

# RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

**Part H**

**Electrical Installations**

**Rules for the Survey and Construction of Steel Ships**  
**Part H** **2012 AMENDMENT NO.1**  
**Guidance for the Survey and Construction of Steel Ships**  
**Part H** **2012 AMENDMENT NO.1**

Rule No.29 / Notice No.43 15th June 2012  
Resolved by Technical Committee on 10th February 2012  
Approved by Board of Directors on 6th March 2012

**ClassNK**  
NIPPON KAIJI KYOKAI

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# **RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**RULES**

**Part H**

**Electrical Installations**

## **2012 AMENDMENT NO.1**

Rule No.29      15th June 2012

Resolved by Technical Committee on 10th February 2012

Approved by Board of Directors on 6th March 2012

Rule No.29 15th June 2012

AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

“Rules for the survey and construction of steel ships” has been partly amended as follows:

**Part H ELECTRICAL INSTALLATIONS**

**Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN**

**2.5 Switchboards, Section Boards and Distribution Boards**

Paragraph 2.5.4 has been amended as follows.

**2.5.4 Busbars**

**1** Busbars are to be of copper ~~having a conductivity of 97% or more~~ or of copper-surrounded aluminum alloy.

(-2 to -5 are omitted)

**2.9 Cables**

**2.9.9 Current Rating of Cables**

Table H2.13 and Table H2.14 have been amended as follows.

Table H2.13 Current Ratings of Cables (for continuous service)  
(Based on ambient temperatures of 45 °C )

Nominal sectional area of conductor (mm <sup>2</sup> )	Current rating in amperes											
	PVC insulation- (general purpose) (60 °C)			PVC insulation- (heat resisting) (75 °C)			EP rubber insulation and Cross-linked polyethylene Insulation (85 °C)			Silicon rubber insulation and Mineral insulation (95 °C)		
	1 core	2 cores	3 cores	1 core	2 cores	3 cores	1 core	2 cores	3 cores	1 core	2 cores	3 cores
1	8	7	6	13	11	9	16	14	11	20	17	14
1.5	12	10	8	17	14	12	20	17	14	24	20	17
2.5	17	14	12	24	20	17	28	24	20	32	27	22
4	22	19	15	32	27	22	38	32	27	42	36	29
6	29	25	20	41	35	29	48	41	34	55	47	39
10	40	34	28	57	48	40	67	57	47	75	64	53
16	54	46	38	76	65	53	90	77	63	100	85	70
25	71	60	50	100	85	70	120	102	84	135	115	95
35	87	74	61	125	106	88	145	123	102	165	140	116
50	105	89	74	150	128	105	180	153	126	200	170	140
70	135	115	95	190	162	133	225	191	158	255	217	179
95	165	140	116	230	196	161	275	234	193	310	264	217
120	190	162	133	270	230	189	320	272	224	360	306	252
150	220	187	154	310	264	217	365	310	256	410	349	287
185	250	213	175	350	298	245	415	353	291	470	400	329
240	290	247	203	415	353	291	490	417	343	-	-	-
300	335	285	235	475	404	333	560	476	392	-	-	-

Nominal sectional area of conductor (mm <sup>2</sup> )	Current rating in amperes											
	PVC insulation (general purpose) (70 °C)			PVC insulation (heat resisting) (75 °C)			EP rubber insulation and Cross-linked polyethylene Insulation (90 °C)			Silicon rubber insulation and Mineral insulation (95 °C)		
	1 core	2 cores	3 cores	1 core	2 cores	3 cores	1 core	2 cores	3 cores	1 core	2 cores	3 cores
1.5	12	13	11	17	14	12	23	20	16	26	22	18
2.5	17	18	15	24	20	17	30	26	21	32	27	22
4	22	25	20	32	27	22	40	34	28	43	37	30
6	29	31	26	41	35	29	52	44	36	55	47	39
10	51	43	36	57	48	40	72	61	50	76	65	53
16	68	58	48	76	65	53	96	82	67	102	87	71
25	90	77	63	100	85	70	127	108	89	135	115	95
35	111	94	78	125	106	88	157	133	110	166	141	116
50	138	117	97	150	128	105	196	167	137	208	177	146
70	171	145	120	190	162	133	242	206	169	256	218	179
95	207	176	145	230	196	161	293	249	205	310	264	217
120	239	203	167	270	230	189	339	288	237	359	305	251
150	275	234	193	310	264	217	389	331	272	412	350	288
185	313	266	219	350	298	245	444	377	311	470	400	329
240	369	314	258	415	353	291	522	444	365	553	470	387
300	424	360	297	475	404	333	601	511	421	636	541	445

Note: The values in this table are not applied to cables which do not satisfy the maximum rated conductor temperature of the concerned insulation.

Table H2.14 Correction Factor for Various Ambient Temperatures

Maximum rated conductor temperature of insulation	Correction factor									
	40°C	45°C	50°C	55°C	60°C	65°C	70°C	75°C	80°C	85°C
60°C	<del>1.15</del>	<del>1.00</del>	<del>0.82</del>	-	-	-	-	-	-	-
75°C	<del>1.08</del>	<del>1.00</del>	<del>0.94</del>	<del>0.82</del>	0.71	0.58	-	-	-	-
80°C	<del>1.07</del>	<del>1.00</del>	<del>0.93</del>	<del>0.85</del>	0.76	0.65	0.53	-	-	-
85°C	<del>1.06</del>	<del>1.00</del>	<del>0.94</del>	<del>0.87</del>	0.79	0.71	0.61	0.50	-	-
95°C	<del>1.05</del>	<del>1.00</del>	<del>0.95</del>	<del>0.89</del>	0.84	0.77	0.71	0.63	0.55	0.45

Maximum rated conductor temperature of insulation	Correction factor									
	40°C	45°C	50°C	55°C	60°C	65°C	70°C	75°C	80°C	85°C
70°C	1.10	1.00	0.89	0.77	0.63	-	-	-	-	-
75°C	1.08	1.00	0.91	0.82	0.71	0.58	-	-	-	-
90°C	1.05	1.00	0.94	0.88	0.82	0.74	0.67	0.58	0.47	-
95°C	1.05	1.00	0.95	0.89	0.84	0.77	0.71	0.63	0.55	0.45

## 2.13 Lighting Fittings

Paragraph 2.13.2 has been amended as follows.

### 2.13.2 Construction

- 1 Ratings of lampholders are to be in accordance with *IEC Publication 60092* or other standards that are deemed appropriate by the Society.
- 2 Lampholders are to be constructed of non-hygroscopic and flame-retardant or incombustible materials.
- 3 Large lampholders are to be provided with means for locking lamps into their holders.
- 4 Enclosures are to be composed of metal, glass or synthetic resins having sufficient mechanical, thermal and chemical resistant properties; furthermore, they are to have a suitable degree of protection depending on their location. Synthetic resin enclosures which support current-carrying parts are to be flame retardant.
- 5 Terminal boxes and leading-in parts of cables are to be of construction suitable for maritime applications. Consideration is to be given so that the insulation of cables does not deteriorate at an early stage due to any temperature rises of terminals and other parts.
- 6 The internal wiring of lighting fittings is to use wiring which takes into account the effects of ultraviolet rays and heat in order to prevent the early-stage degradation of the cable insulation cover.
- ~~7~~ Lighting fittings installed in engine rooms or similar other spaces which are exposed to risks of mechanical damage are to be provided with suitable gridded metallic guards to protect their lamps and glass globes against such damage.

## 2.17 High Voltage Electrical Installations

### 2.17.6 Testing

Sub-paragraph -3 has been amended.

3 The following high voltage tests on high voltage electrical equipment and cables are to be carried out at the place of manufacturer, etc.:

((1) to (3) are omitted)

(4) Test voltages for high voltage cables of the following values.

Rated voltages above 500V and 1,000V or below: 3,500V

Rated voltages above 1,000V and 3,600V or below: 6,500V

Rated voltages above 3,600V and 7,200V or below: ~~11,000~~ 12,500V

Rated voltages above 7,200V and 12,000V or below: ~~15,000~~ 21,000V

Rated voltages above 12,000V: ~~22,000~~ 30,500V

### EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 June 2012.

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# **GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**Part H**

**Electrical Installations**

**GUIDANCE**

**2012 AMENDMENT NO.1**

Notice No.43      15th June 2012

Resolved by Technical Committee on 10th February 2012

AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

## Part H ELECTRICAL INSTALLATIONS

### H2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

#### H2.2 System Design - General

Paragraph H2.2.7 has been added as follows.

##### H2.2.7 Lighting Circuits

For lighting circuits which satisfy the following conditions, the wording “not exceed 80% of the ratings of protective devices” in 2.2.7-2, Part H of the Rules can be interpreted to mean “not exceed the ratings of protective devices”.

- (1) Such circuits are not used in accommodation areas
- (2) Electrical apparatus with unspecified load currents (such as receptacles, etc.) are not connected.
- (3) The ratings or appropriate settings of protection devices are decided based upon maximum load currents of connected lighting points

#### H2.9 Cables

Paragraph H2.9.6 has been amended as follows.

##### H2.9.6 Voltage Drop

1 Voltage drop calculations are to be carried out by using the following formulae as standards:

- (1) In the case of *d.c.* circuits

$$\text{Voltage drop (\%)} = \frac{R_{20} \times K \times 2L \times I \times 100}{V}$$

- (2) In the case of *a.c.* circuits

$$\text{Single phase a.c. circuits Voltage drop (\%)} = \left( \frac{R_{20} \times K \times 2L \times I \times 100}{V} \right) \times \delta$$

$$\text{Three phase a.c. circuits Voltage drop (\%)} = \left( \frac{R_{20} \times K \times 2L \times I \times 100}{V} \right) \times \frac{1.73}{2} \times \delta$$

*L* : length of cable for single passage (*m*)

*I* : maximum load current (*A*)

*V* : circuit voltage (*V*)

*R*<sub>20</sub> : *d.c.* resistance at 20°C ( $\Omega/m$ )

*K* : temperature factor at the maximum allowable temperature of conductor

~~60~~70°C : ~~1.16~~1.20

75 °C : 1.22

~~80 °C : 1.24~~ 1.28

~~85 °C : 1.26~~ 1.30

$\delta$  : factor of voltage drop (See **Table H2.9.6-1**)

2 (omitted)

Table H2.9.6-1 Factor ( $\delta$ ) of *a.c.* Voltage Drops in Rubber Insulated Cables

Nominal sectional area of conductor ( $mm^2$ )	Power factor (%)							Inductance ( $mH/km$ )
	100	95	90	85	80	75	70	
1.5	1.00	0.95	0.90	0.85	0.81	0.76	0.71	0.370
2.5	1.00	0.95	0.91	0.86	0.81	0.76	0.71	0.341
4	1.00	0.96	0.91	0.86	0.81	0.76	0.71	0.317
6	1.00	0.96	0.91	0.86	0.82	0.77	0.72	0.299
10	1.00	0.96	0.92	0.87	0.83	0.78	0.73	0.279
16	1.00	0.97	0.93	0.89	0.84	0.79	0.75	0.263
25	1.00	0.98	0.95	0.90	0.86	0.82	0.77	0.259
35	1.00	0.99	0.96	0.92	0.88	0.84	0.80	0.250
50	1.00	1.01	0.98	0.95	0.91	0.87	0.83	0.248
70	1.00	1.03	1.02	0.99	0.96	0.93	0.89	0.240
95	1.00	1.07	1.06	1.04	1.02	0.99	0.96	0.240
120	1.01	1.10	1.11	1.10	1.08	1.06	1.03	0.235
150	1.01	1.13	1.15	1.15	1.14	1.12	1.10	0.235
185	1.02	1.18	1.21	1.23	1.23	1.22	1.20	0.234
240	1.04	1.26	1.32	1.35	1.36	1.37	1.36	0.230
300	1.05	1.35	1.43	1.48	1.51	1.53	1.53	0.229

### EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 June 2012.