Reheating Furnace Hearth Loading and Residence Time

Steel held on the hearth of a reheating furnace from its dimensions, stock thickness and coverage, the residence time at a throughput and the specific hearth rating.

Method: Reheating furnace inventory relations

Input parameters

Unit system: SI

Parameter	Value	Unit
Throughput	150.00	t/h
Effective hearth length	30.000	m
Effective hearth width	12.000	m
Stock thickness	220.00	mm
Hearth coverage	85.000	%
Steel density	7,850.0	kg/m³

Calculated results

Parameter	Value	Unit
Steel on the hearth	528.46	t
Residence time	3.5231	h
Hearth rating	416.67	kg/(m²·h)
Hearth area	360.00	m²

Notes for this case

• Steel on hearth = L·W·coverage·thickness·ρ; residence time = held mass / throughput. Residence time must cover heating to a uniform temperature, roughly in proportion to thickness (often 8–12 min per 10 mm for slabs heated from both faces); hearth ratings of about 400–700 kg/(m²·h) are usual for walking-beam furnaces.

Formula and method

$$m_h = LWft\rho, \quad t_r = \frac{m_h}{\dot{m}}, \quad \frac{\dot{m}}{A} = \frac{\dot{m}}{LW}$$

Variables

$\dot{m}$	Throughput	kg/s
L	Effective hearth length	m
W	Effective hearth width	m
t	Stock thickness	m
f	Hearth coverage	-
ρ	Steel density	kg/m³
m_h	Steel on the hearth	kg
t_r	Residence time	s
$\dot{m}/A$	Hearth rating	kg/(m²·s)
A	Hearth area	m²

Method and standards

Hearth loading.

Assumptions and limits

- Uniform stock and coverage along the hearth.

References

Reheating furnace inventory relations

Report details

Report reference	FCC-XTP7-VE35 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/materials/steelmaking-foundry/reheating-furnace-hearth-loading

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.