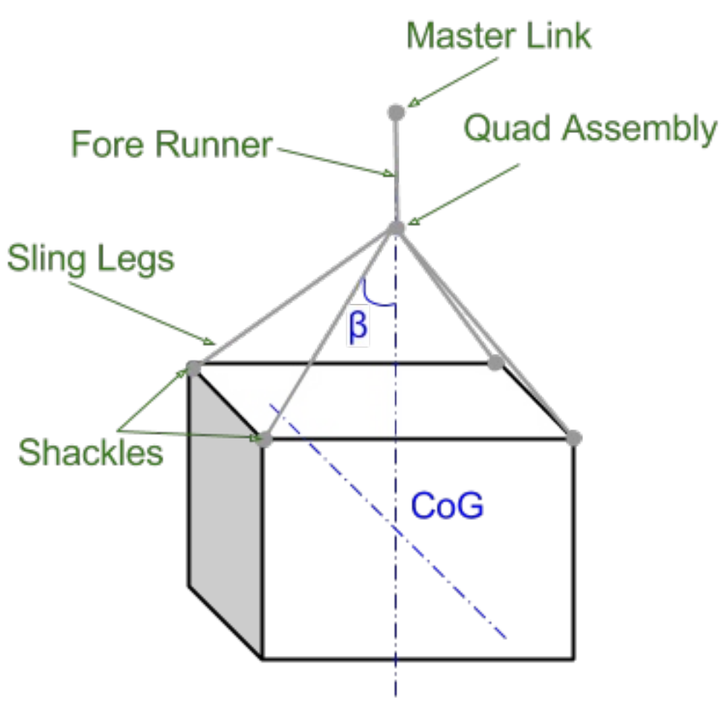
DNV DESIGN

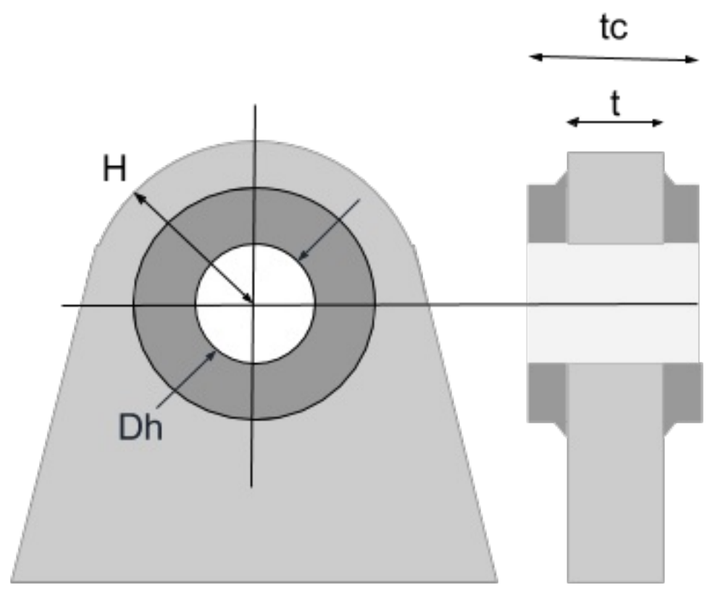
Details

Code Details			
Code	DNV 2.7-1 2006 with AISC 360-10 ASD	**Description**	This is the 2006 edition of the DNV Standard for Certification No 2.7-1, which defines minimum technical and safety related requirements to certify Offshore Containers, as mandated by the IMDG code. American Standard AISC 360-10 ASD is used to design the supporting members container.
Project Units	Imperial	**Project ID**	1234567
Company	ABC Consultants Inc	**Logo**	
Designer	Sam Carigliano	**Client**	SkyCiv Engineering
Project Notes	Skid Car #20-2039 for deadline 18th September 2017		

DNV

Setup	
Lifting Type (Symmetric)	
Leg Angle β (°)	15
Number of Padeyes	2
30° Tilt Test	Unit able to withstand 30 degree tilt.

Dimensions and Masses			
Container Length (inch)	120	**Gross Mass (lb)**	1000
Container Height (inch)	120	**Tare Mass (lb)**	500
Container Width (inch)	120	**Payload Mass (lb)**	500
Total Length of Load Bearing Members (inch)	120	**Lifting Set Mass (lb)**	200

Padeye Design	
Dh (inch)	1
H (inch)	2
t (inch)	1
tc (inch)	2
Re (ksi)	50000
Padeye Type	

Design Loads

4.2.3 Lifting Loads

	Load on Structure (lbf)	Internal Load (lbf)
4.2.3.1 4-point lifting	11124.344	8899.475
4.2.3.2 Lifting with fork truck	8543.496	4983.706
4.6.3.3 2-point lifting	6674.606	4449.738

4.2.4 Impact Loads (Static Equivalent)

	Formula	Load (lbf)
4.2.4.1 Horizontal Impact (corner post, external bottom frame)	$F_{HI} = 0.25 \times R \times g$	1112.434
4.2.4.1 Horizontal Impact (other primary structure)	$F_{HI} = 0.15 \times R \times g$	667.461
4.2.4.2 Vertical Impact (bottom)	$F_V = 0.25 \times R \times g$	1112.434

4.4.2 Loads on Intermediate Deck

	Formula	Load (lbf)
Tween Deck Load	$F_W = 0.5 \times P \times \Psi \times g$	3337.303

4.4.7 Internal Loads on Side Wall

	Formula	Load (lbf)
Load On Walls	$F_W = 0.6 \times P \times g$	1334.921

Distributed Loads on Floor

	Total Load		Distributed Load (Total Load / Length of Load Bearing Members)
	Formula	**Load (lbf)**	**D. Load (lbf/inch)**
4 Point Lift	F = (2.5 x R)g	11124.344	3.65
2 Point Lift/ Diagonal Lift	F = (1.5 x R)g	6674.606	2.19
Fork Pocket Lift	F = 1.6 x (R + S)g	8543.496	2.803
Impact Loads	F = R x g	4449.738	1.46

Padeye

Resulting Sling Force

Component	Magnitude(lbf)
Sling Angle	13820.122
F_V	13349.212
F_H	3576.911

Padeye Strength

Calculated Stresses	Magnitude (ksi)
Tear out stress	21.421
Contact stress, 6% clearence	77.699

Shackle Dimensions

Dimension	Formula	Magnitude (inch)
Minimum bolt diameter	D_{min} = 0.94 x Dh	23.876
Maximum shackle inside width at pin	W_{max} = tc / 0.75	67.733

Padeye and Shackle Check

No shackle found in EN 13889:2000 that matches the pad eye. Proposing minimum recommended shackle with respect to strength.

Shackle Parameter	Value
Working Load Limit (t)	4.75
Nominal pin diameter (inch)	22
Nominal inside width at pin (inch)	31
Dee - min. inside length S (inch)	52
Bow - min. inside length S (inch)	65

Lifting Sets

Strength Requirements for Lifting Sets

Enhancement factor (x)	No factor given
Working Load Limit (t)	7

Quad Assembly (Masterlink + Intermediate links) Requirements

Load on quad assembly (t)	7

Forerunner Requirements

Load on forerunner (t)	7
Wirerope sling, fibre core EN 13414-1 (inch)	26
Wirerope sling, steel core EN 13414-1 (inch)	26
Chain sling EN 818-4 (inch)	16

Sling Leg Requirements

Load per sling leg (t)	3.623
Wirerope sling, fibre core EN 13414-1 (inch)	20
Wirerope sling, steel core EN 13414-1 (inch)	18
Chain sling EN 818-4 (inch)	13

Shackle Requirements

Load on each shackle (t)	3.623
Recommended min. standard shackle EN 13889 (t)	4.75

AISC MEMBER DESIGN

Project Details

Design Code:	DNV 2.7-1 2006 with AISC 360-10 ASD
Provision:	ASD
Country:	International
User Name:	Sam
Project Name:	XYZ Project
Project ID:	1234567
Company:	ABC Consultants Inc
Designer:	Sam Carigliano
Client:	SkyCiv Engineering
Notes:	Skid Car #20-2039 for deadline 18th September 2017
Unit System:	Imperial

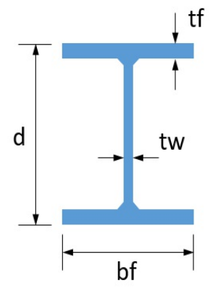
NOTE: The calculations for this design code are in **BETA** stage development. If you notice any irregularities or problems please contact support@skyciv.com.

Design Input Information

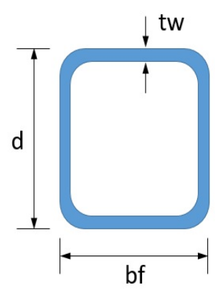
Design Factors			
Ωt	Ωc	Ωb	Ωv
1.67	1.67	1.67	1.67

Design Materials			
ID	E (ksi)	Fy (ksi)	Fu (ksi)
1	29000	38	60

Section Dimensions



ID	Name	d (in)	tw (in)	bf (in)	tf (in)
2	W14x53	1.390e+1	3.700e-1	8.060e+0	6.600e-1



ID	Name	d (in)	bf (in)	tw (in)	
3	HSS12x3-1/2x5/16	1.200e+1	3.500e+0	2.910e-1	

Section Properties

ID	Name	A (in^2)	J (in^4)	Iyp (in^4)	Izp (in^4)	Iw (in^6)	Syp (in^3)	Szp (in^3)
2	W14x53	1.5600e+1	1.9400e+0	5.7700e+1	5.4100e+2	2.5400e+3	2.2000e+1	8.7100e+1
3	HSS12x3-1/2x5/16	8.4600e+0	5.6000e+1	1.8600e+1	1.3400e+2	0.0000e+0	1.2100e+1	2.9600e+1

Member Properties							
Member ID	Section ID	KzL (ft)	KyL (ft)	Lb (ft)	Cb	LST	LSC
1	2	1	1	1	1	300	200
2	3	1	1	1	1	300	200
3	3	1	1	1	1	300	200
4	3	1	1	1	1	300	200
5	2	1	1	1	1	300	200

Member Design Capacity

Member ID	Pn/Ωt (kip)	Pn/Ωc (kip)	Mzn/Ωb (k-ft)	Myn/Ωb (k-ft)	Vyn/Ωv (kip)	Vzn/Ωv (kip)
1	354.97	354.20	165.16	41.72	78.17	145.25
2	192.50	191.80	56.13	20.32	88.41	20.87
3	192.50	191.80	56.13	20.32	88.41	20.87
4	192.50	191.80	56.13	20.32	88.41	20.87
5	354.97	354.20	165.16	41.72	78.17	145.25

Design Ratio

Member ID	P	Mz	My	Vy	Vz	(P,Mz,My)	KL/r	Status
1	0.14	0.12	0.12	0.38	0.07	0.31	0.03	OK
2	0.26	0.36	0.25	0.34	0.48	0.80	0.04	OK
3	0.26	0.36	0.25	0.34	0.48	0.80	0.04	OK
4	0.26	0.36	0.25	0.34	0.48	0.80	0.04	OK
5	0.14	0.12	0.12	0.38	0.07	0.31	0.03	OK

Definitions

Ωt	Safety factor for tensile
Ωc	Safety factor for compression
Ωb	Safety factor for flexure
Ωv	Safety factor for shear
E	Modulus of elasticity
Fy	Specified minimum yield stress
Fu	Specified minimum tensile strength
A	Cross-sectional area
J	Torsional constant
Iyp	Moment of inertia about the Y axes
Izp	Moment of inertia about the Z axes
Iw	Warping constant
Syp	Plastic section modulus about the Y axis
Szp	Plastic section modulus about the Z axis
KL	Effective length
Cb	Buckling modification factor (from all load combinations)
Lb	Length between braced points
LST	Limited slenderness for tension
LSC	Limited slenderness for compression
LD	Limited deflection
Pn	Nominal axial strength (tension/comression)
Mn	Nominal flexural strength (about Z/Y axis)
Vn	Nominal shear strength (along Z/Y axis)
P	Design ratio in case of axial force
Mz	Design ratio in case of bending about Z axis
My	Design ratio in case of bending about Y axis
Vy	Design ratio in case of shear along Y axis
Vz	Design ratio in case of shear along Z axis
(P,Mz,My)	Design ratio in case of axial force and bending action
KL/r	Design ratio in case of section slenderness
δ	Design ratio in case of member deflection
OK	Capacity is provided
NG	Capacity is not provided