April 25, 2017

Port of Tacoma Engineering Department
1 Sitcum Plaza
Tacoma, WA 98421
Attn: Stan Ryter

Subject: Maintenance Shop Bays 3 & 4 Bridge Crane Feasibility Study

Mr. Ryter,

Thank you for the opportunity to support the Port of Tacoma with this project. Cardno's team was tasked with evaluating the feasibility of installing a bridge crane in Bays 3 and 4 of the Strad Maintenance shop. There are existing crane rails and crane beams as well as electrical infrastructure that were installed when the building was constructed in the 1990s. The Cardno team evaluated the existing infrastructure and clearances to assess whether a 20 ton capacity bridge could be installed, and if not to determine the next larger size crane that can be installed. We have also provided an opinion of probable cost for the crane installation and commissioning as well as improvements that would be required to install the crane.

The results of our investigation and research are presented on the following pages. The full reports prepared by each of the specialist consultants (AHBL and BCE) are included at the end of this report.

Please call or email with any questions.

Sincerely,

Rick Unruh
Project Manager
206-999-9579
Richard.Unruh@Cardno-GS.com

Port of Tacoma

Maintenance Shop Bays 3 & 4 Bridge Crane Feasibility Study

Findings

Clearances

A 20-ton girder bridge crane can fit within the available clearance envelope, but the crane hook would not clear the height of the Kalmar ESC 340 straddle carrier, even with the guardrails in the lowered position. Because of this limitation, we do not recommend a 20-ton crane.

Based on information provided by one crane manufacturer (Demag), a 12 metric ton (13.6 US ton) crane will fit within the available space envelope and the crane hook will clear the straddle carrier with the guardrails in their raised position. A 12 metric ton crane is our recommended solution. Note that other manufacturers may have similarly sized and configured cranes with a higher capacity that may also be feasible options.

Note that the information provided by DEMAG as part of the AHBL report is for reference only. Actual specifications and details for the crane to be installed will be determined during final design (to establish the performance specification for bidding) and by the selected crane manufacturer, during the shop drawing review process. Options, dimensions and other details in the enclosed information were used to establish a general budget and clearance envelope only.

Structure

The team evaluated the existing crane rails, beams and supporting corbels. The beams can safely support either of the cranes that were reviewed, but the welds attaching the corbels to the columns are of generally poor quality and are improperly sized. Because of this, reinforcement will need to be installed at each of the 4 corbel locations to support any crane. The reinforcement is detailed in the attached report from AHBL. As noted in AHBL's report, we anticipate that the structural improvements will require an over-the-counter permit.

Electrical

When the building was constructed, infrastructure was installed for a "future" 3-phase, 480V, 3-wire, 30A dedicated circuit for the bridge crane in Bays 3 and 4. A 3P-30A circuit breaker was installed in Panel A, with conduit and #10 AWG-Cu conductors running to a 60A disconnect switch on the back wall of Bay 3, directly below the end of the northeast crane beam.

Based on the information provided by Demag, a the 12 metric ton crane will draw up to 37 full load amps, which will require a 50 amp circuit. The recommendation is to replace the existing #10 conductors in the conduit with (4) #6 AWG-Cu conductors and replace the circuit breaker with a new 3P-50A breaker. The existing 60A disconnect will be acceptable for the new crane. As noted in BCE's report, this work can be completed by Port electricians under the standing TPU permit. If the work is completed by an outside contractor, it will require an over-the-counter permit. In either case, the work must be inspected by TPU.

As part of the final design phase, demand meters will be installed on Panel A and Building Power Distribution Switchboard No. 5 to confirm that capacity exists for the larger breaker.

It was also noted by the team that the lighting in Bays 3 and 4 is not consistent with the lighting in Bays 1 and 2, particularly closer to the ceiling, where higher work may be performed on strads. The recommended illumination level for a maintenance shop is 50 footcandles at work height (2'-6" above finished floor level), per IES. It is recommended that lighting be evaluated and upgraded as needed to accommodate the new use of the bays.

Costs

Crane -- $85,000 + installation & commissioning ($20-50,000) use	$135,000
Structural Upgrades --	$ 12,000
Electrical for crane --	$ 7,000
Lighting upgrades --	$ 36,000
Total construction costs --	$190,000

Using a 1.7 multiplier for soft costs (final design, contingency, project management, etc.) the total project cost is estimated at **$325,000**.

Note that determining the actual installation and commissioning costs will require that the crane manufacturer and installer visit the site to confirm the most suitable means and methods of raising the crane into place.

Schedule

Final design & Bidding:

Construction cost estimate: 5/15/217

90% plans & specifications for review: 3-4 weeks – 5/31/2017

100% plans and specifications/bid documents: 1-2 weeks from receipt of comments

Bidding – 4 week bid/award cycle

Construction phase:

4 week shop drawing review phase

18-20 weeks manufacturing of crane

4 weeks delivery/install of crane

28 week total construction time.

PROJECT MEMO

TO:	Mr. Rick Unruh, Cardno	**DATE:**	April12, 2017
FROM:	Joseph Simon, P.E. Tacoma, office: (253) 383-2422	**PROJECT NO.:**	2160768.20
		PROJECT NAME:	Maintenance Shop Crane Installation Feasibility Study
SUBJECT:	Crane Installation Feasibility Study Preliminary Results		

AHBL was retained to study the feasibility of installing a bridge crane in a bay of the straddle carrier maintenance building on the Port facility. The building was remodeled in the late '90's. Crane rails on crane beams were installed at the time of the remodel, but a crane was not installed. The Port is now considering installation of a 20 ton bridge crane on the existing rails. If a 20 ton crane is not feasible, the Port is interested in the next lower capacity crane that will work in the building.

AHBL has been tasked with the following:

- Determining the space available for the crane to move within.
- Determining the largest capacity crane that can work within the available space.
- Determining what modifications are necessary, if any, for the new crane installation.
- Generating a cost estimate for the modifications, the crane, its installation, testing and commissioning by the crane installer.

Based on our investigations we find that a 20-ton girder bridge crane can be installed in the maintenance building but that the crane hook for the 20-ton crane extends below the bridge beams in its highest position and will not clear the height of the Kalmar ESC 340 strad carriers with their guardrails in the lowered position. We find that a Demag 12 metric ton crane (13.6 US ton) crane can fit within the available space and raise its hook to clear carrier guardrails in their up position. Based on our field observations and calculations, as well as testing of the welds of the crane beam supports, we find that the existing crane rail beams are satisfactory for the 20-ton crane, but that reinforcement of the corbels supporting the crane rail beams will be required for both a 12-ton and a 20-ton crane. A sketch of this reinforcement along with the results of AHBL's site survey, site observations, weld testing, are presented in the appendix. AHBL estimates that the material and labor installed cost of the corbel reinforcements will be $12,000. This estimate includes the installation contractor supplying his own rented lift. AHBL recommends an over-the-counter pre-application meeting with the Tacoma building department be arranged to determine whether a building permit will be required for the crane installation.

AHBL surveyors field measured the top of, and distance between, the crane beams and also measured the elevation to all sprinkler pipes, air ducts, louvers, and other items that project below the building structure. AHBL structural engineers observed and measured the crane beams and the four crane beam corbels welded to the building frame columns. Pacific RimNDT evaluated the welds at the roots of the crane beam corbels. Their testing showed several flaws in the welds at several locations and observed that, in general, the welds were fillet welds were of a generally poor quality, with an effective size less than ¼ inch. Calculations by AHBL indicate that the welds would be highly stressed by both the 20- and 12-ton cranes and subject to fatigue under the cyclical loading associated with a moderate frequency of use expected of the bridge crane.

Field-acquired information was shared with Mr. John Ward with Demag Cranes. Based on the overhead clearance and clearance required over the straddle carriers, he recommended a 12-metric ton crane. The crane manufacturer's product information and a cost estimate for the crane are presented in the appendix to this report. Installation and commissioning costs that are estimated to be between $20,000 and $50,000.

Power requirements for the crane were also supplied by Mr. Ward and have been shared with BCE engineers who are evaluating the electrical aspects of the new crane installation.

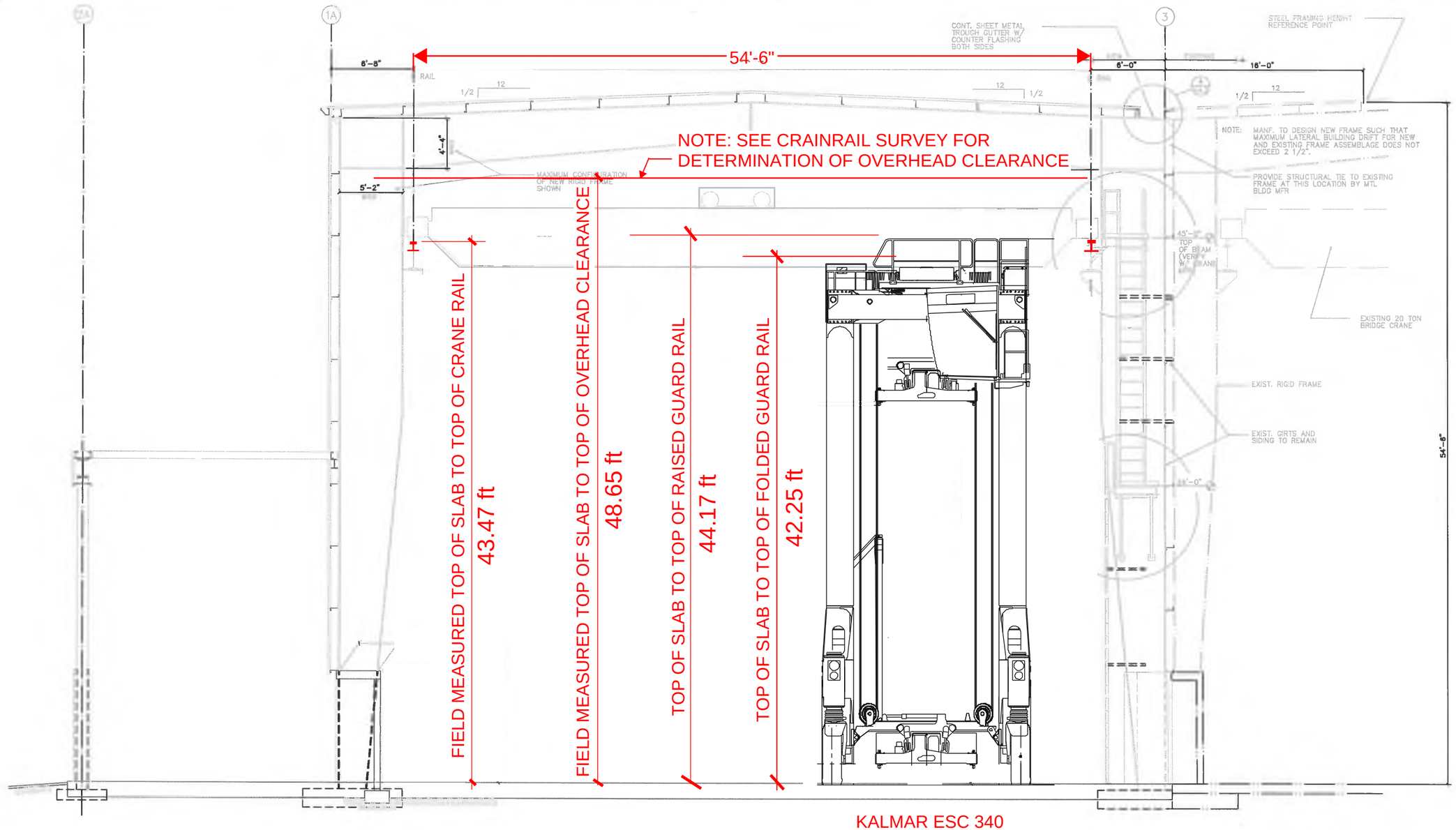
While information for Demag cranes was used in this report, we understand that the final selection of a crane supplier/manufacturer will be based on competitive bidding. AHBL has attempted to accurately and prudently address the issues involved in the new crane installation. Nevertheless, the crane supplier ultimately chosen through the bidding process will have to carefully evaluate the situation on site for themselves to determine the suitability, configuration, and capacity of their crane for installation in the building maintenance building.

We hope this report is complete and useful for your needs. Please feel free to call with any questions.

Sincerely,

Joseph Simon, P.E.

Appendix



BUILDING SECTION ALONG GRID D

1/8" = 1'-0"

1

89172
STRADA41

PORT OF TACOMA
P.O. BOX 1837 TACOMA,WASHINGTON 98401
(206)383-5841

CONSULTANTS
AHBL
CIVIL · STRUCTURAL ENGINEERS · LAND PLANNERS
2215 NORTH 30th SUITE 210 · TACOMA, WA. 98403
(206) 383-3422 · FAX: (206) 383-2572

SEAL

APPROVED
PROJ. ENGINEER DATE

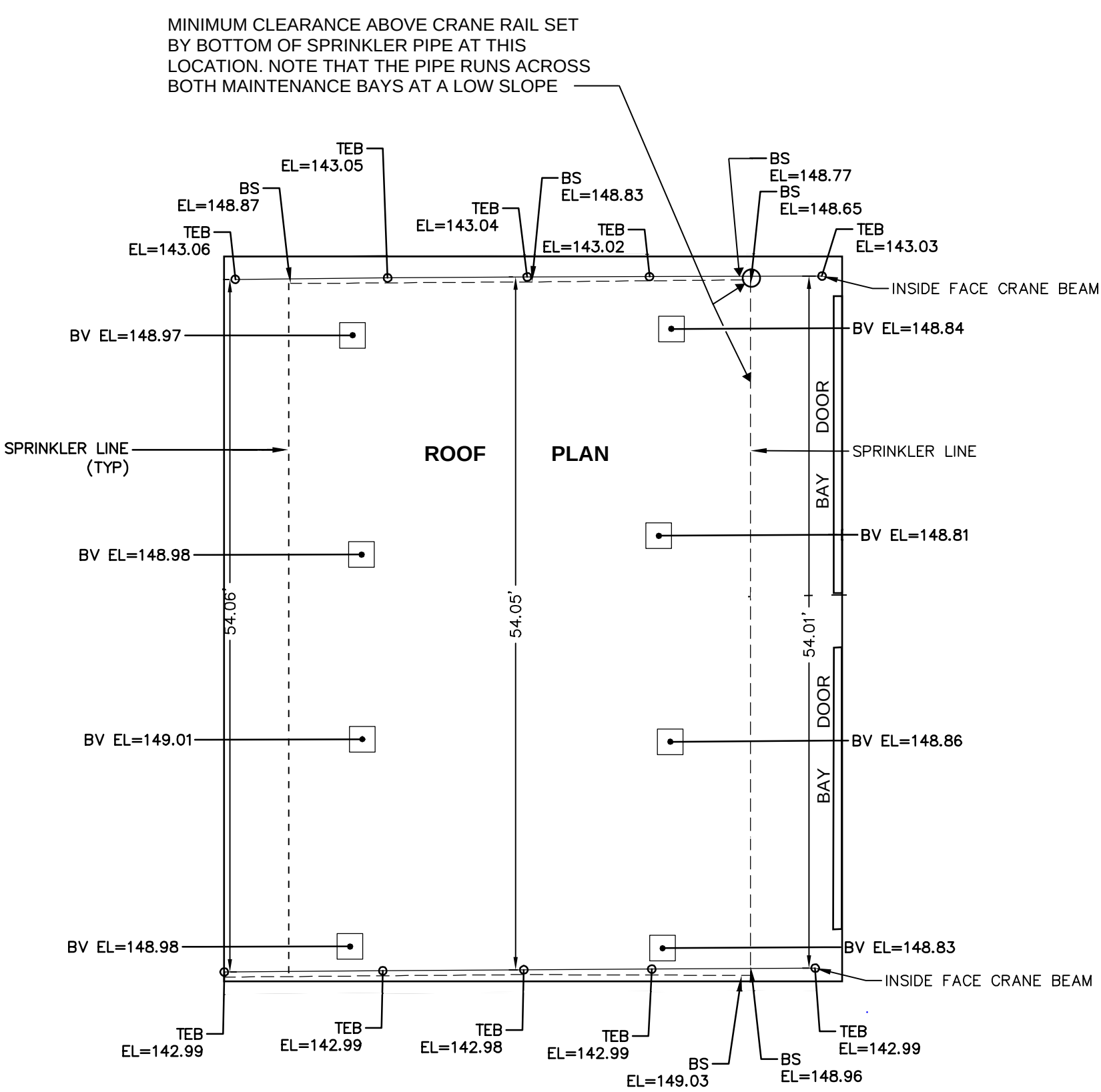
DRAWN BY DATE | CHECKED BY DATE
AS-BUILT BY DATE | PROJ.ENGR. DATE

MARK REVISION BY APP. DATE

BUILDING SECTION
EXISTING CONDITIONS BASED ON
MAINTENANCE SHOP REMODEL
DRAWINGS DATED 1990

DRAWING No: EP-4360-4
CONTRACT No: 680
SHEET No: A4.1 OF 8

CRANE RAIL SURVEY 3-23-17



FINISHED FLOOR ELEVATION = 100.00'

LEGEND

BS	BOTTOM SPRINKLER
BV	BOTTOM VENT
TEB	TOP EDGE BEAM

N

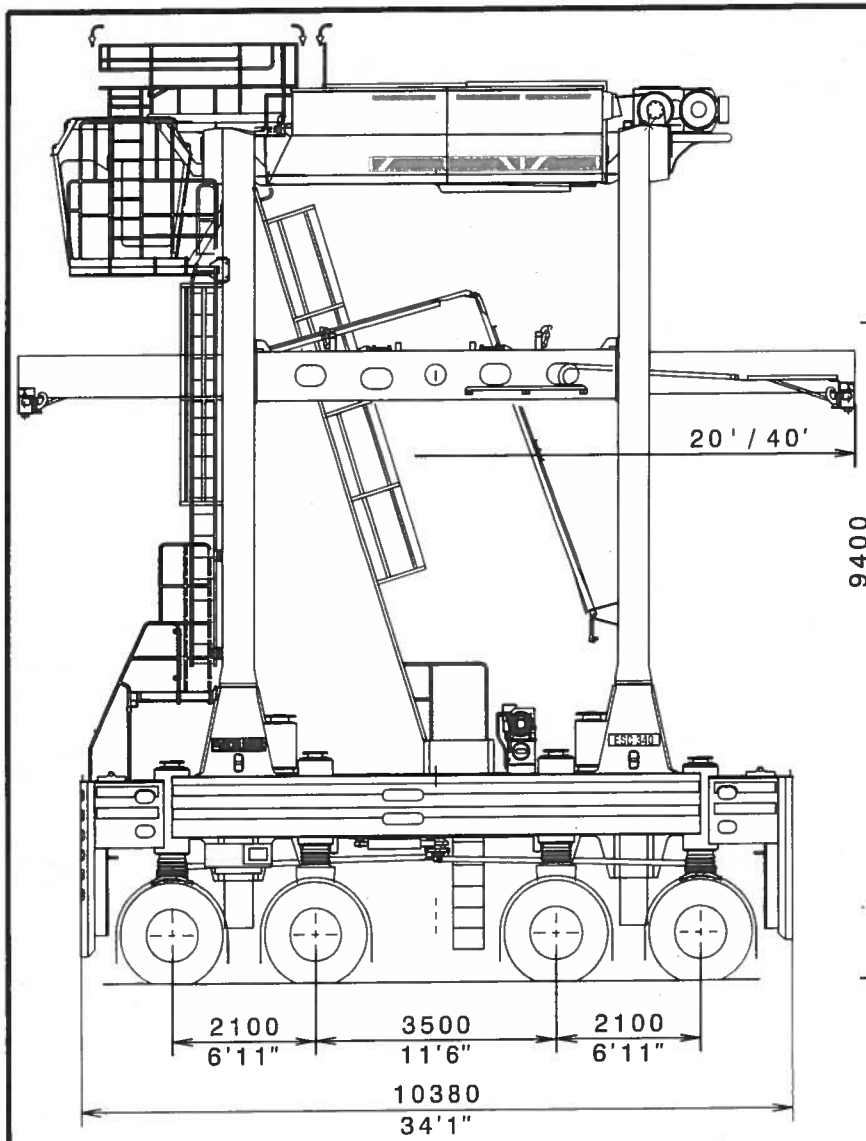
PROJECT NORTH

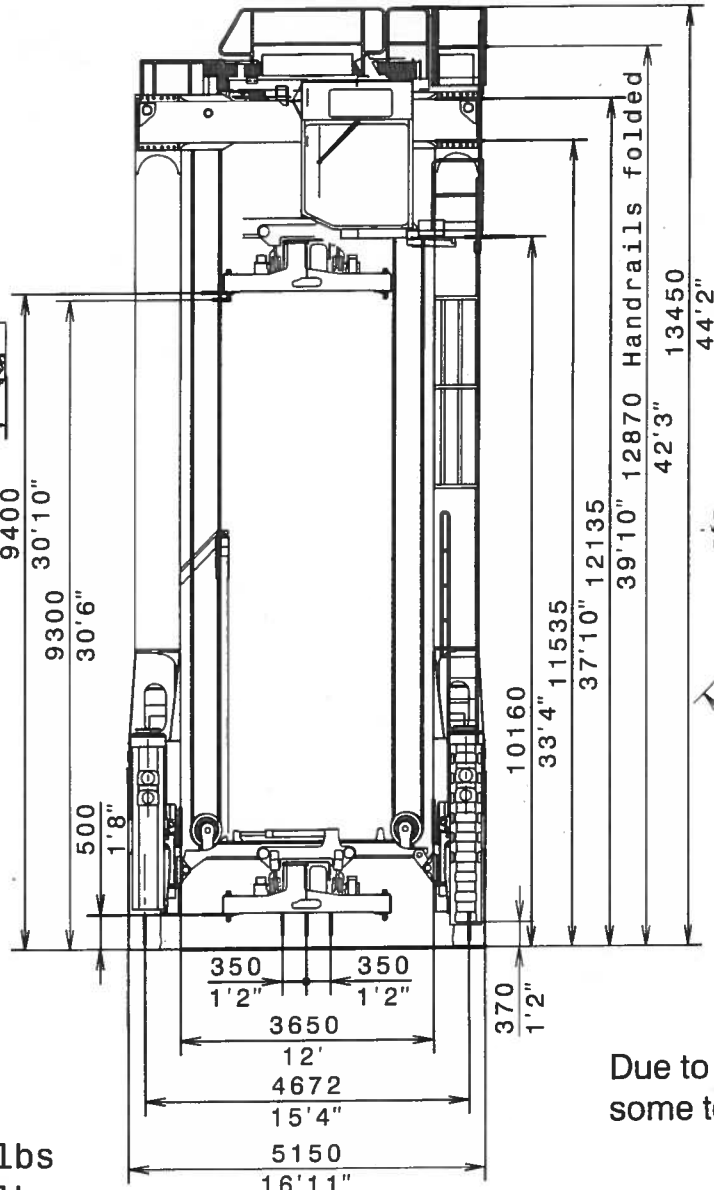
1"=10'

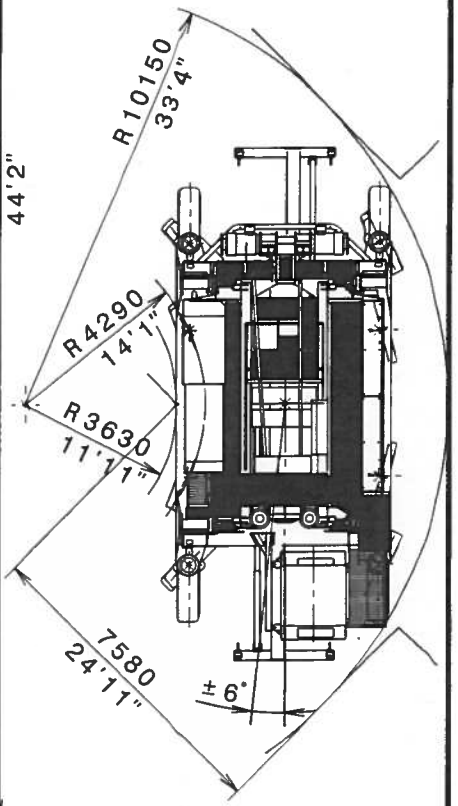
JOB NO. 2160768
March 23, 2017
CRANE RAIL SURVEY
EXHIBIT BY: TD
w:\sdskproj\2016\2160768\2160768.dwg

AHBL

2215 North 30th Street,
Suite 300,
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX







Due to nature of product some tolerances exist.

Load	50,000 kg	110,200 lbs
	40,000 kg	88,200 lbs
Own weight	69,000 kg	136,700 lbs
Max speed loaded	30 km/h	18.6 mph

TITLE Kalmar, ESC 340
3x9'6"x20'/40'

DES 09/05/16 PPS
APPR. DM

Kalmar

DRAWING NO DNG5702

REVISION

SHEET 1/1

PacificRimNDT, LLC

149 3rd Ave SW
Pacific, Wa 98047
Phone: (253) 691-1124
E-Mail: JakePit@PacificRimNDT.com
Web: PacificRimNDT.com

Magnetic Particle Inspection Report

Report #: 492
P.O. #: 17S027
Date: 3/21/2017

General Information

Company: AHBL	Project: Port of Tacoma	
Procedure: PRNDT-MT-201	Specification: ASTM E709	
Acceptance Criteria: AWS D1.1	Item No:	Job No:

Information of Examination Area

- Both Visual and Magnetic Particle Inspection were performed on these parts. See CAD drawing for specific welds.
- After performing a Visual Inspection on the welds noted, it was apparent that nearly all welds sizes were under ¼".
- Page 1 is a General Arrangement of the building with inspected points.
- Page 2 is a CAD drawing of the typical Beam to Column configuration.
- Paint was not removed for any Visual Inspection of the welds. Paint was removed as best as possible for Magnetic Particle, but the corners of welds had no access with the equipment provided by the Port.

Qty	Item	Description	Dimensions	Acc/Rej
1	1	Rejecable Indication on a "stop-start" of a weld. (See Page #3)		Rej
1	2	Rejectable indication on web of base material. (See Photo #4/5)		Rej
1	3	Need smooth transition from flange to column. (See Photo #6/7)		Rej

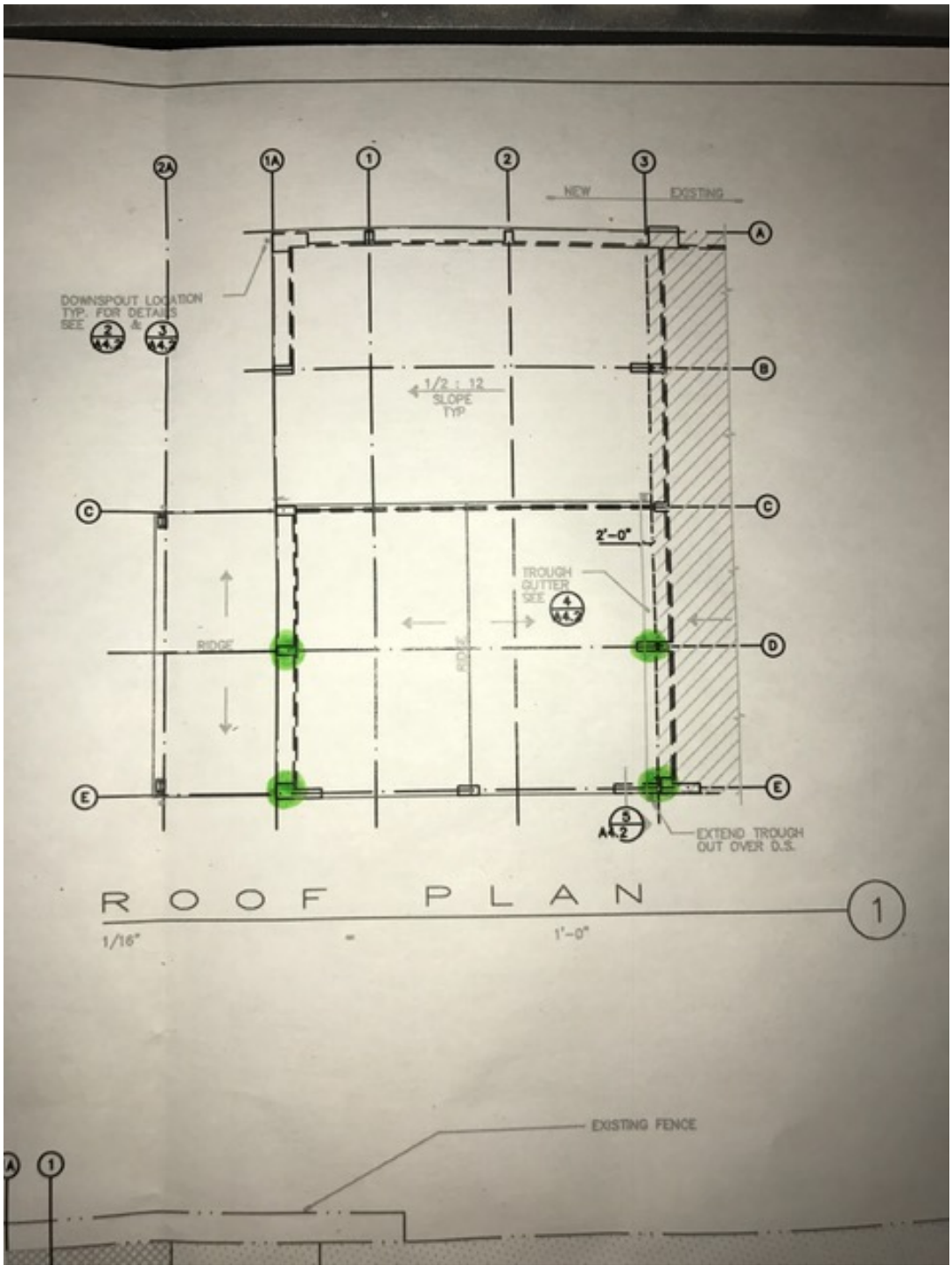
Equipment Information

Instrument: Parker DA-400	S/N: 22425	Calibration Date: 6/1/2016	Calibration Due: 6/1/2017
Current Type: AC	Field: Longitudinal	Demagnetization:	Reading After Demag:
Particle Type: Dry	Color: Grey	Light: Ambient	Surface Finish: Clean Metal
Visible Light Meter: NUB1010B	S/N: S041651	Calibration Date: 6/5/16	Calibration Due: 6/5/17
UV Light Meter:	S/N:	Calibration Date:	Calibration Due:
Visible Light Reading: 156 FC	UV Light Reading:		

Print Name: Jake Pitingoro Level: II

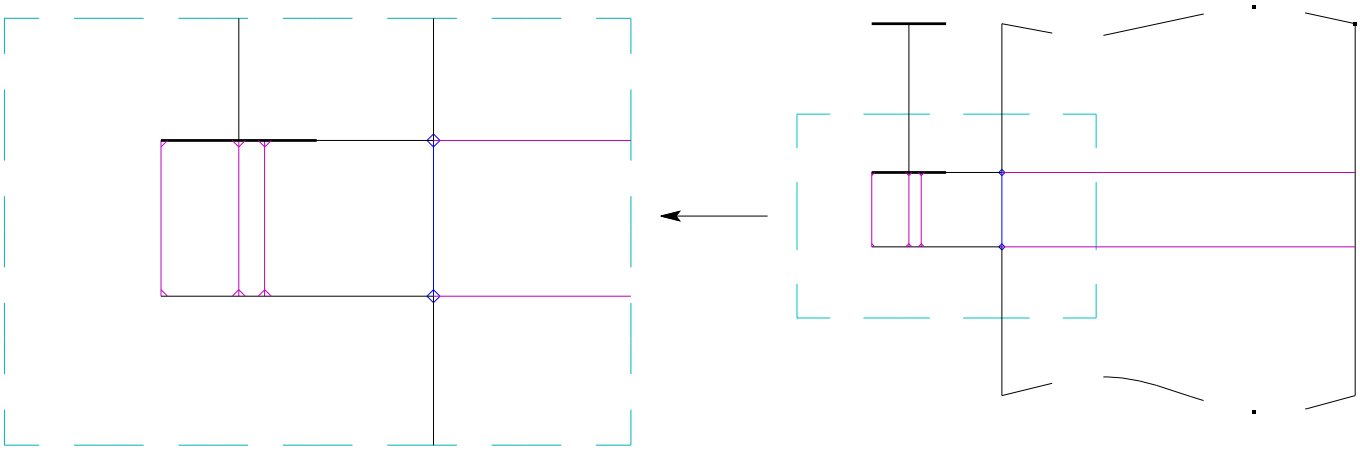
Signature: Jake Pitingoro

General Arrangement of the Points Tested. (Highlighted in Green)



Typical Column to Beam Configuration

Enlarged



Color Legend

Welds that had Visual Inspection Performed

Welds That had Magnetic Particle Inspection Performed

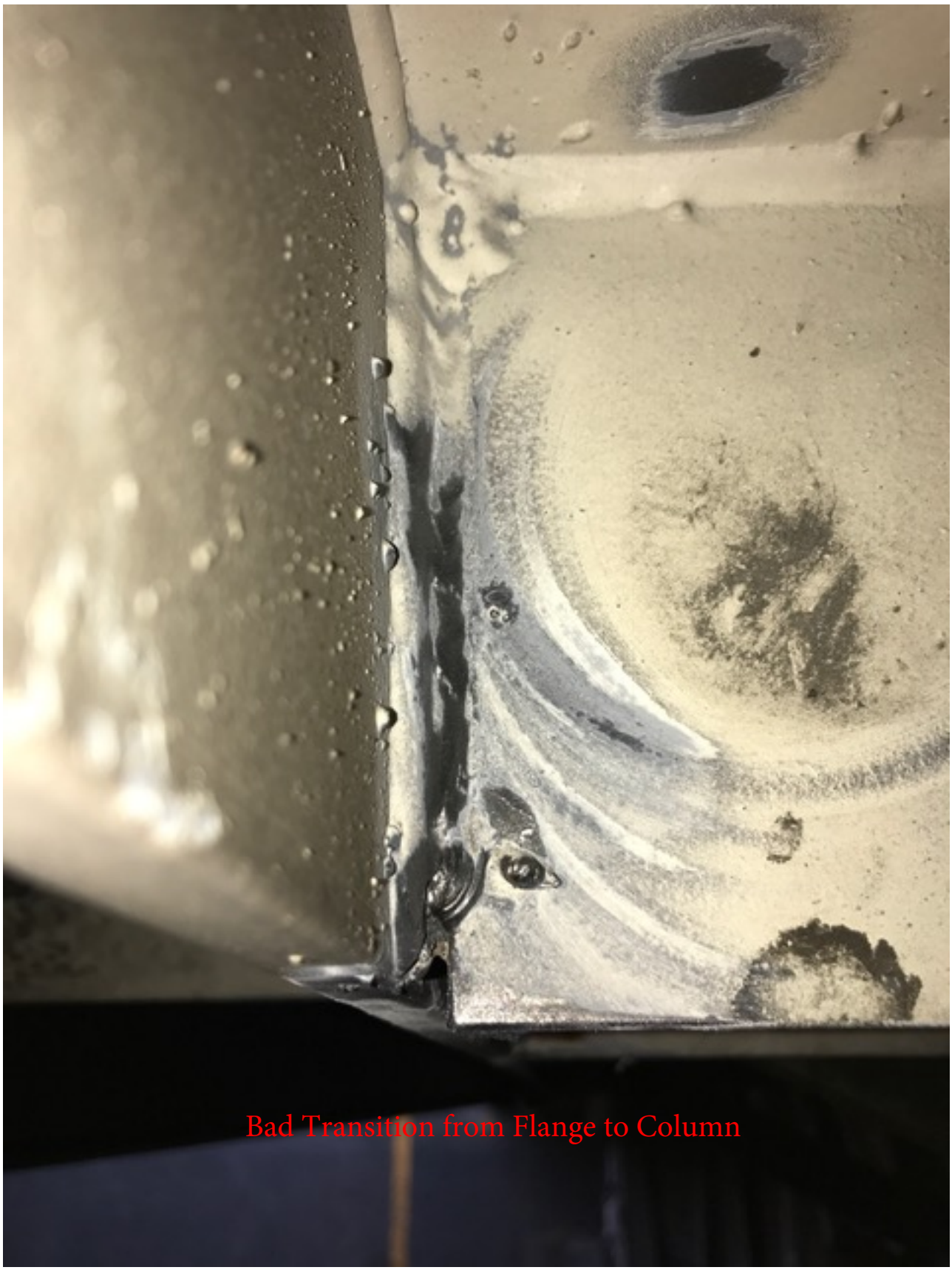

Crater Crack @ Grid Line D,3
Bottom Flange to Column

Indication found on base metal of web plate.
Grid line: E,3


Zoomed in view of
Indication @ Grid
Line: E,3

Indication at Grid Line: E,1A (Top Flange)

Indication at Grid Line: E,1A (Top Flange)



Project POT CRANE
Subject REINFORCEMENT
With/To
Address
Date 4/7/17

Project No. 2160768.20
Phone
Fax #
Faxed Pages
By JFS

☐ Page ____ of ____
☐ Calculations
☐ Fax
☐ Memorandum
☐ Meeting Minutes
☐ Telephone Memo

AHBL

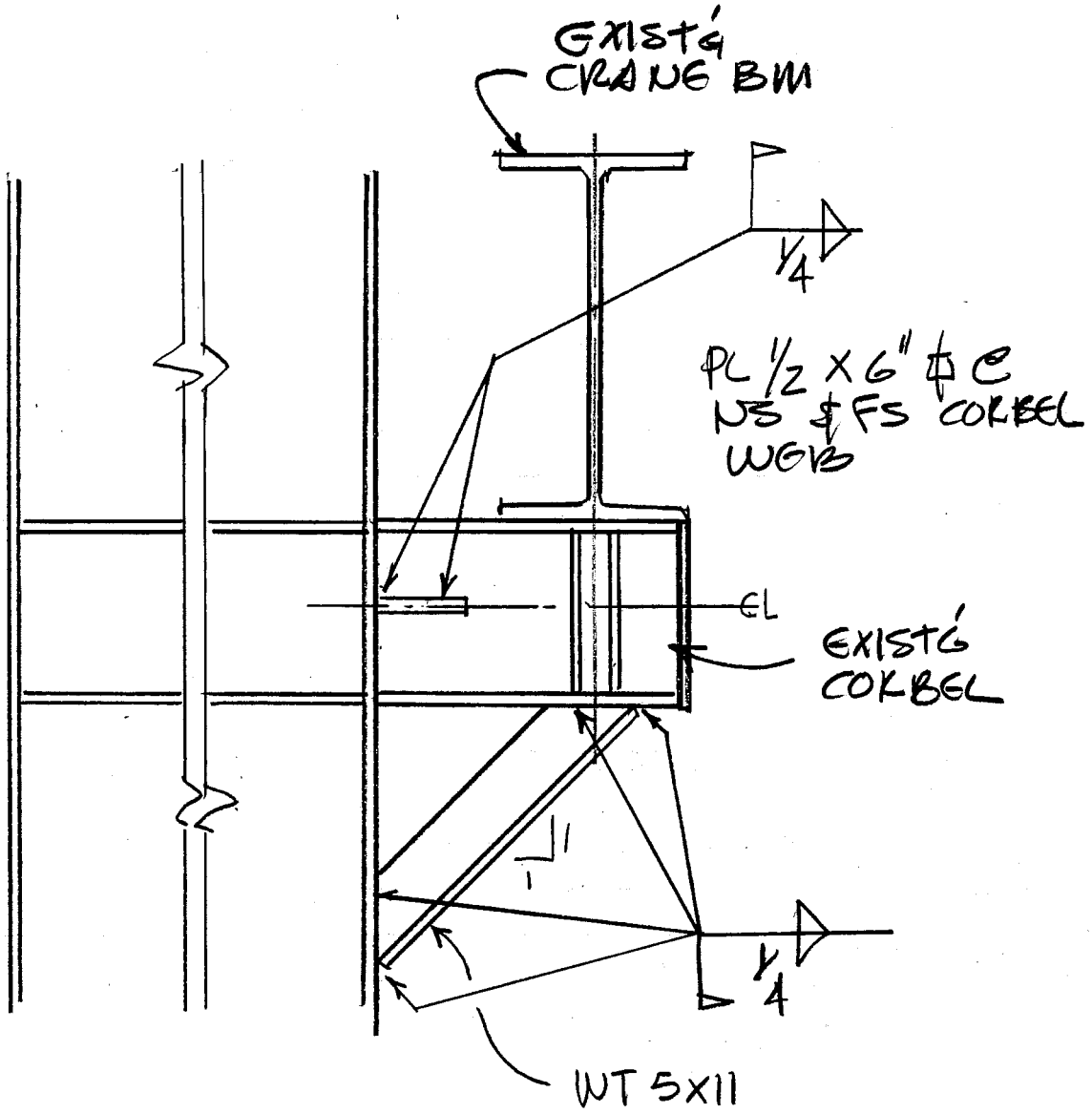
Civil Engineers

Structural Engineers

Landscape Architects

Community Planners

Land Surveyors



CRANE BEAM CORBEL REINFORCEMENT

THIS DETAIL OCCURS AT FOUR LOCATIONS

If this does not meet with your understanding, please contact us in writing within seven days. THANK YOU.

DEMAG
Cranes & Components

April 07, 2017

Mr. Joe Simon, PE
AHBL, Inc.
Tacoma WA 98403

Reference: PORT OF TACOMA – PORTAL CRANE MAINTENANCE HOIST

Dear Mr. Simon,

Thank you for requesting a quotation for Terex MHPS/DEMAG material handling equipment. Demag is the world's largest and oldest manufacturer of material handling equipment, providing quality products for more than 180 years. The knowledge that we are part of a multi-billion dollar corporation provides assurance that we will be manufacturing parts and equipment for years to come. Your equipment will be as valuable to you in the coming years as it is today. As an active member of the Crane Manufacturers Association of America, (C.M.A.A.), Demag is committed to supplying equipment which meets or exceeds industry standards.

When considering this request, I ask you to consider these factors which sets Demag apart from other companies in the material handling industry. Please take time to review all aspects of this quotation.

Hopefully this proposal will meet with your approval. Please contact me if you have any questions, or if I can be of any assistance.

Respectfully submitted,
Demag Cranes & Components Corp.

John A. Ward, Sr.

John A. Ward, Sr.
Senior District Manager

E-mail: john.ward@demagcranes.com
Phone: 425.883.4668

Enclosures:
Quality & Service
Equipment Features
Technical Data and Pricing
Preliminary Approval Drawing

QUALITY & SERVICE

	**EXPERIENCE:** Demag is the world's largest and oldest manufacturer of material handling equipment, components and computer controlled systems. In the United States we have five crane manufacturing facilities strategically located across the country. They are located in Cleveland, OH; Houston, TX; Chicago,IL; Atlanta, GA; and San Bernardino, CA. Our Canadian facilities are located in Toronto, Ontario and Montreal, Quebec. In the five US crane fabrication facilities, Demag manufactures more cranes than any other domestic supplier.
	**TECHNOLOGY:** As the largest manufacturer of material handling equipment and components, our size permits extensive in house development of state-of-the-art crane and hoist components. We design and manufacture our motors, gears, and hoists to be crane components rather than adapt the equipment from outside suppliers.
	**PRODUCT SUPPORT:** Even the finest products are not bargains without a good supply of parts and extensive after sales service capabilities. Each of the Demag manufacturing facilities have parts in stock. In addition, over one hundred dealers and distributors throughout the United States make product support a priority.
	**CODES & SPECIFICATIONS:** Cranes will be designed and manufactured in accordance with Demag's interpretation of the following codes and specifications. A. American Gear Manufacturers Association (AGMA) 1. 210.02 Surface Durability - Spur Gears 2. 211.02 Surface Durability - Helical and Herringbone Gears 3. 220.02 Rating strength of Spur Gears 4. 221.02 Rating strength of Helical and Herringbone Gears B. American Institute of Steel Construction (AISC) Manual of Steel Construction C. American National Standards Institute (ANSI) D. American Welding Society (AWS) E. Crane Manufacturers Association of America (C.M.A.A.) F. Occupational Safety and Health Administration (O.S.H.A.) Part 1910, Section 1910-179 G. National Electrical Code (NEC)

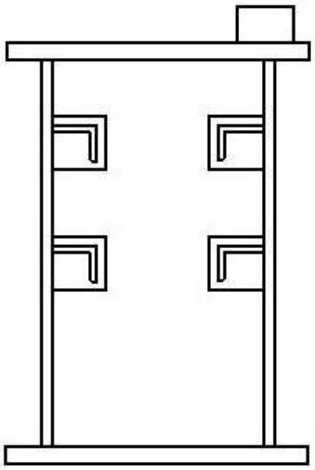
QUALITY & SERVICE

	**TESTING:** Prior to shipment, hoists are tested with a load simulating 125% of rated capacity. Motor amperage draw, and functional testing are performed for all components, prior to shipment.
	**QUALITY ASSURANCE:** Precision parts, assembled by high trained electro-mechanics, our certified welders, and ISO 9000 certified components, are just part of our commitment to manufacturing and delivering quality crane products.
DEMAG DEALER NETWORK	**24 HOUR NATIONWIDE SERVICE:** Factory trained personnel are available to service your equipment throughout the USA and Canada. In addition to Demag servicemen, service support is available from the extensive Demag dealer network.
	**ERECTION AND INSTALLATION:** Demag can handle all your material handling needs including runway erection and crane installation. From turn-key projects to equipment start-up and operator training, trust Demag to get the job done.
	**WARRANTY:** A one year warranty is provided on parts per Demag's standard warranty policy and includes the first 90 days for any replacement labor costs incurred. Extended warranty programs are also available.

Equipment Features

ISO 9001 and 14001 Certified

DEMAG
A TEREX BRAND

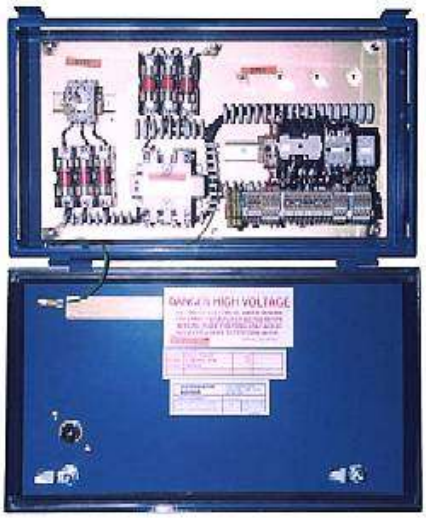
	**CRANE TYPE:** Feature: Top running double girder crane type ZKKE. These rugged cranes of welded box girder construction are designed for a heavy duty service. A DEMAG DR, DMR or DH wire rope hoist is standard. Benefit: We offer standardized cranes for your specific application. Designs are based on high volume and are tested under the toughest applications.
	**GIRDERS:** Feature: Girders for double girder cranes are fabricated plate box sections, with diaphragms, designed to resist all vertical horizontal, and torsional forces. Trolley rails are ST52 rectangular sections welded directly over girder webs, to optimize transmission of loads into the girder structure. Maximum allowable girder deflection is 1/888 of span. Benefit: The girder design insures the optimum strength to weight ratio. This can save building costs in new construction applications.
	**GIRDER CONNECTION:** Feature: End trucks are bolted to girder ends to form a rigid connection. Bolts in shear or welded connections are not used. Benefit: The girder connection is precision aligned to insure proper tracking of the crane. Cranes do not have to be field aligned thus saving installation time and cost.

	**END TRUCKS:** Feature: End trucks are of box section type, having a side connection to the bridge girder, with double flanged wheels supported on rotating axles. The axles are supported by dual anti-friction bearings having a minimum B-10 life in accordance with the CMAA crane classification specified. Wheels are cast and machined from spheroidal graphite material. Wheels are designed to carry the rated load without undue wear to themselves or the crane runways rails. End trucks are fitted with bumpers capable of decelerating and stopping the crane within the limits stated by OSHA and CMAA. Benefit: Heavy duty high cycling drives and wheels with low wearing wheels that self-lubricate as they travel, and gearbox that improve lifetime of the travel components.
	**BRIDGE DRIVES:** Feature: Horizontal bridge drives are of the CMAA type A-4. Motors are totally enclosed, fan cooled and drive fully enclosed gearing. All gear reduction stages are oil bath lubricated. The gear reducers directly drive the wheel axles through splined shafts. VFC (variable frequency control) combined with DEMAG cylindrical rotor motors offer smooth acceleration and deceleration to minimize load swing. Motors have Class F insulation and are thermally protected by heat sensors imbedded in the windings. Benefit: Smooth acceleration and deceleration provides the operator with exceptional control.

Equipment Features

ISO 9001 and 14001 Certified

DEMAG
A TEREX BRAND

	**CONTROLS:** Feature: VFC bridge control provides smooth accel and decel characteristics for accurate load handling. The bridge inverter drive handles a wide speed range and adds safety by reducing load sway. Enclosures are selected to meet the service requirements of the application. Standard enclosure classification is NEMA 12, water tight and dust resistant. Control voltage is isolated from the main power supply by a transformer and does not exceed 120 volts. The standard control voltage for cranes with type DR hoist is 48 volts. Benefit: State of the art controls for smooth crane operation
	**BRIDGE ELECTRIFICATION:** Feature: Electrification across bridge for power and control circuits consists of highly flexible neoprene covered flat-section cable suspended from smooth running enclosed track system. Benefit: This provides a cost effective solution to bridge electrification
	**PAINT:** Feature: All structural and Component parts are cleaned with solvent and or shot blasted or wire brushed. Prime coat and finish coat are applied. Standard colors are safety-yellow for structural parts and DEMAG blue for machinery. Benefit: The product has an exceptional appearance due to the painting process.

Equipment Features

ISO 9001 and 14001 Certified

DEMAG
A TEREX BRAND

HOIST TYPE:
Feature: The DEMAG DMR rope hoist meets all the requirements for state-of-the-art hoists for tomorrow's needs. Besides the space-saving design and particularly long service life, it also offers a higher lifting speed for faster handling rates and a comprehensive list of standard features at an attractive price.

Benefit: Standard features included in hoist Insures long trouble free life.

HOIST MOTOR: Feature: DEMAG designed and manufactured, these motors offer dependable performance with a minimum of maintenance. An optimized motor design for low-vibration, quiet operation 12/2-pole squirrel-cage motor with cylindrical rotor. All motors have Class F insulation and are protected from overheating by thermal protectors imbedded in the windings. Motors are totally enclosed, fan cooled (TEFC). Enclosure is outdoor rated IP 55 with a duty of 60% running time and 360 starts/hour.

Benefits: The hoist motor specifically designed and manufactured by DEMAG insures to meet the challenges of lifting applications.

HOIST GEARING: Feature: All gear stages have helical gearing and are case hardened for low noises and smooth running. Each gear and hub connection is designed with a conical bonded press-fit connection. This means high resistance to vibration and insensitivity against load peaks. Gear lubricant is synthetic and does not require replacement for the normal life of the hoist. The standard hoist design is rated for FEM2m+ (20% greater duty than FEM2).

Benefit: The heavy duty gears are permanently immerse in a high grade synthetic oil that leads to long life.

HOIST BRAKE: DEMAGs DC disk brake is a fail-safe type, electrically released, spring set for close positioning and motor start-up monitoring, with a minimum brake safety factor of 1.8. The brake is fast acting brake due to integrated electronic modules. The hoist (DMR) includes a brake sensor that monitors brake wear and will provide a warning to the operator if a brake adjustment is necessary. The high quality brake is designed for a minimum of 5 years life under single shift operation.

Benefit: The hoist has failsafe braking that insures safe lifting, spotting, and positioning of loads.

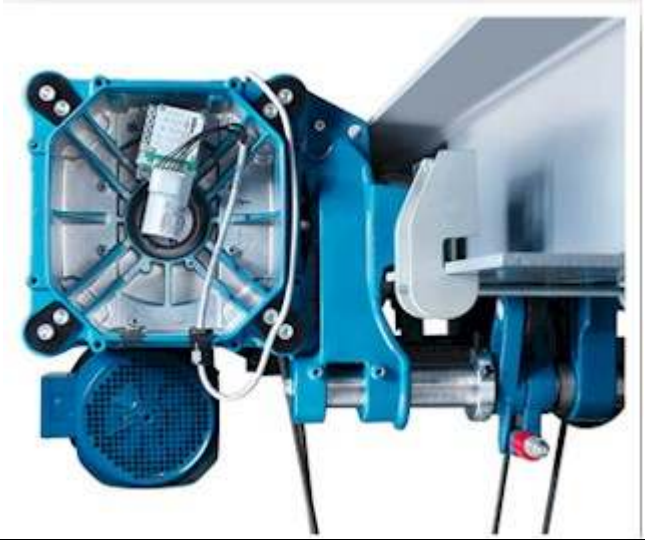
ROPE DRUM: Feature: Drum is of welded steel construction, with machined groove, optimized to a minimum depth of 0.375 times the rope diameter. Supported at each end by sealed anti-friction bearings, the drum is driven by a central splined shaft. To assure positive winding of rope on the drum and to prevent rope overlapping and potentially dangerous groove peak contact, a hoisting rope guide is employed.

Benefit: Reduce rope and drum wear and no risk of double wrapping the rope on the drum.

Equipment Features

ISO 9001 and 14001 Certified

DEMAG
A TEREX BRAND

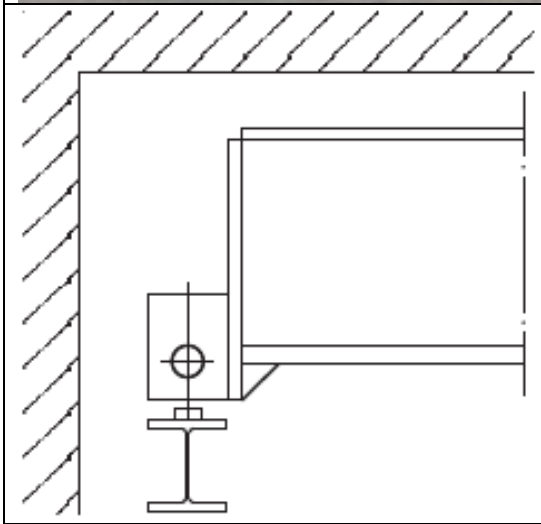
	**BOTTOM BLOCK:** Feature: Bottom block has a totally enclosed housing fabricated of steel. The rope sheaves are supported on anti-friction bearings and the hook is forged alloy-steel and supported on an anti-friction thrust bearing. Hook is equipped with a heavy spring safety latch. A handle recess makes it easier to be gripped and handled. Moving plastic elements close the opening where the rope enters and leaves the bottom block thus preventing the hands from getting caught and jammed. Benefit: Safe handling by keeping operator hands in handle and away from the load.
	**LIMIT SWITCH:** Feature: Hoist is equipped with a 4 position geared upper and lower limit switch. This switch is easily adjusted to set the extreme upper and lower limits of hook travel. The limit switch is equipped with a digital drum revolution counter for use in evaluating service conditions and maintenance intervals. Benefit: Hoist slows than stops at the bottom and the upper limit positions.
	**TROLLEY:** Feature: The EZDMR close headroom double rail trolley supports the hoist on one side of the beam allowing an excellent high-hook dimension. The precision machined and welded steel trolley frame includes drops stops and lifting lugs for transport and installation. The compact design allows for minimum hook approach dimensions. Benefit: Low headroom capability with improved headroom and end approach.

TROLLEY DRIVE: Motorized trolleys are powered by a DEMAG cylindrical rotor motors with DC brake. VFC (variable frequency control) provides smooth accel and decel characteristics to minimize load swing resulting in safe and efficient load handling.

Motors have Class F winding insulation and are totally enclosed. Motors are protected from overheating by thermal protectors imbedded in the windings.

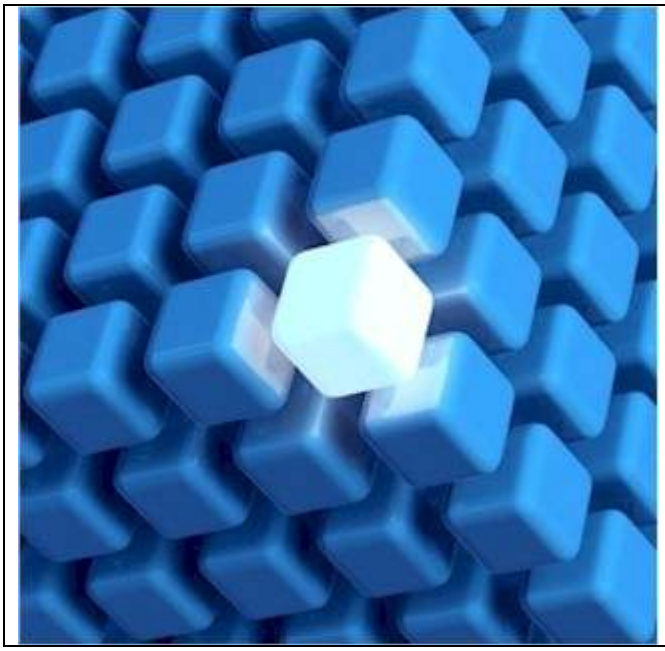
CRANE WALKWAY: Feature: Full length walkway fabricated from steel checkered safety plate with 4 inch high toe guards on all sides. The steel handrails are fabricated from 1 1/2 inch square tubing and are 42 inches high. The All Welded Construction allows the walkway to become an integral part of the box girder.

Benefit: Safe area for plant maintenance personal to work on the crane.



STOOLED UP BRIDGE GIRDERS:

Feature: Optimizes available headroom, maximizes high hook and clearance under bridge.



DEMAG SMARTCHECK: Demag SmartCheck: The DMR sensor system includes: rotary encoder (with pulse wheel), load detector, motor temperature sensor (microtherm) and brake opening contact continously monitor safety-relevant functions.

TECHNICAL DATA, PRICING, & TERMS
Customer: AHBL, INC
Enduser: PORT OF TACOMA
Quotation #:415-17-662B Date: 04/06/2017

ISO 9001 and 14001 Certified

CRANE DATA:	QUANTITY 1
MODEL / TYPE:	ZKKE/ CLASS C/ INDOOR TOP RUNNING DOUBLE GIRDER CRANE with BOX GIRDER DESIGN
CAPACITY:	12.50 M T
SPAN:	54 FT 6.000 IN
MAX. WHEEL LOAD:	19300 LBS
SHIPPING WEIGHT:	19562 LBS
VOLTAGE:	460/3/60

HOIST DATA:	QUANTITY 1
MODEL:	DMR10-12.5-H30/15-4/1-Z-V0.84/4.8-CC
CAPACITY:	12.50 TONS
LIFT (avail. on hoist):	49 FT
SPEED:	16/2.7 FPM(2 Speed)
MAIN MOTOR:	ZBV132B12/2
HORSEPOWER:	2.7/16.9 HP

ENDTRUCK DATA:	
MODEL:	DFW-L-Z 250/4000
WHEEL DIAMETER:	10.0 IN
WHEEL BASE:	158 IN
SPEED:	160 VFC FPM (Ramp and Hold)
MOTOR:	2 x ZBA 90B4
HORSEPOWER:	2 x 3.7 HP @87Hz

TROLLEY DATA:	QUANTITY 1
MODEL:	EZDMR
CAPACITY:	12.50 TONS
WHEEL DIAMETER:	6.3 IN
SPEED:	100 VFC FPM (Ramp and Hold)
MOTOR:	2 x ZBC 80A4
HORSEPOWER:	2 x 1.5 HP @120Hz

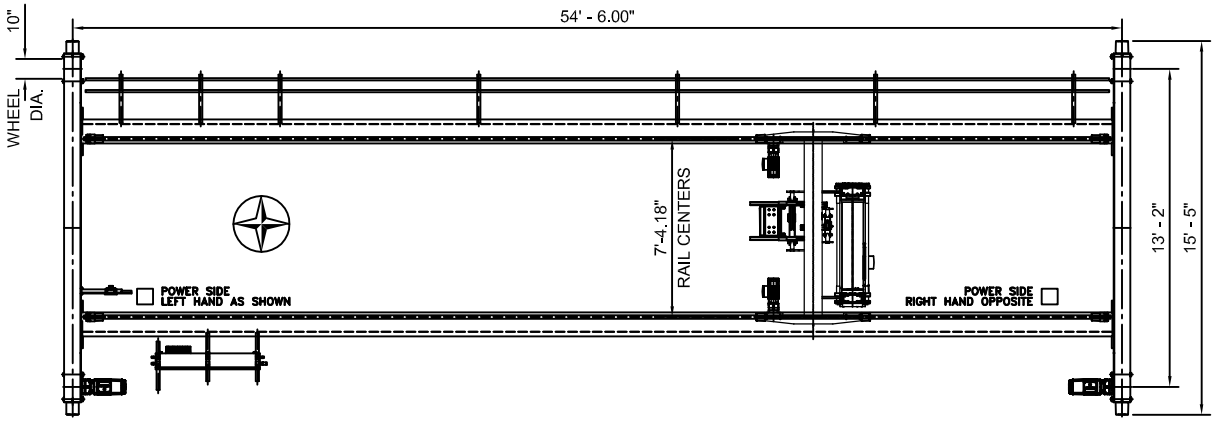
FEATURES (Please see separate detailed equipment feature list for further explanation):

- Low headroom hoist and side connection endtrucks.
- Heavy duty bridge drives with totally enclosed gears in oil bath.
- Stool girders up approximately 25in

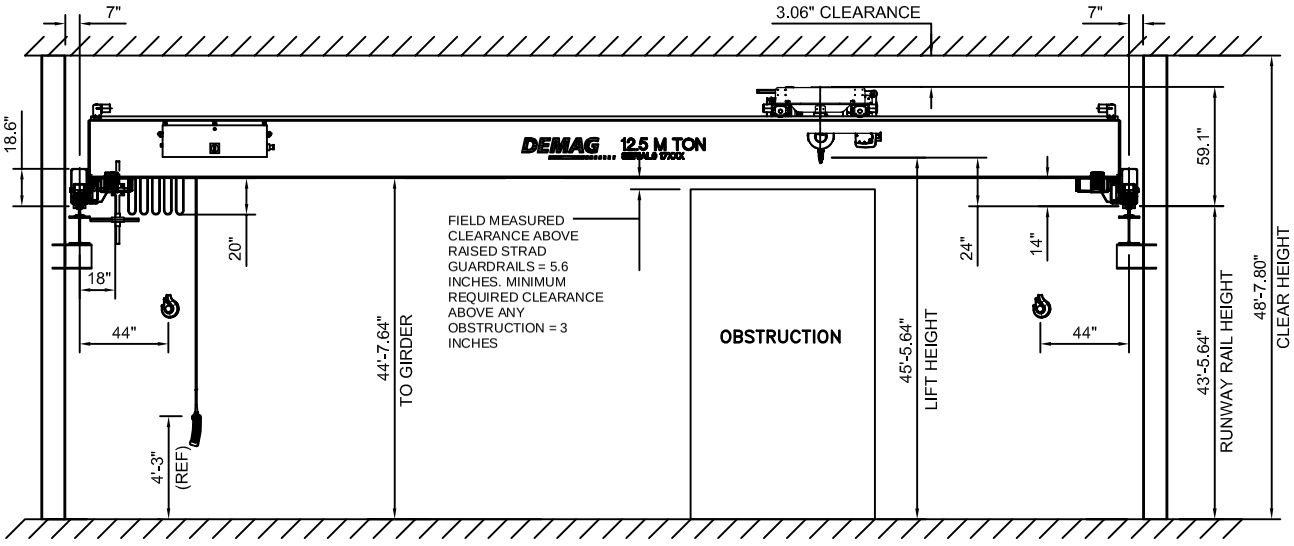
PRICE $ 82,718.06 /each

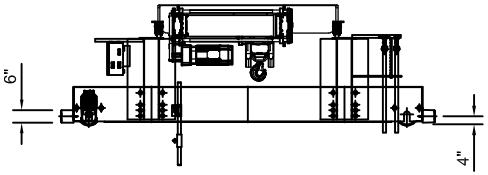
OPTIONS/COMMENTS:

1. For Anti-Condensation Heaters in Control Enclosures, Please ADD: $ 6,084.00 [____].
2. Terms:
    a. Inco Terms: FCA Manufacturing Plant.
    b. Payment Terms: 30% Invoiced upon receipt of order, 30% upon completion of Engineering, 30% prior to shipment, Balance n30 from shipment.
3. Terex MHPS/DEMAG commercial terms and conditions apply.
4. Price valid for 30 days
5. Price does not include state and local tax
6. Price does not include freight, installation, commissioning, or start-up
7. Delivery 18 to 20 week(s) from receipt of order and signed approval drawing.
    a. receipt of complete order, which includes signed approval drawings and complete clarification of technical and commercial details;
    b. if first payment is not received within two weeks after our receipt of order, the order will be placed on hold and re-scheduled upon receipt of payment, subject to production loading and material availability at that time;
    c. please note that delivery time quoted above is based upon production schedules and supplier deliveries at the time of this quote;
    d. delivery times may vary from this quote at the time of actual order placement.;
    e. please check with your regional terex mhps representative for updated delivery conditions at the time of order



CRANE CAPACITY:		12.5 M ton (27558 LBS)
CRANE CLASS, SERVICE:		CMAA CLASS C, INDOOR
TROLLEY TYPE:		EZDMR
HOIST TYPE:		DMR10-12.5 H30/15 4/1 Z-V0.84/4.8-CC
CRANE TRAVEL SPEED:		160 VFC FPM 2 x 3.7 HP @87Hz
TROLLEY TRAVEL SPEED:		100 VFC FPM 2 x 1.5 HP @120Hz
HOIST LIFTING SPEED:		16/2.7 FPM 2.7/16.9 HP
ENDTRUCK TYPE:		DFW-L-Z 250/4000
WHEEL LOAD MAX. R1,R2:		19300 LB
RUNWAY BEAM:		BY CUSTOMER
RAIL SIZE, TYPE:		80# ASCE
LENGTH OF RUNWAY:		50'
VOLTAGE:		460/3/60
ELECTRIFICATION TYPE, MTG:		DEMAG DCL,
TOTAL* CURRENT DRAW:		STARTING 173A, FULL LOAD 37A
GIRDER	**WEIGHT:**	6720 LB Drive/ 6725 LB Idler
ENDTRUCK QTY(2)	**WEIGHT:**	1771 LB/EACH
TROLLEY	**WEIGHT:**	2575 LB/EACH
TOTAL SHIPPING	**WEIGHT:**	19562 LB
REMARKS:		



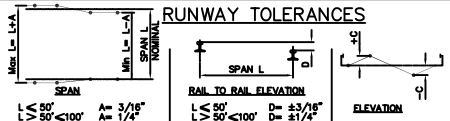


PRELIMIANRY– NOT FOR CONSTRUCTION

CUSTOMER:	**ENDUSER:**
AHBL,INC	PORT OF TACOMA
2215 NORTH 30TH STREET, SUITE	PO BOX 1837
TACOMA, WA 98403	TACOMA, WA 98401-1837

*** NOTE: FOR SIZING ELECTRICAL LOADS, TOTAL CURRENT CONSISTS OF; THE CURRENT OF THE NUMBER OF HOIST MOTORS AND BRIDGE MOTORS**

RUNWAY TOLERANCES



SPAN		RAIL TO RAIL ELEVATION		ELEVATION
L ≤ 50'	A= 3/16"	L ≤ 50'	D= ±3/16"	C= 3/8"
50'<L≤100'	A= 1/4"	50'<L≤100'	D= ±1/4"	
L > 100'	A= 3/8"	L > 100'	D= ±3/8"	

0	DATE	INITIAL	DESCRIPTION OF REVISION

DEMAG

	2017	DATE	INITIALS
DRAWN		04/06	BC
CHECKED			
APPR.			
SCALE: CRANE SPAN (NTS)			
DEPT. CODE			

DESCRIPTION: ZKKE QUOTATION DRAWING

TYPE

QUOTE NO. 415-17-662B

IDENT–NO. 21362149 SK AZ 00

F	U.A.	S	SHT.	OF
3	A	E	1	1

ORIGINATED FROM: | REPLACEMENT FOR: | REPLACED BY:

April 25, 2017

Cardno
801 Second Avenue, Suite 700
Seattle, WA 98104

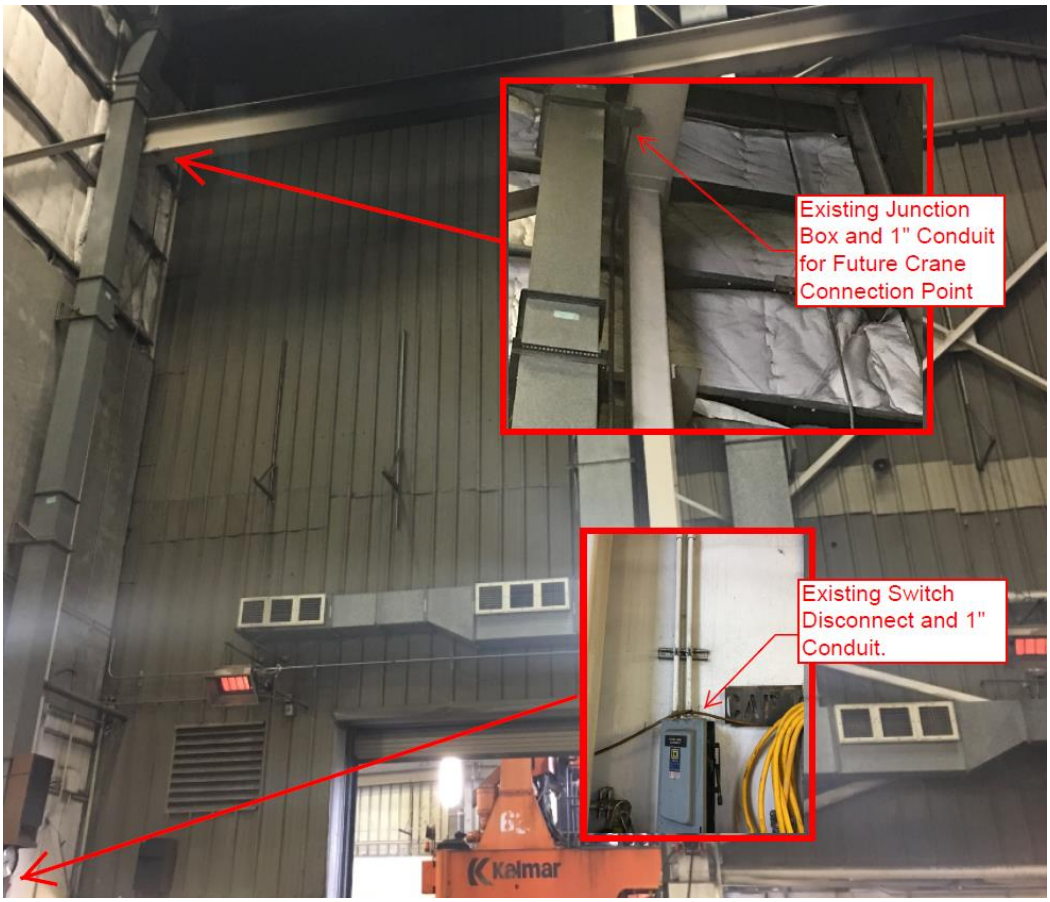
Attn: Rick Unruh

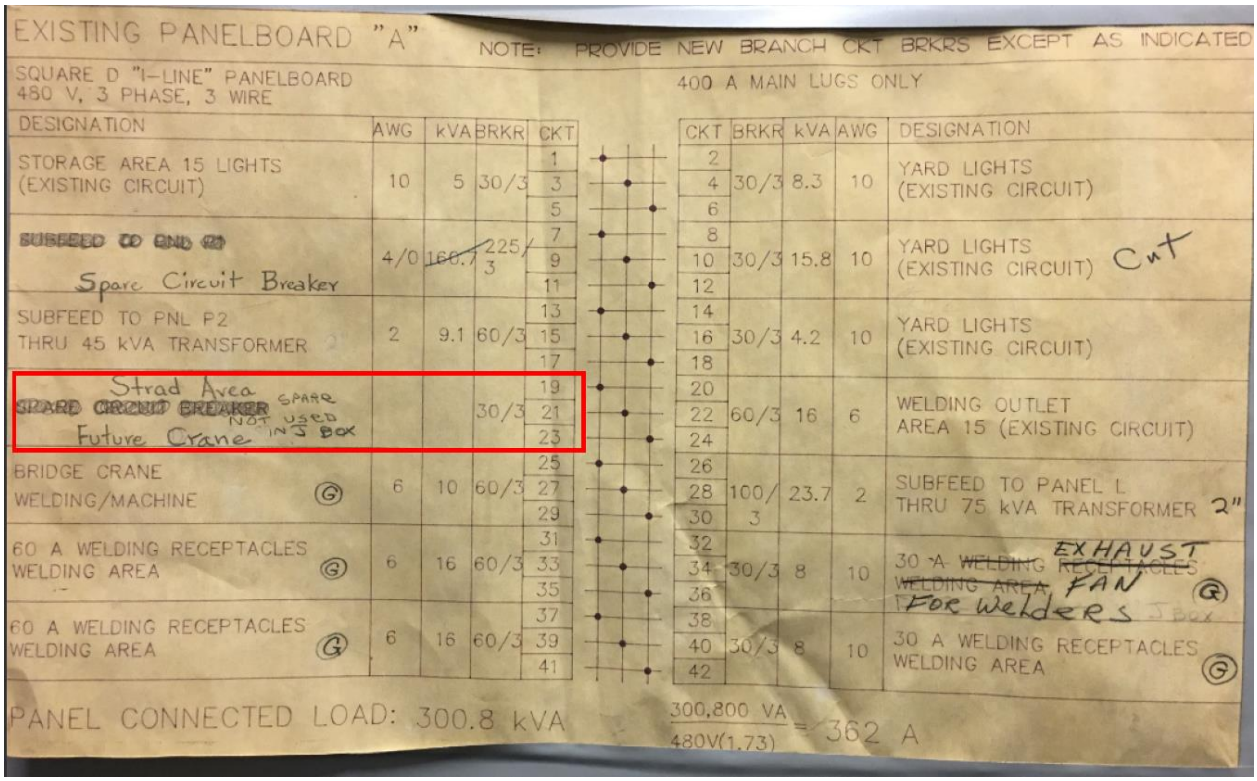
Project: Port of Tacoma – Strad House Bridge Crane Addition Engineering Report
Survey Completed: 3/21/17
Survey Completed By: Henry Santos

Electrical

There is a "Future" 3-phase, 480V, 3-wire, 30A dedicated circuit infrastructure for the Strad Bridge Crane. The infrastructure consists of 3P-30A circuit breaker originating from Panel "A", 1" conduit with #10 AWG-Cu and a disconnect switch (60A rated) located directly below the end of the northeast beam.

Per our coordination with the bridge crane manufacturer, 12.5 Ton will draw up to 37 full load amps which will require a 50A circuit.





EXISTING PANELBOARD "A"

NOTE: PROVIDE NEW BRANCH CKT BRKRS EXCEPT AS INDICATED

SQUARE D "I-LINE" PANELBOARD
480 V, 3 PHASE, 3 WIRE

400 A MAIN LUGS ONLY

DESIGNATION	AWG	kVA	BRKR	CKT
STORAGE AREA 15 LIGHTS (EXISTING CIRCUIT)	10	5	30/3	1 3 5
~~SUBFEED TO END @~~ Spare Circuit Breaker	4/0	~~160.7~~	225/3	7 9 11
SUBFEED TO PNL P2 THRU 45 kVA TRANSFORMER	2	9.1	60/3	13 15 17
Strad Area ~~SPARE CIRCUIT BREAKER~~ SPARE NOT USED IN J Box Future Crane			30/3	19 21 23
BRIDGE CRANE WELDING/MACHINE (G)	6	10	60/3	25 27 29
60 A WELDING RECEPTACLES WELDING AREA (G)	6	16	60/3	31 33 35
60 A WELDING RECEPTACLES WELDING AREA (G)	6	16	60/3	37 39 41

CKT	BRKR	kVA	AWG	DESIGNATION
2 4 6	30/3	8.3	10	YARD LIGHTS (EXISTING CIRCUIT)
8 10 12	30/3	15.8	10	YARD LIGHTS (EXISTING CIRCUIT) Cnt
14 16 18	30/3	4.2	10	YARD LIGHTS (EXISTING CIRCUIT)
20 22 24	60/3	16	6	WELDING OUTLET AREA 15 (EXISTING CIRCUIT)
26 28 30	100/3	23.7	2	SUBFEED TO PANEL L THRU 75 kVA TRANSFORMER 2"
32 34 36	30/3	8	10	30 A ~~WELDING RECEPTACLES~~ ~~WELDING AREA~~ EXHAUST FAN For Welders (G)
38 40 42	30/3	8	10	30 A WELDING RECEPTACLES WELDING AREA (G)

PANEL CONNECTED LOAD: 300.8 kVA

300,800 VA / 480V(1.73) = 362 A

Recommendations:

- Replace existing (4) #10 AWG-Cu wires with (4) #6 AWG-Cu wires for the new 50A circuit. Replace circuit breaker with a 3P-50A. Re-use the existing 60A rated disconnect switch. Utilize the existing 1" conduit where feasible. Additional 1" conduit infrastructure maybe required to route the new (4) #6 AWG-Cu (50A Circuit).

- To verify load capacity of the origin of existing spare 30A circuit, we will propose to install (2) demand meters for 30-days to monitor Panels "A" and the Building Power Distribution Switchboard No. 5.

- For the above electrical work, we have confirmed with TPU that the bridge crane addition doesn't require a plan review submittal. For Port of Tacoma in-house electrician installation, the master TPU electrical permit will be applied and will only require TPU inspection. Otherwise, the electrical contractor will be required to apply for a separate over-the-counter permit and inspection.

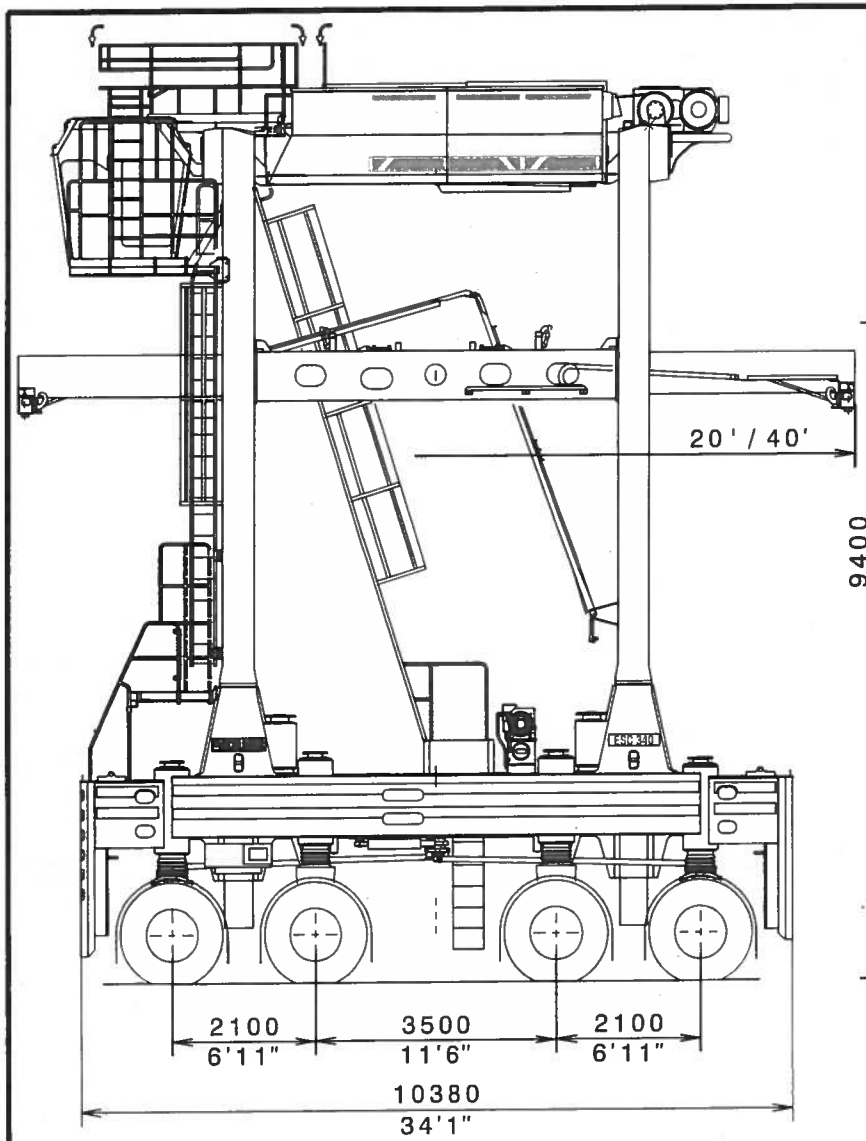
Other Observations:

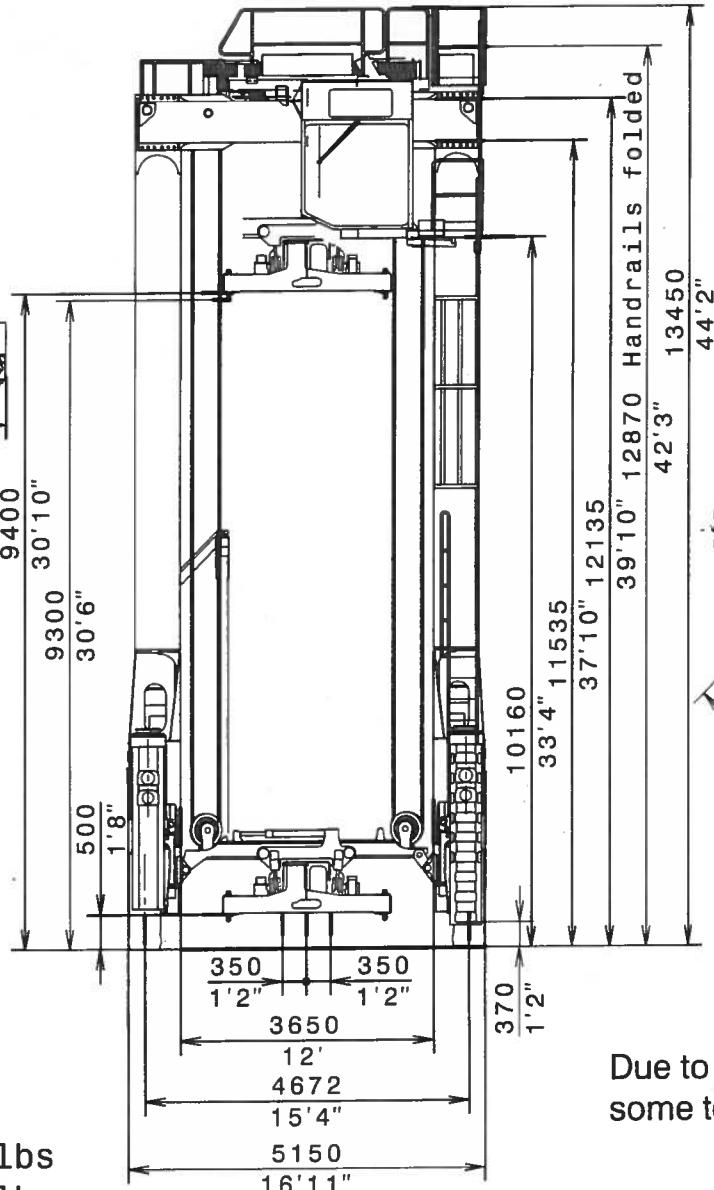
Existing Lighting system doesn't match the lighting level of other adjacent Strad Repair bay with cranes. We will recommend further investigation and measurements of the existing lighting system if Port of Tacoma will require lighting upgrade to meet the repair bay lighting levels.

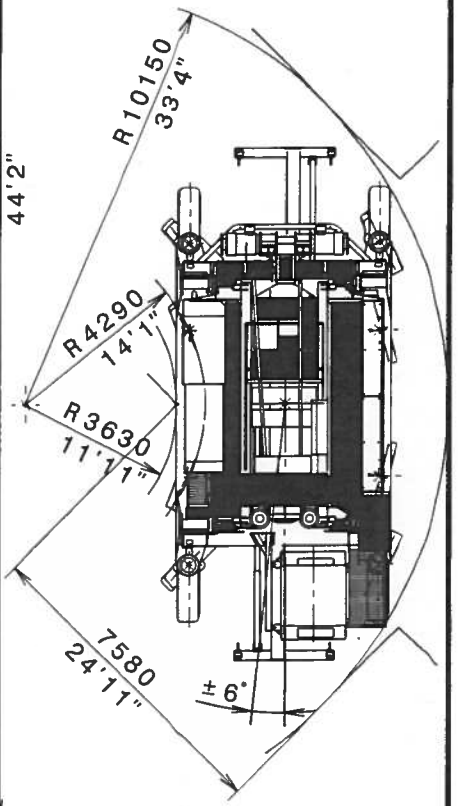
Per IES recommendation, maintenance bays should be provided with an average of 50 footcandles at the work plane height (2'-6"AFF or as defined by the user).

Mechanical and Fire Protection

Existing HVAC ductworks and Fire Sprinkler pipes appears to be all previously installed with proper clearances with the consideration of the future bridge crane.







Due to nature of product some tolerances exist.

Load	50,000 kg	110,200 lbs
	40,000 kg	88,200 lbs
Own weight	69,000 kg	136,700 lbs
Max speed loaded	30 km/h	18.6 mph

TITLE Kalmar, ESC 340
3x9'6"x20'/40'

DES 09/05/16 PPS
APPR. DM

Kalmar

DRAWING NO DNG5702

REVISION

SHEET 1/1