

## ADDENDUM NO. 5 – July 26, 2024

### CTF Phase 3 Expansion, CIP WW 22-38

This addendum amends the Contract Drawings and Specifications for this project as follows:

1. The bid opening date for the project has been rescheduled to Tuesday, August 6, 2024 at 2PM at City Hall.
2. The working days for the Project have been modified as follows:
  - Phase Three Operational: within 375 Working Days
  - Completion of Project: within 425 Working Days

The following Requests for Information (RFI) have been received by the City, and are followed by the City's answer (A):

R1: Spec section 04200, 2.1B states that the CMU will be split face or smooth finish as indicated on the plans, and integrally colored or painted as indicated on the drawings. There is no mention of texture or color of the CMU on the plans, and no call out for painting the CMU in the plans. What is the texture and color of the CMU?

A1: All masonry on Sheet AC3.2.1 and AD3.2.1. shall be gray unpainted precision block (sample to client for approval) with clear coat weather sealer per specs, portions of building shall be plastered per the plansheet.

R2: For the excavation of the proposed Phase III Water Recycle Facility, please confirm it is acceptable to open-cut the excavation and expose the east face of the existing Phase II Water Recycle Facility in the process.

A2: Structural engineer of record has confirmed no kickers are required on the Phase 2 tank walls with Phase 2 filled with water and no backfill on the outside of the walls. Contractor will be required to submit an Engineer's Soil Report to allow a 3/4:1 slope. There is no need to expose the existing structure.

R3: The Contractor is responsible for implementing the City-provided SWPPP. Can you please provide the plan?

A3: Plan is not yet available, but will be made available to the awarded contractor during document submittals. There will be normal perimeter protection only.

R4: Please provide the required color and texture of the exterior and interior CMU walls for both buildings.

A4: See R1/A1

R5: Who is providing concrete & soils testing?

A5: ENGE0 will be providing all soils and concrete testing and special inspections, paid for the by the City.

R6: Door schedule on A3.4.1 calls out hardware groups which are not found in the specifications, please provide hardware groups noted.

A6: Hardware shall match existing in Phase 2 Mech Building.

R7: The wall schedule for types CW1 & CW2 in the tank foundation plan 01/SS3.2.1 call for #5@16" each face. The detail 08/SS3.0.3 which happens to be the same wall as above calls for #6@9" each face, in addition the detail calls for an added #6@9" with a net spacing of 4.5"

A7: Plan SS3.2.1 applies with #5 at 16" OC each face. The detail 08 SS3.0.3 shall be changed to be an extra #5 bar on all corners at 16" spacing for effective spacing of 8". Detail will follow in Addendum 6.

R8: Please confirm that there are no domestic material requirements for the project.

A8: There are no domestic material requirements for the project.

R9: As follow-up to Q&As No. 41 & 42, please explicitly confirm the Owner will make payment for the Kovalus Membranes pursuant to page 8 of 10 of their pre-negotiated proposal. The answers to the previous questions 41 and 42 indicate the Contractor will be financing this equipment prior to delivery, not a position some Contractor's will put themselves in. Additionally, please provide a freight allowance amount for all bidders to include with their bids.

A9: The City will issue a joint check to the Contractor and payable to the vendors of bid items 17, 18 and 19 for the allowances listed in each of the stated bid items. Also see R4 / A4 in Addendum 4.

R10: Please confirm size and type of door for guide connection with sectional door track and wheel.

A10: See R39/A39

R11: The wall schedule for types CW1 & CW2 in the tank foundation plan 01/SS3.2.1 call for #5 rebar @16" each face. The detail 08/SS3.0.3 which happens to be the same wall as above calls for #6 rebar @9" in each face; in addition the detail calls for an added #6 rebar@9" with a net spacing of 4.5". Please clarify this apparent discrepancy.

A11: Please follow plan view rebar table CW1 & CW2 in the tank foundation plan 01/SS3.2.1, calling for #5 rebar @16" each face. On all corners provide an additional #5 bar at 16 inches on OC each face so effective spacing is 8 inches. Detail applies with reduced bar size and updated spacing.

R12: Will the City be providing a Builder's Risk policy?

A12: No, the City will not provide a Builder's Risk policy for this work.

R13: Drawing M3.0.1 shows #19 Citric Acid Chemical Tank, 1000gal. (Note says in ACID ROOM); however, Drawing M3.7.3 ACID ROOM drawing shows a 3,000gal tank that is noted as #15. There is no 1000gal tank shown. Please clarify size and location of tank.

A13: Note #15 does not specify the volume, and the drawing scales to 1000 gallons. The note #19 on M3.0.1 applies and Spec 13200 specifies tank requirements.

R14: Please provide a detail for the 12" wide trench drains shown at the Dewatering Building that shows required depth of trench and if it is to have embedded grating angles or not.

A14: Depth of trench shall be 8" from finished grade, no embed angles are required on the sludge cake area trench drains

R15: On drawing C3.3.0, Note 13, is the intent this tie-in is a hot tap with the description tapping sleeve? Or, can the pipeline be taken out of service for the connection?

A15: With advanced notice of a minimum of 3 days the line maybe taken out of service for up to 2 hours.

R16: Please provide the invert elevation of the 24" pipe shown in Drawing C3.5.5.

A16: The invert of the 24" pipe into the Crossroads Basin A shall be 24" above the basin finished grade

R17: Please provide pipe invert on Drawing C3.3.0, Note 38.

A17: The invert of this existing pipe constructed in approximately 2004 is about 4-6 feet below grade

R18: Please provide the drain location for the bathroom at Phase 3 WRF Structure.

A18: A 4" diameter schedule 80 PVC drain shall be installed from the bathroom and shall discharge to the manhole downstream of Note 19 on Sheet C3.3.0

R19: We don't believe the project can be completed in 375 working days or roughly 19 months; Please confirm if it is anticipated that the Contractor include overtime costs to complete the project in the prescribed timeframe.

A19: The working days for the Project have been modified as follows:

- Phase Three Operational: within 375 Working Days
- Completion of Project: within 425 Working Days

R20: The proposed network diagram on Sheet I0.2 shows the fiber optic ring routing from Control Panel CP-1A to CP-DW to CP-C. Following the duct bank details and wire/cable schedules, the fiber optic cable routing is shown from CP-DW to CP-C. There doesn't seem to be routing indicated from CP-DW to CP-1A. Please provide that routing path.

A20: An existing pull box is located directly west of the storm drain basin within Tesla Way (east of the proposed dewatering building). Fiber shall be re pulled through this pull box from 1A to DW to C. A new 2" PVC conduit shall be provided from this pull box to the dewatering building for this purpose.

R21: Is Borger and approved equal to Vogelsang rotary lobe pumps?

A21: Yes

R22: Addendum 4 eliminated the jack and bore under the levee. Is steel casing still required for the installation?

A22: No casing is required. A pipe boot/weld shall be provided for liner penetrations per Detail B on C3.5.5.

R23: For the doors, where can the hardware groups be found? They are not in specification 008710.

A23: Hardware shall match existing in Phase 2 Mech Building

R24: Please provide the Kovalus Scope of Supply.

A24: Please see Attachment A – Vendors' Scopes of Supply for Neuros and Kovalus products to be purchased for the Project.

R25: On Equipment List M3.0.1, are B.I. 11A, B, C Vogelsang Rotary Lube Pumps part of Kovalus's Supply Contract?

A25: Please see Attachment A – Vendors' Scopes of Supply for Neuros and Kovalus products to be purchased for the Project.



R26: Are there as-built drawings for the head works being removed?

A26: No As-Builts will be provided.

R27: On Equipment List M3.0.1, are B.I.s #41A, B & 42A, B Screw Press & Floc Tanks supplied by FKC?

A27: YES

R28: Are these part of an Allowance or has owner purchased these direct?

A28: Contractor will need to provide submittals and purchase these pieces.

R29: Section 13500 calls for a 26' x 70' building, but the specs also qualify the dimensions are inside of girt. Please confirm if the 26' x 70' dimension are to inside or outside of girt.

A29: Inside dimensions required.

R30: No building Occupancy is given. Confirm if the building should be Type II or Type III.

A30: Unoccupied Type U with Type 3 non combustible metal materials per Spec 07412.

R31: Section 13500 calls for roof vents. Confirm the number of roof vents.

A31: 2 roof fans minimum 2500 cfm each updraft are required.

R32: Section 13500 also calls for louvers, confirm the quantity and size of louvers.

A32: A minimum of 2: 36x36" louvers are required

R33: No Collateral Load for Maintenance Building is given; provide a collateral load or confirm that 3psf is acceptable.

A33: Use 5 psf collateral load in the design

R34: Section 13500 calls for G90 secondaries. Given the other specifications for the building, confirm that standard G30 secondaries are acceptable.

A34: G90 secondaries are required unless stamped and signed by a CA Licensed Structural Engineer using G30 material.

R35: There is a spec section for Metal Walls and Soffit Panels (07412) but no metal walls are seen on plans. Please verify where this scope is shown or indicate if this spec is an error.

- A35: Phase 3 does not include improvements to the Admin Building. The BID ADDER Maintenance Building has Metal Walls and shall use this specification.
- R36: Sheet D3.1.2, Detail B, Demo note 1 states to remove existing sludge. Please provide the quantity of sludge to be removed; or provide size and depth of pond so that a quantity can be calculated.
- A36: Please ignore note 1, no sludge to remove.
- R37: The Invitation to Bid states that contractor shall complete work within 375 "working days". Please confirm that "working days" are defined as calendar days (not business days).
- A37: See R19 / A19.
- R38: Please clarify the difference between bid schedule item B.12 (Winter Sludge Storage Building) and B.13 (Sludge Dewatering Building). Various plan references indicate these are the same building.
- A38: The Winter Sludge Storage Building is outlined on Note 6 on C3.5.0. The Sludge Dewatering Building is the rectangular building on the southeast corner of the Winter Sludge Storage Building
- R39: Clarify specification for Steel Frame Glass Panel Doors – Section 08331.
- A39: Clopay Doors, Model 904, Full-View Sectional Door, 12'-0" x 12'-0", Clear Aluminum Anodized, 1/8" Tempered Glass, 50k Spring Cycles, 3" Clip Mounted to CMU, Reverse Angle, 15" Radius.
- R40: Please verify if Square D is preferred supplier for all MSB, MCC, VFD and related power equipment.
- A40: Allan Bradley is an approved equal.
- R41: Can we provide one manufacturer for all the components of MSB1 and MCC-3?
- A41: No exceptions to common manufacturer on MSB1 and MCC3
- R42: Pursuant to the response to Addenda No. 4, Question No. 40: Please confirm that the allowances for Bid Items #4, #17, #18, and #19 include freight to the project site.
- A42: The allowances for Bid Items #4, #17, #18, and #19 include freight to the project site.

- R43: M3.8.4 note 5 indicates a 30" x 36" removable grating section. The W10 x12 beams in this area are spaced 5'-7" apart and will not provide support for the removable grating. How are the removable grating sections to be supported? Please provide additional design details if required.
- A43: Standard full size grating is acceptable, a 30x36" reduction is not required
- R44: M3.8.4 notes 1 and 4, please provide a detail for the railing in this area. It is unclear if this is aluminum railing or another type of railing.
- A44: Standard aluminum railing is required for Notes 1 and 4 with floor socket per detail 241 on SS3.4.4
- R45: M3.3.0 note 6, please provide design details for the aluminum access stair.
- A45: Contractor to provide standard aluminum stairs per Drawing M3.3.0 Detail B dimensions (18.50 top of stairs and 13.0 landing elevation) and 6' wide with top and bottom supports to concrete.
- R46: SS3.2.2 references detail 241A. Drawing SS3.4.4 has a detail 241 but no detail 241A. Please provide detail 241A.
- A46: Detail 241A shall use same grating as Detail 241. Dims for this OF box shall be per Detail B on M3.6.0. Wall structural design shall match remaining tank walls.
- R47: M3.6.0 note 6, please provide a detail for the removable handrails.
- A47: Contractor to provide 1" diameter links yellow fiberglass chain between handrail sections at actuator locations
- R48: M3.8.0 note 27, please provide a detail for the guard rail.
- A48: See Spec Section 05501 for aluminum hand rail requirements
- R49: M3.8.0 note 28 and M3.8.1 note 14 references a structural pipe rack per structural plans. We did not find details for the pipe rack on the structural plans. Are the design details included in the contract documents? If not, please provide design details for the structural pipe rack.
- A49: Supplier shall provide 5' long HSS6x6x1/2 cantilevered members fastened to the top of the south W14x30 on Sheet SS3.2.4 at 6' O.C. Design shall be submitted and stamped/signed by structural engineer.
- R50: SS3.2.1 calls to detail 127, we did not find detail 127 in the drawings. Please provide detail 127.

A50: The bottom of the MBR basins shall be grout filled to the elevations, shape, and slope shown on M3.9.0

R51: C3.3.6 detail A, are the barrier posts existing?

A51: Contractor to supply 2 x 6" diameter yellow bollards in the location shown to protect the air gap

R52: C3.6.0 bollards detail G. We did not find a location for this detail, can you provide locations for any new bollards required.

A52: C3.3.6 barrier posts shall be bollards per this detail

R53: M4.0 note 8, please provide a design detail for the single aluminum access step.

A53: Contractor to provide standard aluminum stairs per Drawing M4.0 dimensions (18.50 top of stairs and 17.5 landing elevation) and 4' wide with side supports to concrete.

R54: M3.7.4 note 6, are any supports required for the H20 grating? If yes, please provide design details.

A54: Stainless embed angles required on interior corners of the sump per plans and specs

R55: M3.9.0 section A, note 2 appears to be pointing to grating and may be a typo. Please provide details for this opening including any grating and grating supports required.

A55: See Note 1 area, H20 rated Steel grating is required with stainless embed angles required on interior corners of the sump per plans and specs

R56: Is LobePro an approved equal to Vogelsang rotary lobe pumps?

A56: No

R57: D3.1.2 Detail B the note said we are to remove and haul off the sludge. Is there a quantity we should assume of sludge to be removed?

A57: The Contractor will not need to remove any sludge, disregard note 1.

R58: Can you show dimension on the structural plans as not all the dimension are clearly shown on the mechanical drawings.

A58: Dimensions are intentionally not included on some structural drawings to avoid discrepancies with mechanical drawings

R59: Sheet C3.5.0 Can you clearly define the extent of the 6" PCCP concrete paving we are supposed to install?

A59: EOP Edge of Pavement on C.3.5.0 is shown on the left (south) side of the superpad, contractor shall follow L1+C1+L2+C2+L3 extended to Tesla Way road section. The east edge of pavement follows the alignment of Item 6 (concrete wall), and turns east to Tesla Way at NE Point 7.

R60: Pursuant to Drawing G3.1.2, Water Notes, 7, calls out thrust blocks or megalug joints must be provided. However, multiple locations on the Civil Drawings require MJ restraints & TB. Please confirm if restrained MJ joints are used that TB's still required?

A60: Both MJs with TBs will be required where shown.

R61: Per Spec 02200 - 1.1C, any deficit of material shall be provided by the city. Will this material be delivered to the job site, or will the contractor need to haul in this material from a stockpile? If the contractor is responsible for hauling this material, please clarify its location.

A61: It will be supplied to jobsite.

R62: Per Spec 02200 – 2.1D, onsite soil material is suitable as fill material provided it is processed to remove concentrations of glass fragments (debris, etc.) greater than 6 inches in maximum dimension. Can this requirement be met by passing the glass-contaminated soil through a 4" sieve in order to separate/break-up the glass fragments?

A62: Yes, this is acceptable if needed.

R63: Please share the Phase 2 bridge crane submittal.

A63: Please see Attachment B - Phase 2 bridge crane submittal.

R64: Section 15072 FRP Duct states furnish and install FRP duct for odor control in accordance with the contract documents. Could not locate FRP duct on the plans. Section 01610 Seismic Design Criteria references Section 11400 - Headworks Odor Control System, but cannot be located in the contract docs. Please confirm if FRP Duct is part of the project scope and if so where can it be located on the plans.

A64: There is no FRP ductwork on this project, the existing headworks was completed by others

R65: Section 15500 2.5 Piping states, "Piping in air conditioning systems shall be galvanized steel in accordance with Section 15030 - Steel Pipe." Refrigerant lines on drawing ME3.02 specify SCH 10 Stainless Steel. Please clarify material for the refrigerant split system piping. Should the refrigerant piping material/insulation for the split systems on ME3.02 and the mini-split on M3.10.1 be the same?

A65: Schedule 10 304 Stainless minimum.

R66: Drawing ME3.0.1 specifies Magicaire #HBB-12 for the indoor unit FC-1 and Carrier 24ABB336 for the outdoor unit CU-1. Will OR APPROVED EQUAL units be acceptable?

A66: As equal units as determined by the engineer and City will be considered

R67: Sheet D3.1.2, Detail B, Demo note 1 states to remove existing sludge. Please provide the quantity of sludge to be removed; or provide size and depth of pond so that a quantity can be calculated.

A67: Contractor shall broom clean this area after Operations has disposed of remaining cake to less than 0.5" thickness remaining.

R68: I need more information to quote the 7-ton MBR crane, but the Davit cranes and the replacement hoist and trolley were fine.

A68: Please see Attachment B - Phase 2 bridge crane submittal.

R69: A short circuit study does not seem to be mentioned in the specifications, is one required for this project?

A69: Contractor shall provide load-flow, short circuit, arc flash study SKM model and breaker coordination report signed and stamped including completion of breaker settings and adjustments on all new equipment. Existing facilities not included.

R70: Spec 16100 2.14E says the supplier is to perform a coordination study, and provides some details about it. However this section seems brief and vague for a coordination study on a project of this size. Is this spec section complete as is?

A70: Contractor shall provide load-flow, short circuit, arc flash study SKM model and breaker coordination report signed and stamped including completion of breaker settings and adjustments on all new equipment. Existing facilities not included.

R71: Is there any HVAC equipment in the Dewatering Bldg? Dwg. M3.10.2, note 25 identifies an exhaust fan but note 25 cannot be found. There are no mechanical (ME) drawings found for the Dewatering Bldg. Is this open to the sky?

A71: Items 21, 22, and 24 on M3.10.1 show HVAC on the lower floor electrical room and bathroom. Item 23 on M3.10.1 and Item 25 on M3.10.2 show supply and exhaust fans. Electrical per E3.2.13.

R72: Construction Note 2 on C3.5.0 references Sheet C3.4.2. Please provide.

A72: See C3.5.3

R73: As follow-up to Q&As No. 41 & 42, please explicitly confirm the Owner will make payment for the Kovalus Membranes pursuant to page 8 of 10 of their pre-negotiated proposal. The answers to the previous questions 41 and 42 indicate the Contractor will be financing this equipment prior to delivery, not a position some Contractor's will put themselves in. Additionally, please provide a freight allowance amount for all bidders to include with their bids.

A73: See R9/A9. Shipping is included in the allowances for bid items 17, 18, 19, and 20.

R74: Please confirm what is intended in the openings above the screw presses in the Dewatering Bldg. We find no reference calling out if this is open to the sky or if something removable is intended. The architectural drawings show roofing over the entire footprint.

A74: A removable fiberglass panel shall be provided to span the opening and mount to the edge angle shown on the right side of Detail 252 on SS3.4.5. The panel shall be clipped to the angle during normal operation.

ATTACHMENTS

A - Vendors' Scopes of Supply for Neuros and Kovalus products

B – Phase 2 bridge crane submittal.

When submitting the bid for the project, the Contractor must acknowledge receipt of the addendum.

Recommended by: Ken Reed  
Ken Reed  
Senior Construction Manager

7-26-2024  
Date

Approved by: Ken Reed For BRAD Taylor  
Brad Taylor, P.E.  
City Engineer

7-26-2024  
Date

ATTACHEMNT A - BID ITEM 18



Quotation

Log Number AM-2024-3293-1  
 Created Date 7/22/2024  
 Last Modified Date 7/22/2024, 1:56 PM

**Delivery address:**

Lathrop, CA  
 18001 South Howland Road  
 Lathrop, CA 95330  
 United States

**Invoice address:**

Lathrop, CA

Project Description

**Project Name:** Lathrop, CA  
**Project Number:** 16-0002  
**Models:** 4 x NX50-C050; 1 x NX50-C070; 3 x NX100-C070

Item	Quantity	Product Description	Product Code	Details	Sales Price	Total Price
1	4.00	Core Impeller Change	SRV00014-0017.0	NX50 Core Impeller Change from -C050 to -C070 model Impeller change on existing NX50-C050 to -C070 impeller. a) NX50-C050 Core S/N: K11X21F30001 (TBC) b) NX50-C050 Core S/N: K11X21F35002 (TBC) c) NX50-C050 Core S/N: K11X21F35003 (TBC) d) NX50-C050 Core S/N: K11X21F35001 (TBC) Lead time: 10-12 weeks per core impeller change	USD 15,915.00	USD 63,660.00
2	1.00	Core Rental	SRV00014-0019.0	NX50-C70 Core lease per month or portion of Additional months will be charged at a rate of \$1,950/month Lead time: 3-4 weeks after PO reception	USD 1,950.00	USD 1,950.00
3	4.00	On-Site Visit	SRV00014-0003.0	On-Site Visit for one tech for 4 days to remove core and reinstall after the impeller change and performance test. 4 Days is an estimation, additional days @ \$1,500.00 per tech per day to be adjusted on the final invoice.	USD 1,500.00	USD 6,000.00
4	1.00	Travel Expenses	SRV00014-0009.0	Estimated travel expenses for one tech for 4 days. To be adjusted on final invoice.	USD 5,600.00	USD 5,600.00
5	1.00	Travel Time	SRV00014-0006.0	Estimated travel time for one tech. To be adjusted on final invoice.	USD 940.00	USD 940.00
6	1.00	Shipping	SRV00011-0011.0	Estimated Shipping. To be adjusted on final invoice.	USD 925.00	USD 925.00
7	1.00	Sales Tax	SRV00011-0011.0	Added CA State Sales Tax at 8.75% on Lines 1-5	USD 6,838.13	USD 6,838.13

Subtotal USD 85,913.13  
 Total Price USD 85,913.13  
 Grand Total USD 85,913.13





**Quotation**

Log Number AM-2024-3293-1  
Created Date 7/22/2024  
Last Modified Date 7/22/2024, 1:56 PM

Price does not include applicable taxes

Quote Prepared By  
Kevin Chamberlain  
Special Projects Coordinator

Expiration Date  
8/21/2024

- Payment method: CK, Wire transfer, Credit card
- Payment: Net 30 Days
- Shipping: PPA

***Thank you for choosing APG-Neuros!***



## PULSION® MEMBRANE MODULES

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Ref: City of Lathrop Replacement

### CITY OF LATHROP, CA

390 Towne Center Drive  
Lathrop, CA 95330  
Attn: Ken Reed  
kreed@ci.lathrop.ca.us

### KOVALUS SEPARATION SOLUTIONS™, LLC

Jack Cangiano | Regional Sales Manager, East USA  
M +1 781-249-7245  
jccangiano@kss-sep.com

**FIRM PROPOSAL**

24-1159-0

July 15, 2024



## KOVALUS FIRM PROPOSAL

We thank you for your inquiry and are pleased to provide you with the following proposal for PULSION® membrane modules for the City of Lathrop replacement project.

### COMMERCIAL PROPOSAL

#### KOVALUS SCOPE OF SUPPLY & PRICING

Product Code	Item	Qty	Unit Price (USD)	Total Price (USD)
726360U	PLSN MDL LE-44/44 PVDF WS*	12	103,800.00	1,245,600.00
FRT	FREIGHT CHARGES	1	9,750.00	9,750.00
Subtotal				1,255,350.00
Sales Tax of 8.75% for taxable items noted with *				108,990.00
<b>Grand Total</b>				<b>1,364,340.00</b>

*If an item is not specifically mentioned in the Kovalus scope of supply, it is not included. The Buyer must furnish all other materials and services for complete installation, start-up, operation, and maintenance of the PULSION® modules and existing MBR system.*

*\*Denotes taxable item. Sales tax of 8.75% has been applied to taxable items. Total tax is shown above. The Buyer is to advise any changes to tax rate or tax requirements. Buyer is responsible for any increases in tax due to changes in tax rates and/or tax law occurring between order and project completion. In case of increase, the adjusted invoice will be provided by Kovalus with charges to the Buyer.*

***This proposal is valid for ninety (90) days from proposal date.***

#### PAYMENT TERMS

100% of the order price due net 30 days from shipment of the equipment.

*Kovalus has the right to suspend performance for delayed or non-payment of invoices. All orders are subject to credit approval prior to acceptance. Payments must be made via a financial institution that is not subject to the sanction laws of the United States, the European Union, or other applicable jurisdictions.*

#### Proprietary Notice

All information supplied herewith, including without limitation technical or financial data, know how, formulae, processes, designs, photographs, drawings, specifications, software programs and samples and any other material bearing or incorporating any information relating to **KOVALUS SEPARATION SOLUTIONS™**, LLC (“Kovalus” or “KSS”) products or systems is proprietary information belonging to Kovalus. Such information shall not be copied, reproduced, used or disclosed, (in whole or in part) without the prior written consent of Kovalus for any purpose other than that for which it has been supplied.

***For related patent and trademark information, visit: [www.kovalus.com/Legal](http://www.kovalus.com/Legal)***



## SHIPPING TERMS

“DDP –Lathrop, CA”, per Incoterms 2020.

## MANUFACTURING LEAD TIME

The estimated lead time to prepare this equipment for shipment is sixteen (16) weeks from receipt and acceptance of signed Agreement. A more accurate shipping schedule will be provided at the time of order acceptance.

*\*Note: Lead times are subject to change due to the current and/or potential disruptions in the global freight market that can include, among other issues, delays, backlogs, and empty container shortages.*

## TERMS AND CONDITIONS OF SALE

This proposal is based on Kovalus Standard Terms and Conditions of Sale (Ver 10/23) except where modified by this proposal.

## KOVALUS CONTACT PERSON

Jack Cangiano  
Regional Sales Manager, East USA  
M +1 781-249-7245  
jkcangiano@kss-sep.com

## MISCELLANEOUS COMMERCIAL TERMS

### Prices

All prices are stated and must be paid in U.S. dollars only. Changes made at the request of the Buyer to the scope of supply or project delays that result in an interruption of manufacturing may require a price or delivery adjustment. Changes in either will be conveyed to the Buyer within a reasonable time after receipt of request.

### Force Majeure

Force Majeure means any circumstances beyond the reasonable control of either party, including an act of God (such as, but not limited to unusually severe weather conditions, earthquakes, drought, tidal waves and floods), disease, epidemic, quarantine, fire, explosion, plant shutdown, strikes or other labor disputes (unless solely restricted to employees of seller), acts of terrorism or war, hostilities, act of foreign enemies, riots or other civil disturbances or voluntary or involuntary compliance with any law, order regulation, sanction, embargo, recommendation or request of any governmental authority, inability to obtain materials necessary for manufacture of the Goods, total or partial failure of any of seller’s usual means of transportation of the Goods or any other events or circumstances not within the control of the party affected, whether similar or dissimilar to any of the foregoing. Neither party will have any liability, other than for the payment of monies owing, to the extent that the performance any of their contractual obligations are delayed, hindered or prevented arising out of or in connection with events of Force Majeure.

If and to the extent that a party is delayed, hindered or prevented by an event of Force Majeure, then the affected party shall be entitled to extension of time in which to perform its obligations which takes into account the duration of the Force Majeure event and any reasonable period required to recover from its impact.

## Storage of Goods

If Buyer is unable or willing to accept or take delivery of the Goods within fourteen (14) days after contract agreed date, Buyer shall pay Kovalus a storage charge at a rate of two hundred dollars per square meter (\$200/m<sup>2</sup>) of floor space for each additional 30-day period, or portion thereof, of storage from the contract agreed date. Storage charges shall be invoiced monthly. Goods stored by Kovalus for Buyer under this provision shall be held at Buyer's sole risk. If the period of storage exceeds one hundred fifty (150) days from the date on which Kovalus notified the Buyer that the Goods were ready to ship, Kovalus shall have the option to provide Buyer with thirty (30) days prior written notice of its intention to terminate the agreement. If by the end of such thirty-day period, Buyer has not taken delivery of the Goods, Kovalus may, without limiting the other remedies available to it, terminate the agreement without liability to Buyer and may resell or otherwise dispose of part or all of the Goods.

## Cancellation

In the event that the Buyer chooses to cancel this order, for any reason, it must be in the form of written notice to Kovalus. In the event of such cancellation, the Buyer agrees to pay Kovalus for all invoices prepared in accordance with the payment terms stated herein, up to the time of order cancellation, along with those costs which arose out of or resulted from the cancellation, plus a cancellation fee of 25% of the order price. Materials received, work in progress, goods manufactured and results and products of the work performed, in part or whole, prior to the time of cancellation, shall be retained by and shall be the property of Kovalus. When calculating the cancellation related payments, payments made by the Buyer to Kovalus prior to cancellation shall be taken into account.

## Late Payments

The lesser of either a 2.5% per month interest charge or the maximum rate allowable by law will be added to any overdue amount.

## General Limits on Kovalus Liability

THIS ORDER IS EXPRESSLY LIMITED TO THE STANDARD TERMS AND CONDITIONS ATTACHED HEREIN AND MADE A PART OF THIS OFFER BY REFERENCE. KOVALUS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

## Agreement

This proposal, including the attachments hereto, constitutes the entire agreement between Buyer and Kovalus and supersedes all prior written or oral understandings. This Agreement may only be amended, supplemented, modified or cancelled by a duly executed written instrument signed by both Buyer and Kovalus.





### Proposal Acceptance

IN WITNESS WHEREOF, the duly authorized representatives of both Buyer and Kovalus have signed this Agreement.

CITY OF LATHROP, CA ("Buyer")	
<i>Signature</i>	_____
<i>Printed Name</i>	_____
<i>Title</i>	_____
<i>Date</i>	_____

KOVALUS SEPARATION SOLUTIONS™, LLC ("Kovalus" or "KSS")	
<i>Signature</i>	_____
<i>Printed Name</i>	_____
<i>Title</i>	_____
<i>Date</i>	_____

### ATTACHMENTS

The following attachments are added to this proposal:

1. Kovalus Standard Terms and Conditions of Sale
2. Membrane Data Sheet

# STANDARD TERMS AND CONDITIONS OF SALE



KROVALUS SEPARATION SOLUTIONS™, LLC ("KSS") provides the following Standard Terms and Conditions of Sale ("Terms and Conditions"), which apply to all quotations and sales made by KSS. All purchases by customer, owner, or its agent ("Purchaser") are expressly limited and conditioned upon acceptance of the following Terms and Conditions, and no provision, printed or otherwise, contained in any order, acceptance, confirmation, or acknowledgement which is inconsistent with, different from, or in addition to these Terms and Conditions is accepted by KSS unless specifically agreed to in writing by KSS. Acceptance of Purchaser's order by KSS is subject to verification of Purchaser's creditworthiness.

**1. TIME LIMIT.** All quotations are valid for a period of sixty (60) days, unless otherwise specified.

**2. SHIPMENT.** Pricing and shipping terms shall be ex-works the manufacturing facility. If the Purchaser has not issued inspection or shipping instructions by the time the Goods are ready for shipment, KSS may select any reasonable method of shipment, without liability by reason of its selection. Shipments made on Purchaser's behalf shall be insured at Purchaser's expense. If KSS is required to arrange for shipment of the Goods or any parts thereof, Purchaser shall reimburse KSS for all freight, insurance and other shipping related costs and Purchaser will pay KSS a handling fee for each such shipment. Shipment of Goods held by reason of Purchaser's request or inability to receive Goods will be at the risk and expense of Purchaser. Claims for shortages in shipment shall be deemed waived unless made in writing to KSS within ten (10) days from date of invoice.

**3. PAYMENT TERMS.** Payments will be made in accordance with the specified payment schedule. All payments are due net thirty (30) days from date of invoice, unless otherwise specified. Purchaser's failure to make payment when due will be a material breach of the order and these Terms and Conditions. KSS, at its sole option and without incurring any liability, may suspend its performance until such time as the overdue payment is made or KSS receives assurances, adequate in KSS' opinion, that the payment will be promptly made. In the event of such suspension of performance by KSS, there will be an equitable adjustment made to the delivery schedule and order price reflecting the duration and cost resulting from such suspension. Purchaser may only suspend the order upon KSS' written consent. In the event of such Purchaser suspension, the delivery time will be changed, taking into account the suspension, and Purchaser will promptly pay KSS for all costs and related overhead costs resulting from such suspension. KSS will equitably re-price the goods and services if the cumulative suspension exceeds ninety (90) days. If in the judgment of KSS, Purchaser's financial position does not justify the terms of payment specified, KSS may require full or partial payment prior to shipment of the goods. Purchaser agrees to furnish KSS with the required credit information. Payments for all export shipments will be in accordance with the specified payment schedule included herein by way of an Irrevocable Letter of Credit, established in favor of KSS, drawn on and confirmed by a prime U.S.A. bank that is approved by KSS. This Letter of Credit is to be established at the time of award of an order. All costs associated with the Letter of Credit will be for the Purchaser's account.

**4. TAXES.** Federal, state, or local indirect taxes, including but not limited to sales and/or use taxes, VAT taxes, GST taxes, transfer taxes or any similar tax are not included in the prices set forth herein.

**5. WARRANTY.** KSS warrants only that all goods manufactured by KSS, except membranes, shall be free from defects in material and workmanship; provided, however, that this warranty shall be limited to goods found to be defective within a period of one (1) year from initial use or fifteen (15) months from the date of shipment, whichever expires first, except as may otherwise be provided ("Warranty Period"). MEMBRANES ARE SOLD AS IS. This warranty does not cover Purchaser furnished/specified equipment and/or Purchaser furnished materials. Resale products shall carry only the warranty offered by the original manufacturer and no warranty by KSS.

The sole and exclusive remedy of the Purchaser for any liability of KSS of any kind, including (a) warranty, express or implied whether contained in the terms and conditions hereof, or in any terms additional or supplemental hereto, (b) contract, (c) negligence, (d) tort, or (e) otherwise, is limited to the repair or replacement, FOB point of manufacture, by KSS of those goods which an examination by KSS reveals to be defective during the Warranty Period, or at KSS' option to refund to Purchaser the money paid to KSS for such goods. Purchaser and KSS may mutually agree to acceptance of the goods to be designated "as is" with an agreed upon reduction in price. KSS will have no obligation to remedy defects unless, within the Warranty Period, Purchaser gives KSS written notice of its claim and returns the defective goods after receipt of shipping instructions from KSS to return such goods. Purchaser will ship the goods to KSS, freight prepaid, and KSS will return the goods to Purchaser, freight collect. All goods returned for repair or replacement pursuant to this section are to be packaged in accordance with the instructions received.

In no event shall KSS incur any obligation to repair or replace goods which are determined by KSS to be defective due to customer misuse, or due to use not in accordance with specified operating conditions, and operating and maintenance instructions. KSS retains the option to witness the operation of the goods to verify operating conditions. KSS shall not incur any obligation hereunder with respect to goods which are repaired or modified in any way by the Purchaser without KSS prior written approval. Installation by the Purchaser during regular intervals of normal maintenance of parts supplied by KSS shall not constitute such modification.

EXCEPT FOR THE EXPRESS WARRANTY STATED HEREIN, KSS DISCLAIMS ALL WARRANTIES WITH RESPECT TO THE GOODS, INCLUDING ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

**6. CONFIDENTIAL INFORMATION.** The information, drawings, plans, and specifications being furnished by KSS have been developed at KSS' expense and shall not be used or disclosed by Purchaser for any purpose other than to install, operate, and maintain the goods supplied hereunder.

**7. DELIVERIES.** The delivery date(s) quoted are based on KSS' best estimate of a realistic time when delivery to the carrier will be made, and are subject to confirmation at time of acceptance of any resulting order. KSS reserves the right to make either early shipment or partial shipments and invoice Purchaser accordingly.

**8. EXCUSABLE DELAYS.** KSS shall not be liable for loss, damages, detention, or delays resulting from causes beyond its reasonable control or caused by but not limited to strikes,

restrictions of the United States Government or other governments having jurisdiction, delays in transportation, inability to obtain necessary labor, materials, or manufacturing facilities, or any other cause reasonably beyond its control, whether similar or dissimilar to those listed.

**9. PATENTS.** The Purchaser will indemnify and hold KSS harmless against any expense or loss or other damage resulting from infringement of patents or trademarks arising from KSS compliance with any designs, specifications, or instructions of the Purchaser. In addition, all license fees and royalties are the exclusive responsibility and liability of Purchaser.

**10. TITLE AND RISK OF LOSS OR DAMAGE.** Title, risk of loss and/or damage will pass to the Purchaser upon shipment of the goods.

**11. INSTALLATION/SERVICE.** Installation of goods furnished hereunder will be by the Purchaser, unless otherwise agreed to in writing.

Field service will be provided on a per diem basis upon written authorization by the Purchaser and will be at the rates in effect at the time such services are provided, unless otherwise agreed in writing. Field service at the job site to diagnose equipment problems will be provided on a per diem basis at the then-current rates.

**12. CANCELLATION.** Cancellation of any order must be by written notice to KSS and will be subject to cancellation charges, which will include all expenses incurred by KSS and a reasonable profit on the sale.

**13. RESTOCKING FEE.** If Purchaser orders the wrong material, it may NOT be returned to KSS unless the following conditions have been met:

- KSS has authorized the return of the material, and has issued a Return Material Authorization Number;
- the material is unused and undamaged;
- the material consists of standard KSS membranes, U-bends, or gauges;
- the material is returned with all freight costs paid for by Purchaser; and
- Purchaser pays a restocking fee of twenty percent (20%) of the original purchase price.

NOTE: KSS will not authorize or accept the return of any system or cleaning chemicals under any circumstances.

**14. LAWS, CODES, AND STANDARDS.** Except as expressly stated herein, the price and schedule included herein are based on United States laws, codes, and standards in effect as of the date of this order. Should such laws, codes, and standards change and increase or decrease the cost of performing the work or impact the schedule, KSS will advise Purchaser of such change. Purchaser and KSS will mutually agree to any modification of the order resulting from such change.

**15. CONSEQUENTIAL DAMAGES; LIMITATION OF LIABILITY.** KSS WILL NOT BE LIABLE FOR ANY LOST PROFITS, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER ARISING UNDER WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY, INDEMNIFICATION, OR ANY OTHER CAUSE OR COMBINATION OF CAUSES WHATSOEVER. THIS LIMITATION WILL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. In no case will KSS' liability exceed the amount paid to KSS by the Purchaser for the specific goods giving rise to such liability. Purchaser agrees to indemnify and hold KSS harmless from and against all liabilities, claims, and demands of third parties of any kind relating to the goods and their use arising after shipment of the goods.

**16. MODIFICATION.** No change, modification, or waiver to any terms or scope of the order will be binding and valid unless it is accepted in writing and signed by an authorized representative of KSS.

**17. ASSIGNMENT.** This order may not be transferred or assigned by operation of law or otherwise, without the prior express written consent of KSS. Any transfer or assignment of any rights, duties, or obligations hereunder without such consent shall be void. Provided, however, that KSS will not be prohibited from subcontracting all or a part of its obligations under this order.

**18. EXPORT SALES.** No provision of this agreement will be construed to require KSS to export or deliver any technical information, data, and/or equipment if such export or delivery is then prohibited or restricted by any law or regulation of the U.S. Government. Purchaser will comply with all applicable export and reexport control laws and regulations, including without limitation, the Export Administration Regulations (15 C.F.R. Parts 730, et seq.) maintained by the U.S. Department of Commerce and the Office of Foreign Assets Control Regulations (31 C.F.R. Chapter V) of the U.S. Treasury Department. Specifically, Purchaser will not, directly or indirectly, sell, export, reexport, transfer, provide, divert, loan, lease, consign, or otherwise dispose of goods, services, software, source code, or technology received in connection with this order to any person, entity, or destination prohibited by the laws or regulations of the United States, without obtaining prior authorization from the competent government authorities as required by those laws and regulations. Notwithstanding any other provision of this order, Purchaser will not be required to take or refrain from taking any action penalized under the laws of the United States or any applicable foreign jurisdiction, including without limitation, the antiboycott laws administered by the U.S. Commerce and Treasury Departments.

**19. INSURANCE.** Upon the request by Purchaser, KSS will provide a Certificate of Insurance evidencing the following types of insurance:

Workers Compensation	Statutory	
Employer Liability	\$1,000,000.00	
Comprehensive General Liability	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate
Comprehensive Auto Liability and Physical Damage	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate

**20. GOVERNING LAW.** All matters involving the validity, interpretation, and application of these Standard Terms and Conditions of Sale will be controlled by the laws of the Commonwealth of Massachusetts, United States of America. The parties disclaim any applicability of the U.N. Convention on the International Sale of Goods to the order.

**21. HEADINGS.** The headings used throughout are for convenience only and will be disregarded for the purpose of construing and enforcing this agreement.

# PULSION® Hollow Fiber Modules

PURON® Hollow Fiber Submerged Membrane Modules for MBR Applications

PRODUCT DESCRIPTION	
Membrane Chemistry:	Proprietary PVDF
Membrane Type:	Braided hollow fiber for outside-in operation
Fiber Support Chemistry:	Polyester
Nominal Pore Size:	0.03 µm
Outside Fiber Diameter:	0.1 inch (2.6 mm)
Regulatory Information:	Accepted by California Department of Public Health (CDPH) for compliance with California Water Recycling Criteria (Title 22)
Potting Material:	Proprietary epoxy compound
Module Frame Material:	316 Stainless Steel
Permeate Collection Tube Material:	ABS, PVC, PE manifolds
Storage Solution:	Glycerin

PRODUCT SPECIFICATIONS		
Part Number	Nominal Membrane Area ft <sup>2</sup> (m <sup>2</sup> )	
LE 8	3,746 (348)	
LE 16	7,492 (696)	
LE 44	20,602 (1,914)	

OPERATING & DESIGN INFORMATION*	
Temperature Range:	41 - 104°F (5 - 40°C)
Maximum Filtration Transmembrane Pressure:	9 psi (0.6 bar)
Maximum Backflush Transmembrane Pressure:	9 psi (0.6 bar)
Allowable pH Range for Cleaning:	2.0 – 10.5
Maximum Allowed Total Chlorine @ 95°F (35°C) or Lower:	1,000 ppm @ pH 8 or higher during maintenance clean
Maximum Allowed Total Chlorine @ 95°F (35°C) or Lower:	2,000 ppm @ pH 8 or higher during recovery clean
Maximum Allowed Total Chlorine Contact:	1,000,000 ppm-hrs cumulative

\* Consult Process Technology Group for specific applications.

NOMINAL DIMENSIONS & WEIGHT								
Model	L		W		H		Dry Weight	
	inches	mm	inches	mm	inches	mm	Pounds	kg
LE 8	36.4	925	37.0	940	104%	2,652	1,300	590
LE 16	66.0	1,675	37.0	940	104%	2,652	2,500	1,135
LE 44	88.9	2,258	70.0	1,780	104%	2,652	6,070	2,754

\* See Outline drawings for details

CONNECTIONS				
Model	Permeate		Air	
	Type	Size	Type	Size
LE 8	Grooved Coupling	2½" IPS	Grooved Coupling	1½" IPS
LE 16	Grooved Coupling	3" IPS	Grooved Coupling	2" IPS
LE 44	Grooved Coupling	4" IPS (2X)	Grooved Coupling	2½" IPS (2X)

The information contained in this publication is believed to be accurate and reliable, but is not to be construed as implying any warranty or guarantee of performance. We assume no responsibility, obligation or liability for results obtained or damages incurred through the application of the information contained herein. Refer to Standard Terms and Conditions of Sale and Performance Warranty documentation for additional information

KOVALUS SEPARATION SOLUTIONS™, LLC • 850 Main Street, Wilmington, MA 01887

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For complete contact information and listing of our global locations, visit [www.kovalus.com](http://www.kovalus.com)

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## PURON® MBR SYSTEM

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Ref: Lathrop Three Train Expansion

### CITY OF LATHROP, CA

390 Towne Center Drive  
Lathrop, CA 95330  
Attn: Ken Reed  
kreed@ci.lathrop.ca.us

### KOVALUS SEPARATION SOLUTIONS™, LLC

Jack Cangiano | Regional Sales Manager, East USA  
M +1 781-249-7245  
jccangiano@kss-sep.com

**FIRM PROPOSAL**

21-1373-2

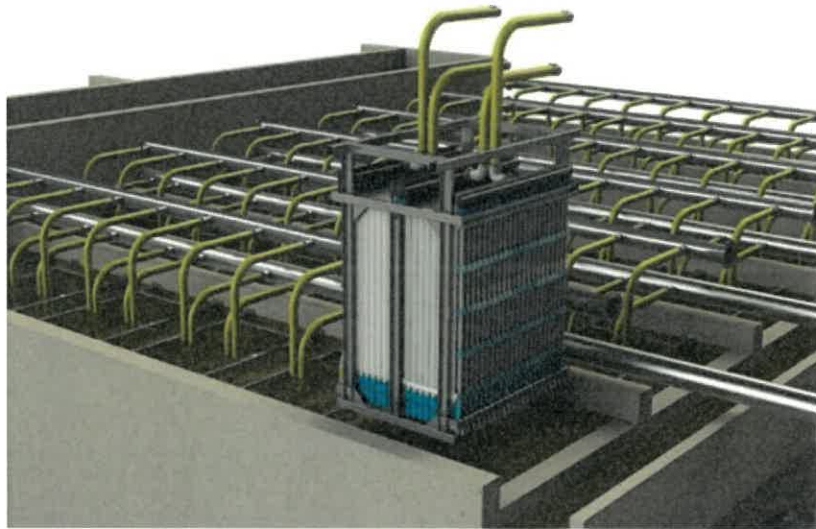
July 15, 2024



## KOVALUS FIRM PROPOSAL

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Rendering of a Kovalus PULSION® module being loaded into a membrane tank

#### Proprietary Notice

All information supplied herewith, including without limitation technical or financial data, know how, formulae, processes, designs, photographs, drawings, specifications, software programs and samples and any other material bearing or incorporating any information relating to **KOVALUS SEPARATION SOLUTIONS™, LLC (“Kovalus” or “KSS”)** products or systems is proprietary information belonging to Kovalus. Such information shall not be copied, reproduced, used or disclosed, (in whole or in part) without the prior written consent of Kovalus for any purpose other than that for which it has been supplied.

*For related patent and trademark information, visit: [www.kovalus.com/Legal](http://www.kovalus.com/Legal)*

## INTRODUCTION

Thank you for your interest in our PULSION® MBR Systems. For half a century, **KOVALUS SEPARATION SOLUTIONS™, LLC (“Kovalus” or “KSS”)** has been a world-class developer and manufacturer of innovative membrane filtration systems serving a global marketplace. We manufacture our own membranes, build custom and pre-engineered systems for a broad array of industries, and provide superior technical and customer service support.

In Kovalus, you will find a partner that is ISO 9001:2015 certified with in-house engineering, design, membrane manufacturing, and technical support capabilities. We also continue to set the standard as an industry-leading membrane system provider.

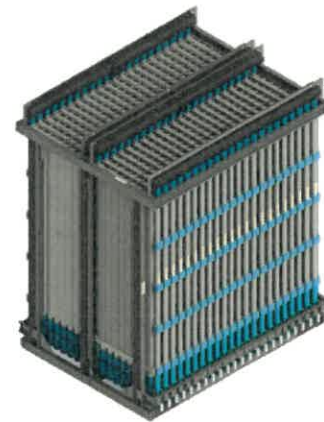
## KOVALUS PURON® MBR SOLUTION

The use of membrane bioreactors (MBR) for wastewater treatment was first introduced over 30 years ago. MBRs, like conventional secondary treatment, utilize activated sludge but in place of gravity clarification MBR employs a physical barrier in the form of a membrane for solid-liquid separation, limiting the passage of suspended solids, colloidal material, bacteria and other pathogens, while allowing clean effluent (permeate) to flow through.

### Benefits of the PULSION® MBR Product

The PULSION® submerged MBR product was specifically developed for MBR applications. The PULSION® MBR product uses the same membrane used in its previous generation, the PURON® PSH module, but it is packaged with individual bundle cages, and it uses an advanced large bubble aeration mechanism. The main product features and advantages of the PULSION® product include:

- Reinforced, virtually unbreakable UF hollow fiber product with optimal pore size and pore size distribution leads to high production flux rates, small system footprint and consistent, high quality performance
- Single header design, preventing sludging and clogging of the membrane modules with thick sludge, hair and other solids
- Central aeration, for efficient air scouring and fouling removal at low energy usage



**PULSION® LE44 module**

Altogether, these features make the PULSION® MBR product the most economical MBR product in the market, with typical aeration power consumption of 0.05 – 0.06 kWh/m<sup>3</sup>, and with life cycle costs in the same range of conventional treatment technologies.

### Note

*Information provided in this Introduction and subsequent sections, including attachments, is for reference only and should not be interpreted as a performance guarantee.*





**SCOPE OF SUPPLY**

**KOVALUS SCOPE OF SUPPLY**

**Equipment**

For this project, Kovalus is offering the MBR system components and services required for the Lathrop three train expansion. The Kovalus scope of supply includes the membrane filtration equipment as listed in Table 1.

**Table 1: System Components**

Item	Description	Qty	Specifications
1	Membrane modules	12	PULSION® LE 44, each 1,914 m <sup>2</sup> , in 3 trains, total area: 22,968 m <sup>2</sup>
2	Membrane traverses	12	To be used for lifting and installation of the PURON® LE 44 membrane modules; custom traverses with grating
3	Module connection kits	12	To connect the PURON® LE 44 membrane modules
4	Permeate manifolds	3	As per Kovalus design standards, fabricated with Schedule 10 316SS
5	Aeration manifolds	3	As per Kovalus design standards, fabricated with Schedule 10 304SS
6	Membrane blowers	4	3 duty + 1 standby, positive displacement type, each: 3,036 Nm <sup>3</sup> /h (1, 786 scfm) @ 0.35 bar (5.0psi); by Kaeser
7	Permeate pumps	3	Rotary lobe type: 46 - 337 m <sup>3</sup> /h (202 - 1,482 gpm) @ 1.0 bar (14.5 psi)
8	Sodium hypochlorite dosing pumps	2	1 + 1, 167 gph each, peristaltic type; by Blue White
9	Citric acid dosing pumps	2	1 + 1, 55 gph each, peristaltic type; by Blue White
10	Valves & instrumentation	lot	Equipment for 3 additional trains, as shown on the original plant P&ID and per the initial equipment specification, E&H brand for permeate pressure transmitter; Valves for 3 new trains  Also includes air scour valves, permeate pressure transmitters, and powerflush valves for the three existing trains
11	Control package PLC/HMI code	lot	NEMA 4 main control enclosure with pre-programmed Allen Bradley PLC and HMI; SCADA capability incorporated into the HMI package; ample I/O will be provided for control of all Kovalus supplied equipment. Field wiring including power to panel and wiring between the control panel and field devices is by others.
12	Permeate pump VFDs	lot	NEMA 4 VFDs for Kovalus supplied permeate pumps; PowerFlex by Allen Bradley; equipment is shipped loose



Item	Description	Qty	Specifications
13	Compressor	1	One compressor with dryer; 30 scfm @125 psi; by Kaeser or equal

## Engineering Support Services

### Factory Inspection

Kovalus will perform a factory inspection for this equipment consisting of the following:

- System assembly verification - hardware & instrumentation checks for compliance with Kovalus design specifications and data sheets
- Review of all hardware documentation
- Software simulation and control panel check

### Documentation

Kovalus will provide the following documentation for this equipment:

- Engineering reference package comprising a P&ID, equipment outline drawing, and equipment specifications
- System operating and maintenance (O&M) manual, written in English, will be supplied on USB drive with P&ID, equipment outline drawing, and wiring diagrams.

### Technical Field Service

Kovalus will provide onsite technical service for system commissioning and operator training. This includes up to ten (10) days of onsite support from Kovalus Process Engineering representatives and up to ten (10) days of onsite support from a Kovalus Field Service representative. Travel expenses are included for four (4) trips to the jobsite.

The onsite service will consist of the following:

- Kovalus field service representative will verify that the Goods have been installed properly.
- Kovalus field service representative will conduct the startup procedures, followed by operational checkouts.
- Once the startup procedures and operational checkouts have been completed, the Goods will commence operation on clean water.
- During startup and commissioning, the Goods will be operated to demonstrate that:
  - all equipment is coordinated and operating properly from an electrical and mechanical perspective;
  - all controls operate properly in coordination with equipment installed; and
  - installed equipment complies in all respects mechanically and electrically with applicable Kovalus drawings and specifications.

*If needed, additional time on site can be provided at Kovalus Standard rates for technical service.*

***If an item is not specifically mentioned in the Kovalus scope of supply, it is not included.***



**BUYER'S SCOPE OF SUPPLY**

The Buyer must furnish all other materials and services for complete installation, start-up, operation, and maintenance of the filtration system. This includes, but is not limited to, the MBR equipment listed in Table 2 and the other items/services listed in Table 3.

**Table 2: Buyer's scope of supply - MBR equipment**

Item	Description	Qty	Specification
1	Membrane return pumps	3	Centrifugal, submersible type: 474 - 948 m <sup>3</sup> /h (2,087 - 4,173 gpm) @ 0.32 bar (4.6 psi)

**Table 3: Buyer's scope of supply - other**

Item	Description	Specification
1	Job site / facility requirements	Freight, unloading, duties, taxes, permits, licenses, bonds, etc. as required
2	Installation area	Building, foundation, civil works, construction engineering, drains, sumps, HVAC, odor control, emergency power supply, safety equipment, heating, lighting, etc.
3	Other equipment	The following equipment, as required: <ul style="list-style-type: none"> <li>• Pre-treatment and/or post-treatment</li> <li>• Existing MBR system</li> <li>• Wastewater collection and pump stations</li> <li>• Influent pumps</li> <li>• Sludge holding and dewatering equipment, scum removal, grit collection/disposal, effluent disposal</li> <li>• Disinfection, as required</li> </ul>
4	Installation labor and materials	Labor and installation materials for: <ul style="list-style-type: none"> <li>• Installation of MBR filtration system including membrane installation and installation of Kovalus supplied equipment, and all process piping and connecting piping/lines for MBR system</li> <li>• Electrical wiring and installation for power, design and connection of all equipment, instruments and control panels</li> <li>• Design and connection of all equipment, instruments, and control panels</li> <li>• Structural beams and structural items required for installation</li> <li>• Overhead crane for installation and removal of membrane module; permanently installed crane is not required</li> </ul>
5	Utilities	All utilities including electrical, telephone line for modem access (if required), plant service water, compressor / compressed air supply, etc.
6	Operational labor and materials	<ul style="list-style-type: none"> <li>• Labor and materials for system operation including start-up, system operation, maintenance, maintenance and operational spare parts, operating / maintenance / cleaning logs, etc.</li> <li>• Biomass seed material and nutrient feed to sustain biomass</li> </ul>



Item	Description	Specification
7	Consumables	<ul style="list-style-type: none"><li>Analytical instrumentation and test kits as required for system monitoring, equipment calibration, etc.</li><li>Laboratory services for startup and on-going plant operation support</li></ul> All consumables, including treatment and cleaning chemicals, transfer or offloading equipment required for handling of the treatment chemicals, and chemical storage





COMMERCIAL PROPOSAL

PRICING

MBR System Expansion* .....	\$2,334,000
Freight .....	\$28,000
Sales Tax of 8.75% for taxable items noted with * .....	\$204,225
<b>Offer Price.....</b>	<b>\$2,566,225</b>

*\*Denotes taxable item. Sales tax of 8.75% has been applied to taxable items. Total tax is shown above. The Buyer is to advise any changes to tax rate or tax requirements. Buyer is responsible for any increases in tax due to changes in tax rates and/or tax law occurring between order and project completion. In case of increase, the adjusted invoice will be provided by Kovalus with charges to the Buyer.*

***This proposal is valid for ninety (90) days from proposal date.***

*Pricing may change at any time and is subject to confirmation at time of order placement. Due to market price and supply chain fluctuations, all prices and deliveries are subject to change after order placement and will be verified and updated once Kovalus engineering and design is complete and Kovalus is released to place its order(s). The price included in this Proposal ("Price") assumes stable costs for raw materials (including steel), purchased components and transportation ("Costs") and further assumes that Kovalus will not be required to pay any surcharges in connection with acquisition of such raw materials, purchased components and transportation. If surcharges accrue or Costs escalate between the date of this Proposal and the date that Kovalus issues its sub-orders for raw materials, components and/or transportation relating to this Proposal, Buyer agrees that the Price will be increased by the amount of such additional Costs or surcharges.*

PAYMENT TERMS

1. 10% of the order price due net 30 days from receipt and acceptance of a signed Agreement
2. 10% of the order price due net 30 days from receipt of approval to order long lead time items
3. 20% of the order price due net 30 days from Kovalus' initial submittal of engineering reference package (consisting of dimensions sketch, P&ID and parts list)
4. 20% of the order price due net 30 days from receipt of drawing approvals and Notice to Proceed with Manufacturing
5. 30% of the order price due upon Notice of Equipment Availability for Shipment; this payment and all prior payments are due prior to equipment shipment
6. 10% of the order price due after start-up of the equipment, or 90 days after Notice of Equipment Availability for Shipment, whichever occurs first

*Kovalus has the right to suspend performance for delayed or non-payment of invoices. All orders are subject to credit approval prior to acceptance. Payments must be made via a financial institution that is not subject to the sanction laws of the United States, the European Union, or other applicable jurisdictions.*





## SHIPPING TERMS

“DDP –Lathrop, CA”, per Incoterms 2020.

## MANUFACTURING LEAD TIME

The estimated lead time to prepare this equipment for shipment is thirty (30) weeks from Notice to Proceed with Manufacturing. A more accurate shipping schedule will be provided at the time of order acceptance.

*\*Note: Lead times are subject to change due to the current and/or potential disruptions in the global freight market that can include, among other issues, delays, backlogs, and empty container shortages.*

## TERMS AND CONDITIONS OF SALE

This proposal is based on Kovalus Standard Terms and Conditions of Sale (Ver 10/23) except where modified by this proposal.

## KOVALUS CONTACT PERSON

Jack Cangiano  
Regional Sales Manager, East USA  
M +1 781-249-7245  
jccangiano@kss-sep.com

## MISCELLANEOUS COMMERCIAL TERMS

### Prices

All prices are stated and must be paid in U.S. dollars only. Changes made at the request of the Buyer to the scope of supply or project delays that result in an interruption of manufacturing may require a price or delivery adjustment. Changes in either will be conveyed to the Buyer within a reasonable time after receipt of request.

### Force Majeure

Force Majeure means any circumstances beyond the reasonable control of either party, including an act of God (such as, but not limited to unusually severe weather conditions, earthquakes, drought, tidal waves and floods), disease, epidemic, quarantine, fire, explosion, plant shutdown, strikes or other labor disputes (unless solely restricted to employees of seller), acts of terrorism or war, hostilities, act of foreign enemies, riots or other civil disturbances or voluntary or involuntary compliance with any law, order regulation, sanction, embargo, recommendation or request of any governmental authority, inability to obtain materials necessary for manufacture of the Goods, total or partial failure of any of seller’s usual means of transportation of the Goods or any other events or circumstances not within the control of the party affected, whether similar or dissimilar to any of the foregoing. Neither party will have any liability, other than for the payment of monies owing, to the extent that the performance any of their contractual obligations are delayed, hindered or prevented arising out of or in connection with events of Force Majeure.

If and to the extent that a party is delayed, hindered or prevented by an event of Force Majeure, then the affected party shall be entitled to extension of time in which to perform its obligations which takes into account the duration of the Force Majeure event and any reasonable period required to recover from its impact.



## Storage of Goods

If Buyer is unable or willing to accept or take delivery of the Goods within fourteen (14) days after contract agreed date, Buyer shall pay Kovalus a storage charge at a rate of two hundred dollars per square meter (\$200/m<sup>2</sup>) of floor space for each additional 30-day period, or portion thereof, of storage from the contract agreed date. Storage charges shall be invoiced monthly. Goods stored by Kovalus for Buyer under this provision shall be held at Buyer's sole risk. If the period of storage exceeds one hundred fifty (150) days from the date on which Kovalus notified the Buyer that the Goods were ready to ship, Kovalus shall have the option to provide Buyer with thirty (30) days prior written notice of its intention to terminate the agreement. If by the end of such thirty-day period, Buyer has not taken delivery of the Goods, Kovalus may, without limiting the other remedies available to it, terminate the agreement without liability to Buyer and may resell or otherwise dispose of part or all of the Goods.

## Cancellation

Buyer recognizes that Kovalus designs and manufactures custom engineered systems and that each is made to order to meet our client's unique requirements. In the event that the Buyer chooses to cancel this order, for any reason, it must be in the form of written notice to Kovalus. In the event of such cancellation, the Buyer agrees to pay Kovalus for all invoices prepared in accordance with the payment terms stated herein, up to the time of order cancellation, along with those costs which arose out of or resulted from the cancellation, plus a cancellation fee of 25% of the order price. Materials received, work in progress, goods manufactured and results and products of the work performed, in part or whole, prior to the time of cancellation, shall be retained by and shall be the property of Kovalus. When calculating the cancellation related payments, payments made by the Buyer to Kovalus prior to cancellation shall be taken into account.

## Late Payments

The lesser of either a 2.5% per month interest charge or the maximum rate allowable by law will be added to any overdue amount.

## General Limits on Kovalus Liability

THIS ORDER IS EXPRESSLY LIMITED TO THE STANDARD TERMS AND CONDITIONS ATTACHED HEREIN AND MADE A PART OF THIS OFFER BY REFERENCE. KOVALUS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

## Agreement

This proposal, including the attachments hereto, constitutes the entire agreement between Buyer and Kovalus and supersedes all prior written or oral understandings. This Agreement may only be amended, supplemented, modified or cancelled by a duly executed written instrument signed by both Buyer and Kovalus.



### Proposal Acceptance

IN WITNESS WHEREOF, the duly authorized representatives of both Buyer and Kovalus have signed this Agreement.

CITY OF LATHROP, CA ("Buyer")	
<i>Signature</i>	_____
<i>Printed Name</i>	_____
<i>Title</i>	_____
<i>Date</i>	_____

KOVALUS SEPARATION SOLUTIONS™, LLC ("Kovalus" or "KSS")	
<i>Signature</i>	_____
<i>Printed Name</i>	_____
<i>Title</i>	_____
<i>Date</i>	_____

## ATTACHMENTS

The following attachments are added to this proposal:

1. Kovalus Standard Terms and Conditions of Sale
2. Membrane Data Sheet

# STANDARD TERMS AND CONDITIONS OF SALE



KOVALUS SEPARATION SOLUTIONS™, LLC ("KSS") provides the following Standard Terms and Conditions of Sale ("Terms and Conditions"), which apply to all quotations and sales made by KSS. All purchases by customer, owner, or its agent ("Purchaser") are expressly limited and conditioned upon acceptance of the following Terms and Conditions, and no provision, printed or otherwise, contained in any order, acceptance, confirmation, or acknowledgement which is inconsistent with, different from, or in addition to these Terms and Conditions is accepted by KSS unless specifically agreed to in writing by KSS. Acceptance of Purchaser's order by KSS is subject to verification of Purchaser's creditworthiness.

**1. TIME LIMIT.** All quotations are valid for a period of sixty (60) days, unless otherwise specified.

**2. SHIPMENT.** Pricing and shipping terms shall be ex-works the manufacturing facility. If the Purchaser has not issued inspection or shipping instructions by the time the Goods are ready for shipment, KSS may select any reasonable method of shipment, without liability by reason of its selection. Shipments made on Purchaser's behalf shall be insured at Purchaser's expense. If KSS is required to arrange for shipment of the Goods or any parts thereof, Purchaser shall reimburse KSS for all freight, insurance and other shipping related costs and Purchaser will pay KSS a handling fee for each such shipment. Shipment of Goods held by reason of Purchaser's request or inability to receive Goods will be at the risk and expense of Purchaser. Claims for shortages in shipment shall be deemed waived unless made in writing to KSS within ten (10) days from date of invoice.

**3. PAYMENT TERMS.** Payments will be made in accordance with the specified payment schedule. All payments are due net thirty (30) days from date of invoice, unless otherwise specified. Purchaser's failure to make payment when due will be a material breach of the order and these Terms and Conditions. KSS, at its sole option and without incurring any liability, may suspend its performance until such time as the overdue payment is made or KSS receives assurances, adequate in KSS' opinion, that the payment will be promptly made. In the event of such suspension of performance by KSS, there will be an equitable adjustment made to the delivery schedule and order price reflecting the duration and cost resulting from such suspension. Purchaser may only suspend the order upon KSS' written consent. In the event of such Purchaser suspension, the delivery time will be changed, taking into account the suspension, and Purchaser will promptly pay KSS for all costs and related overhead costs resulting from such suspension. KSS will equitably re-price the goods and services if the cumulative suspension exceeds ninety (90) days. If in the judgment of KSS, Purchaser's financial position does not justify the terms of payment specified, KSS may require full or partial payment prior to shipment of the goods. Purchaser agrees to furnish KSS with the required credit information. Payments for all export shipments will be in accordance with the specified payment schedule included herein by way of an Irrevocable Letter of Credit, established in favor of KSS, drawn on and confirmed by a prime U.S.A. bank that is approved by KSS. This Letter of Credit is to be established at the time of award of an order. All costs associated with the Letter of Credit will be for the Purchaser's account.

**4. TAXES.** Federal, state, or local indirect taxes, including but not limited to sales and/or use taxes, VAT taxes, GST taxes, transfer taxes or any similar tax are not included in the prices set forth herein.

**5. WARRANTY.** KSS warrants only that all goods manufactured by KSS, except membranes, shall be free from defects in material and workmanship; provided, however, that this warranty shall be limited to goods found to be defective within a period of one (1) year from initial use or fifteen (15) months from the date of shipment, whichever expires first, except as may otherwise be provided ("Warranty Period"). MEMBRANES ARE SOLD AS IS. This warranty does not cover Purchaser furnished/specified equipment and/or Purchaser furnished materials. Resale products shall carry only the warranty offered by the original manufacturer and no warranty by KSS.

The sole and exclusive remedy of the Purchaser for any liability of KSS of any kind, including (a) warranty, express or implied whether contained in the terms and conditions hereof, or in any terms additional or supplemental hereto, (b) contract, (c) negligence, (d) tort, or (e) otherwise, is limited to the repair or replacement, FOB point of manufacture, by KSS of those goods which an examination by KSS reveals to be defective during the Warranty Period, or at KSS' option to refund to Purchaser the money paid to KSS for such goods. Purchaser and KSS may mutually agree to acceptance of the goods to be designated "as is" with an agreed upon reduction in price. KSS will have no obligation to remedy defects unless, within the Warranty Period, Purchaser gives KSS written notice of its claim and returns the defective goods after receipt of shipping instructions from KSS to return such goods. Purchaser will ship the goods to KSS, freight prepaid, and KSS will return the goods to Purchaser, freight collect. All goods returned for repair or replacement pursuant to this section are to be packaged in accordance with the instructions received.

In no event shall KSS incur any obligation to repair or replace goods which are determined by KSS to be defective due to customer misuse, or due to use not in accordance with specified operating conditions, and operating and maintenance instructions. KSS retains the option to witness the operation of the goods to verify operating conditions. KSS shall not incur any obligation hereunder with respect to goods which are repaired or modified in any way by the Purchaser without KSS prior written approval. Installation by the Purchaser during regular intervals of normal maintenance of parts supplied by KSS shall not constitute such modification.

EXCEPT FOR THE EXPRESS WARRANTY STATED HEREIN, KSS DISCLAIMS ALL WARRANTIES WITH RESPECT TO THE GOODS, INCLUDING ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

**6. CONFIDENTIAL INFORMATION.** The information, drawings, plans, and specifications being furnished by KSS have been developed at KSS' expense and shall not be used or disclosed by Purchaser for any purpose other than to install, operate, and maintain the goods supplied hereunder.

**7. DELIVERIES.** The delivery date(s) quoted are based on KSS' best estimate of a realistic time when delivery to the carrier will be made, and are subject to confirmation at time of acceptance of any resulting order. KSS reserves the right to make either early shipment or partial shipments and invoice Purchaser accordingly.

**8. EXCUSABLE DELAYS.** KSS shall not be liable for loss, damages, detention, or delays resulting from causes beyond its reasonable control or caused by but not limited to strikes,

restrictions of the United States Government or other governments having jurisdiction, delays in transportation, inability to obtain necessary labor, materials, or manufacturing facilities, or any other cause reasonably beyond its control, whether similar or dissimilar to those listed.

**9. PATENTS.** The Purchaser will indemnify and hold KSS harmless against any expense or loss or other damage resulting from infringement of patents or trademarks arising from KSS compliance with any designs, specifications, or instructions of the Purchaser. In addition, all license fees and royalties are the exclusive responsibility and liability of Purchaser.

**10. TITLE AND RISK OF LOSS OR DAMAGE.** Title, risk of loss and/or damage will pass to the Purchaser upon shipment of the goods.

**11. INSTALLATION/SERVICE.** Installation of goods furnished hereunder will be by the Purchaser, unless otherwise agreed to in writing.

Field service will be provided on a per diem basis upon written authorization by the Purchaser and will be at the rates in effect at the time such services are provided, unless otherwise agreed in writing. Field service at the job site to diagnose equipment problems will be provided on a per diem basis at the then-current rates.

**12. CANCELLATION.** Cancellation of any order must be by written notice to KSS and will be subject to cancellation charges, which will include all expenses incurred by KSS and a reasonable profit on the sale.

**13. RESTOCKING FEE.** If Purchaser orders the wrong material, it may NOT be returned to KSS unless the following conditions have been met:

- KSS has authorized the return of the material, and has issued a Return Material Authorization Number;
- the material is unused and undamaged;
- the material consists of standard KSS membranes, U-bends, or gauges;
- the material is returned with all freight costs paid for by Purchaser; and
- Purchaser pays a restocking fee of twenty percent (20%) of the original purchase price.

NOTE: KSS will not authorize or accept the return of any system or cleaning chemicals under any circumstances.

**14. LAWS, CODES, AND STANDARDS.** Except as expressly stated herein, the price and schedule included herein are based on United States laws, codes, and standards in effect as of the date of this order. Should such laws, codes, and standards change and increase or decrease the cost of performing the work or impact the schedule, KSS will advise Purchaser of such change. Purchaser and KSS will mutually agree to any modification of the order resulting from such change.

**15. CONSEQUENTIAL DAMAGES; LIMITATION OF LIABILITY. KSS WILL NOT BE LIABLE FOR ANY LOST PROFITS, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER ARISING UNDER WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY, INDEMNIFICATION, OR ANY OTHER CAUSE OR COMBINATION OF CAUSES WHATSOEVER. THIS LIMITATION WILL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.** In no case will KSS' liability exceed the amount paid to KSS by the Purchaser for the specific goods giving rise to such liability. Purchaser agrees to indemnify and hold KSS harmless from and against all liabilities, claims, and demands of third parties of any kind relating to the goods and their use arising after shipment of the goods.

**16. MODIFICATION.** No change, modification, or waiver to any terms or scope of the order will be binding and valid unless it is accepted in writing and signed by an authorized representative of KSS.

**17. ASSIGNMENT.** This order may not be transferred or assigned by operation of law or otherwise, without the prior express written consent of KSS. Any transfer or assignment of any rights, duties, or obligations hereunder without such consent shall be void. Provided, however, that KSS will not be prohibited from subcontracting all or a part of its obligations under this order.

**18. EXPORT SALES.** No provision of this agreement will be construed to require KSS to export or deliver any technical information, data, and/or equipment if such export or delivery is then prohibited or restricted by any law or regulation of the U.S. Government. Purchaser will comply with all applicable export and reexport control laws and regulations, including without limitation, the Export Administration Regulations (15 C.F.R. Parts 730, et seq.) maintained by the U.S. Department of Commerce and the Office of Foreign Assets Control Regulations (31 C.F.R. Chapter V) of the U.S. Treasury Department. Specifically, Purchaser will not, directly or indirectly, sell, export, reexport, transfer, provide, divert, loan, lease, consign, or otherwise dispose of goods, services, software, source code, or technology received in connection with this order to any person, entity, or destination prohibited by the laws or regulations of the United States, without obtaining prior authorization from the competent government authorities as required by those laws and regulations. Notwithstanding any other provision of this order, Purchaser will not be required to take or refrain from taking any action penalized under the laws of the United States or any applicable foreign jurisdiction, including without limitation, the antiboycott laws administered by the U.S. Commerce and Treasury Departments.

**19. INSURANCE.** Upon the request by Purchaser, KSS will provide a Certificate of Insurance evidencing the following types of insurance:

<i>Workers Compensation</i>	Statutory	
<i>Employer Liability</i>	\$1,000,000.00	
<i>Comprehensive General Liability</i>	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate
<i>Comprehensive Auto Liability and Physical Damage</i>	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate

**20. GOVERNING LAW.** All matters involving the validity, interpretation, and application of these Standard Terms and Conditions of Sale will be controlled by the laws of the Commonwealth of Massachusetts, United States of America. The parties disclaim any applicability of the U.N. Convention on the International Sale of Goods to the order.

**21. HEADINGS.** The headings used throughout are for convenience only and will be disregarded for the purpose of construing and enforcing this agreement.

# PULSION® Hollow Fiber Modules

PURON® Hollow Fiber Submerged Membrane Modules for MBR Applications

PRODUCT DESCRIPTION	
Membrane Chemistry:	Proprietary PVDF
Membrane Type:	Braided hollow fiber for outside-in operation
Fiber Support Chemistry:	Polyester
Nominal Pore Size:	0.03 µm
Outside Fiber Diameter:	0.1 inch (2.6 mm)
Regulatory Information:	Accepted by California Department of Public Health (CDPH) for compliance with California Water Recycling Criteria (Title 22)
Potting Material:	Proprietary epoxy compound
Module Frame Material:	316 Stainless Steel
Permeate Collection Tube Material:	ABS, PVC, PE manifolds
Storage Solution:	Glycerin

PRODUCT SPECIFICATIONS	
Part Number	Nominal Membrane Area ft <sup>2</sup> (m <sup>2</sup> )
LE 8	3,746 (348)
LE 16	7,492 (696)
LE 44	20,602 (1,914)

OPERATING & DESIGN INFORMATION*	
Temperature Range:	41 - 104°F (5 - 40°C)
Maximum Filtration Transmembrane Pressure:	9 psi (0.6 bar)
Maximum Backflush Transmembrane Pressure:	9 psi (0.6 bar)
Allowable pH Range for Cleaning:	2.0 – 10.5
Maximum Allowed Total Chlorine @ 95°F (35°C) or Lower:	1,000 ppm @ pH 8 or higher during maintenance clean
Maximum Allowed Total Chlorine @ 95°F (35°C) or Lower:	2,000 ppm @ pH 8 or higher during recovery clean
Maximum Allowed Total Chlorine Contact:	1,000,000 ppm-hrs cumulative

\* Consult Process Technology Group for specific applications.

NOMINAL DIMENSIONS & WEIGHT								
Model	L		W		H		Dry Weight	
	inches	mm	inches	mm	inches	mm	Pounds	kg
LE 8	36.4	925	37.0	940	104%	2,652	1,300	590
LE 16	66.0	1,675	37.0	940	104%	2,652	2,500	1,135
LE 44	88.9	2,258	70.0	1,780	104%	2,652	6,070	2,754

\* See Outline drawings for details

CONNECTIONS				
Model	Permeate		Air	
	Type	Size	Type	Size
LE 8	Grooved Coupling	2½" IPS	Grooved Coupling	1½" IPS
LE 16	Grooved Coupling	3" IPS	Grooved Coupling	2" IPS
LE 44	Grooved Coupling	4" IPS (2X)	Grooved Coupling	2½" IPS (2X)

The information contained in this publication is believed to be accurate and reliable, but is not to be construed as implying any warranty or guarantee of performance. We assume no responsibility, obligation or liability for results obtained or damages incurred through the application of the information contained herein. Refer to Standard Terms and Conditions of Sale and Performance Warranty documentation for additional information

KOVALUS SEPARATION SOLUTIONS™, LLC • 850 Main Street, Wilmington, MA 01887

Main: +1-978-694-7000 • Toll Free: +1-888-677-5624

For complete contact information and listing of our global locations, visit [www.kovalus.com](http://www.kovalus.com)

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10/23 Rev 23-2





# STANDARD TERMS AND CONDITIONS OF SALE

KROVALUS SEPARATION SOLUTIONS™, LLC ("KSS") provides the following Standard Terms and Conditions of Sale ("Terms and Conditions"), which apply to all quotations and sales made by KSS. All purchases by customer, owner, or its agent ("Purchaser") are expressly limited and conditioned upon acceptance of the following Terms and Conditions, and no provision, printed or otherwise, contained in any order, acceptance, confirmation, or acknowledgement which is inconsistent with, different from, or in addition to these Terms and Conditions is accepted by KSS unless specifically agreed to in writing by KSS. Acceptance of Purchaser's order by KSS is subject to verification of Purchaser's creditworthiness.

**1. TIME LIMIT.** All quotations are valid for a period of sixty (60) days, unless otherwise specified.

**2. SHIPMENT.** Pricing and shipping terms shall be ex-works the manufacturing facility. If the Purchaser has not issued inspection or shipping instructions by the time the Goods are ready for shipment, KSS may select any reasonable method of shipment, without liability by reason of its selection. Shipments made on Purchaser's behalf shall be insured at Purchaser's expense. If KSS is required to arrange for shipment of the Goods or any parts thereof, Purchaser shall reimburse KSS for all freight, insurance and other shipping related costs and Purchaser will pay KSS a handling fee for each such shipment. Shipment of Goods held by reason of Purchaser's request or inability to receive Goods will be at the risk and expense of Purchaser. Claims for shortages in shipment shall be deemed waived unless made in writing to KSS within ten (10) days from date of invoice.

**3. PAYMENT TERMS.** Payments will be made in accordance with the specified payment schedule. All payments are due net thirty (30) days from date of invoice, unless otherwise specified. Purchaser's failure to make payment when due will be a material breach of the order and these Terms and Conditions. KSS, at its sole option and without incurring any liability, may suspend its performance until such time as the overdue payment is made or KSS receives assurances, adequate in KSS' opinion, that the payment will be promptly made. In the event of such suspension of performance by KSS, there will be an equitable adjustment made to the delivery schedule and order price reflecting the duration and cost resulting from such suspension. Purchaser may only suspend the order upon KSS' written consent. In the event of such Purchaser suspension, the delivery time will be changed, taking into account the suspension, and Purchaser will promptly pay KSS for all costs and related overhead costs resulting from such suspension. KSS will equitably re-price the goods and services if the cumulative suspension exceeds ninety (90) days. If in the judgment of KSS, Purchaser's financial position does not justify the terms of payment specified, KSS may require full or partial payment prior to shipment of the goods. Purchaser agrees to furnish KSS with the required credit information. Payments for all export shipments will be in accordance with the specified payment schedule included herein by way of an Irrevocable Letter of Credit, established in favor of KSS, drawn on and confirmed by a prime U.S.A. bank that is approved by KSS. This Letter of Credit is to be established at the time of award of an order. All costs associated with the Letter of Credit will be for the Purchaser's account.

**4. TAXES.** Federal, state, or local indirect taxes, including but not limited to sales and/or use taxes, VAT taxes, GST taxes, transfer taxes or any similar tax are not included in the prices set forth herein.

**5. WARRANTY.** KSS warrants only that all goods manufactured by KSS, except membranes, shall be free from defects in material and workmanship; provided, however, that this warranty shall be limited to goods found to be defective within a period of one (1) year from initial use or fifteen (15) months from the date of shipment, whichever expires first, except as may otherwise be provided ("Warranty Period"). MEMBRANES ARE SOLD AS IS. This warranty does not cover Purchaser furnished/specified equipment and/or Purchaser furnished materials. Resale products shall carry only the warranty offered by the original manufacturer and no warranty by KSS.

The sole and exclusive remedy of the Purchaser for any liability of KSS of any kind, including (a) warranty, express or implied whether contained in the terms and conditions hereof, or in any terms additional or supplemental hereto, (b) contract, (c) negligence, (d) tort, or (e) otherwise, is limited to the repair or replacement, FOB point of manufacture, by KSS of those goods which an examination by KSS reveals to be defective during the Warranty Period, or at KSS' option to refund to Purchaser the money paid to KSS for such goods. Purchaser and KSS may mutually agree to acceptance of the goods to be designated "as is" with an agreed upon reduction in price. KSS will have no obligation to remedy defects unless, within the Warranty Period, Purchaser gives KSS written notice of its claim and returns the defective goods after receipt of shipping instructions from KSS to return such goods. Purchaser will ship the goods to KSS, freight prepaid, and KSS will return the goods to Purchaser, freight collect. All goods returned for repair or replacement pursuant to this section are to be packaged in accordance with the instructions received.

In no event shall KSS incur any obligation to repair or replace goods which are determined by KSS to be defective due to customer misuse, or due to use not in accordance with specified operating conditions, and operating and maintenance instructions. KSS retains the option to witness the operation of the goods to verify operating conditions. KSS shall not incur any obligation hereunder with respect to goods which are repaired or modified in any way by the Purchaser without KSS prior written approval. Installation by the Purchaser during regular intervals of normal maintenance of parts supplied by KSS shall not constitute such modification.

EXCEPT FOR THE EXPRESS WARRANTY STATED HEREIN, KSS DISCLAIMS ALL WARRANTIES WITH RESPECT TO THE GOODS, INCLUDING ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

**6. CONFIDENTIAL INFORMATION.** The information, drawings, plans, and specifications being furnished by KSS have been developed at KSS' expense and shall not be used or disclosed by Purchaser for any purpose other than to install, operate, and maintain the goods supplied hereunder.

**7. DELIVERIES.** The delivery date(s) quoted are based on KSS' best estimate of a realistic time when delivery to the carrier will be made, and are subject to confirmation at time of acceptance of any resulting order. KSS reserves the right to make either early shipment or partial shipments and invoice Purchaser accordingly.

**8. EXCUSABLE DELAYS.** KSS shall not be liable for loss, damages, detention, or delays resulting from causes beyond its reasonable control or caused by but not limited to strikes,

restrictions of the United States Government or other governments having jurisdiction, delays in transportation, inability to obtain necessary labor, materials, or manufacturing facilities, or any other cause reasonably beyond its control, whether similar or dissimilar to those listed.

**9. PATENTS.** The Purchaser will indemnify and hold KSS harmless against any expense or loss or other damage resulting from infringement of patents or trademarks arising from KSS compliance with any designs, specifications, or instructions of the Purchaser. In addition, all license fees and royalties are the exclusive responsibility and liability of Purchaser.

**10. TITLE AND RISK OF LOSS OR DAMAGE.** Title, risk of loss and/or damage will pass to the Purchaser upon shipment of the goods.

**11. INSTALLATION/SERVICE.** Installation of goods furnished hereunder will be by the Purchaser, unless otherwise agreed to in writing.

Field service will be provided on a per diem basis upon written authorization by the Purchaser and will be at the rates in effect at the time such services are provided, unless otherwise agreed in writing. Field service at the job site to diagnose equipment problems will be provided on a per diem basis at the then-current rates.

**12. CANCELLATION.** Cancellation of any order must be by written notice to KSS and will be subject to cancellation charges, which will include all expenses incurred by KSS and a reasonable profit on the sale.

**13. RESTOCKING FEE.** If Purchaser orders the wrong material, it may NOT be returned to KSS unless the following conditions have been met:

- KSS has authorized the return of the material, and has issued a Return Material Authorization Number;
- the material is unused and undamaged;
- the material consists of standard KSS membranes, U-bends, or gauges;
- the material is returned with all freight costs paid for by Purchaser; and
- Purchaser pays a restocking fee of twenty percent (20%) of the original purchase price.

NOTE: KSS will not authorize or accept the return of any system or cleaning chemicals under any circumstances.

**14. LAWS, CODES, AND STANDARDS.** Except as expressly stated herein, the price and schedule included herein are based on United States laws, codes, and standards in effect as of the date of this order. Should such laws, codes, and standards change and increase or decrease the cost of performing the work or impact the schedule, KSS will advise Purchaser of such change. Purchaser and KSS will mutually agree to any modification of the order resulting from such change.

**15. CONSEQUENTIAL DAMAGES; LIMITATION OF LIABILITY. KSS WILL NOT BE LIABLE FOR ANY LOST PROFITS, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER ARISING UNDER WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY, INDEMNIFICATION, OR ANY OTHER CAUSE OR COMBINATION OF CAUSES WHATSOEVER. THIS LIMITATION WILL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.** In no case will KSS' liability exceed the amount paid to KSS by the Purchaser for the specific goods giving rise to such liability. Purchaser agrees to indemnify and hold KSS harmless from and against all liabilities, claims, and demands of third parties of any kind relating to the goods and their use arising after shipment of the goods.

**16. MODIFICATION.** No change, modification, or waiver to any terms or scope of the order will be binding and valid unless it is accepted in writing and signed by an authorized representative of KSS.

**17. ASSIGNMENT.** This order may not be transferred or assigned by operation of law or otherwise, without the prior express written consent of KSS. Any transfer or assignment of any rights, duties, or obligations hereunder without such consent shall be void. Provided, however, that KSS will not be prohibited from subcontracting all or a part of its obligations under this order.

**18. EXPORT SALES.** No provision of this agreement will be construed to require KSS to export or deliver any technical information, data, and/or equipment if such export or delivery is then prohibited or restricted by any law or regulation of the U.S. Government. Purchaser will comply with all applicable export and reexport control laws and regulations, including without limitation, the Export Administration Regulations (15 C.F.R. Parts 730, et seq.) maintained by the U.S. Department of Commerce and the Office of Foreign Assets Control Regulations (31 C.F.R. Chapter V) of the U.S. Treasury Department. Specifically, Purchaser will not, directly or indirectly, sell, export, reexport, transfer, provide, divert, loan, lease, consign, or otherwise dispose of goods, services, software, source code, or technology received in connection with this order to any person, entity, or destination prohibited by the laws or regulations of the United States, without obtaining prior authorization from the competent government authorities as required by those laws and regulations. Notwithstanding any other provision of this order, Purchaser will not be required to take or refrain from taking any action penalized under the laws of the United States or any applicable foreign jurisdiction, including without limitation, the antiboycott laws administered by the U.S. Commerce and Treasury Departments.

**19. INSURANCE.** Upon the request by Purchaser, KSS will provide a Certificate of Insurance evidencing the following types of insurance:

<i>Workers Compensation</i>	Statutory	
<i>Employer Liability</i>	\$1,000,000.00	
<i>Comprehensive General Liability</i>	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate
<i>Comprehensive Auto Liability and Physical Damage</i>	\$1,000,000.00	\$1,000,000.00
	Combined Single Limit for BI & PD	aggregate

**20. GOVERNING LAW.** All matters involving the validity, interpretation, and application of these Standard Terms and Conditions of Sale will be controlled by the laws of the Commonwealth of Massachusetts, United States of America. The parties disclaim any applicability of the U.N. Convention on the International Sale of Goods to the order.

**21. HEADINGS.** The headings used throughout are for convenience only and will be disregarded for the purpose of construing and enforcing this agreement.



## SUBMITTALS FOR:

- 5 TON SGUH BRIDGE CRANE
  - 1.5 TON MANUAL HOIST
- PER SPECIFICATION SECTION NO.: 14300**

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### PROJECT 686-Lathrop

### CONSOLIDATED TREATMENT FACILITY PHASE 2 EXPANSION CIP #WW14-14

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Contractor: GSE Construction

Subcontractor: Trademark Hoist & Crane  
Telephone: (909) 455-0801  
Facsimile: (909) 622-4708

Submitted: May 11, 2017

Resubmitted: August 8, 2017

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SECTION 02:	Crane Endtrucks
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SECTION 06:	1.5 Manual Chain Hoist & Trolley



# Section 01

## 5 Ton Electric Hoist & Trolley

# The Industry Leader—Strength & Dependability

## EC Hook & Lug Suspension Models

**COFFING EC Models** - *High performance* hoists engineered for heavy duty industrial service. Designed for safety, the EC incorporates mechanical load brake, motor brake, and overload clutch as standard.

- **CAPACITIES & LIFTS** - Rated loads from 1/4 to 5 Tons, with 10, 15, and 20-foot standard lifts. Other lifts available. Standard push button drop is 4-feet less than lift.
- **VOLTAGE & MOTOR OPTIONS** - 115/230, 208 - single phase; 230/460, 208, 220/380, 575 - three phase. 60 hertz standard, 50 hertz available. Two-speed motors available (3 to 1 speed ratio).
- **SUSPENSION OPTIONS** - Rigid or swivel top hook, lug, plain, geared, and motorized trolley available.
- **STANDARD FEATURES** - Refer to pages 6 & 7.
- **SMALL FRAME DESIGN** - Features housings of cast aluminum alloy construction for minimum weight. Engineered and designed for use with motors up to 1 HP.
- **LARGE FRAME DESIGN** - Features load bearing housings of ductile iron construction for maximum strength. Non-load bearing housings of cast aluminum alloy for minimum weight. Engineered and designed for use with higher torque 2 and 3 HP three phase motors
- **DURABLE CONSTRUCTION** - Built in compliance with ASME/ANSI B30.16 and CSA standards.
- **ACCESSORIES & OPTIONS** - Full line available to meet a variety of applications. See pages 22-27.
- **LIFETIME WARRANTY**



**1/4 - 5 Ton**  
Made in USA



**S P E C I F I C A T I O N S**

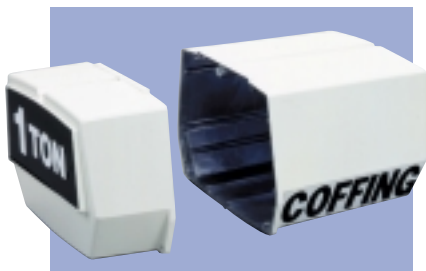
**EC Hook & Lug Suspension Models**

Capacity		Model Number	Frame* Size	No. of Chains	Motor HP	Lift Speed (FPM)		Headroom (In.)	Housing Dimensions (In.)			Net Wt.** (Lb.)
(Lb.)	(Ton)					Single	Two		H	W	L	
500	1/4	<b>EC-0516</b>	S	1	1/4	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	100
500	1/4	<b>EC-0532</b>	S	1	1/2	32	10.7	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	108
500	1/4	<b>EC-0564</b>	S	1	1	64	21.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
1000	1/2	<b>EC-1009</b>	S	1	1/4	9	3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	104
1000	1/2	<b>EC-1016</b>	S	1	1/2	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	106
1000	1/2	<b>EC-1032</b>	S	1	1	32	10.7	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	118
2000	1	<b>EC-2004</b>	S	2	1/4	4	1.3	18 <sup>1</sup> / <sub>4</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
2000	1	<b>EC-2008</b>	S	2	1/2	8	2.7	18 <sup>1</sup> / <sub>4</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
2000	1	<b>EC-2012</b>	S	1	3/4	12	4	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	114
2000	1	<b>EC-2016</b>	S	1	1	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	118
2000	1	<b>EC-2032</b>	L	1	2	32	10.7	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	295
4000	2	<b>EC-4006</b>	S	2	3/4	6	2	18 <sup>15</sup> / <sub>16</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	127
4000	2	<b>EC-4008</b>	S	2	1	8	2.7	18 <sup>15</sup> / <sub>16</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	133
4000	2	<b>EC-4016</b>	L	1	2	16	5.3	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	295
4000	2	<b>EC-4024</b>	L	1	3	24	8	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	302
6000	3	<b>EC-6005</b>	S	3	1	5	1.7	23 <sup>1</sup> / <sub>4</sub>	8	12	26 <sup>3</sup> / <sub>8</sub>	200
6000	3	<b>EC-6010</b>	L	2	2	10	3.3	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	340
6000	3	<b>EC-6016</b>	L	2	3	16	5.3	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	347
8000	4	<b>EC-8008</b>	L	2	2	8	2.7	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	345
8000	4	<b>EC-8012</b>	L	2	3	12	4	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	352
10000	5	<b>EC-10005</b>	L	3	2	5	1.7	27 <sup>7</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	393
<b>10000</b>	<b>5</b>	<b>EC-10008</b>	<b>L</b>	<b>3</b>	<b>3</b>	<b>8</b>	<b>2.7</b>	<b>27<sup>7</sup>/<sub>8</sub></b>	<b>10<sup>7</sup>/<sub>8</sub></b>	<b>14<sup>13</sup>/<sub>16</sub></b>	<b>31<sup>3</sup>/<sub>16</sub></b>	<b>393</b>



\* **S** = Small frame hoist, parallel mounted, single or three phase. **L** = Large frame hoist, cross mounted, three phase only.  
 \*\* For 10 ft. lift, top hook suspension and lug suspension units.

**NOTE:** For complete dimensional data, refer to Coffing Dimensional Databook.



**Housing Design**

Brake cover (left) and electrical cover (right) easily removed for maintenance or service of unit. (Covers for EC Small Frame Unit Shown)



# Suspensions For A Variety of Applications



1/4 - 5 Ton  
Made in USA

## EC Trolley Suspensions

**COFFING ECT, ECGT, and ECMT Models** - Plain, geared, and motorized trolley suspensions with all the features of basic EC models for added flexibility in a variety of applications.

- **PLAIN TROLLEY** - For manual positioning of hoist and load.
- **GEARED TROLLEY** - For more precise positioning of hoist and load. Standard hand chain drop is 2-feet less than lift.
- **MOTORIZED TROLLEY** - For faster positioning of hoist and load over longer distances. 35 or 75 FPM speeds standard with optional speeds of 18, 24, 50, 100, and 150 FPM.
- **VOLTAGES** - 115/230, 208 - single phase; 230/460, 208, 220/380, 575 - three phase. 60 hertz standard, 50 hertz available.
- **TWO-SPEED MOTORIZED TROLLEY MODELS** - Optional with 3 to 1 speed ratio, three-phase, single voltage only.
- **WRAP-AROUND SIDE PLATES** - Act as safety lugs and as bumpers to protect wheels. Available to fit American Standard I-Beams, wide-flange, and patented track beams. Specify track type and beam size.
- **PRECISION TROLLEY WHEELS** - Machined, cast iron wheels with sealed, lifetime lubricated ball bearings for extended trolley life. Motorized trolley wheels heat treated for added durability. Bronze and stainless steel wheels optional.
- **TWO TROLLEY DESIGNS** - 4-wheel design on 1/4 - 3 ton negotiates 48" minimum radius curve, including patented track applications. 8-wheel design on 4 and 5 ton reduces beam flange stress.
- **ACCESSORIES & OPTIONS** - Full line available to meet a variety of applications. See pages 22-27.
- **LIFETIME WARRANTY**



# ELECTRIC CHAIN HOISTS

## SPECIFICATIONS

### EC Plain, Geared & Motorized Suspensions

Capacity		Model Number	Frame* Size	Trolley† Mount	ECT & ECGT Hdrm (In.)	ECMT Hdrm (In.)	Flange Width (In.)	Beam Ht. (In.)	Min. Rad. Curve (In.)	Net Wt.** (Lb.)	ECMT Net Wt. (Lb.)
(Lb.)	(Ton)										
500	1/4	<b>EC(†)-0516</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	145	180
500	1/4	<b>EC(†)-0532</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	153	188
500	1/4	<b>EC(†)-0564</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	161	196
1000	1/2	<b>EC(†)-1009</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	151	186
1000	1/2	<b>EC(†)-1016</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	151	186
1000	1/2	<b>EC(†)-1032</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	163	198
2000	1	<b>EC(†)-2004</b>	S	P	18 <sup>5</sup> / <sub>8</sub>	18 <sup>5</sup> / <sub>8</sub>	3.332 - 6	6 - 18	48	161	196
2000	1	<b>EC(†)-2008</b>	S	P	18 <sup>5</sup> / <sub>8</sub>	18 <sup>5</sup> / <sub>8</sub>	3.332 - 6	6 - 18	48	161	196
2000	1	<b>EC(†)-2012</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	158	194
2000	1	<b>EC(†)-2016</b>	S	P	17 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	163	198
2000	1	<b>EC(†)-2032</b>	L	C	21 <sup>9</sup> / <sub>16</sub>	22 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	347	375
4000	2	<b>EC(†)-4006</b>	S	P	19 <sup>5</sup> / <sub>16</sub>	19 <sup>5</sup> / <sub>16</sub>	3.332 - 6	6 - 18	48	172	207
4000	2	<b>EC(†)-4008</b>	S	P	19 <sup>5</sup> / <sub>16</sub>	19 <sup>5</sup> / <sub>16</sub>	3.332 - 6	6 - 18	48	178	213
4000	2	<b>EC(†)-4016</b>	L	C	21 <sup>9</sup> / <sub>16</sub>	22 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	347	375
4000	2	<b>EC(†)-4024</b>	L	C	21 <sup>9</sup> / <sub>16</sub>	22 <sup>1</sup> / <sub>4</sub>	3.332 - 6	6 - 18	48	354	362
6000	3	<b>EC(†)-6005</b>	S	P	23 <sup>1</sup> / <sub>4</sub>	24	3.332 - 6	6 - 18	48	260	320
6000	3	<b>EC(†)-6010</b>	L	C	26	26 <sup>5</sup> / <sub>8</sub>	3.332 - 6	6 - 18	48	396	424
6000	3	<b>EC(†)-6016</b>	L	C	26	26 <sup>5</sup> / <sub>8</sub>	3.332 - 6	6 - 18	48	403	431
8000	4	<b>EC(†)-8008</b>	L	C	25 <sup>15</sup> / <sub>16</sub>	26 <sup>3</sup> / <sub>4</sub>	4 - 6	8 - 18	***	520	560
8000	4	<b>EC(†)-8012</b>	L	C	25 <sup>15</sup> / <sub>16</sub>	26 <sup>3</sup> / <sub>4</sub>	4 - 6	8 - 18	***	527	567
10000	5	<b>EC(†)-10005</b>	L	C	29 <sup>3</sup> / <sub>4</sub>	30 <sup>5</sup> / <sub>8</sub>	4 - 6	8 - 18	***	561	599
<b>10000</b>	<b>5</b>	<b>EC(†)-10008</b>	<b>L</b>	<b>C</b>	<b>29<sup>3</sup>/<sub>4</sub></b>	<b>30<sup>5</sup>/<sub>8</sub></b>	<b>4 - 6</b>	<b>8 - 18</b>	<b>***</b>	<b>568</b>	<b>606</b>

† Specify **ECT** for plain trolley, **ECGT** for geared trolley, and **ECMT** for motorized trolley models.

\* **S** = Small frame hoist, single or three phase. **L** = Large frame hoist, three phase only.

‡ **P** = Parallel mount, standard on small frame hoists. **C** = Cross mount, standard on large frame hoists.

\*\* Weight for 10 ft. lift ECT units. Add 10 lb. for ECGT unit weights.

\*\*\* 4 & 5 ton straight track only. Articulated model for 48" min. radius curved track available — consult factory.

**NOTE:** For complete dimensional data, refer to Coffing Dimensional Databook.



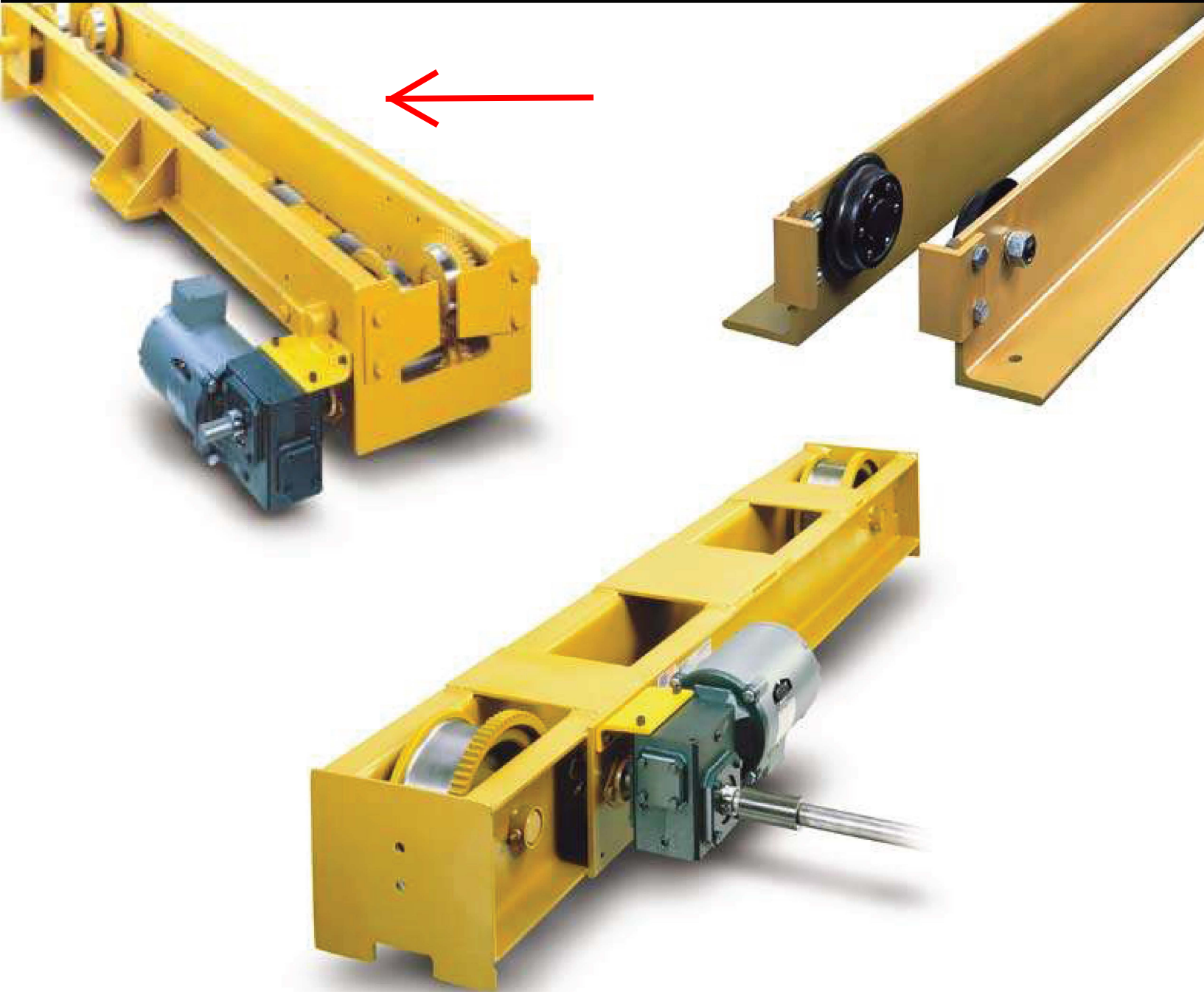
Section 02  
Crane Endtrucks





## ***Crane Kits***

# ***Specifications***



### Motor Driven with Dual Drive Underhung Capacity 1/4 - 3 ton/Spans to 48 feet

Max. Capacity (tons)	Max. Span (ft)	Speed (fpm)	Kit Code No.	Kit Consists of			Approximate Shipping Weight (lbs)			
				End Truck Code No.	Gear Reducer (Qty 2)	Controls & Motors	1 Speed	2 Speed		
3	36	55	B03/36UD*55	905369 4' - 6" WB	905378	1 each Control 2 each 1/2 hp Motor 1 each Disconnect (See Below)	545	565		
		70	B03/36UD*70		905377					
		110	B03/36UD*110		905376					
	48	55	Not Available							
		70	B03/48UD*70	905380	905377	1 each Control 2 each 1/2 hp Motor 1 each Disconnect (See Below)	645	665		
		110	B03/48UD*100	6' - 0" WB	905376					

- For Runway Flange Widths of 3<sup>3</sup>/<sub>8</sub>"-5<sup>1</sup>/<sub>2</sub>"  
Single phase not available

\* Specify: 1 = Single Speed  
2 = Two Speed

### Capacity 1/4 - 5 ton/Spans to 36 feet

Max. Capacity (tons)	Max. Span (ft)	Speed (fpm)	Kit Code	Kit Consists Of:			Approx Shipping wt (lbs)	
				End Truck Code Number	Gear Reducer (Qty 2)	Controls & Motors	1 Speed	2 Speed
<b>Standard</b>								
1/4 thru 5	36	50	B05/36UD*50	905525 4'-6" WB	905378	1 each Control 2 each 1/2 hp Motor 1 each Disconnect (see below)	665	685
		65	B05/36UD*65		905377			
		100	B05/36UD*100		905376			

- For Runway Flange Widths of 4'-6<sup>1</sup>/<sub>4</sub>"  
Single phase not available

\* Specify: 1 = Single Speed  
2 = Two Speed

### Motor & Controls for Dual Drive Underhung Cranes

Max. Span (ft)	Travel Speed (fpm)	Number of Speeds	200 - 208 Volt Power			230 Volt Power		
			Motor 2 Req'd	Control 1 Req'd	Disconnect Switch 1 Req'd	Motor 2 Req'd	Control 1 Req'd	Disconnect Switch 1 Req'd
36	50, 70 and 100	Single	1/2 HP 905381	44600311	905388	1/2 HP 905381	44600311	905388
		Two	1/2 HP 32879624	44600351	905388	1/2 HP 905394	44600351	905388
48	50	Not Available						
	70 and 100	Single	1/2 HP 905381	44600311	905388	1/2 HP 905381	44600311	905388
		Two	1/2 HP 32879624	44600351	905388	1/2 HP 905394	44600351	905388
				460 Volt Power			575 Volt Power	
36	50, 70 and 100	Single	1/2 HP 905381	44600313	905389	1/2 HP 905382	44600314	905389
		Two	1/2 HP 905395	44600343	905389	1/2 HP 905396	44600344	905389
48	50	Not Available						
	70 and 100	Single	1/2 HP 905381	44600313	905389	1/2 HP 905382	44600314	905389
		Two	1/2 HP 905395	44600343	905389	1/2 HP 905396	44600344	905389

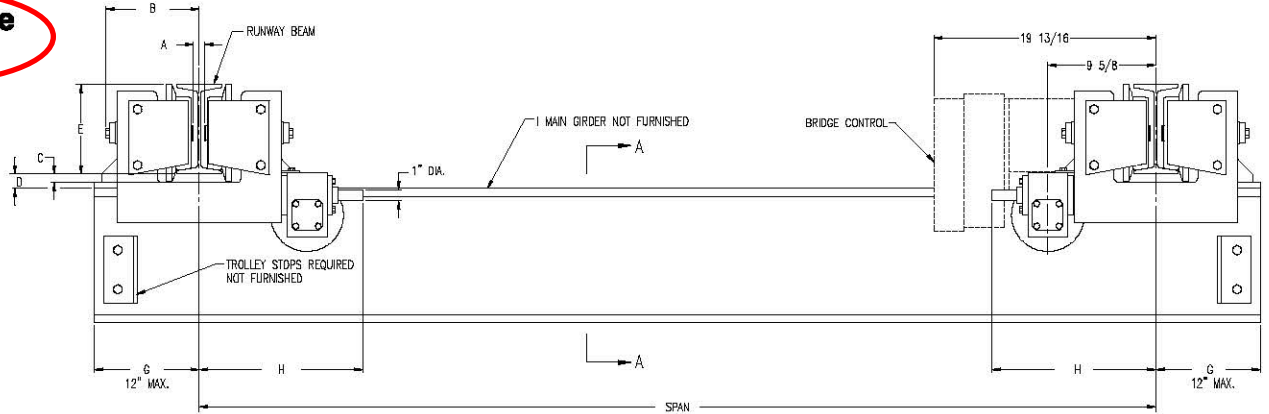
Single phase not available

NEMA 1 Enclosures Standard

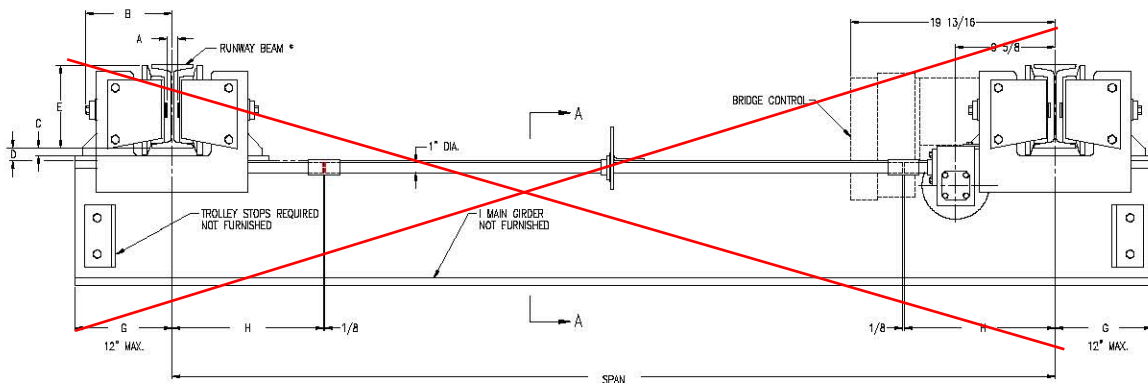
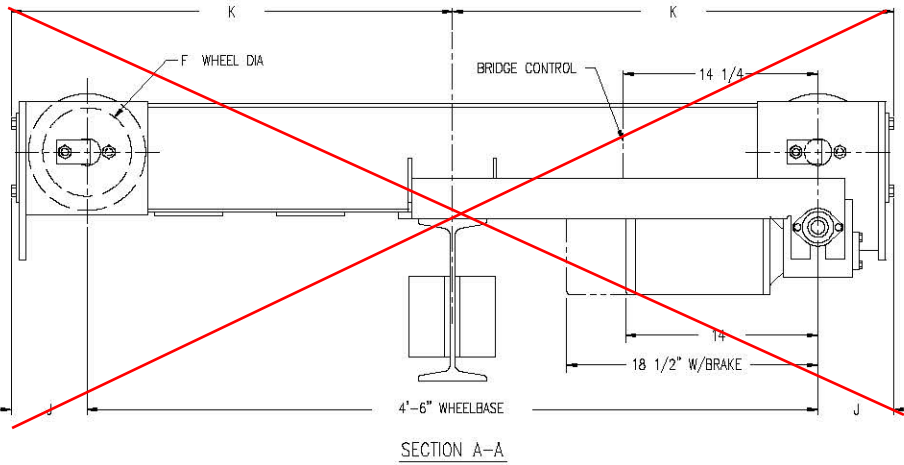
Control panel includes mainline contactor, bridge fusing, reversing contactor and 115 volt control circuit transformer.



**Dual Drive**



**Single Drive**



**Clearance Dimensions (in.)**

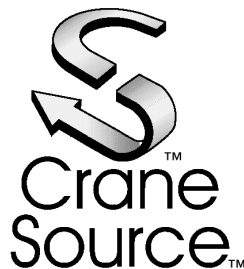
Product Code	Rated Capacity (tons)	* Max. Span (ft)	Runway Beam Sizes**			A	B	C	D	E	F Wheel Dia.	G Min.	H	J†	K	Max. Wheel Load Per Pair (lbs)	Approx. Shipping Wt (lbs)
			Min. Beam Width	Min. Flange Width	Max. Flange Width												
905369	1/4 - 3	36	S6x12.5	3-3/8	5-1/2	1-1/8	7-13/16	15/16	1-7/16	5-1/8	4	8-1/4	14	4	2' - 7"	4240	400
905525	5	36	S8x18.4	4	6-1/4	3/4	8-11/16	13/16	1-5/16	8	6-1/2	9-3/8	14-5/8	5-1/2	2' - 8-5/8"	7520	480

\*\*Runway beam sizes shown indicate range of beams that trucks will fit. For proper runway size, consult qualified engineer or architect.  
 End trucks for wider flange beams or 3-1/4" patented track are available.  
 Dimensions A, B, C, D and E are based on minimum beam.  
 † Dimension with rubber bumpers: 3 ton catalogs 905369 = 7 3/8 and 5 ton catalogs 905525 = 8-7/8.  
 \* For spans from 36' up to 48' consult factory.

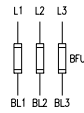
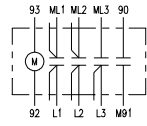
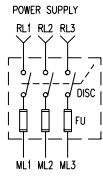
# WIRING DIAGRAMS FOR BRIDGE CONTROL PANELS

## Bridge W/D's

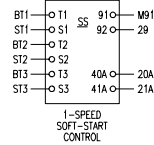
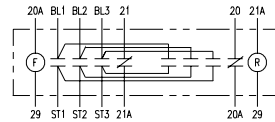
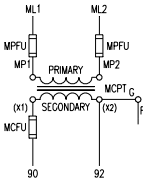
		Panel Part #	Page No.
Nema-4/12	1-Speed	444231-**	2
→ Nema-4/12	1-Speed with Soft-Start	444711-**	3
Nema-4/12	2-Speed	444232-**	4
Nema-4/12	2-Speed with Soft-Start	444712-**	5
Nema-4/12	V.F.C. P3 thru 10 hp	448550-**	6
Nema-4/12	V.F.C. G+ thru 30 hp	445351-**	7
Nema-1	1-Speed	446003-**	8
Nema-1	2-Speed	446003-**	9
Nema-1	1-Phase	446003-**	10
	Typical Interconnection M-1H-1T-1B P.B. from Trolley	11	
	Typical Interconnection M-1H-1T-1B P.B. from Bridge	12	
	Typical Interconnection M-2H-2T-2B P.B. from Trolley	13	
	Typical Interconnection M-2H-2T-2B P.B. from Bridge	14	



WIRE #	DEVICE CONNECTED
RL1	DISC
RL2	DISC
ML1	DISC, M, MPFU
ML2	DISC, M, MPFU
ML3	DISC, M
MP1	MPFU, MCPT
MP2	MPFU, MCPT
L1	M, BFU
L2	M, BFU
L3	M, BFU
BL1	BFU, F-R
BL2	BFU, F-R
BL3	BFU, F-R
ST1	F-R, SS
ST2	F-R, SS
ST3	F-R, SS
BT1	SS
BT2	SS
BT3	SS
20	TB1 R
20A	R, F, SS
21	F
21A	F, R, SS
28	
29	TB1 R, F, SS
90	TB2 MCFU, M
M91	M, SS
92	TB2 MCPT, G, M
93	TB2 M
BB1	TB1 F-R
BB2	TB1 F-R



CONNECT PER NAMPLATE FOR PROPER VOLTAGE



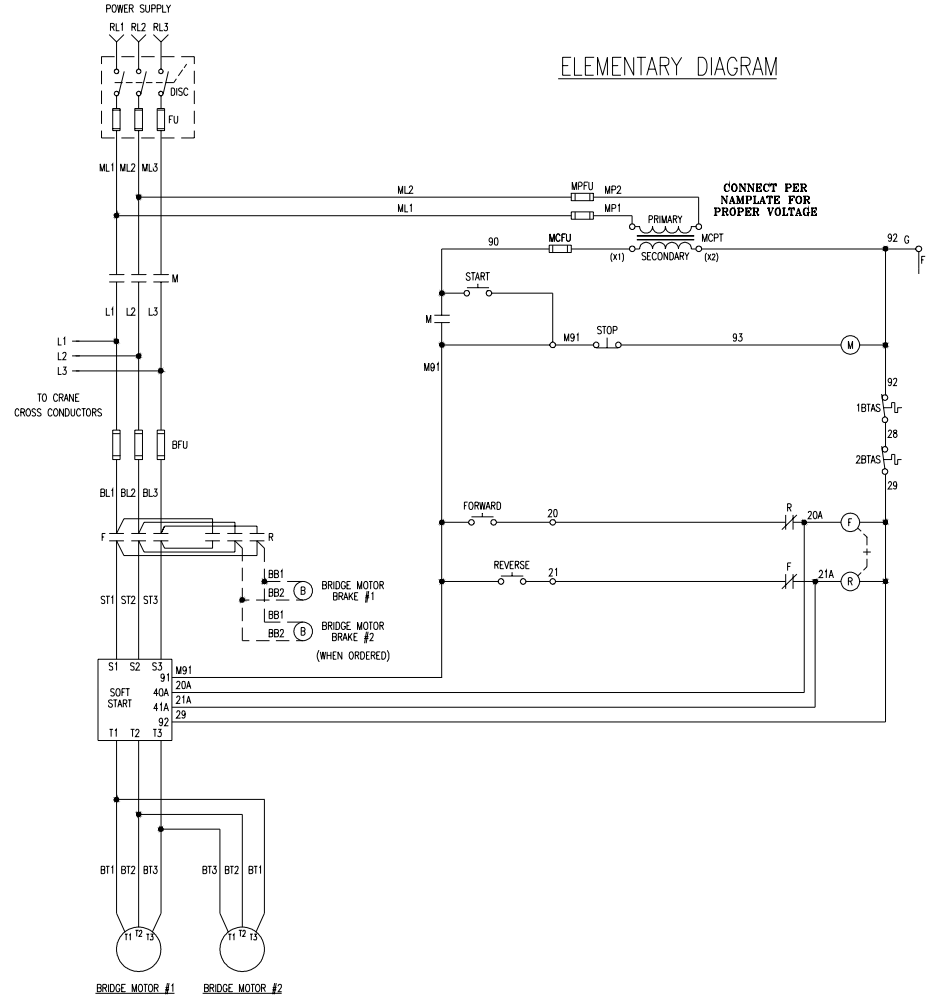
1-SPEED  
SOFT-START  
CONTROL

**SYMBOL DESIGNATIONS**  
 DISC - POWER DISCONNECT SWITCH  
 M - MAINLINE CONTACTOR  
 BFU - BRIDGE MOTOR CIRCUIT FUSING  
 MCPT - CONTROL CIRCUIT TRANSFORMER  
 MPFU - CONTROL CIRCUIT PRIMARY FUSING  
 MCFU - CONTROL CIRCUIT SECONDARY FUSING  
 F - BRIDGE FORWARD CONTACTOR  
 R - BRIDGE REVERSE CONTACTOR  
 SS - SOFT-START ELECTRONIC MODULE  
 BTAS - BRIDGE MOTOR TEMPERATURE ACTUATED SWITCH  
 TB - TERMINAL BOARD  
 G - FRAME GROUND  
 F

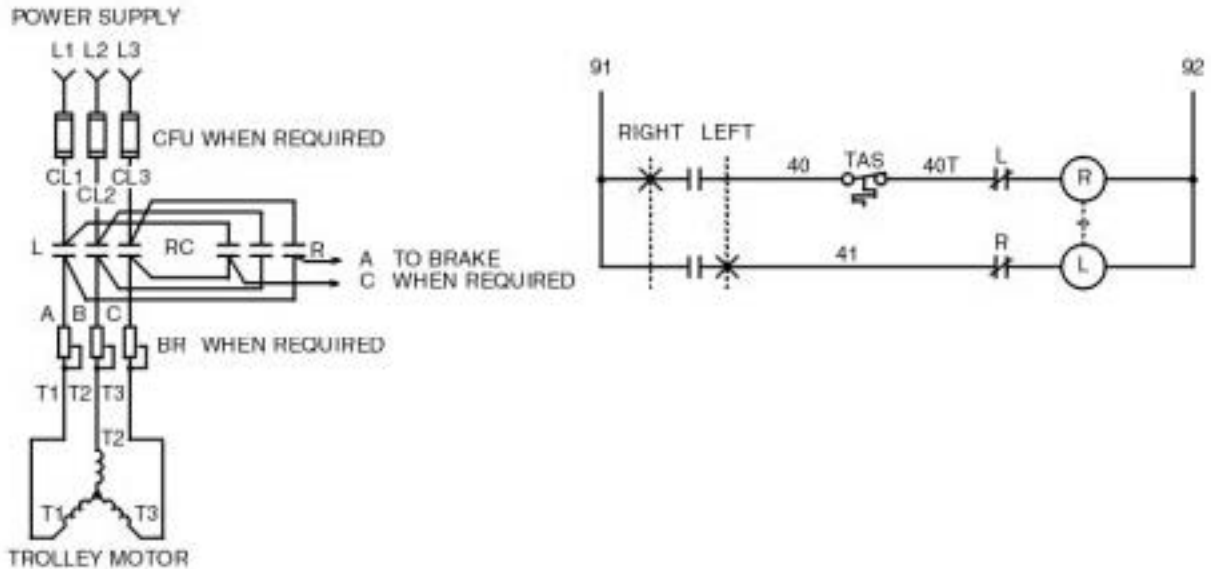


**WARNING:**  
 THIS EQUIPMENT MUST BE EFFECTIVELY GROUNDED  
 ACCORDING TO APPLICABLE CODES.

ELEMENTARY DIAGRAM

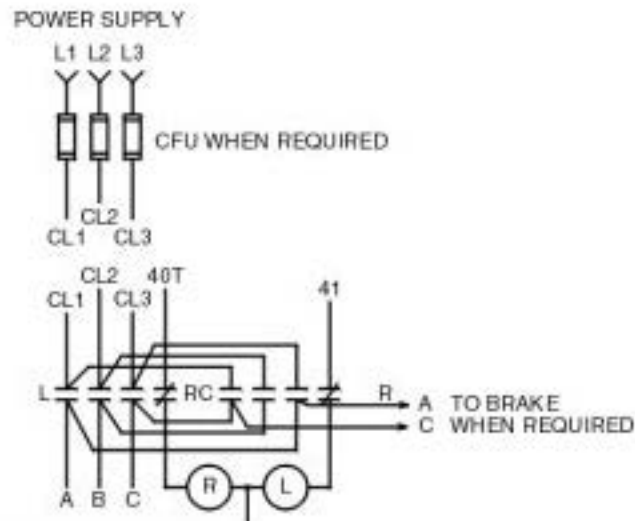


# WIRING DIAGRAMS FOR SHAW-BOX MOTOR DRIVEN TRAVERSE ARRANGEMENT (FOR 113533-76 AND 113533-77)



**ELEMENTARY DIAGRAM**

WIRE		DEVICE CONNECTED
L1		CFU
L2	TB	CFU
L3	TB	CFU
CL1	TB	CFU



\* WHEN BR REQUIRED  
USE A,B,C  
ELSE USE T1,T2,T3



CL2	TB	CFU, RC
CL3	TB	CFU, RC
A	TB	CFU, RC
B	TB	CFU, RC
C	TB	CFU, RC
40	TB	RC
40T	TB	RC
41	TB	RC

**WARNING**

THIS EQUIPMENT MUST BE EFFECTIVELY GROUNDED

**CONNECTION DIAGRAM**

329121

## WIRING DIAGRAM FOR ONE SPEED TROLLEY CONTROL

Section 03

Power Bar

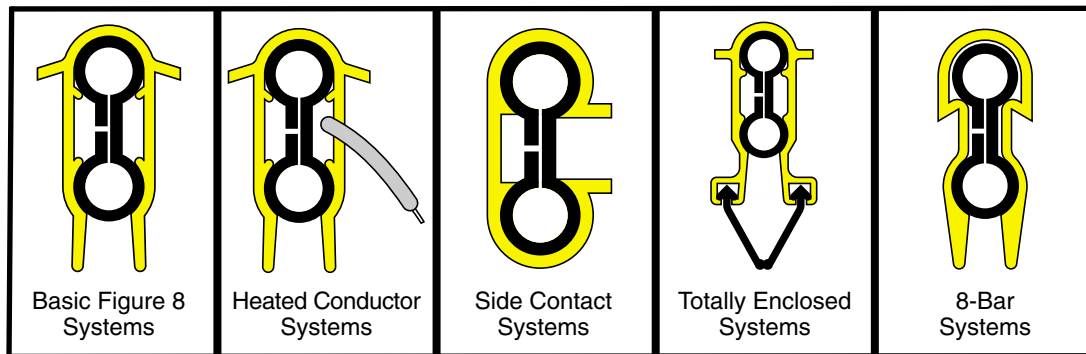


# DUCT-O-BAR<sup>®</sup>

## Figure 8 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.

- 90 AMP Rolled Galvanized Steel
- 110 AMP Rolled Galvanized Steel
- 250 AMP Rolled Stainless Steel — Copper Laminated
- 250 AMP Rolled Copper — Steel Laminated
- 350 AMP Rolled Electrolytic Copper



### ⚠ WARNING

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

[www.ductowire.com](http://www.ductowire.com)



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Corona, California 92882  
Phone: 951-735-8220  
Fax: 951-735-2167  
E-mail: [sales@ductowire.com](mailto:sales@ductowire.com)

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File # E29805  
Contr. 678L

Approved  
in Canada

# Conductor Bar Selection

## Determining Ampere Load

The conductor selected must be large enough to carry the necessary ampere load safely without undue heating. To compute the ampere load, proceed as follows:

1. List the horsepower of all motors used in the application.
2. Determine the voltage and type of current that will feed the conductor. For example: 230 VDC 2 wire; 460 VAC 3 phase; etc.
3. Refer to the Horsepower Conversion Table on page 3 and convert the horsepower to amperes.
4. Prepare the ampere load figure that will be used to size the conductors as follows:

List the full load ampere rating of each motor used on the crane or monorail unit. Determine the duty cycle from the following paragraphs and apply the corresponding factor.

### Light Duty — Class A and B Crane Service

Standby or infrequent use. Up to two motors started at a time. Two to five lifts per hour. Use a factor of 90% of the calculated ampere load.

### Average Duty — Class C Crane Service

Moderate use during the work day. Five to ten lifts per hour. Not over 50% of the lift at rated capacity. Use a factor of 100% of the calculated ampere load.

### Heavy Duty — Class D Crane Service

Used continually during the work day and usually for more than one shift. Loads of 50% of rated capacity or more handled constantly during the work period. Use a factor of 110% of the calculated ampere load.

### Severe Duty — Class E and F Crane Service

Used continually for two or more work shifts a day for loads approaching 100% of capacity. Use a factor of 120% of the calculated ampere load. Due to the mechanical considerations on severe duty use, contact the factory engineering group when selecting the conductor system for this application.

5. If the conductors are to be located where the ambient air temperature is unusually high, the current carrying capacity of the conductor is reduced. Multiply the current capacity of the selected conductor by the derating factor in the following table.

## Temperature Derating Table

Ambient Air Temperature	Derating Factor
100°F	95%
130°F	75%
160°F*	50%

\* At this ambient temperature it will be necessary to use the higher rated conductor cover, XHT rated at 280°F. Use of XHT cover at 160°F allows for full ampacity at that temperature.

## Determining Voltage Drop

According to CMAA, the voltage drop to the unit motors shall not be more than 3% from the power taps to the load at the farthest point on the conductor run. To determine the voltage drop use the appropriate formula in the following table.

Current Type	Formula
AC 3 phase 60 cycle	$V = L \times I \times Z \times 1.73$
AC 1 or 2 phase 60 cycle	$V = L \times I \times Z \times 2$
DC 2 wire system	$V = L \times I \times R \times 2$

V = Voltage drop

L = Distance from power feed to end of conductor

I = Total amperes drawn as calculated from conversion charts

Z = AC impedance

R = DC resistance

See Conductor Engineering Data Table on page 4 for values of Z and R.

Divide voltage drop by system voltage to get the percent of voltage drop.

Maximum voltage drops that are 3% of various supply voltages are as follows:

Supply Voltage	Voltage Drop (V)
460 VAC	13.8
230 VAC or VDC	6.9
575 VAC	17.2

Volts lost that are equal to or less than the above values when using the formulas above will help in selecting the correct conductor.



### Conductor Selection Example

Given a 300 foot runway, power fed at the center, using 460 volt, 3 phase, 60 cycle power supplied to a bridge crane — there is a 40 h.p. hoist motor, a 20 h.p. bridge motor, and a 5 h.p. trolley motor. The operation is **Average Duty**. Ambient temperature varies from 50°F in winter to 90°F in summer on this **Indoor** installation.

#### Step 1 — Determining Ampere Load

See *National Electric Code article 610-14(e)* for determining motor loads where there are multiple motors on a single crane. Then from the Horse Power Conversion Table 460V column (right):

- 40 h.p. hoist motor — 52 amps @ 100% = 52 amps
- 20 h.p. bridge motor — 27 amps @ 50% = 13.5 amps
- 5 h.p. trolley motor — 7.6 amps @ 50% = 3.8 amps

**The total current load is 69.3 amperes.**

With Average Duty cycle, the current load is factored at 100%. Normal ambient conditions of 50°F to 90°F require no temperature derating. Selecting a 90 amp conductor caused a voltage drop of 4.3% using the formula. Since this is unsatisfactory, use a 110 amp conductor (FE-908) for Step 2.

#### Step 2 — Determining Voltage Drop

Use the AC 3 phase formula on page two.

- $V = L \times I \times Z \times 1.73$  where:
- L = 150 ft. (Distance to the end of the runway from the center power feed.)
- I = 69.3 amperes
- Z = .0008 for 110 amp conductor (From the Conductor Engineering Data Table, page 4.)
- 1.73 = 3 phase constant

$$V = 150 \times 69.3 \times .0008 \times 1.73 = 14.4 \text{ volts}$$

$$14.4/460 = 3.1\%$$

Since this voltage drop only occurs at the farthest end when two or more motors are started simultaneously, exceeding the 3% voltage drop goal by only 0.1% will not cause a problem.

### Horsepower Conversion Table

3 Phase AC — 60 Cycle Amperes				Direct Current Amperes
h.p.	230V	460V	575V	230V
1/2	2	1	.8	2.7
3/4	2.8	1.4	1.1	3.8
1	3.6	1.8	1.4	4.7
1-1/2	5.2	2.6	2.1	6.6
2	6.8	3.4	2.7	8.5
3	9.6	4.8	3.9	12.2
5	15.2	7.6	6.1	20
7-1/2	22	11	9	29
10	28	14	11	38
15	42	21	17	55
20	54	27	22	72
25	68	34	27	89
30	80	40	32	106
40	104	52	41	140
50	130	65	52	173
60	154	77	62	206
75	192	96	77	255
100	248	124	99	341
125	312	156	125	425
150	360	180	144	506
200	480	240	192	675

### Ampere Load Calculations for Multiple Units

For information about sizing ampere loads for multiple cranes on the same runway, see Article 610-14 (e) of the National Electrical Code for the demand factors. This article also covers additional loads on the bridge cranes other than motor loads.

### Induction Type Squirrel Cage and Wound Rotor Motors

The Horsepower Conversion Table is taken from the 1996 NEC Article 430. The values are for motors running at usual speeds with normal torque characteristics. Motors built for especially low speeds or high torques may require more running current, and multi-speed motors will have

full-load current varying with speed. In these cases, use the higher nameplate current rating.

The voltages listed are rated motor voltages. The current listed shall be permitted for system voltage ranges of 110 to 120, 220 to 240, 440 to 480, and 550 to 600 volts. Motors rated at 208 VAC should increase the 230 volt column figures by 10%.

For motors that are wound for single or double phase operation, use the nameplate rating. For older slip ring motors or models that have secondary windings be sure to obtain both primary and secondary current ratings. Secondary windings may also need separate conductors or cables when updating the electrification.





## Conductor Engineering Data Table

Conductor Bar No.	Description	Weight per 10' section lbs.	Ampere Rating		Coefficient of Linear Expansion per °F	Resistance Factor		Circular Mills
			Continuous	Intermittent*		AC (z) ohms/ft.	DC (R) ohms/ft.	
FE-758	Galvanized Steel	4.5	90	135	.000007	.0011	.00072	130,000
FE-908	Galvanized Steel	6.5	110	165	.000007	.0008	.0005	189,000
FE-1608	Stainless/Copper Laminate	6.5	250	350	.000008	.000144	.0001	188,000
FE-2008	Copper/Steel Laminate	6.25	250	350	.000008	.000142	.0001	189,000
FE-3008	Rolled Copper	6.75	350	530	.000009	.000085	.000058	188,000

\* Intermittent Service Rating is determined for one minute on, one minute off operation.

## Miscellaneous Applications

### Curves

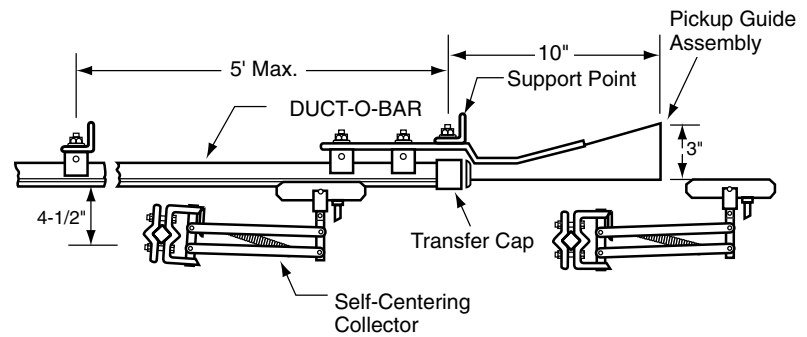
Duct-O-Bars<sup>®</sup>, except the Totally Enclosed System, can be bent to form curved sections without damaging the insulating cover or conductor. Bends with a five-foot radius or greater can be done in the field by using a fly wheel, monorail beam, or similar object to bend the conductor to approximately the necessary radius. Hangers used on curved sections must be placed at intervals of 2-1/2 feet maximum — and closer if required. Use B-100 cross bolt clamp type hangers and P-Series collectors.

The minimum spacing between conductors on curves is three inches.

For curves of five-foot radius or more, use five-inch collector shoes. For curves of less than five-foot radius use three-inch collector shoes; also consult the factory for additional information.

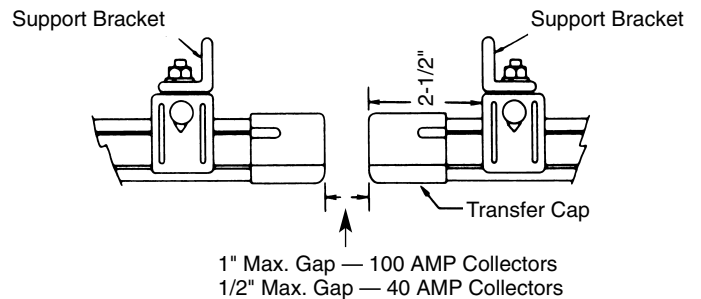
### Discontinuous Circuits

On discontinuous circuits a pickup guide assembly must be installed to ensure that the self-centering type collectors engage and disengage the conductor bar. The pickup guide (FE-2JNN3 is illustrated) must have its own support point.



### Interlocks, Switches, or Fixed Gaps

The maximum fixed gap occurring at interlocks is one-inch when using 100 amp P-Series collectors and 1/2 inch when using 40 amp collectors. Use transfer caps as shown to ensure that the collector brushes transfer evenly and smoothly. Also round both ends of the contact brushes to facilitate the transfer. Use clamp type hangers only. When both interlocks and curves of less than a four-foot radius are encountered, the tandem 40 amp collector is recommended.



### Other Special Applications

Consult the factory for recommendations on applications such as de-icing systems, totally enclosed systems, and other systems not covered here.



## Expansion Gaps

Expansion gaps should be placed at intervals determined by 1) the expansion rate of the metal in the conductor selected, and 2) the variation in temperature that will occur at the conductor location over a full year of operation.

### 1. Steel Conductor Systems

Given that steel conductors expand 1" for every 120' of runway with a temperature change of 100°F over a full year of operation, put the length of the runway and the maximum temperature change for the system to be used into the following formula:

$$\text{Total Steel Expansion (inches)} = X/120' \times Y/100^\circ\text{F}$$

where *X* is the runway length and *Y* is the 12 month temperature variation.

Example: A 450' long steel conductor (*X*) installed in a building with an indoor temperature change of 40°F (*Y*).

$$\text{Total Expansion} = 450'/120' \times 40^\circ\text{F}/100^\circ\text{F} = 1.5".$$

(See Section 3.)

### 2. Copper Conductor Systems

Given that copper conductors expand 1" for every 100' of runway over a 100°F temperature change at the conductor over a full year of operation, put the length of the runway and the maximum temperature change for the system to be used into the following formula:

$$\text{Total Copper Expansion (inches)} = X/100' \times Y/100^\circ\text{F}$$

Example: A 300' long copper conductor system (*X*) installed outdoors with an anticipated temperature fluctuation of 80°F (*Y*).

$$\text{Total Expansion} = 300'/100' \times 80^\circ\text{F}/100^\circ\text{F} = 2.4".$$

(See Section 3.)

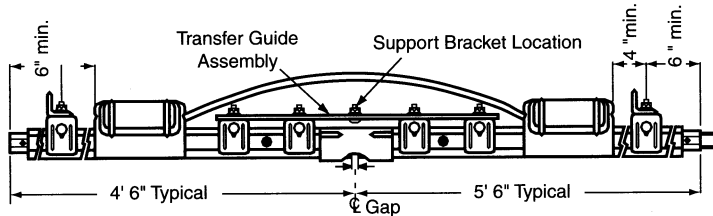
### 3. Determine the Number of Expansion Gap Assemblies

After calculating the actual expansion of the runway conductor system, use the following rule of thumb to pick the number of expansion gap assemblies:

- Under 1" of expansion, use no expansion assemblies. Install one anchor clamp set at the center of the conductor run.
- From 1" to 2" of expansion, use one expansion assembly in the center of the conductor run.
- From 2" to 4" of expansion, use two expansion assemblies. Locate them at 1/3 of the runway length in from each end.
- For systems with more than 4" of expansion, use one expansion gap assembly for each 2" of expansion.

### 4. Anchors

Anchor clamps are required at midpoint on all systems without expansion gaps and halfway between gaps and from gaps to the end of systems with multiple gaps. See the *Figure 8 Installation Instructions* on anchor locations.



**The maximum gap opening for all ten foot Figure 8 expansion gap assemblies is 1-3/4 inches.**

**Expansion assemblies are also required at building expansion joints.**

## Conductor Assembly Selection

Duct-O-Wire® Figure 8 Conductor Bars are furnished as assemblies consisting of a ten-foot long conductor bar rated at 600 volts, an insulating cover, splice cover, and connector pins or joint clamps as applicable.

The insulating cover must be appropriate for the environment — indoor, outdoor, or high temperature — in which the conductor is to operate.

Indoor systems are for use in ambient temperatures up to 160°F. They have an Orange PVC Insulating Cover. They are not recommended for outdoor use in direct sunlight.

Outdoor systems are for use in direct sunlight and ambient temperatures up to 160°F. They have a Gray PVC Insulating Cover with an ultraviolet additive.

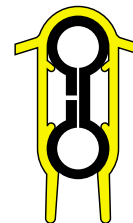
High temperature systems are for use in ambient temperatures up to 280°F. They have a Yellow Polycarbonate Insulating Cover.

From the table to the right, you can select the basic (FE) conductor assembly with the appropriate bar and insulating cover for your application.

For information on other conductor assemblies, see page 12.

### Basic Figure 8 (FE) Conductor Assemblies

10 ft. Lengths		Assembly Catalog No.		
Conductor Bar No.	Weight Pounds	Indoor Use	Outdoor Use	High Temp. Use
FE-758	4.5	FE-758-2	FE-758-2-SC	FE-758-2XHHT
FE-908	6.5	FE-908-2	FE-908-2-SC	FE-908-2XHHT
FE-1608	6.5	FE-1608-2	FE-1608-2-SC	FE-1608-2XHHT
FE-2008	6.25	FE-2008-2	FE-2008-2-SC	FE-2008-2XHHT
FE-3008	6.75	FE-3008-2	FE-3008-2-SC	FE-3008-2XHHT



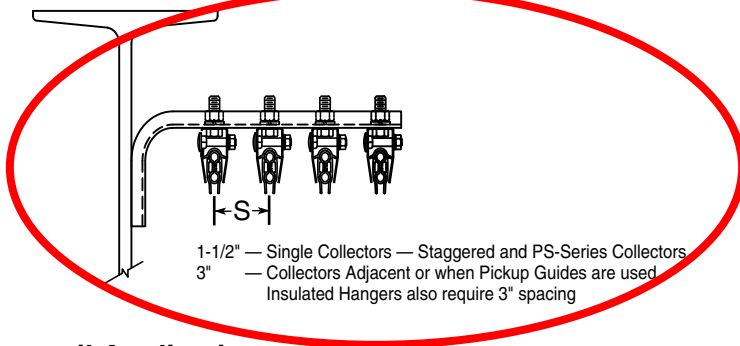
Cross-sectional drawing of Basic Figure 8 (FE) Conductor Assembly

## Typical Conductor Mounting

Note: ← S → indicates minimum conductor spacing.

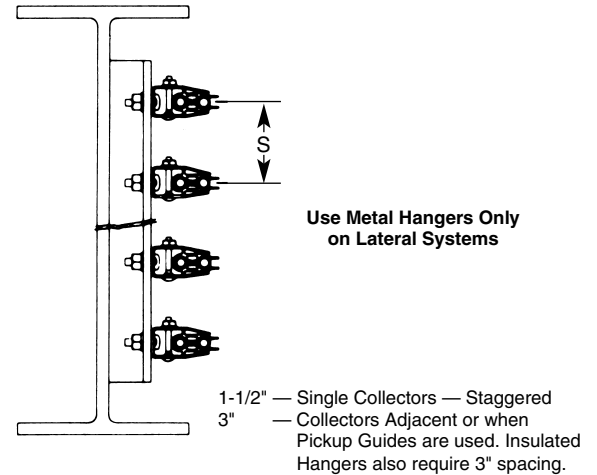
### Standard Vertical Mounted Conductors (Bottom Entry)

3-Phase System • Bottom Contact • 5 Ft. Maximum Support Spacing



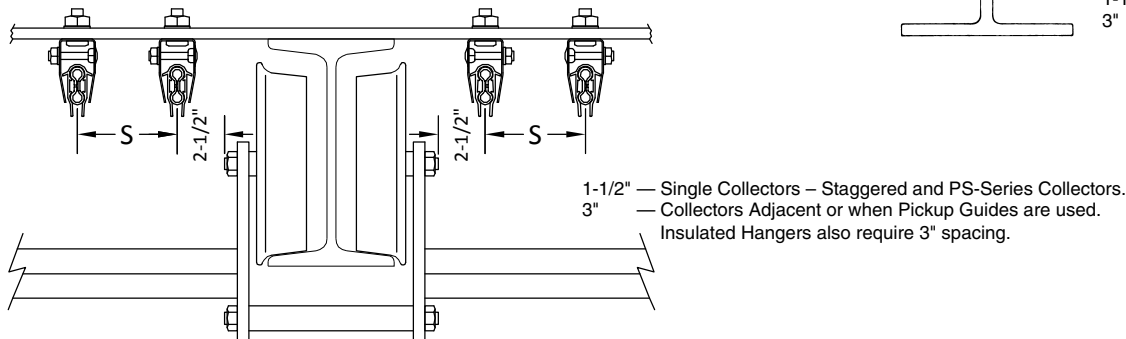
### Lateral Mounted Conductors (Side Entry)

4 Ft. Maximum Support Spacing.  
Use only Lateral (L) Model Collectors.



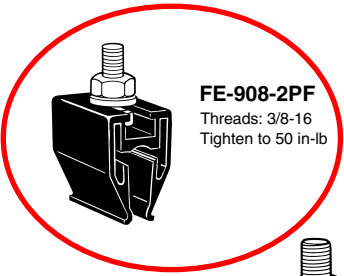


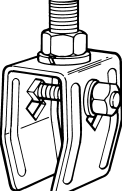

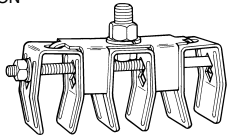
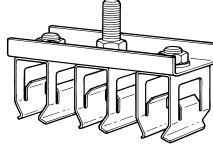

### Monorail Application

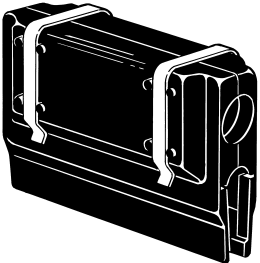
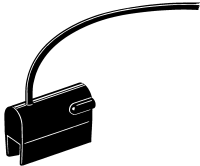
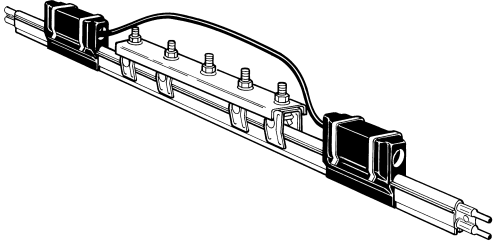
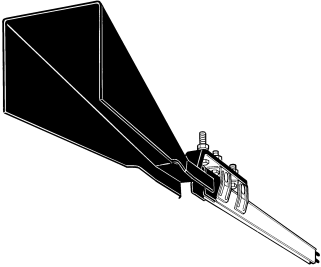
Install two conductors on one side of the beam and one conductor on the opposite side to balance the collector spring forces, particularly on light weight hoists.



## Duct-O-Bar<sup>®</sup> Figure 8 (FE) Components

	Catalog Number	Weight Pounds	Description
	<b>B-100-BR1A</b>	1.00	<b>Angle Brackets for Web Mounting</b> <i>Brackets are galvanized 12 gage rolled steel channel. Hangers are priced separately, but will be factory installed at no charge when hanger locations are shown on sketch.</i> Bracket — 11-1/4" long.
	<b>B-100-BR7A</b>	1.42	Bracket — 15-3/4" long.
	<b>B-100-BR7B</b>	1.70	Bracket with gusset support — 15-3/4" long.
	<b>B-100-BR13A</b>	1.71	Bracket — 20-1/4" long. Do not use with tandem collectors.
	<b>B-100-BR13B</b>	2.04	Bracket with gusset support — 20-1/4" long.
	<b>B-100-BR-EXT</b>	.31	<b>Bracket Extension for Ground Bar</b> Bracket — 4th bar extension to be used with prepunched brackets shown above.
	<b>B-100-BR-EXT-XL</b>	.27	Bracket — 4th bar extension to be used with angle iron.

	Catalog Number	Weight Pounds	Description
 <p><b>FE-908-2PF</b> Threads: 3/8"-16 Tighten to 50 in-lb</p>  <p><b>FE-908-2SF</b> Threads: 3/8"-16 Tighten to 150 in-lb</p>	<p><b>FE-908-2PF</b> <b>FE-908-2PFS</b></p> <p><b>FE-908-2SF</b> <b>FE-908-2SFE</b></p>	<p>.10 .10 .11 .11</p>	<p><b>Snap-In Type Hanger Assemblies</b> <i>These hangers are not recommended for curves, switches or short runs unless separate anchors are used. Refer to the Figure 8 Installation Instructions.</i></p> <p>Nylon Insulating Hanger. Nylon Insulating Hanger with Stainless Steel Hardware. <i>DO NOT USE nylon hangers in temperatures higher than 130°F.</i></p> <p>Zinc Plated Steel Hanger. Epoxy Coated Steel Hanger.</p>
<p>Threads: 3/8"-16 Tighten to 150 in-lb</p> 	<p><b>FE-908-2SFG</b> <b>FE-908-2SFFG</b> <b>FE-908-2SFSG</b></p>	<p>.20 .20 .20</p>	<p><b>Snap-In Type Spring Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications</b></p> <p>Zinc Plated Steel Hanger with Insulator. Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Insulator and Stainless Steel Hardware.</p>
<p>Threads: 3/8"-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE.</p> 	<p><b>B-100-2FF</b> <b>B-100-2FFE</b></p>	<p>.19 .19</p>	<p><b>Clamp Type Hanger Assemblies for All Conductor Systems</b></p> <p>Zinc Plated Steel Hanger. Epoxy Coated Steel Hanger. For special environments.</p>
<p>Threads: 3/8"-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE.</p> 	<p><b>B-100-2FG</b> <b>B-100-2FFG</b> <b>B-100-2FSG</b></p>	<p>.30 .30 .30</p>	<p><b>Clamp Type Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications.</b></p> <p>Zinc Plated Steel Hanger with Insulator. Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Stainless Steel Hardware.</p>
<p>Threads: 3/8"-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE.</p>  <p><b>B-100-2F3</b></p>	<p><b>B-100-2F3</b> <b>B-100-2F4</b> <b>B-100-2F4-3</b></p>	<p>.59 1.25 1.50</p>	<p><b>Clamp Type Special Hanger Assemblies</b></p> <p>Zinc Plated Steel Triple Hanger Assembly. 1-1/2" centers. For indoor dry applications only. Staggered Collectors. Quad Hanger Bracket on 1.5 inch centers. Quad Hanger Bracket on 3.0 inch centers.</p>
<p>Threads: 3/8"-16 Centers: 1-1/2" Tighten to 150 in-lb</p>  <p><b>FE-908-2SF3</b></p>	<p><b>FE-908-2PF3</b> <b>FE-908-2SF3</b> <b>FE-908-2SF4</b> <b>FE-908-2PF3-3</b> <b>FE-908-2SF3-3</b> <b>FE-908-2SF4-3</b></p>	<p>.55 .57 .80 .72 .76 1.09</p>	<p><b>Snap-In Type Special Hanger Assemblies</b></p> <p>Plastic Triple Hanger Assembly. Zinc Plated Steel Triple Hanger Assembly. Zinc Plated Steel Four-Gang Hanger Assembly. Plastic Triple Hanger Assembly mounted on 3" centers. Zinc Plated Triple Hanger Assembly mounted on 3" centers. Zinc Plated Four-Gang Hanger Assembly mounted on 3" centers.</p>
<p>Threads: 3/8"-16 Tighten to 150 in-lb</p> 	<p><b>B-100-1G</b> <b>B-100-1G-SS</b></p>	<p>.15 .15</p>	<p><b>Mushroom Insulators with Hardware</b></p> <p>30% Glass-filled Nylon — 400°F rated. 30% Glass-filled Nylon with Stainless Steel Hardware — 400°F rated.</p>

	Catalog Number	Weight Pounds	Description
	<p>→ <b>FE-908-2CP</b></p> <p><b>FE-1158-2CP</b></p> <p><b>FE-2008-2CP</b></p> <p><b>FE-3008-2CP</b></p>	<p>.25</p> <p>.26</p> <p>.63</p> <p>1.10</p>	<p><b>Power Feeds with Insulating Case</b></p> <p>90 Amp Rated — Steel. For FE-758-2 systems. Will accept up to # 4 AWG cable.</p> <p>110 Amp Rated — Copper. For FE-908-2 systems. Will accept up to # 2 AWG cable.</p> <p>250 Amp Rated — Bronze. For FE-1608-2 and FE-2008-2 systems. Will accept up to # 1/0 AWG cable.</p> <p>350 Amp Rated — Cast Bronze. For FE-3008-2 systems. Will accept up to # 3/0 cable.</p>
	<p><b>FE-758-GCTP</b></p> <p><b>FE-908-GCTP</b></p>	<p>.14</p> <p>.14</p>	<p><b>End Power Feeds</b></p> <p>40 Amp Rated. For all systems with FE-758 conductor bar.</p> <p>40 Amp Rated. For all systems with FE-908, FE-1608, FE-2008, and FE-3008 conductor bar.</p>
 <p>Anchor sets and connector pins are included with the hardware package.</p>	<p><b>FE-758-2H10</b></p> <p><b>FE-758-2H10-SC</b></p> <p><b>FE-758-2H10XT</b></p> <p><b>FE-908-2H10</b></p> <p><b>FE-908-2H10-SC</b></p> <p><b>FE-908-2H10XT</b></p> <p><b>FE-1608-2H10</b></p> <p><b>FE-1608-2H10-SC</b></p> <p><b>FE-1608-2H10XT</b></p> <p><b>FE-2008-2H10</b></p> <p><b>FE-2008-2H10-SC</b></p> <p><b>FE-2008-2H10XT</b></p> <p><b>FE-3008-2H10</b></p> <p><b>FE-3008-2H10-SC</b></p> <p><b>FE-3008-2H10XT</b></p>	<p>7.0</p> <p>7.0</p> <p>7.0</p> <p>9.0</p> <p>9.0</p> <p>9.0</p> <p>10.5</p> <p>10.5</p> <p>10.5</p> <p>10.0</p> <p>10.0</p> <p>10.0</p> <p>10.0</p> <p>12.5</p> <p>12.5</p> <p>12.5</p>	<p><b>Expansion Gap Assemblies</b></p> <p><i>Each assembly consists of a ten-foot conductor bar, insulating cover, connector pins for one end, guide assembly, two power feeds with a jumper cable and hanger set. Refer to the Figure 8 Installation Instructions.</i></p> <p>For Indoor System FE-758-2.</p> <p>For Outdoor System FE-758-2-SC.</p> <p>For High Temperature System FE-758-2XHT.</p> <p>For Indoor System FE-908-2.</p> <p>For Outdoor System FE-908-2-SC.</p> <p>For High Temperature System FE-908-2XHT.</p> <p>For Indoor System FE-1608-2.</p> <p>For Outdoor System FE-1608-2-SC.</p> <p>For High Temperature System FE-1608-2XHT.</p> <p>For Indoor System FE-2008-2.</p> <p>For Outdoor System FE-2008-2-SC.</p> <p>For High Temperature System FE-2008-2XHT.</p> <p>For Indoor System FE-3008-2.</p> <p>For Outdoor System FE-3008-2-SC.</p> <p>For High Temperature System FE-3008-2XHT.</p>
	<p><b>FE-2JNN3</b></p>	<p>3.86</p>	<p><b>Special Application Components</b></p> <p>Pickup Guide Assembly — 3" wide. Includes clamps and two foot section of system conductor. Specify conductor system.</p>

	Catalog Number	Weight Pounds	Description
<p>FE-758-GCT</p> <p>FE-908-IP</p> <p>FE-908-IS</p> <p>B-100-TG</p>	<p><b>FE-758-GCT</b></p> <p><b>FE-758-GCTL</b></p> <p><b>FE-758-GCTR</b></p> <p><b>FE-908-GCT</b></p> <p><b>FE-908-GCTL</b></p> <p><b>FE-908-GCTR</b></p> <p><b>FE-908-IP</b></p> <p><b>FE-908-IS</b></p> <p><b>B-100-TG</b></p>	<p>.08</p> <p>.08</p> <p>.08</p> <p>.08</p> <p>.08</p> <p>.08</p> <p>.08</p> <p>.02</p> <p>.19</p> <p>1.81</p>	<p><b>Special Application Components (cont.)</b></p> <p>Transfer Cap. For FE-758 Bar only.</p> <p>Transfer Cap. For FE-758 Bar only. Cut at 45° for left hand curves.</p> <p>Transfer Cap. For FE-758 Bar only. Cut at 45° for right hand curves.</p> <p>Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar.</p> <p>Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar. Cut at 45° for left hand curves.</p> <p>Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar. Cut at 45° for right hand curves.</p> <p>Isolating Piece — 1" long. For all bars.</p> <p>Isolating Piece — 8" long. For all bars.</p> <p>Transfer Guide Assembly with epoxy coated Hangers. For use with isolating pieces.</p>
<p>FC-TB1</p> <p>Bolts: 3/8 - 16 x 1-1/2"</p>	<p><b>FC-TB1</b></p> <p><b>FC-TB1-SS</b></p>	<p>3.50</p> <p>3.38</p>	<p><b>Collector Mounting Post</b></p> <p>Mounting Post with Hardware — 18" long. Mounting plate is 4" square with 3" hole spacing for C-Series and P-Series Collectors. (Contact factory for special lengths or finishes.)</p> <p>Stainless Steel Mounting Post with Stainless Steel Hardware — 18" long.</p>
<p>Maximum O.A.L.: 12-1/4"</p> <p>C-100-V5</p>	<p><b>C-40-V3</b></p> <p><b>C-40-L3</b></p> <p><b>C-100-V5</b></p> <p><b>C-100-L5</b></p>	<p>1.41</p> <p>2.35</p> <p>1.65</p> <p>2.90</p>	<p><b>C-Series Collector Assemblies</b></p> <p><i>C-Series Collectors are used on short continuous run systems. They feature steel pivot points for good tracking capability.</i></p> <p>40 Amp Collector — single shoe. Vertical mount.</p> <p>40 Amp Collector — single shoe. Lateral mount with steel counter weight. O.A.L. — 15"</p> <p>100 Amp Collector — single shoe. Vertical mount.</p> <p>100 Amp Collector — single shoe. Lateral mount with steel counter weights. O.A.L. — 16"</p>
<p>Maximum O.A.L.: 15-1/4"</p> <p>P-100-V5</p>	<p><b>P-40-V3</b></p> <p><b>P-40-L3</b></p> <p><b>P-40-S3-SCD</b></p> <p><b>P-100-V5</b></p> <p><b>P-100-L5</b></p> <p><b>P-100-S5-SCD</b></p>	<p>2.10</p> <p>2.16</p> <p>2.38</p> <p>2.35</p> <p>2.41</p> <p>2.63</p>	<p><b>P-Series Collector Assemblies</b></p> <p><i>P-Series Collectors are used on straight and curved runs and transfers. The pantograph design provides virtually constant spring pressure for the entire stroke range. Lateral Mount Collectors are provided with spring balance. Conductor Bars must be spaced at least 3 inches apart. To order bronze collectors with stainless steel hardware, add "BR" to the catalog number. Call factory for prices.</i></p> <p>40 Amp Collector — single shoe. Vertical mount.</p> <p>40 Amp Collector — single shoe. Lateral mount.</p> <p>40 Amp Collector — single shoe. Self-centering.</p> <p>100 Amp Collector — single shoe. Vertical mount.</p> <p>100 Amp Collector — single shoe. Lateral mount.</p> <p>100 Amp Collector — single shoe. Self-centering.</p>



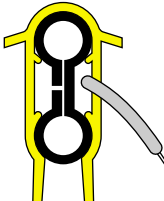



	Catalog Number	Weight Pounds	Description
<p>P-200-VT5</p>	<p>P-80-VT3</p> <p>P-80-LT3</p> <p>P-80-ST3-SCD</p> <p>P-200-VT5</p> <p>P-200-LT5</p> <p>P-200-ST5-SCD</p>	<p>3.71</p> <p>3.91</p> <p>4.35</p> <p>4.20</p> <p>4.40</p> <p>4.84</p>	<p><b>P-Series Collector Assemblies (cont.)</b></p> <p>80 Amp Collector — double shoe. Vertical mount.</p> <p>80 Amp Collector — double shoe. Lateral mount.</p> <p>80 Amp Collector — double shoe. Self-centering.</p> <p>200 Amp Collector — double shoe. Vertical mount.</p> <p>200 Amp Collector — double shoe. Lateral mount.</p> <p>200 Amp Collector — double shoe. Self-centering.</p>
<p>PS-40-V3</p> <p>PS-200-VT5</p>	<p>PS-40-V3</p> <p>PS-100-V5</p> <p>PS-80-VT3</p> <p>PS-200-VT5</p>	<p>1.32</p> <p>1.55</p> <p>2.32</p> <p>2.80</p>	<p><b>PS-Series Collector Assemblies</b></p> <p><i>PS-Series Collectors can be used on 1-1/2 inch centers and are able to use smaller brackets. PS-Series Collectors are not recommended for curves, lateral systems, or applications that require expansion gaps or pick-up guides.</i></p> <p>40 Amp Vertical Collector.</p> <p>100 Amp Vertical Collector.</p> <p>80 Amp Tandem Vertical Collector.</p> <p>200 Amp Tandem Vertical Collector.</p>
<p>FE-1GC</p> <p>FE-2ER-EX</p> <p>B-100-2L</p> <p>FE-908-1M</p> <p>B-100-2FEA</p>	<p>B-100-2L</p> <p>B-100-2FEA</p> <p>FE-1GC</p> <p>FE-908-A</p> <p>FE-908-1M</p> <p>FE-908-1MB</p> <p>FE-2ER-EX</p>	<p>.03</p> <p>.30</p> <p>.04</p> <p>.02</p> <p>2.88</p> <p>.10</p> <p>.05</p>	<p><b>Additional Components</b></p> <p>Spring Cover Clip — Zinc Plated Steel. Used only to ensure alignment of the cover on laterally mounted systems. Place over bar cover midway between hangers.</p> <p>Clamp Hanger Set — 2 pieces. Clamps both sides of hanger.</p> <p>Flexible PVC End Cap. For all Figure 8 conductor bars.</p> <p>Nylon Anchor Pin. For drilled anchoring. Two required, one on each side of the hanger.</p> <p>Connector Tool. One tool usually ordered for each new system. Used to pull two sections of bar together.</p> <p>Replacement Connector Tool Pins — Pair.</p> <p>Splice Cover — Standard black. Use this part number when ordering extra splice covers.</p>
<p>C - 40 - B3</p> <p>C - 100 - B5</p>	<p>C-40-B3</p> <p>C-100-B5</p> <p>C-40-B3-SCC</p> <p>C-100-B5-SCC</p> <p>SFE-40-B3</p> <p>SFE-100-B5</p> <p>EC-100-B5X</p>	<p>.13</p> <p>.21</p> <p>.13</p> <p>.21</p> <p>.12</p> <p>.20</p> <p>.37</p>	<p><b>Conductor Bar Shoes/Brushes</b></p> <p><i>Contact the factory for application.</i></p> <p>3" Contact Shoe</p> <p>5" Contact Shoe</p> <p>3" Contact Shoe for Self Centering Collectors.</p> <p>5" Contact Shoe for Self Centering Collectors.</p> <p>3" Side Entry Contact Shoe.</p> <p>5" Side Entry Contact Shoe.</p> <p>5" Contact Shoe for Totally Enclosed Systems.</p>
<p>C - 40 - B3-SC</p> <p>C - 100 - B5-SC</p> <p>C-100-CT</p>	<p>C-40-B3-SC</p> <p>C-100-B5-SC</p> <p>C-100-CT</p>	<p>.13</p> <p>.21</p> <p>.14</p>	<p><b>Conductor Bar Cleaning Accessories</b></p> <p><i>Contact the factory for application.</i></p> <p>3" Cleaning Shoe with Carborundum Insert.</p> <p>5" Cleaning Shoe with Carborundum Insert.</p> <p>Cleaning Brush — Stainless Steel Bristle.</p>



# DUCT-O-BAR<sup>®</sup>

## Special Application Conductors

All Duct-O-Wire<sup>®</sup> Figure 8 conductor systems can be sized electrically by using the general and technical information contained in this brochure. For applications with special mechanical or environmental considerations, refer to the table below for the proper Duct-O-Bar<sup>®</sup> System to use.

Conductor System	Application or Usage	*Technical or Installation Bulletin
 <p>Heated (HFE)</p>	To prevent ice build-up problems such as outdoor yard cranes or indoor frozen food storage.	FE-2014INST and HFE Supplement*
 <p>Side Contact (SFE)</p>	Monorails and some underhung units which require special mounting hanger brackets to fit the manufacturer's tracks. Not recommended for outdoor use, wet, or dirty environments.	SFE-97INST*
 <p>Totally Enclosed (EFE)</p>	Prevents airborne contaminants from collecting on conductor surfaces.	EFE-95INST*
 <p>8-Bar (8-BAR)</p>	When contour cover shape is specified or requested.	8-95INST*

\*Refer to [www.ductowire.com](http://www.ductowire.com) for the latest editions to the Technical or Installation brochures.



Duct-O-Wire<sup>®</sup> representatives and distributors are located throughout the U.S. and Canada. Call the factory for the representative or distributor closest to you.

Brochure FE-14  
Replaces FE-04  
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Printed in U.S.A.

## Section 04

# Festoon for 5 Ton Hoist



# Industrial Festooning Systems

**Standard Duty Flat Cable • Special Duty Flat Cable**  
**Standard Duty 14 Gauge Galvanized Steel** and **Stainless Steel C-Track**  
**Heavy Duty 12 Gauge Galvanized Steel and Stainless Steel C-Track**  
**Aluma-Track Systems • I-Beam Supported Trolleys**  
**Wire Supported Systems • Round Cable and Air Hose Carriers**  
**Ball Bearing Types: Standard, Stainless, Brass and Precision**



## CAUTION

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

Specifically designed for use on overhead cranes, hoists, monorails, and other industrial applications.  
Special purpose wheel bearings for high speed operation, corrosive environments, and other applications.  
Flat Cable is UL Listed and CSA Approved.

[www.duct-o-wire.com](http://www.duct-o-wire.com)

P.O. Box 519

Corona, California 92878-0519

Phone: 909-735-8220; 800-543-3885; 800-735-1922

Fax: 909-735-2372; 800-752-6001; 800-735-0857

1351 W. Second Street

Oconomowoc, Wisconsin 53066

Phone: 262-567-2288

Fax: 262-567-0857

379 Davis Road, Unit #3

Oakville, Ontario, Canada L6J 2X2

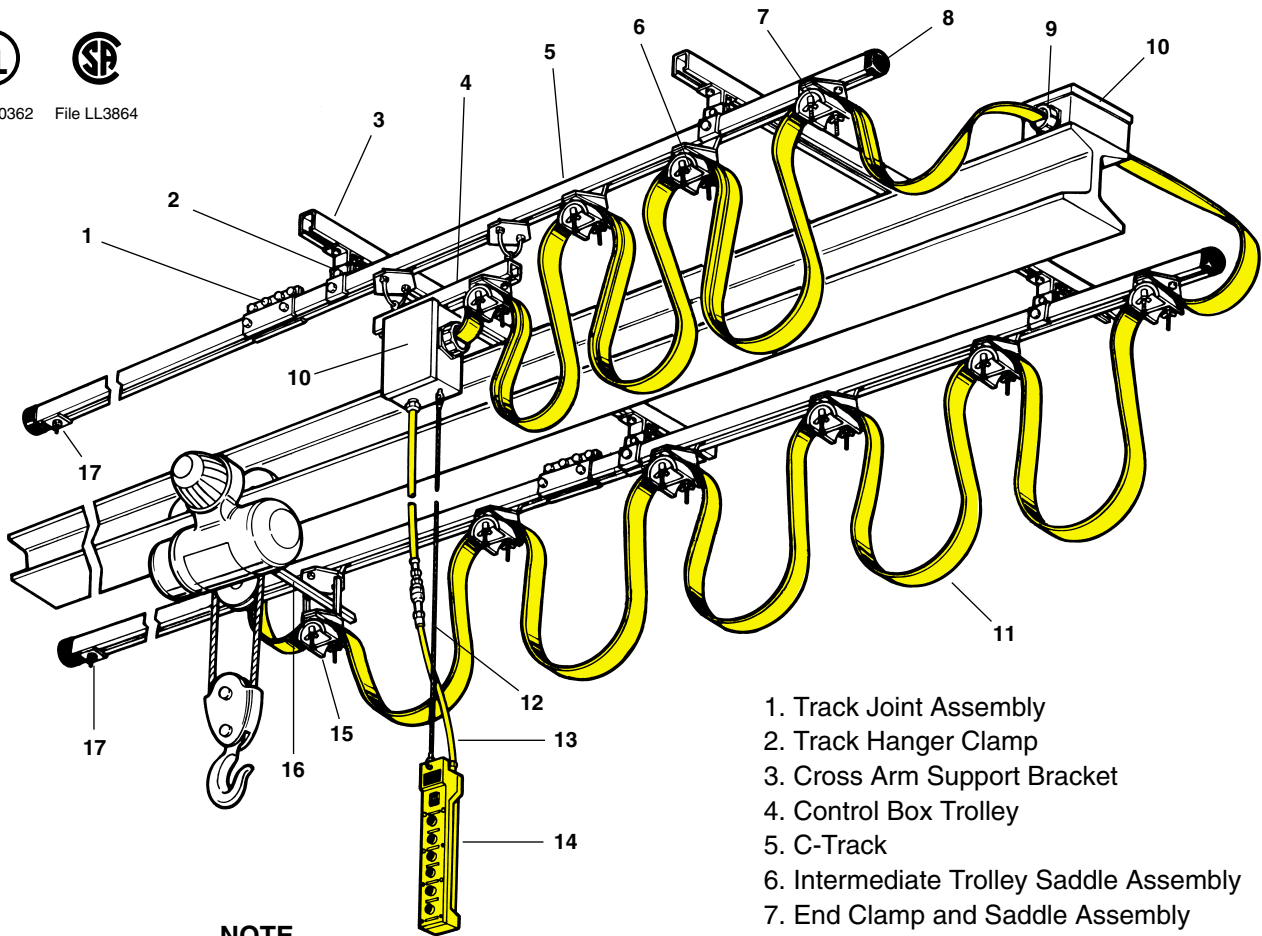
Phone: 905-844-1791; 800-361-9473

Fax: 905-844-2533; 800-663-0933

## Typical C-Track Festoon System Installation



File E60362 File LL3864



1. Track Joint Assembly
  2. Track Hanger Clamp
  3. Cross Arm Support Bracket
  4. Control Box Trolley
  5. C-Track
  6. Intermediate Trolley Saddle Assembly
  7. End Clamp and Saddle Assembly
  8. End Cap
  9. Cable Connector
  10. Junction Box
  11. Flat Cable
  12. Strain Relief Cable\*
  13. Pendant Push Button Cable\*
  14. Pendant Push Button Station\*
  15. Tow Trolley and Saddle Assembly
  16. Tow Bar
  17. End Stop
- \* See Pendant Push Button Brochure

### NOTE

Three cable saddles — small, standard, and large — are used with Duct-O-Wire Festooning Systems. Please refer to the following table to determine the dimensions of each.

Saddle Designation	Diameter Inches	Cable Window Inches
Small	1-1/2	2-3/16 x 1
→ Standard	3	2-3/16 x 1
Large	6	$\left\{ \begin{array}{l} 5-3/8 \times 2 \\ 4-1/8 \times 2 \end{array} \right.$

## Flat Cables and Connectors

### → Standard Copper Cable (Model FC)

- Yellow PVC Jacketed Flat Cable – 600 Volt AC Rated
- Extra Flexible, Color Coded According to NEMA Standards
- UL and CSA –40°C to +105°C (–40°F to +221°F) Temperature Range

### Shielded Copper Cable (Model SFC)

- 600 Volt AC Rated
- Standard Cable with Tinned Copper Braided Shield
- 95.7% Min. RFI Rating
- Black Heat Shrink Tubing Outer Cover

### Test Report

The following numerical data was used to calculate braid angle and shield coverage (per QQB-575B1 PARA.4.3.2.)

Braid Angle	A = 24
Coverage	K = 99
Diameter of Shield	D = 0.750
Strand Diameter	d = .005
Picks per inch	P = 9
Number of Carriers	C = 96
Strands per Carrier	N = 9
NPD/sin a	F = 99118776



## Flat Cables

Required cable length equals track length plus 10% plus length required for end connections

Catalog Number††		Cable Size		Continuous Duty Rating at 30°C (86°F) Ambient Amps*	Short Time Rating - Amps**		No. of Strands per Conductor	Weight per Foot-Pounds	Nominal Dimensions Unshielded Cable Inches†
Yellow PVC Jacket	Shielded Flat Cable	Number of Conductors	AWG Wire Size		60 Min.	30 Min.			
					Control Cables				
FC-42		4	#2	130	148	173	665	1.342	.575 x 1.975
FC-44		4	#4	95	111	130	420	.896	.515 x 1.750
FC-46	SFC-46	4	#6	75	83	94	266	.620	.435 x 1.490
FC-48	SFC-48	4	#8	50	63	69	168	.401	.375 x 1.225
FC-410	SFC-410	4	#10	40	49	52	105	.239	.290 x .890
POWER	FC-412	SFC-412	4	#12	30	36	65	.180	.260 x .800
	FC-414	SFC-414	4	#14	25	31	41	.138	.240 x .690
	FC-712	SFC-712	7	#12	21	32	65	.308	.260 x 1.310
	FC-812	SFC-812	8	#12	20	Control Cables		.343	.260 x 1.440
	FC-814	SFC-814	8	#14	17			.254	.240 x 1.290
	FC-816	SFC-816	8	#16	15	No Short Time Rating		.194	.225 x 1.170
	FC-1214	SFC-1214	12	#14	17			.380	.240 x 1.825
CONTROL	FC-1216	SFC-1216	12	#16	15			.292	.225 x 1.700

\* See Current Correction Factors for Temperatures above 30°C (86°F)

\*\* For crane and hoist motors in accord with article 610 of the 1989 National Electrical Code for 90°C Cables

† Unshielded cable measurements may vary due to manufacturing tolerances. Contact factory for shielded cable dimensions.

†† All cables from #10 AWG through #16 AWG have zip cords for easy removal of the outer jacket.



### Connectors with Bushings for Unshielded Flat Cables

For shielded cable, use heat shrink fittings.

Catalog No.	Number of Cables	Cable Size		NPS
		Number of Conductors	AWG Wire Size	
FC-4/8C		One 4-conductor cable, #10, 12, or 14 AWG and one 8-conductor cable, #14 or 16 AWG		1.25
FC-42C	1	4	#2	2"
FC-44C	1	4	#4	2"
FC-46C	1	4	#6	1.50
FC-48C	1	4	#8	1.25
FC-410C	1	4	#10	1"
FC-412C	1	4	#12	1"
FC-414C	1	4	#14	1"
FC-712C	1	7	#12	1.25
FC-712C2	2	7	#12	1.25
FC-812C	1	8	#12	1.50
FC-812C2	2	8	#12	1.50
FC-816C	1	8	#14 or 16	1.25
FC-816C2	2	8	#14 or 16	1.25
FC-1216C	1	12	#14 or 16	2"
FC-1216C2	2	12	#14 or 16	2"
FC-1216C3	3	12	#14 or 16	2"

## Connectors

### Heat Shrinkable Cable Connectors for Single Cable and Multiple Cable Groupings

Corrosion Resistant • Flame Retardant • Exceed Navy Requirements for Tightness and Integrity when used with One Flat Cable or Multiple Flat Cables of the Same Size.

Catalog Number	Maximum Number of Cables	Cable Size		Cable Entry Range		NPS
		Number of Conductors	AWG Wire Size	Min.	Max.	
HS-CG1	3	4	#12 or 14	.5	1.125	1"
HS-CG2	4	8	#14 or 16	.75	1.625	1.5
		7	#12			
		3	#8, 10 or 12			
		2	#6 or 8			
HS-CG3	5	12	#14 or 16	1"	2.125	2"
		4	#8			
		3	#6 or 4			

### Continuous Duty Current Correction Factors for Ambient Temperatures Above 30°C (86°F).

(Per Article 310-16 of the 1996 National Electrical Code)

Ambient Temperature		Correction Factor
°C	°F	
30	86	1.00 (Full load current rating)
50	122	.82
65	149	.58


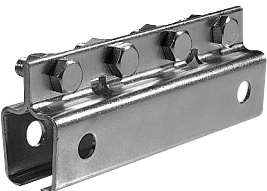
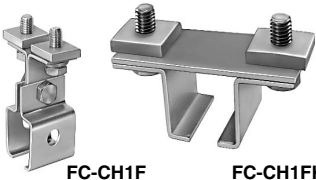
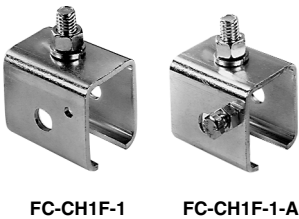





# Standard Duty 14 Gauge C-Track System Components



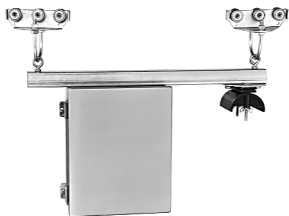





Galvanized Steel • Stainless Steel

Precision Bearings and Curved Sections Available

Flat Cable System Components

	Catalog Number		Weight Pounds	Description
	Galvanized Steel	Stainless Steel		
	<b>FC-CH1A-10</b> FC-CH1A-20 FC-CH1A CUT	FC-CH1A-10-SS FC-CH1A-20-SS FC-CH1A-SS CUT	10 20 1 lb./ft.	<b>14 Gauge C-Track</b> 10 ft. section. 20 ft. section. Cross Arm Support Bracket or Cut Lengths. <b>Specify length in 1/2 foot increments.</b>
	<b>FC-CH1D</b>  FC-CH1DW	FC-CH1D-SS	1.38  .11	<b>Track Joint Assembly</b> Joint clamp for secure attachment and proper alignment of track sections. Includes four bolts, lock washers, and nuts. <b>One required for each track section per run less one.</b> Welding sleeve for joining track sections.
	<b>FC-CH1F</b> FC-CH1FK	FC-CH1F-SS	.60 .51	<b>Track Hanger Clamp Assembly</b> <b>One required for each cross arm support bracket for each track run. 5' spacing.</b> For mounting track to cross arm support bracket. Includes all required hardware. Low profile track hanger assembly.
	FC-CH1F-1 FC-CH1F-1-A FC-CH1F-1-R FC-CH1F-1-A-R		.38 .40 .44 .46	<b>Single Bolt Track Hanger &amp; Anchor Assembly</b> <b>One required for each cross arm support bracket for each track run. 5' spacing.</b> Single Mounting Bolt Track Hanger Assembly. Single Mounting Bolt Track Anchor Assembly. Single Mounting Bolt Track Hanger w/Rect. Nut. Single Mounting Bolt Track Anchor w/Rect. Nut. The FC-CH1F-1 track hanger assembly is designed to be mounted on angle iron brackets with one mounting hole. The use of one FC-CH1F-1-A track anchor per track run, which also mounts in one mounting hole, will prevent the track from sliding out of position. The rectangle nut hangers and anchors are used with cross arm brackets made from cut pieces of C-track material.
	<b>FC-CH1G</b>	FC-CH1G-SS	.12	<b>End Stop</b> <b>One required for each track run.</b> Bumper with mounting hardware.
	<b>FC-TMC-U</b>	FC-TMC-U-SS	.38	<b>Mounting Clamp for Cross Arm Support Bracket</b> <b>Two required for each cross arm support bracket.</b> Universal mounting clamp with bolt.
	<b>FC-CH1GC</b>	FC-CH1GC	.03	<b>Rubber End Cap</b>



	Catalog Number		Weight Pounds	Description	
	Galvanized Steel	Stainless Steel			
	FC-TRT1		2.19	<b>Tow Trolley and Saddle Assembly</b> Load Rating: 45 lb. max. <b>One required for each piece of moving equipment to be electrified.</b> Plated steel trolley and standard saddle with cut out box for tow bar. Same except stainless steel trolley with stainless steel wheels. Same except stainless steel trolley with brass wheels.	
		FC-TRT1-SS	2.19		
		FC-TRT1-BR	2.19		
	FC-TB1	FC-TB1-SS	3.5	<b>Tow Bar</b> <b>One required for each tow trolley.</b> For mounting on moving equipment. 18" long.	
	FC-TRC1		4.75	<b>Control Box Trolley (Optional Brake Available)</b> Two trolleys and one standard saddle mounted on bracket plus fittings to attach control box. Control box not included. Same as FC-TRC1 except with stainless steel trolleys and stainless steel wheels. Same as FC-TRC1-SS except with brass wheels.	
		*	FC-TRC1-SS		4.75
			FC-TRC1-BR		4.75
	FC-BX1		9.0	<b>Junction Boxes and Terminal Strips</b> 8" x 10" x 4" steel junction box for control box trolley assembly. Rated NEMA 13. Accepts up to 2 terminal strips. Stainless steel junction box. Rated NEMA 4X. Fiberglass junction box. Rated NEMA 4X. 12-Pole terminal strip. Heavy-duty 12-pole terminal strip.	
			FC-BX1-SS		9.0
			FC-BX1-4X		7.0
		FC-BXT FC-BXT-HD	FC-BXT FC-BXT-HD		.20 .40
	FC-TR1		1.10	<b>Standard Duty Intermediate Trolley-Saddle Assemblies</b> Load Rating: 45 lb. max. Consult factory for 2-tiered trolleys or special bearings. 5-inch trolley with 4 steel shielded ball bearing wheels, cable pad. Standard saddle and hardware. Same as FC-TR1 except stainless steel trolley with 4 stainless steel wheels. Same as FC-TR1-SS except with 4 brass wheels.	
			FC-TR1-SS		1.10
			FC-TR1-BR		1.10
	FC-TR2		.75	<b>Short Intermediate Trolley Assembly</b> 3 inch trolley with 4 steel shielded ball bearing wheels, cable pad, small saddle and hardware. Same except stainless steel trolley & wheels.	
		FC-TR2-SS	.75		
	FC-CS1	FC-CS1-SS	.72	<b>End Clamp and Saddle Assembly</b> <b>One required for each track run at storage end of track.</b> Standard saddle with clamp and hardware to secure cable	
 (Shown with optional FC-TRB bumper)	FC-TR8 FC-TRB		1.10	<b>Options</b> 5 inch intermediate trolley/saddle assembly with steel saddle. Polyurethane trolley bumper.	
					.10

\* For quick plug control trolley and components, see CT Brochure.

## Section 05

# Operator Push Button Pendant



# L Series Pendant Push Button Stations

Single-Speed, Two-Speed, Three-Speed and Accessories  
With Standard Multi-Step Cord Grip



L2-S



L4-S  
L4-D



L6-S  
L6-D



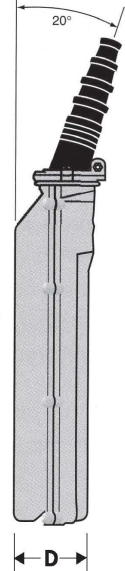
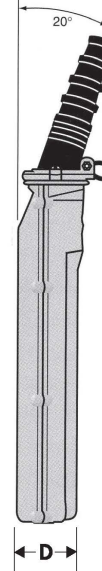
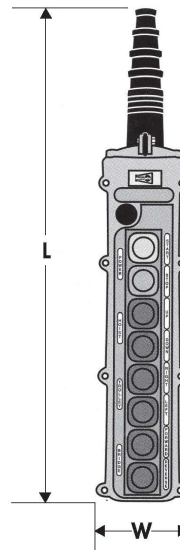
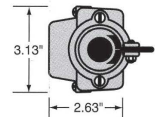
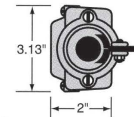
L8-S  
L8-D



L10-S  
L10-D

- Polypropylene Construction
- NEMA 1, 3, and 12
- Multi-Step Cord Grip for 4 to 24 Conductor Cable
- Slim Back Profile (S) for Ergonomic Look & Feel
- Deep Back (D) Profile for Extra Wiring Space
- Strain Relief Hook and Cable Clamp Set
- Large Variety of Accessory Switches Available
- Replaceable Neoprene Boots
- Easy to Read Legend Plates (Button and Body)
- UL Listed and CSA Approved (150928)

Catalog Number	Enclosure Type	W Width	D Depth	L Length	Wt. #	Cable Range
L2-S	2 Button Shallow	3.13"	2.00"	11.75"	.56	.640" - .890"
L4-S	4 Button Shallow	3.13"	2.00"	13.25"	.64	.640" - .890"
L6-S	6 Button Shallow	3.13"	2.00"	15.50"	.74	.640" - .890"
L8-S	8 Button Shallow	3.13"	2.00"	17.75"	.88	.640" - .890"
L10-S	10 Button Shallow	3.13"	2.00"	20.00"	.96	.640" - .890"
L4-D	4 Button Deep	3.13"	2.63"	13.25"	.70	.640" - .890"
L6-D	6 Button Deep	3.13"	2.63"	15.50"	.80	.640" - .890"
L8-D	8 Button Deep	3.13"	2.63"	17.75"	.92	.640" - .890"
L10-D	10 Button Deep	3.13"	2.63"	20.00"	1.04	.640" - .890"



Pictures are for illustration purposes and may not represent actual product.  
Duct-O-Wire® recommends installation of an Emergency Stop on all Pendants.

## Section 06

### 1.5 Manual Chain Hoist & Trolley

# Cyclone Army type trolley hoist

Same quality and performance as the Cyclone In a compact, low headroom integral trolley mount. Ideal for applications requiring a moveable hoist including:

- Rugged steel loadbars connected directly to hoist frame
- Reduced headroom, side clearances and end approach for easy maneuvering of heavy loads in tight places
- Standard Load Limiter automatic overload protection
- Plain and geared trolley mounts in capacities from 1/4 to 12 tons
- Universal tread trolley wheels for operation on sloped or flat flanged beams
- Standard hand chain drop 2 feet less than lift (example: 8 foot lift hoist has 6 foot hand chain drop)
- Chain containers, zinc-plated load and hand chain, aluminum unwelded hand chain, Latchlok hooks, bronze hooks, bullard hooks, larger beam trolleys, trolley guards, and units without Load Limiter optional, depending on capacity
- Lifetime warranty
- Metric rated
- Made in U.S.A.



## **⚠️WARNING**

Overloading and improper use can result in injury.

**To avoid injury:**

- Do not exceed working load limit, load rating capacity
- Do not use to lift people or loads over people.
- Use only alloy chain for overhead lifting.
- Read and follow all instructions.

## Specifications

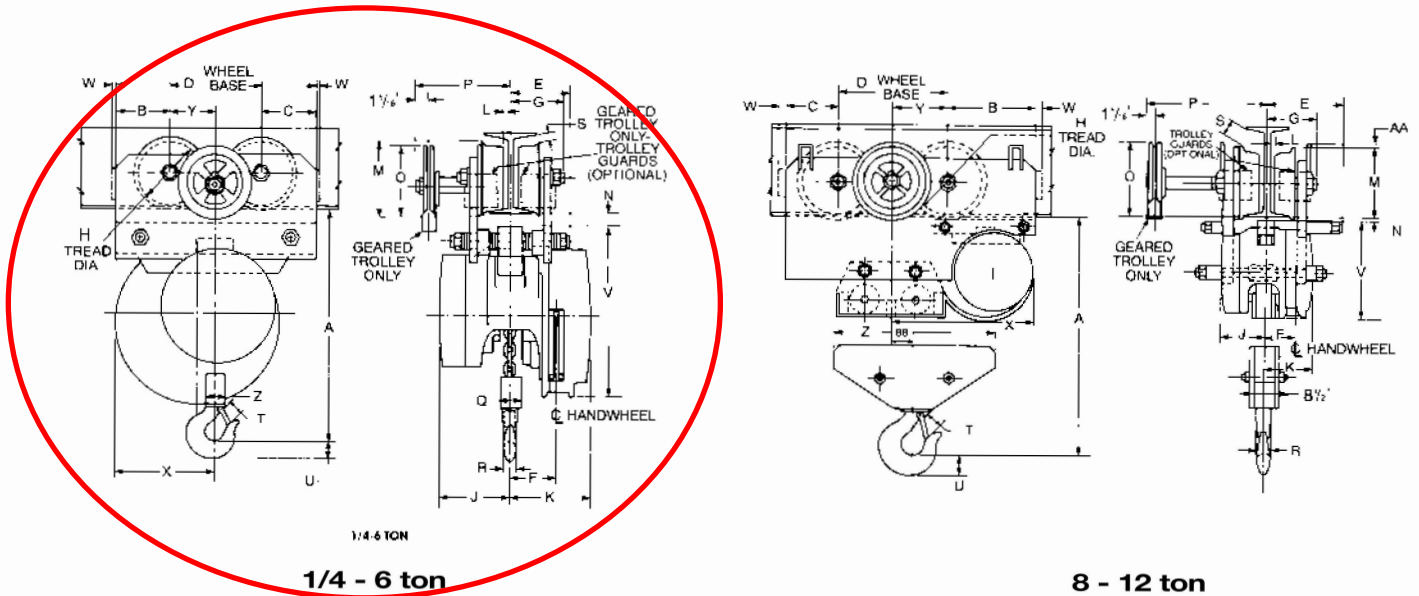
Rated capacity* (tons)	Product code		Standard lift (ft.)	Reeving	American standard depth (in.)†	Beam adjustment ranges flange width (in.)†	Chain pull to lift capacity loads (lbs.)	Chain overhauled to lift load one foot (ft.)	Min. headroom (in.)	Min. radius curve (in.)	Shipping weight (lbs.)	
	Plain trolley	Geared trolley									Plain trolley	Geared trolley
1/4	4521	4541	10	1	4-12**	2 5/8-5 1/2	23	22 1/2	11 3/4	30	88	110
1/2	4522	4542	10	1	4-12**	2 5/8-5 1/2	48	22 1/2	11 3/4	30	88	110
1	4524	4544	10	1	4-12**	2 5/8-5 1/2	69	30	11 3/4	30	81	133
1 1/2	4525	4545	10	1	8-15	3 3/8-5 5/8	80	40 1/2	15 5/8	30	140	168
2	4526	4546	10	1	8-15	3 3/8-5 5/8	83	52	15 5/8	30	140	168
3	4527	4547	10	2	7-15	3 3/8-5 5/8	85	81	18 7/8	48	189	237
4	4528	4548	10	2	7-15	3 3/8-5 5/8	87	104	18 7/8	48	189	237
5	4529	4549	10	3	8-18	4-6 1/4	74	156	23 1/2	60	278	310
6	4530	4550	10	3	8-18	4-6 1/4	89	156	24	60	283	315
8	4531	4551	10	4	12-24	5-8	91	208	28 1/4	72	526	601
10	4532	4552	10	5	12-24	5-8	93	260	28 1/4	72	535	611
12	4533	4553	10	6	15-24	5 1/2-8	95	312	30 3/8	96	1088	1098

\*\* For 1/4 through 1 ton geared trolleys - minimum beam size 96 x 12.5 (3 3/8 flange width)

† Universal tread track wheels designed to operate on either sloped or flat flange beam, rails or tracks



# Cyclone Army type trolley hoist-Specifications



Clearance dimensions (in.)

Rated capacity\* (tons)

Dimension	1/4, 1/2 & 1		1 1/2 & 2		3 & 4		5		6		8		10		12	
	Plain	Geared	Plain	Geared	Plain	Geared	Plain	Geared	Plain	Geared	Plain	Geared	Plain	Geared	Plain	Geared
A	11 3/4	11 13/16	15 5/16	15 5/16	18 7/8	18 7/8	23 1/2	23 1/2	24	24	28 1/4	28 1/4	28 1/4	28 1/4	30 3/8	30 3/8
B	4 3/16	4 3/8	3 1 1/16	3 1 1/16	5 3/4	5 3/4	6 1/2	6 1/2	6 1/2	6 1/2	8 15/16	8 15/16	8 15/16	8 15/16	10 7/8	10 7/8
C	2 9/16	2 9/16	3 1 1/16	3 1 1/16	3 7/16	3 7/16	3 3/4	3 3/4	3 3/4	3 3/4	5 1/4	5 1/4	5 1/4	5 1/4	7 3/16	7 3/16
D	6	6	6	6	6 7/8	6 7/8	7 3/4	7 3/4	7 3/4	7 3/4	11	11	11	11	11	11
E	4 1/2	4 15/16	5	5	5 7/16	5 7/16	6 1/8	6 1/8	6 1/8	6 1/8	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4
F	2 1/16	2 1/16	3 1/8	3 1/8	3	3	2 13/16	2 13/16	2 13/16	2 13/16	3	3	3	3	3	3
G	3	3 3/4	3 5/8	3 3/4	4 5/16	4 5/16	4 15/16	4 15/16	4 15/16	4 15/16	5 9/16	5 9/16	5 9/16	5 9/16	5 13/16	5 13/16
H	3 1/8	4	4 3/4	4	5	5	6	6	6	6	8	8	8	8	8	8
J	3 1/4	3 1/4	4 13/16	4 13/16	4 13/16	4 13/16	5	5	5	5	4 13/16	4 13/16	4 13/16	4 13/16	4 13/16	4 13/16
K	4 1/8	4 1/8	5 1/16	5 1/16	5 1/16	5 1/16	4 7/8	4 7/8	4 7/8	4 7/8	5 1/16	5 1/16	5 1/16	5 1/16	5 1/16	5 1/16
L	5/16	5/16	1/2	5/16	1/4	1/4	3/8	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1 1/16	1 1/16
M	4	4 3/4	5 9/16	4 3/4	5 7/8	5 7/8	7	7	7	7	9 7/16	9 7/16	9 7/16	9 7/16	9 1/2	9 1/2
N	1/2	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1/2	1/2	1/2	1/2	7/16	7/16
O	-	5 9/16	-	5 9/16	6 1/8	6 1/8	6 3/4	6 3/4	6 3/4	6 3/4	7 9/16	7 9/16	7 9/16	7 9/16	7 3/16	7 3/16
P	-	10	-	10	8 15/16	8 15/16	10 7/16	10 7/16	10 7/16	10 7/16	11 7/16	11 7/16	11 7/16	11 7/16	11 11/16	11 11/16
Q	2	2	2 1/2	2 1/2	3 7/8	3 7/8	4	4	4	4	11 15/16	11 15/16	-	-	-	-
R	1 1/16	1 1/16	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 3/8	1 3/8	1 13/16	1 13/16	1 13/16	1 13/16	2 3/8	2 3/8
S	1/16	15/16	3/16	15/16	15/16	15/16	3/4	3/4	3/4	3/4	2 3/16	2 3/16	2 3/16	2 3/16	5 1/16	5 1/16
T	1	1	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 3/4	1 3/4	2 5/16	2 5/16	2 5/16	2 5/16	3	3
U	7/8	7/8	1 1/8	1 1/8	1 1 1/16	1 1 1/16	1 1 1/16	1 1 1/16	1 7/8	1 7/8	2 9/16	2 9/16	2 9/16	2 9/16	3	3
V	10 1/8	10 1/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	1 3/8	11 3/8	11 3/8	11 5/8	11 5/8	11 5/8	11 5/8	11 5/8	11 5/8
W	1/4	3/8	3/8	3/8	1/2	1/2	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
X	7 9/16	7 9/16	6 1 1/16	6 1 1/16	8 15/16	8 15/16	10 9/16	10 9/16	10 9/16	10 9/16	14 7/16	14 7/16	14 7/16	14 7/16	16 3/8	16 3/8
Y	3	3	3	3	3 7/16	3 7/16	3 7/8	3 7/8	3 7/8	3 7/8	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
Z	2	2	2 1/2	2 1/2	4 1/2	4 1/2	6 1/4	6 1/4	6 1/4	6 1/4	13 15/16	13 15/16	18 3/16	18 3/16	21 11/16	21 11/16
AA	-	-	-	-	-	-	-	-	-	-	3/8	3/8	3/8	3/8	3/8	3/8
BB	-	-	-	-	-	-	-	-	-	-	1 5/16	1 5/16	0	0	0	0

Note: Dimensions are based on minimum beam and may vary with larger beams.



GENERAL REQUIREMENTS

- 1. NO CHANGES ARE TO BE MADE TO THESE PLANS WITHOUT THE KNOWLEDGE AND WRITTEN CONSENT OF THE ENGINEER OR ARCHITECT.
2. ALL DIMENSIONS CONTROLLED BY EXISTING CONDITIONS SHALL BE VERIFIED BY THE CONTRACTOR AT THE SITE.
3. CONSTRUCTIONS AND MATERIALS SHALL COMPLY WITH AND BE INSTALLED IN ACCORDANCE WITH ALL THE REQUIREMENTS OF ALL LEGALLY CONSTITUTED PUBLIC AUTHORITIES HAVING JURISDICTION, INCLUDING ALL COUNTY AND LOCAL ORDINANCES, AND THE SAFETY ORDERS OF THE STATE INDUSTRIAL ACCIDENT COMMISSION, OSHA,
4. GENERAL CONTRACTOR SHALL VISIT THE JOB SITE AND VERIFY ALL GRADES, DIMENSIONS, AND CONDITIONS PRIOR TO BIDDING AND COMMENCING CONSTRUCTION.
5. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF ALL WORK, INCLUDING THAT OF ALL SUB-TRADES.
6. GENERAL CONTRACTOR SHALL NOTIFY ENGINEER AND ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES FOUND WITHIN THE CONTRACT DOCUMENTS.
7. ALL WORK PERFORMED SHALL CONFORM WITH THE REQUIREMENTS OF THE LOCAL BUILDING CODE (LATEST ADOPTED EDITION) OR OTHER APPLICABLE GOVERNING CODES AND BUILDING ORDINANCES.
8. ALL SUB-CONTRACTORS SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS ACCUMULATED AS A RESULT OF THEIR OPERATION, ALL SCRAP, DEBRIS, AND OTHER EXCESS MATERIAL SHALL BE REMOVED FROM THE BUILDING SITE.
9. THE OWNER SHALL HAVE THE RIGHT TO MAKE CERTAIN CHANGES IN THE WORK AND THE CONTRACT AMOUNT SHALL BE ADJUSTED ACCORDINGLY. HOWEVER, THE GENERAL CONTRACTOR SHALL NOT PROCEED WITH ANY CHANGES WITHOUT THE WRITTEN APPROVAL OF THE OWNER.
10. ALL MATERIALS SHALL BE FURNISHED AS SHOWN HEREIN UNLESS EQUAL ALTERNATES ARE APPROVED IN WRITING BY THE OWNER.
11. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR SHORING AND PROVIDING BRACING DURING CONSTRUCTION AND/OR ERECTION TO SUPPORT ALL LOADS TO WHICH THE STRUCTURE MAY BE SUBJECTED.
12. SEE ARCHITECT'S SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS, IF APPLICABLE.
13. ANY REFERENCE TO THE WORDS APPROVE, APPROVED, OR APPROVAL IN THESE DOCUMENTS SHALL BE HERE DEFINED TO MEAN GENERAL ACCEPTANCE OR REVIEW AND SHALL NOT RELIEVE THE CONTRACTOR AND/OR HIS SUB-CONTRACTORS OF ANY LIABILITY IN FURNISHING THE REQUIRED MATERIALS OR LABOR SPECIFIED.
14. THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES, INCLUDING, BUT NOT LIMITED TO BRACING AND SHORING, OBSERVATION VISITS TO THE SITE BY FIELD REPRESENTATIVES OF THE ARCHITECT OR ENGINEER SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES. ANY SUPPORT SERVICES PERFORMED BY THE ARCHITECT OR ENGINEER DURING THE CONSTRUCTION SHALL BE DISTINGUISHED FROM CONTINUOUS AND DETAILED INSPECTION SERVICES WHICH ARE FURNISHED BY OTHERS. THESE SUPPORT SERVICES PERFORMED BY THE ARCHITECT OR ENGINEER, WHETHER OF MATERIAL OR WORK, AND FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING COMPLIANCE WITH CONTRACT DOCUMENTS, DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
15. THE SHOP DRAWING REVIEW PROCESS BY THIS ENGINEER WILL ONLY COMMENCE AFTER THE SUBMITTED FABRICATION OR SHOP DRAWING HAVE BEEN AS FOLLOWS:
A. INITIALLY REVIEWED AND ACCEPTED AS CONFORMING WITH THE STRUCTURAL CONSTRUCTION DRAWINGS BY THE RESPONSIBLE SUPERVISOR AND DRAWING CHECKER WITH THEIR SIGNATURES.
B. APPROVED AND ACCEPTED WITH A STAMP FROM THE GENERAL CONTRACTOR AS CONFORMING TO THE CONSTRUCTION DOCUMENTS.
C. CONTRACTOR TO SUBMIT THE DESIRED NUMBER HARD COPIES OF SHOP DRAWINGS PLUS TWO EXTRA SETS TO ENGINEER FOR REVIEW. IF PDF'S ARE SUBMITTED THE NUMBER OF COPIES PRINTED OUT WILL BE CHARGED AT THE CONTRACTORS EXPENSE. THE FULL AMOUNT OF THE PRINTS SHALL BE PAID BEFORE THE REVIEWED DRAWINGS WILL BE RELEASED.
16. STRUCTURAL OBSERVATION WILL BE PERFORMED BY AN ENGINEER OR ARCHITECT EMPLOYED BY THE OWNER. THIS DESIGNATED INDIVIDUAL SHALL CONFORM TO THE REQUIREMENTS AS STATED IN CBC CHAPTER 17.

SEISMIC FACTORS

Table with 2 columns: Factor Name and Value. Includes Importance (1.25), Risk Category (III), Site Class (D), Seismic D.C. (D), Seismic F.R.S. (12.2-1H), and other seismic parameters.

DESIGN LOADS

Table with 3 columns: Location, D.L., L.L. Includes Bridge (57.0 PLF), Hoist (393.0 LB), Trolley (606.0 LB), Festoons (10.0 PLF), and Misc. (5.0 PLF).

STRUCTURAL STEEL

- 1. ALL STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM AND SHALL BE FABRICATED ACCORDING TO AISC PRACTICE AND SPECIFICATIONS FOR BUILDING.
2. PLATES & BARS SHALL CONFORM TO ASTM A-36/A36M-05 U.N.O.
3. STRUCTURAL SHAPES SHALL CONFORM TO ASTM A-992/A992-06a.
4. TUBE MEMBERS SHALL CONFORM TO ASTM A-500, GRADE B (Fy=46 KSI) PIPE COLUMNS SHALL CONFORM TO ASTM A-53, GRADE B.
5. WELDING SHALL CONFORM WITH THE LATEST ADDITION OF THE WELDING CODE AWS D1.1-08. USE APPROVED ELECTRODES CONFORMING WITH ASTM A-233. WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS APPROVED BY THE BUILDING DEPARTMENT. ALL FIELD WELDING SHALL BE CONTINUOUSLY INSPECTED BY A REGISTERED DEPUTY INSPECTOR, AT THE EXPENSE OF THE GENERAL CONTRACTOR UNLESS A PRIOR AGREEMENT IS NEGOTIATED WITH THE OWNER.
6. UNLESS OTHERWISE NOTED, ALL SHOP AND FIELD BOLTED CONNECTIONS SHALL BE WITH 7/8"Ø A325-N. HOLE SIZE SHALL BE BOLT DIAMETER PLUS 1/16".
7. ALL CONNECTIONS USING ASTM A325 BOLTS SHALL BE TORQUED EITHER BY TURN OF THE NUT METHOD OR BY CALIBRIATED TORQUE WRENCH PER AISC.
8. STRUCTURAL STEEL SHOP DRAWINGS SHALL BE REVIEWED BY THE STRUCTURAL ENGINEER PRIOR TO FABRICATION.
9. ALL EXPOSED WELDS SHALL BE FILLED AND GROUND SMOOTH WHERE METAL COULD COME IN CONTACT WITH THE PUBLIC.
10. NO HOLES OTHER THAN THOSE SPECIFICALLY DETAILED SHALL BE ALLOWED THRU STRUCTURAL STEEL MEMBERS. NO CUTTING OR BURNING OF STRUCTURAL STEEL WILL BE PERMITTED WITHOUT PRIOR CONSENT OF THE ENGINEER.
11. GROUTING OF COLUMN BASE PLATES: BASE PLATES SHALL BE DRYPACKED OR GROUTED WITH "FIVE-STAR" NON-SHRINK GROUT OR EQUAL. MINIMUM COMPRESSIVE STRENGTH SHALL BE AS SPECIFIED IN THE CONCRETE SECTION OF THESE NOTES. ALL SURFACES SHALL BE PROPERLY CLEANED OF FOREIGN MATERIAL PRIOR TO THE GROUTING OPERATION.
12. PROVIDE 3x NAILER WITH 1/2"Ø BOLT AT 24" O.C. (2 FACES) AT ALL STEEL COLUMNS IN WOOD STUD WALLS. U.N.O.

CRANE SPECIFICATIONS

INDUSTRIAL FESTOONING SYSTEMS
MANUFACTURER: DUCT-O WIRE
SADDLE DESIGNATION: STANDARD
FLAT CABLES & CONNECTORS: STANDARD COPPER CABLE (MODEL FC)
FLAT CABLES: FC-410 POWER, FC-1216 CONTROL CABLES
CONNECTORS: FC-412C, FC-1216C3
14 GA. C-TRACK SYSTEM COMPONENTS: FC-CH1A-10, FC-CH1D, FC-CH1F, FC-CH1G, FC-CH1GC, FC-TR11, FC-TB1, FC-TRC1, FC-BX1, FC-TR2, FC-CS1
POWER SUPPLY: 460V/3 PH/60HZ
PUSH BUTTON STATION
MANUFACTURER: DUCT-O WIRE
L SERIES PENDANT PUSH BUTTON STATIONS: L8-S, 8 BUTTON SHALLOW
CONDUCTOR SYSTEM
MANUFACTURER: DUCT-O WIRE
FIGURE 8 ELECTRICAL CONDUCTOR SYSTEMS MODEL - FE 758, INDOOR USE
90 AMP ROLLED GALVANIZED STEEL
BASIC FIGURE 8 SYSTEMS
DUCT-O-BAR FIGURE 8 COMPONENTS: B-100-BR13B, B-100-BR-EXT, FE-908-2PF, FE-908-2CP, FC-TB1, P-80-VT3, B-100-2FEA, FE-1GC, FE-2ER-EX
CRANE:
END TRUCK: YALE LIFT TECH KIT CODE B05/36UD165
TROLLEY: COFFING HOISTS MODEL EMCI 10008
CAPACITY: 5 TON
TYPE: SINGLE GIRDER UNDER RUNNING
SPECIFICATION: CMAA 74, CLASS C
TROLLEY: UNDER RUNNING
CRANE DRIVE: TYPE A4
CONTRACT SPECIFICATION: SECTION 14300 (CRANE)
CRANE PAINT/FINISH:
PRIMER FOR CRANE PER SPEC. 09800, SECTION 2.1, A-EXTERIOR EXPOSED AND SPEC. 09900, SECTION 3.4 SHOP PRIMING
INTERMEDIATE COAT FOR CRANE: PER SPEC. 09800, SECTION 2.1, A-EXTERIOR EXPOSED AND SPEC. 09900, SECTION 3.4 SHOP PRIMING
FINISH COAT FOR CRANE: PER SPEC. 09800, SECTION 2.1, A-EXTERIOR EXPOSED AND SPEC. 09900, SECTION 3.4 SHOP PRIMING COLOR: THERMAL ORANGE

CRANE DESIGN CRITERIA

Table with 2 columns: ITEM and DESCRIPTION. Lists service class, rated capacity of bridge (5 tons), hoist (5 tons), span (30'-9"), and various speed and arrangement specifications.

SPECIAL INSPECTION

SPECIAL INSPECTION BY A DEPUTY REGISTERED INSPECTOR APPROVED BY THE BUILDING DEPARTMENT SHALL BE PROVIDED FOR THE FOLLOWING: (UNLESS NOTED OTHERWISE.)
SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING:
1. PLACEMENT OF ALL CONCRETE WITH Fc OF GREATER THAN 2,500 PSI
2. BOLTS INSTALLED IN CONCRETE. PRIOR TO PLACEMENT OF CONCRETE AROUND BOLTS.
3. SPECIAL MOMENT-RESISTING CONCRETE FRAME.
4. REINFORCING STEEL AND PRESTRESSING STEEL TENDONS.
4.1 DURING ALL STRESSING AND GROUTING OF TENDONS IN PRESTRESSED CONCRETE.
4.2 DURING PLACING OF REINFORCING STEEL AND PRESTRESSING TENDONS FOR ALL CONCRETE REQUIRED TO HAVE SPECIAL INSPECTION BY ITEM 1.
5. WELDING
5.1 CONTINUOUS INSPECTIONS DURING WELDING OF ANY MEMBER OR CONNECTION EXCEPT:
- WELDING DONE IN AN APPROVED FABRICATOR'S SHOP.
- SINGLE-PASS FILLET WELDS NOT EXCEEDING 5/16"
- FLOOR AND ROOF DECK WELDING
- WELDED STUDS WHEN USED FOR STRUCTURAL DIAPHRAGM OR COMPOSITE SYSTEMS.
- WELDED SHEET STEEL FOR COLD-FORMED STEEL FRAMING MEMBERS-SUCH AS STUDS AND JOISTS
- WELDING OF STAIRS AND RAILING SYSTEMS
5.2 SPECIAL MOMENT-RESISTING STEEL FRAMES.
- NON-DESTRUCTIVE TESTING IS ALSO REQUIRED.
5.3 WELDING OF REINFORCING STEEL.
6. HIGH STRENGTH BOLTING
7. STRUCTURAL MASONRY
7.1 OTHER THAN FULLY GROUTED OPEN-END HOLLOW-UNIT MASONRY. DURING PREPARATION AND TAKING OF ANY REQUIRED PRISMS OR TEST SPECIMENS, PLACING OF ALL MASONRY UNITS, PLACEMENT OF REINFORCEMENT, INSPECTION OF GROUT SPACE, IMMEDIATELY PRIOR TO CLOSING OF CLEANOUTS, AND DURING ALL GROUTING OPERATIONS.
7.2 FOR FULLY GROUTED OPEN-END HOLLOW-UNIT MASONRY DURING PREPARATION AND TAKING OF ANY REQUIRED PRISMS OR TEST SPECIMENS, AT THE START OF LAYING UNITS, AFTER THE PLACEMENT OF REINFORCING STEEL, GROUT SPACE PRIOR TO EACH GROUTING OPERATION, AND DURING ALL GROUTING OPERATIONS.
8. DURING MIXING AND PLACING OF CLASS B REINFORCED GYPSUM CONCRETE.
9. DURING APPLICATION OF INSULATING CONCRETE FILL WHEN PART OF A STRUCTURAL SYSTEM.
10. SPRAY APPLIED FIRE PROOFING.
11. PILING, DRILLED PIERS AND CAISSONS, DURING DRIVING AND CONSTRUCTION OF CAST-IN-PLACE DRILLED PILES OR CAISSONS.
12. SHOTCRETE. DURING THE TAKING OF TEST SPECIMENS AND PLACING OF ALL SHOTCRETE.
13. SPECIAL GRADING, EXCAVATION AND FILLING. DURING EARTH-WORK EXCAVATIONS, GRADING AND FILLING OPERATIONS INSPECTIONS ARE TO SATISFY REQUIREMENTS OF THE GRADING SECTION OF THE CODE.
14. SMOKE CONTROL SYSTEMS. SEE ARCHITECT FOR ADDITIONAL INFORMATION IF REQUIRED.
\* REFER TO 2013 C.B.C.
ADDITIONAL SPECIAL INSPECTION ITEMS SPECIFIC TO THIS JOB:
A. VERIFY THAT THE SOILS CONDITIONS ARE IN SUBSTANTIAL CONFORMANCE WITH THE SOILS INVESTIGATION REPORT.
B. VERIFY THAT THE FOOTING EXCAVATIONS EXTEND TO THE PROPER BEARING STRATUM.
C. ALL EXPANSION ANCHOR INSTALLATIONS INCLUDING CLEANOUT AND TORQUE TEST.
D. ALL EPOXY ANCHOR SYSTEMS INCLUDING CLEANOUT AND INSTALLATION.
E. PLACEMENT OF ANCHOR BOLTS FOR COLUMNS PRIOR TO PLACING CONCRETE.
THE PERMIT APPLICATION SHALL RETAIN A RESPONSIBLE ENGINEER APPROVED BY THE BUILDING OFFICIAL TO ENSURE THAT:
A. ALL ELEMENTS OF CONSTRUCTION WHICH REQUIRE SPECIAL INSPECTION ARE INSPECTED BY QUALIFIED DEPUTY INSPECTORS APPROVED BY THE BUILDING OFFICIAL; AND
B. ALL CODE DEFICIENCIES DETECTED AND DEVIATIONS FROM THE APPROVED PLANS ARE BROUGHT TO THE ATTENTION OF THE CONTRACTOR FOR CORRECTION, AND IF NOT CORRECTED, REVISED DESIGNS TO OVERCOME THE DEFICIENCY SHALL BE PREPARED BY THE DESIGN ENGINEER OR ARCHITECT OF RECORD FOR APPROVAL BY THE BUILDING OFFICIAL; AND
C. ALL CORRECTIVE WORK REQUIRED IS COMPLETED IN ACCORDANCE WITH APPROVED PLANS, SPECIFICATIONS, AND CITY ADOPTED CODES.
A FINAL INSPECTION REPORT, SIGNED BY THE SPECIAL INSPECTOR AND THE RESPONSIBLE ENGINEER, IS SUBMITTED TO THE BUILDING OFFICIAL UPON THE COMPLETION OF EACH ELEMENT REQUIRING SPECIAL INSPECTION. THE REPORT MUST CERTIFY THAT THE WORK WAS IN COMPLIANCE WITH APPROVED PLANS, SPECIFICATIONS AND APPLICABLE CITY CODES INCLUDING ANY AUTHORIZED CHANGES TO THE PLANS.

ABBREVIATIONS

Table listing abbreviations and their full names, such as A.B. ANCHOR BOLT, ABV. ABOVE, A/C. AIR CONDITIONING, etc.

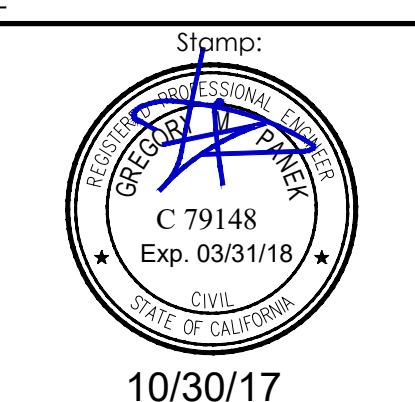


914 E. KATELLA AVENUE
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LATHROP CTP
PH 2 EXPANSION
18800 CHRISTOPHER WAY
LATHROP, CA 95330



10/30/17

REVISIONS

Table with 2 columns: ISSUE DATE and Description. Includes fields for Checked by, Date, Scale, and Project Number.

GENERAL NOTES

SHEET NUMBER

S1







## STRUCTURAL CALCULATIONS



Client: Trademark Hoist & Crane

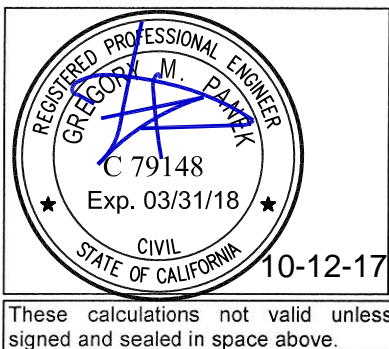
Project: Lathrop CTP Phase 2 Expansion – 5 Ton Crane Bridge Beam

Location: 18800 Christopher Way, Lathrop, CA 95330

Building Code: 2016 CBC

Plump File No: S.1709099 By: B.G.H. Date: October 9, 2017

Revisions:





PLUMP Engineering, Inc.  
 914 E. Katella Ave.  
 Anaheim, California 92805  
 P:714.385.1835 x 113 F:714.385.1834  
[www.peica.com](http://www.peica.com)

**SEISMIC BASE SHEAR CBC 2016**

Seismic Coefficients

$F_a = 1.087$	$S_{MS} =$	$F_a \times S_s = 1.122$	$I_e = 1.00$
$F_v = 1.672$	$S_{M1} =$	$F_v \times S_1 = 0.609$	$R = 1.25$
$S_s = 1.032$	$S_{DS} =$	$0.67 \times S_{MS} = 0.748$	*ASCE Table 12.2-1-G
$S_1 = 0.364$	$S_{D1} =$	$0.67 \times S_{M1} = 0.406$	
$H = 26.00 \text{ ft}$	$C_t = 0.02$	$T = 0.23 \text{ sec}$	$x = 0.75$

Design Base Shear

$C_s = S_{DS} / (R/I_e)$	=	0.598	EQ. 12.8-2 ASCE 7-10
$C_s = S_{D1} / (T(R/I_e))$	=	1.410	EQ. 12.8-3 ASCE 7-10 (NOT GREATER THAN)
$C_s = 0.044 S_{DS} I_e$	=	0.033	EQ. 12.8-5 ASCE 7-10 (NOT LESS THAN)
$C_s = 0.5 S_1 / (R/I_e)$	=	0.146	EQ. 12.8-6 ASCE 7-10 (NOT LESS THAN)
$V = C_s W$	=	0.419 W (ASD)	EQ. 12.8-1 ASCE 7-10 Seismic Base Shear

Bridge Beam Info

Size	=	W21x 57	
Span	=	30.75 ft	
Hoist Weight	=	393 lb	
Trolley Weight	=	606 lb	
Festoons	=	308 lb	→ 10.00 plf
Misc	=	154 lb	→ 5.00 plf
		<u>1491 lb</u>	

Bridge Beam Lateral

Beam	=	734.05 lb	→ 23.87 plf
Hoist Weight	=	164.59 lb	
Trolley Weight	=	253.79 lb	
Festoons	=	129 lb	→ 4.19 plf
Misc	=	64 lb	→ 2.09 plf
		<u>1346 lb</u>	





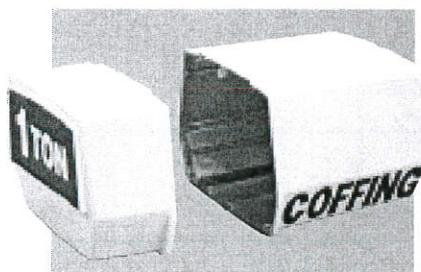
**SPECIFICATIONS**

**EC Hook & Lug Suspension Models**

Capacity		Model Number	Frame* Size	No. of Chains	Motor HP	Lift Speed (FPM)		Headroom (In.)	Housing Dimensions (In.)			Net Wt.** (Lb.)
(Lb.)	(Ton)					Single	Two		H	W	L	
500	1/4	EC-0516	S	1	1/4	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	100
500	1/4	EC-0532	S	1	1/2	32	10.7	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	108
500	1/4	EC-0564	S	1	1	64	21.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
1000	1/2	EC-1009	S	1	1/4	9	3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	104
1000	1/2	EC-1016	S	1	1/2	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	106
1000	1/2	EC-1032	S	1	1	32	10.7	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	118
2000	1	EC-2004	S	2	1/4	4	1.3	18 <sup>1</sup> / <sub>4</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
2000	1	EC-2008	S	2	1/2	8	2.7	18 <sup>1</sup> / <sub>4</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	116
2000	1	EC-2012	S	1	3/4	12	4	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	114
2000	1	EC-2016	S	1	1	16	5.3	16 <sup>7</sup> / <sub>8</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	118
2000	1	EC-2032	L	1	2	32	10.7	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	295
4000	2	EC-4006	S	2	3/4	6	2	18 <sup>15</sup> / <sub>16</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	127
4000	2	EC-4008	S	2	1	8	2.7	18 <sup>15</sup> / <sub>16</sub>	8	11 <sup>5</sup> / <sub>8</sub>	23 <sup>3</sup> / <sub>8</sub>	133
4000	2	EC-4016	L	1	2	16	5.3	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	295
4000	2	EC-4024	L	1	3	24	8	23	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	302
6000	3	EC-6005	S	3	1	5	1.7	23 <sup>1</sup> / <sub>4</sub>	8	12	26 <sup>3</sup> / <sub>8</sub>	200
6000	3	EC-6010	L	2	2	10	3.3	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	340
6000	3	EC-6016	L	2	3	16	5.3	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	347
8000	4	EC-8008	L	2	2	8	2.7	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	345
8000	4	EC-8012	L	2	3	12	4	27 <sup>3</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	352
10000	5	EC-10005	L	3	2	5	1.7	27 <sup>7</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	393
10000	5	EC-10008	L	3	3	8	2.7	27 <sup>7</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	14 <sup>13</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>16</sub>	393

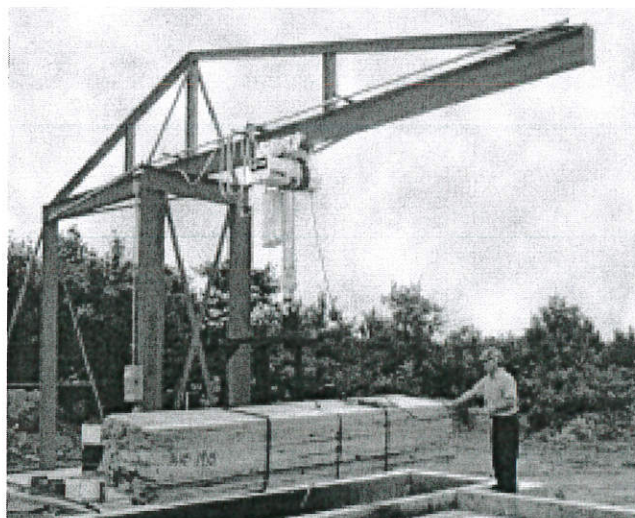
\* S = Small frame hoist, parallel mounted, single or three phase. L = Large frame hoist, cross mounted, three phase only.  
 \*\* For 10 ft. lift, top hook suspension and lug suspension units.

NOTE: For complete dimensional data, refer to Coffing Dimensional Databook.



**Housing Design**

Brake cover (left) and electrical cover (right) easily removed for maintenance or service of unit. (Covers for EC Small Frame Unit Shown)





**SPECIFICATIONS**

**EC Plain, Geared & Motorized Suspensions**

Capacity		Model Number	Frame* Size	Trolley ‡ Mount	ECT & ECGT Hdrm (In.)	ECMT Hdrm (In.)	Flange Width (In.)	Beam Ht. (In.)	Min. Rad. Curve (In.)	Net Wt.** (Lb.)	ECMT Net Wt. (Lb.)
(Lb.)	(Ton)										
500	1/4	EC(†)-0516	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	145	180
500	1/4	EC(†)-0532	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	153	188
500	1/4	EC(†)-0564	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	161	196
1000	1/2	EC(†)-1009	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	151	186
1000	1/2	EC(†)-1016	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	151	186
1000	1/2	EC(†)-1032	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	163	198
2000	1	EC(†)-2004	S	P	18 5/8	18 5/8	3.332 - 6	6 - 18	48	161	196
2000	1	EC(†)-2008	S	P	18 5/8	18 5/8	3.332 - 6	6 - 18	48	161	196
2000	1	EC(†)-2012	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	158	194
2000	1	EC(†)-2016	S	P	17 1/4	17 1/4	3.332 - 6	6 - 18	48	163	198
2000	1	EC(†)-2032	L	C	21 9/16	22 1/4	3.332 - 6	6 - 18	48	347	375
4000	2	EC(†)-4006	S	P	19 5/16	19 5/16	3.332 - 6	6 - 18	48	172	207
4000	2	EC(†)-4008	S	P	19 5/16	19 5/16	3.332 - 6	6 - 18	48	178	213
4000	2	EC(†)-4016	L	C	21 9/16	22 1/4	3.332 - 6	6 - 18	48	347	375
4000	2	EC(†)-4024	L	C	21 9/16	22 1/4	3.332 - 6	6 - 18	48	354	362
6000	3	EC(†)-6005	S	P	23 1/4	24	3.332 - 6	6 - 18	48	260	320
6000	3	EC(†)-6010	L	C	26	26 5/8	3.332 - 6	6 - 18	48	396	424
6000	3	EC(†)-6016	L	C	26	26 5/8	3.332 - 6	6 - 18	48	403	431
8000	4	EC(†)-8008	L	C	25 15/16	26 3/4	4 - 6	8 - 18	***	520	560
8000	4	EC(†)-8012	L	C	25 15/16	26 3/4	4 - 6	8 - 18	***	527	567
10000	5	EC(†)-10005	L	C	29 3/4	30 5/8	4 - 6	8 - 18	***	561	599
10000	5	EC(†)-10008	L	C	29 3/4	30 5/8	4 - 6	8 - 18	***	568	606

† Specify **ECT** for plain trolley, **ECGT** for geared trolley, and **ECMT** for motorized trolley models.

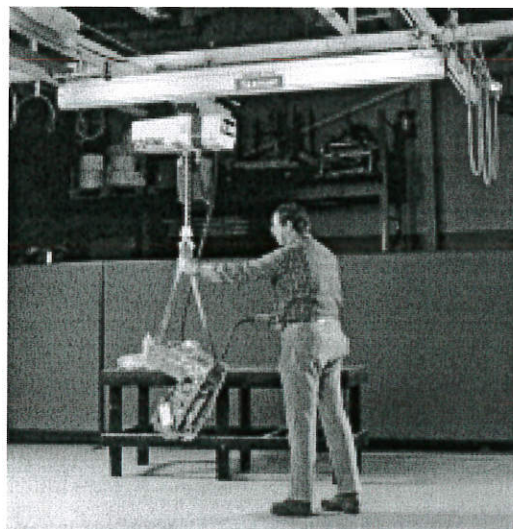
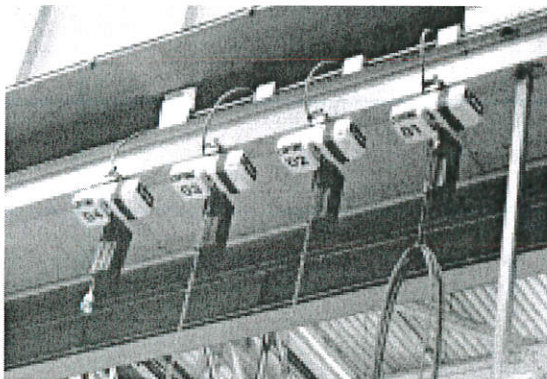
\* **S** = Small frame hoist, single or three phase. **L** = Large frame hoist, three phase only.

‡ **P** = Parallel mount, standard on small frame hoists. **C** = Cross mount, standard on large frame hoists.

\*\* Weight for 10 ft. lift ECT units. Add 10 lb. for ECGT unit weights.

\*\*\* 4 & 5 ton straight track only. Articulated model for 48" min. radius curved track available — consult factory.

**NOTE:** For complete dimensional data, refer to Coffing Dimensional Databook.





# USGS Design Maps Summary Report

## User-Specified Input

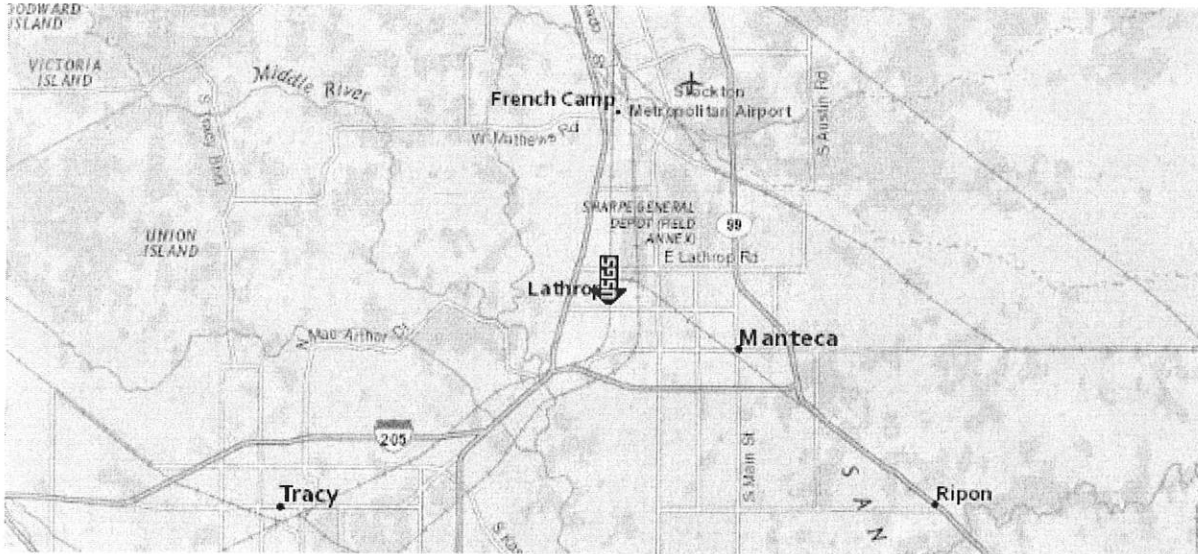
**Report Title** Lathrop, CA  
Wed October 4, 2017 17:34:39 UTC

**Building Code Reference Document** 2012/2015 International Building Code  
(which utilizes USGS hazard data available in 2008)

**Site Coordinates** 37.82271°N, 121.27661°W

**Site Soil Classification** Site Class D - "Stiff Soil"

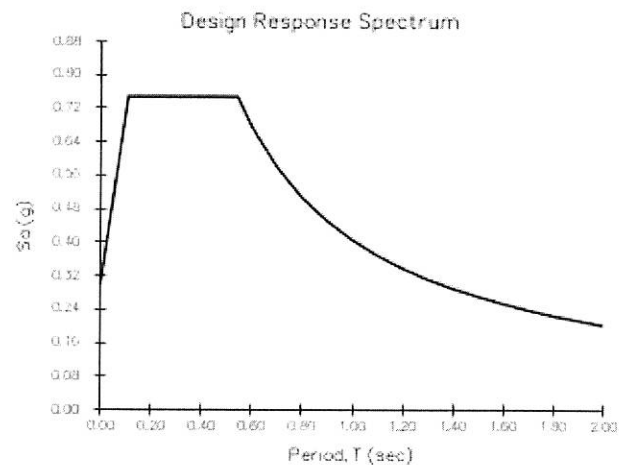
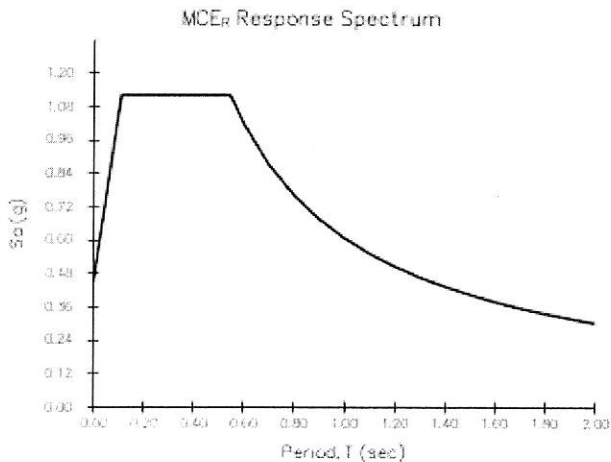
**Risk Category** I/II/III



## USGS-Provided Output

$S_s = 1.032 \text{ g}$	$S_{MS} = 1.122 \text{ g}$	$S_{DS} = 0.748 \text{ g}$
$S_1 = 0.364 \text{ g}$	$S_{M1} = 0.609 \text{ g}$	$S_{D1} = 0.406 \text{ g}$

For information on how the  $S_s$  and  $S_1$  values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.



Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)  
VALUES OF SITE COEFFICIENT  $F_a$

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_s$

**For Site Class = D and  $S_s = 1.032$  g,  $F_a = 1.087$**

TABLE 1613.3.3(2)  
VALUES OF SITE COEFFICIENT  $F_v$

Site Class	Mapped Spectral Response Acceleration at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_1$

**For Site Class = D and  $S_1 = 0.364$  g,  $F_v = 1.672$**

**Steel Beam**

File = P:\ENERCALC\S1ED2A-1.EC6  
 ENERCALC, INC. 1983-2017, Build:10.17.9.25, Ver:10.17.9.25

Lic. #: KW-06001611

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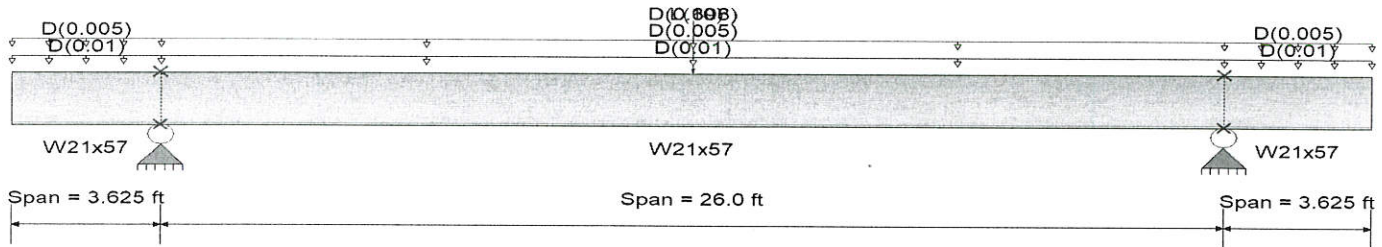
Description: (N) 5 Ton Bridge Beam

**CODE REFERENCES**

Calculations per AISC 360-10, IBC 2012, ASCE 7-10  
 Load Combination Set: ASCE 7-10

**Material Properties**

Analysis Method: Allowable Strength Design  
 Beam Bracing: Completely Unbraced  
 Bending Axis: Major Axis Bending  
 Fy: Steel Yield: 50.0 ksi  
 E: Modulus: 29,000.0 ksi



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading  
 Load for Span Number 1  
 Uniform Load: D = 0.010 k/ft, Tributary Width = 1.0 ft, (Festoon)  
 Uniform Load: D = 0.0050 k/ft, Tributary Width = 1.0 ft, (Misc)  
 Load(s) for Span Number 2  
 Point Load: D = 0.3930 k @ 13.0 ft, (Hoist)  
 Point Load: D = 0.6060 k @ 13.0 ft, (Trolley)  
 Point Load: L = 10.0 k @ 13.0 ft, (Live Load)  
 Uniform Load: D = 0.010 k/ft, Tributary Width = 1.0 ft, (Festoon)  
 Uniform Load: D = 0.0050 k/ft, Tributary Width = 1.0 ft, (Misc)  
 Load for Span Number 3  
 Uniform Load: D = 0.010 k/ft, Tributary Width = 1.0 ft, (Festoon)  
 Uniform Load: D = 0.0050 k/ft, Tributary Width = 1.0 ft, (Misc)

**DESIGN SUMMARY**

**Design OK**

Maximum Bending Stress Ratio =	0.882 : 1	Maximum Shear Stress Ratio =	0.045 : 1
Section used for this span	<b>W21x57</b>	Section used for this span	<b>W21x57</b>
Ma: Applied	93.354 k-ft	Va: Applied	7.686 k
Mn / Omega: Allowable	105.789 k-ft	Vn/Omega: Allowable	170.910 k
Load Combination	+D+1.250L	Load Combination	+D+1.250L
Location of maximum on span	13.000ft	Location of maximum on span	26.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2
Maximum Deflection			
Max Downward Transient Deflection	-0.078 in	Ratio =	1,115 >=600
Max Upward Transient Deflection	-0.078 in	Ratio =	1,115 >=600
Max Downward Total Deflection	0.274 in	Ratio =	1138 >=400
Max Upward Total Deflection	-0.114 in	Ratio =	764 >=400

**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
+D+L															
Dsgn. L =	3.63 ft	1	0.001	0.038		-0.47	0.47	537.50	321.86	1.00	1.00	6.44	256.37	170.91	
Dsgn. L =	26.00 ft	2	0.730	0.038	77.10	-0.47	77.10	176.40	105.63	1.31	1.00	6.44	256.37	170.91	
Dsgn. L =	3.63 ft	3	0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91	
+1.10D+1.150L															
Dsgn. L =	3.63 ft	1	0.002	0.043		-0.52	0.52	537.50	321.86	1.00	1.00	7.33	256.37	170.91	
Dsgn. L =	26.00 ft	2	0.834	0.043	88.06	-0.52	88.06	176.40	105.63	1.31	1.00	7.33	256.37	170.91	
Dsgn. L =	3.63 ft	3	0.002	0.002		-0.52	0.52	537.50	321.86	1.00	1.00	0.29	256.37	170.91	
+D+1.250L															
Dsgn. L =	3.63 ft	1	0.001	0.045		-0.47	0.47	537.50	321.86	1.00	1.00	7.69	256.37	170.91	
Dsgn. L =	26.00 ft	2	0.882	0.045	93.35	-0.47	93.35	176.67	105.79	1.31	1.00	7.69	256.37	170.91	
Dsgn. L =	3.63 ft	3	0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91	
+D+S															
Dsgn. L =	3.63 ft	1	0.001	0.008		-0.47	0.47	537.50	321.86	1.00	1.00	1.44	256.37	170.91	





Plump Engineering, Inc.  
 914 E. Katella Ave.  
 Anaheim, CA 92805  
 Phone: (714) 385-1835  
 Fax: (714) 385-1834

Project Title: CTF Lathrop  
 Engineer: BGH  
 Project Descr: 5 Ton Single Girder Under Running Crane  
 Project ID: S.1709099

Printed: 5 OCT 2017, 12:57PM

**Steel Beam**

File = P:\ENERCALC\S1ED2A-1.EC6  
 ENERCALC, INC. 1983-2017, Build:10.17.9.25, Ver:10.17.9.25

Lic. #: KW-06001611

Licensee: PLUMP ENGINEERING INC.

Description: (N) 5 Ton Bridge Beam

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 26.00 ft	2		0.121	0.008	12.10	-0.47	12.10	166.96	99.97	1.24	1.00	1.44	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.750Lr+0.750L</b>														
Dsgn. L = 3.63 ft	1		0.001	0.030		-0.47	0.47	537.50	321.86	1.00	1.00	5.19	256.37	170.91
Dsgn. L = 26.00 ft	2		0.578	0.030	60.85	-0.47	60.85	175.86	105.30	1.30	1.00	5.19	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.750L+0.750S</b>														
Dsgn. L = 3.63 ft	1		0.001	0.030		-0.47	0.47	537.50	321.86	1.00	1.00	5.19	256.37	170.91
Dsgn. L = 26.00 ft	2		0.578	0.030	60.85	-0.47	60.85	175.86	105.30	1.30	1.00	5.19	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.60W</b>														
Dsgn. L = 3.63 ft	1		0.001	0.008		-0.47	0.47	537.50	321.86	1.00	1.00	1.44	256.37	170.91
Dsgn. L = 26.00 ft	2		0.121	0.008	12.10	-0.47	12.10	166.96	99.97	1.24	1.00	1.44	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.70E</b>														
Dsgn. L = 3.63 ft	1		0.001	0.008		-0.47	0.47	537.50	321.86	1.00	1.00	1.44	256.37	170.91
Dsgn. L = 26.00 ft	2		0.121	0.008	12.10	-0.47	12.10	166.96	99.97	1.24	1.00	1.44	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.750Lr+0.750L+0.450W</b>														
Dsgn. L = 3.63 ft	1		0.001	0.030		-0.47	0.47	537.50	321.86	1.00	1.00	5.19	256.37	170.91
Dsgn. L = 26.00 ft	2		0.578	0.030	60.85	-0.47	60.85	175.86	105.30	1.30	1.00	5.19	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.750L+0.750S+0.450W</b>														
Dsgn. L = 3.63 ft	1		0.001	0.030		-0.47	0.47	537.50	321.86	1.00	1.00	5.19	256.37	170.91
Dsgn. L = 26.00 ft	2		0.578	0.030	60.85	-0.47	60.85	175.86	105.30	1.30	1.00	5.19	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+D+0.750L+0.750S+0.5250E</b>														
Dsgn. L = 3.63 ft	1		0.001	0.030		-0.47	0.47	537.50	321.86	1.00	1.00	5.19	256.37	170.91
Dsgn. L = 26.00 ft	2		0.578	0.030	60.85	-0.47	60.85	175.86	105.30	1.30	1.00	5.19	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.002		-0.47	0.47	537.50	321.86	1.00	1.00	0.26	256.37	170.91
<b>+0.60D+0.60W</b>														
Dsgn. L = 3.63 ft	1		0.001	0.005		-0.28	0.28	537.50	321.86	1.00	1.00	0.86	256.37	170.91
Dsgn. L = 26.00 ft	2		0.073	0.005	7.26	-0.28	7.26	166.96	99.97	1.24	1.00	0.86	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.001		-0.28	0.28	537.50	321.86	1.00	1.00	0.16	256.37	170.91
<b>+0.60D+0.70E</b>														
Dsgn. L = 3.63 ft	1		0.001	0.005		-0.28	0.28	537.50	321.86	1.00	1.00	0.86	256.37	170.91
Dsgn. L = 26.00 ft	2		0.073	0.005	7.26	-0.28	7.26	166.96	99.97	1.24	1.00	0.86	256.37	170.91
Dsgn. L = 3.63 ft	3		0.001	0.001		-0.28	0.28	537.50	321.86	1.00	1.00	0.16	256.37	170.91

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+1.250L	1	0.0000	0.000	+D+1.250L	-0.1138	0.000
	2	0.2742	13.173		0.0000	0.000
	3	0.0000	13.173		-0.1138	3.625

**Vertical Reactions**

Load Combination	Support notation : Far left is #1				Values in KIPS
	Support 1	Support 2	Support 3	Support 4	
Overall MAXimum		7.946	7.946		
Overall MINimum		1.018	1.018		
+D+L		6.696	6.696		
+1.10D+1.150L		7.616	7.616		
+D+1.250L		7.946	7.946		
+D+0.750Lr+0.750L		5.446	5.446		
+D+0.750L+0.750S		5.446	5.446		
+D+0.60W		1.697	1.697		
+D+0.70E		1.697	1.697		
+D+0.750Lr+0.750L+0.450W		5.446	5.446		
+D+0.750L+0.750S+0.450W		5.446	5.446		
+D+0.750L+0.750S+0.5250E		5.446	5.446		
+0.60D+0.60W		1.018	1.018		
+0.60D+0.70E		1.018	1.018		
D Only		1.697	1.697		
Lr Only					
L Only		5.000	5.000		
S Only					
W Only					
E Only					



Plump Engineering, Inc.  
 914 E. Katella Ave.  
 Anaheim, CA 92805  
 Phone: (714) 385-1835  
 Fax: (714) 385-1834

Project Title: CTF Lathrop  
 Engineer: BGH  
 Project Descr: 5 Ton Single Girder Under Running Crane

Project ID: S.1709099

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### Steel Beam

Lic. #: KW-06001611

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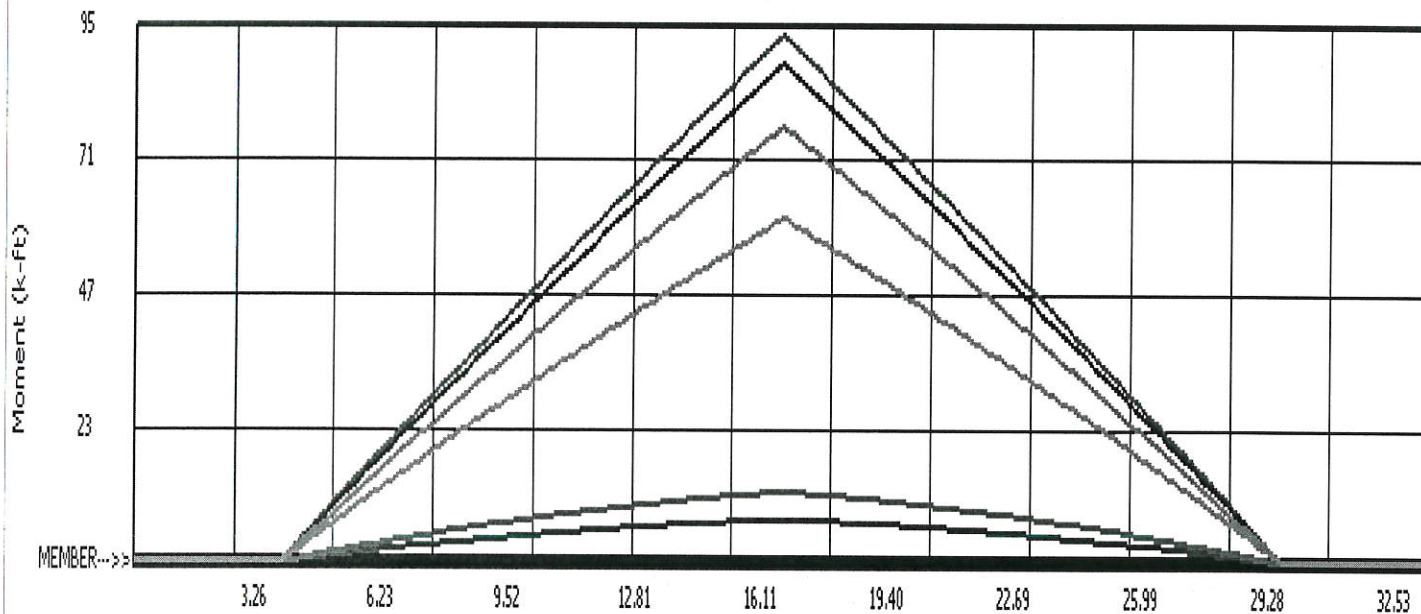
Description: (N) 5 Ton Bridge Beam

### Vertical Reactions

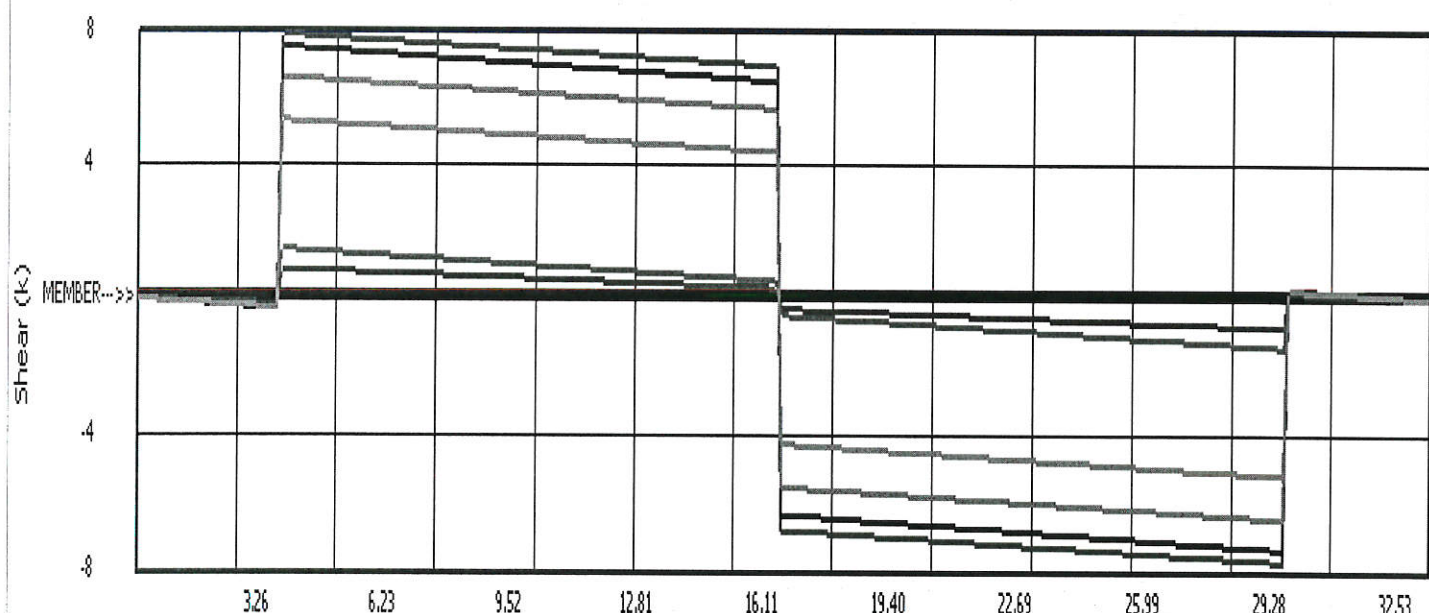
Support notation: Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
H Only				



- +D+L
- +D+D.60W
- +D+D.60D+0.70E
- +1.10D+1.15DL
- +D+0.70E
- +D+1.25DL
- +D+0.75DL+0.75DL+0.45DW
- +D+5
- +D+0.75DL+0.75DL+0.45DW
- +D+0.75DL+0.75DL+0.525DE
- +D+0.75DL+0.75DL
- +D+0.75DL+0.75DL+0.45DW
- +D+0.75DL+0.75DL+0.525DE
- +D+0.75DL+0.75DL
- +D+0.60D+0.60W



- +D+L
- +D+D.60W
- +D+D.60D+0.70E
- +1.10D+1.15DL
- +D+0.70E
- +D+1.25DL
- +D+0.75DL+0.75DL+0.45DW
- +D+5
- +D+0.75DL+0.75DL+0.45DW
- +D+0.75DL+0.75DL+0.525DE
- +D+0.75DL+0.75DL
- +D+0.75DL+0.75DL+0.45DW
- +D+0.75DL+0.75DL+0.525DE
- +D+0.75DL+0.75DL
- +D+0.60D+0.60W





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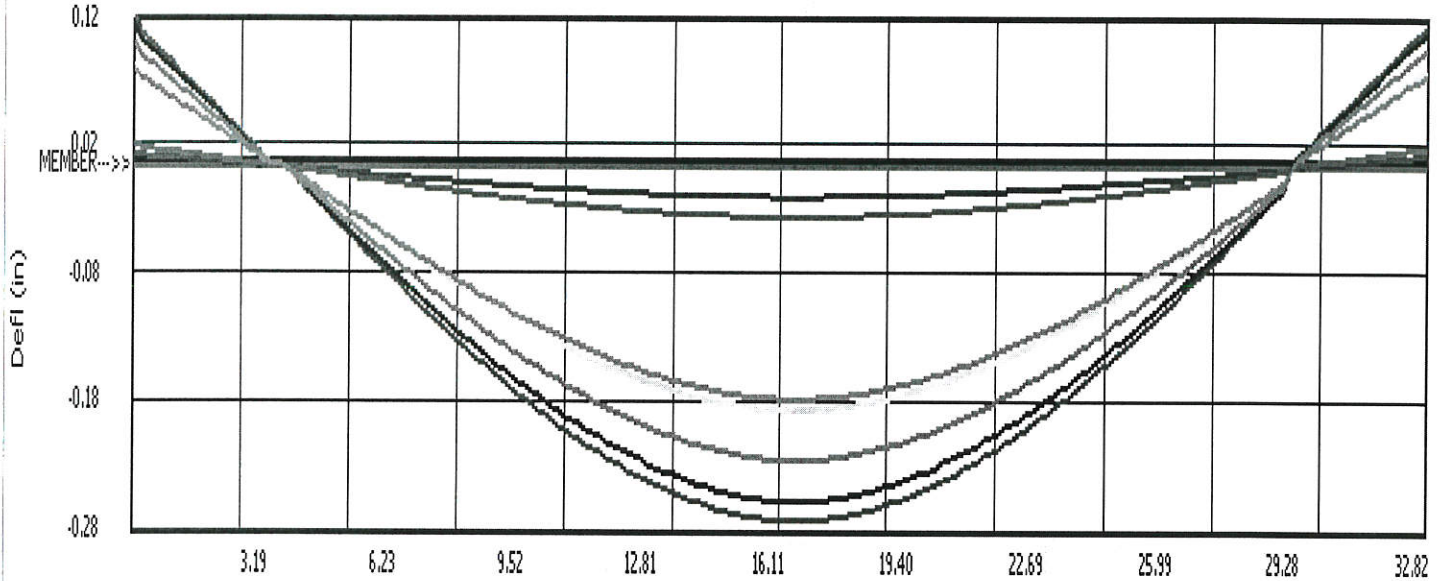
**Steel Beam**

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Licensee : PLUMP ENGINEERING INC.

Description : (N) 5 Ton Bridge Beam



- |                |                 |                           |                           |                            |                    |
|----------------|-----------------|---------------------------|---------------------------|----------------------------|--------------------|
| ■ +D+L         | ■ +1.10D+1.150L | ■ +D+1.25DL               | ■ +D+S                    | ■ +D+0.750L+0.750L         | ■ +D+0.750L+0.750S |
| ■ +D+0.60W     | ■ +D+0.70E      | ■ +D+0.750L+0.750L+0.45DW | ■ +D+0.750L+0.750S+0.450W | ■ +D+0.750L+0.750S+0.5250E | ■ +D+0.60D+0.60W   |
| ■ +D.60D+0.70E | ■ D Only        | ■ L Only                  | ■ L Only                  | ■ S Only                   | ■ W Only           |
| ■ E Only       | ■ H Only        |                           |                           |                            |                    |



**Steel Beam**

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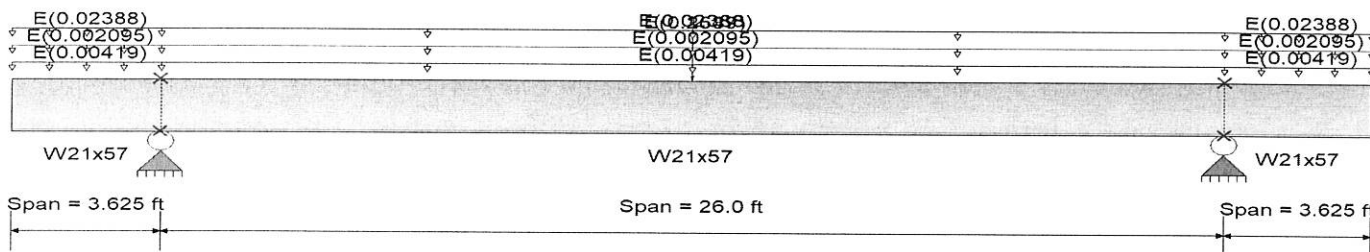
Description: (N) 5 Ton Bridge Beam (Lateral)

**CODE REFERENCES**

Calculations per AISC 360-10, IBC 2012, ASCE 7-10  
 Load Combination Set : ASCE 7-10

**Material Properties**

Analysis Method : Allowable Strength Design  
 Beam Bracing : Completely Unbraced  
 Bending Axis : Minor Axis Bending  
 Fy : Steel Yield : 50.0 ksi  
 E : Modulus : 29,000.0 ksi



**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
 Load for Span Number 1  
 Uniform Load : E = 0.004190 k/ft, Tributary Width = 1.0 ft, (Festoons)  
 Uniform Load : E = 0.002095 k/ft, Tributary Width = 1.0 ft, (Misc)  
 Uniform Load : E = 0.02388 k/ft, Tributary Width = 1.0 ft, (Beam)  
 Load(s) for Span Number 2  
 Point Load : E = 0.1647 k @ 13.0 ft, (Hoist)  
 Point Load : E = 0.2539 k @ 13.0 ft, (Trolley)  
 Uniform Load : E = 0.004190 k/ft, Tributary Width = 1.0 ft, (Festoons)  
 Uniform Load : E = 0.002095 k/ft, Tributary Width = 1.0 ft, (Misc)  
 Uniform Load : E = 0.02388 k/ft, Tributary Width = 1.0 ft, (Beam)  
 Load for Span Number 3  
 Uniform Load : E = 0.004190 k/ft, Tributary Width = 1.0 ft, (Festoons)  
 Uniform Load : E = 0.002095 k/ft, Tributary Width = 1.0 ft, (Misc)  
 Uniform Load : E = 0.02388 k/ft, Tributary Width = 1.0 ft, (Beam)

**DESIGN SUMMARY**

**Design N.G.**

Maximum Bending Stress Ratio =	0.137 : 1	Maximum Shear Stress Ratio =	0.004 : 1
Section used for this span	<b>W21x57</b>	Section used for this span	<b>W21x57</b>
Ma : Applied	5.072 k-ft	Va : Applied	0.6014 k
Mn / Omega : Allowable	36.926 k-ft	Vn/Omega : Allowable	170.560 k
Load Combination	+D+E	Load Combination	+D+E
Location of maximum on span	13.000ft	Location of maximum on span	26.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2
Maximum Deflection			
Max Downward Transient Deflection	-0.261 in Ratio =	332 <400.0	
Max Upward Transient Deflection	-0.261 in Ratio =	332 <400.0	
Max Downward Total Deflection	0.622 in Ratio =	502 >=400.	
Max Upward Total Deflection	-0.261 in Ratio =	333 <400.0	

**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mny	Mny/Omega	Cb	Rm	Va Max	Vny	Vny/Omega
+D+E														
Dsgn. L =	3.63 ft	1	0.005	0.004		-0.20	0.20	61.67	36.93	1.00	1.00	0.60	255.84	170.56
Dsgn. L =	26.00 ft	2	0.137	0.004	5.07	-0.20	5.07	61.67	36.93	1.24	1.00	0.60	255.84	170.56
Dsgn. L =	3.63 ft	3	0.005	0.001		-0.20	0.20	61.67	36.93	1.00	1.00	0.11	255.84	170.56

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000			
E Only	2	0.6216	13.173	E Only	-0.2613	0.000
	3	0.0000	13.173	E Only	-0.2613	3.625



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 Engineer: BGH  
 Project Descr: 5 Ton Single Girder Under Running Crane

Project ID: S.1709099

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### Steel Beam

Lic. #: KW-06001611

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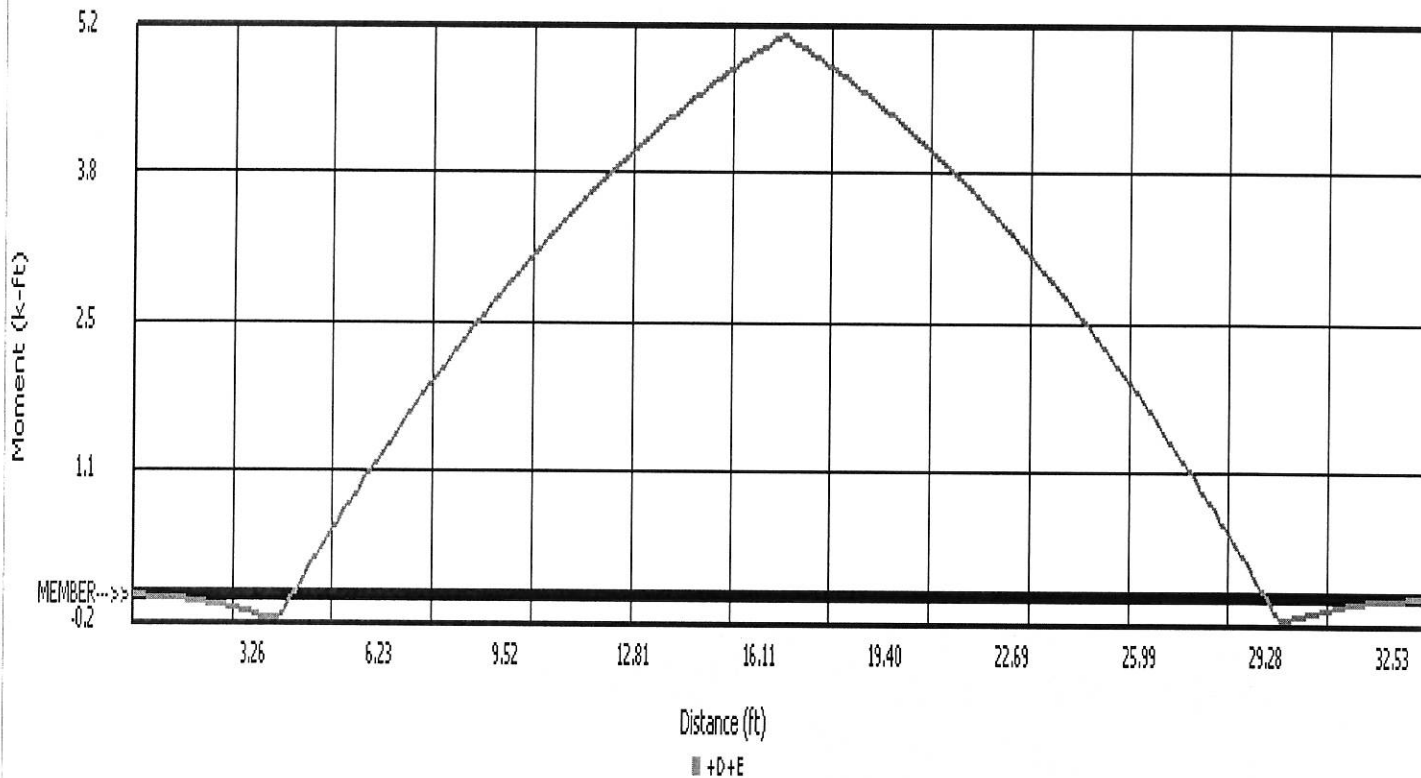
Description: (N) 5 Ton Bridge Beam (Lateral)

### Vertical Reactions

Support notation: Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		0.711	0.711	
Overall MINimum		0.711	0.711	
+D+E		0.711	0.711	
E Only		0.711	0.711	





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**Steel Beam**

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 Licensee : PLUMP ENGINEERING INC.

Lic. #: KW-06001611

Description: (N) 5 Ton Bridge Beam (Lateral)

