REFERENCE PANEL

GUIDANCE NOTES

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CONCRETE FINISHES

to

National Structural Concrete Specification

Edition 4
CONSTRUCT Concrete Structures Group Limited is an association, membership of which is based on specialist concrete contractors and associated companies in the supply chain, notably those in the ready mixed concrete, formwork and reinforcement industries. Its objectives are to promote excellence in concrete structures and to introduce measures which will improve construction efficiency and productivity.

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The members of CONSTRUCT identified the need for physical reference panels to demonstrate typical finishes. The DETR agreed and offered 50% funding for a project to produce and locate panels at strategic sites throughout the UK. The National Concrete Frame Specification (NCFS) and subsequently, the National Structural Concrete Specification for Building and Construction, adopted the standards for concrete finish given in BS 8110 Structural Concrete and the reference panels and guidance notes have been produced for use with both specifications.

These notes have now been updated so that they are in accordance with the NSCS 4th Edition which has adopted BS EN 13670 Execution of Concrete Structures.
CONCRETE FINISHES - REFERENCE PANELS

GUIDANCE NOTES FOR INTERPRETATION AND USE

(Refer also to NSCS Standard Specification clause 8.6.1 and BS EN 13670: 2009 clause 8.8)

Introduction

These panels constitute a realistic, consistently achievable standard as a benchmark for the benefit of the construction industry. They represent interpretations of the most often used finishes in situ concrete, agreed by a committee of experienced, professional practitioners appointed by CONSTRUCT.

It is impossible to produce panels with a perfect finish straight from the formwork. Neither is it practical to produce panels with a ‘just acceptable’ range of blemishes such as blowholes, surface irregularities, colour variation and arris lines. The panels produced have therefore been assessed in conjunction with these guidance notes. They should be reviewed from a standard distance of 3 metres and the prevailing light and ambient conditions should be taken into consideration.

Information on the materials and methods used are only for background information. The panels are considered to be representative, irrespective of the type of material, methods and reuses of formwork used.

Index

| Introduction ............................. Page 1 | Plain Finish Panels ................. Pages 6-7 |
| Details of Panels ..................... Pages 2-3 | Locations ................................ Pages 8-9 |
| Ordinary Finish Panels........ Pages 4-5 |

These panels were provided by CONSTRUCT Concrete Structures Group Ltd in association with Department of the Environment Transport and the Regions under a Partners in Technology contract.

The site has been generously provided by the University of Paisley. CONSTRUCT gratefully acknowledges their co-operation and support.
WALL ELEVATION

FORMWORK ELEVATION

SECTION 1 - 1

SECTION 2 - 2

NOTES

1. CONCRETE TO BE GRADE C 35 TO BS 5328.
2. REINFORCEMENT TO BE HIGH YIELD.
3. COVER TO ALL BARS TO BE 40mm.
4. MANUFACTURER TO PROVIDE SPACERS BETWEEN REINFORCEMENT MATES AS REQUIRED, AND TAKE THE FORM OF REINFORCEMENT U BARS. ALL THE WIRE ENDS MUST BE TURNED IN AWAY FROM THE PANEL FORMWORK SURFACE.
5. BOLT HOLES FOR FORMWORK TO BE PLASTIC WITH CONES.
6. ONE BOLT HOLE TO BE FILLED FLUSH (ON BOTH SIDES), AND ONE BOLT HOLE TO BE FILLED AND NEATLY RECESSSED TO WITHIN 10mm BELOW SURFACE (ON BOTH SIDES).
7. LIFTING SOCKETS TO BE C.C.L M20 SOCKETS COMPLETE WITH 400mm LONG HARMONIOUS T12 SHAFTS ALL IN ACCORDANCE WITH MANUFACTURER SPECIFICATIONS OR SIMILAR AGREED.
8. TOTAL PANEL WEIGHT APPROX. 1.80 TONNES.
9. TWO PANELS TO BE CONSTRUCTED AS FOLLOWS:

<table>
<thead>
<tr>
<th>PANEL FINISH</th>
<th>EACH</th>
<th>FORMWORK</th>
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<tr>
<td>ORDINARY</td>
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10. PANELS MUST BE CONSTRUCTED IN THE VERTICAL POSITION AS WALL PANELS WITH TOP & BIM POSITIONS AS MARKED.
11. FORMWORK TO BE OF THE SAME CONSTRUCTION TO ALL PANELS.
## DETAILS OF PANELS - CONSTRUCTION DETAILS (Scotland)

### CONCRETE C28/35

**Materials:**
- Cement: CEM III A (Castle, Clyde (with 40% ggbs))
- Aggregate: 20-5 mm. low shrinkage gravel (Russel, Cambusmore)
- Sand: Low shrinkage sand (Russel, Cambusmore)
- Admixture: Grace Construction Products WRDA30

**Mix details:**
- 325kg/m³ cement; w/c .50; agg/cem 5.87; 38.8% sand

### FORMWORK

**Design:**
- Pour rate: Both finishes, Full hydrostatic
- Consistence: Both finishes, 75mm Slump
- Temperature: Both finishes, Concrete +5°C; Air 5-25°C

**Materials:**
- Face Sheeting:
  - Ordinary finish: Douglas fir G1S plywood
  - Plain finish: Resin impregnated paper faced plywood (Pourform)
- Secondary support: Both finishes, Timber 100mm x 75mm nominal PAR
- Primary support: Both finishes, Steel Soldiers - RMD
- Release agent:
  - Ordinary finish: Chemical - Romoil
  - Plain finish: Chemical - Romoil

### REINFORCEMENT

**See Page 2** Both panels

### CONSTRUCTION

**Delivery:**
- Concrete: Both finishes, Ready-mixed (approx 20 min. travel)

**Consistence:**
- Concrete: Both finishes, 75mm Slump

**Placing:**
- Concrete: Both finishes, Crane and skip

**Pour Rate:**
- Concrete: Both finishes, 6 m/hr

**Compaction:**
- Concrete: Both finishes, Internal vibrator - 65mm internal petrol driven.

**Temperature:**
- Both finishes, Concrete (unknown); Air 14°C

**Striking:**
- Formwork: Both finishes, Approx 60 hours
ORDINARY FINISH - GUIDANCE

This is for use where visual quality is not important or it is to receive applied finishes. It is recommended that this finish is not used where surfaces are only to be painted. The use of small panel forming systems is considered suitable for producing this finish. Joints between formwork panels will show and the step may be up to 5mm. Grain marks are generally due to slight absorbance variations causing local colour variation, but the surface is generally smooth. Panels and bolt holes may not be a regular pattern. Colour of the finish will vary with the concrete delivered, the release agent used and reuse of the forming material. Project sample panels should not be specified for this finish. As the concrete finish is not important visually, making good is acceptable and so blowholes and minor surface blemishes can either be dealt with or accepted untreated by agreement between the CA and Constructor based on achieving an overall standard similar to the reference panels. If a system formwork is to be used eg Peri Trio/Duo, the finish of the formwork will generally be acceptable and the CA is expected to be aware of its quality.
ORDINARY FINISH - INTERPRETATION (Scotland)

These panels are typical of what should be expected of an Ordinary finish, subject to the comments below

**Surface Blemishes**

Note: Mastic sealing of joints in formwork would reduce grout loss at edges

**Abrupt Irregularities**

Some should be expected at ply joints

**Making Good**

Typical bolt hole making good shown - recessed and flush

**General**

Good panels which more than meet the requirements for Ordinary finish
PLAIN FINISH - GUIDANCE

A Plain finish is for use where visual quality is of some importance such as areas occasionally seen or to be directly painted. The use of sheet material to limit jointing in forming material is considered suitable for producing this finish. In any one visible elevation the sheets should be of the same type and have had the same number of previous uses. Joints between formwork panels will show and the step may be up to 3mm. Tie-bolt holes should ideally be recessed, or alternatively filled flush, although this may not be so aesthetically pleasing. Panels and bolt holes should be in a regular pattern. Colour of the finish will change with concrete delivered and reuse of the forming material. A special product sample panel should not be specified for this finish, but a project example should be produced as one of the first areas of concrete poured on the project and used as the benchmark for the rest of the concrete.
These panels are typical of what should be expected of a Plain finish, subject to the comments below

**Surface Blemishes**

Note: Mastic sealing of joints in formwork would reduce grout loss at edges

- Large blowholes might need making good if required
- Handling/storage marks

**Abrupt Irregularities**

- Ply joints within Specification
- Mechanical damage may need making good if required

**Colour**

Note: Mastic sealing of joints in formwork would reduce edge and joint discoloration

- Darkening at arrises, bolt holes and ply joint might need making good for exposed finish
- Mottling to be expected on first use

**General**

- More small blowhole blemishes than normally expected but they are within the Specification
### LOCATION OF ALL SITES IN UK DISPLAYING PANELS

<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
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<tr>
<td>London South</td>
<td>The Medway School of Engineering&lt;br&gt;Medway University Campus&lt;br&gt;University of Greenwich&lt;br&gt;Chatham Maritime, Kent ME4 4TB</td>
<td>020 8331 8368</td>
<td><a href="mailto:t.d.stevens@gre.ac.uk">t.d.stevens@gre.ac.uk</a></td>
<td>Tony Stevens</td>
</tr>
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<tr>
<td>Central England</td>
<td>PERI Ltd&lt;br&gt;Market Harborough Road&lt;br&gt;Clifton upon Dunsmore&lt;br&gt;Rugby CV23 0AN</td>
<td>01788 861600</td>
<td><a href="mailto:peter.stenning@peri.ltd.uk">peter.stenning@peri.ltd.uk</a></td>
<td>Peter Stenning</td>
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<tr>
<td>North East England</td>
<td>University of Sheffield&lt;br&gt;Sir Frederick Mappin Building&lt;br&gt;Mappin Street&lt;br&gt;Sheffield S1 3JD</td>
<td>0114 225 754</td>
<td><a href="mailto:k.nash@sheffield.ac.uk">k.nash@sheffield.ac.uk</a></td>
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<tr>
<td>Scotland</td>
<td>University of Paisley&lt;br&gt;High Street&lt;br&gt;Paisley PA1 2BE</td>
<td>0141 848 3280</td>
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LOCATION OF PANELS

Scotland
University of Paisley
Paisley Campus
Glasgow

North East England
University of Sheffield
Mapping Street
Sheffield

Central England
PERI Ltd
Clifton upon Dunsmore
Nr Rugby

London South
Medway University Campus
University of Greenwich
Chatham Maritime