

RFP 2015C-07
Design/Build: Fire Academy Burn Bldg. W-4
Renovation

Attachment J

Structural Assessment Live Fire Training
Building

Prepared by: Structural Engineers Group, Inc.

Dated 11/21/2011



Structural Assessment
Live Fire Training Building

FSCJ South Campus
Jacksonville, Florida

Florida State College
at Jacksonville

November 21, 2011

Report of a Structural Assessment

of

Live Fire Training Building

at FSCJ South Campus

Jacksonville, Florida

for

Florida State College at Jacksonville

Jacksonville, Florida

Prepared by

Structural Engineers Group, Inc.

Jacksonville, Florida



Mr. Richard Dowling
Senior Supervisor of Campus Plant, South Campus
Florida State College at Jacksonville
11901 Beach Boulevard
Building E, Room 104
Jacksonville, FL 32246

November 21, 2011

Re: Live Fire Training Building Structural Assessment
FSCJ Purchase Order Number 2012 06050605

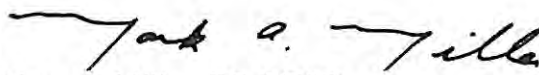
Dear Mr. Dowling:

We are transmitting herewith a report of our assessment of the FSCJ South Campus Live Fire Training Building. This assessment was conducted at the request of FSCJ for the purpose of fulfilling requirements of NFPA 1403, Standard on Live Fire Training Evolutions, 2007 Edition.

The inspection was performed in two parts on November 8, 2011 and November 18, 2011 with the assistance of Jason Carpenter of JFRD. While we found the structural portion of the building in good condition overall, there are several maintenance and repair items that need to be addressed. A list of these items and their locations are provided in the report.

It has been a pleasure providing these services for you and please feel free to call on us any time we can be of assistance.

Very truly yours,


Mark A. Miller, PE, SECB
Florida P.E. # 45319
Vice President



Encl (x 3 copies)

Structural Engineers Group, Inc.

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Executive Summary **1**

Executive Summary

It is our opinion that the Live Fire Training Building structure is in good condition, considering the age of the building and the use to which it has been subjected. This opinion is based on our recent visual observations and our review of the structural assessment which was prepared in September of 2006. After being in service for 15 years, no major structural problems were observed during this assessment. The steel thermal shields on the inside of the walls and ceilings of the scenario rooms are in very good shape, particularly when compared to the condition during the 2006 assessment. Deterioration is normally expected on these sacrificial components intended to protect the concrete and masonry walls and ceilings by limiting direct contact with flames and water, however there was limited deterioration.

Some deterioration has occurred to metal doors and door frames and some of these doors and frames need to be replaced. Other minor repairs, such as touching up corroded metal doors and frames, also needs to be accomplished. All exterior concrete panel sealant appears to be in acceptable condition.

The building should continue to provide acceptable service for many years, provided the methods and procedures of use do not substantially change. Based on our inspection, it is very likely that the useful life of the structure will extend beyond the normal 20 year life span for this type of building.

According to our interpretation of NFPA 1403, *Standard on Live Fire Training Evolutions, 2007 Edition*, the next scheduled inspections would be in three years and again in 5 years. The next 5 year inspection would require removal of thermal linings as well as core drilling of the concrete slab over the scenario rooms.

Introduction **2**

Introduction

Purpose of Assessment

This assessment was conducted at the request of FSCJ for the purpose of fulfilling requirements of NFPA 1403, Standard on Live Fire Training Evolutions, 2007 Edition. In addition to reporting on a visual inspection as required by NFPA, general maintenance recommendations were also reported. This is a 'five year' assessment, so core drilling and review of the structural concrete is not required. See Appendix A for the specific requirements outlined in the referenced NFPA document.

Scope of Investigation

An initial set of meetings was held at the project site to review the use and history of the building as well as to locate those portions of the steel shielding which would be required to be removed for the assessment of the structure behind them.

Jason Carpenter of JFRD provided access to the building and provided background information on the current use of the building and the upcoming training schedule.

John Harrell, a representative of Warden Construction Company, was onsite to review those portions of steel shielding which would be required to be removed. Warden was designated by FSCJ to provide incidental contracting services including the cutting and removal of portions of the steel protection plating to allow visual inspection of the ceiling slab and masonry walls.

The scope of the field inspection was limited to visual inspection and light hammer tapping at representative locations to sound for delamination of concrete.

Field Measurements and Procedures

Original architectural and structural drawings were available for use during inspection and no field measurements were necessary. Portions of the original architectural floor plans and exterior elevations have been included in this report with observations noted along with photograph locations and notations on maintenance repairs that are recommended. These drawings are located in the report section "Site Visit Observations and Recording".

Description of Structure **3**

Description of Structure

General Description

The two story Live Fire Training Building is a two way rigid concrete frame structure with precast exterior concrete wall panels and non-load bearing concrete masonry interior partitions. The floor and roof levels are framed with flat slabs and dropped beams. The one interior stair is cast concrete and one exterior stair is unpainted galvanized steel. All interior and exterior doors are metal with concrete filled metal frames. There is only one exterior window in the building, located at the control room. The roof slab over the second floor and the stair penthouse roof slab are protected by a deck coating. A central control room has windows located at each scenario room.

There have been no significant alterations or additions to the structure since completion of the original construction.

History of Use

The building, constructed in 1995, has been utilized for the past 15 years on a regular basis for the training of fire fighters. Controlled fires are generated in scenario rooms No. 2 and No. 4 using gas fired burners to simulate realistic fire conditions. The masonry walls, concrete columns and concrete second floor slab overhead in the area directly adjacent to the fire source are protected from direct contact with the flames by steel plates located 6 inches off the concrete surfaces. Fire fighters enter the room and direct water on the fire to bring it under control. These two rooms have had the heaviest use with respect to exposure to fire. Currently these two scenario rooms are used 10 to 12 times per year. This frequency of use is much less than was occurring prior to the 2006 assessment which may explain the exceptionally good condition of the shielding plates during this assessment.

Scenario room No. 1 originally was used in a manner similar to rooms 2 and 4, however currently is houses as a wood mock up of a sloping roof surface and has not been exposed to a live fire in at least five years (since the last structural assessment). The steel shielding plates in this room have not experienced heavy corrosion and need not be replaced at this time.

Scenario room No. 3 has been utilized using class "A" fires rather than fires from gas burners. The fuel for the fires consists of hay and oak pallets. We were informed by Jason Carpenter that this room is rarely used for live fires anymore. There has been minimal damage to the steel protection plating in this area requiring since the last structural assessment in 2006.

The second floor area has been covered with a maze constructed for training firefighters for working in a smoke filled environment in restricted spaces. Much of the structure is obscured from view by the maze construction. This area is not subjected to high heat or water quenching.

The interior and exterior stairs and the roof level are subjected to foot traffic but no hard use.

Site Observations and Recording **4**

Site Observations and Recording

Overview

The majority of the building was inspected on November 8, 2011 by Mark Miller, PE and Jacob Frye, EIT, representing Structural Engineers Group. Specific ceiling and wall shielding plates were designated by SEG to be removed during this initial inspection on November 8th. These plates were removed on November 14th, and a follow up inspection was performed on November 18, 2011 by Mark Miller, PE. This inspection was a visual inspection of the CMU walls behind the steel protective shielding and the concrete slab and shielding support beams above the ceiling shielding. All the areas behind the protective shielding, as well as the protective shielding and shielding support structure were in acceptable condition. All shielding which was removed was acceptable to be re-installed.

Observations and Recording

A walkthrough inspection of the building was made in a systematic manner beginning with the exterior walls, exterior stair, the roof levels, interior stair, and second floor in that order. Both engineers worked together conferring on observations and agreeing on the extent of deficiencies observed and maintenance and repair recommendations. Observations were noted on reduced prints of architectural floor plans and elevations. Photographs were taken at representative locations to demonstrate the nature of the problems observed and the location of each photo was recorded. A summary of these observations and maintenance repair recommendations are annotated on the floor plans and exterior elevations included at the end of this section. A *Repair Legend* identifies the nature of each deficiency and repair noted on the drawings. Deficiencies and recommended repairs are indicated by letter designation shown in a circle. Photographs are identified by number in a square symbol. The legend is shown on drawing number SK1.

REPAIR LEGEND

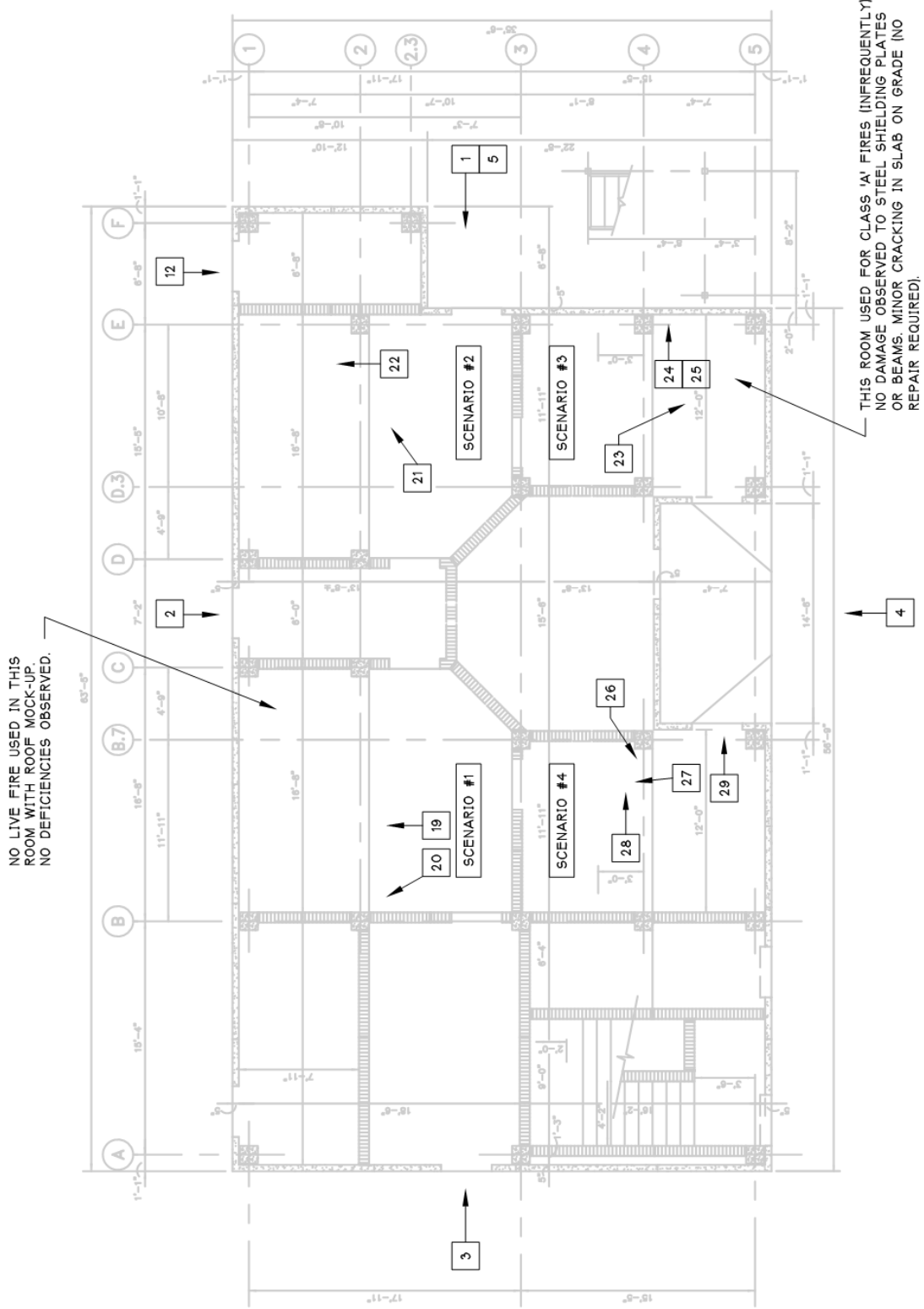
NOTE: SEE PLAN & ELEVATION DRAWINGS #SK2 THRU #SK8 FOR LOCATIONS.

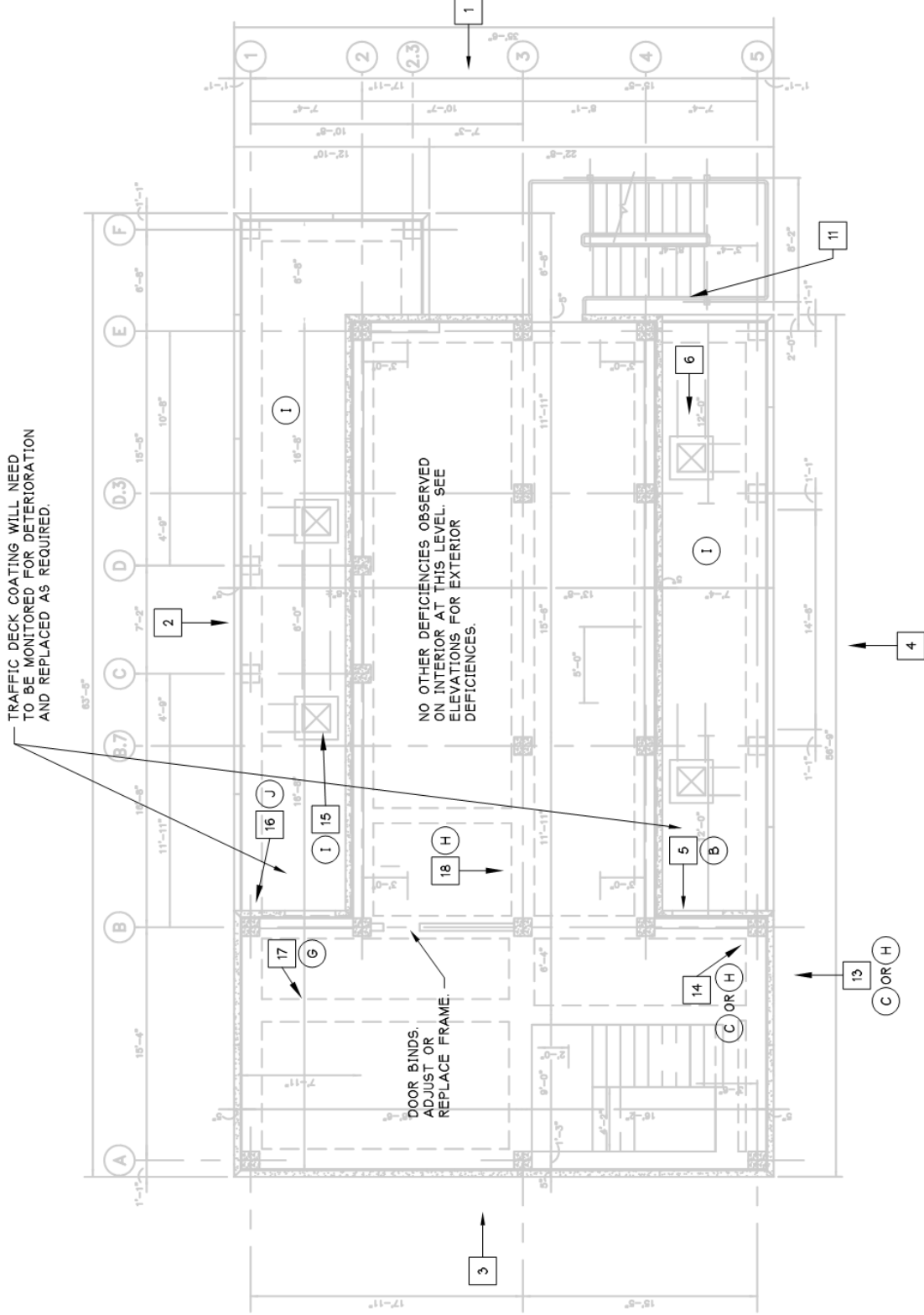
- A REPAIR RUSTED GALVANIZED METAL BY CLEANING AND COATING WITH 2 COATS OF COLD GALVANIZING REPAIR PAINT EQUAL TO ZRC.
- B REPAIR RUSTED UN-GALVANIZED METAL BY CLEANING, PRIMING AND APPLYING 2 COATS OF EXTERIOR ALKYD PAINT. REPAIR ALL EXTERIOR DOORS AND FRAMES.
- C REPLACE DOOR FRAME WITH HOT DIPPED GALVANIZED PRESSED METAL CONCRETE FILLED FRAME. PAINT WITH PRIMER FOLLOWED BY 2 COATS OF EXTERIOR ALKYD PAINT FOR DOOR & FRAME. MATCH FRAME TO ORIGINAL.
- D ALL DOOR HINGES NOT REPLACED NEED TO BE CLEANED AND LUBRICATED.
- E CLEAN PRIME AND PAINT ALL CORRODED PIPE AND STACK BRACKETS AS DESCRIBED IN A AND B ABOVE.
- F REPLACE DOOR SWEEP.
- G RE-ATTACH ALL LOOSE STAINLESS EXPANSION JOINT COVERS AT INTERIOR MASONRY PARTITIONS.
- H STICKING OR NON-WORKING DOOR OR LOCKSET. REPLACE PARTS OR RE-WORK AS REQUIRED TO ALLOW FOR PROPER FUNCTION.
- I REMOVE AND MAINTAIN REMOVAL OF ALL VEGETATION ON ROOF.
- J. REPLACE BROKEN LIGHT BULB AND INSTALL PROTECTIVE GLOBE.
- K. PROVIDE STEEL CAP PLATE ON STAIR COLUMNS. DRILL DRAINAGE / VENT HOLE AT BASE OF COLUMNS. STANDING WATER IN COLUMNS.

NOTE:

REPAIR DETAILS INDICATED THUS: (X)

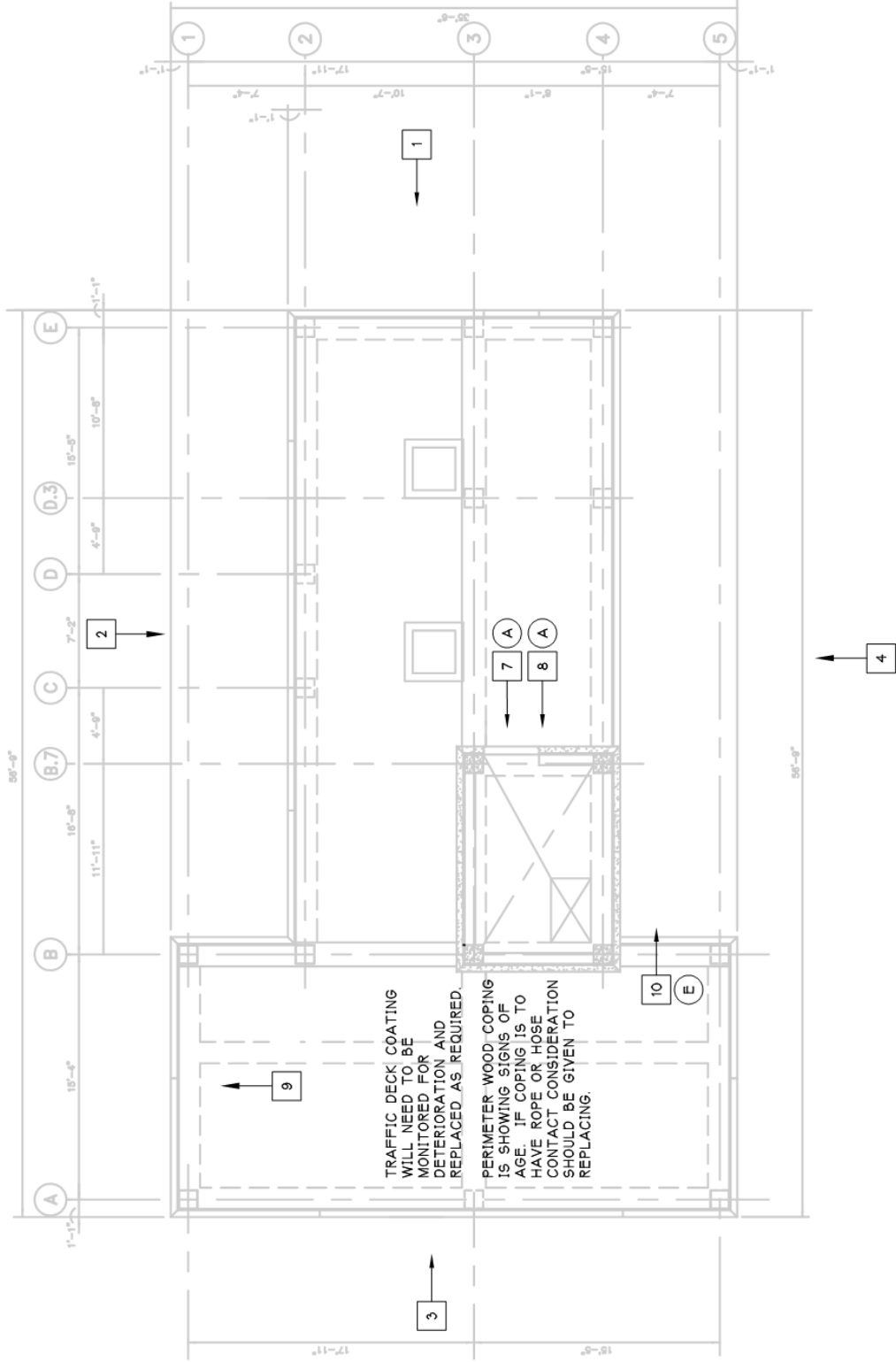
PHOTO NUMBER INDICATED THUS: #





SECOND FLOOR/LOW ROOF FRAMING PLAN
NOT TO SCALE

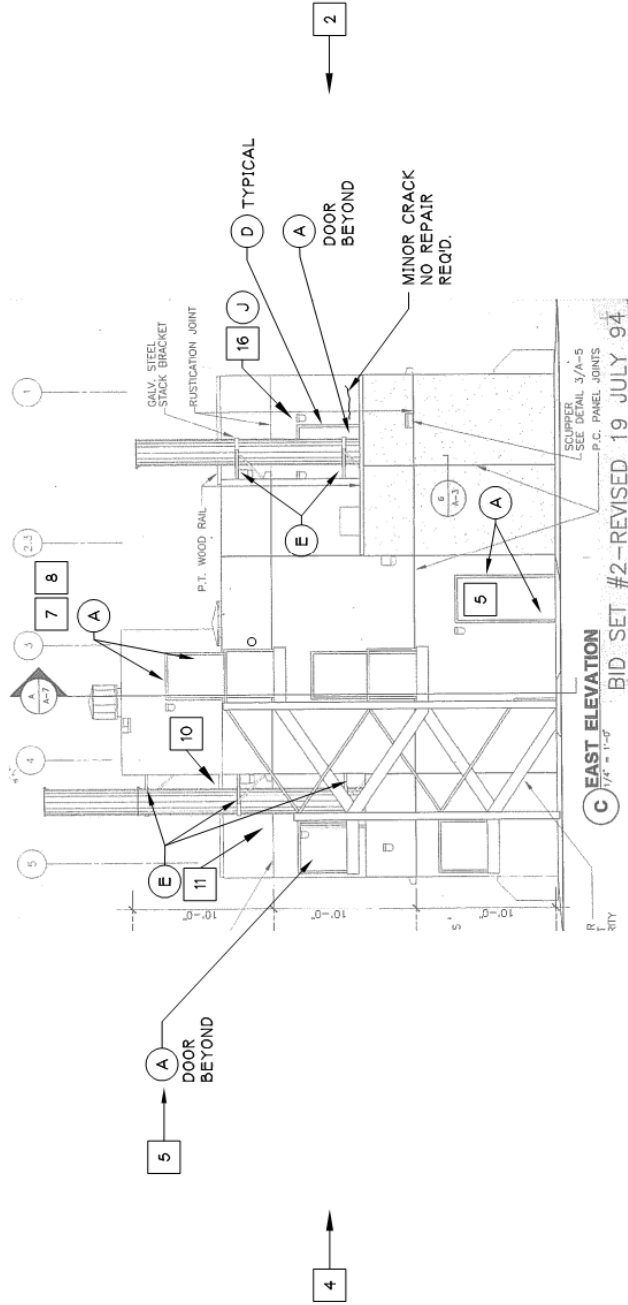




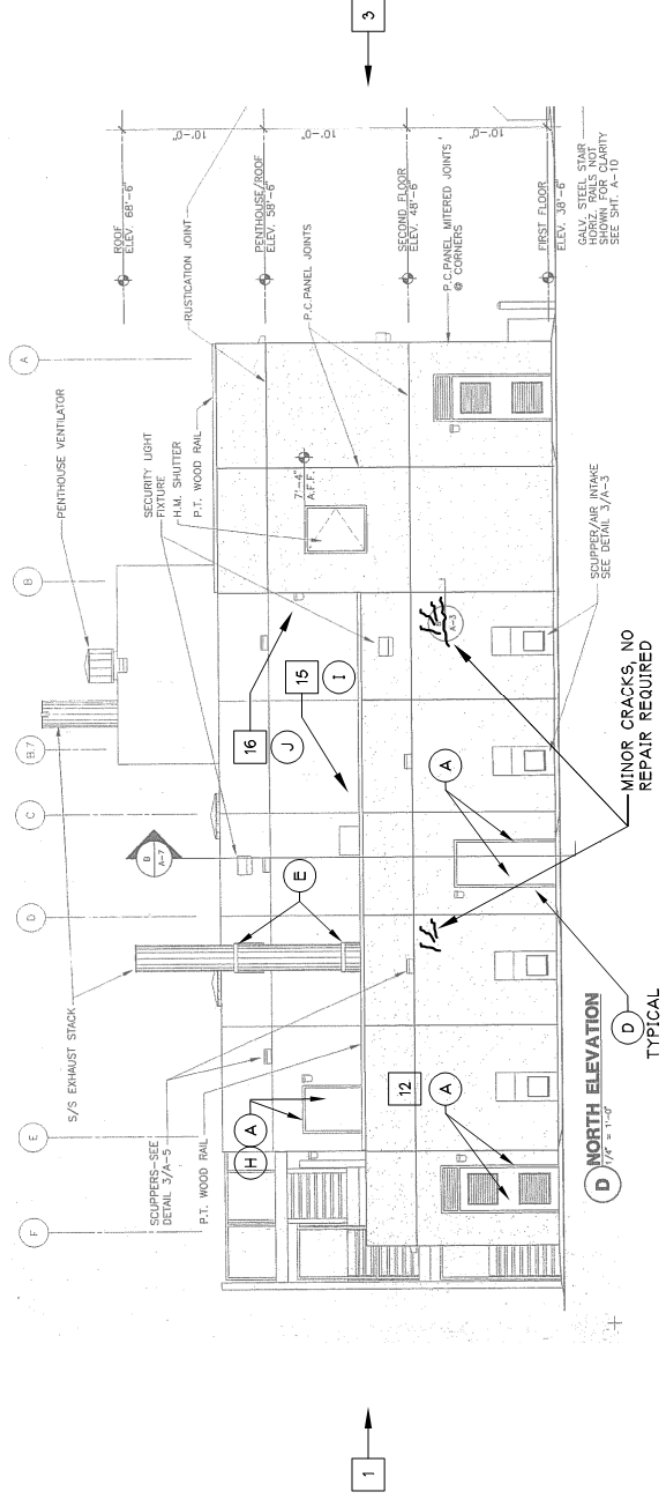
TRAFFIC DECK COATING
 WILL NEED TO BE
 MONITORED FOR
 DETEIORATION AND
 REPLACED AS REQUIRED.
 PERIMETER WOOD COPING
 IS SHOWING SIGNS OF
 AGE. IF COPING IS TO
 HAVE ROPE OR HOSE
 CONTACT CONSIDERATION
 SHOULD BE GIVEN TO
 REPLACING.

PENTHOUSE FLOOR/ROOF PLAN
 NOT TO SCALE

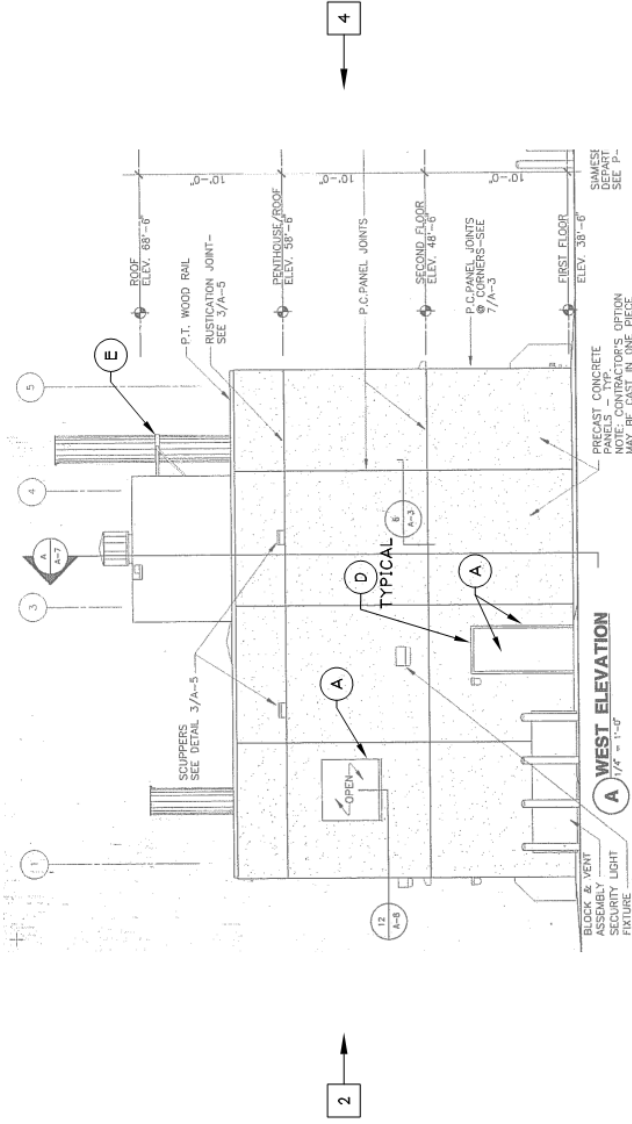




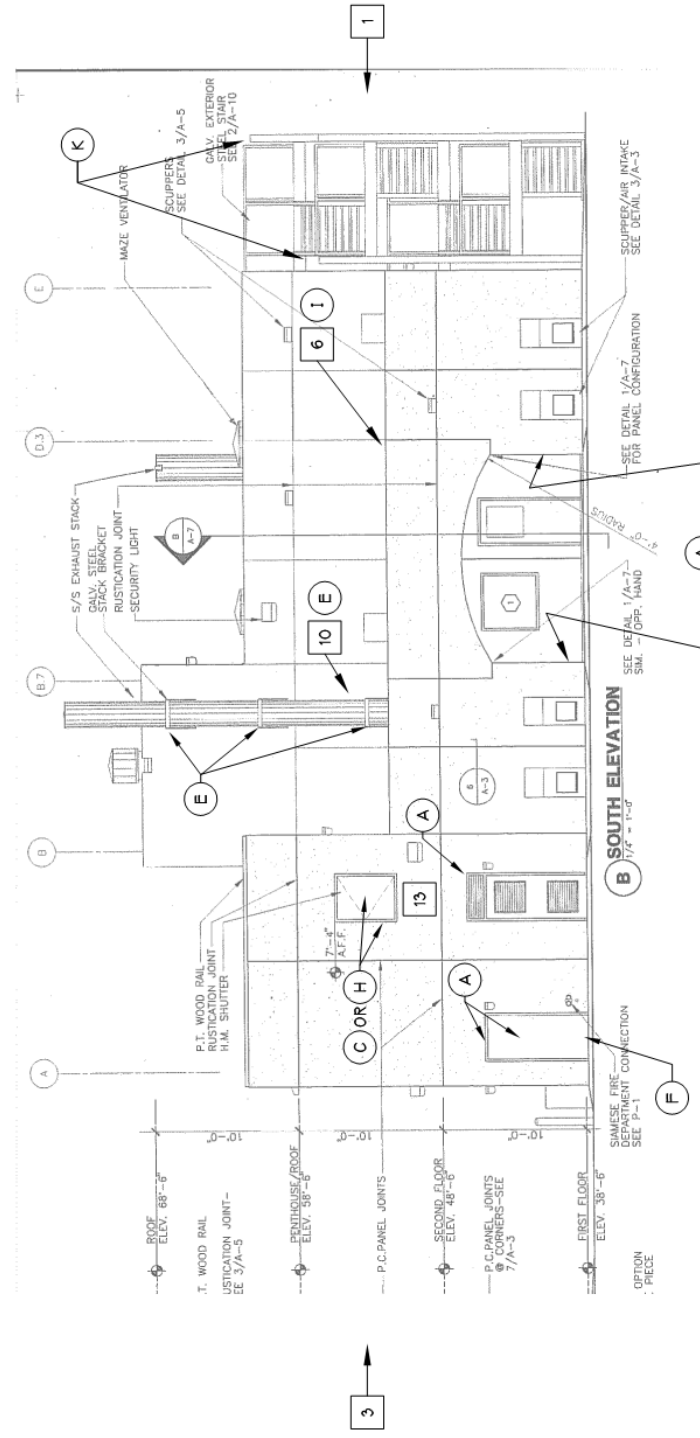
EAST ELEVATION [1]
NOT TO SCALE



NORTH ELEVATION 2
 NOT TO SCALE



WEST ELEVATION 3
 NOT TO SCALE



SOUTH ELEVATION
1/4" = 1'-0"
DOORS TO SCENARIO ROOMS - BOTH SIDES
NOT TO SCALE

List of Photographs

The identification number and location of photographs taken are listed below:

| <i>Photo #</i> | <i>Location and Description</i> |
|-----------------------|---|
| <i>1</i> | East Elevation |
| <i>2</i> | North Elevation |
| <i>3</i> | West Elevation |
| <i>4</i> | South Elevation |
| <i>5</i> | Ground level, east elevation, rusted door frame |
| <i>6</i> | Low roof level, south side |
| <i>7</i> | High roof level, south side |
| <i>8</i> | High roof level, south side, rusted door frame |
| <i>9</i> | High roof level, looking west |
| <i>10</i> | Low roof level, rusted bracket |
| <i>11</i> | Exterior Stair, lack of column cap |
| <i>12</i> | North elevation, east end, rusted door frame |
| <i>13</i> | South elevation, west end, rusted door frame and sticking door |
| <i>14</i> | South elevation, west end, rusted strike plate for door in photo 13 |
| <i>15</i> | Low roof, north side, looking east, plant growth |
| <i>16</i> | Low roof, north side, looking west, broken light and missing globe |
| <i>17</i> | Second Floor, Interior corridor, loose joint cover |
| <i>18</i> | Second Floor, Vestibule to maze, sticking door |

Note: Photos #19 through #29 are representative of the condition of the steel fire protective shielding in the Scenario rooms.

| | |
|------------------|--|
| <i>19</i> | Scenario Room #1 (NW) Ceiling Plates |
| <i>20</i> | Scenario Room #1 (NW) Ceiling Plates |
| <i>21</i> | Scenario Room #2 (NE) Ceiling Plates |
| <i>22</i> | Scenario Room #2 (NE) Ceiling Plate Removed |
| <i>23</i> | Scenario Room #3 (SE) Ceiling Plates |
| <i>24</i> | Scenario Room #3 (SE) Wall Plate Removed |
| <i>25</i> | Scenario Room #3 (SE) Ceiling Plate Removed |
| <i>26</i> | Scenario Room #4 (SW) Ceiling Plates |
| <i>27</i> | Scenario Room #4 (SW) Ceiling Plates Removed |
| <i>28</i> | Scenario Room #4 (SW) Missing Nut |
| <i>29</i> | Scenario Room #4 (SE) Door Frame |



Photo #1 - East Elevation



Photo #2 - North Elevation



Photo #3 - West Elevation



Photo #4 - South Elevation



Photo #5 Exterior Door, East Elevation



Photo #6 - Low Roof, South Side



Photo #7 - High Roof, South Side



Photo #8 - High Roof, South Side



Photo #9 - High Roof, Looking west



Photo #10 - Low Roof, South Side



Photo #11 - Exterior Stair



Photo #12 - North Elevation, East End



Photo #13 - South Elevation, West End

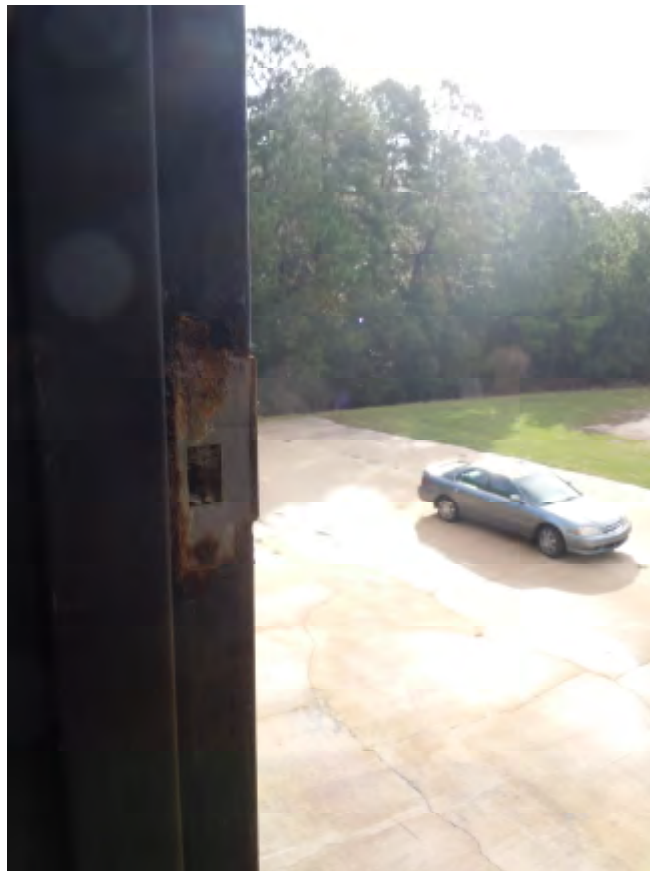


Photo #14, South Elevation , West End



Photo #15 - Low Roof, North Side, Looking East



Photo #16 - Low Roof, North Side, Looking West



Photo #17, Second Floor Corridor, North End



Photo #18, Second Floor, Vestibule to Maze



Photo #19 - Scenario Room #1 (NW) Ceiling Plates



Photo #20 - Scenario Room #1 (NW) Ceiling Plates



Photo #21 - Scenario Room #2 (NE) Ceiling Plates



Photo #22 - Scenario Room #2 (NE) Ceiling Plate Removed



Photo #23 - Scenario Room #3 (SE) Ceiling Plates



Photo #24 - Scenario Room #3 (SE) Wall Plate Removed



Photo #25 - Scenario Room #3 (SE) Ceiling Plate Removed



Photo #26 - Scenario Room #4 (SW) Ceiling Plates



Photo #27 - Scenario Room #4 (SW) Ceiling Plate Removed



Photo #28 - Scenario Room #4 (SW) Missing Nut



Photo #29 - Scenario Room #4 (SW) Door Frame

Conclusions and Recommendations **5**

Conclusions and Recommendations

It is our opinion that the Live Fire Training Building is in good condition after 15 years of use on a regular basis. No serious structural problems were observed. With continued good management of the use of the building and periodic attention to maintenance needs, the structure should provide satisfactory service for many years to come and could well exceed the normal life expectancy for this type of structure.

We recommend that the following maintenance issues be corrected as soon as possible to ensure that the building continues to function well. These maintenance items include:

- Repair of deteriorated coatings.
- Repair or replacement of some door frames.
- Replace one door sweep.
- Reattach loose interior stainless steel expansion joint covers at masonry partitions.
- Cap stair columns and provide drain hole near base

The roof traffic deck coating should be monitored and replaced as required.

Disclaimers and Limitations **6**

Disclaimers and Limitations

The referenced building was observed for the purpose of assessing the physical condition and state of repair of the major structural components to the extent reasonably ascertainable without disturbing the floor, wall, or ceiling finishes or the roof covering.

It should be noted that the opinions and recommendations contained in this report are based solely on visual observations at randomly selected representative locations and limited testing and that there is no claim, either stated or implied, that all conditions were observed.

Limited physical testing was performed; a series of concrete samples were cored, tested and microscopically examined. No calculations have been made to determine the adequacy of the structural system or its compliance with accepted building code requirements.

This report does not express or imply any warranty of the structural systems nor an opinion regarding the adequacy of the original design.

Appendix **7**

A portion of Chapter 5 of NFPA 1403, Standard on Live Fire Training Evolutions, 2007 Edition is clipped below for reference. This section describes some of the requirements for the required evaluations.

Chapter 5 Gas-Fired Live Fire Training Structures

5.2 Structures and Facilities.

5.2.1* Strict safety practices shall be applied to all structures selected for live fire training evolutions.

5.2.2* Live fire training structures shall be inspected visually for damage prior to live fire training evolutions.

5.2.2.1 Damage shall be documented.

5.2.2.2* The structural integrity of the live fire training structure shall be evaluated and documented periodically by a licensed professional engineer with live fire training structure experience and expertise.

5.2.2.3 The frequency of the structural evaluation shall be as follows:

- (1) Once per year for live fire training structures that support more than 60 days of live fire training per year (a day of live fire training is any day during which at least one live fire training evolution has been conducted)
- (2) Once every two years for live fire training structures that support 31 to 60 days of live fire training per year
- (3) Once every three years for live fire training structures that support 30 or fewer days of live fire training per year
- (4) Immediately if visible structural defects have formed, such as cracks, spalls, or warps in structural floors, columns, beams, walls, metal panels, and so on

5.2.2.4* Part of the live fire training structure evaluation shall include, once every 5 years, the removal and reinstallation of a representative area of thermal linings (if any) to inspect the hidden conditions behind the linings.

5.2.2.4.1 This requirement shall be permitted to be waived under both of the following conditions:

- (1) The thermal lining has never had a break in any part of its thermal barrier (no cracks, holes, breaks, or insulation sags that could allow heat to pass through the lining system).
- (2) Thermocouples between the thermal lining and the structural element indicate that temperatures have never exceeded 149°C (300°F) behind the lining.

5.2.2.4.2 If the requirement of 5.2.2.4 cannot be waived for a concrete structure, and if removal and reinstallation of thermal linings would be difficult or expensive due to the permanent nature of the lining system, then it shall be permitted to take concrete cores through the protected ceiling slab from the top surface of the slab in order to spot check conditions hidden by the thermal lining.

5.2.2.5 The engineer shall core solid structural concrete slabs and walls that have been exposed to temperatures in excess of 149°C (300°F) to check for hidden delamination and to test compressive strength once every 10 years for conventional (Portland) concrete and once every 3 years for refractory (calcium aluminate) concrete.

5.2.2.6 Where the live fire training structure damage is severe enough to affect the safety of the students, training shall not be permitted.

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