TETRA TECH

Design Review
CHEF PTTC Water Tower Design Review
WO-A-0071
PLANS DATED 02 DEC 2010

Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Comment #	Reviewer	Reference	Comment	Response Code	Response	Back-Check	Response Code	IOM Response	Back -Check	IOM Response-back Feb. 17, 2011	Back -Check- Tetra Tech 2_28_2011	IOM Response-back Mar. 09, 2011
S-1	ALH	S001	The ACI318-08 is referenced as the applicable ACI code and all the ACI section references are from ACI 318M-08. Suggest updating Code reference to ACI 318M-08.	D	Our copy of ACI 318-08 is without the "M" suffix. There is ample provision in ACI 318-08 for metric equivalents. Our call out is correct.	Noted						
S-2	ALH	S001	Fig 1-1: The clear cover noted for slabs is for 36 diameter bars and less. Please clarify on the drawing.	D	We are unclear as to the Engineering point the reviewer has	The comment was suggesting that "clear cover" chart should specify that the cc noted is for =< 36d	**D**	Our first response stated there are no bars on the drawings in the size range that has	Noted			
S-3	ALH	S001	Foundations note 3 requires the polyethylene on both the bottom and the sides when applicable, the liner is noted on the bottom on the drawings.	D	The intent of the Polyethylene (PE) lining is for **temporary** use only and it is not intended to be incorporated into the permanent structure, though it would be acceptable if some or all of it were. The purpose of the PE is to protect the foundation after it is inspected and ready for use. This protection is to avoid the delay and/or expense of subsequent re-compaction	Noted						
S-4	ALH	S001	Concrete note 6 refers to ACI 318-05. Please Verify	A	Revised	Noted						
S-5	ALH	S001	Reinforcing Steel note 1 refers to Section 3.5.38. Please Verify	A	Revised call out to 3.5.3.8	Noted						
S-6	ALH	S001	No backup calculations to verify splice class-B Table 1-1	D	These splices are governed by ACI 12.2.2 and are a standard part of our office references (as they are with most offices).	splice lengths shown are 1.3ld. Noted		??				
S-7	ALH	S101	Per the foundations note 3 the polyethylene liner should be called out for both the bottom and the sides of the foundation when applicable.	D	A mud slab is shown. Once this slab is in place there would be no requirement for further protection of the soil in the footing bearing area. The sides of the concrete footing would be a standard form and if any PE were required it would be on the trench earth walls 1 to 3 feet or more away.	Noted						
S-8	ALH	S101	Suggest adding (typ) after each of the clear cover call-outs	A	Done	Noted						
S-9	ALH	S101	Suggest adding (typ) after the call-out for corner reinforcement bars	A	Done	Noted						
S-10	ALH	S101	no backup calculations to verify the reinforcement	A	The full computer file is over 3720 pages. We are attaching the full file for your review.	Please highlight the maximum moment in the footing under the applied loads / related reinforcement calculation and add note with comment number.		SEE CALCULATION PAGE 50 & 51	Noted			
S-11	ALH	S103	Per the foundations note 3 the polyethylene liner should be called out for both the bottom and the sides of the foundation when applicable.	D	There is no purpose for a vapor barrier on a footing. We usually only require a vapor barrier for slabs on grade and crawl spaces.	Noted						
S-12	ALH	S103	Suggest adding (typ) after each of the clear cover call-outs	D	We feel clear cover is adequately covered elsewhere. We are trying to get away from redundant call-outs of which there are still too many.	Noted						
S-13	ALH	S103	Suggest adding call-outs for the clear cover on both the side and the bottom.	D	See S-12	Noted						
S-14	ALH	S103	no backup calculations to verify the reinforcement	A	See S-10	See S-10						
S-15	ALH	Fnds calcs	no backup calculations for the foundation design (45degree and 90degree scenario) were submitted. The loads, bearing pressures, modulus of subgrade, flexural envelopes could not be checked.	A D	The Soils Consultant has provided a Subgrade Modulus.	Please highlight the input data from ETABS to SAFE / resulting maximum soil bearing under controlling load case and add note with comment number.		SEE CALCULATION PAGE 52	Based on previous submittal, it is reviewer's understanding that the ETAB model assumed fixed base condition for the columns. If the fixed condition is assumed, then there is a moment load at the base of each column which is not reflected in the current calculations. Please revise.	ETABS model assumed fixed condition and run with many combinations which were produced by ETABS model and another combinations set up by the designer and applied to ETABS (such as 90degree and 45 degree earthquake effects). The worse case is 45 degree. We submitted both cases UDCON1, 90 degree and 45 degree, for reviewer to check each condition. For more information, see calc page 17, 18, 19, 100, and 101	Noted	
S-16	ALH	Fnds pg 1	The soil pressure diagram shows pressures greater than the allowable. Please verify	A	We have revised our ETABS SAFE Calc to use R=8 and the soil pressures are now within tolerance.	q < qa, Noted. Revise drawing note B on S-100 to match calcs.	D	We assume the reviewer is referring to S001. Why would we revise the Maximum Allowable Soil Bearing Pressure? This was provided by the Soils Consultant.	Current drawing shows R=3 under Note B on S-100. Please revise it to match calcs.	Done	Noted	
S-17	ALH	Fnds pg 1	The soil pressure diagram shows a portion of the slab in a positive region (tension). Please verify	A	See S-16	ok						
S-18	ALH	Fnds pg 1	The screen shot of "soil pressure diagram - (45deg)" on fnds page 1 appears to be the same diagram shown on fnds page 6 except for the pressures noted are at different locations. Please provide backup calculations for these diagrams.	A	See S-16	ok						
S-19	ALH	Fnds pg 2	See comment S-15	A	See S-15	ok						
S-20	ALH	Fnds pg 3	Provide backup calculations for the 460psf shown on the diagram	A	The computer program supplies this data.	Please highlight the input/ relevant information and add note with comment number.		SEE CALCULATION PAGE 53	Noted			
S-21	ALH	Fnds pg 4	Provide backup for the modulus of subgrade shown	A	The Soils Consultant has provided a Subgrade Modulus.	Noted - assumed the input number was the same number given to the designer by the soils consultant		SEE CALCULATION PAGE 54	Include the subgrade modulus used in the calculations under Structural Note B. "Design Criteria" on sheet S001.	Done	Noted	

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S-22	ALH	Fnds pg 5	Provide backup for capacity ratio shown. The capacity/applied load ratio must be > = 1.0.	A	If the reviewer is referring to the factor of Safety against overturning the computer program shows it is now it is now over 1.5.	It is referring to the graphic "punching shear capacity ratios/ shear reinforcement" which shows ratios < 1.	D	Punching Shear is calculated by the program and has been hand calculated from time to time by this writer. The reviewer surely must know computers don't arbitrarily skip calculations from time to time. SEE CALCULATION PAGE 55	Noted			
S-23	ALH	Fnds pg 6	The soil pressure diagram shows pressures greater than the allowable. Please verify	A	See S-16	Noted						
S-24	ALH	Fnds pg 6	The soil pressure diagram shows a portion of the slab in a positive region (tension). Please verify	A	See S-16	Noted						
S-25	ALH	Fnds pg 6	See comment S-18	A	See S-16	Noted						
S-26	ALH	Fnds pg 7	The soil pressure diagram shows pressures greater than the allowable. Please verify	A	See S-16	Noted						
S-27	ALH	Fnds pg 7	The soil pressure diagram shows a portion of the slab in a positive region (tension). Please verify	A	See S-16	Noted						
S-28	SAM	Steel Tank Calcs. (General)	Calcs provided are numbered pages 2 through 5. It appears page one is missing. Also pdf provided with pages out of sequence	D	This writer always starts his calculations on page 2. This saves page 1 for a summary of "Codes, Loads and Assumptions". Since these pages were to be added to other calcs page 1 was not needed.	Page 1 is now added, ok. Pages are now numbered sequentially, ok.						
S-29	SAM	Steel Tank Calcs. pg. 2	When all the components of the tank's operating weight shown in the table at the upper right corner of the page are added, you get 169.5 kips not the 34.5 kips used in the tank design (arithmetic error). This difference will likely have a significant affect on the tank design.	A	Revised calculation continues to show the loads are small with respect to the non-earthquake resisting structure tank.	Calculation revised, ok.						
S-30	SAM	Steel Tank Calcs. pg. 2	"SEISMIC DEMANDS ON NONSTRUCTURAL COMPONENTS" (ASCE7 Section 13.3.1) is referenced and used to calculate the Seismic Design Forces on the tank. ASCE7 - 05 section 15.7 (TANKS AND VESSELS) must instead be used for this purpose.	D	We did not have AWWA D100 so we did not take advantage to the provisions of that code. Instead we used the more conservative loads required by ASCE 7 par 13.3.1. The Tank itself is not part of the Seismic resisting structure but must resist the Seismic loads that it could see. Chapter 13 is the most conservative part of ASCE 7 for these loads. The AWWA calc demonstrates the design is very conservative but we do not think there as anyplace in the tank that we should reduce the plates. We have removed the diameter 28 rod reinforcing the corner joints between the wall and roof and bottom plates in view of the very small forces.	OK. Page 2 of the hand calculation, I=1.0 is used stead of I=1.25 for Fp calculation. Please verify.	D	Please refer to ASCE 7 Sect 13.1.3. None of the conditions 1 through 3 apply therefore the last paragraph stipulates the Ip = 1.0	If the designer has determined that this structure is not an occupancy category IV, then the Importance factor I_p =1.0 is acceptable.	The designer has determined that the Occupancy category is **III**, since the important factor is **I=1.25 (**ASCE 7-05 Table 11.5-1), see Calc page 27.	Noted. On Calculation page 2, "Occupancy Category IV" and " Importance Factor I=1.5" are used. Please revise. "I=1.25" is used in ETABS and it is correct based on Occupancy Category III.	Done. See revised calculations.
S-31	SAM	Steel Tank Calcs. pg. 4	Provide back up for the 160 lb/LF Tank Roof Beam Design Load	D	The calculation is on the bottom of page 3 of the 25 Nov 2010 calcs.	OK						
S-32	SAM	Steel Tank Calcs. pg. 4	The moment of inertia I =10.4 in^4 for the tank roof beam could not be verified based on the beam web and flange thicknesses (t_w and t_f) provided in the calculation. Please provide back up calculation for the moment of inertia used.	A	Calc redone with two similar Channels. No change is recommended.	C120 x 52 moment of inertia revised ok. This revised moment of inertia is less than the required 8.68 in^4 moment inertia, hence the C120 x 52 can not be used, Moment of inertia for the C140 x 58 looks reasonable but can not be verified due to lack of information on section geometry. It is not clear from the designer's response whether or not he intends to use the the C140 in lieu of the C120! Detail "07 SECTION B-B" on drawing number S105 still calls for C120 x 52 and detail "02 TANK SECTION" on the same drawing calls for C120 x 55. Please revise both details and the tank plan to call for C140 x 58.	A D	We have continued learning the AWWA Code and find that internal wave pressure requires the roof be reinforced for wave action. The C100 diaphragms have been added to tank roof to accommodate compression flange buckling . To address the reviewer's comment more directly, most of the structural quality steel here is Russian and Russian steel properties apply. Two grades of steel come out of Pakistan. The satisfactory grade is patterned after the Russian steel and it is more expensive than the Russian steel. Russian steel properties apply. The less expensive steel from Pakistan is entirely unsatisfactory and frequent testing is the only way we know to keep it off the project. We presume other sources could supply steel here but we have yet to see any.	Calculated moment of inertia for C120 x 52 is 7.3 in^4 as per designer's calculation page 4, also the required moment of inertia is 8.68 in^4 as per the designer calculation page 4 . Hence, as per designer's calculations, channel section C120 x 52 is not adequate. Drawings referenced in my previous back-check comment still call out C120 x 52 for the roof beams. Please revise.	The drawing has been revised with the new C140x58. Moment of inertia is 11.8 in^4 which is bigger than the required moment of inertia (8.68 in^4).	Noted. "02 Tank Section" on S105 shows C120x55. Please revise.	Done. See revised drawings.
S-33	SAM	Concrete Tower Hand Calcs. (General)	Calcs provided are numbered pages 2 and 3. It appears page one is missing. Also pdf provided with pages out of sequence	A	Writer's preference. The calculations are now renumbered as a set.	Page 1 is now added, ok. Pages are now numbered sequentially, ok.						

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S-34	SAM	Concrete Tower Hand Calcs. Page 2	Provide back up for the various dead and live loads shown in the tables and the diagram on page 2.	D	We want to be helpful but this is obvious. Each of the loads is named.	Although the table and the diagram noted in the comment made the distinction between DL and LL, the individual components that make up these loads were not marked up and no back up calculation of these component loads were provided, they just appeared as several arbitrary numbers and they were added to make up the DL or LL. The new calculations does mark up the individual components and provide back up calculations, ok.	D	Please re-look at the "Loads". You will see we identified the loads as "Tank", "Insulation", and "Water" and the columns are labeled "D for Dead" and "S for Snow" on page 2. This should be sufficient for a reviewer never the less we went ahead and added an elementary load calculation to augment the original estimate and which confirmed the original estimate was conservative. In other places where we bring loads forward we put a source page number in the left margin if the reference is not sequentially obvious. In this writer's personal experience he has never known anybody, child, student or professional who could have made the "error" seen. We presume the "mistake" was intentional by persons unknown and made after the original calculation.	TT stated in previous back-check response that the designer has provided in the latest calculations, adequate explanations of the tank loads, and the reviewer had no further comments. It is not clear as to what mistake or error the designer is referring to in his latest response. As far as this review is concerned no further action is necessary on this item.	Done	Noted	
S-35	SAM	Concrete Tower Hand Calcs. Page 3	Platform Design Moments: Negative moments at exterior face of first interior support shall be WuLn^2/9 instead of WuLn^2/10 used here.	A	Calc revised with the new coefficient and with the net span. There is no change in the required area of steel.	Calculation package appear to have been reordered and the part relevant to this comments appears to be missing fro the new package. Please highlight revision noted under Response and designate them as revisions due to reviewers comment S-35. It would also be helpful to have a table of content indexing all the calculations in the package.	A	Our calculations are not kept in a secure place when they are not being worked on. There were 4 "deliberate errors" in this set. We have revised the pages referred to and they are now included as pages 48 and 49.	Referenced pages 48 and 49 not included in latest calculation package. This item has not been addressed.	New calculations are being provided ($WuLn^2/9$) along with revised the drawing. According the new calc., previous drawings showning Φ12 @ 20cm o.c and Φ16@25cm o.c have been revised showing Φ12 and Φ16@15cm. See calc page 5	Noted	
S-36	SAM	Concrete Tower Hand Calcs. Page 3	Platform Design Moments; Comments similar to comment S-34 above.	D	See S-34 above.	See Back-Check in comments S-35 and S-34.			See Back-Check in comment S-35. This item has not been addressed.	See S-35	Noted	
S-37	JZ	General Comment on code reference	Current design is concrete moment frame-supported elevated tank and is not one of the two standard types of elevated tanks in AWWA D100. AWWA D100 doesn't cover this type of structure.	A D	This design, while not efficient was required by others as possibly, in their view, being easier to construct.	Noted						
S-38	JZ	S001 and Concrete tower ETABS calc page 1	IBC 2009 is called out on S-001 Structural Notes, IBC 2006 is used in ETAB. Pleas coordinate.	D	This is an artifact of our version of Safe. There are no material differences between 2006 and 2009 in this part of the Safe program.	Noted						
S-39	JZ	S001 and Concrete tower ETABS calc page 1 (total 26 pages)	Seismic Parameters Ss=2g and S1=1g are used in the design since this is a prototypical design. In case the CHEF PTTC Water Tower Design will be used on a site with higher seismic design Parameters, suggest add following note to Sheet S-001-Structure Notes B Design Criteria: "Contractor to verify site specific seismic parameters Ss and S1. If they are higher than the specified Ss and S1, the CHEF PTTC Water Tower shall be redesigned."	A	USAID, IRD and IOM have studied the USGS Seismic Risk Study for Afghanistan and the risk values assumed cover all or nearly all populated areas in Afghanistan. Never the less the note provided by USAID covers this suggestion.	Noted						
S-40	JZ	S001 Structural Notes B Design Criteria and Concrete tower ETABS Calcs page 1	Occupancy Category III and Seismic Importance factor I=1.25 are used in the design. Per ASCE 7-05, water storage facilities required to maintain water pressure for fire suppression is in Occupancy Category IV with seismic Importance factor I=1.5. Please confirm that the CHEF PTTC Water Tower is not in this category.	D	There is no fire protection in this system/design. Fire protection is to be provided by others.	Page 3 Table 1-1 on ASCE 7-05 refers to "… for fire suppression" not "fire protection". Please confirm the structure is not "Ancillary structures required for operation of Occupancy Category IV structures during an emergency". Please let us know if you don't have access to any of the reference code section referred here. We will scan them and send over.	D	This is a small school that would be Occupancy Category II except the population is just over 600 during the day. It is wrong to mix it up with Essential Facilities of any kind.	Based on desinger's response, we assume that designer confirmed this is NOT an occupancy Category IV structures.	See S-30	See S-30	
S-41	JZ	S001 Structural Notes B Design Criteria and Concrete tower ETABS Calcs page 1	Please specify structure system for the concrete tower per ASCE 7-05. Once the specific structural system has been picked, the design needs to satisfy the "detailing requirements" of ASCE 7-05 Table 15.4.-1 and 15.4.-2 . Per our understanding, "Special Reinforced Concrete Moment Frames" are intended to be used.	A	As Engineers we try to avoid designing "Special Moment Frames" because of the congestion of the reinforcement and special inspection that is required by IBC Chapter 17. Accordingly we kept the R value at 3 and proceeded with an Intermediate Moment Frame type design. We fully kept in mind the more stringent requirements for a SMF while keeping the much larger forces that resulted from R=3. By this effort we developed a plan that satisfied a SMF in every respect except the congested reinforcement. Unfortunately the Seismic action of the increase in column size now causes the toe pressure to be too high so we have revised our R to 8 and detailed the column and beams as a SMF.	The Seismic Design Category of the structure is Category E per ASCE 7-05 section 11.6. According to Table 15.4-1 page 162 of ASCE 7-05, "Intermediate reinforced concrete moment frames" "with permitted height increase" and R=3 has a height limit of "50 ft" for Seismic Design Category E. Our structure is over 50f. "Intermediate reinforced concrete moment frames" and R=3 is not applicable here.	D	Nothing in either the letter or spirit of the code requires to user to make the "code minimum" his "design maximum" . We are perfectly aware of the interpretation presented here by the reviewer but broad experience, Nationwide in the US, with actual field construction using "SMF" rules has demonstrated that even where conditions are far better than Afghanistan it is unwise to unnecessarily design to SMF Rules. This small structure offers no possibility of effecting the needed savings in materials that might justify the difficulty and expense of SMF construction. It is unknown whether an Afghan contractor's performance will successfully meet SMF standards.	Please clarify which structure system will be used for the concrete tower. The design, based on the second submittal, uses a SMF but the designer seems to be implying that this cannot be constucted.	According the ASCE 7-05 and SDS=1.33, SD1=1.0, only Special Reinforced Concrete Moment Frame can be used, which we used now in ETABS model, R=8, Cd=5.5 and Ω0=3. See calc page 14a	Noted	
S-42	JZ	Concrete tower ETABS calc page 1	Height for "STORY5" is shown as 11.155ft, which seems low. Please double check the number.	A	Corrected	Noted.						

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S-43	JZ	Concrete tower ETABS calc page 1	" Ct=0.028 & x=0.8" are used in the calculation on page 1. Per ASCE-7 Table 12.8-2 , for concrete moment resisting frames "Ct=0.016 & x=0.9" are to be used. Please verify and revise.	D	This is an artifact of the ETABS program which is written for buildings, not non-building structures. ASCE 7 Table 12.8-2 does not apply to this tower (See ASCE 7 par 15.4.4). However something has to be put in to allow the program to run. The period for the tower is correctly calculated in accordance with par 15.7.10.7.2. In any case the calculation is only used to determine if the structure is to be designed as a "rigid" or "non-rigid" structure. The period is not otherwise used in any tower structural calculations.	Noted.						
S-44	JZ	Concrete tower ETABS calc page 2	Site Class E is used in calculating seismic load. Per ASCE 7-05 section 11.4.2: Site class D shall be used where the soil properties are not known. If Site Class D is assumed, then the seismic base shear load is about 11% higher.	D	The Soils Report gives the site as Class D. ASCE 7 par 11.6 requires this site to be re-classified as Class E because of the magnitude of S1.	No soil report has been submitted. "Site Class" is different from "Seismic Design Category". ASCE7-05 section 11.6 is for "Seismic Design Category" not for "Site Class". The Seismic Design Category of the structure is E. If the soil Report gives the site as Class D, Then Fa=1.0 (per ASCE 7-05 Table 11.4-1) not Fa=0.9 used in the calcs. (page 16 in the Hand calcs.). Seismic base shear load is 11% higher with Fa=1.0.	D	We note the reviewer's reliance on the code default value for Site Class. We ask that the reviewer add to his deliberations that this is a multiple site design. It is intended to cover sites that we believe are Class E as defined in ASCE 7 Chapter 20 by their SPT blow counts. We also have sites that are default Site Class D. The Soils Consultant does not explicitly define the Site Class in any of the 9 reports we have. Class E is more Seismically demanding except in the one Sds term the reviewer has referred to, so we have concentrated on Site Class E. We have run the computer program for the effects of Site Class D and find the results acceptable. We are attaching this additional analysis. A copy of the Soils Reports are available in the USAID and our offices. You are invited to look at our copy any time that is convenient for you and of course you may copy any pages you wish. **SEE CALCULATION PAGE 56, 57,**	Based on S1 and Ss values used for the design, site class D will give a higher base shear load than site class E. Will site class E soil be able to give 2000psf soil bearing capacity? Calculation page 56 & 57 show the input of Site Class D in the ETABS program. No calculation results corresponding to the site class D are presented to confirm designer's conclusion.	In revised calcs, Site class D used Fa=1, Fv=1.5, Table 11.4-1 and 2. See calc pages 27, 28, and 29	Noted	
S-45	JZ	Concrete tower ETABS calc page 2 and Page 6 & 7	The total reaction force at base for EQX (x direction seismic force) or EQY is shown as 177.2 kips on Page 2, 6 and 7. It is not clear if the weight of the Steel tank and water inside were included in the seismic load calculation of the concrete tower (it seems like that the weight of the steel tank and water inside were not included). Due to the weight and vertical location of the steel tank and water inside, the seismic effect of the steel tank and water is significant. Please specify and clarify if it is included.	D	The tank and its contents were included.	Wasn't able to locate "horizontal seismic force from Steel tank and water" applied in the ETABS calcs. Under ETABS Summary report: Please highlight the total base shear for EQX/EQY, Total W (weight) used to get the EQX/EQY and horizontal seismic force from Steel tank and water only in ETABS calcs. Please mark down "Comment S-45" next to them. Currently, 3.035E+04 kg (about 67 kips) is shown under "total reactive forces" and 7.99E+02 kg is shown at Top of Tank under "Story Forces". The horizontal seismic force from Steel Tank and water insider shall be larger than 7.99E+02 kg.			NO Response on this item.	Weight of the water and steel tank including external and internal ladder are considered, see calc pages 3, 4, and 98	Noted. Will this dead load be included in the total weight of the structure to get the seismic force? Currently in ETABS, the total "W" (used to get "V") is 396.74 kips as shown on Pages 70 and 71. And the corresponding "V" is 82.65 kips. The total "W" doesn't seem to include weight of the water and steel tank, which is 160kips as shown on page 4. So the corresponding "V=82.65" doesn't include the horizontal seismic force from steel tank and water. Also, the weight of the water and steel tank is applied at story 5 level. But the actual center of gravity for the weight of the water and steel tank is about 5 ft higher. Please consider the additional overturning moment from "actual center of gravity" to story 5 level.	All weight are calculated and shown in the hand calc and in ETABS model as well. The end reslut is alomost the same. Please see calc pages 5 and 46. For overturning moment, please check calc page from 5 to 8.
S-46	JZ	Concrete tower ETABS calc pg 20 to 22 and Fnds pg2	Concrete tower column axial forces on ETABS calc pg 20 to 22 doesn't match applied force on Fnds pg2. Please clarify. Also, the concrete tower frames are fixed at bottom per ETABS model, moments from concrete columns shall be applied during the footing design.	A	We are unable to identify the reviewer's intent. Please ask again.	Please highlight the loads used for the footing design in SAFE program with "Comment S-46" next to them.		SEE CALCULATION PAGE 58 & 59	The ETAB model assume Fixed condition , based on the second submittal, for the base of the columns. If the fixed condition is assumed, then there is a moment load at the base of each column. Page 58 & 59 didn't show that moments have been applied.	See S-15	Noted	
S-47	JZ	Concrete tower ETABS calc	Wasn't able to locate the P-Delta effect design in the calculation. Per ASCE 7 section 15.7.10.3, P-Delta Effects shall be considered. Due to the weight of the steel tank and water, the P-Delta effect can be significant.	D	P delta and Cb are both correctly input and we have added the page that captures this . See page 22 & 23.	ETABS calculations: Please highlight "P-Delta effect design" with "Comment S-47" next to them.		SEE CALCULATION PAGE 60	Calculation page 60 show the input of P-delta effect in the ETABS program. No calculation results corresponding to the P-delta effect are presented to confirm that the concrete tower is stable and satisfying under P-delta effect.	P DELTA effects is considered and Cd is used 5.5. See calc pages15 and 48.	Noted	
S-48	JZ	Concrete tower ETABS calc	Wasn't able to locate load combination per ASCE 7-05 in the calculation. Please specify load combinations based on ASCE 7. The direction of loading shall meet the requirements of ASCE 7-05 section 12.5.	D	We put all the load combinations into ETABS.	Noted						

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S-49	JZ	Concrete tower ETABS calc	Please check drift per ASCE 7 section 15.4.5 Drift Limitations.	D	Drift was included in the ETABS Calc. We have attached a copy of this input pages as 22 & 23. Because of the increased weight of the columns for moments we have revised R from 3 to 8 and modified the reinforcement call outs to show where the bars can be spliced. We have also reduced the Stirrup spacing to d/4 max. Unfortunately my hand calc now fails so we are relying on the SAP/SAFE calcs for soils pressure. We have contacted the Soils Consultant and he has guided to a better value for the Subgrade Modulus. The R Value of 8 Special Moment 'frame brings all values into the allowable range.	Noted. Please confirm drift has been checked against ASCE 7-05 section 15.4.5 Drift limitations.			NO Response on this item.	Drift calc is done and multiplied by Cd=5.5, according to section 15.5.2.1 -ASCE 7-05. See calc page 6.	Noted	
S-50	JZ	Concrete tower calc	Missing reinforced concrete moment frame beam and column design calculations. Design and details shall meet ACI 318-08 Chapter 21 requirement.	A D	Col connection is shown on Dwg S103 and S104. Column Calculation was by ETABS. Attention has been paid to the cracked section "I" as defined by ACI 318 Sec 10.10.4.1.	Noted.						
S-51	JZ	Concrete tower calc	Wasn't able to locate Steel Tank to Concrete Platform anchor bolt design calculations. The Anchor bolts shall be designed to transfer lateral and uplift loads into the concrete platform and also satisfy AWWA D100 and ASCE 7 section 15.7.5 requirements.	D	We have added a calculation. The bolts primary duty is to preclude temperature induced movement of the tank. See bottom of page 10.	Noted						
S-52	JZ	S105 and S106	20 Dia Anchor bolts are used. Per AWWA D100 section 3.8.5: The minimum anchor bolt diameter shall be 1 in (25.4mm). Please revise. Anchor bolts shall meet the requirements of AWWA D100 section 3.8 Anchorage. Also, Oversized holes on 10mm bottom plate are necessary for installation. Please specify hole size on the drawing and consider oversized holes impact during anchor bolt design.	D	This is a very small water tank when general industry requirements are considered. As cited above the principle duty of the bolts will be to prevent temperature induced movements.	Oversized holes on bottom plate are not addressed. Also, 1 in minimum anchor bolt size is due to corrosion consideration.	D	Anchor Rod holes are usually a subject for the Shop Drawings. AISC 13th Table 14-2 provides the largest recommended hole size for Bearing Plates. The tank bottom plate is not a bearing plate but we could look at it as if it were similar. There is no design issue here. The Anchor bolts are Galvanized so the ¼" corrosion allowance is not an issue in our opinion. We always accept anything permitted by the code and we believe that USAID will as well.	The minimum anchor bolt diameter of 1 in (25.4mm) is required by the AWWA D100 code.	Done	Noted	
S-53	JZ	Concrete tower details on S101, S103 & S104	Details do not meet ACI 318-08 chapter 21 requirements on "Special moment frames"	D	ASCE 7 Table 12.2-1 does not apply to this tower. This tower is designed as an Intermediate Moment Frame in accordance with Table 15.4-2.and par 15.4.4	Conflict with Response to Comment #S-53. Please see Back-Check response to comment #S-53. Currently, some details shown on the drawings don't satisfy SMF requirements. For example, ACI 318-08 section 21.12.2.2 requires 90-degree hooks with the free end of the bars oriented toward the center of the column. Current drawing S101 shows the hooks towards the other direction. And S104 "04 BEAM SECTION" doesn't satisfy ACI 318 section 21.5.3.3. Please go through ACI 318-08 chapter 21 and update drawings.	A	Done	A quick review of the details in the drawing set found that they do not all satisfy the detail requirements of ACI 318-08 chapter 21. Please go through ACI 318-08 chapter 21 and make sure all details shown on the drawings satisfy SMF requirements.	Based on ACI 318-08 chapter 21, drawings fulfills the Special moment frame such as: • All columns and beams size fulfill the 21.6.1 • Longitudinal rebar is between 1 and 6%, fulfills the 21.6.3.1 • Transverse reinforcement used according to 21.6.4.1 and 10.5 • Columns stirrups spacing is 10cm which d/4 fulfills 21.6.4.3 • Stirrups hook and numbers fulfills 21.6.4.2 • Columns stirrup extended in to the footing according 21.6.4.6 • Column and beam joints detail fulfills 21.7 • Joints hoop detail are provided according the ACI 315-99 page 27 fig 7	Noted. Detail 01/S104 doesn't satisfy ACI 318-08 section 21.7.5.1: The 90 degree hook of the column longitudinal reinforcement shall located within the confined core of the column. Detail 01, 02 and 03 on S104, please revise and show column transverse reinforcement through "column and beam joints".	Done. See revised drawings.
S-54	JZ	Concrete tower details on S101, S103 & S104	Specify rebar splice locations on the drawings. ACI 318-08 chapter 21 has specific requirements on the lap splices locations.	A	Done	Noted						
S-55	JZ	S102	Please specify the location where 12 DIA top rebar @20cm O.C. switches to 16 DIA top rebar@ 25cm O.C. (or the starting location for each type of rebar) on the "WATER TOWER PLATFORM PLAN" on sheet S102. Currently, it is not clear.	A	The plans require the contractor follow the ACI Standard Practice (SP 66) but we have added the suggested information.	Noted						
S-56	JZ	S102	Missing Reinforcement detail at platform concrete slab opening, like opening at tower ladder location.	A	The general notes specify the requirements for re-entrant corners. This requirement is now added to the plan.	Noted						
S-57	JZ	General Comment on Steel Tank Design	Welded Steel Tank shall be designed and detailed in accordance with AWWA D100 and ASCE 7 - 15.7 applicable sections.	A	We have added sheets 7 to 19. We ask the reviewer to note that the tank wall axial stress is on the order of .11 ksi. Hoop stress 1.91 ksi. These calculations would be very important on an ordinary municipal water tank but this project is for a very small tank that does not justify this calculation. The reviewer will not we had already verified the hoop stress for the original submittal. We have carried this calculation much further than we believe is necessary in the hope of early approval.	Noted						

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S-58	JZ	General Comment on Steel Tank Design	Missing Steel Tank wall connection detail and weld calculation. Missing top and bottom wall joint (continuous 28mm DIA bar) calculation.	D	The connection is detailed on S105 Det 04. .	Will the 8mm Tank wall be shipped in pieces? If so, how are they connected?	A D	We can expect the best bid price if we leave this issue for the contractor to decide. Because of the tank size we think some contractors may want to fabricate it on site then lift it into place. There are issues of Plate joint connections. They can be either butt welded or lap joints in most cases. This is properly a subject for the shop drawings. The contractor can even choose to have a Steel Fabricator such as ayandesazan@yahoo.com furnish the tank. Ayande equipment can make two plane bends in steel plate and they have supplied many elevated water and fuel tanks in Afghanistan.	Noted			
S-59	JZ	General Comment on Steel Tank Design	Missing Steel Tank roof supporting column calculation.	D	The connection is shown on dwg S106 Det 06 and 07. The column is not connected directly to tank roof to aid in column fabrication. The C Channel is connected to the roof and the column is connected to the C Channel. This makes the construction tolerances easier.. Finally a redundant lateral connection is provided. The column calculation is on the bottom ¼ of sheet 4 and top of sheet 5 dtd 29 Nov 2010.	Noted						
S-60	JZ	Steel Tank Design S105	Tank roof slope is 1.92% as shown on Tank Section 02 on S105, which is less than the minimum roof slope 3/4 in 12 as specified in AWWA D100 section 3.6.1.2. Please review.	A	The tank roof was originally designed with a witches cap configuration but revised to flat to allow fabrication by more vendors. Roof slope is provided by the tapered insulation. The roof slope has been revised to 6% to comply with AWWA D100 which we now have.	Noted						
S-61	JZ	Steel Tank Design S105 Tank Section 02	Please verify the availability of tapered rigid insulation in Afghanistan.	D	Tapered insulation is known and available here and is used on several of our projects.	Noted						
S-62	JZ	Steel Tank Design S105 & S106	The minimum size of fillet welds (except seal welds) shall be 4.76mm per AWWA D100 section 8.14. 4mm fillet welds have been provided in the details. Please review and revise.	A	We have increased all the welds to 5 mm where it is possible considering the metal thickness joined. In many cases this results in a weld that is too large for the plate. See AISC 13th ed page 9-5. As a comment, the 3/16th inch min weld is specified in the code to assure enough heat is input into the plate to assure the weld does not cool too quickly. That concern is not applicable here but we want as speedy approval as practical and we do not believe the change effects the cost here in Afghanistan, as it would in the US.	Noted						
S-63	JZ	Tank Lid Keeper Detail 3 on S106	25mm DIA holes on 8mm plate cover for the 3-12 DIA cover keeper: Will rain water, insect or debris get into the water tank through these holes?	D	The risk is minimal but no waste or water will enter when the nut and washer are in place. We have further added a neoprene washer.	Noted						
S-64	JZ	General Comment on Tower Ladder	Missing Tower Ladder calculations. Tower Ladder shall be designed per AWWA D100 section 5.4.2 and shall comply with OSHA requirements.	D	Ladders comply with 29 CFR 1910.27. This is an established design and we have provided calculations.	Noted						
S-65	JZ	Tower ladder detail S108	Ladder to concrete connection 20 DIA x 300mm Anchor bolts: Are these anchors preset anchor bolts or post installed epoxy anchors? Please clarify on the drawing. Post installed epoxy anchors will be easy for construction. If these are epoxy anchors, please specify type of epoxy anchor and minimum embedment length required. Missing Anchor bolt calculation.	D	The ladder connection is detailed on dwg S108 Detail 08 and 04. The bolt is suitable for over 2.4 kips per bolt in accordance with IBC Table 1911.2. We have used a diameter 20 bolt as it is our standard, simplifies procurement and inspection and there are very few exceptions to the standard bolt requirements. If the contractor requested it we would permit drilled in anchors such as HILTI HSL or HVA. No calculation is needed for this connection as it can be seen to be adequate by inspection. Never the less we have provided a calculation anyway to speed approval.	Noted. Post installed epoxy anchors will be easy for construction, but this is designer's choice.	D	The reviewer does not appear to be aware that (at least until last year) only three drilled in anchors are presently code approved for Seismic applications. All are Hilti Anchors and there are no HVA (epoxy) type anchors presently approved for cracked concrete. (The usual condition for Seismic Anchors.) This does not preclude their use in non-structural applications but it certainly limits their suitability.	Noted			
S-66	JZ	Tower ladder detail 03 on S108	Ladder to 100mm concrete slab connection 20 DIA x 300mm Anchor bolts: Anchor bolts have small edge distance. Check anchor bolt strength. Concrete spalling can be a concern here as well. Will the anchor bolt interfere with slab rebar? Please see previous comment as well. Suggest attaching top of the ladder to the platform beam instead.	D	The general Notes require these bolts to be galvanized so we think spalling from corrosion is unlikely. Connection from the beam is possible but not more simple.	Noted.						

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S-67	JZ	Platform Guard Rail connection detail 05 on S108	Guardrail to 100mm concrete slab connection 20 DIA x 300mm Anchor bolts: Anchor bolts have small edge distance. Check anchor bolt strength. Missing guardrail and anchor bolt calculations. Concrete spalling can be a concern here as well. Will the anchor bolt interfere with slab rebar? Please specify epoxy anchors or preset anchor bolts.	D	Calc provided on pp 21 & 22. The design shown was correct. But out of respect for Murphy's Law we have increased the Slab to 150mm.	Noted						
S-68	JZ	Tank Exterior Ladder detail 03 on S106	Ladder to concrete slab connection 20 DIA Anchor bolts: Are these anchors preset anchor bolts or post installed epoxy anchors? Please clarify on the drawing. Please specify type of epoxy anchor and minimum embedment length required.	D	The drawing details show imbedded (cast in place) anchors. If the contractor were to request a drilled in anchor we would consider it on a case by case basis. For drilled in anchors, because of the hole size we would likely revise the connection to require the anchor bolts to be installed vertically as in this case edge distance would be more material.	Noted. Please specify embedment length for anchors.	D	We show the projection (50 mm) and bolt length. The additional dimension is merely redundant.	Didn't see either bolt length or projection (50mm) was specified on Detail "03 Tank exterior ladder" on sheet S106.	Platform slab thickness has been increased to 200mm to embed the anchor bolts at least 150mm in concrete as shown in revised drawing. See 02 and 06/S106,	Noted	
S-69	JZ	S106 Interior Galvanized Steel ladder	Suggest apply same coating over interior galvanized steel ladder as inside of tank per note 4 on S106.	A	The General notes have been revised to insure all interior surfaces are to be coated..	Noted						
New Comments												
S-1	JZ	Hand Calcs page 8 and ETABS Input page 12	Hand Calcs page 8 doesn't match ETABS Input page 12 on R value, W (weight), Cs used.						NO Response on this item.			
S-2	JZ	Hand Calcs page 8	ASCE7-05 formular 15.4-4 is the minimum requirement on Cs. The actual Cs shall be calculated from formular 12.8-2 Cs=Sds/(R/I)				D	Chapt 15 is for non-building structures. Chapter 12 is for Building Structures. Chapter 12 does not apply to this project. Please refer to ASCE 7 par 11.1.2; 12.1.1 and 15.1.1.	ASCE7-05 section 15.4.1 specifies that "non building structures shall be designed to resist minimum seismic lateral forces that are not less than the requirements of section 12.8." This issue is addressed correctly in the ETAB, second submittal.			
S-3	JZ	Concrete strength on S-001 and Concrete Frame Design calcs Page 3	Drawing S001 specified 4500psi(31 Mpa) concrete. Page 3 of Concrete frame design calcs used 4000psi concrete.				D	We do not know what the reviewer is looking at. All concrete on this project is designed for f'c=4500 psi. **SEE CALCULATION PAGE 61**	Noted			
S-4	JZ	Concrete Frame Design calcs Page 4 & 5 Column K value	Kmajor and Kminor =1 are used for all columns. Please provide back up calculation for that. It will be fine if K values are calculated by ETABS. Provide unbraced lengths and K used for columns along grid line B and grid line 2. Please explain the meaning of "L Ratio Major" and "L Ratio Minor".					SEE CALCULATION PAGE 62, AND SEE 63, 64, 65	Submitted calculations pages 62 to 65 were not related to this review comment.	K values are calculated by ETABS,	Non corner columns B1, B3, A2 and C2 only have beams framing into them in one direction at 1st story to 4th story. The unbraced length of these columns in the other direction will exceed the story height (close to 5 times of the story height). Please submit detail calculation of these columns including column unsupported length. Please also submit detail calculation of one corner column (A1, A3, C1 or C3) including K value calculation.	The designer modeled the water tower in ETABS, and considered cracked section and P-delta effect. There are no failed massages in ETABS calculation. Besides, we provided hand calculation for both columns as **non sway frame** and **sway frame. P**lease see calc pages from 9 to 23.

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Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Back -Check- Tetra Tech 3_28_2011
Noted
Noted

Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Back -Check- Tetra Tech 3_28_2011

Back -Check- Tetra Tech 3_28_2011
Noted. The weight of the water and steel tank has been included in the total "W" to get seismic "V". The seismic force of the water and steel tank is applied at story 5 level instead of at the center of steel tank, shown as "75.53 Kips" on calc page 46. Please add to ETABS model the additional moment due to moving the seismic force of the water and steel tank to story 5 level, which is about 260kips.ft. By moving the seismic force of the water and steel tank to story 5 level, it reduced vertical loads to the columns unless the additional moment is included. Overturning is fine as shown on calcs pg 5 to 8 and is not the concern here.

Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Back -Check- Tetra Tech 3_28_2011
Noted

Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Back -Check- Tetra Tech 3_28_2011

Response Legend
A - Agree
D - Disagree
O - Out of scope
AE - Agree with exception

Back -Check- Tetra Tech 3_28_2011
Calc page 13: For the middle columns: The unsupported length Lu is more than 158in in the direction of no beams framing into them, since no members providing lateral support from floor 1 to floor 4, only have lateral support on floor 5. The unbrace length is about 158*5= 790in.