Title: DEVELOPMENT OF EXTERIOR CLOSURE & INTERIOR CONSTRUCTION LAYAWAY PROCEDURES.

PROJECT ADMINISTRATION DATA

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Security class (U,C,S,TS): U  ONR resident rep. is ACO (Y/N)  N
Defense priority rating : NONE  NNA supplemental sheet
Equipment title vests with: Sponsor X  GIT

FIXED PRICE DEL. ORDER SUBJECT TO THE TERMS OF BOA DACA88-90-D-0006 #164.
NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 02/07/91

Project No. D-48-612
Project Director MYERS J H
Sponsor ARMY/CON ENG RES LAB, IL

Center No. 10/24-6-R6945-040
School/Lab DEAN ARCH

Contract/Grant No. DACA88-90-D-0006-0004
Prime Contract No.

Title DEVELOPMENT OF EXTERIOR CLOSURE & INTERIOR CONSTRUCTION LAYAWAY PROCEDURES
Effective Completion Date 900924 (Performance) 900924 (Reports)

Closeout Actions Required: Date Submitted
Final Invoice or Copy of Final Invoice Y __  
Final Report of Inventions and/or Subcontracts Y __  
Government Property Inventory & Related Certificate N __  
Classified Material Certificate N __  
Release and Assignment N __  
Other N __  
Comments __________________________

Subproject Under Main Project No. __________________________
Continues Project No. __________________________

Distribution Required:

Project Director Y 
Administrative Network Representative Y 
GTRI Accounting/Grants and Contracts Y 
Procurement/Supply Services Y 
Research Property Management Y 
Research Security Services N 
Reports Coordinator (OCA) Y 
GTRC Y 
Project File Y 
Other N 

NOTE: Final Patent Questionnaire sent to PDPI.
REGIONAL ADJUSTMENT FACTORS

Four basic conditions have been identified for the realignment planning. These consist of

1) Long term deactivation (> 1 year) with ample reactivation time (> 45 days)
2) Long term deactivation (> 1 year) with fast reactivation time (< 45 days)
3) Short term deactivation (< 1 year) with ample reactivation time (> 45 days)
4) Short term deactivation (< 1 year) with fast reactivation time (< 45 days)

While there may be extensive overlap in some of the inspections and maintenance required, each of these conditions has certain unique implications for the level of inspection, maintenance and conditioning.

A set of basic inspections and maintenance guidelines has been developed. Variations have been added to accommodate the difference in the four conditions and whether the activity is deactivation or reactivation. Also, a standard reference list of defects and causes has been prepared to support all inspection and maintenance activities.

The following requirement should be followed for each realignment condition:

1) Long term deactivation (> 1 year) with ample reactivation time (> 45 days)
   Deactivation: Apply basic checklist (minimum or preferred) with additional deactivation modifications
   Periodic: Apply deactivation checklist annually and correct defect
   Reactivation: Apply preferred deactivation checklist only with supplementary reactivation procedures, correct all defects.

2) Long term deactivation (> 1 year) with fast reactivation time (< 45 days)
   Deactivation: Apply preferred basic checklist with additional modifications
   Periodic: Apply preferred basic checklist semi-annually
   Reactivation: Apply preferred basic checklist with additional reactivation procedures.

3) Short term deactivation (< 1 year) with ample reactivation time (> 45 days)
   Deactivation: Apply preferred basic checklist without deactivation modifications
   Periodic: Apply preferred basic checklist
   Reactivation: Apply preferred basic checklist with supplementary reactivation procedures.
4) Short term deactivation (< 1 year) with fast reactivation time (< 45 days)

**Deactivation:** Apply preferred basic checklist without deactivation modifications

**Periodic:** Apply preferred basic checklist and correct all defects

**Reactivation:** Apply preferred basic checklist with supplementary reactivation procedures.
DEACTIVATION/REACTIVATION ACTIVITY TYPES

DEACTIVATION INSPECTION MAINTENANCE AND REPAIR - CONSTRUCTION TYPE

MIN: Do minimal basic checklist and correct defects plus additional modifications

PREF: Do preferred basic checklist - correct minimal defects and record supplemental for reactivation

ROUTINE INSPECTION AND MAINTENANCE

MIN: Do basic minimal checklist annually - correct defects

PREF: Do basic minimal checklist semi-annually and correct defects

REACTIVATION INSPECTION AND MAINTENANCE

MIN: Do preferred basic checklist and repair all defects

PREF: Do minimum above plus:

- low pressure water wash exterior
- clean all interior features and finishes with detergent - biocide
- refinish all surfaces as required to provide a clean, sound, attractive finish
- replace all ventilators with windows; rehang doors
EXTERIOR CLOSURE/INTERIOR CONSTRUCTION

DEACTIVATION INSPECTION AND MAINTENANCE AND REPAIR
(MINIMAL AND PREFERRED)

DEACTIVATION PERIOD > 1 YEAR     REACTIVATION PERIOD > 45 DAYS

The objective for the deactivation inspection program is, at a minimum, to identify and correct any defect which either 1) would allow any form of moisture into the building or 2) is symptomatic of structural failure.

Additional work to the building is recommended to prevent the excessive build-up of moisture and humidity. This work is beyond the inspection and repair guidelines because it involves the introduction of new components. These work items are listed at the end of the inspection guidelines.

BASIC INSPECTION PROCEDURES

The following procedures should be followed, in order, at the earliest possible time after it has been decided to close the building. This is to allow the maximum possible time to prepare and execute the work.

EXTERIOR:

1. Walk around the exterior perimeter of the building to be closed. Look for the following problems:

   MINIMUM:
   a) site grading sloped into the building
   b) clogged French drains
   c) disconnected or missing downspouts/gutters
   d) cracked/missing bricks
   e) missing mortar
   f) cracked, dislocated or missing lintels and sills
   g) bulging

   PREFERRED:
   h) to be added

2. During the exterior walk around, check all windows and doors for the following:

   MINIMUM:
   a) window sash missing ( 1 or both)
   b) window glass broken
   c) cracked, broken or warped vinyl jamb liners
   d) broken glass
   e) open sash
   f) broken and disconnected sash balances
3. During the exterior walk around, check all exterior doors for the following:

**MINIMUM:**

- a) missing doors
- b) warped doors or frames, obstructing closure
- c) damaged or missing hardware
- d) damaged sections which permit passage or air, water, insects, birds, etc.

**PREFERRED:**

- e) to be added

**INTERIOR:**

Enter the building after completing the exterior walk-around. The inspection of interior features and finishes will be to look for areas of major structural failure, or moisture penetration.

Walk through every circulation space and room to examine the walls, floor, ceilings. Also any examination of the interior of the windows which is necessary to resolve questions, should be undertaken.

1. Examine all floor surfaces for:

**MINIMUM:**

- a) buckling
- b) blistering
- c) cracking and discoloration

**PREFERRED:**

- d) to be added

2. During the interior walk-through, all painted plaster walls should be examined at a minimum for:

**MINIMUM:**

- a) wetness or water staining
- b) detachment or bulging
- c) sugaring or disintegration

**PREFERRED:**

- d) paint soundness
- e) minor hairline cracks, crazing
3. During the interior walk-through, check all painted plaster ceilings at a minimum for:

**MINIMUM:**

- a) wetness or water staining
- b) detachment or bulging
- c) sugaring or disintegration

**PREFERRED:**

- d) paint soundness

4. During the interior walk-through, check all interior doors at a minimum for:

**MINIMUM:**

- a) full open position (except as noted under "Additional Deactivation Procedures")

**PREFERRED:**

- b) firmly attached, operating hardware
- c) damage, holes, cracks

**ADDITIONAL DEACTIVATION PROCEDURES**

Unwanted moisture, i.e. condensation and high humidity levels are a major cause of the failures and deterioration of interior features and finishes in closed buildings. In certain regions, diurnal conditions can cause liquid water to form on or in materials on a daily basis. The subsequent wetting and drying cycles are extremely detrimental to materials. The following recommendations are intended to be a passive technique of minimizing this potential problem by promoting passive ventilation.

1) Replace (4) window units in one top floor room with fixed, screened louvered ventilators. Remove room door from hinges.

2) Replace 4 window units in one room, at opposite end of barracks; on ground floor. Remove room door from hinges.

3). On each end of the building where ventilators are installed, close the stair doors. On opposite ends from the ventilators, open the stair doors.

4) These techniques will promote a natural air flow through the building from one end to the other, driven by natural convection, preventing build-up of moisture.

**SUPPLEMENTARY REACTIVATION PROCEDURES**

1) low pressure water wash exterior

2) clean all interior features and finishes with detergent - biocide

3) refinish all surfaces as required to provide a clean, sound, attractive finish

4) where applicable, replace all temporary ventilators with windows; rehang doors
GENERAL DEFECT REFERENCE LIST

This list is to be used as a reference for all inspection and maintenance lists.

I. EXTERIOR WALL - BRICK

<table>
<thead>
<tr>
<th>DEFECT/SYMPATOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. brick faces eroded</td>
<td>mortar too hard; poor quality bricks; harsh chemical cleaning</td>
</tr>
<tr>
<td>b. mortar missing - general</td>
<td>weak mortar mix</td>
</tr>
<tr>
<td>c. moss growth</td>
<td>moisture in wall</td>
</tr>
<tr>
<td>d. open coping joints</td>
<td>weak mortar mix; poor application; severe exposure</td>
</tr>
<tr>
<td>e. cracks above lintels</td>
<td>uneven settling; failure of lintel</td>
</tr>
<tr>
<td>f. bulging</td>
<td>failure of masonry keys to wall structure</td>
</tr>
</tbody>
</table>

II. EXTERIOR WALL - WINDOWS

<table>
<thead>
<tr>
<th>DEFECT/SYMPATOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sash missing/dislocated</td>
<td>failure of balances; failure of jambs/strips</td>
</tr>
<tr>
<td>b. sash won't park</td>
<td>failure of balances</td>
</tr>
<tr>
<td>c. cladding missing</td>
<td>failure of adhesives, joints; accidental impact</td>
</tr>
<tr>
<td>d. rusting steel lintels</td>
<td>paint and sealant failure; excessive moisture</td>
</tr>
</tbody>
</table>

III. FLOORS/STAIRS

<table>
<thead>
<tr>
<th>DEFECT/SYMPATOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. spalling</td>
<td>inadequate curing; poor workmanship</td>
</tr>
<tr>
<td>b. cracking</td>
<td>uneven settlement</td>
</tr>
<tr>
<td>c. plastic/vinyl tiles coming loose - general</td>
<td>moisture rising through slab</td>
</tr>
<tr>
<td>d. plastic/vinyl tiles coming loose at exterior walls</td>
<td>moisture from exterior walls; rising damp</td>
</tr>
</tbody>
</table>

IV. PLASTER WALLS AND CEILINGS

<table>
<thead>
<tr>
<th>DEFECT/SYMPATOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. cracks with matching level edges</td>
<td>shrinkage cracking</td>
</tr>
<tr>
<td>b. cracks with uneven edges</td>
<td>shrinkage and structural movement</td>
</tr>
</tbody>
</table>
c. hairline cracks of crazing    differential drying/curing between plaster coats

d. bulging or detachment    failure of lath; detachment from base

e. cracks over doors/windows shrinkage of wood frames; inadequate installation of lath

f. corner cracking - even shrinkage
   width

g. corner cracking - wider at structural movement
   top or bottom

V. INTERIOR DOORS

a. binding frames warped; hinges failed

b. pin holes and attendant pest infestation; beetles, termites
   sawdust on wood doors and trim
May 30, 1990

Mr. Don Uzarski  
U.S. Army Corps of Engineers  
Construction Engineering Research Laboratory  
2902 Newmark Drive  
Champaign, IL 61820  

Dear Don,

Enclosed is a modified report which includes the pending items from the earlier draft. Please note that the order of the various pieces has been changed to be more logical. A table of contents has been added to reflect this as well.

Conceptually, the approach is unchanged but "cleaned up" a bit. There are still basic minimum and preferred inspection and actions levels. These are presented once, then appropriate combinations are called for in Section II, based on the requirements of the four deactivation/reactivation periods.

The delay this morning was because I was able to schedule a meeting with our mechanical engineer to discuss the theory and practice of ventilating the Rolling Pin Barracks. I felt like it was worth it to get a better handle on this question and include it in the draft. Given your tight time lines, specific details which come up may be best handled by phone, in discussions like we had yesterday, May 29.

Sincerely,

John H. Myers  
Asst. Dean for Research  
JHM:aar  

Enclosure

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FORT DIX - REALIGNMENT ISSUES

I. INTRODUCTION

Mothballing, or the stabilization of a building for purposes of closing it down and potentially reopening it in the future, has received virtually no attention as a subject for investigation or publication in the U.S. Most of the articles which have addressed this issue, approach it from the perspective of the owner who has acquired an older/historic building, but is not ready to begin rehabilitation or restoration, hence the scope is typically short-term. Articles identified to date are not in-depth treatments of the subject.

It is possible that more attention has been given to this subject at the international level. Attempts should be made to explore this, however our search of an international bibliographical database has revealed few English language publications on the general subject.

FACTORS AFFECTING DETERIORATION

There are several critical "natural" factors in material deterioration, and these may be further exacerbated by the action or inaction of man. These natural factors include:

- wetting and drying
- freezing and thawing
- moisture and biological decay (organic - wood/plaster/paint)
- moisture and corrosion (metal/nails/structure/reinf.)

Most agree that abandoned buildings deteriorate faster than occupied building. Vandalism is sometimes a factor in addition to the natural ones, but generally the lack of maintenance and observation as occurs with occupied building allows deterioration to begin and continue, giving way to an escalating cycle of failure. In addition, other human factors such as the lack of maintenance and repair, or poor workmanship when such work is done, can contribute significantly to the rate of deterioration.

The primary factor in most deterioration cycles (note in all 4 above) is moisture. Controlling moisture should be a key factor in slowing the deterioration cycle. Realistically the cycle never stops. The goal must always be to retard the process to the maximum extent possible.

Many types of deterioration can be slowed dramatically, or eliminated if moisture levels are kept below known levels for the subject material. That level is different for different materials, e.g. wood vs. bronze, but the numbers are established in the technical literature. This is potentially an important area of research to establish effective stabilization methods.

Moisture may come a many sources, including but not limited to:

- atmospheric moisture (high humidity)
- condensation
- roof leaks (failure/flashing/caulking)
- interior plumbing sources
- ground water (negatively sloped grading/rising damp)
- poor water handling systems (gutters/drains/downspouts)
- wind driven rain
PLANNING FOR MOTHBALLING:

The reduction in the use of a building, up to and including total long-term closure, is typically economically driven. There is, therefore, a need to act responsibly, but at the lowest possible cost. In general, this translates into planning which focuses on critical problems -- eliminating the major causes of deterioration (See discussion of moisture in preceding section) and slowing the deterioration process as much as possible. Core activities must focus on: 1) the detection and elimination of moisture in all forms and 2) elimination of active structural faults.

Other issues to consider in planning include:

- **Very little attention has been given to the overall issue**
- **It is not "natural" to "plan to not use" a building, therefore**
- **Most writing is in the context of owners with deferred rehabilitation plans (due to lack of funds/delays in getting plans or money, hence is addressing the short term perspective**
- **The anticipated period of disuse will be very important to determining the level of effort required**
- **A decision matrix or software program could address:**
  - anticipated period of closure
  - climate
  - building/construction type
  - related interior features/finishes
  - types of actions possible
  - maintenance evaluation (state of systems at point of closure)
- **Techniques of cost-effective heating and dehumidification may need attention, as well as passive ventilation**
- **Intellectual barriers and false perceptions may need to be explored, e.g.**:
  - the idea of not putting any money into closed building is probably not realistic
  - alternative uses may need to be identified based on community needs, government needs (state/local/Federal)
  - review history of closed bases, e.g. Ft. Hancock
  - lack of use
  - lack of funding
  - poor condition at turnover
  - focus on tendency to short-cut M&R prior to closing; sometimes this creates problems, or exacerbates them
  - planning for furniture should be based on stability of materials
II. REGIONAL ADJUSTMENT FACTORS

Four basic conditions have been identified for the realignment planning. These consist of:

1) Long term deactivation (> 1 year) with ample reactivation time (> 45 days)
2) Long term deactivation (> 1 year) with fast reactivation time (< 45 days)
3) Short term deactivation (< 1 year) with ample reactivation time (> 45 days)
4) Short term deactivation (< 1 year) with fast reactivation time (< 45 days)

While there may be extensive overlap in some of the inspections and maintenance required, each of these conditions has certain unique implications for the level of inspection, maintenance and conditioning.

A set of basic inspection and maintenance guidelines has been developed and included as Section III. Supplementary procedures have been added to accommodate the difference in the four conditions and whether the activity is deactivation or reactivation. Also, a standard reference list of defects and causes has been prepared to support inspection and maintenance activities.

The following requirements should be followed for each realignment condition:

1) Long term deactivation (> 1 year) with ample reactivation time (> 45 days)
   
   **Deactivation:** Apply basic checklist (minimum or preferred) with additional deactivation modifications
   
   **Periodic:** Apply deactivation checklist annually and correct defects
   
   **Reactivation:** Apply preferred checklist only with supplementary reactivation procedures, correct all defects.

2) Long term deactivation (> 1 year) with fast reactivation time (< 45 days)
   
   **Deactivation:** Apply preferred basic checklist with additional deactivation procedures
   
   **Periodic:** Apply preferred basic checklist semi-annually, correct all problems
   
   **Reactivation:** Apply preferred basic checklist with additional reactivation procedures.

3) Short term deactivation (< 1 year) with ample reactivation time (> 45 days)
   
   **Deactivation:** Apply preferred basic checklist without deactivation modifications if heated. If not heated, apply deactivation procedures.
   
   **Periodic:** Apply preferred basic checklist semi annually, correct minimal defects
   
   **Reactivation:** Apply preferred basic checklist with supplementary reactivation procedures
4) Short term deactivation (< 1 year) with fast reactivation time (< 45 days)

**Deactivation:** Apply preferred basic checklist without deactivation procedures.

**Periodic:** Apply preferred basic checklist semi annually and correct all defects

**Reactivation:** Apply preferred basic checklist with supplementary reactivation procedures as required.

It should be noted that all materials have an expected service life. Deterioration will occur and the best possible attention will only slow the rate of deterioration, hopefully to imperceptible levels.

During the deterioration cycle, as materials get older, weaker, damaged or otherwise deteriorated, they may continue to deteriorate at a faster rate and/or affect other components, thus, protecting sound materials is "cheap insurance" against early failures.

The combinations recommended above are directed at achieving a balanced approach to this objective.
III. DEACTIVATION/REACTIVATION CHECKLIST FOR INSPECTION AND MAINTENANCE (MINIMAL AND PREFERRED)

The objective for the deactivation inspection program is, at a minimum, to identify and correct any defect which either 1) would allow any form of moisture into the building or 2) is symptomatic of structural failure.

Additional work to the building may be recommended to prevent the excessive build-up of moisture and humidity. This work is beyond the inspection and repair guidelines because it involves the introduction of new components. These work items are listed at the end of the inspection guidelines as supplementary deactivation/reactivation procedures.

The following checklist represents a basic guideline: for minimal and preferred inspections. The items listed, once inspected, may or may not require corrective action, depending upon the realignment objectives. The actual procedures to be followed in each of the four conditions are specified in Section II. Different combinations of inspection, repair deactivation and reactivation procedures are specified based upon the deactivation/reactivation time frames.

In all cases, the Preferred list constitutes the Minimal procedures plus the additional Preferred items.

BASIC INSPECTION PROCEDURES

The following procedures should be followed, in order, at the earliest possible time after it has been decided to close the building. This is to allow the maximum possible time to prepare for and execute the work.

EXTERIOR:

1. Walk around the exterior perimeter of the building to be closed. Look for the following problems:

   MINIMUM:
   a) site grading sloped into the building
   b) clogged French drains
   c) disconnected or missing downspouts/gutters
   d) cracked/missing bricks
   e) missing mortar
   f) cracked, dislocated or missing lintels and sills
   g) bulging walls
   h) missing sealants or caulks in coping

   PREFERRED:
   i) rusting steel lintels
   j) staining
   k) dried or detached caulk and sealants
   l) moss or fungus growth in shaded areas
2. During the exterior walk around, check all windows and doors for the following:

MINIMUM:

a) window sash missing (1 or both)
b) window glass broken
c) failed or missing vinyl jamb liners
d) broken glass
e) open sash

PREFERRED:

f) broken and disconnected sash balances
g) cracked, warped vinyl jamb liners

3. During the exterior walk around, check all exterior doors for the following:

MINIMUM:

a) missing doors
b) warped doors or frames, obstructing closure
c) missing hardware
d) damaged sections or holes which permit passage or air, water, insects, birds, etc.

PREFERRED:

e) paint failure
f) damaged, or loose, or non-functional hardware

INTERIOR:

Enter the building after completing the exterior walk-around. The inspection of interior features and finishes will look for areas of major structural failure, or moisture penetration.

Walk through every circulation space and room to examine the walls, floor, ceilings. Also any examination of the interior of the windows which is necessary to resolve questions, should be undertaken.

1. Examine all floor surfaces for:

MINIMUM:

a) buckling
b) blistering
c) major cracking (greater than 1/16")

PREFERRED:

d) minor cracking (less than 1/16")
e) discoloration or staining
FORT DIX REALIGNMENT ISSUES

EXTERIOR CLOSURE AND INTERIOR CONSTRUCTION
2. During the interior walk-through, all painted plaster walls should be examined at a minimum for:

MINIMUM:

a) wetness  
b) detachment or bulging  
c) sugaring or disintegration

PREFERRED:

d) paint cracking, flaking, or blistering  
e) minor hairline cracks, crazing  
f) water staining (dry)

3. During the interior walk-through, check all painted plaster or drywall ceilings for:

MINIMUM:

a) wetness  
b) detachment or major bulging  
c) sugaring or disintegration

PREFERRED:

d) paint soundness  
e) evidence of staining (dry)  
f) evidence of sagging  
g) failing drywall joints

4. During the interior walk-through, check all interior doors at a minimum for:

MINIMUM:

a) full open position (except as noted under "Additional Deactivation Procedures")

PREFERRED:

b) loose or missing hardware  
c) damage, holes, cracks  
d) paint failure

ADDITIONAL DEACTIVATION PROCEDURES

Unwanted moisture, i.e. condensation and high humidity levels are a major cause of the failures and deterioration of interior features and finishes in closed buildings. In certain regions, diurnal conditions can cause liquid water to form on or in materials on a daily basis. The subsequent wetting and drying cycles are extremely detrimental to materials. The following recommendations are intended to be a passive technique of minimizing this potential problem by promoting passive ventilation.
The passive techniques are recommended to take advantage of prevailing winds and the Rolling Pin Barracks design. The passive techniques may or may not work as well for other building types. Available research tends to indicate that while "Thermal Chimneys" to promote ventilation do work, they are over-powered and defeated by even low level winds. The following passive techniques are intended to capitalize on the natural winds and wind pressures which will occur at the barracks, by adding ventilators on opposite sides of the building, allowing the winds to flow across (through) the building on each floor.

1) Purchase or fabricate screened, louvered ventilators to be installed in the windows of selected rooms. These will be of the type to fit and lock in place against the jambs and be held in place by the sash they may be full sash width and 1/3 to 1/2 the sash height.

2) Install the vents securely in selected room pairs on all floors of the building. Vents should always be installed in rooms directly opposite (i.e. across the hall from) one another to promote unrestricted flow through.

3) The number of vents and spacing of rooms should be calculated to provide adequate ventilation for a floor. This pattern and arrangement should be duplicated on all other floors. The objective will be a high volume, low velocity exchange of air.

4) Sash are to be left in place and fixed securely.

**Alternative One**

As an alternative to the passive techniques an active system may be installed. This would have the added benefit of bringing a permanent addition to the building and providing mechanical ventilation of wet areas when/if the building is reduced.

1) Purchase or specify a humidistatically controlled ventilating fan in bath/shower rooms. Fans should be shuttered to remain closed when off.

2) Install fans in all bath/shower areas on all floors.

3) Install ventilators of the type described in the previous section on passive ventilation at both ends of each floor. This will allow air intake at each end and exhaust from the center of the building. The number of vents will be dependent on the capacity of the fans used. Relatively low velocity fan units should be used to avoid pulling rain into the intake vents.

**SUPPLEMENTARY REACTIVATION PROCEDURES**

1) low pressure water wash exterior

2) clean all interior features and finishes with detergent - biocide

3) refinish all surfaces as required to provide a clean, sound, attractive finish

4) where applicable, remove all temporary ventilators with windows; rehang doors as required

5) Remove all mechanical restrictions which have been used to secure moveable building parts such as doors or windows
6) Repair all defective windows or replace as required by standard building practices to provide functional units
IV. GENERAL DEFECT REFERENCE LIST

This list is to be used as a reference for all inspection and maintenance lists.

I. EXTERIOR WALL - BRICK

<table>
<thead>
<tr>
<th>DEFECT/SYMPOTOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>brick faces eroded</td>
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<tr>
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<td>weak mortar mix; poor application; severe exposure</td>
</tr>
<tr>
<td>cracks above lintels</td>
<td>uneven settling; failure of lintel</td>
</tr>
<tr>
<td>bulging</td>
<td>failure of masonry keys to wall structure</td>
</tr>
<tr>
<td>wet areas</td>
<td>defective gutters and downspouts; wind driven rain; rising damp; roofing problems; internal sources</td>
</tr>
</tbody>
</table>

II. EXTERIOR WALL - WINDOWS

<table>
<thead>
<tr>
<th>DEFECT/SYMPOTOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>sash missing/dislocated</td>
<td>failure of balances; failure of jambs/strips</td>
</tr>
<tr>
<td>sash won't park</td>
<td>failure of balances</td>
</tr>
<tr>
<td>cladding missing</td>
<td>failure of adhesives, joints; accidental impact</td>
</tr>
<tr>
<td>rusting steel lintels</td>
<td>paint and sealant failure; excessive moisture; poor</td>
</tr>
<tr>
<td>design detailing</td>
<td></td>
</tr>
</tbody>
</table>

III. INTERIOR FLOORS/STAIRS

<table>
<thead>
<tr>
<th>DEFECT/SYMPOTOM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>spalling</td>
<td>inadequate curing; poor workmanship; impact</td>
</tr>
<tr>
<td>cracking</td>
<td>uneven settlement; shrinkage</td>
</tr>
<tr>
<td>plastic/vinyl tiles</td>
<td>moisture rising through slab</td>
</tr>
<tr>
<td>coming loose - general</td>
<td></td>
</tr>
<tr>
<td>plastic/vinyl tiles</td>
<td>moisture from exterior walls; rising damp</td>
</tr>
<tr>
<td>coming loose at exterior walls</td>
<td></td>
</tr>
</tbody>
</table>
### IV. INTERIOR PLASTER WALLS AND CEILINGS

| a. | cracks with matching level edges | shrinkage cracking |
| b. | cracks with uneven edges | shrinkage and structural movement |
| c. | hairline cracks of crazing | differential drying/curing between plaster coats |
| d. | bulging or detachment | failure of lath; detachment from base |
| e. | cracks over doors/windows | shrinkage of wood frames; inadequate installation of lath |
| f. | corner cracking - even width | shrinkage |
| g. | corner cracking - wider at top or bottom | structural movement |
| h. | mildew | excessive moisture, inadequate ventilation |

### V. INTERIOR DOORS

| a. | binding | frames warped; hinges failed |
| b. | pin holes and attendant sawdust on wood doors and trim | pest infestation; beetles, termites |
V. SAMPLE REFERENCES TO MOTHBALLING

The following five pages present samples of publications addressing the issue of building and/or building material stabilization/performance. A total of 105 references were found in a computerized bibliographical reference. Most of these references are very problem/material specific, and do address the overall problem of total building closure. Selected references have been used in the development of this report.