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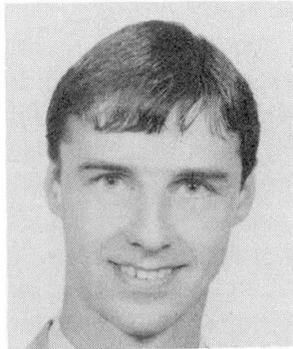
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## Renovation of Prefabricated Concrete Elements: Nikolaiviertel in Berlin

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### Summary

Over 30 millions of apartment units in Eastern Europe are built of prefabricated concrete elements. This type of building shows a good general performance in respect to cost effectiveness, shape of the units and durability, but has some typical constructional weaknesses, that are similar in all eastern European countries including the former GDR. A major problem represents the joint construction between the elements, where leakage leads to concrete corrosion, water intrusion and a function loss of the thermal insulation. On the example of the Nikolaiviertel in Berlin a system for facade renovation is demonstrated, that combines cost effectiveness, long term performance of the joint sealing system and concrete protection with the option of colour design.

### 1. Introduction

When Germany was reunited, in East Germany a stock of **2.1 million** of prefabricated element **apartments** was waiting for renovation. In the first stage the technology of joint tapes was widely used to fix leakage of prefabricated facades. Later, in the second phase, the housing companies began to modernize their houses systematically, started with the oldest buildings and added mainly external insulation systems (**EIFS**). Currently, in the third phase, the modernization of approx. **750,000 units** with **sandwich elements** is going on. Here in many cases the internal insulation is in good shape and addition of EIFS gives no economic advantage. This is, why a growing number of Housing companies chooses for the facades the **combination of joint tapes, concrete repair and elastic facade colours**, which is the subject of the following paper.

### 2. The Joint Tape

In Germany three major types are available: **Polysulfide Tape** (market share approx. 70 %) **Silicone Tape** (market share approx. 20%) and **Polyurethane Tape** (market share approx. 10%). Best in UV-stability and weatherability are silicone and polysulfide tapes, best in mechanical properties are polysulfide and polyurethane tapes.

All types are glued with adhesives, that have the same material basis as the tape itself and are mounted on clean and dry surfaces. The substrate may be concrete, brick, ceramic tiles, aluminium, wood, renders etc.. Before the tape is installed, the adhesion zones are treated with a primer (different types, depending on substrate).

The tape is positioned over the joint so that at both sides a 20% wide part of the tape is glued on the substrate and an elongation part (approx. 60% of tape width) is kept free to take up the expected movement of the elements. Tapes are available from 25 mm to 300 mm width.

### 3. The Facade Renovation System Based on Joint Tape

The system combines **three elements**. A polymer coated concrete repair system (**PCC-system**) that includes a primer compound, a standard mortar, a fast setting mortar and a smooth render. An elastic, crack bridging, UV-curing **acrylic facade coating** system that includes a solvent free primer and two layers of elastic coating. The **joint tape** in combination with facade sealants.

### 4. Advantages of the Tape Facade System

**Reduction of Central Heating Costs:** The typical sandwich element suffers from leakage of the joints and wet internal insulation. By covering the wall elements with the elastic colour and closing the joints with tape, water intrusion is completely stopped. In praxis this leads to a reduction of the "k - value" (W per m<sup>2</sup> and K, unit of heat conduction) from 0.85 (typical value for an untreated, "wet" sandwich element) to almost 0.65 (theoretical k - value for the "dry" sandwich element). If the facade treatment is combined with exchange of the windows and additional roof and cellar insulation, it is possible to reach for a typical sandwich element building of the early 1980ies the energy status, that is required by German law ("Wärme-Schutz-Verordnung) for houses built after 1995.

**Durability:** The tape has a proven life expectancy of more than **20 years**.

**Architectural Design:** The colour/tape system offers to the designer the full variety of options as the EIFS do. However the character of the buildings is not getting lost, what is already an issue in Germany.

**Cost advantage:** The cost per square meter facade depends on the status of the building, the geometry of the facade, the over all volume of the project and many other factors. However, in East Germany the average price can be estimated for EIFS with **120 to 150 DM per m<sup>2</sup>** and for the colour/tape system with **65 to 80 DM per m<sup>2</sup>**.

### 5. General Outlook / Conclusion

Most of the sandwich element buildings in East Germany are in relative good shape and show only moderate to light concrete damage. The financial situation of the housing companies, the communities and the people who live in the houses is already stressed and is expected not to improve, eventually to get worse in the coming years. This lead in the last two years to a strong trend towards the **tape facade system** with already **10000 - 20000 apartment units** renovated according to this method. With almost **50% of cost savings** compared to EIFS it represents a fair compromise between technical performance, aesthetic appearance and economic value.