

IV. Materials Use and Specifications Requirements

Note: For all testing and observation requirements for all divisions, refer to Appendices 01400 and 01410. The designer is to provide all sections of specifications required for the project. Items of specific concern are listed below. Individually developed specifications can be used as long as the specifications cover these items.

Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract

0. The documents for bidding will be provided by BYU-Idaho to the design firm contract forms.
0. Contracts for the construction will be written to the selected qualified bidder by BYU-Idaho on the standard contract form.
0. Construction document forms will be provided by BYU-Idaho. Revisions will be provided by BYU-Idaho prior to incorporation.
0. Project specific forms will be provided or made available by the owner. BYU-Idaho standard contract forms are available on the CD provided to each architect and engineer.
0. "Division 0" is to be developed by the design professional in collaboration with the owner. Consult with the owner and review the finished documents for coordination and completeness.
0. Supplementary general conditions to include \$1,500 per day liquidated damages.

Division 1 – General Requirements

01000 – General Requirements

0. Prepare Section 01010, Summary of Work and other Division 1 sections required by specific project conditions.

01030 – Alternates

0. Alternates are normally deducts.
0. Alternates shall address portions of the work that are reasonably discreet and identifiable.

01045 – Cutting and Patching

0. Coordinate and describe as necessary all cutting and patching requirements in the specifications and drawings. Avoid duplication or conflicts between the architectural and engineering work as it relates to cutting and patching.

01120 – Special Project Procedures

0. Fully describe any special procedure or schedule. Consider and review with the owner such items as: special coordination of work with the academic calendar, university use of premises, special hours of work, coordination with other contractors such as hazardous material abatement or owner directed construction, project walk-throughs at weekly/bi-weekly intervals, and preinstallation meetings.

01200 – Project Meetings

0. Specify all project meetings required and/or anticipated. Include schedule for meetings, location, responsibilities, those expected in attendance and agenda items. Design professional, contractor's representative, and owner shall attend all meetings. The design professional shall conduct all meetings and prepare minutes of all meetings.
0. Project meetings shall include pre-construction, quality control, regular construction, pre-installation and project walk-throughs at weekly/bi-weekly intervals.
0. The following pre-installation meetings are, at the discretion of the owner, to be scheduled the same day as weekly construction meetings:
 - Quality control meeting
 - Excavation, backfill
 - Concrete formwork, placing, and backshoring
 - Waterproofing
 - Mortar/masonry/flashing
 - Roof and roof flashing
 - Entrance and window installation
 - Sealant
 - Vapor barrier

- Fire sprinkler and ductwork
- Painting and flooring
- Cabinetry and casework

01300 – Submittals

1. Each contractor request for payment shall include an updated construction schedule, schedule of values, and any other special requirements.
2. The design professional shall define the requirements and procedures for all contractor submittals. See General Conditions, A201, as amended by the owner, for turnaround time by the design professional.

01400 – Quality Assurance and Quality Control Services

1. Quality assurance testing shall be indicated in each specification division defining the type of test and method; test frequency; test pass/fail tolerance; and action required for failed tests.
2. Provide a consolidated spreadsheet referencing all testing and observations required for the project. Refer to Appendices 01400 and 01410 for testing and observation requirements.
3. Specify that the contractor, notwithstanding the requirements of General Conditions, A201 Subparagraph 13.5.1, shall provide a minimum of 5 working days notice to appropriate owner consultants before starting work requiring observation or testing, and a minimum of 3 working days notice thereafter for each testing and observation for the continuation of the work items, and a reasonable date and time fixed for such observation and testing; and if the work is covered up prior to any required testing or observation, it shall be uncovered for review at the contractor's expense.
4. Specify that the observation and testing agencies are not authorized to release, revoke, alter or enlarge requirements of the contract documents or approve, reject or accept any portions of the work.
5. The contractor shall schedule and coordinate all pre-construction and construction testing and observation. Provide safe access to testing/observation areas and secure and protect samples and testing equipment. Provide all necessary scaffolding, lifts, enclosures, temporary heat, etc...required by the owner's observation or testing agencies in order to perform their work. Make any repairs required due to testing or observation procedures. Provide and transport to owner's testing facility all materials to be tested for testing and observations. The contractor is responsible for the costs of each.
6. Observation and testing services shall assist in verification of certain aspects of the work for probable compliance with the requirements specified and indicated for the owner. These services do not relieve the contractor of responsibility for compliance with the contract document requirements.
7. When any testing or observations indicate that the work is in non-compliance with the contract documents then all retesting and re-observations shall be performed by the owner's testing or observation agencies. All costs for retesting and re-observations, including additional services of the design professional, design

professional's consultants and owner's consultants, are the contractor's responsibility and shall be deducted from the contract amount by supplemental agreement.

8. Specify that testing company shall distribute copies of the tests to the design professional, owner, general contractor, structural, building official and owner's consultant.

01500 – Construction Facilities and Temporary Controls

0. Define responsibility and describe each relevant area. Include:
 0.
 - Fencing, site security, and lighting for materials and pedestrians.
 - Temporary utilities; water, electricity, toilets, steam, and fuel.
 - Field office with space and facilities for the owner, consultants, design professional, and testing lab personnel sole use shall be provided by the general contractor, with complete plans, specs, addenda, and shop drawings, heating, air conditioning, lights, phone, fax and completely furnished with contractor responsible for all costs.
 - Temporary heat (installation, operation and removal); refer back to Design Standards section.
 - Prohibit contractors use of all new and existing HVAC systems during construction **absent prior written approval by the owner, and then specify all conditions necessary to assure that the system is returned in equal or better condition**
 0. Specify temporary enclosures for safety, security, thermal, dust protection, and/or noise protection as required for new and existing spaces/systems/components.
 0. Specify night/day protection of new and existing roofs.
 0. Provide site maintenance/control of erosion, weeds, snow, debris, etc.
 0. Specify that the contractor shall develop an appropriate site access plan that is approved by the owner.

01650 – Commissioning

0. Refer to III. Design Standards and consult with the owner to determine appropriate specification(s).

01700 – Contract Closeout

0. Specify the format and number of copies of as-built drawings to be provided by the contractor.
0. Specify that the contractor is to provide on-site instructions in the operation of mechanical, electrical, and building systems.
0. Specify that the contractor is responsible for obtaining the Certificate of Occupancy from the code official.
0. Contractor to provide all guarantees, warranties, as-built drawings, operation maintenance instruction manuals, shop drawings to design professional for the owner.

Division 2 – Site Work

02000 – Site Preparation

- 0. Provide for restoration or repair of any damaged roads, sidewalks, curbs, utilities, or plant material; the owner shall review repair work with contractor for acceptance.

02050 – Demolition

- 0. Include provision for dust and noise control, and protection of adjacent buildings, roofs, structures, and finishes.
- 0. Provide for access and egress from building or site if occupied.
- 0. Materials and equipment removed must have post demolition ownership described.

02051 – General Site Work Requirements

- 0. Include a discussion of site verification requirements including utilities.
- 0. List requirements for spillage control, dust control, erosion and storm water control, and repair or restoration of site.

02200 – Earthwork

- 0. For excavation beyond that described in the contract documents, include cost per cubic yard on the bid form. Excavation quantities shall be as measured in place to the line neat prior to excavating. Fill quantities shall be as measured in place after compaction.
- 0. The design professional is to define the excavation depth and extent, fill, backfill, compaction, and surface drainage, and all other pertinent items based on the recommendation of the Geotechnical engineer. The definition of excavation depth and extent shall be of simple elevation and simple geometry.
- 0. Require that contractor provide notice as required by Section 01400.
- 0. Specify that all backfill or fill materials have less than 5% passing the #200 sieve, except for topsoil caps adjacent to buildings at exterior walls. No frozen backfill placed or backfill with ice or snow. No fill footings or slabs shall be placed on soils, which have frozen or contain frozen material or soil covered with ice or snow. Do not let backfill or fill freeze during placement and compaction.
- 0. Specify protection of bottoms of excavations from frost and freezing.
- 0. Specify that foundation wall waterproofing must be backfilled within 3 days of placements. The toe of the excavations must be at least 3' from foundation walls and footings to be waterproofed.
- 0. Specify that all in-place foundations and slabs be protected from frost penetration of the supporting soils until project completion.
- 0. Specify no standing water in excavation at any time.

02230 – Site Clearing

- 0. Identify the requirements for tree, planting, and lawn removal.

- 0. Topsoil to be stockpiled on site for use on this project.

02311 – Rough Grading

- 0. Determine who will establish grades on site and who is responsible to maintain those grades during construction.
- 0. Note tolerances for final grades.

02315 – Excavation and Fill

- 0. Work with BYU-Idaho to write this section
- 0. Include a rock section and blasting section.
- 0. Define acceptable backfill for building and utility trenches.
- 0. Advise of procedures should asbestos or other hazardous materials be encountered. (Stop work in the affected area and notify the design professional and the owner immediately.)

02500 – Paving

- 0. Specify that the bituminous paving plant must be certified and shall provide designated and certified mixes, aggregates, etc. Both plant and mix current certifications are to be submitted for the design professional's written approval before the start of the work.

02710 – Foundation Drainage

- 0. The owner prefers gravity foundation drainage systems whenever practicable.
- 0. Specify two pumps per sump wired to emergency power (to be cycled with one always on standby as backup).
- 0. Specify slope of drainpipe down to drains. The minimum drainpipe size is 6", encased by drain rock and filter fabric. Consider filter fabric sock around the drainpipe.

02900 – Landscaping

- 0. Specify that the contractor shall maintain new plant material until acceptance. Require a one-year warranty for all new plant material after acceptance. Notwithstanding the requirements of General Conditions, A201 – Clause 12.2.2.3, all defective material shall be replaced and this new material shall also be warrantied for an additional complete cycle of the seasons (no less than one year).
- 0. Coordinate with the owner as to the location of sprinklers and security lighting.
- 0. Owner will review specific planting lists and approve for bidding.
- 0. BYU-Idaho uses Toro brand sprinklers on campus.
- 0. All designs shall comply with water management plans by BYU-Idaho.

Division 3 – Concrete

03100 – Concrete Formwork

1. The owner prefers backshoring rather than reshoring. However, ACI 347-14 section 3.8.3 (1997) cautions that this work must be performed under careful supervision by the contractor. The design professional should discuss this with the owner. Also, provide maximum areas that forms can be removed before installing backshores or reshores. Backshores and reshores must be installed immediately as forms are removed and within the same day.
2. All form coatings or release agents, sealers, curing agents, surface coatings, concrete treatments and the like applied to concrete or concrete blocks receiving waterproofing or thru-wall flashings shall have prior written approval from the appropriate waterproofing and thru-wall flashing manufacturers. This includes manufacturers of floor waterproofing treatments (as mechanical penthouses, shower rooms, etc.) above occupied space.
3. All supported concrete shall have attained a minimum compressive strength of 100% of the 28-day strength (with field cured cylinders) prior to form removal. Contractor is responsible for determining numbers of cylinders, testing dates, and all costs associated with the field-cured cylinders.
4. Specify for each unsupported structural type of cast-in-place concrete, the minimum strength or minimum time required before removal of formwork is allowed.

03316 – Mortar Toppings

1.01 Summary

1. This section includes the installation of rapid set mortar toppings to be applied over concrete decks as thin infills over rough surfaces or as thicker topping fills to create slopes to drain or other flooring fills such as depressions or voids where partitions were demolished and removed.
2. This material is to be used in conjunction with interior waterproofing products specified under Section 07125 – Concrete Deck Waterproofing where the substrate requires underlayment infills and slopes to drain.
3. Related Sections
 - A. Section 01300 – Project Meetings: Pre-Installation Conferences
 - B. Section 01410 – Testing Laboratory and Inspection Services
 - C. Section 03300 – Cast in Place Concrete
 - D. Section 07125 – Concrete Deck Waterproofing
 - E. Section 07900 - Joint Sealants

1.02 Application Qualifications

1. The mortar topping application shall be performed by a single firm experienced and specialized in applying rapid set mortar toppings, as shown and specified, and shall be an approved and trained applicator by the Manufacturer. The field supervisors and

the project foreman for the waterproofing Subcontractor shall each have at least 3 years approved experience with the application of this mortar topping product.

1.03 Submittals

1. Product Data: Submit copies of the manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties, and printed instructions for installation of mortar topping, including procedures and materials for bonding, tooling, and finishing.
2. Submit a copy of the Manufacturer's approval of the applicator and indicate by transmittal form, that copies of the specifications and application instructions have been distributed to the applicator.
3. Submit written approval of the condition of the substrate to proceed with the mortar topping, signed by the all of the following parties: Manufacturer's Representative, Installing Subcontractor, and General Contractor.
4. Submit MSDS information for all materials.

1.04 Quality Assurance

1. There shall be a Pre-Installation Conference in accordance to Section 01300, Project Meetings. Applicator shall meet with the manufacturer's representative, Contractor, Architect, and Owner's representatives at the project site to review the topping installation procedures, acceptance of surfaces, minimum curing period, forecasted weather conditions, special details and coordination of other trades. The Contractor shall provide notice to attendees prior to convening Pre-Installation Conference as Specified in Section 01300 – Project Meetings. Review methods and procedures related to work, including but not limited to the following:
 - A. Tour job site areas to be infilled with mortar topping. Inspect and discuss conditions of substrate, existing conditions, drains, curbs, penetrations, required slopes, and other preparatory work performed by other trades.
 - B. Review required submittals. Read the entire specification, line item by line item.
 - C. Contractor to submit written approval of the condition of the substrate as required by paragraph 1.03.C.\
 - D. Review and finalize construction schedule related to mortar topping work and verify availability of materials, applicator's personnel, equipment and facilities needed to make progress and avoid delays.
 - E. Review required inspections and testing.
 - F. Review manufacturer's guidelines with respect to weather conditions.

1.05 Project/Site Conditions

1. Environmental Requirements: Do not apply mortar topping materials if ambient, materials, and/or substrate temperatures are outside the range of ambient temperatures recommended by the manufacturer. Temperatures must be rising and stay above the minimum for the following 48 hours. All surfaces to receive the mortar topping shall be free of water, dew, frost, snow and ice, and shall remain dry until cured.

2.01 Mortar Topping Products

1. Products: Subject to compliance with requirements, provide products by one of the following manufacturer's:
 - A. "SikaTop 122" by Sika.
 - B. "Thoroc 10-61 Rapid Mortar" by ChemRex, Inc.
 - C. "Emaco T430 Rapid Strength Mortar" by MasterBuilders Technologies, Inc.
2. Bonding Agents: Manufacturer's standard factory formulated bonding agent recommended for substrate and conditions indicated. A water-based epoxy/cementitious bonding agent and rebar coating.
 - A. "Armatec 110 Bonding Agent" by Sika.
 - B. "Thoroc P-24" by ChemRex, Inc.
 - C. "Emaco P-24 Bonding Agent" by MasterBuilders Technologies, Inc.

1.1.1 General

1. All work performed under this section shall be in accordance with the specifications, drawings, and the manufacturer's instructions and recommendations. In the event of a conflict, the stricter requirement shall prevail.
- B. SURFACE PREPARATION:
1. Prior to onset of mortar topping work, topping subcontractor shall inspect entire area to be infilled for compliance with requirements and other conditions affecting performance. Contractor shall submit written approval of substrate per requirements of paragraph 1.03.C.
 - A. Any new concrete substrate shall be placed and air-dried for a minimum of 28 days.
 - B. Sandblast the surface to reveal clean, and sound bonding surface. Verify that substrate concrete is sound and properly roughened.
 - C. Square-cut loose edges of concrete and roughen by sandblasting or scabbling.
 - D. Dampen with water as recommended by topping manufacturer.
 - E. Verify that substrate is visibly free of standing water.
 - F. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. BONDING AGENT APPLICATION:
- A. Thoroughly scrub a bond coat of the bonding agent into the saturated surface of the concrete substrate with a stiff brush.
 - B. Do not apply more bonding agent than can be covered with mortar topping before the bond coat dries.
 - C. Do not temper the bonding agent or retemper the bond coat.
 - D. Apply a thickness of bonding agent in preparation for mortar topping, as specified by the Manufacturer's recommendations for the bonding agent.

D. MORTAR TOPPING

- A. Immediately place the mortar topping into the wet bonding agent of the prepared area.
- B. As the application proceeds, work the mortar topping material into the bottom and sides of the patch area to assure a good bond.
- C. Level the mortar topping material and tool to the required dimensions and slopes.
- D. Broom finish the mortar topping in preparation for waterproofing application where required.

E. MINIMUM APPLICATION THICKNESSES:

- A. SikaTop 122: 1/8" thickness with maximum depth of 1" per lift
- B. Thoroc 10-61: 1/2" thickness
- C. Emaco T430: 1/4" thickness

F. ADDITIONAL APPLICATION THICKNESSES:

- A. Refer to Manufacturer's recommendations for extending the thickness of the mortar topping fills by adding certain proportions of aggregate to the mortar topping mix, depending on the desired depth.

3.02 Curing, Protecting, and Cleaning

1. Cure according to Manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
2. Wet cure the mortar topping by covering with a dampened burlap material over the
3. entire mortar topping application for a minimum of 3 days. Keep burlap damp to avoid shrinkage cracking due to fast cure and drying.
4. Application of any curing compounds or coatings not permitted.
5. Air dry the mortar topping without any covering for a minimum of 3 additional days after the wet cure, for a total of 6 days of curing wet and dry. Curing period shall be complete before any subsequent moisture content testing of the topping.
6. Protect topping from damage and wear during remainder of construction period. The
7. Contractor shall prevent any liquid moisture from running or dribbling across the topping area immediately after the placement and during the curing.
8. Clean spillage and soiling from adjacent construction using cleaning agents and
9. procedures recommended by manufacturer of affected construction. The completed
10. topping surface shall be thoroughly protected from damage by any cleaning agents.

03200 – Concrete Reinforcement

1. Verify with owner the use of epoxy coated rebar and nova mesh.
2. The owner's consultant shall observe all rebar before any structural concrete is placed. All rebar (including dowels) must be in place and secured with observations and re-configuration completed prior to delivery of concrete. For walls and columns, rebar must be observed before forms are closed.

3. For exposed to weather concrete features, exterior stairs, exterior walks, curbs, and loading docks all reinforcing steel and accessories shall be epoxy-coated: ASTM A 775. Other reinforcement shall be unprotected.
4. For walls reinforced on both faces, provide spreader bars and chairs to surfaces of forms on each side at spacing not to exceed 8' in either direction. For walls with single layers of reinforcement, provide chairs to each side at spacing not to exceed 8' in either direction. Also, use spreaders for footings with two or more layers of reinforcement.
5. Welded wire fabric is not allowed.
6. Provide a table for the various concrete compressive strength for lap length requirements for the various rebar sizes for black and epoxy rebars.
7. Specify the structural requirements for epoxy rebar (lap length, etc.) The epoxy coating plant must be CRSI certified (second party certification program). Provide written certification for the design professional's written approval prior to coating the rebar.
8. Specify the following:
 - A. Reinforcing
 1. Epoxy-coated reinforcing bars – When specified by the design professional epoxy coated reinforcing bars shall conform to ASTM A 775.
 - a. Repair of damaged epoxy coating – When required, damaged epoxy coating shall be repaired with patching material conforming to ASTM A 775. Repair shall be done in accordance with the patching material manufacturer's recommendations. ASTM A 775 for plant repairs. ASTM D 3963 for field repairs.
 - B. Fabrication
 1. All reinforcement shall be bent cold unless otherwise permitted by the design professional.
 - C. Placing (field installation)
 1. Epoxy-coated reinforcing bars supported from formwork or ground shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Wire bar support shall be coated with dielectric material for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy-coated. In walls having epoxy-coated reinforcing bars, spreader bars where specified by the design professional, shall be epoxy-coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcing bars shall be made of corrosion-resistant material.
 2. Epoxy-coated reinforcing bars shall be fastened with nylon-, epoxy-, or plastic-coated tie wire, or other acceptable materials.
 3. Splices of reinforcing bars shall be made only as required or permitted by the Contract Documents, and as authorized by the design professional.
 - a. Welded splices – When required or permitted, all welding of reinforcing bars shall conform to AWS D1.4. Unless otherwise permitted, welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.
 - b. Suitable ventilation shall be provided when welding epoxy-coated reinforcing bars.

- c. After completion of welding on epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with Section a.1.1. All welds, and all steel splice members when used to splice bars, shall be coated with the same material used for repair of coating damage.
 - d. Mechanical connections – When required or permitted, mechanical connections shall be installed in accordance with the splice device manufacturer’s recommendations.
 - e. After installing mechanical connections on epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with Section a.1.1. All parts of mechanical connections used on coated bars, including steel splice sleeves, bolts, and nuts shall be coated with the same material used for repair of coating damage.
4. Reinforcing bars partially embedded in concrete shall not be field bent, except as indicated on the Contract Documents and permitted by the design professional. When heat is used to field bend epoxy-coated reinforcing bars, suitable ventilation shall be provided. When epoxy-coated reinforcing bars are field bent, coating damage shall be repaired in accordance with Section A.1.a.
 5. Unless permitted by the design professional, reinforcing bars shall not be cut in the field. When epoxy-coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

03300 – Cast-in-Place Concrete

1. Specify that contractor shall provide the concrete mix designs. The mix designs shall be designed and signed by a professional engineer employed by a qualified independent laboratory; said laboratory to be other than the owner’s testing laboratory. The structural engineer shall approve concrete mix designs after consideration of the entire pre-construction test results.
2. Fly ash or other concrete substitutes in concrete mix are not allowed.
3. Specify the following for each concrete application: slump, (before and after High Range Water Reducer (HRWR) added on site), compressive strength, air entrainment for exposed locations, and reactivity potential, water cement ratio, aggregate size, and shrinkage (where appropriate).
4. Discuss locating and providing for conduit runs, sleeves, and accessories.
5. Specify 1/8" per foot minimum slope-to-drain on concrete finish for all slabs with floor drains.
6. Specify all finishes and tolerances for level, plumb, and slopes. Also, provide tolerance for finished floor elevation as compared to floor elevations on drawings.
7. Specify placement, curing, form removal, shoring, etc. to achieve project and program requirements for levelness and flatness (deflection).
8. Specify that all elevated concrete shall have attained a minimum compressive strength of 100% of twenty-eight day strength (with field cured cylinders) prior to form removal.
9. Specify that all waterproofing and thru-wall flashings substrates be free of coatings, form release agents, sealers, curing agents, treatments, and the like, unless written

prior approval of the products used is obtained from the specified waterproofing or thru-wall flashing manufacturers. This requirement applies to sections 03300, 04200, 07120, and 07125, and all other appropriate sections.

- 0. Specify if the concrete of a concrete delivery truck was rejected for any reason, the truck will not be allowed on-site for the next 12 hours
- 0. Specify that all concrete shall be Ready-Mixed concrete, mixed and delivered in accordance with ASTM C94.
- 0. Specify that the concrete deliveries shall be scheduled to ensure that the concrete in each load is placed within 90 minutes after water was added for non-air entrained concrete and 60 minutes after water was added for air entrained concrete.
- 0. Specify that the concrete shall not free fall more than 4' during placement (MNDOT 2401.3).
- 0. Typically, the most stringent requirement from both the 1997 UBC 1905.11 and the ACI 318-5.11.1 for concrete curing should be used, and the concrete shall be maintained above 50 degrees F and in a moist condition for at least the first seven days after placement.
- 0. Curing compounds are not allowed.
- 0. Specify both cold and hot weather requirements for protection.
- 0. Specify the thickness of concrete between the reinforcing bars and concrete surfaces.
- 0. The design professional shall review the floor flatness (FF) and floor levelness (FL) requirements with the owner. Typically FF and FL designations would be used and measured by the owner's testing laboratory, with pairs of F-numbers provided for both Overall and Minimum Local.
- 0. Provide concrete vibration and/or requirements.
- 0. Provide shrinkage criteria for slabs, beams, joists, etc.
- 0. All surfaces (including sub-grade and reinforcement) that will be in contact with newly placed concrete to be above minimum temperature of 35 degrees F.

03450 – Precast Concrete

- 0. The manufacturer of precast pre-stressed concrete shall submit structural calculations certified by an Idaho Registered Professional Engineer to the design professional for approval.

Division 4 – Masonry

04100 – Mortar

1. Specify that the method of measuring materials for the mortar and grout used shall be by their volume (checked by weight) or weight, and in such a way that the specified proportions of the mortar and grout can be controlled and accurately maintained. Measurement of materials by shovel shall not be permitted. Retemper mortar only twice within two hours after introduction of water. Mortar must be placed within 2 ½ hours after initial mixing or rejected. Grout must be placed within 1 ½ hour after initial mixing or retested.
2. Mortar cement shall be only Portland cement.
3. Specify that the contractor shall comply with ASTM C 270, Property Specification for types of mortar required, etc. For grout site mixed, comply with ASTM C 476.
4. Specify the minimum and maximum compressive strength for each mortar type for the construction field-testing.
5. Specify that contractor shall provide the mortar and grout mix designs. The mix designs shall be designed and signed by a professional engineer employed by a qualified independent laboratory; said laboratory to be other than the owner's testing laboratory. The structural engineer shall approve mortar and grout mix designs after consideration of the pre-construction test results.
6. The owner's testing laboratory shall verify mortar and grout proportions during the construction sampling.
7. The design professional shall specify all mortar performance characteristics and ASTM criteria pertinent to the specific project.

04200 – Unit Masonry

1. Specify the use of low lift masonry practices; grout vertical re-bar cells in no more than four-foot lifts. Grout pours over 12" in height shall be mechanically vibrated
2. All exterior masonry joints shall be tooled concave. Raked joints are not allowed on exterior masonry.
3. The exterior brick must be SW grade to meet ASTM C67. The selected brick must pass freeze thaw pre-qualification testing prior to bidding.
4. Specify that the contractor shall provide a freestanding mock-up panel on a concrete foundation similar to the project brick ledge detail. The windowsill and head flashings may also be requested (to be determined by the owner). The mock up will include the waterproofing, concrete block back-up, wall ties, vertical rebar, grouting, horizontal reinforcement, thru-wall flashing assemblies, weeps, insulation, brick, etc. The mock up will be used to determine the workmanship standard for installation of all components and shall be constructed for review as a part of the pre-installation meeting for masonry and thru-wall flashings. The concrete foundation and block back up would be placed and cured prior to the meeting and will also be used to evaluate chips and other aesthetic determinations. The contractor is to provide written notice that they are completely prepared for the meeting. All re-observation and re-testing and associated costs will be the responsibility of the contractor.

5. Specify that all pre-construction testing for this section in the construction documents must be completed by the owner's independent testing laboratory for this project, paid for by the owner and approved by the design professional in writing prior to start of masonry site work.
0. Specify that the contractor shall submit certifications (cement and lime) and all other pre construction test results performed by the owner's independent testing laboratory to the design professional 30 days prior to the scheduled start of masonry work for written approval prior to the start of work.
0. Require control joints a maximum of every 30 linear feet of exterior wall and at one side of linteled openings. Control joints shall be placed within 4' of both sides of each corner. Include soft joints at each shelf angle and at top of wall.
0. Consider brick growth when designing exterior walls. Verify expansion and contraction influences on wall sections. Allow for brick growth regarding parapet coping details.
0. Per the project structural engineer's recommendation, specify building expansion joints and expansion joints between all new and existing structures.
0. Masonry course reinforcement and accessories shall be type 304 Stainless steel at all exterior walls.
0. Specify stainless steel eye and pintel wall ties for all cavity wall construction at all exterior walls.
0. The design professional shall review with the owner which other cavity wall metals are to be galvanized and which other cavity wall metals are to be stainless steel. The 2000 IBC states the minimum corrosion resistance required.
0. Review with the structural engineer the need to start the brick ties a maximum of 8" from terminations such as brick ledges, lintels, expansion and control joints, thru-wall flashings, window and door openings, corners, or other interruptions.
0. Specify that the mason is responsible for the protection of the brick ledge flashing after completion by the waterproofing subcontractor.
0. Require masonry or concrete backup for all exterior walls.
0. Require 2" minimum air space between face brick and cavity insulation.
0. Cavity shall be unobstructed, free from mortar droppings.
0. Require weep holes, specifying minimum of 18" doubled back cotton rope.
0. Specify sealants compatible with asphalt coated copper or detail accordingly.
0. Require thru-wall flashing of copper beginning a minimum of 12" above base course of brick. Flashing above doors, mechanical louvers, and windows (above and below) to be seamless and end dammed. Detail all thru-wall flashing to prevent contact with sealant
0. Specify that masonry walls shall be cleaned. Specify masonry cleaning so that cleaning shall not diminish the appearance or weather resistance of the building exterior. Specify sequence and protection so that cleaning does not damage adjacent permanent surfaces.
0. Specify full head and bed joints.
0. Specify that the contractor shall maintain masonry materials and surrounding air temperatures above 40 degrees F (with enclosures and heat sources on both sides of the wall and batching area also enclosed and heated as a minimum) prior to, during, and 48 hours after completion of the work when temperatures are 40 degrees F or below.

24. Do not use concrete block below grade.
25. All concrete block shall be specified by performance, not by manufacturing process, unless the owner endorses a compelling argument.
26. No wet block units shall be placed.
27. Specify the brick and mortar joint dimensions.
28. Specify that the contractor provide concealed flashings in masonry work at, or above, all shelf angles, lintels, ledges, and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Flashing above doors, mechanical louvers, and above and below windows shall be continuous pieces with no seams and end dams at both ends. Install all other flashings in lengths as long as possible with as few laps as possible. Prepare masonry surfaces smooth and free from projections, which could puncture flashing. Place vertical legs of asphalt coated copper thru-wall flashing on a continuous bed of mastic. Place termination bar in bed of material. Seal termination bars, flashing top edges and lap edges, laps, fasteners, additional corner pieces, and brick ties after insulation with mastic or liquid-applied membrane waterproofing (consistent with the vertical leg material) before covering with mortar. Completely press flashings and termination bar into mastic or liquid-applied membrane waterproofing applications where appropriate.
 - A. Extend flashing the full length of lintels and shelf angles, a minimum of 4" beyond ends of lintels, and form end dams minimum 6" beyond opening. Extend asphalt coated copper thru wall flashing ¼" out from exterior face of outer wythe of masonry with a ¼" drip edge, through the outer wythe, turned up a minimum of 12" along the face of the back-up concrete masonry wall with vertical leg set in a full bed of mastic. Terminate thru-wall flashings with a stainless steel compression bar set in a full bed of flashing adhesive mastic. At heads and sills turn up ends not less than 2" to form a pan. Provide a 1" wide thin band (on concrete and masonry, ½" on steel) of mastic under the front edge of flashing to retard water from infiltrating under the flashing, if flashings were to be placed on these materials. Only exception if flashing covered by reglet and metal to protect from water infiltration under it. At end dams, provide vertical band against stone or brick to which flashing abuts. Place these thin bands slightly back from the front edge so as not to drip mastic on the brick face and press flashing into thin bands.
 - B. Install prefabricated stainless steel waterproofing protection flashing over liquid-applied membrane waterproofing thru-wall flashing and rigid insulation at brick ledge. Let into brick mortar joint between the first and second brick above brick ledge, if brick is used below grade. Provide end dams for liquid-applied membrane waterproofing flashings on brick ledge by providing a boot of asphalt coated copper flashing double lapped by neoprene flashings, sandwiched between layers of liquid-applied membrane waterproofing and neoprene.
 - C. For all flashings, provide a small piece of flashing set in and covered with bedding material at all inside and outside corners (including end dams) and all flashing folds to cover all cuts, folds (end) and corners in the flashings.
 - D. Provide weeps in the head joints of the same course of masonry bedded in the flashing mortar. Weeps to be 16" on center (maximum). Also, specify weep top end securement.

- E. Overlap end joints of asphalt coated copper flashings not less than 6"; coat the contacting surfaces and seal lap with mastic. Provide 16" minimum overlaps for steps in flashings. Seal exposed edges with mastic. Asphalt-coated copper flashings to be continuous pieces above openings. Install all other flashings in lengths as long as possible with as few laps as possible. Use full height end dams where possible. End joints of prefabricated stainless steel flashings are to be fully soldered.
 - . Install all asphalt impregnated thru-wall flashings and mastics as necessary to minimize any contact with sealant.
28. Specify: flashings shall be protected immediately following installation.

Division 5 – Metals

05120 – Structural Steel

- . Fabricator and erector shall have a minimum of 5 years experience in performing the work of this section. The fabricator and erector shall submit resumes showing compliance with the work experience requirement to the design professional for written approval prior to starting work.
- . Fabricator shall submit certifications that they are registered and approved by the building official, in accordance with 2000 IBC Chapter 17, and participate in an approved AISC quality control program to the design professional and structural engineer for written approval, prior to the start of work. The fabricator shall participate regularly in the third party quality control program of AISC and be registered and approved by the building official in accordance with 2000 IBC Chapter 17. Fabricator shall also be acceptable to the structural engineer.
 0. As an alternate to the requirements above, the contractor will pay for full-time inspection during the fabrication of the project steel. This inspection will be conducted by the owner's inspection company (at the fabrication plant). In addition, the fabrication plant must also be acceptable and approved in writing by the structural engineer, design professional, and building official. Do not proceed with work until the design professional has provided final written approval.
- . Specify that the contractor provide certification that welders to be employed in this work have satisfactorily passed AWS qualification tests. Fabricator and erectors shall submit current welding certifications, for fabrication plant and field welding, to the design professional for written approval prior to the start of welding. If re-certification of welders is required, retesting will be the contractor's responsibility.

05310 – Steel Decking

- . Fabricator and erector shall have a minimum of 5 years experience in performing the work of this section. The fabricator and erector shall submit resumes showing compliance with the work experience requirement to the design professional for written approval prior to starting work.
- . Specify that the contractor provide certification that welders to be employed in this work have satisfactorily passed AWS qualification tests. Fabricator and erectors shall submit current welding certifications, for fabrication plant and field welding, to the design professional for written approval prior to the start of welding. If re-certification of welders is required, retesting will be the contractor's responsibility.
- . Specify fabrication plant must comply with the Quality Control provisions as established by the Steel Deck Institute. Submit documentation that verifies compliance to the design professional for their written approval prior to start of work. Fabrication must also be approved by the building official and the structural engineer in writing prior to start of work.

05500 – Metal Fabrication and All Other Metal Sections

- . Same requirements as Section 05120-Structural Steel.
- . The design professional shall comply with 2000 UBC for minimum corrosion resistance for veneer support, anchors, ties (excluding brick ties), etc.

Division 6 – Wood and Plastics

06100 and 06200 – Rough Carpentry and Finish Carpentry

- . Specify and approve a nailing schedule.
- . Specify kiln dry and moisture content of all permanent lumber.
- . Specify grade and species of lumber.
- . Specify exterior grade for all plywood.
- . Require a grade stamp on all wood brought to the construction site for structural use.
- . Specify only screws or bolts for use with treated wood. Screws or bolts must be unaffected by treatment chemicals and corrosion resistive, such as galvanized or stainless steel.

06 – Architectural Millwork

- . Specify material for face frame of cabinets.
- . Specify locks to be on campus master.
- . Specify all hardware.
- . Do not specify custom stains without approval of BYU-Idaho.
- . Specify countertops by application.

06 – Backing

- . Specify fire treated plywood backing behind furniture and accessories.
- . Specify fire treated solid wood backing behind accessories.

Division 7 – Thermal and Moisture Protection

07120 – Waterproofing

- A. All waterproofing materials and procedures shall be as specified by the owner. No substitutions shall be allowed. Refer to Appendix 07120 for specifications.

07210 – Building Insulation

- A. Specify procedures/precautions for installation of vapor barriers (at each location). Completely detail the vapor barrier to prevent condensation from occurring at relative humidity levels anticipated by ASHRE or caused by Program.
- B. Specify insulation by type and manufacturer, stating performance characteristics of density, aged average R-value per inch, flame spread, and fire rating.
- C. Once specified, do not allow substitutions.

07500 – Roofing

- A. All roofing materials and procedures shall be as specified to achieve a BYU-Idaho standard roof. Refer to Appendix 07500. Minimum requirements will be for fully adhered EPDM, no exception.
- B. Specify on-site storage requirements of roof materials (tarp and pallet).
- C. Roof blocking wood shall be non-treated.

07600 – Flashing and Sheet Metal

- A. Specify gauge. Specify whether galvanized, stainless steel, pre-painted, pre-finished steel; or anodized aluminum.
- B. Require isolation of dissimilar metals.
- C. Specify that no fasteners penetrate through horizontal surfaces of parapet flashing.
- D. Flashing Materials
 - 1. Thru-wall flashing materials shall be specified by the owner. No substitutions shall be allowed. Specify the following for concealed flashing materials:
 - a. Thru-wall flashing at brick ledge shall be American Hydrotech MM6125 liquid applied membrane waterproofing with Hydrotech Flex-Flash Un sheet reinforcing membrane furnished and installed under Section 07120 but only when installed above American Hydrotech waterproofing.
 - b. Waterproofing protection flashing shall be prefabricated, preformed, fully welded, stainless steel flashing fabricated from Type 304, 20 gauge, sheet steel, furnished and installed by the masonry contractor.
 - c. Thru-wall flashing above grade, and brick ledge where waterproofing is not applied to the brick ledge shall be “Copperseal” by York Manufacturing with a continuous sheet of copper weight 3 oz./sq. ft., coated both sides with plasticized asphalt weighing not less than 6 oz./sq. ft. Install with 6” laps sealed with “Cop-R-Tite” Mastic by York on both contact surfaces.
 - d. Flashing adhesive/mastic to be “Cop-R-Tite” (asbestos free) by York Manufacturing for copper seal, 6”laps, vertical legs, etc.

- e. Fasteners for thru-wall flashing to be ¼”x 1½” diameter long Powers “Mushroom Head Nylon Nailin” anchors with stainless steel nails, #02548.
- f. Brick tie anchors that penetrate thru-wall flashing to be Dur-O-Wall 5213 series (stainless steel).
 - . Compression bar to be 15-16 gauge x 1½” stainless steel bar set in full bed of “Cop-R-Tite” mastic and anchored with ¼”x 1½” long Powers “Mushroom Head Nylon Nailin” anchors with stainless steel nails at 12” o.c. but starting no more than 3” from ends.
 - . Approved equals will be considered.

07900 – Joint Sealers

- . All joint sealer materials and procedures shall be reviewed by BYU-Idaho.
- . Installer must be a firm with five years experience specializing in installing sealants.
- . Specify minimum and maximum depth and width for each sealant application.
- . Comply with recommendations of ASTM C 1193 for use of joint sealants.
- . Verify compatibility and adhesion of sealants with thru-wall flashings.
- . Backer rod to be non-oily, non-gassing, as recommended or accepted by the sealant manufacturer.
- . Specify that all concrete and masonry exterior joints scheduled to receive sealant are primed after the other preparations are completed. The primer must be as recommended by the manufacturer.
- . Specify that if a staining type primer is used, apply material in a manner that will prevent exposed stain residue.
- . Specify that the sealant or primer shall not be applied when the air or substrate temperatures are 40 degrees F or below.
- . Comply with joint sealant manufacturers written instructions.

Division 8 – Doors and Windows

08100 – Hollow Metal (Steel) Doors and Frames

- A. Contact the owner for approved manufacturers of hollow metal door/frame combinations, and hollow metal frame/wood door combinations. No substitutions are allowed.
- B. Specify only standard sizes.
- C. Specify early separate delivery of hollow metal doorframes.
- D. Specify that shop drawings are to be started immediately following notice to proceed to achieve early frame delivery. Shop drawings shall be submitted to the design professional for approval in sufficient detail to assure a comprehensive quality control check. Shop drawing door and frame numbers shall be numbered the same as on architectural drawings and door schedule.
- E. Specify minimum of 18 gauge interior doors, 16 gauge interior frames, 14 gauge galvanized or stainless steel exterior doors and frames.
- F. Frames shall be factory pre-assembled with mitered fully welded joints ground smooth and delivered to the job site with spreaders. If knockdown and two-piece frames are unavoidable, specification must require quality standards for securing and finishing these frames.
- G. All fire-rated doors and frames shall bear the appropriate UL label. Specify the appropriate UL label.
- H. Specify shop priming. All primers shall be applied uniformly: inside, outside, and under removable stops and trim.
- I. Specify transport, handling, and job site storage protection requirements for doors and frames (spreaders, rapping, vertical storage, pallets, etc.).
- J. Specify all frames shall be delivered prior to masonry construction.
- K. Specify flush and seamless end channel closure pieces at door heads.
- L. Specify all frames in masonry walls shall be grouted full with Portland cement grout. Gypsum grout is not permitted.

08200 – Wood Doors

- A. All wood doors shall be solid core, 5 ply, guaranteed against manufacturing defects for the life of the building.
- B. Shop drawings shall be submitted in sufficient detail to assure a comprehensive quality control check. Shop drawing door numbers shall be numbered the same as on architectural drawings and door schedule.
- C. Define requirements for delivery, storage, and handling to assure that manufacturer's criteria are met. Specify doors shall not be delivered until building is enclosed, warm, and dry, and the painting subcontractors are on the job and ready to apply finish immediately after delivery.
- D. Specify wood door adhesives shall be 100% waterproof.
- E. Specify all wood doors shall be mortised from templates furnished by the hardware supplier and coordinated with hollow metal supplier.
- F. Specify all edges of wood doors are to be sealed.

08410 – Aluminum Entrances and Windows

- A. All window products shall be as specified by the owner. Refer to Appendix 08500 for window specifications and Appendix 08900 for curtain wall specifications.
- . Include in this specification division, all fire and smoke containment requirements for aluminum window walls and aluminum curtain wall assemblies; spec may be written to have single source responsibility. Window and/or curtain wall manufacturer shall be responsible for these requirements.
 - . Specify manufacturer shall submit a cutaway sample of the frame section and anchorage to be used. Retain sample until installed units are verified to be in conformance with construction documents.
 - . Finish shall be by anodizing only.
 - . Shop drawings shall detail all frame section components and show elevations, dimensions, and details of all entrances and windows, including descriptions of metal finishes, glazing, and sealant material. Contractor is responsible for proper dimensions of rough and masonry openings.
 - . Require factory glazed, unitized construction of the largest possible expanses of assembly as possible.
 - . Specify and detail window openings to be thermally broken, sills flashed to exterior, flashings end dammed, and that wall conditions do not short circuit thermal break of installed window.
 - . Doors and frames shall be shop mortised and reinforced per hardware manufacturer's templates for specified hardware items.
 - . Weather stripping for exterior doors shall be continuous except at heads, jams and door bottoms.
 - . Care shall be exercised during handling and installation to prevent damage to finishes throughout the project so that the work shall be free of scratches, dents, and deformations. Units with any such damages or defects shall be replaced at contractor's expense.
 - . Glazing units shall be provided according to manufacturer's recommendation for sealants and edge clearances.
 - . All window and entrance frames shall be of thermal break construction except at jambs and heads of entrance frames.
 - . All glazing, including spandrel glass, shall be insulated.
 - . The entrance contractor shall furnish and apply all isolation, caulking, and sealant materials required to caulk all joints between entrance frames and other construction to provide a complete, thermally broken, weather tight installation.
 - . Thresholds shall be set in double bed of sealant.
 - . Specify air infiltration, water infiltration, and deflection limits.
 - . Require cleaning after installation of all frames, glass, adjacent masonry, etc. Remove misplaced sealants, other materials, and stains.
 - . Specify and detail window frame anchorage.
 - . Specify that the window manufacturers shall submit and window installer shall install a sample window at pre-installation conference under the inspection of the owner's window consultant and testing technician. Pre-installation unit shall pass air and water infiltration tests prior to installation of remaining units and prior to payment for window materials.

08710 – Hardware

- A. Provide a clear definition of extent and scope of finished hardware items.
- B. Provide hardware section to the owner for review and approval prior to specifying.
- C. Alarmed exit devices allowed only upon owner's approval; investigate/ recommend magnetic locking device wired to fire alarm.
- D. Specified hardware shall be suitable and adaptable to details and surrounding conditions.
- E. Require UL listed hardware for fire-rated door assemblies.
- F. Hardware on doors serving hazardous or restricted locations shall comply with building code.
- G. Specify hardware schedule is to be submitted to the design professional for approval prior to ordering. The list shall include each hardware item, base metal, finish, and type number.
- H. Specify hardware suppliers to have local representation.
- I. Specify samples shall be furnished.
- J. Hardware supplier shall furnish other contractors, subcontractors, and the owner with copies of the final approved hardware schedule.
- K. Necessary templates and schedules shall be submitted as soon as possible to hollow metal and wood door fabrication in accordance with their fabrication schedule.
- L. Upon approval by the design professional of the hardware schedule, a keying schedule shall be submitted to the design professional for review and approval by the owner.
- M. Manufacturer's written installation and adjustment instructions shall be followed.
- N. Installation of hardware shall be by experienced personnel.
- O. Hardware shall be fitted before final coat of paint or other finishes are applied.
- P. Hardware shall be permanently installed after finishing operations are complete and dry.
- Q. Hardware shall be properly adjusted and left in operating condition at the time of substantial completion. Coordinate with electrical specification for any special alarms and/or releases.
- R. Provide construction cylinder cores, keys, and core puller.
- S. Specify magnetic hold open for all doors with closers.

Section 08711 – Hardware

- A. Panic hardware shall be secured open by interchangeable core.
- B. Everest Primus cores by Schlage are the only acceptable building locks.
- C. Exterior door, Everest Primus core, add side bar for security.

Section 08740 – Electro-Magnetic Hardware

All fire rated doors required to have a closer shall be equipped with magnetic hold-opens.

08800 – Glazing

- A. At ground level, not to exceed head height, tempered glass is allowed; otherwise specify laminated safety glass.
- B. Glass material shall be specified in accordance with performance criteria: daylight transmittance, daylight reflectance, U value – winter night, U value – summer day, shading coefficient, and relative heat gain.
- C. Glass manufacturer's warranty shall guarantee insulating glass seal for a period of ten years. Guarantee shall be in writing and delivered to the design professional for transmittal to the owner.

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Division 9 – Finishes

- A. For each type of finish work specify minimum and maximum requirements of substrate and ambient conditions for installation including, but not limited to, moisture and temperature requirements.
- B. Specify ventilation and isolation requirements to avoid complaints regarding noxious fumes.
- C. SPECIFY THAT THE CARPET INSTALLER MUST BE CERTIFIED BY THE CARPET MANUFACTURER FOR INSTALLATION OF A SPECIFIC PRODUCT. In the specifications, list the approved installers and state that no substitutes will be considered. The carpets are Owner furnished and Contractor installed. The brands will be Lees Carpets, Mannington Carpets, or Interface Carpet Tiles.

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Division 10 – Specialties

- A. For each type of finish work, specify minimum and maximum requirements of substrate and ambient conditions for installation including, but not limited to, temperature and moisture requirements.
- B. All signage shall comply with ADA and be provided and installed by owner.

DRAFT

Division 11 – Equipment

- A. Equipment shall be recommended by the design professional after consultation with the owner.
 - . Steam in contact with food or food containers shall not be the same as, and shall be isolated from, treated heating plant steam.

DRAFT

Division 12 – Furnishings

- . All furnishings shall be owner furnished and installed.

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Division 13 – Conveying Systems

14200 – Elevators

- . Elevator capacity shall be sized to accommodate movement of an emergency medical gurney, equipment, furnishings, etc.
- . Verify university's product preference, and service records.
- . Keyed elevators shall not be specified.

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Division 14 – Mechanical

15050 – Basic Mechanical Materials and Methods

- . Pre filters (2" pleated) are required. Secondary filters shall exceed 65% (ASHRAE standards) at 0.3-micron particle size.
- . Specify that all cooling coils shall have drip pans large enough to keep all condensate off the floor, and shall be manufactured with 1/4"/foot slope to drain. Require inspection and water test prior to acceptance.
- . Require automatic control such that additional fume hood exhaust will cause the supply air to be increased to meet exhaust needs.
- . Unions or flanges shall be provided on all coil piping connections to allow for ease of future cleaning.
- . Detail the distances from elbows and fittings when required for proper airflow.

15990 – Testing, Adjusting and Balancing

- B. The balancing damper locations shall be specified in contract documents and not left to the discretion of the contractor.
- B. Dampers in diffusers and registers shall not be used for balancing airflow.
- B. Specify balancing at 100% maximum outside CFM and at minimum outside CFM.
- B. Specify hydronic balancing at peak cooling and peak heating conditions.
- B. Specify water flow balanced to no less than 90% of required flow.
- B. Specify that pump discharge pressure shall be adjusted to the lowest setting possible to achieve balance at the most remote hydronic terminal.
- B. Specify that balancing must confirm that total fan airflow equals the total airflow of all terminal units.
- B. Specify that balancing shall be performed by an independent balancing contractor hired by the general contractor and shall be 100% inspected by the owner's balancing consultant. Specify that the balancing company measure the minimum fresh air at both peak summer and peak winter modes. Require a length of straight duct inside the building to permit accurate measurement of outside airflow.

V. Appendices

Appendix 00001 – Sample of Submittal Signature Approval Sheet

Project Name
Phase Submittal
Approvals

By _____
Title: Administrative Vice-President
Date: _____

By _____
Title: Director – Facilities Planning and Construction
Date: _____

By _____
Title: Dean of (list appropriate College or Department)
Date: _____

Building committee members

Design professional

Design professional's address

Appendix 01400 – Quality Assurance Chart

The following schedule identifies the owner’s consultants’ participation in the observation and testing process.

OITL = Owner’s Independent Testing Laboratory

	Tests Specified	Owner’s Consultant	Owner’s Testing Lab(s) (Testing)	Owner’s Testing Lab(s) (Observation)	Owner’s Roof Consultants	Owner’s Window Consultant (Observation Tests)
Section 02200, Earthwork	X	X	X	X		
Section 02240, Soil Grouting	X		X	X		
Section 02710, Foundation Drainage	X		X	X		
Section 03200, Concrete Reinforcement	X	X	X			
Section 03300, Cast-In-Place Concrete	X	X	X			
Section 04100, Mortar	X	X	X			
Section 04200, Unit Masonry	X	X	X			
Section 05100, Structural Steel	X		X	X		
Section 05310, Metal Roof Deck	X		X	X		
Section 05320, Metal Floor Deck	X		X	X		
Section 05500, Metal Fabrication	X		X	X		
Section 07120, Membrane Waterproofing		X				

	Tests Specified	Owner's Consultant	Owner's Testing Lab(s) (Testing)	Owner's Testing Lab(s) (Observation)	Owner's Roof Consultants	Owner's Window Consultant (Observation Tests)
Section 07125, Concrete Deck Waterproofing		X				
Section 07250, Sprayed-On Fireproofing	X		X	X		
Section 07500, Bituminous Roofing Membrane					X	
Section 07530, Single-Ply Membrane Roofing					X	
Section 07600, Roof Related Sheet Metal					X	
Section 07700, Roof Accessories					X	
Section 07900, Joint Sealants	X	X				
Section 08210, Aluminum Doors and Frames	X		X			
Section 08520, Fixed Aluminum Windows	X		X			
Section 08950, Aluminum Curtain Wall	X		X			
Section 15990, System Balancing		X				

Appendix 01410 – Required Testing and Inspection Services

Section 02200 – Earthwork

- A. Recommend that owner:
 - 0. Recommend that owner retain the services of an independent testing laboratory to perform continuous (full-time) on-site geotechnical observation during rough grading, stripping, excavating, filling, and backfilling operations. Do not commence or perform any of this work without the presence of the testing laboratory. Notify the Testing Laboratory 5 working days in advance of rough grading, stripping excavating, filling and backfilling operations. Provide a minimum of 3 working days notice thereafter.
 - 0. Recommend that owner retain the services of an independent testing laboratory to perform analysis of fill materials and density testing. Testing procedures, frequency, and requirement for fill materials and placements are to be specified in Section 02200 of the construction documents.
 - 0. Recommend that owner retain their consultant to provide observation on a “spot check” basis.
- A. Specify that the owner’s geotechnical testing laboratory shall advise the contractor and the design professional of any materials or operations that in their professional opinion will not produce specified results, and shall perform the following operations:
 - 0. Observe and evaluate soil conditions at bottom of all excavations; determine limits of excavation where applicable. Evaluate excavation depth and width needed and document size of excavation based on contractor’s staking. Perform hand auger borings. Classify soil as per ASTM D 2488 and ASTM D2487.
 - 0. Qualify on-site and borrow soils for suitability to project requirements.
 - 0. Observe, evaluate and report contractor’s operations within context of soil limitations and project requirements.
 - 0. Choose location and conduct soil density tests on fill and backfill materials.
 - 0. When applicable, determine quantities of excavation and/or fill for payment.
 - 0. Evaluate and report if actual soils bearing values meet soil-bearing values on which building design is based.
 - 0. Document a comparison between the original soil testing report and borings and that found. Also, report the oversize excavation and depth of excavation.
 - 0. Perform analysis of fill materials. Testing procedures, frequency, and requirement for fill materials and placements are specified in Appendix 01400.

Section 02200 – Earthwork: Minimum Schedule of Tests

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure)
1. Excavation Observation	Hand auger boring with Soil Classification per ASTM D2487 and D2488	Judgment by Geotechnical Engineer in comparison with subsurface exploration report.	When all structural excavations are completed and prior to fill or concrete placement.	Additional excavation and/or surface compaction.
2. Fill Testing	A. Mechanical Analysis ASTM D422	Results within Specified percentage ranges for different size particles for each fill type.	1 per 1000 tons or 550 cu yds (which ever produces the most tests), or fraction thereof for each soil type	Reject fill type or retest.
	B. Modified Proctor ASTM D1557	Test required in conjunction with density test for determination of compaction levels.	1 per soil type.	N/A.
	C. Density Test ASTM D1556 or D2922	Minimum specified compaction level (as compared to Modified Proctor).	Reject – additional compaction or removal/ replacement required. Then retest	

Section 02200 – Earthwork: Minimum Testing Table—for consideration

Description	Minimum Percentage Modified Proctor	Modified Proctor
Natural sub-grade (cohesive less soils)	90%	1/500 sq yd and at every column pad and every 50' under wall/strip footings and fraction thereof (both).
General building fill	95%	1/100 sq yd and fraction thereof
Fill under building foundations & oversize	95%	1 per every 50' under wall/strip footings and fraction thereof and every column pad
Exterior building backfill (non-structural areas)	90%	1/500 sq yd and fraction thereof
Fill under and within 10' of paved and concrete areas (exterior)	95%	1/500 sq yd and fraction thereof
Landscape fill areas (more structural)	90%	1/1000 sq yd and fraction thereof

Section 02500 – Asphalt Paving – Construction Testing

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Density	ASTM: D979 (cores).	Minimum of 95% of the density of the maximum Marshall density.	One per 500 tons or fraction thereof per course per day, minimum of 3 tests per installation per course.	Remove and replace.
2. Marshall Properties	ASTM D1559	Meet mix design criteria.	Two tests each day of paving.	Adjust plant mixing. Reject if more than 2 consecutive failing tests.
3. Extraction/Gradation	ASTM D2172 ASTM C136 & C117.	Meet asphalt cement content and aggregate gradation criteria as established by mix design.	Two tests each day of paving. Secured with sample for Marshall.	Same as above
4. Thickness (During paving only)	N/A	Use ruler or other device to spot-check compacted thickness during paving.	Once per 100 lineal feet of paving.	Adjust paver screen height.
5. Temperature	N/A	Temperature to range at delivery as specified.	Once per 200 sq ft per day.	Adjust temperature at batch plant.

Section 02513 – Asphalt Concrete Paving – Pre-construction

(For projects greater than 1000/sq ft.)

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Mix Design and Gradation	ASTM D1559 (Marshall Method of Mix Design) ASTM C136 and C117 (Aggregate)	Refer to specification for requirements	One mix design for each type of mix with aggregate gradations. Adjust mix design (aggregate).	Adjust mix design (aggregate).
2. Asphalt Cement	ASTM D5 (Penetration) AASHTO T49.	Review manufacturer's product certification for acceptance. Test if current certification not available.	Review certifications for each shipment	Do not accept asphalt cement.

Section 02710 – Sub-Drain System

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Cross-Section	N/A	Review that the drain tile cross-section system was installed in accordance with project documents.		Notify design professional and contractor.
2. Elevation	N/A	Verify drain tile elevation.		Notify design professional and contractor.
3. Performance Test	N/A	Test with water flow or check the drain tile lines before backfilling to assure free flow.		Notify design professional and contractor.
3. Aggregate	ASTM As specified.	All aggregate to meet grading requirements.		Change material & retest.

Section 03310 – Concrete Work - Pre-construction

Concrete Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Concrete Materials A. Cement	ASTM C150	Review certification to document conformance. Chemical and physical requirements of ASTM C150. Test if current certificate is not available for all requirements.	One sample for each proposed cement type.	Cement not accepted.
B. Aggregate	ASTM C33	Review tests to document conformance to the requirements of ASTM C33. Test if current test is not available for all requirements.	One sample for each proposed aggregate	Aggregate not accepted.
C. Potential Reactivity	ASTM C289	Review tests to verify material is innocuous according to standard outlined in ASTM C289. Test if current test report is not avail.	One sample for each proposed aggregate.	Aggregate not Accepted.
2. Admixtures	ASTM C494 ASTM C260	Review manufacturer's certification to document conformance to ASTM C494. Verify compatibility of admixtures to work together.	Manufacturer's certifications reviewed prior to start of project for each admixture.	Admixture not accepted.

Concrete Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
3. Mix Designs A. Proportioning	ACI 201 ACI 211	Prepare a test batch for each design mix provided by the contractor. The project batch plant to batch design mixes. Conduct all tests. One trial batch and testing for each proposed design mix.	One trial batch for each proposed concrete mix.	Re-design mix.
B. Acceptance	ACI 301	Review proposed mix designs to verify design includes the following info: mix number, specified compressive strength (at 28 days), maximum water/cement ratio, mix proportions, size of coarse aggregate, slump (with and without high range water-reducing agent), air content, specified admixtures and 28 day average compressive strength over design.	Every mix design.	Mix design not accepted.
4. Reinforcement, Epoxy Coated Bars, coated tie wire, and chairs	ASTM A775 ASTM A615	Review certifications to document conformance. The tensile strength of the epoxy-coated bar will meet the requirements set forth under ASTM A615. The epoxy coat shall have a film thickness 8 to 12 mils after fully cured. There shall not be more than an average of 2 holidays per linear foot of coated bar. The plant and rebar must comply with ASTM A775 / A775M. Review production plant reports for all the proceeding.	Test for thickness of coating shall be made on a minimum of two bars of each size used. Bend test of coating flexibility for coating shall be conducted on at least one bar of each size used. Holiday testing of coating shall be made on at least ½ of the bar-stock (normally at manufacturers plant). One tension test and one bend test (for all black and coated project rebar) shall be made of each size bar.	Bar not accepted.

Concrete Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
5. Reinforcing Bars	ASTM A615	A615 60 ksi yield grade requirements of ASTM A615	One tensile and bend test per bar size and each type to be used in work.	Do not accept lot of bars.
6. Concrete Uniformity	ASTM C94 Annex A-1	Review certification of document conformance. Limits for variation in unit weight, air content, slump, coarse aggregate content, and compressive strength. Test if current certification is not available for all the requirements.	One per plant per 2 years or fraction thereof.	Do not accept source for concrete.

Section 03310 – Concrete Work – Construction

Description	Description	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Sampling Fresh Concrete				
A. Slump	ASTM C143	All concrete slump not to exceed design slump. Refer to Specifications.	Test at the point of discharge each and every truck. Slump every truck.	Concrete not accepted.
B. Air Content	ASTM C173 (Volumetric) or ASTM C231 (Pressure)	Air content must be in range of design mixes. Refer to Specifications.	One test at start of each day's pour and every 50 yd thereafter in conjunction with casting of compressive strength specimens. Air content test every truck with air entrained concrete.	Concrete not Accepted
C. Concrete Temperature	ACI 306R-88	Refer to the minimum placement temperatures in ACI 306R, table 3,1 Placement temperatures should not be higher than the minimums by 20deg. F.	Test each truck as concrete arrives when air temperature is 40? F or below and when 80? F and above	N/A

D. Casting of Compressive Strength Specimens	ASTM C31	Specimens cast by a certified ACI Level I technician	One set of four standard cylinders at start of day's pour and every 50 yd thereafter for each type of concrete for laboratory curing.	Adjust mix design for proper yield
. Unit Weight and Yield	ASTM C138	The concrete mixture shall yield a minimum of 27 cu ft per yd	One test at start of each day's pour for each class of concrete and every 50 yd thereafter.	
. Compressive Strength Testing	ASTM C39	Must meet or exceed design compressive strength for each particular concrete class.	One set (1-7 day, 2-28 day and one hold) at the frequency of item D above.	Additional testing and/or concrete rejected.
. Concrete Delivery		Air-entrained concrete must be discharged within 60 minutes from time of initial mixing. Non-air entrained concrete must be discharged within 90 minutes.	Every truck	Concrete not accepted.
2. Batch Plant Inspection	ASTM C94	ACI Level I technician present at batch plant to verify batching tolerance is not exceeded (random basis).	Random basis. Review plant certifications once during construction.	Concrete not accepted.
3. Floor flatness and levelness	ASTM E1155	Refer to project specifications	All interior slabs and critical exterior flat work. Floor levelness does not apply to cambered or inclined surfaces.	Design professional/owner to determine corrections

Section 04100 – Mortar

- A. Specify the minimum and maximum compressive strength for each mortar type for the construction field-testing.
- A. Specify that contractor shall provide the mortar and grout mix designs. The mix designs shall be designed and signed by a professional engineer employed by a qualified independent laboratory; said laboratory to be other than the owner's testing laboratory. The structural engineer shall approve mortar and grout mix designs after consideration of the pre-construction test results.
- A. The owner's testing laboratory shall verify mortar and grout proportions during the construction sampling.

Section 04200 – Unit Masonry

- C. Brick selection for testing and approval is required early in the design process. The selected brick must pass color selection and prequalification testing prior to bidding. Brick testing (12 weeks per sample) shall start during schematic design and be completed during the design development phase. Refer to Division 4 – Masonry, 04200 and Appendices 01400 and 01410.
- C. Specify all pre-construction testing for this section in the construction documents must be completed by the owner's independent testing laboratory for this project, paid for by the owner and approved by the design professional in writing prior to start of masonry site work.
- C. Specify that the contractor shall submit certifications (cement and lime) and all other preconstruction test results performed by the owner's independent testing laboratory to the design professional 30 days prior to the scheduled start of masonry work for written approval prior to the start of work.
- C. The structural masonry would be observed and tested based on the building codes, structural engineers and owner's requirements and the Quality Control Plan approved by the building officials. Specify the requirements (Quality Control Plan) for observations and testing. The owner retains the observation agency and the test laboratory.
- C. Recommend that the owner's consultant on a "full time" basis will observe all thru-wall flashings.

Section 4 – Brick Masonry – Pre-construction

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (if failure occurs)
<p>1. Physical Test of Units Properties</p> <p>A. All requirements of ASTM C216</p> <p>B. Freeze/Thaw Tests</p>	<p>ASTM C67 Cut Section</p> <p>ASTM C67 Method</p>	<p>Meet all ASTM C216 requirements for Grade SW, Type FBS. Also review cut section for vitrification if question pour structures. Check specification for required brick type.</p> <p>Brick must pass ASTM C67 requirements after 50 cycles of freezing and thawing.</p>	<p>Review previous test data from supplier and one set of brick units tested for each brick. Do not accept brick.</p> <p>Review previous Test data & perform freeze/thaw testing for each brick type.</p>	<p>Do not accept brick.</p> <p>Do not accept brick</p>
<p>2. Mortar Mix Design</p> <p>A. Gradation and Quality of Sand</p>	ASTM C144	Meet all ASTM C144 requirements	One sample of source material.	Do not accept sand.
<p>B. Mix Design (7 and 28 day compressive strength, water retention, and air content)</p>	ASTM C270 also, additional trail batch at field flow and test for compressive strength using UBC #21-16. Include pigments, if used.	<p>For laboratory flow mortar, comply with all ASTM C270 property requirements for all mortar types.</p> <p>For field flow mortar, refer to specifications and construction testing table for field mortar strength range requirements.</p>	One trail batch with laboratory flow for ASTM C270 tests and one trail batch with field flow for UBC #21-16 tests, for each type of mortar	Adjust mix design.
<p>3. Test of Assemblages</p> <p>A. Tensile Bond Strength</p>	ASTM E518	As required by Structural Engineer. The contractor shall mix mortar and cast test prisms in the testing facility where the prisms will be tested.	Five test prisms of 7 bricks each.	Adjust mix design.

Section 4 – Concrete Masonry – Pre-construction

Description	Method of Test	Standard (Pass/Fail)		Frequency Action Required (If Failure Occurs)
<p>1. Physical Test of Units Properties</p> <ul style="list-style-type: none"> Meet all requirements of ASTM C90 Shrinkage 	<p>ASTM C140</p> <p>ASTM C426</p>	<p>Meet requirements for Grade N Type I as set forth in ASTM C90.</p> <p>Comply with ASTM: C90, Table 1</p>	<p>Review previous test data from supplier and one set of blocks tested for each structural block type.</p> <p>Run tests if block does not meet moisture content requirement above.</p>	<p>Do not accept block.</p> <p>Do not accept block.</p>
<p>2. Mix Designs</p> <ul style="list-style-type: none"> Gradation & Quality of Aggregate Mortar -Grout Mortar Mix Design (7- and 28-day compressive strength, water retention, and air content) 	<p>ASTM C144</p> <p>ASTM C404</p> <p>ASTM C270 also, additional trial batch at field flow and test for compressive strength using UBC #21-16. Include color pigment, if used</p>	<p>Meet all requirements of ASTM C144</p> <p>ASTM C404 Meet all requirements of ASTM C404</p> <p>For laboratory flow mortar, comply with all ASTM C270 property requirements for all mortar types. For field flow mortar, refer to specification and construction testing table for field mortar strength range requirements.</p>	<p>One sample.</p> <p>One test sample of sand and coarse aggregate. One trail batch laboratory flow for ASTM C270 tests and one trail batch with field flow for UBC #21-16 test. For each type of mortar.</p>	<p>Do not accept sand.</p> <p>Do not accept Aggregates</p> <p>Adjust mix designs</p>

Section 4 – Concrete Masonry – Preconstruction (cont'd)

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
<ul style="list-style-type: none"> Grout Mix Design 	ASTM C476 UBC NO. 21-18	As required by structural engineer to achieve his required f'm.	One test set per type with trial batch and test prisms.	Adjust mix design.
3. Test of Assemblages <ul style="list-style-type: none"> Prism Compressive Strength 	ASTM C1314	Based on structural design. The contractor shall mix mortar, grout and cast test prisms in the testing facility where the test prisms will be tested. Provide structural strengths required by structural engineer.	One set of 5 prisms for each type of block and mortar at 28 days. Where corresponding construction is partially grouted, two sets of prisms shall be made – one grouted and the other non-grouted.	Adjust mix design, use different block and/or redesign wall for low load carrying capacity

Construction

Section 4 - Brick Masonry – Construction Testing Table

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Physical Test of Units Properties	ASTM C67	All requirements of ASTM C216, Grade SW, Type FBS. Check specification for the required brick type.	One set of 10 bricks for every 100,000 units or fraction thereof.	Increase sampling frequency for rejection. Notify design professional and owner
2. Mortar Compression Tests (Field Mortar)	UBC No. 21-16	Structural to specify compressive strength range required for field testing of each mortar type.	One set of six (6) 2" x 4" cylinders for every 500 sq ft of wall area or floor level, whichever is less, to give the most tests. 3 tested at 7 days and 3 tested at 28 days.	Increase sampling frequency; review data with structural engineer for action required.
3. Mortar Aggregate	ASTM C144, gradation only	Meet gradation requirements of ASTM C144 and evaluate grain size to per-construction test results.	One sample of material per delivery of sand.	Review test results with Design professional if significant difference from per-construction tests.
4. Cold Weather Practices	Observe methods	Observe methods B.I.A Recommended Practices and Guide for Cold Weather Masonry Construction and specification requirements (whichever provides most stringent protection)	Daily basis	Notify authorities if work is damaged as result of exposure. Contact structural and materials engineer for remedial action.
5. Test of Assemblages . Bond Strength	ASTM E518	As required by structural engineer.	One set of 5 test prisms of 7 bricks each at time of sample panel construction and during the first week of masonry construction.	Increase sample frequency and review data with structural engineer.

Construction

Section 4 - Brick Masonry – Construction Testing Table

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
B. Water Permeance	ASTM E514	Inspect Masonry. If workmanship not acceptable, contractor to build panel at owner's OITL for testing.	Daily Basis.	Accept or reject portions of work as compared to test panel.

Section 4 - Concrete Masonry – Construction Testing Table

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Mortar Compression Tests (Field Mortar)	UBC NO. 21-16	Structural to specify compressive strength range required for field testing of each mortar type.	One set of six (6) 2"x4" cylinders for each type of mortar per every 500 sq ft of wall area or floor level, whichever is less, to give the most tests, 3 tested at 7 days and 3 at 28 days.	Increase sampling frequency; review data with structural engineer for action required
2. Grout Compression Tests	ASTM C1019 NCMA – TEK 71 UBC NO. 21-18	As required by structural engineer to achieve required f _m .	One set of 4 prisms every 500 sq ft of wall area or floor level, whichever is less, to give the most tests. One prism tested at 7 days and 3 at 28 days.	required.
3. Compressive Strength of Prism * (Refer to note below) *Where corresponding construction is partially grouted, two sets of prisms shall be cast and tested – one set grouted and the other not grouted for noted frequency.	ASTM C1314	As required by structural engineer to achieve required f _m .	One set of 4 prisms per every 5000 sq ft of wall area, or floor level, whichever is less, to give the most tests. One prism tested at 7 days and 3 tested at 28 days.	Increase sampling frequency; review data with structural engineer for action required.

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
4. Cold Weather Practices	Observe methods onsite	IMIAC Recommended Practices and Guide for Cold Weather Masonry Construction and specification requirements (whichever provides the most stringent protection).	Daily basis	Notify authorities if work is damaged as result of exposure. Contact structural and material engineers for remedial action.
5. Physical Test of Units Properties	ASTM C140	Meet requirements of Grade N, Type I as set forth in ASTM C90.	Once during 1 st wk of masonry construction and randomly thereafter for each size and type	Check production, increase testing frequency. Notify structural engineer.
6. Mortar and grout mix aggregate gradations.	ASTM C144 ASTM C404	Meet gradation requirements of ASTM C144 or ASTM C404, respectively.	Sampled on site after aggregate is delivered (each delivery immediately).	If significant difference design professional to evaluate and determine action.

Sections 05120, 05310, and 05500 - Structural Steel, Steel Decking, and Metal Fabrication

- B. The owner shall retain an independent testing agency or the structural engineer of record to perform the observations and testing of this section.
- B. As an alternate to fabricator certification, the contractor will pay for full-time inspection during the fabrication of the project steel. This inspection will be conducted by the owner's inspection company (at the fabrication plant). In addition, the fabrication plant must also be acceptable and approved in writing by the structural engineer, design professional, and building official. Do not proceed with work until the design professional has provided final written approval.

Section 5 – Structural Steel – Source and Field

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Bolted Connections	Specification for Structural Joints Using ASTM A325 or A490 Bolts.	100% of friction connection bolts shall be torqued to provide the minimum required tension as per AISC and 100% connections inspected. For bearing type bolted connections 100% of bearing type bolts and 100% connections visually inspected. Two bolts of each type to be tested for chemical, hardness, and tensile proper-ties in accordance with the respective ASTM designation.	As pass/fail criteria.	Connection rejected, bolts retightened, and retested
2. Fillet Welds	AWS D1.1 Figure 5.4 and Table 6.1 (visual)	The weld shall have an acceptable weld profile, with no cracks or porosity. There must be adequate fusion and less than acceptable amounts of undercut.	100% of all fillet welds.	Connection rejected. Weld repaired and reinspected.
3. Full and partial Penetration Welds	AWS D1.1 – Section 6 (Ultrasonic)	Only acceptable amounts of discontinuities shall be found on the ultrasound scope.	100% of all full and partial penetration welds.	Connection rejected. Weld repaired and reinspected.
4. Decking Welds	AWS D1.3 – Section 4.5	Welds shall be visually reviewed for the locations, size, and length. Also their bond shape, reinforcement, and undercut shall be acceptable	100% of all deck welds.	Connection rejected. Weld repaired and reinspected.
5. Stud Shear Connectors	AWS D1.1 Section 7	Welds shall be visually acceptable with a full 360 weld. Studs shall have acceptable sounding. Conduct bend tests according to AWS D1.1, Section 7 without any signs of failure.	100% of studs sounded with maul and 100% welds observed. Conduct bend tests according to AWS D1.1, Section 7.	Studs that fail should be replaced, re-inspected and resounded. Also, the replacement and additional studs for failed bend tests studs to be rebent to the angles required without any signs of failure.
6. Fabrication Plant and Project Erection	UBC (Chapter 17)	Test laboratory to review if special inspection required and perform the work if required.		

Section 06440 – Wood Moldings and Ornaments

- A. The architect is to include art rail in the hallways and corridors on all walls exceeding 6' in length.

Section 07250 – Sprayed-on Fireproofing Construction

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure Occurs)
1. Thickness and Density of Sprayed Fire-Resistive Material.	ASTM E605 UBC No. 7-6 Perform both methods independently on different areas.	Required thickness and minimum individual and density values as listed in the appropriate U.L. design to meet design fire rating.	Test both methods independently.	Insufficient thickness areas should be resprayed and tested. Low densities may be corrected with changes in spraying procedures, respray replacing and retested. Remove and replace unacceptable areas.
2. Cohesion/ Adhesion of Sprayed Fire-Resistive Materials.	ASTM E736 UBC# 7-6 Perform both Tests independently.	Refer to specification	Not less than one test from a column, beam and deck for each 10,000 sq. ft. of floor area or fraction thereof or for each floor if floor smaller than 10,000 sq. ft-- for the minimum testing for each test method.	Remove and replace unacceptable areas.
3. Asbestos Testing.		Polarized light microscopy. Zero percent asbestos.	Five bag samples prior to start of work and 3 times during application. Test for asbestos content dry (before adding water to fireproofing).	Reject material.

Section 07510 – Roofing

- A. All roofing and sheet metal work shall be inspected full time 100% during construction.
- B. Inspectors will check night seals, drain edges, and penetrations for water tightness every night before leaving job site.
- C. Inspectors will report for repair/relocation all unanticipated piping, conduit, and masonry conditions.

- D. Inspector will, each day, consider weather conditions to determine if that day is a roof working day for purposes of liquidated damages.
 A. Roofing shall be fully adhered EPDM.

Section 8 – Windows – Field Testing

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure)
Field Test Installed windows	For Air Infiltration: AAMA 502.90 Method B	Fixed: Max. Rate: 0.06 cfm/sq ft of sash area. Operating-projected or casement: Max. Rate: 0.10 cfm/foot of sash crack length. Horizontal Sliding: Max. Rate: 0.30 cfm/foot of sash crack length. Air infiltration test pressure: 6.24 lbs/sq. ft.	10% or minimum of 3, whichever is greater.	For each failed test, retest the failed unit until passes, and test two additional units.
Field Test Installed windows	For Water Resistance: AAMA 502.90 Method B	No uncontrolled water shall penetrate through the perimeter framing, be visible on interior surfaces, pass beyond the vertical plane intersecting the innermost framing member or be present within or enter the wall cavity during the water resistance test. Water resistance test pressure: 12 lbs/sq. ft.	Same as above.	Same as above.
Field Test Installed windows	For Uniform Load Structural: ASTM E330	No glass breakage; no permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any damage which causes the window or door to be inoperable; no permanent deformation of any main frame, sash, panel or sash member in excess of 0.2% of its span, when tested at structural test pressure equal to 1.5 times design wind pressure (or greater value when specified), at both a positive and negative loading.	One test for each anchorage type.	Same as above
Field Test Installed Curtain Wall	Same as above for air infiltration, water resistance and uniform load structural.	Same as above for air infiltration, water resistance and uniform load structural.	For each curtain wall type, test one entire bay, including areas of discontinuity.	Same as above.

Section 07900 – Sealants (for exterior applications) Pre-Construction

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure)
1. Peel Strength Testing.	N/A	Each substrate type in which sealant is to be in contact with, must be reviewed or tested by the manufacturer during the pre-construction meeting. The manufacturer must perform a peel test on at least one substrate during the meeting. Contractor to supply list of all substrates for exterior sealants.	As discussed in standard.	Written approval must be provided by manufacturer discussing each substrate and compatibility. Primer is required for specified exterior applications. Manufacturer to provide type and application.

Section 07900 – Sealants Construction

Description	Method of Test	Standard (Pass/Fail)	Frequency	Action Required (If Failure)
1. Surface Preparation	N/A	Design professional to review sealant substrate on-site with manufacturer and owner's representatives to observe that surface preparation was acceptable. Placed concrete, mortar, and grout require 28 days of field curing before sealant or primer application.	Once for each substrate type.	Complete surface preparation.
2. Application Review	N/A	Check that primers have been used. Review applications for sealant joint wetting, tooling, shoulder bond, and general crosssection configuration. Also review identifications and mixing time (typically 5 to 7 minutes).	Spot-check basis for each type of substrate.	Remove unsound sealant and adjust application.

Section 08740 – Electro-Magnetic Hardware

- F. All fire rated doors shall be equipped with magnetic hold-opens.

Section 08711 – Door Hardware

- A. Locksets for doors into Computer Technicians Offices, Data Rooms, Custodial Closets, Mechanical Rooms, Communications Rooms, Audio Visual Rooms, Electrical Rooms, Plumbing Chases, Elevator Equipment Rooms, and other similar restricted access rooms shall be D70 or D53 styles.

Section 15990 – Testing, Adjusting and Balancing

- D. Specify that balancing shall be performed by an independent balancing contractor hired by the general contractor and shall be 100% inspected by the owner's balancing consultant.
- D. Specify that the balancing company measure the minimum fresh air at both peak summer and peak winter modes.
- D. Require a length of straight duct inside the building to permit accurate measurement of outside airflow.

Section 16000 – Electrical Service Testing

- A. Medium voltage electric service testing:
 - 0. At new installations contractor to perform a "Megger" test on medium voltage service cabling. Test to manufacturer guidelines.
 - 0. At existing installation no requirement for "Megger" testing shall be required unless owner has reported a history of problems with regard to repairs or faults. In that case, a further in-depth investigation shall be done by a testing agency.

Appendix 07125 – Interior Waterproofing Specifications

Section 07125 – Concrete Deck Waterproofing

PART 1 – GENERAL

1.01 Summary

- A. This section includes the application of a cold fluid applied, polyurethane concrete deck waterproofing with non-slip aggregate surface that prevents the passage of water.
- B. This waterproofing is intended for pedestrian traffic only. It may be used as an exposed floor finish or may be used under thin set tile flooring. Refer to plans and details for specific locations.
- C. Mortar Toppings: The concrete deck substrate under the waterproofing membrane may require the application of mortar toppings to infill roughness, craters, and crevices in the concrete, or to provide slope to drain locations. Refer to Section 03316 –Mortar Toppings for approved mortar toppings to use in these situations.
- D. Related Sections
 - 1 Section 01300 – Project Meetings: Pre-Installation Conferences
 - 2 Section 01410 – Testing Laboratory and Inspection Services
 - 3 Section 03300 – Cast in Place Concrete
 - 4 Section 03316 – Mortar Toppings
 - 5 Section 07900 - Joint Sealants

1.01 Application Qualifications

- A. The membrane waterproofing work shall be performed by a single firm experienced and specialized in applying waterproofing, as shown and specified, and shall be an approved and trained applicator by the manufacturer. The field supervisors and the project foreman for the waterproofing Subcontractor shall each have at least 3 years approved experience with the application of this waterproofing product.

1.02 Submittals

- A. Product Data: Submit copies of the manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties, and printed instructions for installation of waterproofing, including procedures and materials for flashing, splicing and bonding.
- B. Submit a copy of the Manufacturer's approval of the applicator and indicate by transmittal form, that copies of the specifications and application instructions have been distributed to the waterproofing applicator.

- C. Shop Drawings: Shop Drawings shall indicate tie-in details to existing substrates, termination and non-typical details show changes from horizontal to vertical elevation, and inside and outside corner applications. Shop Drawings shall include a waterproofing protection plan. Provide descriptions and drawings of materials and methods to protect waterproofing system from damage by subsequent construction activities.
- D. Manufacturer's Review of Waterproofing System: Before delivering waterproofing materials to the project site, submit the following:
 - 1 A written statement signed by the Contractor's waterproofing Applicator and Manufacturer's Representative stating that the Architect's Drawings and Specifications have been reviewed, and that they are in agreement that the selected materials and system for waterproofing are proper and adequate for the application shown. Indicate by transmittal form that a copy of this statement has been distributed to the Owner.
 - 2 A written approval of the condition of the substrate to proceed with the waterproofing, signed by the all of the following parties: Manufacturer's Representative, Installing Subcontractor, and General Contractor.
 - 3 Manufacturer's Approval of Moisture Content/Test Results: The Manufacturer shall test the moisture content of each floor location scheduled for waterproofing, immediately prior to waterproofing, and shall submit the written approval of the moisture content of each of the substrates to the Architect based on the attached test results. Tests shall be made no sooner than 28 days after the installation of new concrete substrate, and no sooner than 6 days after the installation of topping mortar. The moisture tests shall comply with ASTM D4263, "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method" or commonly referred to as the "Rubber Mat Moisture Test". Additional testing may be conducted, if desired, by the Manufacturer. The Owner's Representative shall observe all moisture content testing, and the Contractor shall notify the Owner's Representative at least 5 days in advance of any testing.
 - 4 If any portion of the floors scheduled to be waterproofed become wet after the testing and approval performed per paragraph 1.03.D.3, but prior to waterproofing, then the moisture testing and approval procedures shall be repeated.
- A. Submit MSDS information for all materials.
- B. Maintenance Data: Provide maintenance manuals which identify substrates and type of waterproofing system applied and includes recommendations for periodic inspections, cleaning, care, maintenance, and repair of the waterproofing system.

1.03 Quality Assurance

- A. There shall be a Pre-Installation Conference in accordance to Section 01300, Project Meetings. After completion of Shop Drawing review and upon completion of the 28 day cure of new concrete, 6 day cure of any mortar topping, and mechanical preparation (shot blasting) of the substrate, the waterproofing applicator shall meet with the manufacturer's representative, Contractor, Architect, and Owner's representatives at the project site for the Pre-Installation Conference. The parties shall review the waterproofing procedures, acceptance of surfaces, minimum curing periods, forecasted weather conditions, special details and sheet flashings and

coordination of other trades. The Contractor shall provide notice to attendees prior to convening Pre-Installation Conference as Specified in Section 01300 – Project Meetings. Review methods and procedures related to work, including but not limited to the following:

- 1 Tour job site areas to be waterproofed. Inspect and discuss conditions of substrate, existing conditions, drains, curbs, penetrations and other preparatory work performed by other trades. Review the field conditions for each item of Paragraph 1.06.C.
 - 2 Review required submittals.
 - 3 Review the entire specification, line item by line item.
 - 4 Review and finalize construction schedule related to waterproofing work and verify availability of materials, applicator's personnel, equipment and facilities needed to make progress and avoid delays.
 - 5 Review required inspections and testing.
 - 6 Review manufacturer's guidelines with respect to weather conditions.
- A. Each floor surface must be inspected after all floor preparation is completed. Written approval of the prepared floor surface, signed by the waterproofing Manufacturer's Representative, the Installing Subcontractor, and the General Contractor, shall be submitted to and approved by the Architect prior to the waterproofing application.
- B. Source Limitation: Obtain waterproofing materials through one source from a single manufacturer.
- C. Mockups: General Contractor to prepare a separate concrete slab 9 sq. ft. (.84 sq. m) in area, displaying a typical, slab-to-wall joint/curb transition. Cure mockup slab 28 days, for the mockup waterproofing application. If mortar topping is required on the project, then Contractor shall apply topping and wet/dry cure for a minimum of 6 days. Apply topping as specified by Section 03316 after concrete cure is completed. Mechanically abrade the substrate, prime and apply the waterproofing system to the mockup deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. If Architect determines mockups do not comply with requirement, reapply waterproofing until mockups are approved. Mockup slabs shall be stored in areas to be waterproofed in preparation for mockup application, and shall be retained for reference during the waterproofing application.

1.1 Delivery, Storage, and Handling

- A. Deliver all materials in original, unopened containers of packaging clearly labeled with Manufacturer's name, brand name and type, shelf life, date of manufacture and all identifying numbers.
- B. Store all materials for waterproofing work in accordance with the manufacturer's recommendations, as approved, and in accordance with the requirements herein specified. Store products away from sparks and open flames.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Remove all solvent soaked rags from the site or place them in proper containers to be removed from site at the end of each day.
- E. Protect stored materials from direct sunlight.

1.11 Project/Site Conditions

- A. Environmental Requirements: Do not apply waterproofing materials if ambient, materials, and/or substrate temperatures are outside the range of ambient temperatures recommended by the manufacturer. Temperatures must be rising and stay above the minimum for the following 48 hours. All surfaces to receive the waterproofing shall be free of water, dew, frost, snow and ice. Do not apply waterproofing when the surface temperature is below 40°F (4°C) or above 90°F (32°C). Do not apply when temperatures are less than 5°F (3°C) above dew point or when weather rain, snow, fog, or mist can directly interfere with the application and curing period. Do not apply waterproofing until substrates have a moisture content approved by the Manufacturer immediately prior to application, and the written approvals have been received and approved by the Architect.
- B. Moisture Testing: The condition of “dry” substrate for the start of waterproofing application shall be determined by the ASTM D 4263 moisture test method per paragraph 1.03.D.3. The Architect or Owner’s Representative shall be notified at least 5 days in advance of any moisture content testing in order to observe the testing, and shall be advised in writing of the results of the Manufacturer’s moisture testing whenever a moisture test is completed and approved, prior to beginning waterproofing.
- C. Inspect and identify existing substrate for conditions requiring special preparation:
1. Verify and discuss method of substrate preparation. Advise of type of machinery required to mechanically shot blast, abrade, rout, grind, and prepare the substrates. Review the cleanup required upon completion of substrate preparation.
 2. Metal projections, pipe penetrations, and drain perimeters to be prepared and primed per Paragraph 3.03.
 3. Cracks up to 1/16” wide per Paragraph 3.04.B.
 4. Cracks between 1/16” and 1/8” wide per Paragraph 3.04.C.
 5. Cracks greater than 1/8” wide per Paragraph 3.04.D.
 6. Expansion joints per Paragraph 3.04.E.
 7. Review defect projections such as fins, ridges, exposed aggregate, honeycombs, spalls, and granulations to be leveled and made smooth by grinding or by applying approved mortar toppings and their bonding agents as described in Section 03316 – Mortar Toppings.
 8. At terminations of waterproofing on flat substrates, verify the location of the ¼”x ¼” keyways to terminate coating per Paragraph 3.03.E.
 9. At any existing polyurethane deck coatings being restored or tied into, Manufacturer’s Representative shall inspect the surface, determine compatibility, and recommend preparation of interface surface, including wire brushing, grinding, sandblasting, solvent washing, and priming necessary.
 10. Upon completion of all substrate preparation work, provide written approval of the substrate as required by Paragraph 1.03.D.
- A. Verify whether any fiberglass fiber reinforcing is present in the concrete substrate. If so, any fiber projections must be burned off the substrate surface with a weed burner flame immediately after abrasion of the concrete surface and just prior to waterproofing.

- B. Verify locations of temporary closures at all openings to prevent contamination of waterproofing before, after, and during application, and to coordinate ventilation of area from adjacent, occupied areas. Remove temporary enclosures at waterproofing completion.
- C. Plan and install adequate ventilation for process of application and curing.

1.12 Warranty

- A. Manufacturer's and Applicator's Joint Warranty: Submit to Architect for transmittal to Owner, three (3) copies of manufacturer's standard warranty on all materials used on the Project for a period of five (5) years from date of Substantial Completion.
- B. Warranty shall cover the complete waterproofing installation, and any defects in the installation because of materials or workmanship, regardless of any previous inspections and approvals of the installation by the Owner's Representative, shall be properly corrected during the warranty period at no cost to the Owner. Upon written notification within the warranty period of any such defects, the necessary repairs and replacement shall be properly made at the convenience of the Owner.

PART 2 – PRODUCTS

1.01 Waterproofing Products

- A. Products: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. "Vulkem 350 Base Coat / 351 Top Coat" by Mameco/Vulkem/Tremco International Inc.
 - 2. "Sonoguard Base Coat and Sonoguard Top Coat" by Sonneborn, Division of ChemRex, Inc.
- A. Physical Requirements: Provide waterproof coating complying with ASTM C 957, ASTM D 412, and ASTM D 2240.
- B. Material Compatibility: Provide primers, sealants, detail coat material, vertical application material, base coat material, and top coat material, and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- C. Primer: Manufacturer's standard factory formulated primer recommended for substrate and conditions indicated. Primer shall be applied to each substrate.
 - 1. Vulkem: Primers #171, #181, and #191
 - 2. Sonoguard: Primers #733, #770, and #772
- A. Sealant: Manufacturer's recommended two-part polyurethane sealant and primer proven by the Manufacturer to be compatible with their deck coating.
 - 1. Vulkem: Vulkem Two-Part; Tremco Dymeric and Primer #1.
 - 2. Sonoguard: Sonneborn NP2 and Primer #733.
- A. Detail Coats: Single component, slightly thixotropic, aromatic liquid polyurethane coating for liquid applied flashings, particularly on vertical transitions or slopes.
 - 1. Vulkem 350 Base Coat: 30 wet mil thickness minimum; 35 wet mil max.

2. Sonoguard Base Coat: 25 wet mil thickness minimum; 35 wet mil max.
- A. Base Coat: Single component, slightly thixotropic, aromatic liquid polyurethane elastomeric waterproofing. Apply minimum wet mil thickness of the Base Coat recommended by the manufacturer as follows:
 1. Vulkem 350 Base Coat: 30 wet mil thickness minimum; 35 wet mil max.
 2. Sonoguard Base Coat: 25 wet mil thickness minimum; 35 wet mil max.
- A. Intermediate Coat: Single component, slightly thixotropic, aromatic liquid polyurethane elastomeric waterproofing. Apply minimum wet mil thickness of the intermediate coat of “Base Coat” material as recommended by the manufacturer as follows:
 1. Vulkem 350 Base Coat as Intermediate Coat: 20 wet mil thickness minimum; 35 wet mil maximum.
 2. Sonoguard Base Coat as Intermediate Coat: 20 wet mil thickness minimum; 35 wet mil maximum.
- A. Top Coat: Single component, aliphatic liquid polyurethane elastomeric waterproofing. Apply minimum wet mil thickness of the topcoat recommended by the Manufacturer as follows:
 1. Vulkem 351 Top Coat: 20 wet mil thickness minimum with aggregate; 35 wet mil maximum.
 2. Sonoguard Top Coat: 20 wet mil thickness minimum with aggregate; 35 wet mil maximum.
- A. Vertical Coat Applications: Single component, aliphatic liquid polyurethane elastomeric waterproofing. Apply minimum wet mil thicknesses of the base coat and topcoat recommended by the Manufacturer as follows:
 1. Vulkem 350 Base Coat for Vertical Application: three layers of 10 wet mil thickness minimum; Vulkem 351 Top Coat: two layers of 10 wet mil maximum with aggregate.
 2. Sonoguard Base Coat for Vertical Application: three layers of 10 wet mil thickness minimum; Sonoguard Top Coat: two layers of 10 wet mil maximum with aggregate.
- A. Aggregate: Uniformly graded, washed silica sand composed of clean grit particles at least 6.5 on the MOH’s scale of hardness, 80% in the 25-40 mesh size and no more than 2% fines passing a 70 mesh screen. The aggregate shall contain no more than 0.5% iron oxide. Aggregate shall be approved in writing from Manufacturer.
 1. Spreading Rate: As recommended by Manufacturer for substrate and service conditions indicated, by not less than 10 to 20 lb/100 sq. ft. (4 to 12kg/10sq.m.).
 2. Aggregate shall be applied to the wet Topcoat, and shall be backrolled into the coating.
 3. Contractor shall apply a sample area at the initial application for approval of the texture by the Architect or Campus Representative.

2.02 Miscellaneous Materials

- A. Joint Sealant: Two-part component polyurethane sealant and primer recommended by manufacturer for substrate and joint conditions indicated and for compatibility with waterproofing coatings; complying with ASTM C 920. Type M, Class 25, Grade NS for sloping and vertical applications or Grade P for deck applications, and use T where subject to traffic or use NT elsewhere.

- B. Reinforcing Strip: Manufacturer's recommended mesh reinforcement embedded in the Base Coat application. Sonoshield Reinforcing Fabric by Sonoguard.
- C. Backer Rod: Non-oily, non-gassing, non-absorbent, non-staining open cell backer rod or other resilient material recommended by approved sealant manufacturer. Nongassing, closed cell "Soft Rod" is approved or equal. Polyethylene material is not permitted.

PART 3 – EXECUTION

3.01 General

- A. All work performed under this section shall be in accordance with the specifications, drawings, and the manufacturer's instructions and recommendations. In the event of a conflict, the stricter requirement shall prevail.
- B. Prior to onset of waterproofing work, waterproofing subcontractor shall inspect entire area to be waterproofed for compliance with requirements and other
 1. Verify that concrete has cured and aged for minimum of 28 days, and that mortar toppings have then cured and aged for minimum of 6 additional days, as recommended by waterproofing Manufacturer, prior to moisture content testing.
 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture in the substrate using test submitted by Manufacturer per Paragraph 1.03.D.3. Architect shall provide approval of written copy of moisture test report before proceeding with waterproofing work.
 3. Inspect substrate for surface imperfections. Proceed with installation only after unsatisfactory conditions have been corrected.
 4. Provide letter of acceptance of the substrate to the Architect prior to beginning the work of this Specification per Paragraph 1.03.D.2.
 5. Provide temporary protection of existing conditions, work in progress and work in place as described in the Shop Drawing's construction protection plan. Provide for adequate ventilation.
 6. Protect all finish surfaces from damage resulting from spillage, dripping, and dropping of materials. Prevent waterproofing materials from entering or clogging drains and water conductors. Repair and restore or replace other work, which is soiled or damaged in connection with performance of the waterproofing work.
 7. If floor becomes wet after prior approvals to proceed, then repeat test procedures per Paragraph 1.03.D.3 before proceeding.

1.01 Preparation of Concrete, Mortar Toppings, and Masonry Surfaces

- A. If possible to coordinate with General Contractor prior to pouring the concrete or mortar topping substrate, provide reglet recesses in the concrete substrate in which to apply sealant coves at corner transitions, such as at slab intersections with walls or around mechanical curb perimeters, so that the finish application is flush. Refer to Drawings.
- B. All new concrete and masonry surfaces on which waterproofing is to be applied shall have been air dried for a minimum of 28 days after forms have been stripped prior to any mortar topping installation. All mortar toppings shall wet cure for a minimum of 3 days and air dry for another minimum of 3 days before moisture content testing of

the substrates for the waterproofing application. All surfaces shall be dry, clean and free of other foreign matter detrimental to performance.

- C. Apply bonding agents and mortar toppings as required to infill cavities or provide slope to drain as indicated on the plans, after substrate is approved and surface prep is completed. When infilling large areas abutting vertical wall surfaces, tool the mortar topping with an edging tool or install form for a reglet recess to accommodate the perimeter sealant application. Install mortar topping per Section 03316.
 - . Mechanically abrade the substrate surfaces in a uniform manner by shotblasting or other method recommended and approved by Manufacturer.
 - . Burn off any fiberglass fibers embedded in the concrete substrate using a weedburner.
 - . Surface shall be free of spalling, voids, loose material and projections, with no coarse aggregate exposed. Remove all oil grease, dirt, dust and debris and other contaminants.
 - . Mask off adjoining surfaces not receiving waterproofing to prevent spillage or over application, affecting other construction.

3.03 Preparation at Terminations and Penetrations

- . Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions. Wire brush and/or sandpaper all metal surfaces to be waterproofed to a clean, shiny surface. Vacuum areas and wipe metal surfaces clean.
- . Prime substrate, as instructed by waterproofing Manufacturer.
- . Apply sealant infills and perimeter seals as recommended by the Manufacturer. Provide sealant cants around penetrations and at inside corners of deck-to wall butt joints when recommended by waterproofing manufacturer. Allow all sealant applications to cure a minimum of 16 hours.
- . Prime and apply a Detail Coat of waterproofing and embed a joint reinforcing strip in Detail Coat when recommended by waterproofing manufacturer, and extend Detail Coat for the full height of any vertical application (10 mil). Allow Detail Coat to cure for 24 hours.
- . At terminations of waterproofing areas on flat substrates: Rout a ¼"x ¼" keyway straight across flat surface, in which to terminate coating.

3.04 Joint and Crack Treatment

- . Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and the Manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
- . Cracks less than 1/16" wide:
 - 0. Prime and apply Detail Coat a minimum of 6 inches (150 mm) wide, 3 inches (75mm) along each side of joint or crack, and extend Detail Coat for the full height of any vertical application (10 mil). Embed a joint reinforcing strip in the wet Detail Coat if recommended by Manufacturer. Allow all Detail Coats to cure for minimum 24 hours.
 - 0. Feather terminating edge of Detail Coat to avoid edges from showing through the finished coating.

- A. Cracks between 1/16" and 1/8" wide:
 - 1. Prime, fill with sealant, and tool flush with putty knife. Allow sealant to cure a minimum of 16 hours.
 - 2. Prime and apply a Detail Coat a minimum of 6 inches (150 mm) wide, 3 inches (75mm) along each side of joint or crack, and extend Detail Coat for the full height of any vertical application (10 mil).
 - 3. Embed a joint reinforcing strip in the wet Detail Coat if recommended by Manufacturer.
 - 4. Allow all Detail Coats to cure for minimum 24 hours.
 - 5. Feather terminating edge of Detail Coat to avoid edges from showing through the finished coating.
- A. Cracks over 1/8" wide in any length of the crack:
 - 1. Mechanically rout out joint to 3/8" wide and 1/2" deep, and vacuum clean the joint.
 - 2. Comply with ASTM C 1193 for joint sealant installation.
 - 3. Prime substrate within joint.
 - 4. Apply bond breaker or non-gassing backer rod between sealant and bottom of joint.
 - 5. Apply sealant within joint, per Manufacturer's instructions, and tool flush at surface. Sealant shall cure for minimum 16 hours.
 - 6. Prime and apply Detail Coat a minimum of 6 inches (150 mm) wide, 3 inches (75mm) along each side of joint or crack, and extend Detail Coat for the full height of any vertical application (10 mil). Embed a joint reinforcing strip in the wet Detail Coat if recommended by Manufacturer. Allow all Detail Coats to cure for minimum 24 hours.
 - 7. Feather terminating edge of Detail Coat to avoid edges from showing through the finished coating.
- A. Cants at inside corners, curbs to floors, walls to floors, wall to wall:
 - 1. Sweep, vacuum and clean joints.
 - 2. Comply with ASTM C 1193 for joint sealant installation.
 - 3. Prime substrate within joint.
 - 4. Apply bond breaker or non-gassing backer rod between sealant and bottom of joint.
 - 5. Apply sealant within joint, per Manufacturer's instructions, and tool flush at surface. Sealant shall cure for minimum 16 hours.
 - 6. Prime and apply Detail Coat a minimum of 6 inches (150 mm) wide, 3 inches (75mm) along each side of joint or crack, and extend Detail Coat for the full height of any vertical application (10 mil). Embed a joint reinforcing strip in the wet Detail Coat if recommended by Manufacturer. Allow all Detail Coats to cure for minimum 24 hours.
 - 7. Feather terminating edge of Detail Coat to avoid edges from showing through the finished coating.
- A. Expansion joints: Do not apply waterproofing coats across true expansion joints. Terminate on each side and seal to expansion joint seal according to Manufacturer's recommendations for sealing expansion joints.

3.05 Waterproof Coating Application

- A. Apply each coat of waterproof coating according to ASTM C 898 and Manufacturer's written instructions.
- B. Start installing waterproof coating in presence of Manufacturer's technical representative.
- C. Apply primer over prepared substrate.
- D. Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply Base Coat of waterproofing to obtain a seamless membrane free of entrapped gases, with a minimum/maximum wet film thickness as noted in Paragraphs 2.01.G and 2.01.J above. Allow Base Coat to cure 24 hours. Check for surface tack.
 - 2. Base Coat and Intermediate Base Coat must each have a slight surface tack to aid in adhesion of the next coating. Coating shall not debond from premature curing. If the Base or Intermediate Base Coat has cured longer than 24 hours and has no tack, then the surface must be cleaned with a cloth dampened with Xylene or Xylol, and then primed with waterproofing primer. **DO NOT SATURATE THE WATERPROOF COATING SURFACES WITH SOLVENT.**
 - 3. Apply Intermediate Base Coat of waterproofing in seamless membrane free of entrapped gases, with a minimum/maximum wet film thickness per Paragraphs 2.01.H and 2.001.J. Allow Intermediate Coat to cure for 24 hours. Check for surface tack (see previous paragraph).
 - 4. Apply initial Topcoat at vertical surfaces only per Paragraph 2.01.J (10 mil).
 - 5. Upon completion of previous item #4, apply Topcoat of waterproofing in seamless membrane free of entrapped gases, with a minimum/maximum wet film thickness per Paragraphs 2.01.I and 2.01.J.
 - 6. Immediately broadcast sand grit aggregate into the wet horizontal and vertical Topcoat at a rate of 10 to 20 lbs. per 100 sq. ft. Immediately back-roll the surface to fully coat and imbed aggregate particles as the coating is applied.
 - 7. Architect or Campus Representative shall view and approve the finish texture of the aggregate application after the first 100 square feet are applied, and shall compare to the mockup sample.
 - 8. Apply all waterproofing coatings up vertical pipe penetrations and vertical wall surfaces at transitions to horizontal surfaces. Cove waterproof coating a minimum 6 inches up vertical surfaces. End waterproofing in a straight horizontal line.
 - 9. Verify wet film thickness of waterproofing on each coat every 100 sq. ft. (9.3sq.m.).
 - 10. Allow finished waterproofing application to cure 24 hours before allowing any traffic or work over its surface.

3.06 Field Quality Control

- A. Periodically check waterproofing layers for any indication of bubbling or trapped air or excess moisture during its application and cure. Any bubbling shall be corrected according to the Manufacturer's recommendations prior to any further application of coatings.
- B. Where ceramic tile is applied over waterproofing material, verify that the aggregate finish in the final topcoat is applied at the specified rate and is not coated over with

the topcoat to an extent that smooth, shiny areas develop in the finish. The aggregate roughness is required to develop physical bond with the tile setting bed.

- C. Flood Testing: To be performed at the Owner's discretion. Contractor shall construct all watertight dams and shall perform the flood testing. Flood testing each deck area for leaks, according to recommendations in ASTM D5957, after completing waterproofing, but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water. Contractor to repair all damages, or replace damaged materials, as a result of flood testing failures or leakages, at no additional cost to the Owner.
0. Flood to an average depth of 2 ½ inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
 0. Flood each area for 48 hours.
 0. After flood testing, repair leaks, repeat flood tests, and make further repairs according to the Manufacturer's instructions until waterproofing installation is watertight.
- C. Owner will engage an independent inspection consultant to perform construction observation during installation of all waterproof coatings. Consultant will observe conditions under which the coatings are installed, observe flood testing, if performed, and observe underside of decks and terminations for evidence of leaks during such flood testing. Notify the inspection consultant per requirements listed in Section 01400 at least 5 days prior to applications, and coordinate schedule.

3.07 Curing, Protecting, and Cleaning

- . Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
- . Protect waterproof coating from damage and wear during remainder of construction period.
- . Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

Appendix 07120 – Exterior Waterproofing Specifications

07120 – Exterior Membrane Waterproofing

PART 1 – GENERAL

1.1 APPLICABLE SECTIONS

The requirements/provisions of Divisions 0 and 1 apply to this Section.

1.2 SCOPE

The work under this Section includes all materials, labor, equipment and related incidental services necessary for the complete application of all membrane waterproofing work to the exterior surfaces, exterior face of the foundation walls, and through-wall flashing set in 6125 Hydrotech, as shown on the Drawings and specified herein.

1.3 APPLICATOR QUALIFICATIONS

The membrane waterproofing work shall be performed by a single firm experienced and specializing in applying American Hydrotech as shown and specified. Must be an American Hydrotech approved and trained applicator.

1.4 SUBMITTALS

Comply with requirements of Division 0 and 1.

- A. Shop Drawings (SD): Submit showing layouts of sheets, locations of field splices, typical splices, terminations and antipodal details. Submit as part of hop drawings a construction protection plan. Provide descriptions and drawings of materials and methods to protect waterproofing system from damage by subsequent construction activities.
- B. Product Data (PD): Submit manufacturer's printed instructions for installation of membrane, including procedures and materials for flashing, splicing and bonding.
- C. Product Data (PD): Submit copies of manufacturer's specifications and application instructions for the membrane waterproofing work. Indicate by transmittal form that copies of the specifications and application instructions have been distributed to the membrane waterproofing applicator.
- D. Manufacturer's Review Of Membrane Waterproofing System (SR): Before delivering waterproofing materials to the project site, submit a written statement signed by the Contractor, membrane waterproofing applicator and manufacturer's representative stating that the Architect's Drawings and Specifications have been reviewed by the Hydrotech regional manager, and that he is in agreement that the selected materials and system for membrane waterproofing are proper and adequate for the application shown. This submittal is also to be submitted to the Owner.

1.5 WARRANTY

- A. Manufacturer's Warranty: Submit to Architect for transmittal to Owner three (3) copies of manufacturer's standard warranty on all materials for use on the project for a period of fifteen (15) years from the date of application.
- B. Membrane Guarantee: Submit to Architect for transmittal to Owner three (3) copies of an unqualified guarantee for a period fifteen (15) years on all materials, workmanship and water-tightness, signed by the membrane waterproofing applicator and the Contractor on the complete membrane waterproofing and insulation installation for the Project and that any defects in the installation because of materials or workmanship will be properly corrected during the guarantee period at no cost to the Owner. Upon written notification within the guarantee period of any such defects, the necessary repairs and replacement shall be properly made at the convenience of the Owner.

1.6 PRE-INSTALLATION MEETING

- A. Membrane waterproofing applicator shall meet with the manufacturer's representative, Contractor, Architect and Owner or Owner's representatives at the project site to review the membrane waterproofing procedures, acceptance of surfaces and coordination of other trades. Review methods and procedures related to work, including but not necessarily limited to the following:
 - 1. Tour job-site areas to be waterproofed. Inspect and discuss conditions of substrate, drains, curbs, penetrations and other preparatory work performed by other trades.
 - 2. Review required submittals, both completed and yet to be complete. Read the entire specification line item by line item.
 - 3. Review and finalize construction schedule related to waterproofing work and verify availability of materials, applicator's personnel, equipment and facilities needed to make progress and avoid delays.
 - 4. Review manufacturer's guidelines with respect to weather conditions.
 - 5. Review required inspections and testing.

1.7 INSPECTION AND TESTING

Full time inspection is required for work specified in this Section. Cooperate with any inspection and testing service that may be engaged by the Owner to perform on-site inspection of the membrane waterproofing work. Comply with the inspector's request in connection with specific test samples, and provide any additional testing that may be requested in order to confirm that the work complies with the requirements. The inspection company must be notified five (5) working days in advance of start up of any work to be performed on-site, and three (3) working day notice per inspection trip thereafter.

- A. To determine whether the substrates are dry, there shall be two tests performed and paid for by the Contractor and observed by Owner inspection personnel. If test methods 1 or 2 fail, then the application of waterproofing shall not proceed until the surface is dried and the test passes.
 - 1. Test 1: A 3 foot by 3 foot piece of clear poly shall be applied to the concrete surface and left for 3 hours. If moisture shows up on the underside of the poly, the concrete is not ready for application of waterproofing.

2. Test 2: If test 1 passes using the poly system, then the substrate shall be primed and a 4-foot by 4-foot section of 6125 applied. If either bubbles or moisture is apparent during the application, then the substrate is not dry enough and not ready for the application of 6125. During both tests, the inspection personnel shall be on the site, and if either test fails, material shall not be applied.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store all materials for membrane waterproofing work in accordance with the manufacturer's recommendations, as approved, and in accordance with the requirements herein specified.
 1. Deliver materials in Manufactures unopened containers fully identified with brand, type, class, grade and all other qualifying and product information.
 2. Store membrane no more than one pallet high. Provide cover on top and all sides, allowing for adequate ventilation. The membrane is to be stored off the ground or concrete surfaces.
 3. Store primer, mastic, protection board adhesive, and liquid membrane in a dry area away from high heat, flames, or sparks.
 4. Store protection board flat and off the ground, preferably on wood platforms. Provide tarpaulin cover on top and all sides.
 5. Store only as much material at point of use as required for each day's work.

1.1 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply waterproofing materials if ambient, material, and/or substrate temperatures are lower than 0 degrees F.

PART 2 – PRODUCTS

2.1 REQUIREMENTS

- A. Products used shall have the written approval of American Hydrotech Inc. for said use.

2.2 SURFACE CONDITIONER

- A. American Hydrotech, Inc. pre-mixed surface conditioner only.

2.3 LIQUID WATERPROOFING MEMBRANE

- A. American Hydrotech Liquid Membrane 6125 supplied in 50 pound cakes, ten cakes per drum, meeting manufacturer's specifications, ready for melting and application.

2.4 SHEET REINFORCING MEMBRANE

- A. Hydrotech Flex-Flash UN supplied in uncut rolls, 60 mils thick, for overall coverage of the liquid membrane. Additional reinforcement strips of Flex-Flash UN are to be used for additional reinforcement at inside/outside corners, construction joints, at corner intersections between vertical and horizontal surfaces, construction joints and cracks. Also use Flex-Flash UN at expansion joints to 1/2" in width and with a design total movement of less than 50%. For joints 1/2" to 2" in width with a design total movement of less than 50%, the sheet shall be looped down into the joint to a

depth equal to the width of the joint at its maximum opening with a backer rod (1" greater in diameter than the maximum joint opening) set into the joint. Then a second sheet of reinforcement shall be looped over the backer rod and set into and top coated with the membrane. For other expansion joints, refer to details by architect.

2.5 JOINT AND LAP CEMENT

- . American Hydrotech Liquid Membrane shall be used for sealing of all laps and edges of the sheet membrane.

2.6 PROTECTION BOARD

- . A heavy duty synthetic fiber-reinforced, rubberized asphalt sheet (horizontal applications only) - American Hydrotech, Inc., Hydroflex 30. For vertical applications, use "Sealtight Protection Course" (PC-2) as manufactured by W. R. Meadows, Inc. in 1/8" thickness and 4' X 8' sheets. Use American Hydrotech Hydroflex 10 on brick ledge if Hydrotech System used for bottom brick ledge flashing.

2.7.1 CAP FLASHINGS

- . Fry Reglet Corporation, 0.020 stainless steel, 6" high, surface mounted with sealant trough along upper edge, complete with all fastenings. Furnished prefabricated exterior and interior corner units. Such reglets shall be non-magnetic (nickel) stainless steel. Ferrous stainless steel is not accepted.

2.7.2 BRICK LEDGE FLASHING

- . 20-gauge stainless steel fabricated and attached as per drawings. (Specify if required by this project)

2.8 INSULATION

- . Close-cell extruded polystyrene foam board, thickness as shown on the Drawings, comply with Federal Specifications HH-I-524, Type II, Class B, "Styrofoam RM" or "Styrofoam SM" as manufactured by the Dow Chemical Company. Horizontal applications shall be "Styrofoam PD," with a compressive strength of 60 psi. The substitution of "beadboard" is not acceptable.

2.9 BITUMINOUS MASTIC CEMENT

- . Shall conform with Federal Specifications SS-C-15C, Type I.

2.10 SEALANT

- . Shall be a two-component polyurethane sealant and primer conforming to Federal Specifications TT-S-00227E, Type II, Class A, such as "Sonolastic NP II" as manufactured by Sonneborn Building Products Division of Contech, Inc., or "Sikaflex 2C", as manufactured by Sika. Sealant and primer application in accordance with Section 07900 or other applicable section.

2.11 BACKER ROD

- A. Sof Rod as manufactured by NOMACO, Inc., a reticulated, closed cell, non-gassing backer rod.

2.12 TERMINATION BAR

- A. Shall be 1/16" thick by 1 1/2" high, type 304 stainless steel bar, with pre drilled holes starting at 2" from each end and continue with a 1'-0" on center spacing therein.

2.13 ANCHORS FOR TERMINATION BAR

Shall be 1/4" diameter by 1 1/2" long, Powers Nylon Nailin #2548 with mushroom head and type 304 stainless steel nail.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work performed under this section shall be in accordance with the specifications, drawings and the manufacturer's instructions and recommendations. In event of a conflict, the stricter requirement shall prevail.
 - 1. Prior to onset of work, waterproofing or through-wall flashing set in liquid
 - 2. Membrane, subcontractor shall inspect entire area to be waterproofed or through-wall flashed. Defects and improper conditions affecting installation shall be brought to the attention of the general contractor, in writing, for correction before proceeding with work. The Hydrotech representative must be on site for the first two days of a new installation to ensure the waterproofing installer gets started properly. Hydrotech's representative shall be available, as needed, throughout the installation.

3.2 WEATHER CONDITIONS

- A. Do not proceed with membrane waterproofing work during inclement weather, or when weather forecasts are unfavorable. Do not proceed with waterproofing for a minimum of 24 hours of drying time after the surface to be waterproofed has become completely wetted. If surface dryness remains in question, refer to Section 3.4, Section 3.5.7 and Section 1.7 INSPECTION AND TESTING.

3.3 PROTECTION

- A. Protect all finish surfaces from damage resulting from spillage, dripping and dropping of materials. Prevent waterproofing materials from entering or clogging drains and water conductors. Repair and restore or replace other work, which is soiled or damaged in connection with performance of the membrane waterproofing work.

3.4 PREPARATION OF NEW CONCRETE AND MASONRY SURFACES

- A. All new concrete and masonry surfaces on which Hydrotech Liquid Membrane 6125 is to be applied shall have been air-dried for a minimum of 14 days after forms have been stripped. All surfaces shall be thoroughly clean and additional drying shall be accomplished with torches, if necessary. All surfaces shall be dry, clean and free of other foreign matters detrimental to its performance. The concrete form release agent or curing compound shall be removed or approved to remain in writing by American

Hydrotech, Inc. All concrete and masonry surfaces shall be completely covered with surface conditioner primer to receive the liquid membrane.

1. Examine surface conditions of all substrates and adjoining construction to which the membrane is to be applied. Work shall not proceed until any unsatisfactory conditions detrimental to the proper and timely completion of the work have been corrected.
2. Surface shall be free of spalling, voids, loose material and projections, with no coarse aggregate exposed. Remove all oil, grease and other contaminants. Remove all dirt, dust and debris. Clean all expansion joints back and minimum of 1" from the surface of the joint in a manner acceptable to American Hydrotech.

3.5 PREPARATION OF EXISTING CONCRETE SURFACES

A. Following the complete removal of all existing subsurface materials, insulation, dampproofing, waterproofing, sheet metal, etc., on the concrete surfaces in the designated areas, the surfaces shall be lightly sandblasted to remove all traces of any asphaltic materials and solvents used to remove the original material. Any concrete formwork-releasing agent shall be removed unless given written approval by manufacturer. After all existing materials that are to be removed have been removed; the concrete surfaces to which the liquid membrane is to be applied should be examined for any conditions, which will be detrimental to the proper and timely application of the membrane. Work shall not proceed until all surface conditions that are unsatisfactory are corrected to the satisfaction of the membrane applicator, as follows:

1. Repair or patch all concrete and masonry surface spalls, voids, and any honeycombed concrete.
2. Remove all loose material, projections, and concrete fins or "flash" from form boards, leaving the surface uniform.
3. Remove all grease, oil, and other contaminants.
4. Remove all dust, dirt, and debris.
5. Thoroughly clean all expansion joints back one inch from the face of the joint.
6. In addition to tie-in detailing shown on the drawings, at tie-ins to existing asphalt based waterproofing applications, clean and lightly torch existing waterproofing prior to priming.
7. After all existing surfaces have been examined, corrected, and found acceptable to the membrane applicator, the surfaces shall be thoroughly dried out, using torches if necessary. All concrete and masonry surfaces shall be clean, dry, and primed with the Surface Conditioner prior to application of the liquid membrane; all other surfaces shall be clean and dry.

3.6 PRIMING

- A. Apply the Surface Conditioner Primer to the surface scheduled to receive the Liquid Membrane, using a Hudson-type sprayer or with a roller at a rate of approximately one gallon of primer per 300 to 600 square feet and allowed to dry. The primed surface shall be browned but not blackened.
1. Primer shall dry until tack-free. The primer shall be applied so that all surfaces and voids in the primed area are coated.

2. Primer shall be applied to only the area which can be covered with liquid membrane that day. However, if the primed area is protected by tenting, etc., so that it remains clean, frost-free, dry and free of other foreign materials detrimental to its performance, the primed area may be left three days before the liquid membrane application.

3.7 LIQUID MEMBRANE APPLICATION

- A. Melt cakes of Liquid Membrane in a American Hydrotech approved double-shell melter under continuous agitation until the material can be drawn free-flowing and lump-free at a temperature between 350 - 400 degrees F. but not exceeding 425 degrees F., and no less than 350 degrees F. Membrane shall be applied evenly at a rate to provide a continuous coating averaging 3/16" thick but not less than 1/8" thick.
 1. At all construction joints and cracks in the concrete over 1/16" and less than 1/4" in width, apply a continuous strip of liquid membrane not less than 1/8" thick and embed a continuous strip of Flex-Flash UN membrane, 6" wide for the full length of the crack and pressed down into the warm, tacky liquid membrane, 3" on each side of the crack. A second coating of liquid membrane not less than 1/8" thick shall be applied over the Flex-Flash UN membrane immediately and carried a minimum of 3" beyond the edges of the Flex-Flash UN.
 2. For any cracks, excluding expansion joints, exceeding 1/4" wide, the Architect and Owner's representative shall be notified for inspection and direction for waterproofing requirements and/or corrective work.
 3. At vertical intersections with horizontal slabs, apply a layer of Flex-Flash UN membrane between two coats of liquid membrane in the same manner as described above for crack reinforcement. The sheet membrane reinforcing shall be extended 6" horizontally and vertically.
 4. Cover all inside and outside vertical corners with a pre-strip layer of Flex-Flash UN sheet membrane a minimum of 6" wide applied at the axis of the corner. This reinforcing sheet shall be installed between two coatings of liquid membrane in the same manner as described above for crack repair.
 5. At brick ledge conditions to be waterproofed, liquid membrane shall be applied evenly to the entire ledge and provide a continuous coating of a target thickness as close to 125 mils as possible without exceeding 125 mils.
 6. Over the entire area to be waterproofed, liquid membrane shall be applied evenly at a rate to provide a continuous coating averaging 3/16" thick, but not less than 1/8" thick over the total area. This application shall be applied over all required reinforcement membrane work, and only after said work has been completed.
 7. While the liquid membrane is still warm and tacky, cover the entire surface of the liquid membrane, including all work at joints and cracks, with (Flex-Flash UN) uncured neoprene sheet, lapping seams 6" and sealing laps and all edges of the neoprene membrane with the liquid membrane. Where vertical waterproofed walls interface footings, both liquid and sheet membranes shall cover the footing horizontal surface and extend 6" down the footing vertical face. After this application has been completed, install a small section of Flex-Flash UN sheet membrane sized to cover each of the inside and outside corners. This sheet

- membrane shall be installed between two coatings of liquid membrane in the same manner as described above for crack repair.'
8. Inspect the membrane surface for bulges, fish-mouths, bubbles and roll-over seams which should be cut back, repaired with additional coatings of liquid membrane, and an additional section of neoprene membrane installed, lapping at least 6" beyond any affected area. After any entrapped air is relieved, the neoprene membrane is to be set between layers of liquid membrane as described above for crack repair. All corners shall be smooth, free of sharp edges with a smooth dense surface. All repairs shall be made immediately.
 9. Cover the membrane waterproofing completely with extruded insulation and waterproofing protection board (except in cavity wall) as soon as possible while the membrane is still warm, refer to details. Form a continuous over-all protective layer over the membrane waterproofing. Cut and fit extruded insulation tightly any pieces necessary and butt edges tightly. Protection board to start minimum of 2" below and beyond, bottom and sides of waterproofing membranes. Lap protection board 2-3 inches. Membrane shall be covered at the end of each day's work. Disallow and otherwise prevent damaging traffic, subsequent construction activities until the waterproofing system is covered with the permanent material of the project design.
 10. The insulation/protection board must be protected to eliminate debris of any type from becoming lodged between insulation or protection board and membranes.
 11. Install and maintain construction protection systems such that construction activities cause no damage to the waterproofing system. Refer to article 1.4.1.
 12. Owner's inspector must be present at removal of construction protection system. Any damage to waterproofing system will cause the waterproofing system to be nonconforming work, subject to removal and replacement.

3.8 INSULATION

- A. Do not deliver rigid insulation to the project prior to time of its installation. Protect material during delivery, handling and installation from fire. As soon as practical after the installation of an area of rigid insulation work, protect the material with the other specified work so that it will not remain exposed longer than necessary.
 1. Do not install rigid insulation or protection board that has become wet or soiled, or covered with ice, frost or snow. Also protect the rigid insulation from exposure to high ambient temperatures, excessive exposure to sunlight or contact with hot surfaces and materials which are in excess of the safe temperature above the sublimation temperature indicated by the manufacturer.
 2. The installer shall examine all parts of the supporting substrate and the condition under which the rigid insulation work is to be performed, and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until all conditions have been corrected in a manner acceptable to the installer.
 3. Apply the insulation/protection board with staggered joints. Extend insulation/protection board full thickness over the entire area to be covered. Cut and fit rigid insulation tightly around projections. Lap protection board joints 2-3 inches. Do not leave any voids.

3.9 STAINLESS STEEL CAP FLASHING

- A. Over the membrane waterproofing along foundation walls at finish grade, install the stainless steel cap flashing vertical lag to cover the top edges of the waterproofing and insulation/protection board down approximately 6" below grade. Anchor the metal cap flashing securely in place in accordance with the manufacturer's directions. Lap joints tightly and set in a bed of sealant. Where possible, use through-wall flashings for the terminations at the top of the waterproofing of vertical walls. Apply as per drawings.
 - . Close and seal ends to maintain water tightness and fill top trough with sealant to provide a water tight, surface mounted cap flashing.

3.10 TEMPORARY PROTECTION

- . If there are any delays in the work, such that materials will not be properly protected, because the specified sequence of work will not be performed in a timely manner, the Contractors will provide all necessary temporary protection and remove the temporary protection when work is resumed.

Appendix 07510 – Roofing Standards

Goal

- A. The BYU-Idaho goal is to have durable and maintainable roofs that will, with comprehensive, annual roof management, provide 40 years of service life for low-sloped roofs (less than 2" per foot) and a minimum of 40 years of service life for steep-sloped roofs (greater than 5" per foot) To achieve these goals, three basic elements, which apply to new as well as reroofing construction, are necessary:

ELEMENT OBJECTIVE

1. Facilities Design Standards convey the standards.
2. Construction Inspection Standards Achieve the design detailed in the construction documents.
3. Annual Roof Management Program Document the roof's condition, performance, and needs as it ages. Plan for roof repairs/replacement and execute annual roof repairs.

1. Facilities Design Standards

- A. These standards apply to both re-roofing and new construction and have originated from many sources, including professional associations, consultants, manufacturers, contractors, and BYU-Idaho experience. These standards are based on the tests of time and understanding of how Idaho roofs successfully perform and prematurely fail. Each roof must be evaluated independently for roof system suitability and the ability to meet these standards.
1. Unobstructed Positive Slope to Drain: Use ¼" per foot slope minimum (reroofing projects can utilize 1/8" per foot slope under certain conditions). 3' x 3' flat sports at roof drain sumps on a built-up roof are acceptable for construction reasons (installation of the drain bowl). Roof design shall ensure the ¼" slope notwithstanding camber of structure or location of mechanical units. New construction can utilized structural slope, or a combination.
 2. Proven Roof System Types and Materials: (For this climate) Use systems with at least 20 years of satisfactory performance history. Use materials with at least 10 years of satisfactory performance history.
 3. Roof Penetrations: Minimize roof penetrations. Penetrations in the roof system are generally high maintenance items and lead too premature roof failure via movement from thermal expansion/contraction, and service requirements. On a reroofing project, relocate conduits and pipes inside the building. On a new roof project, keep equipment, conduits, and pipes off the roof.
 4. Optimize Roof Drainage: Configure roof drainage pattern to optimize drainage and prevent equipment curbs and other required penetrations from occurring close to drains. Relocate drains as required.

5. Watertight and/or Properly Flashing Walls: must be repaired as required for both new construction and reroofing construction to prevent water entry into and below the roof system. This can include design features such as thru-wall flashing, window or louver sill modifications, and masonry restoration.
0. Detailing: All roof system designs shall meet the attached B1.Design Standards Detailing Criteria.
0. Flashing Height: Choose flashing heights to anticipate and accommodate possible future needs for additional roof insulation.
0. Building Code Compliance: All roof system designs shall comply with the International Building code, and shall also meet local code requirements. An average roof insulation R-value of between 25 and 30 is required by BYU-Idaho.
0. Vapor Barriers: BYU-Idaho requires the use of roof system vapor barriers to provide system protection from interior humidity conditions. Vapor barriers can also be used for construction sequencing purposes such as achieving a watertight condition or providing a staging area from which to install thru-wall flashing.
0. Maintainable Roofs: Roof systems shall be designed for simple repair and maintenance to achieve expected performance life.
0. Roof Warranties: A roofing contractor's five-year warranty is required. Manufacturer's warranties may be required for some systems; however, none are required for built-up roof systems. Remember that manufacturer's warranties are used to protect the manufacturer, not the owner.
0. Design Standards Detailing Criteria:
 - . Gravel Stop Roof Edge Details are not permitted.
 - . Use of treated wood is not permitted.
 - . Place a roof drain within 10 feet (approximate) of any cooling tower.
 - . Roof drains are preferred vs. scuppers.
 - . Install new roof drains to replace marginal/poorly performing existing drains.
 - . Design for 45-degree insulation valley lines (plan view of insulation crickets).
 - . Use EPDM rubber (not poly) behind all sheet metal cap and counter flashings.
 - . Use drive cleat corners to join roof edge sheet metal.
 - . Use welded hoods to weldable stacks.
 - . Do not locate roof penetrations in insulation valley lines or roof drain sumps.
 - . Remove or relocate existing penetrations in valley lines or relocate the roof drain.
 - . Do not use sealant except for reglet insert locations (sealant priming is required).
 - . Base flashing heights shall be minimum 8", prefer 12". Roof edges can be less than 8".
 - . Thru-wall flashing shall be installed in all cavity wall construction above roof flashing and below all doors, windows, louvers, or other wall penetrations.
 - . The height of the lower thru-wall flashing shall be a minimum of two brick courses above the highest parapet/expansion joint/control joint and no less than 18" (24" preferred) above the deck for reroofing, and no less than 24" (30" preferred) above the deck for new construction.
 - . Use pre-finished sheet metal or other approved metals such as copper.

- . Use 3" = 1' – 0" scale details on drawings to adequately show all elements clearly.
- . No "or equal" or "and/or" language shall be used in specifications.
- . Include ladders/hatches for proper roof access to all roof areas.
- . Design the roof to isolate it from moisture penetration, which may occur due to adjacent conditions.

2. Construction Inspection Standards

- . All roofing and sheet metal work shall be inspected full time 100% during construction.
- . Inspectors will check night seals, drain edges, and penetrations for water tightness every night before leaving job site.
- . Inspectors will report for repair/relocation all unanticipated piping, conduit, and masonry conditions.
- . Inspector will, each day, consider weather conditions to determine if that day is a roof working day for purposes of liquidated damages.
- . Submittals and condition survey are required prior to the pre-construction meeting.
- . A pre-construction meeting shall be held before the delivery of materials and reroof tearoff.
- . Changes to the construction as designed are not allowed.
- . Roofs adjacent to construction shall be protected.
- . Removal from the site of wet, damaged, or rejected materials shall be enforced.
- . BYU-Idaho shall be notified immediately as to all nonconforming work.
- . Contractors shall report reductions from planned crew size(s).

3. Annual Roof Management Program

- . The campus shall maintain a historical record for each roof:
 - 0. Date of installation.
 - 0. Name of installing contractor.
 - 0. Roof system and materials, with names of major product manufacturers.
 - 0. Documentation of repairs and corrective actions with dates.
 - 0. Original drawings; as-built drawings; and specifications, including addenda.
 - 0. Manufacturer and contractor warranties.
 - 0. Document and file warranty claims
 - 0. Documentation of roof inspections or evaluations, including photos and reports.
 - 0. Minutes of pre-construction and final inspection meetings.
- A. The campus should visually inspect roofs immediately following severe weather, documenting any signs of damage and schedule repairs as soon as possible.
- A. Annual roof inspections shall be conducted by a BYU-Idaho designated Roofing Consultant. These will include infrared roof moisture surveys and a comprehensive report. Schedule repairs as soon as possible.
- A. Verify that roof access is minimized.
- A. Perform periodic housekeeping surveys and clear debris from drains and scuppers.
- A. Check roof to wall connections for possible cracks or separations.
- A. Inspect around roof penetrations and roof top equipment for blisters, separation of roofing material, signs of water ponding, and excessive wear.
- A. Check and secure any loose metal flashing.

- A. Visually look for open seams, blisters, punctures, wrinkles, ridges, areas of non-adhered membrane, deteriorated surface coating or membrane, and ponding.
- A. Look for and document any interior signs of leakage on walls and ceilings.
- A. Check exterior walls for efflorescence and signs of water damage attributable to the roof.
- A. Do not allow the installation of any additional roof top equipment including mechanical units, conduit, antenna, satellite dishes, etc. without approval by the owner.

DRAFT

Division 14 – Conveying Systems

Section 14200

Minimum Requirements

- . Elevator equipment room shall be in compliance with the appropriate codes including the State of Idaho Elevator Code. Specific items include but are not limited to:
 - 0. Furnish and install 60 minute rated door and frame in the opening to the equipment room.
 - 0. Floor, walls, and ceiling shall be 1-hour rated.
 - 0. No extraneous conduits, ducts, or other non-elevator systems shall pass within the envelope.
 - 0. Maintain required clear work areas around all electrical panels.
 - 0. Install fire sprinkler systems.
 - 0. Exhaust vents shall have a fire damper at the fire rated envelope.
 - 0. Joints between masonry/concrete and gypsum wallboard shall be fire caulked. The fire caulking shall not be applied over drywall tape, paint or any other non-rated material.
- A. The elevator shaft shall be in compliance with the appropriate codes including the State of Idaho Elevator Code. Specific items include but are not limited to:
 - 0. All penetrations in the shaft shall be sealed with fire caulk, no exceptions.
 - 0. Furnish and install a smoke curtain at each opening.
 - 0. The ladder into the shaft shall be constructed in accordance with the IBC and OSHA requirements.
 - 0. The floor, walls, and ceilings shall be rated per applicable codes.
 - 0. The elevator shall comply with the IBC requirements for accessibility.

This list indicates the correction notices the university has received for the elevators built in the last two years. Attention to the matters at the design phase will eliminate delays in receiving an operating certificate for the elevators at completion.