Non-destructive Testing of Materials Used for Protective Structures Built from High Performance Fibre Reinforced Concrete after the Contact Explosion Loading

**Ltc Eva Zezulová, PhD**
University of Defence, Faculty of Military Technology
Department of Engineer Technologies
Phone: +420-973-443 250
eva.zezulova@unob.cz

**MAJ Jiří Štoller, PhD**
University of Defence, Faculty of Military Technology
Department of Engineer Technologies
Phone: +420-973-443 252
jiri.stoller@unob.cz
**Introduction**

Field tests of the HPFRC slabs

Ultrasonic Pulse Velocity Method

Preparation of slabs, before their testing and loading by TNT explosion

Measurement and evaluation of the velocity of ultrasound propagation

**Conclusion**
Field tests of the slabs made from HPFRC (High Performance Fibres Reinforced Concrete)
Introduction
Field tests of the HPFRC slabs

Ultrasonic Pulse Velocity Method

Preparation of slabs, before their testing and loading by TNT explosion

Measurement and evaluation of the velocity of ultrasound propagation

Conclusion

Test slabs
Introduction

Field tests of the HPFRC slabs

Conclusion

Contribution ID=405

Presentation:

University of Defence
Department of Engineer Technologies

11th ECNDT 2014
PRAGUE

Preparation of slabs, before their testing and loading by TNT explosion

Ultrasonic Pulse Velocity Method

Measurement and evaluation of the velocity of ultrasound propagation

Test slabs
Introduction

Field tests of the HPFRC slabs

Ultrasonic Pulse Velocity Method

Preparation of slabs, before their testing and loading by TNT explosion

Measurement and evaluation of the velocity of ultrasound propagation

Conclusion

The Ultrasonic Pulse Velocity (UPV) testing method

\[ v_L = \frac{L}{t} \text{ [m.s}^{-1}] \]
Preparation of slabs, before their testing and loading by TNT explosion
Measurement and evaluation of the velocity of ultrasound propagation.
Measurement and evaluation of the velocity of ultrasound propagation.
Ultrasonic slabs measurements before and after TNT explosion

Introduction

Field tests of the HPFRC slabs

Ultrasonic Pulse Velocity Method

Preparation of slabs, before their testing and loading by TNT explosion

Measurement and evaluation of the velocity of ultrasound propagation

Conclusion

Izovel Distribution in HPFRC Board no.3 before the explosion
Measurements before detonation

Izovel Distribution in HPFRC Board no.3 after the explosion
Measurements after detonation
Ultrasonic slabs measurements before and after TNT explosion

Fig. 15 Testing slab No.3 after loading by explosion of 70 g of PIInp10 – reverse side.
Ultrasonic slabs measurements before and after TNT explosion

Fig. 17 The slab from the plain concrete C70/85 (150 mm thick) after 200 g PINp10 loading – total destruction of the slab.

Fig. 18 The slab from steel fibre reinforced concrete C80/95 (150 mm thick) after 200 g PINp10 loading.
Ultrasonic slabs measurements before and after TNT explosion.

The HPFRC slab (50 mm thick), the hole at the bottom of the slab is caused by loading of 200 g of PINp10 explosion. The holes surroundings have remained without external or internal cracks.

The HPFRC slab 100 mm thick backside, the top splinter was caused by the 200 g of PINp10 explosion; the by the 250g of PINp10 explosion. Holes surroundings have remained without changing.
Table No. 1: The approximate determination of concrete quality [6]

<table>
<thead>
<tr>
<th>General conditions</th>
<th>Pulse velocity [ft/sec]</th>
<th>General conditions</th>
<th>Pulse velocity [m/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Above 15000</td>
<td>Excellent</td>
<td>Above 4500</td>
</tr>
<tr>
<td>Good</td>
<td>12000 - 15000</td>
<td>Good</td>
<td>3700 - 4500</td>
</tr>
<tr>
<td>Questionable</td>
<td>10000 - 12000</td>
<td>Questionable</td>
<td>3000 - 3700</td>
</tr>
<tr>
<td>Poor</td>
<td>7000 - 10000</td>
<td>Poor</td>
<td>2100 - 3000</td>
</tr>
<tr>
<td>Very poor</td>
<td>Below 7000</td>
<td>Very poor</td>
<td>Below 2100</td>
</tr>
</tbody>
</table>
Introduction

Field tests of the HPFRC slabs

Ultrasonic Pulse Velocity Method

Preparation of slabs, before their testing and loading by TNT explosion

Measurement and evaluation of the velocity of ultrasound propagation

Conclusion

Questions?

Ltc. Eva Zezulová, Ph.D.
University of Defence, Faculty of Military Technology
Department of Engineer Techlogies
Phone: +420-973-443 250
eva.zezulova@unob.cz

Technology in the Building Industry,
Building Constructions