Cost efficient and reliable fabrication with TM steel

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Long experience in the Netherlands

Zuid Beveland Brug, 1992

Tonnage: 800 t S460M (10-80 mm)
         900 t S355M (10-100 mm)
Proven in imposing bridge projects

Zandhazenbrug

Total delivery: 8,200 t with 6,900 t S460M/ML up to 120 mm
Not only in Steel Construction...

Many other applications profit from TM Steels:
Pipelines, Offshore Platforms, Offshore Wind...

⇒ e.g. > 90 % of steel foundations for Offshore Wind built with TM Steel

So, why is TM Steel preferable?
Production – Thermomechanical rolling

**TM ➔ fine grain**

**Hall-Petch relation:**

- Grain size ↓
- Strength ↑
- Toughness ↑
- Excellent weldability

Normalized (N), TM (air), TM (ACC)
Reduction of preheating according to EN 1011-2 method B

- Reduced fabrication time
- Less energy needed
- HIGH COST-EFFECTIVITY
Flame cutting

(e.g. typical DI-MC 460 (~ Gr. 65) with plate thickness ~ 50 mm)

**Recommended temperature management for flame cutting**

<table>
<thead>
<tr>
<th>Steeltype</th>
<th>Plate thickness [mm]</th>
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<tbody>
<tr>
<td>DI-MC</td>
<td>50.0</td>
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</table>

**Chemische Elemente**

<table>
<thead>
<tr>
<th>S Sulphur</th>
<th>C Carbon (&lt;= 0.80)</th>
<th>Mn Manganese (&lt;= 2.10)</th>
<th>Mo Molydenum (&lt;= 1.50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 0.025</td>
<td>0.075</td>
<td>1.6</td>
<td>0.014</td>
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</table>

<table>
<thead>
<tr>
<th>V Vanadium (&lt; 0.4)</th>
<th>Cu Copper (&lt;= 0.80)</th>
<th>Cr Chromium (&lt;= 3.00)</th>
<th>Ni Nickel (&lt; 9.50)</th>
</tr>
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<tbody>
<tr>
<td>0.0010</td>
<td>0.029</td>
<td>0.237</td>
<td>0.052</td>
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</table>

**Preheating temperature or minimum temperature during flame cutting [°C]**

*RT= room temperature

extracted from E-Service Tool from Dillinger Hütte Website
Cold forming:
- Excellent behaviour due to high toughness values

Hot forming:
- No classical hot forming possible due to formation of new grain structure
- but medium-hot forming up to 580 °C

Stress relief heat treatment:
- Temperature: 530 - 580 °C
- Soaking time: max 4 h
Advantages of TM-Steel

**TM ➔ lower carbon equivalent**
- excellent weldability
- no or less preheating
- cost as well as time savings

**TM ➔ high toughness**
- toughness buffer for secure fabrication
- additional construction safety

**TM ➔ improved surface quality**