











2







### Ritchies Ritchies Offshore Services Ltd **Moral Concerns** Organisations - have moral obligations to ensure that its activities are not harmful to employees and others Individually - we have a duty to ourselves, our families and work colleagues to work in a safe manner PPE

- Look after your PPE (It is very expensive and it will not be replaced easily)
  Only wear company issued PPE
  Replace any damaged PPE (*Last Line of Defence*)







### 





#### What Factors lead to Injuries?

- Inadequate supervision
- Insufficient training for the task being carried out
- Incorrect protection or equipment choices
- Incorrect use or set-up of equipment including personal protective equipment
- Unwillingness to change the way a task is carried out when a safer alternative is identified
- Suitable equipment being unavailable



### Safe Systems of Work (Fit for Purpose)

All operations large or small must be controlled by establishing a Safe Systems of Work (Legal Requirement)

**Ritchies** 

Planning the operation

Ritchies Offshore Services Ltd

- Selection of correct crew and equipment Maintenance of equipment .
- Selection of trained competent personnel
- Provision of competent supervision Safety of those involved or other affected by the operation
- Effective communication between all parties
- Ensure all necessary test certificates / documentation is in order
- . Preventing unauthorised movement / use of equipment



The production of a written method statements is one of the most important duties of the Company

- It will highlight any risks and how they are to be addressed
- It explains the method of operations and ensures that suitable equipment is used
- It provides a basis for the communication (Tool Box Talk) to other members of the team



# Ritchies Offshore Services Ltd Reporting of defects and incidents The appointed person should ensure that there is an effective procedure for reporting defects and incidents.

This procedure should include the notification of the following:

- a) any defects found during daily or weekly checks;
- b) defects found at any other time;
- c) incidents or accidents, however slight;d) shock loads, however they occur;
- e) dangerous occurrences or reportable accidents.





7









Operator: Movement of all items in a safe and controlled manner

Banksman: Relays instructions to the operator during lifting activities.





Ritchies Offshore Services Ltd	Ritchies CHART
Factor of Safety	
The Minimum Breaking Load (M.B.L)	
The minimum breaking load is the calculated load at whic will break or fail.	h a sample of the item
Safety Factor (SF)	still Sector. 7:1
It is a factor which is applied to the MBL to determine the WLL Constant number according to standard	Anter Yellow
Safety Factor 7:1	Straight Chokar Basket
SAFETY FACTOR SHOULD BE APPLIED 7: 1	IB te: ITES T1203 IB te: ITES T1203 Bate: ITES T1203 Made with 100 % High-Tenacity Polyester



































Ritchies	Offshore Services Ltd		
	LS.O ME	TRIC COURSE THR	EAD (ALL DIMENSIONS IN mm.'s)
	Diameter	Pitch	
	10.00	1.50	
	12.00	1.75	
	14.00	2.00	
	16.00	2.00	
	18.00	2.50	NOTE:
	20.00	2.50	ALL PITCH SIZES MUST BE HALVED TO
	22.00	2.50	GIVE CORRECT SHIM THICKNESS
	24.00	3.00	
	27.00	3.00	
	30.00	3.50	
	33.00	3.50	
	36.00	4.00	
	39.00	4.00	
	42.00	4.50	
	48.00	5.00	

















			SINGLE	E EYEBOLT		T SWL PER PAIR OF EYEBOLTS							
NOR	MAL ZE	AX	IAL	TRUN MOUI	INION NTING	PERPENI	DICULAR	3 DEG	0 REES	e DEG	0 REES	9 DEG	0 REES
		Ľ	]		jt	ţ	⊐‡	Į	<u>Y</u> =	Ź	Ľ.		ľ
		ton	nes	ton	nes	toni	nes	ton	nes	ton	nes	ton	nes
M10	3/8"	0.25	0.25	0.06	0.06	0.13	0.13	0.32	0.32	0.2	0.2	0.13	0.13
M12	1⁄2"	0.32	0.5	0.08	0.12	0.16	0.25	0.40	0.63	0.26	0.4	0.16	0.25
M16	5/8"	0.63	0.9	0.16	0.22	0.32	0.45	0.79	1.13	0.50	0.72	0.32	0.45
M20	3/4"	1.25	1.4	0.31	0.35	0.63	0.70	1.60	1.76	1.00	1.12	0.63	0.70
M22	7/8"		2.0		0.5		1.00	2.00	2.52		1.60		1.00
M24	1"	2.0	2.75	0.50	0.68	1.00	1.38	2.50	3.47	1.60	2.20	1.00	1.38
		The	abov	e table	e is dei	rived from	AS2317	-1984	and E	3S427	78-198	34	





Ritch	iies Offshore Se	rvices Ltd			Ri TRAININ		FSHORE RVICES
	<b>Q</b>	¢ G	ð ð G	G	¢ G ¢	G	
	M10	1	2	0.4	0.8	0.8	
	M12	2	4	0.7	1.5	1.6	
	M16	4	8	1.5	3.0	3.1	
	M48	32	64	12	24	25.5	































Ritchies Olfshore Services Ltd	CONSULTANCY HEALTH& SAFETY
Spreader Beams Care and maintenance	
Store beams in dry conditions Store beams on stands or adequate packing If beams are dismantled store all parts togeth & Reassemble correct components	g ier























































Ritchies Offshore Services Ltd

1.0

3000

8000

HT LIFT CHOKE LIFT

0.8

SAFETY COLOUR CODE 7-I SAFETY FACTOR STRA

MODE FACTO VIOLET

GREEN

GREY









Ritchies Offshore	Services Ltd	K	TRAINING CONSULTANCY HEALTH&SAU
	Chamical Basic	tanas Chart	
	Chemical	Polyester	<u> </u>
	Acid		
	Alcohols	OK	
	Aldehydes	NO	
	Strong Aldalis		
	Bleaching Agents	ОК	
	Dry cleaning Solvents	ОК	
	Ethers	NO	
	Halogenated Hydrocarbons	ОК	
	Hydrocarbons	OK	
	Ketones	OK	
	Oils, Crude	OK	
	Oils, Lubricating	ОК	
	Soap and Detergents	ОК	
	Water and Seawater	OK	
	Weak Alkalis	OK	
	THIS IS A GENERAL *Disintegrated by concer **Degraded by strong alkalis	GUIDELINE ONLY trated sulphuric acid. at elevated temperatures.	



















Ritchies Offshore Services Ltd	
Safety Factor	
Mobile Crane Hoist Bone	4.5 - 6 to 1
Overhead Crane (Gen. Duties)	6 to 1
Wire Rope Slings	6 to 1
Multi Leg Slings	8 to 1
Lifts and Hoists (Goods)	6 to 1
Lifts and Hoists (Passenger)	12 to 1
Note: Steel cored rope must be used	in hot works condition only

Ritchies Offshore Services Ltd			5	Rit	CONSULTANCY HEALTH & SAFETY
\$ \$				A	
¥ ¥ \$	Rope dia.	1 Leg	Endless	2 Leg	3&4 Leg
	5	0.2	0.4	0.4	0.5
BASKET	6	1.4	0.6	0.5	0.8
	7	0.5	0.8	0.7	1.1
200	8	0.7	1.1	1.0	1.6
LOAD	9	0.9	1.4	1.3	2.0
	10	1.2	1.8	1.7	2.5
	11	1.4	2.1	1.9	2.9
	12	1.7	2.5	2.4	3.5
	13	2.0	3.0	2.8	4.2
	14	2.3	3.5	3.2	4.8
	38	17.1	25.7	23.9	36.0

### Wire Rope For DNV 271



Wire rope sling to this standard are not calculated with the uniform method used in BS 1290 / BS 7072 a different more complex system is used.

- $\begin{array}{l} BF = Breaking \mbox{ Force} \\ R = Gross \mbox{ Mass ( Gross Weight )} \\ G = Acceleration ( 9.81 ) \\ N = Number of Sling \mbox{ Legs} \\ V = Angle \mbox{ from Vertical ( } 30^\circ = 0.866 \mbox{ } 45^\circ = 0.707) \\ SF = Safety \mbox{ Factor ( Reference Load Chart )} \end{array}$

Note when carrying out calculations for slings you should calculate 4 legs slings as 3 legs ( Normally only 3 legs would support the load ) and calculate 2 leg slings as single legs ( so 1 not 0.707 or 0.866 ) this is because of the angles involved













Ritchies Offshore Services Ltd	R		HORE
Inspection Points	;		
Inspection points: • The wire rope sling shall not be used Broken wires Broken wires Surface wires are worn by 1/3 or more	d and shall be disposed if the Bird cages Normal Normal daneter Change of diameter	hey are: Kinks Reduced dameter Anormal	

































Ritchies Offshore Services Ltd

Check for signs of "opening up"

Check for wear and cracks **Ritchies** 

Check for wear and deformation

Check for cracks and twisting

hies Offsh	ore Service	es Ltd			R	Ritc TRAINING CO	hies 🔠
Calcul	ated by <b>UN</b>	IIFORMED	WORKING Grade 'T' (8 LOAD method of	LOAD LI 3) Chain Sli f rating	MITS		
CH/ SIZ Dia.r	NN E nm	SINGLE LEG Tonnes	ENDLESS Tonnes	TW 0*- 90* Tonnes	O LEG 90*- 120* Tonnes	THREE LEG 0*- 90* Tonnes	&FOUR LEG 90*- 120* Tonnes
6 7 8		1.12 1.5 2.0	1.8 2.5 3.2	1.6 2.12 2.8	1.12 1.5 2.0	2.36 3.15 4.2	1.7 2.24 3.0
10 13 10	3	3.15 5.3 8.0	5.0 8.5 12.5	4.25 7.5 11.2	3.15 5.3 8.0	6.7 11.2 17.0	4.75 8.0 11.8
19 23 26	3	11.2 16.0 21.2	18.0 26.5 33.5	16.0 26.5 30.0	11.2 16.0 21.2	17.0 35.5 45.0	18.0 25.0 31.5
3	2	31.5	50.0	45	31.5	67	47.5



Ritchies Offsh	ore Service	s Ltd						5	2	Rit		ies Jancy H	OFFSHOR SERVICE
	<b>.</b>		S	<b>∩</b>			88	R	6		S S	References	þ
CHAIN SIZE mm	Top Angle	30*	60•	90*	120•	30*	60*	90•	120*	30*	60*	90•	120*
6 7 8	1.1 1.5 2.0	2.1 2.9 3.9	1.9 2.6 3.5	1.5 2.1 2.8	1.1 1.5 2.0	3.2 4.3 5.8	2.9 3.9 5.2	2.3 3.1 4.2	1.7 2.2 3.0	4.3 5.8 7.7	3.8 5.2 6.9	3.1 4.2 5.7	2.2 3.0 4.0
10 13 16	3.2 5.4 8.0	6.1 10.4 15.4	5.5 9.3 13.8	4.5 7.6 11.3	3.2 5.4 8.0	9.2 15.6 23.1	8.3 14.0 20.7	6.7 11.4 16.9	4.8 8.1 12.0	12.3 20.8 30.9	11.0 18.7 27.7	9.0 15.2 22.6	6.4 10.2 16.0
19 22 26	11.5 15.5 21.6	22.2 29.9 42	19.9 26.8 37	16.2 21.9 31	11.5 15.5 22	33.3 44.9 63	29.8 40.2 56	24.3 32.8 46	17.2 23.2 32	44.4 59.8 83	39.8 53.6 75	32.5 43.8 61	23.0 31.0 43
32	32.0	62	55	45	32	93	83	68	48	124	111	90	64





### **Grades of Chain Slings**

Wrought Iron: Very little mechanical strength unless heat-treated periodically.

Mild Steel Grade 30:Low carbon content producing a soft chain with high ductility. Not to used for lifting purposes

High Tensile Steel Grade 40: Medium carbon steel has good wear and shock absorbing properties also used for shackles, eyebolts & other lifting gear

Alloy Steel Grade 60: Alloy steel of this grade produces a chain 50% stronger than high tensile steel and does not suffer from brittleness in extreme cold Alloy Steel Grade 80: Harder than lower grades and more resistant to wear,

allowing for a lighter sling for given load.

Alloy Steel Grade 100 (8 + 10): 25% better lifting properties than a grade 80 chain sling

Ritchies Offshore Services	: Ltd	R	Ritchies CERNCE							
Grade	S.W.L	Proof Load	Breaking Load	Factor of Safety						
Wrought	6 tons	12 tons	27 tons	4.5 to 1						
Mild steel (G30)	6 tons	12 tons	30 tons	5 to 1						
High tensile (G40)	8 tons	16 tons	40 tons	5 to 1						
Alloy steel (G60)	12 tons	24 tons	60 tons	5 to 1						
Alloy steel (G80)	20 tons	40 tons	80 tons	4 to 1						
Due to risk must n	Due to risk of embrittlement alloy steel grade (t) chain slings must not be used in acid or acid laden atmospheres.									



Ritchies Offshore S	Services	Ltd					R I	Rite		ORE
WILL		LEG GRADE	١	т	SLING EMPERAT	URE	WOF	REDUC	TION IN LOAD LIMIT	
SINGLE-LEG 1	1	mm O	1	- 4	0°C TO 2	00°C	NONE	-	NONE	
MULTILEO	N		1	20	0°C TO 3	00°C	10%			
tt		29	J	30	0°C TO 4	00°C	25%		DO NOT USE	
		00		A	ABOVE 400°C DO NOT		JSE	1		
c	WORKING LOA Grade T(8),00 Calculated by UNIFORMED LOAD method of rain CHARL SIGLE SEE SHOLE Dame Tomes Tomes Tom					THREE LI 0*- 50* Tonnes	IG &FOUR LEG 90*-120° Tonnes			
	6 7 8	1.12 1.5 2.0	1.8 2.5 3.2	1.6 2.12 2.8	1.12 1.5 2.0	2.36 3.15 4.2	1.7 2.24 3.0			
	10 13 16	3.15 5.3 8.0	5.0 8.5 12.5	4.25 7.5 11.2	3.15 5.3 8.0	6.7 11.2 17.0	4.75 8.0 11.8			
	19 23 26	11.2 16.0 21.2	18.0 26.5 33.5	16.0 26.5 30.0	11.2 16.0 21.2	17.0 35.5 45.0	18.0 25.0 31.5			
	32	31.5	60.0	45	31.5	67	47.5			





R	Ritchies Offshore Services Ltd					R		CS OFFSHORE SERVICES
ſ		1 LEG	2	LEG	3 I	ÆG	4 L1	EG
	00000000		Carlonger	<b>O</b>	55	Å		<b>~</b>
			0°- 90°	90°- 120°	0°- 90°	90°- 120°	0°- 90°	90°- 120°
ľ	6	1.1	1.5	1.1	2.3	1.6	2.3	1.6
	7	1.5	2.1	1.5	3.1	2.2	3.1	2.2
	8	2.0	2.8	2.0	4.2	3.0	4.2	3.0
	10	3.2	4.5	3.2	6.7	4.8	6.7	4.8
	13	5.4	7.6	5.4	11.4	8.1	11.4	8.1
	16	8.0	11.3	8.0	16.9	12.0	16.9	12.0
	19	11.5	16.2	11.5	24.3	17.2	24.3	17.2
	20	12.5	17.6	12.5	26.4	18.7	26.4	18.7
	22	15.5	21.8	15.5	32.8	23.2	32.8	23.2



Rite	Ritchies Offshore Services Ltd						HORE	
	Dia.	Ç						
		0	30	60	90	120		
	mm	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes		
	7	1.5	2.9	2.6	2.1	1.5		
	10	3.2	6.1	5.5	4.5	3.2		
İ	13	5.4	10.4	9.3	7.6	5.4		
İ	16	8.2	15.8	14.2	11.6	8.2		
	19	11.5	22.2	19.9	16.2	11.5		
	23	16.9	32.6	29.25	23.9	16.9		
	26	21.6	41.7	37.4	30.5	21.6		
ł	32	32.8	63.3	56.8	46.3	32.8		



ies Off:	hors S	ervices Ltd				K	
<b>.</b>		90°	ß				
Chain							Encliess
- 01a.							
mm							Factor 1.6
7	8	1.5	2.12	1.5	3.15	2.24	2.5
7	10	2	2.8	2	4.2	3	3.2
8	8	2	2.8	2	4.2	3	3.2
10	8	3.15	4.25	3.15	6.7	4.75	5
10	10	4	5.6	4	8.4	6	6.4
13	8	5.3	7.5	5.3	11.2	8	8.5
13	10	6.7	9.5	6.7	14	10	10.7
16	8	8	11.2	8	17	11.8	12.5
16	10	10	14	10	21.2	15	16
19	8	11.2	16	11.2	23.6	17	18
19	10	14	20	14	30	21	22.4
23	8	16	23.6	16	35.5	25	26.5
23	10	21	29.5	21	44	31.5	33.5
26	8	21.2	30	21.2	45	31.5	33.5
26	10	27	38	27	57	40	43
32	8	31.5	45	31.5	67	47.5	50
32	10	40	56	40	85	60	65





































Ritchies Offshore Services Ltd	Ritchies CERNER TRAINING CONSULTANCY   HEALTH & SAFETY
Chain Slings Care and Maintenance	
Keep clean and protect from corro Do not leave chains lying around on the they are liable to be damaged If left out side slightly oil	osion. floor where l.















































































## Ritchies Offshore Services Ltd Ritchies Offshore Services Ltd Read Construction Services Ltd Read Construction Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services Services

In order to calculate it properly we need to know density of materials

their weight and what kind of information is required

Please note that the density may vary depending on water content (some material may be saturated with water), contamination, decomposition etc

Therefore we can only  $\underline{\textbf{estimate}}$  it – never assume that it will be precise calculation

There is a table of Densities of Materials on the next slide recommended by BS 7121-3:2000

Ritchies Offshore Service	s Ltd	
	Material	Density kg/m <sup>3</sup>
	Aluminium	2700
	Brass	8500
Densities of	Brick	2100
Materials	Copper	8800
	Concrete	2400
(BS 7121- 3:2000)	Earth	1600
	Iron – Steel	7700
	Lead	11200
	Oil	800
	Water	1000
	Wood	350 to 1000 (soft / hard)

Ritchies Offshore Services Ltd



In order to estimate the weight of the load first of all we need to determine its volume  $% \left( {{{\mathbf{r}}_{i}}} \right)$ 

There are various forms of load can be encountered within the lifting industry  $% \label{eq:constraint}$ 

Basic forms - easy to calculate the volume

Complex forms - need to be carefully calculated

Following formulae can be used for volume determining

NOTE:

Always ensure that all measuring units are the same, i.e. all dimensions are in meters

























































### Ritchies Offshore Services Ltd Centre of Gravity (CoG) – is the point about which all parts of the load (body) exactly balanced against each other To ensure safety of the lift the hook of lifting appliance should be positioned above the CoG Estimation for basic shapes is straight forward, e.g. the CoG of a straight pipe can be found just by measuring a midpoint in each direction For complex shapes usually CoG of subdivided parts is estimated and then combined CoG is found

In any case the determined CoG should be marked in some way, e.g. sticky

In any case the determined CoG should be marked in some way, e.g. sticky tape, marker, chalk etc

On following slides we will have a look on some examples of CoG estimation

















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tchies Offshore Services Ltd			
0º	SWL=	SWL of one sling x 2	
<b>30</b> º	SWL=	SWL of one sling x 2 x 0.966	
60º	SWL=	SWL of one sling x 2 x 0.866	
90 <sup>°</sup>	SWL=	SWL of one sling x 2 x 0.707	
120º	SWL=	SWL= SWL of one sling x 2 x 0.5	
0º	SWL=	SWL of one sling x 2	
<b>30</b> º	SWL=	SWL of one sling x 1.93	
60º	SWL=	SWL of one sling x 1.73	
90 <sup>2</sup>	SWL=	SWL of one sling x 1.414	
120º	SWL=	SWL of one sling only	













Ritchies Offshore Servi	ces Ltd	
When the weigh and fittings will	t is not evenly distributed between liftin not have the same tension.	g points, the slings
Leg 2 is closer to	the COG and therefore has the more	tension.
(	Leg 1 = 5 x 3 / (3 + 7) = 1.5 te Leg 2 = 5 x 7 / (3 + 7) = 3.5 te	
Leg 2		Leg I
	cog ● 5te	
	3m 7m	



























