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To: [REDACTED] USAID Roads & Vertical Structures Lead

Cc: [REDACTED] USAID COR and Christine Katin, USAID ACOR

From: [REDACTED] PE, BCEE, AESP Chief of Party [REDACTED] PE, AESP Lead

Date: December 7, 2014

Subject: WO-LT-0082 Engineering Support for Vertical Structures Construction
Sabez School, Adraskan District, Herat Province– Design Review

This memo addresses a request from USAID to Tetra Tech to review the proposed Sabez School design for conformance with the International Building Code's (IBC) structural and seismic requirements. This review provides an overall design review of the proposed Sabez School located in the Herat Province, Adraskan District, Afghanistan.

Information Provided for Review

Information was provided by USAID for the overall design review. In summary, the materials received included:

- Structural Drawings – Sabez School, S00-S08 (Missing Sheet S05), dated 2/16/2014
- Architectural Drawings – Sabez School, A01-A02, dated 2/16/2014
- In addition, USAID provided a Bill of Quantities, Work Plan and Detail Budget. These were not reviewed by Tetra Tech since they are independent of checking for conformance with IBC.

Summary of Review Findings

Based upon our review findings, Tetra Tech has several concerns with the proposed design and offers the following comments regarding the suitability of the proposed Sabez School.

1. The intent of the Sabez School design review and analysis is to verify the proposed design complies with the requirements of IBC 2012 and relevant seismic requirements. Based on Tetra Tech's review, the proposed design does not meet the IBC 2012 code requirements including seismic requirements.
2. Technical specifications, basis of design, design loads and design calculations were not provided. Drawings appear incomplete and are missing essential information. Sufficient information, details and sections are critical to the construction of the completed structure.
3. The design drawings provided to Tetra Tech list the same individual in both the "Designed By" and "Checked By" blocks on all of the drawings in the package. This is poor design practice, providing for no QA/QC of the documents.
4. Tetra Tech performed a structural analysis of the proposed school to assess the proposed design of the structure and found several areas of deficiency in the design. Detail findings are under "Summary of Results."
5. Numerous assumptions were made regarding key design features such as soil properties, design loads and geometry and are listed under "Design Assumptions." It should be noted that assumptions made by Tetra Tech may differ from the design parameters used in the proposed design.
6. The Adraskan District is located in the Herat province of Afghanistan. Seismic parameters were identified for the Adraskan District using UFC (Unified Facilities Criteria) seismic maps. Per the UFC seismic map of Afghanistan, the seismic parameters for the Adraskan District are $S_s=0.21g$ and $S_1=0.11g$, and used in the structural analysis. Per IBC 2012 and with these seismic parameters, the

Seismic Design Category for the project is C. Moment-resisting Intermediate Reinforced Concrete Moment Frame is an allowable lateral force resisting system under Seismic Design Category C and used in the structural analysis. Based on the Tetra Tech analysis, the proposed beams and columns do not meet the Intermediate Reinforced Concrete Moment Frame requirements.

7. The foundations located in the two center rows (along the transverse direction of the building) fail due to the applied bearing pressure being higher than the assumed allowable bearing pressure, 1.00kg/cm^2 (2.0ksf), as indicated under Foundation Notes on drawing S00.
8. Interior and exterior wall types were not indicated on the drawings. Based on the Bill of Quantities, it was assumed the walls are made of two layers of brick. It is not clear if reinforcement or connectors (connecting brick walls to the concrete moment frame) are provided. More information is needed to assess the adequacy of the wall design.

A comprehensive review of the available information was performed by our structural staff and is included below for your reference.

Structural Review

Tetra Tech performed a structural review of the proposed Sabez School. The review of the proposed building was performed by modeling and analyzing the building in RAM Structural System. RAM Structural System is a structural program used for design and analysis of buildings. The roof slab design was not analyzed within the model. The roof slab was reviewed independently from the model using RAM Elements beam module. RAM Elements is a structural program used for the design and analysis of individual building components. Several of the design parameters that were used to develop the proposed design were not provided to Tetra Tech and therefore assumptions were used in the analysis.

Design Assumptions

- Design Loads
 - Lateral Loads and Live Loads (Based on ASCE7-10, IBC 2012 & UFC 3-301-01 U.N.O)
 - Risk Category II (assumes that the occupancy of the building is less than 250)
 - Seismic spectral acceleration based on $S_s=0.21g$ and $S_1=0.11g$ (based on UFC 3-301-01 maps for the Adraskan District), Risk Category II, Site Class D, Importance Factor, $I_e=1.0$. Direction of seismic load is in accordance with ASCE 7-10, 12.5 Direction of loading.
 - Wind: Basic wind speed, using 3-second gust, 178 km/hr (110 mph), Risk Category II, exposure C, and Importance Factor, $I_w=1.0$. No wind speed data is available for Adraskan or Herat, Afghanistan. The wind speed is based on UFC for Kabul, Afghanistan. Wind load is NOT the controlling lateral force. Seismic load is the controlling lateral force.
 - Roof Live Load: 100.0 kg/m^2 (20 psf)
 - Dead Loads
 - Walls (Exterior & Interior) were modeled as a line load. Wall type and dimensions are not clearly shown on plans. Based on the Bill of Quantities, it was assumed the walls are made up of two layers of brick. The exterior wall also has a layer of plaster which was included in the dead load. The walls were assumed to be non-load bearing.
 - Parapets were modeled as a line load along the edge of the slab. Parapet dimensions were not clearly shown on plans. It was assumed the parapet was 420mm x 150mm.
 - A surface load of 180 kg/m^2 (37 psf) was added to the roof slab to account for the additional roofing materials. The surface load was based on the material weights for the following layers as shown on drawing A02: Roof membrane, 5cm of PCC (Portland cement concrete), 10cm of rigid insulation and 2cm of plaster.

- Geotechnical
 - Design based on an assumed allowable bearing pressure of 9800.0 kg/m² (2.0 ksf) per Note A.7 on Sheet S00.
 - A surcharge due to the soil cover on the foundations was included in the model. The surcharge was based on an assumed unit weight of soil. Assumed soil = 1923 kg/m³ (120pcf).
 - Note A2 on sheet S00 calls for the bottom of footings subjected to frost to be at least 1.2m below finished grade. The drawings show bottom of footing set at 1.05m below finished grade which is not consistent with the above note. Model was based on plans and therefore bottom of footing was set at 1.05m below finished grade. The foundation fails due to exceeding allowable bearing pressure.

- General Design Assumptions
 - Roof Slab – In order to accurately distribute the roof loads to the frame both one-way and two-way slabs were incorporated into the model. The central span was treated as a one way slab as it didn't meet ACI318-11 two way slab requirements. The other spans sections were modeled as two way slabs.
 - No roof slope was indicated on the drawings, so the roof was modeled with no slope
 - The building was modeled as a Moment-resisting Intermediate Reinforced Concrete Frame. The frame type was governed by the seismic parameters and Seismic Design Category C. The beams and the columns were modeled to take both gravity and lateral loads.
 - Gridline spacing is not consistent throughout the plans. The model was based on the gridlines shown on sheet S02.
 - Based on sheet S08, it was assumed the slab overhang is 600mm.
 - The building story height was modeled based on the Sections on sheet S01.
 - The top reinforcement layout for the concrete beams is unclear. Based on the beam detail on S06, Tetra Tech could not verify if the top bars were designed to be continuous and the locations at which each bar should end. For the model, it was assumed that the bars are continuous and the lap lengths were set per code requirements.
 - Sheet S00 indicates lap and hook length are to be per ACI318-05 code, but the provided table for splices leaves insufficient lengths for bar diameters greater than 22. Per ACI a different equation shall be used for bars of larger diameter thereby requiring greater length. Bar diameter greater than 22 was not used in the proposed design. For the model, it was assumed that the bar splices were set per code requirements.

Construction Documents:

Technical specifications, basis of design, design loads and design calculations were not provided. Drawings appear incomplete and are missing essential information. The overall quality of the drawings is inconsistent and not in accordance with generally accepted standards. The following is a list of drawing comments:

- General
 - Drawings are not to scale.
 - Mechanical, electrical and plumbing drawings are missing from the plan set.
 - There are missing details /sections.
 - No cover sheet or index of drawings was provided.

- Structural Drawings
 - Sheet S00 – The general notes do not include Design Loads or the structural system.
 - Sheet S00 has conflicting information regarding the bottom of footing elevation (See Note A2 on Sheet S00 and elevations noted throughout the plan set)
 - Sheet S00 indicates inconsistent codes to be used. For instance, ACI318 08 was used for reinforced concrete design, but ACI318-05 was indicated for Steel Reinforcement.
 - S00 title block is upside down.
 - S00 - Splice lengths for reinforcement bars larger than No. 22 are incorrect.
 - S02 Grid line dimensions conflict with S03, S04 and S08. S02 dimensions are used in the model.

- Slab-on grade layout on S02 Foundation plan is inconsistent with section cuts throughout the plan set. Grade beam elevations are not apparent.
- S06 – 01 beam 2 section: Not clear if concrete beam top reinforcement is continuous.
- S07 – 01 column and footing section: Column Rebar splice locations are not indicated.
- S07 – 01 column and footing section: At Column to beam connection: Column dowel into beam is not specified.
- S07 – 01 column and footing section: Starting point for column ties is not specified.
- Missing parapet detail.
- Rebar callouts are not correct. The standard practice is bar diameter @ Spacing or number of bars and the bar diameter.
- Throughout the drawing set, dimensions that are necessary for construction are missing.
- Elevation noted for Top of Wall appears to be incorrect throughout the drawings.
- Architectural drawings:
 - Missing interior and exterior wall types on the drawings: Brick wall consisting of 2-4 inch layers were assumed.
 - Missing window and door schedule; Room schedule – floor/wall/ceiling finish
 - No Architectural detail sheets – such as parapet details, flashing detail, wall types, wall sections/details.
 - Missing reflected ceiling plan
 - Missing roof plan

Summary of the results:

The proposed design does not meet the requirements of IBC 2012.

- Beam Design
 - All beams fail to meet the requirements of ACI 318-11. ACI 318-11 is part of the IBC 2012 requirement.
 - The spacing for the transverse reinforcement exceeds the maximum allowable spacing (ACI 318-11 Sec 21.3.4.2). Typical for both Beam types.
 - Top flexural reinforcement exceeds the maximum allowable spacing (ACI 318-11). Typical for Beam Type 2.
- Column Design
 - All columns fail to meet the requirements of ACI 318-11. ACI 318-11 is part of the IBC 2012 requirement.
 - The Longitudinal reinforcement provided does not meet the minimum reinforcement required (ACI 318-11 Sec. 10.9.1)
 - The transverse reinforcement does not meet the minimum size requirements (ACI 318-11 Sec. 7.10.5.1) or requirements for bar spacing (ACI 318-11 Sec. 21.3.4.2)
- Foundation Design
 - The foundations located in the two center rows (along the transverse direction of the building) fail due to exceeding the allowable bearing pressure.
 - The design for the foundations located along the exterior gridlines (along the transverse direction of the building) is satisfactory.
- Roof Slab
 - The roof slab design is adequate.
- Walls
 - The available information was insufficient to assess the adequacy of the walls.

Conclusion

Based on our review of the provided materials, Tetra Tech concludes that the proposed design for Sabez School does not meet the code requirements of IBC 2012 and its relevant seismic requirements.

Appendices

The following appendices are attached for reference

- A. Adraskan Location
- B. Adraskan Seismic Parameters
- C. Herat Seismic Parameters
- D. Kabul Wind Parameters
- E. Information Provided by USAID

End of Memo

APPENDIX A
ADRASKAN LOCATION

APPENDIX B
ADRASKAN SEISMIC PARAMETERS

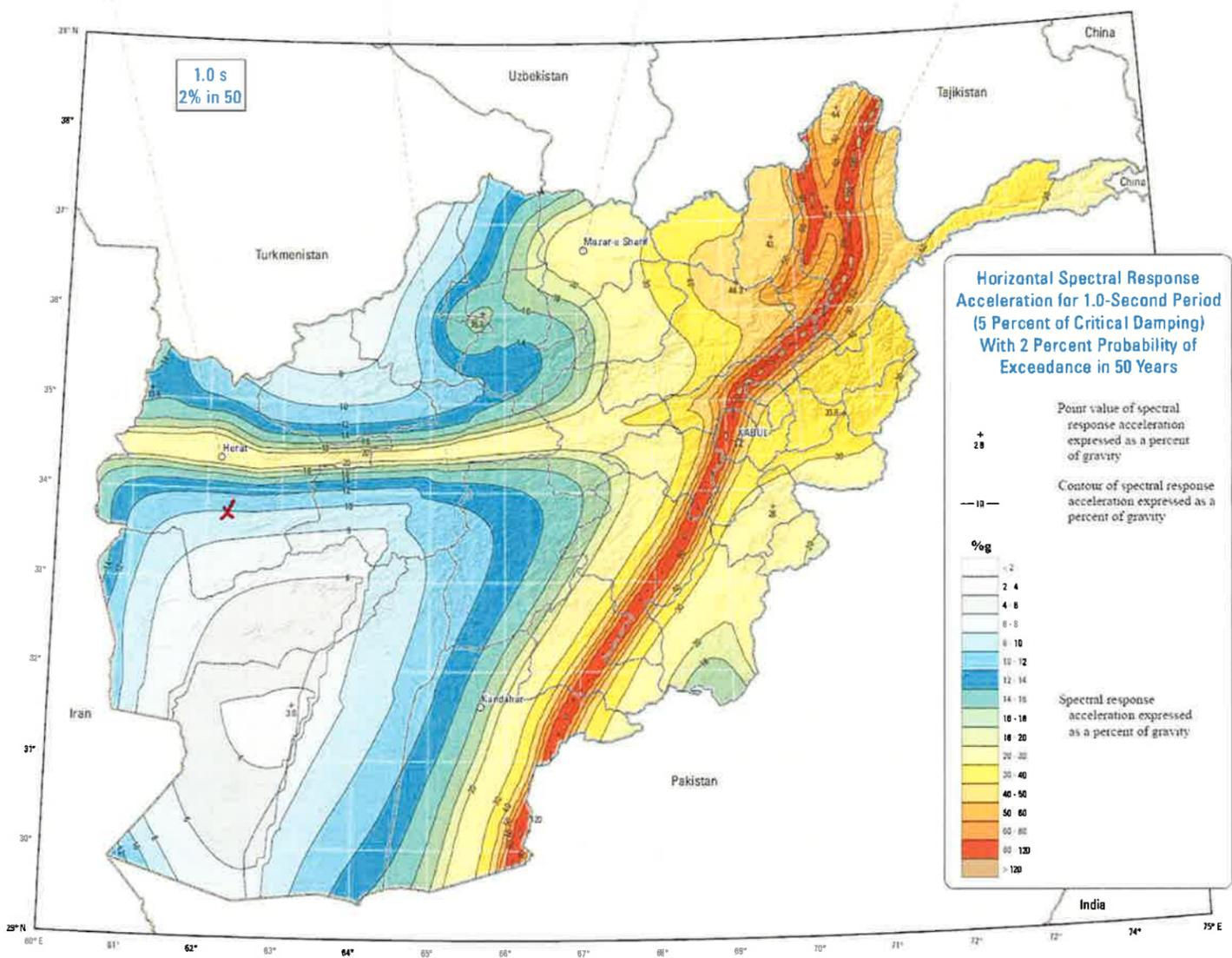
APPENDIX B

ADRASKAN SEISMIC PARAMETERS

UFC 3-301-01
27 January 2010
With Change 3, 31 January 2012

APPENDIX H SEISMIC SPECTRAL ACCELERATION MAPS AT SELECTED LOCATIONS OUTSIDE OF THE UNITED STATES, ITS TERRITORIES AND POSSESSIONS

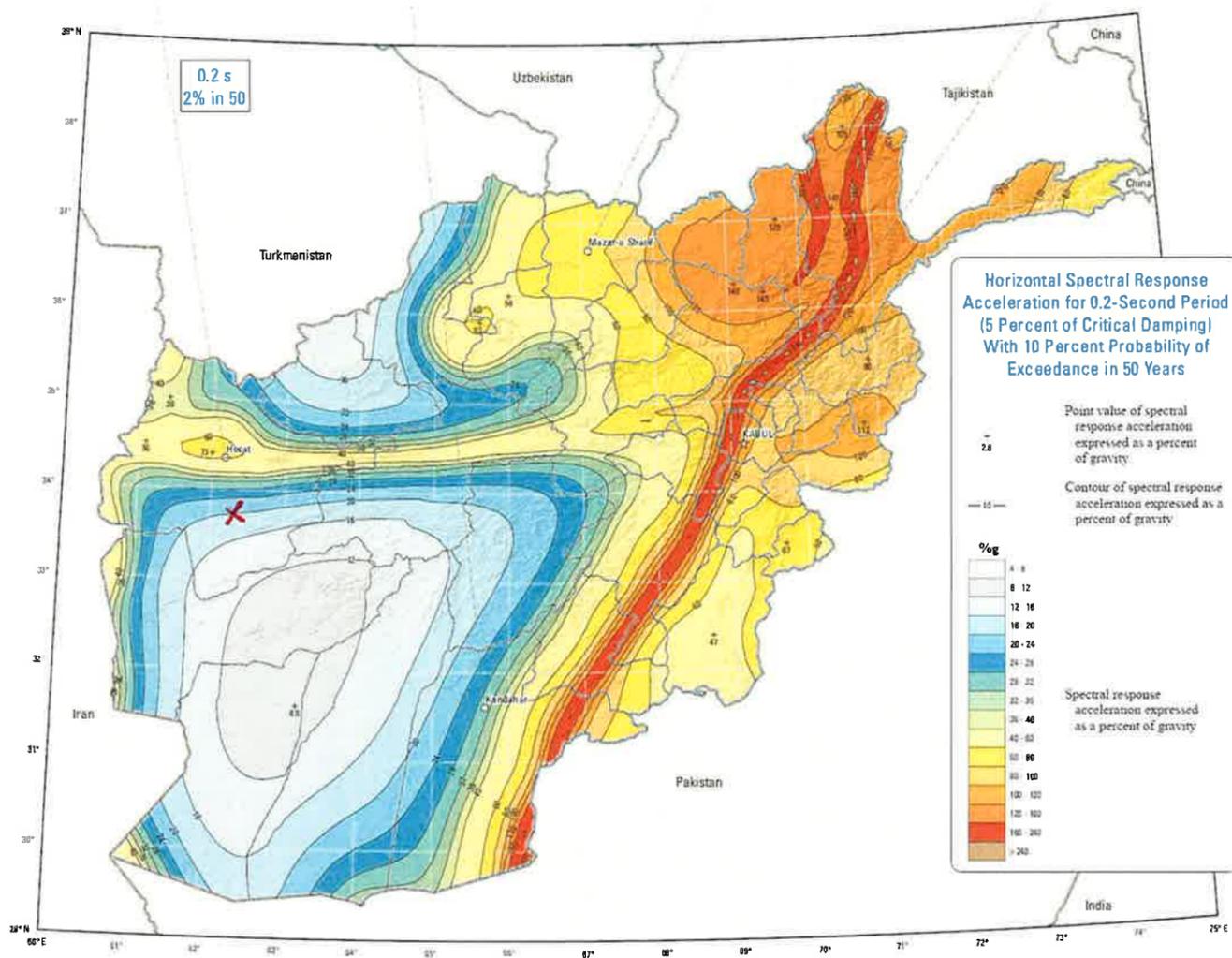
FIGURE H-1 - AFGHANISTAN - HORIZONTAL SPECTRAL RESPONSE ACCELERATION FOR 1.0 SECOND PERIOD (5 PERCENT OF CRITICAL DAMPING) WITH 2 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Adras Kan = $S_1 = 11$

UFC 3-301-01
27 January 2010
With Change 3, 31 January 2012

FIGURE H-2 - AFGHANISTAN - HORIZONTAL SPECTRAL RESPONSE
ACCELERATION FOR 0.2 SECOND PERIOD (5 PERCENT OF CRITICAL DAMPING)
WITH 2 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



AdrasKan = $S_g = 21$

APPENDIX C
HERAT SEISMIC PARAMETERS

APPENDIX C
HERAT SEISMIC PARAMETERS

UFC 3-301-01
1 June 2013
Change 1, 15 May 2014

Table F-3

			Seismic Data (Site Class B)								
Continent / Region	Country	Base / City	PGA (%g)	S _s (%g)	S ₁ (%g)	S _{s,5/50} (%g)	S _{1,5/50} (%g)	S _{s,10/50} (%g)	S _{1,10/50} (%g)	S _{s,20/50} (%g)	S _{1,20/50} (%g)
Africa	Tanzania	Dar es Salaam	7	18	8			9	4		
		Zanzibar	5	12	6			6	3		
	Togo	Lome	15	39	19			21	10		
	Tunisia	Tunis	36	95	45			50	24		
	Uganda	Kampala	18	46	22			24	11		
	Zambia	Lusaka	9	23	11			12	6		
	Zimbabwe	Harare	2	6	3			3	1		
Asia	Afghanistan	Bagram	66	146	84			73	35		
		Gardeyz	26	63	30			35	17		
		Herat	26	62	32			16	5		
		Jalalabad	45	106	39			59	21		
		Kabul	48	111	58			61	28		
		Kandahar	13	32	19			18	10		
		Lashkar Gah	7	16	11			9	5		
		Mazar-e Sharif	33	78	27			41	15		
		Pol-e Charkhi	42	100	47			57	26		
	Qalat	35	79	45			41	20			
	Bahrain	Manama	11	28	13			15	7		
		NSA Bahrain	12	32	15			17	8		
Bangladesh	Dhaka	28	73	34			38	18			
Brunei	Bandar Seri Begawan	15	39	18			20	10			

APPENDIX D
KABUL WIND PARAMETERS

**APPENDIX D
KABUL WIND PARAMETERS**

UFC 3-301-01
1 June 2013
Change 1, 15 May 2014

TABLE F-1 - WIND LOADING DATA – OUTSIDE OF THE UNITED STATES, ITS TERRITORIES AND POSSESSIONS

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a)				Wind Speed (km/h) - Note (a)			
			Risk Category				Risk Category			
			I	II	III-IV	V	I	II	III-IV	V
Africa	Djibouti	Djibouti	106	114	122	148	171	183	196	238
	Egypt	Alexandria	100	110	115	140	161	177	185	225
	Morocco	Casablanca	106	114	122	148	171	183	196	238
Asia	Afghanistan	Kabul	100 (92)	110 (99)	115 (105)	140 (128)	161 (148)	177 (159)	185 (170)	225 (206)
	Bahrain	NSA Bahrain	100	110	115	140	161	177	185	225
	India	Bombay	107	115	123	150	173	185	198	241
		Calcutta	134	144	154	187	216	232	248	302
		Madras	108	116	124	151	175	187	200	243
		New Delhi	107	115	123	150	173	185	198	241
	Iraq	Baghdad	100 (0)	110 (0)	115 (0)	140 (0)	161 (0)	177 (0)	185 (0)	225 (0)
		Basra	100 (0)	110 (0)	115 (0)	140 (0)	161 (0)	177 (0)	185 (0)	225 (0)
	Japan	NAF Atsugi	118	126	135	164	190	203	218	265
		MCAS Iwakuni	141	152	162	197	228	244	261	318
		Iwo Jima	248	265	284	345	398	427	457	556
		Misawa AFB	119	128	137	166	192	205	220	267
		Okinawa (All installations)	212	227	243	296	341	366	392	476
		Sagamihara	118	126	135	164	190	203	218	265

APPENDIX E
INFORMATION PROVIDED BY USAID

SHEET NO. 5 00

General Note

DRAWING TITLE:

SCALE NTS:

DESIGNED BY: A. WARDHANI

CHECKED BY: A. WARDHANI

FILE NAME: ADR002

PLT DATE: 16 Feb 2014

KEY PLAN

NO. DATE DESCRIPTION

CONSIDERED

STATED DIVISIONS ARE TO BE

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GENERAL NOTE:

TENDER SET SUBMISSION

DATE: 16 Feb 2014

HERAT PROVINCE Dept

Sabzej School

49795496.DSR/PROJECT

IOM (CCI) Community Cohesion Initiative.

A. FOUNDATIONS (REFER TO SPECIFICATION SECTIONS IN DIVISION 318.32 FOR ADDITIONAL REQUIREMENTS)

- 1- THE CONTRACTOR SHALL PERFORM EXCAVATION, FOOTING CONSTRUCTION, PREPARATION OF THE SUB GRADE FOR ALL STRUCTURAL WORK, AND PLACEMENT OF BACKFILL MATERIALS IN ACCORDANCE WITH THE RECOMMENDATIONS CONTAINED IN THE GEOTECHNICAL REPORT.
- 2- BOTTOM OF ALL FOOTINGS SUBJECTED TO FROST SHALL BE AT LEAST 120mm BELOW FINISHED GRADE. FOOTINGS SHALL BE FURTHER LOWERED TO APPROVED BEARING ELEVATIONS AS REQUIRED BY THE FIELD GEOTECHNICAL ENGINEER, STEP DOWN FOOTINGS IF REQUIRED.
- 3- EXCAVATIONS FOR SPREAD FOOTINGS AND CONTINUOUS WALL FOOTINGS SHALL BE CLEANED AND HAND TAMPED TO A UNIFORM SURFACE. FOOTING EXCAVATIONS SHALL HAVE THE SIDES AND BOTTOMS TEMPORARILY LINED WITH 0.3mm POLYETHYLENE IF PLACEMENT OF CONCRETE DOES NOT OCCUR WITHIN 24 HOURS OF THE FOOTING EXCAVATION.
- 4- DIFFER FROM THOSE DESCRIBED IN THE DRAWINGS SHALL BE REPORTED TO THE ARCHITECT, STRUCTURAL ENGINEER AND GEOTECHNICAL ENGINEER BEFORE FURTHER CONSTRUCTION IS ATTEMPTED.

5- SLAB ON GRADE SHALL BE UNDERLAID BY A MINIMUM OF 15cm OF GRANULAR MATERIAL HAVING A MAXIMUM AGGREGATE SIZE OF 4cm AND NO MORE THAN 2% FINES PASSING #100 SIEVE. PRIOR TO PLACING THE GRANULAR MATERIAL, THE FLOOR SUBGRADE SHALL BE PROPERLY COMPACTED, PROOFROLLED, FREE OF STANDING WATER, MUD AND FROZEN SOIL. BEFORE PLACEMENT OF CONCRETE, A 0.3mm POLYETHYLENE VAPOR BARRIER SHALL BE PLACED ON TOP OF THE GRANULAR MATERIAL.

6- FOUNDATION SOILS BENEATH THE GRAVEL LAYER SHALL BE COMPACTED TO AT LEAST 95% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557 MODIFIED PROCTOR.

7- ASSUMED ALLOWABLE BEARING CAPACITY OF THE SOIL FOR THE DESIGN IS 1.00kg/cm² (20kSf) AND WILL BE CONFIRMED BY THE PROJECT GEOTECHNICAL REPORT.

8- CONTRACTOR SHALL CALL THE ENGINEER IN TIME TO INSPECT OPEN FOOTINGS AND NOT DELAY WORK, AND SHALL APPROVE IN WRITING ANY VERTICAL OR NEAR VERTICAL CUTFILL SIDEWALL THAT IS GREATER THAN 1.2m IN HEIGHT.

9- ALL ORGANIC AND/OR OTHER UNSUITABLE MATERIALS SHALL BE REMOVED FROM SUB GRADE AND BACKFILL AREAS AND BACKFILLED WITH SELECTED FILL COMPACTED TO 95 PERCENT OF MODIFIED PROCTOR (ASTM D1557) MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT.

B. STRUCTURAL CONCRETE (REFER TO SPECIFICATION SECTIONS IN DIVISION 3 FOR ADDITIONAL REQUIREMENTS)

- 1- THE MINIMUM COMPRESSIVE STRENGTH OF CONCRETE, f'_c (FOR BOTH PLAN AND REINFORCED CONCRETE) SHALL BE 28MPa (4000Psi).
- 2- THE MINIMUM COMPRESSIVE STRENGTH OF CONCRETE, f'_c (FOR BOTH PLAN AND REINFORCED CONCRETE) SHALL BE AS MEASURED BY 28 DAY CYLINDER STRENGTH.

3- IF TEMPERATURE IS 7°C OR LOWER, REQUIREMENTS FOR COLD WEATHER CONCRETING BASED ON THE ACI 318-08 SECTION 5.12 AND ACI 308 R SHALL BE REQUIRED, INCLUDING, AT A MINIMUM:

a) ADEQUATE EQUIPMENT SHALL BE PROVIDED FOR HEATING CONCRETE MATERIALS, AND PROTECTING CONCRETE DURING FREEZING OR NEAR FREEZING WEATHER.

b) ALL CONCRETE MATERIALS AND ALL REINFORCEMENT FORMS AND GROUND WITH WHICH CONCRETE IS TO COME IN CONTACT SHALL BE FREE FROM FROST, FROZEN MATERIALS OR MATERIALS CONTAINING ICE.

4- REQUIREMENTS FOR HOT WEATHER CONCRETING SHALL BE BASED ON THE ACI 318-08 SECTION 5.13. AND ACI 308R INCLUDING, AT A MINIMUM:

a) DURING HOT WEATHER, PROPER ATTENTION SHALL BE GIVEN TO INGREDIENTS, PRODUCTION METHODS, PLACING PROTECTION AND CURING TO PREVENT EXCESSIVE CONCRETE TEMPERATURES OR WATER EVAPORATION THAT COULD IMPAIR REQUIRED STRENGTH OR SERVICEABILITY.

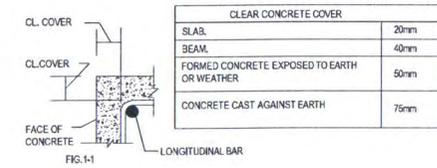
5- CONCRETE SHALL HAVE NATURAL SAND FINE AGGREGATES AND NORMAL WEIGHT COARSE AGGREGATES CONFORMING TO ASTM C33, TYPE I AND PORTLAND CEMENT CONFORMING TO ASTM C150, AND ALL EXTERIOR CONCRETE AND CONCRETE EXPOSED TO WEATHER SHALL BE AIR-ENTRAINED 6% OF CONCRETE VOLUME. MAXIMUM CONCRETE SLUMP SHALL BE 10cm. INTERIOR CONCRETE THAT WILL BE TEMPORARILY EXPOSED (GREATER THAN ONE WEEK) TO WINTER WEATHER SHALL BE AIR-ENTRAINED.

AGGREGATE SHOULD BE SALT FREE FOR ALL CONCRETE, NO MATERIALS OTHER THAN STEEL SHOULD BE PUT IN ANY CONCRETE.

6- MAXIMUM WATER CEMENT RATIO (W/C) FOR EXTERIOR EXPOSED CONCRETE SHALL BE 0.45.

7- MINIMUM CONCRETE COVER PROVIDED FOR THE REINFORCEMENT SHALL BE IN ACCORDANCE WITH ACI 318-08 SECTION 7.7.1 SEE FIG. 1-1.

8- MIXING, TRANSPORTING, AND PLACING OF CONCRETE SHALL CONFORM TO ACI 301.



B.1 FORM WORK

1- ALL FORM WORK SHALL BE IN ACCORDANCE WITH ACI 347. 2- FORMS FOR FINISHED SURFACES, EXCEPT WHERE CONCRETE IS PLACED AGAINST EARTH, SHALL BE WOOD OR STEEL OR OTHER APPROVED CONCRETE FORM MATERIAL. 3- FORM COATINGS AND RELEASE AGENTS: A- COATINGS-FORM COATINGS OR SEALERS ARE USUALLY APPLIED IN LIQUID FORM TO CONTACT SURFACES EITHER DURING MANUFACTURE OR IN THE FIELD TO SERVE ONE OR MORE OF THE FOLLOWING PURPOSES: ALTER THE TEXTURE OF THE CONTACT SURFACE; IMPROVE THE DURABILITY OF THE CONTACT SURFACE; FACILITATE RELEASE FROM CONCRETE DURING STRIPPING; OR SEAL THE CONTACT SURFACE FROM INTRUSION OF MOISTURE. B- RELEASE AGENTS-FORM RELEASE AGENTS ARE APPLIED TO THE FORM CONTACT SURFACES TO PREVENT SOAK AND THUS FACILITATE STRIPPING. THEY CAN BE APPLIED PERMANENTLY TO FORM MATERIALS DURING MANUFACTURE OR APPLIED TO THE FORM BEFORE EACH USE. WHEN APPLYING IN THE FIELD, BE CAREFUL TO AVOID COATING ADJACENT SURFACE.

4- FORMS SHALL BE REMOVED PREVENTING DAMAGE TO THE CONCRETE AND ENSURING THE COMPLETE SAFETY OF THE STRUCTURE. FORM WORK FOR COLUMNS, WALLS, SIDES OF BEAMS AND OTHER PARTS NOT SUPPORTING THE WEIGHT OF CONCRETE MAY BE REMOVED WHEN THE CONCRETE HAS ATTAINED SUFFICIENT STRENGTH TO RESIST DAMAGE FROM THE REMOVAL OPERATION BUT NOT BEFORE AT LEAST 24 HOURS HAS ELAPSED SINCE CONCRETE PLACEMENT. SUPPORTING FORMS AND SHORES SHALL NOT BE REMOVED FROM BEAMS, FLOORS AND WALLS UNTIL THE STRUCTURAL UNITS ARE STRONG ENOUGH TO CARRY THEIR OWN WEIGHT AND ANY OTHER CONSTRUCTION OR NATURAL LOADS. SUPPORTING FORMS OR SHORES SHALL NOT BE REMOVED BEFORE THE CONCRETE STRENGTH HAS REACHED 75 PERCENT OF DESIGN STRENGTH AS DETERMINED BY FIELD CURED CYLINDERS OR OTHER APPROVED METHODS. THIS STRENGTH SHALL BE DEMONSTRATED BY JOB-CURED TEST SPECIMENS.

5- EXCEPT AS OTHERWISE SHOWN, EXTERNAL CORNERS THAT WILL BE EXPOSED SHALL BE CHAMFERED, BEVELED, OR ROUNDED BY MOLDBINGS PLACED IN THE FORMS.

6- ORDINARY SURFACE FINISH: IMMEDIATELY FOLLOWING THE REMOVAL OF FORMS, ALL FINES AND IRREGULAR PROJECTIONS SHALL BE REMOVED FROM ALL SURFACES EXCEPT FROM THOSE WHICH ARE NOT TO BE EXPOSED OR ARE NOT TO BE WATERPROOFED. ON ALL SURFACES, THE CAVITIES PRODUCED BY FORM TIES AND ALL OTHER HOLES, HONEYCOMB SPOTS, BROKEN CORNERS OR EDGES AND OTHER DEFECTS SHALL BE THOROUGHLY CLEANED, AND AFTER HAVING BEEN KEPT SATURATED WITH WATER FOR A PERIOD OF NOT LESS THAN THREE HOURS, SHALL BE CAREFULLY POINTED AND TRUED WITH A MORTAR OF CEMENT AND FINE SAND. MORTAR USED IN POINTING SHALL NOT BE MORE THAN ONE HOUR OLD. ALL CONSTRUCTION AND EXPANSION JOINTS IN THE COMPLETED WORK SHALL BE LEFT CAREFULLY TOOLED AND FREE OF ALL MORTAR AND CONCRETE. THE JOINT FILLER SHALL BE LEFT EXPOSED FOR ITS FULL LENGTH WITH CLEAN AND TRUE EDGES. THE RESULTING SURFACES SHALL BE SMOOTH, TRUE AND UNIFORM IN SHAPE AND UNIFORM IN COLOR.

7- CONCRETE FINISHES FOR MONOLITHIC SLABS: A- SCRATCH FINISH FOR SURFACES TO RECEIVE CONCRETE FLOOR TOPPING OR MORTAR SETTING BED. B- STEEL TROWEL FINISH FOR SURFACES TO BE EXPOSED TO VIEW OR COVERED WITH RESILIENT FLOORING, CARPET, TILE OR OTHER THIN FINISH SYSTEM. C- TROWEL AND FINE BROOM FINISH FOR SURFACES TO RECEIVE THIN SET CERAMIC OR QUARRY TILE. D- NON-SLIP BROOM FINISHES FOR EXTERIOR CONCRETE PLATFORMS, STEPS, AND RAMPS. E- NON-SLIP AGGREGATE FINISH FOR CONCRETE STAIR TREADS PLATFORMS, RAMPS AND SLOPED WALKS.

8- WHERE THE CONCRETE SURFACE IS EXPOSED AND APPEARANCE IS IMPORTANT, THE PROPER TYPE OF FORM TIE OR HANGER WILL NOT LEAVE EXPOSED METAL AT THE SURFACE. OTHERWISE, NONCORROSIVE MATERIALS SHOULD BE USED WHEN THE HOLES ARE LEFT UNPATCHED, EXPOSING THE TIE TO THE ELEMENTS.

B.2 REINFORCING STEEL

- 1- REINFORCEMENT SHALL BE ASTM A615 GRADE 60, F_y=20MPa. STEEL REINFORCING BARS SHALL COMPLY WITH ACI 318-08 SECTION 3.5.3.1.
- 2- MINIMUM LAP SPLICES SHALL BE IN ACCORDANCE WITH ACI 318-08 AND AS SHOWN IN TABLE 1-1
- 3- EACH SOND BEAM ALONG TOP OF WALL SHALL HAVE CONTINUOUS REINFORCEMENT CONSISTING OF 2Ø12 MIN.
- 4- FOR ACI STANDARD END HOOKS REFER TO TABLE 1-2

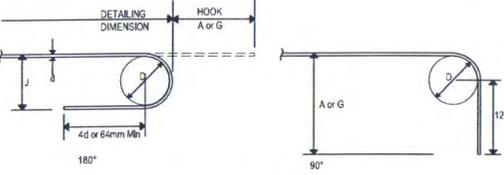


TABLE 1-1

BAR DIA. (Ø)	CONCRETE REINF. SPLICE CLASS-B	
	BARS IN CONTACT	
	TYPICAL BARS (cm)	*TOP BARS (cm)
10	45	60
12	55	70
14	65	80
16	75	95
18	80	105
20	90	115
22	100	130
25	115	145
28	125	165
30	135	175

TABLE 1-2

BAR DIA. (mm)	END HOOKS				
	D (cm)	180° HOOKS		90° HOOKS	
		A or G (cm)	J (cm)	A or G (cm)	J (cm)
10	6	13	8	15	
12	8	15	11	20	
14	10	17	13	22	
16	10	18	13	24	
18	11	19	15	27	
20	12	22	16	30	
22	14	25	18	34	
25	16	28	20	38	
28	24	38	30	46	
30	26	40	32	50	

* TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 30cm OF FRESH CONCRETE CAST BELOW THE BARS.

5- DETAILING OF CONCRETE REINFORCEMENT BARS AND ACCESSORIES SHALL CONFORM TO THE RECOMMENDATIONS OF ACI 315 "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT" AND ACI SP-66 "DETAILING MANUAL". PLACING OF REINFORCING BARS SHALL CONFORM TO THE RECOMMENDATIONS OF ACI 315R "MANUAL OF STRUCTURAL AND PLACING DRAWINGS FOR REINFORCED CONCRETE STRUCTURES" AND CRSI "MANUAL OF STANDARD PRACTICE".

6- PROVIDE STANDARD BAR CHAIRS AND SPACERS AS REQUIRED TO MAINTAIN CONCRETE PROTECTION SPECIFIED.

7- WELDING OF REINFORCEMENT STEEL SHALL NOT BE PERMITTED.

8- HORIZONTAL FOOTING AND WALL REINFORCEMENT SHALL BE CONTINUOUS AND SHALL HAVE 90-DEGREE BENDS AND EXTENSIONS. OR CORNER BARS OF EQUIVALENT SIZE LAPPED 47 BAR DIAMETERS, AT CORNERS AND INTERSECTIONS.

9- PROVIDE 2 Ø12 x 130 cm DIAGONAL BARS AT ALL RE-ENTRANT CORNERS AND AROUND RECTANGULAR HOLES IN SLABS UNLESS NOTED OTHERWISE. PLACE BAR AT MID DEPTH OF THE SLAB AND DIAGONAL TO THE CORNER WITH 50mm CLEARANCE FROM THE CORNER.

C. STRUCTURAL STEEL (REFER TO SPECIFICATION SECTIONS IN DIVISION 5 FOR ADDITIONAL REQUIREMENTS)

1- STRUCTURAL STEEL WIDE FLANGE SHAPES, CHANNELS, PLATES AND ANGLES SHALL CONFORM TO ASTM A36. STRUCTURAL STEEL PIPE SHALL CONFORM TO ASTM A51, TYPE E OR S GRADE B. STRUCTURAL STEEL TUBING SHALL CONFORM TO ASTM A600 GRADE B ANCHOR BOLTS SHALL CONFORM TO ASTM F1554, GR 36 UNLESS NOTED OTHERWISE.

2- STRUCTURAL STEEL DETAILING, FABRICATION AND ERECTION, SHALL CONFORM TO THE AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" AISC 360-05 AND AISC 303-05 CODES OF STANDARD PRACTICE FOR STEEL BUILDINGS.

3- WELDING SHALL CONFORM TO THE AMERICAN WELDING SOCIETY STANDARD D1.1. ELECTRODES FOR SHOP AND FIELD WELDS SHALL CONFORM TO AWS A5.1 OR AWS A5.5, CLASS E70XX, LOW HYDROGEN. ALL WELDERS SHALL HAVE BEEN CERTIFIED WITHIN THE LAST 6 MONTHS FOR STRUCTURAL WELDING PER AWS D1.1. TEN PERCENT OF ALL FILLET WELDS SHALL BE PERIODICALLY NDT INSPECTED BY A CERTIFIED WELDING INSPECTOR (CWI) WHO HAS BEEN CERTIFIED IN ACCORDANCE WITH AWS D1.1. A CWI SHALL BE PRESENT AT THE BEGINNING OF WELDING TO VERIFY THE WELDER QUALIFICATION, ELECTRODES AND EQUIPMENT. NON DESTRUCTIVE TESTS (NDT) SHALL INCLUDE A VISUAL INSPECTION AND EITHER A DYE PENETRANT TEST OR MAGNETIC PARTICLE TEST. TEN PERCENT OF ALL ROOF DECK WELDS SHALL BE PERIODICALLY VISUALLY INSPECTED BY A CWI IN ACCORDANCE WITH AWS D1.3

4- SPLICING OF STRUCTURAL STEEL MEMBERS WHERE NOT DETAILED ON CONTRACT DOCUMENTS IS PROHIBITED WITHOUT THE PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.

5- PROVIDE STRUCTURAL STEEL WITH ONE COAT OF RUST HANDLING PREVENTIVE SHOP PRIMER, TOUCH UP PAINT WHERE WELDING OR ERECTION PROCEDURE DAMAGE PAINT.

6- ALL WEATHER EXPOSED STEEL SUPPORTING MASONRY, STONE, OR PRECAST CONCRETE SHALL BE HOT DIPPED GALVANIZED. ALL OTHER WEATHER EXPOSED STRUCTURAL STEEL SHALL BE BLASTED CLEAN, AND PAINTED WITH A WEATHER RESISTANT PAINT AS SELECTED BY THE OWNER OR IOM.

ALLOWANCES

IN ADDITION TO ALL INFORMATION SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL INCLUDE THE FOLLOWING ADDITIONAL MATERIAL:

- STRUCTURAL CONCRETE (INCLUDING REINFORCEMENT, SHUTTERING, ETC.) = 5m³
- STEEL ANGLES FOR LITTELS (INCLUDING GALVANIZED PAINT) = 500kg

**IOM (CCI)
Community
Cohesion
Initiative.**

TENDER SET SUBMISSION

DATE: Feb 16 2014

HERAT PROVINCE Deh
Sabez School
ADRASKAN DISTRICT

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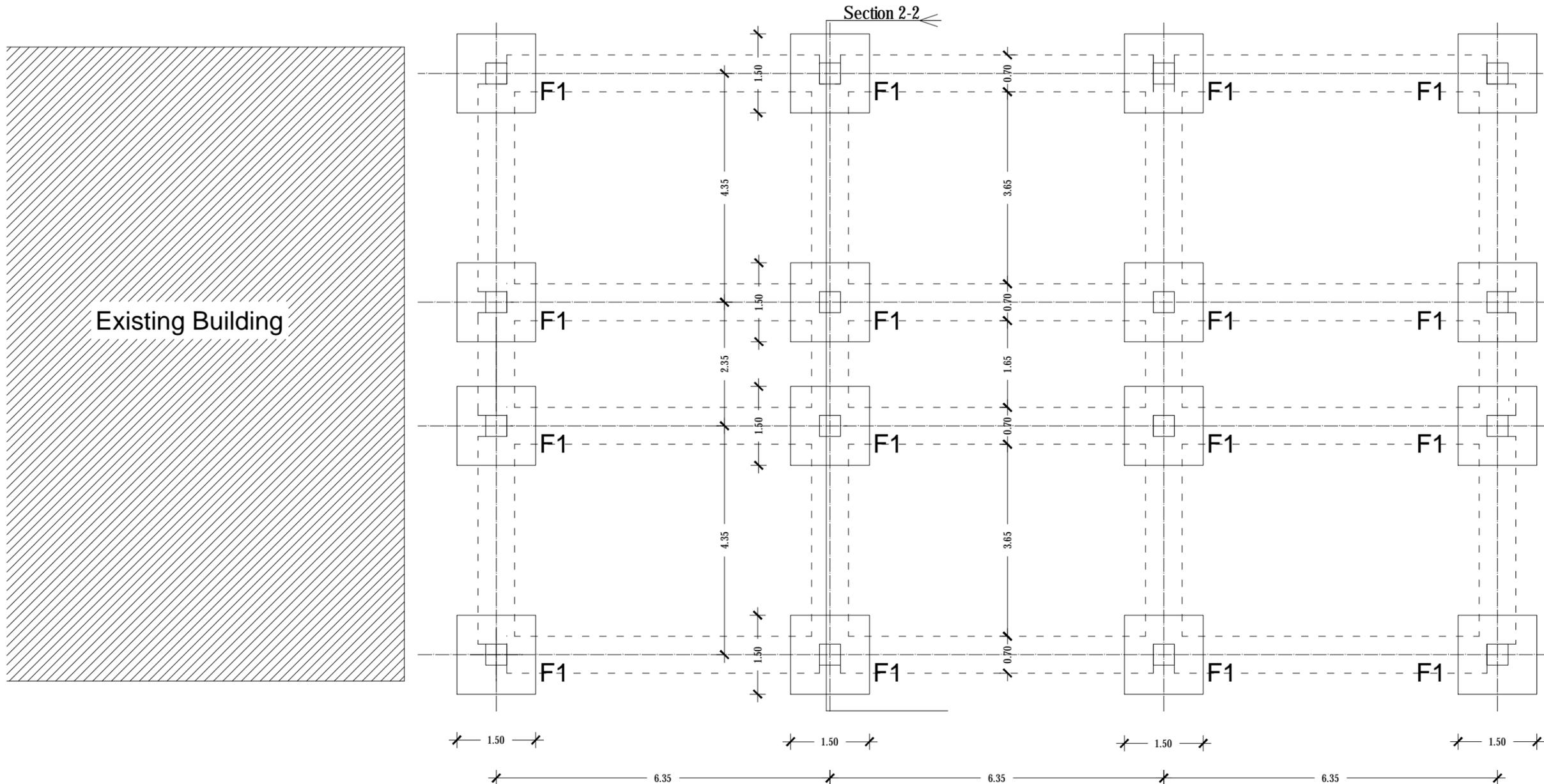
NO.	DATE	DESCRIPTION

KEY PLAN:

PLOT DATE: 16 Feb 2014
FILE NAME: ADR002
DESIGNED BY: A. Walid Noori
CHECKED BY: A. Walid Noori
SCALE: NTS

DRAWING TITLE:
SCHOOL FOOTING
PALN

SHEET NO: S 02



01 FOUNDATION PLAN
Scale:NTS

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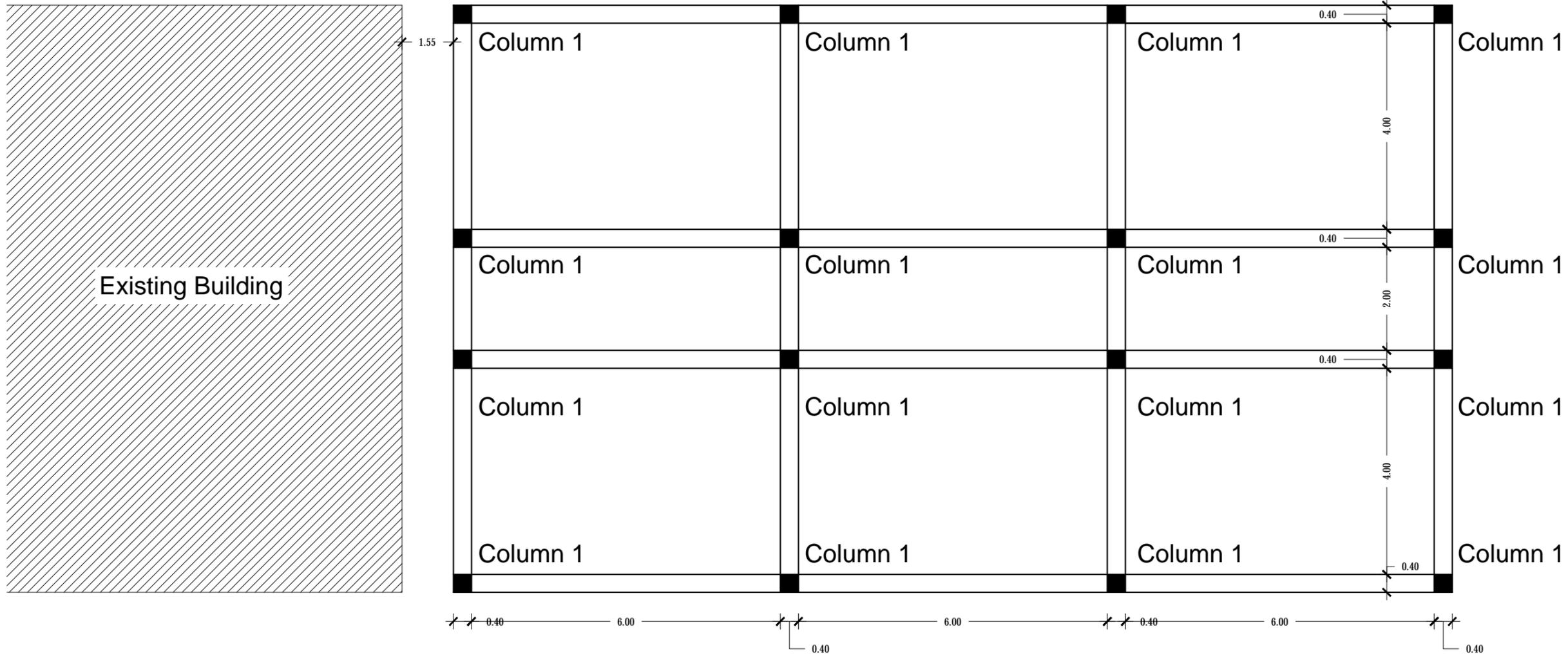
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KEY PLAN:

PLOT DATE: 16 Feb 2014
FILE NAME: ADR002
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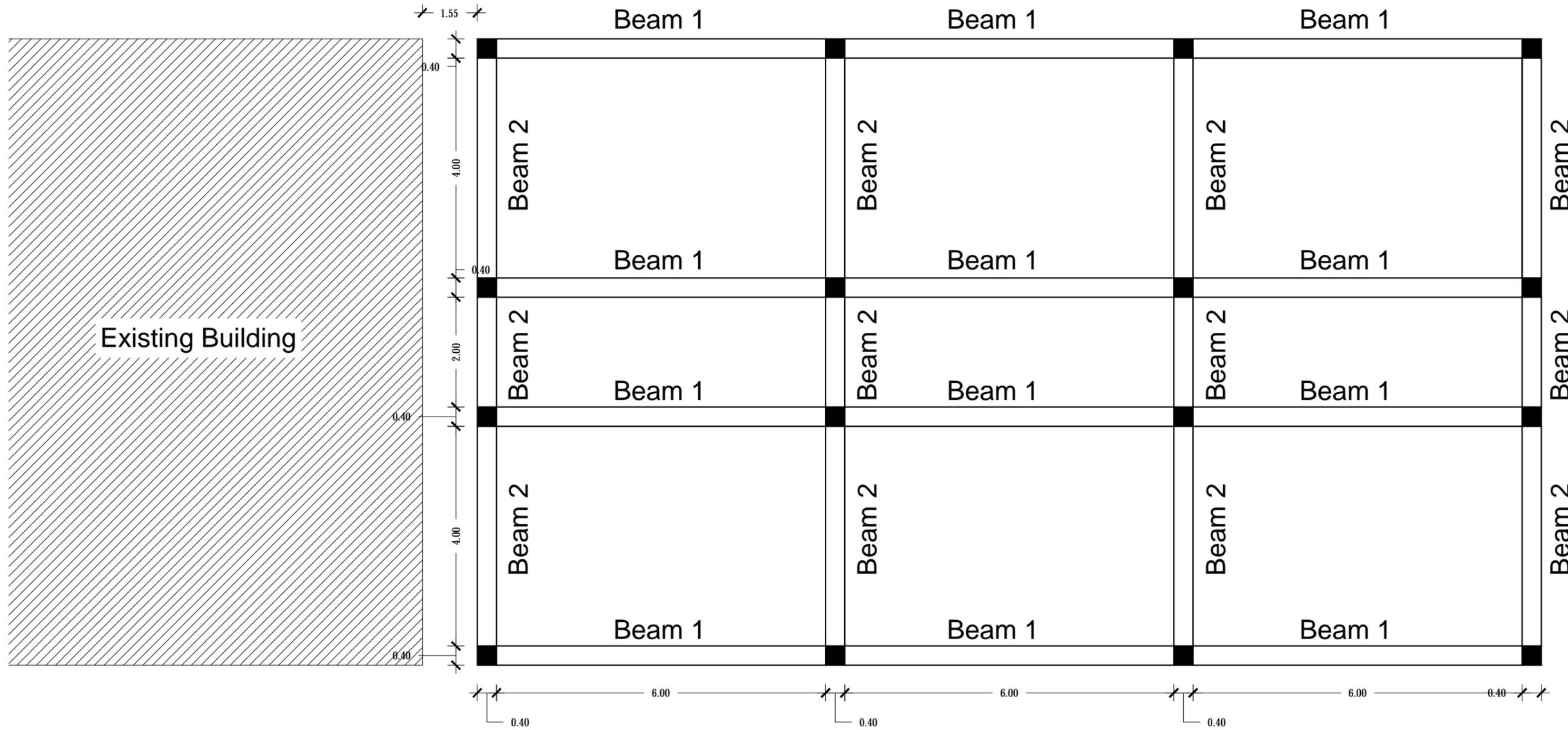
DRAWING TITLE:
COLUMN PLAN

SHEET NO: S 03



01 COLUMN PLAN
Scale:NTS

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01 BEAM PLAN
Scale:NTS

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NO.	DATE	DESCRIPTION

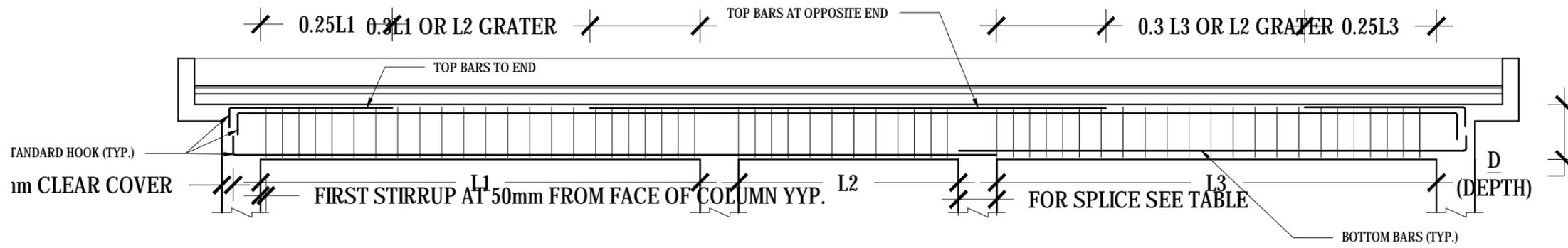
KEY PLAN:

PLOT DATE: 16 Feb 2014
FILE NAME: ADR002
DESIGNED BY: A. Walid Noori
CHECKED BY: A. Walid Noori
SCALE: NTS

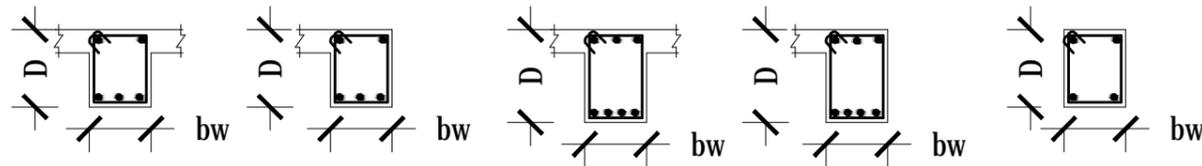
DRAWING TITLE:
BEAM PLAN

SHEET NO: S 04

**IOM (CCI)
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01 BEAM 2 SECTION
SCALE:NTS



02 BEAM 2 SECTION
SCALE:NTS

03 BEAM 1 SECTION
SCALE:NTS

04 GRADE BEAM 1 SECTION
SCALE:NTS

TYP	SIZE (m)		REINFORCEMENT						REMARKS
	bw	D	TOP BARS @ BEAM MARK END	TOP BARS	BOT. BARS	TOP. BARS@BEAM OPPOSITE END	SIDE BARS	STIRRUPS	
B1	0.40	0.60	S<<SS	'<<SS	('<<SS	S<<SS	S<<SS	<<SS<<SS	
B2	0.40	0.50	S<<SS	&<<SS	' '<<SS	S<<SS	S<<SS	<<SS<<SS	
GB1	0.40	0.50	S<<SS	&<<SS	&<<SS	S<<SS	S<<SS	<<SS<<SS	

05 BEAM SCHEDULE
SCALE:NTS

TENDER SET SUBMISSION

DATE: Feb 16 2014

HERAT PROVINCE Deft
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NO. DATE DESCRIPTION

KEY PLAN:

PLOT DATE: 16 Feb 2014
FILE NAME: ADR002
DESIGNED BY: A. Walid Noori
CHECKED BY: A. Walid Noori
SCALE: NTS

DRAWING TITLE:
BEAM DETAIL

SHEET NO: S 06

**IOM (CCI)
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NO.	DATE	DESCRIPTION

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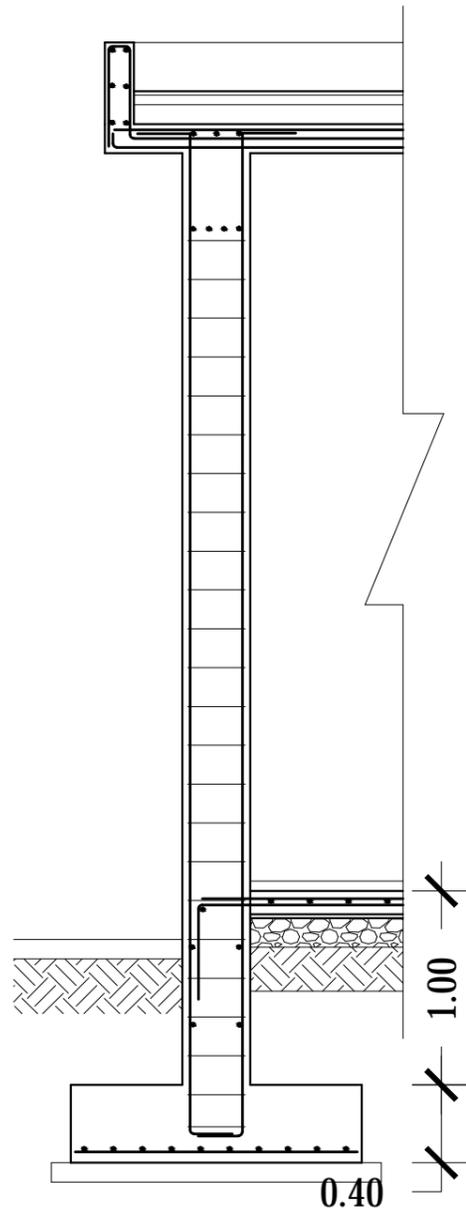
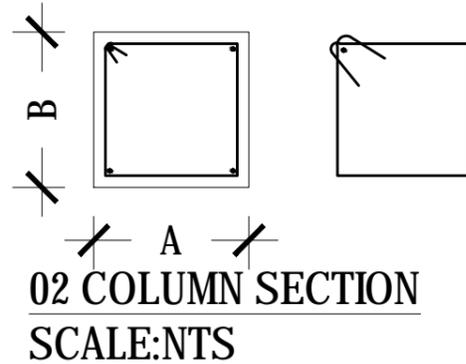
PLOT DATE: 16 Feb 2014
FILE NAME: ADR002
DESIGNED BY: A. Walid Noori
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SCALE: NTS

DRAWING TITLE:
COLUMN FOOTING
DETAILS

SHEET NO: S 07

TYP	SIZE (m)		REINFORCEMENT		REMARKS
	A (m)	B (m)	LONG. BARS (mm)	STIRRUPS (mm)	
C1	0.40	0.40	⌀ 8	⌀ 6	

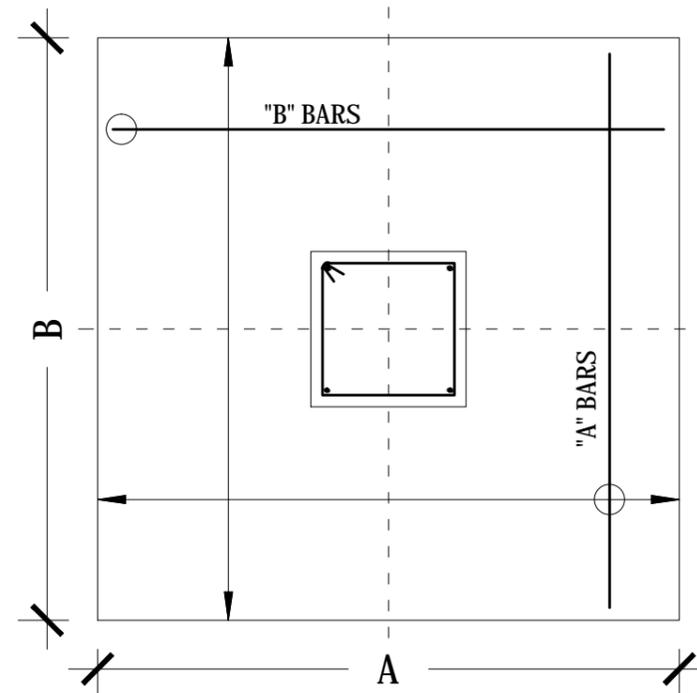
04 COLUMN SCHEDULE
SCALE:NTS



**01 COLUMN AND FOOTING
SECTION**
SCALE:NTS

TYP	SIZE (m)			REINFORCEMENT		REMARKS
	A (m)	B (m)	B (m)	"A" BARS	"B" BARS	
F1	1.50	1.50	0.40	⌀ 8	⌀ 8	

05 TYP. COLUMN FOOTING SECTION
SCALE:NTS



03 TYP. COLUMN FOOTING SECTION
SCALE:NTS

**International Organization for Migration
Community Cohesion Initiative (CCI)
Extension of Deh Sabz Preliminary School
Work Plan**

No	Task Name	Duration Days	Start Date	Finish Date	Month 1			Month 2			Month 3			Month 4			Month 5		
					10	20	30	10	20	30	10	20	30	10	20	30	10	20	30
	School Building Construction	150	01 Month 1	30 Month 5	20%			20%			20%			20%			20%		
1	Contract Milestones	150	01 Month 1	30 Month 5															
1.1	Contract Signature & Notice to Proceed (NTP)	0	01 Month 1	01 Month 1															
1.2	Period of Performance (PoP)	140	01 Month 1	20 Month 5															
1.3	Contract Complete	0	01 Month 1																
2	Construction	145	01 Month 1	25 Month 5															
1	Excavations for foundations and leveling (any type of soil): Excavations, disposal and temporary support or shearing and all related activities.	10	01 Month 1	10 Month 1															
2	PCC under foundation : Concrete, shuttering, curing with all related works.	5	10 Month 1	15 Month 1															
3	Back fill and compaction around of foundations: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	5	05 Month 2	25 Month 2															
4	Back fill Gravel under floor and side walk: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	20	25 Month 2	15 Month 3															
5	Back fill Gravel under Side walk concrete: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	25	15 Month 3	10 Month 4															
6	Reinforced Concrete for Foundations (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	15	15 Month 1	30 Month 1															
7	Reinforced Concrete for Slab on Grade And Grade Beam (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	15	30 Month 2	15 Month 2															
8	Reinforced Concrete for Columns (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	15	15 Month 2	30 Month 2															
9	Reinforced Concrete for Beam (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	15	01 Month 3	15 Month 3															
10	Reinforced Concrete for Roof Slab (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	15	15 Month 3	30 Month 3															
11	Reinforced Concrete for Parapet Wall (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	10	01 Month 4	10 Month 4															
12	15cm Crush Gravel Under Slab on Grade: Supply of materials, laying with all related activities.	5	20 Month 1	30 Month 1															
13	0.3mm Polyethylene Membrane: Supply of materials, installation with all related works.	2	25 Month 1	27 Month 1															
14	5 cm PCC floor finishing (21 Mpa): Supply of materials, mixing, pouring, curing with all related works.	10	01 Month 4	10 Month 4															
15	Brick Masonry Wall: Supply of bricks, Installation with 14 Mpa cement mortar and all related activities.	30	01 Month 3	30 Month 3															
16	Window Sills Concrete (21 Mpa): Supply of materials, mix, pouring, curing with all related activities.	5	20 Month 3	25 Month 3															
17	Plaster (interior wall surfaces) M 300: Supply of materials, execution, preparation, plastering, curing of plaster and all related activities.	10	01 Month 4	10 Month 4															
18	Interior Surface Wall Paint (Plastic emulsion paint): Supply of materials, painting with all related activities.	10	10 Month 4	20 Month 4															
19	Plaster (exterior wall surfaces) M 300: Supply of materials, execution, preparation, plastering, curing of plaster and all related activities.	10	01 Month 4	10 Month 4															
20	Exterior painting (acrylic paint): Supply of materials, execution, coating, curing and all related works.	10	10 Month 4	20 Month 4															
21	Rigid Insulation: 10cm Rigid Insulation on top of the roof slab	5	20 Month 4	25 Month 4															
22	PCC on Top of the Rigid Insulation: 14 Mpa, PCC on top of the rigid insulation, supply of materials, mix, pouring and curing with all related activities.	10	25 Month 4	05 Month 5															
23	ISOGAM ROOF MEMBRANE: High Quality issogam with 10 years warranty, supply of materials, installation with all related activities.	5	05 Month 5	10 Month 5															
24	Concrete for the Side Walk (21 MPa): Supply of materials, shuttering, concrete curing with all related activities.	10	10 Month 5	20 Month 5															
25	U-PVC window W (230X150) cm: Supply of materials, installation and all related works.	10	01 Month 4	10 Month 4															
26	U-PVC Door D (330X100) cm: Supply of materials, installation and all related works.	10	01 Month 4	10 Month 4															

**Community Cohesion Initiative (CCI)
Bill of Quantity (BoQ) School**

Project name: Extension of Deh Sabz cultural center to accommodate the

Activity Code: ADR002

District: Adraskan

Province: Herat

No	Line Items Description	Unit	Quantity	Unit Cost (USD in letters)	Unit Cost (USD in numbers)	Total Cost (USD)	Remarks
1	Excavations for foundations and leveling (any type of soil): Excavations, disposal and temporary support or shearing and all related activities.	CUM	200				
2	PCC under foundation : Concrete, shuttering, curing with all related works.	CUM	2.5				
3	Back fill and compaction soil around of foundations: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	CUM	48				
4	Back fill Gravel under floor and side walk: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	CUM	34				
5	Back fill Gravel under Side walk concrete: Supply of filling materials, execution, compacting, removal of excess materials from site with all related activities.	CUM	10				
6	Reinforced Concrete for Foundations (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	14.4				
7	Reinforced Concrete for Slab on Grade (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	26				
8	Reinforced Concrete for Columns (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	11.52				
9	Reinforced Concrete for Beam (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	29				
10	Reinforced Concrete for Roof Slab (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	37				
11	Reinforced Concrete for Parapet Wall (28 MPa): Concrete, reinforcement, shuttering, concrete curing and all related activities	CUM	3				
12	15cm Crush gravel floor finishing	CUM	34				
13	0.3 mm Polyethylene membrane	CUM	223				
14	5 cm PCC floor finishing (21 Mpa)	CUM	11				

15	Brick Masonry Wall: Supply of briks, Installation with 15 Mpa cement mortar and all related activities.	CUM	96	
16	Window Sills Concrete (21 Mpa)	CUM	0.5	
17	Plaster (interior wall surfaces) M 300: Supply of materials, execution, preparation, plastering, curing of plaster and all related activities.	SQM	660	
18	Interior Surface Wall Paint (Plastic emulsion paint): Supply of materials, painting with all related activities.	SQM	660	
19	Plaster (exterior wall surfaces) M 300: Supply of materials, execution, preparation, plastering, curing of plaster and all related activities.	SQM	130	
20	Exterior painting (acrylic paint): Supply of materials, execution, coating, curing and all related works.	SQM	130	
21	Rigid Insulation: 10cm Rigid Insulation on top of the roof slab	SQM	235	
22	PCC on Top of the Rigid Insulation: 14 Mpa, PCC on top of the rigid insulation, supply of materials, mix,	CUM	13	
23	ISOGAM ROOF MEMBRANE: High Quality issogam with 10 years warranty, supply of materials, installation with all related activities.	SQM	235	
24	Concrete Pavement for the Side Walk (21 MPa): Supply of materials, shuttering, concrete curing with all related activities.	CUM	7	
25	U-PVC window W (230X150) cm: Supply of materials, installation and all related works.	SQM	42.00	
26	U-PVC Door D (330X100) cm: Supply of materials, installation and all related works.	SQM	14.00	
27	U-PVC Door D (340X200)cm: Supply of materials, installation with all related activities.	SQM	14.00	
28	Class chair and Class Table Supply of materials, installation and all related works. A. Class Chairs: (30cm width, 120cm Length, Height a. 50 cm b. 30cm - Chair Frame: Box Profile 30x30mm, 18 Gauge - Anti- rust and 3 layer Black Paint- 16mmm MDF piece (MDF Quality) - Robber at the bottom of the chair posts B. Class Table: (40cm Width, 120cm Lenght, 90cm Height) - Table frame, Box Profile 30x30mm, 18 Gauge - Anti- Rust and 3 layer Black Paint - 1.6mm MDF peice (MDF Quality) - Robber at the bottom of the table posts	Set	40.00	
29	Teacher Chairs: Supply of materials, installation and all related works. Black Ordinary Chair, Leather sitting surface.	Unit	6.00	
30	Teacher Desk: Supply of materials, installation and all related works. Master Brand, Width=60cm, Length=120cm, Hieght=90cm Malaysia Qulaity.	Unit	6.00	
31	Black board (120 x 250 cm): Supply of materials, installation and all related works.	Unit	6.00	
32	Solar Panel: supply and Installation Solar panel 250W, monocrystal Hiltran 72cell, made in Germany	Unit	6.00	
33	Invertor:supply and Installation UPS Invertor 4KW, DC/AC made in Italy	Unit	1	
34	Power Controler:supply and Installation Power controler 96W, Kingstone 45AMP made in USA	Unit	1	
35	Metalic Frame:supply and Installation Metalic frame (W:490cm,L:168cm,H:250cm included pilar piple 4")	Set	1	
Grand Total in USD				

Item #	Item description/Specifications	Unit	Qty	Qty	Unit Price AFA	Unit Price US\$	Amount AFA	Amount US\$	Amount AFA	Amount US\$
3.01	Communication and Outreach materials	Com	1.00							
4.0	Program Administration and Services - CCI Managed									
4.01	Community Contribution Unskilled Labor ((Disposal of waste mateials, security of the project and any other task assinged)	Lump Sum		1.0						
5.0	Hawal Dealer Cost									
5.01	Hawala Dealer Charges	Lump Sum	1							