

Addendum No. 1 to



CITY OF SOMERVILLE, MASSACHUSETTS
Department of Procurement and Contracting Services
KATJANA BALLANTYNE
MAYOR

To: All Parties on Record with the City of Somerville as Holding IFB #26-26 165 Broadway
Level 1 Temporary Basement Shoring

From: Felisa Gárate, Senior Procurement Manager

Date: 11/25/2025

Re: Questions and Answers from Pre-Bid
Updated Drawings (C000 and S100)
Updated Technical Specifications (021000 and 033000)

Addendum No. 1 to IFB #26-26

Please acknowledge receipt of this Addendum by signing below and including this form in your proposal package. Failure to do so may subject the proposer to disqualification.

NAME OF COMPANY / INDIVIDUAL: _____

ADDRESS: _____

CITY/STATE/ZIP: _____

TELEPHONE/FAX/EMAIL: _____

SIGNATURE OF AUTHORIZED INDIVIDUAL: _____

ACKNOWLEDGEMENT OF ADDENDA:

Addendum #1 _____ **#2** _____ **#3** _____ **#4** _____

Addendum No. 1 to

Updated/Revised Drawings

- Per this addendum, the drawings have been revised and are attached in this addendum. The updated drawings are also uploaded on Google Drive which can be accessed via the link in the bid package (page 4). Updates/revisions have been made to the following sheets:
 - o C000
 - o S100

Updated/Revised Technical Specifications

- Per this addendum, the technical specifications have been revised and are attached in this addendum. The updated technical specifications for Shoring (021000) and Cast-in-Place Concrete (033000) are also uploaded on Google Drive which can be accessed via the link in the bid package (page 4). Updates/revisions have been made to the following sections:
 - o 021000
 - o 033000

#	Question	Answer
1.	What is the required capacity of the posts? Is there blocking?	5 kips minimum as shown on S100. Blocking is included per Details 1 & 2/S100.
2.	Is the depressed slab only in one location?	Yes.
3.	Will there be maintenance of the posts/tightening?	Yes, but the maintenance is not part of this contract. The City will maintain the posts.
4.	Will doweling the slab depression be required?	No.
5.	Will the circular/rounded area near the slab depression be filled?	Yes. The crushed stone is not required in this area.
6.	Will there be re-seeding done outside?	No. This is to be removed from the scope of work as it will be too cold to do re-seeding.
7.	Is DCAMM certification required?	No, project value is below the DCAMM-required threshold.
8.	Will the channel going into the wall near the slab depression be filled?	No.

Addendum No. 1 to

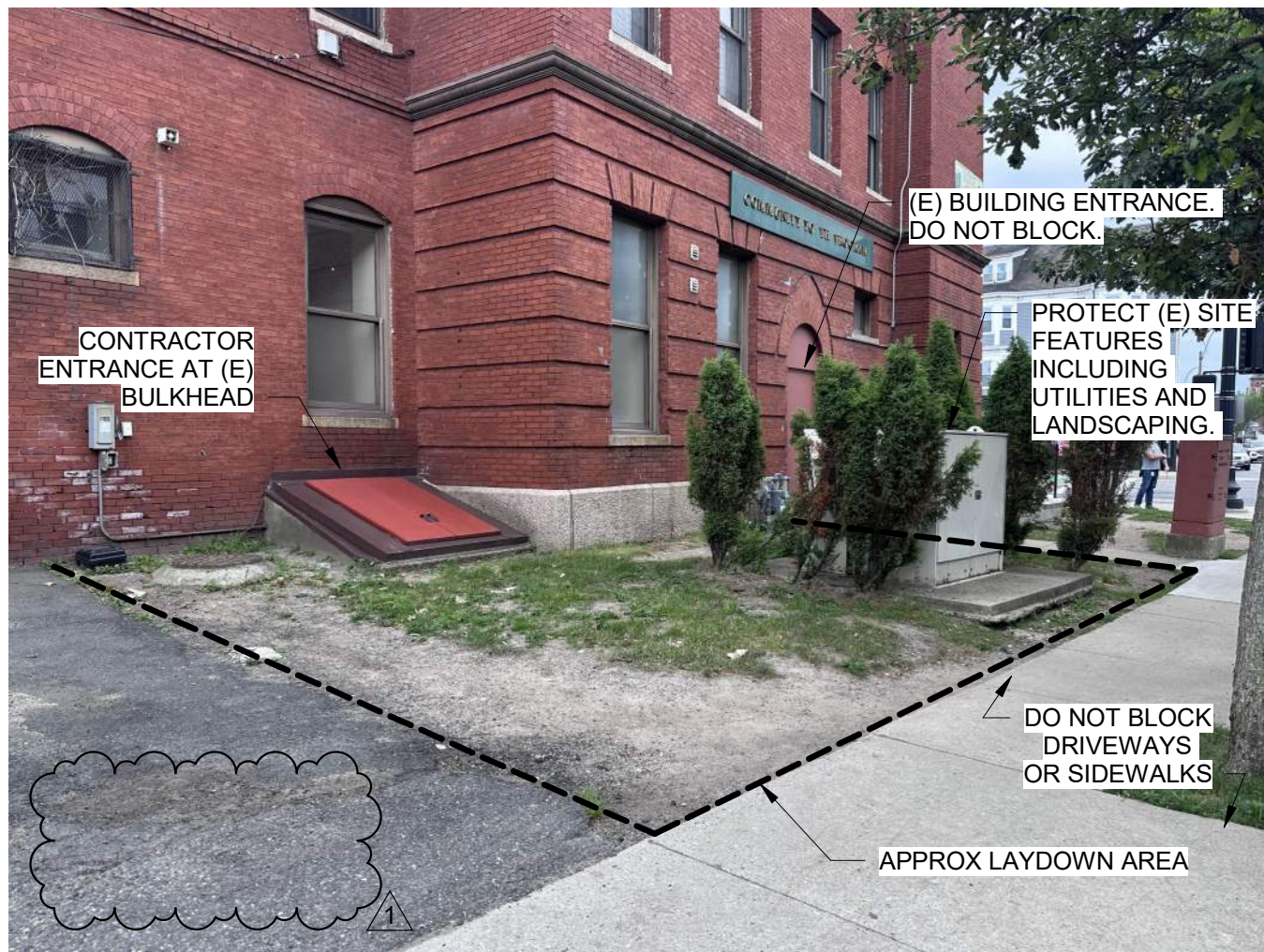
9.	When doing knockdowns, does the steel have to be treated?	No.
10.	Are permits required?	Yes, permits will need to be pulled. The fee(s) will be waived by the City.
11.	Is the concrete sealer and curing compound required?	No.
12.	Does a bond breaker need to be provided at the slab depression?	Turn up the vapor barrier to provide a bond breaker between the new and existing slabs.
13.	Will the requirement for rodent control be necessary? If so, to what extent?	No.
14.	What is required for temporary lighting?	The contractor shall provide temporary lighting as required to perform the work. The contractor shall remove the lighting at the end of the project.
15.	Section 21000 1.05 A1 by statute the owner is responsible for the design.	Section 21000 1.05 A1 has been removed. Submit PE-stamped shoring shop drawings and load tables for review.

LEVEL 1 TEMPORARY SHORING

165 Broadway, Somerville, MA 02145



LOCATION MAP



LAYDOWN AREA

DRAWING LIST	
Sheet Number	Sheet Name
C000	COVER SHEET
S001	GENERAL NOTES
S100	LEVEL 1 SHORING & REPAIR PLAN



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Boston, MA 02199
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Consultant

No.	Date	Description	By
1	11.24.25	ADDENDUM 1	GRZ

Level 1 Temporary Shoring

165 Broadway
Somerville, MA 02145

Project

COVER SHEET

Drawing Title

Project No. 241254.02	Checked GT	Date 11/04/25
Drawn GRZ	Approved SAC	Scale As indicated

Drawing No.	
C000	
Seal	

ADDENDUM 1

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GENERAL NOTES:

PART 1 - GENERAL REQUIREMENTS AND DESIGN CRITERIA

1.1 SCOPE OF WORK

- A. THE WORK CONTEMPLATED BY THE CONTRACT DOCUMENTS INCLUDES THE WORK OF ALL TRADES REQUIRED AND ALL LABOR, EQUIPMENT, MATERIALS, ACCESS, AND SUPERVISION NECESSARY AND INCIDENTAL TO THE WORK INDICATED. THE FOLLOWING DESCRIPTIONS OF THE WORK REPRESENT A BRIEF SUMMARY OF THE PROJECT. FOR ADDITIONAL AND MORE COMPLETE INFORMATION, REFER TO THE DRAWINGS AND SPECIFICATIONS.
1. PROJECT MOBILIZATION
- a. THIS WORK SHALL INCLUDE GENERAL CONTRACTOR AND SUBCONTRACTOR MOBILIZATION COSTS. INCLUDE PERMITS, TEMPORARY FACILITIES, BONDING COSTS, ETC.
2. PROJECT GENERAL REQUIREMENTS
- a. THIS WORK SHALL INCLUDE ALL MISCELLANEOUS WORK ASSOCIATED WITH THE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, PROTECTION OF WORKS, BARRICADES, CONSTRUCTION FENCING, TREE PROTECTION, CLEANUP, DUST AND FUME CONTROL, LAYOUT, EQUIPMENT, WASTE DISPOSAL, DOCUMENTATION, AND OBSTRUCTION REMOVAL AND REPLACEMENT.
- b. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION PHASING WITH THE OWNER.
- c. ALL TEMPERATURE-DEPENDENT WORK SHALL BE PERFORMED PRIOR TO COLD WEATHER. NO WINTER CONDITIONS ARE INCLUDED.
- d. THE CONTRACTOR SHALL REMOVE DEBRIS DAILY FROM THE SITE. NO DUMPSTER WILL BE ALLOWED ON THE PREMISES.
- e. THE CONTRACTOR SHALL PROVIDE TEMPORARY LIGHTING TO REMAIN IN PLACE AFTER PROJECT COMPLETION.
- f. THE MASSACHUSETTS PREVAILING LABOR WAGE RATES, AS INCLUDED IN THE CONTRACT DOCUMENTS, WILL BE USED IN THE CONSTRUCTION OF THIS PROJECT.
- g. ATTEND WEEKLY SITE MEETINGS TO REVIEW PROGRESS OF THE WORK WITH THE OWNER AND ENGINEER. DEVELOP WEEKLY MEETING MINUTES FOR DISTRIBUTION TO THE PROJECT TEAM.
- h. ALL WORK SHALL BE COMPLETED DURING NORMAL WORKING HOURS UNLESS OTHERWISE APPROVED BY THE CITY.

1.2 GENERAL

- A. PRIOR TO BIDDING, ALL BIDDERS MUST VIEW THE PREMISES AND NOTE CONDITIONS AT AND AROUND WHERE WORK IS TO BE PERFORMED. BIDDERS SHALL FULLY INFORM THEMSELVES OF ALL CONDITIONS AFFECTING THE WORK OF THIS PROJECT.
- B. REFER TO THE PROJECT SPECIFICATIONS FOR THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, FOR THE GENERAL REQUIREMENTS, AND FOR THE DETAILED REQUIREMENTS FOR MATERIALS AND WORKMANSHIP.
- C. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS REQUIRED FOR CONSTRUCTION.
- D. DEFICIENT WORK AND/OR WORK NOT IN CONFORMANCE WITH THE CONTRACT DOCUMENTS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL COMPENSATE THE CLIENT FOR SERVICES ARISING FROM DEFICIENT WORK, REVIEW OF MODIFICATIONS/CONTRACTOR SUBSTITUTION, OR EXPEDITING OF SUBMITTALS.
- E. COST OF INVESTIGATION AND/OR REDESIGN INCURRED BY THE ENGINEER OF RECORD DUE TO CONTRACTOR ERRORS WILL BE AT THE CONTRACTOR'S EXPENSE.
- F. ALL CONSTRUCTION SHALL COMPLY WITH APPLICABLE CODES AND LOCAL REQUIREMENTS. CONTRACTOR MUST COMPLY WITH CONTRACTOR REGISTRATION REQUIREMENTS OF ALL GOVERNING AUTHORITIES AND ALL WORKER SAFETY STANDARDS. WORK SHALL NOT COMMENCE UNTIL ALL PERMITS REQUIRED FOR THE SUBJECT PORTION OF THE WORK ARE OBTAINED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO HAVE ALL REQUIRED PERMITS AND/OR EVIDENCE OF COMPLIANCE WITH APPLICABLE REGULATIONS ON SITE AT ALL TIMES DURING THE EXECUTION OF THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY AND ALL CONSTRUCTION PERMITS NOT FURNISHED BY THE CITY, PRIOR TO THE START OF ANY CONSTRUCTION. ALL FEES AND PERMITS SHALL BE PAID FOR BY THE CONTRACTOR.
- G. APPROVED PLANS SHALL BE KEPT IN A PLAN BOX AND SHALL NOT BE USED BY WORKMEN. ALL CONSTRUCTION SETS SHALL REFLECT THE SAME INFORMATION. CONTRACTOR SHALL MAINTAIN ONE COMPLETE SET OF PLANS ON THE PREMISES IN GOOD CONDITION AT ALL TIMES. THIS SHALL INCLUDE ALL ADDENDA AND CHANGE ORDERS.
- H. CONTRACTOR IS TO PROTECT ALL SITE FEATURES INDICATED TO REMAIN. CONTRACTOR IS TO RESTORE ANY FEATURES THAT ARE DISTURBED OR DAMAGED BY THE CONTRACTOR'S OPERATIONS TO THEIR ORIGINAL CONDITION OR BETTER.
- I. CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL WHILE WORKING IN PUBLIC AND PRIVATE ROW OR ADJOINING PROPERTIES. ALL SIGNAGE AND TRAFFIC CONTROL DEVICES SHALL BE PROVIDED IN ACCORDANCE WITH THE FEDERAL HIGHWAY ADMINISTRATION'S MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, ANY APPLICABLE MASSDOT TRAFFIC CONTROL DESIGN CRITERIA, OR REQUIREMENTS OF THE CITY OF SOMERVILLE. CONTRACTOR TO OBTAIN POLICE DETAILS AS NEEDED AND AT ITS OWN EXPENSE.
- J. CONTRACTOR IS SOLELY RESPONSIBLE FOR CONSTRUCTION SAFETY. FUTURE PERIMETER OF WORK EXTENTS SHALL BE TEMPORARILY FENCED. SPECIAL PRECAUTIONS MAY BE REQUIRED IN THE VICINITY OF POWER LINES AND OTHER UTILITIES.
- K. THE CONTRACTOR SHALL NOT UNREASONABLY ENCUMBER THE PREMISES WITH EQUIPMENT AND MATERIALS. THE STORAGE AND EQUIPMENT PARKING SHALL BE CONFINED TO SUCH LIMITS AS MAY BE JOINTLY AGREED UPON BY THE CITY AND CONTRACTOR.
- L. FOR CONSTRUCTION DETAILS NOT SHOWN, USE THE MANUFACTURER'S APPROVED SHOP DRAWINGS / DATA SHEETS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND LOCAL REGULATIONS.

1.3 EXISTING CONDITIONS, SURVEY, ELEVATIONS, & DIMENSIONS

- A. ALL DIMENSIONS, ELEVATIONS AND EXISTING CONDITIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR, AND ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD FOR CLARIFICATION BEFORE PROCEEDING WITH THE AFFECTED PART OF THE WORK. DIMENSIONS AND ELEVATIONS NOTED IN THE CONTRACT DOCUMENTS AS (+/-) AND ALL FIELD CONDITIONS SHALL BE VERIFIED IN THE FIELD (VIF) BY THE CONTRACTORS PRIOR TO COMMENCING ANY WORK.
- B. ALL EXISTING CONDITIONS AND TYPICAL SECTIONS ARE APPROXIMATE AND BASED ON RECORD DRAWINGS AND FIELD MEASUREMENTS PERFORMED BY SGH. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING EXISTING CONDITIONS, INCLUDING THE CONFIGURATION OF ALL STRUCTURAL, ARCHITECTURAL, AND PUBLIC UTILITY ELEMENTS AFFECTING THE WORK PRIOR TO CONSTRUCTION AND NOTIFYING CITY AND EOR OF ANY DISCREPANCIES FOUND.
- C. THE DRAWINGS SHOW THE APPROXIMATE LOCATION OF CONCRETE DETERIORATION. THE CONTRACTOR IS RESPONSIBLE FOR VISUALLY INSPECTING AND SOUNDING ALL ACCESSIBLE CONCRETE SURFACES AS REQUIRED TO DISCOVER ALL CONCRETE DETERIORATION IN ACCORDANCE WITH THE DRAWINGS AND PROJECT SPECIFICATIONS.
- D. ALL ELEMENTS SHOWN ON THE DRAWINGS ARE ASSUMED TO BE NEW AND WILL BE PROVIDED BY THE CONTRACTOR UNLESS INDICATED AS EXISTING.

1.4 BUILDING CODES AND REFERENCED STANDARDS

- A. MASSACHUSETTS STATE BUILDING CODE, 9TH EDITION, WHICH ADOPTS AND AMENDS THE 2015 INTERNATIONAL BUILDING CODE AND THE 2015 INTERNATIONAL EXISTING BUILDING CODE.

1.5 QUALITY ASSURANCE

- A. THE CONTRACTOR SHALL PERFORM ALL WORK IN STRICT ACCORDANCE WITH ALL APPLICABLE LAWS, AND REGULATIONS OF THE CITY OF SOMERVILLE, AND WITH ALL OTHER AUTHORITIES HAVING JURISDICTION. ALL SUCH REQUIREMENTS SHALL TAKE PRECEDENCE OVER THE REQUIREMENTS OF THE SPECIFICATIONS EXCEPT IN CASES WHERE THE REQUIREMENTS OF THE SPECIFICATIONS ARE MORE EXACTING OR STRINGENT.
- B. TESTING OF MATERIALS AND INSPECTIONS OF INSTALLED WORK SHALL BE COMPLETED THROUGHOUT THE DURATION OF THE PROJECT, AS REQUIRED BY THE SPECIFICATIONS OR DIRECTED BY THE EOR AND/OR CITY. THE CITY RESERVES THE RIGHT TO PERFORM INSPECTIONS AND TESTING AT ANY TIME DURING THE EXECUTION OF WORK. CONTRACTOR SHALL PROVIDE FREE AND SAFE ACCESS TO ALL RECORDS, MATERIAL STOCKPILES, AND FACILITIES FOR THE CIVIL EOR AND/OR CITY INSPECTORS.

PART 2 - SHORING

2.1 SCOPE OF WORK

- A. INSTALL SHORING AT THE UNDERSIDE OF THE LEVEL 1 SLAB.

2.2 REQUIREMENTS

- A. REFER TO SECTION 021000 - SHORING FOR DETAILED SUBMITTAL, MATERIALS, AND EXECUTION REQUIREMENTS.

PART 3 - CONCRETE REPAIR WORK

4.1 SCOPE OF WORK

- A. INFILL EXISTING BASEMENT SLAB DEPRESSION WITH COMPACTED GRAVEL AND CONCRETE.
- B. REMOVE LOOSE CONCRETE AT THE UNDERSIDE OF THE LEVEL 1 SLAB.
- C. REPAIR AREAS OF DELAMINATED AND/OR SPALLED CONCRETE AT STAIRS.

4.2 REQUIREMENTS

- A. REFER TO SECTION 033000 - CAST-IN-PLACE CONCRETE FOR DETAILED SUBMITTAL, MATERIALS, AND EXECUTION REQUIREMENTS.
- B. REFER TO SECTION 037320 - CONCRETE REPAIR FOR DETAILED SUBMITTAL, MATERIALS, AND EXECUTION REQUIREMENTS.

ABBREVIATION WORD OR PHRASE

&
@
ADDL
APPROX
ASTM

And
At
Additional
Approximate
American Society for
Testing and Materials

BIT
BOT
BS

Bituminous (Asphalt)
Bottom
Both Sides/Bottom of Step

C/J
CIP
CL
CLR
CONC
CONT

Control Joint
Cast-in-place
Center Line
Clear
Concrete
Continuous

DIA, Ø
DN
DWG(S)

Diameter
Down
Drawing(s)

(E)
EA
EF
EL
EMBED
EOR
EOS
EQ
ES
EW

Existing
Each
Each Face
Elevation
Embedment
Engineer of Record
Edge of Slab
Equal
Each Side
Each Way

FS
FT

Far Side
Foot, Feet

HORIZ

Horizontal

ABBREVIATION WORD OR PHRASE

IN.
LOW

Inch, Inches
Limit of Work

MAX
MIN

Maximum
Minimum

(N)
NO or #
NS
NTS

New
Number
Near Side
Not to Scale

OC
OPP

On Center
Opposite

REINF

Reinforcing

SEOR
TOC
SOG
STD

Structural Engineer of
Record
On Center
Slab on Grade
Standard

T&B
TOC
TYP

Top and Bottom
Top of Concrete
Typical

UON

Unless Otherwise Noted

VERT
VIF ±

Vertical
Verify in Field

W
W/
WWR

Width
With
Welded Wire Reinforcing



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Consultant

ADDENDUM 1

No.	Date	Description	By

Level 1 Temporary Shoring

165 Broadway
Somerville, MA 02145

Project

GENERAL NOTES

Drawing Title

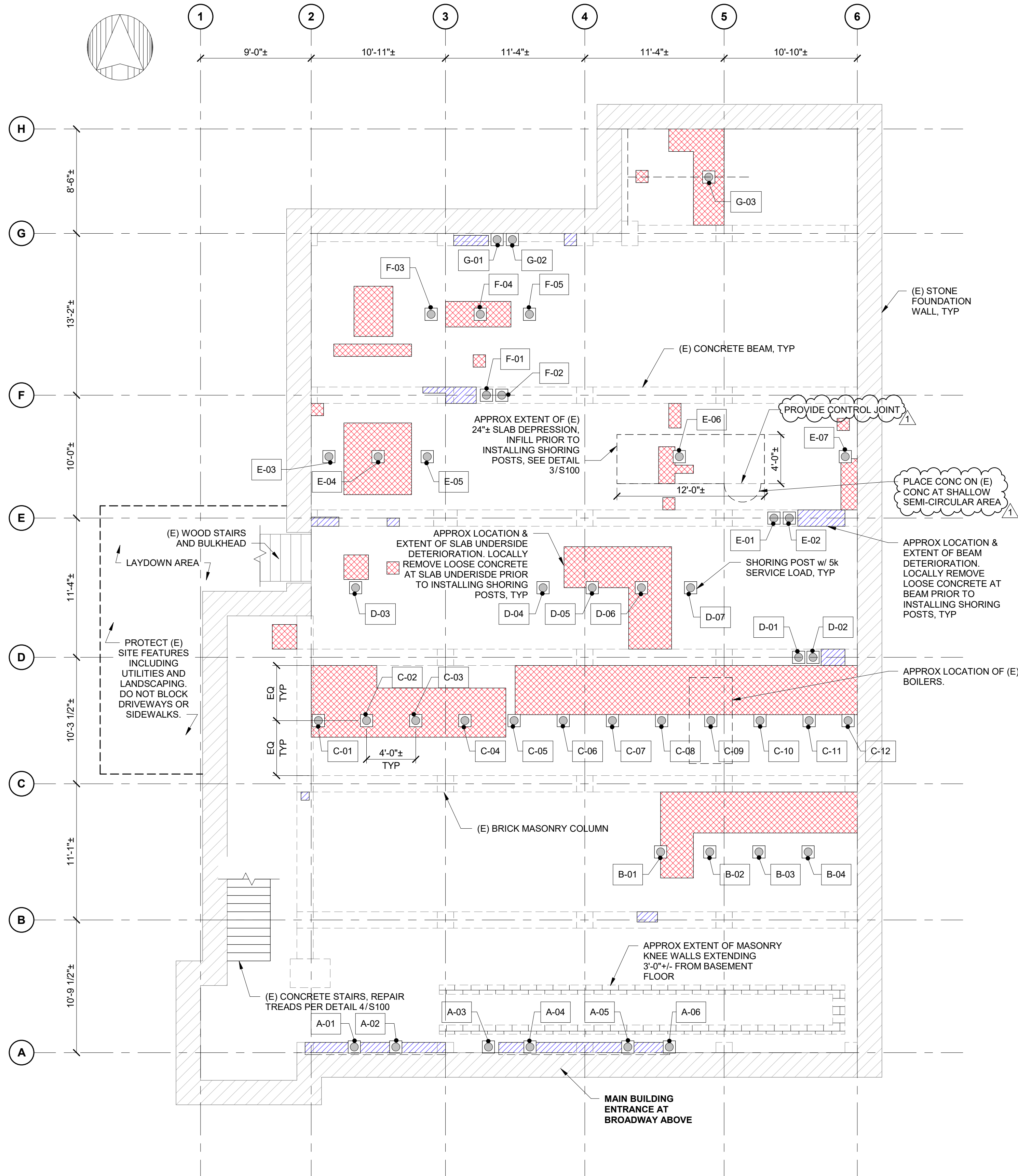
Project No. 241254.02	Checked GT	Date 11/04/25
Drawn GRZ	Approved SAC	Scale 12" = 1'-0"

Drawing No.

S001

Seal

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SHORING & REPAIR PLAN

3/16" = 1'-0"

REPAIR NOTES:

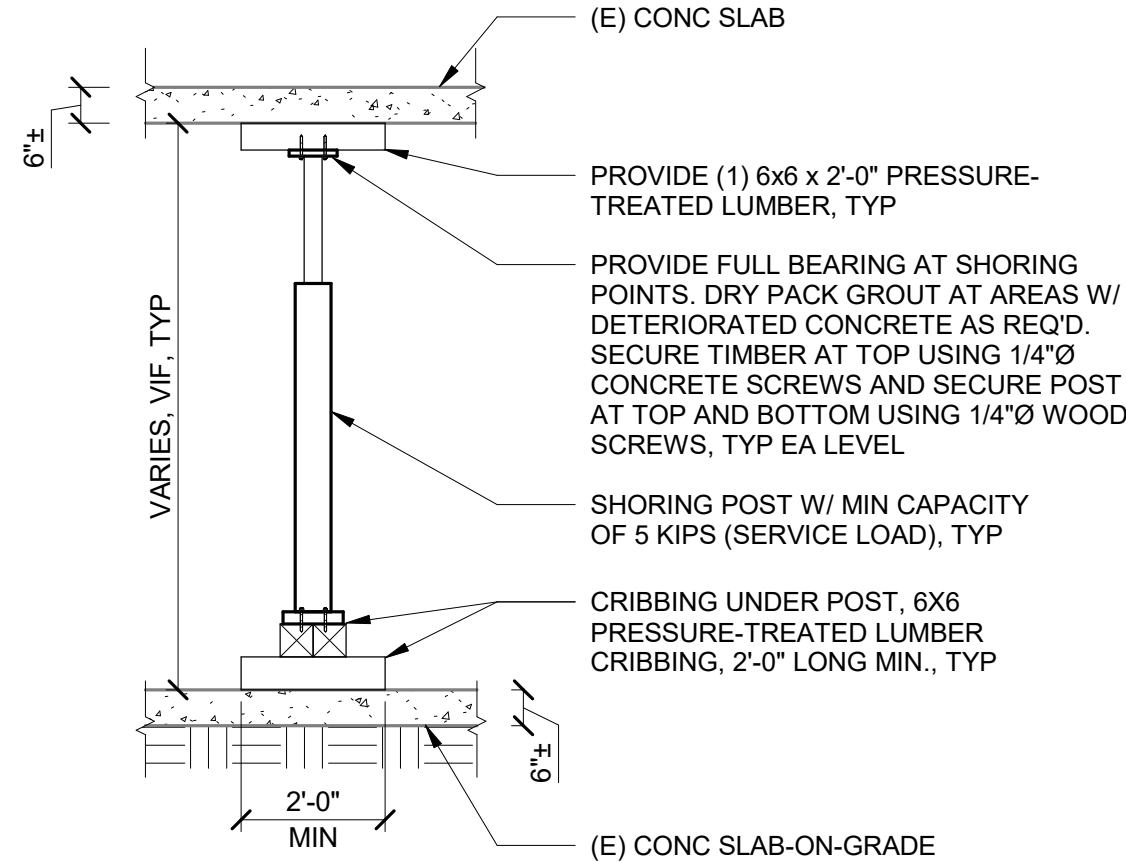
- THE CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING CONDITIONS, INCLUDING ALL ELEVATIONS, DIMENSIONS, AND THE CONFIGURATIONS OF ALL THE STRUCTURAL, ARCHITECTURAL, MEP, AND FIRE PROTECTION ELEMENTS AFFECTING THE WORK.
- THE PLAN SHOWS THE APPROXIMATE LOCATIONS OF CONCRETE DETERIORATION AT THE UNDERSIDE OF LEVEL 1. THE CONTRACTOR IS RESPONSIBLE FOR VISUALLY INSPECTING ALL CONCRETE SURFACES TO DISCOVER, IDENTIFY, AND RECORD ALL LOOSE CONCRETE. THE CONTRACTOR SHALL MARK ALL LOCATIONS OF LOOSE CONCRETE IN THE FIELD USING PERMANENT PAINT FOR REVIEW BY THE ENGINEER.
- USE HAMMERS ONLY FOR REMOVAL OF LOOSE CONCRETE. DO NOT USE ELECTRIC OR PNEUMATIC TOOLS. ANY CONCRETE THAT CANNOT BE REMOVED USING HAMMERS SHALL REMAIN UNLESS DIRECTED BY THE ENGINEER.
- NOTIFY ENGINEER FOR INSPECTION ONCE ALL LOOSE CONCRETE HAS BEEN REMOVED.

SHORING NOTES:

- THE CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING CONDITIONS, INCLUDING ALL ELEVATIONS, DIMENSIONS, AND THE CONFIGURATIONS OF ALL THE STRUCTURAL, ARCHITECTURAL, MEP, AND FIRE PROTECTION ELEMENTS AFFECTING THE WORK.
- THE CONTRACTOR SHALL INSTALL A TAG WITH THE SHORING POST IDENTIFICATION NUMBER INDICATED FOR EACH POST.
- CONTRACTOR SHALL PURCHASE SHORING POSTS FOR THE CITY TO TAKE POSSESSION OF AFTER THE WORK IS COMPLETED.

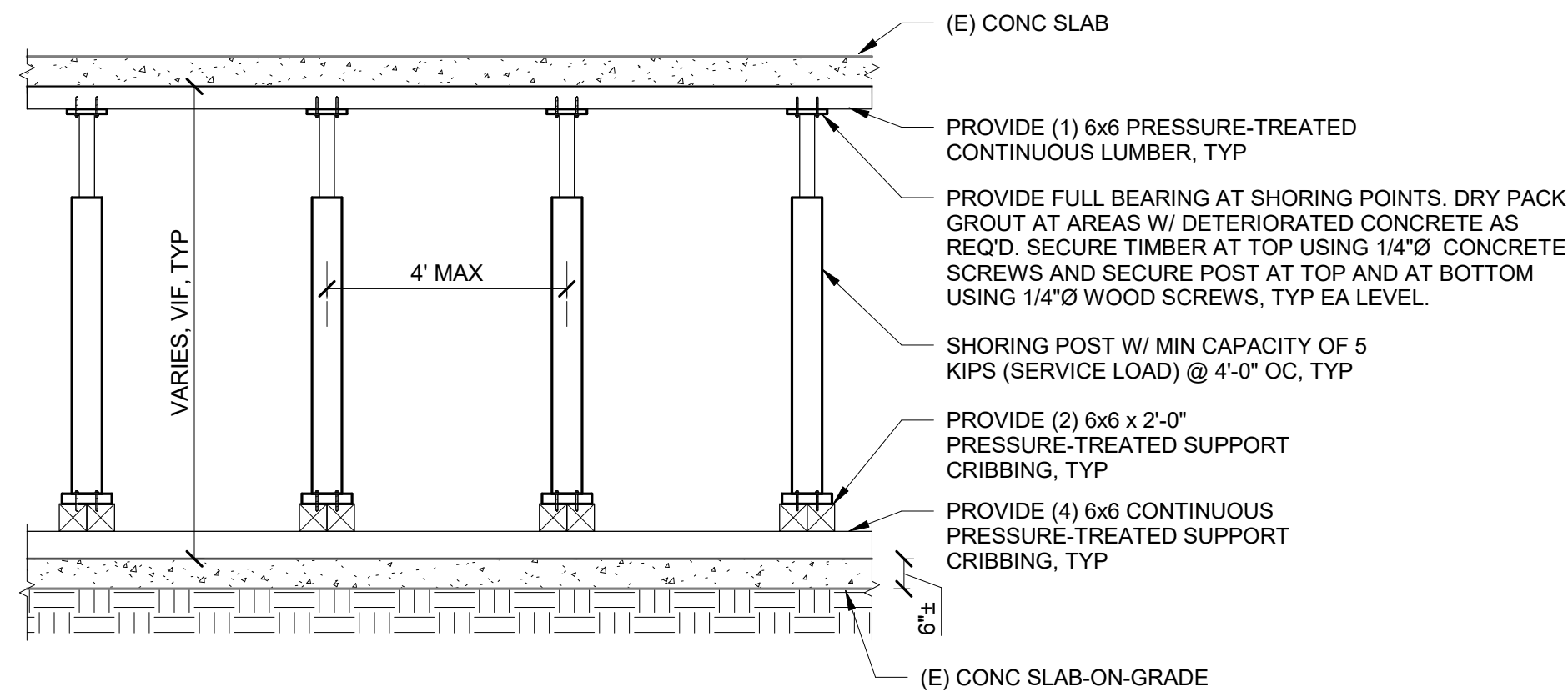
LEGEND

- APPROXIMATE LOCATION AND EXTENT OF SLAB UNDERSIDE DETERIORATION. LOCALLY REMOVE LOOSE CONCRETE.
- APPROXIMATE LOCATION AND EXTENT OF BEAM DETERIORATION. LOCALLY REMOVE LOOSE CONCRETE.
- SHORING POST w/ 5k SERVICE LOAD
- SHORING POST IDENTIFICATION NUMBER



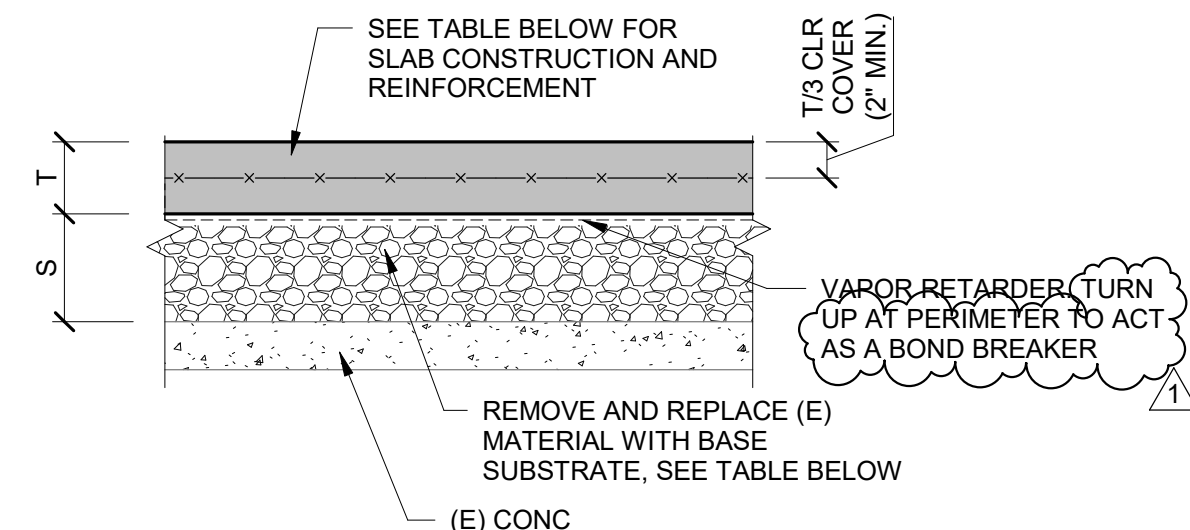
SHORING POST ELEVATION

3/8" = 1'-0"



ROW OF SHORING POSTS ELEVATION

3/8" = 1'-0"



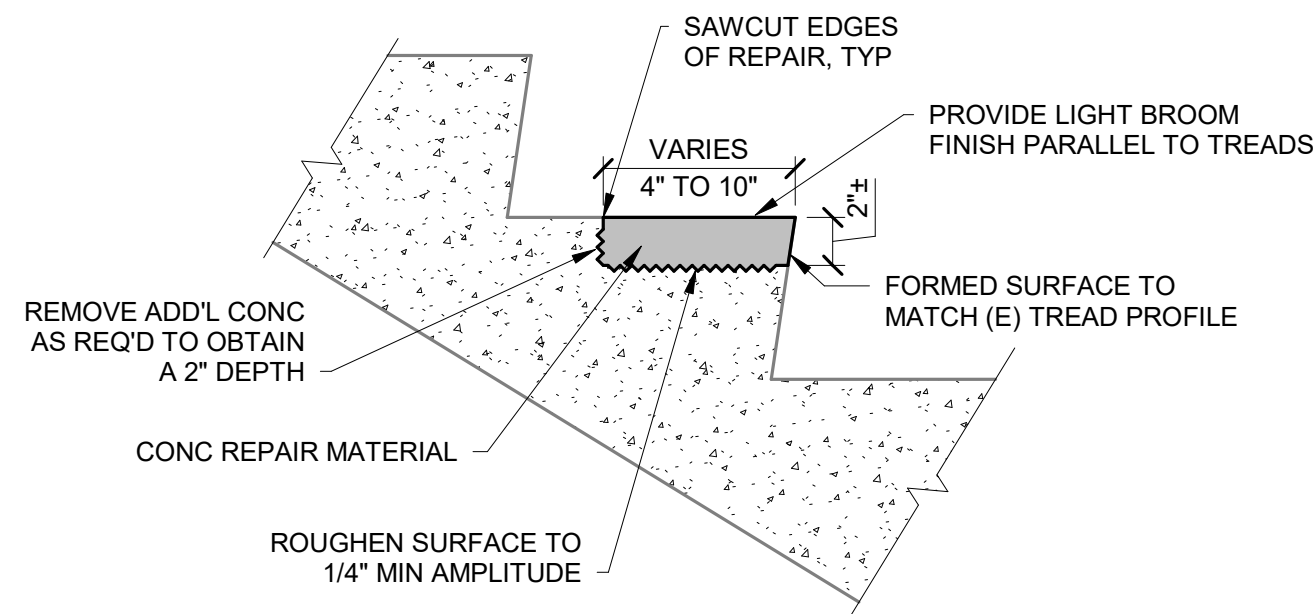
SLAB IDENTIFICATION	T (IN)	S (IN)	BASE SUBSTRATE	REINFORCEMENT
SO4	5	20±	COMPACTED GRAVEL	WWR 6x6 - W4.0xW4.0, EPOXY-COATED

NOTES:

- SEE PLANS, GENERAL NOTES, AND SPECIFICATIONS FOR SUB-BASE, VAPOR RETARDER, AND SUBGRADE REQUIREMENTS.
- ACCURATELY POSITION, SUPPORT, AND SECURE REINFORCEMENT AGAINST DISPLACEMENT. SEE SPECIFICATIONS FOR DETAIL.
- GAS-POWERED COMPACTION MACHINES ARE PROHIBITED. PROVIDE MANUAL COMPACTION.

SLAB ON GRADE DETAIL

3/4" = 1'-0"



STAIR TREAD REPAIR

1 1/2" = 1'-0"



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No.	Date	Description	By
1	11.24.25	ADDENDUM 1	GRZ

Level 1 Temporary Shoring

165 Broadway
Somerville, MA 02145

Project

LEVEL 1 SHORING & REPAIR PLAN

Drawing Title

Project No. 241254.02	Checked GT	Date 11/04/25
Drawn GRZ	Approved SAC	Scale As indicated

Drawing No.

Seal

\$100

ADDENDUM 1

SECTION 021000

SHORING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Drawings, Contract Requirements, and the General Requirements (Division 1) of the Contract for Construction are hereby made a part of this Section.

1.02 SCOPE OF WORK

- A. Work includes, but is not limited to, providing all labor, materials, equipment, and supervision necessary to design, provide, and install shoring to safely support the existing structure.
- B. The shoring shown on the Drawings shall be considered the minimum requirements for shoring, and the Contractor is responsible for determining the need for additional shoring. Shoring shall be restrained against lateral movement, to prevent posts and beams from tipping or shifting under vibrations due to demolition activities.

1.03 RELATED WORK

- A. Work related to this Section includes, but is not limited to, the following:
 - 1. Section 037320 – Concrete Repair.

1.04 REFERENCES

- A. Meet or exceed all relevant recommendations and requirements listed in the following documents, unless more-stringent requirements are specified herein:
 - 1. Tenth edition Massachusetts State Building Code with Current Amendments.
- B. The following references are incorporated into these Specifications. These written Specifications take precedence over incorporated references. The references included in the Specifications refer to the most recent revision of the publication. The Contractor shall have the following references at the Project site at all times and shall be familiar with the reference contents:
 - 1. SEI/ASCE 37 – Design Loads on Structures during Construction.
 - 2. Scaffolding, Shoring and Forming Institute, Inc., Codes of Safe Practices and Safety Rules.

1.05 ACTION SUBMITTALS

- A. The submittals described herein are for review only and are not for approval. Review by the Engineer does not relieve the Contractor of its responsibility for designing and implementing a safe shoring system.
1. Submit Shop Drawings to the Engineer for review. The Shop Drawings shall bear the seal of the Professional Structural Engineer licensed to practice in the Commonwealth of Massachusetts who is responsible for the design of the shoring system. The Shop Drawings shall include, without limitation, the shoring system layout and details. The Shop Drawings shall be based on actual field measurements of the existing structural elements.
 2. Submit manufacturer's Product Data with application and installation instructions, including load-capacity ratings.

1.06 INFORMATIONAL SUBMITTALS

- A. Submit procedures, indicating the methods, such as wedging or jacking that will be used to ensure that the shores are supporting the intended loads.
- B. Submit copies of all safety and precautionary measure regulations applicable to the installation and utilization of all shoring.

1.07 QUALITY CONTROL AND QUALITY ASSURANCE

- A. The Contractor shall conduct a quality control program that includes, but is not limited to, the following:
1. Inspection of all existing conditions to ensure familiarity with the Contract requirements.
 2. Establishment of procedures for executing the Work.
 3. Inspection of all Work in progress to ensure that the Work is being done in accordance with established procedures; manufacturer's instructions; specific Engineer instructions, if given; or recommended practices as given in the references of Para. 1.04.
 4. Inspection of all Work completed, including visual examination of all shoring in place and correction of all defective or deficient shoring.
 5. Inspection of all completed Work throughout construction to ensure that shoring does not shift or fall due to demolition and/or other repair activities.

6. The Shoring Engineer shall visit the site to confirm that all shoring is installed in general conformance with the shoring construction documents and design. The Shoring Engineer shall provide written confirmation that all shoring meets the intent of the documents prior to demolition.
- B. Qualifications
1. The Contractor and its site superintendent shall have at least five years of experience supervising the installation of temporary structural shoring.
- C. Preinstallation Conference
1. Attend a preinstallation conference to be held with a representative of the Owner, Engineer, Contractor's field superintendent, foreman, and other trades involved to discuss the conduct of the Work of this Section.

1.08 GENERAL PROCEDURES

- A. The Contractor shall become familiar with the intended usage of the shores and shoring systems and with the existing conditions as they affect transportation of materials, layout work, traffic control, and other conditions that may affect the installation of the shores.
- B. Do not start Work, until the Engineer has reviewed the submitted Shop Drawings and calculations.
- C. Work only in areas permitted by the Owner-approved schedule and project phasing plan.
- D. Construction loads shall not exceed 25 lbs/sq ft for light-duty construction, as defined in ASCE 37-14.
- E. Protect the parking garage and its contents from all risks associated with the Work in this Section. Schedule and execute all work without exposing adjacent building areas or construction phases outside the current work zone to water, dust, debris, or materials used by this Contractor. Protect adjacent areas from damage and stains with appropriate barriers and masking. Repair all damage as a result of the Work of this Section to its condition at the start of Work or, if such cannot be determined, to its original condition. Clean all stains by approved means.
- F. Compliance with OSHA and all other safety laws and regulations is the exclusive responsibility of the Contractor, his/her subcontractors, suppliers, consultants, and servants.

1.09 COORDINATION

- A. Coordinate the arrangement and details of the shores with the work of other trades affected by or dependent upon shoring.

1.10 BASIS OF PAYMENT

- A. Refer to Form for General Bid.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Shores and shore assembly components supplied by the Contractor, including cribbing, base frames, base plates, cap plates, head screw jacks, U-heads, cross-bracing, structural steel members, and frame spacers, shall be manufactured or custom-fabricated products.
- B. All shore assembly components shall be free of structural damage and in good working order. In particular, the screw jacks shall be free of rust and grime and shall be lubricated so as to have smooth operation during height adjustment of the head.
- C. Shore assembly components shall be examined by the Contractor immediately after delivery. Components not meeting the criteria of Para. 2.01.B shall be removed from the Project site. The Contractor shall replace the rejected shore components without any additional costs to the Owner.

PART 3 – EXECUTION

3.01 DESIGN AND CONSTRUCTION

- A. Temporary shoring shall be designed by the Contractor's engineer and constructed by the Contractor adopting the following criteria:
 - 1. Temporary shoring shall support the dead weight of the existing structure, and the construction loads with a minimum factor of safety (ultimate capacity divided by working load) of 2.5 on shoring, so as not to overload the existing floors and construction on which it bears. Compatibility of deformations shall be considered in the shoring design.
 - 2. Shoring posts shall be restrained against lateral movement by mechanical anchors into the underside of the slab or beam and/or blocking in order to prevent posts from tipping or shifting under vibrations from demolition activities. Where mechanical anchors are used, the Contractor shall locate all

reinforcement, prior to installing anchors and avoid cutting into reinforcement. Lateral restraint shall also meet the minimum requirements of the shoring system manufacturer.

- B. The arrangement of the shoring shall be in conformance with the approved Shop Drawings.
- C. All shores shall be checked, and shall be adjusted, where required, prior, during, and after each demolition and concreting operation.
- D. All shores shall be maintained with a tight fit and/or preloaded, where necessary.

3.02 GENERAL SAFETY REQUIREMENTS

- A. The erection and operation of shores shall conform to all safety and precautionary measures as recommended by the Scaffolding, Shoring and Forming Institute, Inc., and in accordance with all state, local, and federal codes, ordinances, and regulations.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Drawings, Contract Requirements, and the General Requirements (Division 1) of the Contract for Construction are hereby made a part of this Section.

1.02 SCOPE OF WORK

- A. The Work includes, but is not limited to, providing all labor, materials, equipment, and supervision to accomplish the following cast-in-place, fiber-reinforced concrete Work in accordance with the Drawings and Specifications. Locations of Work are as shown on the Drawings and as identified by the EOR on site.

- 1. Infill the existing basement slab depression.

1.03 RELATED SECTIONS

- A. Work related to this Section includes, but is not limited to, the following:

- 1. Section 037320 – Concrete Repair.

1.04 REFERENCES

- A. The following references are incorporated into these Specifications. These written Specifications take precedence over incorporated references. The references included in the Specifications refer to the most recent revision of the publication. The Contractor shall have the following references at the Project site at all times and shall be familiar with the reference contents.

- 1. American Concrete Institute (ACI) ACI 117 – Standard Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 – ACI Standard Specification of Structural Concrete.
 - 3. ACI 304 – Recommended Practice for Measuring, Mixing, Transportation and Placing Concrete.
 - 4. ACI 305 – Hot Weather Concreting.
 - 5. ACI 306 – Cold Weather Concreting.

6. ACI 308 – Standard Practice for Curing Concrete.
7. ACI 309 – Standard Practice for Consolidation of Concrete.
8. ACI 318 – Building Code Requirements for Reinforced Concrete.
9. ACI 347 – Recommended Practice for Concrete Formwork.
10. ACI SP-15 – Field Reference Manual.
11. ACI SP-66 – Detailing Manual.

1.05 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water-to-Cement Ratio: The ratio by weight of water to cementitious materials.

1.06 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at the Project site.
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. City of Somerville Personnel.
 - b. General Contractor (Contractor) for site construction.
 - c. Independent testing agency responsible for concrete design mixtures.
 - d. Ready-mix concrete manufacturer.
 - e. Concrete subcontractor.
 - f. Engineer of Record (EOR).
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms, and form removal limitations, methods for achieving specified floor and slab flatness and

levelness, floor and slab flatness and levelness measurement, and concrete protection.

1.07 SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and independent testing agency.
- B. Samples of or manufacturer's data sheets for all materials to be used, each properly labeled.
- C. Certifications (in time to prevent delay in the Work) by the producers of the materials that all materials supplied comply with all the requirements of the appropriate ASTM International (ASTM) and ACI Standards.
- D. Material Test Reports: Provide reports for the following from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates: Include testing data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- E. Concrete mixing procedures and application and curing procedures.
- F. Schedule of time showing areas of Work.
- G. Plant batching records and truck tickets for all concrete.
 - 1. Material Test Reports: Provide reports for the following from a qualified testing agency, indicating compliance with requirements:
 - a. Aggregates: Include testing data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
 - 2. Concrete Mix Proportions: The required average strength used as the basis for selecting concrete proportions, and the test results used for establishing the required average strength and the concrete proportions.
 - 3. Concrete mixing procedures and application and curing procedures.
- H. Design Mixtures: For each concrete mixture. The Contractor shall warrant by the submission of the design mixes that such mixes are totally representative of the concrete that he intends to supply to meet the requirements of the Contract Documents. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Include the following information for each concrete mix design:

1. Indicate the amounts of mixing water to be withheld for later addition at the Project site.
2. Mix identification designation (unique for each mix submitted).
3. Statement of intended use for mix.
4. Method used to determine the proposed mix design.
5. Compressive Strength at Seven and Twenty-Eight Days: Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard deviation calculation, and determination of required average compressive strength.
6. Gradation of Fine and Coarse Aggregates: Testing data confirming proposed coarse aggregate meets ASTM C33 class designation. Include ASTM test results for aggregates subject to freeze-thaw environment.
7. Proportions of all ingredients, including all admixtures to be added either at the time of batching or at the jobsite.
8. Water-to-cementitious materials ratio.
9. Slump tested in accordance with ASTM C143.
10. Air content of freshly mixed concrete by the pressure method, ASTM C231, or the volumetric method, ASTM C173.
11. Unit Weight of Concrete: ASTM C138.
12. Mill test reports of portland cement chemical and physical analysis and certification of compliance with ASTM C150, Type I.
13. Mill test reports of fly ash chemical and physical analysis and certification of compliance with ASTM C618, Class C or F, if used.
14. Manufacturer's spec data sheets of each concrete admixture, including brand name, manufacturer, and dosage rate range.
15. Certification of aggregate compliance with ASTM C33, including all restrictions on reactive materials, with the additional provision that the effectiveness of the use of a cement with less than 0.60% alkalis (sodium oxide equivalent) or other mitigation methods shall be demonstrated by ASTM C1567 or ASTM C1293 testing prior to acceptance.

- I. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the EOR.
 - J. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Semirigid joint filler.
 - 5. Joint-filler strips.
 - K. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
 - L. Field quality-control reports.
 - M. Minutes of preinstallation conference.
 - N. Manufacturer's SDS sheets for all materials to be used.
- 1.08 QUALITY CONTROL AND QUALITY ASSURANCE
- A. Conduct a quality control program that includes, but is not limited to, the following:
 - 1. Inspection of all materials to ensure conformity to contract requirements and that all materials are new and undamaged.
 - 2. Establishment of procedures for executing the Work.
 - 3. Inspecting all subgrade preparation prior to concrete application.
 - 4. Inspection of Work in progress to ensure that Work is being done in accordance with established procedures; manufacturer's instructions; specific EOR instructions, if given; or recommended practices as given in the references in Para. 1.04.
 - 5. Inspection of all Work completed.
 - B. Qualifications

1. The Contractor and its site superintendent shall have at least five years of experience supervising and performing the installation of similar concrete repairs and topping slabs.

C. Preinstallation Conference

1. Attend a preinstallation conference to be held with a representative of the Owner, EOR, the Contractor's field superintendent, foreman, and other trades involved to discuss the conduct of the Work of this Section.

- D. The Owner's Testing Agency may conduct quality assurance tests during the Work. Provide assistance and access to Work areas for the Owner's Testing Agency as necessary.

1.09 GENERAL PROCEDURES

- A. Work only in areas permitted by the Owner-approved schedule.
- B. Remove all tools, buckets, and materials from Work areas and store them neatly at a central location daily at the end of Work.
- C. Deliver materials clearly marked with legible and intact labels with manufacturer's name and brand name and identifying contents of containers.
- D. Store materials in areas where temperatures conform to manufacturer's recommendations and instructions.
- E. Deliver, store, and handle steel reinforcement so as to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- F. Protect the building and its contents from all risks associated with the Work in this Section. Schedule and execute all Work without exposing adjacent building areas to water, dust, debris, or materials used by this Contractor. Protect adjacent areas from damage and stains with appropriate barriers and masking. Repair all damage as a result of the Work of this Section to its condition at the start of Work, or if such cannot be determined, to its original condition. Clean all stains by approved means.
- G. Protect the Work from damage such as impact, marring of the surfaces, and other damage.
- H. Compliance with OSHA and all other safety laws and regulations is the exclusive responsibility of the Contractor, his Subcontractors, suppliers, consultants, and servants.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperatures are expected to fall below 40°F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90°F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is the Contractor's option.
 - 2. Fog-spray forms and steel reinforcement without forming standing water on the completed waterproofing, just before placing concrete.

1.11 WARRANTY

- A. Provide a Warranty for all Work under this Section in a document stating that if, within two years after the Date of Substantial Completion of the Work, any of the Work of this Section is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. Also, state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney's fees, to enforce compliance with the obligation of this Warranty. The obligation of this Warranty shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract, and shall not be limited by conditions other than this Contract.

1.12 BASIS OF PAYMENT

- A. Refer to Form for General Bid.

PART 2 – PRODUCTS

2.01 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following, unless modified by requirements in the Contract Documents:

- 1. ACI 301.
- 2. ACI 117.

2.02 GRAVEL BASE

- A. Gravel Base: Gravel base material shall meet the requirements of MHD M1.03.1.
- B. Crushed Stone: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100% passing a 1-1/2-in. sieve and 0% to 5% passing a No. 8 sieve.

2.03 UNDERSLAB VAPOR RETARDER

- A. Under-Slab Vapor Retarder: 15 mil, multilayer plastic extrusion with water vapor presence less than 0.03 perms, meeting the requirements of ASTM E1745 Class A. Basis of design is Stego Wrap Class A Vapor Retarder (15 mil) by Stego Industries, LLC.
- B. Provide additional materials, including, but not limited to, seam tape, double-sided tape, and mastic, as required and recommended by the manufacturer.

2.04 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows.
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 1 in. by 1 in., minimum.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and that does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.05 REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A497, flat sheet.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 or ASTM A706/A706M, deformed bars, matching indicated cross-sectional area and assembled with clips or in-plant fusion welding; are an acceptable alternate for slab-on-metal deck reinforcement.
- D. Epoxy-Coated Reinforcing Bars: ASTM A615, Grade 60, deformed bars, ASTM A775, epoxy coated, with less than 2% damaged coating in each 12 in. (300 mm) bar length.
- E. Epoxy-Coated Welded Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel. Provide in flat sheets.

2.06 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
- B. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.07 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source and from single manufacturer.
- B. Cementitious Materials
 1. Portland Cement: ASTM C150, Type I/II.
 2. Fly Ash: ASTM C618, Class F.

C. Aggregate

1. Normal-Weight Fine Aggregate: Shall be washed, inert, natural sand conforming to ASTM C33.
2. Normal-Weight Coarse Aggregate: Shall be well-graded crushed stone or washed gravel containing no deleterious substances and conforming to ASTM C33. Provide normal-weight coarse aggregate with a maximum size of 3/4 in.
 - a. Aggregate shall be nonreactive in the presence of alkalis in accordance with ASTM C1260 or ASTM C1293. Aggregates will be acceptable as non-deleteriously-reactive if the aggregate produces ASTM C1567 expansion values of less than 0.1% at fourteen days using the same source material and relative proportions of cementitious materials proposed for use in the mix design.

D. Water: Mixing water for concrete shall be fresh, clean, and potable.

E. Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Air-Entraining Admixture: ASTM C260.
2. Shrinkage Reducing Admixture: Eclipse 4500 by Grace Concrete Products.
3. Water-Reducing Admixture: ASTM C494, Type A.
4. High-Range Water-Reducing Admixture: ASTM C494, Type F or Type G.
5. Water-Reducing Accelerating Admixture: ASTM C494, Type E.
6. Water-Reducing Retarding Admixture: ASTM C494, Type D.
7. Corrosion Inhibitor: ASTM C494, Type C.

2.08 **CURING MATERIALS**

- A. **Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz per square yard (305 g per square meter), when dry.**
- B. **Moisture-Retaining Cover: One of the following, complying with ASTM C171:**

1. **Polyethylene-Coated, Blended Polyester Fabric: HydraCure Wet Curing Cover, PNA Construction Technologies, Inc., 9 Dunwoody Park, Suite 111, Atlanta, GA 30338.**
2. **Polyethylene film.**
3. **Polyethylene-coated burlap.**
4. **Use of curing compounds is strictly prohibited.**

2.09 PROPORTIONING AND DESIGNING MIXES

- A. Submit written reports to the EOR of each proposed mix for each class of concrete at least fifteen days prior to start of Work. Do not begin concrete production, until proposed mix designs have been reviewed by the EOR.
- B. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301 and ACI 318. For the trial batch method, use an independent testing agency acceptable to EOR for preparing and reporting proposed mix designs.
 1. Do not use the same testing agency for field quality control testing.
 2. Limit use of fly ash to not exceed 25% of cementitious materials content by weight.
 3. Limit use of slag to not exceed 50% of cementitious materials by weight.
 4. Limit use of supplementary cementitious to not exceed 50% of cementitious materials content by weight.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15% by weight of cement.
- D. Design mixes to provide normal-weight concrete with the following properties as indicated on Drawings and schedules:
 1. Cement Content: 705 lbs per cubic yard, maximum. If a low-alkali cement is used to address potential aggregate reactivity, its effectiveness shall be demonstrated by testing according to ASTM C1567 or ASTM C1293.
 2. Twenty-Eight-Day Compressive Strength: 5,000 psi.
 3. Water-to-Cement Ratio: 0.40 maximum.

4. Air Content: Total 6% with a tolerance of $\pm 1.5\%$ (4.5% to 7.5%) based on 3/4 in. aggregate. If other coarse-aggregate size is used, the air content will need to be adjusted to meet minimum air contents as identified in ACI 318 for severe exposure.
 5. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement not more than 7 in. at the point of placement after the addition of any high-range water reducers.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by EOR. Laboratory test data for revised mix design and strength results must be submitted to and accepted by EOR, before using in Work.
- F. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 2. Use accelerating admixture in concrete slabs placed at ambient temperatures below 40°F.
 3. Use water-reducing and water-retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 4. Use high-range water-reducing admixture in pumped concrete and concrete with water-to-cement ratios below 0.45.
 5. Use air-entraining admixture in all concrete, unless otherwise indicated.

2.10 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: All concrete shall be ready-mixed, complying with requirements of ASTM C94 and as specified. Furnish batch ticket information.
1. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 1-1/2 hrs to 75 min., and when air temperature is above 90°F, reduce mixing and delivery time to 60 min. Concrete exceeding the delivery time shall be rejected.

PART 3 – EXECUTION

3.01 PROTECTION

- A. All existing areas shall be protected from construction operations, including, but not limited to, the following:
 - 1. Barricades shall be placed between all Work areas and adjacent public areas.
 - 2. Plywood shall be placed over any new concrete area that is used as Work or staging area.
 - 3. Water runoff shall be controlled to prevent staining of nonconstruction areas or automobiles.

3.02 COMPACTION

- A. Place backfill and fill soil materials in layers not more than 12 in. in loose depth for material compacted by heavy compaction equipment, and not more than 6 in. in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:
 - 1. Under concrete pads, scarify and recompact top 6 in. below subgrade, or of the existing gravel base where applicable, and compact each layer of backfill or fill soil material at 95% minimum.

3.03 VAPOR BARRIER INSTALLATION

- A. Install vapor barrier in accordance with ASTM E1643.
- B. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement, whenever possible.
- C. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
- D. Seal vapor barrier to footing/grade beam with double-sided tape and termination bar, fastened at 12 in. o.c. max.
- E. Overlap joints 6 in. and seal with manufacturer's tape.

- F. Apply tape to a clean and dry vapor barrier.
- G. Seal all penetrations (including pipes) per manufacturer's instructions.
- H. No penetration of the vapor barrier is allowed, except for reinforcing steel and permanent utilities.
- I. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 in., and taping all sides with tape.

3.04 FORMWORK INSTALLATION

- A. Construct formwork so that concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- B. Construct forms tight enough, to prevent loss of concrete mortar.
- C. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 1. Install keyways, reglets, recesses, and the like for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- D. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- E. Do not chamfer exterior corners and edges of permanently exposed concrete, unless otherwise noted.
- F. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris, just before placing concrete.
- G. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- H. Before placing concrete, remove dust and debris from within the forms.

3.05 PLACING OF REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder, before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces, or toward vapor barrier.

3.06 JOINTS

- A. General: Construct joints to match existing and true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so that strength and appearance of concrete are not impaired at locations indicated or as approved by EOR.
 - 1. Install joint filler in accordance with manufacturer's recommendations.
- C. Control Joints: Form weakened-plane control joints, sectioning concrete areas, as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16 in. wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Joints shall be cut 4 to 12 hrs after concrete placement.
 - b. Install joint filler in accordance with manufacturer's recommendations.

3.07 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at the Project site, or during placement unless approved by EOR.
- C. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Screed slab surfaces with a straightedge and strike off to correct elevations.
3. Slope surfaces uniformly as indicated.
4. The minimum thickness of the new concrete slab shall not be less than 4 in.
5. Begin initial floating using bull floats or darbies using minimum number of passes required to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.08 FINISHING SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Do not steel trowel the concrete.
- B. The Contractor must install temporary elevation grade "stakes" (rebar doweled into slab) to establish final top-of-slab elevation. The stakes must be of sufficient quantity and spacing to provide a uniform repair profile and are to be removed after initial screeding.
- C. Float Finish: Consolidate surface by hand floating. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture. Do not steel trowel the concrete.
 1. Finish surfaces to the following tolerances:
 - a. Construct concrete surfaces within 1/4 in. of the indicated elevation and deviating not more than 1/8 in. from a 10 ft straightedge placed anywhere on the surface. Additionally, under no circumstances are concrete surfaces to exceed the limitations in the applicable accessibility regulations.
- D. Broom Finish
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with EOR, before application.

3.09 CONCRETE PROTECTING AND CURING

- A. General: Cure concrete/mortar according to ACI 308R-01. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306R for cold-weather protection and ACI 305R for hot-weather protection during curing.**
- B. Unformed Surfaces**
- 1. Initial Curing: When concrete/mortar bleed rate, concrete temperature, ambient temperature, relative humidity, wind speed, and solar heating create a risk of premature drying, conduct initial curing using evaporation retarder or fogging during concrete placement and finishing.**
 - 2. Intermediate Curing: When concrete/mortar finishing is completed before final set of the concrete and when final curing methods might damage the concrete either mechanically or by raising the water/cement ratio of the near-surface region, conduct intermediate curing using evaporation retarder or fogging.**
 - 3. Final Curing: Begin final curing immediately after finishing is complete and after the concrete/mortar has reached final set and will not be damaged by final curing operations. Conduct final curing using moisture curing or moisture-retaining cover. Conduct final curing for a minimum of seven days.**
- C. Cure concrete by one or a combination of the following methods:**
- 1. Evaporation Retarder: Apply evaporation retarder according to manufacturer's written instructions.**
 - 2. Fogging: Continuously fog mist above the concrete/mortar surface to elevate the relative humidity of the air above the surface.**
 - 3. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:**
 - a. Water.**
 - b. Continuous water-fog spray.**
 - 4. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12 in. lap over adjacent absorptive covers.**

- 5. **Moisture-Retaining Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete/mortar, placed in widest practicable width, with sides and ends lapped at least 12 in., and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.**
- 6. **Curing Compound: Curing compound shall not be used.**
- D. **Appearance of cracks shall be cause for rejection of the work so affected. Rejected concrete shall be removed and replaced at the Contractor's expense.**
- E. **Appearance of unconsolidated or honeycombed concrete shall be cause for rejection of the work so affected. Rejected concrete shall be removed and replaced at the Contractor's expense.**
- F. **During the curing period, the concrete shall be protected from damage due to mechanical disturbances, such as shock and vibration due to adjacent construction activities. All finished concrete surfaces shall be protected from damage.**

3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least twenty-eight days, or longer as recommended by manufacturer. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 in. deep in formed joints. Overfill joint and trim joint filler flush with top of joint, after hardening.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by EOR. Remove and replace concrete that cannot be repaired and patched to EOR's approval.
- B. Patching Mortar: Mix dry-pack patching mortar consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins, and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 in. in any dimension to solid concrete. Limit cut depth to 3/4 in. Make edges of cuts perpendicular to concrete surface. Clean dampen with water and brush-coat holes and voids with bonding grout. Fill and compact with patching mortar, before bonding grout has dried. Fill form-tie voids with patching mortar.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match, before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance, as determined by EOR.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 in. wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least fourteen days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing them with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 in. to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 5. Repair defective areas, except random cracks and single holes 1 in. or less in diameter, by cutting out and replacing with fresh concrete. Remove defective

areas with clean, square cuts and expose steel reinforcement with at least a 3/4 in. clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding grout. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1 in. or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding grout. Place patching mortar before bonding grout has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hrs.
- E. Repair materials and installation not specified above may be used, subject to EOR's approval.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections
 1. Verification of use of required design mixture.
 2. Concrete placement, including conveying and depositing.
 3. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu yd but less than 25 cu yd, plus one set for each additional 50 cu yd or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch, if fewer than five are used.
 2. Slump: ASTM C143; one test at point of placement for each composite sample but not less than one test for each day's pour of each concrete mixture. Perform additional tests, when concrete consistency appears to change.

3. Air Content: ASTM C231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40°F and below or 80°F and above, and one test for each composite sample.
5. Compression Test Specimen: ASTM C31; one set of five standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for standard-cured test specimens. Provide field storage curing facility and monitor temperature per ASTM C31. Place cylinders in final curing conditions meeting the requirements of ASTM C511.
6. Compressive-Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cu yd plus additional sets for each 50 cu yd more than the first 25 cu yd of each concrete class placed in any one day; one specimen tested at seven days, three specimens tested at twenty-eight days, and one specimen retained in reserve for later testing if required.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Test results will be reported in writing to the Owner, EOR, Ready-Mix Producer, and Contractor within 24 hrs after tests. Include the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at twenty-eight days, concrete mix proportions and materials, compressive breaking strength, and type of break for both seven-day tests and twenty-eight-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by EOR but will not be used, as sole basis for approval or rejection of concrete.
10. Additional Tests: Independent testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by EOR. Independent testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by EOR.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION