Technical Update 27

Clarification of watertightness requirements with reference to dismantling of test specimens

1 A number of requests for clarification of watertightness requirements have been received by CWCT. Some confusion may have arisen due to the fact that references relating to watertightness occur in different parts of the CWCT *Standard for systemised building envelopes* and *Standard test methods for building envelopes*. This Technical Update brings together the various clauses that relate to the watertightness requirements and provides some clarification of the requirements.

CWCT Standard for systemised building envelopes clause 3.4.2.1.

2 The basic requirement is given in Clause 3.4.2.1as follows:

> *'There shall be no leakage onto the internal face of the specimen at any time during the test.*
>
> *At the completion of the test there shall be no standing water in locations intended to remain dry.*
>
> *Any remedial modification to the test specimen that is made in order to pass this test shall be reported and incorporated in the installed envelope'*

3 This is followed by the following guidance note

> *'To avoid difficulty in interpreting the results it is good practice to agree which materials and zones within the building envelope may be allowed to get wet.'*

Clarification/comment

4 The reference to '*any time during the test'* should be interpreted to include the whole test sequence including dismantling and is not limited to the period when water is being sprayed on the test specimen. Care is required to distinguish between water passing through the specimen and water that is deposited on the inside of the specimen from other sources.

5 Locations intended to remain dry may include cavities which can only be inspected during dismantling hence the assessment of watertightness cannot be confirmed until dismantling has been carried out.

6 Water within drained cavities is acceptable; however, where water is held within drained cavities and not draining freely this should be reported for information.

7 Water may enter the dry zone of the test specimen for a number of reasons. It is likely to be difficult to prove the source of water is other than due to a failure of the test. Where water is proven to not be the result of the test, it should not be considered a failure.

8 Note, some systems make use of drainage tracks (or similar) that might allow for water to be observed on internal faces of the system. In these instances, relevant areas should be identified as zones intended to be wetted and agreed ahead of the test. Water observed on these agreed internal faces of the specimen during the test would not constitute a failure. However, these areas should drain freely and not contain any standing water (other than incidental water held by surface tension) at the completion of the watertightness testing, with reasonable time allowed for drainage to be completed (i.e., any water in these drainage tracks should be actively draining).

Clause 1.5 of the CWCT Standard test methods for building envelopes

9 This clause states:

'Water penetration under test will be unacceptable if:

- *Water emerges on the interior surface of the test specimen, or*
- *Water enters cavities where it may impair the performance or durability of the building envelope.*

Prior to testing it is essential to establish:

- *Which, if any, materials may be permitted to be wetted.*
- *Any zones of the wall where water should not enter.*
- *Any other criteria that may determine a water penetration failure.'*

Clarification/comment

10 This requires information described above be provided prior to testing. This would typically include clearly marked-up drawings. Failure to provide this information may lead to disputes over whether the specimen has passed the test. Test laboratories should request this information prior to testing if it is not provided.

Clauses 6.5 and 7.7 of the CWCT Standard test methods for building envelopes

11 Clause 6.5 relates to the static watertightness test and states

'Throughout the tests, the inside face of the sample shall be examined for water penetration. The emergence of any water on the inside face shall be recorded together with the pressure level at which the leakage occurred. The location and extent of the leakage shall be noted on a drawing of the specimen.'

12 Clause 7.7 relates to the dynamic watertightness test. It repeats the requirement of clause 6.5 and adds

'Immediately following the test, the specimen should be examined for further evidence of water penetration. The presence of any water in any envelope cavities should be recorded and the location and extent of the leakage noted on a drawing of the test specimen.'

Standard for systemised building envelopes Clause 8.11

13 This is the only clause that specifically relates to dismantling of the test specimen. It states:

'The Testing authority shall witness sufficient of the installation and dismantling of the test specimen to ascertain any variations from the agreed details. These shall be recorded on a set of the test specimen assembly drawings prepared by the Building Envelope Contractor. The extent of water penetration into the system shall also be recorded. This clause applies to tests on both proprietary envelopes and custom envelopes.'

14 This is followed by the following guidance notes

'The Testing Authority may request selective dismantling soon after testing to inspect details for construction as per the drawings, for evidence of any water penetration of zones not designed to be wetted, and to help establish the cause of failure.

The Building Envelope Contractor shall ensure that any changes to the design or method of construction identified during erection, testing or dismantling shall be included as revisions to the working drawings and installation method statements and re-submitted to the specifier with a view to adoption in the main works of the building.'

Clarification/Comment

15 There is no specified limit on the time between completion of the test and dismantling. It is recommended that relevant parties agree a maximum number of days following the watertightness test before the test specimen is dismantled prior to testing.

16 It is beneficial to dismantle the test specimen soon after the watertightness testing, as this may allow for any water in 'dry' zones to be observed before these zones have an opportunity to dry. It will also limit the possibility of water ingress if the watertightness of the sample has been compromised by subsequent tests. However, a reasonable time frame, allowing for lead-times with regards to lifting equipment, access, personnel availability, and more must be considered. Additionally, the watertightness testing is not the final test in the sequence and adequate time to complete these tests (and retests if necessary) should be allowed for.

17 As general guidance, simpler systems, such as a face-fixed rainscreen system, might be readily dismantled and thus it could be reasonable (taking into account the considerations above) that dismantling takes place within a few days of completing the final testing (impact testing typically). For more complicated systems, such as a unitised curtain wall, cranage needs to be arranged to complete the dismantling. If parties anticipate the system passing, and pre-arrange for it, lifting equipment might be available within one week of completing the final testing, but this timeline will be highly dependent on crane availability, which might be outside the control of those involved in the testing.

18 Dismantling should, so far as is practicable, be completed in dry weather to avoid introducing rainwater into areas that had previously been dry. Where this is not practicable, relevant parties should agree a reasonable approach to mitigating this risk.

19 Where dismantling of the specimen cannot be completed within a timeline satisfactory to relevant parties, it would be reasonable to allow for selective dismantling (as discussed in clause 8.11 above) or selective investigations into critical zones using small investigation openings, endoscopes or similar agreed methods.

20 Dismantling and inspection should not be limited to joints between units or systems but should also include any dry zone identified in the drawings, such as spandrel or opaque panels of a curtain wall system, stack joints and split-mullion joints and more.

21 Note, some specifiers request that pressures are increased until failure of the specimen. Though this may be of interest for specifiers and it is within their prerogative to request this; such a test to failure will likely compromise the ability to check for water ingress and the condition of the system during dismantling. E.g., damage observed could be from the test to failure or from earlier tests and without certainty as to the cause of the damage, a failure of the test may be deemed the appropriate result by the test authority.

Standard for systemised building envelopes Clause 8.15

22 This clause gives reporting requirements for tests. Among the requirements are:

'A statement describing any penetration of water into the specimen'

'The overall outcome of the test series including classification (if appropriate).'

Comment/clarification

23 The test laboratory must report the presence of water and record observations. The requirement to state the overall outcome of the test requires the test authority to make a judgement on whether any water observed during dismantling constitutes a failure to meet the requirements of the standard as described above.

References

CWCT Standard for systemised building envelopes, 2005, Bath

CWCT Standard test method for building envelopes, 2005, Bath

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