Table 3-3
Composition ranges for commonly specified nickel-base filler metals used in the fabrication of DMWs between 9%Cr CSEF steels and austenitic stainless steels [25–27]

Element	ENiCrFe-3 (IN 182)	ERNiCr-3 (FM 82)	ENiCrFe-2 (INCO A)	ENiCrMo-3 (IN 112)	ERNiCrMo-3 (FM 625)	ENiCrCoMo-1 (IN 117)	ERNiCrCoMo-1 (FM 617)	ENiFeCr-4 ERNiFeCr-4 (EPRI P87)
C	0.10 max	0.10 max	0.10 max	0.10 max	0.10 max	0.05–0.15	0.05–0.15	0.08–0.14
Si	1.0 max	0.50 max	0.75 max	0.75 max	0.50 max	0.75 max	1.0 max	0.05–0.50
Mn	5.0–9.5	2.5–3.5	1.0–3.5	1.0 max	0.50 max	0.3–2.5	1.0 max	1.2–1.8
Cr	13.0–17.0	18.0–22.0	13.0–17.0	20.0–23.0	20.0–23.0	21.0–26.0	20.0–24.0	8.5–9.5
Ni	59 min	67 min	62 min	55 min	58 min	Bal.	Bal.	54 max
Nb+Ta	1.0–2.5	2.0–3.0	0.5–3.0	3.15–4.15	3.15–4.15	1.0 max		0.9–1.4
Fe	10.0 max	3.0 max	12.0 max	7.0 max	1.0 max	5.0 max	3.0 max	38–42
Ti	1.0 max	0.75 max			0.40 max		0.60 max	0.05 max
P	0.03 max	0.03 max	0.03 max	0.02 max	0.02 max	0.03 max	0.03 max	0.01 max
S	0.015 max	0.015 max	0.02 max	0.03 max	0.015 max	0.015 max	0.015 max	0.01 max
Mo			0.5–2.5	8.0–10.0	8.0–10.0	8.0–10.0	8.0–10.0	1.8–2.2
Co						9.0–15.0	10.0–15.0	
Cu	0.50 max	0.50 max	0.50 max	0.50 max	0.50 max	0.50 max	0.50 max	0.25 max
B								0.0005–0.02
Al					0.40 max		0.8 to 1.5	0.10–0.20
N								0.02 max

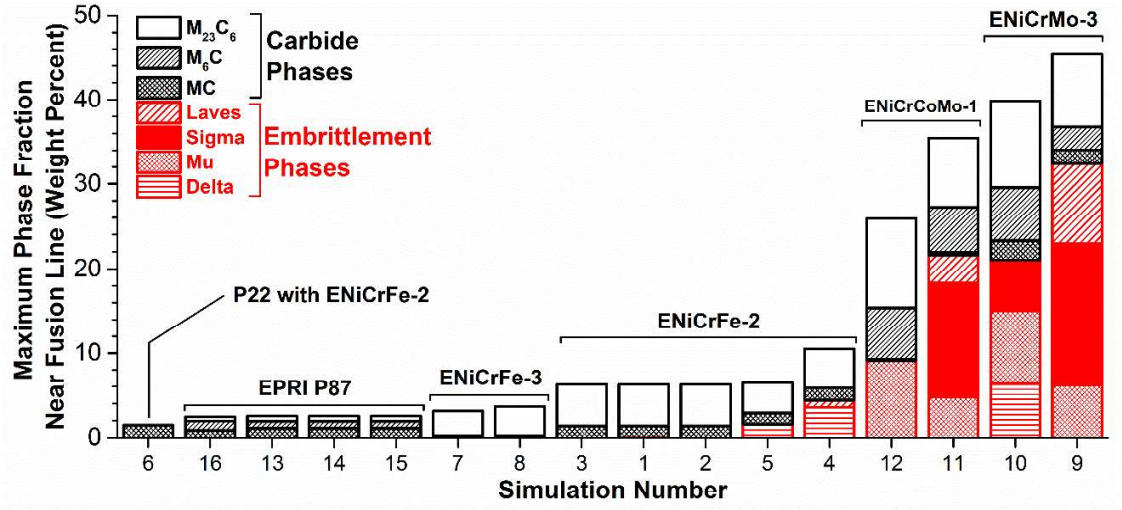

Figure 3-4
Effect of composition on the formation of carbide and embrittling phases at the fusion line between ferritic steels and commonly specified nickel-base filler metals (simulation conditions listed in Table 3-4) [24]

Table 3-4
Descriptions for the DMW simulations in Figure 3-4 [24]

Simulation	Ferritic Material	Weld Metal	PWHT[1,2]	Service Simulation[3]
1	Grade 91	ENiCrFe-2	None	625°C (1157°F)
2			675°C (1247°F)	625°C (1157°F)
3			760°C (1400°F)	625°C (1157°F)
4				550°C (1022°F)
5	9%Cr-1Mo			625°C (1157°F)
6	Grade 22		730°C (1346°F)	550°C (1022°F)
7	Grade 91	ENiCrFe-3	760°C (1400°F)	550°C (1022°F)
8				625°C (1157°F)
9		ENiCrMo-3		550°C (1022°F)
10				625°C (1157°F)
11		ENiCrCoMo-1		550°C (1022°F)
12				625°C (1157°F)
13		ENiFeCr-4 (Code Case 2734)	None	625°C (1157°F)
14			675°C (1247°F)	625°C (1157°F)
15			760°C (1400°F)	625°C (1157°F)
16				550°C (1022°F)

1 PWHT = Post Weld Heat Treatment
2 All PWHT simulations = 4-hour duration
3 All service simulations = 50,000-hour duration