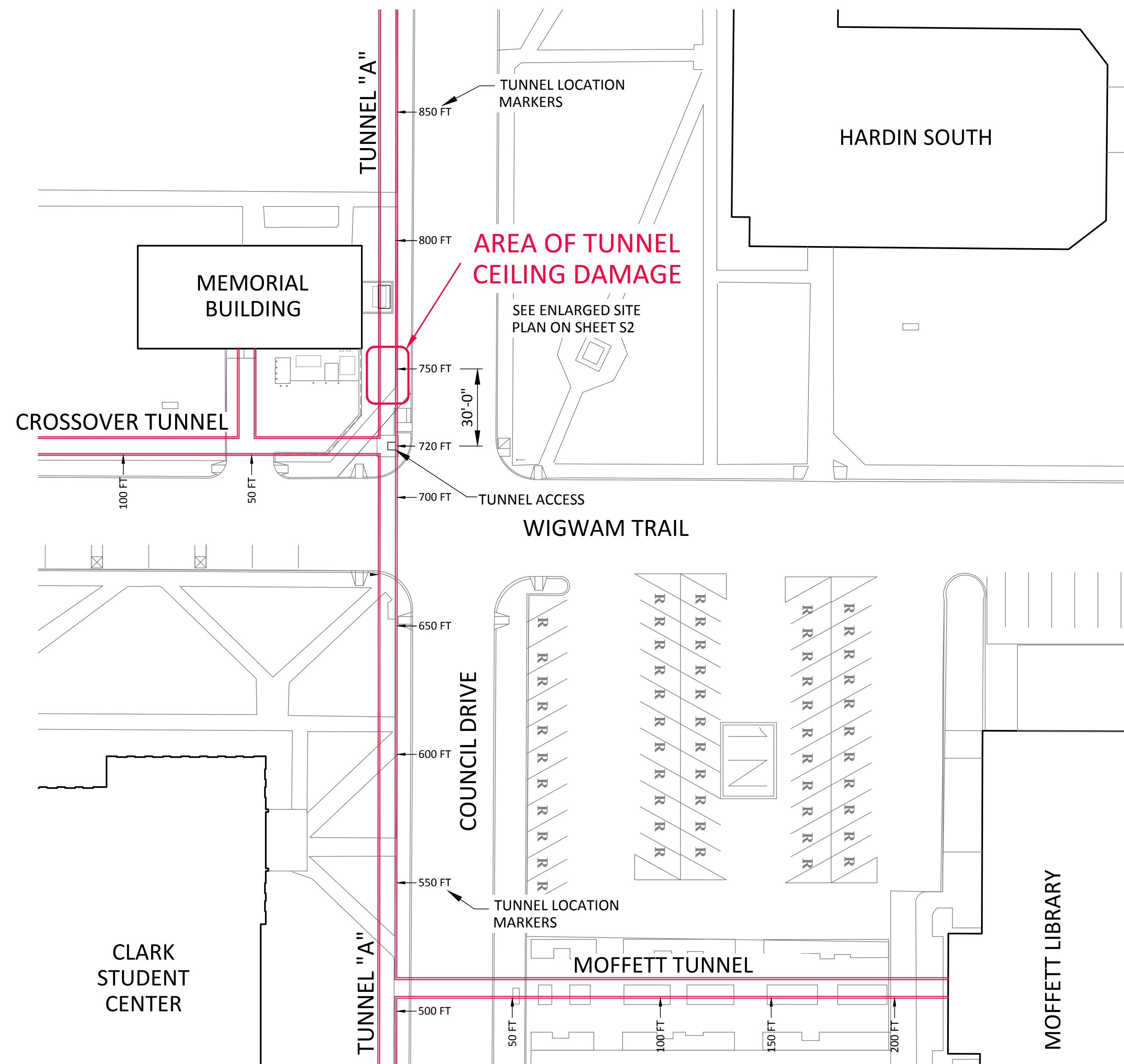




# MIDWESTERN STATE UNIVERSITY

## UTILITY TUNNEL REPAIRS

### TUNNEL A - 750 FT MARK



**PARITAL UNDERGROUND TUNNEL PLAN**  
SCALE: 1/32" = 1'-0"

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### TUNNEL REPAIR SEQUENCE

1. INSTALL TEMPORARY SHORING AS SHOWN ON DRAWINGS
2. EXCAVATE ABOVE UTILITY TUNNEL TO EXPOSE ROOF DECK
3. INSTALL EPOXY DOWEL BARS INTO EXISTING TUNNEL ROOF
4. FORM AND PLACE 8" CONCRETE ROOF REPAIR SLAB
5. BACKFILL ABOVE TUNNEL
6. REPAIR/REPLACE DAMAGED SIDEWALKS AS NECESSARY
7. REMOVE ROOF SHORING AFTER 28 DAYS AND COMPLETION OF CONSTRUCTION WORK ABOVE
8. REPAIR/PATCH EXISTING CEILING IN TUNNEL

### PROJECT NOTES & SPECIFICATIONS

#### GENERAL NOTES

1. THESE DRAWINGS ARE FOR THE STRUCTURAL REPAIR OF THE DISTRESSED CONCRETE ROOF DECK OF A SECTION OF UTILITY TUNNEL AT MIDWESTERN STATE UNIVERSITY IN WICHITA FALLS, TEXAS. THERE IS AN AREA OF SIGNIFICANT CONCRETE SPALLING AND CORRODING STEEL REINFORCEMENT IN THE TUNNEL CEILING ADJACENT TO THE 750 FT MARK OF TUNNEL "A", AS NOTED ON THE DRAWINGS. THE WORK WILL INVOLVE EXCAVATION DOWN TO THE TOP OF THE UTILITY TUNNEL ROOF AND CONSTRUCTION OF A NEW SECTION OF 8" REINFORCED CONCRETE SLAB OVER THE TOP OF THE EXISTING DISTRESSED ROOF SLAB. WHEN THE NEW 8" SLAB SECTION IS COMPLETE, THE DETERIORATED UNDERSIDE SURFACE OF THE EXISTING CONCRETE ROOF DECK WILL BE REPAIRED BY REMOVING SPALLED CONCRETE DOWN TO SOLID SUBSTRATE, INSTALLING ADDITIONAL REINFORCING STEEL, AND HAVING REPAIR MORTAR APPLIED TO BUILD BACK THE SURFACE OF THE CEILING AS NOTED ON THE PLANS.
2. TUNNEL ROOF DESIGN LOADS:  
CONCRETE SLABS: EXISTING 6" + NEW 8" = 175 LBS  
OVERBURDEN: 3'-0" SOIL DEPTH = 360 LBS  
LIVE LOADS: SURCHARGE LOADING = 400 PSF  
CONCENTRATED LOAD = 4000 LBS
3. THE CONTRACTOR IS TO PERFORM A THOROUGH REVIEW OF THE PROJECT DRAWINGS FOR A COMPLETE UNDERSTANDING OF THE WORK INVOLVED.
4. ALL WORK IS TO BE COORDINATED THRU THE M.S.U. MAINTENANCE DEPARTMENT IN CONJUNCTION WITH THE ENGINEER. THE CONTRACTOR IS TO WORK CLOSELY WITH THE M.S.U. MAINTENANCE DEPARTMENT - CENTRAL PLANT PERSONNEL IN PERFORMING ALL WORK NOTED ON THESE PLANS.
5. CONTRACTOR SHALL VERIFY ALL DETAILS AND CONDITIONS SHOWN IN THE PLANS AGAINST ACTUAL FIELD CONDITIONS. WHERE EXISTING INSTALLATION AND CONSTRUCTION DETAILS VARY FROM THOSE SHOWN ON THESE DRAWINGS, THE DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR FURTHER REVIEW, EVALUATION AND ADDITIONAL REPAIR RECOMMENDATIONS.
6. IN THE COURSE OF WORK, THE CONTRACTOR MAY UNCOVER ADDITIONAL DISTRESS OR UNUSUAL CONDITIONS WHICH REQUIRE ADDITIONAL ATTENTION AND REPAIR. SUCH ADDITIONAL DISTRESS AND UNUSUAL CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE M.S.U. MAINTENANCE DEPARTMENT AND THE ENGINEER FOR FURTHER REVIEW AND DIRECTION.
7. ANY MODIFICATIONS TO THE SCOPE OF WORK SHOWN HEREIN, MUST BE APPROVED BY THE M.S.U. MAINTENANCE DEPARTMENT IN ASSOCIATION WITH THE ENGINEER.
8. WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE FOLLOWING CODES:  
• INTERNATIONAL BUILDING CODE 2015  
• ACI BUILDING CODE - REQUIREMENT FOR REINFORCED CONCRETE (ACI 318-14)  
• ACI MANUAL OF CONCRETE PRACTICE, PART 1
9. THE CONTRACTOR IS TO ABIDE BY ALL OSHA, FEDERAL, STATE AND MUNICIPAL CONSTRUCTION STANDARDS AND SAFETY PRACTICES. IN PARTICULAR, ALL SAFETY PRACTICES OF THE M.S.U. MAINTENANCE DEPARTMENT.

#### SPECIAL PROJECT REQUIREMENTS

1. THE REPAIRS TO THE UTILITY TUNNEL ROOF AS NOTED HEREIN WILL REQUIRE THE EXCAVATION OF EARTH FROM ABOVE THE TUNNELS AND EXPOSURE OF THE TOP OF THE CONCRETE TUNNEL ROOF. EXTREME CAUTION IS TO BE EXERCISED BY THE CONTRACTOR IN PERFORMING THIS EXCAVATION WORK AND EXPOSURE OF THE TUNNEL ROOF.
2. PRIOR TO PERFORMING ANY EXCAVATION OR UNCOVERING THE DISTRESSED TUNNEL ROOF, TEMPORARY TUNNEL SHORING IS TO BE INSTALLED IN ACCORDANCE WITH THESE PLANS. THE ENGINEER IS TO BE CONTACTED FOR REVIEW AND APPROVAL OF THE TUNNEL SHORING INSTALLATION ONCE IT IS COMPLETE.
3. A BARRICADE LINE IS TO BE MARKED AT GROUND LEVEL 5 FEET OUT FROM THE EDGE OF THE TUNNEL ON EACH SIDE. ALL EXCAVATION EQUIPMENT AND CONSTRUCTION VEHICLES ARE TO BE RESTRICTED FROM OPERATING OVER THE TUNNELS AND SHALL NOT BE ALLOWED WITHIN THE 5 FOOT BARRICADE LINE OF THE TUNNELS.
4. THE CONTRACTOR IS TO PROVIDE A PLAN FOR HIS INTENDED PROCEDURE FOR EXCAVATING THE EARTH FROM OVER THE TUNNELS TO THE ENGINEER AND M.S.U. MAINTENANCE DEPARTMENT FOR THEIR REVIEW AND APPROVAL. THE SIZE AND TYPE OF CONSTRUCTION EQUIPMENT IS TO BE LIMITED TO ONLY THAT WHICH IS ADEQUATE FOR COMPLETION OF THIS SHALLOW EXCAVATION IN A SAFE AND RESPONSIBLE MANNER.
5. THE ENGINEER SHALL BE CONSULTED ON A DAILY BASIS AS WORK PROGRESSES AND NOTIFIED IMMEDIATELY AS UNCOVERED CONSTRUCTION CONDITIONS BECOME APPARENT, THE ENGINEER SHALL BE AFFORDED THE OPPORTUNITY FOR INSPECTION OF UNCOVERED CONDITIONS THAT MAY HAVE AN IMPACT ON THE REPAIRS BEING PERFORMED. ADDITIONAL RECOMMENDATIONS FOR REPAIR MAY BE REQUIRED AT THAT TIME.
6. ADDITIONAL INSPECTIONS AND CONSTRUCTION WORK WITHIN THE TUNNELS MAY YET UNCOVER CRACKING AND SPALLING TO THE UNDERSIDE SIDE OF THE TUNNEL ROOF DECK OR THE WALLS THAT IS IN NEED OF REPAIR. CONTRACTOR IS REQUESTED TO PROVIDE A SQUARE FOOTAGE QUOTATION FOR REPAIRING THE UNDERSIDE OF DISTRESSED TUNNEL ROOF DECK.
7. ALL WORK PERFORMED WITHIN THE TUNNELS SHALL BE COORDINATED CLOSELY WITH M.S.U. FACILITIES AND MAINTENANCE DEPARTMENTS. A LOG OF WORKMEN ACCESS IN AND OUT OF THE TUNNELS SHALL BE KEPT WITH M.S.U. MAINTENANCE PERSONNEL TO KEEP ALL PARTIES INFORMED OF WORKMEN LOCATIONS WITHIN THE TUNNELS.
8. IT IS THE CONTRACTORS RESPONSIBILITY TO ASSURE AN ABUNDANT FRESH AIR SUPPLY AND POSITIVE VENTILATION WITHIN THE TUNNELS FOR WORKMEN HEALTH AND SAFETY. THE CONTRACTOR IS RESPONSIBLE FOR KEEPING CONSTRUCTION RELATED DUST WITHIN THE TUNNELS TO A MINIMUM. AN AUXILIARY SOURCE OF FRESH AIR SUPPLY MAY BE REQUIRED WITHIN THE TUNNELS.
9. NO DIESEL OR GASOLINE OPERATED MACHINERY SHALL BE PERMITTED WITHIN THE TUNNEL SYSTEM DUE TO EXHAUST EMISSIONS.
10. PATHWAYS WITHIN UTILITY TUNNELS SHALL BE KEPT CLEAR OF CONSTRUCTION MATERIALS AND DEBRIS AT ALL TIMES FOR READY ACCESS AND PASSAGE WITHIN THE TUNNEL SYSTEM.
11. ALL TUNNEL SHORING IS TO REMAIN IN PLACE UNTIL CONSTRUCTION OF THE NEW WALKWAY ABOVE IS COMPLETE AND ALL ASSOCIATED CONSTRUCTION ACTIVITIES INVOLVING HEAVY EQUIPMENT OPERATING ABOVE THE TUNNEL HAVE CONCLUDED.

#### BACKFILL & SUBGRADE PREPARATION NOTES

1. A 6 INCH SAND CUSHION WITH A PLASTICITY INDEX OF 8 OR LESS SHALL BE PLACED ON THE TOP OF THE NEW SLAB AND OVER THE WATERPROOFING MEMBRANES PRIOR TO GENERAL BACK FILL OPERATIONS. THE SAND CUSHION SHALL BE DAMP AND COMPACTED PRIOR TO PLACING ADDITIONAL BACKFILL.
2. ALL FILL MATERIAL USED FOR BACKFILLING OR LEVELING PURPOSES BELOW PROPOSED CONCRETE WALK SECTIONS OR ADJACENT TO OR BELOW EXISTING FOOTINGS OR FOUNDATIONS SHALL BE LOW P.I. FILL WITH A PLASTICITY INDEX BETWEEN 4 AND 12, AND SHALL BE PLACED IN 6 INCH MAXIMUM COMPACTED LIFTS.
3. FILL MATERIAL, ADJACENT TO OR BELOW EXISTING FOOTINGS OR FOUNDATIONS, SHALL BE PROCESSED TO NEAR (+/-) 2% OPTIMUM MOISTURE AND COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY PRIOR TO PLACING THE NEXT LIFT.
4. GENERAL BACKFILL MATERIAL OVER OPEN YARD AREAS MAY BE RECLAIMED PREVIOUSLY EXCAVATED SOIL THAT IS PROCESSED AND COMPACTED IN 6 INCH LIFTS TO WITHIN 12 INCHES OF FINISH GRADE.
5. THE TOP OR FINAL 12 INCHES OF FILL MATERIAL AT EXCAVATIONS IN OPEN YARD AREAS SHALL BE PREPARED TOP SOIL.
6. EXCAVATIONS AND GENERAL CONSTRUCTION DAMAGE TO OPEN YARD AREAS SHALL BE COVERED WITH NEW GRASS SOD.

#### CONCRETE WORK

1. ALL CONCRETE WORK SHALL CONFORM TO THE LATEST EDITION OF ACI-318.
2. CONCRETE SHALL BE TYPE I CEMENT AND HAVE A COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS, WITH DESIGN SLUMP OF 4 TO 5 INCHES.
3. ALL REINFORCING STEEL SHALL BE NEW BILLET STEEL WITH DEFORMATIONS CONFORMING TO ASTM A615, GRADE 60.
4. LAP SPLICE AND HOOK LENGTHS FOR STEEL REINFORCEMENT SHALL BE IN ACCORDANCE WITH ACI-318.
5. ALL REINFORCING STEEL IS TO BE IN CONTINUOUS LENGTHS.
6. MINIMUM CONCRETE COVER FOR REINFORCING STEEL SHALL BE IN ACCORDANCE WITH ACI-318.
7. PROVIDE SUPPORT CHAIRS OR PROPER SUPPORT MEANS FOR ALL REINFORCEMENT STEEL TO MAINTAIN PROPER PLACEMENT, ALIGNMENT AND CLEARANCES.
8. WATER TO CEMENT RATIO SHALL BE STRICTLY CONTROLLED TO MINIMIZE SHRINKAGE CRACKING IN CURED CONCRETE.
9. AN INDEPENDENT TESTING AGENCY SHALL PERFORM MATERIAL TESTING AND SAMPLING. FOUR CYLINDERS SHALL BE TAKEN FROM EACH POUR AND COMPRESSION TESTS MADE BY THE TESTING AGENCY TO VERIFY 7, 14 AND 28 DAY COMPRESSION STRENGTHS. THE FOURTH CYLINDER IS KEPT AS A SPARE FOR ADDITIONAL TESTING IN THE EVENT OF A SUBSTANDARD BREAK.
10. SLAB FINISH SHALL BE A LIGHT BROOM FINISH.
11. NO CONSTRUCTION LOADS ARE TO BE ALLOWED OVER THE REPAIRED TUNNELS UNTIL THE NEW CONCRETE ROOF DECK HAS ACHIEVED 28 DAY 4000 PSI COMPRESSIVE STRENGTH.
12. DURING HOT WEATHER CONDITIONS ABOVE 90°F, TO ASSURE HIGH QUALITY CONCRETE, PROVISIONS FOR HOT WEATHER CONCRETE WORK SHALL BE EMPLOYED AS FOUND IN ACI 305.1-06 "SPECIFICATIONS FOR HOT WEATHER CONCRETING".
13. ALL DRILLED DOWELS AND DRILLED ANCHOR BOLTS SHALL BE INSTALLED USING HILTI HIT RE 200 EPOXY ADHESIVE OR APPROVED EQUAL.

#### SPECIALTY CONCRETE PRODUCTS

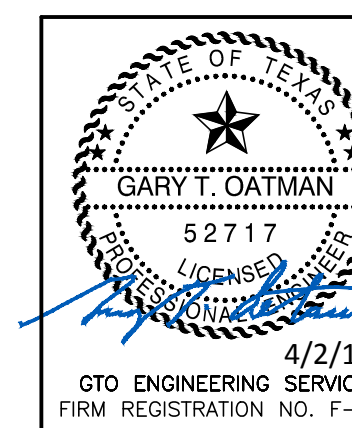
1. CONCRETE PLANT IS TO PROVIDE A CONCRETE MIX DESIGN UTILIZING "MASTERLIFE 3000 WATERPROOFING ADMIXTURE" (formerly MASTER BUILDERS RHEOMAC 3000) WITH A MIX RATE OF 11.0# PER CUBIC YARD. MASTERLIFE 3000 (formerly RHEOMAC 3000) BY BASF CORPORATION IS AN INTEGRAL CRYSTALLINE CAPILLARY WATERPROOFING ADMIXTURE FOR CONCRETE.
2. MASTIC DAMP-PROOFING MEMBRANE WHICH IS TO BE BRUSHED, SPRAYED OR ROLL APPLIED TO THE TOP SURFACE OF THE REPAIRED CONCRETE TUNNEL ROOF SLAB SHALL BE "TAMKO FIBERED ROOF & FOUNDATION COATING" AS MANUFACTURED BY TAMKO BUILDING PRODUCTS. "TAMKO FIBERED ROOF & FOUNDATION COATING" IS A SEMI-MASTIC MATERIAL CONSISTING OF SELECT ASPHALT MINERAL STABILIZERS, PETROLEUM SOLVENTS AND SPECIAL FIBERS. A TWO COAT APPLICATION IS TO BE USED ALLOWING THE FIRST COAT TO DRY 24 HOURS PRIOR TO THE SECOND COAT APPLICATION. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. PLASTIC SHEET VAPOR BARRIER TO BE PLACED ABOVE TUNNEL ROOF SLAB SHALL BE A 15 MIL THICK PLASTIC SHEETING MEMBRANE "PERMINATOR 15 MIL" AS MANUFACTURED BY W.R. MEADOWS, INC. VAPOR RETARDER MEMBRANE MUST MEET OR EXCEED ALL REQUIREMENTS OF ASTM E1745, CLASSES A, B, & C. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. MEMBRANE TO BE PROVIDED IN CONTINUOUS LENGTHS. WHERE SEAMS ARE REQUIRED OVERLAP JOINTS 6 INCHES AND SEAL WITH MANUFACTURER'S TAPE. PLASTIC SHEETING IS TO BE INSTALLED OVER THE MASTIC DAMP-PROOFING WHILE THE SECOND MASTIC COAT IS STILL MOIST/TACKY.

#### CONCRETE RESTORATION PRODUCTS

1. REPAIR MORTAR - FOR THE BUILD-BACK, COATING AND SEALING OF SPALLED CONCRETE ROOF AND WALL SURFACES THE ONE-COMPONENT GENERAL PURPOSE STRUCTURAL REPAIR MORTAR "MEADOW-CRETE GPS" AS MANUFACTURED BY W.R. MEADOWS, INC. IS TO BE USED. THIS POLYMER-MODIFIED REPAIR MORTAR IS A ONE-COMPONENT, TROWEL-APPLIED (WET PROCESS), CORROSION-INHIBITOR, CEMENTITIOUS REPAIR MORTAR.
2. CONCRETE BONDING AGENT - "ACRY-LOK" BY W.R. MEADOWS IS TO BE USED AS A BONDING AGENT FOR COATING EXISTING CONCRETE SURFACES WHERE NEW CONCRETE OR MORTAR PATCH IS TO BE INSTALLED.
3. CRACK SEALANT - FOR THE SEALING AND REPAIR OF SIGNIFICANT CONCRETE CRACKS "RESI-WELD 1000" BY W.R. MEADOWS IS TO BE USED. "RESI-WELD 1000" IS A TWO-COMPONENT CONSTRUCTION-GRADE EPOXY ADHESIVE. "RESI-WELD 1000" MAY BE POURED OR INJECTED INTO CRACKS FOR BONDING AND SEALING CRACKS. THE PRODUCT MAY ALSO BE USED TO SECURE METAL ANCHORS, BOLTS, AND REBAR. MIXED WITH SAND OR OTHER AGGREGATES THE PRODUCT MAY USED TO PATCH MINOR SPALLS AND DEFECTS IN CONCRETE ROOF, FLOOR OR WALL SURFACES.
4. ADDITIONAL SPECIALTY CONCRETE REPAIR PRODUCTS MAY BE REQUIRED DEPENDING ON THE SEVERITY AND UNIQUENESS OF THE DISTRESS ENCOUNTERED. AS NECESSARY CONSULT WITH THE ENGINEER ON PRODUCTS TO BE USED FOR SPECIFIC APPLICATIONS AND LOCATIONS.
5. ALL CONCRETE RESTORATION PRODUCTS ARE TO BE MIXED AND APPLIED IN STRICT CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.
6. WELDED WIRE FABRIC - WHERE NOTED FOR USE IN THE REPAIR OF DELAMINATED CONCRETE ROOF OR WALL SURFACES THE STEEL REINFORCEMENT SHALL BE FLAT SHEETS OF HOT DIP GALVANIZED WWF 4x4-W2.0xW2.0. REINFORCEMENT WIRES ARE TO BE 0.165 INCH THICK ON A 4"x4" SPACING.

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This authorization is for Revision 0 only.



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<b>MIDWESTERN STATE UNIVERSITY</b>				
TAFT BLVD., WICHITA FALLS, TEXAS				
<b>UTILITY TUNNEL REPAIR PLANS</b>				
<b>TUNNEL A - 750 FT MARK</b>				
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