Pressure calculations for default areas according to ISO12215-5:2008

Contents

Default areas are assumed as one panel between closest frames/bulkheads.
Pressure calculations are presented in tables below

Principal boat data

Length of hull	LH=	8,550	m
Length of waterline	LWL=	8,500	m
Beam of hull	BH=	2,284	m
Beam of waterline	BWL=	1,930	m
Chine beam	BC=	1,928	m
Maximum speed at mLDC	V=	20,0	kn
Displacement speed	Vdispl=	7,1	kn
loaded displacement	mLDC=	2000	kg
deadrise angle at 0,4LWL	beta(0,4)=	19,7	degrees
Design category	DC=	B	
pressure coefficient for DC	kDC=	0,8	

Motor craft design pressures for default areas

ISO 12215-5:2008(E)

Motor craft
Bottom pressure

8.1.2.

Motor craft bottom pressure in displacement mode

(7)	PBMD=	PBMD(BASE)*kAR*kDC*kL			
(8)	PBmin=	0,45*((mLDC)^0,33)+(0,9*LWL*kDC)			
(9)	PBMDbase=	2,4*((mLDC)^0,33)+20			
	mLDC=	2000	kg		
	PBMDbase=	49,48	kN/m2		
	LWL=	8,5	m		
	kDC=	0,8			
	PBmin=	11,65	kN/m2		
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)			
	kR=	1,5-3/10000*b			
	b=	660	mm	short side of bottom panel	
	kR=	1,302			
	AD=	(l*b)/1000000			
	l=	1330	mm	long side of bottom panel	
	AD=	0,8778			
	kAR=	0,423396			
	MINkAR=	0,25			
	MAXkAR=	1,00			
	kAR=	0,423396			
	kL=	1,00	simplified to geet stresses higher		
	PBMD=	**16,76**	**kN/m2**	**Design pressure for displacement bottom**	

8.1.3.

Motor craft bottom pressure in planing mode

(10)	PBMP=	PBMPBASE*kAR*kL	
(8)	PBmin=	11,65	kN/m2
(11)	PBMPbase=	((0,1*mLDC)/(LWL*BC))*(1+((kDC)^0,5)*nCG)	
	mLDC=	2000	kg
	LWL=	8,50	m
	BC=	1,928	m
	kDC=	0,8	
	nCG=	0,32*(LWL/(10*BC)+0,084)*(50-beta0,4)*(((V^2)*(BC^2))/(mLDC))	
	beta0,4=	19,7	
	V=	20	kn
	nCG=	3,783	
	PBMPbase=	53,50	kN/m2
	kAR=	0,423396	
	kL=	1,00	simplified to geet stresses higher
	PBMP=	22,65	kN/m2

Design pressure for planing bottom

Motor craft Bottom Design pressure selection for further works:			
	PB(Furth)=	**max(PBMD;PBMP)**	
	PBMD=	**16,76**	**kN/m2**
	PBMP=	**22,65**	**kN/m2**
	PB(Furth)=	**22,65**	**kN/m2**

Side pressure

8.1.4.

Motor craft side pressure in displacement mode

max of:

(12)	PSMD=	(PDMbase+kZ*(PBMDbase-PDMbase))*kAR*kDC*kL			
	or				
(13)	PSMmin=	0,9*LWL*kDC			
	LWL=	8,5	m		
	kDC=	0,8			
	PSMmin=	6,12	kN/m2		
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)			
	kR=	1,5-3/10000*b			
	b(lower)=	490	mm		short side of lower side panel
	b(upper)=	550	mm		short side of upper side panel
	kR=	1,353			
	mLDC=	2000		kg	
	AD=	(l*b)/1000000			
	l=	1300	mm		long side of lower side panel
	l=	1300	mm		long side of upper side panel
	AD(lower)=	0,637			
	AD(upper)=	0,715			
	kAR(lower)=	0,484407			
	kAR(upper)=	0,467908			
	MINkAR=	0,25			
	MAXkAR=	1,00			
	kAR(lower)=	0,484			
	kAR(upper)=	0,468			
	PDMbase=	17,575	kN/m2		calculated below, see Deck pressure
	kZ=	(Z-h)/Z			
	Z=	0,987	m		height of deck form LWL at fr #12
	h(lower)=	0,25	m		midspan of of lower panel from LWL
	h(upper)=	0,74	m		midspan of of upper panel from LWL
	kZ(lower)=	0,747			
	kZ(upper)=	0,250			
	PBMDbase=	49,48161	kN/m2		
	kDC=	0,8			
	kL=	1,00			simplified to geet stresses higher
	PSMD(lower)*=	**16,04**	**kN/m2**		
	PSMD(upper)*=	**9,57**	**kN/m2**		

*"lower" and "upper" mean lower and upper side panels, separated by step, please consult general hull shape in main document

8.1.5.

Motor craft side pressure in planing mode

max of:

(14) PSMP= (PDMbase+kZ*(0,25*PBMPbase-PDMbase))*kAR*kDC*kL

or

(13) PSMmin= 6,12 kN/m2

kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)		
kR=	1,5-3/10000*b		
b(lower)=	490	mm	short side of lower side panel
b(upper)=	550	mm	short side of upper side panel
kR=	1,353		
mLDC=	2000	kg	
AD=	(l*b)/1000000		
l=	1300	mm	long side of lower side panel
l=	1300	mm	long side of upper side panel
AD(lower)=	0,637		
AD(upper)=	0,715		
kAR(lower)=	0,484407		
kAR(upper)=	0,467908		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR(lower)=	0,484		
kAR(upper)=	0,468		
PDMbase=	17,58	kN/m2	calculated below, see Deck pressure
kZ=	(Z-h)/Z		
Z=	0,987	m	height of deck form LWL at fr #12
h(lower)=	0,25	m	midspan of of lower panel from LWL
h(upper)=	0,74	m	midspan of of upper panel from LWL
kZ(lower)=	0,747		
kZ(upper)=	0,250		
PBMPbase=	53,50296	kN/m2	
kDC=	0,8		
kL=	1,00		simplified to geet stresses higher

PSMP(lower)= 6,12 kN/m2
PSMP(upper)= 6,19 kN/m2

Motor craft Side Design pressure selection for further works:

PS(Furth)=	max (PSMP; PSMD)	
PSMP(lower)=	6,12	kN/m2
PSMD(lower)=	16,04352	kN/m2
PSMP(upper)=	6,185415	kN/m2
PSMD(upper)=	9,567683	kN/m2

PS(Furth lower)= 16,04 kN/m2
PS(Furth upper)= 9,57 kN/m2

Deck pressure

8.1.6.

Motor craft deck pressure

	max of:			
(15)	PDM=	PDMBASE*kAR*kDC*kL		
	or			
(16)	PDMmin=	5	kN/m2	
(17)	PDMbase=	0,35*LWL+14,6		
	LWL=	8,50	m	
	PDMbase=	17,58	kN/m2	
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)		
	kR=	1,5-3/10000*b		
	b=	320	mm	short side of deck panel
	kR=	1,404		
	AD=	(l*b)/1000000		
	l=	1140	mm	long side of deck panel
	AD=	0,3648		
	kAR=	0,594162		
	MINkAR=	0,25		
	MAXkAR=	1,00		
	kAR=	0,594		
	kDC=	0,8		
	kL=	1,00	foredeck area	
	PDM=	**8,35**	**kN/m2**	

Superstructures & D/H pressure

8.1.6.

Motor craft superstructures and deckhouses pressure

PSUPM=	PDMbase*kDC*kAR*kSUP		
PDMbase=	17,575	kN/m2	
kDC=	0,8		
kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)		
kR=	1,5-3/10000*b		
D/H top			
b=	990	mm	short side of D/H top panel
kR=	1,203		
AD=	(l*b)/1000000		
l=	1700	mm	long side of D/H top panel
AD=	1,683		
kAR=	0,321807		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR=	0,322		D/H top
kSUP(Top <800mm walking)=	0,50		
PSUPM(Top)=	**2,26**	**kN/m2**	
D/H front			
b=	560	mm	short side of D/H front panel
kR=	1,332		
AD=	(l*b)/1000000		
l=	1430	mm	long side of D/H front panel
AD=	0,8008		
kAR=	0,445248		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR=	0,445		D/H front
kSUP(Front)=	1,00		
PSUPM(front)=	**6,26**	**kN/m2**	
D/H Side			
b=	580	mm	short side of D/H side panel
kR=	1,326		
AD=	(l*b)/1000000		
l=	1300	mm	long side of D/H side panel
AD=	0,754		
kAR=	0,451322		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR=	0,451		D/H side
kSUP(Side Non Walking)=	0,50		
PSUPM(side)=	**3,17**	**kN/m2**	

kSUP(Aft End)=	0,50
kSUP(Side Walking)=	0,67

Sailing craft design pressures fro default areas

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Sailing craft
Bottom pressure

8.2.1.

Sailing craft bottom pressure

(19)	PBS=	PBSbase*kAR*kDC*kL		
(20)	PBSmin=	0,35*((mLDC)^0,33)+(1,4*LWL*kDC)		
(21)	PBSbase=	(2,0*((mLDC)^0,33)+18)*kSLS		
	mLDC=	2000	kg	
	kSLS=	1,0	this is a normal stability craft	
	PBSbase=	42,57	kN/m2	
	LWL=	8,5	m	
	kDC=	0,8		
	PBSmin=	13,82	kN/m2	
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)		
	kR=	1,5-3/10000*b		
	b=	660	mm	short side of bottom panel
	kR=	1,302		
	AD=	(l*b)/1000000		
	l=	1330	mm	long side of bottom panel
	AD=	0,8778		
	kAR=	0,423396		
	MINkAR=	0,25		
	MAXkAR=	1,00		
	kAR=	0,423396		
	kL=	1,00	simplified to get stresses higher	
	PBMD=	**14,42**	**kN/m2**	**Design pressure for displacement bottom**

Side pressure

8.2.2.

Sailing craft side pressure

(22)	PSS=	(PDSbase+kZ*(PBS(base)-PDS(base)))*kAR*kDC*kL		
(23)	PSSmin=	1,4*LWL*kDC		
	PSSmin=	5	kN/m2	
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)		
	kR=	1,5-3/10000*b		
	b(lower)=	490	mm	short side of lower side panel
	b(upper)=	550	mm	short side of upper side panel
	kR=	1,353		
	mLDC=	2000	kg	
	AD=	(l*b)/1000000		
	l=	1300	mm	long side of lower side panel
	l=	1300	mm	long side of upper side panel
	AD(lower)=	0,637		
	AD(upper)=	0,715		
	kAR(lower)=	0,484407		
	kAR(upper)=	0,467908		
	MINkAR=	0,25		
	MAXkAR=	1,00		
	kAR(lower)=	0,484		
	kAR(upper)=	0,468		
	PDSbase=	18,14	kN/m2	calculated below, see Deck pressure
	kZ=	(Z-h)/Z		
	Z=	0,987	m	height of deck form LWL at fr #12
	h(lower)=	0,25	m	midspan of of lower panel from LWL
	h(upper)=	0,74	m	midspan of of upper panel from LWL
	kZ(lower)=	0,747		
	kZ(upper)=	0,250		
	PBSbase=	42,56801	kN/m2	
	kDC=	0,8		
	kL=	1,00		simplified to geet stresses higher
	PSS(lower)=	**14,10**	**kN/m2**	
	PSS(upper)=	**9,08**	**kN/m2**	

Deck pressure

8.2.3.

Sailing craft deck pressure

(24)	PDS=	PDSbase*kAR*kDC*kL			
(25)	PDSmin=	5	kN/m2		
(26)	PDSbase=	0,5*(mLDC^0,33)+12			
	mLDC=	2000	kg		
	PDSbase=	18,14	kN/m2		
	kDC=	0,8			
	kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)			
	kR=	1,5-3/10000*b			
	b=	320	mm	short side of deck panel	
	kR=	1,404			
	AD=	(l*b)/1000000			
	l=	1140	mm	long side of deck panel	
	AD=	0,3648			
	kAR=	0,594162			
	MINkAR=	0,25			
	MAXkAR=	1,00			
	kAR=	0,594162			
	kL=	1,00	simplified to get stresses higher		
	PDS=	**8,62**	**kN/m2**		
	PDS=	**8,62**	**kN/m2**		

Superstructure pressure

8.2.4.

Sailing craft supertstructure pressure

PsupS=	PDSbase*kAR*kDC*kSUP			
PDSbase=	18,142	kN/m2		
kDC=	0,8			
kAR=	(kR*0,1*((mLDC)^0,15))/((AD)^0,3)			
kR=	1,5-3/10000*b			
D/H top				
b=	990	mm	short side of D/H top panel	
kR=	1,203			
AD=	(l*b)/1000000			
l=	1700	mm	long side of D/H top panel	
AD=	1,683			
kAR=	0,321807			
MINkAR=	0,25			
MAXkAR=	1,00			
kAR=	0,322		D/H top	
kSUP(Top <800mm walking)=	0,50			
PSUPS(Top)=	**2,34**	**kN/m2**		

D/H front			
b=	560	mm	short side of D/H front panel
kR=	1,332		
AD=	(l*b)/1000000		
l=	1430	mm	long side of D/H front panel
AD=	0,8008		
kAR=	0,445248		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR=	0,445		D/H front
kSUP(Front)=	1,00		
PSUPM(front)=	**6,46**	**kN/m2**	
D/H Side			
b=	580	mm	short side of D/H side panel
kR=	1,326		
AD=	(l*b)/1000000		
l=	1300	mm	long side of D/H side panel
AD=	0,754		
kAR=	0,451322		
MINkAR=	0,25		
MAXkAR=	1,00		
kAR=	0,451		D/H side
kSUP(Side Non Walking)=	0,50		
PSUPM(side)=	**3,28**	**kN/m2**	

kSUP(Aft End)=	0,50
kSUP(Side Walking)=	0,67

Summary of pressures for default areas

As project at hand is dual-purpose craft, maximum pressures from sailing and motor craft ara selected for structural design work. Results are presented in table below. Before each value of pressure, a note, stating if it results from motor or from sailing craft calculation is made.

Bottom pressure		
Motor craft	22,65	kN/m2
Lower side pressure		
Motor craft	16,04	kN/m2
Upper side pressure		
Motor craft	9,57	kN/m2
Fore deck pressure		
Sailing craft	8,62	kN/m2
Deckhouse top pressure		
Sailing craft	2,34	kN/m2
Deckhouse front pressure		
Sailing craft	6,46	kN/m2
Deckhouse side pressure		
Sailing craft	3,28	kN/m2