



УНСТИТУТ УМЦ АД
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TESTING REPORT

No. DSM 275/10

Subject of testing:

Production and impregnation of wooden poles
for overhead (power and TT) lines by creosote
oil WEI Type C.

Client:

IMPREGNACIJA AD BEOGRAD - BRANCH
CIĆEVAC
Karađorđeva Street 58
37 210 Cicevac.

Request/Offer/Contract:

No. 41-1754 of November 30, 2010

Contents:

Seven pages altogether, two of which being
attachment.

Report approved by:

Laboratory for testing wood and synthetic
materials

Manager



Grlica Novaković, B.Sc.

Belgrade, December 2010



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1. GENERAL DATA

- 1.1 Subject of testing:
Production and impregnation of wooden poles for overhead (power and TT) lines by creosote oil WEI Type C.
- 1.2 Manufacturer:
IMPREGNACIJA AD BEOGRAD - BRANCH CICEVAC
Karađorđeva Street 58,
37 210 Cicevac.
- 1.3 Date of sampling :
December 8, 2010. Protocol on taking samples LZ DSM 259 No. 027 /10 of
December 8, 2010.
- 1.4 Quantity of samples:
Representatives of the Institute, Mr. Grujica Novaković and Mr. Stevan Zotović,
surveyed the production and impregnation process of wooden poles for overhead
(power and TT) lines by creosote oil WEI Type C and performed the necessary
measurements-tests on December 8, 2010 in the company IMPREGNACIJA AD
BEOGRAD – BRANCH CICEVAC.
- 1.5 Starting date of the testing period:
December 8, 2010.
- 1.6 Tests performed by:
Novaković Grujica, B.Sc.
Zotović Stevan, B.Sc.
- 1.7 Issuing date of the Report:
December 22, 2010.
- 1.8 Testing methods and testing scope:
In order to test production and impregnation quality of wooden poles for overhead
(power and TT) lines by creosote oil WEI Type C, following tests were performed
pursuant to the Client's request:
 - 1.8.1 Tests performed before impregnation (accepting, storing of round timber and its
control at the Company)
 - 1.8.2 Processing of round timber before impregnation.
 - 1.8.3 Testing impregnation agent.
 - 1.8.4 Checking moisture content of poles before impregnation.
 - 1.8.5 Checking impregnation procedure (overall tracking of one batch)
 - 1.8.6 Checking penetration depth of protective agent.
 - 1.8.7 Weighing after impregnation.
 - 1.8.8 Marking of impregnated poles.
 - 1.8.9 Yard storing of impregnated poles.
 - 1.8.10 Impregnation control.



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The tests are regulated by a number of corresponding valid Serbian standards, DIN and EN norms, as well as by electric power industry branch standards – GSE, as for example:

- SRPS D.B2.020 : 1982 Round technical wood. Utility poles.
- SRPS D.A1.041 : 1957 Testing wood. Wood defects. Measuring.
- SRPS D.T4.021 : 1983 Preservation of wood. Impregnation of utility poles.
Preparation and perforation.
- SRPS D.T4.022 : 1959 Preservation of wood. Impregnation of utility poles
by creosote oil.
- GSE-41/81 : 1982 Electric power industry branch standard – Technical conditions
for takeover and impregnation of wooden poles for overhead
utility lines.
- GSE 55/86 : 1986 Electric power industry branch standard – Technical conditions
for takeover and preparation of hardwood poles for overhead
electric power lines.
- GSE 54/86 : 1986 Electric power industry branch standard – Technical conditions
for reimpregnating wooden poles.

In addition to the above mentioned norms, application ways of impregnation agents for wooden poles used for overhead (power and TT) lines in order to extend their service life is regulated by DIN 68 811 : 2007-01 norm, Impregnation by creosote oil WEI Type C.

Moisture content of poles is determined according to:

- SRPS EN 13 183-2:2005 Electrical resistance method.
- SRPS EN 13 183-1:2005 Wood drying method in kilns.

- 1.9 Measuring and regulation equipment
 - 1.9.1 Thermo-hygrometer for measuring surface and fluid temperature, as well as material and air humidity (with thermoresistant, capacitive and conductometric sensors "GANN" Germany, type RTU 600).
 - 1.9.2 Cased measuring tape, range 0 to 5m, serial number M24.
 - 1.9.3 Circometer (perimeter measuring device) "PREISER" Germany, range 20 to 300 mm.
 - 1.9.4 Circometer (perimeter measuring device) "PREISER" Germany, range 300 to 700 mm.



2. TESTING RESULTS

2.1 Acceptance and yard storing of round wood:

Acceptance of wood is performed in accordance with SRPS D.B2.020:1982 norm and Electric power industry branch standards GSE 41/81 and GSE 55/86.

Round utility pole wood is delivered by reliable suppliers. Records are kept on acceptance of logs and the report contains all the essential data:

- Botanical species.
- Time of felling.
- Arrival date.
- Quantity (m³).
- Dimensions.
- Water content (%).
- Person accepting the logs.

Round wood (black and white pine, spruce, fir, larch, chestnut, oak, acacia) is stored at a spacious, clean, level, asphalted or gravelled ground.

Position and construction of base enable proper and slowest possible wood seasoning, which along with continuous air circulation prevent its splitting and deforming. When storing round wood, attention should be paid as follows:

- Round timber is sorted by art and dimension.
- Round pole wood is piled in rows with gaps of 5 to 10 cm.
- Rows are separated by 3 to 4 transversally placed poles.
- Distance between the stacks is at least 1.5 m
- Bases (skids) are made of protected wood and are placed 30 to 40 cm away from the ground.

2.2 Processing of round timber before impregnation

To obtain a proper, good quality poles and to prevent wood deterioration, bark and bast, as well as bigger nubs should be removed from logs within 30 days by a wood peeling machine. After that the poles are worked to dimensions regulated by the mentioned standards. Poles which do not meet criteria of the standards are rejected.

Lower (thicker) end is cut vertically to its axis and edges are slightly rounded – blunted. Upper (thinner) end is cut in shape of a two-layer roof. Poles, processed in that way are stacked, separated according to dimensions and art of wood. Gaps between poles, rows and stacks shall be taken care of for providing a proper seasoning. Poles are prepared for impregnation when moisture content drops under 25% due to atmospheric air exposure.

Acceptance of the prepared poles is performed by a commission consisting of:

- Authorized persons appointed by the buyers or
- Company's person in charge

in accordance with criteria of the SRPS B.B2.020. norm (dimension control, wood faults and moisture content)



2.3 Testing of impregnation agent

The impregnation agent, creosote oil WEI Type C is supplied directly by the manufacturer "RUTGERS", Germany. The agent has been tested by authorized German institutions and "IMPREGNACIJA AD BEOGRAD – BRANCH CICEVAC" is in possession of their relevant certificates and technical instructions.

2.4 Checking moisture content of poles before impregnation

Moisture content of wood (poles) is determined:

- In standard way (with hygrometer and gravimetrically)
- By direct measuring (weighing)

Average moisture content of 25% has been obtained by means of hygrometer "GANN RTU 600". The same moisture content percentage was measured using hygrometer owned by "IMPREGNACIJA AD BEOGRAD - BRANCH ČICEVAC".

2.5 Checking impregnation procedure

Impregnation procedure of wooden poles is performed in accordance with SRPS D.T4.022 and DIN 68 811:2007-01 norms. Pole impregnation plant meets all conditions required by the norm. Impregnation records are kept daily, containing all the significant data and values defined by the norm. Impregnation procedure is controlled and registered by a registering device which registers pressure, vacuum and temperature. In addition to that, following data are entered into graph: batch No., date, quantity and signature of the authorized controlling person.

The process consists of several phases:

- Filling poles into impregnation autoclave.
- Forming air pressure of 2 to 4 bar.
- Maintaining air pressure.
- Filling autoclave with oil, previously heated to 105 - 110 °C.
- Increasing pressure to 6 - 8 bar.
- Maintaining oil pressure at temperature of 90 - 95°C.
- Releasing oil from the impregnation autoclave.
- Forming vacuum of at least 0.8 bar.
- Maintaining vacuum.
- Releasing vacuum.
- Taking poles out.

The average oil absorption per m³ amounts to 80±10% according to DIN 68 811:2007-01 norm.

2.6 Checking penetration depth of protective agent

After the completed impregnation process, test specimen were drilled out from the poles (ten drill-outs from each batch) using Pressler drill to observe the penetration depth of the impregnating agent.

2.7 Weighing after impregnation

Poles are weighed after impregnation and the weight difference before and after impregnation shows oil quantity absorbed by a batch. Average weight pro m³ is obtained by dividing this value with volume of the wood mass.



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2.8 Marking

Every impregnated pole is marked by the so-called nails which contain:

- Length of pole.
- Manufacturer's logo and year of impregnation.
- Designation of the agent

Marks are placed at 176 cm distance from the lower (thicker) part of the pole.

2.9 Storing of the impregnated poles

Upon completion of the impregnation procedure, the poles are unloaded from the wagon and stacked on skids in closed heaps, where they remain until further shipment.

2.10 Impregnation control

Inspection of documents on acceptance and control and the impregnation log book, showed that all the phases have been monitored professionally.



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3. EXPERT OPINION

Pursuant to the testing results of wooden poles for overhead (power and TT) lines production and impregnation by creosote oil WEI Type C it has been concluded as follows:

Production of impregnated wooden poles in the company
IMPREGNACIJA AD BEOGRAD - BRANCH ČIČEVAC
is performed in accordance with regulations of norms valid for this area and this kind of protection and technical conditions of the electric power industry association (SRPS D.B2.020, SRPS D.T4.022, DIN 68 811:-01, GSE 41/81, GSE 54/86....), which means that the produced poles can be used for overhead (power and TT) lines.

Expert opinion is an integral part of the Testing report DSM 275 /10 of December 2010.

The shown results refer exclusively to the tested samples. No liability is assumed for authenticity of sampling, unless it was performed in presence of the Laboratory representative. The Testing report must not be copied, except as a whole, without consent of the Materials Testing Laboratory.

Belgrade, December 21, 2010
Attachments : Photos, 2 pages

Test Manager

Stevan Zotovic, B.Sc.

(Attachment to Testing report DSM 275/10)



Photo No. 1: Air seasoning of poles

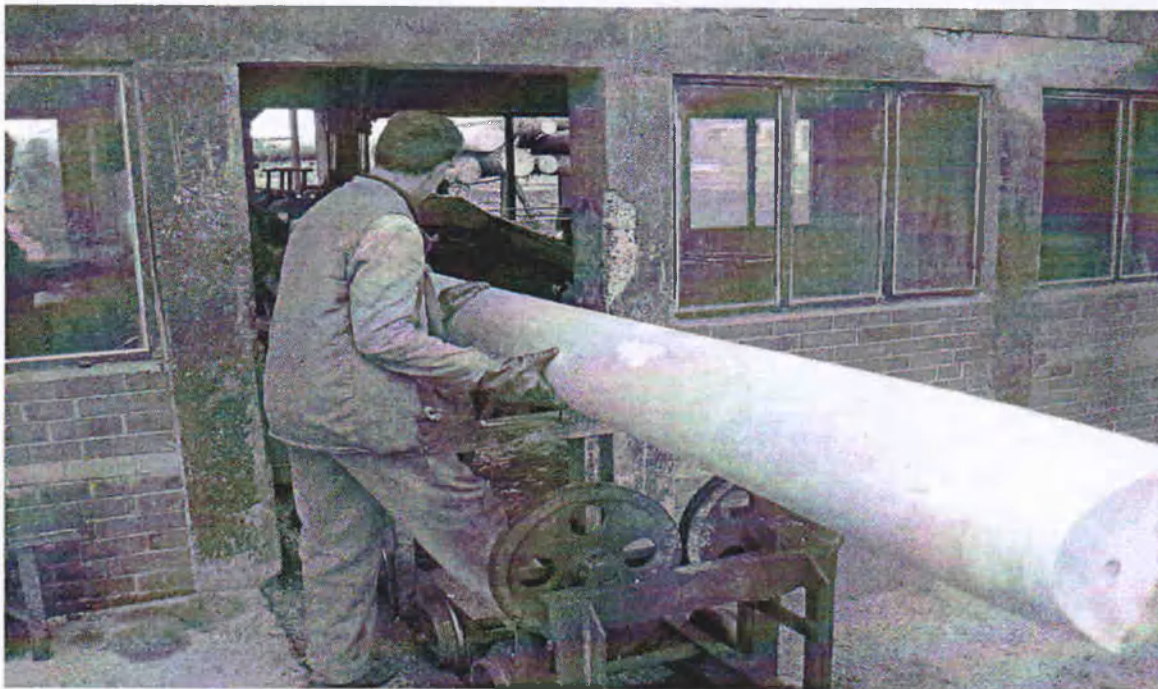


Photo No.2: Processing of poles

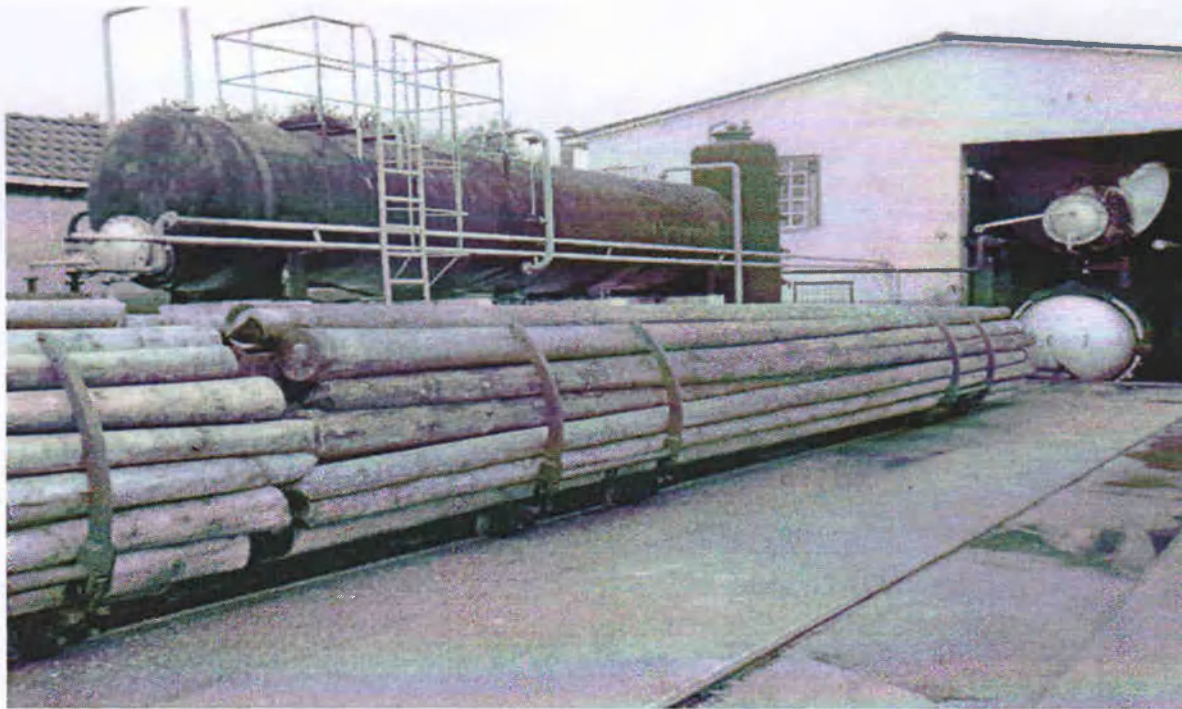


Photo No. 3: Poles prepared for impregnation

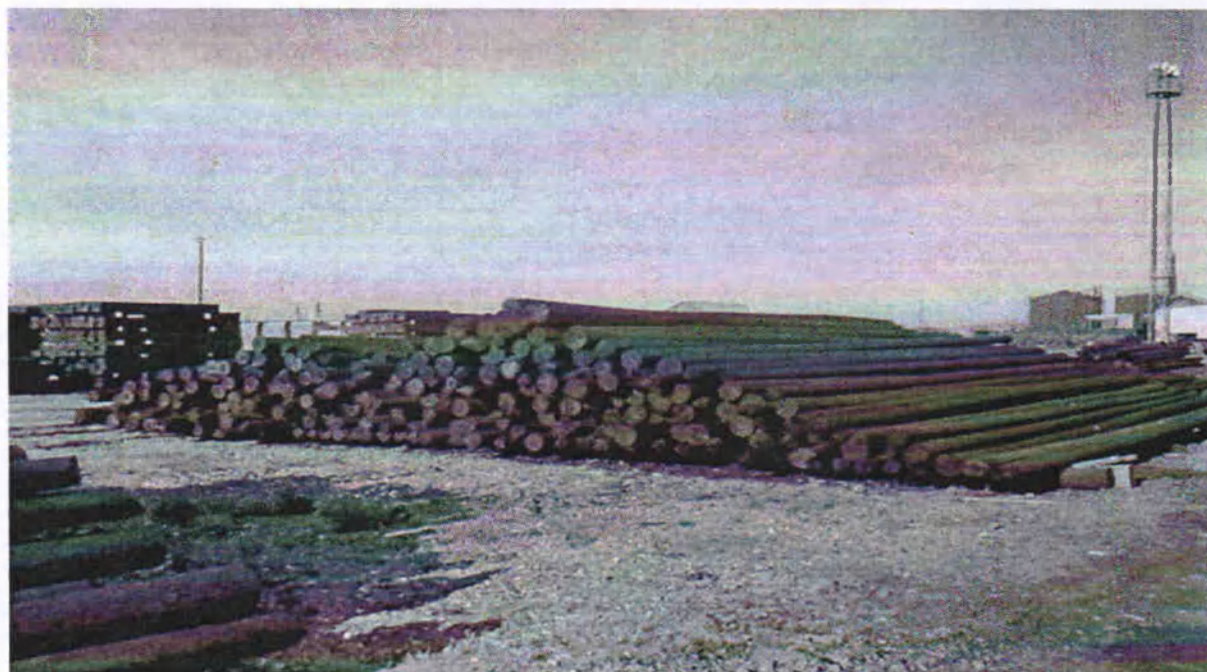


Photo No. 4: Yard-stored impregnated poles waiting for shipment