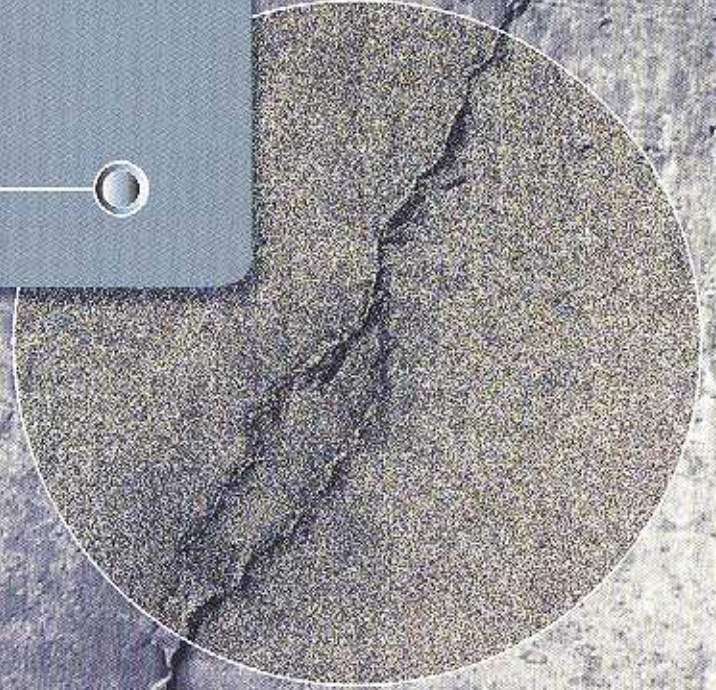




NZRMCA

Cracking in Concrete Floors



INTRODUCTION

All hardened concrete has a tendency to crack and it is not always possible to consistently produce completely crack-free floors.

In most cases cracks are the result of improper design and construction practices.







These can include:

- Omission of isolation and control joints and improper jointing practices.
- Improper subgrade preparation.
- The use of high slump concrete (without superplasticisers) through the addition of water on the job.
- Improper finishing.
- Inadequate or no curing and / or protection, especially in less than ideal weather conditions.

JUDGEMENT OF CONDITIONS

Concrete as supplied by Ready Mixed Concrete suppliers is designed to be used in favourable conditions. The concrete manufacturer is not always in the best position to make judgements on each job he supplies as he may have little or no knowledge of site conditions and could be many kilometres away. The responsibility for judging placing conditions must be made on site by the concrete contractor who has the opportunity to study local conditions and to judge what special precautions if required should be employed. Each job is different and a competent operator will make judgements as to timing, ground temperatures, wind velocity, slump, use of admixtures and resources required to suit the conditions existing at the time

TYPES OF CRACKS

| | LOCATION OR DIRECTION | PRIMARY CAUSE | SECONDARY CAUSE / FACTORS | TIME OF APPEARANCE | PREVENTION |
|---|--|--|---|--------------------------------------|--|
|  <p>PLASTIC SETTLEMENT</p> | <p>Over reinforcement.</p> <p>Change of depth.</p> | <p>Excess bleeding with restrained settlement</p> | <p>Rapid early drying conditions</p> | <p>10 minutes to 3 hours</p> | <p>Reduce bleeding, revibrate to eliminate</p> |
|  <p>PLASTIC SHRINKAGE</p> | <p>Diagonal.</p> <p>Random.</p> <p>Over reinforcement.</p> | <p>Evaporation.</p> <p>Rapid early drying.</p> <p>Steel near surface</p> | <p>Low rate of bleeding</p> | <p>30 minutes to 6 hours</p> | <p>Reduce rate of evaporation by early curing and protection from wind</p> |
|  <p>EARLY THERMAL CONTRACTION</p> | <p>External restraint.</p> <p>Internal restraint.</p> | <p>Restraint of thermal movement.</p> <p>Excess temperature gradients.</p> | <p>Rapid cooling</p> | <p>1 day to 2-3 weeks</p> | <p>Protect from extremes of heat and cold and provide adequate early curing. Ensure isolation joints are properly constructed</p> |
|  <p>CRAZING</p> | <p>Surface defect</p> | <p>Over trowelling</p> | <p>Poor placement.</p> <p>Poor curing.</p> | <p>1-7 days sometimes much later</p> | <p>Ensure adequate curing and proper finishing</p> |
|  <p>DRYING SHRINKAGE</p> | <p>Random</p> | <p>Inefficient joints</p> <p>No joints</p> | <p>Excess shrinkage, inefficient curing</p> | <p>Several weeks or month</p> | <p>Utilise appropriate concrete mix-designs, lower slumps, adequate curing, use of isolation and control joints and steel for crack control.</p> |
|  <p>CONSTRUCTION MOVEMENT</p> | <p>Formwork sub-grade movement</p> | <p>Poor formwork, sub-grade preparation</p> | | <p>From 1-2 days</p> | <p>Ensure sub-grade and formwork are properly formed and constructed</p> |

CONSIDERATIONS / PRECAUTIONS

To reduce and control cracking in concrete:

- Plan and organise job in advance.
- Correct preparation of sub-grade.
- Well constructed and braced form work.
- Adequate manpower to quickly place, finish and cure the concrete.
- Look at short and long range weather forecast in conjunction with local knowledge.
- Correct control jointing practices. Use of steel mesh and/or fibre mesh. Saw cuts should be approximately one third the thickness of the slab and no further apart than thirty times the thickness.
- Erect sunshades to reduce concrete surface temperatures.
- Moisten the ground, reinforcing steel and formwork to prevent moisture loss.
- During summer consider early morning or evening placement to avoid mid day sun.
- Wind breaks to reduce wind speed over concrete slab.
- Communication with concrete supplier to ensure correct scheduling of mixer trucks.
- Correct concrete slump (100mm max).
- Always vibrate concrete.
- Fog sprays to prevent evaporation.
- Consider Anti evaporation aids and curing membranes.
- Protect concrete from extreme temperature differences.
- Protect concrete during any appreciable delay between placing and finishing.
- Ensure appropriate and adequate curing under all circumstances.
- Use a member of the "New Zealand Master Concrete Placers' Association."

REFERENCES

"The Aberdeen Group" 4285
Westgate St Addison, Illinois

"What, Why & How Cracking Concrete
Surfaces" NRMCA, 900
Spring Street, SilverSpring
Maryland USA

"Plastic Movement in Concrete"
D.J. Ferguson, 42 Motatau Rd
Papatoetoe, Auckland, NZ

With Compliments