DEFORMED BAR TENSION DEVELOPMENT LENGTH (Ld)						
FOR NORMAL WEIGHT STONE CONCRETE & UNCOATED BARS						
BAR SIZE	3000 PSI CONCRETE		4000 PSI CONCRETE		5000 PSI CONCRETE	
	CASE I	CASE II	CASE I	CASE II	CASE I	CASE II
#3	17	25	15	22	13	20
#4	22	33	19	29	17	26
#5	28	42	24	36	22	32
#6	33	50	29	43	26	39
#7	48	72	42	63	38	56
#8	55	83	48	72	43	64
#9	62	93	54	81	48	72
#10	70	105	61	91	54	81
#11	78	116	67	101	60	90

DEFORMED BAR TENSION LAP SPLICE - CLASS B						
FOR NORMAL WEIGHT STONE CONCRETE & UNCOATED BARS						
BAR SIZE	3000 PSI CONCRETE		4000 PSI CONCRETE		5000 PSI CONCRETE	
	CASE I	CASE II	CASE I	CASE II	CASE I	CASE II
#3	22	33	19	28	17	25
#4	29	43	25	37	23	34
#5	36	54	31	47	28	42
#6	43	65	37	56	34	50
#7	63	94	54	81	49	73
#8	72	107	62	93	56	83
#9	81	121	70	105	63	94
#10	91	136	79	118	71	106
#11	101	151	87	131	78	117

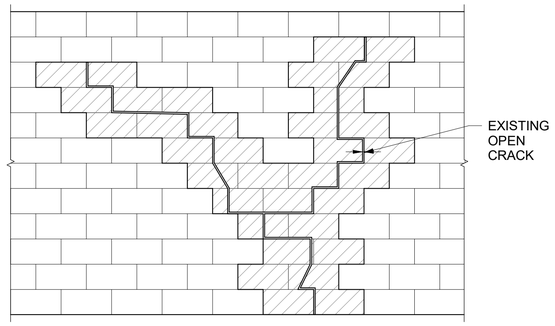
DEFORMED TENSION BAR NOTES:

1. FOR HORIZONTAL REINFORCEMENT WITH 12 INCH OR MORE FRESH CONCRETE CAST BELOW IT, TENSION DEVELOPMENT LENGTH/ TENSION LAP SPLICE LENGTH SHALL BE 1.3x THE VALUES GIVEN.
2. FOR REINFORCEMENT IN LIGHTWEIGHT CONCRETE, TENSION DEVELOPMENT LENGTH/TENSION LAP LENGTH SHALL BE 1.3x THE VALUES GIVEN.
3. FOR EPOXY-COATED BARS:
   A. WHERE CONCRETE COVER IS LESS THAN 3x BAR DIAMETER, OR CLEAR SPACING IS LESS THAN 6x BAR DIAMETER, TENSION DEVELOPMENT LENGTH/ TENSION LAP SPLICE LENGTH SHALL BE 1.5x THE VALUES GIVEN.
   B. WHERE CONCRETE COVER IS EQUAL TO OR GREATER THAN 3x BAR DIAMETER AND CLEAR SPACING IS GREATER THAN 6x BAR DIAMETER, TENSION DEVELOPMENT LENGTH/ TENSION LAP SPLICE LENGTH SHALL BE 1.2x THE VALUES GIVEN.
4. CASE I APPLIES WHEN EITHER OF THE FOLLOWING SETS OF CONDITIONS ARE MET:
   A. ALL THREE OF THESE:
      a. CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED IS NOT LESS THAN DB AND
      b. CLEAR COVER IS NOT LESS THAN DB AND
      c. STIRRUPS OR TIES ARE PROVIDED THROUGHOUT THE DEVELOPMENT LENGTH AND THE QUANTITY IS NOT LESS THAN THE CODE MINIMUM.
   B. OR BOTH OF THESE:
      a. CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED IS NOT LESS THAN 2DB AND
      b. CLEAR COVER IS NOT LESS THAN DB.

   CASE II APPLIES TO ALL OTHER CONDITIONS NOT DESCRIBED IN CASE I

DEFORMED BAR COMPRESSION DEVELOPMENT LENGTH (Ldc)			
FOR NORMAL WEIGHT STONE CONCRETE & UNCOATED BARS			
BAR SIZE	3000 PSI CONCRETE	4000 PSI CONCRETE	5000 PSI CONCRETE
#3	9	8	8
#4	11	10	9
#5	14	12	12
#6	17	15	14
#7	20	17	16
#8	22	19	18
#9	25	22	21
#10	28	25	23
#11	31	27	26

DEFORMED BAR COMPRESSION LAP SPLICE			
FOR NORMAL WEIGHT STONE CONCRETE & UNCOATED BARS			
BAR SIZE	3000 PSI CONCRETE	4000 PSI CONCRETE	5000 PSI CONCRETE
#3	12	12	12
#4	15	15	15
#5	19	19	19
#6	23	23	23
#7	27	27	27
#8	30	30	30
#9	34	34	34
#10	39	39	39
#11	43	43	43

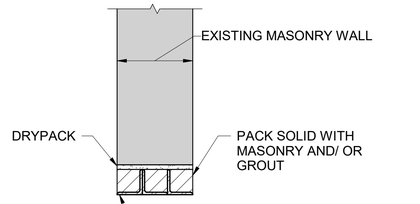


NOTES:

1. ▨ DENOTES BRICK TO BE REPLACED. WHERE CRACK IS THRU WALL REPLACE ALL WYTHES OF BRICK ON EACH SIDE OF CRACK TO 1ST MORTAR JOINT. REPLACE EXISTING HEADERS WITH NEW HEADERS. REPLACE LOOSE AND CRACKED BRICKS. WHERE CRACK IS ONLY IN OUTER WYTHE, REPLACE ONLY OUTER WYTHE.
2. WHERE CRACK IS OPEN AND 1/4" OR LESS AND IS PRESENT ONLY IN OUTER WYTHE AND ONLY IN JOINTS, RAKE AND REPOINT JOINTS ONLY.

1 S5.5 TYPICAL REPAIR IN BRICK MASONRY

N.T.S.



2 S5.5 TYPICAL ANGLE LINTEL IN EXISTING MASONRY WALL

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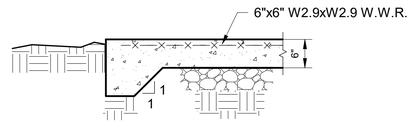


NOTES:

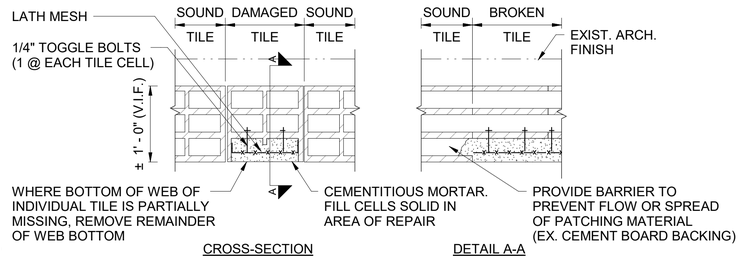
1. FOR SIZE AND LOCATION SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.
2. CONCRETE FOR PADS SHALL BE NORMAL WEIGHT WITH f'c = 4000 PSI
3. THREADED RODS TO BE 3/8" Ø A-36 STEEL IN EXPANSION INSERTS @ 18" O.C. HY-200 ADHESIVE OR APPROVED EQUAL.

3 S5.5 TYPICAL EQUIPMENT PAD ON GRADE (EXTERIOR)

N.T.S.

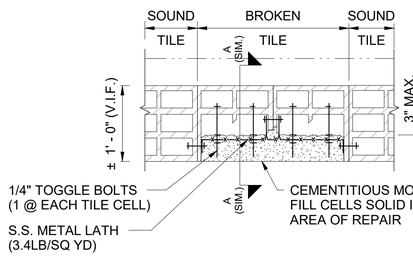
NOTES:

1. APPLICABLE TO SUBSTRATE MATERIAL CONDITIONS ENCOUNTERED DURING ARCHITECTURAL EXTERIOR/INTERIOR FINISH REPAIRS.
2. WIDTH AND LENGTH CAN BE IN ANY DIRECTION.
3. TROWEL-ON OVERHEAD CEMENTITIOUS MORTAR (BONDING AGENT) OPTIONS:
   A. JAHN M100
   B. SIKAREPAIR 223 (SIKA ARMATEC 100 EPOCEM)
4. FOLLOW MANUFACTURER PREPERATION REQUIREMENTS
5. SUBMIT MANUFACTURER'S SPECIFICATIONS, INSTALLATION PROCEDURES, AND MATERIAL SAFETY DATA SHEETS FOR ONE OF THE APPROVED PRODUCTS.

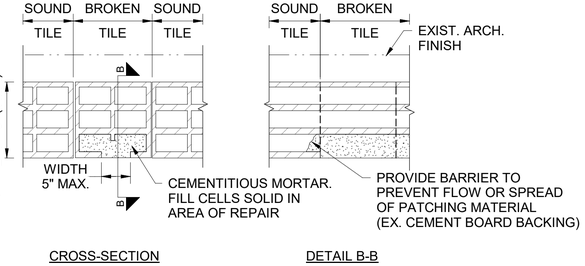


CROSS-SECTION DETAIL A-A

DETAIL 1:TYPICAL TERRACOTTA REPAIR



DETAIL 2: LARGE REPAIR AREA

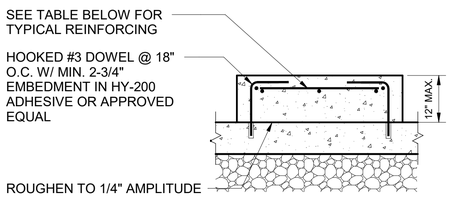


CROSS-SECTION DETAIL B-B

DETAIL 3: NARROW TERRACOTTA REPAIR

6 S5.5 TERRA COTTA WALL REPAIR DETAIL

N.T.S.



AT SLAB ON GRADE

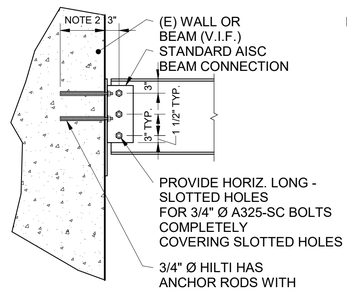
EQUIPMENT PAD TEMPERATURE AND SHRINKAGE REINFORCING	
PAD THICKNESS	REINFORCING
4"-5"	#3 @ 12" O.C. EACH WAY
6"-9"	#4 @ 12" O.C. EACH WAY
10"-12"	#5 @ 12" O.C. EACH WAY

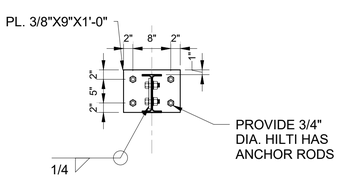
NOTES:

1. FOR SIZE AND LOCATION SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.
2. CONCRETE FOR PADS SHALL BE NORMAL WEIGHT WITH f'c = 4,000 PSI.

4 S5.5 TYPICAL EQUIPMENT PAD

N.T.S.





NEW STEEL BEAM ANCHORED TO CONCRETE WALL AT FLOOR SUPPORT

NOTES:

1. VERIFY ANCHORAGE SUBSTRATE MATERIAL AND INDICATE ON SHOP DRAWINGS.
2. MINIMUM EMBEDMENT FOR ADHESIVE ANCHORS SHALL BE AS FOLLOWS" 6" FOR CONCRETE, 8" FOR BRICK MASONRY.
3. ANCHORAGE DETAIL BASED UPON HILTI HIT-HY 200 FOR EMBEDMENT IN CONCRETE AND HILTI-HY 270 FOR EMBEDMENT IN MASONRY.
4. CONTRACTOR TO PERFORM NON-DESTRUCTIVE EVALUATION TO LOCATE WALL/BEAM REBAR PRIOR TO STEEL INSTALLATION. DO NOT DAMAGE EXISTING REINFORCING STEEL.
5. FIREPROOF STEEL AS REQUIRED. SEE SPECIFICATIONS (FIREPROOFING NOT SHOWN FOR CLARITY).

5 S5.5 END PLATE CONNECTION

N.T.S.

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 14677
10/27/2023
NATHANIEL OPPENHEIMER

A/E FIRMS	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
ARCH: QUINN EVANS 219 1/2 N. MAIN STREET ANN ARBOR, MI T: 734.663.5888	KH	02 S5.5	LIBBEY BATHHOUSE TYPICAL DETAILS	128 182951
ENG: SILMAN 211 N 4TH AVE. ANN ARBOR, MI T: 734.800.2460	CADD: CM			PMIS/PKG NO. 318915
	TECH. REVIEW: NH		REHABILITATE BATHHOUSES HOT SPRINGS NATIONAL PARK	
	DATE: 10.27.2023			225 OF 286

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