

Submittal Guide

May 2023

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Change Record

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I. **Introduction**

A. Purpose

To provide guidance to contractors on the desired format and required content of submittals referenced in Navy Crane Center procurement contracts.

B. Scope

This guide is applicable to all Navy Crane Center contracts, whether specifically invoked or not.

II. Description of Submittals

This section lists and describes each of items required to be submitted by the crane contractor.

For submittals that reference a NAVCRANECEN form, all forms can be found on the NAVCRANECEN website at https://ncc.navfac.navy.mil/ under the "Downloads" page.

A. Schedules, Status Reports, and RFIs

These documents are provided at various times during the contract period as the need arises. Schedules and Status Reports are typically required to be provided at the Post-Award meeting and monthly thereafter for the duration of the contract delivery order. Requests for Information (RFI) are required when needed. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Schedule with Milestones

The schedule with milestone submittal is the contractor's post-award schedule which captures the major events during design, fabrication, installation and testing of the crane. At a minimum, the schedule shall include:

- 1. Post Award Conference
- 2. First Design Package Submittal
- 3. Government Review of Design Package
- 4. Subsequent Design Package Submittal
- 5. Government Review of Design Package
- 6. Fabrication Initiation
- 7. Fabrication Completion
- 8. Pre-Installation Conference
- 9. Government-Witnessed Shop Test
- 10. Mobilization Start
- 11. Existing Crane Removal (if applicable)
- 12. New Crane Installation
- 13. Field Inspection & Acceptance Test
- 14. Crane Acceptance
- 15. Contract Completion Date
- 16. Receipt of Final Operation and Maintenance Manuals
- 17. Completion of Warranty

It is the contractor's responsibility to ensure that all required submittals are received in a timely fashion to support key milestone events. It is recommended that the contractor track the due dates of critical CDRLs (contracts data requirements list) on a submittal register that may be provided along with the project Milestone Schedule. Approval and/or acceptance of specific CDRLs are prerequisites to initiating key project milestones. Critical CDRL items that have caused project schedules to slip include, but are not limited to:

- 1. Final Stamped Drawings
- 2. Hook NDT Certification
- 3. Runway Rail Survey & Certification
- 4. Contractor Shop Test Procedure
- 5. Lift, Installation & Handling Plan
- 6. Accident Prevention Plan

Refer to Appendix A for a sample Schedule with Milestones.

ii. Monthly status report

The status report shall be in contractor's format. The first page of the report shall contain the following information:

- 1. Title/Project Description
- 2. Reporting Period
- 3. Contract Number
- 4. Name and Title of the Report Preparer
- 5. Security Classification (when required)
- 6. Distribution Statement

NCC recommends the report contain the following items, as applicable:

- 1. *Milestone/task status*. Include a brief statement of the overall project status, followed by the status of each milestone/task as defined by the contract. Address whether or not the project is on schedule; if not, describe the effort planned to meet the schedule. Provide explanation for schedule deviation(s) from previously submitted status report.
- 2. *Schedule*. Include updated schedule sheets or milestone charts identifying phase of task and percentage of completion of each task, technical instruction, or order. Identify key dates in any testing program and a description of tests performed and significant test results.
- 3. Design & Review. For designs in-process, provide estimated dates for design and drawing completion. For designs under review, indicate review level (100%, Final, Post-Final Back-check), and projected design approval date. List and briefly describe current Request(s) for Information (RFI).
- 4. Problems & Deficiencies. Describe outstanding problems existing as of

the previous status report, and their resolution status, indicating who has action to continue resolution. List new problem areas encountered or anticipated, their effect on the overall work effort/project, and steps being taken to remedy problem situations.

- 5. *Conference/Trip Outcomes*. Describe significant results of conferences, trips, or directives from the Contracting Officer's representatives. List all contract modifications issued.
- 6. *Other*. Provide any other information which may cause significant changes in the program schedule.
- 7. *Future plans*. Provide a summary of future progress, recommendations and proposals both for the next reporting period and for any long term plans.
- 8. *Appendices*. Attach appendices, where applicable, for tables, references, charts, or other descriptive material. Each appendix shall be identified and referenced in the appropriate area of the report.

The initial status report & schedule is due within 15 days of contract award. Submit subsequent monthly status report no later than the 1st of each month.

Refer to Appendix B for a sample Monthly Status Report.

iii. RFI Form

RFIs are used to document and respond to contractor inquires during the post award phase of an acquisition. An RFI form will be provided to the contractor to use as the official record in documenting contractor inquiries and NCC's responses for questions with an active procurement. Each RFI shall be a complete submittal that includes all information pertinent to the request or shall clearly reference the location of the information, if provided separately (e.g. in a recent/upcoming design submittal).

NCC's project manager is responsible for ensuring RFIs are processed in a timely manner.

NCC's lead engineer is responsible for evaluating any technical questions or recommendations from the contractor as compared to contractual requirements and the original scope of work.

NCC's contract specialist utilizes the completed RFI form to initiate a formal request for proposal when the RFI response requires a modification to the contract.

Refer to Appendix C for a sample of the NCC RFI Form.

B. **Drawings**

This section lists and describes drawings typically required to be submitted by the crane Contractor.

i. General Drawing Border with Title Block

All drawings must include a PE stamp as indicated in the example. Drawings submitted for review must follow the format described. Be sure to change drawing revision numbers to reflect the most current revision and to list a description of any changes in the revision blocks.

Refer to <u>Appendix D</u> for an example General Drawing Border with Title Block.

ii. General Arrangement Drawings

General arrangement drawings reflect the exact overall design and configuration of the crane and demonstrate proper interface with the facility/building and relation to other crane components, other cranes on the same rail system, and the lower rail system. These drawings show the layout of the crane, including all major components of the crane. These drawings show the plan view, front elevation view, side elevation view and trolley layout (if not included as product data) and typically include:

- 1. All dimensions specified in Appendix A of the specification, including:
 - a. Span of girder from centerline to centerline of runway rails
 - b. Hook height
 - c. Distance from top of rail to lowest obstruction point on ceiling
 - d. Distance from top of rail to floor
 - e. Hook approach on both ends of the girder (centerline hook to runway rail)
 - f. Runway hook approach (centerline hook to face of bumper).
 - g. Distance between main and auxiliary hook (if applicable)
 - h. Distance from top of pendant controller to floor.
 - i. Distance from each end of girder to nearest obstruction on each wall
 - j. Distance from top of trolley to lowest overhead obstruction
 - k. Distance from centerline of rail to nearest obstruction on each wall.
 - 1. Rail size
 - m. Mid-runway travel limits (if obstructions exist)
 - n. Hook depth below floor level (if pits exist)
 - o. Wheel spacing of bridge end trucks
 - p. Runway power conductor location and dimensions (if new)
- 2. A list of crane system descriptions from section 1.3 of the specification, including:
 - a. Total crane capacity
 - b. Main hoist capacity
 - c. Auxiliary hook capacity
 - d. Rated speeds of bridge, trolley and hoists
 - e. Minimum speeds of bridge, trolley and hoists
 - f. Maximum wheel load without impact
 - g. Voltage and full load amps
- 3. A list of weights of crane components, including:
 - a. Total crane weight

- b. Drive Girder
- c. Idle Girder
- d. Trolley/Hoist
- e. End Trucks
- f. Miscellaneous Equipment (e.g., Crosswalks and Girder Ties)

Refer to Appendix E for example General Arrangement Drawings.

iii. Electrical Drawings

Electrical drawings are the fundamental electrical submittal for cranes and reflect the exact design and configuration of the crane. These drawings show the layout of electrical equipment on the crane, including control panel enclosures, motors, brakes, limit switches, conduits, disconnects, and conductor systems. These drawings typically include:

- 1. A one line drawing showing wiring and connections between all electrical components and panels
- 2. Schematic representation of the control and power circuits of the crane. These schematics should show:
 - a. Conductor sizes, type, and temperature, including notification of the use of finely stranded conductors.
 - b. Type of overcurrent devices and the rating of the device. For adjustable circuit breakers, any adjustable settings for the breakers should be shown on the schematic. For fuses, the fuse type should be shown on the schematic.
 - c. Motor nameplate data, as specified by NFPA 70
 - d. A note or description for any special description of operation.
 - e. Labels for all components that correspond to the nameplates that will be on the crane.
 - f. Specific drive parameters which add clarity to the drawing and allows the schematic reader to verify functionality of the circuit.
 - g. A systematic approach to naming components and for displaying relay and contactor contacts and coils, such that all drawings are easily referenced.
 - h. Obvious connections between crane manufacturer's components and subcontractor component's (i.e. radio control systems, load monitoring systems, etc.), such that it is easy for the end user to navigate from the crane schematic to the component manufacturer's schematics
 - i. All optional equipment removed from the schematics and not shown on the schematics as "optional".
- 3. Drawings showing component placement for all equipment located in a control panel.
- 4. Drawings showing the controller to be used and the layout of the controls and ancillary devices on the controller

- 5. Drawing to show festoon, cable, and festoon car layout
- 6. A complete material list of all electrical components on the crane

Refer to Appendix F for example Electrical Drawings.

iv. Mechanical Drawings

Mechanical drawings are typically limited to the drive arrangements. These drawings show the layout of the particular drive components with basic dimensions in plan view, front elevation view, side elevation view and trolley layout if not included as product data. Identify and label individual drive components with the appropriate part number, including:

- 1. Travel Wheels: Including dimensions and assembly including wheel material, tread hardness, wheel to axle fit and cross section.
- 2. Sheaves: Provide dimensional and assembly for top and equalizer sheaves, including sheave groove hardness and cross section.
- 3. Hook and Hook Block: Provide dimensional and assembly including the block cross section and hook. If the hook is not a commercial product, a separate drawing for the hook shall be provided.
- 4. Drawings for any non-commercial products
- 5. Reeving Diagram
- 6. Coupling and brake drum installation including: locations, applicable shaft engagement, and bore and key details.
- 7. Lubrication information showing the location of lubrication points, type of lubricant to be used, quantity required and the frequency of lubrication.

Refer to Appendix G for example Mechanical Drawings.

v. Structural Drawings

Structural drawings are the fundamental structural submittal for cranes and reflect the exact design and configuration of the crane. These drawings show the layout of the crane, including all major components of the crane and fabrication welding and bolted connection details. These drawings typically include:

- 1. Girder fabrication drawings. These drawings include:
 - a. Dimensions of overall length of the girder
 - b. Overall span length of the girder
 - c. Location of full diaphragms
 - d. Location of short diaphragms
 - e. Location of stiffeners
 - f. Material list including grade and size of components used

- g. Connection details to the end trucks
- h. Location and connection of trolley end stops
- i. Installation requirements for structural bolted connections
- j. Weld details for all components
- k. Rail, rail clips, and rail splices
- 1. Lift points
- m. Fall protection anchorages (if applicable)
- n. Walkways, ladders and their connection to the girder
- 2. Bridge end truck fabrication drawings, if not included in product data. These drawings include:
 - a. Dimensions of overall length of the end truck
 - b. Wheel spacing
 - c. Material list including grade and size of components used
 - d. Location and connection of bridge bumpers
 - e. Installation requirements for structural bolted connections
 - f. Weld details for all components
 - g. Rail sweeps
 - h. Lift points
 - i. Fall protection anchorages (if applicable)
- 3. Trolley end truck fabrication drawings, if not included in product data. These drawings include:
 - a. Dimensions of overall length of the end truck
 - b. Material list including grade and size of components used
 - c. Location and connection of trolley bumpers
 - d. Installation requirements for structural bolted connections
 - e. Weld details for all components
 - f. Rail sweeps
 - g. Lift points (if applicable)
 - h. Fall protection anchorages (if applicable)
- 4. Trolley fabrication drawings, if not included in product data. These drawings include:
 - a. Dimensions of overall size of the trolley
 - b. Material list including grade and size of components used
 - c. Installation requirements for structural bolted connections
 - d. Weld details for all components
 - e. Lift points
 - f. Fall protection anchorages (if applicable)

Refer to Appendix H for example Structural Drawings.

vi. Control System and Network Drawings

Control System and Network Drawings shall at a minimum include:

- 1. Network diagram must show interconnection cabling, equipment locations, names, models, and IP addresses on network communications schematic for all PLC, RTU, Supervisory Controller, and other Network-Capable Devices.
- 2. Software block, flow, and ladder diagrams.

Refer to Appendix I for example Control System and Network Drawings.

C. **Product Data**

Product Data is typically required for all major standard commercial components (as defined by section 2.4 of the solicitation). Submission is preferred to be provided prior to crane fabrication and must be approved prior to shop test. Specific requirements for the timing of submission will be provided in the delivery order documentation.

Submit product data in bookmarked .pdf format. Mark up catalog cuts to clearly identify which components are being used on the crane and to which items these components apply. On the submitted catalog data, clearly identify any options and features that are utilized or that are necessary to meet the crane specification. The catalog cuts should be complete, such that the reviewer can easily tell what equipment is being supplied, how it meets the specification and how it relates to the drawings.

i. Electrical Product Data

Electrical product data is the manufacturer's catalog data for specific electrical components used on the crane. Typically electrical catalog information is required for:

- 1. Variable Frequency Drives Show drives used for each motion, show selections for reactors, show data logging equipment and dynamic braking resistors.
- 2. Motors Show all information required by NFPA 430.7, motor type, and any options that are selected.
- 3. Electrical Enclosures Show sizes and NEMA type of enclosures provided.
- 4. Runway Electrification and Collectors Show all components for runway electrification system, ampacity of electrification system and collectors, collectors are of the tandem type, power feed componentry and connection, collector to crane componentry and connection, and any specialty options for outdoor or other special environments.
- 5. Limit Switches Show both geared limit switches and weighted limit switches provided.

- 6. Bridge to Trolley Electrification Show all equipment used for electrification including festoon cables, festoon cars, junction boxes, power feed componentry and connections, collector shoe componentry and connection, etc.
- 7. Operator Controls Show controllers (pendant or radio) used on the crane, layout of controls, and options selected for controller. Show receiver information for radio controls systems.
- 8. Warning and Pilot Devices Include all information for key switches, pilot lights, push buttons, and other devices.
- 9. Disconnect Switches Provide current rating and fuses used for disconnect switches.

Refer to Appendix J for examples of electrical product data.

ii. Mechanical Product Data

Mechanical product data is the manufacturer's catalog data for specific components used on the crane. The majority of mechanical design is provided through catalog cuts. Typically catalog information is required for:

- 1. Hoists (if preassembled) If the hoist is a preassembled unit, bought as a commercial component, the product data must be included. Clearly mark the options to show compliance with the specification. Note: typically one or more options are required from the basic equipment to meet the specification.
- 2. Speed Reducers Indicate case material, size, reduction, efficiency rating, service factor, installation information and gear ratio.
- 3. Brakes Indicate model and sizing. Show specific torque values and setting criteria; include electrical, installation and maintenance information.
- 4. Bearings Show size, rating and housing information for bearings not internal to commercial components.
- 5. Couplings Show size selection and installation criteria.
- 6. Load Block and Hooks For commercial load blocks, show size selection.
- 7. Wheels and Sheaves
- 8. Wire Rope Show size selection, class construction, lay, classification, and minimum breaking force.

9. Load Indication Device (LID)

Refer to Appendix K for examples of Mechanical Product Data.

iii. Structural Product Data

Structural product data is the manufacturer's catalog data for specific components used on the crane. Typically structural catalog information is required for:

- 1. Bridge End Trucks including drive units
- 2. Trolley End Trucks including drive units
- 3. Patented track used for bridge girders or for runways of underrunning cranes
- 4. Bumpers including bumper compression and the resulting force based on the total kinetic energy absorbed.
- 5. Swing gates
- 6. Painting system (including completed NCC Form "Coating System Summary Form")

Refer to Appendix L for examples of Structural Product Data.

iv. Control System and Network Product Data

Ensure the following is provided in the product data for PLC, RTU, Supervisory Controller, or other network-capable (whether networked or not upon delivery) control devices as applicable:

- 1. Hardware list (Hardware list must include the following for each device):
 - a. Manufacturer
 - b. Model
 - c. Location
 - d. Key technical ratings (e.g. memory)
 - e. Serial number
 - f. MAC addresses
 - g. IP addresses
- 2. Software List (Software list must include the following for each device):
 - a. Manufacturer
 - b. Version/subversion
 - c. Location/device
 - d. Used network ports/protocols/services
- 3. List and discussion of all security features of Contractor hardware and software.

Refer to <u>Appendix M</u> for examples of Control System and Network Product Data.

D. Design Data

Design Data is typically required to be provided prior to crane fabrication and must be approved prior to shop test. Specific requirements for the timing of submission will be provided in the delivery order documentation.

These calculations shall be in compliance with the design requirements listed in the specification. Calculations should be complete such that the reviewer can easily tell values of input supplied, how it meets the specification, and how it relates to the calculations. Calculations should clearly state what the allowable design values are, what the calculated design values are and if the design meets the required design values. Submit calculations in bookmarked .pdf format.

i. Electrical Calculations

Electrical calculations are required to verify component section and for components which are not standard commercial products/assemblies. Electrical calculations are required for (as applicable):

- 1. Minimum required horsepower for each drive motor calculations shall be shown to use the following guidelines:
 - a. Shall be based on the formulae given in CMAA 70
 - b. Hoist motor sizing Kc factor shall not be less than 1.0.
 - c. Bridge and trolley drive motor calculations should use the "E" factor that is the published gear reducer efficiency rating. If the published reducer efficiency is not available, then 0.9 should be used for "E".
 - d. The bridge and trolley drive minimum acceleration time to rated speed shall be four and three seconds, respectively.
 - e. No calculations shall be required to be submitted for packaged hoists, however, packaged hoists must still meet the acceleration and deceleration requirements.
- 2. Overcurrent protection calculations shall include:
 - a. Citations for all applicable NEC articles, including, but not limited to 430.72, 450.3, and Section V of article 610
 - b. Sized according to NEC guidelines, and with protective device coordination in mind when choosing proper sizes
- 3. Conduit Fill Calculations shall be shown to use the following guidelines:
 - a. Data from each conduit run with wire type(s), size(s), and quantity of each, along with intended conduit size and type
 - b. Calculations may refer to either Chapter 9 of NFPA 70 or the wire manufacturer's data sheets when calculating conduit fill
 - c. NFPA 70 Chapter 9, Table 1 directs user of allowable cross sectional areas of conduit fill acceptable based on quantity of conductors in the respective conduit, such that 1 conductor may fill up to 53%, 2 conductors may fill up to 31%, and any application greater than 2 conductors is limited to 40% fill, all with respect to cross sectional area.

- 4. Protective device coordination study will include:
 - a. Characteristic curves of each protective device, plotted together with other applicable protective devices with respect to current over time
 - b. Devices are considered coordinated when no curves overlap. A specific example of an out-of-coordination design would be a hoist experiencing an overcurrent condition, but instead of its protective device opening, the upstream main breaker opens, effectively removing power from the entire crane before the hoist's breaker opens due to being out of coordination.
- 5. Lighting calculations (if required). These calculations shall include:
 - a. Arrangement of lights required to meet the lighting requirements requested in the specifications. A typical specification, for example, may ask that lighting be provided such that 40 foot- candles at a distance of three feet from the floor be provided.
 - b. An appropriate Light Loss Factor (LLF) shall be chosen to consider degradation of the light source over time to account for the accumulation of dust and dirt on the lamp, lenses, etc. through normal operation.
 - c. Attention to type of lighting required per the specification must be given. Typical installations requiring metal halide lamps, for example, must either be a thick-glass parabolic reflector lamp (PAR) or use type O lamps with fixtures that provide a containment barrier and are physically constructed such that *only* type O lamps may be used, to be in accordance with NEC article 430.130 (F)(5).

Refer to Appendix N for examples of Electrical Calculations.

ii. Mechanical Calculations

Mechanical calculations are only required for non-commercial, custom designed and built components. They may be specifically requested. Generally, the calculations below are required, as applicable:

- 1. Drum Design calculations to include:
 - a. Rope fleet angle for drum
 - Calculations that show the drum can withstand all combined loads, including crushing or buckling, bending, torsion and shear, with consideration for stress reversal and fatigue
 - c. Stress analysis for the drum shaft
- 2. Bearing Selection calculations applying to all bearings, hook thrust bearing and equalizer sheave bushing calculations shall include:
 - a. Calculations for L_{10} bearing life to show anti-friction bearings meet minimum life expectancy for the specified service class based on full rated speed as provided by CMAA 70, table 4.8.2-1
 - b. Calculation to show that bearing spacing meets CMAA 70 requirements in section 4.11.2 for applicable shafting configuration
 - c. Hook thrust bearing and equalizer sheave bushing require a simple

calculation to show the product ratings satisfy loading conditions

- 3. Shafting and Sheave Pin design calculations for normal operating condition. Impact shall not be included. Calculations shall include:
 - a. Static and fatigue stresses calculations for applicable shaft configurations in CMAA 70 section 4.11.4
 - b. Sheave pin design is considered shafting and requires stresses calculations
- 4. Load Bearing Support Member calculations shall show that the rated load stress does not exceed 20% of the average ultimate strength of the members' material.
- 5. Calculations verifying compliance with Section 4 of CMAA No.70 for any non-commercial items
- 6. Calculations verifying brake selections and settings
- 7. Calculations verifying coupling selections

Refer to Appendix O for examples of Mechanical Calculations.

iii. Structural Calculations

Structural calculations are required for components which are not standard commercial products/assemblies. Typically structural calculations are required for:

- 1. Verifying girder design. These calculations will follow CMAA 70 format and include:
 - a. Calculations of load cases to ensure allowable stresses are not exceeded for the load cases requested in the specification
 - b. Buckling analysis
 - c. Location and size of diaphragms and stiffeners
 - d. Required camber
 - e. Verification that girder proportions are not exceeded
 - f. Verification of weld sizes
 - g. Verification of bolted connection design
 - h. Calculations to ensure the maximum allowable wheel loading is not exceeded
- 2. Verifying bridge and trolley end truck and trolley design. These calculations will include:
 - a. Load cases to ensure allowable stresses are not exceeded for the load cases requested in the specification
 - b. Buckling analysis
 - c. Verification of weld sizes
 - d. Verification of bolted connection design

- 3. Verifying design of trolley and bridge bumpers and end stops in accordance with the specification.
- 4. Verifying shear and bending moment on the runway rail structure is not exceeded if wheel spacing is different than shown on crane information form.

Refer to Appendix P for examples of Structural Calculations.

E. Test Reports

NAVFAC P-307, Appendix E, paragraph 1.4 identifies the requirement for non-destructive testing of crane hooks in the Navy inventory. This submittal is required to support certification of Navy cranes. The details of submittal requirements are taken directly from NAVFAC P-307.

Test Reports are typically required to be provided prior and approved prior to shop test. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Hook Non-Destructive Test (NDT) Report

Reports for hook NDT performed shall meet the requirements of the solicitation.

Refer to Appendix Q for an example of the Hook Non-Destructive Test (NDT) Report.

F. Certificates

Certificates are letters from the contractor or vendor stating compliance with specification. Include contract number, job location, crane serial number and CDRL number on all certificates. Certificates must be signed by a responsible person.

Certificates are typically required to be provided and approved prior to shop test. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Wire Rope Certificate

The contractor shall provide the wire rope manufacturer's certification that the rope meets the published breaking force, or the actual breaking force of a sample taken from the reel and tested. Show the published breaking force on the wire rope certificate; the actual wire rope breaking force must meet or exceed the published value. Certification shall be traceable to the hoist, crane and reel.

Refer to Appendix R for an example of the Wire Rope Certificate.

ii. Crane Runway Rail Certificate & Survey

Navy Crane Center may provide a survey of the runway rail with the contract. The contractor shall provide a certificate stating that the existing runway is suitable for the new crane to operate without any restrictions. If the contractor does not find the existing runway rail to be suitable for the new crane, the contractor shall provide the Government with corrective

actions necessary for the new crane to operate without restriction and provide a list of restriction for crane operation on the existing runway.

For new under-running runways, the contractor shall provide a runway survey showing that the new runway has been aligned to meet the specification requirements. The survey shall be performed by a professional surveyor and shall include adequate detail in order to verify each of the alignment tolerances provided in the documents referenced by the specification.

Refer to Appendix T for an example of the Crane Runway Rail Certificate and Survey.

iii. Hazardous Material Certificate

The contractor shall certify that the crane contains no hazardous materials. This letter should specifically reference the hazardous materials listed in the specification.

Refer to Appendix U for an example of the Hazardous Material Certificate.

iv. Loss of Power Test Certificate

As part of the test, power will be cut to the crane system. The loss of power test certificate is a letter stating that loss of power will not have detrimental effects to the product.

Refer to Appendix V for an example of the Loss of Power Certificate.

v. Coupling Alignment Certificate

The Contractor shall submit coupling alignment data records with certification that the alignment of all shafting connected by means of flexible couplings are within the manufacturer's installation tolerances. The shaft alignments shall be made using laser alignment equipment. Barrel couplings may be aligned using lasers or the OEM recommended method. The data records shall be taken after the coupling's final installation. Coupling alignments shall be verified by the Contractor and witnessed by the Government after crane installation. Barrel coupling alignment data record(s) shall be submitted on the official NAVCRANECEN form titled "Drum Barrel Alignment Data Sheet" located on the NAVCRANECEN website. All other coupling alignment data record(s) shall be submitted on the official NAVCRANECEN form titled "Shaft/Coupling Alignment Record Form" located on the NAVCRANECEN website.

Refer to Appendix W for an example of the Coupling Alignment Certificate.

vi. Hook and Hook Nut Proof Test Certificate

Only applies to custom designed and non-ferrous hooks. The proof test shall be performed prior to the Hook NDT as required in Section E (i).

The Contractor shall submit certification that the hook and hook nut has been proof tested based on the rated capacity of the hoist it is installed on and satisfies the acceptance criteria of ASME B30.10.

Refer to Appendix X for an example of the Hook and Hook Nut Proof Test.

vii. Welding Certifications

The contractor shall provide a certificate stating that all welders, welding operators, weld inspector(s) and welding procedure (qualification) meet the requirements of AWS D 14.1 for all work performed in manufacturing the crane.

The contractor shall provide a separate certificate stating that all welders, welding operators, weld inspector(s), and welding procedure (qualification) meet the requirements of AWS D 1.1 for all work performed in installing/welding parts supporting the crane at/to building interfaces.

Note: More prescriptive welding certifications will be required for Special Purpose Service and ordnance handling cranes.

Refer to Appendix Y for an example of the Welding Certifications.

viii. Public Domain Software

The Contractor shall provide a declaration that public domain software (e.g., freeware, shareware) is not used in the system.

Refer to Appendix Z for an example of the Public Domain Software Certificate.

ix. Software and Services Certificate

The Contractor shall provide a certificate stating that all software and services not required for operation and/or maintenance of the product has been removed. If removal is not technically feasible, then disable software not required for the operation and/or maintenance of the product. Configure the product to allow the ability to re-enable ports and/or services if they are disabled by software. The removal of software or services shall not impede the primary function of the product. If software that is not required cannot be removed or disabled, document a specific explanation and provide risk mitigating recommendations and/or specific technical justification. The software/service to be removed and/or disabled shall include, but not be limited to:

- 1. Cameras
- 2. Games
- 3. Device drivers for product components not procured/delivered
- 4. Messaging services (e.g., email, instant messenger, peer-to-peer file sharing)
- 5. Source code
- 6. Software compilers in user workstations and servers
- 7. Software compilers for programming languages that are not used in the control system
- 8. Unused networking and communications protocols
- 9. Unused administrative utilities, diagnostics, network management, and system management functions
- 10. Backups of files, databases, and programs used only during system development
- 11. All unused data and configuration files
- 12. Remove and/or disable, through software, physical disconnection, or engineered barriers, all services and/or ports in the procured product not required for normal operation, emergency operations, or troubleshooting. This shall include communication ports and physical input/output ports (e.g., USB docking ports, video ports, and serial ports).

Refer to <u>Appendix AA</u> for an example of the Software and Services Certificate.

x. Hazardous Environment Certificates

As applicable for the environment, the following certificates may be required:

- 1. Contractor Hazardous Environment Certificate
 The Contractor shall provide a certificate stating the new crane and all
 associated components excluding the hoist are designed for operation in
 the hazardous environment specified.
- Hoist Manufacturer Hazardous Environment Certificate
 The Contractor shall provide a certificate from the hoist manufacturer stating that the hoist is designed for operation in the hazardous environment specified.

xi. Captivation Record

If required by the solicitation, the Crane Contractor shall provide a captivation record list with positive traceability and method of captivation for every fastener that was captivated. The captivation list shall be in the form of a table, clearly identify components, location, fastener size, type, quantity, and method of captivation. The person who performs the task shall sign and date at each entry of the fastener being captivated.

G. Manufacturer's Instructions

Manufacturer's Instructions are submittals typically provided in the lead-up to shop test and/or mobilization and provide instructions regarding the sequencing and

method of quality control testing and performance of work onsite. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Shop Test Procedure

The Contractor is required to develop and submit a shop test procedure that will demonstrate operation, performance, and safety of the crane. Appendix B of the solicitation typically provides the minimum requirements that the test procedure shall conform to.

ii. Crane Installation Plan

The crane installation plan should address all steps required for the removal of existing components and installation of the new crane. An installation plan shall include the following:

1. A drawing containing:

- a. Weight of each component to be lifted
- b. Location of the center of gravity of each component to be lifted
- c. Location of laydown area
- d. Shipping route to laydown area
- e. Location of each component prior to being lifted
- f. Location of each component in the installed position.
- g. Method of attachment for rigging gear to component to be lifted
- h. Required torques, if necessary
- i. Location of interferences
- j. Calculated tension force in lifting gear
- k. Overhead clearances between structure and rail (runway and bridge)
- 1. Overhead clearances between point sheave and overhead structure

2. A narrative of the lifting plan containing:

- a. Safety precautions
- b. Sequence of events
- c. Down rated capacity of forklift due to shifting of load center if applicable

3. Data Sheet of Lifting Equipment Used:

- a. Load charts for forklifts, tri-lifters, mobile cranes etc.
- b. Swivel Hoist Rings
- c. Hook Information
- d. Ground loading requirements

Refer to Appendix BB for an example of the Crane Installation Plan.

iii. Accident Prevention Plan (APP)

The Accident Prevention Plan should include descriptive information for each of the categories in the delivery order. Accident Prevention Plans and Safety plans shall be site specific and, as a minimum, meet the requirements of Appendix E of the solicitation. The plans shall be prepared, signed, approved, and concurred on by applicable contractor personnel. Please

attach documentation and certification for applicable categories.

Safety Plans shall describe specific requirements and/or procedures for the equipment being installed, inspected and/or maintained.

Procedures or requirements in a Corporate or Company Safety Program may be referenced in a Safety plan. If referenced, the procedures or requirements must be provided with the APP. Referencing a Corporate Safety Program or Manual as a Safety Plan is not site specific and is unacceptable.

Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans.

Using the EM 385-1-1 as a guide, plans may include but are not limited to:

- 1. Overview Background information, including:
 - a. Contractor Name
 - b. Contract Number
 - c. Project Name
 - d. Project #
 - e. Project Description
 - f. Brief Description of Work to be Performed
 - g. Project Location
 - h. Project Contacts, including the name, title, phone number and signature of the following:
 - i. The Plan Preparer (Qualified Person or Competent Person, such as the corporate safety staff person or QC)
 - ii. Plan Approval (Company/Corporate Officers authorized to obligate the company)
 - iii. Plan Concurrence (e.g., Chief of Operations, Corporate Chief of Safety, project manager or superintendent, project safety professional, project QC)
 - i. Responsibilities & Authorities
 - i. Statement of the employer's ultimate responsibility for the implementation of the SOH program
 - ii. Identification and accountability of personnel responsible for safety at both corporate and project level
 - iii. The names of Competent and/or Qualified Person(s) and proof of competency/qualification
 - iv. Requirements that no work shall be performed unless a designated competent person is present on the job site
 - v. Line of authority
 - vi. Policies and procedures regarding non-compliance with safety requirements (including disciplinary actions)
 - vii. Provide written company procedures for holding managers and supervisors accountable for safety

- 2. Description of Plan Implementation
- 3. Subcontractors & Suppliers shall provide procedures for coordinating SOH activities with other employers on the job site and contain the following:
 - a. Identification of subcontractors and suppliers
 - b. Safety responsibilities of subcontractors and suppliers
- 4. Description of Medical Support
 - a. On-site medical support
 - b. Off-site medical arrangements describing rescue and medical duties for those employees who are to perform them and the name(s) of onsite Contractor personnel trained in first aid and CPR Note: A minimum of two employees shall be certified in CPR and first-aid per shift/site.
- 5. Personal Protective Equipment
- 6. Safety and Health Policy
 - a. Provide a copy of the current corporate/company Safety and Health Policy statement, detailing the commitment to providing a safe and healthful workplace for all employees.
 - b. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.
- 7. Safety & Health Inspections
 - a. Specific assignment of responsibilities for a minimum daily job site safety and health inspection including:
 - i. Who will conduct the inspections
 - ii. Proof of inspector's training/qualifications (e.g., copy of license, state license/inspector number, documentation of training completion)
 - iii. Procedures for documentation, deficiency tracking system
 - iv. Follow-up procedures
 - b. Any external inspections/certifications that may be required (e.g., USCG, State/Local)
- 8. Procedure for Accident Reporting
 - a. The Contractor shall identify person(s) responsible for Accident Reporting, including Investigations, Reports, Logs, and Exposure data
 - b. The requirements for accident reporting and notification shall be listed in this section.
- 9. Training
 - a. Requirements for new-employee Safety and Occupational Health orientation training
 - b. Requirements for mandatory training and certifications applicable to the project (e.g., explosive actuated tools, confined space entry, crane operator, driver, vehicle operator, hazmat training, and PPE) and any requirements for periodic retraining/recertification
- 10. Equipment Inspection Records
- 11. Emergency Response Plans, including:
 - a. Emergency escape procedure and emergency escape route assignments including a predetermined assembly meeting area after

- an evacuation
- b. Emergency rescue procedures (e.g., for employees working at heights or in confined spaces)
- c. Rescue and medical duties for those employees who are to perform them
- d. The preferred means of reporting fires and other emergencies (e.g. location of phones at the job site, and the posting of emergency telephone numbers and reporting instructions for ambulance, physician, hospital, fire, and police).
- e. Sketch or map that will be posted at the job-site highlighting the route to the nearest medical facility and hospital
- f. Names and job titles of persons who can be contacted for further information of duties under the accident prevention plan
- g. Spill containment plant to contain and isolate the entire volume of a spilled hazardous substance
- h. Person-overboard plan for work over or immediately adjacent to water, including the wearing of U.S. Coast guard approved life jackets and the immediate availability of a skiff, and a person trained in operating it

12. Activity Hazard Analysis

- a. Project-specific hazards and controls shall be identified by an Activity Hazard Analysis (AHA) for each phase/activity of work that:
 - i. Identifies the work activity steps
 - ii. Identifies the potential hazards of each step
 - iii. Lists the measures for elimination or control of the hazards

13. Critical Lift Plan

- a. Installations utilizing critical lifts require a critical lift plan to ensure the safety of equipment and personnel. Critical lift plans shall be developed, reviewed and signed by all personnel involved in the lift and shall:
 - i. Specify the exact size and weight of the load to be lifted and all crane and rigging components which add to the weight
 - ii. Specify the manufacturer's maximum load limits for the entire range of the lift as listed in the load charts
 - iii. Specify the lift geometry and procedures, including:
 - 1. Crane position
 - 2. Center of gravity of the load
 - 3. Lift height
 - 4. Load radius
 - 5. Boom length and angle, for the entire range of the lift
 - iv. Designate the operator, lift supervisor and rigger and state their qualifications.
 - v. Include a rigging plan, which:
 - 1. Shows the lift points
 - 2. Describes rigging procedures and gear requirements
 - vi. Describe the ground condition and outrigger or crawler track requirements (and, if necessary, the design of mats) needed to

- achieve a level, stable foundation of sufficient bearing capacity for the lift.
- vii. Describe the operating base condition and any potential list (for floating cranes).
- viii. List of environmental conditions under which lift operations are to be stopped.
- ix. Specify the coordination and communication requirements for the lift operation.
- x. For tandem or tailing crane lifts, specify the make and model of the cranes, the line, boom, and swing speeds, and the requirements for an equalizer beam.
- xi. For lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.550 (g).

14. Hazard Communication Plan

- a. A written plan for protecting personnel and property during the transport, storage and use of hazardous materials which addresses:
 - i. Items required by 29 CFR 1926.59 (e)
 - ii. Emergency procedures for spill response and disposal of hazardous materials
 - iii. Hazardous Material Exclusions aside from those used in the contract, the materials listed in Appendix E of the solicitation are prohibited from the Government job-site or activity
 - iv. Yellow Plastic Exclusion Yellow packaging materials are used by activities to contain and/or identify material, and therefore are not permitted for use by contractors on the naval activity, to prevent potential incident.
 - v. Spills Construction equipment shall have adequate oil absorbent material staged at the crane to contain a hydraulic component/system failure/leak. Contractors are responsible to clean up non-emergency oil and hazardous substance spills from their equipment.
 - vi. Labeling system to identify contents on all containers on-site
 - vii. Current inventory of hazardous chemical on site.
 - viii. Location and use of Safety Data Sheets (SDSs):
 - 1. SDS for each hazardous substance at the Government job site will be maintained in an inventory, provided to the Contracting Officer, and made available to all potentially exposed employees.
 - 2. For emergency response purposes, each entry in the inventory shall include the approximate quantities that will be on site at any given time.
 - 3. A site map will be attached to the inventory showing where inventoried hazardous substances are stored.
 - 4. The inventory and the site map shall be updated as frequently as necessary to ensure accuracy.
 - ix. Training (to include potential safety and health effects from exposure to hazardous substances)
 - x. Notification process when hazardous substances are brought onto

the Government job site and that all employees potentially exposed to the substance will be advised of information in the SDS for the substance.

15. Hazardous Energy Control Plan

- a. An OSHA compliant Energy Control Program provides the procedures and methods for the control of hazardous energy during the installation, maintenance, and inspection of all equipment where the unexpected energization or movement of this machinery could result in a release of energy which might cause injury to personnel and/or property damage.
- b. A hazardous energy control plan should describe:
 - i. Specific energy control requirements
 - ii. Lock-out/tag-out procedures
- c. The contractor should comply with 29 CFR 1910.147 and 29 CFR 1910.333 when on activity property. The contractor may use OSHA standard STD 1-7.3 as a guide to follow in the control of hazardous energy when on the job-site.
- d. The contractor should use the colors designated by the activity for the "locks" used in lock-out/tag-out for the respective energy sources when on activity property.
- e. Lock-out/tag-out tags are "danger tags" and should comply with the colors required by 29 CRF 1926.200(b)

16. Fall Protection and Prevention Plan

- a. Description of the fall hazards at the job site
- b. Type of fall protection/prevention methods or systems to be used
- c. Training requirements for employees exposed to fall hazards
- d. Type of fall protection equipment and systems provided to the employees that might be exposed to fall hazards
- e. Identify the tie-off points (anchorages) to be used for attachment of personal fall arrest equipment that are capable of supporting at least 5,000 pounds per employee attached, or have been designed, installed, and used as follows:
 - i. As part of a complete personal fall arrest system which maintains a safety factor of at least two
 - ii. Under the supervision of a Qualified Person (as defined in Appendix E of the solicitation)
- f. If there is a need to devise an anchor point from existing structures such as beams, or eye-bolt, a qualified person should be used to evaluate the anchorages.

17. Fire Protection & Prevention Plan

- a. Must cover items described in NFPA 241, including fire prevention during hot work
- b. Should state that welding, burning, and open flame work will only be performed on the Government job-site when:
 - i. The methods have been approved by the activity (cognizant Safety Office) where the job-site is located
 - ii. The activity where the job-site is located has been notified that hot work is going to be performed, when it is going to be

- performed, and the number of days needed
- iii. A fire watch is provided by the contractor
- iv. An adequate fire extinguishing equipment is available
- v. Fuel bottles are placed by the contractor at ground level and outside of the hot work area
- c. Severe Weather Plan
- d. Lists procedures to follow during severe weather; must state:
 - i. Cranes shall not be operated when wind speeds at the top of the crane approach maximum wind velocity recommendations of the manufacturer
 - ii. Operations undertaken during weather conditions that produce icing of the crane structure or reduced visibility shall be performed at reduced functional speeds and with signaling means appropriate to the situation
 - iii. When conditions are such that lightning could occur, all crane operations shall cease

18. Emergency Lighting Plan

- a. Emergency lighting facilities for means of egress are described in NFPA 101-2000 Life Safety Code
- b. Emergency illumination is typically required for not less than 1-1/2 hours in the event of failure of normal lighting
- c. Emergency lighting facilities must provide initial illumination that is not less than an average of 1 ft.-candle (10 lux) and, at any point, not less than 0.1 ft.-candle (1 lux), measured along the path of egress at floor level.
- d. If the on-site work is being performed in a building that has emergency lighting facilities that provides adequate illumination of the egress routes from the contractor work areas during a power failure, then the building's emergency lighting plan may be used for this submission.

19. Work Site Lighting Plan

- a. Absolute minimum illuminances at any time and location where safety is related to visibility are described in IESNA Lighting RR- 96
- b. Plan should assure that adequate illumination is provided in work areas within a crane, within a building, and during nighttime operations

20. Drug & Alcohol Prevention Plan

- a. A drug and alcohol prevention plan shall prohibit, for employees on the job-site:
 - i. Illegal drug use
 - ii. Consumption of alcohol
 - iii. Use of prescription drugs that have adverse side effects that may affect workplace safety

21. Site Sanitation Plan

- a. Plan shall describe the provisions for:
 - i. Supplying adequate drinking water
 - ii. Supplying toilet facilities
 - iii. Supplying washing facilities and waste disposal
 - iv. Steps taken to ensure all debris is kept clear from work areas,

passageways and stairs, in and around work structures

- 22. Mobile Cranes & Articulating Boom Cranes (if this equipment is being used)
 - a. Plan must comply with ASME B30.5 for mobile cranes; ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, or ASME B30.8 for floating cranes
 - b. For mobile cranes with original equipment manufacturer's (OEM) rated capacities of 50,000 pounds or greater, the crane operator needs to be designated as qualified by a source that qualifies crane operators. The contractor shall provide to the Contracting Officer proof of current qualifications as per contract data requirements list (CDRL) "Crane Operator's Qualification" contained in the contract.
 - c. In addition to meeting the requirements of 29 CFR 1926, the plan shall indicate that mobile cranes be equipped with:
 - i. An anti-two-block device or a two-block damage prevention feature for all points of two-blocking
 - ii. A boom angle indicator or radius indicator readable from the operator's station
 - iii. A boom hoist disconnect, shutoff, or hydraulic relief to automatically stop the boom hoist when the boom reaches a predetermined high angle
 - iv. For telescoping booms:
 - 1. Boom length indicator readable from the operator's station
 - 2. Integrally mounted holding device provided with the telescopic hydraulic cylinder(s) to prevent uncontrolled retraction of the boom during a hydraulic system failure
 - 3. An integrally mounted holding device provided with boom support hydraulic cylinder(s) to prevent <u>lowering</u> of the boom in the event of a hydraulic system failure
 - v. For night operations, lighting shall be adequate to illuminate the working areas while not interfering with the operator's vision.
 - vi. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. The practice of "Christmas tree lifting" steel is prohibited. Long slender objects shall be rigged to be lifted horizontally using two independent choker or eyebolt type pick-up points in such a fashion that the load cannot slide or otherwise become detached, taking into account the sling angle to the load in determining sling loadings.
 - vii. Piers and waterfront areas such as along dry docks and quay walls may have load restrictions
 - 1. Notify the Contracting Officer prior to moving a crane onto a pier, dry dock, or other waterfront area. Provide the Contracting Officer with the crane make, model, and configuration in which it is to be used.
 - 2. The contractor shall comply with cribbing requirements issued with the contract.
 - 3. Fueling and equipment maintenance is prohibited on piers

and other over water sites.

23. Jacking Operations Plan (if applicable)

- a. Jacking operations shall be designed and planned by a registered professional engineer who has experience in jacking systems.
- b. Plan shall include detailed instructions and sketches indicating the prescribed method of erection or disassembly.
- c. Plan shall include provisions for ensuring lateral stability of the ground or pier area during the lifting of the crane onto the crane rails.
- d. A jacking operations plan should discuss the following:
 - i. Jacks/lifting units shall be marked to indicate their rated capacity as established by the manufacturer. The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.
 - ii. Jacks/lifting units shall not be loaded beyond their rated capacity as established by the manufacturer.
 - iii. The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load. Jacking equipment shall be capable of supporting at least two and one-half times the load being lifted during jacking operations and the equipment shall not be overloaded. For the purpose of this provision, jacking equipment includes any load bearing component, which is used to carry out the lifting operation(s).
 - iv. Equipment shall be designed and installed so that the lifting rods cannot slip out of position or the contractor shall institute other measures, such as the use of locking or blocking devices, which will provide positive connection between the lifting rods and attachments and will prevent components from disengaging during lifting operations. In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.
 - v. Jacks/lifting units shall have a safety device installed which will cause the jacks/lifting units to support the load in any position in the event any jack lifting unit malfunctions or loses its lifting ability.
 - vi. Jacking operations shall be synchronized in such a manner to ensure even and uniform lifting of the load. During lifting, all points at which the load is supported shall be kept within tolerance of that needed to maintain the load in a level position. The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.
 - vii. If a leveling is automatically controlled, a device shall be installed that will stop the operation when the specified tolerance set forth in paragraph (vi.) above is exceeded or where there is a malfunction in the jacking (lifting) system.
 - viii. If leveling is maintained by manual controls, such controls shall be located in a central location and attended by a competent

person while lifting is in progress. The competent person must be experienced in the lifting operation and with the lifting equipment being used. A "competent person" is defined as one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

- ix. After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.
- x. The maximum number of annually controlled jacks/lifting units on the load shall be limited to a number that will permit the operator to maintain the load level within specified tolerances of paragraph (vi.) above, but in no case shall that number exceed fourteen.
- xi. Under no circumstances, shall any employee who is not essential to the jacking operation be permitted immediately beneath the load while it is being lifted.
- xii. Jacks/lifting units shall be positively secured so that they do not become dislodged or dislocated.
- xiii. Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:
 - 1. For constant intermittent use: once every 6 months
 - 2. For jacks sent out of shop for special work: when sent out and returned
 - 3. For a jack subjected to abnormal load or shock: immediately before and immediately thereafter
- xiv. Repair or replacement parts shall be examined for possible defects.
- xv. Jacks, which are out-of-order, shall be tagged accordingly, and shall not be used until repairs are made.
- xvi. All jacks shall be properly lubricated at regular intervals.
- xvii.Hydraulic jacks exposed to freezing temperatures shall be supplied with adequate antifreeze liquid.
- 24. Asbestos Hazard Abatement Procedure (if applicable)
 - a. Plan must be in accordance with 29 CFR 1926.1101
 - b. Plan shall include, but is not limited to:
 - i. Safety precautions
 - ii. Confined space entry procedures
 - iii. Encapsulation and removal procedures
 - iv. The precise personal protective equipment to be used
 - v. Location of the asbestos control areas
 - vi. Sequencing of asbestos related work
 - vii. Disposal plan
 - viii. Type of wetting agent and asbestos sealer to be used
 - ix. Locations of local exhaust equipment
 - x. Planned air monitoring strategies

- xi. Detailed description of environmental pollution control method
- xii. Special safety precautions that must be taken if any part of the building is occupied (if applicable)
- xiii. Signed certificates that employees performing removal:
 - 1. Have received training in the proper handling of asbestoscontaining materials and wastes
 - 2. Understand the health implications and risks involved
 - 3. Understand the use and limits of respiratory equipment to be used
- xiv. Information on each testing laboratory selected for sampling, analysis, and reporting of airborne concentrations of asbestos fibers, including:
 - 1. Name, address, telephone number
 - 2. Certification of American Industrial Hygiene Association (AIHA) accreditation
 - Certification that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry
 - 4. Certification that the laboratory successfully participates in the Proficiency Analytical Testing Program
- xv. Written evidence that the landfill for disposal is approved for asbestos disposal by EPA State and local regulations
- xvi. Statement that the contractor will comply with all applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing or asbestos waste materials
- 25. Material Containing Lead Removal Plan (if applicable)
 - a. Plan should show that disposal of material containing lead is in accordance with Federal and local hazardous waste management regulations; plan shall include (but is not limited to):
 - i. Sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system
 - ii. Description of equipment and materials, the appropriate engineering controls implemented, and job responsibilities for each activity such as cutting, sawing, sanding, scraping, abrasive blasting, and/or high temperature cutting of materials containing lead paint from which lead is emitted
 - iii. Eating, drinking, smoking and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not reached or exceeded outside of the lead control area
 - iv. Operational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of

- sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan
- v. Certificate for each employee, signed and dated by the accredited training provider, stating that each employee has received the required training in accordance with 40 CFR 745
- vi. The name, address, and telephone number of the testing laboratory selected to perform the air and wipe sampling, testing, and reporting of airborne concentrations of lead (use a laboratory participating in the EPA National Lead Laboratory Accreditation Program)
- vii. Description of the disposal of all material, whether hazardous or non-hazardous in accordance with all laws and provisions and all Federal, State or local regulations

Additional plans that may be contained in the APP include:

- 1. Layout Plans
- 2. Access and Haul Road Plan
- 3. Respiratory Protection Plan
- 4. Health Hazard Control Program
- 5. Process Safety Management Plan
- 6. Radiation Safety Program
- 7. Abrasive Blasting
- 8. Night Operations Lighting Plan
- 9. Wild Land Fire Management Plan
- 10. Float Plan
- 11. Demolition Plan
- 12. Excavation/Trenching Plan
- 13. Emergency Rescue (tunneling)
- 14. Underground Construction Fire Prevention and Protection Plan
- 15. Compressed Air Plan
- 16. Formwork and Shoring Erection and Removal Plans
- 17. Pre-Cast Concrete Plan
- 18. Lift Slab Plans
- 19. Steel Erection Plan
- 20. Site Safety and Health Plan for HTRW work
- 21. Blasting Safety Plan
- 22. Diving plan
- 23. Confined Space Program.

Please refer to Appendix E of the solicitation for clarification of any requirements or definitions.

Refer to <u>Appendix CC</u> for examples of certain items required to be in the Accident Prevention Plan.

iv. Training Course Outline

The contractor shall prepare a training course outline. The outline shall contain enough detail for the Government to determine that all topics are

adequately covered as prescribed in the specification.

Refer to Appendix DD for an example of the Training Course Outline.

H. Manufacturer's Field Reports

Manufacturer's Field Reports are typically required to be provided and accepted prior to crane installation. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Brake Adjustment Record

The Contractor shall provide a brake adjustment record and installation/maintenance manuals for each brake on the crane. The brake adjustment record shall be submitted on the applicable brake record form located on the NAVCRANECEN website. Each brake measurement shall have a tolerance traceable to the associated brake manual or documentation provided by the brake manufacturer, location of measurements, and the actual brake setting.

Refer to Appendix EE for an example of the Brake Adjustment Report.

ii. Shop Test Deficient Items List

Upon completion of the Government witnessed shop test and inspection of the crane, a list of deficient items will be compiled. The Contractor is typically required to complete the Type of Rework and Resolution blocks as shown in the Updated Deficient Items List in Appendix FF.

Refer to <u>Appendix FF</u> for an example of the Shop Test Deficient Items List and an Updated Deficient Items List.

iii. Field Test Record

The Contractor shall follow the test procedure found in Appendix C of the solicitation that will demonstrate operation, capacity, and safety of the cranes. Any deviations to the field test required by the Contractor must be approved by the Contracting Officer. Upon successful completion of all testing, the Contractor shall submit records of all test data for each crane.

iv. **Operation and Maintenance Data**

The operation and maintenance manuals shall include a table of contents for operation instruction, preventive maintenance, parts information, drawing list, supply list, catalog cuts, photographs, and calculations. The body of the technical manuals shall include the following: contractor's detailed written procedures, operation instructions, preventive maintenance information, drawings, parts information, supplies needed, catalog cuts, photographs, and calculations. Maintenance information shall include recommended maintenance procedures and manufacturer's installation and maintenance manuals (for purchased components) and lubrication instructions. Operation information shall include detailed crane operating and safety instructions.

Parts information shall include all information on all contractor-designed parts, all purchased sub-assemblies and components including the manufacturer's part number. The information shall be broken-out to the smallest replacement part. Within these sections the following information shall also be included:

- 1. Maintenance and programming instructions for the drives
- 2. Maintenance instructions including maintenance, alignment, adjustment, and calibration instructions for commercial components and parts lists
- 3. Operating instructions and special precautions for starting/stopping, operation, and safety
- 4. Preventive maintenance instructions including location of lubrication points, type of lubricant to be used, and the frequency of lubrication, which shall agree with the lubrication drawing provided
- 5. Recommended spare parts list
- 6. A complete listing of all control system parameters with an explanation of their functions
- 7. Control system and network drawings and product data shall be included in the operation and maintenance manual

Refer to Appendix GG for an example of Operation and Maintenance Data.

I. Closeout Submittals

Closeout submittals are requested following crane acceptance, generally as part of the final technical manuals. They are typically required to be provided and accepted prior to final payment. Specific requirements for the timing of submission will be provided in the delivery order documentation.

i. Control System Parameter Record

After the crane has passed the final field test, the contractor shall complete a control system parameter record for the crane and provide the crane parameter file downloaded from the crane at time of acceptance, if applicable. The record shall include the contract number, contractor's name and address, date, and all control system parameters and their final settings. The contractor shall designate each control system parameter as either used or unused.

Refer to <u>Appendix HH</u> for an example of the Control System Parameter Record.

ii. List of Parameters and Crane OEM's Approved Crane Range

After the crane has passed the final field test, the contractor shall submit a parameter list for each electronic drive to document the crane designed parameter ranges in which each parameter can be safely tuned by the end

user for each parameter specified in the parameter list used on the crane. The crane contractor-determined design range shall be the applicable portion of the drive's default range for each parameter. The crane contractor must provide justification for each range of each parameter on the list. When necessary, the justification shall include appropriate calculations.

Refer to <u>Appendix II</u> for an example of the List of Parameters and Crane OEM's Approved Crane Range.

iii. Frequency Allocation Application

The technical section of the frequency allocation application (DD Form 1494), addressing the Contractor's equipment, shall be completed by the manufacturer of the radio control equipment being furnished. DD Form 1494, the "Application for Equipment Frequency Allocation", is located on the NAVCRANECEN website.

Refer to <u>Appendix JJ</u> for an example of the Frequency Allocation Application.

iv. Disabled Ports, Connectors, and Interfaces

Provide disclosure of any known methods for bypassing computer authentication in the product, often referred to as backdoors, and provide written documentation that all such backdoors created have been permanently deleted from the system.

Provide summary documentation of the procured product's security features and security-focused instructions on product maintenance, support, and reconfiguration of default settings.

Provide documentation showing all disabled ports, connectors, and interfaces for all network-capable devices.

Refer to <u>Appendix KK</u> for an example of the Disabled Ports, Connectors, and Interfaces.

v. Network-Capable Devices

For every PLC, RTU, Supervisory Controller, or other network-capable (whether networked or not upon delivery) control device, deliver the following on CD/DVD:

- 1. Original firmware
- 2. Original firmware hash
- 3. SOP for application of firmware updates/patches
- 4. POC or website for firmware updates/patches
- 5. Count of interfaces and types
- 6. Protocols in use, per interface
- 7. Configuration file
- 8. SOP for configuration after the crane has passed the final field test, the contractor shall submit a parameter list for each electronic drive to document the crane designed parameter ranges in which each parameter can be safely tuned by the end user for each parameter specified in the parameter list used on the crane. The crane contractor-determined design range shall be the applicable portion of the drive's default range for each parameter. The crane contractor must provide justification for each range of each parameter on the list. When necessary, the justification shall include appropriate calculations.

Refer to Appendix KK for an example of the Network Capable Devices.

vi. Engineering Workstation

Deliver on CD/DVD the following:

- 1. SOP for application of software updates/patches
- 2. POC or website for software updates/patches including vendor provided software
- 3. Protocols in use, per interface
- 4. SOP for configuration
- 5. PLC programming interface software and licensing
- 6. Any other compatible software and licenses to allow crane software/firmware to be troubleshot, checked and upgraded, and for the data recorder to be accessed and information retrieved

Refer to Appendix KK for an example of the Engineering Workstation.

vii. Control System Access and Control

The Contractor shall document options for defining access and security permissions, user accounts, and applications with associated roles.

Refer to Appendix KK for an example of the Control System Access and Control.

viii. Control System Account Management

The Contractor shall document all accounts (including, but not limited to, generic and/or default) that need to be active for proper operation of the procured product.

Refer to <u>Appendix KK</u> for an example of the Control System Account Management.

ix. Patch Management and Updates

The Contractor shall provide documentation of its patch management program and update process (including third-party hardware, software, and firmware). This documentation shall include resources and technical capabilities to sustain this program and process.

This includes the Contractor's method or recommendation for how the integrity of the patch is validated by the Acquirer. This documentation shall also include the Supplier's approach and capability to remediate newly reported zero-day vulnerabilities.

Refer to <u>Appendix KK</u> for an example of the Patch Management and Updates.

x. Malware Detection and Protection

The Contractor shall provide, or specify how to implement, the capability to automatically scan any removable media that is introduced to the product being acquired.

Refer to Appendix KK for an example of Malware Detection and Protection.

xi. Wireless Technology Provisions

The Contractor shall document:

- 1. Specific protocols and other detailed information required for wireless devices to communicate with the control network, including other wireless equipment that can communicate with the Contractor-supplied devices
- 2. Use, capabilities, and limits for the wireless devices
- 3. Power and frequency requirements of the wireless devices (e.g., microwave devices meet the frequency requirements of Generic Requirements [GR]-63 Network Equipment Building System [NEBS] and GR-1089)
- 4. Range of the wireless devices and verify that the range of communications is minimized to both meet the needs of the Acquirer's proposed deployment and reduce the possibility of signal interception from outside the designated security perimeter
- 5. Wireless technology and associated devices compliance with standard operational and security requirements specified in applicable wireless standard(s) or specification(s) (e.g., applicable IEEE standards, such as 802.11)
- 6. Configuration control options that enable varying of the security level of the devices. The technical section of the frequency allocation application attached as Appendix JJ, addressing their equipment, shall be completed by the manufacturer of the radio control equipment being furnished under this contract.

Refer to Appendix KK for an example of Wireless Technology Provisions.

xii. Control System Inventory

The Contractor shall provide an inventory of all network-capable and microprocessor control devices in accordance with Appendix LL.

Refer to Appendix LL for an example of the Control System Inventory.

xiii. Evaluation Status of Hardware and Software

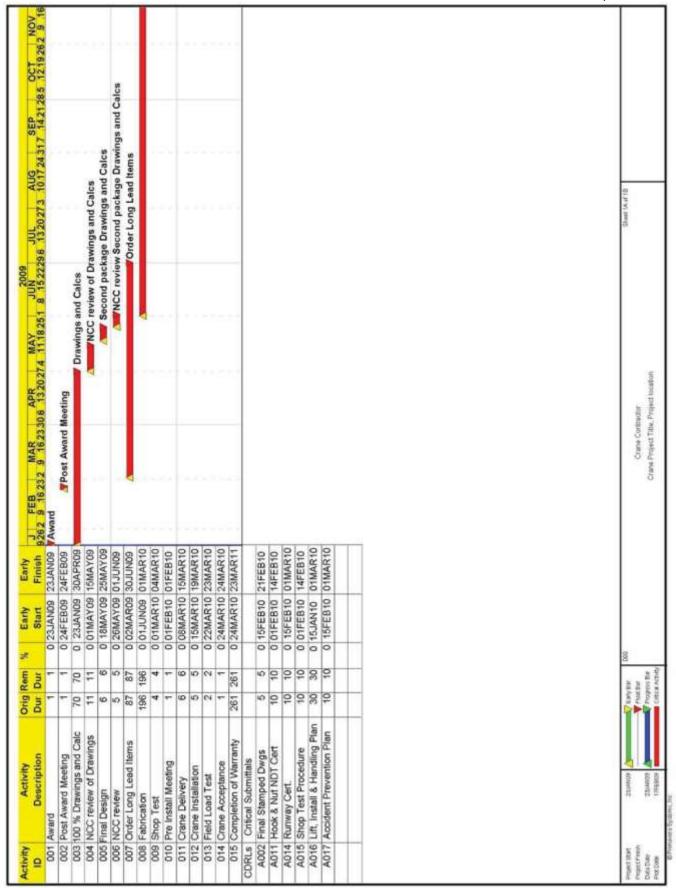
The Contractor shall provide information on Common Criteria or National Information Assurance Partnership (NIAP) or Federal Information Processing Standards (FIPS) evaluation status of hardware and software.

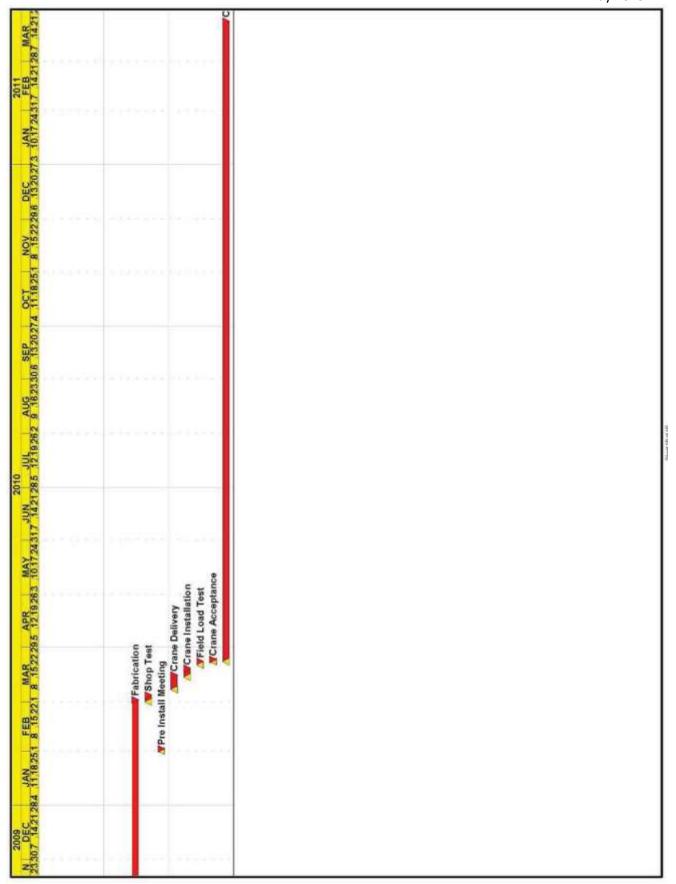
Refer to <u>Appendix MM</u> for an example of Evaluation Status of Hardware and Software.

III. Appendix – Examples

A. Appendix A – Schedule with Milestones

Refer to the following pages for a sample Schedule with Milestones.





B. Appendix B – Monthly Status Report

Refer to the following pages for a sample of Monthly Status Report.



July 2, 2010

From: John Smith, President

Crane Parts Manufacturers (CPM)

Project: 25/5 Ton OET Crane @ Anywheresville Shipyard, Bldg 1232

Title: July 2010 Monthly Project Status (CDRL-A001)
Contract Number: N62470-104-D-XXXX Delivery Order XXXX

Security Level: Unclassified

To: **NCC Contract Administrator** Mr. Norm Yeatts

NCC Project Manager Mr. Thomas Lund

DCMA Mr. Jones

Project / Milestone Status:

Project is currently one week behind original baseline schedule. In the past month, 100% submittal review comments were received and crane design was revised accordingly. Final design has been submitted, reviewed by NCC and approved. Fabrication and procurement of vendor items has begun. Approval of RFI #2 for alternate motor has shortened lead time by 3 weeks, which shortens the project critical path by 2 weeks, this will bring the project back on schedule.

Schedule:

Gantt chart for project milestones and CDRLs is attached to this report.

Design & Review:

Final design has been submitted and approved on 19 June 2010. Four open back-check comments will be corrected on PE stamped drawings which will be submitted next month. RFI #2 for alternate motor was approved on 10 June 2010.

Problems / Deficiencies:

Removal of existing crane may require a roof penetration. CPM engineer to conduct site visit during week of 20 July 2010, and discuss w/ NCC and NNSY. Roof penetration may prolong site work by one week.

Conference / Trip Outcome:

Teleconference to discuss final design review comments was held 14 June 2010, brake issue was resolved and crane design was approved. Contract Mod # 003 was issued which incorporated RFI #2.

Other:

We have requested information on the facility max. ground loading pressure to aid in preparation of the crane removal & installation plans. Information needed by 15 October 2017.

Future Plans:

Fabrication and component procurement will continue. Work on APP and removal/install plan to begin following site visit in July. Pre-installation meeting tentatively scheduled for week of 9 September 2010. Shop test in late September / early October.

Appendices:

None.

John Smith, President Crane Parts Manufacturers

C.

Appendix C – NCC RFI FormPlease see the following page for a sample RFI.

REQUEST FOR INF 2 CONTRACT NUMBER:	ORMAT	ION (R	RFI)			1. RFI Number
3. CONTRACT TITLE:						RFI-
4. PRIME CONTRACTOR			5. SU	BCONTRACTO	R / SUPPLIER	
^{6.} SUBJECT OF RFI:						
a- DRAWINGS:	b. DE	TAILS:		^c SPECII	FICATION	d. CPM ACTIVITY #:
7. INFORMATION REQUESTED:						
* Date Response Required By:	b. Date RFI Su	bmitted:			^c Signature:	
8. CONTRACTOR RECOMMENDATION	l:					
* COST EFFECT: Increase:	Decrease:	None		Estimated A	mount:	
b. TIME IMPACT: Increase:	Decrease:	None	:	Estimated C	alendar Days:	
^{9.} From:		11. Reply Da	ate:		12. Signature:	
^{10.} To:						
13. REPLY:						
* This response is for clarification This response requires a modity work is authorized until the modification.	fication to the	contract. A fo	ormalı	equest for prop	osal will follow u	nder separate correspondence. No nange (PC) is
The RFI process is intended to provide a authorize the contractor to proceed wit written notice to the Contracting Office	h work. To do so r is required with	, the contracto in 20 calendar	r proce days o	eds at his own ris f the reply date.	k. If the contracto	r considers the RFI response a change,
DISTRIBUTION: original file	/ia FEAD	PL	ET	A/E	PC# v	ia the Contracting Officer

INSTRUCTIONS FOR COMPLETING REQUEST FOR INFORMATION FORM

FOR THE CONTRACTOR

- Item 1. Enter three-digit RFI number.
- Item 2. Self-explanatory.
- Item 3. Self-explanatory.
- Item 4. Self-explanatory.
- Item 5. Self-explanatory.
- Item 6. Self-explanatory.
 - Specify any drawing numbers related to the RFI (if applicable)
 - Specify any detail numbers related to the RFI (if a applicable)
 - Specify the specification number related to the RFI (if applicable)
 - d. Specify Critical Path Method (CPM)/Schedule Activity # (if applicable).

Item 7. Provide a narrative detailing the requested information or requested design change.

- a. Specify date response is requested.
- b. Enter date RFI submitted.
- c. Signature of preparer of RFI.

Item 8. If possible, provide a recommended solution to the problem and state if the proposed solution may be considered a change to the contract.

- Indicate in the check box the cost effect. If applicable, provide estimated amount.
- Indicate in the check box the time impact. If applicable, provide estimated calendar days.

FOR GOVERNMENT PERSONNEL

Item 9. Name of government official responding to RFI.

Item 10. Name of contractor point of contact.

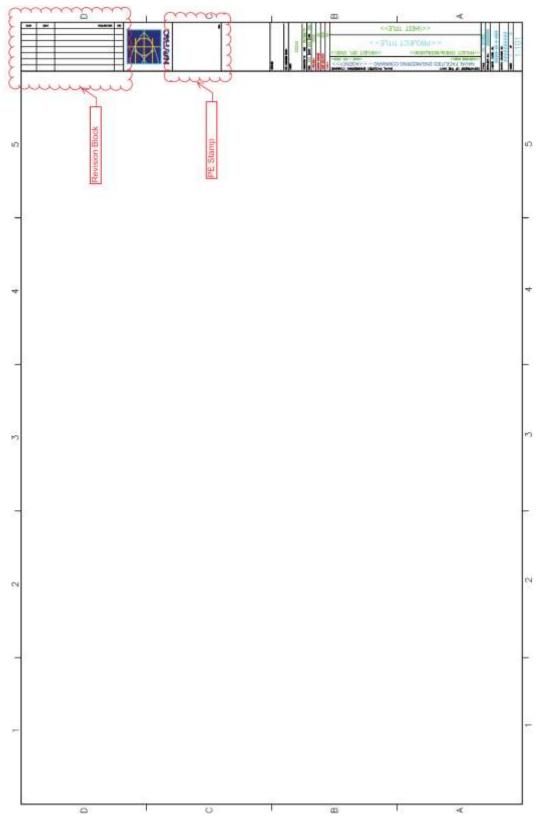
Item 11. Enter date of RFI response.

Item 12. Signature of official responding to RFI.

Item 13. Provide a reply considering cost, schedule, safety, quality, client request, other risks, etc. At no time will the RFI response authorize the contractor to start work. Only the Contracting Officer may authorize additional or changed work.

- Indicate in the check box if the response is for clarification only.
- Indicate in the check box if the response requires a modification to be issued to the contract. If applicable, include the assigned Proposed Change (PC) number.

D. **Appendix D – General Drawing Border with Title Block** Please see the following page for an example of this item.

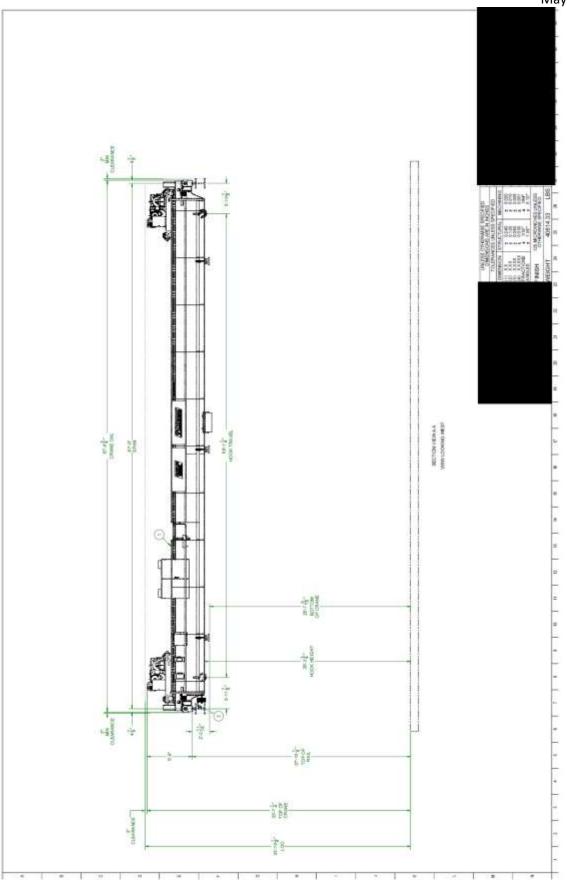


E.

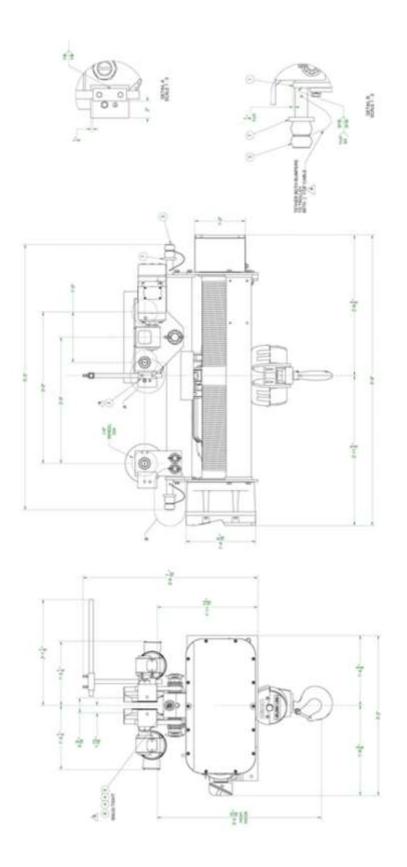
Appendix E – General Arrangement DrawingsPlease see the following pages for examples of general arrangement drawings.

i. General Arrangement

Submittal Guide May 2023 BILL OF MATERIALS 0 3 (E) (11) **Typical Parameters 4**Z



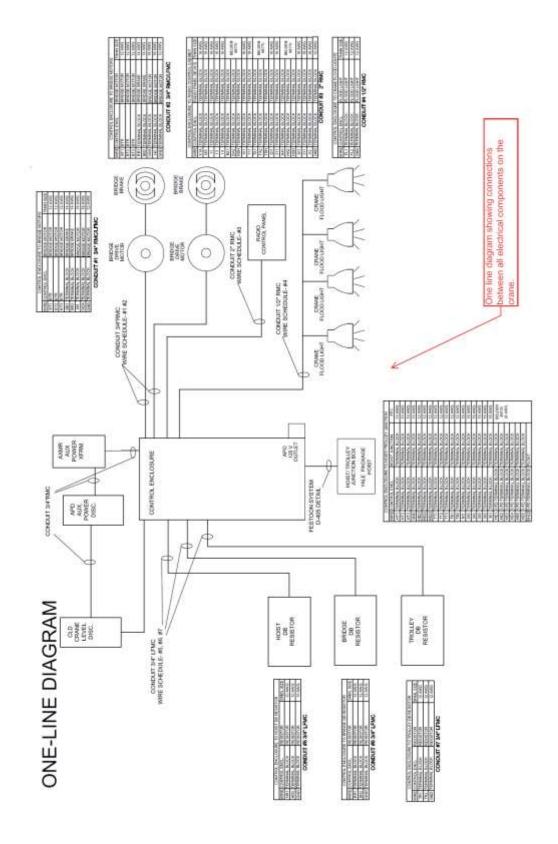
ii. Trolley Arrangement

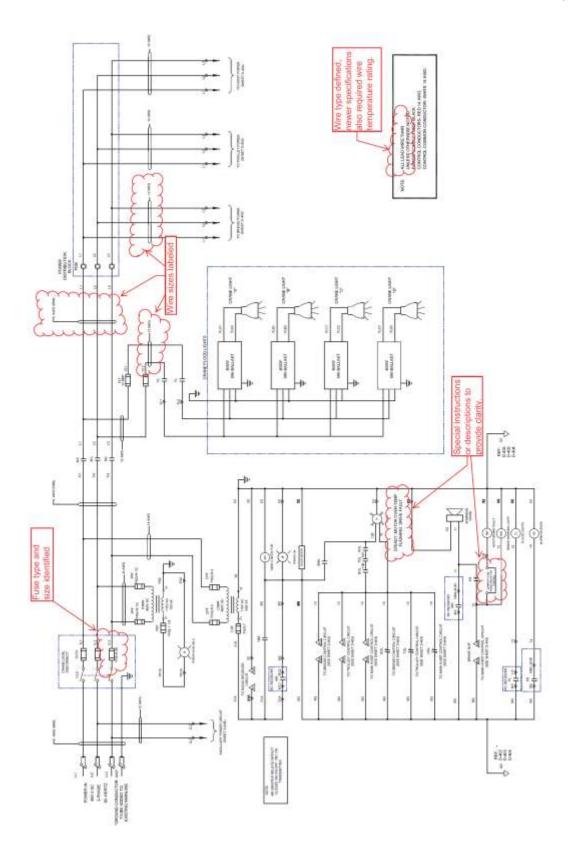


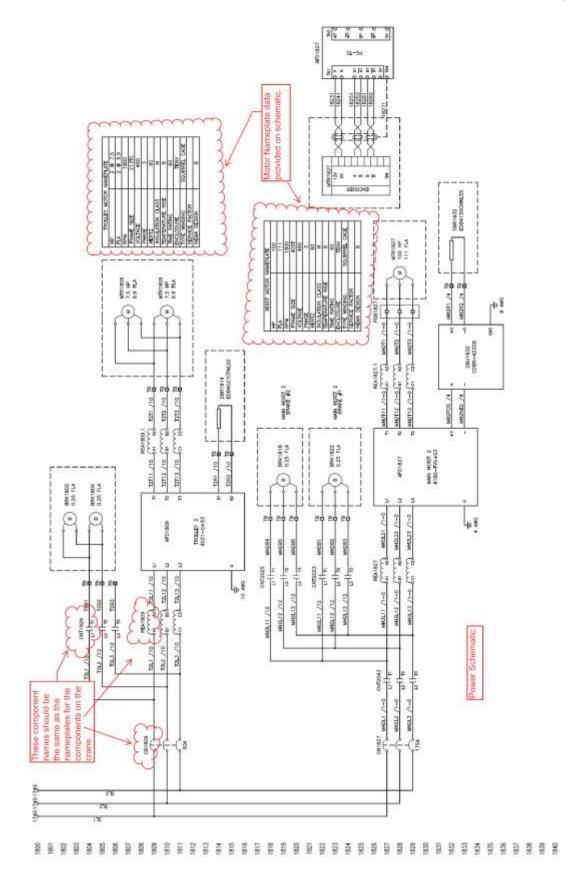
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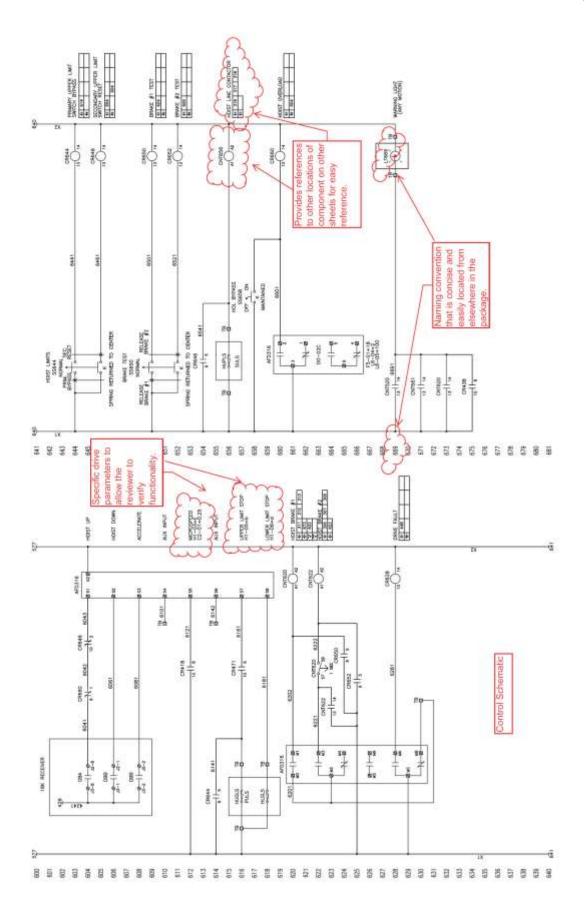
F.

Appendix F – Electrical DrawingsPlease see the following pages for examples of electrical drawings.



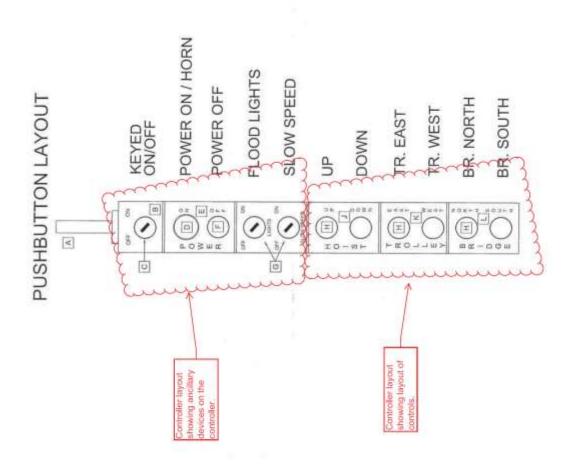


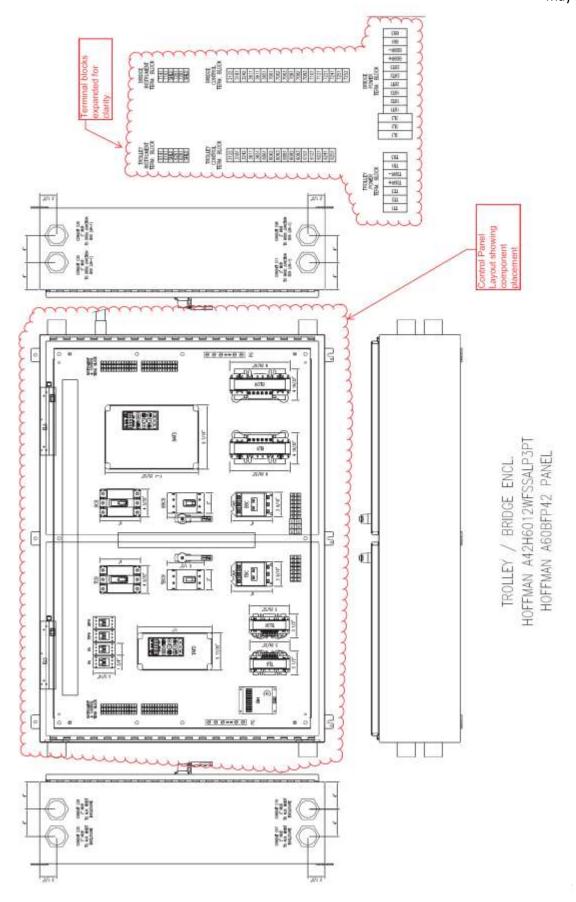




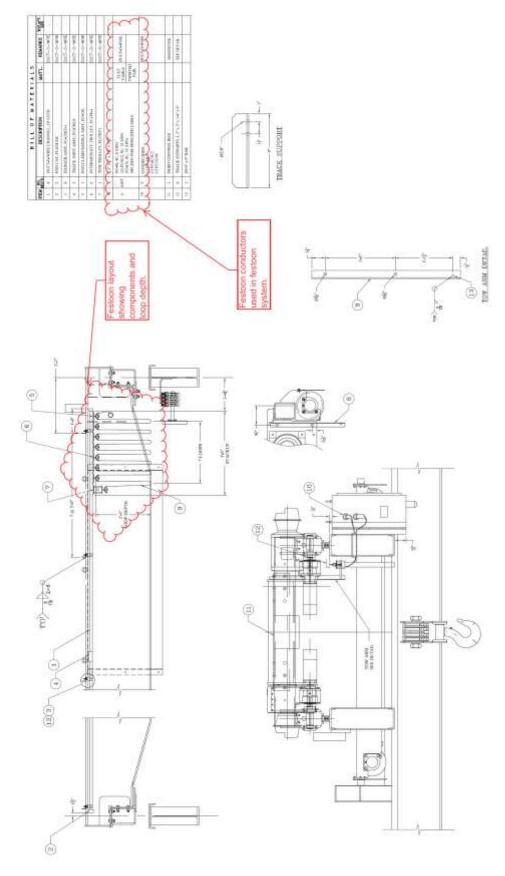
Page 57

8	IMOTY	DESCRIPTION	MANUFACTURER
·c	-	STACKSON ATTENDED AND AND AND ADDRESS OF	+CROSS1
m	-	PENCANT STATISH SHILLDLAW, 19 8UTISH SATHS	SUMMED
0	-	ADSIDION ON BRITISH BOT AND	ALLES BRADES
o	+	MONTHARM NUMBER OF SEASON SHADOWS IN SECTION.	ATTENDATOR.
ni	+	LINESPLATE POWER SNOT SHIETE	10,046.11
	-	MANTANES PLEASANT DLITES MASHEDON (BACKETS STRAIN)	441DN BRACESTY
0	-	MACHINE I Frisk Forman 2 Regiller sextrage:	ALL SHIRMS AND THE
π	-	THE SMILL AND ACCOUNTS OF THE RECEIVED WINGS	900m4E3
-	-	states water soor or book pegal	900008-9
¥	+	A STREET, PLATE TROUBY GAIT WEST SPACE	500,460 to
	*	CREATER PLACE IMIDIZA Neprilly 300,014 gatgath	93mm8.0



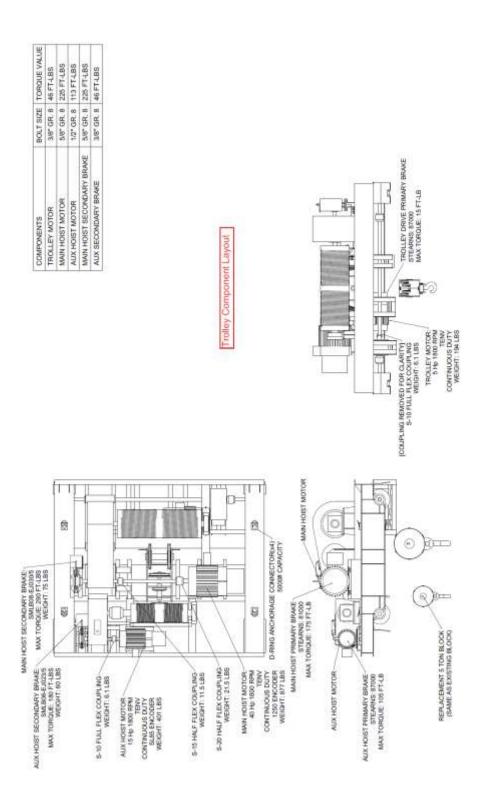


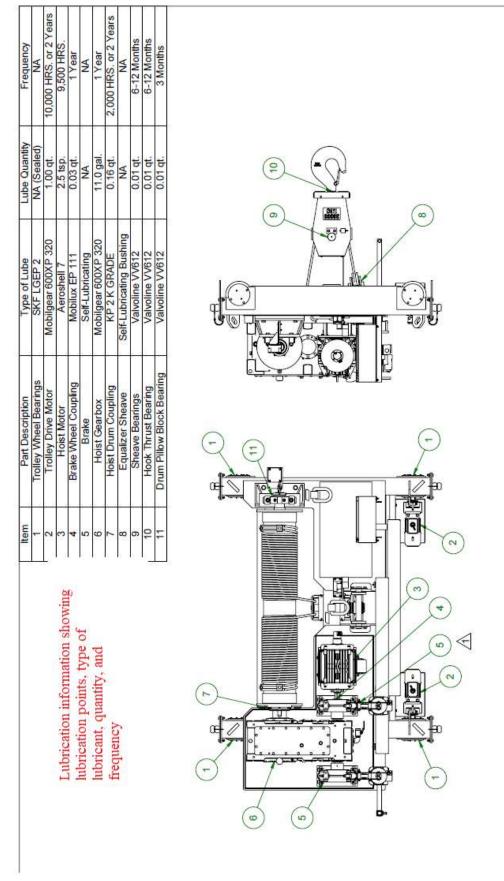
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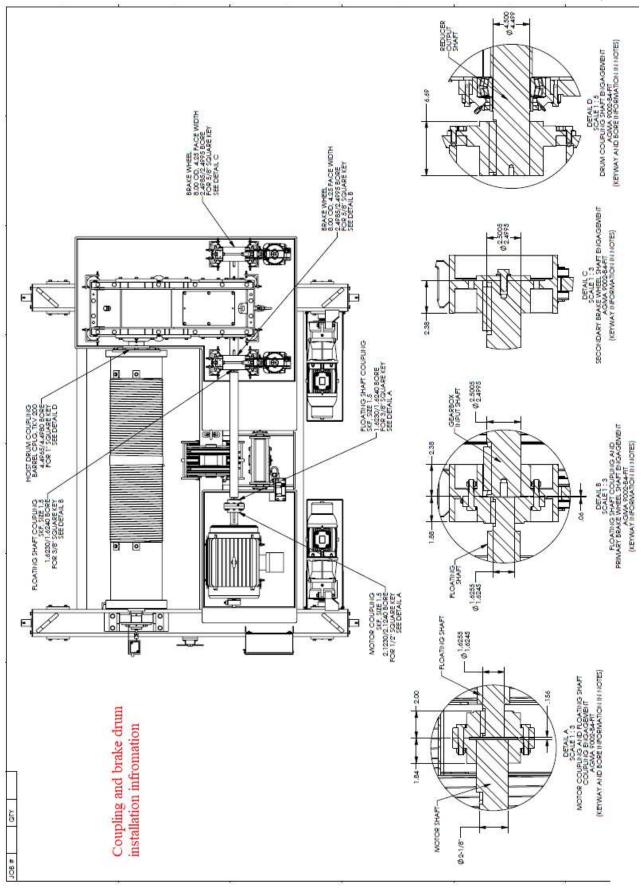


G. Appendix G – Mechanical Drawings

Please see the following page for a sample mechanical drawing.

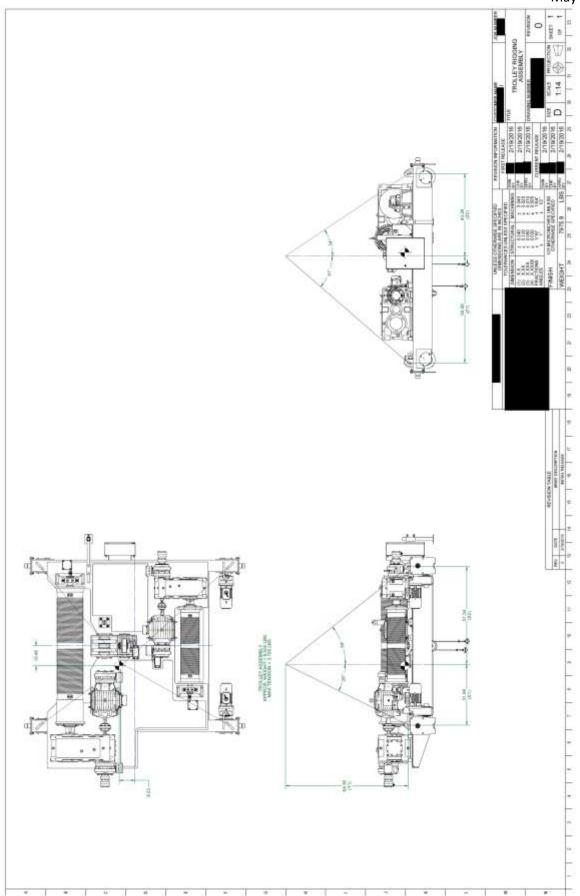






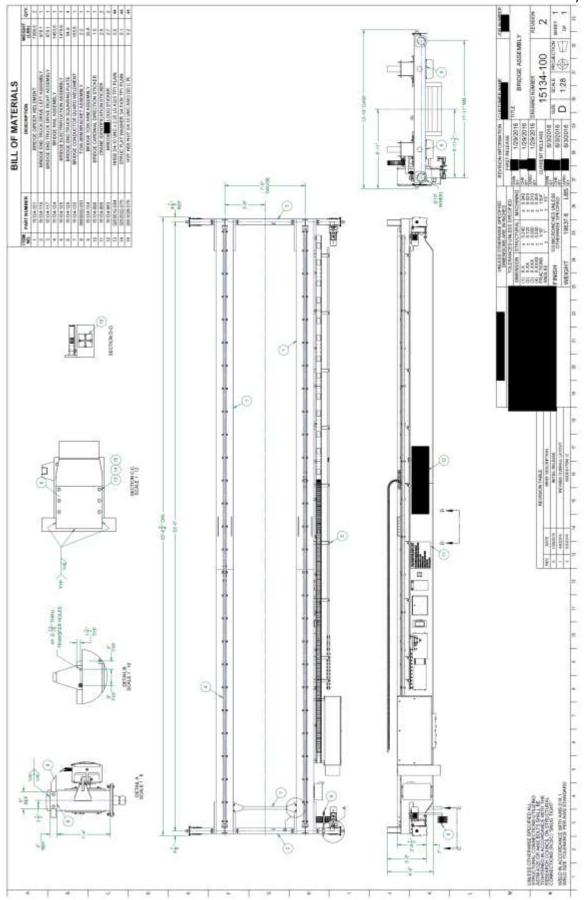
H.

Appendix H – Structural DrawingsPlease see following pages for sample structural drawings.



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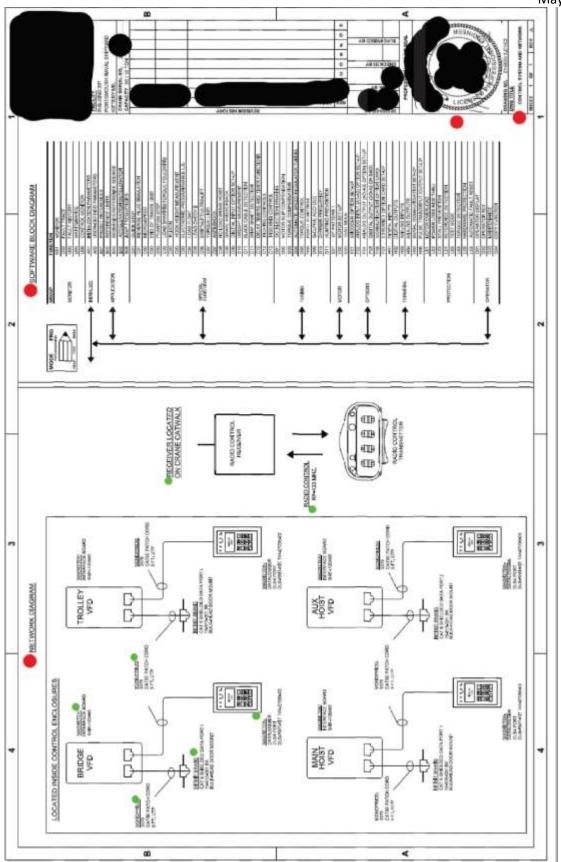
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I. Appendix I – Cybersecurity Drawings

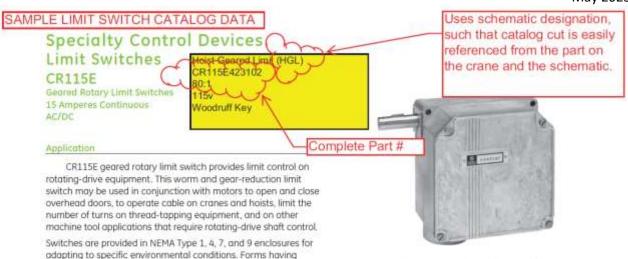
Please see the following pages for a sample of a cybersecurity drawing.



J. Appendix J – Electrical Product Data

Please see the following pages for examples of electrical product data.

CR115E geared rotory limit switch



Feotures

 Long-life: switch equipped with rugged bearings and shaft extension on either or both sides.

long-dwell cams may be ordered by description. Forms with various contact arrangements of snap-acting switches are listed.

- -Flexible operation: gear ratios from 20:1 to 1280:1.
- -Rapid reset: requires fewer turns to reset.
- Easy adjustment; trip points or operating cams can be quickly and easily adjusted independently with standard screwdriver.
- Versatility control: available with up to four precision snapacting switches; each will control an independent function.
- -Maximum input speed: 3600 RPM.

Product Number Selection Instructions

- Order limit switch by complete Product Number from pricing information table.
- Select shaft extension (by type of shaft end and desired side) and substitute suffix number in place of ** in switch Product Number.
 - Example: A NEMA Type 1 enclosed switch with 4 NO-4 NC snap-acting contacts, a 320:1 cam ratio, and a standard plain-end shaft extension on the left side is desired.
- 3. Order: CR115E146111 at \$636.00, GO-10G6.

Reference Publications	
No. to . others	D01/3/88

Specialty Control Devices **Limit Switches**

Section 11

CR115E Geored Rotory Limit Switches

Snap-Acting Forms (0.020 in, contact gap) (ING-INC per switch		
	DEPO.	n

Nominal Input Shaft to Cam Ratio	of Turns of Input Shaft to Trip Switch ¹	Min. Number of Turns of Input Shaft to Trip Switch	Overtravel Number of Turns of Input Shaft to Trip Switch ²	Number of Turns of Input Shaft to Reset Switch	Contact Configuration	Pipe Top Size (NPT)	Enclosure Type	Product Number	List Price ² GO-10G6	
20:1	19116 3/20	1	1/2 (2)	1/1	2 NO-2 NO	7/4	NEPSA Type 1	C#11581211**	\$231.00	
201	19/16 1/8	Ť	1/2/21	1/3	4 NO-4 NC	- 1	NEMA Type 1	C8135E1411**	\$435.00	
40-1	38 (33)	- 5	1/6	2/3	ZND-ZNC	3/4	NEMA Type I.	C8115E1221**	\$231.00	
40:1	38 (33)	- 3	1 (6)	3/1	4 NO-4 NC	- 1	NEPSA Type 1	CR11581421**	\$435.00	
80.1	75 (65)	3	2 (12)	1	Z NO-Z NC	3/4	NEMA Type 1	CR115E1231**	\$231.00	
80.1	75 (65)	1	2 (12)	1	4 NO-4 NC	-1-	NEMA Type I	CR115E1431**	\$435,00	
111:1	104 (90)	1	3 1/4/17 1/4	1/1	2 NO-2 NC	3/4	NEMA Type I	OKL1561241**	\$231.00	
111:I	104 (90)	1	3 1/4/17 1/4	- 1/1	4 ND-4 NC	1	NEMA Type I	CR115E1441++	\$435.00	
222-1	208 (180)	2	6 42 (34 1/2)	2/1	ZNO-ZNC	3/4	NEMA Type I	CR115E1251**	\$432.00	
222:1	208 (180)	2	6.1/2.124.1/3	3/5	4 NO-4 NC	1	NEMA Type 1	CR115E1451**	\$636.00	
3201	300 (260)	î	20 (50)	- 1/1	2 NO-2 NC	3/4	NEMA Type 1	OR119E1261**	\$432.00	
320.1	300 (260)	1	10 (90)	1/1	4 NO-4 NC	-1	NEMA Type I	C#115E1461**	\$636.00	
445 î	415 (360)	3	13 168	1	2NO-2NC	3/4	NEMA Type 1	CR115E1271**	\$432.00	
645.1	415 (160)	1	11 (68)	1	4 NO-4 NC	1	NEMA type 1	CR11581071**	\$636.00	
640:1	600 (120)	2	20 (100)	3/1	2 NO-2 NC	2/4	NEMA Type L	OR11941291**	\$432.00	
640:1	600 (520)	7	20 (100)	4/2	4 NO-4 NO	1	NEMA Type 1	CR115E1481**	\$636.00	
1290:1	1200 (10+0)	3	4012001	1	2 NO-2 NC	3/4	NEMA Type I	OR115E1291**	\$450.00	
1290:1	1200 (1040)	1	4012001	1	4 NO-4 NC	1	NEMA Type I	CR115E1491**	\$654.00	
20:1	19116 1/2		1/z (3)	1/3	2 NO-2 NC	3/4	NEMA Type 4	CR115E4Z11**	\$261.00	
20.1	19/16 1/2	1	1/2/39	41	AND-4NC	7.4	NEMA Type 4	CR115E4411**	\$465.00	
401	38 (33)		199	-20	2 NO-2 NC	3/4	NEMA Type ú	CR13564721**	\$261.00	
001	38.030	- 5	1161	7/1	6 NO. 6 NO.	774	MEMA Turne A	CB11666A21**	\$465	
90:1	75 (60)	3	5.039	1	Z NO-Z NC	3/4	NEMA Type 4	OR115E4231™ •	C securificial	Geated Litt
801	75 861		2 (12)		4 NO-4 NC	79	NEMA Type 4	CRISEGANI**	4.00	
111:1	104 (90)	1	3 1/4 (17 1/4)	1/1	Z NO-Z NC	3/A	NEMA Type 4	CHIIBEAZA1**	\$261 Switte	h (HGL)
111:1	104 (90)	1	3 1/4117 1/6	1/3	4 NO-4 NO	1	NEMA Type 4	CR115E4441**	\$465.00	
222.1	208 (180)		6 1/2 (24 1/16	2/2	2 NO-2 NO	7/4	NEMA Type 4	CR115E4251**	\$462.00	
222.1	200 (190)		6 1/2 (34 1/3	2/2	4 NO-4 NC	7	NEMA Type	CR115E6451**	\$660.00	
320.1	300 (260)		20 (50)	1/5	Z NO-2 NC	3/4	NEMA Typy 4	CR115E4261**	\$462.00	
320.1	300 (260)	+	10 (50)	1/3	4 NO-4 NC	- 14	NEMA TURE 4	CR115E4461**	\$666.00	
945 I	A15 (360)		12 16 (6)	1	5 NO-5 NC	3/4	NEMA TOP 4	CR11564271**	\$462,00	
949.1	415 (160)		13 (6B)	-	4 NO-4 NC	-74	NEMA/ ype 4	CR115E4471**	\$666.00	
640.1	600 (520)		20 (100)	2/1	2 NO-2 NC	3/4		CR115E4281**	\$462.00	
640.1	600 (520)		2013001	40	4 NO-4 NC		NEMA Type 4 NEMA Type 4	CR115E4481**	\$666.00	
1280-1	1200 (1040)		40 (200)	1	2 NO-2 NC	2/4	NaMA Type 4	CW11564291**	\$480.00	
1280:1	1200 (1040)	3	40 (200)	1	4 NO-4 NC	-74	Martin Type H		\$684.00	
20:1	19 (16-1/2)	- 3	1/2.(1)	1/)		Name and Address of the Owner, where		# F1854491**	\$630.00	
		+			2 NO-2 NO	Snows	base part	# 11567211**		
20:1	19 (16 1/3)		1/2/31	1/3	2 NO-2 NO	and on	tions	11527411**	\$834.00	
40:1	28 (13)	- 2	1 (6)	2/3 2/3	4 NO-4 NO	ma op	nons.	11567221++	\$630.00	
90.1	38 (33)	1	1 161	-73		3/4	ADD M 1995 1-2	U-115E7421**	\$834.00	
	75 (63)		2 (12)	-1	2 NO-2 NC	-74	NEMA Type 7-9	Ox11587211**	\$650.00	
00:1	75 (65)	- 3	2 (12)	- 4	410-41	34	NEMA Type 7-9	CR135E7431**	\$834,00	
111:1	104 (90)	1	3 4/4/17 1/4/	4/8	ZNDZNC	3/4	NEMA Type 7-9	CR115E7241**	\$630.00	
111:1	104 998		3 4/4/17 1/6	1/y	4 MO-4 NO		NEMA Type 7-9	CR115E7441**	\$834.00	
222.1	209 (190)	- 1	6-1/2 (34-1/3)	- 45	S NO-S NC	3/4	NEMA Type 7-9	CR115E7251**	\$820.00	
222.1	208 (180)	- 2	6 4/2/34 4/20	2/3	4 NO-4 NC	- 1	NEMA Type 7-9	C#115E7451**	\$1032.00	
320:1	300 (260)	1	20 (50)	10	2 NO-2 NC	3/4	NEMA Type 7-9	CR115E7261**	\$828.00	
320:1	300 (260)	1	20 (50)	40	4 NO-6 NC	- 1	NEMA Type 7-9	CR115E7461**	\$1032,00	
645:1	415 (160)	1	11)68)	1	2 NO-2 NC	3/4	NIMA type 7-9	OK11587271**	\$828.00	
445.7	415 (160)		13.66	/ 1	4 NO-4 NC	_1_	NBWA Type 7-9	CR115E7471**	\$1032.00	
640.1	600 (520)	- 2	20 (100)	2/3	2.NO-2.NC	3/4	NEMA Type 7-9	CR115E7281**	\$829.00	
640:1	600 (520)	- 2	20 (100)	3/1	6 NO-6 NC	1	NIMA Type 7-9	OKI15E74B1**	\$1032.00	
12801	1200 (1040)	3	40 (200)	1	2ND-2NC	Na	NEMA Type 7-9	CR115E7291**	\$845.00	
1780.I	1200 (1040)	- 3	48 (200)	1	A NO-A NO.	7	NEMA Type 7.9	CR115E7491**	\$1050.00	

haft Extension Type		/	
Description	-	haft Extension On	il semiowy
(Type or Shaft End)	Right Side	Left Side	Both Sides
Standard Plain-End Shaft	01	11	213
Woodruff Key-Type End Shaft.	02	12	225
No. 3 Woodruff key is provided	Children or the Control of the Contr	2430.0	247.27

¹Prices shown in gricing information table are for shaft extension on one side only. Add \$6.00, GO-10G6 for forms with shaft extensions on both sides.

Ancient number from Shaft Extension Type Table where ** oppores to complete product number.

Figures shown in parentheses are for long-dwell la59 cam forms. Coder by description. No price addition for long-dwell com.

Contact nearest

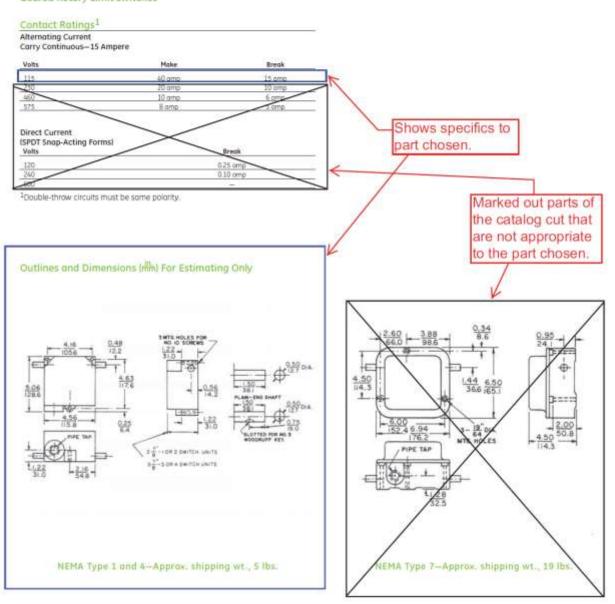
Representative for ones and data for 180° cam forms.

Prices shown are for shaft extension on one side only. Add \$600, 60-1006 for forms with shaft extensions on both sides.

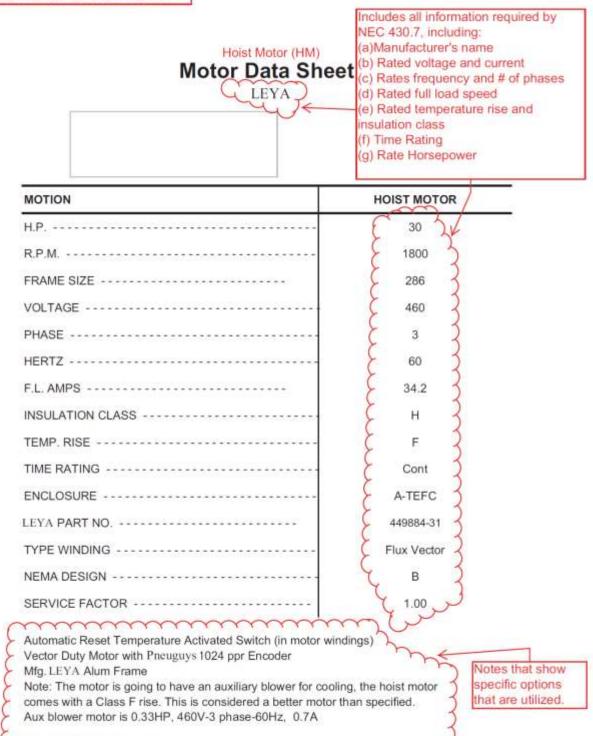
Section 11

Specialty Control Devices Limit Switches CR115E

Geared Rotary Limit Switches



SAMPLE MOTOR CATALOG DATA



50-384 1/5

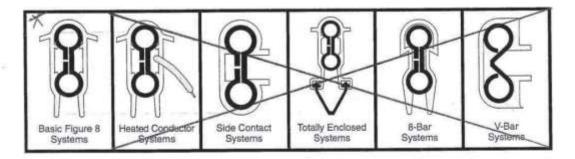
Magic-8 Bar Electrical Conductor Systems

For Overhead Cranes, Trolleys, Monorails, Hoists, Conveyors, Automatic Stacker-Retrieval Systems... any Application that Requires a Reliable, Safe, and

Economical Moving Power System.

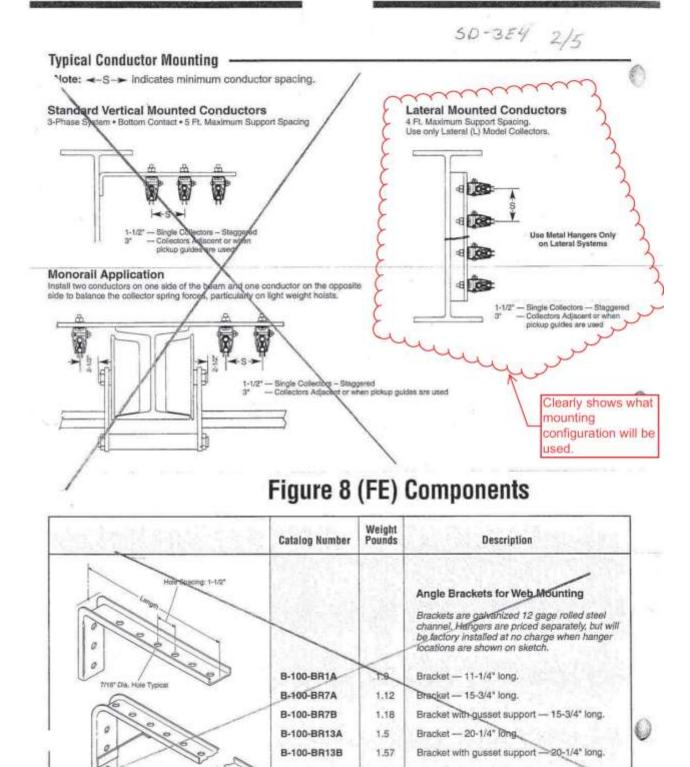
Submittal shows exactly what components are being used in runway system.

- 90 AMP Rolled Galvanized Steel
 110 AMP Rolled Galvanized Steel
 - 160 AMP Rolled Stainless Steel
 Copper Laminated
 - 250 AMP Rolled Copper Steel Laminated
 - 350 AMP Rolled Electrolytic Copper
 - 500 AMP Extruded Electrolytic Copper



CAUTION

MAKE CERTAIN POWER SUPPLY IS DISCON-NECTED BEFORE INSTALLING, REPAIRING, OR WORKING IN THE PROXIMITY OF ANY ELECTRICAL SYSTEM. ONLY QUALIFIED ELECTRICAL PERSONNEL SHOULD INSTALL OR REPAIR THESE PRODUCTS.



	Catalog Number	Weight Pounds	Description	6
FE-908-2PF	FE-908-2PF FE-908-2PFS	.10	Snap-In Type Hanger Assemblies These hangers are not recommended for curves, switches or short runs unities separate anchors are used. Refer to the Figure 8 Installation Instructions. Nylon Insulating Hanger with Stainless Steel Handware. DO NOT USE nylon hangers in temperatures	8
FE-908-2SF	FE-908-2SP FE-908-2SFE FE-908-2SFS	F== 7	higher than 230°F DO NOT exceed 4 lb. per foot torque when tightening nut on mounting bolt. Zinc Plated Steel Hanger. Epoxy Coated Steel Hanger. Stainless Steel Hanger with Stainless Steel Hardware.	
Treeds: 3-6-16	FE-908-2SFG FE-908-2SFFG FE-908-2SFSG	20 20 20	Snap-In Type Spring Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications Zinc Plated Steel Hanger with Insulator. Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Insulator and Stainless Steel Hardware.	
Threads: 5%-16	B-100-2FF	.19	Clamp Type Hanger Assemblies for All Conductor Systems Zinc Plated Steel Hanger.	
	-B-100-2FFS	.19	Epoxy Coated Steel Hanger, For special environments. Stainless Steel Hanger with Stainless Steel Hardware. For special environments.	•
Triviado: SR-16	No Selection		Clamp Type Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications.	-
MALE	B-100-2FG	.30	Zinc Plated Steel Hanger with Insulator.	
<u> </u>	B-100-2FFG B-100-2FSG	.30	Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Stainless Steel Hardware.	
Threadx 38-16	B-100-2F2	.40	Clamp Type Special Hanger Assemblies Zinc Plated Steel Twin Hanger Assembly. 1-1/2 centers. For indoor applications.	
ED THING	B-100-2F3	.59	Staggered Collectors. Zino Plated Steel Triple Hanger Assembly. 1-1/2" centers. For indoor dry applications only. Staggered Collectors.	
Timus 36-16 Centers 1-1/2*	FE-908-2PF3	.50	Snap-In Type Special Hanger Assemblies Plastic-Triple Hanger Assembly.	
FE-908-25F3	FE-908-2SF3 FE-908-2SF4 FE-908-2SF5	.53 .72 .93	Zinc Plated Steel Triple Hanger Assembly. Zinc Plated Steel Four-Gang Hanger Assembly. Zinc Plated Steel Pive-Gang Hanger Assembly.	
Threads: 38-16	uville.i.		Mushroom Insulators with Hardware	+
	B-100-1G	.12	30% Glass-filled Nylon — 400°F rated. Suitable for-chemical or oil-laden atmospheres.	

50.384

1	01	1
7	4	Æ
	13	-

TO A	FE-908-2CP FE-1158-2GP FE-2008-2CP	.25	Power Feeds with Insulating Case 90 Amp Rated — Steel. For FE-758-2 systems. Will accept up to # 4 AWG cable.
	223000000000000000000000000000000000000	26	Will accept up to # 4 AWG cable.
	FE-2008-2CP		-110 Amp Rated — Copper: For FE-908-2
N/II		63	systems. Will accept up to # 2 AWG cable. -260 Amp Rated — Bronze. For FE-1608-2 and
		114	FE-2008-2 systems. Will accept up to # 1/0 AWG cable.
18	FE-3008-2CP	1:10	350 Amp Rated — Cast Bronze, For FE-3008- systems. Will accept up to # 3/0 cable.
		46	End Power Feeds
	FE-758-GCTP		40 Amp Rated. For all systems with FE-758 conductor bar.
	FE-908-GCTP	:14-	40 Amp Rated. For all systems with FE-908, FE-1608, FE-2008, and FE-3008 conductor ba
	E CANADA		
			Expansion Gap Assemblies Each assembly consists of a ten loot conducto bar, insulating cover, connected pins for one end, guide assembly, two power feeds with a jumper cable and harger set. Refer to the Figure 8 Installation Instructions.
	FE-758-2H10 FE-758-2H10-SC	7.0 7.0	For Indoor System FE-758-2. For Oxidoor System FE-758-2-SC.
The state of the s	FE-758-2H10XT	7.0	Por High Temperature System FE-758-2XHT.
TRIVE	FE-908-2H10	9.0	For Indoor System FE-908-2.
	FE-908-2H10-SC FE-908-2H10XT	9.0	For Outdoor System FE-908-2-SC. For High Temperature System FE-908-2XHT.
-	FE-1608-2H10	10.5	For Indoor System FE-1608-2.
186	FE-1608-2H10-SC	10.5	For Outdoor System FE-1608-2-SC.
Anchor sets and connector pins are	FE-1608-2H10XT	10,5	For High Temperature System FE-1608-2XHT.
included with the hardware package.	FE-2008-2H10	10.0	For Indoor System FE-2008-2.
	FE-2008-2H10-SC	10.0	For Outdoor System FE-2008-2-SC.
	FE-2008-2H10XT	10.0	For High Temperature System FE-2008-2XHT.
	FE-3008-2H10	12.5	For Indoor System FE-3008-2.
	FE-3008-2H10-SC	12.5	For Outdoor System FE-3008-2-SC,
	FE-3008-2H10XT	12.5	For High Temperature System FE-3008-2XHT.
	FE-5008-2H10	16.5	For Indoor System FE-5008-2.
	FE-5008-2H10-SC FE-5008-2H10XT	16.5 16.5	For Outdoor System FE-5008-2-SC. For High Temperature System FE-5008-2XHT.
	FE-2JNN3	3.75	Special Application Components Pickup Guide Assembly — 3' wide. Includes clamps and two foot section of system
	-	-	conductor. Specify conductor system.
	FE-2JNN4	4.50	Pickup Guide Assembly — 4" wide. Includes clamps and two foot section of system conductor. Specify conductor system.
		0.73	windstan openy window system.

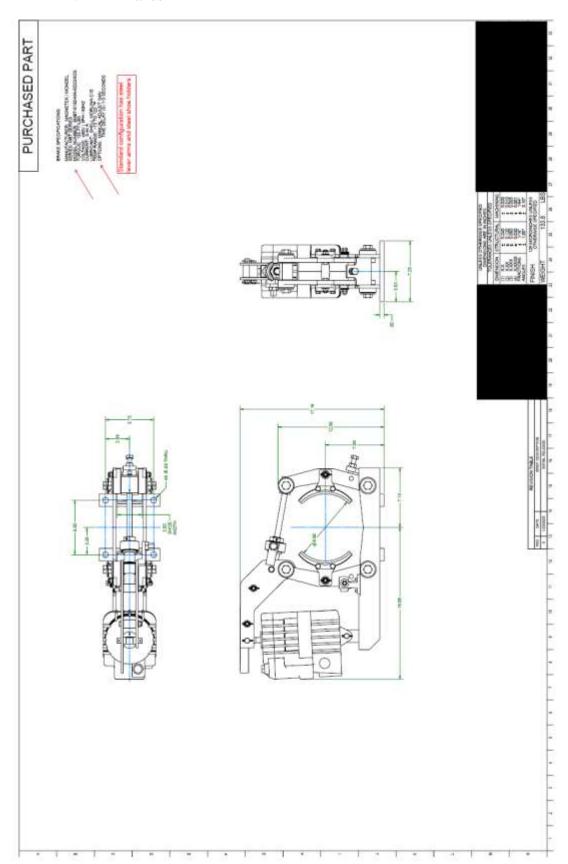
50-384 5/5

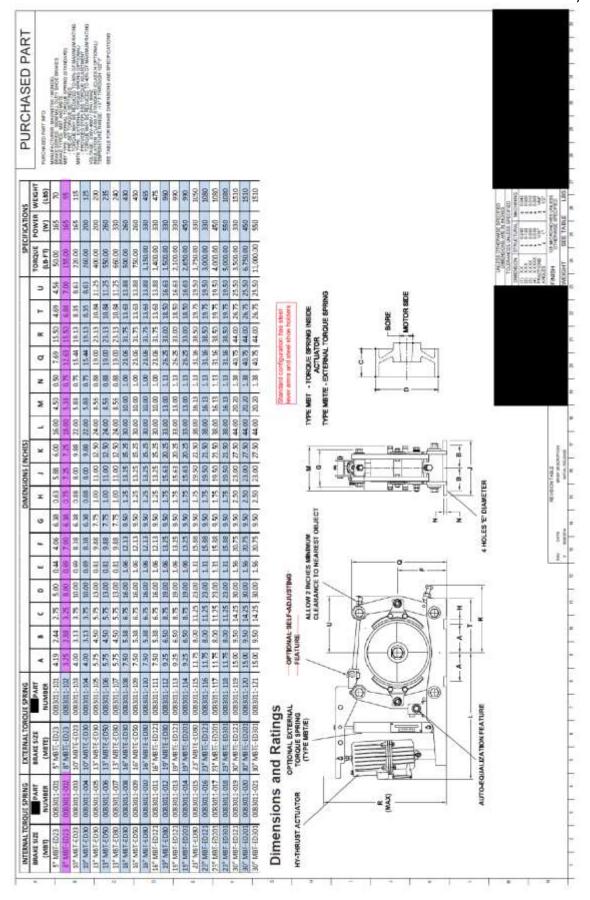
	Catalog Number	Weight Pounds	Description
Maximum Q.A.L.: 28"	lact club		Maria de la contiene
		War A	
The state of the s			P-Series Collector Assemblies (cont.)
	P-80-VT3	4:34	80 Amp Collector — double shee. Vertical mount
	P-80-LT3-	4.35	80 Amp Collector — double shoe, Lateral mount
THE TOP OF	P-80-ST3	4.5	-80-Amp-Collector double-shoe-Self-centering
	-P-200-VT5	5:0	200 Amp Gollector - double shoe, Vertical
			mount.
	P-200-LT5	4.03	200 Amp Collector — double shoe: Lateral — mount.
\sim	P-200-ST5	4.6	200 Amp Collector — double shoe: Seif-
P-200-VT5	A NEEDA		centering.
			Additional Components
FE-IGC	B-100-2L	.03	Spring Cover Clip — Zinc Plated Steel: Used only to ensure alignment of the cover on laterally mounted systems. Placed midway between hangers.
B-100-2L	B-100-2FEA	.30	Clamp Hanger Set — 2 pieces. Clamps both sides of hanger.
	FE-1GC	.04	Flexible PVC End Cap. For all Figure 8 conductor bars.
FE-2ER-EX	FE-908-A	.02	Nylon Anchor Pin. For drilled anchoring. Two required at each hanger.
E	FE-908-1M	2.88	Connector Tool. One tool usually ordered for each new system. Used to pull two sections of bar together.
	FE-908-1MB	110	Connector Tool Pins — Pair.
B-100-2FEA	FE-2ER-EX	.05	Splice Cover — Standard black. Use this part number when ordering extra splice covers.
	C-40-B3-SC	1	Carborendium Insert
	C-100-B5-SC	1	Cleaning Shoe
	/ 13 1 Charles	5531	Conductor Bar Cleaning Accessories
	FER KOE	1,000	Contact the factory for application.
and the same of th	C-100-VCT	1.80	Complete C-Series Collector with cleaning head Vertical mount,
	P-100-VCT	2.19	Complete P-Series Collector with cleaning head Vertical mount.
	C-100-2ACT	.50	Cleaning Head only for C-Series or B-Series Collectors.
	P-100-2ACT	.57	Cleaning Head only for P-Series Collector.
	B-40-2B3-CI	.17	Cast Iron Cleaning Shoe - 3" long x.1/4" wide.
and the same of th	B-100-2B5-CI	.26	Cast Iron Cleaning Shoe - 5° long x 1/4° wide.
	C-100-CT	.14	Cleaning Brush — Stainless Steel.
	B-100-TT	.08	Micro Hone — 1/4" x 4".

K.

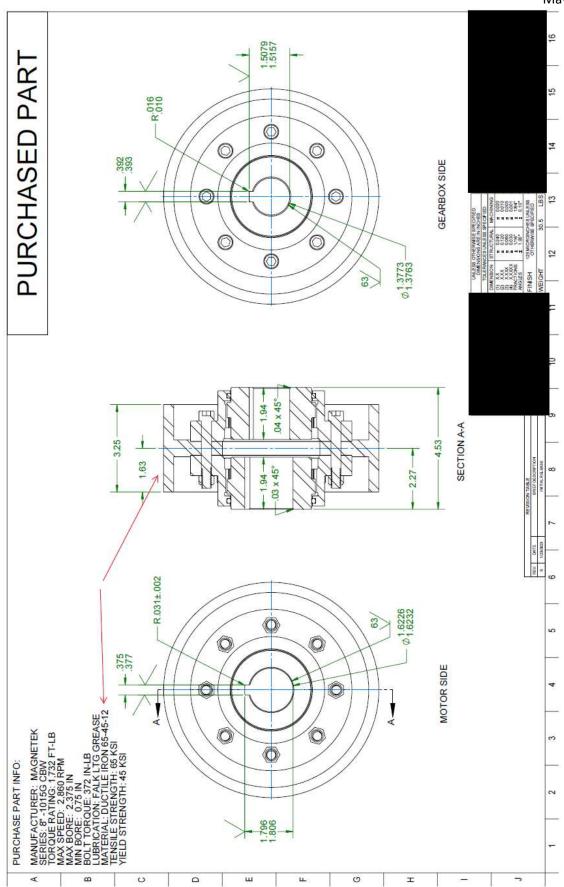
Appendix K – Mechanical Product DataPlease see the following for examples of mechanical product data.

i. Brakes

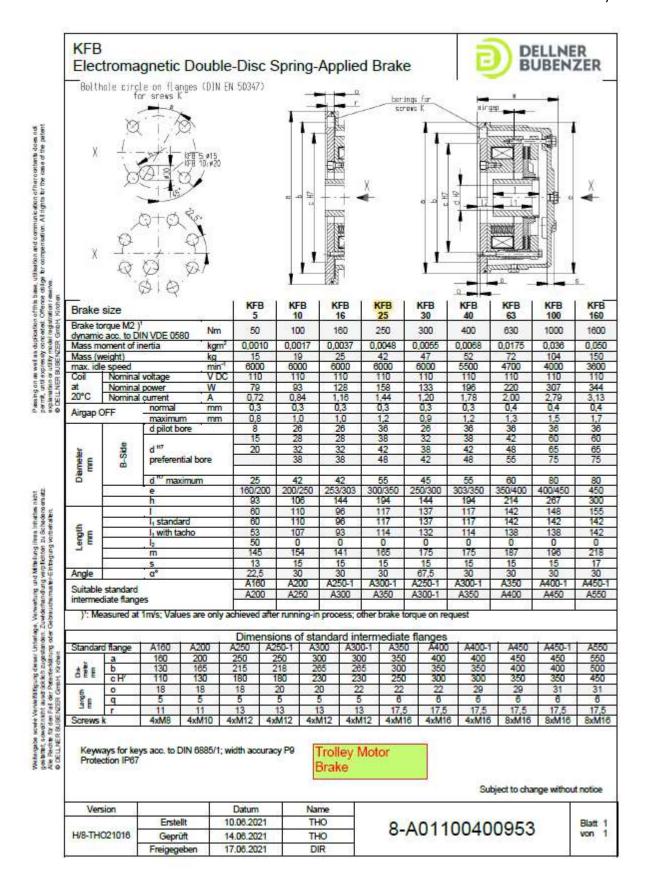


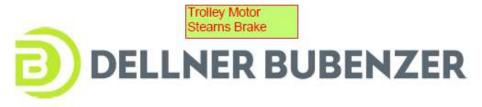


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REF: Q117799

Nidec Avtron Automation 243 Tuxedo Ave Brooklyn Heights, OH 44131

The items in the referenced quote are as follows and contains the below features:

81-902854064251: KFB 25 Brake 81-001473320214: Pinion for KFB 25 81-008361211249: Half Wave Rectifier 81-NID002.11779: NEMA Adapter Plate

Brake Coil Voltage: 207 VDC Brake Coil Amperage: 0.77 A

Brake Rated Torque: 180 Nm (133 ft-lbs)

Manual Release:

Momentary: Hand lever that when pulled achieves 80-90% release of brake

Brake Housing: Cast GG-20 (EN-GJL-200) → ASTM 200/225

Junction Box: Aluminum with salt water protectant

Paint Finish: 2 coats of epoxy primer, 1 coat of finished paint Inspection: (3) ports on side cover for inspection of air gap

Adjustment: Only cover must be removed to adjust air gap (brake can operate without cover)

Features of Brake:

Air Gap: Sensor onboard to monitor air gap (pad wear)
On/Off: Sensor onboard to monitor on/off position of brake

Heater: Anti-Condensation heater in coil – 115 VAC, 40 W – Needs thermostat to control

IP Rating: IP67

Option: Brake is prepared for encoder if one must be added in the future

Pinion: Bored for a 1.625" motor shaft

Half Wave Rectifier: Rated to receive 460 VAC and Convert to 207 VDC

Located within the junction box on the brake

NEMA Adapter Plate: Converts supplied IEC A300 bolt pattern to NEMA AK 12.5", AJ 11"

AISI 1026

Brake cover, junction box and all associated mounting components, and IEC flange (S355JS2+N) receive the paint finish detailed above. The NEMA adapter plate will be raw steel.



3 Layout and function

3.1 View of the product

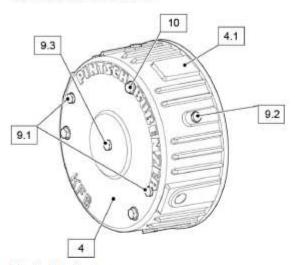


Fig. 1: Exterior view

4	Housing	9.2	Air gap micrometre (3 pcs)
4.1	Rating plate	9.3	Condensate drain plug for vertical attachment
9.1	Manual ventilation screws below locking screws	10	Fastening screw below locking screw

Tab. 1: Legend of exterior view

Layout and function KFB



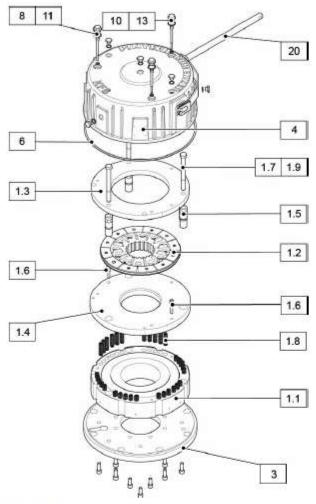


Fig. 2: Interior view

1.1	Coil body group	1.9, 11	Detent-edged ring
1.2	Friction lining support group	3	Intermediate flange
1.3	Brake flange	4	Housing
1.4	Armature plate	6	O-ring
1.5	Setting screw	8	Cheese-head screw
1.6	Manual ventilation screws	10	Locking screw
1.7	Hexagon screws	13	Sealing ring
1.8	Compression coil spring	20	Manual ventilation lever (optional)

Tab. 2: Legend of interior view

Operation KFB



Brake ventilation



CAUTION!

Danger from dropping loads

Persons must not be in the vicinity of the load.

Manual ventilation is done with the help of the hand lever.

 Slowly and carefully pull the hand lever (1) in the direction of the arrow.

The armature plate is pulled to the coil body group. The friction lining support group can now be swivelled freely. The brake action is voided.

NOTE: Be mindful of any possibly attached load during brake ventilation.

- Lower the load gently.
 The lowering speed of the load is accelerated by pulling the hand lever.
- Set down the load. Subsequently lock the hand lever or put the brake in operational state.

Locking the hand lever

The hand lever provides the possibility to void the brake action permanently.

- Continue to hold the hand lever (1) pulled up to end position.
- Screw in the hexagon head screw (2) in the hand lever
 (1) by rotating to the right until it touches the housing.
- Secure the hexagon head screw (2) with the lock-nut.

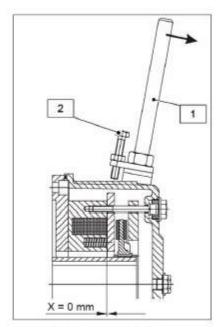


Fig. 25: Pulling the hand lever

Operation KFB



Cancelling manual ventilation

- Release the hand lever (1). The hand lever will return to the starting position on its own.
- Check the air gap (see 5.3).

NOTE: After setting down the load, you must put the brake in operational state immediately. The brake is operational only if the latching is released and the hand lever is in vertical position.

Establishing operational state

Putting the brake in operational state again absolutely requires cancelling the locking of the hand lever.

 The locking is cancelled by turning the hexagon head screw (2) to the left. Unscrew the screw until it no longer touches the housing when you move the hand lever.

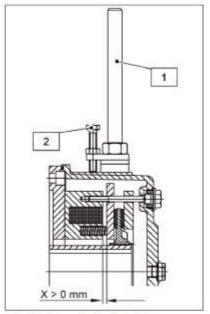
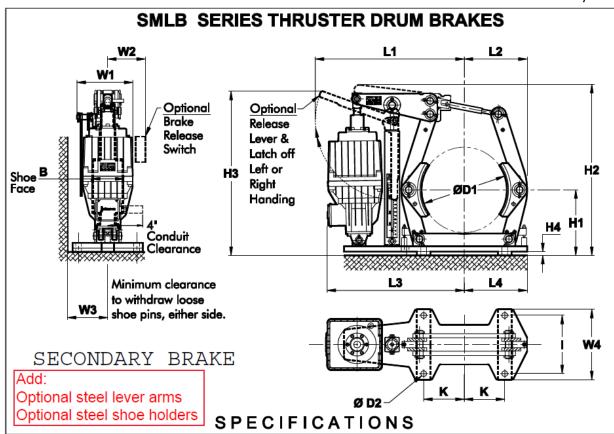


Fig. 26: Releasing the hand lever



NOTE

If lockability of the hand lever is not required, the hexagon head screw (2, see Fig. 25) must be removed.



BRAKE MODEL NUMBER	DRUM SIZE	MAX. TORQUE	THRUSTER POWER	NETT WEIGHT				I M	IPE	RI	ΑL	D	ΙM	ENS	310	NS	(in.)	as /	AISE	
	D1	LB-FT.	KVA	LB	В	D2	H1	H2	Н3	H4	-	K	L1	L2	L3	L4	W1	W2	W3	W4
SMLB06-EJ023/5	þ	180	0.20	60	2.13	0.433	4.724	14.7	13.6	0	3.00	4.00	14.8	5.00	15.5	5.50	7.62	5.15	3.3	4.0
SMLB08-EJ023/5 -EJ030/5	8	220 290	0.20 0.20	75 75	2.76	0.669	7.008		15.8 17.3		5.75	3.25	16.0	6.34	16.8	6.87	7.62	5.15	4.2	7.4
-EJ023/5 SMLB10-EJ030/5 -EJ050/6	10	240 320 530	0.20 0.20 0.20	95 100 125	3.54	0.669	8.386	19.9 19.9 22.7		0.59	6.25	4.00	17.3	7.68	18.7 18.7 19.8	7.90	7.62 7.62 8.80	5.15 5.15 6.75	5.0	7.9
EJ030/5 SMLB13-EJ050/6 EJ080/6	13	380 640 1140	0.20 0.20 0.48	145 175 180	4.33	0.827	9.882	24.3	24.5 24.0 24.5	0.51	9.00	5.75	25.7	9.82	21.6 22.7 22.7	10.00	8.10 9.10	5.15 6.75 6.75	6.1	11.0
EJ050/6 SMLB16-EJ080/6 -EJ121/6	16	630 1190 1960	0.20 0.48 0.48	240 245 280	5.51	1.063	12.126	29.9 29.9 31.5	29.6 29.9	0.71	10.75	7.50	27.5	11.61		11.73	9.10 9.41 9.41 11.34	6.75 6.75 7.75	7.40	13.0
-EJ080/6 SMLB19-EJ121/6 -EJ201/6	19	1180 2140 3850	0.48 0.48 0.52	290 325 325	7.09	1.063	13.268	31.9	32.0	0	13	9.25	38.9	13.84	28.0	14.00	8.80 11.14 11.14	6.75 7.75 7.75	9.3	15.8

^{**} ALWAYS CHECK AVAILABLE SPACE WHEN REPLACING EXISTING BRAKES **

THE ABOVE SPECIFICATIONS ARE FOR ESTIMATING PURPOSES ONLY AND MAY BE CHANGED WITHOUT NOTICE. MORE COMPLETE DETAILS AND CERTIFIED DRAWINGS ARE AVAILABLE UPON REQUEST. PLEASE SPECIFY CALIPER "BRAKE MODEL NUMBER" WHEN INQUIRING OR ORDERING. WE PREFER TO QUOTE EACH SPECIFIC APPLICATION TO ENSURE THE SUITABILITY OF A DRUM BRAKE SELECTION. SPECIAL PURPOSE BRAKES INCLUDING EXPLOSION PROOF, IF NOT ALREADY AVAILABLE, MAY BE DESIGNED TO SUIT CUSTOMER REQUIREMENTS.

iehnsen industries *| elevanja* Itd

Vancouver BC Canada -- Tel: 604 940 4555 Fax: 604 940 4565 -- Tel: 416 213 9991 Fax: 416 213 9992 Toronto ON Canada Bridgwater SOM England -- Tel: 01278 456411 Fax: 01278 429949

SMLB THRUSTER DRUM BRAKES SPRING APPLIED ELECTRICALLY RELEASED

BY: DJ DATE: 12/10/2002 DWG. NO. REV.: (2) DJ50707

PATH: drm/sis/smib.dwg

SMLB-01.2

⁻ A FULL RANGE OF THRUSTERS AND FRICTION LININGS ARE AVAILABLE TO SUIT PARTICULAR TORQUE REQUIREMENTS - COLD STATIC TORQUE VALUES MUST BE DOWN RATED BY AT LEAST 20 PERCENT - MAX. DYNAMIC TORQUE IS BASED ON MINIMUM AIR GAP, LARGEST SPRING AND FRICTION COEFFICIENT OF 0.42 - CUSTOM MOTOR MOUNTING HARDWARE AVAILABLE

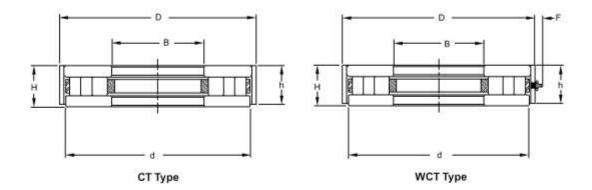
ii. Bearings

THRUST BEARINGS

CYLINDRICAL ROLLER THRUST BEARINGS

Cylindrical Roller Thrust Crane Hook Series With and Without Grease Fitting...

- · Special Design for Crane Hook Applications.
- · Designed to Fit Standard Hook Shanks.
- · Steel "Weathershed" to Keep Out Contaminants.
- · Available With or Without Grease Fittings.
- Bearing Capacity is the Static Load Rating Based on a Permanent Deformation of .0002 inch per inch of Roller Diameter.



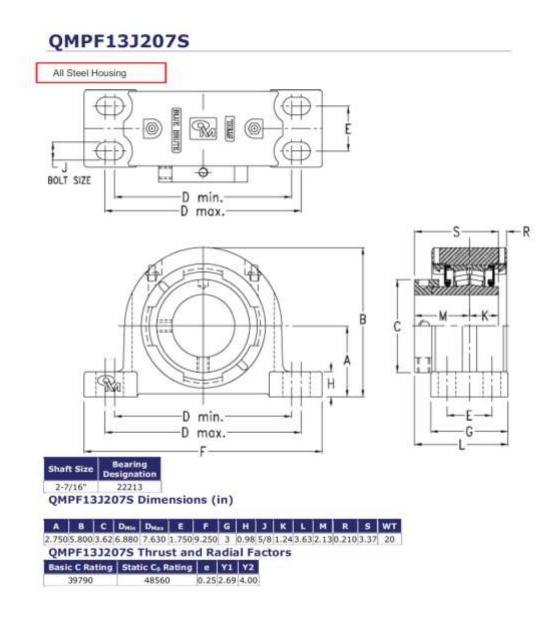
Basic Bearing Number		Designed	Bore	37.57	side	Malada	Into		Bearing
Greas	e Fitting	Hook	2016	(100)	D	Height H	Dimer	Capacity	
None	None Installed Si	Shank	В	CT	WCT*		d	h	
CT-11	WCT-11	1.5/8	1.640	3.093	3.343	0.812	2.95	0.69	36,890
CT-16	WCT-16	1.15/16	1,952	3.468	3,593	0.812	3.22	0.69	65,310
CT-17	WCT-17	2	2.015	3.937	4,000	1.000	3.60	0.88	73,210
CT-19	WCT-19	2 1/4	2.265	4.000	4.250	1.000	3.86	0.88	72,970
CT-20-C	WCT-20-C	2 1/4	2.265	4.250	4.375	1.000	3.98	0.88	88,600
CT-23	WCT-23	2 3/4	2.765	4.750	4.843	1.000	4.45	0.88	93,820
CT-24-A	WCT-24-A	2 3/4	2.765	4.875	5.156	1.250	4.76	1.13	121,300
CT-27-A	WCT-27-A	3 1/4	3.265	6.125	6.250	1.500	5.85	1.38	180,810
CT-27-C	WCT-27-C	3 1/4	3.265	6.187	6.375	1.750	5.97	1.63	212,960
CT-27-B	WCT-27-B	3 1/2	3.515	6.156	6.375	1.625	5.97	1.50	203,410
CT-28-A	WCT-28-A	3 1/2	3.515	6.750	6.937	1.625	6.54	1.50	245,110
CT-34-A	WCT-34-A	3.3/4	3.765	7.125	7.250	1.875	6.86	1.75	288,080
CT-35-A	WCT-35-A	4.1/4	4.265	8.171	8.375	2.000	7.97	1.88	369,200
CT-38-A	WCT-38-A	4 1/2	4.515	8.125	8.312	2.000	7.91	1.88	390,910
CT-39-A	WCT-39-A	5	5.015	9.156	9.375	2.250	8.97	2.13	628,470
CT-44-A	WCT-44-A	5 1/2	5.515	10.500	10.500	2.500	10.10	2.38	628,470
CT-45-A	WCT-45-A	6	6.015	11.156	11,375	3.000	10.97	2.75	923,160
CT-49-A	WCT-49-A	6 13/16	6.827	12.750	12.750	2.500	12.34	2.38	1,004,880

Dimension Fx2 must be added to bearing O.D. for determining overall O.D. on WCT type.
 F = .41 inch (approx.) for all sizes.

Hook Bearing

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Drum Pillow Block Bearing



QMPF13J207S Load Ratings

Life (Hours)										2400 RPM			
5000	17658	14343	11650	8850	7189	6806	6365	6026	5754	5528	5336	5170	5071
10000	14343	11650	9463	7189	5839	5528	5170	4895	4674	4490	4334	4199	4119
20000	11650	9463	7686	5839	4743	4490	4199	3976	3796	3647	3521	3411	3346
50000	8850	7189	5839	4436	3603	3411	3190	3020	2884	2771	2674	2591	2542
100000	7189	5839	4743	3603	2926	2771	2591	2453	2342	2250	2172	2105	2064

*Note: Blue Brute Bearings are made of cast steel; therefore, Blue Brute Bearings pillow block units are designed to accept housing load up to 'Static Co Rating' at any angle from P0 to P180.

	Oil Lubricati	on	Grease Lubrication					
M/N Seal	M/N Seal T/ML Seal		M/N Seal	T/ML Seal	B/C/O Seal			
1800	3200	1500	1800	2800	1500			

QMPF13J207S Shaft Tolerance

Shaft Tolerance

+0.00 / -0.0015

QMPF13J2075 Amount of Float per One Rotation of External housing Nut

Float 0.083



ISO 9001:2000



iii. Couplings

Hoist Drum Coupling

Barrel coupling TCB type



Application

TCB barrel couplings are recommended for installation in crane lifting mechanisms, to connect the cable drum with the gearbox output shaft, as well as in winch conveyors and platform hoists.

When the gearbox output shaft is rigidly connected to the drum in a lifting mechanism, supported between points (Fig. 1), this originates a statically indeterminate case.

This type of mounting requires special care in alignment and levelling, which is difficult to achieve in practice.

Mounting inaccuracies, as well as deformation in structures and wear in moving parts, lead to enormous additional forces, above all in the gearbox output shaft, which as a result of alternative bending loads can lead to breakage due to fatigue and faults in bearings and gear wheels.

In the recommended mounting (Fig. 2) the barrel coupling, which is installed between the gearbox and cable drum, performs the function of an articulated joint, thus making the connection statically determinate and avoiding the occurrence of high bending moments.

Figure 4 shows the mounting of the barrel coupling in a lifting mechanism. Considering the fact that this coupling allows axial displacement, a self-adjusting bearing must be mounted, fixed laterally, at the opposite end of the drum shaft in order to withstand the axial forces that may be generated.

As a special application, the TCB barrel coupling can be designed as an articulated joint that withstands axial forces by itself (type TCBA, see page 15).

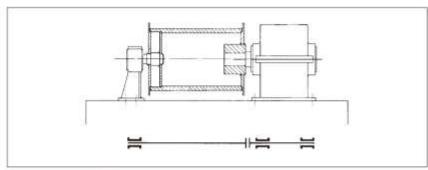


Fig. 1 Rigid mounting of gearbox-drum connection Support at three points.

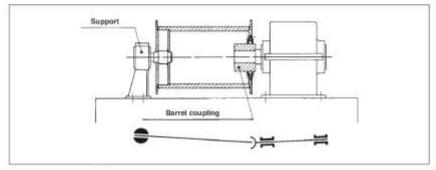
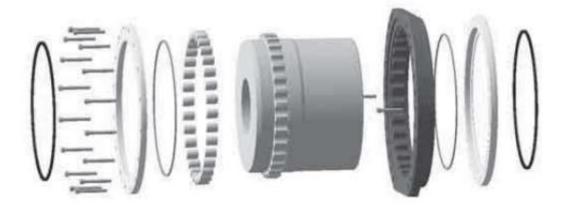


Fig. 2 Mounting with barrel coupling.

Part List



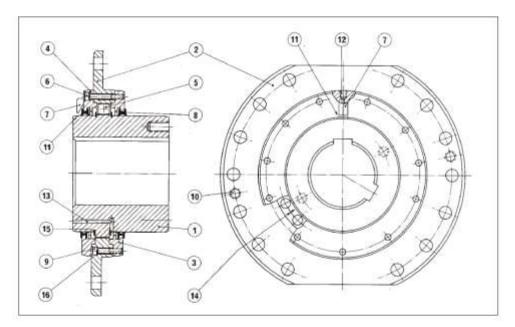


Fig. 3

- 1. Hub
- 2. Sleeve
- 3. Inner cover
- 4. Outer cover
- 5. Barrel
- 6. Allen screw
- 7. Wear and axial adjustment indicator
- 8. Special seal

- 9. Allen screw
- 10. Threaded holes for disassembly
- 11. Wear limit grooves
- 12. Grease connection
- 13. Grease overflow
- 14. Assembly reference
- 15. Barrel guide rings
- 16. Grower washer

Description and characteristics

The barrel coupling consists of a sleeve provided with semicircular toothing around its internal diameter and a hub that is externally toothed in a similar way. A series of cylindrical barrels, of hardened steel, are inserted in the holes formed by this toothing to act as power transmission elements.

Covers with their corresponding special seals serve to assure the perfect tightness of the inner zone, preventing the penetration of dust and guaranteeing the continuity of the necessary lubrication. Two double-lamina elastic rings mounted on the hub, one on each side of the toothing, limit the axial displacement of the barrels.

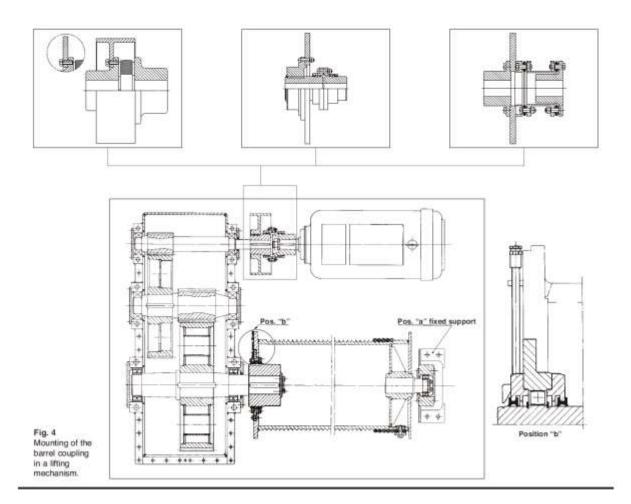
The convex shape of the barrels and the internal spaces of the toothing allows the oscillation of the hub relative to the sleeve, compensating angular misalignments of \pm 1° 30' and an axial displacement that varies between \pm 3 mm and \pm 8 mm (see Table 4, page 8).

Torque is transmitted to the drum's receiving flange, generally by two diametrically opposed flat driving surfaces, located at the periphery of the coupling flange, and also by means of a series of bolts which, at the same time, serve as connection with the drum.

Other connection systems, such as adjusted spring pins or similar, can also be used following the adequate preparation of the flanges (see TCB with special flange on page 15).

The described design is appropriate for bearing large radial loads, as these are distributed over large barrel support surfaces. In the same way, this design also minimises the effect of alternative bending of the torque on the toothing, the latter being robust thanks to its low height and large bottom section. In addition to this, due to the effect of a "crush polishing" of the hardened barrel on the tooth profile, its wear resistance is appreciably improved.

An indicator located on the outer cover (Pos. 7, Fig. 3), which moves relative to the marks provided on the hub as a function of wear, permits control of internal wear of the toothing without the need to disassemble any part of the coupling. The same indicator also serves to control the axial position of the sleeve relative to the hub.



Diameters and parameters

Standard TCB

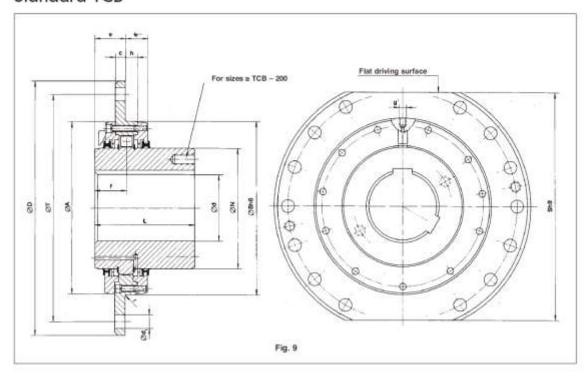


Table 4. Technical data and general dimensions of the standard TCB

TCB	TN (Nm)	Fr (N)	d max.	d min.	D	L	L min.	N	A	В	s	е	ı	c	r	h	k	т	d,	Max. axial a	Wt. (Kg)	(Kg/m
25	4.500	14.500	65	38	250	95	85	95	159	160	220	42	44	12	2,5	16	31	220	15	3	12	0,06
50	6.000	16.500	75	48	280	100	85	110	179	180	250	42	44	12	2.5	16	31	250	15	3	19	0,13
75	7.500	18.500	85	58	320	110	95	125	199	200	280	45	46	15	2,5	17	32	280	19	4	23	0,17
100	9.000	20.000	95	58	340	125	95	140	219	220	300	45	46	15	2,5	17	32	300	19	4	27	0,25
130	15.500	31.000	110	78	360	130	95	160	239	240	320	45	47	15	2.5	19	34	320	19	4	33	0,36
160	19.500	35.000	125	78	380	145	95	180	259	250	340	45	47	15	2.5	19	34	340	19	4	42	0,48
200	24,000	38.500	135	98	400	170	95	200	279	280	360	45	47	15	2,5	19	34	360	19	4	54	0,66
300	28,000	42.000	150	98	420	175	95	220	309	310	380	45	47	15	2,5	19	34	380	19	4	70	0,93
400	38.000	49.000	185	98	450	185	120	260	339	340	400	60	61	20	2,5	22	40	400	24	4	95	1,45
500	61.400	92.000	215	98	510	220	125	300	399	400	460	60	61	20	2,5	22	40	460	24	6	146	2.86
600	70.000	115.000	235	118	550	240	125	312	419	420	500	60	61	20	2,5	22	40	500	24	6	162	3.93
1.000	120.000	125.000	250	138	580	260	130	351	449	450	530	60	61	20	2,5	22	40	530	24	6	195	5,63
1.500	180.000	150.000	295	158	650	315	140	415	529	530	580	65	66	25	2,5	27	45	600	24	6	305	11
2.100	250.000	221,000	305	168	665	330	145	428	542	545	590	65	68	25	2,5	31	49	615	24	6	320	12.2
2.600	310.000	250.000	315	168	680	350	145	443	558	560	600	65	69.5	25	4	34	52	630	24	6	360	16
3.400	400.000	300.000	340	198	710	380	165	475	599	600	640	81	85,5	35	4	34	58	660	28	8	408	20
4.200	500.000	340.000	385	228	780	410	165	539	669	670	700	81	85,5	35	4	34	58	730	28	8	580	34
6.200	685.000	380.000	430	258	850	450	165	603	729	730	760	81	85,5	35	4	34	58	800	28	8	715	52

During start-up, couplings can admit 200% of nominal torque capacity.

Maximum bore diameters for execution with keyways according to DIN 6885/1. For other types of connections consult our Technical Department.
 Maximum angular displacement of axes: ± 1° 30°

g = lubrication point

Up to size 160: R. 1/8" Gas, after size 200: R. 1/4" Gas.

Gear Couplings

ADVANTAGES:

IMPROVED SOFT SEAL offers superior sealing under misaligned conditions.

UNIQUE TOOTH FORM using a 40° pressure angle, distributes the load over a larger area than couplings which use a 20° pressure angle.

FULL TOOTH ENGAGEMENT reduces uneven wear on teeth that results in longer life plus improved performance.

QUALITY EXPOSED FASTENERS consists of SAE Grade 5 bolts with hex nuts and lock washers. Installation is simple, without special tools. Shrouded bolts optional.

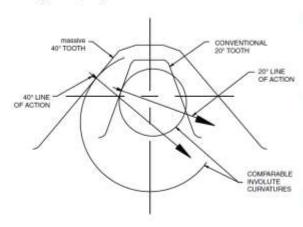
CLEAR RUST INHIBITIVE AND CORROSION RESISTANT FINISH protects coupling in normal industrial environments.

AVAILABLE OFF-THE-SHELF in reborables with large bore capabilities or stock finish bored.

OPTIONAL PILOT RINGS provides positive register between identical halves. Eliminates selective assembly required in male, female sleeves.

INTERCHANGEABLE by half coupling with competitive coupling designs.

HIGHER MISALIGNMENT CAPABILITY sizes 1-7 compensate for up to ±1 1/2° static angular misalignment per gear mesh.



20° vs. 40° Tooth Comparison on the same pitch diameter



Size 1-7

Advantages of the 40° Pressure Angle Tooth

STRONGER TOOTH

The line of action of the force exerted at the pitch line of the new Performance Profile crosses the root circle near the center of the tooth rather than outside the tooth, as in the case of conventional gear teeth. The result is an appreciable reduction in root stress which helps protect against tooth failure.

GREATER TOOTH CONTACT AREA

The profile of the tooth is significantly flatter due to the large involute radius of curvature. This causes the load to be distributed over a larger area. As a result, compressive stresses, lubricant film pressure and tooth wear are minimized.

GREATER SLEEVE CENTERING ABILITY

The 40° pressure angle tooth produces greater radial forces which helps to maintain sleeve concentricity with respect to the axis of rotation. As a result, inherent unbalance and centrifugal forces are minimized and a smooth and efficient operation is imparted to the coupling.

INCREASED ARC OF CONTACT

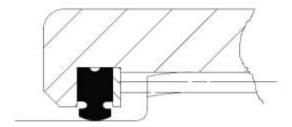
With the 40° pressure angle tooth there is less tendency for some of the teeth to lose contact during misalignment. This prevents a drastic reduction in torque rating with increased misalignment.

INCREASED STRENGTH AND DURABILITY

Under maximum loading and misaligned conditions, the stronger tooth, the greater intimacy between the teeth and the increased arc of contact all combine to produce a coupling unit that is additionally rugged and efficiently useful for longer periods of time.

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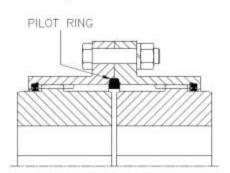
FULL ENGAGEMENT TEETH



The gear coupling has been designed with full length tooth engagement with the inherent result of longer life and improved performance.

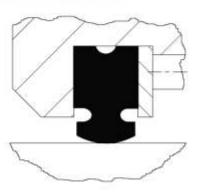
Optional Pilot Rings

The standard coupling consists of two identical half couplings. Optional precision steel pilot rings are available when more accurate centering of the two sleeves is required.



Basic Coupling Size	Pilot Ring Part No.	Wt. (lb.)
1	1W PR	.06
1 1/2	1 1/2W PR	.09
2	2W PR	.12
2 1/2	2 1/2W PR	.21
3	3W PR	.25
3 1/2	3 1/2W PR	.25
4	4W PR	.98
4 1/2	4 1/2W PR	1.1
5	5W PR	1.2
5 1/2	5 1/2W PR	1.5
6	6W PR	1.9
7	7W PR	2.9

HIGH MISALIGNMENT SEAL

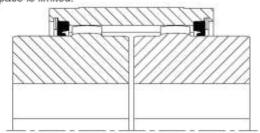


Competitive gear couplings incorporate an O-ring seal. In order to conform with today's high misalignment capacities, this O-ring must fit into a groove that is larger than the ring. couplings use a truly high misalignment seal that seals remarkably under misaligned conditions.

POWERLIGN

This flangeless design transmits identical torques as the standard Coupling. Having a smaller outside diameter, however, it is more compact, lighter, and can run at greater speeds.

This alternative may be selected for applications where space is limited.



Service Factors

Values listed are intended only as a general guide, and are typical of usual service requirements. For systems which frequently utilize the peak torque capability of the power source, verify that the magnitude of this peak torque does not exceed the 1.0 Service Factor Rating of the coupling selected. Applications which involve extreme repetitive shock or high-energy load absorption characteristics should be referred — with full particulars - to

Values contained in the table are to be applied to smooth power sources such as electric motors and steam turbines. For drives involving internal combustion engines of four or five cylinders, add 1.0 to the values listed; for six or more cylinders, add 0.5 to the values listed. For systems utilizing AC or DC Mill Motors as the prime mover, refer to Note (1).

▲CAUTION All peoplemoving applications must be referred to engineering.

Application	Typical Service
AGITATORS	Factor
Pure Liquids	1.0
Liquids & Solids	
Liquids — Variable Density	
Centrifugal	1.0
Lobe	1.5
Vario	1.25
BRIQUETTE MACHINES	2.0
CAR PULLERS — Intermittent Duty COMPRESSORS	1.5
Centrifugal	+ 0
Centriaxial	
Lobe	
Reciprocating — Multi-Cylinder	1.9
CONVEYORS — LIGHT DUTY UNIFORMLY FED	
Apron, Bucket, Chain, Flight, Screw	1.25
Assembly, Belt	1.0
Oven	1.5
CONVEYORS — HEAVY DUTY NOT UNIFORMLY FED	
Apron, Bucket, Chain, Flight, Oven	
Assembly, Belt	1.20
Reciproceting, Shaker.	2.5
Reciprocating, Shaker. CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Revening	25
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Reventing Skip Hoists, Trollay & Bridge Crives	25
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Revening Skip Hoists, Trolley & Bridge Drives Slope	25
Reciprocesing, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Revening Skip Hoists, Trolley & Bridge Drives Skipe CRUSHERS	25 25 20 20
Reciprocesting, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosista, Reversing, Skip Hoists, Trolley & Bridge Crives, Stope CRUSHERS Ore, Stone	25 25 20 20
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hostin, Reversing Skip Holata, Trolley & Bridge Crives Skipe CRUSHERS O're, Stone DREDGES	25 25 20 20 30
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Reversing Skip Hoists, Trolley & Bridge Crives Skipe CRUSHERS Ore, Storie DREDGES Cable Reets	25 20 20 30
Beoprocessing, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Slop Hoists, Trolley & Bridge Onives Slope CRUSHERS Ore, Stone DREPORS Cable Revis Conveyors	25 20 20 20 30 17 15
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Reversing Skip Hoists, Trolley & Bridge Drives Slope CRUSHERS Ore, Stone DREDGES Cable Reels Conveyors Cutter Head Jia Drives	25 20 20 20 30 175 175 25
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Reversing Slope Hoists, Trolley & Bridge Chaves Slope CRUSHERS Ore, Stone DREDGES Cable Reels Conveyors Outlier Head Jig Drives Manauvaring Winches	25 20 20 20 30 17! 15 25
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Reversing Skip Hoists, Trolley & Bridge Drives Slope CRUSHERS Ors, Stone DPEEDGES Cable Reals Conveyors Outs: Head Jig Drives Maneuvering Winches Pumps	25 20 20 30 30 1.7! 1.5 2.6 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Reversing Slope Hoists, Trolley & Bridge Chaves Slope CRUSHERS Ore, Stone DREDGES Cable Reels Conveyors Outlier Head Jig Drives Manauvaring Winches	25 20 20 30 30 1.7! 1.5 2.6 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosta, Reversing Skip Hoista, Trolley & Bridge Drivee Slope CRUSHERS Ore, Storie DREDGES Cable Reets Conveyors Cutter Head Jig Drives Maneuvering Winchee Pumps Screen Drives Screen Drives	2.5 2.0 2.0 3.0 1.7! 1.5 2.5 1.7! 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Skip Hoists, Trolley & Bridge Craves Skipe CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Outler Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Stackers	2.5 2.5 2.0 2.0 3.0 1.7: 1.5 2.6 1.7: 1.7: 1.7:
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Roversing Slop Hoists, Trolley & Bridge Orives Slope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Cutter Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Utility Winches ELEWATORS (NOTE 2)	2.5 2.5 2.0 2.0 3.0 1.7! 1.5 2.5 1.7! 1.7! 1.7! 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Skip Hoists, Trolley & Bridge Orivee Skipe CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Outler Head Jig Drives Maneuvering Winchee Pumps Screen Orines Stackers	2.5 2.5 2.0 2.0 3.0 1.7! 1.5 2.6 1.7! 1.7! 1.7! 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Slop Hoists, Trolley & Bridge Orivee Slope CRUSHERS Ors, Stone DPEEDGES Cable Finals Conveyors Outler Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Utility Winches ELEVATORS (NOTE 2) Bucket	25 25 20 20 30 30 1.77 1.5 2.6 1.77 1.77 1.77 1.77 1.77
Beoprocessing, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Raversing Slope Hoists, Trolley & Bridge Chaves Slope CRUSHERS Ore, Stone DREDGES Cable Reels Conveyors Contres Heed Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Usiny Winches ELEVATORS (NOTE 2) Bucket Centifugal & Grantly Discharge	2.5 2.5 2.0 2.0 3.0 1.7! 1.5 2.5 1.7! 1.7! 1.7! 1.5 1.5 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Slope Hoists, Trolley & Bridge Craves Slope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Cutter Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Utility Winches ELEVATORS (NOTE 2) Bucket Centifugg & Grantly Discharge Escalators Centifugg & Grantly Discharge Escalators Centifugg & Grantly Discharge Escalators	2.5 2.5 2.0 2.0 3.0 3.0 1.7! 1.5 2.5 1.7! 1.17! 1.17! 1.5 1.5 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hostin, Roversing Skip Hoists, Trolley & Bridge Drives Stope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Context Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers Lillity Winches ELEVATORS (NOTE 2) Bocket Centifugal & Grantly Discharge Escalators Freight	25 2.5 2.0 2.0 3.0 1.7! 1.5 2.5 1.7! 1.7' 1.5 1.7' 1.7' 1.5 1.5 1.7' 1.7' 1.5 1.5 1.7' 1.7' 1.5 1.5 1.7' 1.7' 1.5 1.5 1.7' 1.7' 1.7' 1.7' 1.7' 1.7' 1.7' 1.7'
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Skip Hoists, Trolley & Bridge Draves Skipe CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Cutter Head Jig Drives Maneuvaring Winches Pumps Screen Drives Stackers Utility Winches ELEWATORS (NOTE 2) Bucket Centrifugal & Gravity Discharge Escalatos Freigit FANS	2.5 2.5 2.0 2.0 3.0 1.7! 1.5 2.5 1.7! 1.7! 1.5 1.5 1.7! 1.5 1.5 1.7!
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Roversing Skip Hoists, Trolley & Bridge Craves Stope CRUSHERS Ors, Stone DPEDGES Cable Reals Conveyors Outler Head Jig Drives Maneuvering Winches Pumps Screen Drives Stackers LIBITY Winches LIBITY Winches ELEVATORS (NOTE 2) Bucket Centrifugal & Grandy Discharge Escalators Freigit FANS Centrifugal	2.5 2.5 2.0 2.0 3.0 3.0 1.77 1.5 2.6 1.77 1.79 1.79 1.5 1.5 1.5 1.5 1.77 1.79 1.5 1.5 1.5 1.79 1.79 1.79 1.79 1.79 1.5 1.5 1.5 1.5 1.79 1.79 1.79 1.79 1.79 1.79 1.79 1.79
Beoprocessing, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Slope Hoists, Trolley & Bridge Craves Slope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Contrest Head slig Drives Mansuvering Winches Pumps Screen Drives Stackers Utility Winches ELEVATORS (NOTE 2) Bucket Centiflugal & Grandy Discharge Escalators Freight FANS Centriflugal Cooling Towers	2.5 2.5 2.0 3.0 3.0 1.7! 1.5 1.7' 1.7' 1.5 1.5 1.7' 1.5 1.7' 1.5 1.7' 1.5 1.5 1.7' 1.5 1.7' 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
Beoprocessing, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Raversing Slope Hoists, Trolley & Bridge Craves Slope CRUSHERS Ore, Stone DREDGES Cable Reels Conveyors Contres Heed slig Drives Maneuvering Winches Pumps Screen Drives Stackers Usiny Winches ELEVATORS (NOTE 2) Bucket Centrifugal & Grandy Discharge Escalators Freight FANS Centrifugal Cooling Towers Forced Draft Induced Draft without Damper	2.5 2.5 2.0 3.0 3.0 1.7! 1.5 1.7! 1.7! 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hoists, Roversing Skip Hoists, Trolley & Bridge Orivee Skipe CRUSHERS Ore, Stone DREDGES Cable Fleets Conveyors Cutter Head Jig Drives Maneuvering Winchee Pumps Screen Drives Stackers Utility Winches ELEVATORS (NOTE 2) Bucket Centrifugel & Grantly Discharge Escalators Freight FANS Centrifugel Cooling Towers Forced Drives Freight FANS Contributed FORCE FOR	2.5 2.0 2.0 3.0 1.7! 1.5 2.6 1.7! 1.7! 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Reversing Slope Hoists, Trolley & Bridge Craves Slope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Cutter Head Jig Drives Manauvering Winches Pumps Screen Drives Strackers Unity Winches ELEVATORS (NOTE 2) Bucket Centrifugal & Grandy Discharge Escalators Freight FANS Centrifugal Cooling Towers Forced Draft Induced Draft without Damper Control EFEDERS	2.5 2.0 2.0 3.0 1.7! 1.5 2.6 1.7! 1.7! 1.5 1.6 2.6 1.7! 1.7! 1.5 1.6 2.6 1.7! 1.7! 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
Reciprocating, Shaker CRANES AND HOISTS (NOTE 1 and 2) Main hosts, Reversing Slope Hoists, Trolley & Bridge Craves Slope CRUSHERS Ore, Stone DREDGES Cable Reals Conveyors Cutter Head Jig Drives Manauvaring Winches Pumps Screen Drives Stackers Unity Winches ELEVATORS (NOTE 2) Bucket Centifugal & Grandy Discharge Escalatos Freight FANS Centifugal Cooling Towers Forced Draft Induced Draft without Damper	2.5 2.0 2.0 3.0 1.7! 1.5 2.6 1.7! 1.7! 1.5 1.6 2.6 1.7! 1.7! 1.5 1.6 2.6 1.7! 1.7! 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5

Application		Service Factor
GENERATORS — (Not Welding)		
(Not Welding) HAMMER MILLS LAUNDRY WASHERS —		2.0
Reversing		2.0
LINE SHAFT LUMBER INDUSTRY		1.5
Barkers — Drum Type		2.0
Edger Feed		2.0
Live Holls		2.0
Live Rolls		2.0
Off Bearing Rolls		2.0
Planer Food Chains		1.7
Planer Figor Charis		1.7
Off Bearing Role Planer Feed Chains Planer Floor Chains Planer Floor Chains Planer Tilting Host Slab Conveyor		1.5
Sorting Table		1.5
Soring Table Trimmer Feed MARINE PROPULSION Main Drives MACHINE TOOLS Bending Golf		1.7
Main Drives		2.0
MACHINE TOOLS		100,000
Bending Roll Plate Planer		2.0
Plate Planer		2.0
Tapping Machines		2.5
Tapping Machines Other Machine Tools		
Main Drives		1.5
AUXIBARY DITVOS		1,2
METAL MILLS Draw Bench — Carriage Draw Bench — Main Drive		2.0
Draw Bench - Main Drive -		2.0
Sitters		
Mrs. Bowning		22
Reversing		2.5
Wire Drawing & Flattening M	achine	2.0
Revening Wire Drawing & Flattening M Wire Winding Machine METAL ROLLING MILLS (NO Property Mile	TE 1)	
Booming Mills Collers, hot mill Collers, cold mill	(E 1)	
College, hot mill		2.0
Cold Mils		2.0
Cooling Beds		1.7
Door Openers Draw Benches Edger Drives		2.0
Edger Drives		2.0
Feed Rolls, Reversing Mills		3.5
Furnace Pushers		2.5
Furnace Pushers		3.0
Ingot Cars		2.5
Kick-outs		3.0
Manipulators		3.0
Piercere		3.0
Pusher Rams		2.5
Reel Drives		1,7
Reel Drums		3.0
Rod and Ber Mills		1.5
Rod and Ber Mills		3.0
Runout Tables Reversing		0.0
Non-Reversing		3.0
Saws hot & cold		2.5
Saws, hot & cold		3.0
Skelp Mills		3.0
Sitters		3.0
Slabbing Mills		3.0
Straighteners		9.5
Tables, transfer & runout		2.0
		6.4
Thrust Block		3.0
Thrust Block Traction Drive		3.0
Thrust Block Traction Drive Tube Conveyor Holls		3.0
Thrust Block Traction Drive Tube Conveyor Rolls Unscrimblers		2.5
Thrust Block Traction Drive Tube Conveyor Rolls Unscramblers Wire Drawing		2.5
Thrust Block Traction Drive Trabe Conveyor Rolls Unscrimblers Wire Drawing MILLS, ROTARY TYPE Ball		2.5 1.5 2.2
Thrust Block Traction Drive Tube Conveyor Rolls Unscramblers Wire Drawing MILLS, ROTARY TYPE		2.5 1.5 2.2 2.0

Application	Typica Service Factor
Pebble & Rod	2.0
Pug	1.75
Tumbling Barrels	
Concrete Mixers	1.7
Drum Type	1.5
OIL INDUSTRY Chilers	1.00
Paraffin Filter Press	1.21
PAPER MILLS	
Barker Austiaries, Hydrautic	2.0
Barker, Mechanical	2.0
Barking Drum Spur Gear Only	2.25
Bester & Pulper	1.0
Calenders	2.0
Chippers	25
Coaters	1.0
Converting Machines. except Cuthers, Platiers Couch Roll Cuthers, Platiers	
except Gutters, Platers	1.5
Cuttors Plators	2.0
Cylinders	1.75
Cylinders Disc Ratinors	1.75
Dryers	1.79
Fell Stretcher	1.21
Felt Whipper	2.0
Line Shaft	1.75
Log Haul	2.0
Puln Grindor	1.79
Pulp Grinder Press Roll	2.0
Reel Stock Chests Suction Roll Washers & Thickeners	1.5
Stock Chests	1.5
Suction Roll	1.79
Washers & Thickeners	1.5
DOINTING DRESSES	15
Winders PRINTING PRESSES PULLERS — Barge Haul	2.0
DEIMPS	
Centrifugal	1.0
Boler Feed	1,5
Centritugal Boler Feed Reciprocating	
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Gear, Lobe, Vane	
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vane RUBBER MOUSTRY	2.2 1.7 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Gear, Lobe, Vana RUBBER INDUSTRY Waser — Barbury	2.2 1.7 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Gear, Lobe, Vana RUBBER INDUSTRY Wase — Barbury	2.2 1.7 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vana RUBBER INDUSTRY Waser — Barbury Rubber Celerder Bubber Mil 2 or more)	2.9 1.7 2.0 1.5 2.5 2.0 2.0
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vana RUBBER INDUSTRY Waser — Barbury Rubber Celerder Bubber Mil 2 or more)	2.9 1.7 2.0 1.5 2.5 2.0 2.0
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Hotary, Geer, Lobe, Vana RUBBER INDUSTRY Waser — Barbury Hubber Celerder Hubber Mill (2 or more) Sheeter Tine Building Machines Tine 8 Tube Press Openars	2.26 1.77 2.0 1.5 2.5 2.0 2.26 2.0 2.5 1.0
Single Acting 1 or 2 Cylindars 3 or more Cylindars Double Acting Rotary, Gazer, Lobe, Varia RUBBER INDUSTRY Mose — Berbury Rubber Calendar Rubber Mill (2 or more) Sheeter The Building Machines Tine & Tube Press Openers Tubers & Stainers	2.9 1.7 2.0 1.5 2.5 2.0 2.0 2.0 2.0 1.0 2.0
Single Acting 1 or 2 Cylindars 3 or more Cylindars Double Acting Rotary, Gazer, Lobe, Varia RUBBER INDUSTRY Mose — Berbury Rubber Calendar Rubber Mill (2 or more) Sheeter The Building Machines Tine & Tube Press Openers Tubers & Stainers	2.04 1.75 2.0 1.5 2.5 2.0 2.0 2.0 2.0 1.0 2.0
Single Acting 1 or 2 Cylindars 3 or more Cylindars Double Acting Rotary, Gazer, Lobe, Varia RUBBER INDUSTRY Mose — Berbury Rubber Calendar Rubber Mill (2 or more) Sheeter The Building Machines Tine & Tube Press Openers Tubers & Stainers	2.04 1.75 2.0 1.5 2.5 2.0 2.0 2.0 2.0 1.0 2.0
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Gear, Lobe, Varia RUBBER INDUSTRY Mase — Barbury Rubber Calendar Rubber Mill (2 or more) Sheeter The Building Machines Tine & Tube Press Openers Tubers & Strainers SCREENS Air Washing	2.2 1.7 2.0 1.5 2.5 2.0 2.2 2.0 2.5 1.0 2.0
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Gaze, Lobe, Varia RUBBER INDUSTRY Miser — Barbury Rubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Tire Building Machines Tire & Tube Press Openers Tubere & Strainers SCREENS Air Washing Grizzly Rotary — Stone or Grevel	2.29 1.79 2.00 1.5 2.5 2.00 2.29 2.5 1.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.5 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.5 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.5 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.5 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.71 2.0 1.5 2.5 2.0 2.21 2.5 1.0 2.0 2.0 2.0 2.0 1.0 2.0 1.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.6 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Potary, Gaze, Lobe, Varia RUBBER INDUSTRY Waser — Barbury Plubber Celender Rubber Celender Rubber Mil (2 or more) Sheeter Trie Bukkling Machines Trie & Tube Press Openers Tubers & Steinhers SCREENS Air Washing Grizzly Rotary — Stone or Gravel Traveling Water Intake	2 29 1.77 2.00 1.5 2.6 2.0 2.29 2.5 1.0 2.0 2.0 1.0 2.0 1.5
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Hotary, Geer, Lobe, Varia RUBBER INDUSTRY More — Barbury Pubber Celender Flubber Celender Flubber Mil (2 or more) Sheeter Tine Bulkling Machines Tine Bulkling Machines Tine Bulkling Machines Tine Bulkling Machines Tine State Press Openers Lubers & Strainers SCREENS Air Washing Grizzly Potary — Stone or Gravel Traveling Water Intake Vitrasling SEWAGE DISPOSAL EQUIPMENT Bar Scroons Chemical Feeders Collectors, Circuline or Straighfline Dewittering Scroons Grit Collectors Scarm Breakers Scow or Breakers Scow or Breakers Scow or Breakers	2 2 2 1.77 2.0 1.5 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vann RUBBER INDUSTRY Muser — Barbury Rubber Celender Pubber Mill (2 or more) Sheeter Trie Buiking Machines Trie Buiking Machines Trie Buiking Machines Trie & Tube Press Openars Tubers & Strainers SCREINS Air Washing Grizzly Grizzly Botary — Stone or Gravel Travelling Water Intake Versting SEWAGE DISPOSAL, EQUIPMENT Bar Scroons Chemical Feeders Collectors, Circuline or Straightfine Dewnstraing Scroons Grill Collectors Sourn Breekers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers	2 22 17 17 20 15 15 20 20 20 20 20 20 20 20 20 20 20 20 20
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vann RUBBER INDUSTRY Muser — Barbury Rubber Celender Pubber Mill (2 or more) Sheeter Trie Buiking Machines Trie Buiking Machines Trie Buiking Machines Trie & Tube Press Openars Tubers & Strainers SCREINS Air Washing Grizzly Grizzly Botary — Stone or Gravel Travelling Water Intake Versting SEWAGE DISPOSAL, EQUIPMENT Bar Scroons Chemical Feeders Collectors, Circuline or Straightfine Dewnstraing Scroons Grill Collectors Sourn Breekers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers	2 22 17 17 20 15 15 20 20 20 20 20 20 20 20 20 20 20 20 20
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vann RUBBER INDUSTRY Muser — Barbury Rubber Celender Pubber Mill (2 or more) Sheeter Trie Buiking Machines Trie Buiking Machines Trie Buiking Machines Trie & Tube Press Openars Tubers & Strainers SCREINS Air Washing Grizzly Grizzly Botary — Stone or Gravel Travelling Water Intake Versting SEWAGE DISPOSAL, EQUIPMENT Bar Scroons Chemical Feeders Collectors, Circuline or Straightfine Dewnstraing Scroons Grill Collectors Sourn Breekers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers	2 22 17 17 20 15 15 20 20 20 20 20 20 20 20 20 20 20 20 20
Single Acting 1 or 2 Cylinders 2 or more Cylinders Double Acting Rotary, Geer, Lobe, Vana RUBBER NOUSTRY Maser — Barbury Rubber Gelender Pubber Mill (2 or more) Sheeter The Building Machines The & Tube Press Openars Tubers & Strainers SCREENS Air Washing Gritzdy Potary — Stone or Grawel Traveling Water Intake Vibrating SEWAGE DISPOSAL EQUIPMENT Bar Screens Grit Collectors Chemical Feeders Collectors, Crouline or Straightline Dewatering Screens Scum Breakers Slow or Rapid Misers Skutge Cellectors Tradeors Vacuum Fisters	2.22 1.77 2.00 1.5 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.
Single Acting 1 or 2 Cylinders 3 or more Cylinders Double Acting Rotary, Geer, Lobe, Vann RUBBER INDUSTRY Muser — Barbury Rubber Celender Pubber Mill (2 or more) Sheeter Trie Buiking Machines Trie Buiking Machines Trie Buiking Machines Trie & Tube Press Openars Tubers & Strainers SCREINS Air Washing Grizzly Grizzly Botary — Stone or Gravel Travelling Water Intake Versting SEWAGE DISPOSAL, EQUIPMENT Bar Scroons Chemical Feeders Collectors, Circuline or Straightfine Dewnstraing Scroons Grill Collectors Sourn Breekers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers Slow or Rapid Misers	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

* Refer to KOP-FLEX

NOTES

(1) Maximum Torque at the coupling must not exceed Rated Torque of the coupling.

(2) Check local and industrial satisfy codes.

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Selection Procedure

1. Select Coupling Based on Bore Capacity. Select the coupling size that has a maximum bore capacity equal to or larger than the larger of the two shafts. For interference fits larger than AGMA standards, consult KOP-FLEX.

Verify Coupling Size Based on Load Rating. Select the appropriate Service Factor from the Table on page 194.

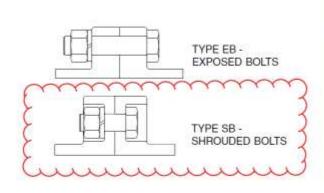
Calculate required HP / 100 RPM:
HP x Service Factor x 100 = HP / 100 RPM

Verify that the selected coupling has a rating greafer than or equal to the required HP / 100 RPM.

 Check Balance Requirements.
 Consult the Dynamic Balancing Guide on page 163 to help determine if balancing is required. Verify that the maximum operating speed does not exceed the maximum speed rating of the coupling. The maximum speed rating does not consider lateral critical speed considerations for floating shaft applications. WALDRON® couplings are available component balanced only.

Note: Care must be exercised on proper selection of any shaft coupling. The Users must assure themselves that the design of the shaft to coupling hub connection is adequate for the duty intended.

Fastener Data

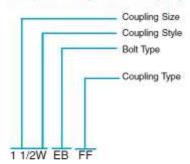


Coupling		Type EB Exposed Be	olt	Type SB Shrouded Bolt						
Size	Oty.	Size & Length	Bolt Circle	Qty.	Size & Length	Bolt Circle				
1	6	1/4 x 1 1/2	3.3/4	6	1/4 x 7/8	3 3/4				
1 1/2	8	3/8 x 2	4 13/16	8	3/8 x 1	4 13/16				
2	6	1/2 x 2 1/2	5 7/8	10	3/8 x 1	5 13/16				
2 1/2	6	5/8 x 2 3/4	7 1/8	10	1/2 x 1 5/16	7				
3	В	5/8 x 2 3/4	8 1/8	12	1/2 x 1 5/16	8				
3 1/2	8	3/4 x 3 3/8	9 1/2	12	5/8 x 1 5/8	9 9/32				
4	8	3/4 x 3 3/8	11	14	5/8 x 1.5/8	10:5/8				
4 1/2	10	3/4 x 3 3/9	12	14	5/8 x 1 5/8	11 3/4				
5	8	7/8 x 4 1/4	13 1/2	14	3/4 x 2 1/8	13 3/16				
5 1/2"	14	7/8 x 3 1/4	14 1/2	-3		12				
6*	14	7/8 x 3 1/4	15 3/4	-		(+c				
7*	16	1 x 3 5/8	18 1/4		9					

Sizes #5 1/2 and larger are available in exposed bolts only.

HOW TO ORDER

PART NUMBER EXPLANATION Complete Rough Bore Coupling



(1 to 7)

(W = Waldron)

(EB = Exposed Bolt

SB = Shrouded Bolt)

(FF = Full Flex

FR = Flex Rigid

SSFF = Short Slide Full Flex

MSFF = Medium Slide Full Flex)

Coupling Parts Description

*FHUB = Flex Hub

*VHUB = Vertical Hub

*RHUB = Rigid Hub

SLEEVE = Standard Sleeve

FS = Fastener Set (w/gasket) LEFD = LEF Disk

SPRxxx = Spacer for x.xx shaft separation

SP = Stop Plate for Slide Couplings

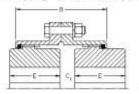
VP = Vertical Plate

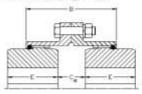
For finish bored hubs, add FB and bore size. All finish bores and keyways per AGMA 9002-A86 with interference fits. Clearance bores are available on request with one setscrew over keyway.

1 1/2W FHUB FB

Hoist coupling

A conventional 4-bearing system has two bearings on the driving shaft and two bearings on the driven shaft. Both angular and offset shaft misalignment will be present to some degree and a full flex coupling is mandatory. The full flex coupling is the standard coupling having two gear ring sets, one set per half coupling. For selection procedure see page 195.

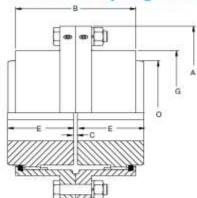




ONE HUB REVERSED

TWO HUBS REVERSED

Full Flex Coupling Size 1-7



Coupling	Maximum Bore with	Rating	Torque	Peak Torque	Maximum	Dimensions									
Size	Standard	HP / 100 RPM	Rating (lbin.)	Rating	Speed (RPM)	Α	В	С	C.	C.	E	G	0		
177	1.5/8	10	6300	12600	10000	4.9/16	3 3/16	1/8	3/8	5/8	1.11/16	3	2 5/16		
1 1/2	2 3/16	24	15100	30200	7400	- 6	3.7/8	1/8	9/16	1	2 1/16	3 13/16	3 1/8		
2	2 3/4	50	31500	63000	5900	7	4 5/8	1/8	13/16	1 1/2	2 7/16	4 13/16	4		
2 1/2	3 1/4	90	56700	113400	5000	8 3/8	5 11/16	3/16	29/32	1.5/8	3 1/32	5 23/32	4 23/32		
3	4	150	94500	189000	4300	9 7/16	6.9/16	3/16	1 1/32	1 7/8	3 19/32	6 23/32	5 5/8		
3 1/2	4 3/4	230	145000	290000	3900	11	7 5/8	1/4	1 5/16	2 3/8	4 3/16	7 3/4	6 5/8		
4	5 3/8	350	221000	442000	3500	12 1/2	8.5/8	1/4	1 7/16	2 5/8	4 3/4	8 31/32	7.1/2		
4 1/2	6	480	300000	600000	3200	13 5/8	9 5/8	5/16	1 5/8	2 15/16	5 3/8	10 1/8	8.1/2		
5	6 3/4	650	410000	820000	2900	15 5/16	10 13/16	5/16	1.11/16	3 1/16	6 1/8	11.3/8	9 1/2		
5 1/2"	7 1/2	850	536000	1072000	2700	16 3/4	11 5/8	5/16	1 7/8	3 7/16	6 5/8	12 9/16	10 27/64		
6+	8 1/4	1100	693000	1386000	2500	18	13.1/4	5/16	2 5/16	4 5/16	7 3/8	13 7/8	11 3/4		
7"	9 1/4	1600	1010000	2020000	2200	20 3/4	14 3/4	3/8	2 3/16	4	8 11/16	15 3/4	13 1/4		

Sizes 5 1/2, 6 and 7 are only available with exposed bolt sleeves. Type EB exposed bolt sleeves are standard.

Coupling Type EB (Exposed Bolts) Part Numbers

Coupling	Full	Flex C	oupling	Fastener Se (Includes Gas		Sleeve	Flex Hub			
Síze "	No Bore Part No.	Wt.	Finish Bore® Part No.	Part No.	Wt.	Part No.	Wt,	No Bore Part No.	Wt.	Finish Bore® Part No.
1	1W EB FF	10	1W EB FF FB	1 EB FS	- 1	1W EB SLEEVE	2	1W FHUB	3	1W FHUB FB
1 1/2	1 1/2W EB FF	19	1 1/2W EB FF FB	1 1/2 EB FS	1	1 1/2W EB SLEEVE	6	1 1/2W FHUB	3	1 1/2W FHUB FE
2	2W EB FF	30	2W EB FF FB	2 EB FS	1	2W EB SLEEVE	8	2W FHUB	7	2W FHUB FB
2 1/2	2 1/2W EB FF	52	2 1/2W EB FF FB	2 1/2 EB FS	2	2 1/2W EB SLEEVE	14	2 1/2W FHUB	12	2 1/2W FHUB FE
3	3W EB FF	76	3W EB FF FB	3 EB FS	3	3W EB SLEEVE	17	3W FHUB	20	3W FHUB FB
3 1/2	3 1/2W EB FF	117	3 1/2W EB FF FB	3 1/2 EB FS	5	3 1/2W EB SLEEVE	28	3 1/2W FHUB	28	3 1/2W FHUB FE
4	4W EB FF	180	4W EB FF FB	4 EB FS	5	4W EB SLEEVE	41	4W FHUB	47	4W FHUB FB
4 1/2	4 1/2W EB FF	244	4 1/2W EB FF FB	4 1/2 EB FS	7	4 1/2W EB SLEEVE	53	4 1/2W FHUB	.66	4 1/2W FHUB FE
5	5W EB FF	361	5W EB FF FB	5 EB FS	9	5W EB SLEEVE	80	5W FHUB	96	5W FHUB FB
5 1/2	5 1/2W EB FF	422	5 1/2W EB FF FB	5 1/2 EB FS	14	5 1/2W EB SLEEVE	89	5 1/2W FHUB	115	5 1/2W FHUB FE
6	6W EB FF	494	6W EB FF FB	6 EB FS	14	6W EB SLEEVE	100	6W FHUB	140	6W FHUB FB
7	7W EB FF	822	7W EB FF FB	7 EB FS	22	7W EB SLEEVE	160	7W FHUB	240	7W FHUB FB

⁽ii) All finish bores and keyways per AGMA 9002-A96 commercial standard tolerances with interference fit bores. Clearance fit bores are available on request and include one setscrew over keyway.

oling Type SB (Shrouded Bolt

Coupling	Full	oupling	Fastener Se (Includes Gas		Sleeve	Flex Hub				
Size	No Bore Part No.	Wt.	Finish Bore® Part No.	Part No.	Wt.	Part No.	Wt.	No Bore Part No.	Wt.	Finish Bore® Part No.
1	1W SB FF	10	1W SB FF FB	1 SB FS	- 1	1W SB SLEEVE	2	1W FHUB	3	1W FHUB FB
1 1/2	1 1/2W SB FF	19	1 1/2W SB FF FB	1.1/2 SB FS	1	1 1/2W SB SLEEVE	6	1.1/2W FHUB	3	1 1/2W FHUB FE
2	2W SB FF	30	2W SB FF FB	2 SB FS	1	2W SB SLEEVE	8	2W FHUB	7	2W FHUB FB
2 1/2	2 1/2W SB FF	52	2 1/2W SB FF FB	2 1/2 SB FS	2	2 1/2W SB SLEEVE	13	2 1/2W FHUB	12	2 1/2W FHUB FE
3	3W SB FF	76	3W SB FF FB	3 SB FS	2	3W SB SLEEVE	15	3W FHUB	20	3W FHUB FB
3 1/2	3 1/2W SB FF	117	3 1/2W SB FF FB	3 1/2 SB FS	4	3 1/2W SB SLEEVE	26	3 1/2W FHUB	28	3 1/2W FHUB FE
4	4W SB FF	180	4W SB FF FB	4 SB FS	4	4W SB SLEEVE	37	4W FHUB	47	4W FHUB FB
4 1/2	4 1/2W SB FF	244	4 1/2W SB FF FB	4 1/2 SB FS	4	4 1/2W SB SLEEVE	50	4 1/2W FHUB	66	4 1/2W FHUB FE
5	5W SB FF	361	5W SB FF FB	5 SB FS	7	5W SB SLEEVE	72	5W FHUB	96	5W FHUB FB

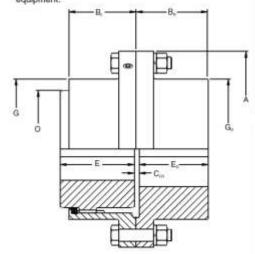
All finish bores and keyways per AGMA 9002-A86 commercial standard tolerances with interference fit bores. Clearance fit bores are available on request and include one setscrew over keyway.

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Bridge and trolley couplings

Flex Rigid and Floating Shaft Couplings Size 1- 7

When driving and driven shafts are widely separated, an unsupported or floating shaft is used to span the gap. The two couplings required at each end of that shaft consist of one half of a standard coupling bofted to a Rigid Hub, each unit called a Flex-Rigid Coupling. Usually, the rigid hubs are mounted on the driving and driven shafts so that the flex halves on the floating shaft may be replaced without disturbing the connected equipment.



Flex Rigid Coupling Rigid Hub® Finish Bore D Part No. EB RHUB FB Size Bore⊕ Part No. W EB FR FB WERE EB RHUB 1 1/2 1.1/2W EB FR 19 1/2W EB FR FB 1/2 EB RHUE 2 EB RHUB 2W EB FR 2W EB FR FB 15

1 1/2 EB RHUB FE 2 EB RHUB FB 2 1/2 2 1/2W EB FR 1/2W EB FR FB 2 1/2 EB RHUB 2 1/2 EB RHUB FB 55 3W EB FR 3W EB FR FB 3 EB RHUB 3 EB RHUB FB 3 1/2W EB FR 1/2W EB FR FB 3 1/2 EB RHUB 3 1/2 EB RHUB FE 4W EB FR 184 4W EB FR FB 4 EB RHUB 90 4 EB RHUB FB 4 1/2 4 1/2W EB FR 1/2W EB FR FB 4 1/2 EB RHUB 124 4 1/2 EB RHUB FE 5W EB FR FB 5 EB RHUB 5 EB RHUB FB 5W EB FR 1/2W EB FR FB 5 1/2 EB RHUB 5 1/2 EB RHUB FB 5 1/2 5 1/2W EB FR 200 6 EB RHUB FB 6W EB FR 6W EB FR FB 6 EB RHUB 7W EB FR FB 7 EB RHUB 7 EB RHUB FB 7W EB FR

Coupling Type SB (Shrouded Bolts) Part Numbers

Coupling Type EB (Exposed Bolts) Part Numbers

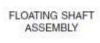
Coupling Size	Flex R	igid (Coupling	Rigid Hub@				
	No Bore Part No.	Wt.	Finish Bore⊕ Part No.	No Bore Part No.	Wt.	Finish Bore® Part No.		
1	1W SB FR	10	1W SB FR FB	1 SB RHUB	5	1 SB RHUB FB		
1 1/2	1 1/2W SB FR	19	1 1/2W SB FR FB	1 1/2 SB RHUB	9	1 1/2 SB RHUB FB		
2	2W SB FR	31	2W SB FR FB	2 SB RHUB	15	2 SB RHUB FB		
2 1/2	2 1/2W SB FR	55	2 1/2W SB FR FB	2 1/2 SB RHUB	27	2 1/2 SB RHUB FB		
3	3W SB FR	83	3W SB FR FB	3 SB RHUB	40	3 SB RHUB FB		
3 1/2	3 1/2W SB FR	126	3 1/2W SB FR FB	3 1/2 SB RHUB	65	3 1/2 SB RHUB FB		
4	4W SB FR	184	4W SB FR FB	4 SB RHUB	90	4 SB RHUB FB		
4 1/2	4 1/2W SB FR	252	4 1/2W SB FR FB	4 1/2 SB RHUB	124	4 1/2 SB RHUB FB		
5	5W SB FR	371	5W SB FR FB	5 SB RHUB	119	5 SB RHUB FB		

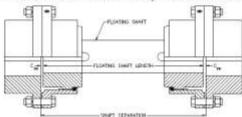
All finish bores and keyways per AGMA 9002-AB6 commercial standard tolerances.
 Rigid hubs are furnished less tasteners.

Flex-Rigid Coupling Data

Coupling Size	Maximum Bore with Standard Keyway		Rating HP / 100	Torque Rating	Peak Torque	Maximum Speed	Dimensions						
	Flex	Rigid	RPM	(lbin.)	Rating (lbin.)	(ŘPM)	A	В,	Bo	C'w	E	E,	G,
- 1	1 5/8	2 1/4	10	6300	12600	10000	4916	1 19/32	1 21/32	5/32	1 11/16	1 9/16	3
1.1/2	2.3/16	2 11/16	24	15.100	30200	7400	6	1 15/16	1.15'16	5/32	2.1/16	1 27/32	3.13/16
2	2 3/4	3 3/8	50	31500	63000	5900	7	4 5/8	238	5/32	2 7/16	2 9/32	4 13/16
2 1/2	3 1/4	4	90	56700	113400	5000	838	5 11/16	3	3/16	3 1/32	2 29/32	5.3/4
3	4	4 3/4	150	94500	189000	4300	97/16	6 9/16	3946	3/16	3 19/32	3 15/32	6.3/4
3 1/2	4 3/4	5 1/2	230	145000	290000	3900	11	7 5/8	418	7/32	4.3/16	4 1/32	7 3/4
4	5 3/8	6 3/8	350	221000	442000	3500	12 1/2	8 5/8	45/8	5/16	4 3/4	4 7/16	. 9
4 1/2	6	7 1/4	480	300000	600000	3200	13.5/8	9 5/8	5 1/4	11/32	5 3/8	5.1/16	10.1/5
5	6 3/4	8 1/2	650	410000	820000	2900	155/16	10 13/16	57/8	11/32	6 1/8	5 11/16	11.3/8
5 1/2"	7 1/2	8	850	536000	1072000	2700	1634	11.5/8	75/32	11/32	6 5/8	6 31/32	10.3/4
6*	8 1/4	8 3/4	1100	693000	1386000	2500	18	13 1/4	721/32	11/32	7 3/8	7 15/32	11 1/2
7.	9 1/4	10	1600	1010000	2020000	2200	20 34	14 3/4	9	7/16	8 11/16	8 3/4	13 3/4

- Sizes 5 1/2, 6 and 7 are only available with exposed bolts. Type EB exposed bolts are standard,
- To Floating shaft length is equal to the shaft separation minus 2 times the C_{sq} dimension.
- 2 Max. speed is based on flange stress limits and does not consider lateral critical speed considerations for floating shaft applications.





Ordering Instructions: When ordering floating shaft couplings, be sure to include hp and rpm, shaft separation, and equipment shaft sizes. Applications with very large shaft separations and/or high speeds may require tubular floating shafts due to lateral critical speed concerns.

Important: Care must be exercised in proper selection of any shaft coupling. The Users must assure themselves that the design of the shaft to coupling hub connection is adequate for the duty intended.

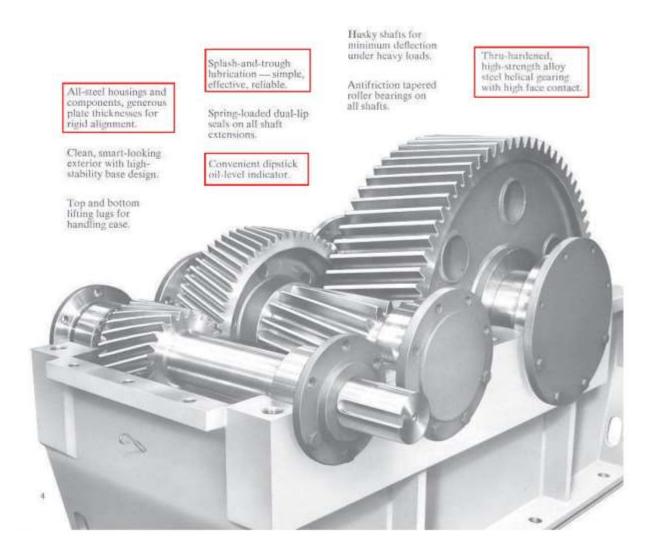
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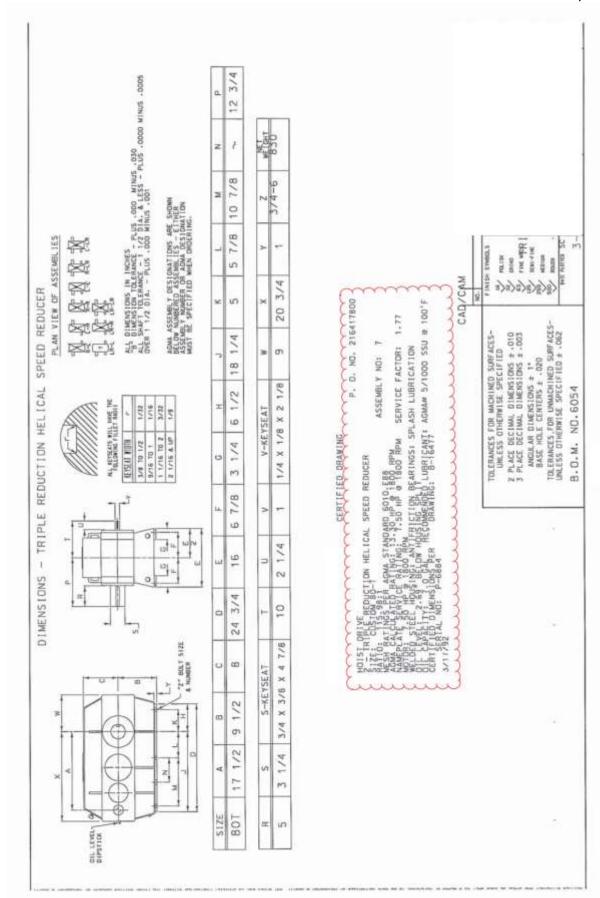
iv. Gearboxes

Speed Reducers: designed for dependability

Advanced Features

Hoist Gearbox





Page 106

Trolley and Bridge Gearmotors

Gearmotors

Again we add to our motor (and brakemotor) technology, this time with reducers to offer the gearmotor.

Numerous reducer configurations are available.

Right angle single worm. It's available with flange or foot mounts, each with solid (single or double) or hollowshaft. Torque arm mounts are available with the hollowshaft.

Ratings: 1/4-30hp Ratio: 5.1-60:1

Output torque: up to 10,000 in.lbs. Combination helical/right angle worm. It's available with flange or foot

mounts, each with solid (single or louble) or hollowshaft. Torque arm mounts are available with the

hollowshaft.

Ratings: 1/4 - 10hp Ratio: 7.2:1 - 372:1

Output torque: up to 18,000

in. lbs.

Helical bevel. It's available with flange or foot mounts, each offered with solid (single or double) or hollowshaft.

> Ratings: %-150hp Ratio: 10:1-160:1

Output torque: up to 350,000 in. lbs.

Helical parallel and concentric shaft. These gearmotors are available with single, double and triple reduction gears, and foot or flange mount, and single solid shaft.

Ratings: ½-150hp Ratio: 1.5:1-1800:1

Output torque: up to 130,000 in. lbs.



Helical parallel shaft

It's available in solid (single and double) hollowshaft with torque arm mount. Three integral sets of mounting feet allow versatility in mounting, without adaptions.

Ratings: ½-10hp Ratio: 4:1-190:1

Output torque: up to 9,075 in. lbs.

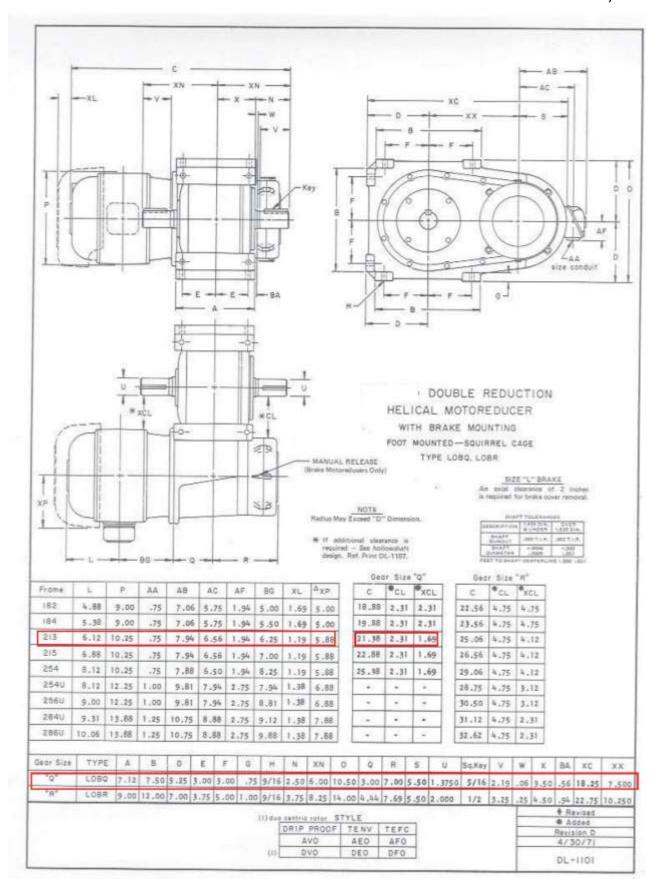
Attachment 001 Rev 1

Item	Qty.	Description
1Н	1	7.5 HP, 1800 RPM, 256U Frame, 480V/3Ph/60Hz, TENV, continuous duty, Flux Vector motor with 1024 encoder, single output shaft Assy A101-F1. The motor minimum insulation shall be Class H with a class B temperature rise, motor thermal protection required, less brake
		(Reference 92-3474A, note changes above)
2 T	I	.25 HP, 1800 RPM, 213 Frame, 480V/3Ph/60Hz, TENV, continuous duty, VFD motor, the motor minimum insulation shall be Class H with a class B temperature rise, motor thermal protection required, double shaft "QB" reducer ratio 125.40:1 with 480V/3Ph/60Hz 3 ft/lb brake adjustable down to 2.5 ft/lb or less, mounted on 5:1 first reduction with manual release
		(Reference 92-3474B, note changes above)
3В	1	.25 HP, 1800 RPM, 213 Frame, 480V/3Ph/60Hz, TENV, continuous duty, VFD motor, the motor minimum insulation shall be Class H with a class B temperature rise, motor thermal protection required, double shaft "QB" reducer ratio 157.17:1 with 480V/3Ph/60Hz 3 ft/lb brake adjustable down to 2.5 ft/lb or less, mounted on 5:1 first reduction with manual release (Reference 91-1364G, note changes above)

Required Design Info:

- a. Standard motor speed torque curves
- b. Motor nameplate data (including all information called for in NFPA 70, Section 430.7) Nameplates shall not be mounted, they will be shipped loose, do not add any holes to the drives for the nameplates.
- c. Certified drawings
- d. Gear reducer ratings
- e. Certification materials meet the requirements of the specifications
- f. Certification of Conformance

Built to NAVY specifications.



PARALLEL SHAFT HELICAL GEAR REDUCER SIZE "OB" —

TRIPLE REDUCTION

(Double Reduction Size "Q" with Size "B" Single Reduction Helical Input)

APPROX. FULL LOAD INPUT RPM	F.L. OUTPUT RPM				FIRST	SECOND REDUC-	THIRD REDUC-	Ot	OUTPUT TORQUE - POUNDS INCHES AND RATED SERVICE FACTOR				
	DESIGN	DESIGN	FLUID	GEAR RATIO	TION SIZE "B" GEAR	SIZE "O" GEAR		HORSEPOWER RATING					
	MOTOR	MOTOR	ROTOR	AATIO				,5	.75	1	1.5	2	
	46	45	44	37.41	2.7	2.05	6.76	657-3	986-3	1315-3	1972-2	2630-1	
	37	36	35	46.18	2.7	2.53	6.76	817-3	1226-3	1635-2	2452-1		
	31	30	29	55.48	2.7	3.04	6.76	975-3	1463-2	1951-1			
1740	26	25	24	67.72	2.7	3.71	6.76	1163-3	1745-2	2327-1			
DESIGN D	21	20	19	85.51	5	2.53	6.76	1440-2	2160-1		4		
1700	17	16	16	102.75	5	3.04	6.76	1779-2	2669-1				
	14	14	13	125.40	5	3.71	6.76	2160-1				_	
	11	11	10	157.17	5	4.65	6.76	2750-1					

NET WEIGHT: 130 lbs. (approx.)

LOAD CAPACITY:

2400 lbs. - Overhung load capacity at middle of standard shaft extension.

2000 lbs. - Thrust load capacity on output shaft.

The allowable loads are based on Class I Service and an average bearing life of 25,000 hours.

The total radial load on both output shaft extensions and/or the total radial and thrust load should not exceed 1800 lbs.

*Ratings marked -1 are for Maximum Class | Service = Service Factor 1.0

Ratings marked -2 are for Maximum Class II Service = Service Factor 1.4

Ratings marked -3 are for Maximum Class III Service = Service Factor 2.0

Size "QB" Gear available in the following frame sizes: 224, 225, 254, 213, 215, and 23.

*See Engineering Data Pages 1300, 1301, and 1302 for application classification data.

Packaged Hoist v.

SERIES 800

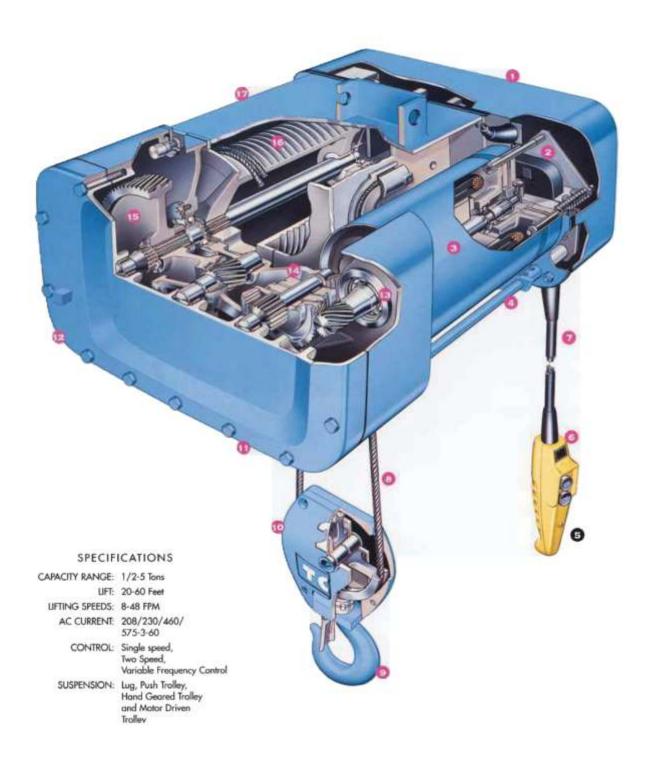
800 Series wire rope hoists are ideally suited for virtually any lifting application of up to five tons. Their modular design and versatility provide a wide range of capacities, lifts, hoisting speeds, and control options, making it possible to select the most efficient hoist for the job without wasted capacity or overkill.

The compact design and closer end approaches of the standard 800 Series hoist allows an unusually high hook lift, as compared to many so-called low headroom hoists, without resorting to design compromises, 800 Series hoists maximize hook coverage within an existing facility, reducing or

800 Series hoists are available in two basic models: single reeved and true vertical lift, with either air or electric power. The heavy-duty wire rope and drum-type hoist line has a steel mounting lug integral with the one-piece welded frame, and is designed for stationary mounting from an overhead structure, or with any of our monorail trolley options. Standard features of this rugged hoist line include a heavy welded steel frame, powerful drive motor, totally enclosed oil bath lubricated drive train, and dual brake reliability.

FEATURES

- Easily accessible control enclosure facilitates maintenance
- D.C. disc motor brake for smooth braking action
- High torque, heavy-duty hoist motor for smooth hoisting action
- Block operated upper limit stop to limit upward book travel
 - Convenient one-handed pushbutton control for easy operation of all motions
 - 115 volts at push button for operator safety
 - Push-button cable with builtin strain reliever cable as used on single speed hoist applications. (All others use a separate steel strain reliever cable.)
 - Improved plow steel pre-formed cable for maximum strength and
 - Full-swiveling, heat-treated forged steel hook with spring loaded latch
 - Shrouded lower block to help prevent pinched fingers
 - Alloy aluminum gear case and cover is lightweight yet rugged
 - Oil level plug permits easy inspection of oil level
 - Anti-friction bearings throughout for a long lasting hoist drive train
- Positive action mechanical load lowering control brake, also acts as a part of the hoist holding brake system
- Triple reduction helical/spur gearing operates in oil bath lube for maximum gearing life
- Deep grooved, large diameter rope drum helps prevent rope overwrap for longer wire rope life
- Heavy welded steel frame ensures precise fit for long hoisting machinery life





700 Series wire rope hoists are

designed and manufactured for heavy-duty service.

This workhorse is built to deliver, day-in and day-out, under tough operating conditions. 700 Series hoists are built to take even the most demanding job cycles in stride, yet can be relied upon to handle your most delicate loads with precision control.

Their compact design, with high hook lift and closer end approaches, maximizes hook coverage within an existing facility, reducing or eliminating the need for costly rebuilding or remodeling. 700 Series hoists achieve an unusually high hook

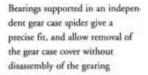
lift, without resorting to design compromises.

This line offers the greatest range of lifting speeds, controls, headroom and mounting options of any hoists on the market today. 700 Series hoists are available in both electric and air powered models. Options include standard and low headroom, deck and base mounted models, with a choice of single reeving or true vertical lift. The lug is integral with the all-steel, one-piece welded

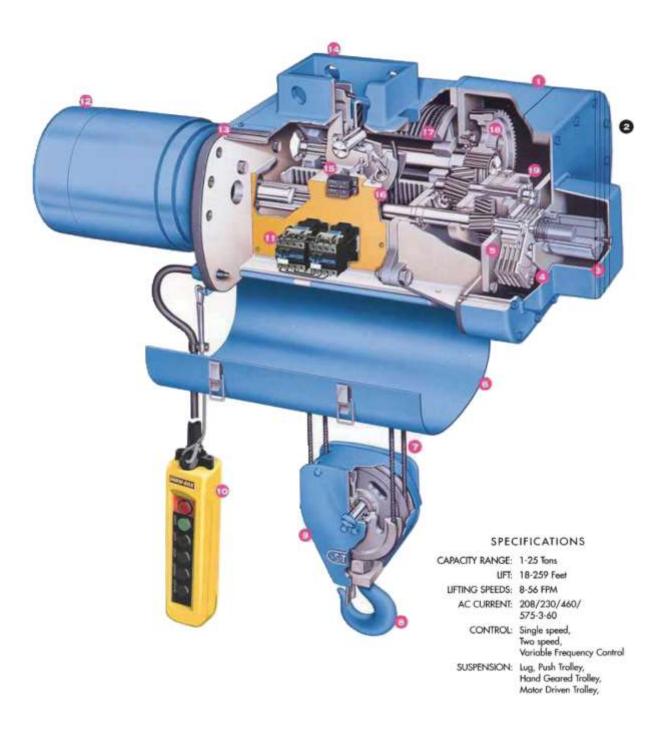
frame, and is designed for stationary mounting from an overhead structure or with any of our trolley options.

FEATURES

- One-piece welded steel frame ensures precise fit and long hoisting machinery life
- Alloy aluminum gear case and cover is lightweight yet rugged
- Direct acting D.C. brake solenoid for smooth braking action
- Multiple disc motor brake for long life and maximum braking efficiency



- Hinged control panel cover permits easy access to the control components
- Improved plow steel preformed wire rope for maximum strength and life
- Full-swiveling, hear-treated forged steel hook with spring loaded latch
- Shrouded lower block to help prevent pinched fingers
 - Push-button control pendant for easy one-handed operation
- Rugged, low-maintenance magnetic contactor control
- High torque, heavy-duty hoist motor for smooth load handling
- Watershed and gaskets for tight frame cover seal and protection of internal components
- Integrally welded mounting lug permits various trolley attachment options
- Block operated limit switch limits upward hook travel
- Rope anchor, easily accessible for inspection and maintenance
- Deep grooved, large diameter rope drum helps prevent rope overwrap for longer rope life
- Double reduction helical gearing provides a smooth, quiet drive
- Positive action mechanical load lowering control brake, also acts as a part of the hoist holding brake system



SERIES 700/800 STANDARD FEATURES



Welded Steel Frame
One-piece welded frame, fabricated
from rolled steel sections, precision
machined for long life and accurate
bearing and component alignment,
(700 Series frame illustrated)

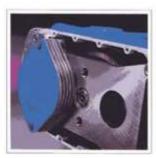


Automatic Load Brake
Weston self-adjusting type, operates
in the oil bath of the hoist gear case
for smooth lowering control. Capable
of holding the load independent of the
hoist motor brake. (700 Series load
brake illustrated)



Lug Suspension

Permits the hoist to be mounted in a permanent location. (Mounting hardware not included)



Hoist Motor Brake

Short stroke, 150% torque spring-set

D.C. rectified disc type brake provides
quiet operation and long life.

(700 Series multiple disc brake
illustrated)



Precision Machined Gearing
For uniform tooth mesh and large
contact surface. Operates in a totally
enclosed, ail bath lubricated gear case.
Gear trains consist of two or three
reductions, using helical and/or
spur gearing.



Machined Rope Drum

Large diameter, welded

construction — deep grooved and
precision machined to give
maximum rope life. Pictured
is a right and left hand grooved
true vertical lift drum.



Dead End Rope Anchor

Used on single reeved boists. Easily accessible and part of the one-piece welded frame, it securely anchors the rope compression thimble fitting which is swaged to the rope ends.

True vertical lift hoists have both ends of the steel rope dead ended to the rope dram.



Heavy-Duty Controls

Designed for a clean, open layout to maximize performance and ease of maintenance. Contactors are oversized for increased life. Panels are bound in a dust resistant compartment designed for easy access and serviceability.

(700 Series hoist control illustrated)



Shrouded Lower Block
Helps present fingers from being
pinched between rope and sheaves
and prevents dirt buildup. All hooks
are provided with spring loaded
safety latches.



Hoist Motors

High starting torque type, designed specifically for boisting, with permanently lubricated ball bearings.

Motors are totally enclosed, non-ventilated (T.E.N.V.) with class F invulation, and provided with an automatic reset, semperature actuated twitch in the windings to provide over current protection.



Block Operated Limit Switch For additional protection of operator, hoist, and load. Positive acting, momentarily reverses the hoisting motion if lower block drifts too high. (700 Series block limit switch illustrated)



Convenient
Push-Button Control

All motions can be controlled from
a convenient, easy to operate poshbutton control station suspended from
the hoist. An external strain reliever
cable extends cable life and prevents
pulling the control cable from the
hoist electrical connection on four
button and larger stations.

SERIES 700/800 OPTIONAL FEATURES



Push Trolley Suspension

Push trolleys are used for mounting
hoists on monorails or single girder
crane bridges. Operator can quickly
move loads by pushing on the load.



Deck Mounted Hoists

Used for applications that require a stationary hoist, or for construction of a top-running trolley.



Hand Geared Trolley Suspension For moving loads where accurate spotting is essential or when operator should not touch the load.



Top Running Double Girder Trolleys

Provides a combination of lower headroom, higher hook lift, and closer end approaches, Maximizes hook coverage within existing facility, without contly remodeling or rebuilding.



Motor Driven Trolley Suspension Used for moving loads quickly over long distances and where accurate load spotting is needed. Control push buttons can be suspended from hoise or crane bridge.



Air Operated Hoists

Air operation is available for all

SHAW-BOX hoists where precise
spotting or slow hoisting speeds are
required, or where an electrically
powered hoist may not be suitable.
(Illustrated is an air-piston motor
driven 700 Series hoist)



Explosion Proof Hoists In addition to normal operating conditions, all SHAW-BOX hoists may be customized for operation in hazardous locations. Life-Tech designs each hazardous location hoist to meet or exceed National Electrical Code standards. (800 Series explosion proof hoist illustrated)



Variable Frequency Control Can be provided for any SHAW-BOX hoist or trolley motion where precise spotting or slow hoisting speeds are required. Available in two, three, or five step control, or two step infinitely variable.



Spark Resistant Features Bronze and high bronze alloys incorporated in key components such as books, lower blocks and wheels, along with stainless steel wire rope, help prevent incidental sparking in hazardous locations.



Weight Watcher Overload Control A factory set mechanical overload clutch built into the hoist drive train prevents lifting excessive overloads. (700 Series overload clutch illustrated with the cover removed)



Special Application Motors For special applications such as 60 minute rating, mill and chemical duty, and tropical proofing are available on many hoise models.

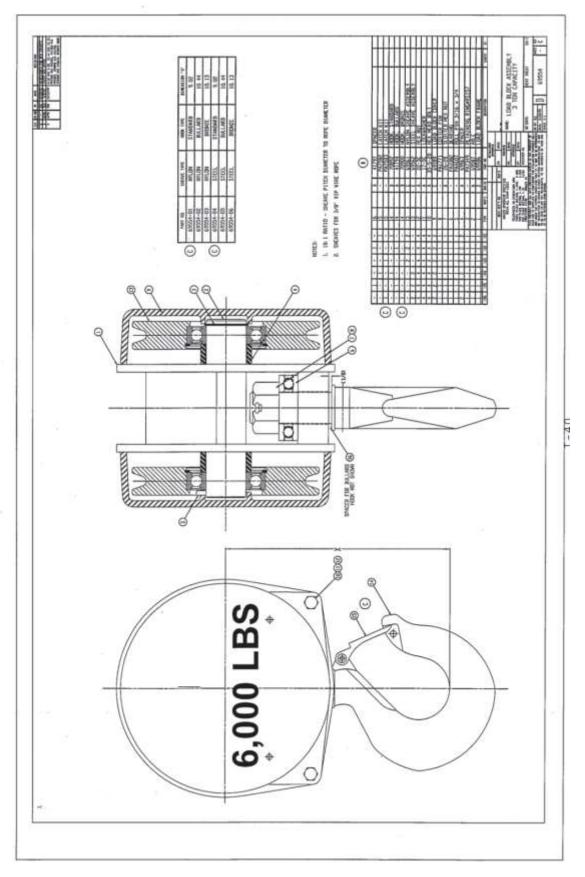
Other Options:

- Low Headroom Hoists
 Radio Control
 Screw Type Limit Swisches
 Power Circuit Limit Swisches
- · Hot Metal Applications
- Magnes Applications
- Epoxy Paint
 NEMA 12, 3R, or 4 Control Enclosures
- · Panel Heaters · Motor Heaters
- · Over Capacity Life Protection
- Warning Lights/Horns
 Patented Track Wheels
 Double Hook Hoists

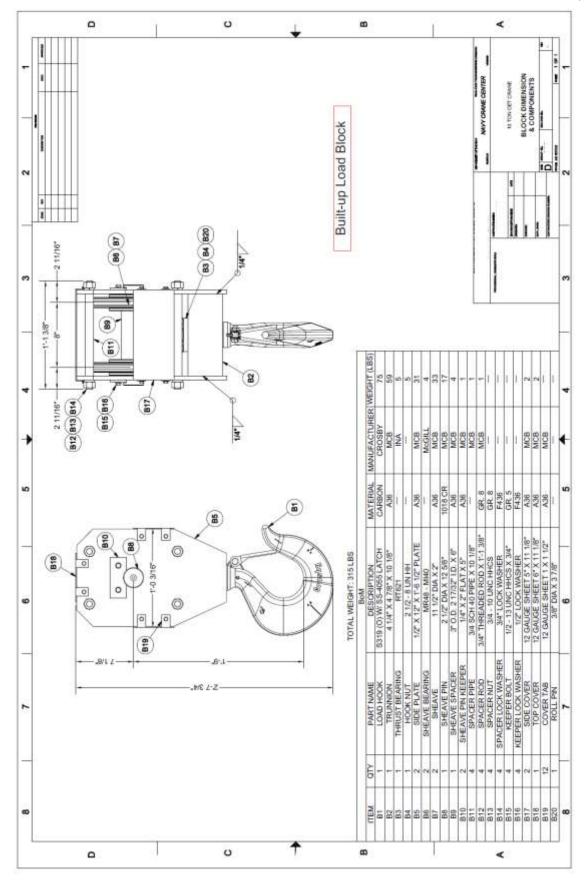
Photos shown are for illustrative purposes only. The actual products may vary in color and design.

Base Mount 700 Series Wire Rope Hoist. Hoist Cat. # 72B05-035D27-1-SPX Capacity: 5 U.S. Ton Gage: Unknown Lift: 27'-0" TVL Pendant Drop: No push button station Hoist Speed: 27 fpm Hoist Motor: 10 hp Rope: 6 PD 5/16" Trolley Speed: N.A. Trolley Motor: N.A. Top of hoist to mounting feet: Approx. 18" Customer to supply Variable Frequency controls. Hoist motor to be inverter duty, 60 minute rated, Class "H" insulation. Junction box is not provided. Upper block and upper/lower rotary-geared limit switches. Steel sheaves in both upper and lower block assemblies. Hoist will not be load tested prior to shipment. Power supply: 460v 3ph 60hz Equipment rated for "H4" Service Approx. weight: 1,300 lbs.

Additional information showing the packaged hoist meets specification



Page 120



Page 121

vii. Wire Rope



Standard Wire Ropes

6x19 and 6x36 Classes Technical Data



6x19 Class

6x19 Seale 6x19 Warrington 6x21 Filler Wire Type U 6x21 Seale 6x25 Filler Wire Type W 6x25 Seale 6x26 Warrington Seale

Rope Di	iameter	Approx.		Nominal Strength*, tons (bright or drawn galvanized* Royal Purple Purple Plus			
176		(inc	ш.)	Royal Purple	Purple F	lus	
inches	mm.	Fiber Core	IWRC	IWRC	Fiber Core	IWRO	
1/4	6.5	0.11	0.12	3.74	3.01	3.40	
5/16	8.0	0.16	0.18	5.80	4.69	5.27	
3/8	9.5	0.24	0.26	8.30	6.71	7.55	
7/16	11.0	0.32	0.35	11.2	9.10	10.2	
1/2	13.0	0.42	0.48	14.6	11.8	13.3	
9/16	14.5	0.53	0.58	18.5	14.9	16.8	
5/8	16.0	0.66	0.72	22.7	18.4	20.6	
3/4	19.0	0.95	1.04	32.4	26.2	29.4	
7/8	22.0	1.29	1.41	43.8	35,4	39.8	
1	26.0	1,68	1.85	56.9	46.0	51.7	
1-1/8	29.0	2.13	2.34	71.5	57.9	65.0	
1-1/4	32.0	2.63	2.89	87.9	71.1	79.9	
1-3/8	35.0	3.18	3.49	106	85.5	96	
1-1/2	38.0	3.78	4.16	125	101	114	
1-5/8	42.0	4.44	4.88	146	118	132	
1-3/4	45.0	5.15	5.66	169	136	153	
1-7/8	48.0	5.91	6.49	192	155	174	
2	52.0	6.73	7.39	217	176	198	
2-1/8	54.0	7.60	8.34	243	197	221	
2-1/4	58.0	8.52	9.35	272	220	247	
2-3/8	60.0	9.49	10.4	301	244	274	
2-1/2	64.0	10.5	11.6	332	269	302	
2-3/4	70.0	12.7	14.0	397	321	361	

"Galvanizing: For Class A galvanized wire rope (EIP grade only), deduct 10% from the nominal strength shown.

Technical data for the above listed constructions are the same and are detailed in the table. For further information on additional constructions and diameters, contact WW's customer service department.



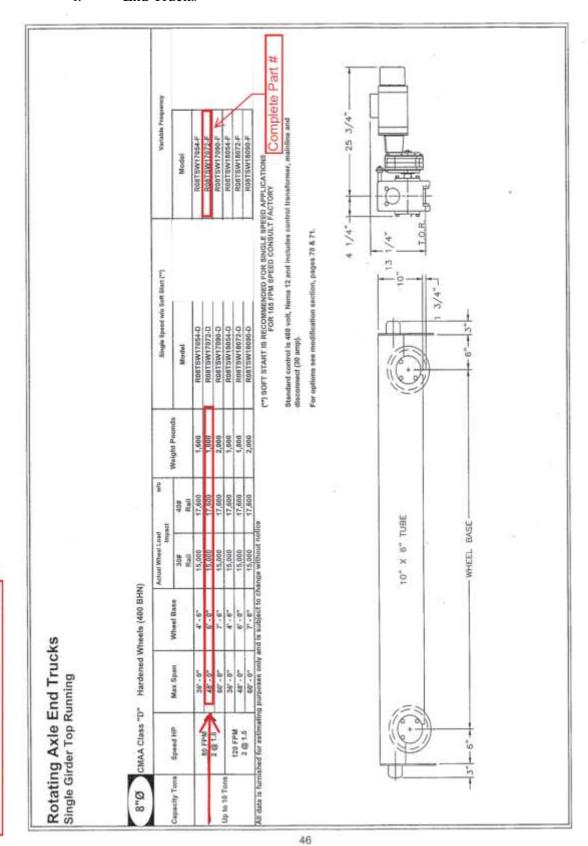
6x36 Class

6x31 Warrington Seale 6x33 6x36 Warrington Seale 6x41 Warrington Seale 6x43 Filler Wire Seale 6x49 Filler Wire Seale

L.

Appendix L – Structural Product Data
Please see the following for examples of structural product data.

i. End Trucks

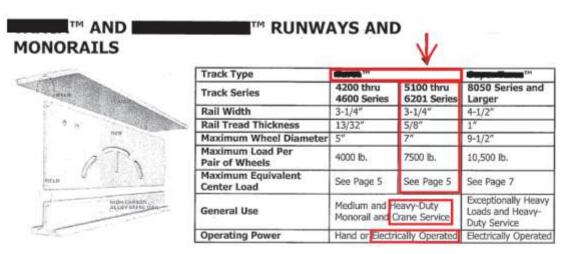


wheel load must not exceed tabulated wheel load.

's are based on CMAA K_{pt} minimums)

ii. Patented Track

SAMPLE PATENTED TRACK CATALOG DATA



Features and Benefits

· Maximum Strength with Minimum Weight

** Track has been engineered to attain maximum strength with minimum weight, consisting of a compound section of A36 steel flange, web, and specially rolled high carbon steel rail. These parts are welded under carefully controlled conditions to form a combined section, free of stress concentrations. The parts are carefully proportioned to produce a balanced design for loads under varying conditions.

Wide Selection

The and sope seed in the great majority of monorall and crane applications. The seed majority of monorall and crane applications. The seed the seed of monoral and crane applications. The seed the seed of monoral and crane applications are seed to see the seed of the se

· Minimal Superstructure Requirement

Frequently, ceiling or overhead conditions are such that independent structural work must be erected to provide track supports at short spacings. The balanced design of tracks allows for increased unsupported lengths which reduces the number of required superstructure supports.

· Ease of Installation

Erection of a monoral or crane system using Tool or T

Track Selection Factors

Selection of track for a monorall or underhung crane system is based on a combination of load and span with consideration given to severity of service. The following factors should all be considered when selecting track:

Determine the Live Load

Determine the maximum shape, size, and weight of the load to be carried. Since experience indicates that loads often increase as time passes, thought should be given to those increases which may occur in the future.

Select the Load Carrying Components

Select the hoist and carrier because the weight of these components must be added to the live load in determining the capacity required in the track and support system. Impact allowance should be taken into consideration based on application.

· Calculate the Total Load

Combine the total live load, the weight of the load carrying components, and the impact allowance.

Determine Layout of System

Determine the track system layout based on considerations for the flow of material. Other factors to be considered are headroom, clearance over and under obstructions, side clearance, transfer points, and switch locations when required.

Suspension Locations

Crane runways and monoralis are suspended on hanger rods supported by the building superstructure. Thus, spacing of the hanger rods is normally determined by the structural members in the building. The size of the track must be selected to span these distances without exceeding maximum approved deflection and stresses under full moving load conditions.

· Select the Track and Fittings

For safety with maximum economy, choose track whose load capacity just exceeds the maximum load requirement. Select the appropriate support system and fittings after determining the maximum loads at each suspension point.



3.56 fps2

2.98 in

8,570 lb

Force transmitted to structure at

100% speed (per bumper): Deflection at 100% speed: 5.60 fps2

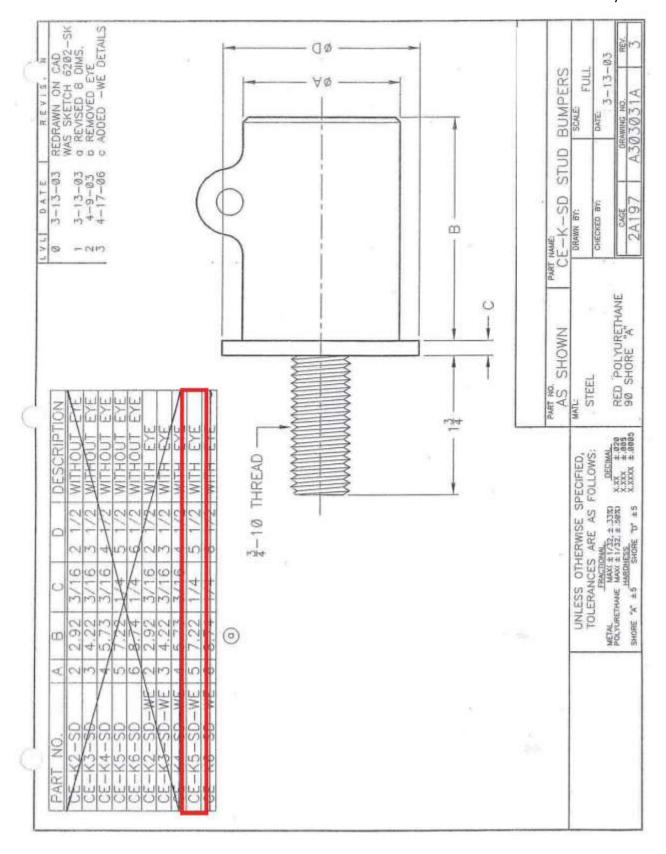
Maximum deceleration from 50%

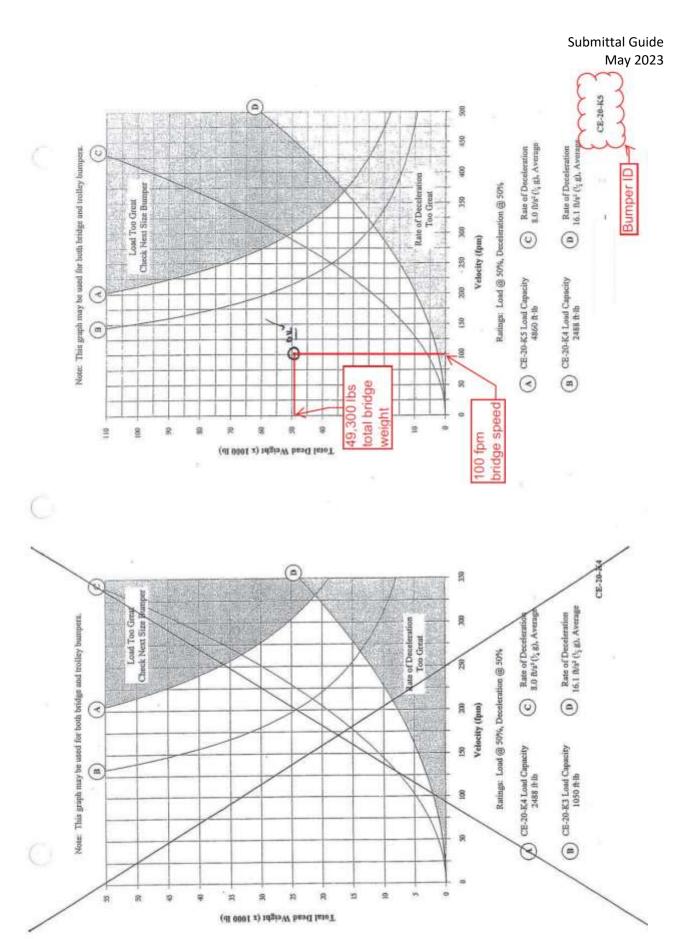
speed:

Maximum average deceleration

from 50% speed:







Page 128

iv. Coating System

COATING SYSTEM SUMMARY FORM

in remarks	section.			
Contract N	221 Total September 1981 (1981)	(A)		
Contractor		turers		
Submittal	Date 07/16/2010			
(Sub)Conti	actor Performing Paint App	olication Let's Pain	t Itl Inc.	
Surfaces w	rill be cleaned and prepared	i to:		
Ø	SSPC-SP1, Solvent Cleaning	3 🗆	SSPC-SP6, Commercial Blast	Cleaning
\square	SSPC-SP2, Hand Tool Clear	ning	SSPC-SP10, Near-White Met	al Blast Cleaning
	SSPC-SP3, Power Tool Clea	ning	SSPC-SP5, White Metal Blast	Cleaning
	Other (please specify):			
Su	rface Profile: 1.5 mils - 4 n	nils		
Note that .	SSPC-SP1 is a predecessor t	o other SSPC surface p	preparation standards.	
If zinc-rich Coat	product is used, what perc	entage by weight in d Dry Film Thickness Range (mils)	200 judos (k	Color(s)
Primer	Koat-Rite Alkyd Primer 300Z	4-6	Spray Gun	Brown
Inter- mediate	Koat-Rite Alkyd Enamel 317	4-6	Spray Gun	Grey
Top Coat	Koat-Rite Alkyd Enamel 317	4-6	Spray Gun	Yellow
Mark "N/A	" where coat is not used.			
Remarks:				

M. Appendix M – Control System and Network Product Data

Please see the following pages for examples of control system and network product data.



IMPULSE: G+&VG+

Adjustable Frequency/Vector Crane Controls
Technical Manual



VFD Firmware: 14707 & 14750 Part Number: 144-23910 R7 November 2020 © Copyright 2020 Magnetek

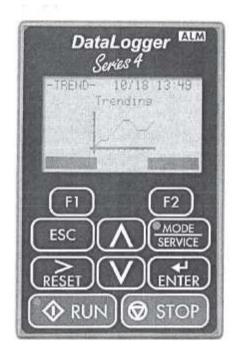
1.3 Specifications

Table 1-2: Specification Values and Information - Heavy Duty

	230 V			460 V			575 V	
Model (-G+/ VG+S4)	Rated Output Current (A)	Output Capacity (kVA)		Rated Output Current (A)	Output Capacity (kVA)	Model (-G+/ VG+S4)	Rated Output Current (A)	Output Capacity (kVA)
2003	3.2	1.2	4001	1.8	1.4	5001	1.7	1.7
2005	5.0	1.9	4003	3.4	2.6	5003	3.5	3.5
2007	6.9	2.6	4004	4.8	3.7	5004	4.1	4.1
2008	8.0	3.0	Trlly 4005	5.5	4.2	5006	6.3	6.3
2011	11.0	4.2	Brdg 4007	7.2	5.5	5009	9.8	9.8
2014	14.0	5.3	4009	9.2	7.0	5012	12.5	12.5
2017	17.5	6.7	4014	14.8	11.3	5017	17.0	17.0
2025	25.0	9.5	4018	18.0	13.7	5022	22.0	22.0
2033	33.0	12.6	Aux 4024	24.0	18.3	5027	27.0	27.0
2047	47.0	17.9	4031	31.0	24.0	5032	32.0	32.0
2060	60.0	23.0	4039	39.0	30.0	5041	41.0	41.0
2075	75.0	29.0	Main 4045	45.0	34.0	5052	52.0	52.0
2085	85.0	32.0	4060	60.0	48.0	5062	62.0	62.0
2115	115	44.0	4075	75.0	57.0	5077	77.0	77.0
2145	145	55.0	4091	91.0	69.0	5099	99.0	99.0
2180	180	69.0	4112	112	85.0	5130	130	129
2215	215	82.0	4150	150	114	5172	172	171
2283	283	108	4180	180	137	5200	200	199
2346	346	132	4216	216	165	-	-	-
2415	415	158	4260	260	198	-	-	-
-	-	-	4304	304	232	-	-	-
-	-	-	4370	370	282	-	-	-
-	-	-	4450	450	343	-	-	-
-	-	-	4605	605	461	-	-	-
-	-	-	4810	810	617	-	-	-
-	-	-	41090	1090	831	-	-	-

NCC note to contractors:

Information submitted for Control System and Network product data will be identical to the information submitted for the electrical product data. The intent is to have them in their own sections so they are readily accessible when needed.



DataLogger Series 4

Technical Manual



Part Number: 144-27097 R1 January 2021 © Copyright 2021 Magnetek







COMFORT. DURABILITY. FLEXIBILITY, THAT'S MLTX.

Our compact MLTX bellybox transmitter incorporates the latest polymer technology in a lightweight, comfortably contoured, yet durable case. It's available with many options to meet the needs of a variety of applications and industries.



COMFORTABLE AND LIGHTWEIGHT

- Ergonomically designed contoured case is more comfortable for the user
- One of the lightest bellybox transmitters available today 50% lighter than other bellybox transmitters
- · Easy to use, angled lever or joystick controls enhance operator comfort

RUGGED AND RELIABLE

- · Rugged, super-tough nylon housing is made to withstand shock
- Rated NEMA 4 (IP66), sealed to withstand harsh, industrial environments
- Synthesized frequency generation enhances reliability
- · Dual access code system provides peace-of-mind, as the signal only operates the intended equipment
- Designed to minimize power consumption, providing one of the longest life batteries in the industry today - rechargable NiMH battery pack standard
- Military grade auxiliary function switches

VERSATILE AND FLEXIBLE

- · Choose up to 7 levers or 2 joysticks
- · Side mounted key switch and code plug
- · Choose up to 6 toggles; mushroom E-stop
- · Available proportional, 1, 2, 3, or 5 speeds in a non-detent lever or joystick
- Customize MLTX to meet your requirements, or select a pre-engineered, off-the-shelf system
- · Backward compatible with most existing systems
- Up to 4 selectable licensed frequencies
- Optional certification for use in hazardous locations requiring ISA 12.12.01 Class I and Class II, Division 2, Group A, B, C, D, E, F and G
- Synthesized RF technology available for:
- Unlicensed (FCC Part 15/RSS-210)
- Licensed (FCC Part 90/RSS-119)

MAGNETEK WIRELESS CONTROLS ARE MADE IN THE USA





IDEAL FOR USE IN A VARIETY OF APPLICATIONS

The MLTX's standard pre-engineered system offers flexibility not found in most of the shelf systems. Also available are innovative, cost-effective, custom engineered wireless communication packages, complete with hydraulic or crane interface controls. These are designed to your specifications, reducing internal engineering and manufacturing costs, improving time to market, and enhancing equipment performance. We offer complete plug-and-play control packages designed specifically for your equipment, manufactured and tested on our panel assembly line.

Packaged system options include:

- · VFDs, PLCs, and contractor controls
- I/O modules supporting various types of machine sensors and valves
- · Custom programming as the application requires
- NEMA 4 and stainless steel enclosures
- Pre-wired cables with valve connectors of choice
- Collision avoidance

COMPATIBLE WITH SEVERAL RECEIVERS

inteleSmart2 Receiver

- · Custom output mapping via a USB
- · Available in 14, 22, or 30 outputs
- Synthesized RF technology available for: Unlicensed (FCC Part 15/RSS-210)

 - Licensed (FCC Part 90/RSS-119)
- Group coding easily allows transmitter to control multiple cranes in various configurations

18K Receiver

- · Modular construction for ease of configuration and maintenance
- Up to 64 programmable outputs
- · Pitch & Catch, Multibox operation options
- Synthesized RF technology available for:
 - Unlicensed (FCC Part 15/RSS-210)
 - Licensed (FCC Part 90/RSS-119)

CAN-6 Receiver

- Easily integrated into CAN based products and products with J1939 communications
- Can be connected to other devices that require an analog voltage input
- 8 analog outputs, 8 digital outputs, and 2 CAN-bus ports
- Designed for outdoor use and sealed to IP66 specifications
- Synthesized RF technology available for:
 Unlicensed (FCC Part 15/RSS-210)
- Licensed (FCC Part 90/RSS-119)

For more information, contact your local Magnetek Sales Representative,

Sales@ErgonomicPartners.com, or the Magnetek location nearest you.



www.ErgonomicPartners.com | Sales@ErgonomicPartners.com

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Distributed by Tri-State Equipment Company sales@tsoverheadcrane.com www.tsoverheadcrane.com Tel: (314) 869-7200

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Telemotive[®] Series 18K Receiver

Radio Control Equipment

Instruction Manual



TC18K-0 Rev. S June 2009 Part Number 24559T ©Copyright 2009 Magnetek Material Handling

Section 13 – 18K Static Stepless Output Boards (Continued)

13-6. Adjustments.

There six output voltage adjustments on the unit. They are as follows:

Hz – Maximum possible output voltage. Maximum output with function lever at maximum. Upper limit to motor input.

VOUT - High reference voltage. The voltage for the speed desired at full lever travel equal to above or

F1 and F2 – Float Direction 1 and 2 respectively. Used for the float function for those units designed with this feature only. Usually with Teltec or Laser Guard on the bridge output. If the control lever is held at maximum and an input to the system is received from a Teltec or Laser Guard, the system will then decrease the output to points that are set by F1 and F2.

D1 and D2 - Offset Direction 1 and 2 respectively. Some systems require an offset that is done with D2 and D1.

13-7. Level Setting.

To adjust outputs:

- 1.) Remove connectors for directional output module (J3).
- 2.) Start system.
- Measuring output on stepless module move lever switch to maximum and adjust R95 for maximum output.
- 4.) Lever still at maximum adjust VOUT for desired high level output.
- Move lever to directionals only and adjust D1 and D2 for 0 Volts output. If an offset voltage is required set to that voltage.

NOTE: Some cranes require 4 Volts for the hoist up function with just the directional activated.

6.) F1 and F2 if your system utilizes float, adjust F3 output when float 1 is inputted to the output module (this is done with speed at maximum). Adjust F4 when float 2 is inputted.

13-8. Indicators.

The indicators S1, S2, S4 and S8 count up in a binary sequence as the transmitter lever is moved up. D1, D2, F1 and F2 indicate the activation of directionals (D) and floats (F) 1 and 2 respectively.

13-9. Special Power Supply.

For some static stepless boards a negative 12VDC output from the power supply is required as well as a plus 12 VDC. Depending on the mains, the following power supplies are used in lieu of the standard supply in static stepless systems:

 3/10/2020

https://www.dell.com/en-us/work/shop/pdr/latitude-14-5424-laptop/xctol542414us?selectionState=eyJPQyl6InhjdG9sNTQyNDE9dXMit.C...

Use code EXTRATT to save an extra TTN on select PCs during Delfs Some-Annual Sale. Shop Deafs (Treave disk convenus/work/oficer (beals/test-525_memorisal(s) 1 Guestascos/ Call et Click to Chie 1-877-302-3355 Urbanneb us, dell'i commetucces/conlogn, autoPagestel-649F7634 AFAA 423A 8417 AZF313H2EAF48consel-8887940E-1938-4298-1901-1914 7597ADE CAnarelina + N.27 respain/S.28 document location/S.291



S. Back to Gustomize I/en-us/work/uhon/dell-lantons and notebooks/latitude 5474-rugged-lamon/spid/atitude 14: 5424-laptop/xctol54241-lus?

selectionStateseyJPOvibinhdG9shTOvNDE0dXMLCJNb2Rgipbey,L/2Cl6NywiT380cybW/3a/SWO(0LHTVIHntENwhn1dfSc/Ndkijo4LCJPcHRzlipbex,L/2Cl

Latitude 5424 Rugged Laptop Summary

List Prine Total Savings

Delf Business Credit

As low as \$63/mo.* (//www.dell.com/ens/s/work/shon/heta/co/dell-businese-

credit#tab3) | Apply (//www.defl.com/Financing/Comm/dbcmaccom? otroe-dbc8/floref-dbc8returnul-intips/s3A/s2F52Fwww.defl.com/s2Feb

ur%2Fwork%2Fahop%2Fodrk2Flotitude 14 5424

Springs25xcol542414ush3FsplectionState130exF9W6inhdGSpNTDyNDE3dRMLC.Nb2Rotobey.LtZD6WnrT380exMW3isSWGOLHTVHHRMwintefSx7lbb



Customize

Option	Selection	SKU / Product Code	Quantity			
8th Gen Insel® Core* 15-83-50U Processor (Quad Core, 6M Cache 1,76Hz,15W, vPror	379-80HG[/ GF8Y60R	1	Processor	Sth Gen Intel® Core* 15- 8350U Processor (Dand Core, 6M Cache, 1.76Hz,15W, vPro)	ESPACE BEHCI/ GEBYSOR	T
Windows 10 Pro 64bit English, French, Spenish	[619-AHKN] / GF4BXA1	1	Operating System	Windows 10. Pro 64bit English, French, Spanish	JAT9- AHKM[/ GE48XAT	1
No Windows AutoPilot	[340-CKSZ] / GYEQ2AP	X	Windows AutoPilot	No Windows: AutoPilot	(340- CKSZ) / GYEOTAP	1
Intel® Core® 15-8350U Processor Base with Integrated Intel UHO 520 Graphics	(338-BPVI) 2 GBGF479	1	Processor	intel® Cour* is 83500 Processor Base with Integrated lotel UHD 620 Graphics	GSH BPVIII (FGBGFA79	1
No Out-of-Band Systems Management vPro Disabled	(691-ABWH) / - GRQX26P	1	Systems Management	No Out-of- Band Systems Management - vPro Disabled	(631- AEIWH-(1 / GROX26P	ť

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3/10/2020

https://www.delf.com/en-us/work/shop/pdr/fatitude-14-5424-laptop/xctot542414us?selection/State=syJPQyf6inhjdG9sNTQyNDE0dXMit.C._

Option	Selection	SKU / Product Code	Quantity			
8G8, 2x4GB, 2666MHZ 6GR4 Non-ECC	[870-AEVI] / GL0092T	1	Memoryl	SGE, 2MGE 2666MHz DDR4 Non- ECC	(370-AEVI) / GLOD92T	0
Cyberlink Media Surte Essentials for Windows 10 and DVD drive (without Media)	(658-8BTV) / GWNMGOV	E.	Optical Software	Cyberlink Media Suite Essentials for Windows 10 and DVD driver (without Media)	(658- BBTV) / GWNMGOY	1
M. 2 256GB PCte NVMe Class 40 Opal 2.0 Self- Encrypting Solid State Orive		U	Hard Drive:	M.2.255GB PCIe NVMe Case 40 Com 2.0 Self Encrypting Solid State Drive	HOG- BETXI / GGURVIT	X
No Additional Hard Drive	[401-AADF] / GNTOSJ7	X:	Secondary Hard Drive	No Additional Hard Drive	[481- AADF]/ GNTDSJ7	1
14" FHD WVA (1920 v 1093) And-Clare Non- Touch	G91 BDXO) / G7NBSZW	U	Oisplay	14" FHD WVA (1920 x 1080) Anti-Glare Non-Touch	(391- 9DXO)/ G74852W	3
Sealed Internal Non- Backlit Keyboord	(389-EIGPO[[580] AFDC] / GEPCS4	1	Keyboard	Scaled Internal Non-Backlit Keyboard	00PO(580- AFDCI/ G3F9CS4	T
No Security Options	[346-BEVG] / G98LKW2	1	Security Options	No Security Options	[346- BEVGE/ G96LKW2	1
No Wireless LAN Card	[555-BBCX] / GE6JT4X	1	Weeless	No Wireless LAN Card	(555- BBCX) / GE6JT4X	+
No Mobile Broadband Card	(362-8888) / GLAU7Q1	1.	Mobile Broadband	No Mobile Broadband Cant	(362- 8888)/ GLAU7Q1	1
3 Call 51Wor ExpressCharge Capable Battery	(45T-BCHCI) GEOTUSM	1	Primary Sattery	3 Cell 51Whi ExpressCharge Capable Battery	GEDTUSM	1
90W Rugged AC Adapset 7 Amm Elbow Barrel	[492-BCNQ] / GXQ6M2N	ī	Power Supply	90W Rupped AC Adapter, 7.4mm Elbow Barrel	492- 9CNQ(/) GXQ6M2N	۲
Factory installed Rigid handle for the field sku	(540-BCHE) GX931ZA	j.	Accessiones	Factory testalled Rigid handle for the field skill	(540-BCH) / GX9312A	
Durniny Airbay Cover	(125-BDEH)/ GFLEPLN	1	Second Battery	Durning Airbay Cover	(325- BDEHE/ GFLEPUT	(1)
ENERGY STAR Qualified	[387-88NJ] / GIHL264	10	ENERGY STAR	ENERGY STAR Qualified	[387- 88NJ] / GHL264	X
Standard Shipment	[800-88GF] / GF6RVZG	1	Transportation from ODM to region	Staretard Shipment	(600- 86GF] / GF6RVZ0	<u>T</u>

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3/10/2020 https://www.dell.com/en-us/work/shop/pdr/latitude-14-5424-laptop/xctol542414us?selectionState=eyJPQyl8inhjdG9sNTQyNDEbdXMiLC...



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3/10/2020

https://www.dell.com/en-us/work/shop/pdr/latitude-14-5424-laptop/xctol542414us?selectionState=eyJPQyl6linhjdG9sNTQyNDE0dXMiLC...

Option	Selection	SKU / Product Code	Quantity				
Microsoft Office 30 Day Trial	[658-BCS8] / GC70FUV	T.	Microsoft Office	Microsi Office 2 Day Tri	10	[658- BCS8] / GC7QEJV	30
McAlee® Small Business Security 30 Day Free Trial	[850-0028] / GNB4956	1.	Security Software	McAfee Small Busines Security 30 Day Free Tri	ns.	(650- 0028) / GN84958	1
None			PDF Solutions	None			
Dell Encryption Personal, 1 Year	[421-9984] 554-3455] / POPETY	t	Dell Endpoint Security	Del Encrypt Person 1 Year		[421- 9984] [954- 3455] / POPETY	1
None			Laplink PCmover	None			
OS-Windown Media Not Included	[620-AALW] / GLAROQ1	1	Operating System Recovery Options	OS- Window Media I Include	Not	(620- AALW) / GLA90Q1	1
Accessories							
Option	Selection		SKU / Prode Code	uct Qu	unt	ity	
None				Se	cur	lute None ity fard	
Also included in t	his system						
The following options an	d default selections are inc	luded with your o	order.				
No TAA Single Primary HD & GDD	Brackets, 5424						
	and Information						
Additional Summ	ary information						

S424/apstpt/sctolS42414ss2
selectionState:rey_PGvisinnjdG9:eNTOyMCEUdXMILG.INb28zijabey_LJZCI6NywIT38ScylW3siSWGHG.iHTVIHNEMwinTdfSx7iMkijo4LC.iPcH82ijobey_LJZCI



Fairt Easy Financing." Godate your technology with great financing offers from Bell

Trell Insylvation Join for free and get up to 6% back in rewards* and the expedited

Fees Shipping & Easy Returns Eggy free shaping and no-harste returns*. It's shapping made

(//www.dell.com/en-us/work/shop/dell-experience/op/dell-experience?ref=stpvakeprops)



Ports & Slots

1. Anchors (straps optional) | 2. Removable Secondary SATA Storage Bay (Optional) | 3. Stylus | 4. Smart Card Reader (Optional) | 5. Removable Primary PCIe Storage Bay | 6. SD and SIM card Stot | 7. USB 3.0 Type A | 8. Blu-ray+R/W or DVD+R/W or Removable Third SATA Storage Bay (Optional) | 9. RJ-45 gigabit Ethernet network connector (Optional) | 10. Serial, VGA, or Display Port (Optional) | 11. Native Serial | 12. RJ-45 gigabit Ethernet network connector | 13. HDMI | 14. Lock stot | 15. Power in | 16. USB 3.0 Type CTM: Power and Display | 17. USB 3.0 Type A | 18. USB 3.0 Type A | 19. Universal Audio Jack

Additional Optional Slots:

ExpressCard or PCMCIA Contacted and Contactless Smartcard Fingerprint Reader

Cabling

Dell 7424

90 watt AC Adapter	492-BCNQ D	ell
E5 Power Cord	537-BBBD D	ell
USB-A to Serial Adapter (DB9)	6726030000413 Trip	p-Lite
DB9 to RJ45	15-109-148 Show M	e Cables



Tripp Lite 1111 W 35th Street Chicago, IL 60609 USA Jelephone: 773.869.1234 www.fripplite.com

USB-A to Serial Adapter (DB9) - Keyspan, High-Speed (M/M), Detachable Cable, TAA

MODEL NUMBER: USA-19HS





nect devices with a 9-pin serial port, such as switches, routers, barcode scanners and network storage devices, to the USB Type-A port on your computer or laptop.

Description

The USA-19HS Keyspan® High-Speed USB-to-Serial Adapter allows you to connect a serial device to a computer or laptop with a USB Type-A port. Widely recommended by serial device manufacturers, the USA-19HS attaches to switches, routers, barcode scanners, GPS units, point-of-sale devices, lab equipment, network storage devices and other devices with a 9-pin serial port. The included 3-foot detachable cable supports data transfer speeds up to 230 Kbps—twice as fast as a built-in serial port. The USA-19HS works with any USB cable up to 16 feet. An LED indicates data activity. This adapter requires no external power and, at just 2 ounces, packs away easily in your laptop bag for use on the go. Windows line monitor and data trace software included. Easy to upgrade with free software downloads. Works with Windows (up to 10) and Mac OS X (up to and including 10.14), Compliant with the Federal Trade Agreements Act (TAA) for GSA Schedule purchases.

Works with DB9 Serial Devices Connects to switches, routers, barcode scanners, GPS units, point-of-sale devices, lab equipment, network storage devices, moderns, graphics tablets and other devices with a 9-pin serial portSupports data transfer speeds up to 230 Kbps—twice as fast as a built-in serial port Easy to Set Up and UseNo external power supply needed/Weighs just 2 oz. for convenient transport in your backpack or laptop bagindudes detachable 3-ft. USB Type-A cableWorks with any USB cable up to 16 ft.

Compatible with Most SystemsWorks with Windows (up to 10) and Mac OS X (up to 10.13), as well as Apple Sandbox applicationsUpgradeable with free software downloadsIncludes Windows line monitor and data trace software

TAA-CompliantCompliant with the Federal Trade Agreements Act (TAA) for GSA Schedule purchases

Highlights

- · Connects 9-pin serial device to computer or laptop USB-A port
- · Supports data transfer speeds up to 230 Kbps
- · Detachable 3-foot USB cable included
- · No external power source required
- · Works with Windows (up to 10) and Mac OS X (up to and including 10.14)

System Requirements

- . USB port
- Compatible with Windows 2000, XP. Vista, 7, 8, 8, 1, 10, Server 2008 R2, Server 2012, Server 2012 R2 Server 2016
- . Competible with Mac OS X 10.5, 10.7, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13, 10.14

Package Includes

- · USA-19HS Keyspan High-Speed USB-to-Serial Adapter
- · USB Type-A cable, 3 ft.
- · CD with driver software and Owner's Manual

Specifications

JVERVIEW		
UPC Code	672603000413	



Tripp Lite
1111 W 35th Street
Chicogo, IL 60609 USA
Telephone: 773.869.1234
www.tripplite.com

PHYSICAL			
Shipping Dimensions (fiwd / in.)	3.00 x 9.00 x 6.00		
Shipping Dimensions (hwd / cm)	7.62 x 22.86 x 15.24		
Shipping Weight (lbs.)	0.35		
Shipping Weight (kg)	0.16		
Unit Dimensions (hwd / in.)	1 x 1.6 x 3.1		
Unit Dimensions (hwd / cm)	2.54 x 4.06 x 7.87		
Color	Black		
CONNECTIONS			
Side A - Connector 1	USB A (MALE)		
Side B - Connector 1	DB9 (MALE)		
FEATURES & SPECIFICATIONS		111111111111111111111111111111111111111	
schnology	Serial (RS232); USB		
CERTIFICATIONS		NI WE	
Certifications	Tested to comply with RoHS, REACH, CE, FCC		
WARRANTY			
Product Warranty Period (Worldwide)	3-year limited warranty		

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CAT5e 24AWG UTP Ethernet Patch Cable



For more information or to order, please contact Monoprice Sales Representative or sales@monoprice.com

Construction

Conductor

24AWG

Material

80

Nom. OD:

2/039±0.008mm

Insulation:

PE

Nominal Thickness: Nom. OD: 0.18mm Min: 0.02mm

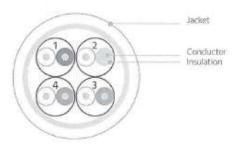
0.97±0.05mm

Jacket

PVC

Nominal Thickness: Nomi OD: 0.55mm Min; 0.05mm

D: 5.4±0.02mm



Wire Connection

Pair 1 White + Blue Pair 2 White + Orange Pair 3 White + Green Pair 4 White + Brown





Ratings/Certifications

JL ROHS, REACH

Electrical Characteristics

Conductor Resistance@20°C

= 87.6 Ohms/km

	LUSS	NEXT	RL	ACR-N	ACR-F	PS NEXT	PS ACR-N	PS ACR-F
MHz	ďΒ	dB	dB	dB	48	dB	d3	dB
1	3.0	60	17	57	57.4	57	54	54.4
d.	4.5	53.5	37	49.1	45.4	50.5	463	42.4
8	6.3	48.6	17	42.7	393	45.5	39,3	36.3
10	73	47	17	39.9	37.4	44	36.9	34.4
16	9.1	43.6	17	34.5	33.3	40.6	31.5	30,3
20	10.2	42	17	31.8	314	39	28.8	28.4
25	11,4	40.3	15	28.9	29,4	373	25.9	26.4
31.25	12.9	38.7	15.7	25.9	27.5	35.7	22.0	24.5
62.5	18.6	33.6	12.1	15	21.5	30.5	12	18.5
100	24.0	30,1	10	6.7	17.4	227	33	14,4

Mechanical Characteristics

Storage Temperature Range Installation Temperature Range Maximum Pulling Force 0°C to 45°C 0°C to 75°C 100 lbs.



Colors: Black Blue, Gray, Green, Grange, Pink, Purple, Red, White, and Yellow Lengths: 0.5, 1, 2, 3, 5, 7, 10, 14, 20, 25, 30, 50, 75, and 100 feet

Jacket Marking: MONOPIUCE TYPE CM JAAWG 4PR 75°C (UL) E467139 ANSI/TIA-568-C.2 CAT SEUTP 100MHz RoHS COMPLIANCE

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MONOPRICE |

www.monoprice.com

SOFTWARE

DELL 5424

WINDOWS 10 PRO 64 ENGLISH, FRENCH, SPANISH- INSTALLED

MICROSOFT OFFICE 365 -NONE

MICROSOFT OFFICE 30 DAY TRIAL – NONE- TO BE DELETED

AFTER PURCHASE

McAfee SMALL BUSINESS 30 DAY TRIAL – NONE- TO BE

DELETED AFTER PURCHASE

DELL RECOVERY ENVIRONMENT- INSTALLED

DELL ENCRYPTION PERSONAL -INSTALLED

OS-WINDOWS MEDIA - NONE

IMPLULSE LINK 4.1 BASIC – MAGNETEK - INSTALLED

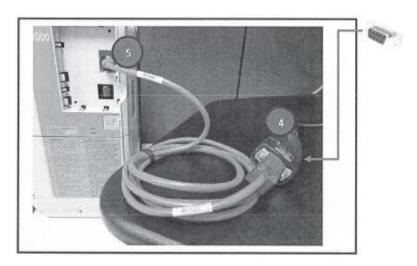


IMPULSE®•Link 5

Viewer and Professional User Manual



April 2020 Part Number: 144-18171 R2 © Copyright 2020 Magnetek



IL5 Professional kit contents:



IMPULSE®-Link 5 Instruction Manual April 2020 Page 47 of 47

SD-G3.C1 HARDWARE 125T	MANUFACTURE	MODEL	LOCATION CRANE. SERIAL #	KEY TECHNICAL BATING	SZRIAL NUMBER	MAC ADDRESSES	IP ADRESSES
VISI	MAGNETEK	STRES 4 0 / VO+	21/5029		780	NOT APPLICABLE	NOT IN NETWORK
DATA LOGGEW	MAGNETER	SERVES 4	21-5023		NOT APPLICABLE.	NOTAPPLICABLE	NOT APPLICABLE
RADIO CONTROL	MACAETEK	THANS WILTY / REC. SAK.	21:5023		160	MOT APPUCABLE	NOT IN NETWORK
M.C.	BOT APPLICABLE						
KTU	NGT-APPLICABLE .						
SUPERVISORY CONTROLLER	NOT APPLICABLE						
and the second second					5		
O KD-KIT-CS SOLLAWARE TRL	MANUFACTURE	VERSION/ SUBVERSION	CRANE SERIAL #	USED NETWORK FORTS /PROTOCOLS / SERVICES			
WG MODEL GH4:	MADRETE	FLASH 1470ZA.	21-5073	CAT 6 6 / MALE - FEMALE			
VPD: MOIDEL VIG-4	MAGNETEK:	FLASH 1470F	21-5023	CAT 6 is /NIALE - FEMALE			
DATA LOGGER	MAGNETE	MARKESPLINKS SS 3.0.	25-5023	USB MICRO			
RACIO CONTROL	MAGNETER	RCP ²	21-5023	USS MINI			
ric .	NOT APPLICABLE				1		
MTU	NOT APPLICABLE						
SUPERVISORY CONTRIBUTER	WOT APPLICABLE						

NCC note to contractors:

This example contains the hardware list, software list, and security features as required by the technical specification. In addition to an actual list, ctalog cut sheets are also required.

N. Appendix N – Electrical Calculations

Please see the following sheets for examples of electrical calculations.

i. Motor

Traverse Motor Horsepower

The bridge acceleration factor (K_a) is calculated according to CMAA #70 5.2.9.1.2.1

$$K_{a} = \frac{f + (\frac{2000aC_{r}}{gE})}{33000K_{t}} \left(\frac{N_{r}}{N_{F}}\right) = 0.0007$$
Where $f = \text{Rolling friction for } 8" \text{ wheels} = 16 \text{ lbs/ ton}$

$$CMAA 70, \text{ Table } 5.2.9.1.2-D$$

$$a = \text{Average acceleration} = 0.25 \text{ ft/s}^{2}$$

$$CMAA 70, \text{ Table } 5.2.9.1.2-A$$

$$C_{r} = \text{Rotational inertia factor} = 1.083$$

$$CMAA 70, 5.2.9.1.2.1$$

$$g = \text{Gravity constant} = 32.2 \text{ ft/s}^{2}$$

$$E = \text{Mechanical efficiency (Mfg. data)} = 0.93$$

$$K_{t} = \text{Equivalent steady state torque}$$

$$relative to rated motor torque$$

$$CMAA 70, \text{ Table } 5.2.9.1.2-C$$

$$N_{r}/N_{F}$$

$$N_{r} = \text{Rated speed of motor in rpm at}$$

$$full load$$

$$N_{F} = \text{Free running rpm of motor when}$$

$$driving \text{ at speed } V$$

Required bridge motor horsepower is calculated according to CMAA #70, 5.2.8.1.1

$$HP = K_aWVK_S = 0.21 hp$$

The bridge motor drive uses a single 0.25 hp motor which exceeds the required horsepower needed to move the bridge crane.

Hoist Motor

From CMAA #70, 5.2.9.1.1.1,

Required Hoist Mechanical HP = $\frac{W(V)}{33000[(E_G)^N(E_S)^M}$

Where W = Weight to be lifted by hoist = 10,150 lbs

rope system

V = Hoist Lift Speed = 21 fpm $E_G = \text{Efficiency per gear reduction}$ = 0.97

CMAA 70, Table 5.2.9.1.1.1-1

E_s = Rope system efficiency per = 0.99

rotating sheave CMAA 70, Table 5.2.9.1.1.1-1

N = Number of gear reduction = 3

Horsburgh-Scott 80T

M = Number of rotating sheaves = 1

Between the drum and equalizer passed over by each part of the moving rope attached to the drum

From CMAA #70, 5.2.9.1.1.2,

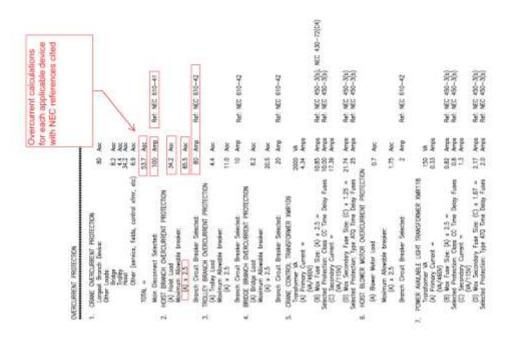
Required Hoist Motor HP = Required Hoist Mechanical HP (Kc)

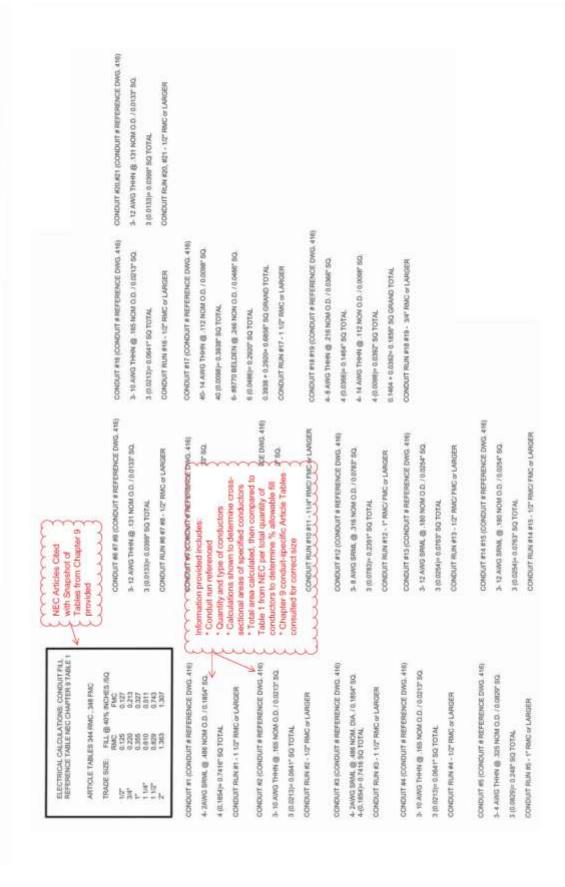
Where K_C = Control factor, which is a correction = 1 value that accounts for the effects the control has on motor torque and speed

Required Hoist Motor HP = 7.15 HP

The proposed hoist motor is rated as 7.5 HP.

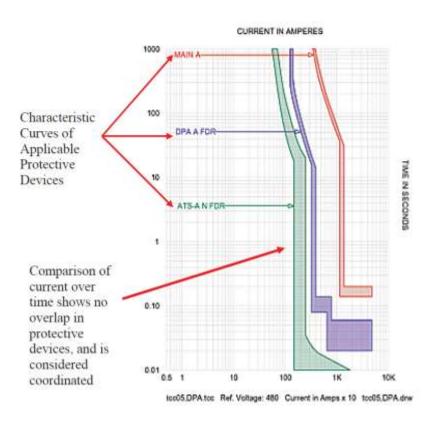
ii. Overcurrent Protection





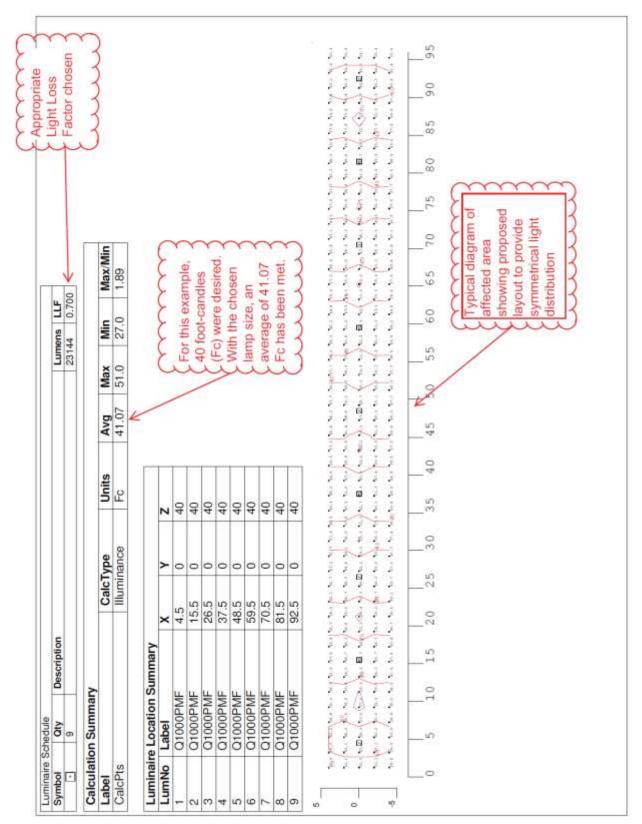
iv. Protective Device Coordination Study

PROTECTIVE DEVICE COORDINATION STUDY EXAMPLE



- Characteristic curve information is available from all protective device manufacturers.
- Coordination study software is available, but typical studies can be hand-drawn provided that scales are kept consistent and accurate.
- Coordination of protective devices is accepted when the study provides proof that, given an overcurrent situation, only the intended unit will be removed from service, and that no other upstream equipment will be affected.

v. Lighting

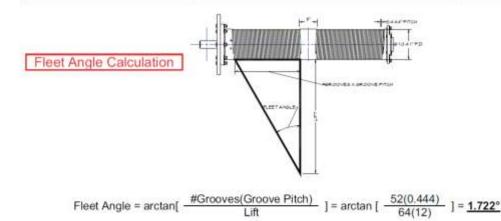


O.

Appendix O – Mechanical CalculationsPlease see the following pages for mechanical calculations.

i. Non-commercial Items

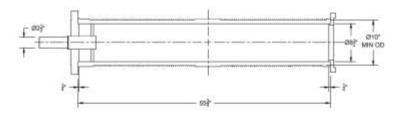
1. Drums



From CMAA #70, 4.4.3.1, the maximum allowed fleet angle is 4°.

The stress analysis of the drum weldment will be done in several sections.

- 1. Radial forces against the drum shell.
- 2. Determination of the drum shell thickness.
- 3. Determination of the end plate thickness and stresses.



Radial Force Against the Drum

In this analysis, we are using the analysis approach from *Design of Weldments* by Omar Blodgett where the turns of the wire rope are treated as a shell. The tensile force in the wire rope (F), creates a uniform inward radial force (p) against the drum shell about which it is wound.

$$F = \frac{(1 + HLF)(TF)(LL) + LB}{n} = 3811 \text{ lbs}$$

Where F = Tensile force in wire rope

LL = Design Capacity = 10000 lbs

= Number of parts of rope = 4 HLF = Hoist Load Factor = 0.15 TF = Test Factor = 1.3125 LB = Load Block = 150 lbs (est.)

$$P = \frac{F}{R_M B} = 1717 \text{ psi}$$

Where P = Uniform internal radial

pressure

R_M = Mean radius of the wire = 5"

rope on the drum shell

B = Width of drum per turn = 0.444"

= groove pitch

Consider the drum shell as long open ended tube with no allowances for the stiffening effects of the end plates. For steel, the critical buckling pressure for the drum shell is

$$P_{CR} = \frac{Et^3}{4(1-v^2)R^3} = 34615 \text{ psi}$$

Where PcR = Critical buckling pressure

pressure

= Mean radius of the shell = 4.63"

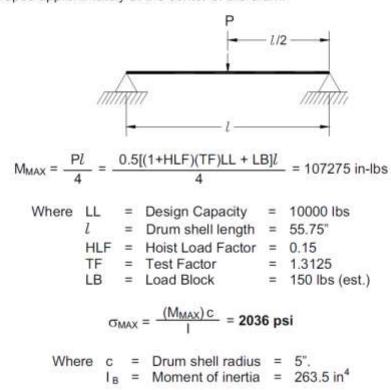
= Poisson's Ratio for steel = .292

= Young's Modulus for steel = 3 X 107 psi

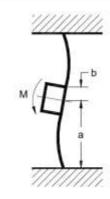
= Tube wall thickness = 0.75"

Since, P << Pck, the possibility of the drum shell collapsing under pressure is minimal.

We can also analyze the drum shell in bending as a simply supported beam with a single load at mid-span. From AISC Steel Construction Manual, 13th Edition, Table 3-23, Case 7 (Simple Beam – Concentrated Load at Center). This would be equivalent to a load that has been raised to the maximum height with both wire ropes approximately at the center of the drum.



To determine the stress in the trunnion shaft and end plate, we will use a plate formula from Roark's Formulas for Stress and Strain (Table 24, case 21, 5th Edition) for a fixed round flat plate with a central couple load located at the center.



$$\sigma_B = \frac{\beta M}{bt^2} = 2985 \text{ psi}$$

Where σ_B = Stress at the shaft to plate joint

M = Moment load = 107275 in-lbs

= Tabulated value for b/a = .706 = 0.467" b = Shaft radius = 1.5" a = Drum inside radius = 4.25" t = End plate thickness = 2"

$$\sigma_{A} = \frac{\beta R_{O}M}{a^{2}t^{2}} = 2947 \text{ psi}$$

Where σ_A = Stress at the drum shell to

plate joint

= Moment load = 107275 in-lbs = Tabulated value for = 0.467"

 R_{O} = Drum inside radius = 4.25" a = Drum inside radius = 4.25" t = End plate thickness = 2"

 σ_A should be the same for each end plate. There should not be any drum shell to end plate stresses for the end plate that houses the barrel coupling.

Each end plate has a 1/4" raised step that is inserted inside the drum shell. The purpose of the raised step is primarily for locating the endplates during assembly. The shear and bearing stress on the raised step are,

$$\tau_{\text{AVG}} = \frac{4V}{3A_{\text{S}}} = \frac{4[0.5[(1+\text{HLF})(\text{TF})\text{LL}] + \text{LB}]}{3A_{\text{S}}} = 100 \text{ psi}$$

$$\sigma_{\text{BEARING}} = \frac{0.5[(1+\text{HLF})(\text{TF})\text{LL} + \text{LB}]}{\text{dt}} = \frac{3552 \text{ psi}}{\text{dt}}$$
Where LL = Design Capacity = 10000 lbs
HLF = Hoist Load Factor = 0.15
TF = Test Factor = 1.3125
LB = Load Block = 150 lbs (est.)
As = Shear area = $\pi d^2/4$ = 53.5 in²
t = Raised step thickness = 0.25"

d = Drum shell ID = 8.5"

2. Bearings

Title	Bridge	Wheel	B	earing			Sheet No. of
Ву	BRS	1	1	Chk.	,	1	Job No.09-5035

```
Bridge Endtruck Wheel Bearing
· MUL = 16,579 lbs
· Maw, L = SOII lbs
- BW = 20462 lbs
. TW = 3042 lbs
 * LL = 20,000 lbs
· X = 554"
 * Spn= 580"
 · f= X/spm=,96
 · Berng = SB 22216
 · Dynamic Rating = 39,600 165
 · Wheel RPM = 21
hw= (,75)(20462) + (,96)(2000) + (,5)(3042) - (,5)(3042) = ,78
 Effective Land = 16,579 0.78 = 12932 165 / 2 bearings
 40 = 1000 000 . ( 39600) 10/3 = 383,550 hors
 Class Craq = 5,000 hours du
```

Title	Trolley	Whee	Be	ering			Sheet No. of
Ву	BRS	1	1	Chk.	1	1	Job No. 07-5036

Trolley Wheel Berring · UCF211-35 · Dynamic Retay = 9,757 lbs " Max Lord = 1/2 · M. W.L = 1/2 + 7027 = 3514 165 · Min Load = 1/2 · Min W.L = 1/2 · 923 = 462 165 · Talley Weight = 3042 165 Kuhu = (2)(26)(2000) /(52) + (15)(3042) = ,71 (3)(26)(20,000) /(52) 4 (15)(3042) Elfective Land = 3514 . 71 = 2475 165 LIO = (1)(16,700) (9757) 3 = 32,148 hours Class Creq = SOCC hows de

Title	D.	?Ilau	Bloc	4			Sheet No. of
Ву	BRS	1	1	Chk.	1	1	Job No. 05-5030

Down Pillow Black · SUCSP 210-31 · SUC 210-31 Being Insert · SPZIO Hasing (stuntess Steel) · Dynamic Rating = 7,895 16f · Drum RPM = 16:34 * Drum Pail End Reachin = 5400 lbs = max load * 1/2 Drum W + (Black + Reps) / 4 = min Load = \frac{1}{2}(509) + (315+62) / 4 = 349 lbs = min Load ku = (2)(5460) + (349) = .69 Effective Load = 5400.69 = 3726 165 $L_{10} = \frac{(1)(16,700)}{(16,34RPM)} \cdot \left(\frac{7895}{3726}\right)^3 = 9,723 \text{ have}$ Class C Rey = 5000 hars chi

Title Black &	Bearings			Sheet No. of
By BRS	11	Chk.	1 1	Job No. 69-5630

Block Sheare Bearing

* Dynamic Rating = 35,900 lbf

Dynamic Repelicul= 5145 => Max Lord = 10,290 165

Block Weight = 315 16s => 315/4parts = 79 16s => Min Lord = 158 16s

Drum RPM = 16,34

kw= (2×10,250) + (158) = .67

Effective Land = 10,290 - ,67 = 6,894 lbs

Lio = 16,666 (35,900) 143 = 249,645 hours

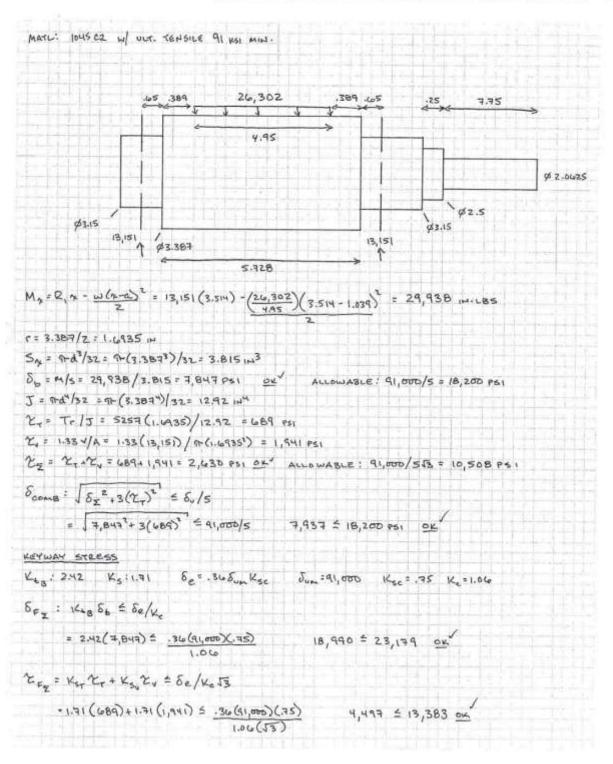
Class C min hours = Sook ohr

Black Thrist Bearing

RT 621 state Rating = 111,000 16f Load = 20,000 16s & 111,000 16s de

3. Shafts

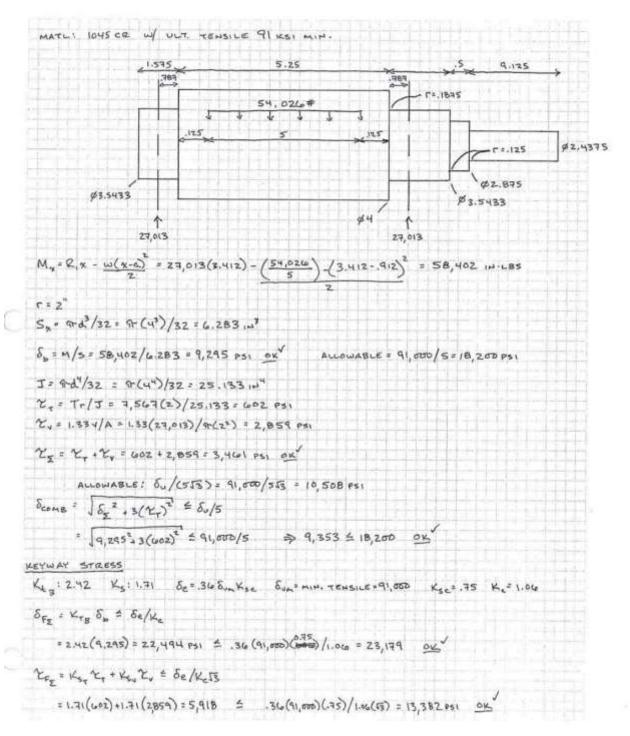
Title TROLLEY]	DRIVE	5	HAFT			Sheet No. of 2
Ву ЛДШ	1	1	Chk.	1	1	04-5025/26 Job No.



TROLLEY -	DRIVE	SH	IAFT		Sheet No. 2 of 2
By 19W	1	1	Chk.	1 1	09-5025/26 Job No.

```
STRESS @ BEARING STEP
 M(xQ.us) = R, x= 13,151 (.65) = 8,548 IN.LES
 T= 3.15/2=1.575 IN
 5 = 17-d3/32 = A(3.153)/32 = 3.069 143
 δ = M/S = B,548/3.069 = 2,785 PSI OL
                                          ALLOWABLE: 91,000/5= 18,200 PSI
 J = Ad/32: A-(3.154)/32= 9.666 W
 2+ = T=/ T = 5257 (1.575)/4.666 = 857 PSI
 2, = 1.33 V/A= 1.83 (13,151) / (1.5752) = 2,244 PSI
 Ty = 857 + 2,244 = 3,101 PS1 OK ALLO WABLE : 91,000 /513 = 10,508 PS1
 5 come : [52 +3(4) = 50/5
        = (2,985 +3/857 ) 4 91,000/5 3,156 £ 18,200 OK
 STEP BEHDING FACTORS
 K4 = 1.43 TORSION FACTOR = 1.3
 SE = K. S. = Se/Ke 193(2,785) = 23,179 5,375 = 23,179 OK
 25 = K, 2, + K, 2, = 5e/k, 13 1.3(057).1.3(2,244) = 13,303 4,031 = 13,303 000
MOTOR STEPS
 D,= $3.15 D,= $2.5 D,= $2.0425
1/03 = .00 1/0x = .05 1/0x = .04
Jb. = 8 d4/32 = 9+(2.54)/32 = 3.835 124
JD, = PA"/32 = P (2.0625")/32 = 1.777 W
D2: Tr/J = 5257 (1.25) /3.835 = 1, 713 PSI OK ALLOWABLE: 10,508 PSI
Dz: Tr/5 = 5257 (1.05/25)/1.777 = 3,051 PSI OK
STEP TORSIGH FACTOR : De 1.6 De 1.68
Dz: 2 = K2 2 + 6 50/K. 13
        = 1.6 (1713) = 13,382 2,741 = 13,382 04
Da: Tre = K, Tr = 5e/Kess
      = 1.68 (3,051) = 13,382 5,124 = 13,382 OL
```

Title BRIDGE I	DRIVE S	Sua	ET			Sheet No. 1 of 2
_{Ву} 29w	1	1	Chk.	1	1	09.5025/26 Job No.



Title BRIDGE D	BRIDGE DRIVE SHAFT					
By 29w	1 1	Chk.	1 1	09.5025/26 Job No.		

```
STRESS @ BEARING STEP
  M(xe.787) = R, x = 27,013 (.787) = 21,259 H-LBS
 C = 3,5433/2 = 1.772"
 5, = n-d3/32 = n-(3.54333)/32 = 4.367 m3
 S. : M/S = 21,259 /4.367 = 4,868 PSI
                                         ALLOWABLE: 91,000/5 = 18,200 PSI OF
 J= 9-84/32= 16(3.54354)/32 =15.475 14
 27 = Tr/J = 7,567 (1.772) /15,495 = 866 PSI
 2, = 1.33 V/A = 1.33 (27,013) / (1.7924) = 3,650 PSI
 2 = 2 + 2 = 866+ 3,650 = 4,516 PSI ALLOWABLE 91,000/5 = 18,200 PSI OK
 Scome = \ \( \delta_2^2 + 3 (\chi_2)^2 \) \( \le \delta_0 / \le \)
 = J4.868 + 3 (866) = 91,000/5 = 5,094 =18,200 PSI OX
 STEP BEHDING FACTORS
 K =1.93 TORSION FACTOR: 1.3
SE = K+ S = Se/K 1.93 (4,868) ≤ 23,179 9,395 € 23,179 OK
 TES = K, T, +16, T, = 50/K, 53 1.3(866)+1.3(3,650) £ 13,382 5,871 £ 13,382 OK
 MOTOR SHAFT STEPS
 D,=3.5433 D,=2.875 D,=2.4375 C=.125
 1/dx = .05 1/d, = .04 01/D, = 1.23 02/D==1.18
ID = md /32 = a (2.8954)/32 = 6.707 144
 Jo, = 9d /32 = 9 (2.43754)/32 = 3.466 144
Dz: Tr/J: 7,567 (1.4375)/6.707 = 1,622 PSI (27) OK
               ALLOWABLE: 91,000/553 = 10,508 PSI
D3: Tr/J = 7,567 (1.219)/3.466 = 2,661 PSI OK
 STEP TORSION FACTOR: D.=1.67 D.=1.58
Dz: 2= K, 2, = Se/16, 13 1.67(1,622) = 13,382 2,709 = 13,382 OK
D31 7Fg = K, E, = Se/K=53 1.58 (2,661) = 13,382 4,204 $ 13,382 OK
```

ii. Brakes

Brake Selections

Full load motor torque T in ft-lbs is calculated by the following formula:

$$T = \frac{5,252xHI}{RPM}$$

1. Hoist Brakes

Requirements: Each hoist shall be equipped with two electro-mechanical brakes, each with a minimum torque rating of 130% of the rated motor torque.

Components:

Main hoist motor: 30HP 1,800 RPM

Main hoist brakes: Primary 125 ft-lbs Starels , and secondary 180 ft-lbs Jamison Industries

Aux hoist motor: 5HP 1,750 RPM

Aux hoist brakes: Primary 15 ft-lbs Starels , and secondary 20 ft-lbs Jamison Industries

	47	M	otor	Brakes				
	HP	RPM	Calculated Motor Torque (fi-lbs)	Torque Required (ft-lbs)	Supplied Bra (ft-ll	Control of the contro	Selection	
Main 20 1000	07.5	1120	Primary	125	OK			
Hoist	30	1,800	87.5	113.8	Secondary	180	ОК	
Aux	3	1.750	Torque (ft-lbs) 87.5		Primary	15	OK	
Hoist	3	1,750	9.0	11.7	Secondary	20	ок	

Note: If hoist requires one brake and a mechanical load brake, NA the secondary brake cells.

2. Travel Brakes

Requirements: Each brake shall have a minimum torque rating equal to 50% of the drive motor rated torque.

Components

Bridge motor: 3HP 1,800 RPM Bridge brake: 10 ft-lbs Starels Trolley motor: 1.5HP 1,800 RPM Trolley brake: 3 ft-lbs Starels

		Mo	otor	Brakes			
	HP	RPM	Calculated Motor Torque (ft-lbs)	Torque Required (ft-lbs)	Supplied Brake Torque (ft-lbs)	Selection	
Bridge	3	1,800	8.75	4.4	10	OK	
Trolley	1.5	1,800	4.4	2.2	3	OK	

iii. Couplings

Coupling Selections

Gear Couplings

Gear coupling minimum torque rating T required in in-lbs is calculated by the following formula:

$$T = \frac{63,000.(Motor\ Horse\ Power).(Service\ Factor)}{Motor\ RPM}$$

Components:

Main Hoist

Motor: 30HP, 1800 RPM max shaft diameter 3.375"

Coupling: 6,150 in-lbs torque rating, max speed 3,300 RPM, max bore capacity 3.625"

Aux Hoist

Motor: 3HP, 1800 RPM max shaft diameter 2.00"

Coupling: 4,125 in-lbs torque rating, max speed 3,300 RPM, max bore capacity 3.000"

Bridge

Motor: 3HP, 1800 RPM max shaft diameter 2.00" Coupling: There is no coupling for bridge drive.

Trolley

Motor: 1.5HP, 1800 RPM max shaft diameter 2.00"

Trolley coupling: 4,125 in-lbs torque rating, max speed 3,300 RPM, and bore capacity 3.000"

	Motor			Calculated	Coupling				
	НР	RPM	Max Shaft Diameter (in)	Transmitted Torque (in-lbs)	Service Factor	Torque Rating (in-lbs)	Max Speed Rating (RPM)	Max bore Capacity (in)	Selection
Main Hoist	30	1,800	3.375	2,100	2	6,150	3,300	3.625	OK.
Aux Hoist	3	1,750	2.000	216	2	4,125	3,300	2.125	OK
Bridge	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trolley	1.5	1,800	1.125	92	1.75	4,125	3,300	2.125	OK

Notes: 1. Service factor for drives are given by the coupling manufacturing.

- 2. Max shaft diameter refers to the larger shaft in the connection
- NA cells those are not applicable.

Drum Barrel Couplings (provide one for each hoist as applicable)

Load to be Lifted, Q (lbs)	67,450	Hoist Tackle Reduction, i_r	4
Hoist Weight, G (Ibs)	2,250	Operating factor, K_1	1.6
Drum and Cable Weight, w (lbs)	3150	Drum and Hoist Efficiency, K2	0.95
Motor Power, Pi (HP)	40	Rope to Coupling Distance, b (in)	16
Hoist Rated Speed V _r (fpm)	16	Drum Length, I (in)	48
Drum Turning Rate, n (rpm)	8	Gearbox Output Shaft Length, d (in)	8
Drum Diameter, D (in)	32	Coupling Compensation Factor, C	3.7

1. Calculation of Nominal Transmission Torque T (lb-ft)

Transmission torque T in ft-lbs based on installed power Pi is calculated by the formula

$$T = \frac{5,252.P_i.K_1}{n} = \frac{5,252.(40).(1.6)}{8} = 42,016 \text{ ft-lbs}$$

Preselected coupling size maximum torque rating $T_N = 51,629$ ft-lbs higher than the torque calculated by means of installed power above.

Selection OK

2. Calculation of Radial Load F to be withstood by the Coupling:

$$F = \left[F_p \left(1 - \frac{b}{I} \right) \right] + \frac{w}{2} = \left[18,344 \left(1 - \frac{16}{48} \right) \right] + \frac{3,150}{2} = 13,804 \text{ lbs}$$

Where F_p = the static pull of the drum including efficiencies

The preselected coupling size withstands a radial load F_r= 25,850 lbs, higher than 13,804 lbs. Selection OK

Corrected Radial Load FA (Optional)

Let's suppose that the calculated radial load F turns out to be 30,000 lbs, higher than manufacture preliminary selection data F_r= 25,850 lbs. In this case, it is possible to make a second check by means of the corrected radial load F_A, prior to selecting a larger coupling size.

$$F_A = F_r + [(T_N - T)(C)] = 25.852 + [(15.736 - 11.678)(3.7)] = 40.866 \text{ lbs}$$

The coupling could withstand a radial load of up to 40,866 lbs > 30,000 lbs.

Selection OK

3. Geometric check of gearbox shaft:

According to the manufacture data, d_{max} = 8.5 inches > 8.0 inches (existing shaft diameter). Selection OK

P. Appendix P – Structural Calculations

Please see the following pages for examples of structural calculations.

Structural Calculations

Contract NXXXX-XX-X-XXXX

1) Table of Contents:

- Design Criteria and Properties
- 2 Load Cases and Dynamic Load Factors
- 2 Box Girder Basic Dimensional Design Limitations
- 3 Girder Section Properties
- 5 End Truck Section Properties
- 7 Inertial Drive Forces
- 7 Skewing Forces
- 8 Girder Required Bending Moment and Shear Capacity
- 15 Girder Bending Stress
- 17 Girder Shear Stress
- 18 Girder Requirements for Diaphrams, Transverse Stiffeners for Web Buckling
- 20 Girder Short Diaphram Spacing and Sizing
- 22 Girder Top Flange Allowable Compressive Stress
- 22 Girder Deflection [ommitted in example for brevity]
- 22 Girder Camber [ommitted in example for brevity]
- 22 End Truck Design [ommitted in example for brevity]
- 22 Trolley Design [ommitted in example for brevity]
- 22 Connections & Fatigue [ommitted in example for brevity]
- Rail Stop and Bummpers [ommited in example for brevity]
 Crane Lifting Point Design [ommited in example for brevity]
- 22 Fall Protection Anchorage Design [ommitted in example for brevity]

2) Design Criteria:

CMAA Service Class: C

Span: $L := 72 \cdot ft$

Crane Capacity: $LL := 120000 \cdot lbf$

Bridge Speed: $S_b \coloneqq 180 \cdot \frac{ft}{min}$

Hoist Speed: $S_h = 25 \cdot \frac{ft}{min}$

Trolley Speed: $S_t = 100 \cdot ft$

Trolley Weight: $TL = 34000 \cdot lbf$

Trolley Wheel Base: $l_t = 12 \cdot ft$

Bridge Drive Deceleration Rate: $a_{bd} = 0.55 \cdot \frac{ft}{sec^2}$

End Truck Weight: $W_{et} = 2850 \cdot lbf$

End Truck Wheel Base: $l_{et} = 13 \cdot ft$

Spacing Between Girders $l_o = 9 \cdot ft$

Page 1 of 22

Structural Calculations

Contract NXXXX-XX-X-XXXX

Walkway Weight:

$$W_{cw} = 30 \cdot \frac{lbf}{ft}$$

Bridge Drive Machinery:

$$W_{dm} = 15 \cdot \frac{lbf}{ft}$$

Steel Yeild Stress:

$$\sigma_{up} = 50 \cdot ksi$$

3) Load Cases and Dynamic Load Factors

$$DLF_b \coloneqq \max \left(1.1, min \left(1.05 + \frac{S_b}{2000 \cdot \frac{ft}{min}}, 1.2 \right) \right) \qquad DLF_b = 1.14$$

Trolley Dead Load Factor: (CMAA 70, 3.3.2.1.4.1)

$$DLF_t = \max \left(1.1, \min \left(1.05 + \frac{S_t}{2000 \cdot \frac{ft}{min}}, 1.2\right)\right) \quad DLF_t = 1.1$$

Hoist Load Factor: (CMAA 70, 3.3.2.1.4.2)

$$HLF := \max \left\{ 0.15, min \begin{bmatrix} 0.005 \cdot S_h \\ ft \\ min \end{bmatrix} \right\}$$

HLF = 0.15

Inertial Forces from Drives: (CMAA 70, 3.3.2.1.5)

$$IFD_{factor} = \max \left\{ \frac{0.078 \cdot a_{bd}}{ft}, 0.025 \right\}$$

Skewing Coefficient (Span:End Truck Wheel Base Ratio=5.5) (CMAA 70, 3.3.2.2.2)

 $S_{sk} = 0.10$

4) Box Girder Basic Dimensional Design Limitations:

Minimum Girder Width: (CMAA 70, 3.5.1)

$$b_g := \frac{L}{65}$$

$$b_g = \frac{L}{65}$$
 $b_g = 13.292 in$

Minimum Girder Height: (CMAA 70, 3.5.1)

$$h_g := \frac{L}{25}$$

$$h_g = \frac{L}{25}$$
 $h_g = 34.56 in$

Maximum Allowable Web Height to Thickness Ratio: (CMAA 70, 3.5.1)

*Longitudinal Stiffeners are not provided.

$$\alpha := \max \left(\frac{1000}{\sqrt{\sigma_{yp}}} \cdot psi^{0.5}, 775 \cdot \sqrt{1.67} \right) \qquad \alpha = 1001.521$$

Structural Calculations

Contract NXXXX-XX-X-XXXX

buf

blf

5) Box Girder Sectional Properties:

Section Properties:

Girder Web Height: $h_m = 56 \cdot in$ Must be > hg

Girder Web Thickness: $t_m := 0.375 \cdot in$

Upper Flange Width: $b_{uf} = 22 \cdot in$

Upper Flange Thickness: $t_{uf} := 1 \cdot in$

Lower Flange Width: $b_{lf} = 22 \cdot in$

Lower Flange Thickness: $t_{if} := 1 \cdot in$

Distance Between Webs: $b_w = 20 \cdot in$ Must be > bg

Cross Section Area:

$$A_1 \coloneqq b_{uf} \cdot t_{uf}$$
 $A_2 \coloneqq h_w \cdot t_w$ $A_3 \coloneqq b_{lf} \cdot t_{lf}$ $A_4 \coloneqq h_w \cdot t_w$
 $A \coloneqq A_1 + A_2 + A_3 + A_4$ $A = 86 \ in^2$

Find Location of Neutral Axis:

(As measured from upper surface of top flange)

$$Y_{\text{bar}} \coloneqq \frac{A_{1} \cdot \frac{t_{uf}}{2} + A_{2} \cdot \left(t_{uf} + \frac{h_{w}}{2}\right) + A_{3} \cdot \left(t_{uf} + h_{w} + \frac{t_{lf}}{2}\right) + A_{4} \cdot \left(t_{uf} + \frac{h_{w}}{2}\right)}{A} \qquad \qquad Y_{\text{bar}} = 29 \text{ in } Y_{\text{bar}} = 2$$

Major Axis Moment of Inertia:

$$I_1 \coloneqq \frac{b_{uf} \cdot t_{uf}^{-3}}{12} \qquad \qquad I_2 \coloneqq \frac{t_w \cdot h_w^{-3}}{12} \qquad \qquad I_3 \coloneqq \frac{b_{lf} \cdot t_{lf}^{-3}}{3} \qquad \qquad I_4 \coloneqq I_2$$

Parallel Axis:

$$\begin{split} I_{pa1} &\coloneqq A_{1} \cdot \left(Y_{bar} - \frac{t_{uf}}{2} \right)^{2} & I_{pa2} &\coloneqq A_{2} \cdot \left(\left(Y_{bar} - \left(t_{uf} + \frac{h_{w}}{2} \right) \right)^{2} \right) \\ I_{pa3} &\coloneqq A_{3} \cdot \left(Y_{bar} - \left(t_{uf} + h_{w} + \frac{t_{lf}}{2} \right) \right)^{2} & I_{pa4} &\coloneqq A_{4} \cdot \left(Y_{bar} - \left(t_{uf} + \frac{h_{w}}{2} \right) \right)^{2} \end{split}$$

Total Moment of Inertia about X-Axis:

$$I_x\!\!\coloneqq\!I_1\!+\!I_2\!+\!I_3\!+\!I_4\!+\!I_{pa1}\!+\!I_{pa2}\!+\!I_{pa3}\!+\!I_{pa4} \qquad \qquad I_x\!\!=\!46724.167~\text{in}^4$$

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Structural Calculations

Contract NXXXX-XX-X-XXXX

Minor Axis Moment of Inertia:

$$I_1 \!\coloneqq\! \frac{b_{u\!f}^{-3} \cdot t_{u\!f}}{12} \qquad \qquad I_2 \!\coloneqq\! \frac{t_w^{-3} \cdot h_w}{12} \qquad \qquad I_3 \!\coloneqq\! \frac{b_{l\!f}^{-3} \cdot t_{l\!f}}{12} \qquad \qquad I_4 \!\coloneqq\! I_2$$

$$I_2 := \frac{t_w^3 \cdot h_u}{12}$$

$$I_3 := \frac{b_{lf}^3 \cdot t_{lf}}{12}$$

$$I_4 := I$$

Parallel Axis:

$$I_{pa2} := A_2 \cdot \left(\frac{b_w}{2} + \frac{t_w}{2}\right)^2$$
 $I_{pa4} := I_{pa2}$

$$I_{pa4} := I_{pa}$$

Total Moment of Inertia about Y-Axis:

$$I_y\!\coloneqq\!I_1\!+\!I_2\!+\!I_3\!+\!I_4\!+\!I_{pa2}\!+\!I_{pa4} \qquad \quad I_y\!=\!6134.135\; \textbf{in}^4$$

$$I_y = 6134.135 in^4$$

Major Axis Section Modulus:

$$S_{xtop} = \frac{I_x}{Y_{bar}}$$

$$S_{xtop} = 1611.178 in^3$$

$$S_{xbot} \coloneqq \frac{I_x}{\left\langle t_{uf} + h_w + t_{if} - Y_{bar} \right\rangle} \qquad S_{xbot} = 1611.178 \ in^3$$

$$S_{\text{obst}} = 1611.178 \text{ in}^3$$

Minor Axis Section Modulus:

$$S_y \coloneqq \frac{I_y}{\frac{1}{2} \cdot \max \left(b_{uf}, b_{lf}\right)}$$

$$S_y = 557.649 \ in^3$$

Girder Weight:

$$w_{girder} := A \cdot 490 \cdot \frac{lbf}{ft^3}$$
 $w_{girder} = 292.639 \cdot \frac{lbf}{ft}$

$$w_{girder} = 292.639 \frac{lbf}{ft}$$

Check Web Height to Thickness Ratio to Confirm it does not exceed the limit α found on page 2:

$$\frac{h_{w}}{t_{w}}$$
 = 149.333 < α = 1001.521 \therefore OK.

Structural Calculations

Contract NXXXX-XX-X-XXXX

-buf-

blf

(2)

6) End Truck Sectional Properties:

Section Properties:

End Truck Web Height: $h_m = 16 in$

End Truck Web Thickness: $t_w = 0.5 \cdot in$

Upper Flange Width: $b_{uf} = 12 \cdot in$

Upper Flange Thickness: $t_{uf} = 0.75 \cdot in$

Lower Flange Width: $b_{lf} = 12 \cdot in$

Lower Flange Thickness: $t_H = 0.75 \cdot in$

Distance Between Webs: $b_{so} = 10 \cdot in$

Cross Section Area:

$$A_1 \coloneqq b_{uf} \cdot t_{uf} \qquad A_2 \coloneqq h_w \cdot t_w \qquad A_3 \coloneqq b_{lf} \cdot t_{lf} \qquad A_4 \coloneqq h_w \cdot t_w$$

$$A_{et} := A_1 + A_2 + A_3 + A_4$$
 $A_{et} = 34 \text{ in}^2$

Find Location of Neutral Axis:

(As measured from upper surface of top flange)

$$Y_{bar} \coloneqq \frac{A_{1} \cdot \frac{t_{uf}}{2} + A_{2} \cdot \left(t_{uf} + \frac{h_{w}}{2}\right) + A_{3} \cdot \left(t_{uf} + h_{w} + \frac{t_{lf}}{2}\right) + A_{4} \cdot \left(t_{uf} + \frac{h_{w}}{2}\right)}{Y_{bar} = 3.459 \ in}$$

Major Axis Moment of Inertia:

$$I_1 \coloneqq \frac{b_{\mathit{uf}} \cdot t_{\mathit{uf}}^{-3}}{12} \qquad \qquad I_2 \coloneqq \frac{t_{\mathit{w}} \cdot h_{\mathit{w}}^{-3}}{12} \qquad \qquad I_3 \coloneqq \frac{b_{\mathit{lf}} \cdot t_{\mathit{lf}}^{-3}}{3} \qquad \qquad I_4 \coloneqq I_2$$

Parallel Axis:

$$\begin{split} I_{pa1} \coloneqq & A_{1} \cdot \left(Y_{bar} - \frac{t_{uf}}{2} \right)^{2} \\ I_{pa2} \coloneqq & A_{2} \cdot \left(\left(Y_{bar} - \left(t_{uf} + \frac{h_{w}}{2} \right) \right)^{2} \right) \\ I_{pa3} \coloneqq & A_{3} \cdot \left(Y_{bar} - \left(t_{uf} + h_{w} + \frac{t_{if}}{2} \right) \right)^{2} \end{split}$$

Total Moment of Inertia about X-Axis:

$$I_{xet} := I_1 + I_2 + I_3 + I_4 + I_{pa1} + I_{pa2} + I_{pa3} + I_{pa4}$$
 $I_{xet} = 2557.684 \text{ in}^4$

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Structural Calculations

Contract NXXXX-XX-X-XXXX

Minor Axis Moment of Inertia:

$$I_1 \!\coloneqq\! \frac{b_{u\!f}^{-3} \cdot t_{u\!f}}{12} \qquad \qquad I_2 \!\coloneqq\! \frac{t_w^{-3} \cdot h_w}{12} \qquad \qquad I_3 \!\coloneqq\! \frac{b_{l\!f}^{-3} \cdot t_{l\!f}}{12} \qquad \qquad I_4 \!\coloneqq\! I_2$$

$$I_2 := \frac{t_w^3 \cdot h_w}{12}$$

$$I_3 := \frac{b_{lf}^3 \cdot t_{lf}}{12}$$

$$I_4 := I$$

Parallel Axis:

$$I_{pa2} := A_2 \cdot \left(\frac{b_w}{2} + \frac{t_w}{2}\right)^2$$
 $I_{pa4} := I_{pa2}$

$$I_{pa4} := I_p$$

Total Moment of Inertia about Y-Axis:

$$I_{yet}\!:=\!I_1\!+\!I_2\!+\!I_3\!+\!I_4\!+\!I_{pa2}\!+\!I_{pa4} \qquad \quad I_{yet}\!=\!657.333 \; \textbf{in}^4$$

$$I_{vet} = 657.333$$
 in

Major Axis Section Modulus:

$$S_{xtopet} \coloneqq \frac{I_x}{Y_{bar}}$$

$$S_{xtopet} = 13506.818 \text{ in}^3$$

$$S_{xbotet} \coloneqq \frac{I_x}{\left(t_{uf} + h_w + t_{lf} - Y_{bar}\right)} \\ S_{xbotet} = 3327.767 \ \textit{in}^3$$

$$S_{-1-1-1} = 3327.767 \text{ in}^3$$

Minor Axis Section Modulus:

$$S_{yet} \coloneqq \frac{I_y}{\frac{1}{2} \cdot \max \left\langle b_{uf}, b_{lf} \right\rangle} \qquad \qquad S_y \! = \! 557.649 \; \textbf{in}^3$$

$$S_y = 557.649 \text{ in}^3$$

End Truck Weight:

$$w_{et}\!:=\!A_{et}\!\cdot\!490\!\cdot\!\frac{lbf}{ft^3} \qquad \qquad w_{et}\!=\!115.694\;\frac{lbf}{ft}$$

$$w_{el} = 115.694 \frac{lbf}{ft}$$

$$W'_{et}\!\coloneqq\!w_{et}\!\cdot\!l_{et}$$

$$W'_{et} = 1504.028 \ lbf$$

NOTE: This weight does not include weight of wheels, drive motors, stiffeners and diaphrams. The total end truck weight (Wet) is used for subsequent calculations

Structural Calculations

Contract NXXXX-XX-X-XXXX

7) Inertial Drive Forces:

(CMAA 70, 3.3.2.1.5)

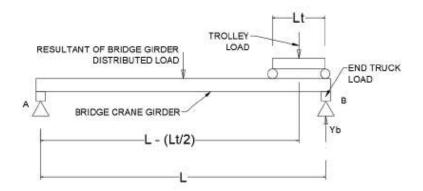
Distributed Dead Load: $dist_weight := (2 \cdot w_{girder} \cdot 1.15 + W_{cw} + W_{dm})$

Concentrated Loads: $conc\ weight := LL + TL$

Note: A factor of 1.15 was added to girder weight to account for the additional weight of stiffeners and diaphrams. This will be confirmed in the subsequent calculations.

8) Skewing Forces:

Determine Wheel Loads



Sum of Forces About Left Support:

$$\Sigma M_a = - \left(DLF_b \cdot \left\langle 2 \cdot w_{girder} + W_{cw} + W_{dm} \right\rangle \cdot \frac{L^2}{2} \right) - \left\langle DLF_t \cdot TL + LL \cdot \left(1 + HLF \right) \right\rangle \cdot \left(L - \frac{l_t}{2} \right) + Y_b \cdot L - W_{et} \cdot L = 0$$

$$Y_{b1} \coloneqq \frac{\left\{DLF_b \cdot \left(2 \cdot w_{girder} + W_{cw} + W_{dm}\right) \cdot \frac{L^2}{2}\right\} + \left\langle DLF_t \cdot TL + LL \cdot \left(1 + HLF\right)\right\rangle \cdot \left(L - \frac{l_t}{2}\right) + W_{et} \cdot L}{L}$$

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Structural Calculations

Contract NXXXX-XX-X-XXXX

Right Hand Reaction and Maximum Reaction Force: $Y_{h1} = 189499.933$ lbf

Load Per Wheel, Assuming 2 Wheels:

$$L_{wheel} := \frac{Y_{b1}}{2}$$

 $L_{wheel} = \frac{Y_{b1}}{2}$ $L_{wheel} = 94749.967 \; lbf$

Skewing Forces on Each Wheel:

$$F_{skew} := S_{sk} \cdot L_{wheel}$$

$$F_{skem} = 9474.997 \ lbf$$

NOTE: This lateral force will be appled to each end truck wheel in the direction perpendicular to the rail, such that each end truck is loaded with a force couple with maginitude equal to this skewing force, and a distance equal to the end truck wheel base.

9) Required Girder Bending Moment and Shear

Required girder bending moment:

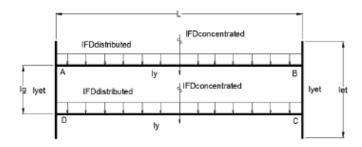
(Assuming trolley is centered-this moment is resisted by BOTH girders)

CMAA Load Case 1: $DL(DLF_B)+TL(DLF_T)+LL(1+HLF)+IFD$

$$\boldsymbol{M}_{x1} \coloneqq \left(\frac{DL\boldsymbol{F}_b \cdot \left\langle \boldsymbol{w}_{girder} + \boldsymbol{W}_{cw} + \boldsymbol{W}_{dm} \right\rangle \cdot \boldsymbol{L}^2}{8} + \frac{\left\langle DL\boldsymbol{F}_t \cdot \boldsymbol{T} \boldsymbol{L} + LL \cdot (1 + HL\boldsymbol{F}) \right\rangle \cdot \boldsymbol{L}}{4} \right) \quad \boldsymbol{M}_{x1} = 3406620.6 \ \boldsymbol{lbf} \cdot \boldsymbol{ft}$$

Find My1 Which results from Inertial Drive Forces (IFD) Using Indeterminate Frame Analysis:

Frame analysis is conducted on the structural model shown below. All resulting flexural forces within the end trucks are assumed to be resisted between the girder connection points. The cantilevered end truck ends (which contain the wheels) are assumed to be free for the purpose of this specific analysis since the small amount of lateral play between the rail head and end truck wheel flanges will allow the end truck ends to deflect under IFD loads. This results in conservatively higher flexural demands on the portion of the end truck that is between the girders.



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Structural Calculations

Contract NXXXX-XX-X-XXXX

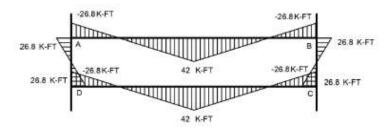
For this example, the indeterminate structural analysis that was needed to find the resulting flexural moments for the IFD loads was performed using Moment Distribution (a classic hand-calculation method). In practice, this analysis would most likely be conducted using comercial structural analysis software. For brevity, the specific Moment Distribution computations have been ommitted in this example, however the inputs and outputs have been fully defined so as to allow an independent reviewer the ability to duplicate the analysis as a means for checking the work.

The moments at the joints are approximately 26.8 k-ft, and the maximum girder moment at mid-span (My1) was found to be approximately 42 k-ft. See result plot below.

Fixed End Moments-Girder:

$$FEM \coloneqq \frac{IFD_{distributed} \cdot L^2}{12} + \frac{IFD_{concentrated} \cdot L}{8}$$

Resulting Bending Moment Diagram Due to IFD Forces:



The resulting maximum girder moment about the Y-Axis from IFD force structural analysis:

$$M_{v1} := 42000 \cdot lbf \cdot ft$$

CMAA Load Case 2: $DL(DLF_B) + TL(DLF_T) + LL(1 + HLF) + IFD + SK$

Major Axis Bending Moment:

$$M_{r2} = M_{r1}$$

Find the minor axis bending moment for Load Case 2 (My2) which results from IFD and Skewing forces Using Indeterminate Frame Analysis:

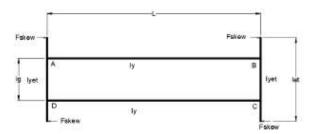
Frame analysis is conducted on the structural model shown below for skewing forces. Moment Distribution is used for analysis. The resulting moments due to the skewing forces are added to the moments found due to IFD forces (in Load Case #1). Unlike the analysis for IFD forces, the entire length of the end truck is used since the skewing forces enter the crane structure through the wheels.

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Structural Calculations

Contract NXXXX-XX-X-XXXX

Load Case 2 Skewing Forces:



Moment Arm From Girder to Wheel Axle where Fskew is Applied:

$$a := \frac{l_{et} - l_g}{2}$$
 $a = 2 ft$

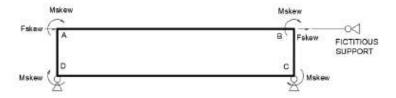
Moment Applied by Fskew:

(This will be distributed into the remaining structure via Moment Distribution)

$$M_{skew} := a \cdot F_{skew}$$

$$M_{skew} = 18.95 \ kip \cdot ft$$

The bending moments were found in the frame shown below using Moment Distribution. NOTE: The fictitious support was needed for this racking analysis to separate the moments that were caused by Fskew from those that were caused by Mskew. All of the moments were summed together at the end (with the fictitious support removed) in order to reach the final moment diagram for skewing forces. See below.



Final Racking Moments Due to Skewing Forces:



NOTE: The moments at the joints are not equal and oposite because there is an additional -18.95 kip-ft from the cantilevered portion of the end trucks (Mskew) that isn't shown. Once this is added each joint is in equalibrium.

Structural Calculations

Contract NXXXX-XX-X-XXXX

Now combine the girder moments due to IFD forces with the girder moments due to skewing forces to get a final Load Case 2 bending moment diagram about the vertical axis (minor axis bending). For Girder AB (Girder CD is similar), the combined end moments:

At A is: $58.9 \cdot kip \cdot ft - 26.8 \cdot kip \cdot ft = 32.1 \ kip \cdot ft$

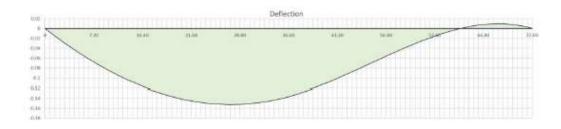
At B is: $58.9 \cdot kip \cdot ft + 26.8 \cdot kip \cdot ft = 85.7 \ kip \cdot ft$

Girder Minor Axis Shear, Bending Moment and Deflection Due To Combined Inertial Drive
Forces and Skewing Forces for Computation of Combined Stresses for CMAA Load Case 2:

| First Moment of |







NOTE: The Moment Distribution sign convention is that clockwise moments on the beam ends are positive. Therefore Girder AD above has clockwise moments acting on it at each end. Meanwhile the sign convention for the moment diagram shown above differs in that positive moments are concave-up beam curvature. As a result, the Moment Distribution results show a positive moment on each end, while the diagram shows one postive and one negative end moment.

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Structural Calculations

Contract NXXXX-XX-X-XXXX

From these results, there are two locations that should be considered:

- Mid-Span where the bending moment due to gravity loads are at a maximum and bending moments due to horizontal loads (IFD and Skewing) are at a local maxima.
- At the right end (Joints B and C) where the bending moment due to horizontal loads are at a maximum.

$$M_{y2_midspan} := 41.2 \cdot kip \cdot ft$$

$$M_{y2_end} = 85.7 \cdot kip \cdot ft$$

Test Load Case 3 for a 125% Test Load:

(NOTE: Load Combination Varies by Contract-See Specification)

$$DL(DLF_b) + TL \cdot (DLF_t) + 1.25 LL + (1 + HLF) \cdot IFD + SK + WLO$$

NOTES:

- 1. The crane considered in this example is an indoor crane therefore WLO is taken as zero.
- 2. All other loads are equivalent to previous load cases except that the Lifted Load will be increased by a factor of 1.25, and the resulting IFD and Skewing Forces must also be increased accordingly. Since this is linear eleastic analysis, the bending moments from Load Case #2 can be increased by a factor which is the ratio of the IFD and Skewing moments found in Load Case #3 divided by the IFD and Skewing moments found in Load Case #2.

Increased IFD Forces:

Determine Wheel Loads

Distributed Dead Load: $dist_weight := (2 \cdot w_{wirder} \cdot 1.15 + W_{cw} + W_{dm})$

Concentrated Loads: $conc_weight := 1.25 LL + TL$

Note: A factor of 1.15 was added to girder weight to account for the additional weight of stiffeners and diaphrams. This will be confirmed in the subsequent calculations.

Fixed End Moments-Girder:
$$FEM := \frac{IFD_{distributed} \cdot L^2}{12} + \frac{IFD_{concentrated} \cdot L}{8}$$

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Structural Calculations

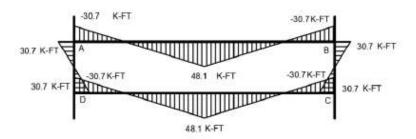
Contract NXXXX-XX-X-XXXX

The fixed-end moments for IFD forces in Load Case #2 were found to be 36.38kip-ft, which resulted in bending moments of -26.8kip-ft (at the ends) and 42 kip-ft (mid span). See pages 8-9. The bending moments due to IFD for Load Case #3 are therefore proportionately increased to account for the increased test load:

Negative Moment :
$$-26.8 \cdot kip \cdot ft \cdot \frac{FEM}{36.8 \cdot kip \cdot ft} = -30.714 \ (kip \cdot ft)$$

Positive Moment:
$$42 \cdot kip \cdot ft \cdot \frac{FEM}{36.8 \cdot kip \cdot ft} = 48.135 \ (kip \cdot ft)$$

Case 3 IFD Moments:



Increased Skewing Forces:

$$Y_{b3} \coloneqq \underbrace{\left(DLF_b \cdot \left(2 \cdot w_{girder} + W_{cw} + W_{dm}\right) \cdot \frac{L^2}{2}\right) + \left(DLF_t \cdot TL + 1.25 \cdot LL \cdot \left(1 + HLF\right)\right) \cdot \left(L - \frac{l_t}{2}\right) + W_{et} \cdot L}_{L}$$

Right Hand Reaction and Maximum Reaction Force: Yb3 = 221124.933 lbf

Load Per Wheel, Assuming 2 Wheels:
$$L_{wheel} = \frac{Y_{b3}}{2}$$
 $L_{wheel} = 110562.467 \ \textit{lbf}$

Skewing Forces on Each Wheel:
$$F_{skew} = S_{sk} \cdot L_{wheel}$$
 $F_{skew} = 11056.247 \ lbf$

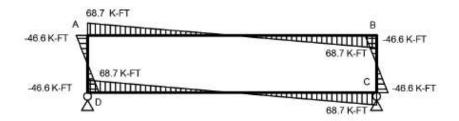
The increased Skewing Force (Fskew) for Load Case #3 is 11,056 lbs verses 9,475 lbs found in Load Case #2. The skewing moments for Load Case #3 will therefore be proportionately increased from those found for Load Case #2 skewing moments as follows:

Negative Moment :
$$-39.9 \cdot kip \cdot ft \cdot \frac{F_{skew}}{9475 \cdot lbf} = -46.559 \ (kip \cdot ft)$$

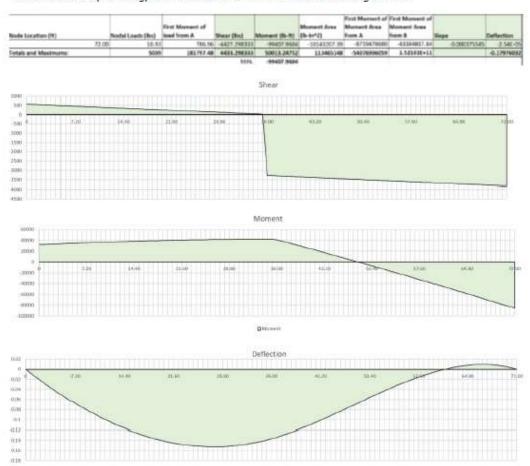
Positive Moment:
$$58.9 \cdot kip \cdot ft \cdot \frac{F_{skew}}{9475 \cdot lbf} = 68.73 \ (kip \cdot ft)$$

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Case 3 Skewing Moments:



Combined Shear, Bending, and Deflection for Case 3 IFD and Skewing Forces:



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Structural Calculations

Contract NXXXX-XX-X-XXXX

From these results, there are two locations that should be considered:

- Mid-Span where the bending moment due to gravity loads are at a maximum and bending moments due to horizontal loads (IFD and Skewing) are at a local maxima.
- At the right end (Joints B and C) where the bending moment due to horizontal loads are at a maximum.

$$M_{y3_midspan} := 48.7 \cdot kip \cdot ft$$

$$M_{u3\ end} := 99.4 \cdot kip \cdot ft$$

Load Case 3 Major Axis Bending:

$$M_{x3} \coloneqq \left(\frac{DLF_b \cdot \left\langle w_{girder} + W_{cw} + W_{dm} \right\rangle \cdot L^2}{8} + \frac{\left\langle DLF_l \cdot TL + 1.25 \ LL \cdot \left(1 + HLF \right) \right\rangle \cdot L}{4} \right)$$

Summary of Bending Moments on the Girder for Load Cases 1, 2, and 3: (All values in kip-ft)

	Major Axis	Minor Axis Mid-Span	Minor Axis-End
Load Case #1	3379	42	26.8
Load Case #2	3379	42	85.7
Load Case #3	4000	48.7	99.4

10) Girder Bending Stress:

Load Case 1:

Allowable Tension/Compression Stress for Yielding: $\sigma_{all1} := 0.6 \cdot 50 \cdot ksi$ (CMAA 70 Table 3.4-1)

$$\sigma_{all1} = 30 \ ksi$$

Top Flange Stress:

$$\sigma_{t1}\!\coloneqq\!\frac{M_{x1}}{S_{xtop}}\!+\!\frac{M_{y1}}{S_y} \qquad \qquad \sigma_{t1}\!=\!26.276~\textit{ksi} \qquad \therefore < \text{allowable. OK.}$$

Bottom Flange Stress:

$$\sigma_{b1}\!\coloneqq\!\frac{M_{x1}}{S_{xbot}}\!+\!\frac{M_{y1}}{S_{y}}\qquad\qquad \sigma_{b1}\!=\!26.276~\textit{ksi}\qquad \therefore < \text{allowable. OK.}$$

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Structural Calculations

Contract NXXXX-XX-X-XXXX

Load Case 2:

Allowable Tension/Compression Stress for Yielding: (CMAA 70 Table 3.4-1)

 $\sigma_{app} := 0.66 \cdot 50 \cdot ksi$

 $\sigma_{all2} = 33$ ksi

Top Flange Stress:

$$\sigma_{t2} \coloneqq \frac{M_{x2}}{S_{xtop}} + \frac{M_{y2_midspan}}{S_y}$$

 σ_{t2} =26.259 **ksi** \therefore < allowable. OK.

Bottom Flange Stress:

$$\sigma_{b2}\!\coloneqq\!\frac{M_{x2}}{S_{xbot}}\!+\!\frac{M_{y2_midspan}}{S_{y}} \qquad \qquad \sigma_{b2}\!=\!26.259~\textit{ksi} \qquad \therefore < \text{allowable, OK.}$$

Minor Axis Bending at Beam Girder:

$$\sigma_{y2_end} \!\coloneqq\! \frac{M_{y2_end}}{S_y}$$

 $\sigma_{v2\ end} = 1.844\ ksi$:. < allowable. OK.

Load Case 3:

Allowable Tension/Compression Stress for Yielding: (CMAA 70 Table 3.4-1)

 $\sigma_{all3} = 0.75 \cdot 50 \cdot ksi$

 $\sigma_{all3} = 37.5 \text{ ksi}$

Top Flange Stress:

$$\sigma_{t3} \coloneqq \frac{M_{x3}}{S_{xtop}} + \frac{M_{y3_midspan}}{S_y} \qquad \qquad \sigma_{t3} = 31.046 \text{ ksi}$$

∴ < allowable. OK.

Bottom Flange Stress:

$$\sigma_{b3} = \frac{M_{x3}}{S_{xbot}} + \frac{M_{y3_midspan}}{S_y}$$

 σ_{b3} =31.046 **ksi** \therefore < allowable. OK.

Minor Axis Bending at Beam Girder:

$$\sigma_{y3_end} \coloneqq \frac{M_{y3_end}}{S_{y}}$$

 $\sigma_{u3\ end} = 2.139\ ksi$... < allowable. OK.

Structural Calculations

Contract NXXXX-XX-X-XXXX

11) Girder Shear Stress:

Load Case 1:

 $\tau_{alli} = 0.36 \cdot 50 \cdot ksi$

Allowable Shear Stress for Yielding:

(CMAA 70 Table 3.4-1)

 $\tau_{all1} = 18$ ksi

Controlling Girder Web Shear:

 $V_{y1} = Y_{b1} - W_{et}$ $V_{y1} = 186.65 \ kip$

Girder Web Shear Stress:

$$\tau_{y1w} = \frac{V_{y1}}{2 \cdot h_w \cdot t_u}$$

 $\tau_{y1w} \coloneqq \frac{V_{y1}}{2 \cdot h_w \cdot t_w} \qquad \tau_{y1w} = 11.666 \text{ ksi} \text{ ...} < \text{allowable. OK.}$

Controlling Girder Flange Shear: $V_{x1} = 4.275 \cdot kip$ See Page 10-IFD Shear

Girder Flange Shear Stress:

$$\tau_{y1f} \!\!\coloneqq\! \frac{V_{x1}}{b_{uf}\!\!\cdot\! t_{uf}\!+\! b_{lf}\!\!\cdot\! t_{lf}} \ \tau_{y1f} \!\!=\! 0.238 \ \textit{ksi} \quad \therefore < \text{allowable. OK.}$$

Load Case 2:

Allowable Shear Stress for Yielding:

(CMAA 70 Table 3.4-1)

 $\tau_{all2} = 0.4 \cdot 50 \cdot ksi$

 $\tau_{all2} = 20 \text{ ksi}$

Controlling Girder Web Shear:

 $V_{y2} = Y_{b1} - W_{et}$ $V_{y2} = 186.65 \ kip$

Girder Web Shear Stress:

 $\tau_{y^{2w}} = \frac{V_{y1}}{2 \cdot h \cdot t}$ $\tau_{y^{2w}} = 11.666 \text{ ksi} \cdot \cdot \cdot \cdot < \text{allowable. OK.}$

Controlling Girder Flange Shear: $V_{x2} = 6.355 \cdot kip$

See Page 15-IFD & Skewing Shear Forces Combined

Girder Flange Shear Stress:

 $\tau_{y2f} = \frac{V_{x2}}{b_{xt} \cdot t_{xf} + b_{xt} \cdot t_{xf}} \quad \tau_{y2f} = 0.353 \text{ ksi} \quad \therefore \text{ < allowable. OK.}$

Load Case 3:

Allowable Shear Stress for Yielding:

 $\tau_{all2} := 0.45 \cdot 50 \cdot ksi$

(CMAA 70 Table 3.4-1)

 τ_{all2} = 22.5 ksi

Controlling Girder Web Shear: $V_{u3} = Y_{b3} - W_{et}$ $V_{u3} = 218.275$ kip

Structural Calculations

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Girder Web Shear Stress:

$$\tau_{y3w} := \frac{V_{y3}}{2 \cdot h_w \cdot t_w}$$

$$\tau_{y3w} = \frac{V_{y3}}{2 \cdot h_{\cdots} \cdot t_{-}}$$
 $\tau_{y3w} = 13.642 \text{ ksi}$... < allowable. OK.

Controlling Girder Flange Shear: $V_{x3} = 7.337 \cdot kip$

$$V_{-2} := 7.337 \cdot kip$$

Girder Flange Shear Stress:

$$\tau_{x3f} \coloneqq \frac{V_{x3}}{b_{uf} \cdot t_{uf} + b_{lf} \cdot t_{lf}} \ \tau_{x3f} = 0.408 \ \textit{ksi} \quad \therefore < \text{allowable, OK.}$$

12) Girder Requirements for Diaphrams, Transverse Stiffeners for Web Buckling

Web Height to Thickness Ratio Limit, CMAA 3.5.4.1:

$$\frac{h_w}{t} = 32$$

$$\frac{h_w}{t_w} = 32 \qquad < \qquad 240 \cdot \sqrt{\tau_{y3w}} \cdot \left(\frac{1}{\textit{psi}^{0.5}}\right) = 28031.942 \qquad < 150 \qquad \qquad \vdots \text{ OK. Additional Full Height siffieners}$$

not required unless required by CMAA 3.4.8

Find Spacing For Transverse Web Stiffeners to Meet Section 3.4.8 Requirements:

Transverse Stiffeners Spacing:

$$a := L$$

$$a = 864 in$$

$$\alpha := \frac{a}{h_{-}}$$

$$\alpha = 54$$

Euller Buckling Stress (CMAA 70, 3.4.8.2): $\sigma_e \coloneqq \frac{\pi^2 \cdot 29000 \cdot ksi}{12 \cdot \left(1 - 0.3^2\right)} \cdot \left(\frac{t_w}{h_w}\right)^2 \qquad \sigma_e = 25.596 \ ksi$

$$\sigma_e \coloneqq \frac{\pi^2 \cdot 29000 \cdot ksi}{12 \cdot (1 - 0.3^2)} \cdot \left(\frac{t_w}{h_w}\right)^2$$

$$\tau_e = 25.596 \ ksi$$

Web Buckling Due to Shear and Normal Stress:

(Using Case 3 and 4 of Table 3.4.8.2-1)

$$\tau \coloneqq \begin{bmatrix} \tau_{y1w} \\ \tau_{y2w} \\ \tau_{y3w} \end{bmatrix}$$

Normal Stress for Load Cases 1,2 and 3:

$$\sigma := \begin{bmatrix} \sigma_{t1} \\ \sigma_{t2} \\ \sigma_{t3} \end{bmatrix}$$

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Structural Calculations

Contract NXXXX-XX-X-XXXX

See CMAA 70, Table 3.4.8.2-1:

$$K_{\tau} = 5.34 + \frac{4}{\alpha^2}$$

$$K_{\tau}\!=\!5.341$$

$$\tau_k := K_\tau \cdot \sigma_e$$

$$\tau_k = 136.719 \ ksi$$

$$K_{\sigma} = 23.9$$

$$\sigma_k := K_{\sigma} \cdot \sigma_e$$

$$\sigma_k = 611.749 \ ksi$$

$$\psi = \frac{\sigma_{63}}{\sigma_{t3}}$$

Critical Comparison Stress:

$$\sigma_{1k} \coloneqq \frac{\sqrt{\sigma^2 + 3 \cdot \tau^2}}{\left(\frac{1 + \psi}{4}\right) \cdot \left(\frac{\sigma}{\sigma_k}\right) + \sqrt{\left(\frac{(3 - \psi) \cdot \sigma}{4 \cdot \sigma_k}\right)^2 + \left(\frac{\tau}{\tau_k}\right)^2}}$$

$$\sigma_{1k} = \begin{bmatrix} 302.81 \\ 302.734 \\ 304.012 \end{bmatrix} ksi$$

 $\sigma_{1k} \!=\! \begin{bmatrix} 302.81 \\ 302.734 \end{bmatrix} \quad \text{Above elastic limit, therefore} \\ \text{used reduced Critical} \\ \text{Comparison Stress:}$

Reduced Critical Comparison Stress:

$$\sigma_{1kR} \coloneqq \frac{\sigma_{yp} \cdot \left(\sigma_{1k}\right)^2}{0.1836 \cdot \left(\sigma_{yp}\right)^2 + \left\langle\sigma_{1k}\right\rangle^2} \qquad \qquad \sigma_{1kR} = \begin{bmatrix} 49.751 \\ 49.751 \\ 49.751 \end{bmatrix} \mathbf{ksi}$$

$$\sigma_{1kR} = \begin{bmatrix} 49.751 \\ 49.751 \end{bmatrix} kst$$
 $\begin{bmatrix} 49.751 \\ 49.753 \end{bmatrix}$

Buckling Factor:

$$v_b \coloneqq \frac{\sigma_{1kR}}{\sqrt{\sigma^2 + 3 \cdot \tau^2}}$$
 $v_b = \begin{bmatrix} 1.501 \\ 1.502 \\ 1.275 \end{bmatrix}$ > 1.35 for Case 1 .: OK. > 1.25 for Case 2 .: OK. > 1.20 for Case 3 .: OK.

... No transverse stiffeners are required for the webs.

Structural Calculations

Contract NXXXX-XX-X-XXXX

13) Girder Short Diaphram Spacing and Sizing:

Short Diaphrams are needed directly below the top girder flange in order to support the trolley rail (and possibly to stiffen the top flange for buckling stress).

Find Short Diaphram Spacing using CMAA 70, Section: 3.5.4.6:

(ASCE #60 Rail w/ 18" Trolley Wheels 320 BHN per Table 4.13.3-4)

$$S_{x_trail} = 6.6 \cdot in^3$$

Trolley Wheel Load:

$$P_{trolley} = \frac{TL + LL}{4}$$

 $P_{trolley} = 38500 \; lbf$

Short Diaphram Spacing:

$$s = 18 \cdot in$$

Trolley Rail Stress:

$$\frac{P_{trolley} \cdot s}{6 \cdot S_{x \ trail}} = 17.5 \ ksi$$

< 18 ksi ∴ OK.

Check Bearing Stress on Short Diaphram Due to Trolley Loads:

Trolley Wheel Load with VIF:

$$P_{trolley_vif} \coloneqq \begin{bmatrix} \frac{TL \cdot DLF_t + LL \cdot (1 + HLF)}{4} \\ \frac{TL \cdot (DLF_t) + 1.25 \cdot LL \cdot (1 + HLF)}{4} \end{bmatrix}$$

Width of Rail:

$$b_{rail} = 4.25 \cdot in$$

Bearing Width:

$$b_{bearing} = b_{rail} + 2 \cdot t_{uf}$$
 $b_{bearing} = 5.75 in$

$$b_1 = 5.75 in$$

Allowable Bearing Stress Cases 1 & 3:

$$\sigma_{BrgALL} = \begin{bmatrix} 0.8 \cdot \sigma_{yp} \\ \sigma_{yp} \end{bmatrix}$$

Required Short Diaphram Thickness to Meet Bearing Pressure Requirements:

$$t_{sd}\!\coloneqq\!\frac{P_{trolley_vif}}{\sigma_{BraALL} \cdot b_{bearing}} \qquad \qquad t_{sd}\!=\!\begin{bmatrix} 0.191\\ 0.183\end{bmatrix} in$$

$$t_{sd} = \begin{bmatrix} 0.191 \\ 0.183 \end{bmatrix}$$
 in

Crane Parts Manufacturer's Structural Calculations Contract NXXXX-XX-XXXXX

Size Short Diaphrams for Shear Strength:

Short Diaphram Thickness: $t_{sd} := 0.25 \cdot in$

Required Shear Forces:
$$v_{sd} \coloneqq \frac{P_{trolley_vif}}{2}$$

Allowable Shear Stress Cases 1 &3:
$$\tau_{ALL} \coloneqq \begin{bmatrix} 0.36 \cdot \sigma_{yp} \\ 0.45 \cdot \sigma_{yp} \end{bmatrix}$$

Required Short Diaphram Height:
$$h_{sd} \coloneqq \frac{v_{sd}}{\tau_{ALL} \cdot t_{sd}}$$
 $h_{sd} = \begin{bmatrix} 4.872 \\ 4.664 \end{bmatrix}$ in

Check Short Diaphram for Flexural Strength:

Set Short Diaphram Height:
$$h_{sd} := 10 \cdot in$$

Required Bending Moment:
$$M_{sd} = \frac{P_{trolley_vif} \cdot b_w}{4}$$

Section Modulus:
$$S_{sd} = \frac{t_{sd} \cdot h_{sd}^{2}}{6}$$

Allowable Stress:
$$\sigma_{ALL} \coloneqq \begin{bmatrix} 0.6 \cdot \sigma_{yp} \\ 0.75 \cdot \sigma_{yp} \end{bmatrix} \qquad \sigma_{ALL} = \begin{bmatrix} 30 \\ 37.5 \end{bmatrix} \textit{ksi}$$

Resulting Bending Stress:
$$\sigma_{sd} \coloneqq \frac{M_{sd}}{S_{sd}}$$
 $\sigma_{sd} = \begin{bmatrix} 26.31 \\ 31.485 \end{bmatrix} ksi < \sigma_{ALL}$ OK.

Conclusion:

Short Diaphram Spacing: 18" Short Diaphram Height: 10" Short Diaphram Thickness 0.25" Structural Calculations

Contract NXXXX-XX-X-XXXX

14) Girder Top Flange Allowable Compressive Stress:

Compute Buckling Stress From CMAA 70 Table 3.4.8.2-1

$$\alpha := \frac{s}{b_w}$$
 $\alpha = 1.8$

$$\psi := 1.0$$

Euller Buckling Stress (CMAA 70, 3.4.8.2):

$$\sigma_e \coloneqq \frac{\pi^2 \cdot 29000 \cdot ksi}{12 \cdot \left(1 - 0.3^2\right)} \cdot \left(\frac{t_{uf}}{s}\right)^2 \qquad \sigma_e = 45.504 \ ksi$$

$$\sigma_e = 45.504 \ ksi$$

Top Flange Buckling Due to Normal Stress: (Using Case 3 of Table 3.4.8.2-1)

Normal Stress for Load Cases 1,2 and 3:

$$\sigma \coloneqq \begin{bmatrix} \sigma_{t1} \\ \sigma_{t2} \\ \sigma_{t3} \end{bmatrix}$$

See CMAA 70, Table 3.4.8.2-1 Case 3:

$$K_{\sigma} \coloneqq \frac{8.4}{\psi + 1.1}$$

 $K_r = 5.341$

$$\sigma_k := K_\sigma \cdot \sigma_e$$

 $\sigma_k = 182.017 \ ksi$

 $\sigma_{1k} = 182.017 \ ksi$

Critical Comparison Stress: $\sigma_{1k} := \sigma_k$

Above elastic limit, therefore used reduced Critical Comparison Stress:

Reduced Critical Comparison Stress:

$$\sigma_{1kR} \coloneqq \frac{\sigma_{yp} \cdot \left(\sigma_{1k}\right)^2}{0.1836 \cdot \left(\sigma_{yp}\right)^2 + \left(\sigma_{1k}\right)^2} \qquad \sigma_{1kR} = 49.317 \text{ ksi}$$

$$\sigma_{1kR} = 49.317$$
 ksi

Buckling Factor:

$$v_b = \frac{\sigma_{1kR}}{\sigma}$$

$$v_b = \begin{bmatrix} 1.877 \\ 1.878 \\ 1.589 \end{bmatrix}$$

> 1.35 for Case 1 ... OK. > 1.25 for Case 2 ... OK. > 1.20 for Case 3 ... OK.

The following sections have been ommited from this example for the sake of limiting the size of the example document. In an actual design, these sections as well as other case-specific sections should be included in order to document a complete design.

Girder Deflection Girder Camber End Truck Design Trolley Design Connections & Fatigue Rail Stop and Bummpers Crane Lifting Point Design Fall Protection Anchorage Design Q. **Appendix Q – Hook Non-Destructive Test (NDT) Report**Please see the following pages for sample NDT report information.

Navy message on acceptable Hook NDT practice:

Subject: Crane Hook and Nut NDT Quality Assurance Requirements

Ref A: NAVFAC P-307

Date: June 1, 2003

1. Ref A, Appendix E, Paragraph 1.4.4 provides nondestructive test (NDT) quality assurance requirements for hooks, retaining nuts, and/or eye pins. These assurance requirements include provisions that the commercial NDT vendor supply a letter certifying that the vendor meets the requirements of ASTM E-543 and that the vendor develop and submit for review, procedures that are specific to the types, shapes and sizes of the parts being examined. For the magnetic particle inspection (MT) method, the procedures shall adequately describe the orientation of the hook, nut, or pin with the magnetizing equipment.

Additionally, the procedures shall be reviewed by a Level III Examiner who is independent of the vendor and is certified in the applicable NDT method.

- NCC has received letters of compliance to ASTM E-543 and MT procedures from two hook manufacturers. The manufacturers are the Crosby Group and Gunnebo Johnson. NCC has had the MT procedures reviewed by an independent Level III Examiner and the procedures have been found to be in agreement with Ref A requirements. NCC will retain this documentation in accordance with Ref A.
- 3. Activities that receive hooks and hook nuts with initial NDT reports from the Crosby Group or Gunnebo Johnson are not required to obtain letters of conformance or MT procedures from these vendors since these documents are retained by NCC. Activities are required to retain hook and hook nut NDT reports in the equipment history file in accordance with Ref A. Initial NDT reports received from Crosby or Gunnebo Johnson, subsequent to the issuance of this message, shall specifically reference the applicable Control Procedure No. 0120, revision 16 and Technique Sheet No. 319N, Rev 1. For Gunnebo Johnson, the NDT report shall reference Gunnebo Johnson Quality System Procedure QSP-69, Revision A.
- 4. When NDT of the hook is required, activities are reminded that purchase orders or contracts should clearly state that the NDT of hooks and hook nuts shall be in accordance with Ref A. Crosby and Gunnebo Johnson have indicated that the applicable MT procedures will only be invoked when NDT in accordance with Ref A is specified on the purchase order or contract.
- NCC will contact other hook vendors and invite them to submit NDT procedures for approval to the requirements of Ref A. Any questions concerning NDT quality assurance requirements should be directed to NCC.



THE CROSBY GROUP, INC. QUALITY CONTROL PROCEDURE NO. 0120

FOR: MAGNETIC PARTICLE INSPECTION

. . .

REVISION IV - JUNE 16, 1989
REVISION V - JULY 11, 1989
REVISION VII - JULY 10, 1990
REVISION VIII - AUGUST 15, 1991
REVISION VIII - JUNE 26, 1992
REVISION IX - MARCH 18, 1993
REVISION X - JULY 28, 1994
REVISION XI - SEPTEMBER 13, 1994
REVISION XIII - JULY 18, 2000
REVISION XIII - October 30, 2000
REVISION XIIII- August 14, 2002
REVISION 15- September 23, 2002
REVISION 16 - September 15, 2003
7 PAGES

APPROVED BY: face Date: 7/15/03

1.01 SCOPE

2 - 2

1.1 This procedure is to be used for magnetic particle inspection using either the wet fluorescent or dry powder method.

2.0 PURPOSE

- 2.1 The inspection process provides for the detection of cracks and other discontinuities and shall be applicable only to ferromagnetic materials.
 - 2.1.1 The sensitivity of the test is greatest for surface discontinuities and diminishes rapidly with depth below the surface.
 - 2.1.2 For the detection of subsurface discontinuities, other inspection methods may be required.

3.0 REFERENCE STANDARDS

- 3.1 ASTM E709
- 3.2 AWS D1.1
- 3.3 MIL-STD-271 (Crosby McKissick only, See 5.1.2.1)
- 3.4 NAVSEA T 9074-AS-GIB-010/271, with appropriate technique sheet

4.0 PERSONNEL QUALIFICATION

4.1 Personnel performing and interpreting magnetic particle testing shall be trained and qualified per the Crosby Group Quality Procedure 4500 NDE, meeting or exceeding the requirements of SNT-TC-1A, Level II.

5.0 EQUIPMENT AND MATERIALS

5.1 Equipment

5.1.1 The types of equipment to be used are wet stationary horizontal units, and DC Yokes.

- 5.1.2 Equipment shall be calibrated annually by a means traceable to the National Institute of Standards and Technology. Comparative readings shall be taken at a minimum of three (3) output levels encompassing the usable range. The equipment readings shall not deviate by more than ± 10% of full scale.
 - 5.1.2.1 Crosby McKissick equipment shall be calibrated every six (6) months, and shall be traceable to the National Institute of Standards and Technology. Amp meter accuracy shall be ±5%.

5.2 Magnetic Particles

- 5.2.1 The magnetic particle powder used in the dry powder method shall be type Magnaflux #3 black or equivalent. Examination shall be performed in an area with sufficient lighting to aid in observing the powder patterns.
- 5.2.2 The magnetic particle powder used in the wet method shall be type 14-A Magnaglow Powder or equivalent. The examination shall be conducted in a darkened area using a filtered black light.
- 5.2.3 The carrier shall be water based.

5.3 Black Light

- 5.3.1 The black light will be allowed to warm up a minimum of five (5) minutes prior to use.
- 5.3.2 The black light intensity shall be measured once a day and documented. The black light intensity at the examination surface (15 inches minimum from the face of the lens filter) shall not be less than 1000 µW/cm².

5.4 Batch Concentration

- 5.4.1 Bath concentration shall be checked daily and documented. The settling volume shall be 0.1 to 0.4 mL in a 100mL batch sample.
- 5.4.2 The suspension shall be run for at least 30 minutes before sampling. The 100 mL suspension sample shall be taken in an Test Method D96, pearshaped centrifuge tube with a 1 mL stem and allowed to settle for approximately 30 minutes.
- 5.4.3 If the settled particles appear to be loose agglomerates rather than a solid layer, take a second sample. If still agglomerated, replace the suspension.

Page 3

5.5 Suspension Vehicles

- 5.5.1 Suspension vehicles shall be conditioned water having good wetting characteristics, good dispersibility, and is non-corrosive.
- 5.5.2 The viscosity should not exceed 5mm² (5.0cSt) when tested in accordance with test method D445.
- 5.5.3 The pH of the conditioned water bath should be between 6.0 and 10.5 as determined by a suitable pH meter.

6.0 Surface Preparation

- 6.1 The surface of the part to be examined shall be essentially clean, dry and free of contaminants such as oil, grease, rust, loose sand, loose scale, lint, galvanizing, thick paint, welding flux and weld splatter. Thin non-conductive coatings in the order of 2 mils (0.5mm) need not be removed except at the point(s) of electrical contact.
- 6.2 As-welded, as-cast, as-forged, as-rolled or machined surfaces are satisfactory. When cleaning is required, the test surface may be cleaned by detergent, organic solvents, or mechanical means. Cast steel products shall be sand blasted or shot blasted prior to performing magnetic particle inspection.

7.0 Magnetizing Current

7.1 Magnetic particle inspection may be performed with equipment utilizing direct current (DC), alternating current (AC), half-wave rectified current (HW) or full wave rectified current (FWDC).

8.0 Part Magnetization

- 8.1 Parts shall be inspected using the Continuous Magnetization Technique.
 - 8.1.1 Parts may be magnetized by passing the current directly through the part (direct magnetization) or by inducing a magnetic field in the part (indirect magnetization).
 - 8.1.2 Parts shall be magnetized and examined in at least two (2) directions with the magnetic fields approximately 90° apart.

Page 4

- 8.2 Dry magnetic powders shall be applied by hand powder applicators in such a manner that a light uniform, dust-like coating settles upon the surface of the test part. The technique will suspend the particles in the air so they reach the part surface in a uniform cloud with a minimum of force.
- 8.3 Before turning off the current, the excess dry powder is removed by a dry air current of sufficient force without disturbing any particles attracted by a flux leakage field.
- 8.4 Wet magnetic particles are to be flowed over the test piece until completely covered and the bath application cut off before removing the magnetizing current.

9.0 MAGNETIC FIELD STRENGTH

9.1 Circular Magnetization - Head and Tailstock Clamps

- 9.1.1 DC, FWDC, or HW current shall be used from 700 to 900 A/inches on parts diameters up to 5 inches, from 500 to 700 A/inches on diameters over 5 inches and up to 15 inches, and from 100 to 300 A/inches on diameters over 15 inches.
- 9.1.2 Optimum current setting shall be determined by use of a magnetic field indicator.

9.2 Yokes

9.2.1 DC Yokes shall have a lifting force of 40 Lbs. minimum

9.3 Longitudinal Magnetization

- 9.3.1 Longitudinal magnetization may be accomplished by use of a fixed coil. The effective field extends on either side of the coil a distance equal to the radius of the coil (R) being employed. The effective field length shall not exceed 9 inches either side of the coil.
- 9.3.2 The magnetizing amperage required for longitudinal magnetization shall be calculated from the following equations:

$$I = \frac{NI}{N} = \frac{45000}{L/D} (\pm 10\%)$$

Where:

. +-

I = Coil current to be used, amperes

N = Number of turns in the coil

L = Part length, inches

D = Part diameter, inches.

NI = Ampere turns

R = Coil Radius

- 9.3.2.1 For L/D ratios less that 3, a ferromagnetic pole piece, approximately the same diameter as the part, should be used to increase the L/D ratio, or an alternate magnetization method used.
- 9.3.2.2 For L/D ratios greater than 15, a maximum L/D value of 15 should be used.
- 9.3.3 A magnetic field indicator (pie gage) shall be used to determine and assure the optimum current setting.
- 9.3.4 Procedure qualification shall be in accordance with MIL.-STD-271, paragraph 4.3.1.2. And NAVSEA Technical Publication T 9074-AS-GIB-010/271, Paragraph 4.3.1.2

10.0 DEMAGNETIZATION

10.1 Demagnetization is not required unless specified on the drawings, specifications, or purchase order. When required, the acceptable level of residual magnetization usually not exceeding 3 gauss, and the measuring method shall also be specified.

11.0 POST CLEANING

- 11.1 The removal of the magnetic particle powders is not required, unless otherwise specified on the drawing or purchase order.
- 11.2 Unless otherwise specified on the drawing or purchase order, magnetic particle powder removal, when specified, shall be accomplished with compressed air and / or solvent.

Page 6

12.0 INTERPRETATION OF INDICATIONS

12.1 All indications shall be investigated to determine if they are of a relevant or non-relevant nature. The surface of the part shall be reconditioned by grinding and then re-examined in accordance with this procedure. The grinding shall be parallel to the contour of the part to produce a smooth surface. Gouge grinding is not allowed.

13.0 ACCEPTANCE LEVELS

. . .

- 13.1 Production forgings shall be evaluated in accordance with specific product Quality Control Procedures and / or nondestructive testing (N.D.T.) Product drawings.
- 13.2 Customer specified magnetic particle inspected products shall be evaluated in accordance with the acceptance criteria per the drawing requirements or as specified on the purchase order.

14.0 MATERIAL REPAIR

14.1 This specification may be used for the localized inspection of excavated areas of castings prior to weld repair, and the evaluation of the area shall be no indications allowed.

2XIII Howeon Pood		319 N Rev. 1 Date: 10/30/02	
2801 Dawson Road	Subject:	Magnetic Particle Examination	
Tulsa, OK 74101-3128		Technique Sheet	
01. This Technique Sheet is to be used	in conjunction with Cro	osby Group Magnetic Particle inspection procedure number	
02. Identification of items for inspection	n:		
24	Shank Hoist	Hook and Nut (Hex / Round)	
03. Whether wet or dry method:	Wet Method		
04. Sequence of examination and requir Coil Shot – 100% coverage (Ho		Head shot - 100% coverage (Hook and Nut)	
05. Method of particle application and r	emoval: Applic	cation: Hose Bath	
	Inspec	tion Removal: None	
	0/90000	W 1740 ASU65	
	Final F	Removal: Air Hose	
6. Sketches or chart showing the typica	ıl inspection grid:	S0319MP0001	
07. Type of magnetic particles:	14-A Magnaglow Pow	der or Equivalent	
98. Equipment: Wet Stationary I	Horizontal Unit HWI	DC	
9. Direction of magnetization and curre	ent levels: Will be veri	ified with field indicator.	
	ent levels: Will be veri	ified with field indicator.	
9. Direction of magnetization and curre 9.1 Circular Magnetization (Head S 9.2 Longitudinal Magnetization (Co	ent levels: Will be veri hot): See Ta	ified with field indicator. able 1	
Direction of magnetization and curre 1.1 Circular Magnetization (Head S	ent levels: Will be veri hot): See Ta	ified with field indicator. able 1	
9. Direction of magnetization and curre 9.1 Circular Magnetization (Head S 9.2 Longitudinal Magnetization (Co 9.2.1 Low, Intermediate or H	ent levels: Will be veri hot): See Ta iil Shot): See Ta igh-Fill Factor Coil:	ified with field indicator. able 1	
Direction of magnetization and curre 1.1 Circular Magnetization (Head S 1.2 Longitudinal Magnetization (Co 1.2.1 Low, Intermediate or H 1.2.2 Central Conductor Magnetization	ent levels: Will be veri hot): See Ta iil Shot): See Ta igh-Fill Factor Coil: N/A	ified with field indicator. able 1 Low	
99. Direction of magnetization and curre 9.1 Circular Magnetization (Head S 9.2 Longitudinal Magnetization (Co 9.2.1 Low, Intermediate or H 9.3 Central Conductor Magnetizatio 0. Magnetizing current type (continuous	ent levels: Will be veri hot): See Ta iil Shot): See Ta iigh-Fill Factor Coil: N/A or residual):	ified with field indicator. able 1 Low	
9. Direction of magnetization and curre 9.1 Circular Magnetization (Head S 9.2 Longitudinal Magnetization (Co 9.2.1 Low, Intermediate or H 9.3 Central Conductor Magnetizatio 0. Magnetizing current type (continuous) 1. Test for concentration of particle susp	ent levels: Will be veri hot): See Ta oil Shot): See Ta igh-Fill Factor Coil: N/A or residual): Test M	ified with field indicator. able 1 Low Continuous	
9. Direction of magnetization and curre 9.1 Circular Magnetization (Head S 9.2 Longitudinal Magnetization (Co 9.2.1 Low, Intermediate or H 9.3 Central Conductor Magnetizatio 0. Magnetizing current type (continuous 1. Test for concentration of particle suspensi 2. Demagnetization of particle suspensi 3. Acceptance Criteria:Mil-Std- ndications believed to be non-relevant	ent levels: Will be veri hot): See Ta il Shot): See Ta igh-Fill Factor Coil: N/A s or residual): Test M on: N/A 2035 - No indications shall be inspected for	Continuous Iethod D96 greater than 1/16".	
9.2 Longitudinal Magnetization (Co. 9.2.1 Low, Intermediate or H. 9.3 Central Conductor Magnetization) 10. Magnetizing current type (continuous) 11. Test for concentration of particle suspensions. 12. Demagnetization of particle suspensions. 13. Acceptance Criteria: Mil-Std-Indications believed to be non-relevant.	ent levels: Will be veri hot): See Ta see Ta igh-Fill Factor Coil: N/A sor residual): Test Mon: N/A 2035 - No indications shall be inspected for If inspection by MT	ified with field indicator. able 1 Low Continuous Iethod D96	

Qc procedures/magnetic particle examination technique sheet.doc

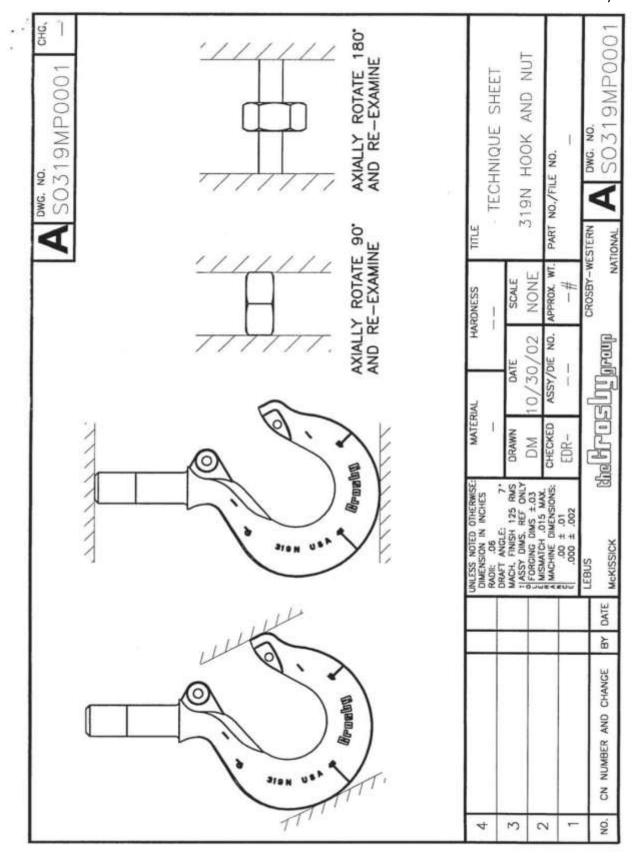
Magnetic Particle Examination June 12, 2003

TABLE 1 HEAD SHOT

Frame Size	Hook	Thread Size	Nut
D	565 -730 Amps	1/2"	525 - 675 Amps
F	660 - 845 Amps	5/8"	660 - 845 Amps
G	810 - 1045 Amps	5/8"	660 - 845 Amps
Н	915 – 1180 Amps	3/4"	790 - 1015 Amps
I	1140 - 1465 Amps	7/8"	875 - 1125 Amps
J	1440 - 1855 Amps	1 1/8"	1140 - 1465 Amps
K	1840 - 2365 Amps	1 1/4"	1265 - 1630 Amps
L	2060 - 2645 Amps	1 5/8"	1750 - 2250 Amps
N	2450 - 3150 Amps	2"	2190 - 2815 Amps

TABLE 2 COIL SHOT (+/-10%)

Frame Size	Hook	Shot
D	1420 Amps	1
F	1490 Amps	1
G	1645 Amps	1
H	1650 Amps	1
I	1700 Amps	1
1	1780 Amps	1
K	1890 Amps	1
L	1965 Amps	1
N	1890 Amps	1





GLOBE X-RAY SERVICES, INC.

8441 SOUTH UNION

TULSA, OKLAHOMA 74132

918 834 9447

For Services or Information
Pertaining To: NDE SERVICES & SCHEDULING

NDE LEVEL III SERVICES & SCHOOL FOR LEVEL II

Contact: DAVID POTTER, LEVEL HI

TONY OZMUN, LEVEL III PHONE: (918) 448-1696 FAX: (918) 445-3314

Date: 10-21-02

Review for approval:

The Crosby Group

Magnetic Particle Procedure 0120, Rev. 15

With attached technique for 319N, 320N, 322N Style Hoist

Hooks

Compliance Requirements:

NAVSEA T 9074-AS-GIB-010/271

Mil-Sid-2035 Acceptance

Approved

Not Approved

ASNT Level III

David Potter

ULTRASONIC, GAMMA RAY, COBOLT, X-RAY, PENETRANT, FAA CS2R753K, HELIUM TESTING, T GAUGE, HARDNESS TESTING, OPTICAL EMISSIONS POSITIVE MATERIAL IDENTIFICATION, LEVEL III SERVICES, ASNY LEVEL II NDE SCHOOL, MAGNETIC PARTICLE Fax from : 9188349447





87-88-89 16:13

Pg: 1

Group Engineering Department Mailing: P.O. Box 3128 (74101-3128) Shipping: 2801 Dawson Road (74110-5052) Tulsa, Oklahoma

Phone: 918.834.4611 Facsimile: 918.834.9447

Facsimile

To: Scott Gridley	Date: July 8, 2009
Company: Navy Crane Center	From: dconner Title:
Fax Number: 757-396-1772	Number of Pages: 1

Reference: Program C of C

This is to certify that The Crosby Group Nondestructive Testing Program meets the requirements specified in ASTM E-543-99.

Respectfully, Don Conner Group QA Mgr.

Reference Crosby QCP 0120, Rev. 16, dated September 15, 2003 Technical Data Sheet 319N, Rev. 1

Document4

R. Appendix R – Wire Rope Certificate

Please see the following page for an example wire rope certificate.



09/07/2008

Crane Parts Manufacturers 123 Crane Center Way Portsmouth, VA 23709

Contract Number:

Job Location:
Crane Serial Number:

CDRL:

NXXXXX-XX-X-XXXX

Anytown, US

XX-XXXXX

information.

INSPECTION-CERTIFICATE acc. EN-10204-3.1

Your order-no. : 78694 date : 09.10.2007 our order-no. : 17431329 delivery-no : 18441090 Invoice-no. : 18451131 LOT# : 6618A+B; 6619A+B

The technical details of the ropes are the following:

lay : regular right ordinary lay (RHOL)

swaged - gressed

length : LOT#6618A = 1.015 m; LOT#6618B = 2.020 m

LOT#6619A = 1.010 m LOT#6619B = 2.160 m

nominal rope diameter : 10,0 mm

4. construction : PYTHON-LOGGING 6WS-V

;

5. material : bright

7. minimum breaking load

tensile strength

6.

actual breaking load

8. weight total : 3.197 k

2160 N/mm²

96,08 kN
115,45 kN

Required information.

Joe Generic
Joe Generic
Customer Service
Signature of responsible person.

456 Wire Way Portsmouth, VA 23709 Phone: 555-897-1212 Fax: 555-897-1213 S. Appendix S - Not Used

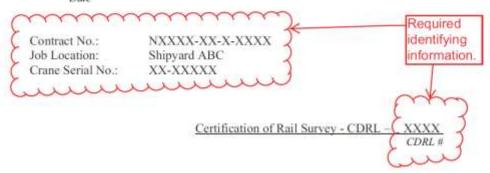
T. Appendix T – Crane Runway Rail Certificate & Survey

Please see the following pages for a sample runway rail certification and survey.



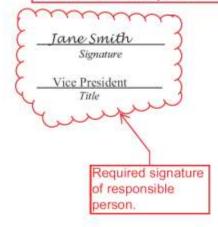
2 - 19 - 10

Date



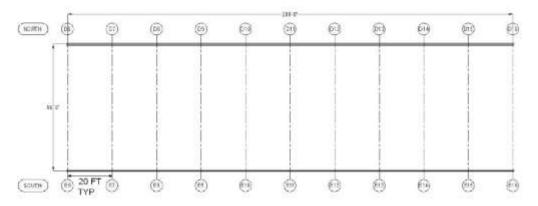
Crane Parts Manufacturers (CPM) has reviewed the runway survey provided by the Navy Crane Center for the Naval Shipyard Building ABC. The span, straightness and rail elevation are all within the tolerances provided within CMAA #70. The rail to rail elevation exceeds the CMAA #70 tolerance at one point by 1/6".

CPM concludes that the rail is not in compliance with CMAA #70 runway standards. The new crane furnished under this contract will perform on this runway without any corrections to the runway.



123 Crane Center Way, Portsmouth, VA 23709 Phone (555) 123-4567 Fax (555) 123-5678

Rail Survey for Crane 123 in Building ABCD



		Crane	Span		
Column Line	Span (L) Nominal 672 in	Span Difference in	Allowable L>100' 0.375 in	Rate of Change in	Allowable Rate of Change 1/4" in 20'
D6/E6	672.00	0.00			
D7/E7	672.15	0.15		-0.15	
D8/E8	672.30	0.30		-0.15	
D9/E9	672.25	0.25		0.05	
D10/E10	672.15	0.15		0.10	
D11/E11	672.38	0.38	EXCEED	-0.23	
D12/E12	672.12	0.12		0.26	EXCEED
D13/E13	672.15	0.15		-0.03	
D14/E14	672.35	0.35		-0.20	
D15/E15	672.13	0.13		0.22	
D16/E16	672.00	0.00		0.13	

	Rail	to-Rail Elevation	on	
Column Line	Elevation Difference (D)	Allowable L>100'	Rate of Change	Allowable Rate of Change
	in	0.375 in	in	1/4" in 20'
D6/E6	0.25			
D7/E7	0.36	i i	-0,11	
D8/E8	0.15		0.21	
D9/E9	0.4	EXCEED	-0.25	
D10/E10	0.25		0.15	
D11/E11	0.15	l)	0.1	
D12/E12	0		0.15	
D13/E13	0.1		-0.1	
D14/E14	0.25		-0.15	
D15/E15	0.38	EXCEED	-0.13	
D16/E16	0.15		0.23	

		Straightness		11.1111
Column Line	Straightness	Allowable 0.375 in	Rate of Change in	Allowable Rate of Change 1/4" in 20'
D6	0.15			
D7	-0.15		0.30	EXCEED
D8	0.10		-0.25	
D9	0.15		-0.05	
D10	0.05		0.10	
D11	0		0.05	
D12	-0.10		0.10	
D13	-0.05		-0.05	
D14	-0.10		0.05	
D15	0.10		-0.20	
D16	0.15		-0.05	

Straightness					
Column Line	Straightness	Allowable 0.375 in	Rate of Change in	Allowable Rate of Change 1/4" in 20'	
E6	0.10				
E7	0.05		0.05		
E8	0.10		-0.05		
E9	0.15		-0.05		
E10	0.05		0.10		
E11	0		0.05		
E12	-0.10		0.10		
E13	-0.05		-0.05		
E14	0.05		-0.10		
E15	0.15		-0.10		
E16	0.2		-0.05		

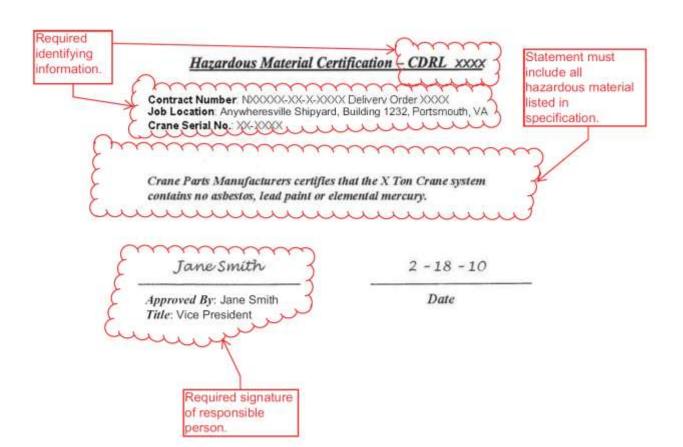
		Elevation		
Column Line	Elevation	Allowable 0.375 in	Rate of Change in	Allowable Rate of Change 1/4" in 20'
D6	0.15			
D7	-0.15		0.30	EXCEED
D8	0.10		-0.25	
D9	0.15	1	-0.05	
D10	0.05		0.10	į.
D11	0		0.05	
D12	-0.10		0.10	
D13	-0.05		-0.05	
D14	-0.10		0.05	î -
D15	0.10		-0.20	
D16	0.15		-0.05	

Elevation					
Column Line	Elevation	Allowable 0.375 in	Rate of Change in	Allowable Rate of Change 1/4" in 20"	
E6	0.10		8 8		
E7	0.05		0.05		
E8	0.10		-0.05		
E9	0.15		-0.05		
E10	0.05		0.10		
E11	0		0.05		
E12	-0.10		0.10		
E13	-0.05		-0.05		
E14	0.05		-0.10		
E15	0.15		-0.10		
E16	0.2		-0.05		

U. Appendix U – Hazardous Material Certificate

See the following pages for a sample hazardous material certificate.



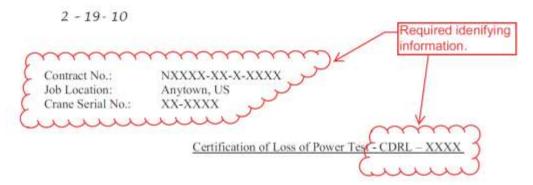


123 Crane Center Way, Portsmouth, VA 23709 Phone (555) 123-4567 Fax (555) 123-5678

V. Appendix V – Loss of Power Test Certificate

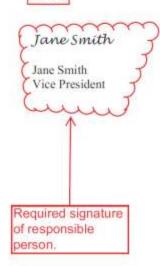
Please see the following page to find a sample loss of power test certificate.





Dear NAVCRANECEN,

A sudden loss of power to the crane such as an emergency stop condition will not have detrimental effects to the crane.



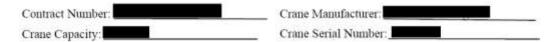
123 Crane Center Way, Portsmouth, VA 23709 Phone (555) 123-4567 Fax (555) 123-5678

W.

Appendix W – Coupling Alignment CertificatePlease see the following pages for sample coupling alignment certificates.

Shaft/Coupling A	lignment Data Sheet	
quipment (check one): 📈 Main Hoist Drive	Aux Hoist Drive	Other:
Coupling Manufacturer/Type/Size		
Alignment Method and Equipment Used	Laser	\$
	Manufacturer's Allowable	Actual (Installed)
Coupling End Gap (inches)	0.19 in	0.19 in
	Parallel (inches)
Manufacturer's Allowable Misalignment (Installation)	0.004	
Manufacturer's Allowable Misalignment (Operating)	0.038	
	Vertical Offset (+) 1 A (-) 1 Y	Horizontal Offset
Actual (inches) NOTE: This shall be less than installation tolerance.	-0.0008**	0.0011"
	Angular (inches)
Manufacturer's Allowable Misalignment (Installation)	0.01	*
Manufacturer's Allowable Misalignment (Operating)	0.108	Own
	Vertical Gap (*) 1/2 (·) 2/1	Horizontal Gap
Actual (inches) NOTE: This shall be less than installation tolerance.	0.0003"	-0.0003"

Navy Crane Center Form 09-001 Coupling Data Sheet (Feb 2013)



√2	Actual diameter of coupling	1. 4.875"
	Laser to center of coupling	2. 5"
\\+U*\U-\\\	Laser to front foot	3. 21"
3 44	Front foot to back foot	4. 16.5"

Shimming Record:

Shims: Start with 0.100" under each foot. No more than four shims shall be placed under each foot. Bolts are shall be installed with lubrication.

Bolt #	Bolt Size	Torque Value	Number of Shims	Total Shim Thickness
1	3/4-10	200 FT-LBS	2	0.280"
2	3/4-10	200 FT-LBS	2	0.290"
3	3/4-10	200 FT-LBS	3	0.240"
4	3/4-10	200 FT-LBS	3	0.290"

Soft Foot Record (maximum 0.002 inches allowable):



Alignment Verified By: _____ Date ______ Date

Navy Crane Center Form 09-001 Coupling Data Sheet (Feb 2013)

			rane Manufacturer:		
rane Capacity:			rane Serial Numbe	r:	
	Drum	Barrel Alig	nment Data S	heet	
quipment (chec	k one): 🗹 Main	Hoist Drive	Aux Hoist Driv	e 🗌 Oth	er:
Coup	oling Manufactu	rer			
Co	oupling Type/Size	e			
			A	ngular (inche	es)
Manufacture	r's Allowable Mi	isalignment		0.0316 in	
Alignment Metho Straight Edge Al		Straight Ed	lge 🗸 Laser	(1)	
Straight Edge	Bar	rel Coupling	4		2
1			6.		//
Position:	ent at Gap:	1 2	3	3	Δ
Measurem Note: Posi aser Alignment	tion 1 is always o	pposite of the wea		10/	Δ
Measurem Note: Posi aser Alignment Solting Requiren	tion 1 is always of Horizontal G	pposite of the wea	vertical Gap:	0.0093"	
Measurem Note: Posi aser Alignment Solting Requiren	tion 1 is always o	pposite of the wea	vertical Gap:	3	
Measurem Note: Posi aser Alignment Bolting Requirem C Number of	tion 1 is always of Horizontal G nents oupling to Drum	pposite of the wea	Vertical Gap: C Number of	0.0093"	es
Note: Posi Laser Alignment Colting Requirem Number of Bolts 26	Horizontal G nents Bolt Size M20	pposite of the weatap: 0.0034" Torque Value 428 FT-LBS	Vertical Gap: C Number of Bolts 10	0.0093" oupling Halve Bolt Size	Torque Value 65 FT-LBS
Note: Posi Laser Alignment Colting Requirem Number of Bolts 26	Horizontal G nents oupling to Drum Bolt Size	pposite of the weatap: 0.0034" Torque Value 428 FT-LBS	Vertical Gap: C Number of Bolts 10	0.0093" oupling Halve Bolt Size 1/2 ock Shimmin	Torque Value 65 FT-LBS
Note: Posi Asser Alignment Colting Requiren C	Horizontal G nents oupling to Drum Bolt Size M20 Block Torque R	pposite of the wearance of the	Vertical Gap: Vertical Gap: C Number of Bolts 10 Pillow BI	0.0093" oupling Halve Bolt Size 1/2 ock Shimmin ms Total	Torque Value 65 FT-LBS g Record

Navy Crane Center Form 13-001 Coupling Data Sheet (April 2013)

X. Appendix X – Hook and Hook Nut Proof Test Certificate

Please see the following page for a sample hook proof test certificate.



April 30, 2010

Crane Parts Manufacturers 123 Crane Center Way Portsmouth, VA 23709

INSPECTION REPORT

Contract No.:

NXXXX-XX-X-XXXX

Job Loacation:

Facility, Anytown, US

Crane Serial No.:

XX-XXXX

CDRL:

XXXX

Required identifying information

On April 23, 2010, International Hook Corp.'s Physical Testing Department received one (1) 20 ton crane hook and nut assembly identified as S/N 095030 H & N for proof load testing per ASME B30.10-2005 at two (2) times the rated load. The samples were tested using our Baldwin

300,000 pound testing machine NDT Control 332.

Following are the results:

Required statement that testing meets ASME B30.10.

s Pounds	Min.	Measurement Inches	Inches	Comments
80,000	10	6.56	6.57	No Visible Damage
00	80,000	00 80,000 10	00 80,000 10 6.56	ds Pounds Min. Inches

Jean-Pierre Vincent

Jean-Pierre Vincent Laboratory Supervisor Required signature of responsible person.

811 Hook Pkwy Anytown, US 99999

Y.

Appendix Y – Welding CertificationsPlease see the following pages for sample welding certification.

iv. Welding Certification



July 16, 2010

Navy Contract No.: NXXXX-XX-XXXX

CDRL: XXXX
Crane Serial No.: XX-XXXX

Crane Location: Navy Facility, Anytown, US

Required identifying information.

WELDING CERTIFICATIONS

We certify that all welders, welding operators, weld inspector(s) and welding procedure (qualification) meet the requirements of AWS D 14.1 for all work performed in manufacturing this crane.

We certify that all welders, welding operators, weld inspector(s), and welding procedure (qualification) meet the requirements of AWS D 1.1 and for all work performed in installing/welding parts supporting the crane at/to building interfaces.

<u>Jane Smith</u>
Jane Smith
Vice President

Required signature of responsible person.

07/12/2010 Date

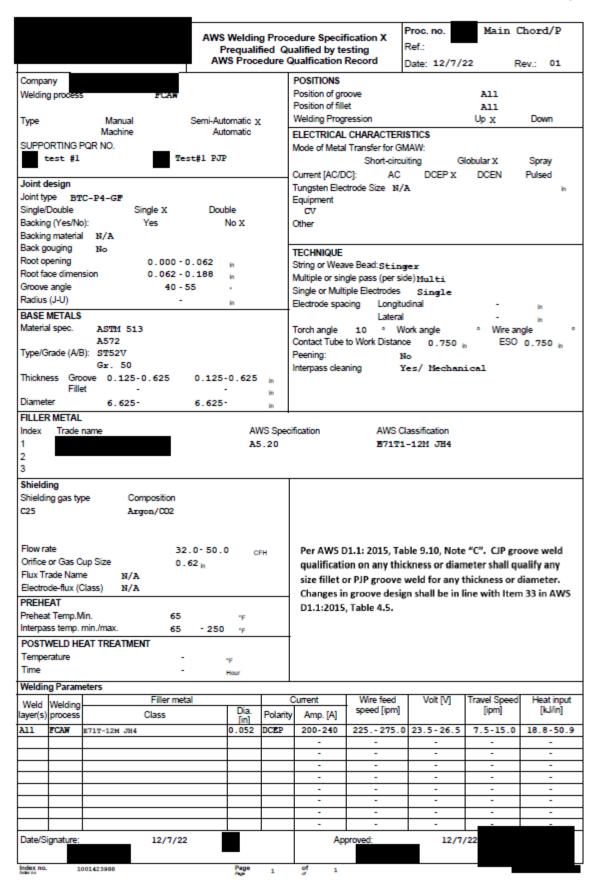
> Statements of meeting required standards.

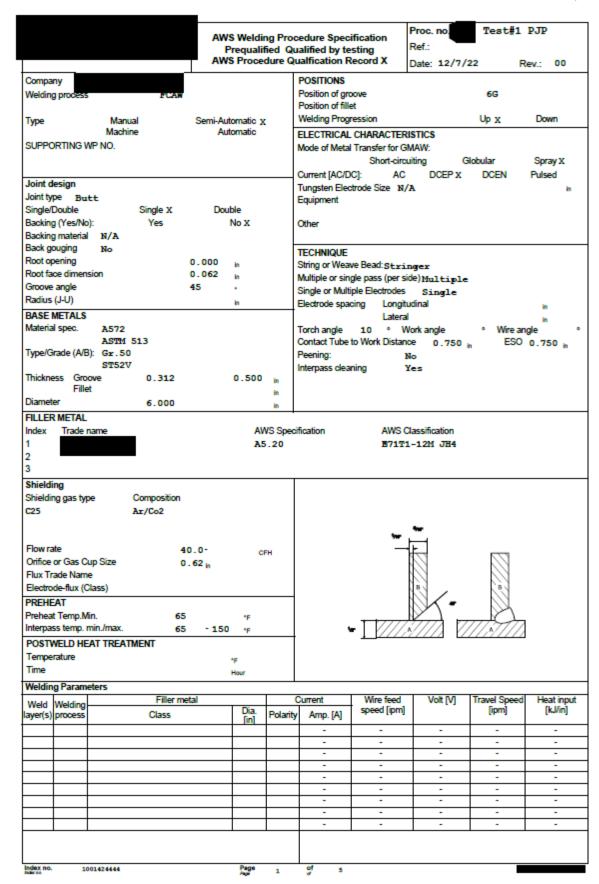
123 Crane Center Way, Portsmouth, VA 23709 Phone (555) 123-4567 Fax (555) 123-5678

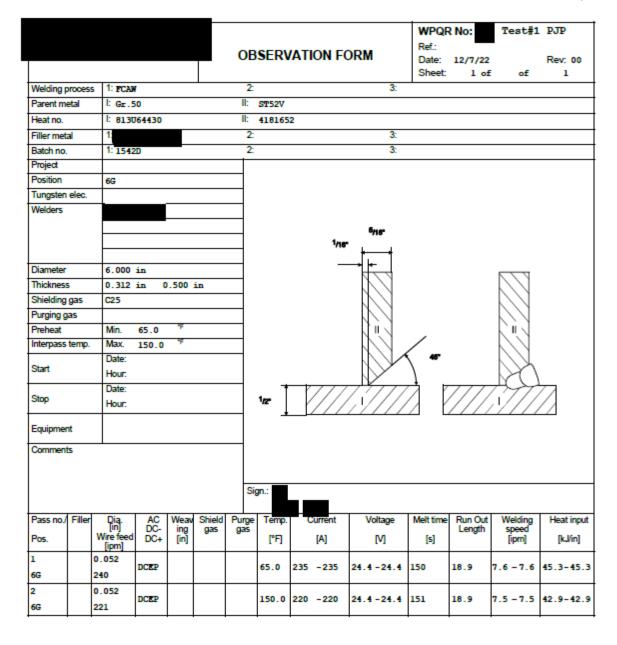
Special Purpose Service Welding Certification

v.

	WELDER,	WELDING OPER QUALIFICATION			R					
Type of Welder			Certif	icate ref. no.						
Welder's name			Identification No. 2422							
Welding Procedure Specif	ncation I10B		Rev	0	Date 6/7/13					
Variab	Voc	Actual Values Us	sed In Qualification	7	Qualification Range					
Process(Table 4.12, Item (FCAN	ACO III GOODII OOLOIT	FCAN	accommodate in the right					
Type [Table 4.12, Item (1)]		Semi-Auto		Semi-Auto						
Electrode (single or multipl	(e)[Table 4.12, item			Single						
Current/Polarity Joint Type		CJP Butt		- Carrier						
Positions [Table 4.12, Item	0 (41)	3G								
120	1000		3.	Pipe-TYK-PJF: angle>30deg) Box Tube-Butt- Box Tube-Butt- Box Tube-TYK-P	V.H) (Dia>24in[600mm]) (F,V,H) (Dia>24in[600mm] CJF: (F,V,H) (Table 4.10	d)				
Weld Progression [Table	e 4.12, Item(5))	Uphill		Uphill	349					
Backing (YES/NO) [Table -	4.12, Item (6)]	Yes		Yes						
Material/Spec.		A36	to A36	Any Approved	8					
Base Metal Thickness: (Plate)										
Groove		25.4		3.0	28					
Fillet				0.0	20					
Thickness: (Pipe/Tube) Groove					Q.					
Fillet				0.0	•					
Diameter: (Pipe)				45,63%						
Groove					28					
Fillet Fillet Metal [Table 4.12]					<u> </u>					
Spec. No.		A5.29								
Class	501	E81T1-1								
F-No. [Table 4.12, Item (2) Type of fuel gas (OFW)	1	C-25								
Other		0-23		- #						
		Acceptable YE	NSPECTION (4.8. ES or NO yes nd Test Result (4.3)							
Туре	16	Result	1	ype	Result					
Side Bend	-	Pass								
		Pass								
Side Bend		Fillet Test Results	(4.30.2.3 and 4.30	.4.1)						
Appearance Fracture Test Root Penetr	ration		Fillet Size Macroetch Test Numb	er						
Appearance Fracture Test Root Penetr Inspected By	ration			er 6/7/13						
Appearance Fracture Test Root Penetr Inspected By	ration	RADIOGRAPHIC	Macroetch Test Numb Date	6/7/13						
Appearance Fracture Test Root Penetr Inspected By Organization	90.452	1 90000000	Macroetch Test Numb Date TEST RESULTS (6/7/13 (4.30.3.2)	No.	Quest Constitution of the				
Appearance	ration Result	RADIOGRAPHIC	Macroetch Test Numb Date	6/7/13 (4.30.3.2)	ut Remai	rks				
Appearance Fracture Test Root Penetr Inspected By Organization	90.452	1 90000000	Macroetch Test Numb Date TEST RESULTS (6/7/13 (4.30.3.2)	uit Remai	rks				
Appearance Fracture Test Root Penetr Inspected By Organization	90.452	1 90000000	Macroetch Test Numb Date TEST RESULTS (6/7/13 (4.30.3.2)	uit Remar	rks				
Appearance Fracture Test Root Penetr Inspected By Organization Interpreted by	90.452	1 90000000	Macroetch Test Numb Date TEST RESULTS (6/7/13 (4.30.3.2) on Resu	uit Remar	rks				
Appearance Fracture Test Root Penetr Inspected By Organization Interpreted by Organization We, the undersigned	Result	Remarks	Macroetch Test Numb Date TEST RESULTS (Film Indentification NMumber) Test Numb Date correct and that the test	6/7/13 (4.30.3.2) on Resu er	ared, welded and tested in					
Appearance Fracture Test Root Penetr Inspected By Organization Interpreted by Organization We, the undersigned	Result d, certify that the state e requirements of S	Remarks tements in this record are	Macroetch Test Numb Date TEST RESULTS (Film Indentification in the context and that the context and that the context amonth signature)	6/7/13 (4.30.3.2) on Resu er er lest welds were prep. Velding Code - Steel	ared, welded and tested in					
Appearance Fracture Test Root Penetr Inspected By Organization Interpreted by Organization We, the undersigned conformance with the	Result d, certify that the state e requirements of S	Remarks tements in this record are	Macroetch Test Numb Date TEST RESULTS (Film Indentification in the context and that the context and that the context amonth signature)	6/7/13 (4.30.3.2) on Resu er	ared, welded and tested in					





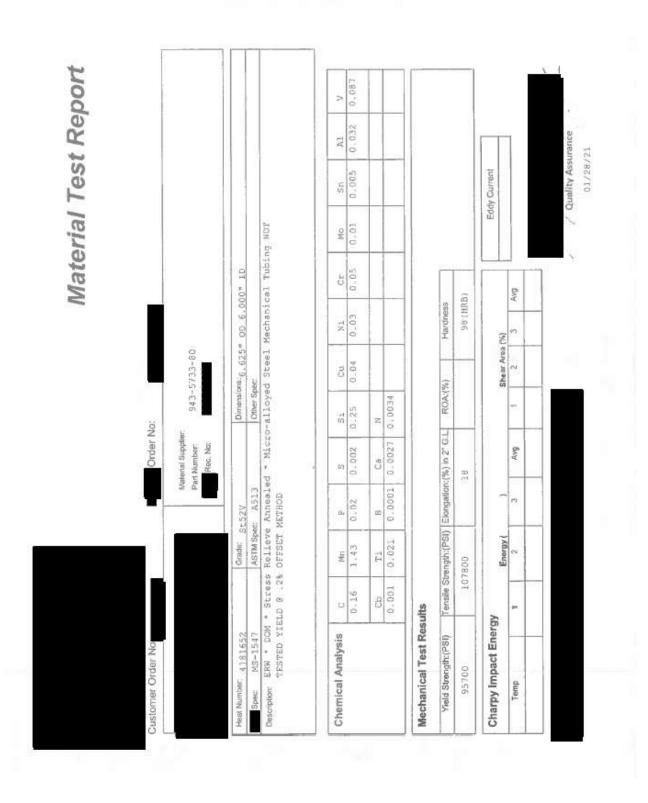


Index no. 1001424444 Page 2 of 5

				WELD	ING P	ROCE	DUF	RE Q	JALIFIC	ATION	RECOF	RD (WP	QR)			
		Test results WPQR no Test#1								Test#1 PJP						
								TENSI	E TESTS							
Specin	ien N.	Width Thickness			Area Ultimate				Ultimate unit stress		Type of failure & location					
			[mm] [mm]			[in²]	_		ьф		[ksi]					
<u> </u>	GUIDED BEND TESTS															
Test	no.	Ту	pe and figu	ure no.			Resul	t		R	emarks					
							С	HEMIS	TRY TES	 T						
С	Mn	81	Р	8	NI	Cr		Мо	V	TI	Zr	Al	Cu			
Other	Elements															
			_						T TESTS					1		
	Туре		Temp	perature [*F	1	1	:	2	3	4	5		Average			
					\top			\neg				\top				
				SPECTIO	N						Radiogra	phic - ult		amination		
Appearan Undercut		Acc Non	eptable •	:					RT report no. Result UT report no. Result							
Piping po		Non							FILLET WELD TEST RESULTS							
Convexity Test date			eptable 3/22	:					Minimum size multiple pass Maximum size single pass							
Witnesse		11/	3/22						Macroetch Macroetch							
Hydrogen																
Report no					Result			ml/100g								
Other tes	ts										All-	weld-met	tal tension	test		
			d sise eptable	verific	ation	macro	s			Tension strength Yield point/strength						
			•						Elongation in 2 in. Laboratory test no.							
									Laborato	ry test no.						
Welder's									,	Clock N	2896		Stamp N			
weders	name								,	AUCK IN			olamp iv			
Tests con	ducted by	,							Laboratory	Test N						
									Per							
Mar "			-115		ula			-4"	ha ko d			dad - **				
				onents in to 01.1M, 201						is were pre	epared, wel	ded, and t	estea in con	nformance with the		
Remarks									Signed	1						
									Ву							
									Title							
									Date		12/7/22	!				
Index no.	1	001424444					Page	3	of	5						



813U64430 .12 1.20 .014 .005 .303.019 .01 .03.006.054.002.033.0002 .002.005.003



CERTIFICATE OF CONFORMANCE & CERTIFIED MATERIAL TEST REPORT

2,937 lbs. 47629869 ES-ZNBK Customer PO: Supplied To: Q3 Lot®: 1542D Heat: 520778 This material was manufactured under lot control in accordance with ASME Section II Part C SFA 5.01, lot class T4, and tested per Schedule I to the requirements of SFA 5.20 classification E71T-12M JH4 and in accordance Material and testing in accordance with ASME Section II Part C, 2021 with the requirements of Edition. No weld splicing with filler material was conducted on this product. This product was manufactured in the U.S.A. Quality System Manual This product was supplied in accordance with Quality System meets the requirements of ASME NCA-3800, conforms to all applicable requirements of 10CFR 50 Appendix B, and meets the basic requirements of NQA-1, 10CFR Part 21 and 10CFR 50.55(e) apply to this order. The product stated herein was manufactured and tested in accordance with the Quality System Program of as outlined in our Quality Assurance Manual. The Quality System has been accredited by ASME as evidenced by Certificate Nos. Program of which expire on March 30, 2023, and is certified to ISO 9001 as evidenced by Certificate No. **Test Conditions** Electrode Size (Inches) .052 FCAW-G / DCEP Process / Electrode Polarity CTWD (Inches) 275 Current (Amps) Arc Voltage (Volts) 27 37 Heat Input (kJ/inch) 15/7 Passes/Layers 75 / 300 Preheat/Interpass Temp. (*F) 75% Argon/25% CO₂ Gas Type 22666 Plate ID Plate 22666 SFA 5.20 As-Welded Mechanical Properties¹ 58,000 psi minimum Yield Strength (psi), 2% Offset Method 76,000 87,000 70,000 - 90,000 psi Ultimate Tensile Strength (psi) 22% minimum 29 % Elongation The strength and elongation properties were obtained from a tensile specimen artificially aged at 105°C (220°F) for 48 hours. SFA 5.20 Plate 22666 As-Welded Impact Properties 20 ft-lbs. minimum Average 75, 84, 80 = 80 Avg CVN ft. lbs. @ -60°F 61, 64, 64 Not Required Lateral Expansion (mils)

62, 56, 56

% Shear

Not Required

Deposit Chemistry	Plate 22666	SFA 5.20	
% Carbon	0.06	.12 max.	
% Manganese	1.45	1.75 max.	
% Silicon	0.46	.90 max.	
% Sulfur	0.01	,03 max.	
% Phosphorus	0.01	.03 max.	
% Chromium	0.03	.20 max.	
% Nickel	0.01	.50 max.	
% Molybdenum	< 0.01	.30 max.	
% Vanadium	< 0.01	.08 max.	
% Copper	0.03	,35 max.	

Diffusible Hydrogen		
mL/100g of Weld Deposit	3.0, 3.3, 2.9, 2.9 = 3.0 Avg.	4.0mL/100g maximum

Radiographic Inspection Results: Met Requirements

This is to certify that the contents of this report are correct and accurate and that all test results and operations performed by the contents of the subcontractors are in compliance with the requirements of the material specification and the specific applicable requirements of the Code as specified by the customer. We do not use mercury in the design and formulation of our consumable products. In the manufacturing and testing of our products, our equipment meets mercury exclusion requirements.



Additional Page

PJP Verification Date:

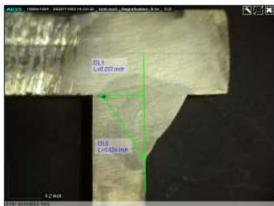
Proc. no.: Test#1 PJP

Ref.:

Date: 12/7/22 Rev.:00

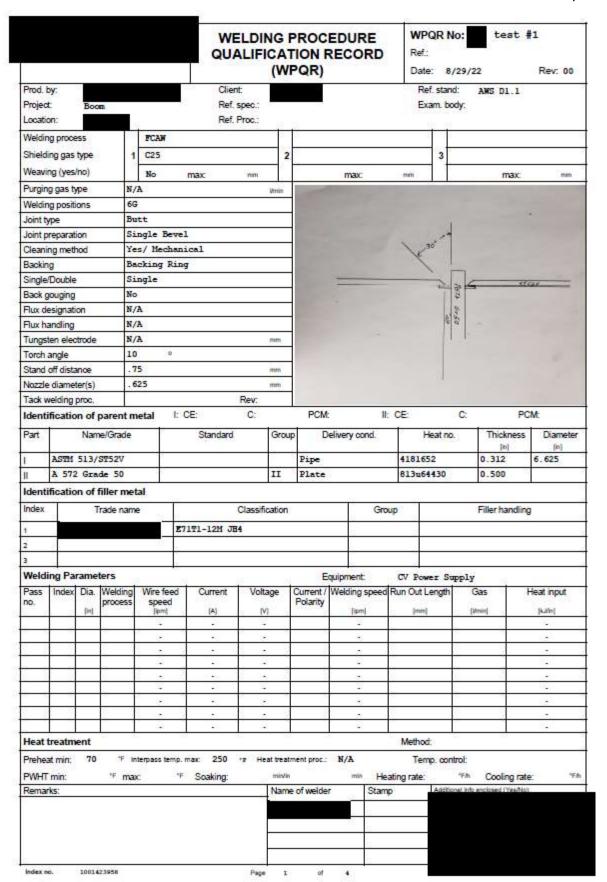


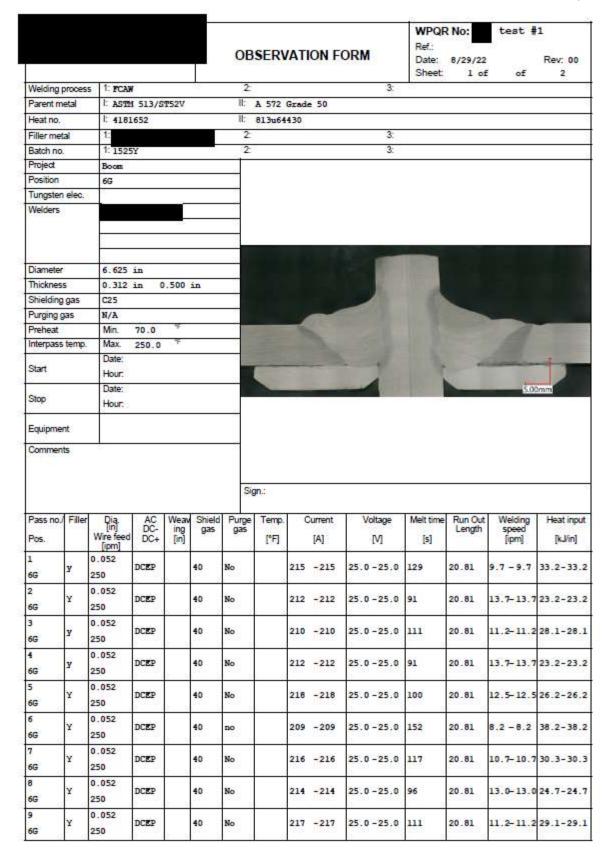
Macros completed to satisfy AWS
D1.1:2015, Clause 4.11.3 Verification
of CJP Groove WPS by Macroetch.
When a WPS has been qualified for
CJP groove weld and is applied to the
welding conditions of a PJP groove
weld, three macroetch cross section
test specimens shall be required to
demonstrate that the specified weld
size shall be equal or exceeded.





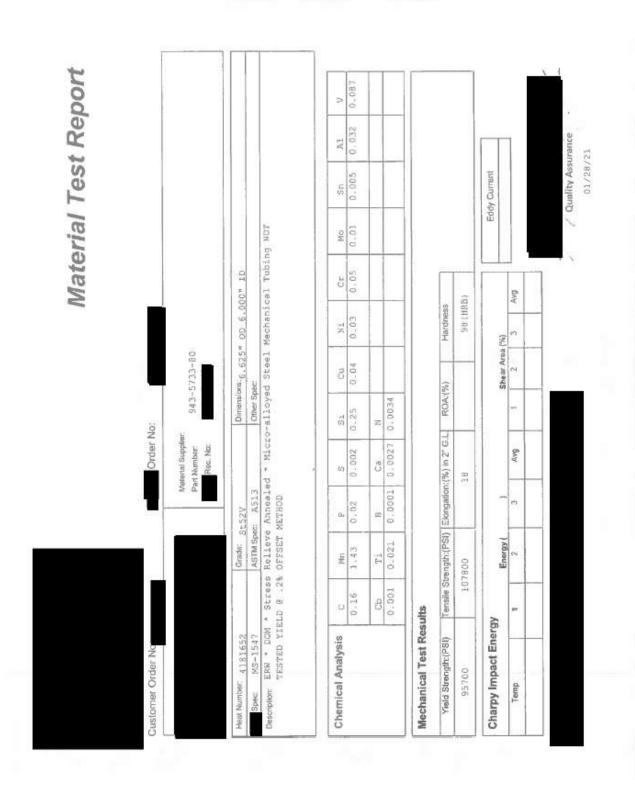
sex: 1001424444-5 Page 5 of

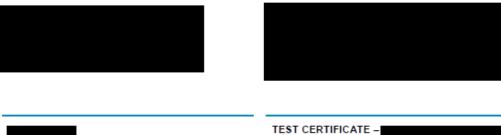




Index no. 1001423956 Page 2 of 4

										1	No: 17	5 test #	1
						OB	SERV	ATION FO	Ref.: Date: Sheet:	8/29/22 2 of		Rev: 00 2	
Pass no./	Filler	Dia. [in]	AC	Weav		Purge	Temp.	Current	Voltage	Melt time			Heat input
Pos.		Wire feed [ipm]	DC+	ing [in]	gas	gas	[°F]	[A]	[V]	[s]	Length	speed [ipm]	[kJ/in]
10		0.052	nown.		40			200 200	05.0.05.0		00.01	10 6 10 6	
6G	Y	250	DCEP		40	No		220 -220	25.0 -25.0	118	20.81	10.6-10.6	31.1-31.1
11		0.052											35 0 35 0
6G	Y	250	DCEP		40	No		224 -224	25.0 -25.0	130	20.81	9.6 - 9.6	35.0-35.0







Date: August 12, 2022
P.O. No.:
Report No.:

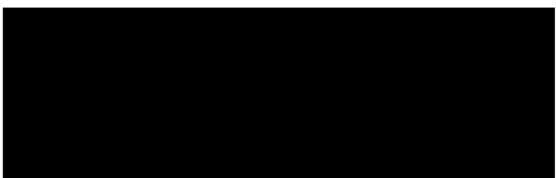
Subject: Weld Procedure Qualification Testing – AWS D1.1

Summary of Sample Identification and Process Information

Identification	:	Test #1
Material	:	0.31 inch thick ST52V pipe to 0.5 inch thick A572 Gr 50 plate
Filler Metal	:	0.052
Joint Configuration	:	Single Bevel with 30° included angle
Test Specifications	:	AWS D1.1/D1.1M:2020

Summary of Testing and Results

The weld procedure qualification test pipe was submitted for evaluation to the requirements of AWS D1.1/D1.1M:2020. The test pipe is presented as received in Figure 1. The weld pipe passed a visual inspection to the requirements of AWS D1.1/D1.1M:2020 Section 6.10.1.1. Additionally, impact testing and a macroetch specimen were requested. The results of the tests performed are included in Tables 1 through 3 and a photomicrograph the macroetch specimen is shown in Figure 2. The results of the bend and tensile testing conformed to the requirements of AWS D1.1. No requirements were provided for the impact testing or the macroetch examination.



Page 1 of 4



Table 1 Guided Bend Test Results

Sample	Notes	
Face Bend 1	0.166" Crack. – Unacceptable; Retests issued	
Face Bend 2		vident flaws or anomalies. – Acceptable
Root Bend 1		vident flaws or anomalies. – Acceptable
Root Bend 2		vident flaws or anomalies. – Acceptable
Face Bend 3 (retest)	0.063" Crack. – Acceptable	
Face Bend 4 (retest)	No visually evident flaws or anomalies. – Acceptable	
Bend Diameter (in)	2.5	
Test Dispo	sition	PASS

Tested in accordance with AWS D1.1/D1.1M:2020, Clause 6, Paragraph 6.10.3.1.

Acceptance criteria per AWS D1.1/D1.1M:2020, Clause 6, Paragraph 6.10.3.3.

Table 2 Tensile Test Results

Property	T1	T2
Width, in.	0.751	0.751
Thickness, in.	0.257	0.267
Original area, in.2	0.193	0.201
Gage length, in.	2.0	2.0
Tensile load, lbs.	15,720	16,100
Tensile strength, ksi	81.5	80.5
Yield strength, 0.2% offset, ksi	67.0	66.0
Elongation, %	11	11
Fracture location	Plate	Plate
Test Disposition	PAS	S ⁽¹⁾

Tested in accordance with AWS D1.1/D1.1M:2020, Clause 6, Paragraph 6.10.3.4.

(1): The referenced test specification requires that the tensile strength of the test specimens shall be no less than the minimum specified tensile range of the weaker base material used (85 ksi per A572 Gr 50).

Report No. Page 2 of 4

Table 3 CVN Impact Test Results

Notch Location	Specimen	Impact Energy, ft-lbf	Lateral Expansion (mils)
	Α	61	60
Weld	В	69	71
vveid	С	75	72
	Average	68	_
	D	64	56
ST52V	E	29	31
HAZ	F	90	79
	Average	61	
	G	6	6
A572	Н	11	9
HAZ	I	5	3
	Average	7	_

Test Temperature, °F	-40
Energy Range, ft-lbf	0 - 300
Specimen Size, mm	10 X 7.5
Notch Type	V-Notch
Striker Radius, mm	8

Tested in accordance with ASTM A370 and ASTM E23.

--- Not applicable

No requirements were specified for the impact testing.

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Fig. 1 The pipe is shown as received. The scale is in inches.

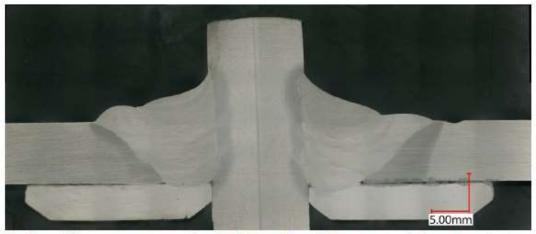


Fig. 2 The macro cross-section is shown after etching to reveal the macrostructure. 10% Nital.

Report No. August 12, 2022 Page 4 of 4



This material was manufactured under lot control in accordance with ASME Section II Part C SFA 5.01, lot class T4, and tested per Schedule I to the requirements of SFA 5.20 classification E71T-12M JH4 and in accordance with the requirements of Material and testing in accordance with ASME Section II Part C, 2021 Edition. No weld splicing with filler material was conducted on this product. This product was manufactured in the U.S.A.

This product was supplied in accordance with Quality System Manual Rev. S dated 1/30/20. Quality System meets the requirements of ASME NCA-3800, conforms to all applicable requirements of 10CFR 50 Appendix B, and meets the basic requirements of NQA-1. 10CFR Part 21 and 10CFR 50.55(e) apply to this order.

The product stated herein was manufactured and tested in accordance with the Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual. The Quality System Program of as outlined in our Quality Assurance Manual in our Quality Assurance Ma

Test Conditions

est conditions	
Electrode Size (Inches)	.052
Process / Electrode Polarity	FCAW-G / DCEP
CTWD (Inches)	1
Current (Amps)	275
Arc Voltage (Volts)	27
Heat Input (kJ/inch)	36
Passes/Layers	15 / 7
Preheat/Interpass Temp. (°F)	75 / 300
Gas Type	75% Argon/25% CO ₂
Plate ID	20191

As-Welded Mechanical Properties ¹	Plate 20191	SFA 5.20
Yield Strength (psi), .2% Offset Method	74,000	58,000 psi minimum
Ultimate Tensile Strength (psi)	84,000	70,000 - 90,000 psi
% Elongation	30	22% minimum

¹The strength and elongation properties were obtained from a tensile specimen artificially aged at 105°C (220°F) for 48 hours.

As-Welded Impact Properties	Plate 20191	SFA 5.20
CVN ft. lbs. @ -60°F	94, 95, 89 = 93 Avg.	20 ft-lbs. minimum Average
Lateral Expansion (mils)	73, 72, 69 = 71 Avg.	Not Required
% Shear	56, 56, 56 = 56 Avg.	Not Required

Deposit Chemistry	Plate 20191	SFA 5.20
% Carbon	0.06	.12 max.
% Manganese	1.48	1.75 max.
% Silicon	0.45	.90 max.
% Sulfur	0.01	.03 max.
% Phosphorus	0.01	.03 max.
% Chromium	0.04	.20 max.
% Nickel	0.01	.50 max.
% Molybdenum	< 0.01	.30 max.
% Vanadium	< 0.01	.08 max.
% Copper	0.03	.35 max.
Nickel Molybdenum Vanadium	0.01 < 0.01 < 0.01	.50 m .30 m .08 m

Diffusible	Hydroge	n

mL/100g of Weld Deposit	1.4, 1.3, 1.2, 1.4 = 1.3 Avg.	4.0mL/100g maximum

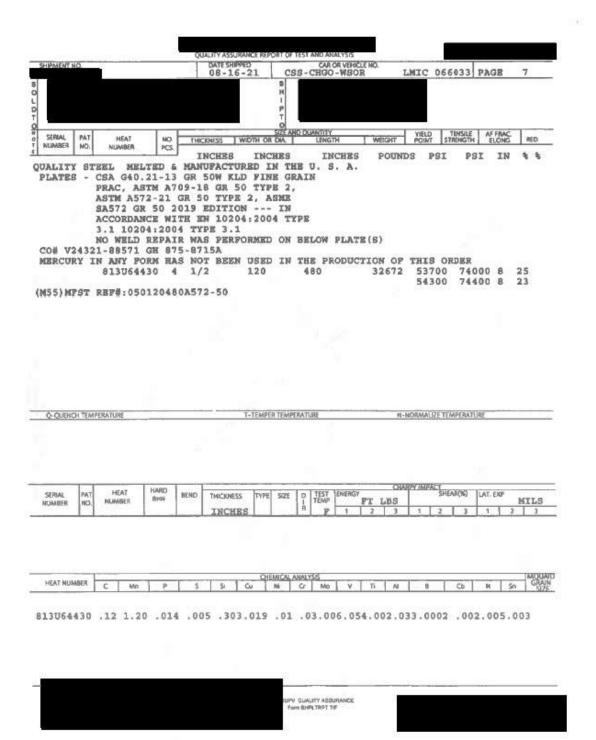
Radiographic Inspection Results: Met Requirements



This is to certify that the contents of this report are correct and accurate and that all test results and operations performed by the content of the material specification and the specific applicable requirements of the Code as specified by the customer. We do not use mercury in the design and formulation of our consumable products. In the manufacturing and testing of our products, our equipment meets mercury exclusion requirements.



"Note: The recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under Federal Statutes including Federal Law, Title 18, Chapter 47."





			AGNET AMINA							
Form: MT-1106-001M Rev. 4										
W.O. NO.:			ATE:	1	5-2	20-20	Page:	1	of	
Purchase Order Number:	Plan or Drawing Number:					Part Numi				
Item Description: Lower Boom		Dimens	ions:		D	imension	ns per drawing			
Product form / Material Type:	Carbon Ste	el	Surfac	e Condit		s Welded			_	
Examination Code / Spec:	Caroon Ste	Procedure	No.:				Acceptance Stand	ard:		
AWS D1.1	7.0	130.00					4.33	e Di		
AWS DI.I		TEC	HNIQ	TIE			AW	S D1	.1	
				O IE.	-		200			
Pre-clean Method: Dry Wipe		Material	N/A			Batch Numi	N/A			
Equipment Make:		Model:	43723		_	Serial No:	18/74			
Parker		1000000000	P2				2117			
Particle Type / Batch No.		Vehicle /	Batch No.:	3		107.00				
8A red	Levenson	D143 244 =	AUTOMOTIVE CO.	LOW.		19L03	Tricing to the second			
CIRCULAR MAGNETIZATION: AC Current: - AM	PS AC Current:		NETIZAT			10000		IETHOD:		
			_	_	AMPS	Curr	2000	AMPS		
DC Current: AM	PS DC Current:			8	AMPS		Spacing: 4 - 6 INCHES			
Contact Type:	Cable Size:						OKE METHOD:			
(Head Shot, Central Conductor, Clamps etc.)	Coil / Soleno	id Turns:		- Spacing: 4-6		_	INCHES			
Continuous Method:	DEMAGNET	TIZATION:		0		COMM	MENTS:	798 xxx.		
Residual Method:	Residual Fie	also in the second	N/A	Gauss	-	Yoke	method AC mag	netiza	tion	
Post Clean Method: N/A	Material: N/			27,71776		Batch No.: N/A				
Additional Lighting if requ	ired: s/n: N/	A second	: Minimun μw/cm² U		0.750 2.55 2.11	ction surface	e Reading:	NA		
20-002-04-01-W		the state of the s	POSITIO							
Piece / Serial Number SRI Lower Boom	Qty. ACC	EPT Q	ny. REJE	T I	smerti	on was nor	Remarks formed on one L	Owner 1	Room	
Job#		_		- N	Veldme	ent accorda	nce with	proce	dure	
Critical welds 1,2,3,4	4		0				No indications w			
Committee Links			0			welds listed ble to AWS	d. Welding was f	ound t	o be	
				- 6	Fran	THE PARTY OF				
	_									
	-	_		_						
TOT,	00000	er	0					-		
Inspector's Name:	Inspector's	agnature:					MT Level:	Date	e:	
1										
							II		5/20/20	

Z. Appendix Z – Public Domain Software Certificate

Please see the following page for an example public domain software certificate.

Crane Contractor letterhead

Certification No Public Domain Software

Crane Contractor certifies that the public domain software (e.g., freeware, shareware) is not used in this system.

Sincerely,

Signature here

John Doe, P.E. Engineering division Crane Contractor, LLC

AA. Appendix AA – Software and Services Certificate

Please see the following page for a sample software and services certificate.

Crane Contractor Letterhead

SD-07.xx Certification Software and Services

Crane contractor certifies that all software and services not required for operation and/or maintenance of the product has been removed and/or disabled.

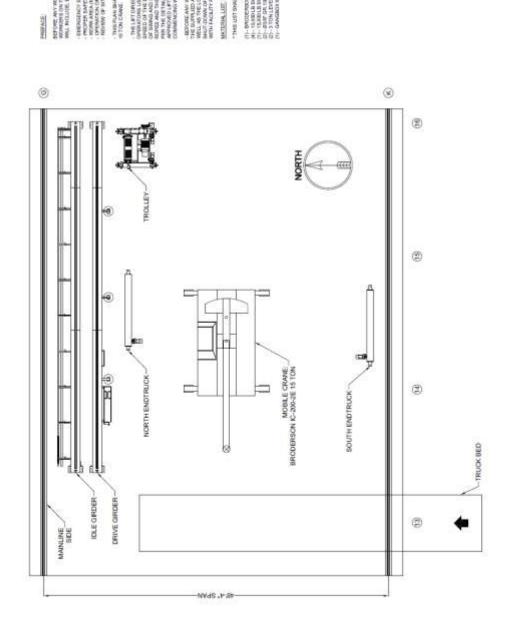
Sincerely,

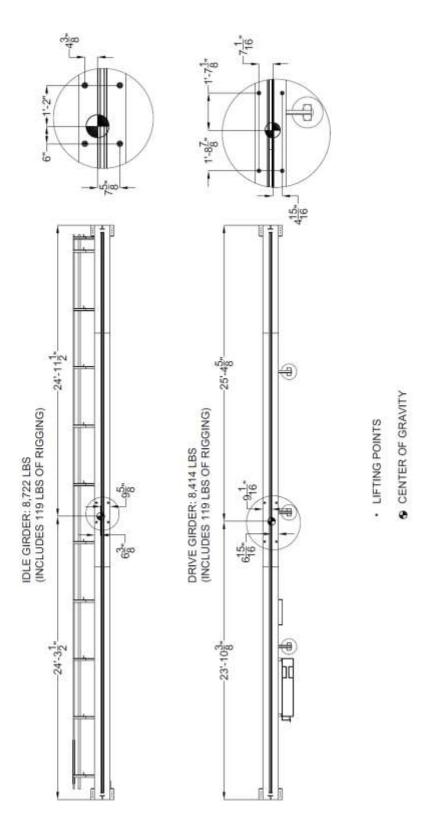
signature here

John Doe, P.E. Engineering Division Crane Contractor, LLC.

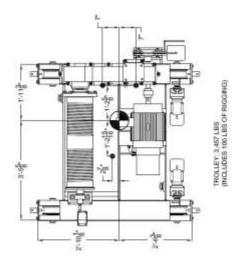
BB. Appendix BB – Crane Installation Plan

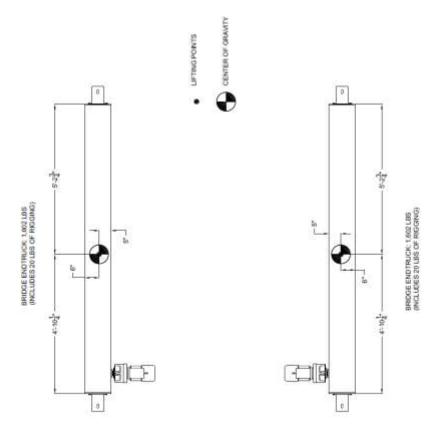
Please see the following pages for a sample crane installation plan.

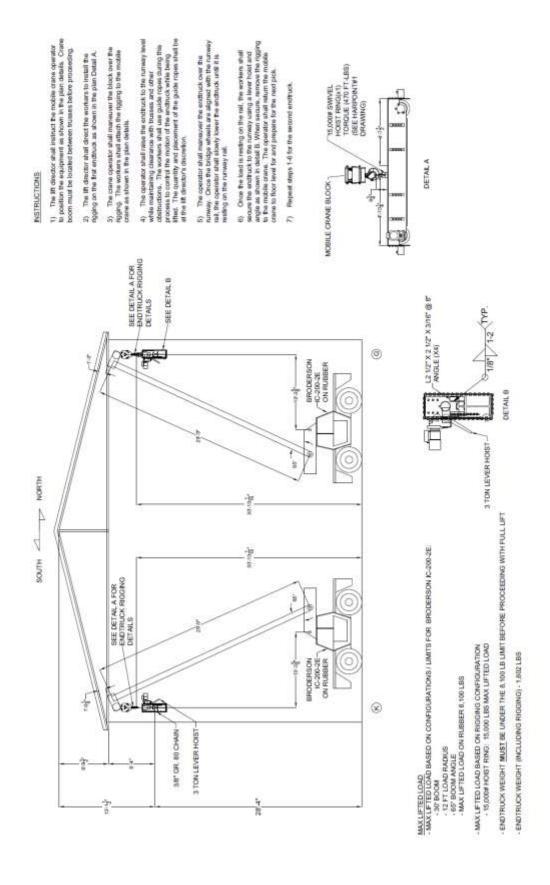


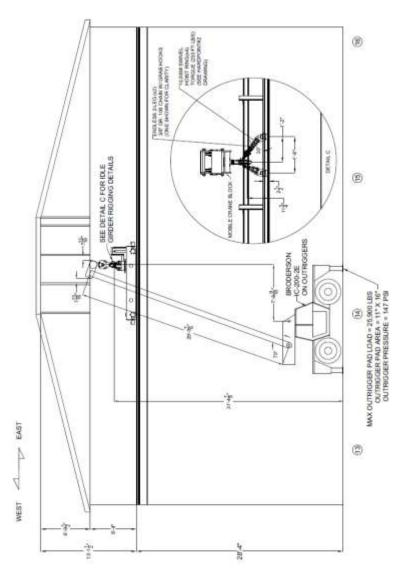


Page 261









MAX LIFTED LOAD

MAX LIFTED LOAD

MAX LIFTED LOAD

BRODERSON IC-200-2E

- 8 FT LOAD RADIUS - 70" BOOM ANGLE - MAX LIFTED LOAD ON DUTRIGGERS 24,000 LBS

MAX.LIFTED LOAD BASED ON FINGSING CONFIGURATION - USING DISS" GR. 100 LIFTING CHAIN. 14,088 LBS MAX.LIFTED LOAD

DLE GRDER WEIGHT MUST BE UNDER THE 14.098 LB LIMIT BEFORE PROCEEDING WITH FULL LIFT

DAE GRIDER WEIGHT INCLUDING RIGGINGI - 8.722 LBS

The lift director shall instruct the mobile crane operator to position the equipment as shown in the plan Detail C.

9) The lift director shall direct the workers to install the figging on the late glober as shown in the pain distals. The figging shall be installed such that the chain is not bound up on bed or caught on any other obstations. Verify that the chain does not have any twists before proceeding.

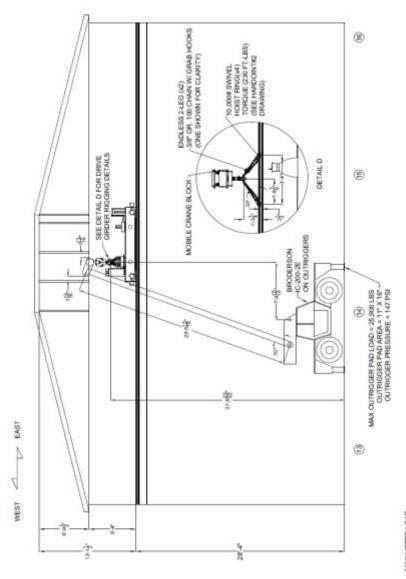
10) The crans operator shall manauver the black over the fligging. The workers shall attach the rigging to the mobile orane as shown in the plan datals. 11) Once the agging is set, the ltt director strat performs the strate. If the ltt is deemed to be unsatisfactory, the ltt director shall instruct the operator to lower the ide girder back to forollews.

12) The lift director shall perform their picks and the disjustment to the rigging unit a seatbackery pick is professed. A satisfactory pick is when one end of the grater does not dip down more than one look from level.

13) Once the pick is satisfactory, the operator shall raise the disigned to the tunway level. The workers shall use again open sharing this process to careful the motion of the side profer white termy filled. The quarity and placement of the guide rayes shall be at the RR devolute discretion.

14) The operator stud maneuver the idle ginder over the anticide. Check the ginder is positioned over the endhucks, the operator shall slowly tower the idle ginser until it is restring on the endhucks.

1d) Once the load is resting on the endatucia, the workers stud secure the dile groter for the endancia. Remove the rigging from the ide gates, lever holds and angle from endancies. The governor shall return the modile crane to those level for and prepare for the next pick.



MAX.LIPTED.LOAD
- MAX.LIPTED.LOAD BASED ON CONFIGURATIONS / UMITS FOR BRODERSON IC-300-2E:
- JAT BOOM
- 8 FT LOAD RADIUS
- 70° BOOM ANGLE
- MAX.LIPTED.LOAD ON OUTRIDGERS 34,000 LBS

- MAX LETED LOAD BASED ON PROGNIG CONFIDENTION - USING 0938" OR: 100 LIFTING CHAIR: 12,688 LBS MAX LETED LOAD

DRIVE GROER WEIGHT MUST BE UNDER THE 12,888 LB LIMIT BEFORE PROCEEDING WITH FULL LIFT

DRIVE GIRDER WEIGHT (INCLUDING RIGGING) - 8,414 LBS

16) The lift director shall instruct the mobile crare operator to position the equipment as shown in the plan Detail D. 17) The lift shedor shall direct the workers to install the higging on the drive grider as shown in the plan odnate. The higging shall be installed south that the chain is not bound up on latel or caught on any other obstacles. Verify that the chain does not have any twists before proceeding. 16) The ciers operator shall manalover the block over the rigging. The workers shall altach the rigging to the mobile crarie as shown in the plan details. 15y. Once the rigging is set, the lift director shall perform a tempt post. If the lift is deemed to be unadefinishing. The lift director shall introd the operator to knew the drive prider both to those the drive girder both to those their.

20) The lift director shall perform test picks and eduluments of the riggrap unit is enterbetchy pick is achieved. A self-factory sick is when one end of the ginder does not dip down more than one foot from level.

 Once the pick is safisfactory, the operator shall raise the drive girder to the runney loyal. The workers shall use guide ropes during this process to control the motion of the other garder while being lithed. The quantity and placement the guide ropes shall be at the Ith director's discretion.

The operator shall maneuver the drive girder over the endbucks. Once the gittler is positioned over the endbucks the operator shall slowly lower the drive gittler until it is resting on the endbucks. 23

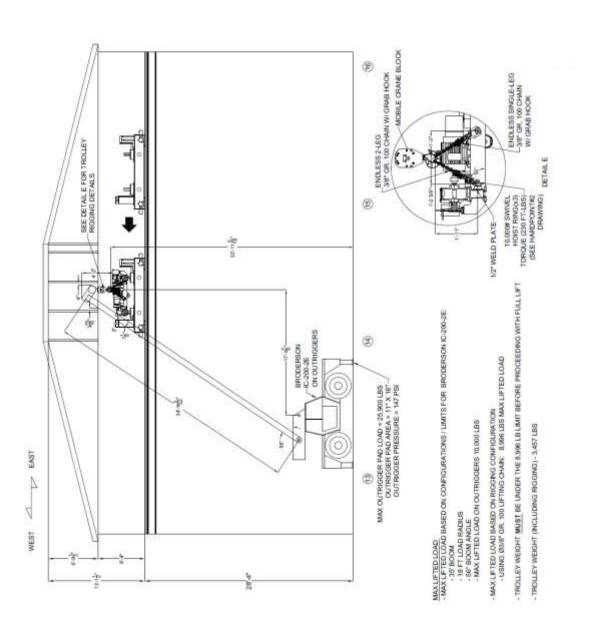
23) Once the load is realing on the endhucks, the workers size floates but of complete in the endhucks and enmove the highes. The operator shall eleum the mobile crare to floor levels for and prepare for the head poids.

INSTRUCTIONS

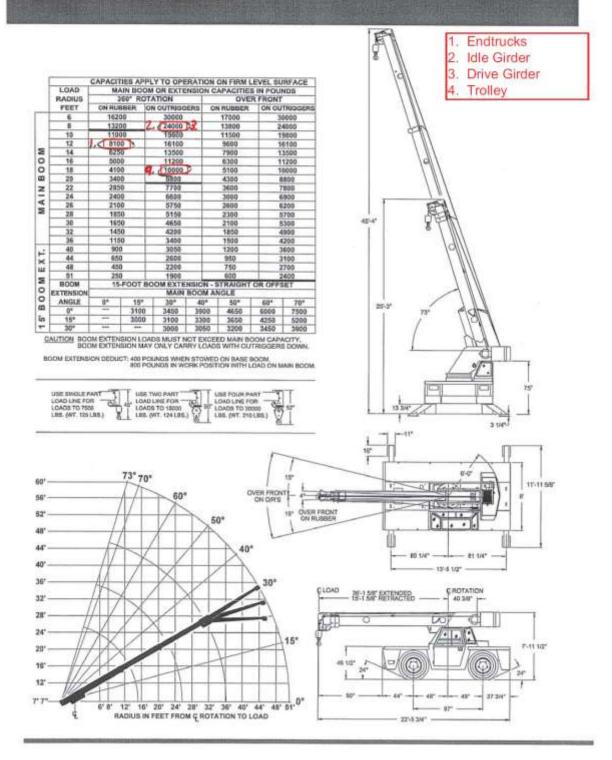
- 24) The lift director shall instruct the mobile crane operator to position the equipment as shown in the plan betail E.
- 25) The lift director shall direct the workers to install the rigging or the trothy as shown in the glain chelds. The ingging shall be installed such that the chain is not bound up migging shall be installed such that the chain is not bound up on leaf or caught on any other obsolded. Verify that the chain does not have any trettle before proceeding.
- 26) The crare operator shall maneuver the block over the rigging. The workers shall attach the rigging to the mobile crare as shown in the plan details.
- 27) Once the rigging is set, the lift devictor shall perform a depict. He also be unsatisfactory, the lift devictor shall not lift at deepened to be unsatisfactory, the lift floor level.

 28) The lift decicles that be perform test picks and advantage of the highing with a satisfactory pick is advanced. A satisfactory pick is when the tolery is 6 degrees advanced.
 - or less from level.

 29. Once the pick is autofactory, the operator shall raise the trolley to the numery level. The workers shall use guide the process during his process in compositive motion of the trolley white being lifted. The quantity and placement of the guide ropes shall be at the lift director's discretion.
- 30) The operator shall raise the Index over the height of the gations. Bridge brakes will be released. Bridge will then be certifully raised under restang beloky, force the Index is positioned over the gatient raise, the operator shall showly lower the trottey until it is resting on the gation rails.
 - Once the Trotley is realing on the gloder rails, the workers shall remove the rigging. The operator shall railum the mobile crane to floor level.



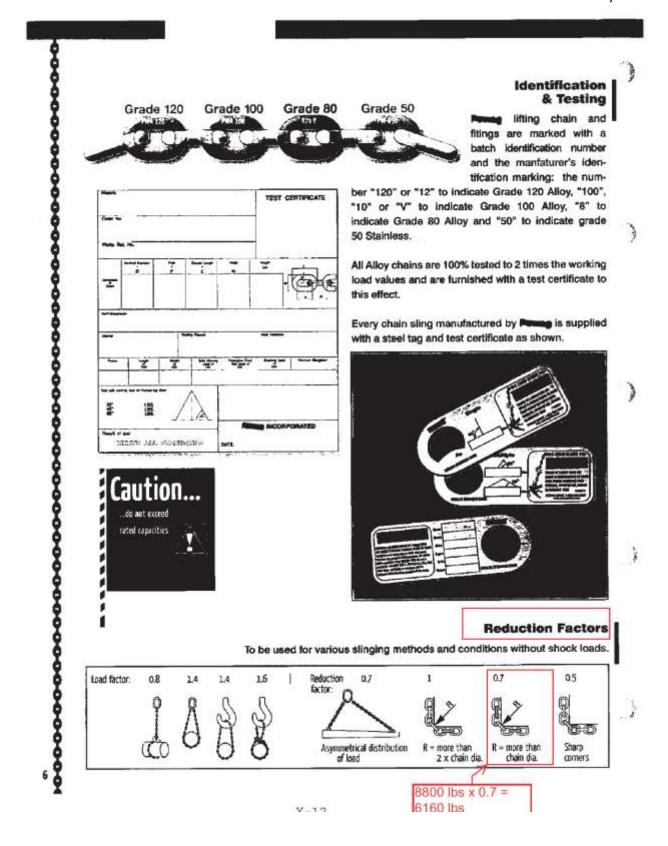
IC-200-2E Preliminary Information



Max atrigger Load

			MAXIMU	IM OUTRIGGE	R LOADS		
1 27.7	CRANE MODEL	TYPICAL CRANE WEIGHT (POUNDS)	MAXIMUM CONDITION LOAD (POUNDS)	MAXIMUM CONDITION RADIUS (FEET)	MAXIMUM OUTRIGGER PAD LOAD (POUNDS)	PAD SIZE (INCHES)	GROU PRESS (PSI
IC-2	20-1B,	6300	5000	4	6620	6 x 6.5	170
			4444	1/3	7 (27 (27 (27 (27 (27 (27 (27 (27 (27 (2		
IC-2	20-1E,1P	6400	5000	4	7250	6 x 6.5	186
IC-S	35-2	7700	8000	4	7620	6 x 8	159
IC-4	40-2	8800	2850	12	7500	6 x 8	156
IC-8	30-1	16900	17000	5	15030	9 x 12	139
IC-8	80-2	17100	17000	5	15120	9 x 12	140
IC-8	80-3	17500	17000	5	15270	9 x 12	141
IG.	200-1	28400	20000	10	25790	11 x 16	149
IC-2	200-2	28900	19800	10	25900	11 x 16	147
IG-	200-3	31300	30000	6	26150	11 x 16	149
3	250- OUT OWN	38600	13500	20	31020	9×9	383
3	250- IN & WN	38600	25050	> <	31370	9 x 9	387
RT-	-200-3	30900	30000	6	27780	12 x 16	145
		9,85003	25950	-14-	40440	16 x 17	149

Maximum Work Load of Various Chain Sling Applications 3-leg slings and 4-leg plays Design Factor 2-ing-sings 1 kg Sings 4:1 35 degrees 45 degrees EO GOSTARE 45 degrees 30 degrees Aude 94 degrees 60 Cegrees Load Factor Grade 120 Alloy Retains 100% of work load limit Ni 720 9/32 at minus 40-400 degrees E Not for 3/8" Ni 1020 temperatures over 400 degrees f. NI 1320 1/2" Grade 100 Alloy Retains 1,00% of work load limit 7/32 NI 5:50 at minus 40-400 degrees F. Not for 9/32" NI 70 temperatures over 400 degrees f. NI 80 5/16 3/8" NI 100 Special 6100 750 F chain for elevated temperature available. NI 130 1/2 Call for details NI 150 5/8" NE 200 3/4" M 220 7/8 NI 260 Grade 80 Alloy Retains 100% of work load limit at NI 5.5 7/32 minus 40-400 degrees E NI 7 9/32 90% at 400-570 degrees £ and M8 5/16" 75% at 570-750 degrees f. 3/8" M 10 Not for temperatures over 750 degrees E. NI 13 1/2 5/8" NI 15 N 20 3/4" Ni 72 7/8" NI 25 NI 32 1-1/4 Grade 50 Stainless Stee Retains 100% of work load limit NA 5 3/15 at minus 50-750 degrees f; 75% NA7 9/32 at 750-1100 degrees F, and 50% 3/8 NA 10 at 1100-1290 degrees E not for NA 13 1/2" temperatures over 1290 degrees f. 4Nik 16 5/8" "Sking work load limits are reduced 10% when the HSK16 eye sking hook is used.



Heavy Duty® Hoist Rings

Material: Forged alloy steel with minimum tensile strength of 180,000 psi.

Design Factor: Minimum Safety Factor = 5:1, 100% magnetic particle inspected, Most Rings retain the same rated load from 0 to 90 degrees from the bolt axis

Range of Novement: Pivot 180°, Swivel 360°

Specifications: Heets Military Specification No. MIL-STD 209C, Meets ANSI/ASME B30.26

Finish: Stack Chide Firesh for corrosion resistance. * Also available in a wide range of plotting - e.g Cadmism, Titanium-Cadmism, Nickel, etc.

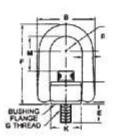
Typical Applications: ADB's HEAVY DUTY® Holst Rings are specified and used in nuclear energy equipment

Patents #4,570,987***, #4,641,986***, #5,405,210, Other Patents Pending

All dimensions approximate variations do not effect use or design factor.

Safety Instructions





				Her	wy D	uty®	Hair	Rings							
Part No.	Rated Load (lbs)	٨	8	c	D	•	•	G	к	t	H	TL *ft-lbs	WT.		Girders and
33101	8000	1.40	5.10	2.05	1.00	1.20	7,37	7/8-9	2.81	0.18	3.37	160	7.33		Trolleys
+33161	8000	1.40	5.10	2.05	1.00	1.20	9.00	7/8-9	2.81	0.18	4.82	160	8.06	4	
33105	10000	1.40	5.10	2.05	1.00	1.45	7.37	1" - 8	2.81	0.18	3.20	230	7.57		
+33168	10000	1,40	5.10	2.05	1.00	1,45	9.00	2" - 8	2.81	0.18	4.82	230	8.30		
33106	10000	1.40	5.10	2.05	1.00	1.20	7.37	1" - 8	2.81	0.18	3.20	230	7.63		Bridge
• 33166	10000	1,46	5.10	2.05	1.00	1.20	9.00	3" - B	2,81	0.18	4.82	230	11.36	_	
33107	10000	1,40	5.10	2.05	1.00	2.20	7.37	1" - 8	2.81	0.18	3.20	230	7.81	./	endtrucks
+33167	10000	1.40	5.10	2.05	1.00	2.20	9.00	1"-8	2.81	0.18	4.2	230	8.54	4	
33402	15000	2.00	6.75	2.87	1.25	1.88	9.72	1 1/4" - 7	3.88	0.18	3.74	470	15.74		
13401	15000	2.00	6.75	2.87	1.25	2.63	9,22	1 1/4" - 7	3.88	0.18	3.74	470	16.0		
133420	20000	2.00	6.75	2.87	1.25	2.63	9,22	1 3/8" - 5	3.88	0.32	3.62	670	17.2		
33424	24000	2.00	6.75	2.87	1.25	2.63	9.22	1 1/2" - 6	3.88	0.32	3.49	800	18.1		
13342	30000	2.00	6.75	2,87	1.25	2.96	9.22	2-4" - 1/2	3.88	0.32	3,49	800	22.9		
133432	30000	2.00	6.75	2.87	1.25	2.96	9.22	2* - B	3.88	0.32	3.49	800	22.9		

† Supplied with stud and nut - Long Bar Models - * Recommended Torque Load

For load ranges of 50,000 to 250,000 lbs. refer to our Safety Engineered Hoist Rings.

Heavy Duty $^{\rm R}$ Hoist Rings are completely interchangeable with Safety Engineered Hoist Rings.

*** Patent Expired

Ingress/Egress Route



CC. Appendix CC – Accident Prevention Plan (APP)

Please see the following pages to find an example accident prevention plan.

Following are examples of some of the items required to be included in the Accident Prevention Plan:

- Project Overview
 - Description

Crane Parts Manufacturers

Contract Number: NXXXXX-XX-XXXXX

Project #: NXXXX-XX-XXXXX

Project Description: Procurement of one 50 ton overhead

electric travelling crane for Shipyard Facility ABC Description of Work to be Performed: Offload and

Installation of 50 Ton Overhead Electric Traveling Crane

Location: Shipyard Facility ABC, Norfolk, VA

Contacts



Plan Preparer: Jim Jones, Safety Manager Office Number: 555-444-3210
Cell Number: 555-678-9012

Signature: Jim Jones

Approved: Jane Smith, Vice President Office Number: 555-444-4321

Cell Number: 555-678-5678

Signature: <u>Jane Smith</u>

Concurrence: Bill Smith, Quality Assurance Office Number: 555-444-8765

Cell Number: 555-678-1289

Signature: Bill Smith

Responsibilities & Lines of Authority

Project Manager

- a. Has the responsibility for the safety and the results that are achieved.
- Assigned authority for the implementation of the safety program.
- c. Holds supervisors accountable for a high level of performance.
- Measures results of performance.
- e. Approves safety policies formulated by the Safety Committee, staff or others.
- Sets the proper example in safety for all employees.
- g. Demands safety adherence and compliance with the Company safety program from all employees and subcontractors.
- 2. Job Supervisor and Safety Coordinator
 - Inspects work areas and equipment for compliance with work rules and safety standards.
 - b. Conducts daily safety meetings.
 - c. Instructs employees on the hazards of the job, how to work safely and according to operating procedures, and on applicable safety and health regulations.
 - Reports all accidents and injuries promptly to NCC or site contact.
 - e. Analyzes all processes, operations and facilities for hazards and changes or eliminates the hazards.
 - f. Compliments safe workers in the presence of co-workers.
 - g. Sets the proper example for safety by complying with the safety program and displaying a positive attitude toward the program.
 - Maintains a safe and healthful work place, proper housekeeping, proper illumination and ventilation, and ensures the use of personal protective equipment as required by each job.
 - Prior to each job, ensures that Company and subcontractor employees are aware of the safety requirements and practices applicable to the job.
 - Investigates all accidents and injuries and completes the required reports within the allotted time.
 - k. Posts required and pertinent safety signs, posters and information.
 - Serves on the Safety Committee.
 - m. Serves on accident investigation committee, if requested.
 - Ensures that all injured employees receive prompt medical attention.
 - Instructs all employees on job-site specific emergency procedures.
 - p. Reports to the Project Manager
 - q. Will be present on-site.
 - r. Smoking will only be allowed in site approved locations.

Employees

- Work in accordance with safe job practices and comply with Company, owner and governmental safety rules.
- Use required personal protective equipment.
- c. Report all unsafe conditions or practices.
- Make safety suggestions.
- e. Cooperate during the investigation of any accidents that occur.
- f. Take an active part and participate in safety meetings or training.
- g. Only perform jobs or operations for which they have been trained or checked out on.
- Serve on safety committee, if requested.
- Promptly report to supervisor all accidents and injuries.
- Complete an employee accident form when involved in an accident.
- k. Report directly to the Site Supervisor
- 4. Lines of authority in order:
 - a. Project Manager > Site Supervisor > Employees/Subcontractors

Subcontractors and Suppliers

Subcontractor and Supplier names and responsibilities will be provided as they are hired to the Contracting Officer and the Government Quality Assurance Representative prior to the operation of any equipment on-site.

Sub-contractors will receive Crane Parts Manufacturers Company Safety Training prior to on-site work and will be held responsible for all safety procedures set forth in the Crane Parts Manufacturers Company Safety manual and this site safety plan.

Current Subcontractors and Suppliers: Company XYZ

LMNOP, Inc.

Statement of Safety and Health Policy

It is the policy of Crane Parts Manufacturers (CPM) to provide a safe and healthful work environment for our employees. The personal safety and health of each employee of the Company is of primary importance. Our objective is a safety and health program that will reduce the number of injuries and illnesses. Our goal is zero accidents and injuries.

Accident Reporting

The Crane Parts Manufacturer Project Manager shall be required to:

Report all accidents as soon as possible but not more than 24 hours afterwards to the

Contracting Officer/Representative (CO/COR).

The Project Manager shall thoroughly investigate the accident and submit the findings of the investigation along with appropriate corrective actions to the CO/COR in the prescribed format as soon as possible but no later than five (5) working days following the accident.

Corrective actions will be implemented as soon as reasonably possible.

Training

The Site Supervisor will conduct safety orientation/training for each new employee prior to work and job-site assignment. The supervisor will document the names of the attendees and the topics reviewed, and provide the information to the on-site government quality assurance representative.

The safety orientation will consist, as a minimum, of the following topics:

- Personal protective equipment requirements.
- · Hazardous substances being used.
- · Specific site safety requirements.
- · Unusual conditions (e.g., excavating/trenching).
- · Emergency telephone numbers and location of nearest phone.
- · Location of closest medical treatment facility.
- · Location of fire fighting equipment.
- Qualified first aid/CPR persons on site.
- · Accident reporting.
- Housekeeping.

All equipment operators will be properly qualified. Equipment will be operated only by a qualified operator that has passed a practical examination and is certified or trained for operation of that specific type of equipment. The project manager and supervision will ensure that all personnel are properly trained and instructed for all jobs which require specific training and/or competency to meet all applicable OSHA regulations, state and federal law, and activity requirements.

Activity Hazard Analysis (AHA)

	Principle Steps	Potential Hazards	Recommended Controls
•	Off Load of Crane at Site Erection of Crane at Facilities Certified Load Testing	Falling Tools/Hardware/Other	Area of work will be roped off or marked to prevent pedestrian traffic Only qualified personnel will operate the equipment Operators will be instructed to not lift over pedestrian traffic. Rigging will be performed by qualified personnel only Do not remove tie down chains until load has been supported by forklift or mobile crane
:	Installation of Electrical Conductors Start-up of Crane Testing of Crane	Electric Shock	Discuss building power with General Contractor The floor mounted disconnect will be locked out while CPM is on site until crane is ready to operate Personnel will follow guidelines for lockout/tagout procedures.
•	Mounting Electrical Conductor Brackets. Miscellaneous Components During Assembly of Crane.	Fire/Welding/Hotwork Fall Hazard	Burn blankets will be used during cutting/weiding procedures to catch slag/sparks and to protect existing structures Fire extinguishers will be placed in the vicinity and in surrounding areas of the "hotwork" prior to start of work Emergency phone number for the Fire Department will be posted at the designated location on-site and in Appendix K of the Accident Prevention Plan 100% tie off required in manlift

DD. Appendix DD – Training Course Outline

Please see the following pages to find an example training course outline.

Crane Training Outline

- vi. Safety Training (2 hrs) Maximum Class Size 10 Personnel
 - 1. General Crane Terminology
 - 2. Safe Operating Procedures
 - 3. OSHA Requirements for Cranes and Hoists
 - 4. Pre-use inspection of equipment.
 - 5. Safety features on Crane
- vii. Operational Training (2 hours) Maximum Class Size 10 Personnel
 - 1. Operator / Rigger Communication Using Hand Signals
 - 2. Crane Operators Pre-Use Inspection
 - 3. Safe Practices
 - 4. Operation
 - a. Hoist
 - b. Trolley
 - c. Bridge
 - 5. Shut Down
 - 6. Radio Control
 - 7. Emergency Stop Buttons
 - 8. Warning Devices
- viii. Troubleshooting and Maintenance (4 hours) Maximum Class Size 8 Personnel
 - 1. Maintenance Manual Review
 - a. Lubrication
 - b. Brake Adjustment
 - c. Preventative Maintenance
 - 2. Drive Manual Review
 - 3. Review of Electrical Drawings
 - 4. Crane VFD Review and Minor Programming Features
 - 5. Required OSHA Inspections and Proper Documentation

EE. Appendix EE – Brake Adjustment Report

Please see the following page for a sample brake adjustment report.

Contract Number:	Crane Manufacturer:	-	Rew 1
Crane Capacity:	Crane Serial Number:		

	Manufacturer	Model#	Serial#
Main Hoist Primary Brake	Magnetek/Mondel	415-10001 8MST-ED23-MA	897392.1
Main Hoist Secondary Brake	Magnetek/Mondel	415-15218 8MST-ED23S-MA	897392.2
Aux Hoist Primary Brake		-	
Aux Hoist Secondary Brake	-		¥2.
Trolley Brake#I	Nord	BRES	203408964-100 80 51871231
Trolley Brake #2	Nord	BRE5	203408964-200 80 51871233
Bridge Brake #1	Nord	BRE20	203408663-100 80 51693809
Bridge Brake #2	Nord	BRE20	203408663-200 80 51693810

0.708" 0.89"	230 lb. ft. 120 lb. ft. - - 0.70" 0.710" 0.89"			5 Nm 2 Nm 0.008"	5 Nm 2 Nm 0.008"	20 Nm 20 Nm - - - 0.012"	20 Nm 20 Nm 0.012"	De De
0.70° 0.708° 0.89°	- - 0.70" 0.710"	* * * * * * * * * * * * * * * * * * *		0.008	0.008"	0.012"	0.012"	je Z
- 0.70" 0.708"	- 0.70" 0.710"	70 70 12		- 0.008"	0.008"	0.012"	0.012"	Ž.
0.70" 0.708" 0.89"	- 0.70" 0.710"	5		0.008"	0.008"	0.012"	0.012"	4
0.70" 0.708" 0.89"	0.70" 0.710"		-	0.008"	0.008"	0.012"	0.012"	A.
0.708" 0.89"	0.710"	-	_	- 22222	-	100000000000000000000000000000000000000		4
0.89*	200.0000	8	7.54	0.008"	0.000			777
	D.89"			01000	0.009"	0.014"	D.012"	H
2.2.2.2.2		-		0.024"	0.024"	0.031"	0.031"	22
0.302"	0.301"	130	3.50	0.293"	0.294"	0.491"	0.493"	DE
0.0625"	0.0625"	2.	7.83	0.177"	0.177"	0.295"	0.295"	2
60%	50%			-			*	De
8.004"	8.005"	-	8#8	1	84	1.52	2	28
7.940"	7.940"		354		(8)	-	-	23
8	.004"	8.005"	.004" 8.005" -	.004" 8.005"	.004" 8.005"	.004" 8.005"	.004" 8.005"	.004" 8.005"

#ATT-0-00-00-0-1-0-0-1-0-0-1-0-0-0-0-0-0-0	 		
Inspector:	 Date:		

MAVY CRANE CENTER FORM 09-002 Brake Adjustment Record Form (February 2013)

NOTES:

1. Any change to busice settings with the signature and requires resubmittal of Brake Adjustment Record Form.

2. Contact percentage is only applicable to shoe and caliper disc baskes.

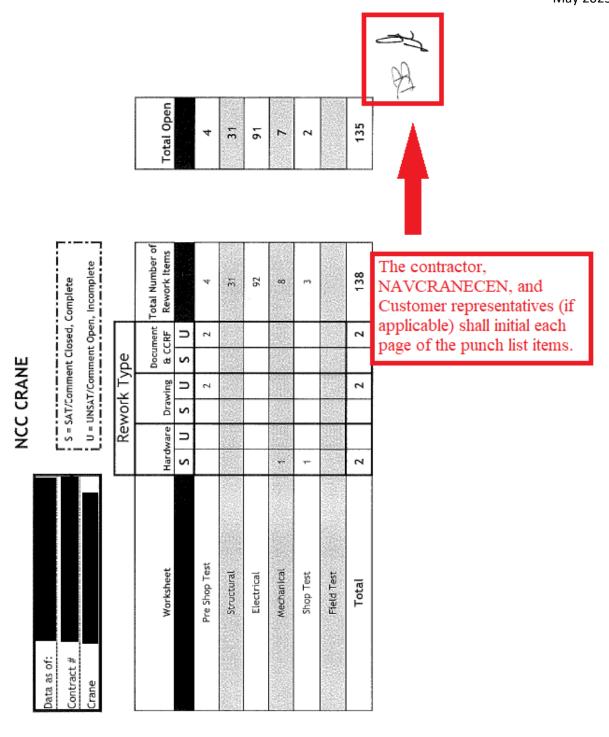
3. Wheel dissurter is only applicable to shoe brakes.

4. Measurements should be made and recorded using OEMs given settings, (ie if OEM Spring Length is given in fractions, measurements should be taken and recorded in fractions)

FF. Appendix FF – Shop Test Deficient Items List

Please see following page for a sample shop test deficient items list.

	Shop Test Sign-In						
Date(s):							
Contractor:							
Project Name:							
Contract Number:							
Organization	Name	Phone Number	Signature	Initial			
Crane Contractor Representative							
Supported Command Representative (if present)							
NCC Representative							
Organization	Name	Phone Number	Signature	Initial			
Organization	Hallie	Phone Number	Signature	IIIIciat			



	STATL	CNSA	UNSA	UNSA:	UNSA	UNSA.	UNSA	UNSA	UNSA	UNSA	ASNU	ß
	VERJFIED BY											₩
	DATE VERIFIED											B
D Equipment Changer Verification D Potenting Change O Documentation/CER Required/Record of Condition	Type of RESOLUTION											Deficient Items List
H Equi D Draw O Docu	Tyn	e all		ď		of a graph of the	.e €.	Ę	E d.	irec	e e Si	ا ا
	DESCRIPTION/COMMENTS	The Ladder rungs are spaced 10° spart. Section 5.1 of ANSI A14.3 requires ladder rung spacing to be 12°. Section 2.3.1.6 of the specification requires all ladders to meet the requirements of ANSI A14.3.	The fasteners securing the ladder are not ASTM #325 boits as shown in drawing 21037-174. Fasteners for ladders shall be considered commertical connections par section 2.3.1.6 of the specification.	Two rail clips on the North side of the South girder do not appear to be securing the rail (i.e. they are tilted upward). 7th clip from the West end of the girder and 5th clip from the East end of the girder.	The fiateners accuring both of the swing gates are not ASTM A125 both as shown in drawing 11057-112 Rev 3. Fasteners for swing gates shall be considered structural connections per section 2.3.1.6 of the specification.	North side of South girder, weld between top flange and web, approximately logs from the West end has porocify that appears to exceed the allowance in section 16 of AWS D14.112015, as required by section 2.3.1.2 of the specification.	At the east end of the bridge walkway, the toeboard (where diamond plate is bent up to form a corner) is not welded as shown in drawing 21057-130 Rev 0	At the West end of the bridge waikway, neither of the toeboard corners (where the diamond plate is bent up to form a corner) are welded, as shown in drawing 21057-130 Rev 0.	On the underside of the trolley, the welds at the ends of the tapered I boam ((bem.4 on drawing 21057-201 Rev.0) appear to have convexity and overlap. Please verify the welds meet the profile requirements of section 10.7.1 of AWS DY4.1.2005, as required by section 2.3.1.2 of the specification.	On the underside of the trolley, mear the equalizer, the top corner of the weld that connects the full-height stiffener to the apered I beam clomestion of term 8 to their 4 on drawing 21057-2010 in the North side looks like it could have a caste. Please welffy there are no creds, as required by section 10.6 of AWS D14.12005 and section 2.3.1.2 of the specification.	On the underside of the trolley, near the equalizer, the top corner of the weld that connects the stiffener to the basers! I beam (connection of item 5 weld them 4 on drawing 2103-201) on the North side looks like it could have a crack, Please verify thene are no crack, as required by section 10.6 of AWS 1014,1:2003 and section 2.3.1.2 of the specification.	Typically completed by Government during Shop Test
	FOUND BY	80	90	90	80	en O	90	90	90	90	80	o
Crane Data as of:	DATE	7/13/22	7/13/22	7/13/22	7/13/22	7/13/22	7/13/22	7713/22	7713/22	7/13/22	7/13/22	Rev 1/2019
ä	МЗП	5-001	2.002	\$-003	5.004	\$-00\$	\$-006	\$.007	8-008	5-009	5-010	

Structural - Items found during the structural inspection of the crane

<u> </u>	Crane Crane Data as d:		I 0 0	H Equipment Change D Drawing Change O Documentation	H Cquipment Change / Verification D Entwing Change O Documentation/CRF Required/Record of Contition			
ITEM	POUND	FOUND	DESCRIPTION/COMMENTS	Type of Rework	RESOLUTION	DATE	VERSFIED	ST
1005	mım.	90	The indeer map are spaced 10' apart, Section 5.1 of ANSI A14.3 requires ladder may specification requires all taken to meet the requirements of ANSI A14.3.	(x)	PHISC; New ladder will be fabricated. NCC; New 5-032 was added to track required drawing update.			5
2005	2713722	80	The featment securing the Leader are not ASTA ALES bolts as shown in drawing 21057-174. In stement for leaders shall be considered commercial connections per section 2.3.1.6 of the specification.	×	Milde: Mechanical fasteners used for shop test knowing that it will be diseasombled for shipping. Structural hardwise will be used as install.			5
\$ 003	27/13/22	8	Two reli citips on the Horth side of the South girder do not appear to be securing the reli (i.e., they are tilted upwerd). 7th citip from the West end of the girder and 5th citp from the East end of the girder.	x	PHBC: Clips have been replaced			5
2004	7/13/22	90	The featment securing both of the wring gates are not ASTM ATZ boths as shown in drawing 21037-125 Rev 3. Pasteners for swing gates shall be comidered structural connections per section 2.3.1.4 of the specification.	×	Pridc; Mechanical fastenen used for shop test knowing that it will be diseasembled for shipping. Structural hardware will be used a testali.			5
5005	27/11/22	8	isorth side of South girder, weld between top flarge and web, approximately 10.2 from the West end has porocity that appears to exceed the allowance in section 10.6 of AWS D14.1:2000, as required by section 2.3.1.2 of the specification.	×	PHISC: Weld has been repaired			5
2008	2713722	8	At the east end of the bridge walloway, the toeboard (where diamond plate is best up to form a corner) is not welded as shown indrawing 21057-130 flev 0.	٥	PHBC; Crawing has been updated			5
200%	2713722	90	At the West end of the birdge walkway, neither of the toeboard comen (where the diamond plate is best up to form a corner) are welded, as shown (indrawing 21097-130 Rev. 0.	٥	PHBC: Drawing has been updated			5
2008	5008 7/11/22	90	On the underside of the trolley, the weld at the ends of the tapered I beam (Bern 4 on drawing 21057-201 Bev 0) appear to have connectly and overlap. Please verify the welds meet the profile requirements of section 10,2,1 of AWS D14.1:2005, as required by section 2,3,1,2 of the specification.	×	PHBC; Weld has been repaired			5
2009	77.872	8	On the underside of the trolley, near the equaliter, the top comer of the weld that connects the full-height stiffener to the tapered I beam connects of them it is then an advantage 100'57.20 is not he forth side looks like it could have a crack. Heters welly there are no cracks, as required by exciton 10.6 of AWS D14.1:2005 and section 2.3.1.2 of the specification.	۰	Pitids: Weld has been impacted by CWI and is approved. Determined to be fourficient paint. NCC will find verify all areas have been painted per paragraph. 2.7.2 of the specification; this will be tracked via them 5-000.	873723	君	

Typically completed by Contractor after Shop Test. Typically required prior to Government approval of the Request to Ship.

50/25

Updated Deficient Items List

Rev 1/2019

GG. Appendix GG – Operation and Maintenance Data

Please see the following pages to find requirements for operation and maintenance data.

Operating and Maintenance Manual

- ix. The Operation and Maintenance Manual shall have a table of contents. The table of contents shall include:
 - 1. Operation instruction
 - 2. Preventive Maintenance
 - 3. Parts information
 - 4. Drawing list
 - 5. Supply list
 - 6. Catalog cuts
 - 7. Photographs
 - 8. Calculations
- x. The body of the manuals shall include the following:
 - 1. Detailed written procedures
 - 2. Operation instructions
 - 3. Preventive maintenance information
 - 4. Drawings
 - 5. Parts information
 - 6. Supplies needed
 - 7. Catalog cuts
 - 8. Photographs
 - 9. Calculations

xi. Operation

- 1. Operation information shall include the following:
- a. Detailed crane operations
- b. Safety device functions
- c. Load handling safety instructions
- d. Special precautions for starting/stopping

xii. Maintenance

- 1. Maintenance information shall include recommended maintenance procedures and manufacturer's installation and maintenance manuals (for purchased components) and lubrication instructions.
- 2. Also include the following:
- a. Maintenance and programming instructions for the drives.
- b. Maintenance instructions including maintenance, alignment, adjustment, and calibration instructions for commercial components and parts lists.
- c. Preventive maintenance instructions including location of lubrication points, type of lubricant to be used, and the frequency of lubrication, which shall agree with the lubrication drawing provided.
- d. A complete listing of all control system parameters with an explanation of their functions.

- 3. Parts information shall include all information on all contractor-designed parts, all purchased sub-assemblies and components including the manufacturer's part number. The information shall be broken-out to the smallest replacement part. Also, include a recommended spare parts list
- 4. Drawings shall be the as-built construction drawings.
- 5. Catalog cuts of the approved design.
- 6. Photographs, if applicable.
- 7. Approved calculations.

HH. Appendix HH – Control System Parameter Record

Please see the following pages for an example of the control system parameter record.

Model: 4045 G+ Series 3, Flash ID: 8001.5 Customer Name:

SNAPSHOT OF CONTROL SYSTEM PARAMETER LIST

Application: Order Number:

Parameter	Description	Setting	Unit	Mod
A1-00	Select Language	0:English		
A1-01	Access Level	2:Advanced Level		
A1-02	Control Method	0:V/F Control		
A1-03	Motion	0:Traverse		
A1-04	Speed Ref	5:Uni-Polar analog		
A1-05	Init Parameters	0:No Initialize		
A1-06	Enter Password 1	Unlocked		
A1-08	Enter Password 2	Locked		
A2-01	User Param 1	No User Data		
A2-02	User Param 2	No User Data		
A2-03	User Param 3	No User Data		
A2-04	User Param 4	No User Data		
A2-05	User Param 5	No User Data		
A2-06	User Param 6	No User Data	-	
A2-07	User Param 7	No User Data		
A2-08	User Param 8	No User Data		
A2-09	User Param 9	No User Data		
A2-10	User Param 10	No User Data		_
A2-11	User Param 11	No User Data		
A2-12	User Param 12	No User Data		+
A2-13	User Param 13	No User Data		
A2-14	User Param 14	No User Data		
A2-15	User Param 15	No User Data		_
A2-16	User Param 16	No User Data		_
A2-17	User Param 17	No User Data		
A2-18	User Param 18	No User Data		
A2-19	User Param 19	No User Data		_
A2-20	User Param 20	No User Data		-
A2-20	User Param 21	No User Data		-
A2-22	User Param 22	No User Data		
A2-23	User Param 23	No User Data		
A2-23 A2-24	User Param 24	No User Data		-
A2-25	User Param 25	No User Data		-
	User Param 26	No User Data		
A2-26 A2-27	User Param 20 User Param 27	No User Data		_
A2-28	User Param 28	No User Data		-
A2-29	User Param 29	No User Data		-
A2-29	User Param 30	No User Data		
A2-30 A2-31	User Param 31	- March State Physical I		
A2-31	User Param 32	No User Data		-
The second second	Charles and Charle	No User Data	4360	-
B1-01	Reference 1	0.00	Hz	
B1-02	Reference 2	0.00	Hz	
B1-03	Reference 3	0.00	Hz	
B1-04	Reference 4	0.00	Hz	-
B1-05	Reference 5	0.00	Hz	
B1-06	Reference 6	0.00	Hz	-
B1-07	Reference 7	0.00	Hz	-
B1-08	Reference 8	0.00	Hz	-
B1-09	Reference 9	0.00	Hz	

Page 1 of 8

" indicates a modified constant

Parameter	Description	Setting	Unit	Mo
B1-10	Reference 10	0.00	Hz	
B1-11	Reference 11	0.00	Hz	
B1-12	Reference 12	0.00	Hz	
B1-13	Reference 13	0.00	Hz	
B1-14	Reference 14	0.00	Hz	
B1-15	Reference 15	0.00	Hz	
B1-16	Reference 16	0.00	Hz	
B1-17	Jog Reference	6.00	Hz	
B1-18	Ref Priority	1:Asalog Ref Only		
B2-01	Ref Upper Limit	100.0	%	+
B2-02	Ref Lower Limit	0.0	%	
B2-03	Ref1 Lower Limit	2.0	%	
B2-04	Alt Upper Limit	100.0	%	-
B3-01	Reference Source	1:Terminals	70	-
B3-02	Run Source	1:Terminals		
B3-02	Stopping Method	0:Decel to Stop		+
B3-03		0:Normal Rotation		
B3-04 B3-06	Change Rotation Cntl Input Scans	1:5mS - 2 Scans		-
B3-07	LOC/REM RUN Sel	0:Cycle Extrn RUN		-
B3-07	RUN CMD at PRG	0:Disabled		
B3-00	AllowRun@Powerup	0:Disabled		-
B4-01		0:Disabled		+
B4-01 B4-02	MOP Ref Memory Trim Control LVI	10	- 20	-
B5-01	Accel Time 1	7.0	%	-
The second		100	sec	
B5-02	Decel Time 1	8.0	sec	-
B5-03	Accel Time 2	2.0	Sec	-
B5-04	Decel Time 2	2.0	sec	-
B5-05	Acc Time N Chg	2.0	sec	-
B5-06	Dec Time N Chg	2.0	sec	+
B5-08	Fast Stop Time	0.5	sec	-
B5-09	Acc/Dec Units	1:0.1 Seconds	A15	-
B5-10	Acc/Dec SW Freq	120.0	Hz	
B5-11	SW Freq. Compare	1:Upper SW Freq		4
B5-12	Accel Time 3	3.0	sec	-
B5-13	Decel Time 3	3.0	sec	_
B5-14	Accel Time 4	3.0	sec	4
B5-15	Decel Time 4	3.0	sec	_
B6-01	SpdSrch at Start	2:Spdsrchl Disable	1000	
B6-02	SpdSrch Current	120	%	
B6-03	SpdSrch Dec Time	2.0	sec	-
B6-05	Search Delay	0.2	sec	_
B6-10	Srch Detect Comp	1.10		
B6-14	Bidir Search Sel	1:Enabled		
B8-01	Jump Freq 1	0.0	Hz	
B8-02	Jump Freq 2	0.0	Hz	
B8-03	Jump Freq 3	0.0	Hz	
B8-04	Jump Bandwidth	1.0	Hz	
B9-01	Field-Weak Lvl	80	%	
B9-02	Field-Weak Freq	0.0	Hz	
C1-01	Quick Stop 0/1	0:Disabled		
C1-02	Quick Stop Time	1.0	sec	
C1-03	Reverse Plug 0/1	1:Enabled		
C1-04	Rev-Plg Dec Time	8.0	sec	

Page 2 of 8

II. **Appendix II – List of Parameters and Crane OEM's Approved Crane Range** Please see the following sheet for an example of the list of parameters and crane OEM's approved crane range.

Crane Drive Usage		Date	6-10-10
Crane	20/5T PNS4		
Function (Hoist / Bridge / Trollery)	Hoist		
Manufacturer and Drive			*
Drive Manufacturer	NCC DRIVE		
Drive Type	E+0#		

Eunction	Parameter ID	Drive OEM Range	Crane Range	Current Setting	Applicable
Emergey Stop/ Quick Stop Enable	10-53	1-0	AIN	10/04	2
Emergency Stop/ Quick Stop Deceleration time	Es.02	D-255ec	NIA	A/N	Z
Raverse Plug Enable	RP.01	1-0	0-1		>
Reverse Plug Decel Time	RP-02	D-255ec	1.5-10:40	1.55ec	7
Reverse Plug Accel Time	Q P. 03	0-25566	2-10560	2 Sec	,

Micro Speedi Stow Speed/Ultra Lift/Guick Lift (identity if a function that can limit the speed to below 60 HZ or allow speeds greater than 80 HZ can be activated and provide the acceptable speed range for these functions.)

Function	Parameter ID	Drive OEM Range	Crane Range C	Current Setting	Applicable
Micro Spreid/Slow Speed Enable	MS-01	1-0	1-0	-	7
Micro Speed/Slow Speed Gain Multiplier	MS-611	9-001-0	3-100%	250/0	>
Ultra Lift/Quick Lift/Fast Lift Enable	G 4 51		1-0	,	>
Ultra Lift/Quick Lift/Fast Lift Maximum Frequency Forward	04.02	5. ISOH2	GD-120 H2	120 HZ	7
Utra LithQuick LithFast Lift Maximum Frequency Reverse	QL.03	0- ISOH2	C.D - 120 HZ	120 HZ	,
Ustra LiftCuick Lift/Fast Lift Maximum Torque Allowed Past Speed Forward	Q1-04	9. 1000/2	0- 6.5.%	70/0	>
Ultra Lift/Quick Lift/Fast Lift Maximum Torque Allowed Fast Speed Reverse	50.70	9,0001.0	9.5.5.0	70%	>
Maximum Frequency Of Operation At Fast Speed	Q.L.o.Go	40-150HZ	40-120 HZ	120 HZ	>

No-Load Brake Start/Stop (Indentity for Holst Functions without load brakes the maximum duration of load float)

Eunction	Parameter ID	Drive OEM Range	Crane Range	Current Setting	Applicable
Speed Point 1	(0.0)	O-60 H2	N/A	N/A	2
Speed Point 2	5.02	O - 60 H2	MIA	A) W	2
Speed Point 3	5.03	6 - 60 HZ	MIM	MIN	2
Speed Point 4	F0-8	0 - 60 HZ	AIN	AIA	2
Speed Point 5	8.05	0.6042	AIN	A/A	2

JJ. Appendix JJ – Frequency Allocation Application

Please see the following sheets for an example of the frequency allocation application.

APPLICATION FOR EQUIPMI	ENT C	LASSIFICATION	DATE	FORM APPROVED OMB No. 0704-0188
FREQUENCY ALLOCATIO	N U	NCLASSIFIED	3/12/2010	1 of 7 Pages
	DOD GEN	ERAL INFORMA	TION	
TO Department of the Navy Navy Marine Corp Spectrum Center 2461 Eisenhower Avenue Suite 1202 Alexandria, VA 22331-1400			Company Na	me and Address
APPLICATION TITLE Manufacturer of the	equipme	ent		2)
2. SYSTEM NOMENCLATURE MLTX Series				
3. STAGE OF ALLOCATION a. STAGE 1 (X one) CONCEPTU		b. STAGE 2 EXPERIMENTAL	c. STAGE 3 DEVELOPME	d. STAGE 4 NTAL OPERATIONAL
FREQUENCY REQUIREMENTS				1/
a. FREQUENCY(IES) 430 to 439.0 b. EMISSION DESIGNATOR(S) TX = 224K	8 MHz .F1D RX =	=224KF1D		
5. TARGET STARTING DATE FOR SUBSEQUENTS	TAGES			1
a. STAGE 2 b.	STAGE 3		c. STAGE 3/26/2010	4
6. EXTENT OF USE INTERMITTENT			37.55	
7. GEOGRAPHICAL AREA FOR				
a. STAGE 2				
b. STAGE 3				
c. STAGE 4				
8. NUMBER OF UNITS				12
a. STAGE 2 b. Governme	STAGE 3		c. STAGE Two (4 2) Transmitters
9. NUMBER OF UNITS OPERATING representa	atives' inf	ME ENVIRONMEN	IT: ONE (1) ONLY	
10 OTHER J/F 12 APPLICATION NUM here a. SUPERSEDED J/F 12/ b. RELATED J/F 12/		IN THE	INSTRUCTIONS FOR PA	
12. NAMES AND TELEPHONE NUMBERS	1	L a.	YES L b. NO	c. NAvail
a. PROGRAM MANAGER (1)	COMMERC Work pt		(2) AUTO	
b. PROJECT ENGINEER (1)	Work ph		(2) AUTO	
	ASSIFICATIO			
N/A UN	NCLASSIFI	ED		

MLTX transmitter Unlicensed (Part 15) 3. TRANSMITTER INSTALLATION	CTURER'S NAME turer's name here (also on other sheets) ITTER TYPE F Solid State Digital OF TUNING ized PLL N DESIGNATOR(S)
1. NOMENCLATURE, MANUFACTURER'S MODEL NO. MLTX transmitter Unlicensed (Part 15) 3. TRANSMITTER INSTALLATION	CTURER'S NAME turer's name here (also on other sheets) ITTER TYPE F Solid State Digital OF TUNING ized PLL N DESIGNATOR(S) D BANDWIDTH (X and complete as applicable)
1. NOMENCLATURE, MANUFACTURER'S MODEL NO. MLTX transmitter Unlicensed (Part 15) 3. TRANSMITTER INSTALLATION	CTURER'S NAME turer's name here (also on other sheets) ITTER TYPE F Solid State Digital OF TUNING ized PLL N DESIGNATOR(S) D BANDWIDTH (X and complete as applicable)
MLTX transmitter Unlicensed (Part 15) 3. TRANSMITTER INSTALLATION	turer's name here (also on other sheets) ITTER TYPE F Solid State Digital OF TUNING itzed PLL N DESIGNATOR(S) D I BANDWIDTH (X and complete as applicable)
MLTX transmitter Unlicensed (Part 15) 3. TRANSMITTER INSTALLATION	TTER TYPE F Solid State Digital OF TUNING ized PLL N DESIGNATOR(S) D N BANDWIDTH (X and complete as applicable)
Man-portable carried by crane operator FSK UH 5. TUNING RANGE 430 to 439.8MHz Synthes 7. RF CHANNELING CAPABILITY 430.0, 432.4, 436.0 to 439.8MHz in 200kHz increments, 20 channels, 433.125 to 434.725MHz in 200kHz increments, 9 channels 9. FREQUENCY TOLERANCE 224KF11 10. FILTER EMPLOYED (X one)	F Solid State Digital OF TUNING sized PLL N DESIGNATOR(S) D N BANDWIDTH (X and complete as applicable)
5. TUNING RANGE 430 to 439.8MHz 7. RF CHANNELING CAPABILITY 430.0, 432.4, 436.0 to 439.8MHz in 200kHz increments, 20 channels, 433.125 to 434.725MHz in 200kHz increments, 9 channels 9. FREQUENCY TOLERANCE +/- 10ppm 10. FILTER EMPLOYED (X one)	OF TUNING idized PLL N DESIGNATOR(S) D N BANDWIDTH (X and complete as applicable)
430 to 439.8MHz 7. RF CHANNELING CAPABILITY 430.0, 432.4, 436.0 to 439.8MHz in 200kHz increments, 20 channels, 433.125 to 434.725MHz in 200kHz increments, 9 channels 9. FREQUENCY TOLERANCE +/- 10ppm 10. FILTER EMPLOYED (X one)	D BANDWIDTH (X and complete as applicable)
430.0, 432.4, 436.0 to 439.8MHz in 200kHz increments, 20 channels, 433.125 to 434.725MHz in 200kHz increments, 9 channels 9. FREQUENCY TOLERANCE +/- 10ppm 10. FILTER EMPLOYED (X one)	D BANDWIDTH (X and complete as applicable)
+/- 10ppm 10. FILTER EMPLOYED (X one)	BANDWIDTH (X and complete as applicable)
☑ a. YES b. NO 11. SPREAD SPECTRUM (X one) 12. EMISSION ☐ a. YES ∑ b. NO 13. MAXIMUM BIT RATE a3dB = 9600 bps 14. MODULATION TECHNIQUES AND CODING c40dB d60dB d60dB	
a. YES	
13. MAXIMUM BIT RATE a3dB = 9600 bps b20dB 14. MODULATION TECHNIQUES AND CODING c40dB d60dB d60dB	CALCULATED IN MEASURED
9600 bps b20dB 14. MODULATION TECHNIQUES AND CODING c40dB d60dB	
14. MODULATION TECHNIQUES AND CODING c40dB d60dB	
d60dB	
	= 760kHz
DI SK Dignal Telemeny Data with CKC	BW = 223.8kHz
	MODULATION FREQUENCY 9.6kHz
16. PRE-EMPHASIS (X one) 17. DEVIATIO	N RATIO
□ a. YES □ b. NO 8.333	HARACTERISTICS
19. POWER a. RATE	NA
a. MEAN 4.0mW b. WIDTH	
b. PEP N/A c. RISE T	TME
20. OUTPUT DEVICE d. FALL 1	
Transistor, Chipcon CC1020 e. COMP	National Control of the Control of t
21. HARMON	IC LEVEL
22. SPURIOUS LEVEL a. 2nd -79.6dBc	-62 9dBc
23. FCC TYPE ACCEPTANCE NO. b. 3rd	Trough Children
STATES AND	-60.6dBc
TNE-430MLTX c. OTHER	-55.5dBe @ 1720MHz
24. REMARKS	

CLASSIFICATION					PAGE		
UNCLASSIFIED					3 of 7 Pages		
		RE	CEIVER E	QUIPME	NT CHARACTERISTICS		
1. NOMENCLATURE,					2. MANUFACTURER'S NAME		
Part 15 receiver, 4	STORY I PROPERTY AND A STATE				A RECEIVED TUDE		
 RECEIVER INSTALL Overhead Cranes 					RECEIVER TYPE Single Conversion, Superheterodyne		
5. TUNING RANGE					6. METHOD OF TUNING		
430 to 439.8 MHz	2				Synthesizer, fixed crystal		
 RF CHANNELING C. 430.0, 432.4, 436.0 to 433.125 to 434.725MHz in 	439.8MHz in 200k			anels,	8. EMISSION DESIGNATOR(S)		
9. FREQUENCY TOLE +/- 10ppm	RANCE				224KF1D		
10. IF SELECTIVITY	1st	2	nd	3rd	11. RF SELECTIVITY (X and complete as applicable)		
a3 dB	307.2kHz				☐ CALCULATED ☑ MEASURED		
b20 dB	307.2kHz				a3 dB 21.3MHz		
c60 dB	307.2kHz				b20 dB 26.4MHz		
					c60 dB 36.6MHz		
12. IF FREQUENCY					d. Preselection Type SAW filter		
a. 1st 307	.2 MHz				13. MAXIMUM POST DETECTION FREQUENCY 4900Hz		
b. 2nd N//	A				14. MINIMUM POST DETECTION FREQUENCY 900Hz		
c. 3rd N//	A				16. MAXIMUM BIT RATE 9600 bps		
15. OSCILLATOR TUNE	D	1st	2nd	3rd	17. SENSITIVITY		
a. ABOVE TUNED FREQUENCY		X			a. SENSITIVITY -105 dBm		
b. BELOW TUNED FREQUENCY					b. CRITERIA BER test		
c. EITHER ABOVE BELOW THE FR					c. NOISE FIG 7dB		
18. DE-EMPHASIS (X or	ле) ⊠ ь. №	·			d. NOISE TEMP NA		
19. IMAGE REJECTION					20. SPURIOUS REJECTION 52dB		
21. REMARKS					•		

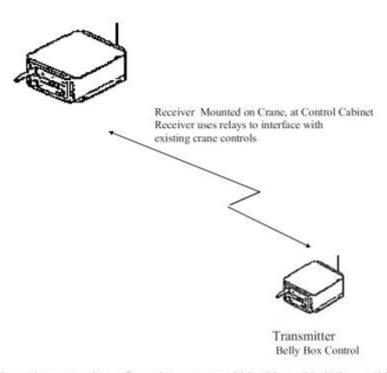
CLASSIFICATION UNCLASSIFIED	PAGE 4 of 7 Pager
ANTENNA EQUIF	PMENT CHARACTERISTICS
1. 🖂 a. TRANSMITTING 🔲 t	b. RECEIVING C. TRANSMITTING AND RECEIVING
2. NOMENCLATURE, MANUFACTURER'S MODEL NO.	3. MANUFACTURER'S NAME
4. FREQUENCY RANGE	5. TYPE
430 to 439.8 MHz	Inverted F PCB
6. POLARIZATION	7. SCAN CHARACTERISTICS
Vertical	a. TYPE Fixed
B. GAIN	b. VERTICAL SCAN
a. MAIN BEAM -12.3dBi	(1) Max Elev N/A
b. 1st MAJOR SIDE LOBE	(2) Min Elev N/A
None, Omni directional	(3) Scan Rate N/A
9. BEAMWIDTH	c. HORIZONTAL SCAN
a. HORIZONTAL 150°	(1) Sector Scanned N/A
b. VERTICAL 180°	(2) Scan Rate N/A
100	d. SECTOR BLANKING (X one) (1) YES (2) NO
10. REMARKS	(1) YES (2) NO
CLASSIFICATION UNCLASSIFIED	

CLASSIFICATION Including mentered her	nodels number PAGE 5 of 7 Page
ANTENNA EQUI	PMENT CHARACTERISTICS
1.	b. RECEIVING . TRANSMITTING AND RECEIVING
2. NOMENCLATURE, MANUFACTURER'S MODEL NO.	3. MANUFACTURER'S NAME
4. FREQUENCY RANGE 430 to 439.8 MHz	5. TYPE ½ Wave monopole
6. POLARIZATION	7. SCAN CHARACTERISTICS
Vertical	a. TYPE Fixed
8. GAIN	b. VERTICAL SCAN
a. MAIN BEAM 6.1 dBi b. 1st MAJOR SIDE LOBE	(1) Max Elev N/A (2) Min Elev
None, Omni directional	N/A (3) Scan Rate N/A
9. BEAMWIDTH	c. HORIZONTAL SCAN
a. HORIZONTAL 360°	(1) Sector Scanned N/A
b. VERTICAL 180°	(2) Scan Rate N/A
	d. SECTOR BLANKING (X one) (1) YES (2) NO
10. REMARKS	
CLASSIFICATION UNCLASSIFIED DD Form 1494, AUG 96	

Page 300

Page 6 of 7

SAMPLE LINE DIAGRAM



The entire system is configured to operate within shipyard buildings, with a nominal effective range of less than 300 ft. The transmitter unit is a "Belly Box" that is carried by the Crane Operator, and weighs about 3 lbs. The receiver unit is mounted on the bridge crane, and interfaces with existing control circuitry to permit remote operation of the crane without use of a wired pendant control station or having an operator located in a cab on the crane.

APPLICATION FOR SPECTRUM REVIEW	CLASSIFICATION: U	NCLASSIFIED	PAGE 7 of 7 Pages
	NTIA GENERAL	INFORMATION	
APPLICATION TITLE			
2. SYSTEM NOMENCLATURE			
3. STAGE OF ALLOCATION (X one) a. STAGE 1 CONCEPTUAL	b. STAGE 2 EXPERIMENTAL	c. STAGE 3	d. STAGE 4 OPERATIONAL
FREQUENCY REQUIREMENTS a. FREQUENCY(IES) 430 to 4 b. EMISSION DESIGNATOR(S) TX = 22	39.8 MHz 4KFID RX = 224KFII)	
5. PURPOSE OF SYSTEM, OPERATIONAL A	ND SYSTEM CONCEPTS	(WARTIME USE) (X one)	a. YES b. NO
6. INFORMATION TRANSFER REQUIREMEN	ITS		
7. ESTIMATED INITIAL COST OF THE SYST	EM		
8. TARGET DATE FOR	-0):	8	
a. APPLICATION APPROVAL	b. SYSTEM ACTIVATI	ON c.	SYSTEM TERMINATION
9. SYSTEM RELATIONSHIP AND ESSENTIA	LITY	<u> </u>	
10. REPLACEMENT INFORMATION			
11. RELATED ANALYSIS AND/OR TEST DATA	Α		
12. NUMBER OF MOBILE UNITS			
13. GEOGRAPHICAL AREA FOR			
a. STAGE 2			
b. STAGE 3			
c. STAGE 4			
14. LINE DIAGRAM See page(s)	[10] (10] (10] (10] (10] (10] (10] (10] (
16. TYPE OF SERVICE(S) FOR STAGE 4	See page(s) R STAGE 4 17. STATION CLASS(ES) FOR STAGE		R STAGE 4
		. 0.8	
18. REMARKS			
DOWNGRADING INSTRUCTIONS N/A	CLASSIFICATION UNCLASSIFIED	D	

KK. Appendix KK – Control System and Network Submittals

The following sheets provide more information for control system and network submittals.

SD-11.7 Disabled Ports Connectors Interfaces and Know Vulnerabilities

See provided SD-11.7 Appendix which provides documentation of all ports. Disabled Ports have been indicated.

There are no known methods for bypassing computer authentication in this product.

See provided SD-11.7 Appendix showing DELL response to request for information. At the time of turn-over to the government, the laptop had no known back doors. The computer as provided by DELL included no known back doors. Crane Contractors created no back doors during set-up and installation of required Magnetek software.

SD-11.8 Network-Capable Devices

- (a) Original Firmware Not Available from Vendor
- (b) Original Firmware hash Not Available from Vendor
- (c) SOP for application of firmware updates/patches
 - Not Available from Vendor
- (d) POC or website for firmware updates/patches
 - dell.com/support/home/en-us//Products?app=drivers
- (e) Count of Interfaces and Types Not Available from Vendor
- (f) Protocols in use, per interface Not Available from Vendor
- (g) Configuration file Not Available from Vendor
- (h) SOP for configuration Not Available from Vendor

SD-11.9 Engineering Workstation

- (a) SOP for application of software updates/patches
 - Windows 10: go to settings>update&security>windows update
- (b) POC or website for software updates/patches
 - Windows 10
 - support.microfsoft.com/en-us/windows/update-windows-10
- (c) Protocols in use, per interface Not Available from Vendor
- (d) SOP for configuration Not Available from Vendor
- (e) PLC programming; other crane interface software & licensing
 - Not Available from Vendor
- (f) Other compatible software Not Available from Vendor

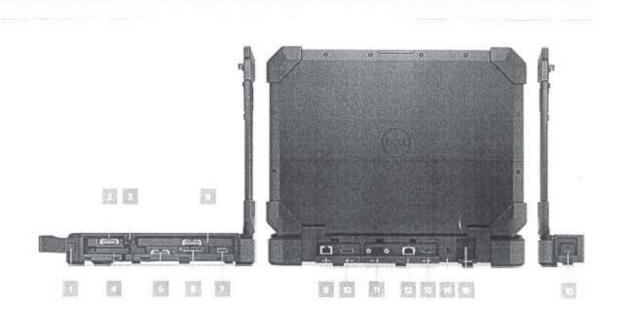
NOTE: Files for CDs/DVDs for SD-11.8 & SD-11.9 are not available

SD-11.10 Control System Access Control.

This Dell laptop has system access VIA a password protection. Multiple accounts can be generated, please reference SD-11.10 appendix for procedure. Upon the booting up of the Dell Laptop the Password screen launched. The Cranes SN# is 19-5050. The provided Laptop has a password of 19-5050. The password is entered in the provided screen and will proceed to the Home page. Also, the Magnetek Software is Pass-Key protected. The software key needs to be installed in a USB port before the Magnetek software is enabled.

- SD-11.11 Control Systems Account Management
 Laptop as provided has only one account that is accessed using the 19-5050 password. Only one active account is needed for proper operation.
- SD-11.12 Patch Management and Updates.
 The Dell laptop is a closed loop computer system. In the occurrence of a required Patch or Update, the presentation of the revised software will have be provided VIA a flash drive and a USB port. Since this is a working closed system, no patch management is required.
- SD-11.13 Malware Detection and Protection.
 The Dell laptop is provided with standard Microsoft Windows malware and corruption protection software protocols.
- SD-11.14 Wireless Technology Provisions. Not applicable.

SD-11.7 APPENDIX



Ports & Slots

1. Anchors (straps optional) | 2. Removable Secondary SATA Storage Bay (Optional) | 3. Stylus | 4. Smart Card Reader (Optional) | 5. Removable Primary PCle Storage Bay | 6. SD and SIM card Slot | 7. USB 3.0 Type A | 8. Blu-ray+R/W or DVD+R/W or Removable Third SATA Storage Bay (Optional) | 9. RJ-45 gigabit Ethemet network connector (Optional) | 10. Serial, VGA, or Display Port (Optional) | 11. Native Serial | 12. RJ-45 gigabit Ethernet network connector | 13. HDMI | 14. Lock slot | 15. Power in | 16. USB 3.0 Type C ™ Power and Display | 17. USB 3.0 Type A | 18. USB 3.0 Type A | 19. Universal Audio Jack

Additional Optional Slots: ExpressCard or PCMCtA Contacted and Contactless Smartcard Fingerprint Reader

Additional Items not provided

Note:

Complete Control System and Network Product Data Available SD-03.C1- C3

SD-11.7 APPENDIX

John Doe

From: Jane Doe

Sent: Wednesday, August xx, 2022 xx:55 AM

To: John Doe, Crane Doe

Subject: FW: Dell Support: SR# 10680090xx from Comp rep [ref:_00D0bGaMp. 5002R1LyDVz:ref]

From: Dell Tech Support <technical_support@help.dell.com>

Sent: Wednesday, August xx, 2022 11:30 AM To: Jane Doe <janedoe@crane.contractor.com>

Subject: RE: Dell Support: SR# 10680090xx from Comp rep [ref:_00D0bGaMp._5002R1LyDVz:ref]

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Jane,

Greetings for the day!

I am sorry but all-encompassing statement requested is not possible.

A backdoor in many aspects will only be tested or detected once the computer has been setup. Once out of the box, the responsibility falls on the user. At that point, the user can install any and all programs he believes he needs for the job - at any rate, we can't validate that the computer or any of the programs installed at the time they used it for the Navy project are even secure Or if those will pass the said standards.

In terms of security, we release BIOS, driver and FW updates as soon as Dell is made aware of such vulnerabilities but at that point where the laptop is being used who knows if the customer installed any of them?

If you wish, you can either get in touch with their account manager or Dell legal team, create a HAC request if you feel it is necessary.

Thank you for choosing Dell!

Thanks and Regards, Company Representative Technical Support Supervisor

Create a local user or administrator account in Windows

Windows 10

You can create a local user account (an offline account) for anyone who will frequently use your PC. The best option in most cases, though, is for everyone who uses your PC to have a Microsoft account.

If needed, the local user account can have administrator permissions; however, it's better to just create a local user account whenever possible.

Caution: A user with an administrator account can access anything on the system, and any malware they encounter can use the administrator permissions to potentially infect or damage any files on the system. Only grant that level of access when absolutely necessary and to people you trust.

SD-11.10 APPENDIX

As you create an account, remember that choosing a password and keeping it safe are essential steps.

Because we don't know your password, if you forget it or lose it, we can't recover it for you.

If you're using Windows 10, version 1803 and later, you can add security questions as you'll see in step 4 under **Create a local user account**. With answers to your security questions, you can reset your Windows 10 local account password. Not sure which version you have? You can check your version.

Create a local user account

- Select Start > Settings > Accounts and then select Family & other users. (In some versions of Windows you'll see Other users.)
- Select Add someone else to this PC.
- Select I don't have this person's sign-in information, and on the next page, select Add a user without a Microsoft account.
- Enter a user name, password, or password hint—or choose security questions—and then select **Next**.

Open Settings and create another account

SD-11.10 APPENDIX

Change a local user account to an administrator account

- 1. Select Start > Settings > Accounts .
- Under Family & other users, select the account owner name (you should see "Local Account" below the name), then select Change account type.

Note: If you choose an account that shows an email address or doesn't say "Local account", then you're giving administrator permissions to a Microsoft account, not a local account.

- Under Account type, select Administrator, and then select OK.
- 4. Sign in with the new administrator account

LL. Appendix LL – Control System Inventory

Please see the following sheets for an example control system inventory.

General Information	Location Information	Hardware Details	Operating system and Platform	Network Information (Actual Function, not potential function)
1	100		Embedded OS	
Unique ID	Facility Name	Device Type	(Yes/No)	MAC Address(es)
NA	NNSY	Computer	Yes	NA
Barcode or Identifier	NFAID	Device Sub-Type	OS Contractor	IP Address(es)
NA	na	Laptop	Microsoft	NA
Region	Commodity	Device Function	Operating System (O/S)	Upstream Device
NA	M140 #5	Crane Controls	Windows	NA
Installation	Floor	Manufacturer	O/S Version	Protocols In Use
NA	NA	Panasonic	10	NA
Option (ONA1)	Alcove	Product Line	Platform Contractor	Host Name
NA	Alcove	Tuffbook	NA	NA
	Location NA	Model # FZ-55A0601VM	Platform Product Line NA	o.
	System Type	Serial #	Platform	
	Computer	2ATTA214xx	NA	
	Functional System or Equipment Control	Remote Connectivity: (Wired/Wireless/None)	Platform Version	
	Control	None	NA	
		Network Type Used:(Serial/Ethernet/Both/None)		

General Information	Location Information	Hardware Details	Operating system and Platform	Network Information (Actual Function, no potential function)
	111	V	Embedded OS	
Unique ID	Facility Name	Device Type	(Yes/No)	MAC Address(es)
NA	NNSY	VFD	Yes	NA
Barcode or Identifier	NFAID	Device Sub-Type	OS Contractor	IP Address(es)
NA	NA	VFD	Magnetek	NA
Region	Commodity	Device Function	Operating System (O/S)	Upstream Device
NA	M140 #5	Hoist Controls	NA	NA
Installation	Floor	Manufacturer	O/S Version	Protocols In Use
NA	NA	Magnetek	NA	NA
Special Area (Option DNA1) NA	Alcove Alcove	Product Line 4014-VG+S4	Platform Contractor NA	Host Name NA
NA	Alcove	4014-VG+S4		NA NA
	Location	Model #	Platform Product Line	
	NA	CIMR-AU4A0018FAA	NA	
	System Type	Serial #	Platform	
	OET CRANE	1W21735989700xx	NA	
	Functional System or Equipment Control Control	Remote Connectivity: (Wired/Wireless/None) NONE	Platform Version NA	
	CONTION	NONE	INA	
		Network Type Used:(Serial/Ethernet/Both/None)		
		None		

General Information	Location Information	Hardware Details	Operating system and Platform	Network Information (Actual Function, not potential function)
THE REP			Embedded OS	
Unique ID	Facility Name	Device Type	(Yes/No)	MAC Address(es)
NA	NNSY	VFD	Yes	NA:
Barcode or Identifier	NFAID	Device Sub-Type	OS Contractor	IP Address(es)
NA	NA	VFD	Magnetek	NA
Region	Commodity	Device Function	Operating System (O/S)	Upstream Device
NA	M140 #5	Bridge Controls	NA	NA
Installation	Floor	Manufacturer	O/S Version	Protocols In Use
NA	NA	Magnetek	NA	NA
Special Area (Option DNA1)	Alcove	Product Line	Platform Contractor	Host Name
NA	Alcove	4005-VG+S4	NA	NA
	Location NA	Model # CIMR-AU4A0007FAA	Platform Product Line NA	
	System Type	Serial #	Platform	
	OET CRANE	1W21735933600xx	NA NA	
	Functional System or Equipment Control	Remote Connectivity: (Wired/Wireless/None)	Platform Version	
	Control	NONE	NA	
		Network Type Used:(Serial/Ethernet/Both/None)		
		None		

General Information	Location Information	Hardware Details	Operating system and Platform	Network Information (Actual Function, not potential function)
	the state of		Embedded OS	No may
Unique ID	Facility Name	Device Type	(Yes/No)	MAC Address(es)
NA	NNSY	VFD	Yes	NA
Barcode or Identifier	NFAID	Device Sub-Type	OS Contractor	IP Address(es)
NA	NA	VFD	Magnetek	NA
Region	Commodity	Device Function	Operating System (O/S)	Upstream Device
NA	M140 #5	Trolley Controls	NA	NA
Installation	Floor	Manufacturer	O/S Version	Protocols In Use
NA	NA	Magnetek	NA.	NA
(Option DNA1)	Alcove	Product Line	Platform Contractor	Host Name
NA	Alcove	4003-VG+S4	NA	NA
	Location NA	Model # CIMR-AU4A0004FAA	Platform Product Line NA	
_	System Type	Serial #	Platform	
	OET CRANE	1W21735986100xx	NA	
	Functional System or Equipment Control	Remote Connectivity: (Wired/Wireless/None)	Platform Version	
	Control	NONE	NA	2
		Network Type Used:(Serial/Ethernet/Both/None)		
		None		

MM. Appendix MM – Evaluation Status of Hardware and Software

Please see the following sheet for an example of this item.

Crane Contractor letterhead

Evaluation Status of Hardware and Software (SD-11.1xx)

Status of Hardware:

- Intel Core i5-8350U Processor
 - Not Evaluated
- Intel Core i5-8350U Processor Base with UHD 620 Graphics Card
 - Not Evaluated
- . M.2 256GB PCIe NVMe Class 40 Opal 2.0 Self Encrypting Solid State Drive
 - Not Evaluated
- 8GB DDR4 Non-ECC Memory
 - Not Evaluated

Status of Software:

- · Micorsoft Windows 10
 - NIAP evaluated on 2019.10.26 (PASS)
- · Cyberlink Media Suite Essentials for windows 10 and DVD Drive
 - Not Evaluated
- McAfee Small Business Security 30 Day Trial
 - Not Evaluated
- Dell Encryption Personal
 - Common Criteria evaluated on 2017.10.02 (PASS)

Sincerely,

Signature here

John Doe, P.E. Engineering Division Crane Contractor, LLC

End of Document