EXTERIOR MASONRY SCOPING GUIDELINES

3.1 Introduction

Exterior masonry represents the largest portion of the building enclosure for the majority of school projects (with the exception of newer buildings with curtain wall or metal cladding, etc.). In many buildings the masonry is very old; decades or even a century or more. This poses challenges not only due to the condition of the masonry but also due to the lack of design documents or other indications of how the walls were built. Probing can help to identify specific conditions, but a general understanding of solid masonry construction in older buildings is typically necessary when evaluating existing masonry. Designers not familiar with solid masonry construction should research the topic in advance of working on these types of projects. The Kidder Parker Architects' and Builders' Handbook is an excellent reference for architectural and structural data on solid masonry buildings and construction details.

Problems with the exterior masonry on existing buildings can come in several forms. Some but not all of these can lead to water leakage on the interior of the building. Brick and stone masonry can suffer deterioration over time, or from being in areas of extreme exposure to the elements. This is especially true for weaker or lower quality materials, or improperly installed materials. Similarly, the mortar between brick and stone can deteriorate for the same reasons, although even properly installed and good quality mortar will eventually break down over time. In some cases, deterioration within the walls can lead to displaced, bulging, or cracking masonry that poses a falling hazard depending on the location. Stone trim elements are often at risk of this due to their projection from the plane of the wall, higher water exposure (or tendency to catch water and runoff), and often lack of flashing. These issues can develop in the absence of water leakage, although leakage usually results from more severe damage. Also, previous removals of overhanging cornices has led to more exposure of the façade. Complicating matters, leakage may be in the form of excessive wetting of the walls which causes deterioration on the interior (blistering/failing plaster, peeling paint, staining, etc.) but may not result in actual dripping water or visible leakage.

- For discussion of Energy Code Compliance issues, refer to the Building Envelope Scoping Guidelines.

- See the Building Envelope Testing Scoping Guidelines for further discussion of testing strategies.

3.2 Project Definition

The Exterior Masonry Capital Category may include some or all of the following components:

- *Exterior Walls*
- *Louvers*
- *Chimney(s); these may be integral with parapets – see Parapet scoping guidelines for related information*
- *Exterior Soffits*
- *Awnings & Canopies*
- *Areaways (including drains, gratings, slabs, railings, stairs, and walls; sometimes scoped under*

"Flood Elimination/Below Grade" if there is water infiltration requiring a separate "Flood Elimination" project, but no other "Exterior Masonry" work.)

- *Loading Dock*
- *Stairs/Ramps: Exterior (including building cheek/flank walls, and railings; typically scoped under "Exterior Masonry")*

Design Requirements: *Refer to DR 4.2.3 of the SCA Design Requirements for further design and technical requirements (For SHPO eligible Projects).*

3.3 Referred Items and Additional Items

The Exterior Masonry category and nodes are intended to address façade conditions from grade to top of the top floor window head where there is an existing parapet or otherwise for the full height of the façade. If parapet replacement is not required, face brick and coping work of the parapet should be included with "Exterior Masonry". Below-grade conditions related to foundations and below-grade waterproofing are typically addressed in the category of "Flood Elimination", but be aware that the exterior masonry above grade may be the source of water into the basement space. Exterior Masonry is typically brick or a combination of brick, stone, or terra cotta masonry, but sometimes includes concrete, precast concrete or cast stone. Stones often encountered include limestone, granite, marble, and/or slate.

Scope all of the above-referenced "Exterior Masonry" components, using the BCAS report as a checklist of items. Use the selected nodes for guidance; however, scope all components under the LLW category. Include repointing of steps adjacent to the exterior wall within the DOE-Referred scope, if required; however, if damage is extensive and replacement of steps is required, replacement will typically trigger accessibility/ADA requirements. If stair or ramp replacement is required, discuss with the DPM/DM and include as an "SCA Additional Recommendation".

Include the "findings" and "recommendations" for repair of interior damage caused by water infiltration due to defects being addressed by the deficiencies listed in the categories which are likely sources of leaks.

Bulkhead/Penthouse masonry repairs, if required, would typically be included under "Roofing" as documented under "Roofing Specialties" in BCAS, but if other "Exterior Masonry" work is required, consult with the DPM or DM for direction whether to include these masonry repairs with "Roofing" or "Exterior Masonry". The rationale to include this work under "Roofing" would be to address any water infiltration and repairs of bulkhead/penthouse masonry, which may impact base and cap flashing, etc. prior to a roof replacement project to make sure the defects do not compromise the new roofing system.

3.4 Investigation & Documentation of Findings

If a hazardous condition exists, immediately notify the DPM and DM in order to have a sidewalk shed erected and/or temporary work done on an emergency basis for public protection. Provide a field report to the DPM or DM, who will transmit it to Construction Management for action. Hazardous conditions may include masonry that has already fallen, masonry that is visibly dislodged, or areas of walls and parapets that exhibit deformation such as bulging or excessive vertical cracking at or near building corners.

Prepare "Existing Condition" or "Damage Mapping" drawings that record the location(s) and extent of deficiencies observed on annotated plans, elevations and other drawings as appropriate. Also, prepare corresponding "Recommended Work" drawings that graphically describe the

recommendations. Refer to the Building Envelope Scoping Guidelines, Section 2.5 Investigation & Documentation of Findings for additional requirements.

3.5 Exterior Masonry Element Work

3.5.1 Exterior Walls

Study the history of the building to find out type of building construction. Inspect the entire façade including cornice/ band, lintels, flashing, and coated masonry areas, etc. Of particular concern is the structural system for the building. Problems of deterioration with load-bearing masonry are typically superficial or result in localized falling risk only. Transitional masonry buildings, which typically date from around 1880 to 1950, were built with a structural steel frame, as opposed to load-bearing masonry walls. In these cases, the exterior masonry is essentially infill around the frame. These types of buildings are subject to potential structural issues caused by corrosion of the steel frame, which in turn is caused by leakage through the exterior. In some cases there is only a single wythe of masonry outboard of the building columns and spandrels – this means that even a properly constructed and pointed masonry wall will allow the steel to get wet. Transitional masonry buildings are also often built with hollow terra cotta block backup walls, which are more absorptive than brick masonry and are more likely to allow water leakage to the interior. Lastly, in extreme cases differential movement between the steel frame and the masonry has the potential to cause shearing of the brick headers that tie the outer wythe to the backup wall, resulting in the risk of large areas of the façade detaching from the building. “Clipped brick” construction, where only a portion of the header connects the face brick to the back-up has been found to cause several façade failures.

When performing inspections, pay close attention to cracking of units, patterns of cracking in stone and brick masonry, masonry joints, and bulging or shifting of masonry. Long vertical cracks, especially at building corners, may be indicative of steel columns corroding behind the masonry (in transitional masonry buildings). Similarly, horizontal bands of bulging masonry can be indicative of corroding spandrels. In newer buildings with cavity wall construction, cracking or spalling in horizontal lines near floor slabs may indicate lack of expansion joints/soft joints in the veneer (the brick will spall where it hits the underside of shelf angles or other fixed supports). Pay close attention to condition of mortar joints, including hardness, erosion, and presence of organic growth.

Study wall sections to correlate distress in the masonry with the location of the structural steel behind or potential failures of masonry anchors. As noted above, bulging or cracks can be related to structural steel corrosion. Bulging is also attributable to lack of ties, especially at concrete spandrels, or sheared brick headers at spandrels or field-of-wall areas. In limestone or other stone veneer claddings, “half-moon” spalls are typical of metal cramps rusting.

Refer to the Building Envelope Testing Scoping Guidelines. Use a combination of probes and Non-destructive Testing (NDT) to assist in determining the source of moisture infiltration as well as reasons for bulging of masonry or cracking of stonework. The SCA has been finding that using spray racks with infrared testing has been effective in determining the general source and path of water infiltration, although probe openings are typically necessary to confirm these findings. It is not necessary to test all leak locations if interior damage and exterior masonry are similar in multiple locations. It is likely that the cause of leakage is the same and it is more cost effective to test different conditions and to verify construction with probe openings.

Probes will also let the designer see the condition of the interior of the masonry. Make sure to select at least one probe location where masonry is in a satisfactory condition so the condition of masonry can be compared with other probes. It is also important to note that although most mortar may appear in good condition, repointing may have been done without fully cutting the previous joint and it may only be a thin outer layer of mortar that is in good condition. This will allow the wall to absorb more water than if the repointed mortar joint ran deep within the wall. In addition, the thin pointing layer will not be durable and is likely to fail. This may be evident in some locations, especially near the edges of the joints.

Work does not have to be done just because there is a project. The intent of the project review is to determine if work is warranted; do not assume that there are definite problems that must be identified. If there is no evidence of leakage and the masonry appears to be in good condition, repair/replacement may not be required. If it is not required, notify the SCA and discontinue work on that component. Sometimes, recent repair projects might have addressed some of the items making a review of the project history very important at the beginning of the review. Interviews with school custodians and more importantly, classroom teachers, is also important in establishing the nature and extent of any water leakage, as both parties may have useful information about leakage (or the lack thereof) that can guide an investigation and repair program.

As many older schools are load bearing masonry construction or framed construction with solid masonry exterior wall construction, extensive water infiltration and spalling or cracking of face brick may be found throughout the façade, which could indicate deterioration of the face brick and mortar joints, voids within the solid masonry back-up wall due to deterioration of mortar, lack of flashing, etc. It is important to determine if pointing will be sufficient to stop the penetration. Probably the most important reason is that during the original construction the back-up wall joints and the collar joint between the face and back-up wall were never filled solid. Such conditions should be carefully evaluated with study of existing drawings, visual inspection, NDT, and probes. Probes will help determine the integrity of the interior wythes and whether the collar joint is filled and are critical to this kind of study. It has been found that many times pointing is not sufficient to stop water penetration if the interior construction allows water to flow freely once water enters inside. If the collar joint space behind the face brick is open, then pointing work will typically not be sufficient and full face brick replacement should be considered in the affected areas. In replacing the face brick, depending on the extent and make-up of the wall, a “pseudo cavity wall” (created by installation of a 3/8” drainage mat within the space of the collar joint) to stop water infiltration into the back-up wall should be considered. This will require structural investigation into the feasibility of replacing the brick while maintaining the integrity of the wall, as some older walls will rely on all wythes being tied together for strength. The water vapor permeability of the drainage layer also needs to be considered; in general solid masonry walls should be kept as vapor permeable as possible to avoid trapping moisture and allow drying to both sides. For a solid wall consisting of terra cotta or clay tile back-up, the use of a pseudo cavity with air/water barrier is often the only choice as clay tile absorbs water to an extent that even a fully filled collar joint may not work successfully to prevent water penetration.

The following additional precautions must be taken when doing a façade replacement:

- Research and determine whether the windows are replacement windows that were panned over the existing wood frames, or if the windows are the original wood windows. Also, determine the masonry back-up material.

- If the alchemy drawings of the window replacement project do not show adding anchors from the existing frame to the substrate, or if the windows are original, the designer should evaluate the potential risk that the anchors may not hold, and the windows may move when the face brick is removed. The investigation may require probes to verify existing conditions and to determine the means of anchoring required. The quality of the back-up wall behind the face brick should be evaluated for adequate potential anchorage of the windows, or if separate/replacement framing needs to be developed. This is especially critical for clay-tile back-up panels.

- If the investigation determines that the existing anchors may be suspect, or if probing is impractical to determine the condition of existing anchors, the design must incorporate a separate means of anchoring the wood frame (or replacement framing system) to the existing back-up (or to the existing structural framing), depending on what is being done with the windows and the condition of the back-up.

    - If the windows are being replaced as part of the project, the drawings must call for the Contractor to design a shoring scheme to support the existing windows in place until the time that they are removed. The note shall indicate that the shoring must be installed immediately (prior to the end of the workday) upon removal of the existing surrounding masonry.

    - If the windows are to remain, whether to be kept in place or reinstalled, additional anchorage as required shall be designed such that it will work with the façade replacement, with a requirement that it be done immediately (prior to the end of the work day) upon removal of the masonry façade around the window. Based on the back-up condition, the designer is to determine if the wood frame can be anchored into the back-up, or if supplemental framing is required to be anchored to the existing steel structure. There shall also be a note that if the permanent anchorage cannot be installed by the end of the workday, the Contractor must immediately (prior to the end of the workday) provide temporary shoring of the window.

- If replacement of the outer wythe is not structurally feasible or desirable, cladding over the existing masonry and introduction of a drainage cavity and weeps should also be considered. However, this has major structural implications with the need to add relieving and the potential weight and torsion to the structure and may only be feasible for a shorter building. In cases where the integrity of the outer wythe is in question, anchorage for the new cladding/veneer may need to be specifically designed to engage the backup walls rather than relying on anchorage into the (potentially unstable) outer wythe only. Alternate methods of face brick replacement should be considered in consultation with the DPM, DM, and SCA technical staff. As per the 2016 New York City Energy Code (NYCECC), replacement may also need to include prescriptive energy saving measures depending on SHPO eligibility and building construction and thus must be carefully considered. Typical requirements for insulation on mass masonry walls, under the 2016 NYCECC, is R-9.5 continuous insulation (which would add approximately 2½" to any assembly). Exterior-only modifications (replacing outer wythes of masonry, for example), with no new framing cavities (furring) added at the interior, would typically not trigger current energy code requirements. If furring on the interior (creating a new framing cavity) is added, the energy code requirements for insulation within the framing cavity may be required.

- Designers on some projects have recommended full replacement of the exterior wythe based on incomplete or inadequate testing or observations, which has significant cost and time impacts.

    - Prior to requesting material testing, study the building design and maintenance. Look for water intrusion and water retention points. Evaluate mortar to brick bond by visual inspection. Note patterns of damage and draw correlations. Eliminating water intrusion and water retention will eliminate freeze/thaw damage.

    - The long-term durability of brick and stone masonry cannot always be determined from the typical tests that are often requested, such as compressive strength. There are lab tests available that can better assess the risk of long-term degradation based on other material properties; these should be considered if the durability of the masonry is in question. For brick, these include testing for conformance to ASTM C216 standards, with the ASTM C67 cold water and hot water absorption tests, and ASTM C67 freezing and thawing tests being the most often performed. Another test is the Mercury Intrusion Porosity (MIP) developed by Manfred Maage, though this test has not been adopted as a standard.

    - For any material, testing for freeze thaw resistance in accordance with ASTM C666 for concrete or C67 for clay masonry will be the best tests, but takes approximately 3 months to complete. However, regular reports of the test progress and percent of material loss at intervals may provide sufficient information to make a determination in a timelier manner.

    - For a comprehensive project-specific evaluation of the ability of a masonry wall to withstand future freeze-thaw damage, perform frost dilatometry in combination with a hygrothermal model analysis. Frost dilatometry is a lab test method that determines the lowest moisture content at which freeze-thaw damage may occur for a given brick. If this can be determined, then hygrothermal modeling such as WUFI can be run for the specific wall composition, temperature conditions, and rain history, to determine if the brick might experience that critical level of saturation.

    - Projects being submitted to SHPO should always have some of the above tests, and also should have RILEM tube tests performed on both the base material and the material joint interface as these are requested by SHPO when making a case for face brick replacement. Note that RILEM tube testing often provides unreliable results. For more comprehensive evaluation of the rate of water penetration through a masonry surface, perform ASTM C1601 testing using a pressurized chamber.

    - Note that cold and hot water absorption testing and freeze-thaw testing will provide an indication of durability, but other factors are equally important. If a masonry wall can resist water infiltration or quickly dry up or drain water out, it could perform well even if the lab test methods indicate the masonry is poor.

    - It must also be noted that a masonry wall may also be vulnerable to freeze-thaw damage even if the lab testing indicates it should be durable, especially if drainage and drying are very poor, or the wall does not have sufficient capacity to store the water until it dries out. The condition of the back-up and collar joint may

be a more critical issue in determining the need for face brick replacement, as a weather resistant brick in front of a wall with an open collar joint will still likely leak if flashings are insufficient or the mass wall does not have sufficient water storage capacity. The initial cost and time associated with the testing will always be significantly smaller than the potential cost of recladding a building, especially in the case where recladding is not warranted based on the masonry conditions. Refer to the Building Envelope Testing Scoping Guidelines for additional information.

- Study the condition of back-up materials when only one wythe of masonry is being removed and replaced. Where feasible, include removal and replacement of back-up material to the existing steel members where there are existing steel members such as beams and columns. Include in the work the exposing, inspection, repair, and application of coatings and flashings to the steel prior to reconstruction of the wall. Areas of light surface corrosion on the steel can generally be treated locally. Any areas with visible section loss or flaking corrosion product must be evaluated structurally and cannot simply be cleaned and concealed in the wall.

- In cavity wall systems, include removal and replacement of the existing vapor barrier, flashings, insulation, and ties when the outer wythe is being replaced. Typically, the outer wythe is supported by relieving angles at each floor, with a soft joint under the relieving angle. In some cases where soft joints are not installed, horizontal cracking and spalling may occur below the shelf angle if the brick has expanded up to that point. To maintain a consistent joint width, the brick sitting on the relieving angle may be a lip brick. The lip of the face brick should be closely inspected for cracking and missing pieces. Also, inspect the masonry details at the flashing and weeps above the relieving angle to ensure that sealant does not prevent water from weeping or allowing moisture to evaporate. In some cases, weeps may have been filled in with mortar or sealant in a misguided attempt to reduce leakage; this often occurs when investigators or contractors are not familiar with the functioning of cavity wall systems. For new cavity walls, provide a minimum 1in. air cavity behind the masonry (ideally 1½" to 2"). It is best practice to provide a drainage mat within the entire cavity to facilitate drainage and minimize the effect of mortar clogging within the cavity in narrower (i.e., <1/2") cavities. The filter fabric side of the drainage mat should face the brick. For wider cavities, require controls such as cleanouts at the base of the wall to reduce the potential for clogged cavities.

- Expansion and control joints are many times a reason for water infiltration, so their condition should be inspected closely and reason for failure of the joint evaluated. A properly constructed expansion joint will include a soft joint in the exterior masonry (sealant and backer rod) with a more robust joint in the backup wall beyond (prefabricated joints, sheet membranes, etc.) Expansion joints should be continuous along the building and should tie into the wall waterproofing system. When available use prefabricated transition pieces and coordinate expansion joint continuity with roofs and other horizontal surfaces. Verify chemical compatibility of expansion joints with waterproofing manufacturer or with existing expansion joint if tying into existing conditions.

- Cracking at quoins, corners, and spandrels are often the result of rusting steel behind. Rusting steel may be structural (beams/columns) or localized ties in the case of quoins or accent pieces. The deterioration starts once water starts infiltrating inside the wall, so verify condition of the steel by ordering probes. Include removing the masonry back-up down to the steel columns or beams and rebuild the masonry instead of replacing only

the outer wythe of masonry. In the case of structural steel damage, this will become a much more involved task. Structural inspection and repair/reinforcement or replacement of steel members may be required during the construction phase. During the investigation/testing phase, selective probes and/or tests should be undertaken to determine typical conditions and provisions and/or allowances be added to the Construction Documents to address this working during the construction phase.

- Use of Exterior-Applied Coatings or Penetrating Sealers for Waterproofing: Typically, the use of exterior-applied coatings or penetrating sealers for waterproofing is not recommended. These materials are typically only effective in the short-term, if at all, and will require frequent (every few years) reapplication or repair to remain effective. The effectiveness of coatings and sealers is heavily dependent on the condition of the masonry, since they function by reducing absorption through the outer surface, but do not prevent leakage at cracks, spalls, and other defects. If the brick face has some limited spalling or the brick is porous, but otherwise appears in good condition and the brick has not previously been coated, the use of a clear vapor permeable weatherproofing (siloxane type) may be considered. The joints must still be pointed and the brick cleaned, as well as any cracks or other damage fully repaired. However, if the collar joint space behind the face brick is open, then this work may not be sufficient and full face brick replacement should be considered.

- Repairs on Masonry with Existing Coatings: Many coatings and paints applied to exterior masonry do not allow the passage of water vapors and may trap moisture behind the coating, accelerating masonry deterioration and causing the masonry to crack and/or spall. To repair existing coated masonry, the old coating will have to be removed (review SCA specifications on paint removal), the joints pointed, and the brick cleaned. Existing coatings should only be removed if they are contributing to any problems (e.g. retaining moisture) or if required to execute necessary work (e.g. pointing). Existing coatings must be tested for asbestos and lead.

- Use of Exterior-Applied Coatings on Previously Coated or Parged Masonry or Poorly Matched Masonry Repairs: If the brick has been coated or parged already and the masonry is structurally sound, a potassium silicate mineral paint (such as those manufactured by Keim or Cathedral) may also be considered after the previous coating or parging is removed. Also, if previous masonry repairs are poorly matched but in otherwise good condition, applying a potassium silicate mineral paint coating may be considered to create a uniform appearance.

- Study drawings for windows and their locations within the width of the wall. In cavity wall construction, water penetration is often due to the cavity not being closed by masonry and the window is in line with the cavity. This condition may necessitate both window and masonry work at the same time, instead of including only masonry or only window related work. It is best practice to turn wall waterproofing into the window frame jambs and provide means to shed the water at the windowsill. If removing and reinstalling the window, or fully replacing it, are not options, it is also helpful to extend window head flashing 3” minimum past the window jamb, with end dams on both sides, to minimize the water traveling within the cavity adjacent to the windows.

- Inspect the condition of lintels over existing windows and exterior doors. Indicate if repair or replacement is required. Typically, lintel replacement, if required, should be scoped with Exterior Masonry Work, since it requires masonry replacement to expose lintels, replace deteriorated lintels and install new lintel flashing, etc. Lintel replacement at top

floor windows should be scoped with Parapet Work. The parapets must be carefully evaluated to confirm that the flashing and/or waterproofing (if any) in the parapet is properly tied into the window lintel flashing. There have been many cases where the Parapet is repaired separately from the lintels, or vice versa, and leakage persisted due to a lack of integration between the two. However, if there is no other masonry or parapet work, lintel repair or replacement should be included with the Window Work. When inspecting the lintels, look for bowing near the center and rusting, especially heavier rust scale. On occasion, the lintels may be coated from below and rusting may be difficult to observe; however, masonry cracking originating at the ends of lintels is often indicative of rusted lintels. Perform a probe at the lintel to inspect lintel condition and presence of flashing, since the top surface of the lintel (concealed) is the most subject to deterioration and must be observed. Double channel lintels in bearing wall construction are typically void in the middle and the ends are not closed off, which all provide a path for water to travel into the building.

- Include rust removal, preparation and painting of exposed portions of lintels under Window and/or Exterior Masonry or Parapet projects. If windows are being replaced, treat all exposed lintel surfaces following removal of existing windows. As noted above, it is critical to understand that simply painting or treating the underside of lintels is not sufficient to address long-term durability, as it is the concealed portions of the lintel that are subject to the greatest risk of deterioration.

- Always verify locations and conditions of wall-mounted items attached to masonry that may require removal and reinstallation or replacement to facilitate construction work, such as wall packs, ladders, window guards, and roof top playground cages (which may also be related to parapets), .

- If exterior masonry work is required, but no window or door work is included, include removal and replacement of sealants at the perimeters of windows and doors if sealant is in a deteriorated condition or is impacted by the proposed masonry work.

- When there are existing coatings at the base of the building and application of a new anti-graffiti coating is required, include removal of all existing layers of coating down to the base material. Include masonry repairs and repointing following coating removals. Prepare areas and apply new anti-graffiti coating per coating-manufacturer's recommendations. Refer to discussions above regarding the need to maintain the vapor permeability of masonry walls. Coatings must be selected that are appropriate for the walls being addressed and the specific type and condition of the masonry in those locations. If graffiti is found behind the removed coating and properly performed mock-ups done with the aid of the manufacturer still results in some graffiti 'ghosting', it may be appropriate to repaint the area with an opaque breathable masonry paint/coating in lieu of the anti-graffiti coating.

3.5.2 Louvers and Glass Block Masonry

Review conditions of louvers and glass block masonry with exterior walls under Exterior Masonry. Identify any defects and determine if the louvers or the surrounding masonry are a source of water infiltration. Review conditions of sealant and flashing at the perimeter, since this often is the reason for water infiltration. It is best practice to treat the perimeter of louver openings similar to windows, by turning waterproofing into the jambs and providing flashing at the head to deter water and sill pan flashing to shed any water that may travel in through the louvers. Glass block areas are highly subject to water leakage since they are relatively thin,

and water can soak through mortar joints to the interior during even moderate wind-driven rain events.

Identify and address connections of ductwork and plenums to existing louvers that require reconnection within the louver scope description.

3.5.3 Chimney(s)

Review the condition of the chimney masonry. Chimneys often see harsher weather due to the higher exposure (i.e., three to four sides are exposed extending higher than the roof and little to no sheltering) and thus the masonry at these locations may be more deteriorated than at lower levels.

The functionality of existing chimneys must be confirmed during the scoping of chimney conditions. Some existing chimneys may be abandoned or no longer be in use. The feasibility of capping them off or reducing their height shall be evaluated to reduce the cost of repairs and/or future maintenance. Determine if the chimney has a stainless steel liner from a recent boiler replacement project.

Review the condition of existing chimney cap(s), copings and liner. The proposed masonry work repair and the extent of work on chimneys has to be carefully considered. Any chimney modification, including replacement of the entire chimney assembly, has to be evaluated and confirmed by a Mechanical Engineer in order to avoid any issues with the mechanical system functionality. In general, comprehensive masonry repair work and modifications (rebuilding a portion of, replacing the entire chimney, large-scale face brick replacement and/or repointing) may trigger code mandated smoke testing and will most likely result in a costly chimney liner installation or replacement.

3.5.4 Cornices

Verify condition of cornices and cornice covers where applicable and correlate with damage and cracking in the cornices. Many times, damage and cracking in cornices can be seen in the shape of half moons that shows the cornice cover was installed using incorrect technique and it is likely that adjoining units will crack in the near future even though they appear to be in satisfactory condition. In addition, if transverse joints of the cornice covers are not properly done, they may collect water and act as a gutter that allows water infiltration into the wall. Although sealant joints in these areas will eventually require replacement due to the severe exposure, properly installed sealant will be much more effective than mortar at preventing water infiltration. Cornice elements need to be sloped to the exterior in all areas. For heavily deteriorated, or highly absorptive, cornice elements, sheet metal flashing or liquid-applied waterproofing on the near-horizontal surfaces should be considered to address the leakage risk. Due to anchoring requirements, sheet metal flashings, if added or replaced must carefully consider the type and spacing of fasteners to avoid spalling. Liquid applied waterproofing along the exposed horizontal surfaces may be simpler and more cost effective.

3.5.5 Exterior Soffits, Awnings and Canopies

Inspect existing conditions including cracking, deteriorating and spalling portions of concrete and/or stucco. Generally, these items are located above entrances, so inform the DPM or DM if there is a potential hazardous condition noted such as loose or hanging pieces of stucco or concrete. Provide details of immediate remedial work or sidewalk bridge location(s).

Depending on the referred items, awnings and canopies may be included with roofs, exterior masonry, or parapets as appropriate to the project.

3.5.6 Areaways (including drains, gratings, slabs, railings, stairs and walls)

Typically, areaways, with associated drains, gratings, slabs, railings, stairs, and walls are to be scoped under "Exterior Masonry". If areaway deficiencies contribute to below grade water infiltration into the building, areaways are to be scoped under the "Flood Elimination/Below Grade" category.

Inspect areaway drains, gratings, slabs, railings, stairs and walls and describe their condition.

The functionality of existing areaways must be evaluated. Some existing areaways may be abandoned or no longer in use. Also sometimes areaways are closed improperly, which becomes a source of water infiltration. Areaways may serve to provide access for servicing of mechanical equipment or supplies and/or proper ventilation of below grade spaces. The feasibility of removing existing areaways or capping them off shall be evaluated to reduce the cost of repairs and/or future maintenance. Areaway modifications must be evaluated by a Mechanical Engineer to determine requirements for ventilation of below grade spaces and/or other mechanical requirements.

Note the location of sill heights (windows/louvers) and their condition within areaways as these may be sources of leakage. Pay close attention to any areaway locations that may have had window openings previously blocked with masonry. The transition of new to old masonry is often a source of leakage in these cases (e.g., if the masonry is not properly "toothed in", or if the infill is thinner than the surrounding walls). In addition, blocked openings may compromise the requirements for mechanical ventilation or access. Check code requirements for minimum height of openings above the bottom of the areaway slab. Work done to the opening must not reduce the openable area required for combustion air nor reduce the distance from the opening above the area way slab to below that required by the 2014 NYC Mechanical Code.

Inspect and verify condition of areaway drains. The drains must be functional; otherwise water ponding in the areaway where walls are not treated, as well as the sill height of window and louver being very low, can provide a path for water infiltration inside the building. It is also possible that normal rainwater exposure at the base of the areaways, even if drained, allows water to reach the base of the wall faster than in adjacent, fully-buried areas and results in leakage only at those locations. In these cases, localized waterproofing may be practical by digging out the areaway (usually only a few feet to the bottom of the wall) and installing waterproofing.

Discuss the functionality of the existing areaway(s) with the School Custodian to confirm the size and other requirements for access through the below grade space(s) or with an access hatch within the grating. Also, establish if ladder access is required below the gratings.

Identify materials, locations and any deterioration noted. Identify if deficiencies result in water infiltration into the building interior. Include recommendations for repair and refinishing of rusted/corroded elements if required.

3.5.7 Loading Dock

Include description of elements and their condition along with any recommended repairs.

3.5.8 Stairs/Ramps: Exterior

Typically, stairs/ramps and associated building cheek/flank walls and railings adjacent to building entrances are to be scoped under "Exterior Masonry". If deficiencies are found at stairs or ramps that result in water infiltration into below grade spaces, the stair/ramp work is to be scoped under the "Flood Elimination/Below Grade" category.

Inspect condition of steps, landings, railings, ramps, cheek walls, etc. Take note if steps or landings are over interior spaces. Exterior entrances can become a major source of water penetration into the basements of older schools. Many exterior stairs are constructed of loose bluestone treads spanning between walls that permits water to enter spaces beneath and may require a complete replacement with a sandwich slab system to provide a waterproof membrane. These items need to be carefully analyzed, as replacement of exterior entrances invokes Chapter 11 requirements of the 2014 NYC Building Code, thus requiring the entrance to be made accessible. Minor work at stairs/ramps can be included in Exterior Masonry. However, extensive damage of stairs and ramps that trigger replacement of stairs and/or ramps are to be scoped as SCA Additional Recommended Items, since the replacement will trigger requirements for accessibility.

The joint at the base of the building wall and pavement shall be inspected for deteriorated caulking or grouting of joints. Deteriorated and/or open joints are surprisingly many times a reason for water infiltration inside the building, even though they may seem like such a small item. However, these joints should always be noted as ongoing maintenance items because they will likely require replacement every 1-2 years to remain effective. Grading of the site is also critical and must be noted as part of this review.

3.6 Related Items

3.6.1 HVAC

The Exterior Masonry Work above may require the removal and reinstallation of existing (or replacement with new) wall or roof-mounted equipment, louvers, fans, piping, etc. The work and expense to remove, reinstall or replace such items is to be included under the Exterior Masonry category.

3.16.2 Plumbing

The Exterior Masonry Work above may require the removal and reinstallation of existing (or replacement with new) wall or roof-mounted piping, etc. The work and expense to remove, reinstall or replace such items is to be included under the Exterior Masonry category.

3.6.3 Electrical

The Exterior Masonry Work above may require the removal and reinstallation of existing (or replacement with new) wall or roof-mounted electrical equipment, fans, conduit, etc. The work and expense to remove, reinstall or replace such items is to be included under the Exterior Masonry category.

3.6.4 Interior Finishes

Solid masonry walls have a high water storage capacity that is acceptable given that the wall can dry both from the exterior and interior. As noted above, normal/acceptable water vapor flow through masonry walls can still lead to interior finish damage in some cases, specifically where gypsum-based plaster is installed directly over masonry walls. Interior finishes must be reviewed and evaluated in areas where work is being considered to assess the risk of further damage, even in the absence of actual water leakage. (See discussion under "Design Considerations" regarding repair options.)

3.7 Design Considerations

Different work shall be clearly identified with a legend on plans and elevations with appropriate details in design drawings. Revise and include designs that reflect the conditions seen after inspecting probes and reviewing NDT results to avoid change orders.

Locate the specific areas where brick replacement and pointing is to be done with dimensions rather than just giving general quantities for the whole facade. Similarly, areas of cracks, spalls, and other repairs must be clearly noted.
At corner replacements and similar conditions where cracks have appeared, provide new control joints from grade level to the head of top floor window lintel level and expansion joints from the head of top floor window lintel level to the top of coping stones.

Engage a structural engineer for transitional masonry buildings that exhibit evidence of structural deterioration.

Use of details such as fully soldered end dams at lintels, spandrel flashing, pre-drilling in masonry to provide new anchors, etc. are recommended to avoid future problems and ensure they are done.

When window guards are being installed in masonry window jambs, verify jamb width is sufficient to install window guards at the jambs without spalling the masonry due to insufficient edge distances.

Investigate the use of alternate materials for terra cotta when required to be replaced. The design should incorporate the use of GFRC or cast stone/architectural precast as appropriate, depending on the location of the material in the building and the intricacy of the units. Provide additional framing as required with appropriate weather resistant barriers. Use of terra cotta for a special condition will require the approval of the Authority. For those projects to be filed with SHPO, the change in material must be documented in the SHPO submission.

Consider modifying interior finishes in areas where finishes are currently damaged to provide more long-term durability:

- Use only cement plaster (not gypsum plaster) directly to the brick masonry and paint with water-based primers/paints only. The cement plaster, similar to exterior "stucco", is more resistant to moisture damage than more commonly used interior gypsum plaster, and water-based coatings tend to be more vapor permeable than oil-based. Along the interior face of exterior walls, remove existing plaster that is damaged by water infiltration or moisture drive (evidenced by bubbling plaster and paint) down to the substrate and replace with cement plaster. Consider appropriate transitions between areas of new cement plaster and existing gypsum plaster to remain, preferably to the nearest inside corners. Where the face brick is removed and an air barrier placed, gypsum plaster can be utilized for repair as the air barrier will prevent or at least reduce moisture and moisture drive through the wall.

- As an alternative to plaster, consider installing fiberglass-faced ("paperless") gypsum wallboard on furring strips over the backup wall as the interior finish if space allows. Also, impacts on existing wall mounted items, trim and placement of existing radiators, etc. must be considered. Provide fiberglass-faced ("paperless") gypsum plaster wallboard, with furring, an air gap between the masonry and the interior finish to reduce moisture migration directly through the finishes and thus reduce the risk of future interior damage. The wallboard can be finished like typical paper-faced board, or covered with a thin skim coat of joint compound to provide a smoother surface. The primary disadvantage of this approach is that the wallboard will have lower impact resistance than direct-applied plaster.

- Consider alternative wall repair strategies behind existing radiators, based upon project conditions, distance between radiator(s) and wall, etc. Removal and reinstallation and/or replacement of existing radiators along exterior walls should be avoided if at all possible for repair of interior plaster only. Consider removing loose plaster and refinishing the wall behind radiator(s) with minimal repairs to avoid disturbing the existing radiator(s). Consult with IEH to determine if the affected plaster areas contain asbestos and determine the appropriate repair and remediation options (including abatement or encapsulation). Consider deferring full repair or replacement of existing plaster finishes until a future Climate Control project that requires removal and replacement of the radiators.

End of Exterior Masonry Scoping Guidelines