We Rig It Right!

THE PROFESSIONAL RIGGER

Volume 24 Number 3 September 2009

TECHNICAL WORKSHOP

Rigging Selection

Circle the best answer for each system which matches the illustrations at the right.

Information: All winches have a maximum capacity of 2 tons. All single sheave rigging blocks are rated at 3 ton WLL, and triple sheave rigging blocks are rated at 10 ton WLL. All load and wall anchor pulling lugs are rated at 8 ton WLL each. All shackles are rated at 12 tons each.

System 1, no blocks

A) OK

B) No, high potential for overload if the winches are not synchronized

System 2, single sheave blocks

A) OK

B) No, it would not tend to pull square and would require constant attention to rollers

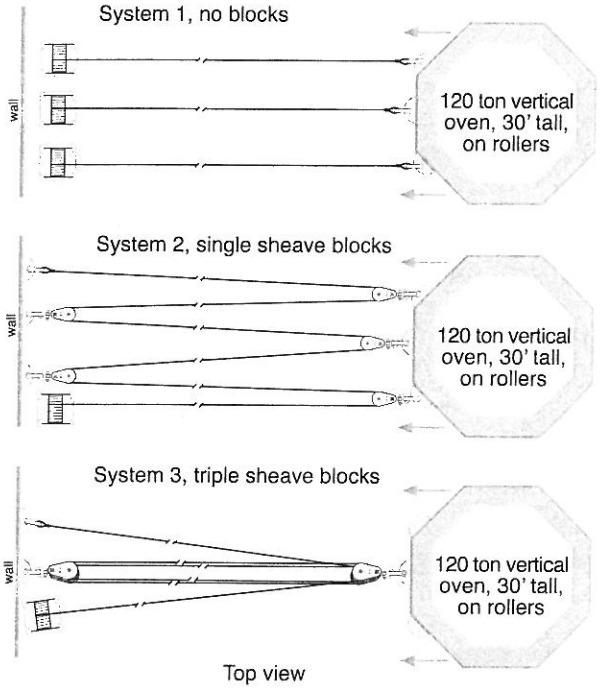
System 3, triple sheave blocks

A) OK

B) No, it would overload the load's pulling lug

Caution: Don't stand in the bight.

Winch & Block Systems



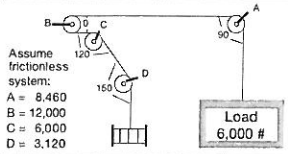
Hint: Assume frictionless system. Review JRRC-P4, MRRC-P1, 2 for methods to estimate tensions.

JRRC - Panels 4 & 5

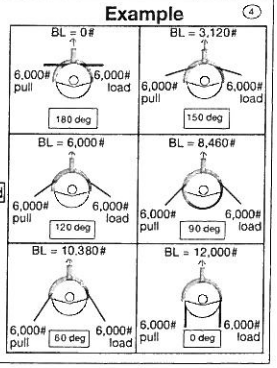
Block & Fairlead Loading

Angle full included	Block Factor	Line Pull in lbs.	Block Load in lbs.
180	0.00	6,000	0
150	0.52	6,000	3,120
120	1.00	6,000	6,000
90	1.41	6,000	8,460
60	1.73	6,000	10,380
0	2.00	6,000	12,000

Formula: Block Factor x Line Pull = Block Load



Example ④



Rigging Hardware Capacities ⑤

FORGED STEEL

Size in inches	Shldr Eye Bolt 5:1 Vertical	Shldr Eye Bolt 5:1 45 deg	Turnbuckle 5:1 Eye or Jaw	Master Link 5:1	Shackle 6:1 SPAnchor	Wire Rope Clip Min # clips	Wire Rope Clip Turnback in inches	Wire Rope Clip Torque in ft. lbs.
1/4	500	125	500	------	1,000	2	4.75	15
5/16	800	200	800	------	1,500	2	5.25	30
3/8	1,200	300	1,200	------	2,000	2	6.50	45
7/16	------	------	------	------	3,000	2	7.00	65
1/2	2,200	550	2,200	4,920	4,000	3	11.50	65
9/16	------	------	------	------	------	3	12.00	95
5/8	3,500	875	3,500	6,600	6,500	3	12.00	95
3/4	5,200	1,300	5,200	10,320	9,500	4	18.00	130
7/8	7,200	1,800	7,200	------	13,000	4	19.00	225
1	10,000	2,500	10,000	24,360	17,000	5	26.00	225
1-1/8	------	------	------	------	19,000	6	34.00	225
1-1/4	15,200	3,800	15,200	35,160	24,000	7	44.00	360

Flat Shackle 5:1	Web Eye Width inches
6,500	1-2
9,000	3
12,500	4
17,000	5

Swivel Hoist Rings 5:1

Size	WLL
3/8	1,000
1/2	2,500
5/8	4,000
3/4	5,000
7/8	8,000
1	10,000

Coefficients of Friction

Concrete on concrete	.65	Continuous lubricated surface	.15
Metal on concrete	.60	Steel on steel	.10
Wood on concrete	.45	Load on wheels	.05
Wood on metal	.30		

D/d Ratios

30:1 = .94	8:1 = .83
20:1 = .92	5:1 = .77
15:1 = .89	2:1 = .65
10:1 = .86	1:1 = .50

MRRC Panels 1 & 2

Master Rigger's Reference Card

Angles / Ratios / Factors / Formulas / Data (1 & 2)

Angle from horizontal	Sling length to height ratio Length : Height : Run	*, % of grade (H/R x 100)	Sling Load Factor [r*]	Full Included Angle**	Block Load Factor [FIA**]	Angle from Ceiling
90	1.000 : 1 : 0.000	○○	1.00	0	2.00	90
85	1.004 : 1 : 0.090	1111.1	1.10	10	1.99	85
80	1.015 : 1 : 0.174	574.7	1.10	20	1.97	80
75	1.035 : 1 : 0.269	371.7	1.10	30	1.93	75
70	1.064 : 1 : 0.363	275.5	1.10	40	1.87	70
65	1.104 : 1 : 0.467	214.1	1.20	50	1.81	65
60	1.155 : 1 : 0.578	173.0	1.20	60	1.73	60
55	1.221 : 1 : 0.701	142.7	1.30	70	1.64	55
50	1.305 : 1 : 0.838	119.1	1.40	80	1.53	50
45	1.414 : 1 : 1.000	100.0	1.50	90	1.41	45
40	1.555 : 1 : 1.191	83.9	1.60	100	1.29	40
35	1.742 : 1 : 1.426	70.1	1.80	110	1.15	35
30	2.000 : 1 : 1.732	57.7	2.00	120	1.00	30
25	2.364 : 1 : 2.142	46.7	3.00	130	.84	25
20	2.924 : 1 : 2.748	36.4	3.00	140	.68	20
15	3.861 : 1 : 3.729	26.8	4.00	150	.52	15
10	5.747 : 1 : 5.659	17.1	6.00	160	.35	10
5	11.490 : 1 : 11.446	8.7	12.00	170	.17	5
0	○○ : 0 : ○○	0.0	○○	180	0	0

A

$A^2 + B^2 = C^2$

$C^2 - A^2 = B^2$

$C^2 - B^2 = A^2$

D/d Ratio Strength Efficiencies

30:1 = .94
20:1 = .92
10:1 = .86
5:1 = .77
2:1 = .65
1:1 = .50

B

d = diameter • r = radius • L = length • H = height • W = width ○○ = infinity • π or Pi = 3.1416 (3.2r*) • Circumference = πd r* = rounded • Area of a circle = πr^2 or $(d^2 \times .8)$ • Volume = LWH Area of a square = LW • Area of triangle = LW/2 • Area of circle, when diameter is doubled it will quadruple the area • Farhenheit to Centigrade °C = 5/9(°F-32), Centigrade to Farhenheit °F = 9/5(°C+32) • Wt. est. = Vol. in cu.ft. x 500 x density factor .02, .05, .10, .20, .30, etc.

C

1 mile = 5,280 ft.,1,760 yds. 1.61 km / 1 kilometer = .62 mile, 3,281 ft
1 yard = 3 ft. 36 inches, .91 meter / 1 meter = 1.09 yds, 3.28 ft, 39.37 in.
1 ton (short) = .891 long ton. .91 metric ton, 2,000 pounds, 907 kgs
1 ton (metric) = 1.1 short ton, .98 long ton, 2204 lbs, 1000 kgs
1 pound = 16 ounces. .45 kg. / 1 kg = 1000 grams. 35 ozs. 2.2 lbs
1 gallon(US liq) = 4 qts. 3.8 liters / 1 liter = .264 gallon (US), 1.06 qts

The workshop above was taken from Mike's Rigging Mysteries, Gray Book. All 110 workshops are available at www.mikesriggingmysteries.com.

Answers on Page 3

ACRP
Association of Crane & Rigging Professionals

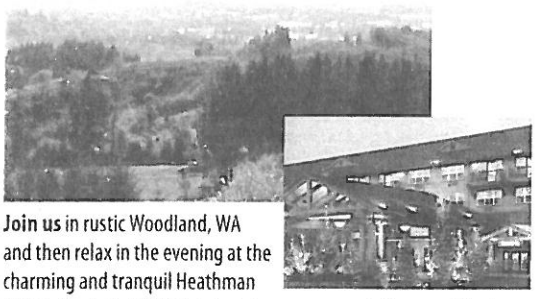
2009 Workshop & General Assembly

October 12-14 in Woodland, WA

Training Strategies ■ Educational Workshops ■ Enlightening Technical Presentations

Tentative Schedule & Topics:

Mon. Oct. 12	• Board Meeting • Welcome Reception
Tues. Oct. 13	• Big Rigging Hardware • Big Rigging Slings • Introduction to National Crane & Rigging Testing Programs
Wed. Oct. 14	• Rigging Engineering for Thames River Bridge Replacement Project • Lift Planning: Normal / Critical • Lift Director / Site Supervisor • Adult Learning Styles & Training Strategies



Join us in rustic Woodland, WA and then relax in the evening at the charming and tranquil Heathman Lodge. There, in addition to luxurious accommodations, you'll enjoy discounted rates as well as free transportation to and from Woodland and between the airport and the Heathman Lodge. Excellent shopping and restaurants are within walking distance.

Registration Information: 800.690.3921
www.acrp.net

Participants may be eligible to earn IACET approved CEUs for applicable classes.

AUTHORIZED IACET PROVIDER

Dedicated to Improving Crane and Rigging Activities

As we once again follow the travelings of "Frequent Flyer Bob", we wonder where in the World is he now? Bob has traveled many miles abroad (he actually had to add pages to his passport) enjoying the experiences that travel and training have to offer. As Bob prepares for his next adventure, we again ask you, where will he go?

- Singapore
- Jakarta
- Dubai, United Arab Emirates
- Batam, Indonesia
- Baku, Azerbaijan
- Veracruz, Mexico

For those that respond, we will be giving out our new Lift Director Field Reference Card. The card is a laminated field reference card which identifies the responsibilities of the Lift Director, Site Supervisor, Crane Owner, Crane User and Crane Operator as described in ASME B30.5 Mobile Cranes.

You can email your answer to whereisbob@wrrc.com.

Hint: In this country, 170,000 square kilometers are considered "Protected Natural Areas." These include 34 reserve biospheres, 64 national parks, 4 natural monuments, 26 areas of protected flora (trees) and fauna (mammals), 4 areas of protected natural resources and 17 sanctuaries.

Cranes Rigging TIRC Heavy Eqpt

Training & Inspection Resource Center

Reference materials for the crane, rigging and heavy equipment industry

- Reference Cards
- Handbooks & Manuals
- CD's & Videotapes
- Inspection Forms & Checklists
- Lift/Load Plans
- ASME Standards
- Posters & Decals
- Pocket Guides
- Tools & Field Equipment

...and much more

Mike's Rigging Mysteries
By TIRC
11 booklets, 24 pages each , 4.25" x 5.5" softbound. This series of books contains over 100 informative and educational rigging workshops which will challenge basic, intermediate and advanced riggers. Included are three field reference cards to use for solving the workshops.
Item # 7000 - $49.95 Complete Set
Item # 7010 - $19.95 Starter Set
(two booklets plus triple reference card pack)

Your one-stop supply source for educational, technical and inspection materials. Order Today.

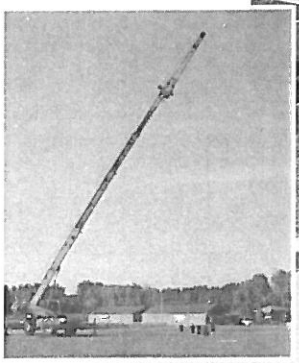
Call Toll Free 888.567.8472
Fax **360.225.5666** or visit us online at **www.tirc.net.**

CIC Mobile Crane Operator Certification

Industrial Training International Inc. is an approved Crane Institute Certification (CIC) test site that offers nationally accredited CIC crane operator certification and recertification (written and practical exams) for mobile cranes.

CIC uses a streamlined process with valuable advantages:

- Convenient scheduling
- Both paper and online written exams
- Calculators provided during exams
- Multi-category written exam
- Ease of set up at your site on your cranes



NCCA-accredited certifications are offered for the following crane types:

- Lattice Boom Crawler
- Lattice Boom Carrier
- Large Telescoping Boom, over 75 tons
- Medium Telescoping Boom, 21-75 tons
- Small Telescoping Boom, under 21 tons

✓ **ONE practical exam will qualify the operator in that category and all lesser categories.**

Certification in one of the categories below automatically qualifies you in the additional indicated categories.

	Lattice Boom Crawler	Lattice Boom Carrier	Lrg. Telescoping Boom	Med. Telescoping Boom	Sm. Telescoping Boom
Lattice Boom Crawler	•	•	•	•	•
Lattice Boom Carrier	•	•	•	•	•
Large Telescoping Boom	•	•	•	•	•
Medium Telescoping Boom				•	•
Small Telescoping Boom					•

Course Fees

3-Day Test Preparation (Classroom Only)	$1,195
Crane Practice Time	$125 per 1/2 hr
CIC Written Exam	$360
CIC Practical Exam	$440

Dates Offered	Location	Course Number
November 2-6, 2009	Woodland WA	CICMCOWA0901
December 7-11, 2009	Woodland WA	CICMCOWA0902
March 29-April 2, 2010	Woodland, WA	CICMCOWA1013
June 14-18, 2010	Woodland, WA	CICMCOWA1022
September 27-October 1, 2010	Woodland, WA	CICMCOWA1034

Program Sessions

The CIC preparatory and certification sponsored by Industrial Training International is formatted into three parts over a five day period, for qualified candidates.

Test Preparation Training (Monday-Wednesday)
Classroom Only
Instructional preparation program, complete with training sessions, sample exams and load chart exercises.

Written Exams** (Thursday)
The Mobile Crane Operator General Knowledge Exam is administered. Additionally, candidates may choose any of the supplemental exams listed below.

Practical Exams** (Friday)
Candidates perform the hands-on practical portion of the Mobile Crane Operator certification process. Practical exams are provided based on the candidate's category selection.

Certification Category	Crane Tonnage
Lattice Boom Crawler	all models
Lattice Boom Carrier	all models
Large Telescoping Boom	over 75 tons
Medium Telescoping Boom	21-75 tons
Small Telescoping Boom	under 21 tons

**Must be registered five weeks prior to the program date.

Industrial Training International, Inc.
9428 Old Pacific Highway • Woodland, WA 98674
800.727.6355 • www.wrrc.com
for more information email rigitright@wrrc.com

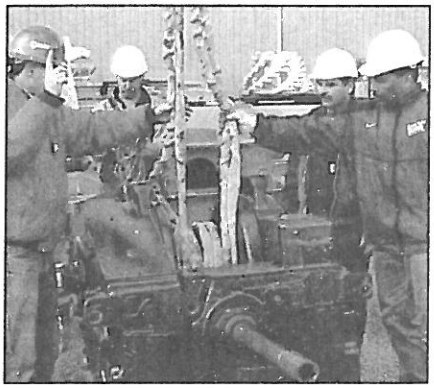
Crane Institute of America Certification — The Standard in Certification

NCCA

Answers to Page 1 Technical Workshop: JRRC Panels 4 & 5 and the MRRC Panels 1 & 2: System 1 = B, System 2 = B, System 3 = A

CLIENT SITE TRAINING PROGRAMS

Course length varies based on the number of participants and course subjects selected.



Journeyman Rigger

- Terms & Definitions
- Load Weight Estimation
- Center of Gravity
- Rigging Removal Criteria
- Load Control
- Rigging Capacities
- Sling Angles & Tensions
- Horizontal Rigging
- Sling & Rigging Selection
- Rigging Procedures
- Accident Case Studies
- OSHA / ASME Standards
- Hands-On Activities

Course Length: 2-3 Days

Master Rigger

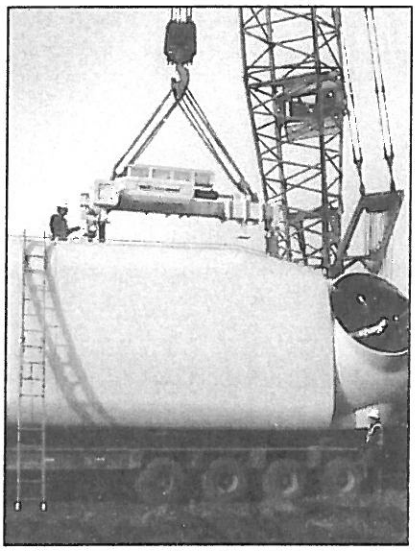
- Journeyman Rigging Review
- Load Weight Estimation
- Discover the CG
- Off-Level Pick Points
- Jacking & Rolling
- Incline Plane
- Chain Fall Load Drifting
- Spreader Bar Lifts
- Rigging Blocks & Winching
- Communications
- Hands-On Activities

Course Length: 3-5 Days

Lift Director & Site Supervisor

- ASME B30.5 Responsibilities
- Lift Site Preparation
- Traffic Control
- Load Chart Confirmation
- Responsibilities of Operator, Rigger, Signaler
- Hazard Recognition
- Multiple Crane Lifts
- Lifting Personnel
- Pick & Carry Operations

Course Length: 1-2 Days



Critical Lift Planning

- Load Affirmation
- Crane Verification
- Rigging Confirmation
- Work Site Approval
- Pre-lift Checklist
- Load Schematic / Rigging Method
- Load Travel Path / Personnel Placement
- Load Handling Sequence and Procedures

Course Length: 1-2 Days

Aerial Work Platform Operator

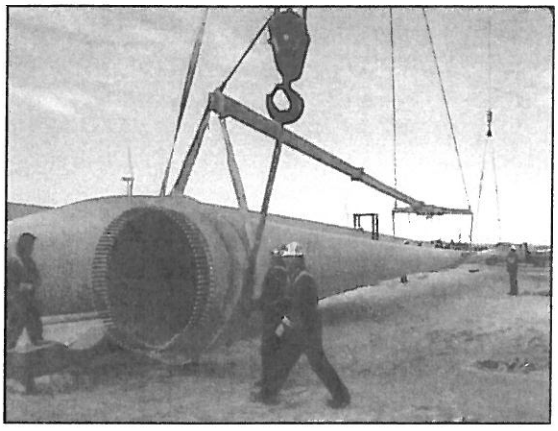
- Introduction to Work Platforms
- Pre-Operational Inspection
- Control Functions
- Operating Practices
- ASME Standards
- Hands-On Operating

Course Length: 1 Day

Forklift & Telehandler Operator

- Introduction to Forklifts
- Operator Qualifications
- Components
- Daily Inspections
- Operating Practices
- Stability
- Safety
- Maintenance
- OSHA / ASME Standards
- Hands-On Operating

Course Length: 1-2 Days



CLIENT SITE TRAINING PROGRAMS

Course length varies based on the number of participants and course subjects selected.

Rigging Gear Inspector Basics

- Wire Rope Slings
- Synthetic Web Slings & Roundslings
- Alloy Chain Slings
- Rigging Hardware
- Below-the-Hook Lifting Devices
- OSHA / ASME Standards
- Hands-on Inspections

Course Length: 1 Day

Rigging Gear Inspector Level I & II

- Wire Rope
- Wire Rope Slings
- Synthetic Web Slings & Roundslings
- Alloy Chain Slings
- Rigging Hardware
- Below-the-Hook Lifting Devices
- OSHA / ASME Standards
- Written Exams
- Students' Hands-On Inspection Evaluations

Course Length: 3-4 Days

Overhead Crane Operator

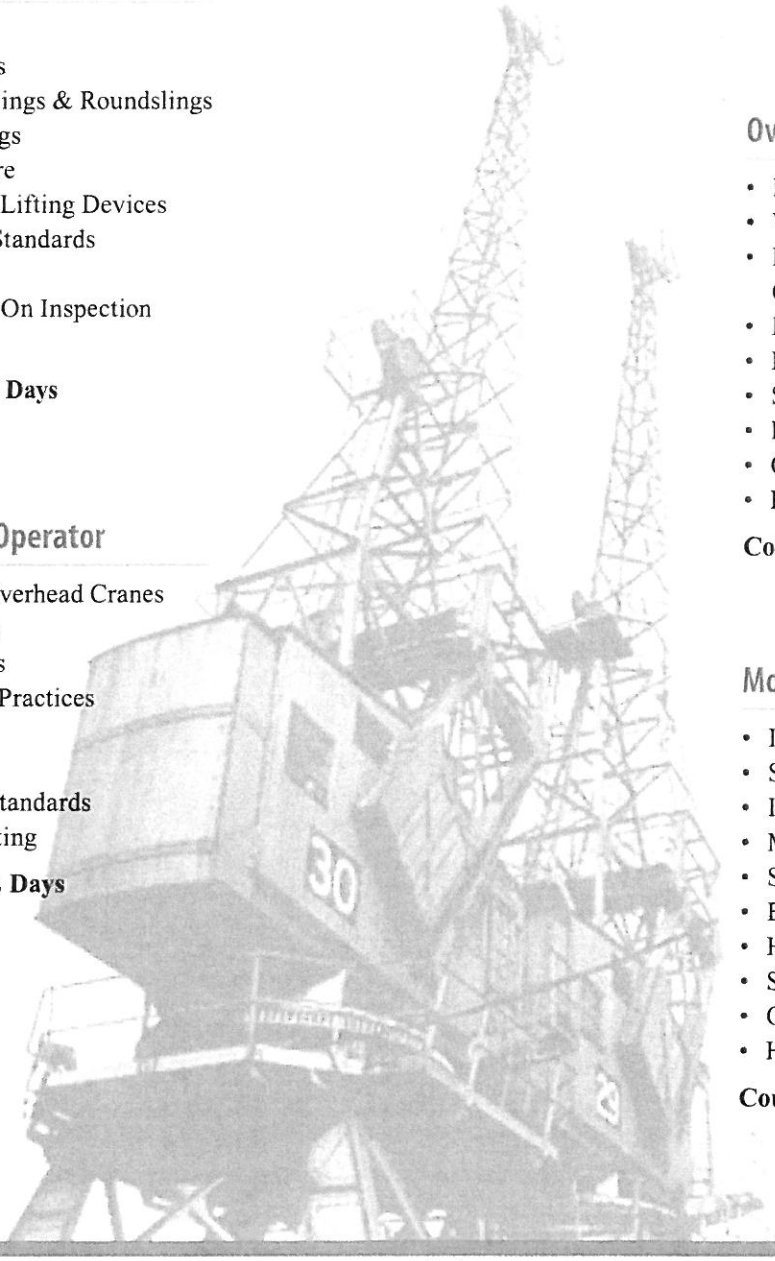
- Introduction to Overhead Cranes
- Daily Inspections
- Control Functions
- Crane Operating Practices
- Hand Signals
- Rigging
- OSHA / ASME Standards
- Hands-On Operating

Course Length: 1-2 Days

Boom Truck Operator

- Daily Inspections
- Boom Truck Set-up
- Load Chart Interpretation
- Operator Responsibilities
- Rigging Practices
- Operating Practices
- Communications
- Operating Near Power Lines
- OSHA / ASME Standards
- Hands-On Operating

Course Length: 3-4 Days



Mobile Crane Operator

- Introduction to Mobile Cranes
- Technical Information
- Operating Practices
- Leverage
- Lift Considerations
- Communications
- Daily Inspection
- Rigging Practices
- Load Charts
- OSHA / ASME Standards
- Hands-On Operating

Course Length: 4-5 Days

Overhead Crane Inspector

- Hoist Chain Inspection
- Wire Rope Inspection
- Daily, Monthly & Annual Checklists
- Limit Switches
- Brakes
- Structural
- Drive Trains
- OSHA / ASME Standards
- Hands-On Inspections

Course Length: 2-4 Days

Mobile Crane Inspector

- Inspection Requirements
- Safety Procedures
- Inspection Components
- Mechanical Systems
- Structural Components
- Electrical, Hydraulic & Air Systems
- Hoist Systems
- Safety Items
- OSHA / ASME Standards
- Hands-On Inspections

Course Length: 2-5 Days

Industrial Training International, Inc. offers two new open enrollment programs

Lift Director & Site Supervisor – 1 Day
With the responsibilities of the Lift Director and Site Supervisor being clearly defined in the American Society of Mechanical Engineers (ASME) B30.5, Industrial Training International has developed a one day program to ensure that crane owner, crane user, crane operator, site supervisor and lift director at a site fully understand their responsibilities and how best to interact during daily and special load handling projects.

Critical Lift Planning – 2 Days
A Critical Lift Plan consists of drawings, specifications, and procedures to accurately assess load details and site details relating to a Critical Lift. Participants work in teams with model cranes and model cities to develop and execute plans according to the procedures they have outlined. The assignments are solved using a paper planning process or specialized software (www.3dliftplan.com).

Lift Director & Critical Lift Planning Attendees
In a day where risk to employees and damage to equipment and property are in the headlines, we would like to acknowledge the companies that have invested in upgrading their operations as a result of attending our Lift Director & Site Supervisor and Critical Lift Planning programs.

Congratulations to the following:

AeroJet
BP Cherry Point Refinery
JF White Contracting Company
LPR Construction Company
Seattle Area Pipe Trades Education Center
SEW Construction
Siemens Power Generation
US Army Corp of Engineers
US Naval Ship Repair Japan
US Naval Undersea Warfare Center
Valley Electric Association, Inc.
Walsh Construction

UPCOMING EVENTS

October 2009

5-6	Journeyman Rigger	Woodland, WA
7	Lift Director & Site Supervisor	Woodland, WA
8-9	Critical Lift Planning	Woodland, WA
13-14	ACRP General Meeting, Technical Workshops	Woodland WA
19-20	Journeyman Rigger	Birmingham, AL
19-22	WSTDA	Seattle, WA
21-23	Rigging Gear Inspector Level I & II	Birmingham, AL
25-28	AWRF	Orlando, FL
27-29	Rigging Gear Inspector Level III	Woodland, WA

November 2009

2-4	CIC Mobile Crane Test Prep	Woodland, WA
5	CIC Mobile Crane Written Exam	Woodland, WA
6	CIC Mobile Crane Practical Exam	Woodland, WA
3-6	Master Rigger	Woodland, WA
17-20	Master Rigger	Birmingham, AL

December 2009

1-4	Rigging Gear Inspector Level I & II	Woodland, WA
7-9	CIC Mobile Crane Test Prep	Woodland, WA
10	CIC Mobile Crane Written Exam	Woodland, WA
11	CIC Mobile Crane Practical Exam	Woodland, WA
15-18	Master Rigger	Woodland, WA

The Professional Rigger is a publication of
Industrial Training International, Inc.
It is distributed to those whose occupations require the safe and proper use of lifting and rigging equipment.

For more information contact
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or visit our website: www.wrrc.com