**TCA is on the Cutting Edge of Residential Concrete Advances**

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The December 2020 release of ACI 332-20 Code Requirements for Residential Concrete (ACI 332-20) and Commentary introduces a new exposure category, RF4. ACI 332-20 defines RF4 (most severe) as “Reinforced concrete exposed to moisture and deicing chemicals with the potential of being saturated when exposed to freezing and thawing cycles”. TCA began researching commercial and residential enhanced durability concrete (CRED) in 2018 (2 years before the current ACI code). TCA research at TTU focused on limiting concrete chloride permeability and hardened concrete absorption to reduce deicing salt damage. Table 1 shows a comparison of TCA CRED mixtures with ACI 332-20 RF4 requirements.

**Table 1. Comparison of TCA CRED Mixtures with ACI 332-20 RF4 Requirements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Property | ACI 332-20 RF4 | TCA CRED 1 | TCA CRED 2 | TCA CRED 3 |
| Total cementing materials (pcy) | None | 520 | 520 | 520 |
| w/cm | 0.40 max | meets | meets | meets |
| Air content % | 6 ± 1.5 for No. 57 stone | meets | meets | meets |
| 28-day Compressive strength (psi) | 5000 min | exceeds | exceeds | exceeds |
| Surface Resistivity (kilohm-cm) | None | Low (SR≥21) @ 28 days | Very Low (SR≥37) @ 28 days | Very Low (SR≥37) @ 14 days |
| Hardened concrete absorption % | None | ≤ 5% | ≤ 5% | ≤ 5% |
| Fly Ash (ASTM C 618) % | 25 | 36 Class F | 0 | 0 |
| Slag (ASTM C989) % | 50 | 0 | meets | meets |
| Silica Fume (ASTM C 1240) % | 10 | 4 metakaolin | 0 | 4 metakaolin |
| Total Pozzolans % | 50 | meets | meets | meets |
| Total of Fly Ash + Silica Fume % | 35 | 40 Class F and metakaolin | 0 | 4 metakaolin |

The CRED mixtures do not align exactly with ACI 332-20 requirements for mixture component materials but are very close (especially considering CRED mixtures were designed 2 years earlier). TCA and TTU have conducted extensive research to verify the superiority of CRED mixtures over current residential mixtures in magnesium chloride salt degradation. TCA and TTU are currently conducting research to verify the superiority of CRED mixtures over current residential mixtures with respect to water addition at the jobsite and lack of proper curing. You can follow the continuing efforts of TCA and TTU to improve residential concrete in Tennessee Concrete magazine.