STRUCTURAL NOTES

GENERAL NOTES:

1. IN INTERPRETATION OF THE DRAWING, INDICATED DIMENSIONS SHALL GOVERN AND DISTANCES AND SIZES NOT BE SCALED FOR CONSTRUCTION PURPOSES.
2. IN REFENCE TO OTHER DRAWINGS, SEE ARCHITECTURAL DRAWINGS FOR DEPRESSIONS IN FLOOR SLABS, OPENINGS IN THE WALLS AND SLABS, INTERIOR PARTITIONS,LOCATIONS OF DRAINS, ETC.
3. IN CASE OF DISCREPANCIES AS TO THE LAYOUT, DIMENSIONS, AND ELEVATIONS BETWEEN THE STRUCTURAL PLANS, AND ARCHITECTURAL DRAWINGS, THE CONTRACTOR SHALL NOTIFY BOTH THE STRUCTURAL ENGINEER AND THE ARCHITECT.
4. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH THE ACI.318_95, BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE AND ALL STRUCTURAL STEEL WORK ACCORDING WITH AISC SPECIFICATION (9th EDITION) IN SO FAR AS THEY DO NOT CONFLICT WITH LOCAL BUILDING REQUIREMENT.
5. ACI REFERS TO AMERICAN CONCRETE INSTITUE, AISC TO AMERICAN INSTITUTE OF STEEL CONSTRUCTION AND ASTM TO AMERICAN SOCIETY FOR TESTING MATERIALS.
6. CONSTRUCTION NOTES AND TYPICAL DETAILS APPLY TO ALL DRAWINGS UNLESS OTHERWISE SHOWN OR NOTED. MODIFY TYPICAL DETAILS AS DIRECTED TO MEET SPECIAL CONDITIONS.
7. SHOP DRAWINGS WITH ERECTION AND PLACING DIAGRAMS OF ALL STRUCTURAL STEELS, MISCELLANEOUS IRON, PRE-CAST CONCRETE, ETC. SHALL BE SUBMITTED FOR ENGINEERS APPROVAL BEFORE FABRICATION.
8. CONTRACTOR SHALL NOTE AND PROVIDE ALL MISCELLANEOUS CURB-IS, SILLS, STOOLS, EQPMENT'S AND MECHANICAL BASES THAT ARE REQUIRED BY THE ARCHITECTURAL, ELECTRICAL, AND MECHANICAL DRAWINGS.
9. ALL RESULTS OF MATERIAL TESTING FOR CONCRETE, REINFORCING BARS, & STRUCTURAL STEEL MUST BE NOTED AND APPROVED BY THE STRUCTURAL DESIGNER.

FOUNDATION

1. FOUNDATIONS ARE DESIGNED FOR AN ALLOWABLE SOIL BEARING PRESSURE 0 98MPA (2000psf). CONTRACTOR SHALL REPORT TO THE DESIGNER / ENGINEER, IN WRITING , THE ACTUAL SOIL CONDITIONS UNCOVERED AND CONFIRM ACTUAL BEARING CAPACITY OF SOIL BEFORE DEPOSITING CONCRETE.
2. FOOTING SHALL REST AT LEAST 1500mm BELOW NATURAL GRADE LINE UNLESS OTHERWISE INDICATED IN PLANS. NO FOOTING SHALL REST ON FILL.
3. MINIMUM CONCRETE PROTECTION FOR REINFORCEMENTS SHALL BE 75mm CLEAR FOR CONCRETE DEPOSITED ON THE GROUND AND 50mm FOR CONCRETE DEPOSITED AGAINST FORMWORK.

CONCRETE

1. CONCRETE MINIMUM ULTIMATE CYLINDER COMPRESSIVE STRENGTHS AT 28 DAYS SHALL BE :

   fc' = 20.70 MPa (3000 psi) FOR GENERAL FOOTING, BEAM BLOCKS, POST AND WALL FOOTING, STIFF BEAMS STAIRS & ALL OTHER CONCRETE NOT SPECIFIED HEREUNDER
   fc' = 24.14 MPa (3500 psi) FOR EXTERNAL PAVEMENT WORKS.
   fc' = 27.50 MPa (4000 psi) FOR GENERAL COLUMN, BEAMS, GIRDERS, MID BEAMS, SLAB ON GRADE ROOF BEAMS & SLOPING ROOF BEAMS , SUSPENDED SLAB ,SELECTED FOOTING & UNDER GROUND WATER TANK
   fc' = 34.5 MPa (5000 psi) FOR SELECTED COLUMN
   fc' = 10.4 MPa (1500 psi) FOR ALL LEAN CONCRETE.

2. AGGREGATE SIZE SHALL BE THE FOLLOWINGS ;

   20 MM MAX. — SUSPENDED SLABS, BEAMS, GIRDER WALLS, AND COLUMNS

   25 MM MAX. — FOOTING, THICKENED SLABS, AND SLABS ON FILL

3. MINIMUM CONCRETE COVER FOR REINFORCING A SFOLLOWS:

   50 MM — FORMED CONCRETE AGAINST GROUND OR EXPOSED TO WEATHER
   40 MM — FOR BARS LARGER THAN 16 MM IN DIAMETER
   40 MM — BEAM STIRRUPS AND COLUMN TIES.
   20 MM — FOR BARS OF 16 MM IN DIAMETER AND SMALLER BEAMS AND COLUMNS NOT EXPOSED TO GROUND OR TO WEATHER. SLAB AND WALLS NOT EXPOSED TO GROUND OR WEATHER.
   75 MM — CONCRETE EXPOSED TO SEWAGE AND UNFORMED CONCRETE DEPOSITED AGAINTS GROUND.

4. ALL REINFORCING STEEL DOWELS , ANCHOR BOLTS AND OTHER INSERTS SHALL BE SECURED IN POSITION PRIOR TO POURING CONCRETE.
5. CONCRETE CYLINDERS SHALL BE TAKEN FOR EACH DAY'S POUR AND EACH 50 CUBIC METERS OR FRACTION THEREOF CAST IN ACCORDANCE WITH A.S.T.M. C31 AND TESTED IN ACCORDANCE WITH A.S.T.M. C39
6. CONCRETE SHALL BE DEPOSITED IN ITS FINAL POSITION WITHOUT FINAL SEGREGATION, RE-HANDLING OR FLOWING, PLACING SHALL BE DONE PREFERABLY WITH BUGGIES, BUCKETS OR WHEELBARROWS, NO CHUTE SHALL BE ALLOWED EXCEPT TO TRANSFER CONCRETE FROM HOPPERS TO BUGGIES, WHEELBARROWS OR BUCKETS, IN WHICH CASE, THEY SHALL BE NOT EXCEED SIX (6) METERS IN AGGREGATE LENGTH.
7. NO DEPOSITING OF CONCRETE SHALL BE ALLOWED WITHOUT THE USE OF VIBRATORS UNLESS AUTHORIZED IN WRITING BY THE DESIGNER . NO CONCRETE DROP WILL BE HIGHER THAN 1200MM.
8. THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE FORMS FOR SHORING UNTIL THE CONCRETE MEMBERS HAVE ATTAINED THEIR SUFFICIENT STRENGTH FOR THE WORKING CONDITON ANTICIPATED.

   8.1 THE REMOVAL OF FORMS :
   1.a BEAMS
   FOR SIDE FORMS - AFTER 24 HOURS
   FOR BOTTOM FORMS - AFTER 72 HOURS (OR AFTER TEST CYLINDER YEILD SATISFACTORY RESULT)
   FOR SHORING - AFTER 7 DAYS

   1.b SUSPENDED SLAB
   FOR SIDE FORMS - AFTER 24 HOURS
   FOR BOTTOM FORMS - AFTER 7 DAYS (OR AFTER TEST CYLINDER YEILD SATISFACTORY RESULT)

   8.2 BEARING WALL - AFTER 72 HOURS
   8.3 COLUMN
   FOR SIDE FORMS - AFTER 72 HOURS : WHEN CONSTRUCTION LIVE LOAD IS TO BE APPLIED
   - AFTER 36 HOURS : WHEN PURPOSE IS FOR FORM RE-USE
   FOR SHORING - AFTER 72 HOURS OR WHEN TEST CYLINDER YEILD SATISFACTORY RESULT

   WHEN A CONCRETE FLOOR IS TO BE POURED , AT LEAST TWO (2) FLOORS SHALL BE SHORED TO SUPPORT THE LOAD.

9. RECOMMENDED SLUMP AS FOLLOWS :
   A. FOR SUB - STRUCTURE .....10 CM
   B. FOR SUPERSTRUCTURE.....15 CM
   C. FOR MISCELLANEOUS CONCRETE .....15 CM

   ADEQUATE ADMIXTURE, SUCH AS WATER-REDUCING, AIR-ENTRAINED OR SUPERPLASTISIZER, CAN BE USED IN ACCORDANCE WITH THE MANUFACTURE'S RECOMMENDATION AND HAS BEEN APPROVED BY THE ENGINEER.

10. WET CURING OF CONCRETE SHALL BE CONTINUOUS FOR A MINIMUM PERIOD OF (7) DAYS IMMEDIATELY AFTER POURING
11. THE CONTRACTOR SHALL SUBMIT THE SCHEDULE OF POURING AND LOCATIONS OF CONSTRUCTION JOINTS TO THE PROJECT INSPECTOR/STRUCTURAL ENGINEER ASSIGNED 3 DAYS PRIOR TO THE POURING FOR APPROVAL.

REINFORCING STEEL BARS

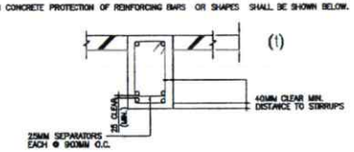
1. GRADE :
   REINFORCING STEEL BARS SHALL BE DEFORMED BARS CONFORMING TO ASTM 615
   GRADE 40 (40,000 psi) 276 MPa - #12 & BELOW
   GRADE 60 (60,000 psi) 414 MPa - #16 & ABOVE
2. MILL CERTIFICATE OF REINFORCEMENTS SHALL BE SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.
3. ALL BARS SHALL BE BENT COLD UNLESS OTHERWISE PERMITTED BY THE STRUCTURAL ENGINEER
4. ALL REINFORCING BARS SHALL BE CLEAN THOROUGHLY OF ALL LOOSE RUST, SOIL OR OTHER MATERIAL IMMEDIATELY PRIOR TO PLACING OF CONCRETE.
5. A FULL WELDED SPLICE SHALL BE BARS BUTTED AND WELDED TO DEVELOP IN TENSION AT LEAST 1.25 PERCENT OF THE SPECIFIED YEILD STRENGTH fy OF THE BAR.
6. ALL WELDING OF REINFORCEMENT SHALL BE CONFORMED TO THE PROVISIONS OF THE STRUCTURAL WELDING CODE REINFORCING STEEL, AWS D 1.4
7. ALL FULL MECHANICAL CONNECTION (REBAR SPLICER) SHALL BE DEVELOPED IN TENSION OR COMPRESSION . AS REQUIRED , AT LEAST 125 % OF THE SPECIFIED YIELD STRENGTH fy OF THE BAR. IF USED ,SUBMIT SAMPLE FOR APPROVAL OF THE DESIGNER.
8. WHEN A BEAM CROSSES A GIRDER ,REST BEAM BARS ON TOP OF GIRDER BAR. REINFORCING BARS SHALL BE SYMMETRICAL ABOUT THE CENTER LINE WHENEVER POSSIBLE AND UPPER LAYERS SHOULD BE PLACED DIRECTLY ABOVE THOSE IN THE BOTTOM LAYER .
9. GENERALLY NO SPLICES SHALL BE PERMITTED ON MEMBERS WHERE CRITICAL BENDING STRESSES OCCUR. LOCATION AND LENGTHS OF LAP SPLICES SHALL BE AS INDICATED IN THESE NOTES AND ON THE STRUCTURAL DRAWINGS.
10. ALL REINFORCING BARS SHALL PASS THE REQUIREMENT OF NSCP SECTION 5.21.2.5

COLUMNS

1. BEAM COLUMN JOINTS SHALL BE PROVIDED WITH TRANSVERSE REINFORCEMENT SPACED AT TWICE THAT REQUIRED BY ITEM 4 WHEN THERE ARE BEAMS HAVING WIDTHS AT LEAST ONE HALF THE COLUMN WIDTH AND DEPTHS NOT LESS THAN THREE QUARTERS OF THE DEEPEST BEAM THAT FRAME INTO FOUR SIDES OF THE COLUMN. FOR ALL OTHER CONDITIONS PROVIDE SAME SPACING AS REQUIRED IN ITEM 4.
2. LAP SPLICES, WHEN REQUIRED, ARE PERMITTED ONLY WITHIN THE CENTER HALF OF THE COLUMN LENGTH AND SHALL BE PROPORTIONED AS TENSION SPLICES. IN NO CASE SHALL BE THE LAP SPLICE BE LOCATED CLOSER THAN EQUAL TO THE DISTANCE MAXIMUM COLUMN DIMENSION FROM THE FACE OF THE BEAM COLUMN JOINT. PROVIDE EXTRA TRANSVERSE REINFORCEMENT OF THE SAME SIZE AND ARRANGEMENT INDICATED IN THE COLUMN SCHEDULE SPACED AT MOST ONE-FOURTH THE MINIMUM COLUMN SECTION DIMENSION THROUGHOUT THE LENGTH OF THE SPLICE.
3. WELDED SPLICES AND MECHANICAL CONNECTIONS MAY BE USED AT ANY SECTION PROVIDED NOT MORE THAN ALTERNATE LONGITUDINAL BARS ARE SPLICED AT ANY SECTION AND DISTANCE BETWEEN SPLICES MUST BE 600MM OR MORE ALONG AXIS OF THE COLUMN.
4. COLUMN TIE SPACING SHALL BE NOT GREATER THAN 1/4 OF THE COLUMN SECTION NOR 100 MM OVER A DISTANCE OF MAXIMUM COLUMN SECTION BUT NOT LESS THAN 1/6 OF CLEAR STOREY HOGHT OR 450MM FROM EACH JOINT FACE.

BEAMS AND GIRDERS

1. UNLESS OTHERWISE NOTED IN PLANS OR SPECIFICATIONS, CAMBER ALL BEAMS AND GIRDERS AT LEAST 6MM FOR EVERY 4500MM OF SPAN EXCEPT CANTILEVERS FOR WHICH THE CAMBER SHALL BE NOTED IN THE PLANS OR AS ORDERED BY THE DESIGNERS BUT IN NO CASE LESS THAN 19MM FOR EVERY 3000MM OF FREE SPAN.
2. IF THERE ARE TWO OR MORE LAYERS OF LONGITUDINAL REINFORCING BARS IN A BEAM OR GIRDER, USE SEPARATORS OF A SIZE NOT LESS THAN 25MM BARS SPACED ABOUT 600MM ON CENTER. IN NO CASE SHALL BE THERE BE LESS THAN TWO (2) SEPARATORS BETWEEN LAYERS OF BARS .
3. LONGITUDINAL REINFORCING BARS SHALL BE PLACED SYMMETRICAL ABOUT THE VERTICAL CENTER LINE OF THE BEAM OR GIRDER SECTION WHERE POSSIBLE, WITH UPPER LAYER BARS PLACED DIRECTLY ABOVE THOSE IN THE BOTTOM LAYERS.
4. MINIMUM CONCRETE PROTECTION OF REINFORCING BARS OR SHAPES SHALL BE SHOWN BELOW.



REINFORCED CONCRETE

5. BEAM REINFORCING BARS BOTH TOP AND BOTTOM TERMINATING IN A WALL, SHALL BE EXTEND AT THE MOST 50MM FROM THE FAR FACE OF THE WALL AND SHALL BE TERMINATE IN A STANDARD 90 DEGREES HOOK .
6. LONGITUDINAL REINFORCEMENT OF GIRDERS, BOTH TOP AND BOTTOM,TERMINATED IN A COLUMN SHALL BE EXTENDED TO THE FAR FACE OF THE CONFINED CONCRETE CORE OF THE COLUMN AND TERMINATED BY A STANDARD 90 DEG. HOOK.
7. GENERALLY, NO LAP SPLICE SHALL BE PERMITTED ON BEAMS AND GIRDERS AT POINTS WHERE CRITICAL BENDING STRESSES OCCUR. IN ADDITION, FOR GIRDERS, NO LAP SPLICE SHALL BE LOCATED WITHIN THE JOINTS OR WITHIN A DISTANCE EQUAL TO TWICE THE MEMBER DEPTH FROM THE FACE OF THE JOINT.
8. PROVIDE LAP SPLICES IN GIRDERS WITH HOOP REINFORCEMENT OVER THE LENGTH OF THE LAPPED BARS SPACED NO FARTHER THAN ONE-FOURTH THE NOMINAL DEPTH OF 100MM.
9. WELDED SPLICES AND MECHANICAL CONNECTIONS MAYBE USED FOR SPLICING BEAMS AND GIRDERS PROVIDED THAT NO MORE THAN ALTERNATE BARS IN EACH LAYER OF LONGITUDINAL REINFORCEMENT ARE SPLICED AT A SECTION AND THE CENTER TO CENTER DISTANCE BETWEEN SPLICES OF ADJACENT BARS IS AT LEAST 600MM MEASURED ALONG THE AXIS OF THE MEMBER.
10. AT LOCATIONS OF DEPRESSED SLABS, BOTTOM OF BEAMS AND GIRDERS SHALL BE DEPRESSED.

CONCRETE SLABS

1. ALL SLAB REINFORCEMENT HAVE A MINIMUM CLEAR DISTANCE OF 20MM FROM THE BOTTOM AND FROM THE TOP OF SLABS.
2. IF SLABS ARE REINFORCED BOTHWAYS, BARS ALONG THE SHORTER SPAN SHALL BE PLACED BELOW THOSE ALONG THE LONG SPAN AT THE CENTER AND OVER THE LONGER SPAN BARS NEAR THE SUPPORTS. THE SPACING OF THE BARS AT THE COLUMN STRIPS SHALL BE APPROXIMATELY ONE AND ONE - HALF (1-1/2) THAT IN MIDDLE STRIPS BUT IN NO CASE GREATER THAN TWO AND ONE- HALF (2-1/2) SLAB THICKNESS OR 450MM.
3. TEMPERAURE BARS FOR SLAB SHALL BE GENERALLY PLACED NEAR THE FACE IN TENSION.

REINFORCED CONCRETE WALLS

1. ALL WALLS SHALL BE REINFORCED ACCORDING TO THE FOLLOWING SCHEDULE OF WALL REINFORCEMENTS UNLESS OTHERWISE INDICATED IN THE PLANS:

WALL THICKNESS (MM)	REINFORCEMENT		REMARKS
	HORIZONTAL	VERTICAL	
100	#10MM @ 300 MM	#10MM @ 300 MM	VERT. BARS @ CENTERS.
125	#10MM @ 250 MM	#10MM @ 300 MM	HOR. BARS STAGGERED
150	#10MM @ 300 MM	#10MM @ 300 MM	
175	#10MM @ 300 MM	#10MM @ 300 MM	HOR. BARS OUTSIDE
200	#10MM @ 250 MM	#10MM @ 350 MM	BOTH FACES,VERT. BARS
225	#10MM @ 250 MM	#10MM @ 250 MM	STAGGERED INSIDE BOTH
250	#10MM @ 250 MM	#10MM @ 300 MM	FACES

2. REINFORCING BARS SHALL HAVE 40MM MINIMUM CLEAR CONCRETE COVER FROM FACE OF WALL EXCEPT FOR WALLS IN CONTICT WITH THE GROUND WHERE A MINIMUM OF 50MM SHALL BE PROVIDED, FOR WALL CAST AGAINST AND PERMANENTLY EXPOSED TO THE EARTH, THE MINIMUM COVER WAS 75MM CLEAR.
3. CARRY VERTICAL BARS AT LEAST 600MM ABOVE FLOOR LEVEL TO PROVIDE FOR SPLICES WHEN NECESSARY. VERTICAL AND HORIZONTAL BARS SHALL BE SPLICED BY LAPPING A DISTANCE EQUAL TO 40MM BAR DIAMETERS AND WIRED SECURELY WITH NO. 16 G.I. WIRE PROVIDED THAT SPLICES IN THE ADJACENT BARS ARE STAGGERED AT LEAST 1500MM.
4. UNLESS OTHERWISE NOTED IN THE PLAN, ALL OPENINGS IN WALLS 250MM OR THICKER SHALL BE REINFORCED AROUND WITH 2-# 20MM BARS; FOR 225MM, 175MM, 150MM WALLS , USE 2-# 16MM BARS; FOR 125MM AND 100MM WALLS, USE 2-# 12MM BARS . ALL WALS SPANNING OPENINGS HAVE VERTICAL REINFORCEMENTS BENT TO U-FORM LIKE STIRRUPS AND SPACED ACCORDING TO THE SCHEDULE UNLESS OTHERWISE NOTED.

MASONRY BLOCK WALLS

1. ALL MATERIALS AND WORKMANSHP SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARDS AND SPECIFICATION OF THE NATIONAL CONCRETE MASONRY ASSOCIATION AND UNIFORM BUILDING CODE.
2. CONCRETE MASONRY UNITS SHAL CONFORM TO ASTM C 90 GRADE N. NON-LOAD BEARING BLOCKS HAVE AN AVERAGE MINIMUM COMPRESSIVE STRENGTH OF 2.4MPa(350Cpsi)
3. MORTAR AND GROUT FOR ALL REINFORCED MASONRY SHALL CONFORM TO ASTM 270-TYPE M AND HAVE A MINIMUM 28 - DAYS STANDARD CYLINDER COMPRESSIVE STRENGTH OF 21 MPa (3000 Psi).
4. ALL CONCRETE HOLLOW BLOCKS MASONRY WALLS SHALL BE LAID IN RUNNING BOND (INTERLOCKING COURSE) WITH FULL MORTAR BEDDING. STICK BOND SHALL BE USED ONLY WHEN SPECIFIED.
5. ALL CELLS SHALL BE SOLIDLY FLLED WITH CONCRETE-GROUT.
6. UNLESS OTHERWISE NOTED ALL EXTERIOR WALL SHALL BE 6"CHB & INTERIOR WALL 4"CHB
7. ALL MASONRY UNITS SHALL BE REINFORCED ACCORDING TO THE FOLLOWING SCHEDULE UNLESS OTHERWISE STATED IN THE PLANS:

SCHEDULE OF CHB REINFORCEMENT FOR NON-LOAD BEARING WALLS OR PARTITIONS

BLOCK THICKNESS	REINFORCEMENT		NOTES
	HORIZONTAL	VERTICAL	
75 MM	#10MM DIA. BARS IF EVERY THIRD COURSE	#10DMM @ 600MM O.C.	A. MINIMUM LAP SPLICE = 250MM B. PROVIDE RIGHT ANGLED REINFORCEMENT 600 MM LONG @ CORNERS. C. WHERE CHB WALLS, ADJOIN COLUMNS, RC BEAMS AND WALL DOWELS WITH SAME SIZE AS VERTICAL OF HORIZONTAL REINFORCEMENT SHALL BE PROVIDED.
100 MM		#10DMM @ 600MM O.C.	
150 MM	#13MM DIA. BARS IF EVERY THIRD COURSE	#12MM @ 600MM O.C.	
200 MM		#12MM @ 600MM O.C.	

LINTEL BEAM IN CMU WALL OPENING (100MM & 150MM THK)

CLEAR SPANLL (MM)	TOTAL LENGTH L+ 400MM	MIN. fc' MPa	HEIGHT OF LINTEL (MM)	REINFORCEMENT		
				TOP BARS	BOT. BARS	TIES
1200	1600	13.J	200	1 - #12MM	1 - #12MM	#10 @ 200 O.C.
1500	1900	13.J	200	1 - #12MM	1 - #12MM	#10 @ 200 O.C.
1800	2200	13.J	200	1 - #12MM	1 - #12MM	#10 @ 200 O.C.
2100	2500	13.J	250	2 - #12MM	2 - #12MM	#10 @ 200 O.C.
2400	2800	13.J	250	2 - #12MM	2 - #12MM	#10 @ 200 O.C.
2700	3100	13.J	250	2 - #12MM	2 - #12MM	#10 @ 200 O.C.
3000	3400	13.J	300	2 - #16MM	2 - #16MM	#10 @ 200 O.C.

SLAB-ON-GRADE

1. THE SOIL SUBGRADE AND FILL LAYERS BELOW ALL SLABS ON GRADE, PAVING AND PIT SLABS SHALL BE MECHANICALLY COMPACTED IN LAYERS TO A MINIMUM OF 100% PERCENT OF THE MODIFIED PROCTOR DENSITY.
2. UNLESS OTHERWISE NOTED, ALL SLABS ON GRADE SHALL BE REINFORCED WITH #10mm BARS AT 205mm O.C., EACHWAY.
3. SLAB DESIGN WAS BASE ON THE CRITERIA OF S-01. MINIMUM SOIL BEARING CAPACITY OF SUBGRADE TO SUPPORT THE SLAB ON GRADE IS 12 TON/M$_2$. PLATE LOAD TEST SHALL BE CONDUCTED AT A RATE OF 1 POINT LOCATION EVERY 250m^2 AREA.

STRUCTURA

PREPARED BY :	CIVIL ENGINEER:	CHECKED BY :	PROJECT TITLE :	SHEET CONTENT:	PREPARED BY:	
ROMBLON STATE UNIVERSITY OFFICE OF PHYSICAL PLANT AND FACILITIES	DICHAEL HABLILIAN JR. CIVIL ENGINEER PRC REG. No. 0129246 Validity : 9-5-21 PTR No.: 0029 3647 Date : 2/11/21 Place : FERROL TIN :	JASON F. RUFON PPFO- Director APPROVED BY: MERLENE CATAJAY-MANILA D., CESE RSU President	REHABILITATION AND FURNISHING OF OLD/EXISTING UNIVERSITY LIBRARY LOCATION : ROMBLON STATE UNIVERSITY - Main Campus, Liwanag, Odiongan, Romblon	AS SHOWN	CAD OPERATOR: BCSC / SLM JOB NO. : DATE:	S-1

STRUCTURAL NOTES

fc' = 20.70 MPa (3ksi)
fy = 275.8 MPa (40ksi) For #12 and smaller
fy = 413.7 MPa (60ksi) For #16 and bigger

BARS	MIN. DEVELOPMENT LENGTH – TENSION S1 (mm)	TENSION S2 (mm)	COMPRESSION S3 (mm)	MIN LAP LENGTH – TENSION S4 (mm)	COMPRESSION S5 (mm)
#10	440	270	200	440	300
#12	530	295	200	530	300
#16	1055	445	355	1055	480
#20	1315	550	440	1315	600
#25	2055	685	550	2055	750
#28	2305	770	615	2305	840
#32	2630	880	705	2630	960
#36	2960	985	790	2960	1080

fc' = 27.50 MPa (4ksi)
fy = 275.8 MPa (40ksi) For #12 and smaller
fy = 413.7 MPa (60ksi) For #16 and bigger

BARS	MIN. DEVELOPMENT LENGTH – TENSION S1 (mm)	TENSION S2 (mm)	COMPRESSION S3 (mm)	MIN LAP LENGTH – TENSION S4 (mm)	COMPRESSION S5 (mm)
#10	380	270	200	380	300
#12	460	295	200	460	300
#16	915	410	305	915	480
#20	1140	510	380	1140	600
#25	1780	635	475	1780	750
#28	1995	715	535	1995	840
#32	2280	815	610	2280	960
#36	2565	915	685	2565	1080

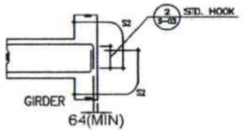
fc' = 34.50 MPa (5ksi)
fy = 275.8 MPa (40ksi) For #12 and smaller
fy = 413.7 MPa (60ksi) For #16 and bigger

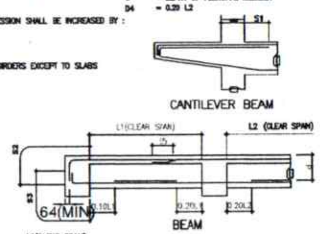
BARS	MIN. DEVELOPMENT LENGTH – TENSION S1 (mm)	TENSION S2 (mm)	COMPRESSION S3 (mm)	MIN LAP LENGTH – TENSION S4 (mm)	COMPRESSION S5 (mm)
#10	340	270	200	340	300
#12	410	295	200	410	300
#16	815	395	290	815	480
#20	1020	495	380	1020	600
#25	1595	615	450	1595	750
#28	1785	690	505	1785	840
#32	2040	790	580	2040	960
#36	2295	890	650	2295	1080

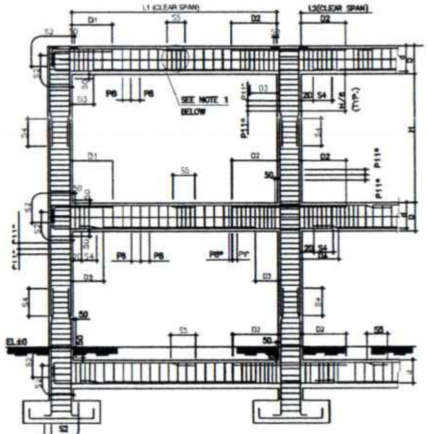
LEGEND:

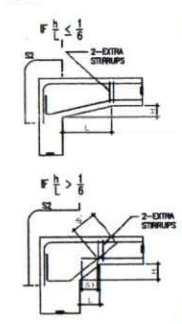
- L1,L2 = CLEAR SPAN OF FLEXURAL MEMBER
- D1 = [0.2L1 + Δ / S1] WHICHEVER IS LARGER
- D2 = [0.2L1 + Δ1 / 0.2L1 + Δ1 / S1] WHICHEVER IS LARGER
- Δ1 = [12db / d] WHICHEVER IS LARGER
- db = SIZE OF LONGITUDINAL BARS
- d = EFFECTIVE DEPTH OF FLEXURAL MEMBER
- P8,P8* = STIRRUP SPACING
- P11,P11* = TIE SPACING
- S1,S2,S3 = DEVELOPMENT LENGTH
- S4,S5 = LAP LENGTH
- D3 = 0.15L1
- D = DEPTH OF FLEXURAL MEMBER
- D4 = 0.20 L2

NOTE:
1. DEVELOPMENT LENGTH, EITHER IN TENSION OR COMPRESSION SHALL BE INCREASED BY :
   a). 20% FOR THREE BAR BUNDLE
   b). 33% FOR FOUR BAR BUNDLE
2. FOR S2, 90° STANDARD HOOK SHALL BE APPLY.
3. FOR S3, 90° HOOK SHALL BE APPLY TO BEAMS AND GIRDERS EXCEPT TO SLABS UNLESS OTHERWISE NOTED.



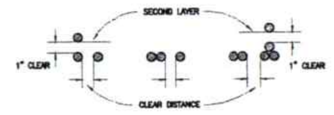






NOTE: 1. MAXIMUM SPACING OF STIRRUPS WITHIN LAP AREA (S5) SHALL BE 100MM.

① MINIMUM DEVELOPMENT LENGTH AND LAP LENGTH



REINFORCEMENT TYPE	TYPE MEMBER	CLEAR DISTANCE
DEFORMED BARS	FLEXURAL MEMBERS	db ≥ 1 IN.
	COMPRESSION MEMBERS, TIED OR SPIRALLY REINFORCED	db ≥ 1 IN.

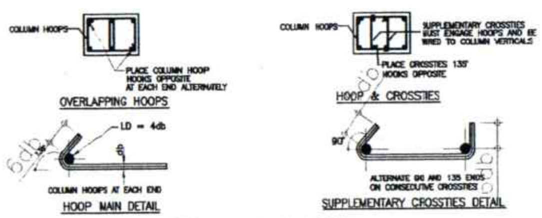
MINIMUM BAR SPACING

1. D = 600MM CENTER TO CENTER OF LAP SPLICE LENGTH
2. FOR BUNDLE BARS, INDIVIDUAL BARS SHALL BE TERMINATED AT DIFFERENT POINTS WITH AT LEAST 40 db STAGGER.

LAP DISTANCE

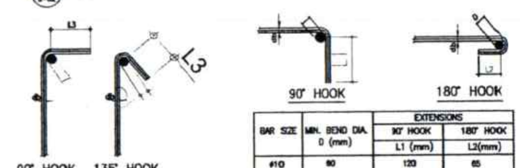
TYPE OF STIRRUPS

④ MISCELLANEOUS REINFORCEMENT DETAIL



FOR #10, #12 AND #16 TIES

③ HOOPS & CROSS TIE BAR PLACEMENT DETAIL



BAR SIZE	MIN. BEND DIA D (mm)	90° 135° HOOK L3(mm)
#10	40	60 mm
#12	50	75 mm
#16	65	100mm

FOR STIRRUPS AND TIE REINFORCEMENTS

BAR SIZE	MIN. BEND DIA. D (mm)	EXTENSIONS – 90° HOOK L1 (mm)	180° HOOK L2(mm)
#10	60	120	65
#12	75	145	65
#16	95	190	65
#20	115	240	80
#25	155	300	100
#28	230	335	115
#32	255	385	130
#36	380	430	145

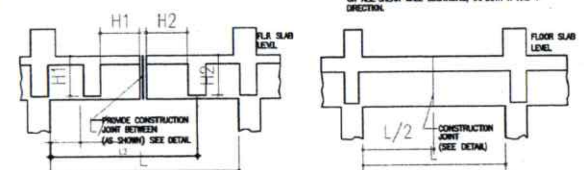
FOR MAIN REINFORCEMENTS

② STANDARD HOOK & BEND

SCHEDULE OF DIAGONAL CROSS BARS	
NO. OF BARS	BEAM WIDTH
2 - #16	UP TO 175mm
2 - #20	200mm TO 500mm
4 - #20	550mm TO 1000mm
8 - #25	1000mm TO 2000mm

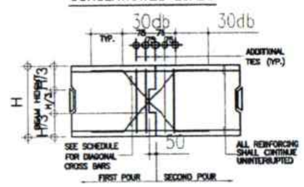
NOTES ON HORIZONTAL JOINTS

1. LOCATE CONSTRUCTION JOINT BETWEEN L/3 TO L/2 BUT NOT WITHIN H1 & H2 AS SHOWN
2. SUBMIT SHOP DRAWINGS FOR ALL CONSTRUCTION JOINTS FOR ENGINEERS APPROVAL.
3. PROVIDE ALTERNATE HORIZONTAL JOINT CONSTRUCTION LOCATION ON EACH FLOOR LEVEL.
4. DO NOT PASS ANY HORIZONTAL JOINT CONSTRUCTION ON ALL SHEAR WALL LOCATIONS, IN BOTH X AND Y DIRECTION.

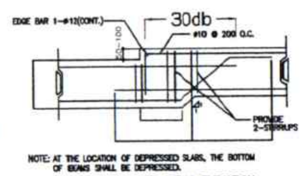


FOR BEAMS WITH CONCENTRATED LOADS

FOR BEAMS WITHOUT CONCENTRATED LOADS



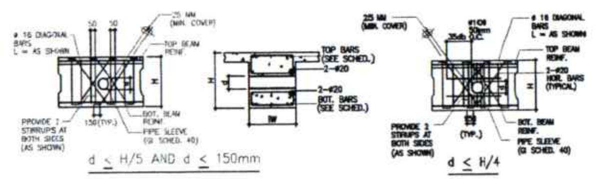
BEAM & GIRDER CONSTRUCTION JOINT DETAIL

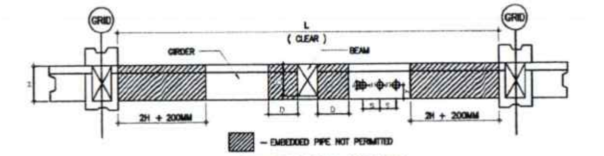


NOTE: AT THE LOCATION OF DEPRESSED SLABS, THE BOTTOM OF BEAMS SHALL BE DEPRESSED.

DEPRESSED BEAM ELEVATION

⑥ CONC. BEAM & GIRDER CONSTRUCTION JOINT





– EMBEDDED PIPE NOT PERMITTED

LOCATION FOR BEAM OPENINGS

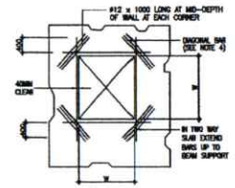
NOTES
1. WHERE OPENINGS ARE SPACED INTERMITTENTLY, PROVIDE HORIZONTAL BARS 2-# 12 (ABOVE AND BELOW HOLE)
2. FOR d < D/10 OR ₵ < 100mm AND D>600mm, OMIT DIAGONAL BARS SHOWN
3. OPENINGS SHALL BE NOT BE PERMITTED AT A DISTANCE 2H + 200MM FROM FACE OF COLUMN.
4. OPENING SHALL BE NOT BE PERMITTED AT A DISTANCE D FROM EDGE OF INTERSECTING BEAM.

WHERE
- H = TOTAL DEPTH OF GIRDER
- Bw = WIDTH OF GIRDER
- D = TOTAL BEAM DEPTH
- n = LAST PIPE DESIGNATION NO.
- d = OUTER DIAMETER OF PIPE SLEEVE
- L = CLEAR LENGTH OF GIRDER FROM FACE OF SUPPORT
- S = ALLOWABLE SPACING OF PIPE OPENINGS ≥ (LEFT (d1) + RIGHT (d2)) / 2
- Y = ALLOWABLE VERTICAL LOCATION OF PIPE OPENINGS
- Y min = DIAL. OF PIPE x 2.0
- Y max. = D/2

⑤ DETAIL OF BEAM OPENINGS

PREPARED BY:	CIVIL ENGINEER	CHECKED BY:	PROJECT TITLE:	SHEET CONTENT:	PREPARED BY:	
ROMBLON STATE UNIVERSITY	DICK G. FAMARUILAN JR. CIVIL ENGINEER	JASON F. RUFON PPFO- Director	REHABILITATION AND FURNISHING OF OLD/EXISTING UNIVERSITY LIBRARY	AS SHOWN	CAD OPERATOR:	S-2
OFFICE OF PHYSICAL PLANT AND FACILITIES	PRC REG. No. 0122414 Validity: 9-5-21	APPROVED BY:			BCSC / SLM	
	PTR No.: 0291647 Date: 2/11/21	MERIAN CATAJAY-MANI Ed. D., CESE RSU President			JOB NO. :	
	Place: FERROL TIN:		LOCATION : ROMBLON STATE UNIVERSITY - Main Campus, Liwanag, Odiongan, Romblon		DATE:	

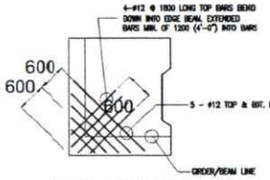
STRUCTURAL NOTES



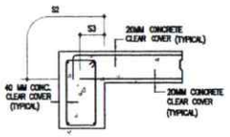
SLAB OPENING DETAIL

NOTES :

1. PROVIDE THESE ADDITIONAL BARS FOR ALL OPENINGS PLUS BARS (NOT SHOWN) PARALLEL TO SIDE OF OPENING EQUAL TO THE NUMBER OF TERMINATED BARS AT OPENING.
2. SEE ARCHITECTURAL & MECHANICAL PLANS FOR SLAB OPENING LOCATION.
3. OMIT TRIMMER BARS WHERE OPENING IS FRAMED BY BEAM.
4. DIAGONAL BARS
   - W < 400MM 2-#12 TOP & BOTTOM BARS
   - W > 400MM 3-#12 TOP OF BOTTOM BARS
   - W < 150MM OR 0.10M² (NO ADDITIONAL REINFORCEMENT REQ'D.)

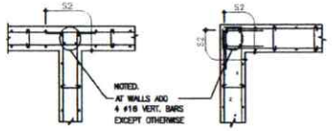


CORNER SLAB DETAIL

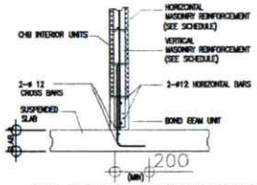


SLAB END DETAIL

1 S-03 MISCELLANEOUS DETAILS

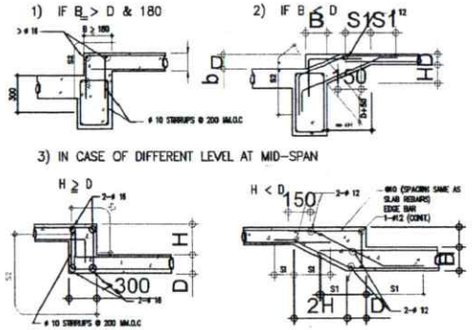


2 S-03 REBARS @ CORNERS OF R. C. WALLS

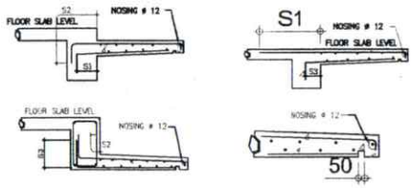


CHB PARTITION ON SUSPENDED SLAB

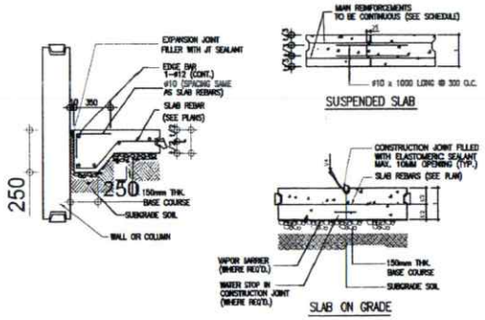
3 S-03 CHB CONNECTION DETAILS



DEPRESSED SLAB DETAILS



CANTILEVER SLABS

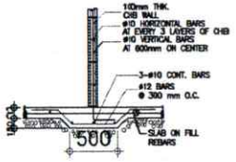


SUSPENDED SLAB

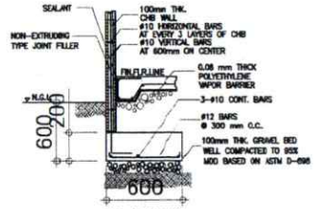
SLAB ON GRADE

SLAB CONSTRUCTION JOINT DETAILS

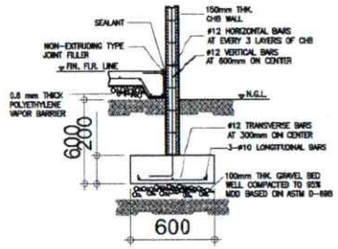
4 S-03 MISCELLANEOUS SLAB DETAILS



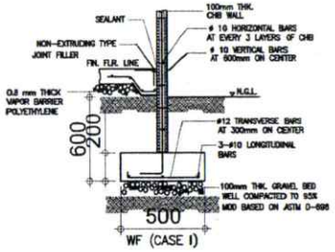
THICKENED SLAB DETAIL (WHERE APPLICABLE)



WF (CASE III)



WF (CASE II)



WF (CASE I)

5 S-03 CHB WALL FOOTING DETAILS (WHERE APPLICABLE)

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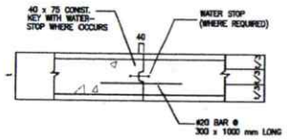
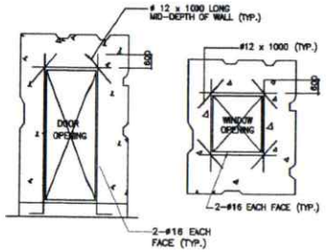
ROMBLON STATE UNIVERSITY OFFICE OF PHYSICAL PLANT AND FACILITIES	DIONEL G. TAMAJILAN JR. CIVIL ENGINEER PRC REG. No. 077414 Validity: 9-5-21 PTR No.: 0295647 Date: 2/11/21 Place: ROMBLON TIN :	JASON F. RUPON PPPO- Director APPROVED BY: MERIAN P. MATABAY-MANILA D. CESE RSU- President	REHABILITATION AND FURNISHING OF OLD/EXISTING UNIVERSITY LIBRARY LOCATION : ROMBLON STATE UNIVERSITY - Main Campus, Liwanag, Odiongan, Romblon	AS SHOWN	CAD OPERATOR: BCSC / SLM JOB NO. : DATE:	S-3

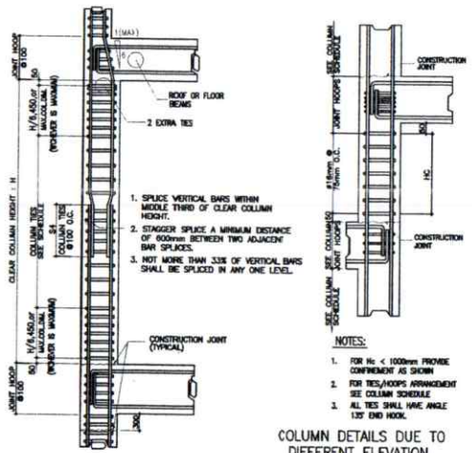
STRUCTURAL NOTES



1 S-04 R. C. WALL CONSTRUCTION JOINT



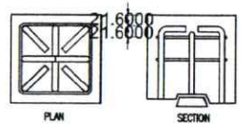
2 S-04 NON-BEARING WALL EXTERIOR WINDOW & DOOR OPENINGS



REINFORCED CONCRETE COLUMN DETAIL

COLUMN DETAILS DUE TO DIFFERENT ELEVATION

3 S-04 MISCELLANEOUS COLUMN DETAILS



REINFORCING BAR TERMINATION @ END OF COLUMN WHERE NO BEAMS FRAME AT THE END OF COLUMN

NOTE:
1. ALL CORNER BARS SHALL BE BEND.
2. FOR NO. OF BARS < 8PCS. ALL BARS ARE TO BE BEND
3. FOR NO. OF BARS > 8PCS. 50% OF THE BARS OTHER THAN THE CORNER BARS SHALL BE BEND.

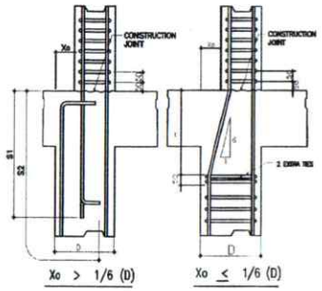
NOTES ON LAP SPLICE:

1. CENTER LINE OF SPLICE SHALL BE WITHIN CENTER HALF OF CLEAR COLUMN HEIGHT EXCEPT OTHERWISE PERMITTED BY THE ENGINEER.
2. MAXIMUM SPACING OF TIES IN LAP LENGTH (S4) SHALL BE:
   a) 4/1 OF SMALLEST COLUMN DIMENSION
   b) BUT NOT LESSER THAN 100mm AND NOT GREATER THAN 150mm.
3. NOT MORE THAN 33% OF THE BARS SHALL BE SPLICED WITHIN THE REQUIRED LAP LENGTH

NOTES ON MECHANICAL AND WELDED SPLICE:

1. MECHANICAL AND WELDED SPLICE SHALL BE DEVELOP IN TENSION OR COMPRESSION AS REQUIRED, AT LEAST 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF THE BAR.
2. MECHANICAL SPLICE SHALL BE USED WITHIN A DISTANCE TWICE THE MAXIMUM DIMENSION OF COLUMN FROM BEAM FACE UNLESS AS STATED IN ITEM (3).
3. MECHANICAL SPLICE SHALL BE PERMITTED TO BE USED AT ANY LOCATION IF IT CONFORMS TO ITEM (1), AND SHALL BE DEVELOP THE SPECIFIED TENSILE STRENGTH OF THE SPLICED BAR.

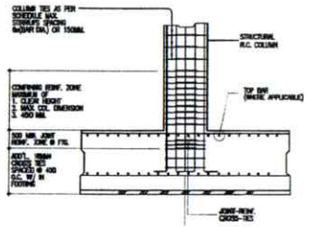
SEISMIC RESISTANT COLUMN SPLICING DETAIL



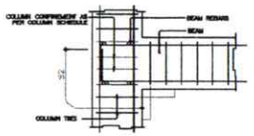
NOTES:

1. THE 90-DEGREE HOOK SHALL BE LOCATED WITHIN THE CONFINED CORE OF A COLUMN OR OF A BOUNDARY MEMBER.
   Xo = OFFSET DISTANCE

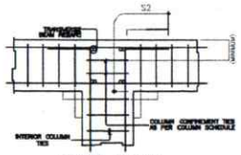
DETAILS DUE TO COLUMN OFFSETS



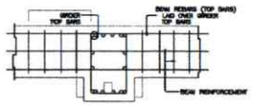
COLUMN VERTICAL BARS EMBEDMENT TO FOOTING DETAIL



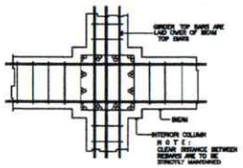
BEAM REBAR TERMINATION BEND



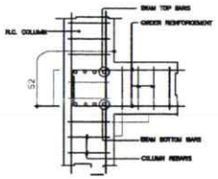
INTERIOR COLUMN TERMINATION BEND



A) AT GIRDER SPAN

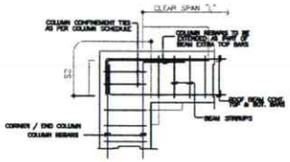


TYPICAL PLAN OF BEAM / GIRDER COLUMN JOINT



B) AT COLUMN INTERSECTION

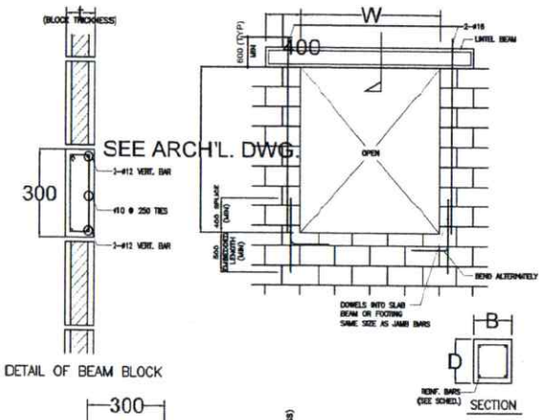
TYP. BEAM AND GIRDER REBAR LAYOUT



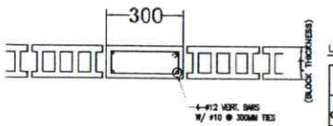
CORNER / EXTERIOR COLUMN TERMINATION BEND

PREPARED BY :	CIVIL ENGINEER:	CHECKED BY :	PROJECT TITLE :	SHEET CONTENT:	PREPARED BY:	
ROMBLON STATE UNIVERSITY OFFICE OF PHYSICAL PLANT AND FACILITIES	DICKING. PRIMA LLAN JR. CIVIL ENGINEER PRC REG. No. 0172941 Validity : 9-8-21 PTR No. : 0295647 Date : 2/11/21 Place : FERNADOL TIN :	JASON F. RUPON PPPO- Director APPROVED BY: MERIAN P. GATAJAY-MANILA D. CESE RSU President	REHABILITATION AND FURNISHING OF OLD/EXISTING UNIVERSITY LIBRARY LOCATION : ROMBLON STATE UNIVERSITY - Main Campus, Liwanag, Odiongan, Romblon	AS SHOWN	CAD OPERATOR: BCSC / SLM JOB NO. : DATE:	S-4

STRUCTURAL NOTES



DETAIL OF BEAM BLOCK



DETAIL OF POST

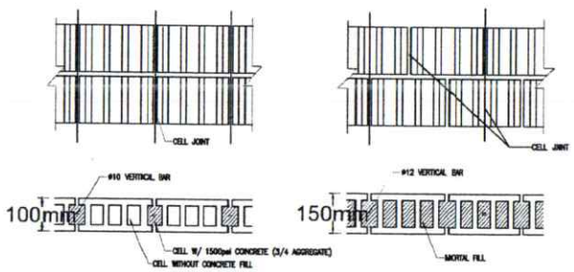
LINTEL BEAM SCHEDULE

W	B	D	REINF. BARS
2000 OR LESS	"t"	250	4-#12 W/ #10 @ 200 STIRRUPS
3000	"t"	300	4-#16 W/ #10 @ 200 STIRRUPS

NOTE:

a) OMIT BARS FOR OPENING LESS THAN 200 VERT. & HOR.

b) "t" THICKNESS OF WALL



INTERIOR CHB WALL TYP. DETAIL
(FOR 4" CHB)

INTERIOR CHB WALL TYP. DETAIL
(FOR 6" CHB)

NOTE:
THIS PARALLEL LAYOUT IS AN OPTION.
FOR CONVENTIONAL LAYOUT (STAGGERED)
REFER TO S-2: MASONRY BLOCK WALL

1 S-05 CONCRETE MASONRY UNIT

GENERAL NOTES ON STRUCTURAL STEEL

1. ALL MATERIALS SHALL BE CONFORM TO THE FOLLOWING UNLESS OTHERWISE NOTED:

STRUCTURAL STEEL	:	ASTM A36 OR APPROVED EQ
STRUCTURAL STEEL PIPE	:	ASTM A53 Gr.B,A501 OR APPROVED EQ
HIGH STRENGTH BOLT	:	ASTM A325M GRADE A OR APPROVED EQ
ORDINARY STRUCTURAL BOLT	:	ASTM A307 TYPE A OR APPROVED EQ
CHECKERED PLATE	:	ASTM A36 OR APPROVED EQ
GRATING	:	ASTM A36 OR APPROVED EQ
ELECTRODES	:	ASTM D1.1 E70XX OR APPRIVED EQ

2. HIGH STRENGTH BOLTS

(a) HIGH STRENGTH BOLTS SHALL BE USED IN BEARING TYPE CONNECTIONS. BOLTS SHALL BE SNUG-TIGHT.

(b) FOLLOWING DIMENSIONS SHALL BE APPLIED UNLESS OTHERWISE NOTED.

	M16	M20	M22	M24
BOLT HOLE DIAMETER(MM)	18	22	24	26
STANDARD BOLT PITCH(MM)	50	60	70	80
STANDARD EDGE DISTANCE(MM)	30	35	40	45

3. ORDINARY STRUCTURAL BOLTS

(a) BOLT THREAD AND NUT SHALL BE CONFORM TO ANSI B1.1(1982) AND ANSI B18.2.2 (1983) OR ISO 262.

(b) DIMENSIONS OF BOLT HOLE DIAMETER, STANDARD BOLT PITCH AND STANDARD EDGE DISTANCE SHALL BE SAME TO THAT OF HIGH STRENGTH BOLTS.

4. LEG LENGTH OF FILLET WELD FOR GUSSET PLATE, RIB PLATE, BUTT PLATE AND STIFFENER PLATE, UNLESS OTHERWISE NOTED:

PLATE THICKNESS(MM)	LEG LENGTH(MM)
6	5
7	5
8	6
9	6
10	7
11	7
12	8
14	9
16	10
	12

5. FABRICATION AND ERECTION TOLERANCE SHALL BE CONFORM TO THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC).

6. PAINTING

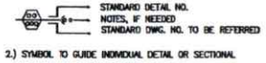
STRUCTURAL STEEL HAD BEEN SURFACE PREPARED AND PAINTED IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATION.

REFERENCE GUIDE SYMBOLS

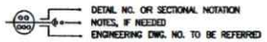
FOR THE PURPOSE OF GUIDING FURTHER DETAILS, SECTIONAL VIEWS AND STANDARDIZED TYPES TO BE REFERRED "REFERENCE GUIDE SYMBOLS" AS DESCRIBED BELOW ARE USED IN THE RELEVANT ENGINEERING DRAWINGS TO MAKE THE REFERENCE RELATION SIMPLE AND CLEAR.

SYMBOL — COLUMN EXPLANATION

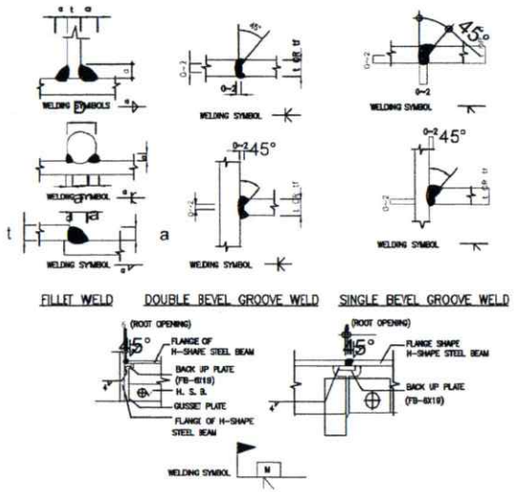
1.) SYMBOL TO GUIDE STANDARD DETAIL



2.) SYMBOL TO GUIDE INDIVIDUAL DETAIL OR SECTIONAL VIEW WHICH ARE NOT STANDARDIZED



2 S-06 GENERAL NOTES ON STRUCTURAL STEEL



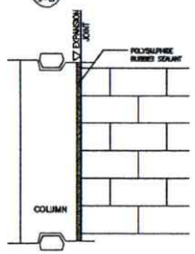
WELDING TYPE OF H-SHAPE FLANGE

THK. OF PLATE (t)	WELDING TYPE	WELDING SYMBOLS
t ≤ 16	SINGLE BEVEL GROOVE WELD	2 45°
t > 16	DOUBLE WELD GROOVE WELD	2 45°

WELDING TYPE OF RIB PLATE, H-SHAPE WEB OR GUSSET PLATE

THK. OF PLATE (t)	WELDING TYPE	WELDING SYMBOLS
t ≤ 12	FILLET WELD	
12 < t ≤ 16	SINGLE BEVEL GROOVE WELD	2 45°
t > 16	DOUBLE WELD GROOVE WELD	2 45°

3 S-05 STANDARDIZED WELDS



4 S-06 MISCELLANEOUS DETAIL
(WALL EXPANSION JOINT)

PREPARED BY:	CIVIL ENGINEER:	CHECKED BY:	PROJECT TITLE:	SHEET CONTENT:	PREPARED BY:	
ROMBLON STATE UNIVERSITY OFFICE OF PHYSICAL PLANT AND FACILITIES	DICK G. FAMAJILMN JR. CIVIL ENGINEER PRC REG. No. 0127041 Validity: 09-5-21 PTR No.: 029 5647 Date: 2/1/21 Place: FERRAZOL TIN:	JASON F. RUFON PPFO- Director APPROVED BY: MERIAN P. CATAJAY-MANALO, CESE RSU President	REHABILITATION AND FURNISHING OF OLD/EXISTING UNIVERSITY LIBRARY LOCATION : ROMBLON STATE UNIVERSITY - Main Campus, Liwanag, Odiongan, Romblon	AS SHOWN	CAD OPERATOR: BCSC / SLM JOB NO. : DATE:	S-5