

| BAR SIZE | LAP CLASS | f'c = 3000 psi | | | | f'c = 4000 psi | | | | f'c = 4500 psi | | | |
|----------|-----------|----------------|--------|------------|--------|----------------|--------|------------|--------|----------------|--------|------------|--------|
| | | TOP BARS | | OTHER BARS | | TOP BARS | | OTHER BARS | | TOP BARS | | OTHER BARS | |
| | | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 |
| #3 | A | 22 | 32 | 17 | 25 | 19 | 28 | 15 | 22 | 18 | 27 | 14 | 21 |
| | B | 28 | 42 | 22 | 32 | 24 | 36 | 19 | 28 | 23 | 34 | 18 | 27 |
| #4 | A | 29 | 43 | 22 | 33 | 25 | 37 | 19 | 29 | 24 | 35 | 18 | 27 |
| | B | 37 | 56 | 29 | 43 | 32 | 48 | 25 | 37 | 31 | 46 | 24 | 35 |
| #5 | A | 36 | 54 | 28 | 41 | 31 | 47 | 24 | 36 | 29 | 44 | 23 | 34 |
| | B | 47 | 70 | 36 | 54 | 40 | 60 | 31 | 47 | 38 | 57 | 29 | 44 |
| #6 | A | 43 | 64 | 33 | 50 | 37 | 56 | 29 | 43 | 35 | 53 | 27 | 41 |
| | B | 56 | 84 | 43 | 64 | 48 | 72 | 37 | 56 | 46 | 68 | 35 | 53 |
| #7 | A | 63 | 94 | 48 | 72 | 54 | 81 | 42 | 63 | 51 | 77 | 40 | 59 |
| | B | 81 | 122 | 63 | 94 | 70 | 106 | 54 | 81 | 67 | 100 | 51 | 77 |
| #8 | A | 72 | 107 | 55 | 82 | 62 | 93 | 48 | 71 | 59 | 88 | 45 | 68 |
| | B | 93 | 139 | 72 | 107 | 80 | 121 | 62 | 93 | 76 | 114 | 59 | 88 |
| #9 | A | 81 | 121 | 62 | 93 | 70 | 105 | 54 | 81 | 66 | 99 | 51 | 76 |
| | B | 105 | 157 | 81 | 121 | 91 | 136 | 70 | 105 | 85 | 128 | 66 | 99 |
| #10 | A | 91 | 136 | 70 | 105 | 79 | 118 | 61 | 91 | 73 | 109 | 56 | 84 |
| | B | 118 | 177 | 91 | 136 | 102 | 153 | 79 | 118 | 95 | 142 | 73 | 109 |
| #11 | A | 101 | 151 | 78 | 116 | 87 | 131 | 67 | 101 | 80 | 120 | 62 | 93 |
| | B | 131 | 196 | 101 | 151 | 113 | 170 | 87 | 131 | 104 | 156 | 80 | 120 |

NOTES:

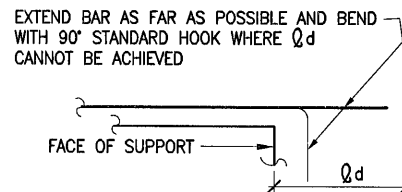
- Table for use with normal weight hardrock concrete and grade 60 uncoated reinforcing bars. For lightweight aggregate use 1.3Q.
- Class A - Half or less of the bars are spliced within a required lap length. Class B - More than half of the bars are spliced within a required lap length.
- Top bars are horizontal bars with 12" or more of concrete cast in the member below the bar.
- For bars enclosed in standard column spirals, use 0.75Q or 12" min.
- Lap splices of individual bars with a bundle shall be 1.2Q for that bar in a 3-bar bundle and 1.33Q for a 4-bar bundle. Entire bundles shall not be lap spliced at the same location. Splices for individual bars within a bundle shall be staggered such that they do not overlap.
- Q - Basic lap length, shown at left.
- Case Selection
 - For foundation reinforcement use Case 1 uno.
 - For column reinforcement and dowels use case 1 uno.
 - For beam reinforcement use Case 1 uno.
 - For structural slab reinforcement use Case 2 uno.
 - For slab on grade reinforcement use Case 1 uno.
 - For wall reinforcement and dowels use Case 1 (Except as noted below) uno.
 - For walls with a single mat of steel centered in the wall, use Case 1 for wall reinforcement and dowels uno.
 - For chord steel reinforcement use Case 2 uno.

TENSION LAP SPLICE TENSION LAP SPLICE LENGTHS, Q (IN INCHES) FOR GRADE 60 UNCOATED BARS
NO SCALE

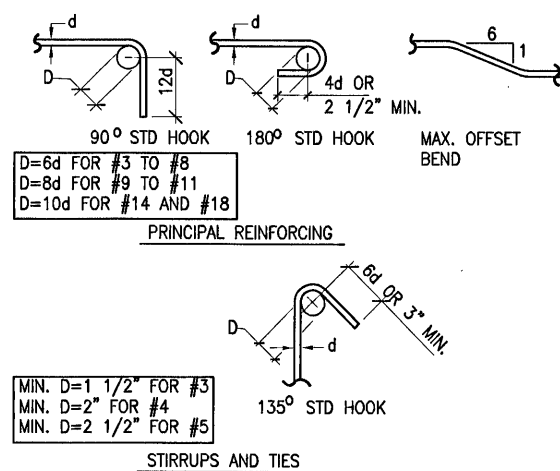
| BAR SIZE | LAP CLASS | f'c = 3000 psi | | | | f'c = 4000 psi | | | | f'c = 4500 psi | | | |
|----------|-----------|----------------|--------|------------|--------|----------------|--------|------------|--------|----------------|--------|------------|--------|
| | | TOP BARS | | OTHER BARS | | TOP BARS | | OTHER BARS | | TOP BARS | | OTHER BARS | |
| | | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 | CASE 1 | CASE 2 |
| #3 | A | 22 | 32 | 17 | 25 | 19 | 28 | 15 | 22 | 18 | 27 | 14 | 21 |
| | B | 28 | 42 | 22 | 32 | 24 | 36 | 19 | 28 | 23 | 34 | 18 | 27 |
| #4 | A | 29 | 43 | 22 | 33 | 25 | 37 | 19 | 29 | 24 | 35 | 18 | 27 |
| | B | 37 | 56 | 29 | 43 | 32 | 48 | 25 | 37 | 31 | 46 | 24 | 35 |
| #5 | A | 36 | 54 | 28 | 41 | 31 | 47 | 24 | 36 | 29 | 44 | 23 | 34 |
| | B | 47 | 70 | 36 | 54 | 40 | 60 | 31 | 47 | 38 | 57 | 29 | 44 |
| #6 | A | 43 | 64 | 33 | 50 | 37 | 56 | 29 | 43 | 35 | 53 | 27 | 41 |
| | B | 56 | 84 | 43 | 64 | 48 | 72 | 37 | 56 | 46 | 68 | 35 | 53 |
| #7 | A | 63 | 94 | 48 | 72 | 54 | 81 | 42 | 63 | 51 | 77 | 40 | 59 |
| | B | 81 | 122 | 63 | 94 | 70 | 106 | 54 | 81 | 67 | 100 | 51 | 77 |
| #8 | A | 72 | 107 | 55 | 82 | 62 | 93 | 48 | 71 | 59 | 88 | 45 | 68 |
| | B | 93 | 139 | 72 | 107 | 80 | 121 | 62 | 93 | 76 | 114 | 59 | 88 |
| #9 | A | 81 | 121 | 62 | 93 | 70 | 105 | 54 | 81 | 66 | 99 | 51 | 76 |
| | B | 105 | 157 | 81 | 121 | 91 | 136 | 70 | 105 | 85 | 128 | 66 | 99 |
| #10 | A | 91 | 136 | 70 | 105 | 79 | 118 | 61 | 91 | 73 | 109 | 56 | 84 |
| | B | 118 | 177 | 91 | 136 | 102 | 153 | 79 | 118 | 95 | 142 | 73 | 109 |
| #11 | A | 101 | 151 | 78 | 116 | 87 | 131 | 67 | 101 | 80 | 120 | 62 | 93 |
| | B | 131 | 196 | 101 | 151 | 113 | 170 | 87 | 131 | 104 | 156 | 80 | 120 |

NOTES:

- Table for use with normal weight hardrock concrete and grade 60 uncoated reinforcing bars. For lightweight aggregate use 1.3Q.
- Top bars are horizontal bars with 12" or more of concrete cast in the member below the bar.
- For bars enclosed in standard column spirals, use 0.75Q or 12" min.
- Development length of individual bars within a bundle shall be 1.2Qd for that bar in a 3-bar bundle and 1.33Qd for a 4-bar bundle.
- Compression development length (only where indicated on drawings) For grade 60 bars use 22 bar diameters.
- Case Selection
 - For foundation reinforcement use Case 1 uno.
 - For column reinforcement and dowels use case 1 uno.
 - For beam reinforcement use Case 1 uno.
 - For structural slab reinforcement use Case 2 uno.
 - For slab on grade reinforcement use Case 1 uno.
 - For wall reinforcement and dowels use Case 1 (Except as noted below) uno.
 - For walls with a single mat of steel centered in the wall, use Case 1 for wall reinforcement and dowels uno.
 - For chord steel reinforcement use Case 2 uno.



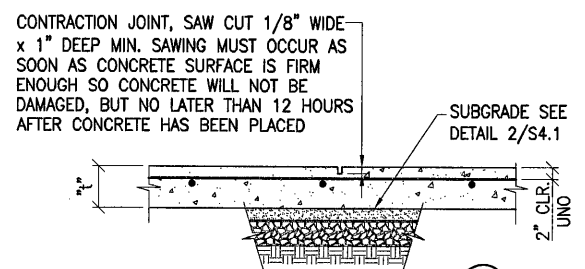
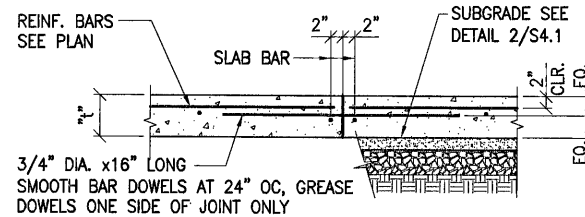
TENSION DEVELOPMENT LENGTH
NO SCALE



NOTES:

- Slab shall be placed in strip pattern.
 - ①=First
 - ②=Second
- Strips to be divided by construction joints at the centerline of columns where they occur and subdivided as required into areas not exceeding 225 sq. ft. by construction joints.
- In areas where columns do not occur provide construction and contraction joints as above.
- Contractors shall obtain architect's approval for all joint locations.

METHOD OF PLACING SLAB ON GRADE
NO SCALE



Concrete

- All aspects of work pertaining to the concrete construction shall be in accordance with ACI 318-02, 'Building Code Requirements for Structural Concrete' and the latest edition of 'Specifications for Structural Concrete for Buildings', ACI 301, with modifications as noted on the project drawings and/or specifications.
- Concrete mix designs shall be submitted to the Structural Engineer for review. All mix designs shall be designed by a qualified testing laboratory and shall be wet stamped by a Civil Engineer licensed in the State of Nevada. Base design mix on field experience or trial mixtures as stipulated in IBC Section 1905.3
- Portland cement shall conform to ASTM C150 Type V where the concrete is in contact with soil. Concrete that will be exposed to sulfate - containing solutions shall comply with IBC Section 1904.3 For IBC Table 1904.3. Severe and Very Severe sulfate exposures as identified in the project geotechnical report, the water cement ratio shall not exceed 0.45 and shall not exceed 0.50 for Moderate sulfate exposure. Type II cement shall be used at all other locations in the structure.
- Fly ash may be used in concrete mixes. The fly ash shall conform to ASTM C618 Class F. The loss of ignition shall be limited to 2%. The addition rate for fly ash shall be limited to 15% of the cement weight. The contractor shall submit all certificates showing the fly ash is in accordance with the above criteria.
- Do not use concrete or grout containing chlorides.
- All concrete exposed to freeze - thaw cycles shall contain 6% +/- 1% of entrained air.
- Hard rock concrete - aggregate shall conform to all requirements and tests of ASTM C33 and project specifications. Exceptions may be used only with approval of the Structural Engineer. Provide concrete mix design with proven shrinkage characteristics of less than 0.0005 inches/inch.
- Structural concrete 28-day strengths & types are as follows:

| Location of Concrete | Strength, psi | Type |
|----------------------|---------------|-----------|
| Lean Mix | 4500 | Hard Rock |
| Footings | 4500 | Hard Rock |
| Slab on Grade | 4500 | Hard Rock |
- The modulus of elasticity of concrete, shall be tested in accordance with ASTM C469 for framed concrete slabs and beams and shall be at least the value given by the equations in section 8.5.1 of ACI 318 for the specified concrete 28-day strength.
- Concrete mixing operations, etc., shall be in accordance with ASTM C94.
- Dry pack or grout under baseplates, sill plates, etc., see specifications. Strength requirements are as required for concrete.
- Submit shop drawings to Architect/Structural Engineer indicating locations of concrete joints for review prior to placing concrete. Place joints at locations to minimize effects of shrinkage as well as being placed at points of low stress.

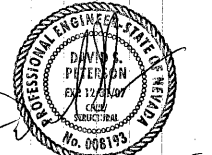
- Concrete placement shall be in accordance with ACI standard 304 and project specifications. Provide keys in construction joints unless detailed otherwise. Thoroughly clean, remove laitance and thoroughly wet and remove standing water in construction joints before placing new concrete. At vertical joints, slush with a coat of neat cement before placing new concrete.
- Roughen concrete surface to a full amplitude of 1/4 inch where masonry walls intersect concrete or where new concrete interfaces with existing concrete.
- If columns and walls are placed with a floor, two hours must elapse between end of column or wall placement and beginning of the floor placement.
- Clear coverage of concrete over reinforcing bars shall be as follows:

| Location of Concrete | Minimum Concrete Cover |
|--|--------------------------|
| Concrete cast against and permanently exposed to earth | 3" |
| Concrete exposed to earth or weather: #6 through #18 bar #5 bar and smaller | 2" 1 1/2" |
| Concrete not exposed to weather or in contact with ground, UNO: Slabs, walls, joists: #14 and #18 bar. #11 bar and smaller. Beams, columns: Primary reinforcing, ties stirrups, spirals. | 1 1/2" 3/4" 1 1/2" |
| Slab on grade: | 2" clear from top |
- Prior to concrete placement, all reinforcing bars, anchor bolts and other concrete inserts shall be well secured in position.
- Mechanical pipes or electrical conduit shall not pass through concrete columns or beams unless specifically detailed.
- Unless otherwise indicated in the mechanical or electrical drawings or project specifications, mechanical pipes and electrical conduits which pass through slab on grade, concrete on steel deck, framed concrete floors and walls do not require sleeves. If sleeves are required, the sleeves shall be installed prior to placing concrete. Do not cut any reinforcing which may interfere with sleeve placement. Coring openings in concrete is not permitted. Notify the Structural Engineer in advance of conditions not shown on the structural drawings.
- With the exception of slabs on grade and concrete on steel deck, the outside diameter of mechanical pipes and/or embedded electrical conduits (other than those passing through) shall not exceed 1/3 of the slab thickness and shall be centered between the top and bottom reinforcing, unless specifically detailed otherwise. Concentrations of mechanical pipes and/or electrical conduits shall be avoided except where detailed openings are provided. Conduit and pipe shall be spaced at 3" or 3 diameters on center, whichever is larger.
- For slabs on grade no pipes or conduits shall be placed within the indicated concrete slab thickness and shall be located below the slab unless specifically detailed otherwise.
- The projecting corners of columns, beams, and walls, etc., shall be formed with a 3/4 in. chamfer, unless otherwise noted on architectural drawings or specifications.
- Maintain concrete above 50 degrees Fahrenheit and in a moist condition for a minimum of 7 days after placement unless otherwise accepted by Architect/Structural Engineer.
- Any curing compounds used on concrete that is to receive a resilient tile finish shall be approved by the Finish Applicator before use.



LOCHSA ENGINEERING
8846 South Jones Blvd Suite #100
Las Vegas, NV 89118
Phone (702) 365-9312
Fax (702) 365-9317
email structural@lochsa.com
LE JOB# 072034

Lorenzi Park Renovation
Phase 1
Restroom/Concession/Storage Building
CONCRETE TYPICAL DETAILS
AND NOTES



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-6535
FAX: (702) 384-8848
TDD: (702) 386-9108

DATE: June 2007
SCALE: AS SHOWN
REV NO: 07.1534101
DRAWING NO: 650.19-47

RCS-S4.2