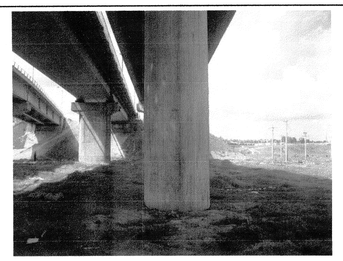
INTERVENTION WORK: C4- PIERS CONCRETE REPAIR

The item covers the following activities:
- Sounding of concrete to locate areas of delamination;
- preparation and cleaning of surface by means of sand blasting and water washing and/or concrete removal by means of hydrodemolition;
- loading and transport of the material resulting from the demolition to an approved dump area;
- procurement, transport,storage and handling of all related materials and equipment;
- epoxy and polyurethane compounds application;
- application of a corrosion inhibitor and a cementitious mortar where concrete is removed;
- verifications after execution in accordance to the design;
- sampling and laboratory testing.

DETERIORATION:



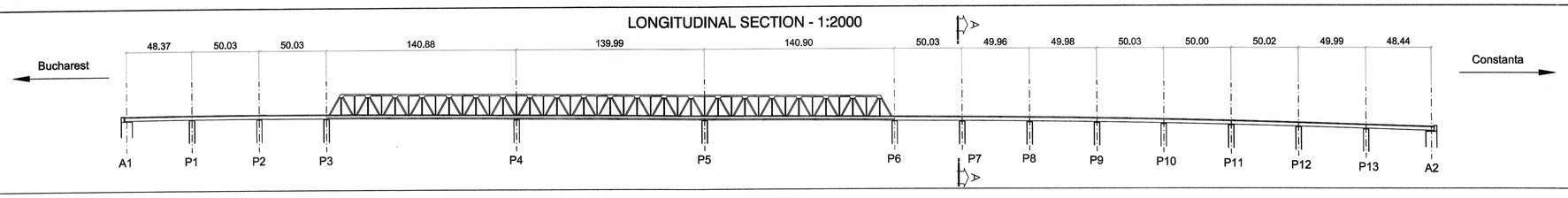
Spalling and corrosion on a viaduct concrete pier

IVANESCU T. TOMA ROMANIA MLPAT DCLR NR. 445 AA, 82, 08 INGINER VERIFICATOR PROIECTE

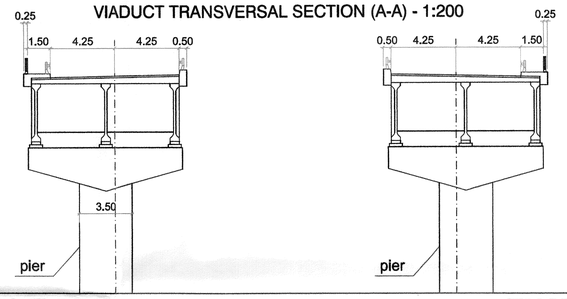
14-11-2008

GENERAL VIEWS

LONGITUDINAL SECTION - 1:2000



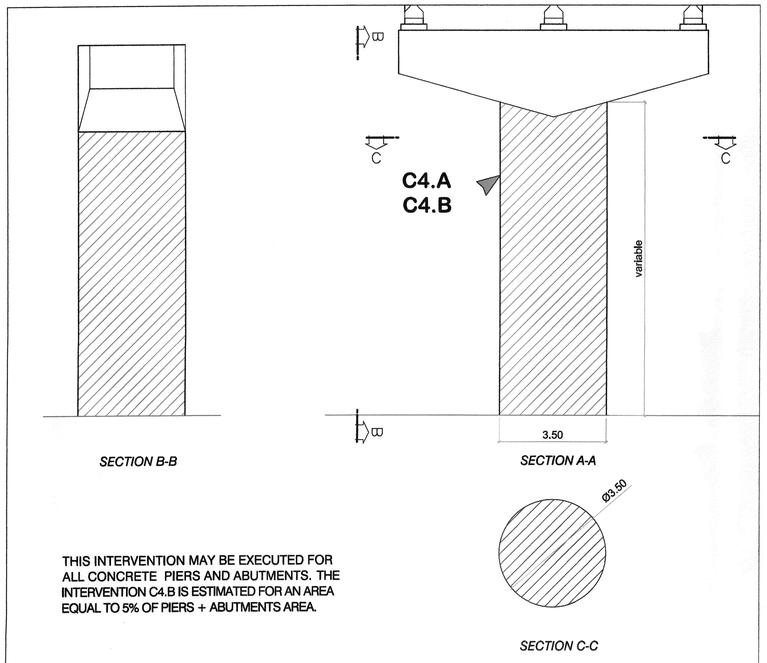
VIADUCT TRANSVERSAL SECTION (A-A) - 1:200



WORKING CODE LIST

CODE	MAINTENANCE AND REHABILITATION WORKS	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
	ROAD FINISHES AND EQUIPMENT										
A1	Painting of pedestrian parapet										
A2	Replacement of pedestrian parapet										
A3	Guard rail replacement										
A4	Electrical equipment replacement										
A5	Walkway slab substitution										
	PAVEMENTS										
B1	Roadway pavement and waterproofing replacement										
B2	Roadway superficial drainage rehabilitation										
B3	Walkway pavement replacement										
B4	Expansion joints replacement										
B5	Bearings replacement										
	CONCRETE REPAIR										
C1	Deck slab repair										
C2	Prestressed concrete beams repair										
C3	Pier caps concrete repair										
C4	Piers concrete repair								■		
C5	Tower leg concrete repair										
C6	Structural strengthening										
C7	Superstructure replacement										
	STEEL WORKS										
D1	Painting of steel structures										
D2	Stay cables maintenance										
D3	Strengthen of anchor bolts										
D4	Rehabilitation of inspection gantry and rails										
	EARTHWORKS										
E1	Ashlar stoneworks repair										
E2	Repair of strutture connection with embankment										
E3	Cone quarters rehabilitation										
E4	Rehabilitation of storm water collecting system										
E5	River bank improvement										

INTERVENTION DETAILS

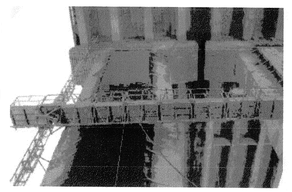


THIS INTERVENTION MAY BE EXECUTED FOR ALL CONCRETE PIERS AND ABUTMENTS. THE INTERVENTION C4.B IS ESTIMATED FOR AN AREA EQUAL TO 5% OF PIERS + ABUTMENTS AREA.

INTERVENTION ON VIADUCT CONCRETE PIERS - 1:100

INTERVENTION C4.A SEQUENCE - INT C4.A :
1 - Sounding of concrete to locate areas of deterioration (spalling, honeycomb, corrosion);
2 - Concrete sand blast cleaning to prepare the surface for receiving protective materials;
3 - Concrete water washing with 1500 psi of pressure to remove oils, grease or other substances;
4 - Application of an epoxy resin primer coat like MASTERSEAL PRIMER PU from BASF or similar;
5 - Application of a polyurethane resin protective coat like MASTERSEAL FORMULA PU from BASF or similar;

INTERVENTION C4.B SEQUENCE - INT C4.B :
1 - Sounding of concrete to locate areas of deterioration (spalling, honeycomb, corrosion);
2 - Hydrodemolition of damaged concrete with 30000 psi of pressure and concrete removal of 4 cm, being atention with reinforcing steel;
3 - Concrete water washing with 1500 psi of pressure to remove oils, grease or other substances;
4 - Application of a modified polymer cementitious monocompound corrosion inhibitor like EMACO NANOCONCRETE AP from BASF or similar;
5 - Application of a thixotropic cementitious mortar with restrained expansion, fiber-reinforced with flexible inorganic fibres, like EMACO FORMULA TIXOFIBER from BASF or similar;
6 - Application of an epoxy resin primer coat like MASTERSEAL PRIMER PU from BASF or similar;
7 - Application of a polyurethane resin protective coat like MASTERSEAL FORMULA PU from BASF or similar;



MASTERSEAL PRIMER PU
Is a solvent-borne two-pack epoxy resin with low viscosity acting as primer for the elastomeric polyurethane coating MASTERSEAL FORMULA PU ans as curing agent for the mortars of the EMACO FORMULA range.
Stir the 2 parts separately, then pour part B (hardener) into part A (base) and use a low-speed mechanical mixer to obtain a smooth mix.
The product must not be diluted; it may be applied by spraying or by roller (for limited areas).

MASTERSEAL FORMULA PU
Is a two-pack elastic solvent-borne polyurethane resin with high solids content by volume, forms a film coating with satin finish having a crack bridging ability and high protective capacity against agents that cause damage to reinforced concrete.
Stir part A well in its can using a low-speed mechanical mixer; ensure that all of part B is emptied into part A and blend together for a couple of minutes, using the mechanical mixer, before application.
The product may be applied by short pile roller or by spray. When using a hand roller, it is advisable to apply 2 sucessive coats at least 12-18 hours apart in excellent environmental conditions (20°C and 65% r.h.).
In airless spraying, the recommended dry thickness of 200-300 µm (micron) may be applied in a single coat.

EMACO NANOCONCRETE AP
Is a single-pack light grey, polymer-modified cementitious primer containing corrosion inhibitors.
Must be applied by brush immediately after having removed the rust. The first coat is applied over the whole length of the bar, using a stiff brush for a thickness of approx. 1mm and the second coat is applied as soon as the first is dry. Then wait for the inhibitor to have set sufficiently before carrying out the repair work with the EMACO FORMULA TIXOFIBER.

EMACO FORMULA TIXOFIBER
Is a ready-mixed air-cured thixotropic cementitious mortar with restrained expansion that is resistant to environmental agents, contains polyacrylonitrile fibres and is reinforced with flexible and durable inorganic fibres. The reinforcement fibres have length 12mm, diameter 14 µm, tensile strength 1700 MPa and modulus of elasticity 72000MPa.
Must be applied onto macroscopically roughened but cohesive surfaces that have been cleaned and satured with water. In the case of extensive surfaces, the product may applied for a thickness from 1 to 5 cm in a single layer using screw or piston sprayers.
During the interruptions in spraying, it is necessary to thoroughly clean the tubes and the pump itself using water under pressure and a soft tube-cleaning rubber ball.

INTERVENTION AND PRODUCTS DESCRIPTION

INVESTOR/INVESTITOR

ROMANIAN NATIONAL COMPANY OF MOTORWAYS AND NATIONAL ROADS
COMPANIA NATIONALA DE AUTOSTRAZI SI DRUMURI NATIONALE DIN ROMANIA

DESIGNER/PROIECTANT

LOUIS BERGER GROUP inc.

CONSULTING SERVICES FOR DESIGN AND WORKS SUPERVISION OF 10 BRIDGES IN DOBROGEA AREA

TECHNICAL DESIGN

B08-BRIDGE A2 BORCEA

TD - B08 - 12

DESIGN TEAM LEADER
Vittorio Ascoli Marcheria

VITTORIO ASCOLI MARCHERIA ORDINE INGEGNERI ROMA N° 12645

CONCRETE REPAIR

CONSULTANTS
SOLIDUS s.r.l. - Roma Italia
Francesco Del Tosto
Romano Tucci

C4
PIERS CONCRETE REPAIR

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data / date	rev.	revision title	des	ver/chk	CP / PC	APPR. AUTHORITY
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