2.0	G1A		Grasp handle
												16.2	AP1		Apply pressure
												6.1	M4A		Move handle
												2.0	RL1		Release handle
									Same as RH		R10B	11.5	R10B		Move hand to machine
									Same as RH		G1A	2.0	G1A		Grasp machine
									Same as RH		M8B10	15.7	M8B10		Turn machine upright
												13.4	M8B5		Tilt front of machine up
											G1A	2.0			
									Apply pressure on switch		AP1	16.2			
												2.0	RL1		Release front of machine
												8.6	R6B		Move hand to adjustment nut
												8.0	G1A	4	Grasp nut
												8.0	MFB	4	Move nut to adjust
												8.0	RL1	4	Release nut
												10.0	R1A	4	Reach for nut
									Release switch		RL1	8.6	R6B		Move hand to front of machine
												11.2	M8B		Set front of machine on bench
									Release machine		RL1	2.0	RL1		Release machine
									Move hand back		R14E	13.0	R14E		Move hand back
												390.0			
2580	Visual inspect part (small)											146.0	EF	20	6 sides to part
												12.0	RL1	6	
												24.0	R2B	6	
												12.0	G1A	6	
										3	M2B	27.6	M2B	6	
										6	RL1	12.0			
										6	M2B	24.0			
										6	G1A	12.0			
										3	M2B	13.8			
												283.4			
2581	Visual inspect part (medium)											175.2	EF	24	6 sides
												12.0	RL1	6	Part
												46.8	R5B	6	To part
												12.0	G1A	6	Part
										6	M5B10	76.8	M5B10	6	
										6	RL1	12.0			
										6	R5B	46.8			
										6	G1A	12.0			
												12.0	RL1	6	

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2581	(continued)											46.8	R5B	6	
												12.0	G1A	6	
												464.4			
2582	Visual inspect part (large)										M10B40	31.9	M10B40		Move into position
												183.0	ET4/10	30	6 sides
												219.0	EF	30	
												24.0	RL1	12	
												138.0	R10B	12	
												24.0	G1A	1	
										12	RL1	24.0			
										12	R10B	138.0			
										12	G1A	24.0			
										8	M10B40	255.2	M10B40	8	
												1061.1			
2584	Visually check run out of cutter											29.0	B		Bend to level of cutter
												146.0	EF	20	Visual check
												31.9	AB		Stand up
												206.9			
2585	Gauge (thread), read											10.6	MSB		Move gauge to eye focus
												2.8	T30°S		To light
	6GX-MITGR01											4.0	MfC	2	To adjust focus
												30.4	ET6/12	4	To read
												14.6	EF	2	Reading
												30.4	ET6/12	4	Repeat to recheck
												14.6	EF	2	Reading
												10.6	MSB		To balance
												118.0			
2586	Glass (magnifying), focus over vernier for reading											15.2	M12C		Move glass to vernier
												5.6	G2		Regrasp glass
												10.2	M1C	3	Bring into focus
	6XX-BITGF01											32.4	P2SE	2	Position for best visibility
															Read vernier
												5.6	G2		Regrasp glass
												13.4	M12B		Move to balance position
												82.4			
2587	Read indicator											29.0	B		Bend to dial
												29.2	EF	4	Read
												31.9	AB		Arise
												90.1			
2588	Micrometer, use, read scale to .001											5.7	ET6/16	1	To mic
												7.3	EF	1	Look at mic
	U-BITMU02											12.2	ET4/10	2	Locate mark
												29.2	EF	4	Look at mark
												12.2	ET4/10	2	Locate .1 scale
												29.2	EF	4	Look at mark and .1 scale

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2588	(continued)											12.2	R14/10	2	Locate .025 scale
												29.2	RF	4	Look .025 scales
												12.2	R14/10	2	To .001 thimble
												29.2	RF	4	Look at .001 reading
												73.0	RF	10	Note scale and thimble readings
												292.0			
2589	Micrometer, use, read scale, vernier bevel protractor											5.7	R16/16	1	To protractor
												14.6	RF	2	Look at protractor
	U-BITMU01											24.3	R12/10	8	Scan vernier
												116.8	RF	16	Locate zero on vernier
												24.3	R12/10	8	For alignment with dial
												116.8	RF	16	Look at minute scale
												24.3	R12/10	8	To dial
												116.8	RF	16	Look at dial for degrees
												116.8	RF	16	Note vernier and dial readings
												560.4			
2590	Read meter											40.0	R120/8	2	From part to meter
												21.9	RF	3	to part
												61.9			
2591	Item, locate in column of 50 items											20.0	RT		Select starting point
												7.3	RF		
	U-BRDIL01											9.6	R12A		Finger to page
												5.6	P1SE		
												16.5	M1B	5	Slide finger down column
												36.5	RF	5	Scan column
												4.9	R?		Read item
												98.4			
2592	Locate part in equipment											20.0	R120/8		To location
												146.0	RF	20	To part
												152.0	R110/10	10	To next part
												318.0			
2593	Check bend											22.1	M20C		Align square to bend
												21.0	P2MSE		
												14.6	RF	2	Check angle
												12.2	M10B		Remove square
												69.9			
2594	Read dimension from blueprint											18.6	TBC1		To bench
												34.0	W2PO		
												37.2	TBC2		
												29.0	B		To blueprint
												18.6	R20B		
												0	G5		Hold down edge

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2594	(continued)								Hold down edge		R20B	18.6			
											G5	0			
												60.0	MT 24/12	3	Search for dimension
												7.3	EF		Read
												20.0	MT 24/12		Check placement of dimension
									Assisting motions		RL2	0	RL2		Remove hand
											R10E	10.5	R10E		
												31.9	AB		Return to shoe
												18.6	TBC1		
												34.0	W2FO		
												37.2	TBC2		
												373.5			
2595	Visually inspect lock seam (per foot)											7.3	EF		Eye focus
												11.4	MT 12/16		Eye travel per foot
												18.7			
2596	Check spackled work	Study made of 344 Sq.Ft. of spackle work checked. Total time - .0586 hrs. .0586/344 =					1	.0002/Sq.Ft.							
2597	Inspect job of painting window (per window)	.0030	.0010	.0180	10	.0018	1	.0018							
2598	Check equipment tag											23.8	R30B		To number tag
												2.0	G1A		Grasp tag
												9.4	T18SB		Turn tag
												29.0	B		Bend to read
												14.6	EF	2	Inspect
													RL2		Release tag
												31.9	AB		Return body position
												112.7			
2599	Check die size											4.6	EF6/20		Look for marking
												14.6	EF	2	Read marking
												19.2			
2600	Inspect pipe assembly after installation											37.2	TBC2		Stoop to pipe assembly
												29.0	B		
												21.9	EF	3	Sight along pipe
												31.9	AB		
									Reach to pipe		R20B	18.6			
									Grasp		G1A	2.0			
									Pull on assembly		AP1	16.2			
									Release		RL1	2.0			
												18.6	TBC1		Move to different position
												34.1	BBC2		
												21.9	EF	3	Look at assembly
												233.4			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2601	Inspect work	.0160	.0040	.0945	12	.0079	1.06	.0084							
2603	Alignment, check with level											20.4	M18C		
												5.6	P1SE		Place level and
	U-BUMAC02											11.2	G2	2	Adjust slightly
												8.0	MFB	4	
												2.0	RL1		Move hand aside
												6.8	R4E		
												43.8	EF	6	
												6.4	R4B		
												2.0	G1A		Move level aside
												13.4	M12B		
												119.6			
2604	Alignment, check with straightedge											22.1	M20C		Move straight edge to part
												16.8	P1SE	3	Position on part
	U-BUMAC01											21.9	EF	3	Inspect visually
												24.0	M4C	3	Move to another location
												18.2	M20B		Move part
												103.0			
2605	Check motor bearings for noise while operating											14.6	M14B		Move screwdriver to bearing
												5.6	G2		
												29.0	S		Stoop
												6.7	M3C		Move ear to screwdriver
												5.6	P1SE		
												416.6			Estimated listening time (15 seconds)
												14.6	M14B		Move opposite bearing
												5.6	G2		Move ear to screwdriver
												6.7	M3C		
												416.6			Estimated listening time (15 seconds)
												31.9	AS		Arise from stoop
												953.5			
2606	Check motor bearing for temperature while operating											21.5	R24B		Touch bearing
												0	G5		housing with hand
												0	RL2		Approx. temperature
												8.9	M5B		
												8.9	M5B		Hold hand on bearing
												0	G5		
												10.6	AP2		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2606	(continued)											0	RL2		
												21.5	R24B		
												71.4			
2607	Inspect by feel											18.6	TBC1		
												30.0	W2P		
												29.0	B		
												18.6	R20B		To part
												0	G5	2	
												44.2	M20C	2	Slide hand along
												0	RL2	2	
												21.5	R10B		
												31.9	AB		
												30.0	W2P		
												18.6	TBC1		
												232.4			
2608	Page, find, in manual								Reach to book		R10A	8.7			Book in R.H.
	U-MRDFF01								Grasp top edge		G1A	2.0			
									Open cover		M16B	15.8			
									Release		RL2	0.0			
									Reach to page edges		R12C	14.2			
									Position thumb		P2SSE	21.0			
									Grasp		G1B	3.5			
											APA	10.6			
									Open book to approx. location		M12B	13.4			
									Release pages		RL2	0.0			
									Reach to upper corner of page	4	R12D	56.8			
									Grasp page	4	G1B	14.0			
									Turn page	4	M12B	53.6			
									Release	4	RL2	0.0			
												213.6			
2609	Check alignment with chalk											14.4	R14B		To chalk
												2.0	G1A		
												13.5	M10C		Chalk to work
												5.6	P1SE		
												73.0	RF	10	Check mark
												108.5			
2610	Inspect, feel with fingers											14.2	R12D		Reach to surface
												3.4	M1C		Contact surface
	6XX-MITIF01											16.2	P2SE		with finger
												0.0	G5	2	Move finger along
												25.4	M9C		surface
												0.0	RL2		
												59.2			
2611	Square, use, part on bench											25.3	M24C		Move square to job
												10.4	P1SSE		Position on job
	U-BSMSU02											5.6	G2		Regrasp

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1	2625 Material, fold 780-8CMMF01								Reach to material		R12B	12.9			
									Grasp material		G1B	3.5			
									Move toward body		M12B	13.4	(R12B)		Reach to material
												3.5	G1B		Grasp material
									Move corners together		M12B	13.4	M12B		Move corners together
									Regrasp 2nd corner		G2	5.6	G2		
												2.0	RL1		Release
												12.9	R12B		Reach to folded edge
												2.0	G1A		Grasp
									Release		RL1	2.0			
									Reach to folded edge		R10B	11.5			
									Grasp		G1A	2.0			
										2	MFB	4.0	MFB	2	
											RL1	2.0	RL1		
												90.7			
	2626 Ride elevator one floor	.0132	.0075	.0722	7	.0103	1	.0103							
	2627 Fork lift, move 20 feet	.0038	.0020	.0058	2	.0029	1	.0029							
	2628 Fork lift, raise and lower 10 feet	.0130	.0105	.0460	4	.0115	1	.0115							
	2629 Throw away accumulated clippings										(R14B)	21.5	R24B		To scrap area on table
												.0	G5	3	Brush scrap
												36.6	M10B	3	Together against
												0	RL2	3	other hand
												23.0	R10B	2	
									Gather scrap together		R6B	8.6	R6B		Gather together
												12.9	G4C		Grasp bunch of
											G4C	12.9			scrap
												18.6	TBC1		Turn body 90°
												51.0	W3P0		To scrap basket
												29.0	B		Release scrap
											(RL1)	0	M6F		
											RL1	2.0	RL1		
												31.9	AB		
												18.6	TBC1		Turn body 90°
												51.0	W3P0		Return to work area
												317.6			
	2630 Take scrap paper to waste box											29.0	B		To scrap paper
											R14B		R14B		To scrap paper
											G1B	52.5	G1B	15	
											M14B	288.0	M20A	15	To left arm
									Scrap paper transferred from right hand	15	M4B	103.5			
												30.0	RL1	15	
												172.5	R10B	15	To scrap paper
												31.9	AB		
												74.4	TBC2	2	
												690.0	W46P		To waste box

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2680	(continued)											18.2	P1SSE	2	Place on nut
												16.2	APB		Apply pressure
												4.0	MFB	2	Unscrew bolt
												2.0	MfC	1	Move wrench for new hold on bolt head
												12.2	M10B		Return wrench to tray
												2.0	RL1		Release
												87.2	x 2 for loosen & tighten = 174.4		
2681	Screw (adjusting) (rusty), loosen or tighten with a screwdriver										R14A	48.6	APB	3	Break screw
										3	RL1	13.8	M2B	3	
										3	G1A	6.0	RL1	3	Loosen screw
												12.0	R2B	3	
	639-BTLSL01											6.0	G1A	3	
												86.4			
2682	Bolt, tighten or loosen with wrench											12.7	M9C		Move wrench and
												19.7	P2SSE		Position
												32.4	AP1	2	Move bolt
	60X-MTLBL01											6.9	M4B		
												5.6	G2		Regrasp wrench
												6.9	M4B		Move bolt
												4.0	D1E		Remove wrench
												88.2			
2683	Place bolt in flange joint and tighten nut by hand											21.5	R24B		Reach to bolt
												2.0	G1A		Grasp
												25.5	M24C		Move to hole
												5.6	P1SE		Position in 1st flange
												10.6	AP2		Shove bolt thru
												6.7	M3C		Flange holes
												16.2	P2SE		Position in 2nd flange
												3.6	M2A		Move into place
												2.0	RL1		Release bolt
									Reach to nut		R24B	21.5			
									Grasp		G1A	2.0			
									Move to bolt		M24C	25.5			
									Position on bolt		P2SD	21.8	(G2)		Regrasp flange
										20	M3B	58.0			
										20	RL1	40.0			
									Run nut on and tighten	20	R1A	50.0			
										20	G1A	40.0			
										3	AP1	48.6	(RL1)		Release flange
												401.1			
2684	Obtain or return cleaning brush and emery cloth from tool box											18.6	TBC1		Turn
												45.0	W3P		To tool box
												29.0	B		Bend to box
									Reach tool box		(R14D)	15.6	R14D		Reach tool box latch
											G5	2.0	G1A		Grasp latch
												16.2	AP1		To break loose
												8.9	M6B		Lift latch
												8.6	R6B		To lid

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2688	Position screw to junction box cover plate and start thread											5.6	G2		Screw
												6.7	M3C		Screw to hole
												5.6	P1SE		Position
												8.0	MFB	4	Start screw with finger
												6.0	RL1	3	
												6.0	RFE	3	Turn screw to hold
												6.0	G1A	3	
												2.0	RL1		
												45.9			
2690	Install bolt or remove											5.6	G2		
												13.4	M12B		Bolt to hole
												21.8	P2SD		
												10.3	M6C		
												11.2	G2	2	Control
												27.6	M2B	6	Start bolt
												33.6	G2	6	
												2.0	RL1		
												125.5			
2691	Obtain nut from pocket and start											20.9	R23B		To pocket edge
												4.6	M2B		Open pocket
												8.6	R6B		To nuts
												2.0	G1A		
												5.6	G2		
												4.0	D1E		From pocket
												25.5	M24C		To end of bolt
												5.6	P1SE		
												76.8			
2692	Loosen nut (bolted siding)											11.5	R10B		Reach for wrench
												2.0	G1A		Grasp wrench
												20.4	M18C		Move wrench to nut
												27.3	P1SSE	3	Position to nut
												8.7	M1B	3	Move wrench on nut
												48.6	AP1	3	Loosen nut
												26.7	M6B	3	Move to loosen nut
												17.2	M10B	1	Move wrench aside
												2.0	RL1		Release
												159.4			
2693	Tighten 1/4" nut											15.8	M16B		Move tightener to nut
												5.2	M2C		To nut
												5.6	G2		Tightener
									Time to tighten taken from T/S			60.0			
												34.1	(SS12	C2	to next nut)
												120.7			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THU	RH	NO.	DESCRIPTION - RIGHT HAND
2694	Remove nut (hand)											18.6	R20B		Reach for nut
												4.0	G1A	2	Grasp nut
												32.4	AP1	2	Loosen
												46.0	M2B	10	Turn nut
												40.0	R2A	10	
												18.2	M20B		Lay aside nut
												159.2			
2695	Thread nuts and tighten with wrench - two nuts			.0285	1	.0285	1	.0285							
2697	Tighten anchor bolts on motor											2.0	RL1		Loosen grasp
												11.5	R10B		Reach to end
												2.0	G1A		Tighten grasp
												64.8	AP1		Pressure to loosen or tighten
												18.0	M12B10		Turn after loosening
												98.3			
2698	Conduit - engage threads											21.8	P2SD		Position end
												2.0	RL1		Regrasp conduit
												8.7	R10A		
												2.0	G1A		
												21.8	P2SD		Start threads
												16.2	M1B10	3	Engage threads
												16.8	G2	3	
												89.3			
2699	Thread conduit (5 full threads)											425.0	M15B	25	Handle back
												50.0	M5A	25	Set ratchet
												405.0	AP1	25	Thread 1/5 of rev.
												835.0	M15B30	25	x 25 = 5 full threads
												1715.0			
2700	Obtain solderless connector and remove nut (split bolt type)								To connector		R24C	22.5			
											G4B	9.1			
									Connector to R.H.		M30A	27.1			
											(RL1)	5.6	G3		Connector
									To nut on connector		(M2B)	5.6	G2		
										12	G1A	24.0			
									Turn to remove nut	12	T120B	81.6			
									To nut	12	R2B	48.0			
										12	RL1	24.0			
												4.6	M2B		Split bolt away from nut
												352.1			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RG.	LH	TMU	RH	RG.	DESCRIPTION - RIGHT HAND
2736	Run off nut by hand											7.0	R6A		To nut
												18.0	G1A	9	
												48.6	AP1	3	Turn nut off
												32.4	M2A	9	
												18.0	RL1	9	
												4.0	R2B		
												128.0			
2737	Obtain blind assembly from end of table											18.6	TBC1		To end of table
												15.0	W1P		Left of operator
												18.6	TBC1		To end of table
											R12B	21.5	M24B		To assembly
											G1A	2.0	G1A		
											M3B	5.7	M3B		Return with assembly
												18.6	TBC1		
												15.0	W1P		
												18.6	TBC1		
											M6B	8.9	M6B		Lay assembly in front
											RL1	2.0	RL1		of operator
												144.5			
2738	Move assembled blind to finish table								To blind		R16B	15.8	R16B		To assembled blind
									Blind		G1A	2.0	G1A		Blind
									Off table		M10B	12.2	M10B		Off table
												37.2	TBC2		Away from table
												75.0	W5P		To end of table
												18.6	TBC1		Around corner
												45.0	W3P		To finish table
												37.2	TBC2		To finish table
									To table		M16B	17.0	M16B		To table
									On table		RL1	2.0	RL1		On table
												262.0			
2739	Move assembled blind aside								To assembly		R8B	10.1	R8B		To assembly
											G1A	2.0	G1A		
									Away from work area		M24B	20.6	M24B		Away from work area
											RL1	2.0			
												34.7			
2740	Slats off drying rack to pile on rinse rack - per two slats											25.8	R30B		To two slats
												2.0	G1A		Slats
									To slats		R30B	25.8			
									To slats		(15)	5.7	D1D		To pile
									To slats		G2	5.6	G2		On pile
									To pile		M30C	30.7	M30C		To pile
									On pile		P15SE	9.1			
												9.1	P15SE		On pile
												2.0	RL1		
												115.8			
2741	Obtain slats from drying rack and stack on assembly table											37.2	TBC2		Along table
												60.0	W4P		Side of table
												18.6	TBC1		Around end
												135.0	W9P		To drying rack

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2757	(continued)										~~M30B~~	--	~~M24B~~		
												750.0	W50P		Returns to cut-off saw
											M10B	12.2	M10B		Lays blades on
											RL1	2.0	RL1		table
												1685.0			
2758	Return dado blades from machine to saw room											750.0	W50P		To saw room
												9.6	R12A		
												2.0	G1A		
												5.4	T90S		Open door
												13.4	M12B		
												2.0	RL1		
												45.0	W3P		
												18.6	TBC1		To peg board
												86.0	R24B	4	To blades in L.H.
												14.0	G1B	4	
												122.8	M30C	4	Blade to peg
												22.4	P1SE	4	
												8.0	RL1	4	
												18.6	TBC1		From peg board
												750.0	W50P		Return to saw
												1867.8			
2759	Hand carry motor components approximately 15 ft. from work bench to cleaning booth, hydraulic press or test panel or return	.0125	.0055	.0285	3	.0095	1	.0095							
2760	Load or unload large power panel (over 40#) on or from hand truck (1 of 2 men)											37.2	TBC1	2	
												90.0	W3P	2	Walk to part
												29.0	S		
												2.0	G1A		
												17.2	M5B20		Lift one end
									Grasp under end		G1A	2.0			
											AP1	16.2	AP1		Pull to lift
											M30B20	37.0	M30B20		Lift panel board end
													~~A8~~		
												37.2	TBC1	2	
												90.0	W3P	2	
											M30B20	37.0	M30B20		Lower panelboard end.
												2.0	RL1		
									Lower one end		M5B20	17.2			
											RL1	2.0			
												416.0			
2761	Lift panel board to bench											29.0	S		Stoop to pallet or trailer
									Grasp panel board		G1A	2.0	G1A		Grasp panel board
									Lift panel board		(M30B 20)	37.0	M30B20		Lift panel board
													~~A5~~		Arise
												18.6	TBC1		Turn body
												51.0	W3P0		Walk to bench

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THU	RH	NO.	DESCRIPTION - RIGHT HAND
2761	(continued)								Lay on bench Release		M12B R1.1	13.4 2.0 153.0	M12B R1.1		Lay on bench Release
2762	Obtain 100# or less pay-out reel or place aside (1) of (2) required men										R12A M18B25	51.0 29.0 30.9 31.9 18.6 51.0	W3P0 S R12A M18B25 AS TBC1 W3P0		To reel Lift reel to body for balance Carry reel
											M18B25 R1.2	30.9 31.9 18.6 293.8	M18B25 R1.2 AS TBC1		Lower reel
2763	Carry rotor or armature to lathe, position in chuck, tighten	.0100	.0060	.0230	3	.0077	1	.0077							
2764	Raise and lower tool bag, equipment or material (average 30 ft.) 2 men								Reach to hand line Pull on hand line (Weight average 7 lbs.)	12 12 12 12	R30B G1A M30B7 R1.1	154.8 12.0 168.0 12.0 12.0 358.8 x 2 717.6	R30B G1A M30B7 R1.1 men	12 12 12 12	Reach to hand line Full hand line
2765	Get hand truck and place components on truck	.0120	.0050	.0445	5	.0089	1	.0089							
2766	Pull hand truck with components approximately 15 ft. to spray booth	.0060	.0030	.0220	5	.0044	1	.0044							
2767	Place 100# or less coil of wire on pay out reel - (1) of (2) required men											18.6 102.0 29.0	TBC1 W6P0 S		To coil Stoop
									Reach to coil Lift coil		R10B G1A M10B25	11.5 2.0 24.7 31.9 102.0 29.0	R10B G1A M10B25 AS W6P0 B		Reach to coil Lift coil Arise To reel Bend
									Coil over reel Lower coil on reel		M10C25 P1SE M10C25 R1.1	26.4 5.6 26.4 2.0 31.9 543.0	M10C25 P1SE M10C25 R1.1 AB		Coil over reel Lower coil on reel

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2845	(continued)								Assisting motions		R12B	12.9	R12B		Reach to side of part
											G1A	2.0	G1A		Grasp and turn part
											M30B	24.3	M30B		over
											RL1	2.0	RL1		Remove hand
												82.0			
2846	Position piece in bench machine - loosen, tighten and remove											18.6	R20B		Reach to adjusting screw
												2.0	G1A		Grasp end of screw
												17.9	1C6		Turn screw to open
									Move and position piece in machine		M10C	13.5			
											P18SE	9.1			
											M10C	13.5			
											P18E	5.6			
												30.6	2C6		Turn to lighter wheels
												2.0	RL1		Release wheels
												12.9	R12B		Reach to crank
												2.0	G1A		Grasp crank
												2.0	RL1		Release crank
												12.9	R12B		Reach adjusting screw
												2.0	G1A		Grasp adjusting screw
												17.9	1C6		Open screw
									Grasp piece		G1A	2.0	RL1		Release screw
									Remove part from machine		M10B	12.2			
												176.7			
2847	Pick up small part and move to assembly										R20B	18.6	R20B		Pick up part
												3.5	G1B		
											G1B	3.5			
											M20B5	21.5	M20B5		Move to assembly
												37.2	TBC2		
												85.0	W5F0		
											M10B5	15.1	M10B5		Place near assembly
												184.4			
2848	Pick up medium part and move to assembly											20.6	SS18C1		Pick up part
											R20B	18.6	R20B		
												3.5	G1B		
											G1B	3.5			
											M20B20	29.6	M20B20		Move to assembly
												37.2	TBC2		
												85.0	W5F0		
											M20B20	29.6	M20B20		Place near assembly
												227.6			
2849	Pick up large part and move to assembly (per man)											68.0	WAF0		Walk to rack
											R20B	18.6	R20B		Pick up part
											G1B	3.5	G1B		
											M20B20	37.8	M20B35		Move to assembly
												85.0	W5F0		Return from rack
											M20B35	37.8	M20B35		Place near assembly
												250.7			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2650	Turn large part and move to soldering position (per man)											12.9	R12B		Reach to part
												2.0	G1A		
											M12B30	28.6	M12B30		Turn part
												2.0	RL1		
												17.2	R16B		
												2.0	G1A		
											M12B30	30.2	M24B30		Turn on edge
												2.0	RL1		
												17.2	R16B		
												2.0	G1A		
									New hold		RL1	2.0			
											R16B	17.2			
											G1A	2.0			
											M12B30	30.2	M24B30		Lay part down
												2.0	RL1		
												17.2	R16B		Move to position
												2.0	G1A		
											M12B30	28.6	M12B30		
											P2SSD	25.3	P2SSD		Position part
												258.6			
2651	Turn small to medium part over								To part		R16B	17.2	R16B		To part
									To part		G1A	2.0	G1A		To part
											MAB15	13.7	MAB15		Part up
											@F	13.7	MAB15		Turn part
									Turn part		MAB15	13.7	@F		
											MAB15	13.7	MAB15		Part down
											RL1	2.0	RL1		
												76.0			
2652	Turn large part over (per man)								Part		R16B	17.2	R16B		To part
									Part		G1A	2.0	G1A		To part
									Part up		M3B25	22.7	M3B25		Part up
									Turn part		@F	22.7	M3B25		Turn part
									Turn part		M3B25	22.7	@F		Turn part
									Part down		M3A25	21.5	M3A25		Part down
											RL1	2.0	RL1		
												110.8			
2653	Turn medium sheet or part over (per man)										R10B	25.8	R30B		To part
											G5	0	G5		Contact grasp edge
											M10B20	37.0	M30B20		Slide to edge of table
												34.1	SB12C2		Step aside
									To part		RL1	2.0	RL1		
											R20B	18.6	R20B		Regrasp sheet
											G1A	2.0	G1A		
									To bench		M40B	30.3	M40B		Turn sheet over
											RL1	2.0	RL1		Remove hand
												151.8			
2654	Pick up brick														
									Reach for brick		R16C	37.2	TBC2		Turn to bricks
									Grasp brick		G1A	17.0			
												2.0			

ELE. SHEET NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL. ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
268;	(continued)											31.9	AB		
												105.0	WTP		To front of shaper
												299.2			
2688	Get tool from tool room											18.6	TBC1		
												375.0	W25P		To tool room
												200.0	WT		Waiting time
												18.6	TBC1		
												18.6	TBC1		
												375.0	W25P		To machine
												18.6	TBC1		
												1024.4			
2689	Get wrench to change blades - return wrench											37.2	TBC1	2	Turn body 45°
												60.0	W2P	2	To get wrench
												58.0	B	2	Under table saw
												3.5	G1B	1	
												26.8	M12B	2	
												63.8	AB	2	Arise bend
												37.2	TBC1	2	Turn body 90°
												60.0	W2P	2	Return to front
												74.4	TBC2	2	of saw
												2.0	RL1		Release wrench
												422.9			
2690	Obtain 12 lin. ft. pre-nailed fascia strip											68.0	W4P		To strip
									To strip		R12B	29.0	B		
											G1A	2.0			
												31.0	AB		
												74.4	TBC2	2	
												102.0	W6P0		To work area
												307.3			
2691	Obtain bender or hickey from within normal work area and lay aside											18.6	TBC1		
												45.0	W3P		To tool nearby
												29.0	B		
													R10B		
												2.0	G1A		Handle
												5.6	02		
												10.6	M6B		Lift handle
									To handle		R10B	12.4			
											G1A	2.0			
									Hickey to body		M10B5	15.4	M10B5		Hickey to body
												31.9	AB		
												18.6	TBC1		
												45.0	W3P		To work area
												18.6	TBC1		
												45.0	W3P		To tool storage
												29.0	B		
									Hickey away from body		M10B5	15.4	M10B5		Hickey away from body
											RL1	2.0			
												10.6	M6B		Lower handle
												2.0	RL1		
												31.9	AB		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2691	(continued)											18.6	TBC1		
												42.0	W3P		To work area
												434.2			
2692	Obtain new bulb from carton and place old bulb in carton								Release changer		RL1	29.0	S		Stoop
									New bulb in carton		G1B	3.5			
												2.0	G1A		
									Remove new bulb from carton		AP2	10.6	AP2		Grasp edge of carton with fingers and hold carton back
											M7B	9.7			
											D2E	7.5			
									Reach back to carton		T18O	9.4			
									Carton to left hand		G3	5.6			
												16.9	M14C		
												5.6	P1SE		Move bad bulb to carton
												16.2	AP1		
									Release carton			11.1	M7C		
											RL1		RL2		
												2.0	AB		Arise from stoop
												31.9			
												161.0			
2693	Obtain conduit ¾" to 2" - 35 lbs.											18.6	TBC1		
												45.0	W3P		Walk to pipe
												29.0	B		Bend to floor
												11.5	R1OB		
												2.0	G1A		Grasp
												31.9	AB		Arise from behd
												29.5	M1OB35		
												18.6	TBC1		
												51.0	W3PO		Walk
												31.9	M1OC35		Move conduit to location
												268.4			
2694	Obtain rigid conduit (2½" to 4") - 1088 - (1) of (2) required men											18.6	TBC1		
												45.0	W3P		Walk to conduit
												29.0	B		Bend
												11.5	R1OB		To conduit
												2.0	G1A		Grasp conduit
												34.3	M1OB34		Conduit to body
												11.2	G2	2	Regrasp conduit
												31.9	AB		Arise
												57.4	M36B34		Conduit to shoulder
												18.6	TBC1		
												51.0	W3PO		To work
												11.2	G2	2	
												57.4	M36B34		Off shoulder
												36.5	M1OC34		To locate
												415.6			
2695	Get parts and tools from tool box			.0067	1	.0067	1	.0067							

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	RH	LH	TMU	RH	RH	DESCRIPTION – RIGHT HAND
2896	Obtain small part from floor (5 paces) (up to 2.5 lbs.)											18.6	TBC1		Turn
												75.0	W5P		Walk
												29.0	S		Stoop
													R10B		Reach
												2.0	G1A		Grasp part
												31.9	A8		Arise from stoop
												18.6	TBC1		Turn
												75.0	W5P		Walk
												250.1			
2897	Obtain screw and position to wire										R10D	12.9	R10D		To screw
												2.0	G1A		
												13.5	M10C		Screw to position
												16.2	P2SE		Position screw
												2.0	RL1		
												46.6			
2899	Remove tester from container and return								Remove tester			15.8	R16B		To handle
												6.0	G1A	3	
											R14B	4.4			
									To container	2	G1A	4.0			
											AP1	16.2	AP1		Pull out of container
												24.1	M20B10		
												2.0	RL1		
									Return			15.8	R16B		To handle
												6.0	G1A	3	
												28.4	M20C10		Tester to container
												26.6	P2MED		Tester
												15.7	M5B10		Move into place
												2.0	RL1		Release handle
									Release box		RL1	2.0			
												179.0			
2900	Remove new tube from carton in left hand											19.8	R20D		Carton top
												10.4	P1NSE		Fingernail under lid
												2.0	G1A		Grasp top
												5.7	M3B		Pull up carton top
												2.0	RL1		Release
												8.4	R4D		To tube in box
												7.3	G1C1		
												10.6	AP2		From box
												6.9	M5B		
									Discard carton		M20B	18.2			
											RL1	2.0			
												99.3			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	NUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2901	Cloth, obtain or put away											25.8	R30B		Reach to cloth
												2.0	G1A		Grasp cloth
												24.3	M30B		Move cloth
												52.1			
2902	Raise part to wash from vat														
									To part in vat		R20	19.8			
									Pick up		G1B	3.5			
									Control part	2	M7B	4.0			
									Control part		G5	5.6			
									Raise to wash		M20B	18.2			
												11.5	R10B		To rag
												18.2	M20B		Rag to part
												5.6	G2		Rag around part
												10.6	AP2		Rag around part
												5.6	G2		Rag in hand
												18.2	M20B		Rag aside
									Get part		G2	5.6			
									Part to vat		M30B	24.3			
									Rinse part		RL1	2.0			
												152.7			
2903	Pick up small particle off floor														
												29.0	S		Stoop
									Reach for particle		R6B	6.6			
									Grasp		G1A	2.0			
												31.9	AS		Arise
												34.1	SSC2		Sidestep
												15.0	W1P		
									Release		RL1	2.0			
												122.6			
2904	Toilet tissue, obtain														
												45.0	W3P		Walk to shelf
												27.2	R32B		Reach for roll
												2.0	G1A		Grasp roll
												21.8	M26B		To side
												37.2	TBC2		Turn towards stall
												133.2			
2905	Towels, paper (2), obtain														
												21.5	R24B		Reach for towel
												2.0	G1A		Grasp towel
												13.4	M12B		Pull towel
												12.9	R12B		Reach for second towel
												2.0	G1A		Grasp
												13.4	M12B		Pull towel
												65.2			
2906	Obtain block and sledge hammer														
												18.6	TBC1		Walk to sledge
												60.0	W4P		hammer
												29.0	B		Bend
												2.0	G1A		Grasp handle
												10.6	M5B		Lift handle
									Grasp other end of handle		G1A	2.0			
									Pull to lift		AP2	10.6	AP2		Pull to lift hammer
												31.9	AB		Arise

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2906	(continued)											45.0	W3P		Walk to block
												29.0	B		Stoop
												2.0	G1A		Grasp block
												31.9	AB		Arise
												105.0	W7P		Walk to work
												18.6	TBC1		
												29.0	B		Stoop
									Position block		P2SSE	19.7			
									Press		AP1	16.2			
									Release		RL1	2.0			
												31.9	AB		Arise
												495.0			
2907	Pick up one additional bolt, nut, washer, clamp etc.								Reach to item in R.H.		R10A	8.7			
									Transfer item to L.H.		G3	5.6	G3		Transfer item to L.H.
												12.9	R10C		Reach into bin
												21.9	G4A	3	Select
												32.0	M5B	4	Suitable
												4.0	RL1	2	Item
												12.2	M10B		Move out of bin or to L.H.
												97.3			
2908	Pick up each clamp bolt, nut, washer etc.											12.9	R10C		Reach into bin
												21.9	G4A	3	Select
												32.0	M5B	4	Suitable
												4.0	RL1	2	Item
												12.2	M10B		Move out of bin or to L.H.
												83.0			
2909	Pick up one clamp, washer, bolt, nut, heel, jack, parallel, etc. from table											15.8	R16B		Reach to
												2.0	G1A		Pick up
												15.8	M16B		Move to balance
												33.6			
2910	Pick up each additional clamp, bolt, washer, heel from table											5.6	G2		Regrasp part in hand
												6.4	R4B		Reach to next part
												2.0	G1A		Pick up additional part
												14.0			
2911	Pick up and lay aside file or stone											12.9	R12B		Reach to file or stone
												2.0	G1A		Pick up
												13.4	M12B		Move to work area
												13.4	M12B		Move file aside
												2.0	RL1		Release file
												43.7			
2912	Get height gauge from case or return								Reach to lock		R16D	17.0	R14B		Reach to lock
									Grasp lock with thumb		P1SE	5.6			
												5.2	M2C		Grasp lock with thumb
												5.6	P1SE		
									Unlock		M1B	2.9	M1B		Unlock

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2912	(continued)								Reach to lid of case		R4B	6.4			
									Grasp		G1B	3.5			
									Open case		M12B	13.4			
									Release		RL1	12.9	R12B		Reach to ht. gauge
												3.5	G1B		Grasp
												7.5	D2E		Pick up
												5.6	G2		Regrasp
												20.4	M18C		Move to bench
												5.6	P1SE		Set on bench
												2.0	RL1		Release
									Reach to lid		R10B	11.5			
									Grasp		G1A	2.0			
									Close lid		M12B	13.4			
									Release		RL1	2.0			
												11.5	R10B		Reach to bore of guage
												2.0	G1A		Grasp
												13.4	M12B		Bring to bal. position
												172.9			
2913	Pick up gauge from bench											19.8	R20D		Reach to gauge
												3.5	G1B		Grasp
												15.8	M16B		Move to balance
												39.1			
2914	Vernier, remove and replace in case								Reach to case		R18B	17.2	R18B		Reach to lock
									Grasp case		G1A	2.0	G5		Grasp lock
	60K-MJPVR01											2.0	MfC		Slide to unlock
									Regrasp		G2	5.6			
									Open case		M5B	8.0			
												12.2	R9D		Reach to vernier
												3.5	G1B		Grasp vernier
												4.0	D1E		Remove from case
									Close case		M5A	17.0	M18B		Bring to bal. position
									Release case		RL1	2.0			
									Reach to case		R18B	17.2			
									Grasp case		G1B	3.5			
									Open case		M5B	8.0			
												20.4	M18C		Move vernier to case
												21.0	P2RSE		Position vernier in case
												2.0	RL1		Release
												9.3	R8E		Move hand out of way
									Close case		M5B	8.0			
												10.1	R6D		Reach to lock
												0.0	G5		Contact grasp lock
												2.0	MfC		Slide to lock
									Release case		RL1	2.0	RL1		Release lock
												177.0			
2915	Assembly (indicator), remove from box								Reach to box		R14B	15.6	R14D		Reach to box lid
									Grasp box		G1A	2.0	G5		Grasp box lid
									Hold box		AFB	16.2	AFB		Break loose box lid
	6XX-MJPAR01											4.6	M2B		Move lid
												5.6	G2		Regrasp lid
												6.9	M4B		Move lid to end of box
												7.5	D2E		Move lid from box
												7.2	AFB		Lay lid aside

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	TIME STUDY: LOW VALUE OBSERVED	TIME STUDY: SUM OF OBSERVATIONS	TIME STUDY: TOTAL NO. OF OBS.	TIME STUDY: AVERAGE OR SELECTED	TIME STUDY: LEVELING FACTOR	TIME STUDY: LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	RG.	LH	TMU	RH	RG.	DESCRIPTION – RIGHT HAND
2915	(continued)											2.0	RL1		Release lid
												12.9	R10D		Reach to indicator
												3.5	G1B		Grasp indicator
												2.9	M1B		Move indicator
												5.6	J2		Regrasp indicator
									Regrasp box		(G2)	12.2	M10B		Lay indicator aside
									Raise box from cabinet		[illegible]B	8.9	RL1		Release indicator
												113.6			
2917	Obtain lawnmower and bring to bench											29.0	B		Bend and
												12.9	R12B		Reach to mower
												2.0	G1A		Grasp mower
												51.9	AB		Arise and pull
												19.4	M22B		Handle up
									To handle		R18B	17.2			
									Grasp handle		G1A	2.0	RL1		Release mower
												34.1	&8;12C2		
												50.0	W2P		Body in position
												37.2	TBC2		to push mower
												12.9	R12B		to bench
												2.0	G1A		Handle
									Set handle against bench		M20B	18.2	M20B		Set handle against bench
									Release		RL1	2.0	RL1		Release
												250.8			
2918	Select and obtain stock from storage rack or bin. (Average length = 36")											80.0	ET46 /16	4	Select proper
												29.2	EF	4	Material
												29.0	B R24B		Bend and reach to stock
												2.0	G1A		Stock
												52.4	AF1	2	Begin to slide stock from rack
									Pick up stock - when stock is obtained from Bin only to stock when in rack		M30B40	49.5	M30B40 /OR/ &8;12C2		Move stock. If from rack-slide stock and step aside if from
											(R20B) G1A	18.6 2.0	TBC1		Bin-pick up Turn when stock is in rack
									Grasp stock		M20B40	40.5	M20B40 &8;10C2 AB		Stock from rack
									Stock from rack			58.0	ET20/ 16	2	Inspect stock
												14.6	EF	2	
												335.6			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2921	Get one tool from tool box or case											20.0	ET		
													30/16		To box
												14.6	ET	2	Search
												12.9	R12B		Reach
												9.1	G4B		Pick up
												17.0	M18B		Lay aside
												2.0	RL1		
												75.6			
2922	Move tool from table of machine to work area								NOTE: can be accomplished with either hand						
									Reach to tool		R14B	14.4			
									Grasp tool		G1A	2.0			
									Move tool to work area		M36B	27.9			
												44.3			
2923	Move tool from work area to table of machine								Move tool to table of machine		M36B	27.9			
									Release tool		RL1	2.0			
									Return hand to rest		R14E	13.0			
												42.9			
2924	Obtain tool from cabinet under bench											29.0	2		Stoop to
												18.4	R18C		Reach into cabinet
												7.3	G4A		Pick up tool
												17.0	M18B		Move tool to balance
												31.9	A8		
												103.6			
2925	Get and lay aside tool from bench											18.6	R20B		Reach to tool
												2.0	G1A		Grasp tool
												24.1	M20B10		Move tool
												-	-		Adjust and use
												24.1	M20B10		
												2.0	RL1		Lay aside
												16.7	R20E		
												87.5			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2928	Place tool in tool box or case											15.2	M12C		Move tool to drawer or case
												10.4	P1SSE		Position tool in drawer or case
												2.0	RL1		Release tool
												27.6			
2929	Return tool to cabinet under bench											29.0	S		Stoop to
												17.0	M15B		Move tool into cabinet
												2.0	RL1		Release tool
												15.5	R15E		Reach to balance
												31.9	AS		Stand up
												95.4			
2932	Get and lay aside electric power tool from bench											18.6	R20B		Reach to tool
												7.3	G1C1		Grasp
												5.6	G2		Regrasp
												29.6	M20B20		Move to work area
												-	-		Use
												29.6	M20B20		Move to bench
												2.0	RL1		
												16.7	R20E		Hand out of way
												109.4			
2933	Move hand tool to Part and away											-	-		Tool in hand
											M12C20	25.9	M12C20		Move to hole
											P2SD	21.8	P2SD		Position in hole
											-	-	-		
											AP1	16.2	AP1		Lift
											D2D	11.8	D2D		-
											M12B	13.4	M12B		Move out
												89.1			
2934	Position tool or part with care and position aside with care											16.2	P2SE		To
												16.2	P2SE		Aside
												32.4			
2935	Pick up and lay aside towel								Reach to towel		R20B	18.6			Hold cutter
									Pick up towel		G1A	2.0			
									Move towel to balance		M20B	18.2			
									Regrasp towel		G2	5.6			
									Move towel aside		M20B	18.2			
									Release towel		RL1	2.0			
												64.6			
2936	Obtain and place knee boards											21.9	B		Bend
												11.5	R10B		To pick up knee boards
												5.6	G1A		Grasp knee boards
									To pick up trowel		R10B	11.5			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	CD.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2936	(continued)								Grasp trowel		G1A	5.6			
												31.9	AB		Arise
									Pick up trowel		~~M2B~~		~~M2B~~		Pick up knee boards
												45.0	W3P		Walk out on concrete
												21.9	B		Bend
												18.2	M2B		Place knee board on
												18.2	M2B		concrete, place 2nd
												4.0	RL1	2	on concrete
												15.0	W1P		Step on back board
												69.4	KBK		Kneel both knees
												5.6	G3		Transfer trowel to right hand
												76.7	AKBK		Arise
									Transfer trowel to left hand		G3	5.6			
												18.6	R2B		Reach to knee board
												5.6	G1A		Grasp board
												12.2	M1B		Pick up 1 board
												14.8	T180M		Turn board
												24.3	M3B		Deposit 1 knee board
												9.4	T180B		
												11.5	R1B		Reach to board
												5.6	G1A		Grasp board
												24.3	M3B		Move 2nd board back
												5.6	RL1		Release
												15.0	W1P		Step on back board
												314.5			
2937	Obtain fire brick										R16B	29.0	B		To brick
									Hand to brick		R2B	24.4			Hammer in hand
									Grasp		G1A	2.0			
									Regrasp		G2	5.6			
											M20B0	31.9	AB		Arise
												92.9			
2938	Get and place measure of material											42.4	M6B	4	Dip container full
												35.6	M5B	4	Material off of sack
												82.4	M24B	4	Material to floor
												27.6	M4B	4	Dump material
												61.8	M24B	3	Container to sack
												24.0	M4C	3	Container into sack
												273.8			
2939	Pick up packing material											29.0	B		To floor
												17.2	R15B		To cardboard
												2.0	G1A		Grasp
												12.9	R12B		To second cardboard
												2.0	G1A		Grasp
									To packing material		R10A	13.4	M12B		To other hand
									Hold		G3	5.6			
												17.2	R15B		To steel bands
												2.0	G1A		Grasp
												12.9	R12B		To other bands
												2.0	G1A		Grasp

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RC	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2944	Obtain part from supply wagon or set aside after use											18.6	TBC1		Turn body
												225.0	W15P		Walk to supply wagon
												37.2	R20B	2	Reach for part
												4.0	G1A	2	Grasp
												36.4	M20B	2	Move out of wagon
												18.6	TBC1	}	Return to work area
												225.0	W15P	}	
												564.8			
2945	Get Hawk and scraper or lay aside											18.6	TBC1	}	Walk to hawk and
												30.0	W2P	}	scraper
												29.0	B		Bend
												15.8	R16B		Reach to scraper
												2.0	G1A		Grasp scraper
												12.2	M10B		Lift scraper
									Reach to hawk		R16B	15.8			
									Grasp hawk		G1A	2.0			
									Lift hawk		M10B	12.2			
												31.9	AB		Arise
												37.2	TBC2		Turn
												30.0	W2P	}	Return
												18.6	TBC1	}	
												255.3			
2946	Obtain gasket cutter case, open, close and return								Reach for case		R24B	21.5			
									Grasp case		G1A	2.0			
									Regrasp to open		G2	5.6			
												12.9	R12B		Reach to latch
												0.0	G5		Touch latch
												16.2	AP1		Press latch
												4.6	M2B		Open latch
												5.6	G2		Regrasp lid
												12.2	M10B		Open lid
									Release case		RL1	2.0	RL1		Release lid
												21.5	R24B		Reach to lid
												2.0	G1A		Grasp lid
												13.4	M12B		Close lid
												4.0	R2B		Reach to latch with thumb
												0.0	G5		Touch latch
												5.6	P1SE		Position latch
												4.6	M2B		Close latch
												2.0	RL1		Release latch
												5.6	G2		Regrasp case
												18.2	M20B		Move to set aside
												2.0	RL1		Release
												161.5			
2947	Obtain large hand cutter and position											18.6	TBC1	}	
												45.0	W3P	}	Walk to cutter
												29.0	B		Bend
											G4A	7.3	G4A		Grasp
									Assisting motions		AP2	10.6	AP2		Pull
												31.9	AB		Arise

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2950	(continued)										(R20B)	18.6	R20B		Reach to pipe
									Assisting motions		G1A	2.0	G1A		Grasp
											M20B20	29.6	M20B20		Lift
												31.9	AB		Arise with pipe
												18.6	TBC1		
												68.0	W4PO		Walk back to hoist
												29.0	B		
												29.6	M20B20		Move end to ground
												2.0	RL1		Release
									Set other end down		M20B20	29.6			
									Release		RL1	2.0			
												31.9	AB		Arise from stoop
												400.4			
2951	Pick up tubing											18.6	TBC1		Turn and walk to
												45.0	W3P		tubing
												29.0	B		Bend
									To assist		R12B		R12B		to tubing
									Grasp		G1A	2.0	G1A		Grasp
									For control		G2	5.6	G2		For control
												31.9	AB		Arise
									Move to balance		M12B15		M12B15		Move to balance
												18.6	TBC1		Turn and walk back
												45.0	W3P		to bench
												195.7			
2952	Get wires											18.6	TBC1		Turn
												102.0	W6PO		Walk to wires
												17.2	R16B		Reach to wires
												12.9	G4C		Grasp several strands
												5.6	G2		Regrasp to hold
									Reach under strands		R12B	12.9			
									grasp and regrasp		G1A	2.0			
									to hold		G2	5.6			
												24.0	M4C	3	Separate several strands
									Reach for new hold		RL1	2.0			
									on selected		R6B	8.6			
									strands		G1A	2.0			
									Regrasp strands		G2	5.6	G2		Regrasp strands
									Pull strands out		M12B	13.4	M12B		Pull strands out
									Release hold		RL1	2.0			
									Reach for new hold		R12B	12.9			
									Grasp strands		G1A	2.0			
												18.6	TBC1		Turn
												102.0	W6PO		Walk to pipes
									Lay wires down		M16B	17.0	M16B		Lay wires down
									Release hold		RL1	2.0			
												366.9			
2953	Obtain large pipe wrench and position on work											18.6	TBC1		
												30.0	W2F		Step to wrench
												29.0	S		
												11.5	R10B		Reach to handle

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		MAN VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2953	(continued)											2.0	G1A		Grasp
												16.2	AP1		Press to lift
												15.7	M3B10		Lift handle
									Reach to wrench head		R10B	11.5			
									Grasp		G1A	2.0			
									Press to lift		AP1	16.2			
									Lift wrench		M3B10	15.7	M3B10		Lift wrench
												31.9	AB		Arise
												18.6	TBC1	]	Step to work
												30.0	W2P	]	
									Assisting motions		M20C10	28.4	M20C10		Move wrench to pipe
											P2B5D	25.3	P2B5D		Position on work
												20.1	M14B10		Lift handle to hold
												322.7			
2954	Obtain supply of stolons											150.0	W10P		To supply of stolons
												29.0	B		
											R5B	7.8	R5B		To box
											G1A	2.0	G1A		Pick up box
												31.9	AB		
												150.0	W10P		Back to furrow
												29.0	B		To ground
											M5B10	10.7	M5B10		
											RL1	2.0	RL1		
												31.9	AB		
												444.3			
2956	Pick up bolt and nut											19.8	R20C		Reach to box
												9.1	G4B		Grasp bolt
												11.2	G2	2	Regrasp bolt in palm of hand
												14.2	R12C		Reach to other box
												9.1	G4B		Grasp nut
												5.6	G2		Regrasp nut in palm of hand
									Reach to right hand		R20A	13.1			
									Transfer bolt to hand		G3	5.6			
									Move bolt to assembly		M20B	16.2			
												105.9			
2957	Obtain and set aside flux jar (within reach)											21.5	R24B		To flux jar
												2.0	G1A		Grasp jar
												18.2	M20B		To work area
												2.0	RL1		Release jar
												15.5	R16E		Remove band

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2957	(continued)											17.2	R16B		To flux jar
												2.0	G1A		Grasp jar
												20.6	M24B		Move aside
												2.0	AL1		Release jar
												10.8	R24E		Remove hand
												120.2			
2958	Obtain or return small to medium part											85.0	W5PO		To part
												29.0	S		Stoop to floor
											R16B	15.8	R16B		To part
											G1A	2.0	G1A		
											M12B15	31.9	AS M12B15		Stand Balance
												18.6	TBC1		To layout table
												85.0	W5PO		
											M18B15	25.5	M18B15		On table
											RL1	2.0	RL1		
												294.8			
2959	Obtain or return large part (per man)											85.0	W5PO		To part
												29.0	S		Stoop to floor
											R12B	12.9	R12B		To part
											G1A	2.0	G1A		
											AS M18B25	31.9	AS M18B25		Stand Balance
												18.6	TBC1		
												85.0	W5PO		To layout table
									On table		M18B25	30.9	M18B25		On table
											RL1	2.0	RL1		Release part
												297.3			
2960	Select template from rack											18.6	TBC1		
												119.0	W7PO		To template rack
												18.6	TBC1		
												119.0	W7PO		
												18.2	M20B		Lay template aside
												2.0	RL1		
												14.2	R16E		
												309.6			
2961	Pick up washer or rivet											18.6	R20B		To washer or rivet
												9.1	GAB		Select and grasp
												20.6	M24B		To work
													W4E		Regrasp around edges
												48.3			
2962	Anchor, get and place under rail											29.0	S		Stoop to rail
											R12B	12.9	R12B		Reach to anchor
	910-MOMA001										G1A	2.0	G1A		Pick up anchor
											G2	5.6	G2		Control anchor
											M12B5	16.4	M12B5		Move anchor to rail
									Let go end of anchor		RL1	2.0			
									To other end of anchor		R10B	11.5			
									Fingers on anchor		G2	5.6	G2		Fingers out of way

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2962	(continued)										M6C5	13.1	M6C5		Align anchor and tie
											AFB	16.2	AFB		Seat anchor on rail
											R12		R12		Hands from anchor
												31.9	AS		Arise from rail
												146.2			
2963	Bar (joint), get and place on rail											18.6	TBC1		Turn from rail
												29.0	S		Stoop to bar on tie
	910-MCHBC01								Assist		R12B	12.9	R12B		Reach to bar
									Assist		G1A	2.0	G1A		Grasp
									Assist		G2	5.6	G2		Pick up
									Assist		M5B15	16.0	M5B15		Lift to clear
											TBC1	18.6	TBC1		Turn back to rail
									Assist		M12C15	23.4	M12C15		Move back to rail
											RL1	2.0	RL1		
												126.1			
2964	Get bucket and brush from right of way	.0085	.0065	.0380	5	.0076	1	.0076							
2965	Cut steel wire with pliers											102.0	W6P0		Walk to coil of wire
												22.9	R26B		Reach for coil
												2.0	G1A		Grasp coil
												28.1	M26B10		Lift coil from ground
												74.4	TBC2	2	Turn toward trailer
												102.0	W6P0		Carry coil to trailer
												11.8	M6B10		Lower coil to trailer
												2.0	RL1		Release coil
									Reach to loosen end of coil		R12C	14.2			
									Grasp end		G4C	12.9			
									Pull out 8" of wire		M12B	12.2			
									Regrasp		G2	5.6			
												17.2	R16B		Reach to pocket for pliers
												2.0	G1A		Grasp pliers
												4.0	D1E		Disengage from pocket
									Regrasp		(G2)	17.0	M16B		Move to wire
												3.6	M2A		Spread handles to open
												3.6	M2A		Close handles to cut
												16.2	AF1		Apply pressure
									Release wire		(RL1)	3.6	M2A		Spread handles to open
									Reach to next spot on wire	24	R10C	309.6			
									Grasp	24	G4C	309.6			
									Pull out next 8" pc wire	24	M10B	292.8			
									Regrasp	24	(G2)	292.8	M10B	24	Move pliers to next cut
												86.4	M2A	24	Spread handles to open
												86.4	M2A	24	Close handles to cut
												388.8	AF1	24	Apply pressure

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2965	(continued)								Release wire	24	(RL1)	86.4	M2A	24	Spread handles to open
												20.4	M18C		Return pliers to pocket
												9.1	P15SE		Position at pocket
												6.1	M4A		Move into pocket
												2.0	RL1		Release
												15.2	R18E		Hand back
												2363.2	for 25 wires		
												94.5	per wire		
2966	Handle (jack), pick up											29.0	S		To ground
	910-MTLMP01								Pick up handle		G1A	2.0			
									Grip handle		APA	10.6			
									Lift handle		M10B20	19.9			
												31.9	AS		Stand up
												93.4			
2967	Level, get from rail														
	910-MTLL001								Level			29.0	S		Stoop
												10.1	R8B		To handle of level
												2.0	G1A		Pick up level
												5.6	G2		Gain control
												17.0	M8C8		Raise level with care
												31.9	AS		Stand up
												95.6			
2968	Plate (tie), get and position on rail											29.0	S		Stoop
											R12B	12.9	R12B		Reach to tie plate
												3.5	G1B		Pick up
	910-MOHPG02								Pick up one end		(G1B)	5.6	G2		
											G2	5.6			
									Assist		M12B10	18.8	M12B10		Lift and move
									Move to tie			15.3	M6C10		
												5.6	P15E		Place one end on tie
											M6C10	15.3	G2		Change hold
									Place other end on tie		P15E	5.6	G5		Hold in place
									Change hold		(G2)	10.6	APA		
											RL1	2.0	RL1		Release
												129.8			
2969	Plate (tie), get and place under rail											29.0	S		Stoop to rail
									Assist		R12B	12.9	R12B		To plate
											G1A	2.0	G1A		Pick up plate
	910-MOHPU01										G2	5.6	G2		Gain control
											M12B10	18.8	M12B10		Plate to tie
									Let go end of plate		RL1	2.0			
									To other end		R14B	14.4			
									Fingers to plate		(G5)	5.6	G2		Fingers from under
											APB	16.2	APB		Push plate
											M18C10	26.5	M18C10		Align plate with rail
											RL2	0.0	RL2		Let go plate
												31.9	AS		Arise from rail
												164.9			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2970	Tool, obtain from roadbed											18.6	TBC1		Face tool
	910-BTLT001											34.0	W2PO		Step to tool
												29.0	B		To roadbed
									Idle			10.1	R8B		Reach to tool
												2.0	G1A		Pick up tool
												5.6	G2		Control tool
												10.6	APA		Grip tool
												18.3	M6B20		Raise tool
												31.9	AB		Stand
												18.6	TBC1		Face rail
												178.7			
2972	Spike, (3/16" x 8") Obtain (to 8) from carton											31.9	AB		
												18.6	TBC1		
												45.0	W3P		
												29.0	B		
												14.4	R14B		
												10.8	G1C3		
												6.0	G2	3	
												31.9	M14E AB		
												18.6	TBC1		
												45.0	W3P		
												29.0	B		
												280.2			
2973	Obtain tag from pocket, and position to write											25.8	R30B		Reach to pocket
												3.5	G1B		Grasp tag
												5.6	G2		
												5.7	M3B		Lift tag out
												24.3	M30B		Move to writing surface
									Reach to tag		R12A	9.6			
									Grasp to hold		G1A	2.0			
												29.0	B		Bend to write
									Release hold		R12	9.6	R12A		Reach to filled out tag
												3.5	G1B		Grasp
												31.9	AB		Arise
												150.5			
2974	Remove magnifying glass from shirt pocket											10.5	R14A		Reach to pocket
												16.2	P2SE		Position hand
												6.9	MAB		Move hand into pocket
												2.0	G1A		Grasp magnifying glass
												5.6	G2		Regrasp
												6.1	MAA		Move glass out of pocket
												4.0	D1E		Move glass out of pocket
												13.4	M12B		Move to balance position
												64.7			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2975	Move sanding block from work											20.6	M24B		Move from work
												2.0	RL1		Release
												22.6			
2976	Return measuring board											85.0	W5P0		To board
											R14B	20.1	R22B		To board
											G1A	2.0	G1A		Board
												74.4	TBC2	2	Turn around
												68.0	W4P0		To tool area
											M6B	37.2	TBC2		
												2.0	RL1		
												288.7			
2977	Clear material from immediate work area (per door)			.0255	1	.0255	1	.0255							
2978	Lay bottom rail aside											12.9	R12B		To bottom rail
												2.0	G1A		
												19.4	S816C1		Side step to right
												8.6	M10B		Lay aside on table
												2.0	RL1		
												44.9			
2980	Lay work on bench holding flaps together										M6A	8.6	R6B		Hand comes around
												2.0	G1A		and grasps work
												9.7	M8A		to lay down
												2.0	RL1		
												22.3			
2982	Template (wood), remove from top of stock								To template		R24B	21.5	R24B		For hammer
									Hold template		G1A	2.0	G1A		
	669-MLOTR01											40.8	M18C	2	To tack on template
												18.2	P188E	2	Align claw on hammer
											RL1	9.2	M2B	2	Pull tack up
											R24B	25.5	M24C		Hammer to strap
											G1A	5.6	G2		
											M1B	5.6	P18E		Align hammer
												13.4	M12B		Onto strap
											RL1	2.0	RL1		
									For template		R24B	25.8	R30B		For template
											G1A	2.0	G1A		
											M24B	24.3	M30B		Lay template aside
											RL1	2.0	RL1		
												197.9			
2983	Plate (cover), replace											10.3	M6C		Screw driver to plate
												23.3	P28SD		Position to edge
	7XX-MTLPR01											5.6	G2		Pry up plate
												16.2	AP8		
											R4B	6.9	M4B		
									To plate		R12B	12.3			
									Grasp		G1A	2.0			
												15.8	M16B		Set screwdriver aside
												2.0	RL1		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2983	(continued)											15.8	R16B		To plate
												2.0	G1A		
											M16B	15.8	M16B		Set plate aside
									Same as R.H.		R11	2.0	R11		
									Same as R.H.		R16B	15.8	R16B		To plate
												3.5	G1B		
												2.9	M1B		
											(G1A)	5.6	G2		
											M16C	18.7	M16C		Put plate back
									Same as R.H.		P2MSD	26.6	P2MSD		
												2.0	R11		
												207.7			
2986	Put screw in box								To R.H.		M10A	11.3	(M10A)		To L.H.
												5.6	G3		
												12.2	M10B		To box
												2.0	R11		
												31.1			
2988	Obtain and put away part or tool (below knee level)											29.0	S		To part
												21.5	M24B		
												2.0	G1A		
												31.9	A8		
													M24B		Lift part
												17.2	M16B		Move part to ceiling
												17.2	M16B		Move part from ceiling
												29.0	S		With part
												20.6	M24B		To set part down
												2.0	R11		

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2994	(continued)								Tip barrel		M5B	11.5	R10B		Reach toward bottom edge
												2.0	G1A		Grasp bottom
									To lift		AP1	16.2	AP1		To lift
									Lift barrel to lugger		M24A22	37.7	M24A22 AB		Lift barrel to lugger Arise
												2.0	RL1		Release edge
												16.6	R20B		To center section
													G5		Hand on side
												25.4	M22B10		Tip barrel
									Tap barrel against lugger	4	M5B	55.1	M5B	4	Tap barrel against lugger
											M24B8	26.8	M24B8 RL2		Lower container
												235.8			
2995	Move ash stand or waste basket aside and reposition								Reach to waste basket		aR12B	29.0	B		Bend to waste basket
									Grasp waste basket		G1A	2.0			
									Move waste basket aside (hold while vacuuming rug with right hand) and return	2	M20B6	43.0			
												17.0	SSC1		Sidestep to position vacuum sweeper
									Release		RL1	2.0			
									Hand aside		R12E	31.9	AB		Arise
												124.9			
2996	Towels, paper, dispose of											60.0	WkP		
									Reach to handle		R10B	11.5			
									Grasp handle		G1A	2.0			
									Lift cover		M10B	12.2			
												12.2	M10B		Dispose of towels
												2.0	RL1		
									Close cover		M10B	12.2	R1E		
									Release		RL1	2.0			
												114.1			
2997	Clear wood blocks from area											18.6	TBC		Walk to blocks
												300.0	W20P		
												29.0	B		Bend
												3.5	G1B		Grasp blocks
												7.1	M2B5		
												5.6	G2		
												31.9	AB		Arise
												150.0	W10P		Walk to block storage
												29.0	B		Bend
												2.0	RL1		Release
												31.9	AB		Arise
												150.0	W10P		Return to
												18.6	TBC1		work
												777.2			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
2998	Move sledge hammer and block aside after use											29.0	B		Bend
												2.0	G1A		
												18.0	M3B15		
											G1A	2.0			Pick up sledge hammer
											AP2	10.6	AP2		
												31.9	A8		
												34.1	S8I2C2		Step to block
												29.0	B		
												2.0	G1A		
												16.2	AP1		Pull block free & pick up
												7.5	D2E		
												31.9	AB		
												18.6	TBC1		Walk
												30.0	W2P		aside
												29.0	B		Bend
												2.0	RL1		Release block
												5.6	G2		Regrasp handle of sledge
												2.0	RL1		Release handle of sledge
									Lower other end of sledge		M3B15	18.0			
									Release		RL1	2.0			
												31.9	A8		Arise
												353.3			
2999	Return bolts, nuts, washers, clamps, heel etc. to bins											12.2	M10B		Move into bin
												2.0	RL1		Release parts
												10.5	R10E		Reach to balance
												24.7			
3000	Clamp (spring), install											14.4	R14B		To clamp
												2.0	G1A		
	U-MCPCI02											18.7	M16C		Move to fixture
												9.1	P1SSE		
												2.0	RL1		
												46.2			
3001	Lay aside each clamp screw or washer											12.9	R12B		Reach to clamp
												2.0	G1A		Grasp
												14.6	M14B		Lay aside on table
												2.0	RL1		
												31.5			
3002	Lay aside gauge on bench											18.7	M16C		Move to bench with care
												2.0	RL1		Release
												10.1	R12BM		Return hand
												30.8			
3003	Indicator and swivel clamp, return to box								Reach to box		R10B	11.5	R10B		Reach to indicator
									Grasp box		G1A	3.5	G1B		Grasp indicator
									Hold box		APB	16.2	M8B		Move indicator to box
	6XX-MJPIR01											5.2	M2C		Move indicator into box

ELE-MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3003	(continued)											26.6	P2MSD		Position indicator against stop
												26.6	P2MSD		Position indicator into slot
												2.0	RL1		Release indicator
												11.5	R10B		Reach to swivel clamp
												2.0	G1A		Grasp swivel clamp
												10.6	M6B		Move swivel clamp to box
												5.2	M2C		Move swivel clamp into box
												19.7	P2SSE		Position swivel into groove
												2.0	RL1		Release swivel clamp
												11.5	R10B		Reach to box lid
												3.5	G1B		Grasp box lid
												10.6	M6B		Move lid to box
												5.2	M2C		Move lid to groove
												26.6	P2MSD		Position lid into groove
												8.1	M6A		Slide lid to close box lid
									Release box		RL1	2.0	RL1		
												210.1			
3004	Place aside completed part								Machine time		M.T.		R12B		Reach to part
											M.T.		G1A		Grasp part
												47.6	M28B40 SS16C1		Part to table Side step to table
												2.0	RL1		Release part
												17.0	SS12C1		Back to machine
												66.6			
3006	Obtain small part from bench and lay aside										R16B	15.8			
									Obtain part		G1A	2.0			
											M10B	12.2			
												5.6	G3		
												12.2	M10B		Lay aside
												2.0	RL1		
												10.5	R10E		
												60.3			
3008	Remove unused stock from machine											17.0	SS12C1		From machine
												30.0	W2P		To stock
												29.0	B		Bend and reach
									Reach to stock		R16B		ReDF		To stock

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3026	Remove threaded pipe from vise and set aside											18.6	TBC1		
												60.0	W4P		Walk to pipe
												18.6	TBC1		
											R10B	11.5	R10B		Reach to pipe
									Assisting motions		G1A	2.0	G1A		Grasp pipe
											M20B40	40.5	M20B40		Lift from vise
												37.2	TBC2		
												170.0	M10P0		Carry pipe aside
												37.2	TBC2		
												29.0	S		Stoop with pipe
												2.0	RL1		Release
									Set down other end		M4B40	24.2			
									Release		RL1	2.0			
												31.9	A5		Arise
												18.6	TBC1		
												60.0	W4P		Return to work area
												363.3			
3027	Remove cut piece of pipe and set aside											17.8	M5B	2	Work pipe up and down
												22.9	D3E		Pull pipe free
												18.6	TBC1		Turn and step to next
												15.0	W1P		position
												18.6	TBC1		Turn back
											R10B	11.5	R10B		Reach to pipe
									Assisting motions		G1A	2.0	G1A		Grasp
											M20B40	40.5	M20B40		Lift pipe
												18.6	TBC1		
												60.0	W4P		
												18.6	TBC1		Carry pipe aside
												29.0	S		Stoop
									Release pipe		RL1	2.0			
												31.9	M10B40		Lower other end
												2.0	RL1		Release
												31.9	A5		Arise
												18.6	TBC1		Return
												60.0	W4P		
												427.5			
3028	Get and return rag											18.6	TBC1		Turn
												30.0	W2P		Walk to rag
												29.0	B		Bend
												12.2	M10B		Reach rag
												2.0	G1A		Grasp rag
												31.9	AB		Arise
												18.6	TBC1		Turn
												30.0	W2P		Walk
												18.6	TBC1		Turn
												15.0	W1P		Walk
												17.0	M10B		Toss rag
													RM1		
												18.6	TBC1		Turn
												15.0	W1P		Walk
												256.5			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3132	Loosen, adjust, and tighten thumb screw clamp											29.0	B		To thumb screw
												18.6	R20B		
												2.0	G1A		Initial loosening of
												2.9	M1B		thumb screw
												2.0	RL1		
												5.0	R1B	2	Loosen thumb screw
												4.0	G1A	2	enough to permit
												5.8	M1B	2	clamp to slide along
												4.0	RL1	2	rod
												2.5	R1B		
												2.0	G1A		Slide clamp down
												8.9	M6B		rod out of way before
												2.0	RL1		lifting leaf to desired
												8.0	R6E		angle
												8.6	R6B		Slide clamp back
												8.9	M6B		flush against stop
												2.0	G1A		
												2.0	RL1		
												7.5	R1B	3	Tighten thumb
												6.0	G1A	3	screw
												8.7	M1B	3	
												10.6	AP2		
												6.0	RL1	3	
												8.0	R6E		Remove hand and
												31.9	AB		arise
												196.9			
3133	Open and close circle arm clamps											21.5	R24B		Raise lever to stop
												2.0	G1A		
												8.9	M7A		
												2.0	RL1		Release lever
												25.8	R30B		Lower lever
												2.0	G1A		
												8.9	M7A		
												10.6	AP2		Apply pressure
												2.0	RL1		Release lever and
												19.2	R24E		return arm to rest
												102.9			position
3134	Release clamps on small, medium, or large part											12.9	R12B		Reach for clamp screw
												6.0	G1A	3	Grasp clamp
												10.6	AP2		Loosen screw
												16.2	T90B	3	Open clamp
												6.0	RfB	3	
												6.0	RL1	3	Release clamp screw
												21.5	R24B		Reach for clamp screw
												6.0	G1A	3	Grasp clamp
												10.6	AP2		Loosen screw
												16.2	T90B	3	Open clamp
												6.0	RfB	3	
												6.0	RL1	3	Release clamp
												10.5	R10E		Reach aside
												134.5			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3135	Clamp (C-type), place on rail flange 410-MCPCP01								Hold			16.2	T90S	3	Turn hand
												6.0	RL1	3	Back for
												6.0	G1A	3	Clearance
									Push clamp under			16.2	T90S	3	Turn nut
									Rail		M8B4	13.4			
									Release clamp		RL1	2.0	G1A		Grasp clamp
									Move hand back		(R2B)	5.6	G2		
									Grasp rod		(G1A)	6.1	M4A		Pull clamp against nut
									Assist		M1A6	4.9	M1A6		and lift to rail
									Hold			6.1	M4A		Push clamp back
												2.0	RL1		To engage rail flange in slot
												4.0	R2B		Reach to nut
												88.5			
3137	Clamp (machine table), loosen & tighten 7.4-SMCL01											15.1	R15B		Reach to tool tray
												2.0	G1A		Grasp box wrench
												15.2	M12C		Move to 1st nut
												27.3	P1SSE	2	Position wrench
												16.2	APB		Apply pressure
												6.0	RfA	3	Move wrench
												6.0	MfB	3	
												2.0	RL1		Release
												10.3	M6C		Move to 2nd nut
												27.3	P1SSE	3	Position wrench
												16.2	APB		Apply pressure
												6.0	RfA	3	Move wrench
												6.0	MfB	3	
												2.0	RL1		Release
												9.2	M5C		Move to 3rd nut
												27.3	P1SSE	3	Position wrench
												16.2	APB		Apply pressure
												6.0	RfA	3	Move wrench
												6.0	MfA	3	
												2.0	RL1		Release
												15.2	M15B		Move wrench to tray
												2.0	RL1		Release wrench
												241.5			x 2 for loosen & tighten 3 bolts with box wrench
											?	x 241.5	= 483.0		

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3139	Tighten or loosen screw in C' clamp											11.5	R10B		Reach to clamp screw
												2.0	G1A	2	Grasp
												18.8	T18SS	2	Turn screw
												2.4	T18SS		Turn hand
												16.2	AP1		
												4.0	RL1	2	Release screw
												61.9			
3141	Clamp (cam action), tighten and loosen											12.9	R12B		Reach for locking handle
												2.0	G1A		Grasp handle
	66X-MCPCT01											13.4	M12B		Move handle up
												16.2	APB		Apply pressure to tighten
												2.0	RL1		Release
												PROCESS	TIME		
												12.9	R12B		Reach for locking handle
												2.0	G1A		Grasp handle
												16.2	APB		Apply pressure to loosen
												13.4	M12B		Move handle down
												2.0	RL1		Release
												93.0			
3142	Clamp (hold down), adjust								Reach for back arm	2	R24B	43.0	R24B	2	Reach for back screw handle
	66X-MCPCA01								Grasp arm	2	G1A	4.0	G1A	2	Grasp screw handle
									Hold arm			32.4	APB	2	Apply pressure to loosen
									Hold arm			7.0	T45S	2	Turn handle down
									Apply pressure	2	APB	32.4			Hold handle
									Move arm up	2	M2B	9.2			Hold handle
												7.0	T45S	2	Turn handle up to tighten
												32.4	APB	2	Apply pressure to tighten
									Release	2	RL1	4.0	RL1	2	Release
									Reach for front arm	3	R18B	51.6	R18B	3	Reach for front screw handle
									Grasp arm	3	G1A	6.0	G1A	3	Grasp screw handle
									Hold arm			48.6	APB	3	Apply pressure to loosen
									Hold arm			10.5	T45S	3	Turn screw handle down to loosen
									Apply pressure	3	APB	48.6			Hold screw handle

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	RD.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3147	Apply oil to bearing or part, per application or per squirt											17.0	SSC1		Step to bearing or part
												21.9	EF	2)	
												15.2	ET10/20	2)	Locate part to be oiled
												22.1	M20C		Move can to part
												16.2	P2SE		Position outlet
												16.2	AP1		Apply oil
												2.0	MFB		
												12.2	M10B		Lift can away
												122.8			
3148	Apply grease to medium part											18.6	TBC1		Walk to grease
												30.0	W2P		
												18.6	R20B		Reach into grease
												2.0	G1A		Pick up grease
												18.2	M20B		
												18.6	TBC1		Walk to
												30.0	W2P		part
												42.4	MBB	4	Rub grease on part
											T90M	8.5			
											RL1	2.0			
									Turn part over		T90M	8.5			
											G1A	2.0			
											T90M	8.5			
												42.4	MBB	4	Rub grease on part
												250.3			
3149	Lubricant, apply grease with a paddle 699-BLVLA01											13.4	M12B		To work
												91.2	M12C	6	Apply grease carefully
												104.6	per sq. ft.		
3150	Spread oil with paint brush (small part)											13.4	M12B		Oil on brush to part
												9.4	T18GB		Turn bristles down
												55.2	M2B	12	Brush
												13.4	M12B		Move away
												91.4			
3152	Bearing (motor), lubricate 699-MLUBL01											18.6	TBC1		
												29.0	S		Get oil can
												2.0	G1A		
									Reach to bearing oil cap		(RBB)	14.6	M14B		Move to motor
									Grasp cap		G1B	3.5			
									Lift cap		MFA	2.0			
												8.0	M4C		Move to bearing oil hole
												5.6	P1SE		Position oil can
												31.8	APA	3	Squirt oil
												6.0	RL1	3	Release
									Release cap		(RL1)	12.2	M10B		Move to opposite bearing

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3152	(continued)								Reach to other oil cap		M10B	12.2			
									Grasp cap		G1B	3.5			
									Lift cap		MfA	2.0			
												8.0	M4C		Move to oil hole
												5.6	P1SE		Position oil can
												31.8	APA	3	Squirt oil
												6.0	RL1	3	Release
									Release cap			2.0			
												31.9			Arise
												236.3			
3153	Cup (grease), screw down											29.0	S		Stoop
	699-MLUCS01											18.6	R20B		Reach to fitting
												2.0	G1A		Grasp fitting
												2.0	G2		Regrasp to turn
												100.0	TS		Turn 1 revolution
												2.0	RL1		Release fitting
												155.6			
3154	Remove and reinstall grease cup											29.0	S		Stoop
												18.6	R20B		Reach to fitting
												2.0	G1A		Grasp fitting
												40.0	MfB	20	Move cup ½ rev.
												40.0	RL1	20	Releases after moves
												40.0	G1A	20	Grasp after reaches
												40.0	RfA	20	Reaches to next move
									Reach for cup		(R20A)	19.2	M20A		Move cup to other hand
												5.6	G3		Transfer grasp
												18.6	R20B		Reach for grease gun
												2.0	G1A		Grasp gun
												18.2	M20B		Move gun
									Reach with cup to gun head		R10B	11.5			
									Regrasp	2	G2	11.2			
									Move gun head to cup		M2C	5.9			
									Position gun head to cup		P1SE	5.6			
									Grasp gun head		G1A	2.0			
									Move head & cup		M10B	12.2	M10B		Move gun
									Reach to gun		R10B	11.5	(G2)		Regrasp gun
									Regrasp		G2	5.6			
									Grasp gun		G1A	2.0			
												5.6	G2		Regrasp gun
									Release gun & head		RL1	2.0			
												18.2	M20B		Lay gun aside
												2.0	RL1		Release gun
												13.1	R20A		Reach for cup
												5.6	G3		Transfer grasp
									Reach hand away		(R20E)	22.1	M20C		Move cup to fitting
												5.6	P1SE		Position cup
												10.0	MfB	5	Move cup ½ rev.
												10.0	RL1	5	Releases after moves
												10.0	G1A	5	Grasps after reaches

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	L NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3154	(continued)											10.0	RfA	5	Reaches to next move
												16.7	R20E		Reach hand away
												31.9	AS		Arise
												503.5			
3155	Gun (grease), attach to Zerk fitting and remove from fitting, hand operated grease gun								Reach to gun head		R20B	18.6	M14B		Raise gun
									Grasp gun head		G1A	2.0			
									Move gun head to fitting		M12C	15.2	(M12B)		Move gun to follow LH
	U-BLUUA01								Position gun head		P3SE	43.0			
									Release gun head		RL1	2.0			
									Reach to gun		R14A	10.5			
									Grasp gun		G1A	2.0			
												5.6	G2		Regrasp gun
												8.1	M6A		Raise handle, pump grease (see below)
									Release gun		RL1	2.0			
									Reach to gun head		R14B	14.4			
									Grasp gun head		G1A	2.0			
									Disengage gun head		D2E	7.5			
									Move away from fitting		M12B	13.4	(M12B)		Move away from fitting
									Release gun head		RL1	2.0			
												140.5			
3156	Pump grease gun handle once against major resistance or several times against minor resistance			.0010	1	.0010	1	.0010							
3157	Oil - hole (no cover)											29.0	S		Stoop
												22.1	M20C		Move oil can to hole
												5.6	P1SE		Position spout
												100.0	TS		Depress thumb pump
												18.2	M20B		Move oil can away
												31.9	AS		Arise
												206.8			
3158	Oil - hole (spring lid or ball cover)											29.0	S		Stoop
									Reach to fitting		R20B	18.6			
									Grasp hinger cover		G1A	2.0			
									Move cover open		M7B	2.0			
									Regrasp		(G2)	22.1	M20C		Move oil can to hole
												5.6	P1SE		Position spout
												100.0	TS		Depress thumb pump
									Release cover		RL2	0.0			
									Reach away		(R20E)	18.2	M20B		Move oil can away
												31.9	AS		
												229.4			
3159	Pour 2 oz. oil			.0017	1	.0017	1	.0017							

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3160	Pour 2¼ oz. oil			.0074	1	.0074	1	.0074							
3161	Relocate sander for new cut											34.0	W2PO		Pull sander back
									To move sander		AP1	16.2	AP1		To move sander
									Assist R. M.		M6B	10.1	M6B		Move sander
												51.0	W3PO		Relocate machine
												111.3			
3162	Tool, remove from chuck											22.1	M20C		Wrench to chuck
									Hold drill			5.6	P1SE		Engage with chuck
	U-MIPIR01											9.1	P1SSE		Mesh teeth
												32.4	APB	2	Break loose
												4.6	M2B		
											RL1	4.0	D1E		Remove wrench
											R2B	11.2	G2	2	Palm wrench
												6.4	R4B		Reach to chuck
												2.0	G1A		Grasp
												4.6	M2B		Turn to loosen
									Aside bit		M16B	15.8	RL1		Release chuck
									Release		RL1	2.0			
												119.8			
3163	Tool, place in chuck and tighten								Reach to chuck		R20B	18.6			
										3	G1A	6.0			
									Open or close jaws	3	M2B	13.8			
	U-MIPIP01									3	RL1	6.0			
										2	R1B	8.0			
												10.3	M6C		Drill to chuck
												5.6	P1SE		Position in chuck
									Reach to drill		R2A	4.0			
									Grasp		G3	5.6			
												6.4	R4B		To chuck
												4.0	G1A	2	
												9.2	M2B	2	
												4.0	RL1	2	Close jaws
												4.0	R2B		
												16.2	APB		
												11.2	G2	2	Unpalm wrench
												5.6	P1SE		Engage chuck
												9.1	P1SSE		Mesh teeth
												4.6	M2B		
												16.2	APB		Tighten
												4.0	D1E		Remove wrench
												15.8	M16B		Aside
												2.0			
												190.2			
3164	Chuck (lathe), turn 3/4 revolution											13.1	R20A		To chuck
												6.0	G1A	3	
	604-MEMCT01											48.6	APB	3	
												83.1	M9C32	3	Move chuck ¾ Rev.
												-	RL2	3	
												32.4	R9B	3	To chuck
												183.2			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3167	Chuck (universal), loosen or tighten 60X-MEMCL05											18.6 2.0 22.1 19.7 439.2 72.0 414.0 72.0 4.0 18.2 2.0 1083.8	R20B G1A M20C P2SSE M10B RL1 R10B G1A D1E M20B RL1	 36 36 36 36 	Reach to chuck wrench Pick up wrench Move wrench to chuck Position wrench in chuck Turn Chuck Jaws In or out Disengage wrench Move wrench aside Release wrench Reach to balance
3168	Loosen chuck nut or tighten											182.4 236.4 160.8 579.6	M12C P2SSE M12B	12 12 	Move To position wrench
3169	Open or close pipe chuck (1-1/4" to 2" ID)											18.6 2.0 16.9	R20B G1A M14C	 	Reach to "T" wrench Grasp To chuck

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL PHR FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3169	(continued)											14.7	P1SSD		Position in socket
												5.6	G2		Regrasp "T" wrench
												96.0	M5B	12	Turn chuck in or out
												22.0	RL1	11	with fingers
												85.8	R5B	11	
												22.0	G1A	11	
												16.9	M14C		Move chuck aside
												11.2	P1SD		Position on machine
												2.0	RL1		Release
												9.3	R8E		Balance hand
												323.0			
3170	Tighten or loosen pipe machine chuck											18.6	R20B		Reach to "T" wrench
												2.0	G1A		Grasp
												16.9	M14C		To chuck
												14.7	P1SSD		Position in socket
									Reach to handle		R8A	7.9			
									Grasp		G1A	2.0			
									Assisting motions		AP1	16.2	AP1		Align chuck to adjust
											M4C8	12.8	M4C8		
									Regrasp handle		G2	5.6	G2		Regrasp handle
									Assisting motions	4	M10B	48.9	M10B	4	Adjust chuck opening
										3	RL1	6.0	RL1	3	
										3	R10B	34.5	R10B	3	
									Hand tighten	2	AP1	32.4	AP1	2	Hand tighten
									Regrasp handle		(G2)	18.6	R20B		Reach to pipe sleeve
												2.0	G1A		Grasp
												16.9	M14C		Move to "T" handle
												11.2	P1SD		Position on handle
									Regrasp handle		G2	5.6	G2		Regrasp for leverage
												48.6	AP1	3	Snug up or loosen
											(RL1)	33.8	M14C	2	Move pipe sleeve
												22.4	P1SD	2	and "T" wrench aside
												4.0	RL1	2	
												14.4	R14B		
												2.0	G1A		
												9.3	R8E		
												407.2			
3171	Spacer, position on outside of cutter on key											5.6	G2		Regrasp spacer
												21.0	P2SSE		Position spacer to key
	605-BSU3P01											2.5	M1A		Move spacer on key
												29.1			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3173	Mask medium object	.0377	.0228	.0605	2	.0285	1	.0285							
3174	Open and close knife, pocket								To knife		(R10A)	11.2	G2	2	Knife in R.H.
												5.6	G3		Knife to L.H.
												8.4	R4D		To blade
												3.5	G1B		Grasp blade
												10.6	AP2		Pull blade open
												4.6	M2B		a little
												5.6	G2		
												10.6	AP2		Pull blade open
												5.4	T90B		
												2.0	RL1		
												7.8	R5B		To knife
												5.6	G3		Adjust hold
												5.6	G2		on knife
									To blade		(R10A)	11.2	G2	2	Knife in R.H.
									Back of blade		G5	-			
											AP2	10.6	AP2		
									Blade to handle		T90B	5.4	T90B		Handle to blade
											RL2	-			
												113.7			
3176	Lid, install on can										R6C	10.1	R6C		Reach to lid
	U-MPKLI01										G1B	3.5	G1B		Grasp at edge
											(M14C)	22.1	M20C		To top of can
											P2SD	21.8	P2SD		Lid on can
											RL1	2.0	RL1		
									Hold			10.1	R8B		To top can
													G5		To push top of can
												63.6	APA	6	Push lid down
												26.5	R3A	5	
									Release		RL2	0.0	RL2		Release
												159.7			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3180	Open and close tool case								To case top		R12B G1A	14.2 3.5	R12C G1B		To latch Grasp
												26.6	P2SSD		
									Hold			2.5	M1A		Open latch
												5.6	G2		Regrasp case
									Open top		M10B	12.2			
									Release case top		RL1	2.0			
									To case top		R12B	12.9			
									Grasp		G1A	2.0			
									Close case		M10B	12.2			
									Release		RL1	2.0			
												95.7			
3184	Remove gas tank cap on trimmer and replace											15.8	R16B		To cap
												8.0	G1A	4	
												16.2	AP1		
												8.0	M7B	4	Remove cap

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3191	(continued)								Gather rag	2	MFB	4.0			
									Grip rag		G2	5.6	G2		Grip rag
									Wring rag		M3B15	18.0	M3B15		Wring rag
									Wring rag		AP1	16.2	AP1		Wring rag
									New hold		G5	5.6	G5		New hold
									Wring rag		M5B15	15.0	M5B15		Wring rag
									Wring rag		AP1	16.2	AP1		Wring rag
									Let go		RL1	2.0			
												12.2	M10B		Move rag to shelf
												2.0	RL1		Lay rag on shelf
												211.0			
3192	Wash tile, per sq. ft.	.0018	.0014	.0048	3	.0016	1	.0016							
3193	Wash walls, per sq. ft.	.0031	.0014	.0220	9	.0027	1.1	.0030							
3194	Wash hands and/or tools in bucket of water			.0062	1	.0062	.90	.0056							
3195	Hand, wipe with cloth or paper towel											25.8	R30B		Reach to rag
												2.0	G1A		Grasp rag
									Other hand to rag		R12A	27.1	M30A	]	Rag to other hand
	U-MCLHW02											5.6	G3	]	
												71.2	M6B	8	Rub other hand
												2.0	RL1		Release
												24.3	M30B	]	Rag to bench
												2.0	RL1	]	
												160.0			
3196	Dip rag in solvent and squeeze											29.0	S		
												13.4	M12B		Into solvent
												53.4	M6B	6	Move in solvent
											R10A	8.7			
											G1A	2.0			
										2	G2	11.2	G2	2	
											M10B	12.2	M10B		Out of solvent
										4	G2	22.4	G2	4	Ball up and squeeze
												31.9	AS		
												60.0	W2P	2	To and from
												244.2			
3197	Clean small part before installing											18.6	TBC1		Walk to solvent
												15.0	W1P		with part
												29.0	S		Stoop and lower part
												35.6	M6B	4	Move part in solvent
												31.9	AS		Arise
												18.6	TBC1		Walk to
												15.0	W1P		machine
									Reach to rag		R30B	25.8			
									Grasp rag		G1A	2.0			
									Move rag to part		M30A	27.1			
									Grasp part with rag		G1A	2.0			
									Wipe part to clean it	8	M4B	55.2			
									Release part		RL1	2.0			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL PER FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3197	(continued)											9.4	T18G3		Turn part end for end
												6.1	M4A		Move part to L.H.
									Grasp part in rag		G3	5.6			
												7.0	R6A		Reach to end of part
												2.0	G1A		Grasp
									Wipe part	8	M4B	55.2			
									Release		RL1	2.0			
									Move rag to pocket		M30C	30.7			
									Position rag		P2SE	16.2			
									Release		RL1	2.0			
												414.0			
3200	Brush table											18.6	R20B		To brush
												2.0	G1A		
												18.2	M20B		To work area
												60.4	M2B	6	Brushing
												18.2	M20B		Move to aside
												2.0	RL1		
												139.4			

ELEMENT NO	DETAILED ELEMENT DISCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3202	Blow chips off small part, vise or small fixture											17.2	R18B		Reach to air hose
												2.0	G1A		Pick up air hose
												20.6	M24B		Move air hose to area
													G2		Regrasp air hose
												10.6	AP2		Press valve
												2.5	M1A		Turn
												34.2	M3B	6	Blow chips off
												2.9	M1B		Release valve
												20.6	M24B		Move air hose aside
													G2		Regrasp air hose
												2.0	RL1		Release air hose
												112.6			
3203	Blow chips or water off large part of fixture											18.6	R20B		Reach to air hose
												2.0	G1A		Pick up air hose
												15.8	M16B		Move air hose to work
												5.6	G2		Regrasp air hose
												16.2	AP1		Press valve
												2.0	M1A		Open
												42.4	M3B	4	Blow chips from
												80.4	M12B	6	Surface
												2.9	M1B		Close valve
												15.8	M16B		Move air hose aside
												5.6	G2		Regrasp air hose
												2.0	RL1		Release air hose
												209.3			
3205	Wipe small fixture with hand											12.9	R12B		Reach to fixture
												13.8	W4B	2	Wipe locating surface
												21.2	M8B	2	of fixture
												11.8	R12E		Reach to balance
												59.7			
3206	Clean table, fixture, or large part with bench brush											18.6	TBC1		Turn toward bench
												30.0	W2P		Walk to bench
												18.6	R20B		Reach to brush
												2.0	G1A		Pick up brush
												18.2	M20B		Move brush to balance
												18.6	TBC1		Turn toward machine
												30.0	W2P		Walk to machine
												18.2	M20B		Move brush to table
													G2		Regrasp brush
												201.0	M12B	15	
												34.1	S312C2		Brush chips off

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3206	(continued)											17.0	SS12C1		table
												22.8	M3B	4	Shake brush
												18.2	M20B		Move brush to balance
												18.6	TBC1		Turn toward bench
												30.0	W2P		Walk to bench
												18.2	M20B		Move brush aside
												2.0	RL1		Release brush
												14.2	R16E		Reach to balance
												18.6	TBC1		Turn toward machine
												30.0	W2P		Walk to machine
												578.9			
3207	Brush off layout table											19.4	M22B		Move brush to table
												109.2	M20B	6	Move brush to table
												92.0	SS22C1	4	Step back and forth
												109.2	M20B	6	Move brush on table
												20.6	M24B		Move brush off table
												350.4			
3208	Wipe grease from finger								To rag		R20B	18.6			
											G1A	2.0			
									Rag to finger		M26A	24.0	(M6A)		Finger to rag
									Close rag around finger		M4A	6.1			
									Wipe finger		AP2	10.6	(D2E)		Wipe finger
												8.9	M5B		Recoil
									Open rag	2	(M4B)	16.2	[illegible]	2	Finger
									Close rag around finger	2	M4A	12.2			
										2	AP2	21.2	(D2E)	2	Wipe finger
												8.9	M5B	2	Recoil
									Open rag		M4B	6.9			
									Rag to bench		M26B	21.8			
									Release rag		RL1	2.0			
												159.4			
3209	Wipe rough surface											97.2	AP1	6	
												48.0	M4C	6	
												145.2			
3210	Part, clean grooves/concave corners only											15.8	R16B		To screw driver or
												2.0	G1A		Similar tool
	60X-MCLPC01											14.6	M14B		
									Move rag to tool		M10B	12.2			
												40.8	T12OB	6	Wrap rag around tool
												12.0	RL1	6	Wrap rag around tool
												40.8	T12OB	6	
												12.0	G1A	6	
											RL1	2.0			
												18.7	M16C		Move rag to part
												5.6	P15E		
												16.2	APB		Force into corner
												15.8	M16B		Move tool cut
									To rag		R12B	12.9			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3210	(continued)										G1A	2.0			
									Move rag off tool		M10B	12.2			
									Away rag		M20B	18.2	M20B		Away tool
											RL1	2.0	RL1		
												45.6	M12C	3	
												301.4			
3212	Part, medium, clean with rag, part on bench											12.2	M10B		Rag to part
												213.6	M6B	24	Wipe one side
	U-BCLPC02										R16B	15.8			
									Position part		G1A	2.0			
											M10B				
											12.5	17.4			Steady
												213.6	M6B	24	
												12.2	M10B		Away rag
												486.8			
3213	Part, small, clean with rag, part on bench											12.2	M10B		Rag to part
												106.8	M6B	12	Wipe one side
	U-BCLPC01										(R10A	8.7			
									Reposition part		(G1A	2.0			
											(M6B	8.9			
												106.8	M6B	12	Wipe opposite side
												12.2	M10B		Away rag
												257.6			
3214	Wipe large part, large fixture, machine column, or table top with towel											25.8	R30B		Reach to towel
												2.0	G1A		Pick up towel
												20.6	M24B		Move towel near part
												5.6	G2		Regrasp towel
												13.4	M12B		Move towel to surface
												80.4	M12B	6	Wipe surface
												24.3	M30B		Move towel aside
												2.0	RL1		Release towel
												19.2	R24E		Reach to balance
												193.3			
3215	Wipe off blocks											13.4	M12B		Move rag to part
												87.6	M14B	6	Wipe off part
												13.4	M12B		Move rag from part
												114.4			
3216	Wipe bad surface (complete coverage) 9 sq. ft.											603.0	M12B	45	Wipe surface
												22.7	M30B		Move rag away from surface
															Regrasp rag
												40.0	M5B	5	Shake dust off rag
									Reach to rag		(R15A)	15.2	M15A		Move rag to other hand
									Contact rag		05	---			
												5.6	G2		Regrasp rag

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL OBS FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3225	Lavatory, wipe with rag											26.8	M12B	2	Rag to surfaces
												159.0	M10B	15	Wipe surface
												27.6	M4B	4	Wipe chrome
												74.8	881502	2	Sidestep to next lavatory
												288.2			
3226	Wipe 1 sq. ft. of flat machine area (dirty)											536.0	M12B	40	Wipe surface 1 sq. ft.
												424.0	AP2	40	
												56.0	G2	5	
												1016.0			
3227	Wipe 1 sq. ft. of flat machine area (dusty)											268.0	M12B	20	Wipe surface 1 sq. ft.
												212.0	AP2	20	
												28.0	G2	5	
												508.0			
3228	Wipe 1 sq. ft. of irregular machine area (dirty)											536.0	M12B	40	Wipe surface 1 sq. ft.
												848.0	AP2	80	
												112.0	G2	20	
												92.0	M2B	20	
												76.0	R2E	20	
												1664.0			
3229	Wipe 1 sq. ft. of irregular machine area (dusty)											268.0	M12B	20	Wipe surface 1 sq. ft.
												424.0	AP2	40	
												56.0	G2	10	
												46.0	M2B	10	
												38.0	R2E	10	
												832.0			
3230	Wipe oily threads or part											25.5	M24C 6E		Rag to oily area
												5.6	P18E		Rag on oily area
												5.6	G2		New hold on rag
												55.2	M4B	8	Wiping motion
												5.6	G2		For clean part of rag
												58.4	M14B	4	Along length of area
												5.6	G2		
												20.6	M24B		Rag aside
												182.1			
3231	Wipe part (small)										R16B	15.8			
											G1A	2.0			
									Pick up part		M10B	12.9			
											(G2)	18.2	M20B		Rag to part
												160.0	M5B	20	Wipe part
											R11	2.0			
											R10A	8.7			
									Turn part		G1A	2.0			
											M10B	12.9			
												160.0	M5B	20	Wipe opposite side
											M16B	15.8			
											R11	2.0			
												412.3			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3232	Wipe part (medium)											116.0	B	4	
									To part - to steady	4	R16B	63.2			
										4	G1A	8.0			
										4	AP1	64.8			
												18.2	M20B		Rag to part
												960.0	M5B	20x6	Wipe part
												121.6	AB	4	Move to another
												136.4	S8C2	4	position
									Hand off	4	RL1	8.0			
											R16E	14.2			
												1510.4			
3233	Wipe part (large)											290.0	B	10	To part
												18.2	M30B		Rag to part
												1608.0	M12B	20	Wipe part
												319.0	AB	10	
												682.0	S8C2	20	
												290.0	S	10	
												319.0	AB		To lower portions
												3526.2			
3234	Clean glass											21.5	R24B		Reach for cloth
												2.0	G1A		Grasp cloth
									Move hand to hold window		(R14B)	20.6	M24B		Move to glass
											(G5)	84.8	AP2	8	Pressure cloth to glass
												116.8	M14B	8	Move cloth across glass
									Move hand from window		(M4B)	20.6	M24B		Move cloth to bench
												2.0	RL1		Release cloth
												268.3			
3235	Clean vision port on helmet											17.2	R18B		Reach for rag in pocket
												2.0	G1A		Grasp rag
												7.5	D2E		Remove rag from pocket
												17.0	M18B		Move rag to port
												30.5	W4A	5	Wipe port
												17.0	M18B		Return rag to pocket
												5.2	M2C		Push into pocket
												2.0	RL1		Release
												98.4			
3236	Clean vision port, don, and remove sandblast helmet assembly											29.0	B		Bend
											R5B	7.8	R5B		Reach to helmet
									Grasp helmet		G1A	2.0	G1A		Grasp helmet
												31.9	AB		Arise
												20.0	ET		Inspect helmet
												7.3	EF		
												2.0	RL1		Release
												10.5	R14A		Reach for rag
												2.0	G1A		Grasp rag
												7.5	D2E		Pull rag from pocket

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3240	(continued)											185.4	M24B	9	Move scraper away from surface
												3676.9 per 9 sq.ft.			
												3676.9 ÷ 9 = 408.5 per sq.ft.			
3241	Part (small), wipe with rag								Move towel to cutter		M10B	12.2			Hold cutter
									Wrap towel around cutter		M2B	4.6			
	60X-MCLPW01								Wipe cutter shank	6	M2B	27.6			
									Regrasp towel		G2	5.6			
												50.0			
3243	Wipe off sign with fine fabric								Reach to sign		R12B	12.9	R12B		Reach to cloth
									Hold sign		G5	12.9	(G1A)		Grasp cloth
									Apply pressure		AP2	13.4	M12B		Move to sign
												69.0	M9B	6	Rub off shavings (6 times)
									Release sign		RL2	12.2	M10B		Transport cloth to table
												2.0	RL1		Release cloth
												122.4			
3244	Surface, clean with scraper, smooth surface, obstructed											388.8	APB	24	Pressure
												254.4	M6B	24	Scrape
	U-BCLSC02											254.4	M6B	24	Return
												897.6			
3245	Surface, clean with scraper, rough surface, unobstructed											318.0	APA	30	Pressure
												207.0	M4B	30	Scrape
	U-BCLSC03											207.0	M4B	30	Return
												732.0			
3246	Wipe surface to be checked or wipe base of tool								Reach to machined Surface		R18B	17.2			
											G5	0			
									Wipe surface with Hand	2	M2B	9.2			
											RL2	0			
												26.4			
3247	Clean guide plate			.1580	1	.1580	1	.1580							
3248	Adjust each jack to exact height under part								Reach to jack		(R12B)	15.2	M12C		Move wrench to jack
									Grasp jack		G1A	2.0			
									Hold jack		AP1	16.2			
												78.8	P2SSE	4	Turn
												64.8	AP1	4	Jack
												35.6	M6B	4	Screw
												16.0	D1E	4	In
												30.9	M6C	3	Or out
												259.5			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3261	Position connector clamp over wire ends											13.5	M10C		Move clamp to wire
												9.1	P1SSE		Position
												22.6			
3262	Conduit - EMT - position to coupling or connector - insert 3/4"											13.5	M10C		To connector
												21.8	P2SD		Position
												2.0	MFB		Insert
												37.3			
3263	Insert funnel in fill hole											29.0	B		To sleeve
												22.1	M20C		Funnel to fill hole
												5.6	P1SE		In hole
												2.0	RL1		Funnel
												31.9	AB		Stand
												90.6			
3264	Reposition pliers										M2B	4.6	(M1C)		To wire
												5.6	P1SE		To wire between jaws
												3.4	M1C		On wire
												5.6	P1SE		Along wire
												5.6	G2		Pliers
												2.5	M1A		Close pliers
												16.2	AP1		
												43.5			
3265	Tool, cutting, position to mark											13.5	M10C		Move tool to object
												25.3	P2SSD		Align with mark
												38.8			
3266	Remove and reinstall starter in fluorescent fixture								Hand ready with new starter			25.8	R30B		To old starter
												2.0	G1A		Remove starter
												16.2	AP1		
												2.8	T30B		
												4.0	D1E		
												24.3	M30B		Toward other hand
									New starter to R.H.		G3	5.6	G3		Old starter to L.H.
												5.6			
									Hand aside		(R20E)	24.3	M30B		Toward starter socket
												3.4	M1C		Starter in socket
												9.1	P1SSE		
												16.2	AP1		
												2.8	T30B		
												2.0	RL1		
												16.7	R20E		Hand aside
												160.8			
3267	Position tape to wire for taping splice								Wire in L.H.			11.8	M8C		Tape to splice
												5.6	P1SE		
											G2	5.6	G2		Tape
											AP2	10.6	AP2		Prepare to tape
											M1B	2.9	M1B		
												36.5			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3268	Back off threading tool											279.0	M36B	10	Handle back
												20.0	MfA	10	Set ratchet
												317.7	M36B5	10	Back off
												616.7			
3269	Position threading tool and remove after threading										M12C7	18.3	M12C7		Tool to conduit end
											P1SE	5.6	P1SE		Tool on conduit end
									Die		G2	5.6			
												15.0	W1P		Forward
									Press die to start		AP1	16.2			
									Die		G2	5.6			
											D2E	7.5	D2E		Remove tool
											M12B7	14.2	M12B7		Tool aside
												88.0			
3270	Push No. 10 wire into place for forming in electrical boxes											17.2	R18C		To wire
												2.0	G1A		Place thumb on wire
												32.4	A[illegible]	2	Apply pressure
												5.0	M1A	2	Move wire into place
												2.0	RL1		Release
												10.5	R10E		Hand aside
												69.1			
3271	Reach for wire and position											11.5	R10B		To wire
												2.0	G1A		
												8.0	M4C		Wire to position
												9.1	P1SSE		Position wire
												2.0	RL1		
												10.5	R10E		Hand aside
												43.1			
3273	Position small wrench to nut or bolt and remove after use											22.1	M20C		Move to nut
												25.3	P2SSD		Position on nut
												4.0	D1E		Disengage
												12.2	M10B		Move away
												53.6			
3274	Rail (venetian blind-bottom), place on folded tapes										R8B	10.1	R8B		To bottom rail
											G1A	2.0	G1A		
											M12C	15.2	M12C		To top of tapes
												10.4	P1NSE		Bottom rail on top
	739-MOKRP01										P1NSE	10.4			Tapes on head rail
											RL1	2.0	RL1		
												50.1			
3275	Position siding sheet for nailing or bolting (2 men)											91.2	M12C	6	Move bar to pry up
												159.6	P2NSD	6	Edge of adjoining sheets

ELE-MENT NU.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3289	Position each part in a complex fixture								Move part in fixture		M10C	13.5	M10C		Move part in fixture
									Position into fixture		P2NSD	26.6	P2NSD		Position into fixture
									Regrasp		G2	5.6	G2		Regrasp
									Move part into fixture		M3C	6.7	M3C		Move part into fixture
									Position to keys	2	P3NSD	106.8	P3NSD	2	Position to keys
									Shift part to seat	6	G2	33.6	G2	6	Shift part to
									Properly on	6	AP1	97.2	AP1	5	Seat properly
									Keys	6	M2C	31.2	M2C		on keys
										2	P3NSD	106.8	P3NSD	2	
											RL1	2.0			Hold down
									Reach to edge of part		R8B	10.1			
									Grasp part		G1B	3.5			
												17.0	S8I2C1		S ep back for leverage
									Move part against	4	M2A4?	85.6			
									Stops	4	AP1	64.8			
												17.0	S8I2C1		Retu -n to normal
									Release		RL1	2.0			
									Reach to top of part		R8B	10.1			
											05	0			
									Hold down		AP1	16.2			
												27.6	M4B	4	Tap part with hand
												24.4	M4A	4	
											RL2	2.0	RL1		
												710.3			
3290	Part, position to first jack 60K-MEMPT01											29.0	B		Bend to see
									Left hand may			11.5	R10B		Reach to part
									follow pattern			2.0	G1A		Grasp part
									of the right hand			10.4	M2C	2	Move punch hole over jack
												48.6	P3SD		Position punch
												14.6	EF2		hole on jack
												2.0	RL1		Release part
												31.9	AB		Stand up
												150.0			
3292	Remove part from vise, collet or chuck											17.2	R16B		Reach to vise and
												2.0	G1A		Grasp part
												4.6	M2B		Move out of
												4.0	D1E		Vise
												27.8			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3293	Remove each part from simple fixture											8.7	R10A		Reach to parts
												2.0	G1A		Pick up parts
												4.6	M2B		Remove to fixture
												16.2	AP1		Apply pressure
												7.5	D2E		Disengage
												39.0			
3294	Remove each part from average fixture								Reach to end of part		R10A	8.7			
									Grasp		G1A	2.0			
									Turn part around boss		M6B7	11.6	R8A		Reach to part
									Regrasp part		G2	5.6	G1A		Grasp
									Work part out of fixture	2	M1B	5.8			
												5.8	M1B	2	Work part out of fixture
									Disengage part		D2D	11.8	D2D		Disengage part
									Regrasp		G2	5.6	RL1		Release
												56.9			
3295	Remove part from complex fixture											14.4	R14B		Reach for pry bar
												2.0	G1A		Pick up bar
												15.2	M12C		Move bar to part
												21.0	P2NSE		Position under part
												16.2	AP1		Raise one edge
												15.7	M6B10		Of part
												4.0	D1E		Remove pry bar
												14.6	M14B		Lay aside on table
												2.0	RL1		
									Reach to part		(R10A)	15.8	R16B		Reach to part
									Grasp edge		(G1A)	3.5	G1A		Grasp part
												20.5	M3B10	2	Work part loose
												32.4	AP1	2	On keys
									Regrasp		G2	5.6	G2		Regrasp
									Disengage from key		D3D	34.7	D3D		Disengage from key
									Regrasp		G2	5.6	G2		Regrasp
									Move part to top of fixture		M2B	4.6	M2B		Move part to top of fixture
									Remove from fixture		D2D	11.8	D2D		Remove from fixture
												239.6			
3296	Remove part from centers											14.4	R14B		Reach to part
												2.0	G1A		Grasp
												4.0	D1E		Remove from center
												4.6	M2B		Move away
												4.0	D1E		Remove tail
												29.0			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3298	Measure location											136.0	W8PO		To location
												29.0	KOK		
											M6C	10.3	M6C		To location with rule
												16.2	P2SE		
											M4C	8.0	M4C		Move to position
												16.2	P2SE		
												2.0	RL1		
												31.9	AKOK		Stand up
												136.0	W8PO		Walk
												29.0	KOK		to other end
											(G2)	24.4	R2SB		Rule
												2.0	G1A		
												16.2	P2SE		
												74.4	TBC2	2	
												31.9	AKOK		
												68.0	W4PO		To base shoe
												69.4	KBK		At saw box
												700.9			
3299	Position saw and hand cut								Hold and slide board		M10B	11.5			
											G1A	2.0			
											M3B	5.7			
											G2	5.6			
												13.5	M10C		Position saw
												21.8	P2SD		
												496.4	M14B	34	Saw 2 x 4 (17 dbl. moves)
												556.5			
3301	Place & remove sign from pantograph machine (per sign)											22.9	R26B		Reach 50" - assist of 6" ratio $\frac{1}{4}$
												2.0	G1A		Pick up sign
												45.0	W3P		Walk to machine table carrying sign
													G3		Transfer to left hand
									Release material in place on machine table		RL1	2.0			
												8.6	R6B		Reach to material on machine table
												2.0	G1A		Grasp
												45.0	W3P		Walk to bench
												2.0	RL1		Place material on bench
												129.3			
3302	Turn block to perform cut								To near side		(R6B)	14.4	R14B		To far side
											G1A	2.0	G1A		Grasp block
											AP2	10.6	AP2		To turn block
											M5B10	13.8	M5B10		Turn block
									Release		RL1	2.0			
									Top of block		R8B	10.1			
									Grasp block		G1A	2.0			
											M2B10	9.0	M2B10		Lay block down
									Regrasp		G2	5.6	(RL1)		Release
												10.1	R8B		To far side
												2.0	G1A		Grasp block
											AP2	10.6	AP2		To turn block

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3302	(continued)										M6B10	13.8	M6B10		Turn block
									Release		RL1	2.0			
									Top of block		RB8	10.1			
									Grasp block		G1A	2.0			
											M2B10	9.0	M2B10		Lay block down
											G2	5.6	G2		Regrasp
											M16B10	21.4	M16B10		slide block down
											RL2	-	RL2		
												156.1			
3303	Position a pneumatic hand chipper or electric hand hammer to hole and remove from hole										D1E	4.0	D1E		Disengage hammer
											M24B	20.6	M24B		Remove hammer from hole
											M24C	25.5	M24C		Return hammer to hole
											P2SE	16.2	P2SE		Position hammer
											G2	5.6	G2		Regrasp
												4.9	M3A		Into hole
												76.8			
3304	Unfold drop cloths or fold											18.6	TBC1		Turn
												85.0	W5P0		Walk to drop cloth
												18.6	TBC1		Turn
												29.0	B		Bend
												15.8	R16B		Reach to drop cloth
												2.0	G1A		Grasp fold
												24.3	M30B		Open fold
												2.0	RL1		Release drop cloth
											R16B	15.8	R10B		Reach to drop cloth
											G1A	2.0	G1A		Grasp ends of drop cloth
												34.0	W2P0		Open fold by walking back
											M24B	20.6	M24B		
											RL1	2.0	RL1		Release drop cloth
												15.0	W1P		Step forward
												15.8	R16B		Reach to drop cloth
												2.0	G1A		Grasp drop cloth
												10.6	M8B		Lift folds to get at folded ends
												2.0	RL1		Release
												11.5	R10B		Reach to end of drop cloth
												3.5	G1B		Grasp
												12.2	M10B		Lift up drop cloth
									Reach to drop cloth		R30B	25.8			
									Grasp folds		G1A	2.0			
									Lift folds		M8B	10.6			
									Release folds		RL1	2.0			
												382.7			
3305	Drag or position hose per occurrence											29.0	B		Bend
									Reach for hose		R16B	15.8			Hold gun
									Grasp hose		G1A	2.0			
												31.9	AB		Arise from bend
												34.1	SSC2		Side step 12"
												170.0	W10P0		Walk with hose

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3308	Open or close pipe cutters								Reach to handles		R20B	18.6			
									Grasp spoke		G1A	2.0			
									Move cutters in	3	M6B	26.7			
									or out	2	RL1	4.0			
										2	R6B	17.2			
										2	G1A	4.0			
									Release spoke		RL1	2.0			
									Balance hand		R6E	8.0			
												82.5			
3309	Bring two large flange joints together; place pin through bolt holes, and remove pin											21.5	R24B		Reach to flange
												2.0	G1A		Grasp edge
									Reach to fixed flange		R12A	9.6			
									Grasp edge		G1A	2.0			
									Grip flange		AP1	16.2	AP1		Pull flange to butt
												8.1	M6A		against existing joint
									Release flange		RL1	2.0			
												5.6	G2		Regrasp flange
												4.6	M2B		Turn pipe
												48.6	P3SD		Align flange holes
												2.0	RL1		Release
												18.6	TBC1		Step to pin
												15.0	W1P		
												18.6	R20B		Reach
												2.0	G1A		Grasp
												18.2	M20B		Lift pin
												18.6	TBC1		Step to joint
												15.0	W1P		
												22.1	M20C		Move pin to flange
												11.2	P1SD		Position
												2.0	MFB		Shove thru 1st flange
												21.8	P2SD		Reposition
												6.7	M3C		Move thru other flange
												11.2	G2	2	Push and lift
												48.6	AP1	3	pin to align
												6.0	MFB	3	flange joints
												2.0	RL1		Release
									Reach to pin		R20B	18.6	R20B		Reach to joined
									Grasp pin head		G1A	2.0	G1A		flanges for support
									Pull pin free		M6B	8.9			
											D2E	7.5	(RL1)		Release grip
									Set pin aside		M20B	18.2			
									Release		RL1	2.0			
												417.0			
3310	Place pin in flange holes to align bolt holes											21.5	R24B		Reach to pin
												2.0	G1A		Grasp pin
									Grasp flange		(G1A)	25.5	M24C		Move to flange
												5.6	P1SE		Position in flange hole
												6.7	M3C		Move to opposite flange hole
												21.8	P2SD		Position in 2nd flange
									Regrasp flange		(G2)	16.2	AP1		Pull or push to align
												6.7	M3C		Move into place

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RD.	LH	TMU	RH	RD.	DESCRIPTION - RIGHT HAND
3310	(continued)								Release flange		RL1	2.0	RL1		Release pin
									Reach to pin		R24B	21.5			
									Grasp pin		G1A	2.0			
									Pull pin free		M6B	8.9			
											D2E	7.5			
									Set pin aside		M24B	20.6			
									Release		RL1	2.0			
												170.5			
3311	Remove pins, gasket and scrap material and set aside											21.5	R24B		Reach to hammer
												2.0	G1A		Grasp handle
												20.6	M24B		Move to position
												11.2	G2	2	Regrasp
									Press down on gasket		(AP1)	29.4	P1SSD	2	Position claw on pin
												32.4	AP1	2	Pull handle down
												8.0	D1E	2	Pull pin free
												18.4	M2B	4	Knock pins from claw
											8	15.2	M12C		Move to 2nd pin
												18.2	M20B		Move hammer aside
									Release pressure		(G5)	2.0	RL1		Release
									Reach to cut gasket		R6B	8.6			
									Grasp edge		G1B	3.5			
									Move to lay aside		M12B	13.4			
									Release		RL1	2.0			
												17.2	R18B		Reach to scrap
												3.5	G1B		Grasp edge
												5.6	G2		Regrasp
												17.0	M18B		Move to lay aside
												2.0	RL1		Release
												251.7			
3312	Carry pipe section to machine and set aside after machining (pipe under 4' long)											18.6	TBC1		Walk to pipe section
												150.0	W10P		
												29.0	S		Bend to pipe
											R20B		R20B		Reach to pipe end
									Assisting motions		G1A	2.0	G1A		Grasp pipe
											M6B20	20.3	M6B20		Lift either end
												31.9	AS		Arise
									Lift pipe		M20B40	40.5	M20B40		Balance pipe to carry
												18.6	TBC1		Carry pipe to machine
												170.0	W10PO		end
												18.6	TBC1		Walk to bench or
												85.0	W5PO		truck
												29.0	S		Bend
											M20B20	29.6	M20B20		Lower pipe
									Assisting motions		RL1	2.0	RL1		Release
											R6E	8.0	R6E		Balance hand
												31.9	AS		Arise
												18.6	TBC1		Return to machine
												72.0	W5P		
												778.6			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3355	(continued)										M15A20	28.9	M15A20		Raise tie
											G2	5.6	G2		Grip pinch bar
												29.0	B		Hold tie up
											M5B8	15.7	M5B8		Pull bar from under tie
												31.9	AB		Stand up to move
												204.2			
3356	Rod (gauge), place on gauge flange											29.0	B		Stoop
									Relax hold			53.6	M24B12	2	Move back and slide
	910-MOMRP01								Allow rod to slide through band		(RL1)	30.9	M30B12		out under rail Push further under
									To guide rod part way under rails			5.6	G2		Pre-position hook and retain hold
									Reach over rail		R10B	11.5			
											G1A	2.0			
									Grasp rod		G2	5.6			
									Assist	2	M2A12	15.8	M2A12	2	Lift rod to rail and
									Assist		RL1	2.0	RL1		slide to engage hook and release rod
												31.9	AB		Straighten
												187.9			
3358	Jack, place under rail and tighten, raise jack one stroke											57.2	TBC2		Turn to rail w/jack
									Drop handle		RL1	2.0			
									To jack		(R10B)	29.0	B		Stoop with jack
									Grasp		G1A				
	910-MTLJP01										M6C10	15.3	M6C10		Place jack in position near rail
									Assist		AP2	16.2	AP2		And push
									Assist		M6A10	12.9	M6A10		Slide under rail
									Retain hold			2.0	RL1		Release carrying handle
												10.1	M6B		Reach to hoisting handle socket
												2.0	G1A		Grasp end
									Steady jack			16.2	M6A	2	Move up and down to tighten against
											RL1	2.0	RL1		Rail and release
												144.9			
3359	Handle, place in jack											29.0	(B)		To jack
													M6B		To handle
	910-MTLHP02											2.0	G1A		Take hold handle
											M15C10	29.5	M15C10		Handle to socket
											F1SD	14.7	F1SD		Handle into socket
												75.2			
3360	Level, place on rail											29.0	B		To rail with level
												17.0	M6C6		One end to rail
	910-MTLLP01								Idle			16.0	F1MD		Place on rail
												5.6	G2		Shift hold
												12.8	M4A		Other end to rail
												5.6	F1SE		Place on rail
												2.0	RL1		Release level
												31.9	AB		Straighten
												119.9			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL. ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3399	(continued)										MGB10	15.7	MGB10		Position to cut
											RL1	2.0	RL1		Release
												31.9	AB		
												800.4			
3400	Kneeling on knee boards move to next location								Reach for balance		R22E	18.0	R22E		Reach for balance
												76.7	AKBK		Arise
												15.0	W1P		Walk 1 pace
												74.4	TBC2	2	Turn body
												29.0	B		Bend
									Reach for board		R12D	14.2	R12D		Reach for board
									Grasp		G1A	2.0	G1A		Grasp
									Regrasp		G2	5.6	G2		Regrasp
									Lift board		M12B	13.4	M12B		Lift board
												31.9	AB		Arise
												74.4	TBC2	2	Turn body
												29.0	B		Bend
									Move board		M18B	17.0	M18B		Move boe d
												29.0	B		Arise
												69.4	KBK		Kneel
									Reach for balance		R22E	36.0	R22E	2	Reach for balance
												40.0	ET	2	Look at leg
												14.2	IM6	2	Move leg
												36.0	R22E	2	Reach for balance
												625.2			
3401	Carry cardboard box of insulation brick											120.0	W5P		To material
												37.2	TBC2		Turn
											R15B	17.2	R15B		To sides of box
											G5	0	G5		Contact grasp
											AP1	16.2	AP1		To gain control
											MG8	8.9	MG8		Slide box out
											G2	5.6	G2		For better control
											MA13	11.6	MA13		Lift box
												18.6	TBC1		Turn to walk
												120.0	W5P		To work site
												29.0	B		With box
									Better control		G2	5.6			
									Set edge down		MGB13	13.6			
												5.6	G2		Better control
												13.6	MGB13		Bring box to rest
											RL2	0	RL2		Release
												31.9	AB		Arise
												454.6			
3402	Get and place nut on bolt and engage threads											17.2	R15B	1	To nut
												2.0	G1A	1	Pick up
												5.6	G2	1	Gain control
									To bolt head	1	(M12C)	20.4	M12C	1	Put to bolt
									To hold in place	1	(G5)		W5F	1	Align during move
												5.6	P1SE	1	Place nut on bolt
												4.0	MP3	2	Turn back and forth to start
												8.0	MP3	4	Turn forward

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3402	(continued)											8.0	R1A	4	Release nut
												8.0	R2B	4	Reach back
												8.0	G1A	4	Grasp nut
												86.8			
3403	Nut setter, place head on nut								Reach to handle		(R5B) R10E	12.9	R12B		Reach to handle
									Assist		G1A	2.0	G1A		
									Assist		G2	5.6	G2		Grasp
	910-MTPNP01								Assist		M2B	4.6	M2B		Lift to clear rail
									Assist		M10B	12.2	M10B		Move socket to side
									Assist		M10C	13.5	M10C		Move socket to nut
									Assist		P1SSD	14.7	P1SSD		Place socket on nut
									Release handle		R1A	2.0			
												67.5			
3404	Remove old nuts from joint bar bolts	.0140	.0125	.0650	5	.0130	1	.0130							
3405	Nut setter, remove from nut								To handle		R12A	9.6			
											(G1A)	9.6	R12A		Reach to handle
									Gain control		G2	5.6	G2		Gain control
	910-RTPNR01								Assist		M3B	5.7	M3B		Disengage from nut
											M6B	8.9	M6B		Aside to clear rail
									Retain hold			39.4			
3406	Nut, seat with wrench and remove wrench								Assist	2	APA	21.2	APA	2	Push on wrench
									Assist	2	M30B7	56.0	M30B7	2	To turn nut
									Assist	3	APB	48.0	APB	3	Push on wrench
	910-RTLN501								Assist	3	M10B7	45.3	M10B7	3	To turn nut for final tightening
									Assist		D1D	5.7	D1D		Wrench from nut
									Assist		M10B7	15.1	M10B7		Lift to carry
												191.3			
3407	Nut, turn down, seat with nut setter. Machine time not included.								Release guide handle		R1A	2.0			
									Reach to clutch lever		R12A	9.6			Hold guide handle
											G1A	2.0			
	910-MTPNT01								Grasp and move lever		G2	5.6			
									To engage clutch		M6A	8.1			
									Move lever						
									Disengage clutch		M6A	8.1			
									Release lever		R1A	2.0			
												2.0	R1A		Release lever
												39.4			
3408	Turn nut down (by hand) ½ turn								Hold			2.0	G1A	1	Grasp
												2.0	M1B	1	Turn forward

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3408	(continued)											2.0	RL1	1	Release
												2.0	RFB	1	Reach back
												8.0			
3409	Nut, turn with wrench								Assist		M4C7	10.7	M4C7		Wrench to nut
	910-MTLNT01								Assist		P2SSD	25.5	P2SSD		Place wrench on nut
									Assist						
									Assist		M30B7	28.0	M30B7		Turn nut $\frac{1}{6}$ turn
									Assist		D1D	5.7	D1D		Remove wrench
									Assist		M30B7	28.0	M30B7		Wrench back to near nut
												97.7			
3410	Clamp small, medium, or large part on carriage											85.0	W4P0		Walk front of carriage
									Reach for sheet metal		R12B	12.9	R12B		Reach for clamp screw
									Hold sheet against clamp		(15)	6.0	G1A	3	Grasp clamp screw
												16.2	T90S	3	
												6.0	RFB	3	Tighten clamp screw
												6.0	RL1	3	Release clamp screw
												21.5	R24B		Reach for second clamp
												6.0	G1A	3	Grasp clamp screw
												16.2	T90S	3	Turn clamp
												6.0	RFB	3	screw
												6.0	RL1	3	Release clamp screw
												21.5	R24B		Reach to clamp screw
												2.0	G1A		Grasp clamp screw
												10.6	AP2		Final tightening
												2.0	RL1		Release clamp
												21.5	R24B		Reach clamp
												2.0	G1A		Grasp clamp
												10.6	AP2		Final tightening
									Release sheet metal		(15)	2.0	RL1		Release clamp
									Reach aside		R12L	11.8	R12E		Reach aside
												271.8			
3411	Unlock and drop arm for removing part or raise and lock arm - small machine											51.0	W3P0		To end of machine
												18.6	R20B		To lever
												2.0	G1A		
												32.4	AF1	2	
												15.8	R16B		To arm
												2.0	G1A		
												15.8	R16B		To arm
												2.0	G1A		
												32.4	AF1	2	
												18.2	M20B		Lower arm
												2.0	RL1		
												11.8	R12E		
												17.0	W1P0		To center of machine
												221.0			
3412	Remove and replace pin on hold down screw											11.5	R10B		Reach for pin
												2.0	G1A		Grasp pin
												10.6	AP2		Pull on pin

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3431	(continued)											16.2	AP1		Lock lever in place
												2.0	MFC		
												2.0	RL1		Release
												17.0	SS12C1		
												119.4			
3432	Adjust speed levers											18.6	TBC1		
												15.0	W1P		Step to levers
												18.6	TBC1		
												21.9	EF	3	Check speed chart
												18.6	R20B		Reach to 1st lever
												2.0	G1A		Grasp
												16.2	AP1		Pull or push
												8.0	M4C		Move to exact speed
												2.0	RL1		Release
									Reach to 2nd lever		R24B	21.5			
									Grasp		G1A	2.0			
									Pull or push		AP1	16.2			
									Move to exact speed		M4C	8.0			
									Release		RL1	2.0			
												21.5	R24B		Reach to 3rd lever
												2.0	G1A		Grasp
												16.2	AP1		Pull or push
												8.0	M4C		Move to exact speed
												2.0	RL1		Release
												18.6	TBC1		Step back to operating
												15.0	W1P		position
												253.9			
3433	Make adjustment on machine to change die sizes											21.9	EF	3	Look to mark
												15.8	R16B		Reach to lever
												2.0	G1A		Grasp
												16.2	AP1		Pull lever down
												8.0	M4C		
												43.6	P2SD	2	Position to mark
												14.6	EF	2	
												14.2	R16E		Balance hand
												136.3			
3434	Tighten or loosen wheel to adjust rear guide clamps for holding or releasing pipe											60.0	W4P		Walk to rear of
												17.0	SS12C1		machine
											R14B	14.4	R14B		Reach and grasp
											G1A	2.0	G1A		lever or wheel
										4	M12B30	114.4	M12B30	4	Move lever or wheel
									Assisting motions	4	RL1	8.0	RL1	4	Release
										3	R24B	64.5	R24B	3	Reach back to turn
										3	G1A	6.0	G1A	3	Grasp to turn
										3	AP1	48.6	AP1	3	Final tighten
										3	MFB	6.0	MFB	3	
												17.0	SS12C1		Return to operating
												60.0	W4P		position
												417.9			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3532	Pick up stepladder and put down											29.0	S		Stoop to ladder
												2.0	G1A		Grasp ladder
									Grasp ladder		(G1A)	24.1	M20B10		Turn ladder on edge
												5.6	G2		Regrasp ladder
												31.9	A8		Arise
												22.7	M16B10		Put ladder to shoulder
												2.0	RL1		Release ladder
												14.2	R16Z		Move arm through
									Release		RL1	2.0			
												20.2	R8B	2	Adjust on shoulder
												4.0	G1A	2	
												28.7	M3B20	2	
									Reach to ladder (bottom)		R20B	18.6	R20B		Reach to ladder (top)
									Grasp		G1A	2.0	G1A		Grasp
												13.4	M3B20		Lift off shoulder
												5.6	G2		Regrasp
									Release		RL1	29.6	M20B20		Let to floor
													G2		Regrasp
												29.0	S)		
													M2I)		Turn down
												31.9	A8		Arise
												316.5			
3533	Climb and descend tower 85 ft.			.0373	1	.0373	1	.0373							
3534	Climb truck ladder to tower ladder and return			.0086	1	.0086	1	.0086							
3561	Jack, adjust to approximate height								Reach to jack		R16B	15.8	R16B		Reach to jack screw
									Grasp jack		G1A	2.0	G1A		Grasp jack screw
									Hold		AFB	97.2	AFB	6	Turn
	605-MEUJA01											27.6	M2B	6	Jack
												10.0	RL1	5	Screw
												20.0	R2A	5	In or out
											RL1	2.0	RL1		Release jack screw
												174.6			
3577	Cut wire to approximate length								Reach to roll		R16B	17.2	R16B		Reach to wires
									Grasp roll		G1A	2.0			
												2.0	G1A		Grasp
												24.3	M30B		Uncoil wires
									Release roll		RL1	2.0			
									Reach to measuring		R14B	14.4			
									stick grasp and		G1A	2.0			
									move to use		M14A	14.4	M14A		Move wire up
									Regrasp stick		G2	5.6	G2		Regrasp stick and wires
									Measure wires		M6C	11.8			
											P1SE	5.6			
												2.0	RL1		Release wires

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL PER FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3738	(continued)											3.5	G1B		Grasp
												31.9	AB		
												18.6	TBC1		Step back to flange
												30.0	W2P		
												13.5	M10C		Move gasket to flange
												19.7	P2SSE		Position gasket
												9.2	M5C		Align to hole
												21.8	P2SD		
												16.2	AP1		Press gasket into place
												2.0	RL1		Release gasket
												255.5			
3739	Get out of pick up truck	.0024	.0006	.0084	6	.0014	1.11	.0016							
3740	Get into pick up	.0046	.0010	.0241	9	.0027	1.11	.0030							
3741	Additional movement under pipe in tack welding											29.0	B		Bend under pipe
									Reach for balancing hold		R24B	21.5			
											G1A	2.0			
												14.6	EF	2	Look at pipe
												21.3	IM6	3	Balance body
									Release hold		RL1	2.0			
												31.9	AB		Arise
												122.3			
3742	Turn assembly around to receive next part											34.1	SS12C2		Step to grasping point
											R24B	21.5	R24B		Reach to assembly
											G1A	2.0	G1A		Grasp assembly
											AP1	16.2	AP1		Lift up
											M4B20	15.8	M4B20		
												102.3	SS12C2	3	Rotate assembly around
											M4B20	15.8	M4B20		Set assembly down
											M20B8	24.1	M20B8		Slide to working position
											RL1	2.0	RL1		Remove hand
											R10E	10.5	R10E		
												18.6	TBC1		Walk to next part
												17.0	W1P0		
												37.2	TBC2		
												317.1			
3743	Position and reposition stencil by eye	.0029	.0013	.0140	6	.0023	1	.0023							
3744	Stick large stencil on guide line	.0360	.0090	.0600	3	.0200	1	.0200							
3745	Select "number" stencil, in sequence			.0070	1	.0070	1	.0070							
3746	Position template on door											23.1	M28B		Move template to door
												15.2	M12C		Move template to door
												5.6	G2		Regrasp

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3746	(continued)											14.6	EF	} 2	Position template
												32.4	P2SE	} 2	
												20.0	ET		To lower part of template
												14.6	EF	2	Position template
												32.4	P2SE	2	
												157.9	Per 2 strips		
3747	Position template to guard post										M16C	18.7	M16C		Move template to right side of post
												16.2	P2SE		Position to post
												8.7	ET8/14		Look to left side of post
									Look at right side of post		EF	7.3			
									Position template at left side of post		M1C	3.4			
											P2SE	16.2			
												2.0	RL1		Release template
												21.5	R24B		Reach to center of template
												7.3	EF		Look to line up template
												3.5	G1B		Grasp template
												3.4	M1C		Move template
												16.2	P2SE		Position template
												-	RL2		Release template
												19.2	R24E		Return hand
												143.6			
												x 4	sides/post		
												574.4			
3748	Brush, dip											5.2	M2C		
	U-BDFBD01											5.6	P1SE		
												4.6	M2B		Into can
												4.6	M2B		Out
												10.4	M2C	2	Wipe on edge
												11.2	G2	2	Turn over
												41.6			
3749	Move funnel into oil hole and remove											22.1	M20C		Funnel in R.H. to part
												5.6	P1SE		
												3.6	M2A		Into hole
												2.0	RL1		
												14.2	R16E		
												-	---		Pour in oil
												18.6	R20B		To funnel
												2.0	G1A		
												4.0	D1E		Remove
												13.4	M12B		
												85.3			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3800	Obtain scale measure and aside											21.5	R24B		Reach to scale
												2.0	G1A		Grasp scale
												8.9	M6C		Lift from pocket
												25.5	M24C		Move to work
									Reach to edge of work		R2D	5.9			
									Grasp edge of work		G5	-			
												5.6	P1SE		Position scale to finger
												21.9	EF	3	Read scale
												5.6	G2		Regrasp scale
												25.5	M24C		Move scale to pocket
												5.6	P1SE		Position in pocket

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3800	(continued)											8.0	M3B		Move into pocket
												2.0	RL1		Release
												138.0			
3801	Mark-off additional lengths of stock														
									Regrasp		G2	5.6			
									Scale to previous mark		M6C	10.3			
									Align scale to mark		P2SE	16.2			
									Regrasp scale		G2	5.6			
												10.3	M6C		Pencil to scale
												16.2	P2SE		Pencil to reading scale
												2.0	MfA		Make mark
												5.7	M3B		Pencil away
												71.9			
3802	Door (office), unlock											15.6	R14C		To pocket for key ring
	U-MCHDU01											5.6	P1SE		Insert hand in pocket
												6.4	R4B		To key ring
												2.0	G1A		Grasp key ring
									Reach to key ring		(R20A)	19.2	M20A		Key ring to center of body
									Grasp key ring		G1A	2.0			
									Release ring		(RL1)	9.1	G4B		Select key
									Reach to door knob		R20B	18.6			
									Grasp knob		(G1A)	22.1	M20C		Key to lock
												5.6	G2		Regrasp key
												10.4	P1NSE		Insert key in lock
												2.0	MfA		
												5.4	T90S		Turn key
									Turn knob		T90S	5.4			
									Open door		M2B	4.6			
												5.4	T90S		Turn key
												4.0	D1E		Disengage key
												145.4			
3803	Unlock and open window											20.1	R22B		Reach to window lock
												2.0	G1A		Grasp window lock
												10.6	AP2		
												4.9	M3A		Move window lock up
												15.8	M16B		Open window
												2.0	RL1		Release lock
												26.5	R36E		Return hand
												81.9			
3804	Close and lock window											30.0	R36B		Reach to window lock
												2.0	G1A		Grasp window lock
												10.6	AP2		
												4.9	M3A		Move lock up
												16.0	M16A		Close window
												4.9	M3A		Move lock down

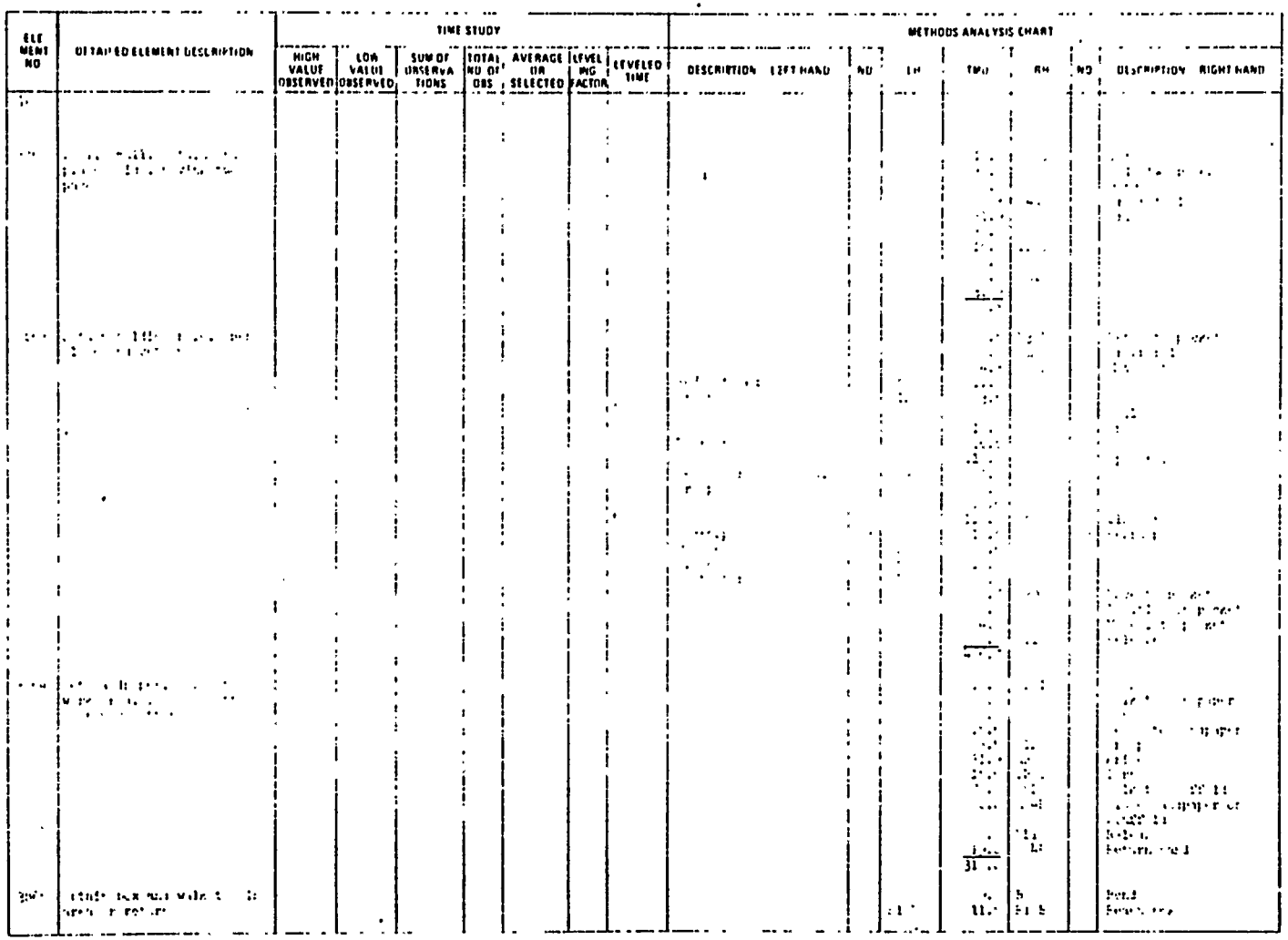
ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3819	(continued)														water with hand (Element PWD-4-E
												31.9	AB		Move hose from bucket
												5.6	G2		
												13.4	M12B		Hose into sink
												2.0	RL1		
												1516.9			
3820	Open and close cabinet door											29.0	B		Bend to
												15.8	R16B		Reach to door handle
												2.0	G1A		Grasp door handle
												5.4	T90S		Turn handle
												27.9	M36B		Open cabinet door
												2.0	RL1		Release handle
												15.5	R18E		Reach to balance
												17.2	R18B		Reach to door handle
												2.0	G1A		Grasp door handle
												27.9	M36P		Close door
												16.2	AP1		Push door tight
												5.4	T90,		Turn latch
												2.0	RL1		Release latch
												14.2	R16E		Reach to balance
												31.9	AB		Stand up
												214.4			
3821	Dispose of rags, rager, etc. in trash can located outside of building											18.6	TBC1		Turn body
												34.0	W2P0		Walk
												29.0	B		Bend
												15.8	R16B		Reach for bucket containing trash
												2.0	G1A		Grasp
												31.9	AB		Arise
												18.6	TBC1		Turn
												1060.0	W200F		Walk to outside - trash can
												18.2	M20B		Move bucket to trash can
												5.6	G2		Regrasp bucket
												14.8	T180M		Turn bucket over
												18.2	M20B		Move bucket to side
												18.6	TBC1		Turn
												1060.0	W200F		Walk back to locker
												29.0	B		Bend
												2.0	RL1		Release bucket
												2376.3			
3822	Cleanup of the job location	.3860	.0050	3.3645	30	.1122	.64	.0718							
3823	Empty scrap metal container and return											17.0	W1P0		
											R12B	12.9	R12B		
											G1A	2.0	G1A		
											M1B8	7.1	M1B8		Remove machine container
											D2E	7.5	D2E		
											M12B8	18.8	M12B8		
									Same as right hand			37.2	TBC2		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3834	Wash hands	.0600	.0030	.1130	5	.0226	1.06	.0240							
3835	Clean out tank (inside and out)					.0307	1	.0307							
3837	Water, wash down job site (300 sq. ft.)	.0408	.0253	.1630	5	.0326	1	.0326							
3838	Remove and return 5 gallon paint can cover	.0220	.0170	.0755	4	.0181	1	.0181							
3839	Remove and return one gallon paint can cover	.0131	.0040	.0277	4	.0069	1	.0069							
3840	Pry cover off paste can											18.6	TBC1		Turn and walk
												30.0	W2P		to paste can
									Assisting motions		R12B	12.9	R12B		Reach to can
											G1A	2.0	G1A		Grasp can
											M6B	6.9	M6B		Lift to balance
												18.6	TBC1		Return to work
												30.0	W2P		area
									Move can aside		M12B	13.4	M12B		Move can aside
									Release		RL1	2.0	RL1		Release
												21.5	R24B		Reach to screwdriver
												2.0	G1A		Grasp
									Reach to can		(R12B)	18.7	M16C		Move to lid
									Grasp to hold		(G1A)	27.3	P1SSE	3	Pry open lid
												48.6	AP1	3	
												13.8	M2B	3	
												35.4	D2D	3	
									Regrasp can		(G2)	16.0	M4C	2	
									Release can		(RL1)	20.6	M24B		Lay screw driver
												2.0	RL1		aside
									Reach to can		(R12B)	21.5	R24B		Reach to lid
									Grasp can		G1A	2.0	G1A		Grasp
												32.4	AP1	2	Remove lid
												9.2	M2B	2	
												5.6	G2		
									Release can		(RL1)	20.6	M24B		Lay lid aside
												2.0	RL1		
												15.5	R15E		Balance hand
												451.1			
3842	Walk unobstructed or with load to 50 pounds per 10 paces											150.0	W10P		Walk 10 paces

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	EM	TMU	AM	NO	DESCRIPTION - RIGHT HAND
3843	Walk obstructed or with load over 50 poundr per 10 pacer											170.0	W10P1		Walk 10 paces
3855	Check out or in tool											19.8	R30B		Reach to ring in pocket
												2.0	G1A		Grasp
									Reach to ring		(F1A	7.1	M3A		Move to other hand
									Grasp and regrasp		G1A & G2	7.6			
									Pull open		(AP	13.6			
											(M2B	4.6			
									Release ring		RL1	2.0			
									Reach to ring		R20B	18.6			
									Grasp and regrasp		G1A & G2	7.6			
									Push closed		(AP	13.6			
											(M1A	3.6			
									Release		RL1	2.0			
												30.7	M30C		Move to pocket
												9.1	P1SSE		Position in pocket
												5.6	G2		Regrasp
												4.6	M2B		Push into pocket
												2.0	RL1		Release
									Reach to ring		R10D	17.9			
											(G5				
									Grasp		(M7B	2.0			
											(G2	5.6			
									Move check from ring		M4C	8.9			
												12.9	R12B		Reach to check
												3.5	G1B		Grasp
												22.1	M20C		Move to ring
												16.2	P2SE		Position on ring
												4.6	M2B		Move on ring
												2.0	RL1		Release
									Move check to clerk		M20B	18.2			
												11.5	R10B		Clerk reaches
												5.6	G3		Clerk grasps
												60.0	W4P)		Clerk walks with
												37.2	TBC1)	2	used check
												18.2	M20B		Clerk moves
									Reach for check		R10B	11.5			
									Grasp check		G3	5.6			
									Move to counter		M12B	13.4			
									Release		RL1	2.0			
												37.2	TBC1	2	
												360.0	W12P	2	Walk to bin and
												37.2	TBC1	2	return
												29.2	EF	4	Look at bin
												40.0	ET	2	Look to other
												22.5	R24C		Reach to tool
												7.3	G4A		Grasp tool
												3.9	M24B10		Lift tool out
												22.8			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
									Clerk reaches for tool		21.8	11.5			
									Clerk grasps tool		G3	5.6			

ELE-MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	ND	LH	TMU	RH	ND	DESCRIPTION - RIGHT HAND
3855	(continued)											14.4	RF	2	Look at tool
												14.8	T18B1		Turn tool
												14.4	RF		Look at
												17.0	SSC1		Step to side
												17.4	RL9B1		Set tool down
												2.0	PL1		Release
												17.0	SSC1		Step back
												2209			
3861	Tool, small, obtain and place aside											11.8	R24B		To tool
												2.0	G1A		
												16.2	RL9B		To work area
												19.6	RL4B		Aside tool
												2.0	PL1		
												64.3			


ELEMENT NO
OBTAINED ELEMENT DESCRIPTION
TIME STUDY
HIGH VALUE OBSERVED
LOW VALUE OBSERVED
SUM OF OBSERVATIONS
TOTAL NO OF OBS
AVERAGE OR SELECTED
LEVELING FACTOR
LEVELED TIME
METHODS ANALYSIS CHART
DESCRIPTION LEFT HAND
NO
LH
TMU
RH
NO
DESCRIPTION RIGHT HAND

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3865	(continued)										G1A	2.0	G1A		Grasp
											M10B	17.2	M10B		Pick up box
												31.9	AB		Arise
												18.6	T90R		Turn
												391.9	WP0F3		Walk
												18.6	T90R		Turn
												514.8			
3866	Locate and pick 3 items from bin											40.2	ET	1	Look at bin tags
												43.6	EF	6	
												9.7	5	1/3	Reach bottom shelves
												51.9	R18B	3	Reach item in bin
												21.9	G1A	3	Grasp
												54.6	M22B	3	Remove item from bin
												6.9	RL-1	3	Release part into box
												15.6	AB	1/3	Arise
												337.4			
3867	Obtain carrying kit from locker											29.9	B		Bend
												2.0	G1A		Grasp strap
												16.2	AP1		Pull
												31.9	AB		Arise
												37.2	TBC2		Turn around
												25.7	M10B35		Move bag to bench
												2.0	RL1		Release
												147.9			
3868	Obtain and open check ring, return and close											25.8	R30B		Reach to ring in pocket
												2.0	G1A		Grasp
									Reach to ring		R10A	27.1	M30A		Move to other hand
									Grasp and regrasp		G1A&G2	7.6			
									Pull open		(AP2	10.6			
											(H2B	4.6			
									Release ring		RL1	2.0			
									Reach to ring		R20B	18.6			
									Grasp and regrasp		G1A&G2	7.6			
									Push closed		(AP2	10.6			
											(I12A	3.6			
									Release		RL1	2.0			
												30.7	M30C		Move to pocket
												9.1	P15SE		Position in pocket
												5.6	G2		Regrasp
												4.6	M2B		Push into pocket
												2.0	RL1		Release
												174.1			
3869	Get tool from carrying bag and give to stock clerk											18.6	TBC1)		Turn to tool bag
												29.0	B)		
									Grasp top of bag		G1A	2.0			
									Pull open		M6B	8.9			
												12.9	R10C		Reach for tool
												2.0	G1A)		
												9.5	M4B5)		Grasp tool and move
												2.0	RL1)		aside

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3869	(continued)											6.4	R4C		Reach for other tool
												2.0	G1A		Grasp
												17.4	M13B17		Lift from bag
												31.9	AB		Arise
												18.6	TBC1		Turn to window
												14.1	M20B10		Pass tool to clerk
									Clerk reaches for tool		R13B	11.5			
									Clerk grasps tool		G3	5.6			
												204.4			
3870	Get tool from tool box and place in carrying bag											37.2	T5C1		Step to box
												14.3	R12C		Reach for tool
												14.6	G4A	2	Grasp tool
												7.6	M4B5		Move tool aside
												2.0	RL1		Release
												8.4	R4C		Reach for other tool
												16.8	M12B5		Lift from bag
												37.2	TBC3		Step to bag
												16.8	M12B5		Move to bag
												2.0	RL1		Release
												158.8			
3871	Obtain tool from clerk and place in carrying bag											24.1	M20B10		Move tool to craftsman
												11.5	R13B		Craftsman reaches
												5.6	G3		Craftsman grasps tool
												24.1	M20B10		Move tool from doorway
												29.0	B		Bend
									Grasp bag		G1A	2.0			
									Pull open		M6B	9.9			
												19.4	M13B10		Move tool to bag
												2.0	RL1		Release tool
												31.9	AB		Arise
												37.2	TBC1	2	Turn to bag and back
												195.7			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3873	Rag, get from covered can U-MJPR001											29.0	B		Bend to can
												2.0	G1A		Grasp handle of cover
												13.4	M12B		Swing back cover
												2.0	RL1		Release
												18.7	R16C		Reach for rag
												2.0	G1A)		Grasp rag
												5.6	G2)		
									Reach to cover		(16B)	15.8	M16B		Lift rag from can
									Grasp cover handle		G1A	2.0			
									Close cover		M12A	12.9			
									Release handle		RL1	2.0			
												31.9	AB		Arise
												137.3			
3874	Obtain and replace pencil											21.5	R24B		Reach to pencil
												2.0	G1A		Grasp pencil
												4.0	D1E		Remove pencil
												20.6	M24B		Move to work surface
												25.3	M24C		Move pencil to pocket
												5.2	M2C		Move pencil into pocket
												16.0	P1RSD		Position clip
												2.0	RL1		Release
												96.8			
3875	Obtain note pad from pocket and return											17.2	R18B		Reach to shirt pocket
												3.5	G1B		Grasp note pad
												18.2	M20B		Remove
									Reach to pad		R8A	7.9			
									Grasp pad		G1A	2.0			
									Regrasp to open	3	G2	16.8	G2	3	Regrasp to open
									Open pad to sheet	3	M5B	24.0	M5B	3	Open pad to sheet
									Move to writing surface		M20B	18.2			
												2.0	RL1		Release
									Regrasp to hold		G2	5.6			
									Turn to writing position		M6B	8.9			
									Regrasp		G2	5.6			
									Regrasp held pad		G2	5.6			
									Close pad		M5B	8.0			
									Reach to right hand		R10A	8.7			
												5.6	G3		Grasp pad
												20.4	M18C		Move to pocket
												11.2	P1SD		Position in pocket
												5.6	G2		Regrasp
												4.6	M2B		Push into pocket
												2.0	RL1		Release
												201.6			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3880	(continued)								Reach to bag		R14B	29.0	B		Bend
									Grasp		G1A	14.4			
									Open		MGB	2.0			
												P.)			
												17.0	M1MB		Put tape in bag
												2.0	RL		Release tape
									Release bag		RL1	10.4	R10E		Pull hand out of bag
												31.0	AB		
												525.8			
3882	Tool, obtain from open tool box and aside to tote box or bench top U-MTLTOOL											14.2	R12C		Reach for tool
												7.3	G4A		Grasp tools
												6.9	M4B		Move tools aside
												2.0	RL1		Release
												8.4	R4C		Reach for tool
												7.3	G4A		
												13.4	M12B		Lift from tool box
												15.2	M12C		Move to hand box
												2.0	RL1		Release
												76.7			
3884	Pick up rag or tool and lay aside											29.0	S		
												12.9	R12B		
												5.5	G1B		Pick up

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3884	(continued)											11.2	G2	2	
												31.9	AS		Use
												15.8	M16B		
												2.0	RL1		Lay aside
												14.2	R16E		
												120.5			
3885	Mop truck, get from or return to janitorial closet											30.0	W2P		Walk into janitorial closet
												18.6	TBC1		Turn to mop truck
												17.2	R18B		Reach to truck
												2.0	G1A		Get hold of truck
												16.2	AP1		Pull truck out of corner
												34.0	W2P0		
												2.0	RL1		Let go truck
												45.0	W3P		Walk to other end of truck
												18.6	TBC1		
												2.0	G1A		Get hold of truck
												16.2	AP1		Align truck with door
												70.5	S813C2	2	
												16.2	AP1		Push truck out of closet
												34.0	W2P0		
												34.1	S813C2		Turn truck 90°
												16.2	AP1		Push truck to sink
												51.0	W3P0		
												2.0	RL1		Let go truck
												18.6	TBC1		Turn away
												444.4			
3886	Carry rod to rail								Hold rod in Both hands			85.0	W5P0	1	Walk and carry rod
												29.0	S	1	Stoop to place rod
												114.0			
3889	Jack, get from under rail											29.0	S		Stoop to jack
	910-MTLJ001											10.1	R8B		Reach to handle
									Idle			2.0	G1A		Grasp
												18.3	M6B20		Pull from under rail
												9.2	M2B	2	Move jack to loosen
												31.9	AS		Straighten with jack
												100.5			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3890	Hardware, load onto handcar or unload from or to storage 910-SOHHL02											34.0	W2PO		Step to pallet
												29.0	B		Bend to pallet
									Assist RH		R10B	11.5	R10B		Reach to part
									Assist RH		G1B	3.5	G1B		Grasp up part
									Assist RH		G2	5.6	G2		Gain control
									Assist RH		M6B10	13.8	M6B10		Raise part
												31.9	AB		Stand up
												18.6	TBC1		Face hand car
												34.0	W2PO		Step to hand car
									Assist RH		M12B10	18.8	M12B10		Part onto hand car
									Assist RH		RL1	2.0	RL1		Let go part
												18.6	TBC1		Face pallet
												221.3			
3891	Hardware, unload handcar along right-of-way 910-SOHHL01														
									Assist RH		R14B	14.4	R14B		To part on hand car
									Assist RH		G1B	3.5	G1B		Grasp part
									Assist RH		G2	5.6	G2		Gain control
									Assist RH		M10B10	17.4	M10B10		Lift part from car
												18.6	TBC1		Turn from car
									Assist RH		M10B10	17.4	M10B10		Part to right-of-way
									Assist RH		RL1	2.0	RL1		Let go part
												18.6	TBC1		Face hand car
												97.5			
3892	Hardware, load on handcar along right-of-way 910-SOHHL01														
												29.0	S		Stoop to rail-bed
									Assist RH		R10B	11.5	R10B		Reach to part
									Assist RH		G1A	2.0	G1A		Grasp part
									Assist RH		G2	5.6	G2		Gain control
									Assist RH		M4B10	11.6	M4B10		Raise part
												31.9	AS		Arise from rail-bed
												18.6	TBC1		Face hand car
									Assist RH		M12B10	18.8	M12B10		Part to hand car
									Assist RH		RL1	2.0	RL1		Release part
												18.6	TBC1		Turn from car
												149.6			
3893	Position tie plate pad	.0045	.0036	.0400	10	.0040	1	.0040							
3894	Move tie puller to next location, average of 5 ties	.0050	.0020	.0657	18	.0037	1	.0037							
3895	Spikes, distribute 910-MOHSD01											29.0	S		Stoop to pile of spikes
									Include spikes	8	(G2)	103.2	R12B	8	Reach to spikes
												16.0	G1A	8	Pick up (1 to 3 spikes)
									Hold spikes			44.8	G2	8	Gain control
												103.2	M12A	8	Move to LH and place
												16.0	RL1	8	in LH
												6.0	RfB	3	Pick up
												6.0	G1A	3	3 and hold
												16.8	G2	3	in RH
												31.9	AS		Straighten
												119.0	W1PO	7	Walk and drop spikes
									Hold spikes				[illegible]2F	7	To spike

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	NUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL. MIS FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION – RIGHT HAND
3903	Carry heavy part from tool crib to truck location and return											29.0	S		Stoop
											G1A	2.0	G1A		Grasp tool
											Wt/C	12.5	Wt/C		Pull to lift
												31.9	AS		Arise
												272.0	W16FO		Walk to truck location
												29.0	S		Stoop
											RL1	2.0	RL1		Release tool
												31.9	AS		Arise
												225.0	W15P		Return to crib
												635.3			
3904	Load heavy tool onto truck and unload from truck											29.0	S		Stoop
											G1A	2.0	G1A		Grasp part
											M1B25	9.1	M1B25		Pull to lift
												31.9	AS		Arise
												18.6	TBC1		Step to truck
												15.0	W1P		
												9.1			Lift over side of truck
											M30B25	31.1	M30B25		
											RL1	2.0	RL1		Release
												18.6	TBC1		Return to parts
												15.0	W1P		
												18.6	TBC1		Step to part on truck
												15.0	W1P		
											R30B	25.8	R30B		Reach to tool
											G1A	2.0	G1A		Grasp
												9.1			
											M30B25	31.1	M30B25		Lift
												18.6	TBC1		Carry aside
												15.0	W1P		
												29.0	S		Lower to the ground
											RL1	2.0	RL1		Release
												31.9	AS		Arise
												379.5			
3905	Pick up supplies and/or equipment and lay aside											18.6	TBC1		Turn
												150.0	W10F		Walk
												29.0	B		Bend
												18.6	R20B		Reach to object
												3.5	G1B		Grasp
												10.6	M3B		Lift
												5.6	G2		Regrasp
												31.9	AB		Arise
												18.6	TBC1		Turn
												75.0	W5P		Walk to next object
									Bend		B	29.0			
									Reach to object		R20B	18.6			
									Grasp		G1A	2.0			
									Lift		M3B	10.6			
									Arise		AB	31.9			
												37.2	TBC2		Turn
												180.0	W12P		Walk to "assembly" area
												29.0	B		Bend

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL. ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3905	(continued)											16.9	M16C		Place object on floor
												2.0	RL1		Release
									Place object on floor		M10B	12.2			
									Release		RL1	2.0			
												11.9	AB		Arise
												704.7			
3908	Wind rope around motor wheel	.0030	.0020	.0100	4	.0025	1	.0025							
3909	Button, depress (doorbell or similar)											18.6	R2CB		To bell
												5.6	P1SE		To button
	U-MACH001											0	G5		Contact button
												21.2	APA	2	Depress button

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RD.	LH	TMU	RH	RD.	DESCRIPTION - RIGHT HAND
3909	(continued)											0 45.4	RL2		Release button
3910	Pull rope to start motor	.0010	.0005	.0030	4	.0008	1	.0008							
3911	Shut motor	.0015	.0005	.0040	4	.0010	1	.0010							
3912	Turn machine on or off											18.6 45.0 18.6 17.2 0.0 10.6 2.0 0.0 18.6 45.0 18.6 196.2	TBC1 W3P TBC1 R16B G5 AP2 M1A RL2 TBC1 W3P TBC1		Turn body Walk to end of machine Turn toward button Reach for button Grasp button Apply pressure Push button in Release button Turn body Return to work area
3913	Start or stop compressor	.0040	.0020	.0180	6	.0030	1	.0030							
3915	Put work gloves on hands and remove	.0050	.0045	.0095	2	.0048	1	.0048							
3916	Drill with hand electric drill and carbide core bit; hole ¼" to 1" dia. hole in hard surface (per inch)	Study made on 22.5 inches of drilling a ½" to 1" dia. hole in hard material. Total time .4640 hrs. .4640/22.5 = .0206					1.0	.0206							
3917	Drill with hand electric drill and carbide tipped core bit; ½" to 1" dia. hole in soft surface (per inch)	Study made on 18 inches of drilling a ½" to 1" dia. hole in soft material. Total time .0834 hrs. .0834/18 = .0046					1.0	.0046							
3918	Drill with hand electric drill and carbide tipped core bit; 1" to 1½" dia. hole in soft surface (per inch)	Study made on 150 inches of drilling a 1" to 1½" dia. hole in soft material. Total time 1.0488 hrs. 1.0488/150 = .0070					1.0	.0070							
3919	Drill with hand electric drill and carbide tipped core bit; 1" to 1½" dia. hole in hard surface. (per inch)	Study made on .75 inches of drilling a 1" to 1½" dia. hole in hard material. Total time .0194 hrs. .0194/.75 = .0259					1.0	.0259							
3920	Drill a 3/8" dia. hole in concrete wall with an electric hand hammer and a star drill (machine time per inch)	Study made on 5 inches of drilling 3/8" dia. holes. Total time .0683 hours. .0683/5 = .0136					1.0	.0136							

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3921	Check fuel, oil, cooling water and other gages before starting			.0113	1	.0113	1	.0113							
3922	Check boom operation, including brakes, clutches, governor control lever and stop control upon starting, or lock housing, secure brakes, disengage clutch and raise boom upon securing	.0097	.0090	.0278	6	.0046	1	.0046							
3923	Obtain and examine stub										R14B	14.4			Reach stub
											G1B	3.5			Grasp
											M14B	14.6			Move stub to body
												58.4	EF	8	Check stub
												3.4	M6C	2/3	Move pencil
												1.7	M2C	2/3	Cross out line
												90.0	WR1	5	Write on stub
												90.0	WR2	5	
												276.0			
3924	Fill out material "chit" and sign								a. Get chit pad from drawer			21.5	R24B		Reach to desk drawer
												2.0	G1A		
												10.6	M8A		Open drawer
												2.0	RL1		
												15.8	A16B		Reach for pad
												3.5	G1B		Grasp pad
												24.3	M30B		Move pad to desk top
												2.0	RL1		
												81.7			
									b. Get pencil from desk top			12.9	R12B		Reach for pencil
													G1A		
												7.6	G2		Grasp pencil
												13.4	M12B		Move pencil to pad
												33.9			
									c. Write 3 item stub chit			8.0	M4C	1	Move pencil to "obj. class"
												44.4	P	4	
													M	11	Write 3 digits
												5.2	M2C		Move to "Exp. Acct."
												165.2	P	17	
													M	35	Write 11 digits
												2.0	M7C		Move pencil to date
													P	10	
												96.0	M	20	Write date
												8.0	M4C		Move pencil to first line
												197.2	M	51	
													P	17	Write first line
												6.7	M3C		Move pencil to second line

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OF SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RH	LH	TMU	RH	RH	DESCRIPTION - RIGHT HAND
3924	(continued)												M	22	
												83.2	P	7	Write second line
												6.7	M3C		Move pencil to third line
													M	36	
												126.0	P	10	Write third line
												6.7	M3C		Move pencil to signature
													M	30	
												121.6	P	11	Write signature
												13.4	M12B		Lay pencil aside
												2.0	RL1		
												894.3			
									d. Remove "chit" from pad and give to carpenter			12.9	R12B		Reach to "chit"
												3.5	G1B		
												10.6	M8B		Remove from pad
												24.3	M30B		Hand to carpenter
												2.0	RL1		
												53.3			
									e. Total			1063.2			
3925	Insert stock number on, or sign stub requisition								Reach stub		R8B	12.9	R12B		Reach for pencil
									Grasp		G5	7.6	G1A-G2		Grasp & regrasp
												15.2	M12C		Move to paper
									Release paper		RL2	160.0	WR1	10	Write
												13.4	M12B		Move pencil to pocket
												2.0	RL1		Release
												11.8	R12E		Return hand
												222.9			
3926	Sign instruction sheet after job											39.2	P	7	
												36.0	M	18	"John"
												16.8	P	3	
												14.0	M	7	"R"
												39.2	P	7	
												46.0	M	23	"Duffy"
												191.2			
3927	Waiting time for air pressure to increase and decrease	.0030	.0007	.1005	5	.0209	1	.0209							
3928	Pre-planning on average emergency/service call								Computation of planning associated with job preparation--observed during delay studies Allowance computed 1.47 Allowance established 1.43 Average call 1.4 hours						

ELE-MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3928	(continued)								$\frac{1.40}{1.43} - \frac{1.40}{1.47}$ = .034 hrs						
3929	Get check from ring and return check to ring								Reach to ring		R10D	12.9			
											(G5				
									Grasp		(M½B	2.0			
											(G2	5.6			
									Move check from ring		M4C	8.0			
												12.9	R12B		Reach to check
												3.5	G1B		Grasp
												22.1	M20C		Move to ring
												16.2	P2SE		Position on ring
												4.6	M2B		Move on ring
												2.0	RL1		Release
												89.8			
3932	Pick up carrying bag and set down											30.0	W2P		Walk to bag
												29.0	B		Bend down
												2.0	G1A		Grasp
												12.5	AP35		Pull
												31.9	AB		Arise with bag
												5.6	G2		Regrasp bag
												43.2	M20C35		Move to shoulder
												5.6	G2		Regrasp strap to release
												2.0	RL1		Release
												13.1	R20A		Reach to strap
												2.0	G1A)		Grasp
												5.6	G2)		
												37.8	M20B35		Lift bag from shoulder
												29.0	B		Bend
												2.0	RL1		Release strap
												31.9	AB		Arise
												283.2			
3933	Move equipment or material aside at job site and move back after job											18.6	TBC1		Turn toward equipment
												30.0	W2P		Walk to equipment
												29.0	B		Bend
									Grasp		G1A	2.0	G1A		Grasp equipment
									Apply pressure		AP1	16.2	AP1		Apply pressure
												31.9	AB		Arise
												68.0	W4P0		Walk to site
												29.0	B		Bend
									Release		RL1	2.0	RL1		Release equipment
												31.9	AB		Arise
												18.6	TBC1		Turn
												45.0	W3P		Walk
									Reach to equipment		R20B	18.6	R20B		Reach to equipment
									Grasp		G1A	2.0	G1A		Grasp
									Move equipment		Wt/C	9.1	Wt/C		Weight const. only
												34.0	W2P0		Walk
												9.1	Wt/C		
									Lay equipment down		M10B25	15.6	M10B25		Lay equipment down
									Release		RL1	2.0	RL1		Release
												412.6			

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3934	Attach pipe machine to rear of truck for towing and detach at destination											18.6	TBC1		Turn toward pipe machine
												30.0	W2P		Walk
												29.0	S		Stoop
			2.0									2.0	G1A		Grasp
												5.6	Wt. Const.		Weight constant
												31.9	AS		Arise
												16.2	AP1		Apply pressure
												136.4	SSC2	4	Side step to side
												37.4	M20C25		Move tongue
												11.2	P1SD		Position tongue
												11.5	R10B		Reach for chain
												2.0	G1A		Grasp
												16.2	AP1		Apply pressure
												8.1	M6A		Move chain
												2.0	RL1		Release
									Detach at destination is the same except for only 2 SSC2 and no P1SD. The motions occur in a different order.			278.7			
												636.8			
3935	Move heavier tools or equipment to truck location. Move from truck location to job site											270.0	W18P		Walk to tool
												29.0	B		Bend down
											G1A	2.0	G1A		Grasp tool
											AP25	9.1	AP25		Pull to lift
												31.9	AS		Arise
												270.0	W18P		Walk outside
												29.0	S		Stoop
											RL1	2.0	RL1		Release
												31.9	AS		Arise
												600.0	W40P		Walk to tools
												29.0	S		Stoop down
												2.0	G1A		Grasp tool
												9.1	AP25		Pull to lift
												31.9	AS		Arise
												600.0	W40P		Walk inside
												29.0	S		Stoop
												2.0	RL1		Release tool
												31.9	AS		Arise
												2009.8			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION – LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION – RIGHT HAND
3940	Part, pick up and set down											29.0	S		Stoop
												2.0	G1A		Grasp one end
	U-MOHPP01											17.2	M5B10		Lift one end
									Grasp other end		G1A	2.0			
									Pull		APB	16.2	APB		
												31.9	A5		Lift part
												29.0	S		Stoop with part
												2.0	RL1		Release part
									Lower other end		M5B10	17.2			
									Release		RL1	2.0			
												31.9	A5		Arise
												160.4			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3942	Slide or push heavy object near and return (2 men) - elapsed time	.0210	.0111	.0710	5	.0142	1	.0142							
3944	Obtain hand box - replace											18.6	TBC1		Step to box
												29.0	B		Bend
												18.6	R20B		Reach
												2.0	G1A		Grasp handle
												34.0	M30B15		Move to edge of shelf
												5.6	G2		Regrasp handle
												39.2	M20A35		Move to floor
												2.0	RL1		Release
												31.9	AB		Arise
												18.6	TBC1		Step to box
												29.0	B		Bend
													R20B		Reach
												2.0	G1A		Grasp
												39.2	M20A35		Lift to shelf
												24.1	M16B15		Slide on shelf
												2.0	RL1		Release
												18.6	R20B		Reach for end
												0	G7		Grasp
												24.1	M16B15		Push in
												0	RL2		Release
												31.9	AB		Arise
												370.4			
3945	Obtain tool box from shelf and return											18.6	TBC1		Step to tool box
												29.0	B		Bend
												18.6	R20B		Reach
												2.0	G1A		Grasp
									Reach to end of box		(R20B)	27.0	M10B32		Move - pull toward edge of shelf
									Grasp edge		(G5)	5.6	G2		Regrasp handle
												28.6	M12B32		Move - pull off shelf
												5.6	G2		Regrasp handle
									Move to floor		M22B40	42.2	M22A40		Move to floor
									Release		RL2	2.0	RL1		Release
												31.9	AB		Arise
												18.6	TBC1		Step to tool box
												29.0	B		Bend
												18.6	R20B		Reach for handle
									Reach for box end - grasp			2.0	G1A		Grasp
											R20B				
											G5	18.6			
									Assist in lifting		(M22A30)	47.2	M22A50		Lift tool box, place on shelf edge
									Push		M10B16	19.9	M10B16		Slide box on shelf

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3945	(continued)											2.0	RL1		Release
												18.6	R20B		Reach for end
												0	G5		Grasp
									Push		M12B16	21.3	M12B16		Push in rest of way
											RL2		RL2		Release
												31.9	AB		Arise
												438.8			
3947	Move tools or material on job site	.0700	.0020	.3930	30	.0131	1.0	.0131							
3948	Put hose in pick up (per section)	.0071	.0043	.0114	2	.0057	1.11	.0063							
3949	Finish sand one square foot											10.6	AP2		Apply pressure
												966.0	M15B	64	Move block back and forth
												976.6			
3950	Pick up material or tools - set down after moving them											29.0	S		To material
												2.0	G1A		Grasp
									To material		R20B	18.6	M4B20		
									Grasp		G1A	2.0			
									Lift material		M20B20	29.6	M20B20		Lift material
									Regrasp material		G2	5.6	G2		Regrasp material
												31.9	AS		Arise with material
												37.2	TBC2		Turn to walk
															Walk to work site
															Walk back to material
												29.0	S		To set down
											RL1	2.0			
												8.4	M4B20		To set on floor
												5.6	G2		
												.0	RL1		
												31.9	AS		Arise from stoop
												18.6	TBC1		To walk
												251.4			
3952	Hand crank gas starter motor for diesel (cold starting)			.0330	1	.0330	1	.0330							

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RG.	LH	TMU	RH	RG	DESCRIPTION - RIGHT HAND
3953	Warm up diesel engine to rated operating temperature	.133	.035	.2877	4	.0719	1	.0719							
3954	Crawler crane travel - 300 yds.			.3410	1	.3410	1	.3410							
3955	Wait or test per 6 minutes								$\frac{6 \text{ minutes}}{60 \text{ min/hr}}$ = .1000 hrs.						
3959	Water, flush inside of equipment	.0341	.0206	.1400	5	.0280	1	.0280							
3960	Water, wash down inside of tank	.0279	.0130	.1125	5	.0225	1	.0225							
3961	Carpentry preparation on job site	.1922	.0030	1.2902	24	.0538	.64	.0342							
3962	Pre-planning per 8-hour day carpentry								Computation of planning associated with job preparation--observed during delay studies Allowance computed 1.47 Allowance established 1.43 $\frac{8.00}{1.43} - \frac{8.00}{1.47}$ = .15 hrs.						
3963	Move heavy machine from elevator to truck location and from truck location to job site or return										R10B	11.5	R10B		To handles
											G1A	2.0	G1A		Grasp handles
											AP1	32.4	AP1	2	To turn machine
												74.4	TBC2	2	Turn machine
												680.0	W40P0		To truck
											RL1	2.0	RL1		Release handles
											R6E	8.0	R6E		Hand aside
											R10B	11.5	R10B		To handles
											G1A	2.0	G1A		Grasp handles
											AP1	32.4	AP1	2	To turn machine
												74.4	TBC2	2	Turn machine
												680.0	W40P0		From truck
											RL1	2.0	RL1		Release handles
											R10E	10.2	R10E		Hands aside
												1623.1			
3964	Phone, dial for transportation after completion of job								For phone		R20B	18.6			
									Grasp phone		G1A	2.0			
									Phone to ear		M30C	30.7			
												22.1	M20C		Finger to dial
												22.4	P1SE	4	Position finger
												24.4	M4A	4	Dial number
												8.0	RFX	4	Lift finger
												100.0		4	Wait for dial
												15.6	M2C	3	Finger to dial

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	NUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RD.	LH	TMU	RH	RD.	DESCRIPTION - RIGHT HAND
3964	(continued)											833.4			Complete phone connection
												-	R20E		Hand aside
									Phone to receiver		M30C	30.7			
									Position phone		P1SSE	9.1			
									Release phone		RL1	2.0			
												1119.0			
3965	Remove or replace tarpaulin on material pile											45.0	W3P		To material pile
												29.0	B		Bend
												10.1	R5B		To weight on tarp.
												2.0	G1A		Grasp weight
												31.9	AB		Arise
												13.8	M5B10		Aside weight
												2.0	RL1		Release weight
												18.6	TBC1		Turn
												30.0	W2P		To 2nd weight
												29.0	B		Bend
									To second weight		R5B	10.1			
									Grasp weight		G1A	2.0			
												5.6	G3		To right hand
												21.4	M16B10		Aside weight
												2.0	RL1		Release
												31.9	AB		Arise
												30.0	W2P		To 3rd weight
												29.0	B		Bend
											R5B	10.1	R5B		To third weight
											G1A	2.0	G1A		Grasp weight
											M20B5	21.5	M20B5		Aside weight
											RL1	2.0	RL1		Release
												31.9	AB		Arise
												18.2	S814C1		For position
												29.0	B		Bend
									To corner of tarp.		R4B	6.4	R4B		To corner of tarp.
									Grasp corner		G1A	2.0	G1A		Grasp corner
												31.9	AB		Arise
											M10B15	19.9	M10B15		Fold tarp back
											RL1	2.0	RL1		Release
												18.6	TBC1		Body balance
												30.0	W2P		Walk
												18.2	S814C1		Position body
												29.0	B		Bend
									To corner tarp.		R4B	6.4	R4B		To corner of tarp.
									Grasp corner		G1A	2.0	G1A		Grasp corner
												31.9	AB		Arise
									Move tarp back		M10B20	22.3	M10B20		Move tarp back
												15.0	W1P		Walk
									Throw tarp aside		M10B20	22.3	M10B20		Throw tarp aside
											RL1	2.0	RL1		Release
											R20E	16.7	R20E		Hands aside
												734.7			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY: HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	METHODS ANALYSIS CHART: DESCRIPTION – LEFT HAND	RH.	LH	TMU	RH	RH.	DESCRIPTION – RIGHT HAND
3966	Tripod (with vise), set up to use										M14B30	30.2	(M12B20)		Position vise with legs down
	U-MYBTS01										RL1	2.0			
											R8B	10.1			
									Lower hand on vise		G1A	2.0	RL1		Release vise
												29.0	B		Bend
												12.9	R12B		Reach to leg of vise
											(G2)	7.3	G1C1		Grasp leg of vise
											AFB	32.4	AFB	2)	
												9.2	M2B	2)	
												11.2	G2	2)	
												58.4	M20A	2)	Open two legs of vise
												4.0	RL1	2)	Release leg of vise
												37.2	R20B	2)	Reach back to leg of
												4.0	G1A	2)	vise and grasp
									Release vise		RL1	2.0			
									Reach to vise leg		R6B	8.6			
									Grasp		G1A	2.0			
									Open 3rd leg		AFB	16.2			
											M22A	20.8			
									Release leg of vise		RL1	2.0	RL1		Release leg of vise
												31.9	AB		Arise
									Set up vise			313.4			
3967	Floor brush, clean											18.6	TBC1		Turn to brush handle
												30.0	W2P		Step to handle
												21.5	R24B		Reach to handle
												2.0	G1A		Grasp handle
									Reach for brush end of handle		(R14A)	20.2	M18B5		Lift floor brush toward body
									Grasp handle		(G1A)	5.6	G2		Regrasp
									Up-end brush		M40B5	34.3	M40B5		Up-end brush
									Regrasp handle		G2	5.6			
												2.0	RL1		Release handle
												15.8	R16B		Reach to nail brush
												2.0	G1A		Grasp nail brush
												20.6	M24B		Move nail brush to brush head
												5.6	G2		Regrasp nail brush
												348.0	M28C	12	Comb dirt out
												433.2	M28C10	12	of bristles

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	RD.	LH	TMU	RH	RD.	DESCRIPTION - RIGHT HAND
3967	(continued)											20.6	M24B		Move nail brush to shelf
												2.0	RL1		Release nail brush
												13.1	R20A		Reach to brush handle
												2.0	G1A		Grasp handle
									Release handle		RL1	2.0			
									Reach for lower grip on handle		R26A	15.8			
									Grasp handle		G1A	2.0			
									Move bristles to floor		M40B5	34.3	M40B5		Move bristles to floor
													B		Bend body
												5.6	G2		Regrasp handle
									Regrasp handle		G2	5.6			
												58.2	M6A	6	Strike brush
												63.6	AP1	6	Against floor
												80.6	M6B5	6	Lift brush off floor
									Release handle		RL1	31.9	AB		Arise bend
												30.0	W2P		Step to walk
												20.9	M18A5		Move brush to wall
												2.0	RL1		Release
												18.6	TBC1		Turn from wall
												1373.8			
3968	Verbal instructions get from supervisor	.1333	.0500	.9689	8	.1211	1.00	.1211							
3969	Dust mop; attach and remove treated cloth											90.0	W6P		Walk with cloth to dust mop
												18.6	TBC1		Turn to dust mop
									Reach to cloth		R14A	14.4	M14A		Move cloth to unfold
									Grasp		G1B	5.6	G2		Regrasp
									Unfold cloth		M14B	14.6	M14B		Unfold cloth
									Release cloth		RL1	2.0			
												30.0	W2P		Step to dust mop
									Reach to top of mop handle		R24B	21.5			
									Grasp mop handle		G1A	2.0			
												30.0	W2P		Step back
									Insert top of mop handle into sleeve		M12C	15.2	M12C		Insert open end of cloth sleeve over mop handle
												18.7	M16C		Pull center hole in sleeve over end of mop handle
												2.0	RL1		Release cloth
												11.4	R16A		Reach to top of mop handle
												2.0	G1A		Grasp handle
									Let go handle		RL1	2.0			
									Reach to sleeve		R16B	15.8			
									Get hold sleeve		G1A	2.0			
									Pull sleeve down over handle		M32B	25.5			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THU	RH	NO	DESCRIPTION - RIGHT HAND
3969	(continued)								Get hold handle		G1A	2.0			
												2.0	RL1		Let go top of handle
												17.5	R30A		Reach to center of handle
												2.0	G1A		Get hold handle
									Let go sleeve and handle		RL1	2.0			
									Reach for end of dust mop		R32B	29.0	B		Bend
									Get hold end of dust mop		G1A	2.0			
									Swing up against mop handle		M14A	14.4			
									Let go end of dust mop		RL1	2.0			
									Reach to sleeve		R20B	18.6			
									Get hold sleeve		G1A	2.0			
									Pull sleeve over dust mop		M38A	33.5			
									Let go sleeve		RL1	2.0			
												31.9	AB		Stand straight
												18.6	TBC1		Turn to wall
												60.0	W4P		Walk to wall
												17.6	M18A		Lean dust mop against wall
												2.0	RL1		Let go handle
												18.6	TBC1		Return to work area
												60.0	W4P		
												661.0			Total; attach cloth to dust mop
												661.0			Remove
												1322.0			Total; attach and remove
3970	Brush, mount and remove from floor polisher											21.5	R24B		Reach for brush
												2.0	G1A		Grasp
									Reach brush		R12A	25.9	M24A7.5		Move
									Grasp		G1A	2.0			
												20.0	ET		
												7.5	EF		
									Turn over brush			16.8	G2	3	Turn over brush
									Release brush		RL1	2.0			
												37.2	TBC2		Turn body to walk
												51.0	W3P0		To buffing machine
									Reach handle		R14B	14.4			
									Grasp		G1A	2.0			
									Tilt handle		M6A	29.0	B		
											RL1	14.3	LM12		
											R18B	18.9	M16B7 .5		
											G1A	7.7	M2C7.5		
											P18SD	14.7	P18SD		Position brush
											M5B7.5	10.7	M5B7.5		Tighten brush
											AP2	10.6	AP2		
											RL1	2.0	RL1		Release

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4001	Give check to stock clerk and obtain check after use from clerk								Move check to clerk		M20B	18.2			
												11.5	R10B		Clerk reaches
												5.6	G3		Clerk grasps
												60.0	W4P)		Clerk walks with
												37.2	TBC1)	2	used check
												18.2	M20B		Clerk moves check to opr.
									Reach for check		R10B	11.5			
									Grasp check		G3	5.6			
									Move to counter		M12B	13.4			
									Release		RL1	2.0			
												183.2			
4005	Dial supervisor on telephone											18.6	R20B		Reach for phone
												2.0	G1A		Grasp phone
												30.7	M30C		Move to ear
									Move finger to dial		M3OC	22.1			
									Position finger	3	P1SE	16.8			
									Dial number	3	W4A	18.3			
									Lift finger	3	R½E	6.0			
									Wait for dial	3		75.0			
									Move finger to dial	2	M½C	4.0			
												30.7	M30C		Move phone to hook
												9.1	P1SSE		Position phone in hook
												2.0	RL1		Release phone
												235.5			
4010	Place ground wire in place or remove											18.6	TBC1		Turn body
												15.0	W1P		Walk to wire
												29.0	B		Reach for wire
												7.3	G1C1		Grasp wire
												31.9	AB		Arise with wire
									Place groundwire			18.6	TBC1		Turn body
												150.0	W10P		Walk to work
												29.0	B		Lay wire on work
												2.0	RL1		Release wire
												31.9	AB		Arise
												333.3			
4011	Torch: Change tip (includes removing old tip and installing new tip)											90.0	W6P		Walk to & from torch tips box
									Reach to torch		R18B	17.2			
									Grasp torch		G1A	2.0			
									Move torch to work area		M16B	17.0	R10A		Reach to torch tip
												2.0	G1A		Grasp tip
												16.2	AP1		
												69.0	M2B	15	)
												30.0	RL1	15	) Screw off tip
												60.0	R2B	15	)
												30.0	G1A	15	)

SYNTHESIS

NO	OPERATION ELEMENT DESCRIPTION	HAND L	HAND R	TIME ELEMENT NUMBER	ELEMENT T.M	FREQUENCY	ELEMENT T.M	REMARKS
8034	Remove and reassemble, ball, roller, or sleeve bearing from shaft, and rotor or armature, wire brush, clean and inspect-motor						.1592	
1	Remove ball, roller or sleeve bearing from shaft or end shield			8013	.0231	2	.0462	Remove bearing
2	Inspect and check bearing before assembly			8052	.0079	2	.0158	Inspect both bearings
3	Carry rotor or armature to lathe, position in chuck, tighten chuck			2763	.0077	1	.0077	
4	Wire brush rotor or commutator while turning in lathe			864	.0100	1	.0100	
5	Adjust platform on hydraulic press to correct level			3507	.0031		.0031	
6	Carry components to cleaning booth, hydraulic press or test panel			2759	.0095	2	.0190	Carry components and return
7	Install bearing on shaft or to end shield on hydraulic press			8013	.0231	2	.0462	Install Bearings on each end of shaft
8	Inspect or check bearing assembly			2580	.0028	4	.0112	Inspect and check both bearings
8035	Take motor to test panel, prepare to test, test and reassemble						.2569	
1	Install screw to hold end shield			8000	.0089	8	.0712	Install 8 screws
2	Cut friction tape from motor leads			941	.0045	3	.0135	Cut tape on 3 leads
3	Strip end of motor lead			835	.0046	3	.0138	Strip 3 leads
4	Carry components to cleaning booth, hydraulic press or test panel			2759	.0095	2	.0190	To bench and return
5	Attach motor lead to test panel lead			830	.0014	3	.0042	Attach clips to 3 leads
6	Run motor, listen to bearings through steel rod at start or after run in period			845	.0135	2	.0300	Listen to bearing at start and running period
7	Attach test meter leads to motor leads and test for ground and short circuit			898	.0108	3	.0324	Attach to leads and check
8	Position cover plate to motor junction box			8005	.0010	1	.0020	
9	Install screw to hold cover plate			8000	.0089	2	.0178	Install 2 screws
10	Remove or reinstall armature brush			8010	.0131	4	.0524	Remove and reinstall set of brushes
8036	Skin end of wire (2 wires)						.0129	
1	Remove tool from belt kit and return			928	.0012	2	.0024	Knife and pliers used
2	Open and close knife			3174	.0011	1	.0011	
3	Skin end of wire			835	.0046	2	.0092	Skin 2 wire ends
8037	Pig tail splice - 2 wires						.0210	
1	Skin end of wires			8036	.0129	1	.0129	
2	Twist wires with pliers, per revolution			2657	.00105	7	.0074	Twist 7 revolutions
3	Cut off wire end			954	.0007	1	.0007	
8038	Tee type splice - 2 wires						.0174	
1	Skin end of wires			8036	.0129	1	.0129	
2	Position wires for splicing			955	.0005	1	.0005	
3	Twist wires by hand, per revolution			2656	.00932	4	.0931	Twist 4 revolutions
4	Bend twisted wire splice down			871	.0009	1	.0009	

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
4096	(continued)								Regrasp top of left loop		G2	5.6			
									Twist outward		T180°	9.4	T180°		Twist outwards forming 2 twists in loops
									Hold			4.0	RL1	2	
												14.0	R6A	2	Reach both loops
									(Repeat from Look)			4.0	G1A	2	
												31.6	M16B	2	Place on crane hook
												12.2	M10B		Draw up tight
												16.2	AP1		
												2.0	RL1		
												152.1			
4099	Move blind to finish table								To blind		R16B	15.8	R16B		To assembled blind
									Blind		G1A	2.0	G1A		Blind
									Off table		M10B	12.2	M10B		Off table
												37.2	TBC2		Away from table
												75.0	W5P		To end of table
												18.6	TBC1		Around corner
												45.0	W3P		To finish table
												37.2	TBC2		To table
									Blind on table		M18B	17.0	M18B		Blind on table
									On table		RL1	2.0	RL1		On table
												262.0			
4100	Set up 16 ft. extension ladder; adjust and take down ladder (2 men)	.0640	.0540	.1180	2	.0590	1	.0590							
4101	Mirror, clean per sq. ft.	.0016	.0009	.0075	6	.0013	1.00	.0013							
4104	Vise (bench), open and close (1/4 inch)											11.5	R10B		Reach to vise handle
												2.0	G1A		Grasp handle
												16.2	APB		Pull or push handle
	U-MVSVC01											58.4	M14B	4	Turn handle
												8.0	RL1	4	Release handle
												43.2	R14B	3	Reach to other end of handle
												6.0	G1A	3	Grasp handle
												11.5	R10B		Reach to vise handle
												2.0	G1A		Grasp handle
												16.2	APB		Pull or push handle
												58.4	M14B	4	Turn handle
												8.0	RL1	4	Release handle
												43.2	R14B	3	Reach to other end of handle
												6.0	G1A	3	Grasp handle
												290.6			
4105	Turn screw 360 degrees											6.0	MFB	3	Turn screw with fingers
												6.0	RL1	3	Let go screw

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4105	(continued)											6.0	RfB	3	To screw
												6.0	G1A	3	Grasp screw
												24.0			
4106	Move and set up 20' extension ladder - average move 26' (lamp spacing 20')											85.0	W5PO		Get into position
									Lower hand to ladder		R5B	17.2	R16B		Raise hand to grasp
									Grasp ladder low		G1A	2.0	G1A		Grasp ladder high
									Hold ladder		G2	5.6	G2		To pull ladder
												16.2	AP1		Pull ladder top out
												35.0	M20B30		Pull ladder up right
												34.0	W2PO		Back ladder upright
												17.4	M10B10		Pull ladder over
									To slip hands to center		G2	5.6	G2		To slip hands to center
												68.0	W4PO		Step to center of ladder
									Assist right hand		G2	5.6	G2		Grasp ladder to carry
									Assist right hand		M16B16	37.1	M16B40		Position ladder to carry
												170.0	W10PO		Carry ladder to fixture
									Hold			52.5	M30B50		Raise top of ladder
									Assist right hand		M10B40	31.9	M10B40		Raise entire ladder
												68.0	W4PO		Position ladder to fixture
									Assist right hand		M10B30	27.2	M10B30		Ladder to rest
									Same as right hand		RL1	2.0	RL1		Let go ladder
									Same as right hand		R10S	16.7	R20E		Hands to side
												697.0			
4107	Signal - give and recognize	.0010	.0006	.0041	5	.0008	1.0	.0008							
4108	Carry pail to and from, and turn faucet on and off											18.6	TBC1		Turn to bucket
												29.0	B		To bucket
												2.0	G1A		Grasp handle
												18.2	M20B		Lift
												31.9	AB		Arise
												18.6	TBC1		Turn to faucet
												450.0	W30P		Walk to faucet
												18.6	T5C1		Face faucet
												18.6	R20B		Reach to faucet
												8.0	G1A	4	
												32.4	AP1	2	
												16.8	M2B	4	Open and
												8.0	RL1	4	close faucet
												6.0	R2A	3	
												6.0	G1A	3	
												500.0	PT		Fill bucket
												31.9	AB		Arise with bucket
												18.6	TBC1		Turn from faucet
												450.0	W30P		Return to pail
												18.6	TBC1		Turn to pail
												29.0	B		Lower bucket
												2.0	RL1		Let go

ELE. MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL PHS FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	ND	LH	TMU	RH	ND	DESCRIPTION - RIGHT HAND
4123	Wipe machine table, vise, surface gage, or square								Reach to table		R16B	17.?			
									Lay hand on table		G5	0			
									Slide hand on table	6	M8B	63.6			
									To clean		RL?	0			
												80.8			
4124	Position part or fixture against stop (each stop)								Left hand may follow pattern of right hand			8.6	R6B		Reach to part
												2.0	G1A		Grasp part
												16.2	AP1		Move part
												6.1	M4A		Against stop
												2.0	RL1		Release part
												34.9			
4125	Pick up and lay aside medium part											14.4	R14B		Reach to part
									Left hand may Follow same Pattern as Right hand			2.0	G1A		Grasp
												13.8	M6B10		Move part
												5.6	G2		Regrasp
												17.4	M10B10		Move to fixture
												5.6	G2		Regrasp
												16.7	M9B10		Lay part aside
												2.0	RL1		
												77.5			
4126	Retighten vise by hand								Reach to handle		R24A	14.9	R24A		
											G1A	2.0	G1A		
									Tighten		M2B	4.6	M2B		
											AP2	10.6	AP2		
									Release		RL1	2.0	RL1		
												34.1			
4127	Measure, mark with pencil - using a pattern (per sign)											21.5	R24B		Reach to pencil
												2.0	G1A		Grasp pencil
												4.0	D1E		Remove pencil
												20.6	M24B		Move to work surface
												8.0	M4C	4	Move pencil for pre-positioning
												64.8	P2SE	4	Positioning of pencil
												40.2	M12B	3	Move to make mark
												9.2	M2B	2	Move to make mark
												25.5	M24C		Move pencil to pocket
												5.2	M2C		Move pencil into pocket
												16.0	P1NSD		Position clip
												2.0	RL1		Release
												219.0			
4128	Vise - close and open vise on object											18.6	R20B		Reach to handle
												2.0	G1A		Grasp handle
												4.0	R2B		Reach to handle to spin
									Close			.0	G5		Grasp handle
												56.5	M10A	5	Spin handle
												.0	RL2		Release

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4128	(continued)											2.0	G1A		Grasp handle
												16.2	AP1		Apply pressure to handle
												10.6	AP2		
												3.6	M2A		Tighten handle
												2.0	RL1		Release handle
												114.5			
									Open			18.6	R20B		Reach to handle
												2.0	G1A		Grasp handle
												16.2	AP1		Apply pressure
												10.6	AP2		
												4.6	M2B		Move into position to spin
												2.0	RL1		Release handle
												4.0	R2B		Reach to handle for spin
												.0	G5		Grasp handle for spin
												56.5	M10A	5	Spin handle
												.0	PL2		Contact release
												114.5			
									Close vise			114.5			
									Open vise			114.5			
												330.0			
4129	Adjust vise as necessary (open or close)											21.2	R8B	2	Turn handle
												4.0	PL1	2	Release handle
												10.1	R8B		Reach to handle
												2.0	G1A		Grasp
												16.2	AP1		Apply pressure
												53.5			
4130	Position small object (2 x 12 x $\frac{1}{2}$ plastic) between two wood blocks and place in 4" vise and remove from vise (per sign)								Reach to sign		R12B	12.9	R12B		Reach to first wood block
									Grasp		G1A	2.0	G1A		Grasp
									Similar to R.H.		M12C	15.2	M12C		Bring parts together
									Reach to 2nd block		R12B	12.9	(G2)		Regrasp
									Grasp		G1A	2.0			
									Place other block over plate		M12C	15.2			
									Transfer grasp		G3	5.6			
												16.2	AP1		Apply pressure to hold plate between blocks
												15.2	M12C		Move to vise
												9.1	P1SSE		Place books in vise prior to tightening
												2.0	RL1		Release
												12.9	R12B		Reach to blocks and sign in vise
												2.0	G1A		Grasp
									Reach to block and sign		(G12A)	12.9	M12A		Move to L.H.
												5.6	G3		Transfer to L.H.
												5.6	G2		Regrasp sign

ELE-MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
4130	(continued)								Set blocks down		R6B	8.6			
									Release		RL1	2.0			
												157.9			
4131	Position tool to work								L.H. same as R.H.		M18C10	26.5	M18C10		Move to part
										2	MfC10	12.2	MfC10	2	Move tool to point
											P2SD	21.8	P2SD		Position to point
											M6B5	11.6	M6B5		Straighten
												21.9	EF	3	Alig.
										2	MfC	4.0	MfC	2	
											G2	5.6	G2		Regrasp handles
												103.6			
4132	Caliper, use, spring inside caliper, dimension up to 8 inches											12.2	M10B		Move caliper to part
												4.9	M3A		Move one leg to dia. of bore
	U-BITCU01											6.7	M3C		Move other leg to bore
												21.6	P2SD		Position leg in bore
												2.9	M1B		Move calipers into bore
												5.6	G2		Regrasp caliper
												4.0	R2B		Reach to spring nut
												2.0	G1A		Grasp spring nut
												266.0	P2NSD	10	Feel for size
												12.0	MfC	6	
												12.0	RL1	6	
												10.0	RfB	5	Adjust calipers
												10.0	G1A	5	
												11.2	G2	2	Regrasp calipers
												6.0	MfC	3	Move calipers to end of bore
												5.7	D1D		Remove calipers from bore
												12.2	M10B		Move calipers from part
												405.2			
4133	Caliper, use, spring outside caliper, dimension up to 8 inches											12.2	M10B		Move caliper to part
												4.9	M3A		Move one leg to dia. of part
	U-BITCU07											6.7	M3C		Move other leg to dia.
												5.6	G2		Regrasp caliper
												4.0	R2B		Reach to spring nut
												2.0	G1A		Grasp spring nut
												266.0	P2NSD	10	Feel for size
												8.0	MfC	4	
												8.0	RL1	4	
												6.0	RfB	3	Adjust calipers
												6.0	G1A	3	
												11.2	G2	2	Regrasp calipers
												4.0	MfC	2	Remove calipers from part
												5.7	D1D		
												12.2	M10B		Move calipers from part
												362.5			

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4148	(continued)											27.0	M30B8		Let to floor
												2.0	RL1		Release
												31.9	AR		Arise
												277.9			
4149	Bar (claw), drive on spike with maul, each additional stroke										M10C5	16.7	M10C5		Hit claw bar with care
											P1SE	5.6	P1SE		Align maul
											M10B5	15.1	M10B5		Raise maul
	910-BTLBD02											37.2			
4150	Jack, place under rail and tighten, raise jack each additional stroke											16.2	M6A		Move up and down to tighten against
												16.2			
	910-MTLJP02														
4151	Spikes, distribute, per spike								910-MOHSD01 (16 spikes)			491.9/16 = 30.7 TMUs per spike			
	910-MOHSD02														
4152	Work, run on jointer											67	CT		Per foot
4153	Jointer, adjust to required table height, each additional adjustment of jointer											7.3	R14B	1/2	To move adjusting wheel
												1.0	G1A	1/2	If cut is not correct
												2.6	M2C	1/2	
												7.3	EF		
													M2C	1/2	
	667-MBUJA02											1.0	RL1	1/2	
												7.2	R14B	1/2	Back to board
												1.0	G1A	1/2	Check measurement
										1/2	M4C	4.0	M3C	1/2	
										1/2	P1SE	2.8			
											EF	7.3			
												41.5			
												x 2			
												83.0			