Los Alamos NATIONAL LABORATORY EST. 1943

Conduct of Engineering
Request for Variance or Alternate Method

Assigned by SMPO or SMPOR: ☐ Alternate Method ☒ Variance Tracking number VAR-2012-066

1.0 Affected Document(s)

☐ Engineering Processes (e.g., P 341) ☐ Engineering Standards (e.g., P 342) ☐ Engineering Training & Qualification (e.g., P 343) If against P documents themselves, revision: ____n/a_____	Subordinate (Functional Series) document if applicable (ESM Chapter, Master Spec, AP, etc.): Document Title/Number: _IBC 2009; ACI 318-08; LMS 03 3001 r4 Reinforced Concrete___ Revision: ___see above____

Section/Para

IBC Section 1904; ACI 318 Table 4.2.1; LMS 03 3001 2.7.H (pg 10)

Specific Requirement(s) as Written in the Document(s)

IBC 2009 invokes ACI 318-08. ACI 318-08 requires LANL to achieve a range of exterior concrete classes depending on the severity of exposure to freeze-thaw cycles. These concrete classes are identified as F0 (no freeze-thaw exposure, F1 (occasional exposed to moisture before freezing), and F2 (continuous exposure to moisture before freezing).

The F1 exposure class requires the performance of concrete to nominally 4500 psi and a 5 percent air content level (plus/minus standard tolerances), and a 0.45 maximum w/c. F2 exposure class requires the performance of concrete to nominally 4500 psi and a 6 percent air content level (plus/minus standard tolerances), and a 0.45 maximum w/c.

LANL Master Specification Section 03 3001 pre-approved mix designs mix 44 and mix 19 are nominally 4000 psi and a 5 percent air-content.

2.0 Request

Brief descriptive title:

Exterior Concrete Strength and Durability per IBC 2009

NCR required (work has occurred)? ☐ Yes ☒ No	If Yes, NCR Number
TA-Bldg-(Room) and/or Project Affected All	System/Component Affected All

Proposal

While new F2-rated mix designs are being developed and instituted, projects underway or getting underway may continue to use the LMS 03 3001 revision appropriate to their code of record date and then place concrete per their project concrete spec so long as their design calculations were based on 4000 psi concrete. As is normal practice, when LMS 03 3001 is revised, new project starts after that date must use the revised spec.

Justification/Compensatory Measures

So long as design calculations are prepared to meet the force and displacement requirements of the IBC 2009, meeting the IBC 2006 (but not 2009 version) for durability does not lessen the structural loading requirements of the building code. Instead, the issue is one of improving durability (long term, gradual degradation) of the concrete material. That said, current (IBC 2006) compliant mix designs frequently meet IBC 2009 criteria already (28-day break data for the past several years indicates strength is normally at least 4500 psi, and air content is normally at least 5 percent and sometimes 6 percent).

The process to revise the mix designs and get them properly tested using the same concrete constituents is expected to take 6-8 months, and is being initiated by ES-DE and CM-CE. Use of pre-approved mix designs has reduced variability in the quality of concrete used on projects at LANL, with very few NCR's issued due to low compressive strength. Therefore, until new pre-approved concrete mix designs can be generated that comply with the 2009 IBC for durability, use of existing pre-approved concrete mixes should continue in order

to maintain project and construction efficiency, while also maintaining existing levels of concrete quality. Management Level (ML) of the existing pre-approved mix designs should remain as ML-3/4 work. The commercial grade dedication process should be used if concrete work is needed for higher levels of ML.

Although not a compensatory measure, identification of concrete placed under this variance should be documented, and monitoring of the durability should be accomplished to determine if any significant material properties changes result when compared to the new compliant concrete mixes. Recall that the new durability requirements will produce concrete with slightly higher compressive strengths (an increase of 500 psi) and slightly higher entrained air content (an increase of 1%) for F2 durability.

In conclusion, since the existing pre-approved mix designs will likely meet the F1 durability requirements consistently, and at times, will even meet F2 requirements, Paragraph 104.10 of the IBC is invoked for the purposes of practicality. Specifically, modification of concrete durability requirements in the 2009 IBC is approved on an interim basis to allow for use of concrete mixes (LATM Mix 19 and 44) that are compliant with the 2006 IBC. This variance will not lessen the structural requirements of the 2009 IBC, as just the durability may be affected.

Duration of Request: as required for new mix design incorporation into 03 3001	Start Date: start of IBC 2009 use		End Date: see "duration" at left	☐ Lifetime
Requestor D. E. Volkman (for the institution)	Z Number 099106	Organization ES-DE	Signature Signature on File	Date 3/28/2012
USQD/USID required (Nucl. High/Mod Hazard)? ☐ Yes ☐ No		If Yes, USQD/USID Number		
Design Authority Representative See SMPO signature	Z Number	Organization	Signature	Date
LANL Owning Manager (FOD or Programmatic)	Z Number	Organization	Signature	Date

3.0 Safety Management Program Owner (SMPO) Representative (SMPOR/POC)

☐ Decline ☐ Accept ☒ Accept Labwide ☐ with Modification:			
POC D. E. Volkman, alternate Chap 5 POC	Z Number 099106	Signature Signature on File	Date 3/28/2012

4.0 Additional Approval for P341 and APs; P342, ESM, Code, and Regulation Matters; and P343

☒ Accepted ☐ Accepted with comments ☐ Declined			
Comments:			
Safety or Security Management Program Owner Daniel Steinberg	Z Number 219089	Signature Signature on File	Date 4/4/12