29.03.2006

Mechanical properties and chemical composition of Ruukki's steel pile RR170/10 S440J2H

1. Back ground information

The statistical data of mechanical properties of Ruukki's steel pile RR170/10 S440J2H was collected from the manufacturing control data from the time period 1st of June 2004 until 29th of March 2006. The chemical composition values are based on typical values of material S440J2H.

2. Mechanical properties of steel grade S440J2H

The mechanical properties of Ruukki's pile material S440J2H compared to standard steel grades according to EN 10219 are shown in table below.

Mechanical properties					
	Yield strength	**Tensile strength**	**Elongation**	**Impact strength**	
	N/mm^2	**N/mm^2**	**A5 %**	**°C[1)]**	**J[2)]**
S440J2H					
guaranteed value	440	490-630	17	-40	27
measured values:					
mean value	489	536	24	-40	258
standard deviation	18	10	1.3		20
minimum value	443	508	21		205
maximum value	537	563	27		310
Minimum values according to EN 10219					
S355J2H EN10219	355	490-630	20	-20	27
S420MH EN10219	420	500-600	19	-20	40
S460MH EN10219	460	550-720	17	-20	40
The impact strength test of RR-piles is carried out in accordance with EN 10045-1. 1) Testing temperature 2) Minimum average value of absorbed energy (J) for standard test piece 10x10 mm^2					

Rautaruukki Oyj
Suolakivenkatu 1 • P.O. Box 138
FI–00811 Helsinki
Finland
Tel. +358 20 5911
Fax +358 20 592 9088
www.ruukki.com
Business ID 0113276–9
VAT No. FI 01132769
Registered Office Helsinki

3. Chemical composition of steel grade S440J2H

The chemical composition of Ruukki's pile material S440J2H compared to standard steel grades according to EN 10219 are shown in table below.

Chemical compositions													
	C	**Si**	**Mn**	**P**	**S**	**Nb**	**V**	**Al_{min}**	**Ti**	**Ni**	**Mo**	**N**	**CEV**
The steel grade S440J2H for RR-piles													
Typical %	0.07	0.18	1.4	0.01	0.006	0.02	0.004	0.03	0.014	0.04	0.001	0.004	0.3
Maximum %	0.18	0.25	1.6	0.02	0.018	-	-	0.020	-	-	-	-	0.39
S355J2H EN 10219													
Maximum %	0.22	0.55	1.6	0.035	0.035	-	-	0.020	-	-	-	-	0.45
S420MH EN 10219													
Maximum %	0.16	0.5	1.7	0.035	0.03	0.05	0.12	0.020	0.05	0.3	0.2	0.02	0.43
S460MH EN 10219													
Maximum %	0.16	0.6	1.7	0.035	0.03	0.05	0.12	0.020	0.05	0.3	0.2	0.02	-

According to EN 10219-1 there are additional requirement for S460MH steel grade:
V+Nb+Ti ≤ 0.22 % and Mo+Cr ≤ 0.30 %

4. Conclusion

The statistic shows that the mechanical properties of the S440J2H steel grade fulfil the requirements S420MH according to EN 10219-1.

Also the chemical composition requirements for both S420MH and S460MH are fulfilled. And S440J2H material even fulfils the options 1.4 and 1.5 according to EN 10219:

- 1.4: the carbon equivalent for fine grain steels is fulfilled
- 1.5: the ladle analysis V+Nb+Ti ~ 0.01 % and Mo+Cr ~ 0.04 % set for S460 are clearly under requirement

The raw material for S440J2H is from thermomechanically rolled steel.

Ruukki's S440J2H fulfils all the requirements - mechanical properties and chemical composition - set for S420MH according to EN 10219.

Rautaruukki Oyj

Tomi Harju
R&D Manager
Ruukki Construction

tel. +358 20 592 5171
mobile +358 40 549 0263
fax +358 20 592 5656
email: tomi.harju@ruukki.com