

NOTES ON LIFTING COURSE

AREA'S TO BE COVERED

1. Health and safety under English Law
2. Weight & centre of gravity
3. Correct equipment for the job
4. Inspection
5. Fitting the equipment
6. The lift
7. Setting the load down safety
8. Tidy up

Course by:

P. Morrall

1. Health and safety under English Law

1.1 The employers responsibilities

1.2 The employees responsibilities

1.3 Inspection of lifting tackle & cranes

1.1 The employers responsibilities

In Section 2 of the health and safety at work act 1974 it says:

Duties of Employers to Employees

(1) It is the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees. An employer must do this by providing:

- (2) (a) A safe plant and systems of work;
(b) The safe use, handling, storage and transport of articles and substances;
(c) Necessary information, instruction, training and supervision;
(d) A safe place of work including safe access and egress;
(e) A safe working environment.

1.2 The employees responsibilities

In Section 7 and 8 of the health and safety at work act 1974 it says:

Duties of Employees

It is the duty of every employee whilst at work to take reasonable care for the health and safety of himself and to co-operate with his employer so far as is necessary to enable them to carry out their statutory duty.

Section 8 No person shall interfere or **misuse** anything provided in the interest of health and safety

1.3 Inspection of lifting tackle & cranes

No lifting machine or tackle shall be taken and used for the first time unless it has been tested and a certificate of test and examination issued. The certificate is to be kept on site and entered into the site register of approved lifting equipment. On this site all approved lifting equipment is given an LPL number this is marked onto the item

Lifting tackle is to be inspected by a competent person every six months and lifting machines

~~On this site a colour coding system is used to identify equipment that has been~~

~~every 14~~

the current colour is marked on the lifting tackle stores.

inspected

2. Weight & Centre of Gravity

2.1 Weight

2.11 Item marked

2.12 Ask or fined out

NO ITEM IS TO BE MOVED USING LIFTING MACHINERY OR TACKLE WITHOUT FIRST FINDING OUT THE WEIGHT OF THE ITEM

2.1 Weight

2.11 Item marked

In some case you are lucky in the fact that the item to be move may have a plate or label attached to the side of the item telling you the actual weight. You should look for this first, before doing anything else.

2.12 Ask or find out

If the item is not marked or labelled then check the weight stated on any documentation. Ask your supervisor or someone who may have moved the item earlier and they should know the weight of the item.

To find out the estimated weight of the item. This can be done using tables of weights and calculating the volume of the item. The following table gives the weight for some common materials.

Weight of materials

MATERIAL	WEIGHT IN KILOGRAMS PER CUBIC METRE	WEIGHT IN POUNDS PER CUBIC FOOT
Aluminium	2700	170
Brass	8500	530
Brick	2100	130
Coal	1450	90
Copper	8800	550
Concrete	2400	150
Earth	1600	100
Iron-Steel	7700	480
Lead	11200	700
Magnesium	1750	110
Oil	800	50
Paper	1120	70
Water	1000	62
Wood	800	50

$$\text{Estimated weight} = \text{Volume} \times \text{Weight per cubic metre}$$

3. Correct equipment for the job

There several different types of lifting equipment and there are different ways of using them . They must all be used correctly.

SLINGS

Belt sling can be used in two ways, either in a vertical straight line or looped. They should not to be choked or twisted as this will reduces the safe working load.

Fibre round slings are a most versatile sling can be used in a vertical straight line, looped, choked and rapped around the job.

Wire rope slings can only to be used in vertical straight line lift.

Chain slings can be used in vertical straight line lift, looped or rapped around the job

EYEBOLTS

Dynamo eyebolts can only be used in vertical lifts

Collar eyebolts may be used for vertical lifts, or angled lifts where the direction of the lifting force is in the same plane as the eye of the eyebolt and at an angle of not greater than 45 degrees

SHACKLES

Dee shackle only to be used in vertical straight line lifts

Bow shackle can be used for vertical lifts, or angle lifts at an angle of not greater than 45 degrees

CHAIN BLOCKS

To be used in a straight line free from twists and knots

TIRFORS

To be used in a straight line with the correct cable and lever handle

CRANES

To be used for lifting and not pulling loads

4. Inspection

ALL LIFTING TACKLE TO BE VISUALLY INSPECTED BEFORE BEING USED

Markings

All lifting tackle and machinery should have the following markings;

A serial or test certificate number

A LPL number

A S.W.L. (safe working load) or this may be marked as W.L.L (work load limit)

Other marking you may see are;

Proof load this is two times the safe working load

M.B.L. Minimum Breaking load

ALL LIFTING TACKLE TO CHECKED FOR THE LPL NO. AND S.W.L. BEFORE BEING
USED

**ANY LIFTING TACKLE OR MACHINERY FOUND DAMAGED OR FAULTY IS TO
BE LABELLED SCRAPPED AND REPORTED TO P. MORRALL**

DAMAGE TO LOOK FOR :

Belt sling Check for cuts and tears in the fabric and damaged stitching on the eyes

Fibre round sling Inspect outer protection for cuts and tears, if there are any fibres showing the sling must not to be used

Wire rope sling Check for kinks, broken wires, correct formation of the lifting eye and the swage ferrules are correctly fitted

Eyebolts Check for damage to the threads, correct length of thread and it is not bent also no cracks or cuts in the metal

Shackles Check the pin for being bent or the thread for damage also make sure it is the correct pin for that shackle and the shackle itself is not bent. A good test is, if the pin screws into the shackle correctly and freely the shackle is not bent.

Chain blocks Check the lifting chain for elongation wear on links, wear or damage from the chain being dragged along the floor also check that joining pins are correctly fitted. The hooks for elongation and safety catches are fitted correctly

t diameter for the tirfor, check that

Tirfors Inspect the steel rope for damage check it is the correct size and it functions correctly and you have the correct lever handle

using it to lift any load

Cranes Check all the working movements of the crane before use

IF IN DOUBT DO NOT USE IT

IF ANY DAMAGE FOUND OR IF IN DOUBT DO NOT USE IT

5. Fitting the equipment

Fitting the lifting tackle incorrectly will either damage the lifting tackle or produce an unsafe lift, hence it is important to decide how you will lift before selecting the tackle. This will enable you to select the correct lifting tackle for the job

6. The lift

1. First take the strain and check the lifting tackle is functioning correctly
2. lift the object about three inches (75 mm) off the ground and again check the lifting tackle and check for an even lift
3. If all checks are o.k. then continue with the lift

During some lifting operations it will be necessary to have an operator (the person controlling the lifting machinery) and a rigger (the person controlling the lift) in which case it will be necessary to use hand signals.

ENSURE NO PERSON IS UNDER THE LOAD AT ANY TIME

7. Setting the load down safety

The load should be lowered gently on to the ground and not dropped or bounced causing shock loading on the equipment.

The area should be clear and free from people.

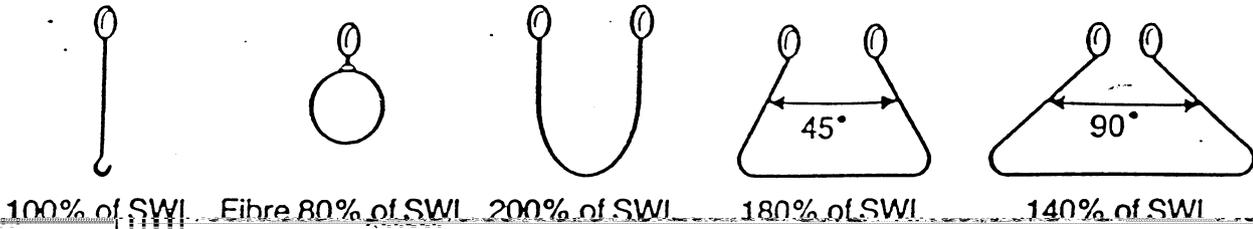
The load should not be lowered on to anything that is unstable, likely to cause damage to the load or damage to the lifting tackle.

8. Tidy up

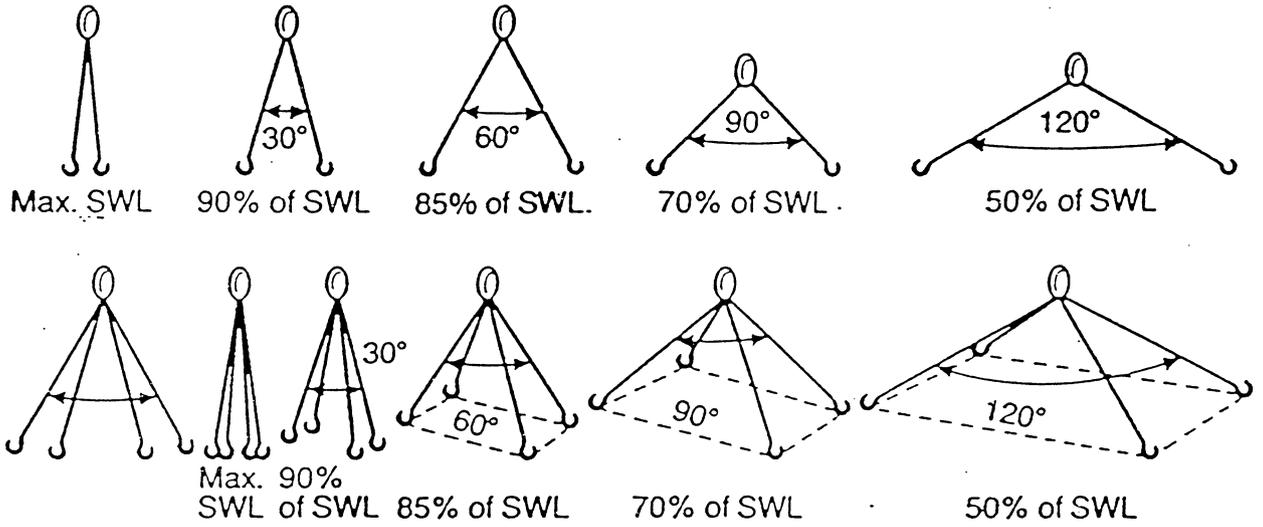
Once the load is safely down and the operation completed the crane should be returned to its parked position and the lifting tackle removed from the job. The lifting tackle must now be re-inspected for any damage, once inspected the lifting tackle must be returned to the correct storage area. Any damaged equipment should be reported straight away and taken out of service.

FIG. 34.9 Maximum safe working loads for slings at various angles

SINGLE LEG Chain 50% of SWL



MULTI-LEG Multi-leg slings are generally stamped SWL at 90°



Select the correct size of a sling for the load taking into account the included angle and the possibility of unequal loading in the case of Multi-leg slings

Distance apart of legs	Sling leg angle	Tension in leg (tonnes)
1/2 length	90°	0.7
1/2 length	120°	1.0
1/2 length	151°	2.0
1/2 length	171°	6.0

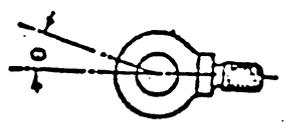
Sling angle	Distance apart of legs
30°	1/2 length
60°	1/2 length
90°	1/2 length
120°	1/2 length



1	1/4	1	3/32	5	20	0	11	0
1	1/2	1	5/16	6	30	0	17	7
1	3/4	1	17/32					0
2		1	3/4					1
2	1/4	1	31/32					
2	1/2	2	3/16					
3		2	5/8					

BOLTS

TABLE 10



Load	θ=30°		θ=45°	
	C.	T.	C.	T.
1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
2	3 1/2	2 1/2	3 1/2	2 1/2
3	6 1/2	4 1/2	6 1/2	4 1/2
4	10 1/2	7	10 1/2	7
5	15	10	15	10
6	20	13 1/2	20	13 1/2
7	25	17	25	17
8	30	21	30	21
9	35	25	35	25
10	40	29	40	29
11	45	33	45	33
12	50	37	50	37
13	55	41	55	41
14	60	45	60	45
15	65	49	65	49
16	70	53	70	53
17	75	57	75	57
18	80	61	80	61
19	85	65	85	65
20	90	69	90	69
21	95	73	95	73
22	100	77	100	77
23	105	81	105	81
24	110	85	110	85
25	115	89	115	89
26	120	93	120	93
27	125	97	125	97
28	130	101	130	101
29	135	105	135	105
30	140	109	140	109
31	145	113	145	113
32	150	117	150	117
33	155	121	155	121
34	160	125	160	125
35	165	129	165	129
36	170	133	170	133
37	175	137	175	137
38	180	141	180	141
39	185	145	185	145
40	190	149	190	149
41	195	153	195	153
42	200	157	200	157
43	205	161	205	161
44	210	165	210	165
45	215	169	215	169
46	220	173	220	173
47	225	177	225	177
48	230	181	230	181
49	235	185	235	185
50	240	189	240	189
51	245	193	245	193
52	250	197	250	197
53	255	201	255	201
54	260	205	260	205
55	265	209	265	209
56	270	213	270	213
57	275	217	275	217
58	280	221	280	221
59	285	225	285	225
60	290	229	290	229
61	295	233	295	233
62	300	237	300	237
63	305	241	305	241
64	310	245	310	245
65	315	249	315	249
66	320	253	320	253
67	325	257	325	257
68	330	261	330	261
69	335	265	335	265
70	340	269	340	269
71	345	273	345	273
72	350	277	350	277
73	355	281	355	281
74	360	285	360	285
75	365	289	365	289
76	370	293	370	293
77	375	297	375	297
78	380	301	380	301
79	385	305	385	305
80	390	309	390	309
81	395	313	395	313
82	400	317	400	317
83	405	321	405	321
84	410	325	410	325
85	415	329	415	329
86	420	333	420	333
87	425	337	425	337
88	430	341	430	341
89	435	345	435	345
90	440	349	440	349
91	445	353	445	353
92	450	357	450	357
93	455	361	455	361
94	460	365	460	365
95	465	369	465	369
96	470	373	470	373
97	475	377	475	377
98	480	381	480	381
99	485	385	485	385
100	490	389	490	389
101	495	393	495	393
102	500	397	500	397
103	505	401	505	401
104	510	405	510	405
105	515	409	515	409
106	520	413	520	413
107	525	417	525	417
108	530	421	530	421
109	535	425	535	425
110	540	429	540	429
111	545	433	545	433
112	550	437	550	437
113	555	441	555	441
114	560	445	560	445
115	565	449	565	449
116	570	453	570	453
117	575	457	575	457
118	580	461	580	461
119	585	465	585	465
120	590	469	590	469
121	595	473	595	473
122	600	477	600	477
123	605	481	605	481
124	610	485	610	485
125	615	489	615	489
126	620	493	620	493
127	625	497	625	497
128	630	501	630	501
129	635	505	635	505
130	640	509	640	509
131	645	513	645	513
132	650	517	650	517
133	655	521	655	521
134	660	525	660	525
135	665	529	665	529
136	670	533	670	533
137	675	537	675	537
138	680	541	680	541
139	685	545	685	545
140	690	549	690	549
141	695	553	695	553
142	700	557	700	557
143	705	561	705	561
144	710	565	710	565
145	715	569	715	569
146	720	573	720	573
147	725	577	725	577
148	730	581	730	581
149	735	585	735	585
150	740	589	740	589
151	745	593	745	593
152	750	597	750	597
153	755	601	755	601
154	760	605	760	605
155	765	609	765	609
156	770	613	770	613
157	775	617	775	617
158	780	621	780	621
159	785	625	785	625
160	790	629	790	629
161	795	633	795	633
162	800	637	800	637
163	805	641	805	641
164	810	645	810	645
165	815	649	815	649
166	820	653	820	653
167	825	657	825	657
168	830	661	830	661
169	835	665	835	665
170	840	669	840	669
171	845	673	845	673
172	850	677	850	677
173	855	681	855	681
174	860	685	860	685
175	865	689	865	689
176	870	693	870	693
177	875	697	875	697
178	880	701	880	701
179	885	705	885	705
180	890	709	890	709
181	895	713	895	713
182	900	717	900	717
183	905	721	905	721
184	910	725	910	725
185	915	729	915	729
186	920	733	920	733
187	925	737	925	737
188	930	741	930	741
189	935	745	935	745
190	940	749	940	749
191	945	753	945	753
192	950	757	950	757
193	955	761	955	761
194	960	765	960	765
195	965	769	965	769
196	970	773	970	773
197	975	777	975	777
198	980	781	980	781
199	985	785	985	785
200	990	789	990	789
201	995	793	995	793
202	1000	797	1000	797

BRITISH STANDARD EYE

A ins.	E ins.	G ins.	θ=0°		θ=15° Working		θ=45°	
			T.	C.	T.	C.	T.	C.
3/8	1 1/8	1 1/2	1	8	1	8	10	13
1/2	1 1/4	2	2	15	2	15	18	23
5/8	1 3/8	2 1/4	3	22	3	22	26	33
3/4	1 1/2	2 3/4	4	30	4	30	35	44
7/8	1 5/8	3	5	40	5	40	48	60
1	1 3/4	3 1/2	6	50	6	50	60	75
1 1/8	2	4	8	65	8	65	80	100
1 1/4	2 1/8	4 1/2	10	80	10	80	100	125
1 1/2	2 3/8	5	12	100	12	100	125	156
1 3/4	2 7/8	5 1/2	15	125	15	125	156	195
2	3	6	20	160	20	160	200	250
2 1/4	3 1/4	6 1/2	25	200	25	200	250	312
2 1/2	3 3/8	7	30	250	30	250	312	375
2 3/4	3 7/8	7 1/2	40	320	40	320	400	500
3	4	8	50	400	50	400	500	625
3 1/4	4 1/4	8 1/2	60	500	60	500	625	781
3 1/2	4 3/8	9	75	625	75	625	781	977
3 3/4	4 7/8	9 1/2	100	800	100	800	1000	1250
4	5	10	125	1000	125	1000	1250	1562
4 1/4	5 1/4	10 1/2	150	1250	150	1250	1562	1953
4 1/2	5 3/8	11	200	1600	200	1600	2000	2500
4 3/4	5 7/8	11 1/2	250	2000	250	2000	2500	3125
5	6	12	300	2500	300	2500	3125	3906
5 1/4	6 1/4	12 1/2	375	3125	375	3125	3906	4883
5 1/2	6 3/8	13	500	4000	500	4000	5000	6250
5 3/4	6 7/8	13 1/2	625	5000	625	5000	6250	7812
6	7	14	750	6250	750	6250	7812	9766
6 1/4	7 1/4	14 1/2	900	7812	900	7812	9766	12188
6 1/2	7 3/8	15	1125	9766	1125	9766	12188	15234
6 3/4	7 7/8	15 1/2	1400	12188	1400	12188	15234	18906
7	8	16	1750	15234	1750	15234	18906	23438
7 1/4	8 1/4	16 1/2						

BERSIDE LIFTING SERVICES LTD.

and Industrial Estate, Ealand,
e, South Humberside. DN17 4JW

Tel: (0724) 711043
Fax: (0724) 711402

Round Slings	Single Part Sling	Endless & Duplex Sling
Average Dia in mm	Width in mm	Width in mm
*	25	*
18	50	25
*	75	*
20	100	50
*	125	*
22	150	75
25	200	100
27	250	125
32	300	150
38	*	200
46	*	250
58	*	300

Lifting Factor	Vertical x 1	Choke x 0.8	Straight Basket x 2	Basket @ 90' x 1.4	Basket @ 120' x 1
Lifting Mode					
Colour	kg	kg	kg	kg	kg
BLACK	500	400	1,000	700	500
VIOLET	1,000	800	2,000	1,400	1,000
WHITE	1,500	1,200	3,000	2,100	1,500
BLACK	2,000	1,600	4,000	2,800	2,000
YELLOW	2,500	2,000	5,000	3,500	2,500
ORANGE	3,000	2,400	6,000	4,200	3,000
RED	4,000	3,200	8,000	5,600	4,000
BROWN	5,000	4,000	10,000	7,000	5,000
BLUE	6,000	4,800	12,000	8,400	6,000
LIME GREEN	8,000	6,400	16,000	11,200	8,000
GREY	10,000	8,000	20,000	14,000	10,000
	12,000	9,600	24,000	16,600	12,000

WE

B SLING COLOUR CHART

Safety hints for rigger and slingers

~~Rigger a trained competent person who can calculate the weight and centre of gravity of a load and select the correct equipment for the job.~~

Slinger a trained competent person who can attach the lifting equipment to the job and signals to the crane operator.

1. Make daily checks and do not use any defective lifting tackle. Report any defects immediately to your supervisor and remove from service
2. Know the weight being lifted, also the weight of your lifting tackle, as the two weights added together equals the total weight being applied to the crane. If in doubt ascertain from a supervisor.
3. No lifting tackle must be used unless the safe working load is indicated thereon.
4. All hooks must be either an approved ' C ' type hook or otherwise be fitted with a properly functional safety catch to prevent displacement of the lifting tackle.
5. Never shorten slings except by using the approved method. Chain slings should be shortened by means of a chain clutch.
6. Make sure the proper pin is used in all shackles, and that this pin is properly screwed home.
7. Do not carry any spare slings on the hook. Spare legs of brothers not in use must be hooked back on the main rings.
8. Protect wire ropes and slings with softwood or other suitable packing from the sharp edges of the load and avoid allowing the load to rest on a wire rope sling as it may crush the strands.
9. All end links, rings or shackles must ride freely upon any hook on which they are used.
10. Always see that the crane hook is centrally placed over the point of lift to prevent swinging. A swinging load is dangerous.
11. Take your hands away from the chains and ropes before the crane takes the load, and stand clear.
12. Proper signals according to the approved code must be given to the crane operator. The signals must be given by the person responsible for the lift (slinger), and nobody else.
13. Always face the crane operator when giving signals and stand in a secure position where you can see the load, and can be clearly seen by the crane operator. Do not stand under a suspended load.

14. Should it be necessary for you to leave the area of the crane operations while it is still working, you must be relieved by a deputy who is fully conversant with the duties involved and who has been trained in those duties.
15. A load must not be lifted with the point of the hook. The hooks should always point outwards when using multi-legged slings.
16. Do not leave loads suspended.
17. Never ride on a crane load, nor allow any other person to do so.
18. When not in use slings should be stored in a tidy manner and not left lying about on the site.
19. Wire ropes should never be sharply bent at any point.
20. Only eyebolts manufactured to approved standards should be used.
21. When slinging loads from stacked material ensure that there is safe egress for its subsequent removal.
22. Improvised slings must never be used to lift loads.
23. When a load is being lifted which approaches the safe working load of the crane, it should first be lifted just clear of the ground and held in this position so that the slings can be checked and the reaction of the crane to the load can also be observed.
24. Check all wire ropes at frequent intervals for kinks or frays and ensure they are free from projecting needles.
25. All lifting tackle must be inspected before and after usage.