Concrete Tech Tip
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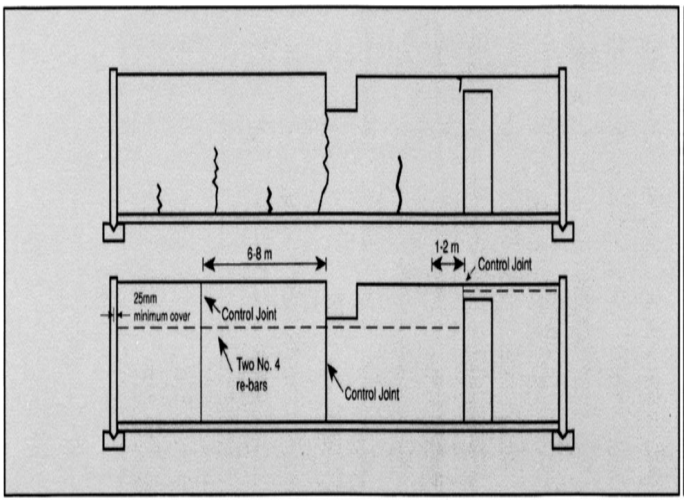
Cracks in Concrete Basement Walls

1. WHAT Types of Cracks May Occur?

Cast-in-place concrete basements provide durable, high quality living space. Cracking of concrete is a natural occurrence and, at times when proper construction practices are not used undesirable cracks occur, such as:

a. Temperature and drying shrinkage cracks. With few exceptions, newly placed concrete has the largest volume that it will ever have. This shrinkage tendency is increased by drying and/or a drop in temperature and can lead to random cracking, if steps are not taken to control the locations of the cracks by providing control joints.

Typical Basement Wall Cracks



Controlled Cracking of Basement Walls

b. Settlements cracks. These occur from non-uniform support of footings or occasionally from expansive soils.

c.. Other structural cracks. In basements these cracks generally occur during backfilling, particularly when heavy equipment gets too close to the walls.

d. Cracks due to lack of joints or improper jointing practices.

2. WHY Do Basement Cracks Occur?

In concrete basement walls some cracking is normal. Most cracks normally occur because one or more of the following rules of "good concrete practice" were not followed:

a. Providing uniform soil support.

References

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3. *International Residential Code*, International Code Council, Washington, D.C. www.iccsafe.org
4. *Residential Concrete*, National Association of Home Builders, Washington, D.C. www.nahb.org
5. *Residential Construction Performance Guidelines*, National Association of Home Builders, Washington, D.C.
6. *Casting Residential Foundation Walls in Cold Weather*, Concrete Foundations Association, Mt. Vernon, IA. www.cfawalls.org
7. *Backfilling Foundation Walls*, Concrete Foundations Association, Mt. Vernon, IA
8. *Cracking in Foundation Walls*, Concrete Foundations Association, Mt. Vernon, IA
9. CIP #7 *Cracks in Concrete Basement Walls*, Concrete. Reviewed & Revised 2016.

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b) Using moderate slump concrete and avoiding addition of water to the concrete mixture on the job.
c. Observing proper concrete placement practices.
d. Providing control joints every 6 - 9 m.
e. Backfilling carefully and, if possible, waiting until the first floor is in place in cold weather (concrete gains strength at a slower rate in cold weather).

3. HOW To Construct Quality Basements.

Since the performance of concrete basements is affected by climate conditions, unusual loads, materials quality and workmanship, care should always be exercised in their design and construction. The following steps should be followed.

a. Site conditions and excavation. Soil investigation should be thorough enough to insure design and construction of foundations suited to the building site. The excavation should be to the level of the bottom of the footing. The soil or granular fill beneath the entire area of the basement should be well compacted by rolling, vibrating or tamping. Footings must bear on undisturbed soil.

b. Formwork and reinforcement. All form work must be constructed and braced so that it can withstand the pressure of the concrete. Reinforcement is effective in controlling shrinkage cracks and is especially beneficial where uneven side pressures against the walls may be expected. Observe provincial and local guidelines for wall thickness and reinforcement if needed.

c. Joints. Shrinkage and temperature cracking of basement walls can be controlled by means of properly located and formed joints. As a rule of thumb, in 2.4 m high and 200 mm thick walls, vertical control joints should be provided at a spacing of about 30 times the wall thickness. These wall joints can be formed by nailing 20mm strip of wood, beveled from 20mm - 13mm in width, to the inside of both interior and exterior wall forms. After the removal, the grooves should be caulked with a good quality joint filler.

d. Concrete. In general, use concrete with a moderate slump (80 to 100 mm). Avoid retempering. Concrete with a higher slump may be used providing the mixture is specifically designed to produce the required strength without excessive bleeding and/ or segregation. In areas where weathering is severe and where the walls may be exposed to moisture and freezing temperatures, air entrained concrete should be used.

e. Placement and curing. Place concrete in a continuous operation to avoid cold joints. Appropriate consolidation of the concrete is vital to avoid issues like “honeycombing”. If concrete tends to bleed and segregate slump must be reduced and the concrete placed in the form every 6 - 9 m around the perimeter of the wall. Higher slump concretes that do not bleed or segregate will flow horizontally for long distances and reduce the number of required points of access to the form. Provide adequate curing and protection to fresh concrete. It should not be allowed to freeze in cold weather. Preventive measures could be taken by completely enclosing the structure and, if necessary, providing heat.

f. Water proofing and drainage. Spray or paint the exterior of walls with damp proofing asphaltic compound. Provide foundation drainage by installing weeping drain tiles or plastic pipes around the exterior of the footing, then covering with clean granular fill to a height of at least 300mm prior to backfill.

g. Backfilling and final grading. Backfilling should be done carefully to avoid damaging the walls. Brace the walls or, if possible, have first floor in place before backfill finished. Positive surface drainage should be provided away from foundation as per local guidelines.

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