

**HLQ**

INDUCTION HEATING EQUIPMENT

Induction vs Flame Straightening for Bridges and Shipbuilding

Both methods correct distortion by local heating and controlled contraction. They differ in how heat enters the steel, how repeatable the heat input is, and what the work site needs. The temperature limit of the steel applies to both.

**1200 °F**

(650 °C) bridge carbon steel
limit

1100 °F

A514 / A709 Gr 100 limit

25–60 kW

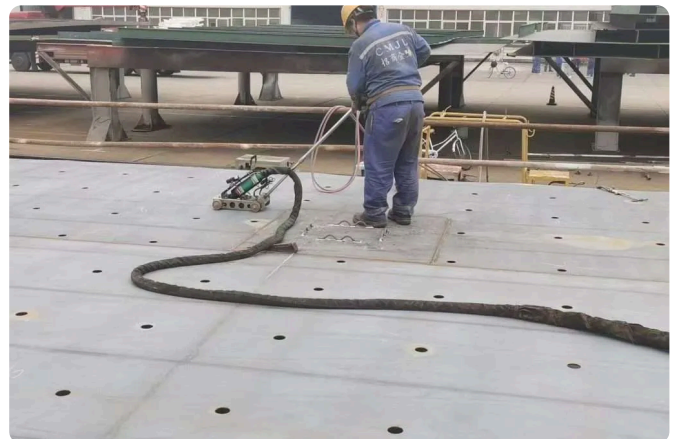
HLQ DWS-P handheld

20–40 m

remote cable

01 Side-by-side comparison

Parameter	Induction	Flame (oxy-fuel)	Engineering impact
Heat source	Eddy currents inside the steel under the coil	Torch flame heats the surface	Induction heat input is set by power and time
Heat control	Power and time set per spot	Depends on torch, tip, distance, travel speed	Repeatability between operators
Temperature limit	Same limit as flame	Same limit as induction	Limits come from the steel, not the method
Site supply	380 V 3-phase, cooling water	Oxygen and fuel gas	Plan utilities on deck or bridge
Mobility	20–40 m cable, 2.2–4.5 kg head (DWS-P)	Gas hoses, light torch	Reach and handling
Open flame	None	Yes	Fire watch, confined spaces
Safety standards	IEC 60519 series	ANSI Z49.1, NFPA 51	Different hazard controls



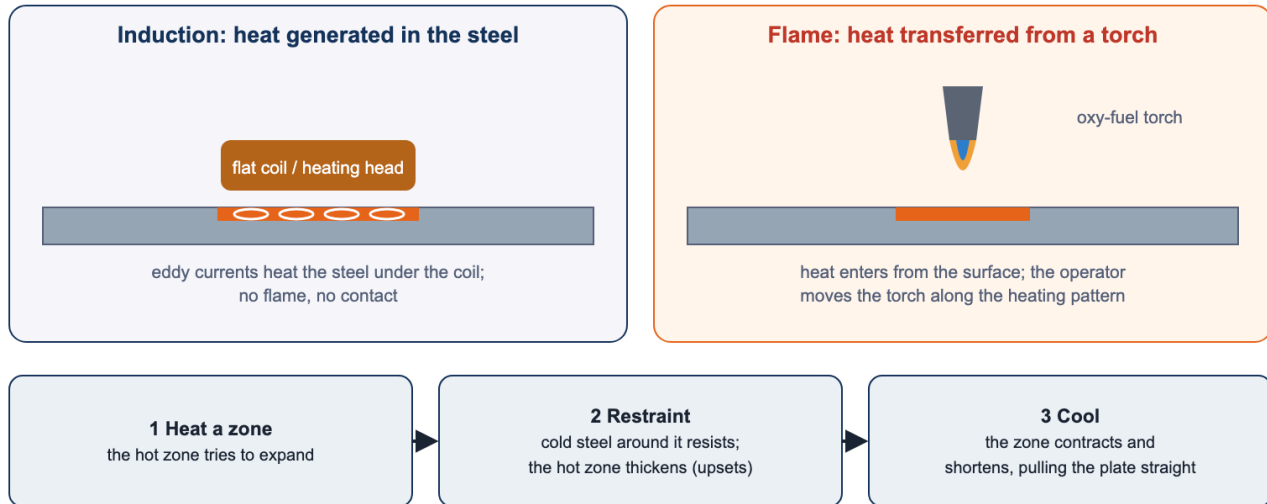
HLQ induction straightening on a ship deck and on a steel structure (original HLQ images).

02 Same mechanism, different heat source

Induction vs Flame Straightening – Working Principle

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Both heat a local zone; they differ in how heat enters the steel. Straightening comes from restrained expansion and contraction.



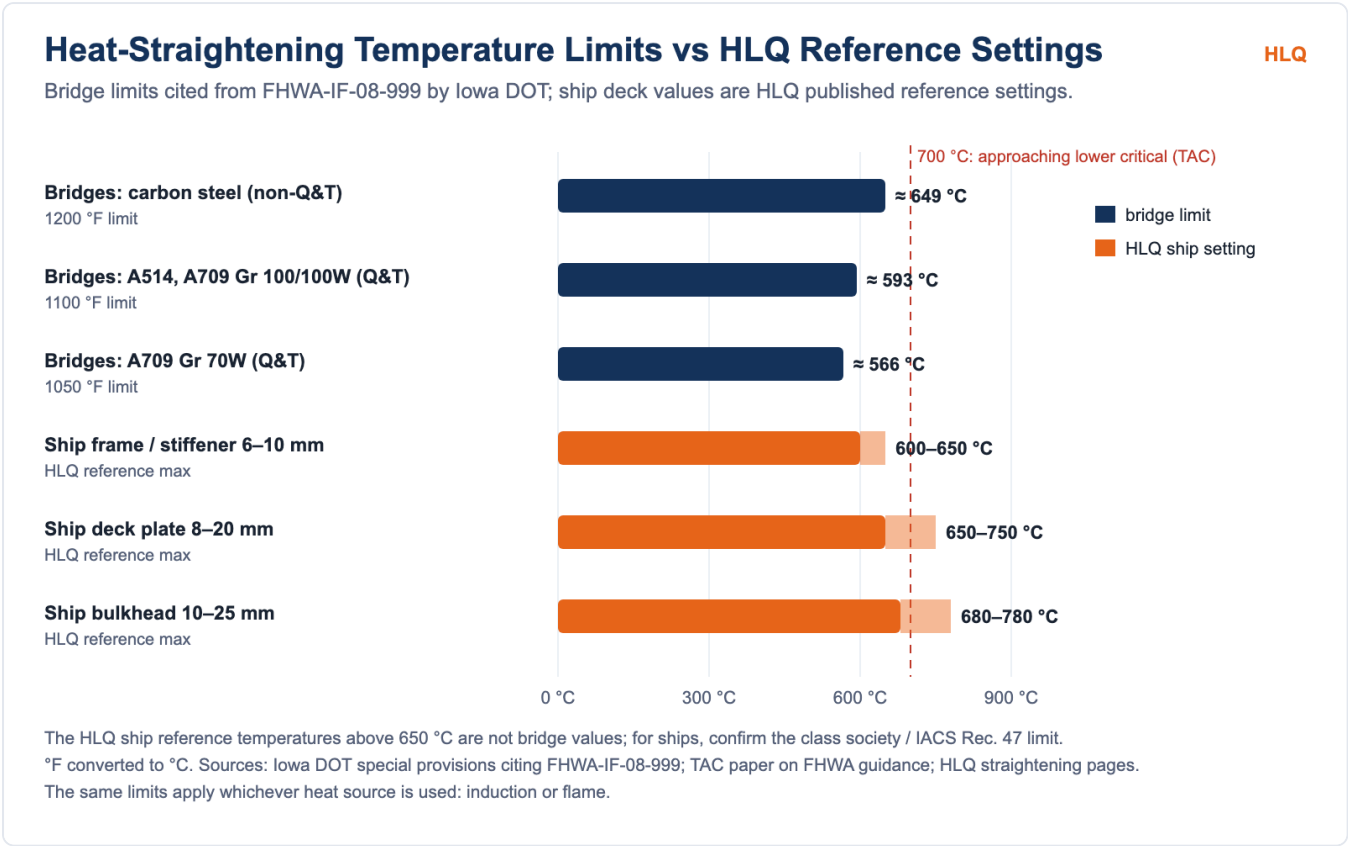
The straightening mechanism is the same for both methods; only the heat source, its control and the working conditions differ.

Temperature must stay within the approved limit for the steel (see FHWA heat-straightening guidance for bridges, class rules for ships).

Schematic, not to scale.

A heated zone tries to expand, is restrained by the cold steel around it and thickens; on cooling it contracts and pulls the plate straight. Induction generates that heat inside the steel; a torch delivers it from outside.

03 Temperature limits and settings



Steel (bridges)	Max. heat-straightening temperature	Source
Carbon steels (non-Q&T)	1200 °F (≈ 650 °C)	Iowa DOT provisions citing FHWA-IF-08-999
A514, A709 Gr 100 / 100W (Q&T)	1100 °F (≈ 593 °C)	Iowa DOT provisions citing FHWA-IF-08-999
A709 Gr 70W (Q&T)	1050 °F (≈ 566 °C)	Iowa DOT provisions citing FHWA-IF-08-999

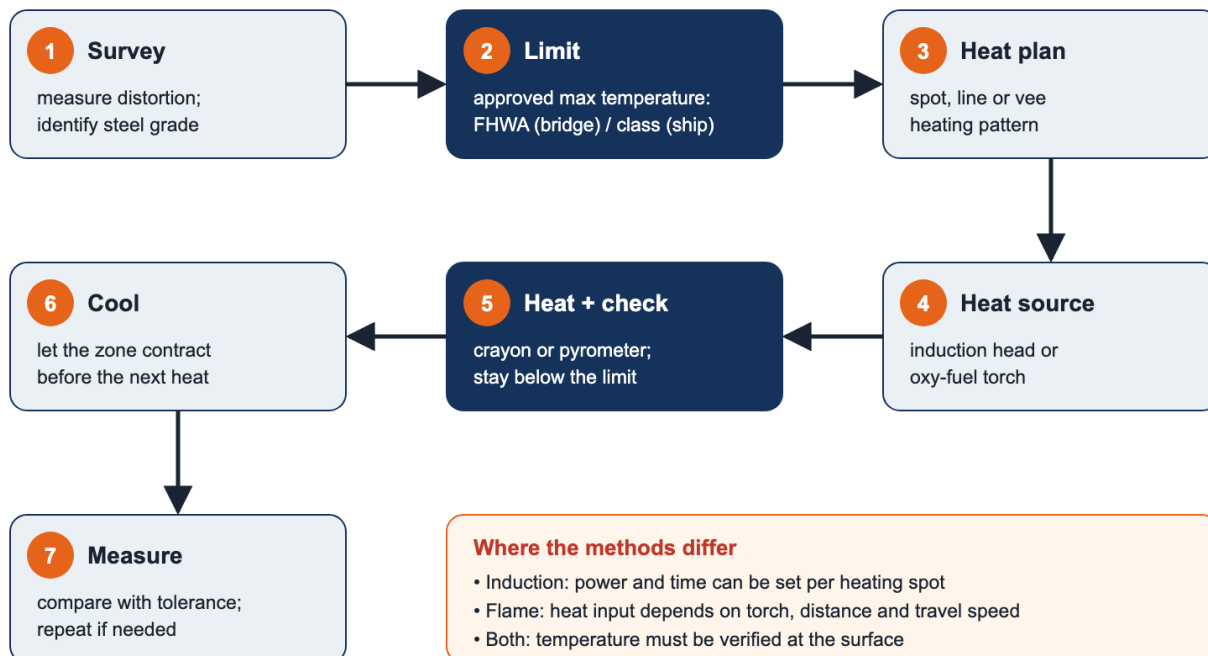
For ships, IACS Rec. 47 (section 6.5) sets maximum surface temperatures for line heating; confirm the value with the class society.

04 Procedure and site setup

Heat-Straightening Procedure – Induction or Flame

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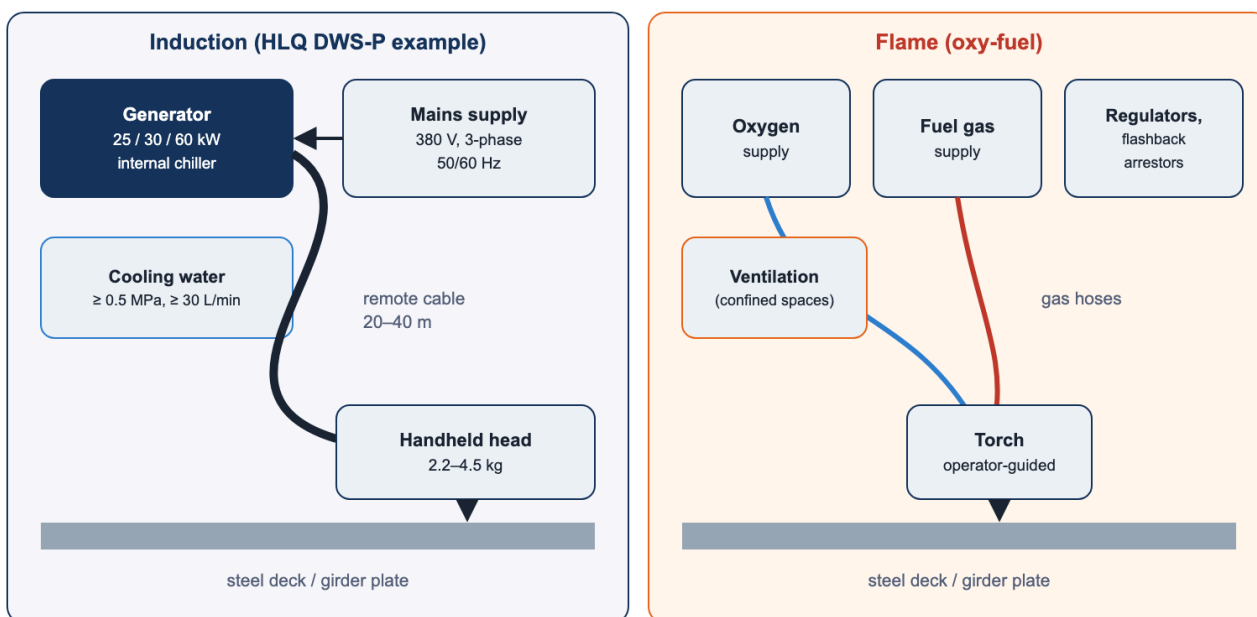
The procedure is the same; the heat source changes how consistently each step can be repeated.



Site Setup – Induction vs Flame Straightening

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Schematic, not to scale. Typical equipment on a ship deck or bridge work platform.



Induction data: HLQ DWS-25P / 30P / 60P handheld remote heater page. Oxy-fuel safety: ANSI Z49.1 and NFPA 51; induction installations: IEC 60519 series. Published DWS duty cycle 50%; check the duty definition for long straightening runs.

05 HLQ induction straightening equipment

DWS handheld	DWS-25P	DWS-30P	DWS-60P
Max. input power	25 kW	30 kW	60 kW
Output frequency	20–50 kHz	20–50 kHz	20–50 kHz
Remote cable	20 m	20–40 m	20–40 m
Duty cycle (published)	50%	50%	50%
Cooling water	≥ 0.5 MPa, ≥ 30 L/min	≥ 0.5 MPa, ≥ 30 L/min	≥ 0.5 MPa, ≥ 30 L/min
Heating head weight	2.2 kg	2.7 kg	4.5 kg

Straightening system	Small	Medium	Large
Power	25–50 kW	50–100 kW	100–300 kW
Frequency	5–15 kHz	2–8 kHz	0.5–5 kHz
Steel thickness	up to 15 mm	up to 30 mm	up to 60 mm
Mobility	portable / cart	semi-portable	fixed / crane assisted

HLQ published data (handheld remote heater page and induction straightening machines page).

06 Frequently asked questions

Is induction straightening better than flame straightening?

For repeated, documented heating of decks and plates, induction gives settable heat input without an open flame; flame is simpler to deploy and needs no electrical supply.

Does induction allow higher temperatures?

No. The steel's limit applies to both methods, e.g. 1200 °F for bridge carbon steels per FHWA guidance.

Can induction straighten bridge girders?

Yes, within the FHWA temperature limits and an approved heating plan; heavy sections may need larger systems.

What does an induction site need?

380 V 3-phase power and cooling water; HLQ DWS-P heads work 20–40 m from the generator.

Why still use flame?

Flame needs only gas supply and suits access-limited or occasional work.

Which standards apply?

IEC 60519 for induction installations; ANSI Z49.1 and NFPA 51 for oxy-fuel work.

Why choose HLQ

Handheld systems

DWS-25P / 30P / 60P.

Long reach

20–40 m cable.

No open flame

Electric heating.

Settable heat

Power and time.

Larger systems

Up to 300 kW.

Honest advice

Limits first.

Plan an induction straightening trial

Send us the structure, steel grade, plate thickness, distortion and approved temperature limit. We will propose the system, heating head and trial plan.

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Please include in your inquiry

- Bridge or ship, structure type
- Steel grade and plate thickness
- Distortion and tolerance
- Approved temperature limit
- Site power and water