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Rehabilitation of Sandwich Wall Panels in the New German Federal States

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Summary

Three-layered external sandwich walls in the new german federal states were found to frequently exhibit damages which influence the durability of these walls and consequently their stability. In order to increase the remaining service life of the large panel buildings, specific rehabilitation measures are necessary. Examinations have proven, that an adequate measure is the application of a thermal insulation system on the outer walls. The stability of the weather exposed layers of the sandwich panels is found to be given, before and after the application of such a measure.

1. Problem

Three-layered external sandwich walls (Fig. 1) in the new german federal states were found to frequently exhibit the following typical damages: Cracks in the outer weather-exposed facings, varying thickness of the outer facing, insufficient concrete cover, high scattering of concrete strength, powdering surfaces, thermal bridges and permeable joints.

In addition, doubts are often being raised, whether the steel anchors between the outer facing and the structural concrete are indeed, made of stainless steel and whether these anchors were installed according to the plans and in sufficient number.

Within the scope of the rehabilitation works on the external sandwich wall panels, which have to be carried out in order to retain the large panel buildings, following questions had to be resolved:

- Can the existing external wall constructions be regarded as being sufficiently safe?
- Are additional anchorages for the outer facing layer necessary?
- What measures are indicated in repairing the external walls in terms of adequate thermal protection, crack formation, corrosion and permeable joints?

- Will the stability be retained once additional thermal insulation measures are applied on the external weather exposed layers?
- Can the dowels required for attaching the thermal insulation systems be anchored exclusively in the outer layers?

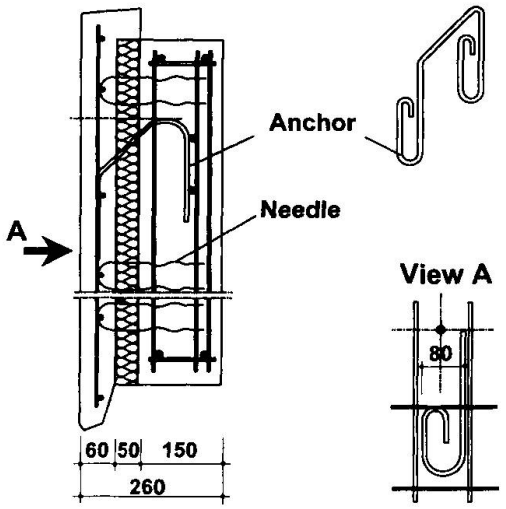

Fig. 1: Structure of the external wall - type WBS 70 in cross section

2. Investigation

In the paper methods for determination of the actual in-situ condition, possibilities of rehabilitation measures and methods for assessing the stability of outer facings and their anchorages are described.

3. Results

Investigations into the load bearing behaviour of three-layered external wall elements (sandwich panels) of large panel buildings in the new german federal states, yielded the following results:

- The stresses imposed on the weather-exposed layer from the relevant loading cases are low.
- The stability of the load bearing anchors was verified under the relevant cases of loading before and after anchoring the thermal insulatuion system in the outer layer.
- A subsequent installation of thermal insulation systems to the weather-exposed layer reduces the action on the load bearing anchors, as this reduces the relevant load case temperature.
- The typical cracks in the weather-exposed layers that mainly occurred during manufacture of the walls pose no danger to the stability of the load bearing anchors.
- The fatigue strength of the stainless steel load bearing anchors subject to thermal cyclic loading is ensured.
- The thermal insulation system is to be fixed to the weather-exposed layer only.
- Application of a suitable subsequent thermal insulation to the weather-exposed layer would stop a possibly already beginning corrosion.