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3. Preliminary Experimental Design – C802

3.6 Number of labs? # of lab affects mainly multilaboratory precision

3.7 Number of replicates? # of replicates affects mainly single-operator precision

3.8 Should we have compressive strength specimens as well?

C802 – 9.4.1:

- At least 10 labs, recommended 10-15
- # of replicates depend on the # of labs = (30/p)+1
- At least 3 replicates

C802 – 9.6:

- "If the number of missing results exceeds 3% of the total, some of the tests should be repeated"

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Preliminary Experimental Design – C802

Number of labs	10 labs	10 labs	15 labs	15 labs
Number of specimens	3 specimens	4 specimens	3 specimens	4 specimens
Number of specimens per size per mix	30	40	45	60
Number of specimens per mix	60	80	90	120
Total number of specimens	180	240	270	360

Without considering extra specimens and possible compressive strength cylinders

Each lab would run a total of either 18 or 24 C78 tests

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4. Criteria for Participating labs

- Accreditation or at least technician certification
- Recently calibrated equipment
- Distance from casting site
- Minimum # of different makers and models of beam testers

5. How to solicit labs

- We will donate the 4 x 4 x 14 molds if wanted

5. Logistics

- C802 section 7.3.1 – "Specimens are produced at one location from a homogeneous sample and then distributed to participating laboratories".

5. What is next?

TABLE A. 2 – TESTING LABORATORY ENROLMENT FORM

Laboratory Information	
Name	
Address	
Does the lab perform third point flexural strength testing?	
Rougly, how many third point tests does your lab run per year?	
Accreditation Information	
Is the lab accredited to run ASTM C78 or AASHTO T97?	
What accreditation does your lab possess?	
When was your lab accredited for C78 or T97?	
How many technicians are certified for ACI strength testing in your lab?	
ILS Participation	
Would the lab be interested in participating in an interlaboratory study to determine precision and bias of the C78 and T97? Each lab is expected to test 18 specimens	
If yes, continue answering the questions below	
Equipment Information	
What equipment is used for the testing (brand and model)?	
What is the load capacity of your equipment?	
Could the lab provide a picture of the heads?	
Would the lab be willing to perform small modifications to the equipment in order to test smaller beams (4 x 4 x 14in)?	
Would the lab be willing to ensure that only a strength certified technician is used for the testing?	
Would the lab be willing to ensure that always the same technician runs the tests?	
What kind of curing facility is available (lime water tanks or moist room) in the lab?	

TABLE A. 3 – LABORATORY ACCREDITATION AND TECHNICIAN CERTIFICATION

Laboratory	Laboratory accreditation		Technician Certification
	General accreditation	Accredited for C78 or T97	
1	AASHTO R18, ASTM C1077, ASTM E329	C78	ACI strength
2	AASHTO R18, ASTM C1077, ASTM E329, USACE validation	C78	ACI strength
3	AASHTO R18, ASTM C1077, ASTM E329, ISO/IEC 17025	C78 and T97	ACI strength
4	AASHTO R18, ASTM C1077, ASTM E329	C78	ACI strength
5	AASHTO R18, USACE validation	C78	WACEL strength
6	AASHTO R18, ASTM C1077, ASTM E329	C78	ACI strength
7	ASTM C1077, AASHTO R18	C78	ACI strength
8	AASHTO R18, ASTM C1077, ASTM E329	C78	ACI strength
9	AASHTO R18, ASTM C1077, ASTM E329, USACE validation	C78 and T97	ACI strength
10	AASHTO R18, ASTM C1077	C78 and T97	ACI strength
11	None		
12	AASHTO R18	C78 and T97	ACI strength
13	AASHTO R18, ASTM C1077	no	ACI strength
14	AASHTO R18, ASTM C1077	no	ACI strength
15	AASHTO R18, ASTM C1077	no	ACI strength
16	AASHTO R18, ASTM C1077	C78 and T97	ACI strength
17	AASHTO R18, ASTM C1077, ASTM E329, USACE validation	C78 and T97	ACI strength
18	AASHTO R18, ASTM C1077	C78	ACI strength
19	AASHTO R18, ASTM C1077, WACEL, USACE validation	C78 and T97	WACEL strength
20	None		WACEL strength
21	AASHTO R18, ASTM C1077	C78 and T97	ACI strength
22	AASHTO R18, ASTM C1077, ASTM E329	C78 and T97	ACI strength

2. APPENDIX B

2.1. MATERIALS PROPERTIES

TABLE B. 1– PROPERTIES OF COARSE AGGREGATES

				Siliceous gravel	Trap rock
ASTM standard				# 57	# 57
		Sieve sizes		% passing	% passing
C136	Sieve analysis	Imperial	Metric		
		1.5 in.	37.50 mm	100	100
		1 in.	25.00 mm	99	100
		3/4 in.	19.00 mm	86	86
		1/2 in.	12.50 mm	54	40
		3/8 in.	9.50 mm	36	19
		#4	4.75 mm	5	3.7
		#8	2.36 mm	1	1.3
Physical properties					
C127	Bulk specific gravity (SSD)			2.587	2.930
	Absorption (%)			1.00	0.85
C29	Unit weight lb/ft^3			105.0	108.1
Deleterious substances					
C117	Material finer than #200			0.3%	< 1.0%
C88	Sulfate soundness (magnesium)			0.4%	1.5%
C131	LA abrasion ≤ 1 1/2 in.			33%	17%

TABLE B. 2– PROPERTIES OF FINE AGGREGATE

ASTM standard		**Sieve sizes**		
		Imperial	Metric	% passing
C136	Sieve analysis	3/8 in.	9.50 mm	100
		#4	4.75 mm	96
		#8	2.36 mm	85
		#16	1.18 mm	70
		#30	600 µm	50
		#50	300 µm	20
		#100	150 µm	3.9
		#200	75 µm	1.7
		Fineness modulus		2.75
Physical properties				
C127	Bulk specific gravity (SSD)			2.678
	Absorption (%)			0.80
C29	Unit weight lb/ft3			113.7
Deleterious substances				
C88	Sulfate soundness (magnesium)			1.7%

ARMORLON®
TRANSGUARD® 4000

REEF INDUSTRIES, INC.

TECHNICAL DATA SHEET

DESCRIPTION

Transguard® 4000 consists of a natural colored polypropylene nonwoven fabric with a white polyethylene coating applied to one side. The non perforated coating contains ultraviolet light stabilizers providing protection against UV degradation.

PHYSICAL PROPERTIES AND TYPICAL VALUES

PROPERTY	ASTM TEST METHOD	U.S. VALUE	METRIC VALUE
Weight	D-2103	42 Lbs/1000 FT^2	20.5 KG/100 M^2
Thickness	D-5199	35 MIL	0.9 mm
Grab Tensile	D-4632	95 Lbf	422 N
Grab Elongation	D-4632	50 %	50 %
Trapezoidal Tear	D-4533	34 Lbf	151 N
Hydraulic Burst	D-3786	190 PSI	1.3 Mpa
Water Loss (per 24 hrs.)	C-156	0.0016 Lbs/Ft^2	8 gm/m^2
Reflectance	E-1347	85 %	85 %
Puncture Strength	D-4833	65 Lbf	289 N

FEATURES AND BENEFITS

Transguard® 4000 Reusable Wet Cure Covers meet or exceed ASTM C-171, "Standard Specification for Sheet Materials for Curing Concrete" for moisture retention and reflection.

OUR CUSTOMERS DON'T JUST *cover their business,*
THEY PROTECT IT

REEF INDUSTRIES, INC.
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E-mail: ri@reefindustries.com • www.reefindustries.com
TOLLFREE 1.800.231.6074

3. APPENDIX C

3.1. TEMPERATURE LOGS FOR ROOM AND CURING TANKS

3.1.1. MIXTURES 1, 2 AND 3

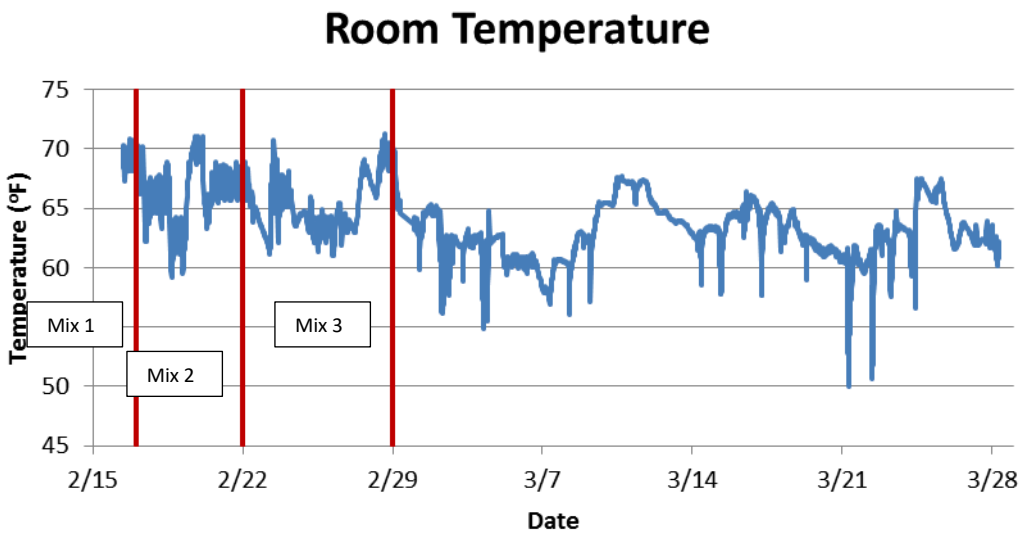

FIGURE C. 1 - ROOM TEMPERATURE AT VULCAN MATERIALS LABORATORY. RED LINES INDICATE MIXING/CASTING DATES.

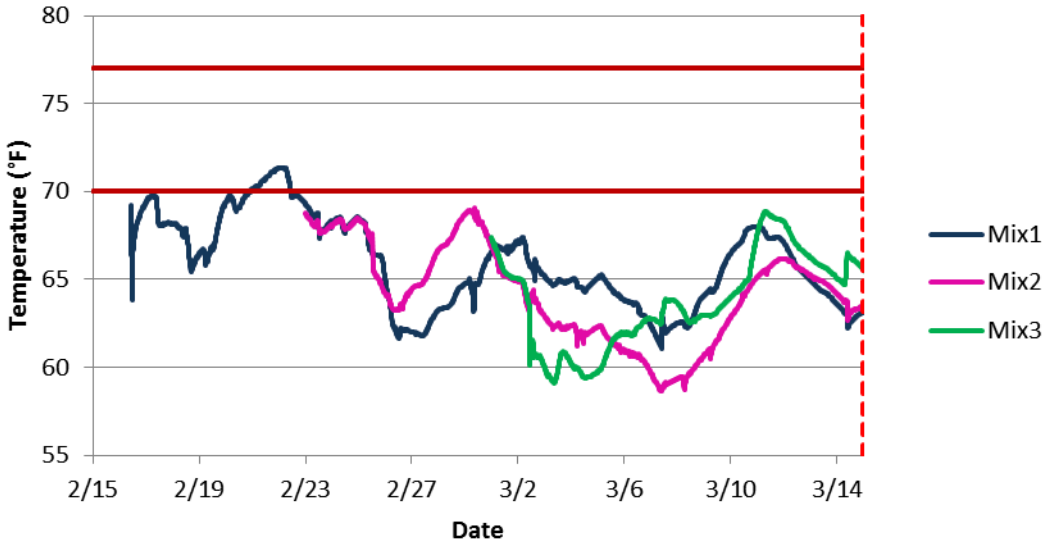

FIGURE C. 2 – TEMPERATURE IN CURING TANKS FOR MIXTURES 1, 2 AND 3. TEMPERATURES ARE SHOWN UNTIL FIRST BEAMS STARTED TO BE DELIVERED TO THE LABORATORIES ON 3/14/16. UP TO THIS DATE, THE BEAMS FOR ALL THE LABORATORIES HAD THE SAME CURING TEMPERATURES BUT FROM THIS POINT ON, CURING VARIED FROM LABORATORY TO LABORATORY.

3.1.2. MIXTURE 4

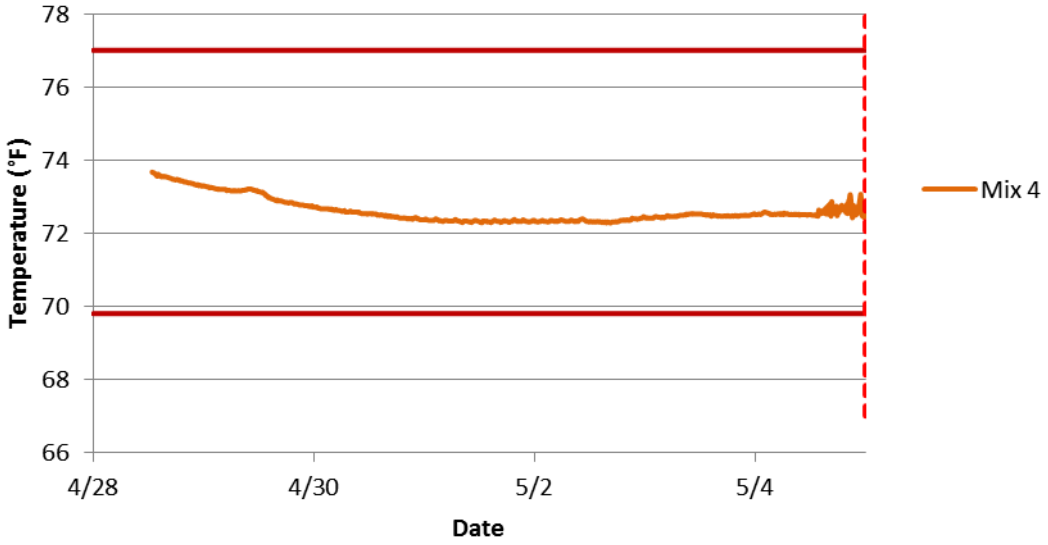

FIGURE C. 3 – TEMPERATURE IN CURING TANKS FOR MIXTURE 4. TEMPERATURES ARE SHOWN UNTIL FIRST BEAMS STARTED BEING DELIVERED TO THE LABORATORIES ON THE 05/05/16. UP TO THIS DATE, THE BEAMS FOR ALL THE LABORATORIES HAD THE SAME CURING TEMPERATURES BUT FROM THIS POINT ON, CURING VARIED FROM LABORATORY TO LABORATORY.

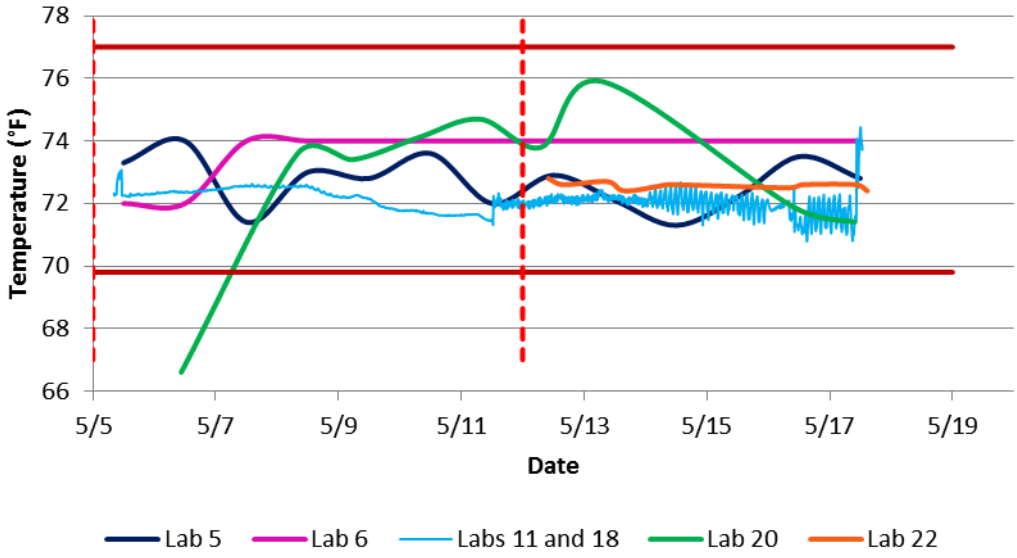

FIGURE C. 4 – CURING HISTORY FOR LABORATORIES THAT EITHER RECEIVED OR HAD BEAMS SHIPPED (LAB 22) ON 5/5/16. VERTICAL DASHED LINE INDICATES THE DATE LAB 22 RECEIVED BEAMS (FROM 5/5 TO 5/12 BEAMS WERE IN TRANSIT).

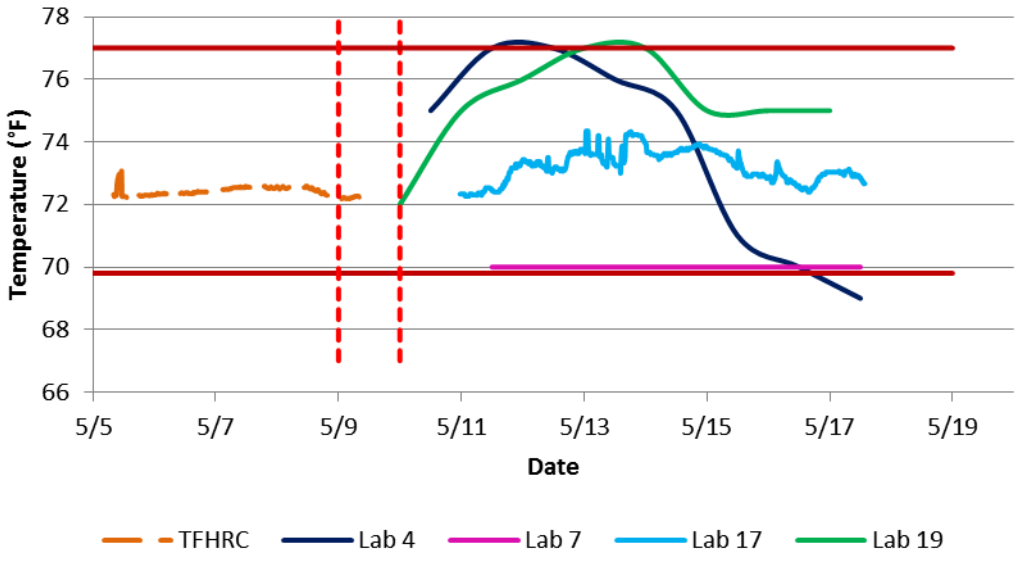

FIGURE C. 5 – CURING HISTORY FOR LABORATORIES THAT RECEIVED BEAMS ON 5/10. FROM 5/5 TO 5/9 BEAMS WERE CURED AT TFHRC. FIRST VERTICAL DASHED LINE (5/9/16) INDICATES THE DATE BEAMS WERE WRAPPED IN CURING SHEETS AND SECOND VERTICAL DASHED LINE INDICATES THE DATE LAD RECEIVED BEAMS.

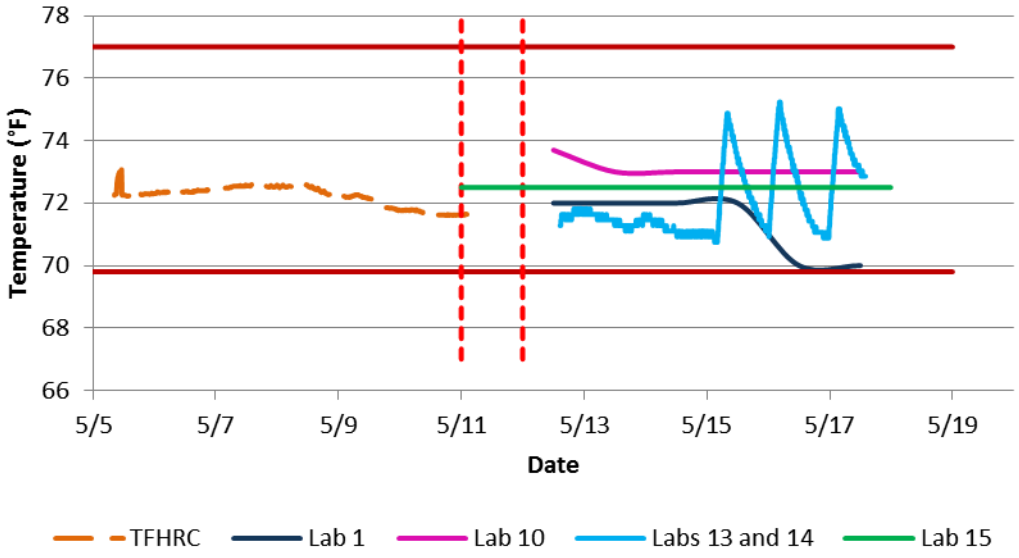

FIGURE C. 6 – CURING HISTORY FOR LABORATORIES THAT RECEIVED BEAMS ON 5/12. FROM 5/5 TO 5/11 BEAMS WERE CURED AT TFHRC. FIRST VERTICAL DASHED LINE (5/11/16) INDICATES THE DATE BEAMS WERE WRAPPED IN CURING SHEETS AND SECOND VERTICAL DASHED LINE INDICATES THE DATE LABORATORY RECEIVED BEAMS.

4. APPENDIX D

4.1. CURING TANKS SKETCHES

L1, L2, L3 and L4 indicate the tier on the shelf. The tiers are shown dislocated one from another in order to allow the proper view of specimens. In some cases, a “zoom in” view is provided to all beams to be seen. Circled numbers indicate tank number.

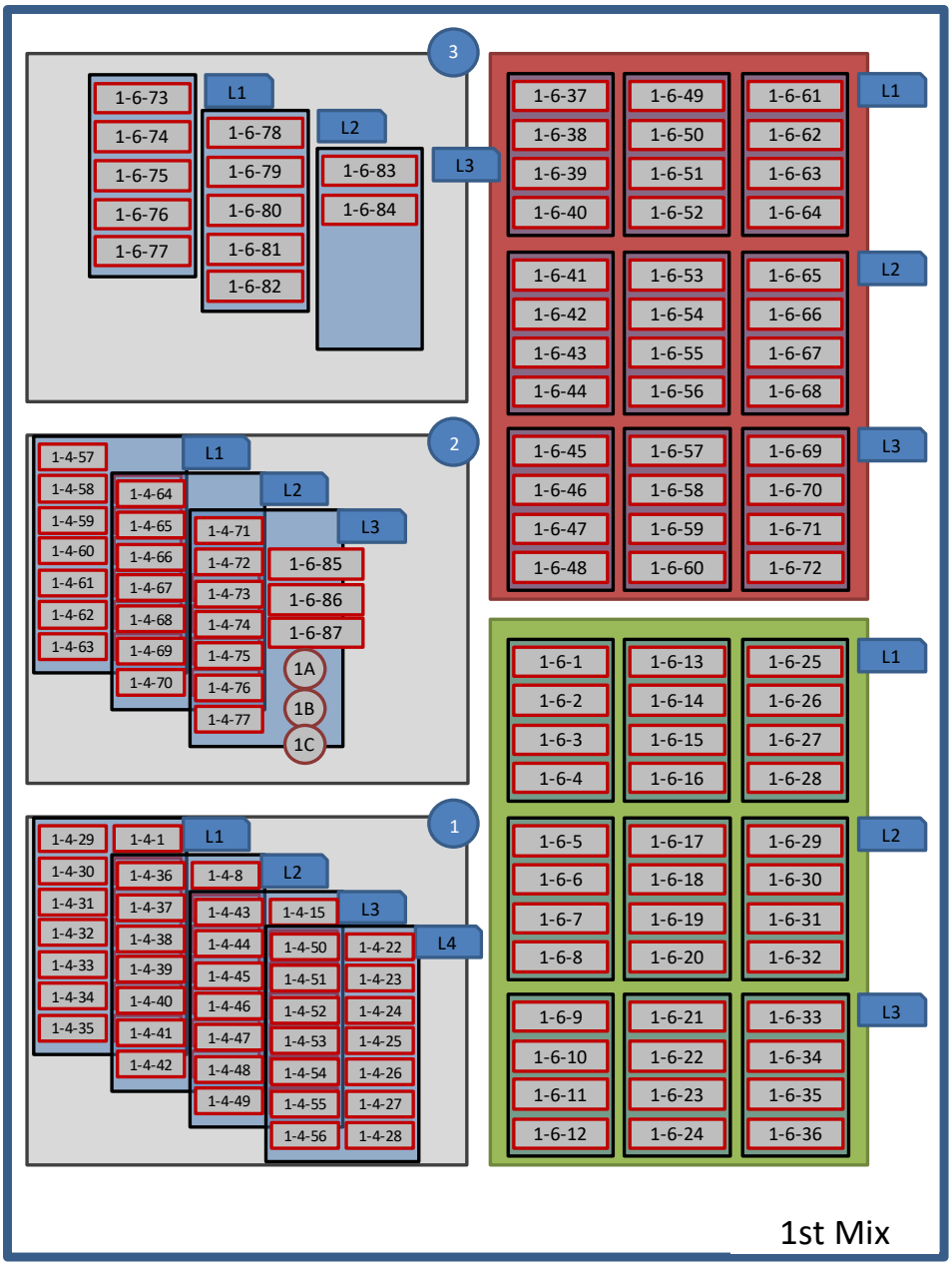

FIGURE D. 1 – TANKS FOR MIXTURE 1.

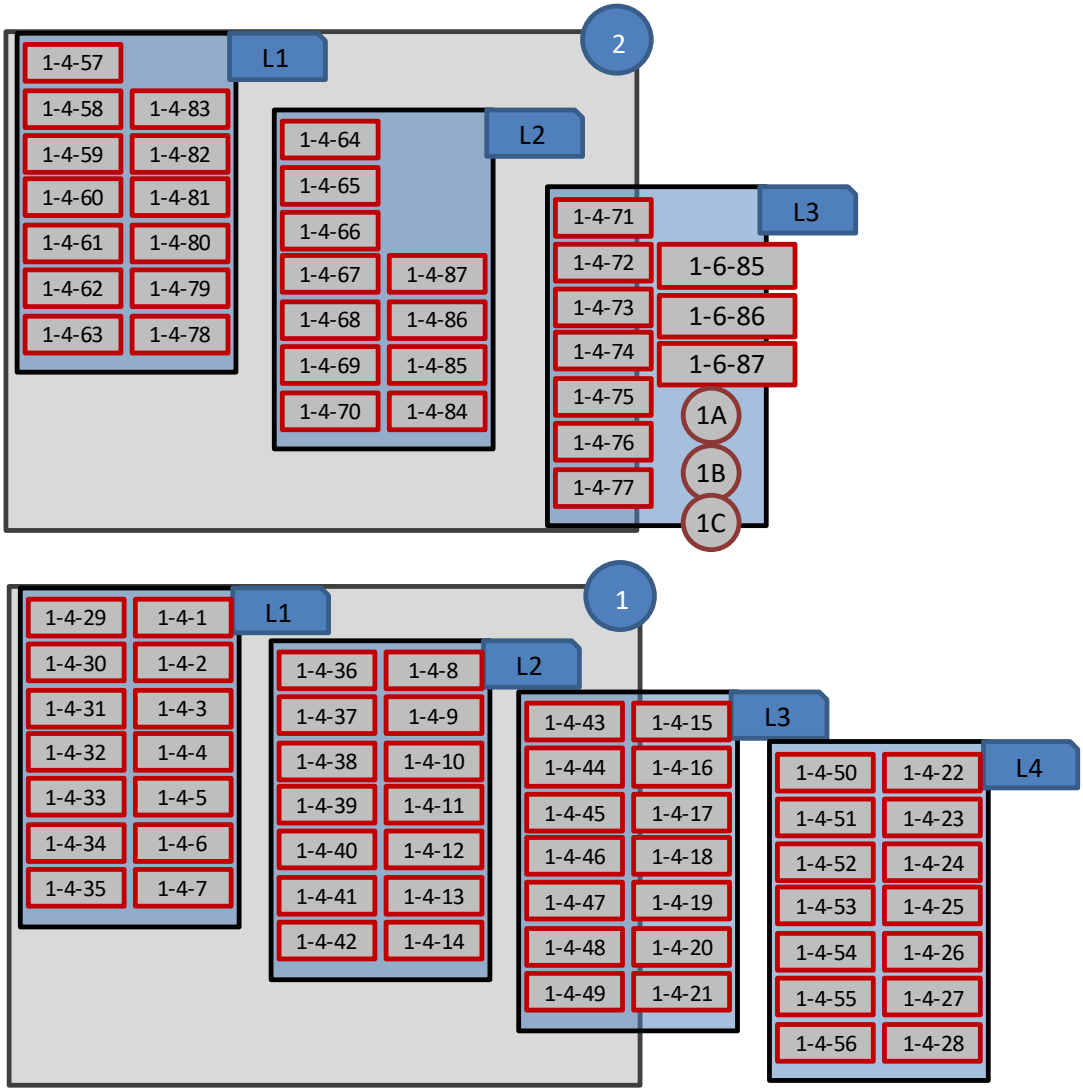

FIGURE D. 2 – ZOOM IN OF TANKS 1 AND 2 FOR MIXTURE 1.