

### Cold Weather Concreting

Quad-Lock walls can be poured in freezing weather under certain conditions. Concrete requires a certain minimum temperature to begin the chemical reaction required to begin the curing process. Mix designs with higher cement content can be placed at lower ambient air temperatures. Consult the table below for minimum temperature conditions.



Concrete must arrive at the site sufficiently warm to be placed at or above this minimum. It is advisable to include air entrainment in the mix design, if concrete is expected to be exposed to freezing temperatures. Under these conditions, the insulating qualities of the Quad-Lock Panels should sufficiently insulate the concrete long enough for the curing process to complete.

Cover the tops of the walls with insulation immediately after the pour to protect from freezing. Exposed steel anchor bolts needed to be insulated to prevent freezing damage to the concrete. Cold temperatures will retard early strength gains of concrete and extend curing times. Consult your ready mix supplier or local cement association representative for more details on cold weather concreting.

| Minimum exposure temperatures for Quad-Lock Walls<br>for concrete placed and surface temperature maintained at 50°F (10°C) for 3 days. |          |   |    |   |     |   |     |   |     |
|--|----------|---|----|---|-----|---|-----|---|-----|
| Minimum ambient air temperature, allowable for Quad-Lock ICF made of 2¼" [57mm] EPS  |          |   |    |   |     |   |     |   |     |
| Thickness of Quad-Lock Wall  |          | Cement Content<br>300 lb/yd <sup>3</sup><br>178 kg/m <sup>3</sup> |    | Cement Content<br>400 lb/yd <sup>3</sup><br>237 kg/m <sup>3</sup> |     | Cement Content<br>500 lb/yd <sup>3</sup><br>296 kg/m <sup>3</sup> |     | Cement Content<br>600 lb/yd <sup>3</sup><br>356 kg/m <sup>3</sup> |     |
| nominal  | actual   | °F  | °C | °F  | °C  | °F  | °C  | °F  | °C  |
| 6" [15]  | 5¾" [14] | 33  | 1  | 27  | -3  | 21  | -6  | 16  | -9  |
| 8" [20]  | 7¾" [19] | 26  | -3 | 18  | -8  | 10  | -12 | 3   | -16 |
| 10" [25]   | 9¾" [24] | 19  | -7 | 9   | -13 | -1  | -18 | -11   | -24 |

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Compiled by Hubert Kustermann\*, Quad-Lock Building Systems Ltd.

| Minimum exposure temperatures for Quad-Lock Walls<br>for <u>Quad-Lock Plus Panels</u> on both sides of wall<br>for concrete placed and surface temperature maintained at 50°F (10°C) for 3 days. |          |   |     |   |     |   |     |   |     |
|--|----------|---|-----|---|-----|---|-----|---|-----|
| Minimum ambient air temperature, allowable for<br>Quad-Lock ICF made of 4¼" [108mm] EPS panels on each side of wall  |          |   |     |   |     |   |     |   |     |
| Thickness of Quad-Lock Wall  |          | Cement Content<br>300 lb/yd <sup>3</sup><br>178 kg/m <sup>3</sup> |     | Cement Content<br>400 lb/yd <sup>3</sup><br>237 kg/m <sup>3</sup> |     | Cement Content<br>500 lb/yd <sup>3</sup><br>296 kg/m <sup>3</sup> |     | Cement Content<br>600 lb/yd <sup>3</sup><br>356 kg/m <sup>3</sup> |     |
| nominal  | actual   | °F  | °C  | °F  | °C  | °F  | °C  | °F  | °C  |
| 6" [15]  | 5¾" [14] | 13  | -11 | 2   | -17 | -11   | -24 | -22   | -30 |
| 8" [20]  | 7¾" [19] | -1  | -18 | -15   | -26 | -32   | -36 | -49   | -45 |
| 10" [25]   | 9¾" [24] | -15   | -26 | -32   | -36 | -52   | -47 | -75   | -59 |

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### Cold Weather Concreting - *cont'd...*

*The previous tables are derived by an interpolation of the values shown in Table 7.3.2 of the "Practitioners Guide to Cold Weather Concreting" in "Manual of Concrete Practice"*

#### **Background Information:**

Depending on the amount of cement content, the chemical process of hydration (hardening) of the cement is producing heat. That energy cannot escape due to the insulating properties of the Quad-Lock forms and insulation on the top of walls. The heat will keep the concrete at temperatures that not only prevent it from freezing, but also ensure proper curing of the freshly poured concrete, as long as the actual ambient temperatures will be above the minimum temperatures shown in the table above.

**Example:** You want to pour an 8" [20cm] R-22 Quad-Lock wall using concrete with a cement content of 500 lb/yd<sup>3</sup> [296 kg/m<sup>3</sup>]. The weather forecast is predicting low temperatures of 5°F [-15°C] over the next days.

**Can you pour?** Look up the table under "Cement Contents 500 lb/yd<sup>3</sup> [296 kg/m<sup>3</sup>]" and across 8" [20cm] and find 10°F [-12°C] as the minimum allowable ambient temperature.

**Answer:** You cannot pour! However, if you were using concrete with a cement content of 600 lb/yd<sup>3</sup> [356 kg/m<sup>3</sup>], the pour will become possible, since the minimum allowable temperature will be lower than the temperature forecasted (3°F versus 5°F [-16°C versus -15°C]).

#### **General Cold Weather Concreting Guidelines:**

- Use air-entrained concrete when exposure to moisture and freezing and thawing conditions are expected.
- Keep surfaces in contact with concrete free of ice and snow and at a temperature above freezing prior to placement.
- Place and maintain concrete at the recommended temperature.
- Place concrete at the lowest practical slump.
- Limit rapid temperature changes when protective measures are removed.
- Contact your Ready Mix Producer to discuss heating water and aggregates, or adding an accelerating admixture, increasing cement content or using Type III Cement.

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