CONDITION ASSESSMENT AND REHABILITATION PLANS, HANGARS 2 AND 3, LADD FIELD NATIONAL HISTORIC LANDMARK FORT WAINWRIGHT, ALASKA

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On Behalf of

U.S. Army Environmental Center
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As part of a Cooperative Agreement with the United States Army Environmental Command, The Louis Berger Group, Inc. was tasked to produce a Condition Assessment and Rehabilitation Plan (CARP) for use by the Department of the Army to determine the feasibility and use of the World War II era hangars to meet current and future anticipated mission needs associated with the projected move of the Aviation Task Force at Fort Wainwright, Alaska. The hangars are contributing elements to the Ladd Field National Historic Landmark. Berger also prepared adaptive use and layaway plans for the hangars.

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0 EXECUTIVE SUMMARY

As part of a Cooperative Agreement with the United States Army Environmental Center (USAEC), The Louis Berger Group, Inc. (Berger) was tasked to produce a Condition Assessment and Rehabilitation Plan (CARP) for use by the Department of the Army to determine the feasibility and use of the World War II era hangars to meet current and future anticipated mission needs associated with the projected move of the Aviation Task Force at Fort Wainwright, Alaska.

Hangar 2 (Building 3008) and Hangar 3 (Building 3005) are among the 24 "significant historic structures" that comprise the Ladd Field National Historic Landmark (NHL) at Fort Wainwright. As such, their qualities of construction and architectural detailing are noteworthy and contribute to the overall character of the base as a historic resource.

However, both hangars contain numerous deficiencies, divided into four basic categories:

1. Life safety issues, which directly and immediately affect the safety of the buildings' occupants
2. Building code issues, which affect the general health and welfare of the buildings' occupants, as well as the general well-being of equipment kept in the hangars
3. Energy conservation issues, which affect the retention of heat in the buildings, the use of fuels to keep them heated and the comfort of persons using the buildings' spaces, and
4. Issues of general preservation, maintenance and upkeep of the buildings.

The life safety issues fall into three general categories: architectural issues – such as the lack of proper fire escapes; electrical issues – such as the lack of an NFPA 72 fire detection system, and fire protection issues – such as the lack of a building sprinkler system in the lean-to attic spaces. These issues are critical in nature, and should remediated as soon as possible, taking into consideration the preservation and retention of as many of the historic architectural and character-defining elements within the buildings as possible. The estimated cost to undertake these life safety issues is roughly $3.12 million per hangar.

Building code issues are conditions that are in violation of the 2003 International Building Code (IBC) or other supporting codes and standards referenced in the IBC, as well as the Department of the Army's Document ETL 1110-3-485, entitled "Engineering and Design: Fire Protection for Helicopter Hangars," dated 15 October 1997. There are many building code issues affecting the hangars, including structural deficiencies and damage in the roof trusses and framing, seismic deficiencies in the columns and roof framing, and ventilation inadequacies throughout both buildings. It is important to note that some building code issues did not exist at the time the hangars were constructed, and therefore, there is some allowance for "grandfathering" the provisions. In these specific instances, this report discusses the concerns and presents options for informed decision-making. Nonetheless, these issues are serious in nature, and should be remedied as soon as the life safety issues (listed above) are resolved; likewise, they should give careful consideration to the preservation and retention of as many historic architectural and character-defining elements in the buildings as possible. The estimated cost to undertake these building code issues is roughly $7.83 million per hangar.

Energy conservation issues affect the ability of the hangars to effectively and responsibly use and conserve fuels and electricity for heating and illumination. Specifically, energy conservation is most effectively achieved with insulation appropriately placed in roofs and walls, and through the upgrading of the buildings' heating systems. These issues should be addressed as soon as the building code issues, listed above, are implemented, and these issues should be studied to maintain and preserve as much of the historic architectural and character-defining elements of the buildings as possible The estimated cost to undertake these energy conservation issues is roughly $4.40 million per hangar.

Issues of general preservation and maintenance affect both the appearance of the hangars (including their general form and visual characteristics) and the upkeep of those materials and spaces within the buildings, including exterior materials, fenestration and construction type. These issues are not associated with any specific timetable or level of urgency, but should be included as a part of all decisions made relating to ongoing preservation, maintenance, repairs and upgrades over time. The estimated cost to undertake these issues is roughly $8.07 million per hangar.

The estimated combined cost of each of these priorities is roughly $23.43 million per hangar. The costs are broken down by priority in Tab 1, the Summary Recommendations and Cost Estimate. They are broken down by individual discipline and line item in Tab 10, the Cost Estimate.

- End of Section -

1 SUMMARY RECOMMENDATIONS AND COST ESTIMATE

1.1 Introduction

Each of the tabs presented in this report divides the investigation of Hangars 2 and 3 into disciplines – architectural, civil, structural, mechanical, electrical, fire protection and geotechnical. Within each tab, the discussion focuses on the existing condition of relevant building components, and concludes with a series of recommendations to make upgrades and corrections/remediations to the various identified deficiencies, taking into consideration the historic architectural and character-defining elements within each hangar that should be preserved, reused and protected to the extent possible.

This tab (Tab 1) serves two purposes; the first is to compile summaries of the recommendations within each specific discipline, as well as to organize them according to priority and need on a global scale for both buildings combined. The priorities are based on the type of deficiencies identified:

- First (highest) priority: life safety issues, which directly and immediately affect the safety of the buildings' occupants.

- Second priority: building code issues, which affect the general health and welfare of the buildings' occupants, as well as the general well-being of equipment kept in the hangars.

- Third priority: energy conservation issues, which affect the retention of heat in the buildings, the use of fuels to keep them heated, and the comfort of persons using the buildings' spaces.

- Fourth priority: issues of general preservation, maintenance and upkeep of the buildings, including the materials and spaces within the buildings, plus the exterior materials, fenestration and construction type.

Within each line item identified herein, the relevant Tab number(s) are cited for reference.

The second purpose of this tab (Tab 1) is to provide compiled cost estimates for the work identified within each area of priority. The costs outlined for the work items within each tab (listed in the following chapters of this report) are grouped according to their priority, and provide a range of costs for those recommendations.

It should be noted, that due to rounding, there are slight discrepancies between the costs listed herein and the costs shown in the various tabs.

It is also important to note that the recommendations and cost estimated presented herein are for each hangar. In virtually every line item, the work required is the same for both hangars – however, the costs listed herein are for each hangar (not both combined).

1.2 The Historic Character of the Buildings

Because the hangars are contributing elements within the Ladd Field NHL, all proposed work should be respectful of the irreplaceable historic character of the buildings - both in terms of the construction materials and finishes (ranging from the very large and imposing Birchwood roof trusses down to the original hardware that still survives intact on certain doors in the buildings) and in terms of the vast open spaces created within the buildings and around them. In general, the following guidelines should be utilized when planning repair and upgrade projects irrespective of priority:

- Existing original and historic materials should be retained and preserved in place whenever possible.
- When existing original and historic materials are at the ends of their serviceable lives and cannot reasonably be repaired, they should be replaced with new materials of comparable scale, finish, texture and color. It shall be acceptable to install substitute materials with improved durability, rot-resistance, energy performance, and so on, provided they do not alter or adversely affect the character of the adjacent materials and spaces.
- When the need arises to replace modern, inappropriate materials and finishes, new materials should be chosen that replicate the original scale and character of the building and its elements. (Likewise, modern, but visually inappropriate materials in fair or good condition should not be removed simply to "restore" the building back to an earlier time frame.)
- The openness of the large Hangar Bay spaces should be maintained and not compromised to the extent possible (the imposing spaces give the buildings their unmistakable character)
- When large renovation projects are anticipated for any of the rooms in the Office Bays, the surfaces and finishes should be carefully surveyed to determine the extent of surviving, intact, and reusable original elements. Said elements should either be retained in place (as specified above) or else carefully harvested and reused elsewhere in the building – and if reuse within the hangars is not possible, then carefully stored for reuse in one of the buildings elsewhere on the campus.

These guidelines constitute sound, reasonable preservation policy – consistent with the *Secretary of the Interior's Standards for Historic Preservation Projects* (SECINC Standards). Although many of the original and historic elements within the buildings have been removed or have become deteriorated and been replaced over the years (in some cases with inappropriate materials), much of the buildings' character-defining elements survive intact and are in good enough condition that they can continue to contribute to the appearance and use of the buildings for many years to come. Careful planning and implementation of the repairs and upgrades listed herein can reasonably accommodate the preservation of the buildings.

1.3 First (Highest) Priority: Life Safety Issues

These issues are critical in nature and should be remediated as soon as possible, taking into consideration the preservation and retention of as many of the historic architectural and character-defining elements within the buildings as possible.

1. Repair/replace existing fire alarm detection system and/or components with new fully addressable system, including fire alarm control panels and all initiation and notification devices. Include the relocation of manual pull stations to within mandated distances from exitways. Include also the installation of magnetic hold-opens for fire doors (Tab 7). Estimated subcontractor cost: $149,128.

2. Upgrade and expand the existing fire suppression system to include: a) new coverage in the area above the second floor ceilings on both support bays; b) replacement of existing deluge fire suppression system in hangar bay with new dry, pre-action, aqueous film-forming foam (AFFF) suppression system – do not use an early suppression fast response (ESFR) system; and c) upgrade or replace fire pumps in Building 3011 to provide 140 psi rated pressure (Tab 8). Estimated subcontractor cost: $608,313.

3. Install new hangar bay slab drainage system, including all necessary piping to carry water 400’ away from the building, and including a new, properly-sloped concrete floor. This is necessary if the buildings continue to be used for helicopter maintenance and repair - (Tab 6 and Tab 8). Estimated direct cost: $277,422.

4. Replace existing combustible hangar bay draft curtains with new, non-combustible draft curtains (Tab 8). Estimated direct cost: $61,687.

5. Install new fire hydrants around exterior of building in accordance with code requirements (Tab 4). Estimated subcontractor cost: $180,339.

6. Replace wood stair towers in all four corners of the building (all are badly rotted and cannot carry the occupant loads) with new steel pan stairs that will be consistent with IBC requirements for occupant loading, and including compliant handrails, treads, risers, nosings and stringers. Reconstruct the badly deteriorated stair tower enclosures with new noncombustible materials that can withstand the weather but which are visually consistent in scale and character with the original, including asphalt composition roof shingles. Replace thresholds at second floor exit doors (Tab 5). Estimated cost: $130,465.

7. Replace all exit lights and augment the amount of emergency lights employed throughout the building (Tab 7). Estimated subcontractor cost: $61,218.

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Using the formulae presented in Tab 10 of this report to provide for the various mark-ups for subcontractors, freight, subcontractor escalation, direct costs, overhead, profit, escalations, and estimating contingencies, the following represents the estimated cost to undertake all the First Priority (life safety) items:

Total estimated cost of First Priority Items: $3,120,442

1.4 Second Priority: Building Code Issues

These issues are serious in nature, and should be remedied as soon as the life safety issues (listed above) are resolved; likewise, they should give careful consideration to the preservation and

retention of as many historic architectural and character-defining elements in the buildings as possible.

8. Replace outdated panelboards, overcurrent protection devices and braided cloth insulated feeders and branch circuit wiring, and install dual-voltage electrical distribution system – 480Y/277 volt and 208Y/120 volt throughout the building (Tab 7). Estimated subcontractor cost: $297,720.

9. Install a complete structural repair and upgrade program to fix broken, cracked, damaged, failed and undersized joints and members in the trusses, purlins, tension rods, columns, intercolumn bracing and buttress web members. As part of this program, install a complete seismic upgrade to the structural system, columns and footings, and install insulation around entire perimeter of building (Tab 5). Estimated subcontractor cost: $1,602,520.

10. Provide a two-hour rated wall between the hangar bays and the first floor, second floor and attic area of both support bays – including closure of upper level openings (with fire shutters, wire glass, etc.) sealing of penetrations, installation of new drywall and non-combustible, cleanable (light-colored) surfaces on the hangar side of the wall that have the same visual character, texture, scale and color as the existing exposed wood siding (Tab 3). Estimated direct cost: $430,049.

11. Replace all historically inappropriate (non-original) doors and hollow-metal frames with new rated units (including lever hardware and panic hardware as appropriate) in all occupancy separation walls in both floors of both support bays. In locations where original doors, frames and hardware remain intact, endeavor to preserve and increase fire rating using nondestructive methods that allow the character of the original historic materials to remain intact (Tab 3). Estimated direct cost: $98,783.

12. Provide ventilation to first floor and second floor offices, shops, rest rooms and sleeping rooms – very little, if any, exists at present. Provide supplemental ventilation to the hangar bay area to meet code requirements for air changes per hour; provide DDC control system for heating and ventilating system (Tab 6). Estimated subcontractor cost: $752,892.

13. Upgrade lighting levels in hangar area from 15-40 footcandles to 75 footcandles by installing new lighting; include new exterior lights as well. This is necessary if the buildings continue to be used for helicopter maintenance and repair (Tab 7). Estimated subcontractor cost: $509,468.

14. Install perimeter fence for force protection. This is necessary if the buildings continue to be used for helicopter maintenance and repair (Tab 4). Estimated subcontractor cost: $81,790.

15. Alternate Compliance Issue #2 (to resolve inconsistencies between the accessibility requirements of the IBC and the stated mission of the Base) – convert one men's room and one women's room on the first floor of each building to become barrier-free, with new plumbing fixtures (including a shower), partitions and equipment (Tab 3). This cost is outlined in the General Maintenance Priority items of this estimate.

Note: the installation of elevators to gain access to both second floors in both buildings (4 total) was not considered as part of this project. The installation of elevators was considered to be beyond the requisite level of reasonable accommodation stipulated in the accessibility requirements of the IBC.

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Using the formulae presented in Tab 10 of this report to provide for the various mark-ups for subcontractors, freight, subcontractor escalation, direct costs, overhead, profit, escalations, and estimating contingencies, the following represents the estimated cost to undertake all the Second Priority (building code) items:

Total estimated cost of Second Priority Items: $7,834,680

1.5 Third Priority: Energy Conservation Issues

Energy conservation issues should be addressed as soon as the building code issues (listed above) are completed. Likewise, these issues should be carefully studied and designed so as to maintain and preserve as much of the historic architectural and character-defining elements of the buildings as possible.

16. Replace the poorly-functioning (and in some areas, non-functioning) hydronic heating units for the office, shop and sleeping spaces, including pumps, piping and terminal units. It should also include replacement of the exchangers to support new supplemental ventilation equipment - cited above. Provide for possible future air conditioning installation in office and sleeping areas – this is required due to the number of air changes per hour mandated by the IBC. Note: new direct digital controls (DDC) for all new terminal devices included in Item 12, above. (Tab 6). Estimated subcontractor cost: $75,164.

17. Replace entire roof assembly above the hangar bay - to include new EPDM membrane and recovery board on top of existing wood decking, and new insulation and vapor retarder below the decking (Tab 3). Estimated direct cost: $1,393,283.

Note: as part of this work, existing insulation on underside (interior surface) of roof deck to be removed – amount of surfaces coated with aircraft exhaust emissions is not known.

Note: ETL 1110-3-485 calls for a Class A or Class B fire rating for the roof assemblies, which can only be achieved with the introduction of a noncombustible ceiling below the wood trusses. Since AFFF suppression systems will be installed in the hangar bays, and since the adjacent attic spaces will be fitted with a wet pipe sprinkler system, and since the visual characteristics of the open spaces and exposed roof trusses and framing contribute significantly to the visual and historic character of the hangar bay spaces, it is recommended that a mitigated exemption under IBC Section 3407 for historic buildings be utilized.

18. Replace entire roof cover above both support bays – to include limited sheathing repairs, vapor retarders, insulation and finish roofing materials – to also include new fascias, soffits,

rakes, flashings and counterflashings. All work should be designed to maintain the character and appearance of the original building as much as possible. Substitution of new, modern materials is permitted where the reuse of original materials is infeasible due to high levels of maintenance or limited durability (Tab 3). Estimated cost: (included in Item 17, above).

19. Replace all insulation in attic space beneath roof of both support bays (Tab 3). Estimated cost: (included in Item 17, above).

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Using the formulae presented in Tab 10 of this report to provide for the various mark-ups for subcontractors, freight, subcontractor escalation, direct costs, overhead, profit, escalations, and estimating contingencies, the following represents the estimated cost to undertake all the Third Priority (energy conservation) items:

Total estimated cost of Third Priority Items: $4,404,280

1.6 Fourth Priority: General Preservation, Maintenance and Upkeep Issues

These issues are not associated with any specific timetable or level of urgency, but should be included as part of all decisions made relating to the ongoing preservation, maintenance, repairs and upgrades over time. This is crucial to prevent the slow, gradual loss of historic elements to rot, deterioration, damage, removal and other deleterious forces affecting the buildings over time.

Because they are considered general preservation and maintenance items, they are cost-estimated on a line-by-line basis (as the other three priority items); instead, they are totaled into a single line item at the end of the section.

20. Replace all exterior windows with new visually appropriate, low-e units – to include vapor retarders and insulation at wall joints and new trim; window sashes to be true divided lites to replicate historic appearance and match original, if possible (preferred), or applied muntins (if low-e not available in true divided lites) (Tab 3).

21. Replace existing exterior wall assemblies with new - to include vapor retarders, insulation, repairs to framing and new visually appropriate, low-maintenance, pre-finished exterior metal siding that replicates the historic original coursing of the siding (Tab 3).

22. Replace all non-historic exterior mandoors and frames at grade level – to include insulated frames and units, panic hardware and rated-glass lites. Note: if any of the current man-doors, frames or hardware are found to be original, carefully dismantle them and reuse them in other locations within the building if possible, or elsewhere on the base if they cannot be reused in the hangars (Tab 3).

23. Repair or (if repair is not possible) replace all exterior doors and frame openings above the catwalks, including repairs/upgrades to the catwalks and exterior balconies (Tab 3).

24. Install topping slab in all concrete floor areas in first floor office and shop areas on both sides of the building; replace all curbs at entry points into the office areas with new ramped, barrier-free entrances. Also, repair/replace displaced floor areas on the second floor – both sides of building (Tab 3).

25. Repair or (if repair is not possible) replace roofing and fascias on north/south canopies at exits to the building (Tab 3).

26. Repair cracked and damaged areas of gypsum wall board and ceiling board on both floors of both support bays in the building, including the buttress wraps – repair/replace vapor retarder and insulation as required. Tape, patch and (re)paint all new and previously painted surfaces (walls, ceiling and trim) in these locations (Tab 3).

27. Undertake a wholesale replacement of all non-original and non-historic interior, non-rated doors with new to match (including lever hardware and panic hardware as appropriate) in both support bays in both buildings. Original and historic doors, frames and hardware should be carefully examined to determine if upgrades can be installed to increase levels of fire/smoke compliance that do not compromise the integrity of the materials. If not, carefully relocate said doors, frames and hardware to locations where fire/smoke ratings are not crucial (Tab 3).

28. Replace all worn and damaged non-original and non-historic floor materials (including vinyl tile and carpeting) and vinyl cove base throughout all office areas in the building. Take care to preserve and reuse any original floor materials (such as exposed wood) wherever possible – and wherever it does not create a tripping, slippage or maintenance hazard (Tab 3).

29. Replace all damaged ceramic tile floors, walls and equipment (but not fixtures) in all rest rooms. Retain and reuse ceramic tile floors, walls and equipment in locations where they are intact and still in sound condition (Tab 3).

30. Relocate rack-mounted telecommunications equipment into secure, locked environments containing appropriate fire ratings (Tab 7).

31. Replace non-original and non-historic fluorescent lighting in shop areas and offices. Take care to reuse, rewire and relamp original lighting fixtures wherever possible. In places where original fixtures no longer provide the requisite light levels, either: a) retain them in place and supplement with new lamps placed nearby, or b) relocate said original lamps to other, less-demanding locations within the buildings. Do not install acoustical tile dropped ceilings into rooms simply for the convenience of installing fluorescent fixtures – especially in rooms where dropped ceilings are currently not in place (Tab 7).

32. Cap abandoned utilities and fill in existing unused service pits. Replace existing domestic water, compressed air, waste, vent piping and plumbing fixtures (Tab 6).

> Note: the rest rooms should be reconfigured to provide barrier-free access in accordance with relevant accessibility codes and the IBC to the extent that such reconfiguration does not compromise historic materials and finishes.

33. Regrade, resurface and repaint the parking area around both buildings (Tab 4).

34. Repair and repaint the large numbers above the hangar doors on both buildings (Tab 3).

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Using the formulae presented in Tab 10 of this report to provide for the various mark-ups for subcontractors, freight, subcontractor escalation, direct costs, overhead, profit, escalations, and estimating contingencies, the following represents the estimated cost to undertake all the Fourth Priority (general preservation, maintenance and upkeep) items:

Total estimated cost of Fourth Priority Items:	$8,066,767

1.7 Summary of Costs

First Priority (life safety) issues:	$3,120,442
Second Priority (building code) issues:	$7,834,680
Third Priority (energy conservation) issues:	$4,404,280
Fourth Priority (general preservation, maintenance and upkeep) issues:	$8,066,767
Summary of estimated costs:	$23,426,169

(Note: there is a roughly an $84,000 discrepancy between the summary cost shown herein and the summary cost shown on Tab 10, Page 1. This difference is attributable to the rounding of individual line items, compounded by the various mark-ups built into the estimating programs between the two Tabs. The difference is roughly 1.0036%, which is insignificant for the purposes of this report.)

- End of Section -

2 PROJECT OVERVIEW AND HISTORICAL SUMMARY

2.1 Project Introduction and Statement of Work

As part of a Cooperative Agreement with the United States Army Environmental Center (USAEC), The Louis Berger Group, Inc. (Berger) was tasked to produce a Condition Assessment and Rehabilitation Plan (CARP) for use by the Department of the Army to determine the feasibility and use of Hangar 2 (Building 3008) and Hangar 3 (Building 3005), two World War II era hangars, to meet current and future anticipated mission needs associated with the projected move of the Aviation Task Force at Fort Wainwright, Alaska. The hangars are highly visible, contributing resources within the Ladd Field National Historic Landmark (NHL) within Fort Wainwright.

Berger assembled a team of John Bowie Associates (historic architects), Ammann & Whitney (consulting civil and structural engineers), Design Alaska, Inc. (consulting architects and M/E/P engineers), Roberts-Keneko electrical Consultants, Inc., (consulting electrical engineers) and Soils Alaska, P.C. (consulting soils and geotechnical engineers) to produce a CARP for use by the Department of the Army. The CARP was to determine the feasibility and use of the World War II era hangars to meet current and future anticipated mission needs associated with the projected move of the Aviation Task Force at Fort Wainwright, Alaska. The CARP also was to take into consideration that the hangars are part of the Ladd Field National Historic Landmark. A cost estimate was to be included in each component of the CARP.

The CARP consists of the following reports:

1. Condition Assessment of Hangar 2 and Hangar 3 – including a Seismic Analysis
2. Rehabilitation Plan and Cost Estimate for repair and reuse of hangars for helicopters
3. Adaptive Use Plan for each hangar
4. Layaway Plan for each hangar

The Condition Assessment was to use previous inspection and structural analysis reports of the hangars by the US Army Corps of Engineers and the 2003 Condition Assessment/Economic Analysis of Hangars 2, 3 and 6 by ECI/HYER. In addition Berger was expected to carry out on-site inspections of all structural, mechanical, fire/safety systems and the general building fabric to assess the existing condition of the buildings. Due consideration was to be given to the building system requirements to assess their ability to meet current facility needs.

The Rehabilitation Plan and cost estimate was to be based on the results of the Condition Assessment and the projected use of the hangars for Blackhawks and Kiowas or similar vehicles and associated administrative or other uses. The Rehabilitation Plan is to consist of a report detailing the needed repairs, upgrades or replacement, and associated costs for the projected use through the year 2012, while taking into account the locality costs and wage determinations that the Army is required to use in Fairbanks, Alaska. The Rehabilitation Plan must follow the Secretary of the Interior's Standards for Rehabilitation (SECINC Standards), or explain the basis where a recommendation does not follow the SECINC Standards. All major costs for repairs, upgrades, etc., will be itemized, along with any suggested alternatives for comparison. It was not

necessary for the Rehabilitation Plan to assume that all historic fabric should be retained as it may be better to replace it with a more appropriate material. The report should summarize any preferred alternatives to historic material (i.e. similar material to original - such as wood) being used and explain the rationale behind the preferred alternatives in accordance with the SECINC Standards.

Berger also was to provide an Adaptive Use Plan for each hangar that was to consider current Army requirements and standards for administrative or other facilities. The Adaptive Use Plan was to consider adaptive use alternatives for converting the hangars for another use. While the Adaptive Use Plan could be general in nature - such as administrative offices, it was to provide general plan drawings to demonstrate the way the hangars could be altered to meet that use. All Adaptive Use Plan proposals had to take into consideration that the hangars are an integral part of the National Historic Landmark. Cost estimates should be provided based on the general plans and should be projected out to the year 2012. Duplicative information related to similar findings such as structural conditions may be repeated in each report. The reports were to stand alone - should only one of the hangars be adapted for a new use. Finally, the reports were to be (1) completed in sufficient detail so the Army could determine the feasibility of an adaptive re-use of the structures, and (2) sufficiently accurate in the cost estimate to provide the Army a true analysis for consideration.

The Layaway Plan for the hangars was to follow military guidelines or procedures for layaway of properties that do not currently meet mission needs. The layaway plan was to include immediate repairs for safety and fire protection, structural or mechanical repairs that are needed to ensure that the buildings are safeguarded while not being actively used. A cost estimate for the layaway of each hangar was to be included in the report.

2.2 Historical Overview

2.2.1 Ladd Field Established

In 1934, at the urging of Lt. Col. Henry H. “Hap” Arnold, Congress authorized construction of an airfield and cold weather station in Fairbanks. Although President Roosevelt issued Executive Order 7596, transferring six square miles of public domain land for the base in 1937 (Price 2004:5).

Ladd Field, however, was not established until 1939 as a Cold Weather Test Station. By the summer of 1940, 1,200 men were employed in the construction of the runway and facilities. The first plane landed on the finished runway in September 1940. In October, staffing of the Cold Weather Test Detachment (CWTD) began and in December, the airfield was named for Major Arthur K. Ladd, an Army Air Corps pilot who died in 1935. The first winter proved to be deadly, as a B-17 crashed, killing the eight-man crew. The streets of the base were named in their honor (Cole n.d.:4-5).

2.2.2 Ladd Field in World War II

By early 1941, several structures had been completed including Hangar 1, quarters for enlisted men and officers, a hospital, theater, power plant, and the commander's house. The buildings were laid out in a horseshoe pattern, with utilities running through underground tunnels that connected all of the buildings (Cole n.d.: 8). After Pearl Harbor, the CWTD was deactivated and all available aircraft were pressed into service in defense of Alaska. In 1942, however, the CWTD was reconstituted and, along with laboratory scientists and factory representatives, cold weather research was conducted at Ladd Field to keep planes flying in extreme sub-zero temperatures (Cole n.d.: 12).

The World War II facilities were designed to fulfill three missions: cold weather experimental station, air depot for repair and testing of aircraft and the principal base in Alaska for the Air Transport Command. Vital lessons were learned in wing-icing, navigation, aircraft maintenance and operation, instruments and controls, radio communication, cold weather-clothing, armament and a wide variety of other investigations for operating aircraft in arctic-like conditions (Thompson 1984).

During the war, "workers extended the runway by 4,000 feet, built a second runway…new warehouses, offices, and other buildings" as well as "hundreds of temporary buildings, four Birchwood hangars, two Kodiak "T" hangars, housing for more than 4,500 troops, and other facilities" (Cole n.d.: 13). Hangars 2 and 3 were authorized in 1943 and completed "ca. 1944" (Thompson 1984: 3).

In August 1941, the American and Soviet governments agreed on a plan to transport aircraft from the United States to the Soviet Union (Thompson 1984:2). In July 1942, the Soviets agreed to a plan to send planes to the Soviet Union via the Siberian route: the birth of the Alaska/Siberian (ALSIB) Movement. Additional airfields were built in Canada (Edmonton, Alberta, and Whitehorse) and Central Alaska (Northway, Tanacross, Big Delta, Galena, and Nome), as stepping stones for aircraft en-route from Great Falls, Montana to Ladd field, which served as the delivery point to the Soviet Union (Cole n.d. 23). In September 1942, five A-2 Havoc attack bombers and 22 P-40 fighters arrived at Ladd Field. On September 24, 1942, the first contingent of Soviet pilots landed at Ladd Field (Thompson 1984: 3). The Air Transport Command (ATC) took over Ladd Field in October 1943. By the end of the war, approximately 7,900 aircraft had been delivered using the Alaska-Siberia route.

By 1945, there were over 4,500 personnel at Ladd Field and included "two runways, over 248,000 square feet of concrete aprons, 15,000 linear feet of taxiways, seven gasoline operational storage tanks and 42 bulk storage tanks, six reinforced ammunition magazine igloos, a runway lighting system, repair and operations facilities in multiple hangars, Air Corps supply, and miscellaneous shops and storage facilities" as well as other support facilities (e.g., motor pools, bakery, mess halls and warehouses) (Price 2004: 15-16). On November 1, 1945, the ATC transferred Ladd Field to the 11th Air Force.

2.2.3 Ladd Field in the Cold War

In 1947, Ladd Field was renamed Ladd Air Force Base (Ladd AFB). While other World War II facilities were closed after the war, Ladd Field's location "near Fairbanks, the Richardson Highway and the Alaska Railroad, its access to fuel from the CANOL pipeline, and its position…as one of the United States' northernmost developed air bases" made it an important component to the defense of the United States. From 1946-1950, Ladd AFB served as an important center for strategic reconnaissance, electronic reconnaissance (using B-29 Ferrets), air defense, weather reconnaissance, air rescue, and research missions (e.g., Arctic Aeromedical Laboratory and Ice Station Research) (Price 2001:9, 26-30).

From 1950 to 1957, Ladd AFB was used intensely, as it served as the logistical support center for the Aircraft Control & Warning (AC&W) sites, the northwestern segment of the Distant Early Warning Line (DEW Line), and the White Alice communications network (WACS). Research into the polar ice cap, geophysics, communications, and other disciplines continued (Price 2001: 9). During the Korean War, additional facilities (e.g., a hospital, additional quarters, family housing, and a jet refueling system) were constructed at the base and fighter-intercept squadrons were based at Ladd AFB. In 1954, the F-89s of the 449th Fighter Interceptor Squadron was based in Hangar 3 (Price 2001: 21).

After 1957, intercontinental ballistic missiles and satellites limited the role of AC&W units, the DEW line, and White Alice (Price 2001: 9). In 1960, flying operations at Ladd were terminated by the Air Force (Price 2001: 10). On January 1, 1961, the Department of the Air Force transferred Ladd Air Force Base to the Department of the Army. The Department renamed the now historic field Fort Jonathan M. Wainwright, for the heroic World War II commander of American forces of Corregidor in Manila Bay in the Philippines (Thompson 1984: 4).

2.2.4 Fort Wainwright and U.S. Army Transformation

Today, Fort Wainwright is home to the 172d Stryker Brigade Combat Team, the "Arctic Wolves," Aviation Task Force 49, and other units. The response Stryker Brigade Combat Team and the Interim Armored Vehicle (IAV) are the vanguard for Army Transformation. The Army's responsibility to satisfy 21st century requirements for an effective full spectrum force demands improved capabilities. Rapid deployment of highly integrated, combined-arms forces is required. They must possess overmatching capabilities, exploiting the power of information and human potential, all while combining the advantages of both light and mechanized forces. They must operate across the full range of military and other-than-military operations. To meet all these requirements, the IAV becomes the first new armored vehicle that the Army has acquired in 18 years. The Stryker Brigades provide the Army with a lethal, deployable, survivable, and mobile force featuring 10 variants of our trademark Stryker vehicle and are designed to fill a capability gap between the Army's light forces and the heavy forces still fielded with M1 Abrams tanks and M2 Bradley Fighting Vehicles. The 172d Stryker Brigade Combat Team was deployed to Iraq in 2005 as part of Operation Enduring Freedom, and have recently been redeployed from Mosul to Baghdad.

2.2.5 The National Historic Landmark

Congress directed the National Park Service to identify World War II resources associated with the war in the Pacific, and in 1985 Ladd Field was designated a National Historic Landmark (NHL) (Price 2004: 2). Ladd Field significance is based on its role as Alaska's first Army airfield, as the Army's Cold Weather Test Station, and as the center of the ALSIB Movement (Thompson 1984).

The nomination states that "considering the many changes in missions over the past 45 years, the overall integrity of the original Ladd field *[sic]* structures is remarkable" and recognized 24 "significant historical features" (Thompson 2004: 3). Hangar 2 (3008) and Hangar 3 (3005) are contributing structures to the NHL. A complete list of the contributing buildings is included in Price (2004: Appendix A).

2.2.6 References Cited

Cole, Dermot
n.d. *Cold Missions: The U.S. Army Air Forces and Ladd Field in World War II.* The Tanana-Yukon Historical Society, Fairbanks, Alaska.

Price, Kathy
2001 *Northern Defenders: Cold War Context of Ladd Air Force Base, Fairbanks, Alaska 1947-1961*. Center for Environmental Management of Military Lands, Colorado State University, Fort Collins.

2004 *The World War II Heritage of Ladd Field, Fairbanks, Alaska*. Center for Environmental Management of Military Lands, Colorado State University, Fort Collins.

Thompson, Erwin N.
1984 *National Register of Historic Places Inventory-Nomination Form*.

2.3 Project Participants

Numerous individuals and organizations contributed to this report, and their efforts are acknowledged:

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- End of Section -

3 ARCHITECTURE

3.1 GENERAL PARAMETERS

3.1.1 General Introduction

A comprehensive condition assessment of Hangars 2 and 3 was conducted in 2003 by ECI/Hyer Inc. This document, together with structural analyses performed on the hangars by the Corps of Engineers in previous years, were used as historical information for this project, which examines the hangars in their current condition to determine if they meet current and future facility needs.

3.1.2 Military Criteria, Codes, and Standards

This report uses the current editions of governing building codes and military criteria, codes and standards in its analysis of the existing hangars. Where conflicts exist between code requirements, the most restrictive requirement is used. The buildings were originally constructed when the 1944 Uniform Building Code was in place. As of December, 2006, the governing code outside municipalities having jurisdiction is the 2003 International Building Code (IBC), as amended by the State of Alaska. The 2003 IBC is also the building code adopted by DOD and governs the design & construction of all property, buildings and structures on military installations, per UFC 1-200-01, 1-3.

The following codes and standards were considered in evaluation of the hangars' current condition:

- Unified Facilities Criteria (UFC), UFC 1-200-01, Design General Building Requirements.
- TM 5-800-1, Construction Criteria for Army Facilities.
- Technical Instructions (TI), TI 800-01, Design Criteria.
- UFC 3-600-01, Fire Protection Engineering for Facilities.
- UFC 4-010-01, Design: DoD Minimum Antiterrorism Standards for Buildings.
- UFC 4-021-1, Mass Notification Systems.
- UFC 4-211-01, Aircraft Maintenance Hangars, Type I and Type II.
- Fort Wainwright Army Installation Design Guide.
- Engineering Technical Letter (ETL), ETL 1110-3-484, Aircraft Hangar Fire Protection Systems.
- ETL 1110-3-485, Fire Protection for Helicopter Hangars.
- National Institute of Standards and Technology (NIST), Technical Note (TN) 1423, Analysis of High Bay Hangar Facilities for Fire Detector Sensitivity and Placement.
- TI 809-04, Seismic Design for Buildings.
- National Fire Protection Association (NFPA), NFPA 1, Uniform Fire Code.
- NFPA 10, Portable Fire Extinguishers.
- NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam.
- NFPA 13, Installation of Sprinkler Systems.

- NFPA 16, Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems.
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.
- NFPA 22, Standard for Water Tanks for Private Fire Protection.
- NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.
- NFPA 30, Flammable and Combustible Liquids Code.
- NFPA 70, National Electrical Code.
- NFPA 72, National Fire Alarm Code (1999).
- NFPA 90A, Installation of Air-Conditioning Systems.
- NFPA 101, Life Safety Code.
- NFPA 110, Standard for Emergency and Standby Power Systems.
- NFPA 170, Fire Safety Symbols.
- NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.
- NFPA 291, Fire Flow Testing and Marking of Hydrants.
- NFPA 409, Standard on Aircraft Hangars.
- NFPA 1963, Fire Hose Connections.
- American National Standards Institute (ANSI), S3.41, Audible Emergency Evacuation Signals.
- Engineering Manual (EM) 385-1-1, Safety and Health Requirements Manual.
- AWWA Manual M31, Distribution System Requirements for Fire Protection.
- UFGS (Uniform Facilities Guide Specifications):

  UFGS 105230, Portable Fire Extinguishers

  UFGS 13209, Water Storage Steel Tanks

  UFGS 13851A, Fire Detection and Alarm System

  Addressable.

  UFGS 13920A Fire Pumps.

  UFGS 13930A, Wet Pipe Sprinkler System, Fire Protection.

  USFS 13955A Aqueous Film-Forrning Foam (AFFF) Fire Protection System.

3.2 BUILDING CODE SUMMARY

3.2.1 Existing Construction Type

Type V-B, Non-Rated, based on IBC 2003. NFPA 220-(Type V (000))

The gross building area of each hangar, including hangar bay, side office/support bays, and exit stairs, is 60,680 sq.ft.

3.2.2 Existing Occupancies (NFPA 101, IBC Chapter 3)

Occupancy classifications from both the NFPA 101 and IBC are shown here because the UFC-3-600-01, Chapter 2, requires the use of a different code when determining various building construction characteristics. IBC occupancies are shown in parentheses.

- Hangar Bay: NFPA 101, Chapter 40, Special Purpose Industrial Occupancy (S-1).
- Offices: NFPA 101, Chapter 38, Business Occupancy (B).
- Support areas: NFPA 101, Chapter 40, Special Purpose Industrial Occupancy (S-1).
- Sleeping areas (dormitory): NFPA 101, Chapter 26, Lodging or Rooming Houses (R-1).

3.2.3 Occupancy Separation Walls (IBC Table 302.3.2)

- Group B/Group S-1 - 2 hours with sprinkler system reduction
- Group B/Group R-1 - 1 hour with sprinkler system reduction
- Group S-1/ Group R-1 - 2 hours with sprinkler system reduction

    - ETL 1110-3-485 3.5 Internal Fire Separations - Walls and ceilings separating helicopter hangar bays from attached , adjoining or contiguous shops, offices, parts storage or similar areas, will have at least 1-hour fire resistance rating with openings protected by listed or approved fire doors having a minimum fire resistance rating of 45 minutes.

- *Existing walls separating Group B/Group S-1/Group R-1 occupancies do not meet these IBC requirements. Inadequate wall construction along with multiple penetrations throughout the building have resulted in non-rated walls or ceilings at required occupancy separations.*

3.2.4 Incidental use areas (IBC 302.1.1)

One hour rated construction or an automatic fire-extinguishing system must be provided at:

- Storage rooms over 100 SF.
- Furnace rooms where any piece of equipment is over 400,000 Btu per hour input.
- Rooms with any boiler over 15psi and 10 horsepower.

However, per Note b, occupancy separations need not be provided for storage areas within Groups B and M if the:

1. Area is less than 10 percent of the floor area;
2. Area is provided with an automatic fire-extinguishing system and is less than 3,000 square feet; or
3. Area is less than 1,000 square feet.

There are a number of locations in both hangars where due to occupancy changes or repairs, storage and mechanical rooms do not have the required construction or sprinkler coverage.

3.2.5 Fire Resistance Rating Requirements for Building Elements (IBC Table 601)

No rated construction is required for any building element of Type VB construction.

3.2.6 Corridors (NFPA 101)

- NFPA 101 40.3.5 does not require corridors to be protected in special purpose industrial occupancies.
- NFPA 101 38.3.6.1 (3) allows corridors to be unrated within buildings protected by an automatic sprinkler system.
- NFPA 101 26 (Lodging or Rooming Houses) does not specify a corridor requirement, therefore see general requirement, Chapter 7. Corridors serving as exit access and serving an occupant load greater than 30 need to be 1-hour rated construction. *This would apply to any areas in the hangars being used for dormitory purposes.*

3.2.7 Allowable Floor Area and Building Height (IBC Chapter 5)

- Hangar Bays- S-1 occupancy:
  - IBC 504.1: Exception: The height of one-story aircraft hangars shall not be limited if the building is provided with an automatic fire-extinguishing system and is entirely surrounded by public ways or yards not less in width than one and one-half times the height of the building.
  - IBC 507.2: Sprinklered, one story: The area of a one-story, Group S building shall not be limited when the building is provided with an automatic fire-sprinkler system throughout and is surrounded and adjoined by public ways or yards not less than 60 feet in width.
  - Table 503:

Total allowable floor area	= unlimited (per IBC 504.1 & 507.2 above)
Actual floor area	= 30,400 SF
Total allowable building height	= unlimited
Actual building height	= 1 story, 57 feet

- Offices - B occupancy:
  - IBC 507.3: Two Story: The areas of a two-story, group B building shall not be limited when the building is provided with an automatic sprinkler system and is surrounded and adjoined by public ways or yards not less than 60 feet in width.
  - IBC Table 503:

Total allowable floor area	= unlimited
Actual floor area first floor	= 7,625 SF (Hangar 2) = 7,500 SF (Hangar 3)
Actual floor area second floor	= 10,000 SF (Hangar 2) = 8,750 SF (Hangar 3)
Total allowable building height	= 60 feet (with automatic sprinkler system: 40 feet plus 20 feet, per IBC 504.2)
Actual building height	= 2 stories, 57 feet

- Support Areas - S-1 occupancy:
  - IBC Table 503:

Total allowable floor area	= 67,500 SF
Actual floor area first floor	= 2,375 SF (Hangar 2) = 2,500 SF (Hangar 3)
Total allowable building height	= 2 stories, 60 feet (with automatic sprinkler system: 40 feet plus 20 feet, per IBC 504.2)
Actual building height	= 1 story, 57 feet

- Sleep Areas (dormitory):
  - IBC Table 503:

Total allowable floor area	= 52,500 SF
Actual floor area 2nd floor	= 1,250 SF (Hangar 3 only)
Total allowable building height	= 3 stories, 60 feet (with automatic sprinkler system: 40 feet plus 20 feet, per IBC 504.2)
Actual building height	= 1 story, 57 feet

- Total building area: 60,680 SF

3.2.8 Exiting Requirements (NFPA 101, Chapter 40, Industrial Occupancies)

NFPA 101.40.2.5 – protected throughout by an approved supervised automatic sprinkler system.

- Dead end corridors will not exceed 50 feet.
- Common path of travel shall not exceed 100 feet.
- Maximum travel distance to exits not to exceed 400 feet.

NFPA 101.40.2.4.1- Number of means of egress:

- Not less than two means of egress shall be provided from every story or section, and not less than one exit shall be reached without traversing another story.

Complies - all industrial occupancy areas: aircraft hangar and support areas such as shops, are located on the main floor.

NFPA 101.40.6.1.2 - Exits from aircraft servicing areas shall be provided at intervals not exceeding 46 meters (150 feet) on all exterior walls. *Complies.*

3.2.9 Exiting Requirements (NFPA 101, Chapter 38, Business Occupancies)

NFPA 101.38.2.5 & 38.2.6 – protected throughout by an approved supervised automatic sprinkler system.

- Dead end corridors will not exceed 50 feet.
- Common path of travel shall not exceed 100 feet.
- Maximum travel distance to exits not to exceed 300 feet.

NFPA 101.38.2.4 - Number of means of egress:

- Not less than two separate exits shall be provided on every story. *Complies - three exits are provided from each 2nd story office area.*

3.2.10 Exiting Requirements (NFPA 101, Chapter 26, Lodging or Rooming House Occupancies)

NFPA 101.26.2 Means of Escape Requirements

- 26.2.1.1 Primary means of escape
- 26.2.1.2 Secondary means of escape

3.2.11 Occupant Load (NFPA 101, per UFC 3-600-01)

NFPA 101.40.1.7 and Table 7.3.1.2, Special Purpose Industrial Occupancies (Hangars):

- Occupant load based on general Industrial use = 30,400/100 = 304. *This exceeds calculated and expected occupant load.*
- Occupant load based on number of exits: There are 7 exit doors from the hangar bay. Each door has an exit capacity of 180 occupants. *This exceeds the calculated and expected occupant load.*

NFPA 101.38.1.7 and Table 7.3.1.2, Business Use (Offices):

- Occupant load based on existing exits: *The existing exit door capacity from both floors exceeds the calculated and expected occupant load.*

NFPA 101.40.1.7 and Table 7.3.1.2, Special Purpose Industrial Occupancies(Support Areas):

- Occupant load based on existing exits: The support areas exit directly into the hangar area.

NFPA 101.26.1.7 and Table 7.3.1.2, Hotels and Dormitories (Dormitories):

- Occupant load based on exit capacity: There are two stairs serving the dormitory area in Hangar 3. *The available capacity exceeds the calculated occupant load.*

3.2.12 Interior Wall Finish

ETL 1110-3-485, 3.9 requires that all interior finishes will have a Flame Spread Rating of less than 25 and a smoke developed rating of 50 or less. In general, the offices and support areas within Hangars 2 & 3 have gypsum board finishes. *However, the hangar bays still retain their original wood board finish, which does not comply.*

3.2.13 Draft Curtains

UFC 4-211-OIN-5.4 requires non-combustible draft curtains separating the hangar bay roof area into sections not exceeding 7500 SF in area, installed per NFPA 409 and UFC-3-610-01.

TL 1110-3-485 requires sections not exceeding 15,000 SF in area.

The current wood draft curtains, installed on the wood roof trusses, do not comply.

3.2.14 Roof Assemblies

Per UFC 3-600-01, and ETL 1110-3-485, roof coverings shall be approved and listed, Class A or B. (Class C is restricted to housing or non-mission critical buildings). Per Carlisle Roofing, Hangars 2 and 3 were reroofed in 1996 with Class A assemblies, EPDM roof. *The current roofing is Class A, but now exceeds its 10 year warranty period.*

3.3 CONDITION ASSESSMENT - HANGARS 2 & 3

Hangar No. 2 was inspected by Janet Matheson AIA, and Hangar No. 3 was inspected by James Bartlett AIA, of Design Alaska Inc. in September, 2006. The hangars are of identical size, age, and materials, but are currently occupied by different companies, and their interior room configurations are slightly different.

Each hangar is approximately 200 feet long by 152 feet wide and 57 feet high. The wood truss roof forms an arch running from north to south. The underside of the roof area has a wooden catwalk system to service mechanical heaters suspended above the floor and to allow roof access. The east and west ends of the hangar are fitted fabric curtain hangar bay doors (see Figs. 3.1 through 3.3).

On the north and south sides of each hangar are two story office and support bays. These bays are 200 feet long by 25 feet deep, with a sloping roof up to the hangar bay wall. The roof rises from 25 feet above finish grade at the eave to 38 feet at the intersection with the hangar bay wall and roof. The support bays generally consist of maintenance shops, supply offices, parts and arms storage rooms on the first floor, and offices, conference rooms, training rooms, lounges, and storage rooms on the second floor. Restrooms and utility rooms are located on both floors. The main mechanical room is located on the south first floor. There is a central interior exit stair and two exterior exit stairs from the second floor at both north and south support bays (see Fig. 3.3).

Wall construction throughout each facility is 2x6 wood studs at exterior walls and 2x4 wood studs at interior walls. Typical interior finish is gypsum board of varying ages.

The main hangar floor is relatively flat concrete, with existing floor drains, tie-down and grounding points (see Fig. 3.4).

3.3.1 EXTERIOR ENVELOPE BUILDING SYSTEMS

The existing metal siding on each hangar has an earth toned color scheme meeting the Base design standards as set forth in the Alaska Installation Design Guide (IDG). The metal siding has a corrugated panel design, maintaining a similar look to the surrounding hangars.

Walls

No destructive demolition was done as part of this assessment, thus a full inspection of the existing exterior wall could not be completed. We believe the exterior wall construction consists of metal siding applied over the original painted 1x6 horizontal board ('drop') siding. Under the original siding, the original construction drawings dating from 1944 show 1" sheathing (diagonal 1x8 shiplap), 15# building paper, 2x6 wood studs @ 16 inches o.c. The presence of insulation or vapor barrier within the wall is unknown. The interior finish on the exterior walls is typically painted gypsum board. All exterior walls are presently load bearing.

- Code and Standard Deficiencies - Walls:
  1. The vapor retarder at the exterior wall is either not existent or is failing. Specific locations showing water damage are at the wall/ceiling joint at the exterior walls (see Figs. 3.5 and 3.6).
  2. All wood access door and frame openings to the exterior are rotting, no longer open and close, do not maintain a seal with the exterior wall, and in some areas water leakage may have affected surrounding wall structural integrity. Most of these openings are located above the catwalk area (see Figs. 3.7 and 3.8).
  3. Exterior siding is in good condition. Minor areas of siding need to be removed and replaced. Both buildings should be refinished (refer back to Fig. 3.1 and see Fig. 3.9).

Roofs

Hangar Bay roofing is a 60 mil EPDM membrane over 7/16" OSB Plywood over the existing 2x T&G decking from the intersection of the support bay's sloped roof on one side, over the arch, to the intersection on the sloped roof on the opposite side. At the underside of the decking in the hangar bay is a minimal amount of insulation held in place with furring strips.

- Code and Standard Deficiencies - Hangar Bay Roof:
  1. Insulation is inadequate at the roof for the Alaskan climate (see Figs. 3.10 and 3.11).
  2. No vapor retarder in roof system (see Figs. 3.10 and Fig. 3.11)
  3. Roof asphalt shingles (above the main hangar doors) have reached the end of their useful life (see Fig. 3.12 and see also Fig. 3.14).
  4. EPDM Membrane appears to be in satisfactory condition, although beyond its 10 year warranty period (see Fig. 3.13).

5. All exterior wood platforms at each corner of the hangars need to be removed. Wood is rotted through in many areas. There are no IBC compliant hand/guardrails, or fall protection. There is no ladder access; the only access is from the catwalk system through rotten access doors to a wood platform (see Figs. 3.14 and 3.15).
6. All exposed wood fascia and trim is rotten and falling away from the building (see Fig. 3.16).
7. Much of the insulation below the roof deck is coated with aircraft exhaust emissions.
8. In areas of asphalt shingles, the metal flashing is failing.

Support Bay roof structure consists of 2x decking spanning joists at 2 feet o.c. Fiberglas batt insulation is stuffed between the joists and held in place with furring strips.

- Code and Standard Deficiencies - Support Bay Roofs:
  1. Vapor retarder is poor and has failed. Water is pooling in the vapor retarder and leaking into the building (see Figs. 3.17 and 3.18).
  2. Furring strips are falling off (see Figs. 3.17 and 3.18).
  3. Walls between support bay roof cavity and hangar are not rated construction (see Fig. 3.19).
  4. Much of the insulation is coated in aircraft exhaust emissions.
  5. Many areas of the chicken wire secured to the walls are falling off.
  6. Concealed roof cavity is not sprinkled.

Floor Slabs

Concrete foundation is uninsulated and extends 6 inches above the first floor slab.

- Code and Standard Deficiencies - Floor Slabs:
  1. The floor slab is cracked, uneven, showing settlement in various areas of the facility, creating trip hazards and making these areas unsafe to walk (see Figs. 3.20 through 3.22).
  2. Curbs at exterior entry doors are trip hazards and do not meet NFPA/IBC code requirements (see Fig. 3.23).
  3. Moss around the perimeter of the building indicates excessive dirt and moisture are being retained against the building (see Fig. 3.24).

Canopies

Entry canopies are metal roofing on 2x wood decking on wood joists on metal beams on metal posts on concrete footings. The undersides and gable ends are faced with plywood with 2x8 wood fascia trim. The canopies are seismically separate from the exterior wall. All wood and structural metal is painted. Metal roofing is factory finished color.

- Code and Standard Deficiencies - Canopies:
  1. All wood fascias have rotted and are falling away from the canopy (see Fig. 3.25).
  2. Metal roofing has taken damage from falling snow and ice, and has completely failed (see also Fig. 3.25).

Windows

Windows have been replaced in the past 10 years with turn/tilt vinyl windows. Windows are in good condition and most still open and close. Original windows were larger than the vinyl windows and so wood infill was added to frame out the smaller vinyl windows. It is also unclear how the wall vapor retarder (if existing) and the window infill vapor retarder overlap.

- Code and Standard Deficiencies:
  1. The wood infill and wood trim have reached the end of their useful life (see Fig. 3.26).
  2. Vapor barrier at all windows may be inadequate or nonexistent.

Doors and Frames

Exterior doors and frames are painted hollow metal. We assume that they are insulated. All are elevated above grade by approximately 6 inches each side of the door.

- Code and Standard Deficiencies:
  1. Doors have reached the end of their life. Door frames are not thermally broken. Many doors are missing weather stripping, thresholds or door closers. Many doors do not have IBC required exit panic hardware. Some doors do not close properly. Some doors have non-IBC code complying glass relites. Doors lack lever hardware (see Figs. 3.27 and 3.28).

Stairs

Exterior stair towers are located at each building's four corners, at the east and west ends of the building. The exterior stairs are wood construction, including stringers, treads and platforms. None of the wood appears to be preservative-treated. Handrails and guard rails are constructed of metal pipe. All stairs are open riser. The stair is enclosed in metal siding on approximately ¾ inch plywood on 1x8 diagonal wood sheathing on 2x6 wood stud construction. All studs are exposed to the interior of the exterior stair. The stair exits through an approximately 3'-0" opening at the base of the tower (see Figs. 3.31 through 3.33).

- Code and Standard Deficiencies:
  1. Exit stairs are non-compliant per NFPA 101.
  2. Much of the stair material is old, rotted and is no longer safe.
  3. Wood base stringer is in direct contact with the ground.
  4. Treads and risers (Rise and Run) do not meet NFPA 101 requirements

Exterior landings outside grade level exterior doors do not exist. Exterior landings at exterior door exits from the second floor stair towers are wood platforms (see Fig. 3.34; also refer back to Fig. 3.27).

- Code and Standard Deficiencies:
  1. Door exits from the second floor thresholds are a trip hazard and do not meet the requirement for level landings each side of door.
  2. Much of the stair material is old, rotted and is no longer safe.
  3. Level landing does not exist on the exterior side of grade exterior doors.

Aprons

The exterior aprons at the aircraft hangar are not level with the main hangar floor. To remedy this condition, a sloped grout or concrete material has been troweled to create a ramp from interior to exterior for aircraft.

- Code and Standard Deficiencies:
  1. The sloped area at the hangar aprons is spalling and failing. The concrete hangar bay floor needs to be modified to correct this floor leveling problem.

3.3.2 INTERIOR BUILDING CONSTRUCTION

Walls

The hangar/support bay walls incorporate wood 12x12 columns. The condition of these columns is described in the structural section of this report. The hangar side of the walls is finished with 1x6 horizontal wood siding over a layer of gypsum board over 1x6 board sheathing applied diagonally to the supporting studs on the hangar side face. The supporting studs are 2x6 wood studs @ 16 inches o.c. The support bay side of these walls has gypsum board and 1x horizontal siding. In the office areas, the 1x horizontal siding has been furred out with a gypsum board finish (see Figs. 3.38 through 3.41; also refer back to Fig. 3.19).

- Code and Standard Deficiencies:
  1. Non fire rated construction as required by NFPA 101. UFC 3-600-01, requires Class A or B finishes at exits but ETL 1110-3-485 requires Class A interior finishes throughout.
  2. Wall finish is over 50 years old and has reached the end of its useful life.
  3. Openings in separation wall between hangar bay and support bays.
  4. Hangar walls are not durable, low maintenance, cleanable surfaces.

The support bay walls consist of indeterminate thickness plywood over 1x6 horizontal wood siding over 1x8 diagonal wood sheathing applied to the face of the 2x6 wall studs @ 16 inches o.c., and painted gypsum board (see Figs. 3.42 and 3.43).

- Code and Standard Deficiencies:
  1. Gypsum board at exterior wall is showing cracking from seismic events or settlement.
  2. Some wall & ceiling gypsum board is showing water damage.
  3. Vapor retarder is failing or inadequate.

Floors

The support bay floors on the second floor are constructed of floor finish over indeterminate thickness plywood over 2x diagonal wood sheathing over joists, with (1) layer of painted gypsum board below (see Figs. 3.44 and 3.45).

- Code and Standard Deficiencies:
  1. Gypsum board at all ceilings is showing cracking from seismic events or settlement.
  2. Various areas of gypsum board ceilings are showing moisture damage along board joints.

3. Paint is peeling off ceilings.
4. Tape joints are failing.
5. Flooring material on second floor is showing cracking from seismic events or settlement.
6. Various areas have gypsum board pulling away from the ceiling.

Ceilings

The support bays' original flat roof is constructed of a foil backed paper exposed as a walking surface over tar or asphalt coating substrate over indeterminate thickness plywood over joists, with (1) layer of painted gypsum board below (see Figs. 3.46 and 3.47).

- Code and Standard Deficiencies:
  1. Gypsum board at all ceilings is showing cracking from seismic events or settlement.
  2. All gypsum board ceilings show moisture damage along all board joints.
  3. Paint is peeling off ceilings.
  4. Tape joints are failing.
  5. Some areas have gypsum board pulling away from the ceiling.

Doors and Frames

Interior doors and frames are uninsulated painted hollow metal (refer back to Figs. 3.29 and 3.30).

- Code and Standard Deficiencies:
  1. Door hardware is failing.
  2. No lever hardware present.
  3. The majority of doors are damaged, dented, scratched, painted multiple times and have reached the end of their useful life.
  4. Doors in occupancy separation walls are unrated.

3.3.3. INTERIOR BUILDING FINISHES

Walls

The interior finishes throughout the facility are painted wood or painted gypsum board. These wall finishes need to be replaced with materials better suited to the hardships of aircraft repair. The second floor wall finishes are painted gypsum board which is satisfactory for the business type uses of these spaces. Restrooms have had major modifications over the years but consist of ceramic tile full height or wainscot walls which are satisfactory for the use of these spaces.

- Code and Standard Deficiencies:
  1. Many of the finishes currently installed throughout the hangar are not durable, low maintenance materials that are easy to clean or designed for workmen doing aircraft repair. Much of the horizontal wood siding on the hangar walls is old and reaching the end of its useful life. Much of the siding has been cut and patched so many times it is un-repairable (refer back to Figs. 3.38 through 3.41).

2. Ceramic tile on walls is old and out of date, showing signs of damage and distress. Many of the restrooms have been remodeled so many times that the tile is failing to work as designed or intended, and is unrepairable (see Figs. 3.48 through 3.50).
3. Rubber and wood base throughout the office/support spaces is in poor condition. They have been cut and patched many times, and have been painted over multiple times (see Figs. 3.51 and 3.52).
4. All gypsum walls are in poor condition. The walls have been painted multiple times and painted poorly. The paint not only covers the gypsum but almost everything mounted to the walls (see Figs. 3.53 and 3.54; also refer back to Figs. 3.51 and 3.52).

Hangar Floor

Consists of a concrete floor slab, to be described in the structural assessment. There is cracking and settlement throughout the facility. There are many areas requiring ramps to transition between hangar and support/office areas.

- Code and Standard Deficiencies:
  1. The sloped floor has settlement and cracking throughout the aircraft hangar bay which may impede service to the aircraft housed in the hangar (refer back to Fig. 3.4).
  2. Floors do not have proper slope, drains, ramps or curbs to contain flow of liquids (refer back to Figs. 3.35 and 3.36).
  3. Ramped transitions and foundation settlement at all doors are in violation of NFPA code requirements (see Figs. 3.60 and 3.61).
  4. Curb each side of exterior wall is in violation of NFPA (refer back to Figs. 3.23 and 3.27).
  5. All vinyl tile is out of date and failing throughout the building (see Figs. 3.55, 3.57 and 3.59).
  6. Concrete both painted and unpainted needs to be removed, clean, patched, repaired and repainted or resealed (see Fig. 3.56).

Office Floors

The Office/Support space floors consist of a mixture of vinyl tile, ceramic tile, concrete, and carpet.

- Code and Standard Deficiencies:
  1. Throughout the facility, carpet is worn, torn, damaged, soiled, stained and fraying (see Fig. 3.63).
  2. Vinyl tile is a mismatch assortment to different types. All are showing age, cracking, chipping, damage, staining, scraped and missing. All vinyl tile is out of date and failing throughout the building (refer back to Figs. 3.55, 3.57 and 3.59).
  3. Treads and risers in stairs are showing wear and tear. Landings are also missing detectable warnings at stairs (see Fig. 3.64).
  4. Transitions at all doors are coming apart, do not exist, are out of date or do not meet code.
  5. Concrete both painted and unpainted needs to be cleaned, patched, repaired and repainted or resealed (refer back to Fig. 3.56).

6. Ceramic tile floors have reached the end of their useful life. Various floors throughout the building have been patched and repaired multiple times. The floor is showing signs of cracking, damage, staining and soiling. Much of the ceramic tile floor is unrepairable (see Fig. 3.65; also refer back to Figs. 3.50 and 3.58).

Ceilings

Ceilings throughout the facility are either open to structure or have a painted hard gypsum board ceiling. The ceiling materials in the support spaces are satisfactory for the uses of the space.

- Code and Standard Deficiencies:
  1. Cracking is appearing in all ceilings throughout the facility (see Figs. 3.66 and 3.67).

Catwalks

The catwalks typically extend from the east end of a hangar to the west down the middle of each hangar. At the east and west end, the catwalk extends from the north to the south wall along the inside bottom chord of the end truss. Approximately centered between the east and west end walls is another section of catwalk running from the north wall to the south wall. The catwalk is typically accessed by ladder or stair central to the north or south wall up the face of the wall to the central section of catwalk. The framing is generally light lumber framing, 2x4 and 2x6 members with plywood sheathing over the walking platform. The catwalks are suspended from the trusses or bear on the truss bottom chord or truss stabilizing struts (see Figs. 3.68 through 3.72, and also refer back to Fig. 3.41).

- Code and Standard Deficiencies:
  1. Wood walking surface is failing in several locations. Some are patched with temporary fixes.
  2. Handrails and guardrails do not meet NFPA/IBC code requirements.
  3. Catwalks need to be refinished.
  4. Stair tread and risers do not meet code.
  5. Ladders do not meet code.
  6. No fall protection.

Draft Curtains

The existing draft curtains consist of plywood sheets attached to the vertical web members of the web trusses (see Fig. 2).

- Code and Standard Deficiencies:
  1. Draft curtains are not non-combustible.
  2. They do not completely separate the roof area in sections.

3.4 PHOTOGRAPHS

Figure 3.1 Exterior Hangar wall and door - Hangars 2 & 3.

Figure 3.2 Wood Truss, existing draft stop, and catwalk - Hangars 2 & 3.

Figure 3.3 Exterior shot hangar with lean-south support bay - Hangar 3.

Figure 3.4 Hangar concrete floor slab at both Hangars 2 & 3.

Figure 3.5 Gypsum board failure and repair at exterior wall - Hangar 3.

Figure 3.6 Gysum board failure and repair at exterior wall - Hangar 3.

Figure 3.7 Above catwalk exterior access doors - head conditions - Hangars.

Figure 3.8 Above catwalk exterior access doors - sill condition - Hangars 2 & 3.

Figure 3.9 Exterior siding damage Hangars 2 & 3.

Figure 3.10 Roof insulation at underside of decking held in place with furring strips - Hangars 2 & 3.

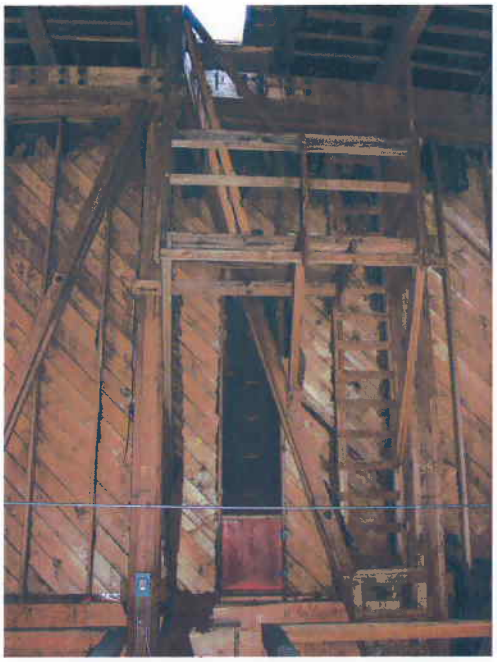


Figure 3.11 Inadequate vapor retarder at exterior walls - Hangars 2 & 3.

Figure 3.12 Asphalt shingles - over hangar doors - Hangars 2 & 3.

Figure 3.13 EPDM roofing - Hangars 2 & 3.

Figure 3.14 Failing asphalt shingles and rotten exterior wood platforms - Hangars 2& 3.

Figure 3.15 Rotten exterior wood platform railings - Hangars 2 & 3.

Figure 3.16 Rotten wood fascia trim - Hangers 2 & 3

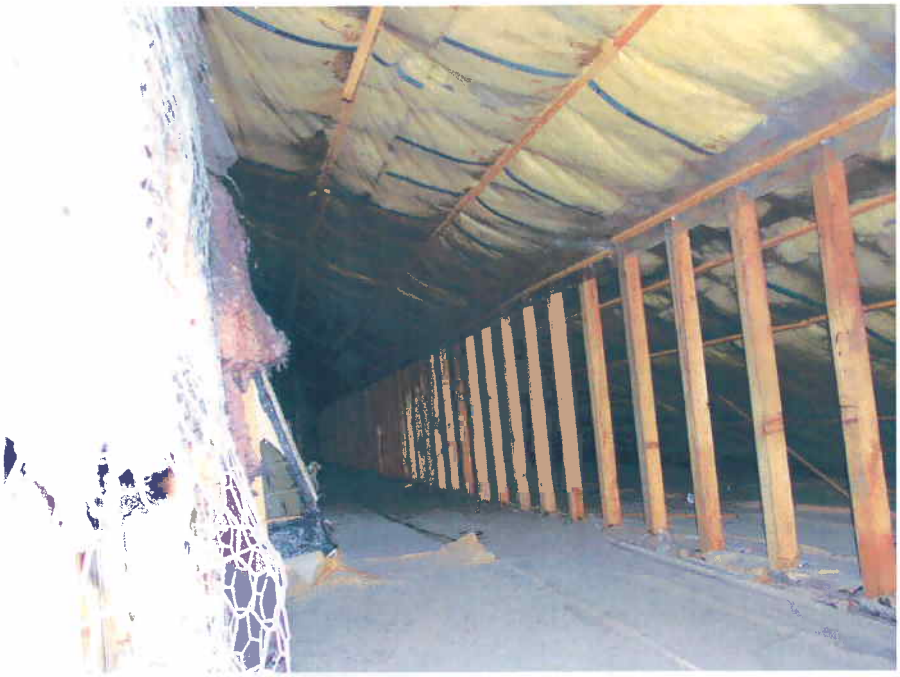


Figure 3.17 Support bay failing roof furring - Hangars 2 & 3.

Figure 3.18 Support bay roof furring - Hangars 2 & 3

Figure 3.19 Un-rated wall between support bay roof and hangar bay - Hangar 2.

Figure 3.20 Concrete floor slab settlement in support bays - Hangars 2 & 3.

Figure 3.21 Concrete hangar floor slab - Hangars 2 & 3.

Figure 3.22 Concrete floor slab - support spaces - Hangar 2 & 3.

Figure 3.23 Concrete curb at exterior doors, typical - Hangars 2 & 3.

Figure 3.24 Moisture problem (moss) at exterior wall base - north side - Hangars 2 & 3.

Figure 3.25 Rotted canopy fascia board - Hangars 2 & 3.

Figure 3.26 Typical vinyl windows shaving infill - Hangars 2 & 3.

Figure 3.27 Exterior door - at canopy - Hangars 2 & 3.

Figure 3.28 Exterior doors inside - Hangars 2 & 3.

Figure 3.29 Interior door note: lack of lockset or pull - Hangars 2 & 3.

Figure 3.30 Interior doors with old hardware, inside - Hangars 2 & 3.

Figure 3.31 Exterior Stair tower, base of stairs - Hangars 2 & 3.

Figure 3.32 Exterior Stair tower, landing from below, pipe railings - Hangars 2 & 3.

Figure 3.33 Exterior stair tower, opening - Hangars 2 & 3.

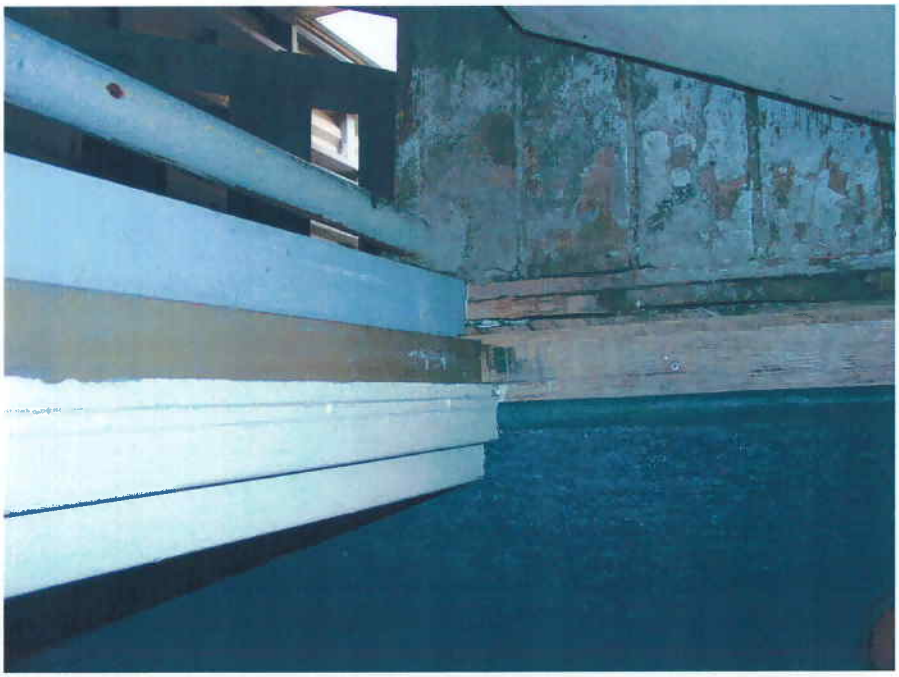


Figure 3.34 Exterior stair tower, threshold at exit door - Hangars 2 & 3.

Figure 3.35 Spalling concrete outside at hangar door entry apron - Hangars 2 & 3.

Figure 3.36 No slope to hangar floors at Hangars 2 & 3 - view at floor slab level.

Figure 3.37 No slope to hangar floor at Hangars 2 & 3 - view from catwalk.

Figure 3.38 Hangar support bay walls - Hangars 2 & 3.

Figure 3.39 Top of column to truss connection at hangar/support bay walls - Hangars 2 & 3.

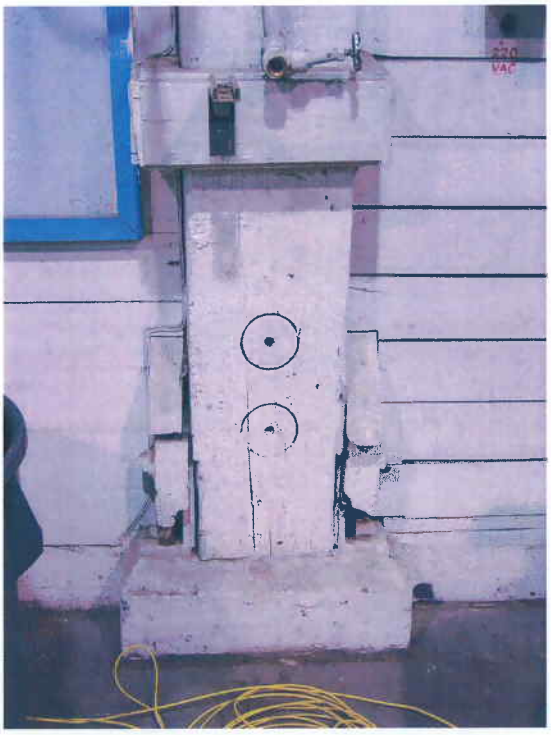


Figure 3.40 Column base at hangar/support bay walls - Hangars 2 & 3.

Figure 3.41 Upper hangar/support bay walls - Hangars 2 & 3.

Figure 3.42 Inside of exterior of wall at corridor - Hangars 2 & 3.

Figure 3.43 View of corridor at exterior wall - Hangars 2 & 3.

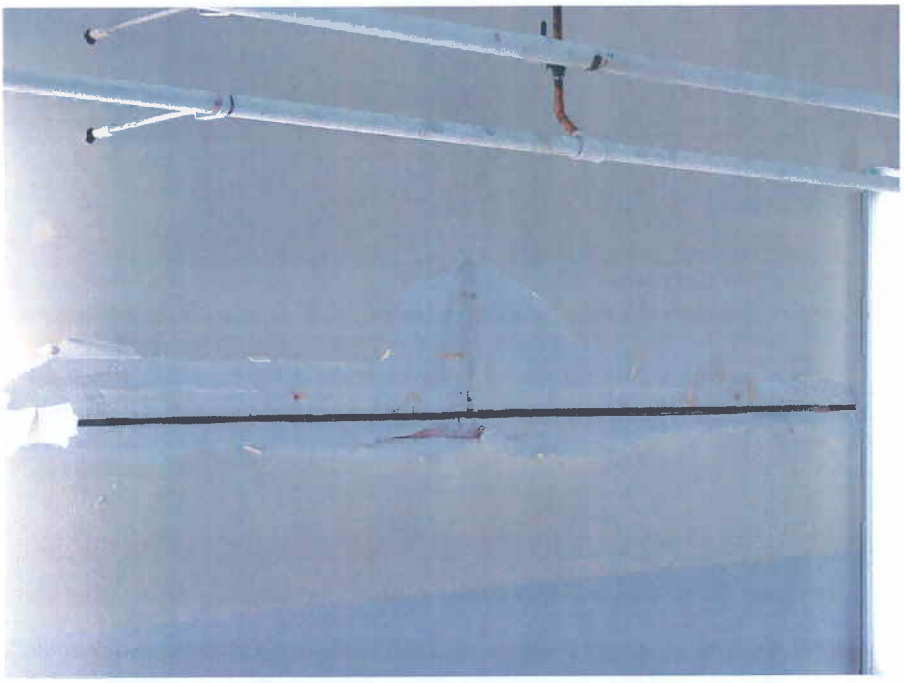


Figure 3.44 Interior ceiling condition - Hangars 2 & 3.

Figure 3.45 Interior ceiling damage - Hangars 2 & 3.

Figure 3.46 Floor/ceiling support bay roof cavity at exterior walls.

Figure 3.47 Floor/ceiling support and bay cavity at cavity at top ceiling - Hangars 2 & 3.

Figure 3.48 Ceramic tile shower walls - Hangars 2 & 3.

Figure 3.49 Base of ceramic tile walls - Hangars 2 & 3.

Figure 3.50 Ceramic tile walls at sinks - Hangars 2 & 3.

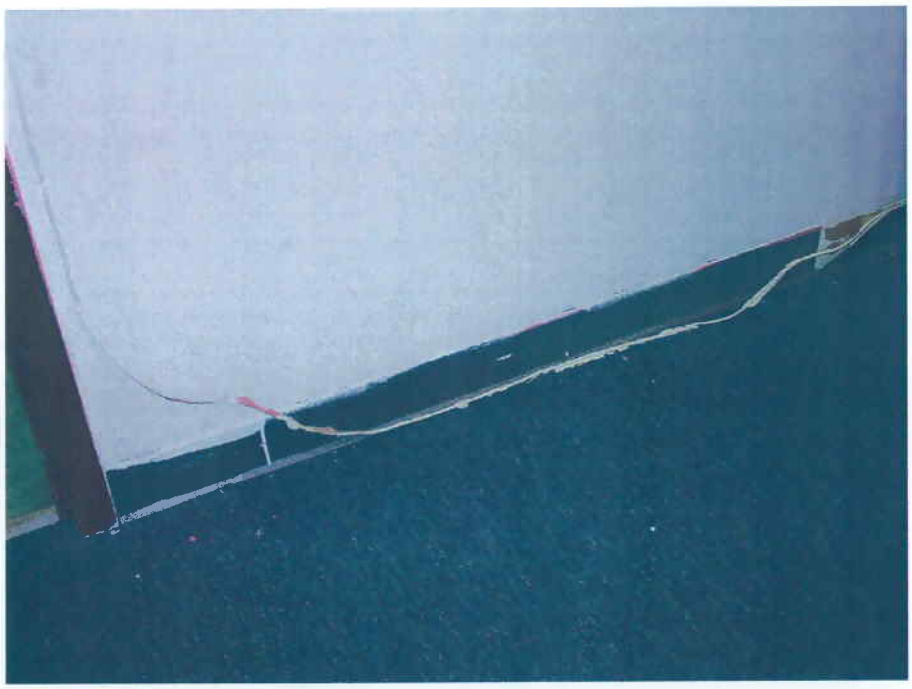


Figure 3.51 Base and wiring at walls - Hangars 2 & 3.

Figure 3.52 Comm. outlet, wiring and base at walls - Hangars 2 & 3.

Figure 3.53 Cracks in wall finish - Hangars 2 & 3.

Figure 3.54 Wiring and wall finish - Hangars 2 & 3.

Figure 3.55 Floor finish changes - Hangars 2 & 3.

Figures 3.56 Floor finish at doors - Hangars 2 & 3

Figure 3.57 Chipped floor finish - Hangars 2 & 3.

Figure 3.58 Damaged base/tiles floor finish - Hangars 2 & 3.

Figure 3.59 Chipped tiles - floor finish - Hangars 2 & 3.

Figure 3.60 Concrete ramp at exterior doors - Hangars 2 & 3.

Figure 3.61 Concrete hangar floor - Hangars 2 & 3.

Figure 3.62 Ramps at interior doors - Hangars 2 & 3.

Figure 3.63 Carpet floor finishes - Hangars 2 & 3.

Figure 3.64 Typical interior stairs and railings - Hangars 2 & 3.

Figure 3.65 Ceramic tile floor and drain without cover - Hangars 2 & 3.

Figure 3.66 Cracks at gypsum board ceiling - Hangars 2 & 3.

Figure 3.67 Damaged gypsum board ceiling - Hangars 2 & 3.

Figure 3.68 Catwalk walking surface temporary patch - Hangar 3.

Figure 3.69 Catwalk access stair up - Hangar 3.

Figure 3.70 Catwalk access stair down - Hangar 3.

Figure 71 Catwalk - Typical - Hangars 2 & 3.

Figure 72 Catwalk - vertical access ladder - Hangars 2 & 3.

- End of Section -

4 CIVIL

4.1 EXISTING CONDITIONS

4.1.1 General

Field Observer: Patrice Buck, Staff Civil Engineer: Design Alaska
Date of Field Observations: September 6 & 7, 2006

The civil portion of the assessment was limited to the infrastructure outside of the two hangars. This includes visual inspection of the condition of the pavement, utilities, fire suppression, and force protection compliance. Utility drawings provided by Base staff were also reviewed. An estimate of cost to remedy deficiencies was also calculated.

4.1.2 Site

The Birchwood Hangars, Hangar 2 (Building 3008) and Hangar 3 (Building 3005) are south of the concrete airport apron which is connected to the airport runways. There is a shared parking lot south of the hangars and north of Montgomery Road.

4.1.3 Topography

The area around the hangars is generally flat. The area is in a Zone X flood plain which is described by FEMA as areas of the 500 year flood, areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood.

4.1.4 Storm Water Drainage

The apron is slightly sloped away from the building. When snow is plowed it is stored on the west end of the apron.

There is one catch basin approximately in the center of the parking lot between the two hangars. However, the pavement in the parking lot is not sloped properly to drain completely and there are numerous puddles after a rain event.

4.1.5 Access and Egress

Vehicles can access the parking lot from Montgomery Road. There is no curb along Montgomery Road. Vehicles can enter the facilities from anywhere along the road. Aircraft access the hangar using a taxiway from the runway. Helicopters land on the apron.

4.1.6 Paving, Curbing, and Parking

The concrete on the apron appears to be in fairly good shape. The pad has expansion/contraction joints that form a 20' x 20' grid over the apron's layout with a 2 inch gap at the joints. It appears to drain well with no surface puddling.

The asphalt parking lot has had multiple resurfacing and patch repairs done in the past. Many large cracks and puddles were observed on the parking surface. The parking spaces paint lines are faded and nonexistent in many locations. There is no curb separating the parking lot and Montgomery Road (see Figs. 4.1, 4.2 and 4.3).

The paved parking area is approximately 140'X1200'. There is room for about 200 parking spaces for both hangars. There would be about 40% fewer spaces with force protection set backs. The utilidor manholes limit some of the parking spaces. There are about 16 upright utility features surrounded by bollards in the parking lot.

4.1.7 Force Protection

The hangars are not in compliance with the 2003 Department of Defense Minimum Antiterrorism Standards for Buildings (UFC 4-010-01). A minimum standoff distance of 25 meters is required to provide compliance with the building separation standards. No private vehicles are allowed within the building setback.

4.1.8 Landscaping

Landscaping opportunities are extremely limited in this area. The areas surrounding the buildings are generally paved everywhere and are intended for industrial/flight line service. No landscaping was observed.

4.1.9 Fire Protection

Two fire hydrants are within 150' to the nearest corner of the building (southwest corner of Hangar 2 and the southeast corner of Hangar 3), but the rest of the buildings do not have hydrants located within required minimum distance (150') listed in Design: Fire Protection Engineering for Facilities (UFC 3-600-01). There are no hydrants on the north side of either building.

There is a 500,000 gallon underground water storage tank for Hangars 2 & 3 fire protection. It is located south of Hangar 2, the utilidor and Montgomery Road, and is connected to the fire hydrants in the parking lot.

4.1.10 Utilities

4.1.10.1 Special Utility Systems - Utilidor

A utilidor runs parallel to Montgomery Street on the north side of the street. The utilidor was replaced in 2005 (see Figs. 4.4 and 4.5). The Utilidor contains the following utilities:

4.1.10.2 Water

- There is an 8" water main.

4.1.10.3 Sanitary Sewer

- An 8-inch gravity flow and 8-inch forced sewer lines.

4.1.10.4 Steam

- An 8-inch Steam pipe and 4-inch condensed steam return line.

4.1.10.5 Service Lines

There are two separate utilidors, one into Hangar 2 and one into Hangar 3 containing the following:

- (2) 4-inch water service line.
- 1.5-inch re- circulating water line.
- 6-inch steam line.
- 4-inch condensate water line.

Two 4" gravity flow sewer lines run from the buildings into a steam operated ejector. The ejector is connected to a main 60" x 60" utilidor with an 8" gravity and a 8" force sewer lines running to the east.

4.1.10.6 Electricity

- Electrical lines are overhead.
- Communication lines underground.

4.1.10.7 Natural Gas

- No natural gas available in this area.

4.1.11 List of Deficiencies

- Parking lots contains many potholes and cracks (see Figs. 4.6 through 4.9).
- The parking spaces paint lines are faded and almost nonexistent (see Figs. 4.10 and 4.11).
- Number and distances of fire hydrants do not meet the UFC 3-600-01 requirements (see Fig. 4.12).
- Barrier needed to comply with Force Protection.

4.2 RECOMMENDATIONS

4.2.1 List of Remedies

- Re-grade, resurface and repaint the parking lot
- Add more fire hydrants around the buildings so that all exterior areas of both hangars will be within 150 feet of a fire hydrant as required by UFC 3-600-01.
- Construct a six foot chain link fence around both hangars with three gates. The gates would allow government vehicles access to the hangars. Different types of barriers could be considered to fulfill the force protection requirements.
- The fence would run 25 meters south of both hangars for about 1000 feet. The fence will run under the sides of each building about 100 feet (25 meter west of Hanger 2 and 25 meter east of Hanger 2). There will be a gate at each end of the hangars and one in the middle.

4.3 PHOTOGRAPHS

Figure 4.1 Parking Lot South of Hangars

Figure 4.2 Parking Lot South of Hangars

Figure 4.3 Looking West

Figure 4.4 Utilidor – Steam Operated Sewage

Figure 4.5 Utilidor – Steam Operated Sewage Ejector

Figure 4.6 Pothole

Figure 4.7 Looking West

Figure 4.8 Potholes

Figure 4.9 Looking South

Figure 4.10 Southern Edge of Hangar 2

Figure 4.11 Looking East by Hangar 2

Figure 12 Fire Hydrant

- End of Section -

5 STRUCTURAL

5.1 Introduction

Ammann & Whitney has performed a field assessment and structural analyses of Ft. Wainwright's Hangars 2 and 3. As a result of our assessment and analyses, we have developed a set of recommendations for the structural improvement of these facilities. These recommendations do not represent a work plan for a contractor. Rather, they are intended as a planning guide for the determination as to whether the hangars should be repaired or replaced.

This section is presented in three parts; the first addresses recommendations for both structures that are a result of the structural analyses; the second section catalogs recommendations that result primarily from our field assessment; and a third section provides potential repair details for the various structural elements requiring repair in both hangars. The first section provides recommendations as to which structural elements need to be improved to meet the requirements of applied stress. The repair recommendations listed in the second section are provided to address structural elements that exhibited observable damage during our field investigation.

Repair recommendations for both hangars are summarized in the table below, along with their associated cost estimates.

Table 1: Table of Structural Elements Requiring Repair - Both Hangars

Item	Priority	Structural Element	Total # Req. Repair	Max. Ratio of Applied/Allowable Stess		Repair Detail	Deficiency	2012 Cost Estimate (thousands)		Comments
				2003 IBC	1942 UBC			Repair to 2003 IBC	Repair to 1942 UBC	
1	3	Purlin Repair	320	3.47	1.29	1	Flexure	$256	$256	Provide Strength. Plates in Place
2	-	Truss Top Chords	0	1.34	1.3	N/A	Axial Compr.	$0	$0	Retrofit not required by applied stress
3	2	Truss Bot. Chords	36	1.32	0.9	2	Axial Tension	$242	$0	Add Strengthening Plates
4	2	Truss Interior Webs	170	2.1	0.92	3	Axial Comr.	$300	$27	Web members near the center
5	-	Columns	0	0.58	0.79	N/A	N/A	$0	$0	Retrofit not required by applied stress
6	1	Wind Brace Webs	144	0.79	2.42	4	Axial Compr.	$214	$214	Removal of drywall reqid for access
7	1	Foundation Repair	1	N/A	N/A	5	Liquifaction	$2,886	$2,886	Add Helical Piles
8	3	Various Timber Mem.	60	N/A	N/A	6	Cracks/Splits	$75	$75	Strengthen Members w/epoxy inj.
9	1	Inter-Column Braces	20	N/A	N/A	7	Cracks/Missing	$285	$285	Replace x-braces, strengthen col.'s
10	3	Tension Rods	15	N/A	N/A	N/A	Bent/damaged	$13	$13	Replace all bent or damaged rods
11	1	Truss Nodes	15	N/A	N/A	8	Cracks	$75	$75	Repair Cracks w/Steel Plates
12	1	Special Repairs	1	N/A	N/A	N/A	Cracks	$20	$20	Strengthen with Steel
							Total Cost to Repair Both Hangars	$4,400	$3,900	

5.2 Recommendations Resulting from Structural Analysis

Our analyses use the 2003 International Building Code (IBC) as their primary basis. Two separate analyses were performed. The first analysis addresses all gravity loading, which

includes live, dead and snow loads. The second analysis addresses lateral loading, which includes wind and seismic loads.

Section 3403.2.1 of the 2003 IBC states that minimum design loads for repaired structures shall be the loads applicable at the time of erection. There are various interpretations and opinions as to which code applied to this building when constructed in 1944. Candidates include the Army's United Facilities Criteria, the Uniform Building Code and the NAVFAC Design Manuals. We have proceeded with our work on the assumption that the 1942 Uniform Building Code (UBC) applied to the original design of these hangars.

It is technically correct to state that if these buildings meet the structural criteria established by the 1942 UBC then they meet the requirements of the 2003 IBC. However, in order to give the Army the broadest spectrum of information, we present the results of our gravity analysis according to the requirements of each code. They are presented here without bias to allow Army program directors to make informed decisions on all available data.

Various framing members do not meet the criteria for applied stress as specified in the 2003 IBC or, in many cases, the 1942 UBC. The following discussion addresses each member type and is summarized in Table 1. Repair recommendations are discussed, and potential repair details are provided.

5.2.1 Gravity loads:

a. Purlins: These members support the 1" roof sheathing boards and span between the trusses. They are generally 5"x14" rough sawn lumber. There are 320 of these members in the two facilities. None of these members meet the requirements for allowable stress by either the 1942 UBC or the 2003 IBC. We recommend strengthening all 320 members. A suggested method for strengthening these members is to provide 3½" x14" gluelam beams on either side of each purlin. This is shown in Detail 1.

b. Top Chords of Trusses:
The top chords of the trusses are compression members that have been retrofitted with confinement clamps at various locations. The maximum ratio of applied stress to allowable under the 2003 IBC is 1.34.

While analysis shows these members to be overstressed, we do not recommend strengthening by the addition of supplemental framing members. As compression members with one edge fully braced, they have a low risk for buckling. Also, they have been confined in many locations, which should have the effect of increasing the ultimate strength of the members in compression. Where members exhibit large checks we recommend epoxy injection strengthening (see discussion below).

c. Bottom Chords of Trusses:
The bottom chords of the trusses are tension members that have been retrofitted in various locations with post-tensioning rods and plates. The maximum ratio of applied to allowable stress in these members is 1.32. In order to meet the applied stress requirements of the 2003 IBC these members should be strengthened.

As tension members, these structural elements are more critical than the compression members in the top chord. Strengthening of these elements could be achieved with the addition of "microlam" timber strengthening plates along the entire bottom chord of all 18 trusses. This method is shown in Detail 2.

d. Webs of Trusses:
The webs of the trusses can be loaded in axial tension or axial compression, depending on the member and the loading condition. The longer members exhibit overstress by the criteria of the 2003 IBC due to their larger unbraced lengths. They are not overstressed by the provisions of the 1942 UBC.

If the applied and allowable stress criteria of the 2003 IBC are adopted, then the eight diagonal web members at the center of each web would require strengthening or bracing. Strengthening through the addition of "sister plates", as shown in Detail 3, is more economical than providing braces. This would apply to 8 diagonal truss members on each of the 14 internal trusses.

e. Columns Supporting Trusses:
The timber columns supporting the main bay trusses are 12"x12". Each column has a splice located 15'-0" above finished floor. These members are not overstressed either by the 2003 IBC or the 1942 UBC. Many of these members have cracks. The suggested remedy for these cracks is addressed in Section 5.3.5 below.

5.2.2 Lateral Loads (Wind and Seismic)

a. Wind Braces:
Wind braces, or buttresses are comprised of a primary diagonal brace and web members connecting the columns to the brace. In each brace three of these web members are overstressed due to lateral loading. These members require strengthening. In order to access these elements, a substantial amount of drywall must be removed and replaced. There are 18 trusses with wind braces at each end, and there are three web elements requiring strengthening per brace, so that a total of 108 of these members require strengthening. A method for strengthening these members using "sister plates" is shown in Detail 4.

b. Foundations:
The geotechnical investigation and analysis has resulted in the determination that both hangars are founded on soils that are susceptible to liquefaction during a seismic event (see Geotechnical Report by Soils Alaska, found in Tab 9). In order to secure the structures during a peak earthquake, the spread footings require retrofitting with piles.

A suggested methodology for providing these piles is shown in Detail 5. Circular, 12" diameter cores through the footings are required in each pile location. After a pile is driven, the core is patched with concrete surrounding the top of the pile.

The number of piles required can not be determined until test piles are driven at the site. As part of the development of a future, comprehensive work plan, test piles would need to be installed at representative locations in each hangar. Based on the results of these

test piles, an allowable bearing capacity per pile can be determined. Preliminary assumptions are that each pile can provide 30,000 lbs of bearing capacity. Accordingly, for the purpose of this report we have assumed that the footings under the primary columns will require four helical piles each and the footings under the wind braces will require two helical piles each.

Under the assumption that 4 helical piles are required per primary column footing and 2 piles are required per wind brace footing, a total of 216 helical piles will be required for the primary spread footings.

Helical piles should also be placed under the exterior walls of the "lean-to' structures. For the purposes of this report, we have assumed that one pile per 15' of wall will be required, requiring an additional 56 helical piles for the perimeter walls.

Additionally, these perimeter walls should be protected from frost heave with an insulation layer. A 4" thick by 4' wide polystyrene layer should be placed adjacent to the outer edges of the lean-to walls. The polystyrene should be placed with 1' below grade, and the pavement above the polystyrene should be replaced after the insulation has been installed.

5.3 Recommendations Resulting from Field Inspection

Over a 7 day period in early September of 2006, Ammann & Whitney engineers inspected the structures of Hangars 2 and 3. Using a man-lift and the catwalk systems, we were able to inspect the trusses and roof framing for both structures. We do not represent our investigation as comprehensive. However, we were able to assess the structures for flaws and problems in most of the visible members.

The primary problems revealed by our inspection are related to the condition of the timber framing. Some other structural defects were observed, including cracked slabs, but the most notable observations relate to cracks, checks and splits in the timber framing. Recommendations are listed below:

5.3.1 Cracks, Checks and Splits in Timber Framing:

a. Definition of Severity:
Cracks, checks and splits were observed in various timber framing members throughout both structures. Checks and cracks are a normal, commonly occurring feature of timber framing, usually caused by shrinkage associated with drying.

There are various available methods for evaluating the severity of cracks checks and splits. The FHWA's *Highway and Rail Transit Tunnel Inspection Manual* defines "checks as cracks in timber, which extend partially through the timber member". It further defines splits as "cracks that extend completely through the member". The FHWA also proposes a classification convention for defining the severity of checks. That convention is presented below and has been adopted as the standard for this report.

Minor Checking – Surface checks perpendicular to the plane of the stress or isolated checks parallel to the plane of stress.

Moderate Checking – Checks with less than 15% penetration into the timber perpendicular to the plane of stress or isolated checks with less than 40% penetration parallel to the plane of stress.

Severe Checking – Checks with greater than 15% penetration into the timber perpendicular to the plane of stress, or numerous checks with greater than 40% penetration to the plane of stress.

All three conditions were observed in each structure. In general, we do not recommend any remediation for Minor Checking. For moderate checking in areas of high stress we recommend strengthening by epoxy injection techniques. For Moderate Checking in areas of low stress we recommend monitoring. For Severe checking we recommend strengthening with epoxy injection techniques.

b. Epoxy Injection:
For Moderate Checking in areas of high stress, the application of epoxy, injected into the checks with low pressure injection techniques, can significantly improve the strength of timber members. This method has been used with success in other timber hangars. Some examples include the Westchester County Airport in White Plains, NY, a Support Activities Warehouse in Ft. Meade, MD, and the Ellis Island Dome.

In addition to strengthening the timber, the epoxy allows for improved future inspection. Future cracking of members can be observed more easily after they have been repaired with epoxy injection. We estimate that 60 locations in the trusses and columns will require epoxy injection. A method for applying the epoxy to the timber is shown in Detail 6.

5.3.2 Inter-column bracing.
Each hangar was designed for four sets of timber, inter-column braces on each wall of the main hangar bay. This bracing is an essential component of the hangars' lateral resistance system for loads applied in the east-west direction. Some of these braces have been removed, and most display cracks at the connections. In their current state, the braces can not be relied upon to develop the required lateral strength of the main bays.

Because the number of damaged and missing braces is so significant, a replacement in kind is not prudent. In their place, we are recommending the replacement of all inter-column braces with steel angles. These angles can be connected to the timber columns with steel collars. These collars will have the effect of locally strengthening the columns (many of which exhibit cracks – see item 5 below). These braces will also provide compressive resistance, whereas the current braces are tension braces only.

Both the column collars and new diagonal bracing are shown in Detail 7. The structure originally had inter-column bracing in eight column bays. These should be replaced with steel bracing as shown. We also recommend the installation of an additional set of braces

per wall so that each column is engaged in the lateral resistance system. A total of 20 sets of steel inter-column braces should be provided.

5.3.3 Bottom chord tension rods.
In the horizontal plane at the elevation of the truss bottom chords, there are a series of tension rods that form a flexible diaphragm and distribute lateral loads. Many of these rods are bent. We recommend replacement in kind of all bent or damaged rods. We estimate that 15 of these rods will require replacement.

5.3.4 Concrete Slabs on Grade:
Two slabs in the lean-to areas exhibit enough cracking that they require replacement.

5.3.5 Columns.
Many of the columns exhibit large cracks or splits parallel to the grain of the wood. While most of these cracks do not significantly reduce the vertical strength of the column, the inter-column bracing is often connected to the columns in locations where cracks exist. In order to strengthen these areas, we recommend collars around the columns in the areas where the inter-column bracing connects to the columns. A suggested strengthening detail is shown in Detail 7.

Additionally, due to the widths of some of these cracks, strengthening by epoxy injection is recommended where the cracks exceed ½" in width.

5.3.6 Bottom chord plates.
In some locations, the bottom chords exhibit longitudinal cracking at the intersections between the webs members and the bottom chord. These cracks are generally parallel to the grain and may be due to applied shear. In order to strengthen these connections we recommend the addition of steel strengthening plates at those nodes where significant cracking has occurred.

This strengthening technique is shown in Detail 8. We estimate that there are 15 locations where this technique should be applied.

5.3.7 Cracked Truss Web Members:
Some of the web members in the trusses exhibit splitting. The accessibility of these members makes them candidates for strengthening with "sister plates" as shown in Detail 3. We have estimated that this repair will be required in 15 locations.

5.4 Repair Details

The eight suggested repair and retrofit details referenced in the above discussion are provided in the subsequent sheets immediately following the cost summary pages.

COST SUMMARY – For Repairs in accordance with 2003 IBC (for both Hangars)

		Base Cost	OH+Profit	Inspection	2006 Total	2012 Total
1	Purlin repair	$148,000	$26,960	$12,000	$188,000	$216,200
2	Top Chord	$0	$0	$0	$0	$0
3	Bottom Chord Strengthening	$152,120	$17,440	$35,000	$205,000	$235,750
4	Internal Webs of Truss Members	$176,000	$31,100	$12,800	$220,000	$253,000
5	Column repair (incl in braces)	$0	$0	$0	$0	$0
6	Buttress web members repair	$125,800	$24,960	$5,400	$156,000	$179,400
7	Foundation repair	$1,650,000	$422,000	$24,000	$2,096,000	$1,410,400
8	Epoxy injection repair	$42,100	$7,000	$6,000	$55,000	$63,250
9	Intercolumn bracing	$166,400	$31,600	$9,000	$207,000	$238,050
10	Tension Rods	$7,500	$1,300	$900	$10,000	$11,500
11	Bott. Chord Joint Strengthening	$43,900	$7,900	$2,400	$54,000	$62,100
12	Special Repair	$9,400	$1,500	$3,600	$15,000	$17,250
	TOTALS	$2,522,020	$571,760	$111,100	$3,200,000	$3,700,000

Note: estimates for structural repair work for Hangars 2 and 3 are essentially the same. When a final work plan is developed, some minor differences in actual costs will occur. However, for the purposes of estimation in this report, the structural repair of each hangar is estimated to be $1,600,000 in 2006 dollars and $1,850,000 in 2012 dollars.

5.4.1 Cost Breakdown by Item (both hangars, 2006 dollars)

5.4.1.1 Purlin Repair
Attach LVLs to purlins (320 locations)

Labor		$59,200
Materials		$75,600
Equipment		$14,000
Subtotal		$148,000
	Contractor Overhead and Profit	$26,960
	Inspector	$12,000
TOTAL COST:		$188,000

5.4.1.2 Top chord repair (none recommended) $0

5.4.1.3 Bottom chord strengthening
Attach LVL to bottom chord – full length of 18 trusses

Labor		$90,720
Materials		$48,800
Equipment		$12,600
Subtotal		$152,120
	Contractor Overhead and Profit	$17,440
	Inspector	$34,992
TOTAL COST:		$205,000

5.4.1.4 Internal webs of Truss Members
Attaching sister plates to truss members (170 members)

Labor		$144,500
Materials		$11,000
Equipment		$20,500
Subtotal		$176,000
	Contractor Overhead and Profit	$31,100
	Inspector	$12,800
TOTAL COST:		$220,000

5.4.1.5 Column repair (included in cost of intercolumn braces)
(none shown herein) $0

5.4.1.6 Buttress web members repair
Attach sister plates to web members (18 wind brace locations)

Labor		$31,700
Materials		$2,700
Misc.		$90,400
Equipment		$1,000
Subtotal		$125,800
	Contractor Overhead and Profit	$24,960
	Inspector	$5,400
TOTAL COST:		$156,000

5.4.1.7 Foundation Repair
Add helical piles to existing foundation – 272 piles

Truss piles – 18 @ $94,000	$1,692,000
Perimeter piles – 2 @ $190,000	$380,000
Subtotal	$2,072,000
Inspector	$24,000
TOTAL COST:	$2,096,000

5.4.1.8 Epoxy Injection Repair

Epoxy injection into split wood members – 60 locations

Labor		$29,600
Materials		$5,500
Equipment		$7,000
Subtotal		$42,100
	Contractor Overhead and Profit	$7,000
	Inspector	$6,000
TOTAL COST:		$55,000

5.4.1.9 Intercolumn bracing
Replace existing column bracing with steel – 20 bays with two pairs of braces per bay

Labor		$44,600
Materials		$113,500
Equipment		$8,300
Subtotal		$166,400
	Contractor Overhead and Profit	$31,600
	Inspector	$9,000
TOTAL COST:		$207,000

5.4.1.10 Tension Rods
Replace 15 rods

Labor		$4,400
Materials		$2,100
Equipment		$1,000
Subtotal		$7,500
	Contractor Overhead and Profit	$1,300
	Inspector	$900
TOTAL COST:		$10,000

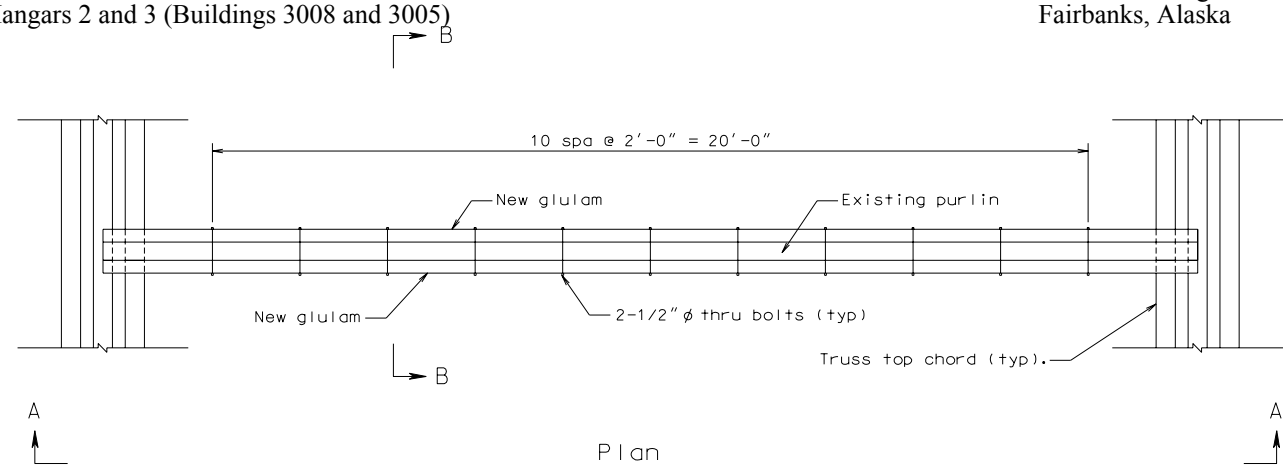
5.4.1.11 Bottom Chord Joint Strengthening
Attaching steel plates to bottom chord joints (15 locations)

Labor		$38,800
Materials		$1,100
Equipment		$4,500
Subtotal		$43,900
	Contractor Overhead and Profit	$7,900
	Inspector	$2,400
TOTAL COST:		$54,000

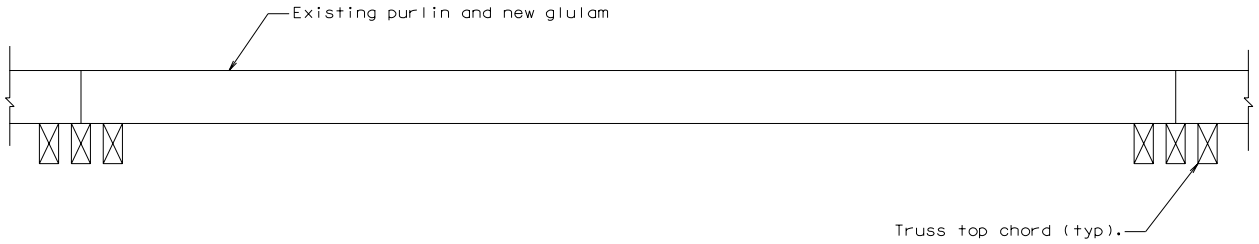
5.4.1.12 Special repair

Repair to one bottom chord fracture and one top chord with Steel plates

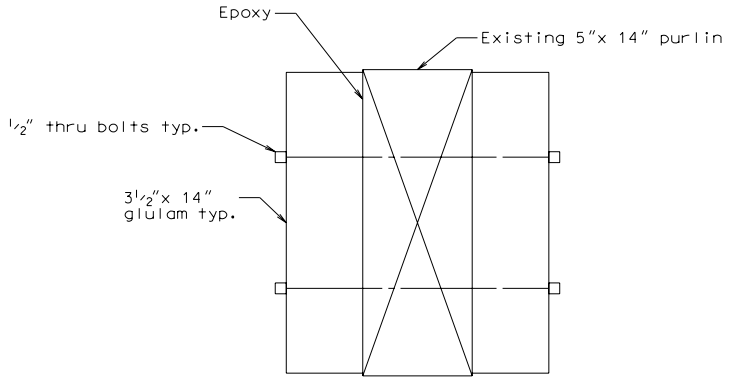
Labor		$4,600
Materials		$3,040
Equipment		$1,750
Subtotal		$9,400
	Contractor Overhead and Profit	$1,500
	Inspector	$3,600
TOTAL COST:		$15,000



Plan
Viewed from above



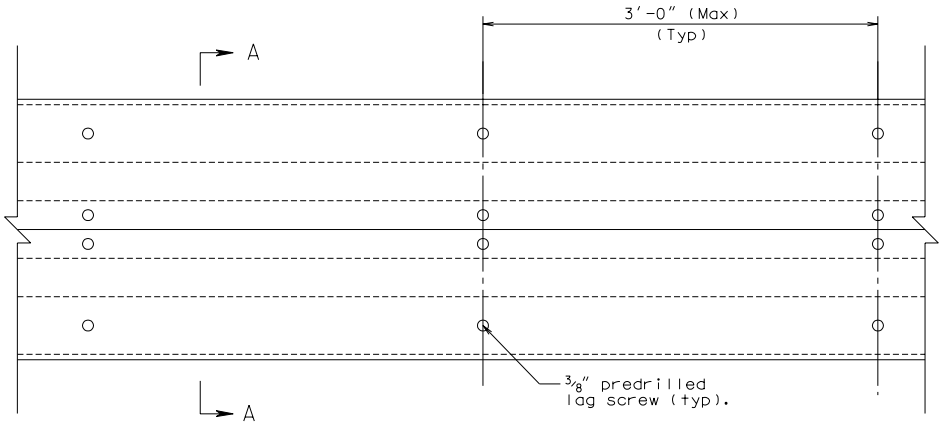
Elevation View A-A



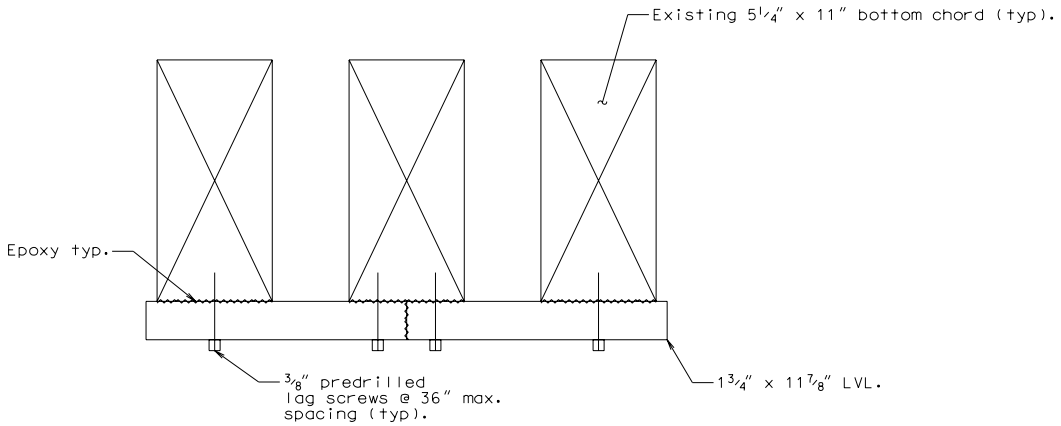
Section B-B

Detail 1
For information only. Not intended as a construction document.

HANGARS 2 & 3 REPAIR DETAILS PURLIN STRENGTHENING	AMMANN & WHITNEY CONSULTING ENGINEERS UNITED STATES ARMY FORT WAINWRIGHT, ALASKA



BOTTOM CHORD PLAN
Viewed from below



Section A-A

Notes :
1. Apply microlams over full length of bottom chords.
2. Required for 2003IBC only.

Detail 2

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HANGARS 2 & 3 REPAIR DETAILS
TRUSS BOTTOM CHORD STRENGTHENING

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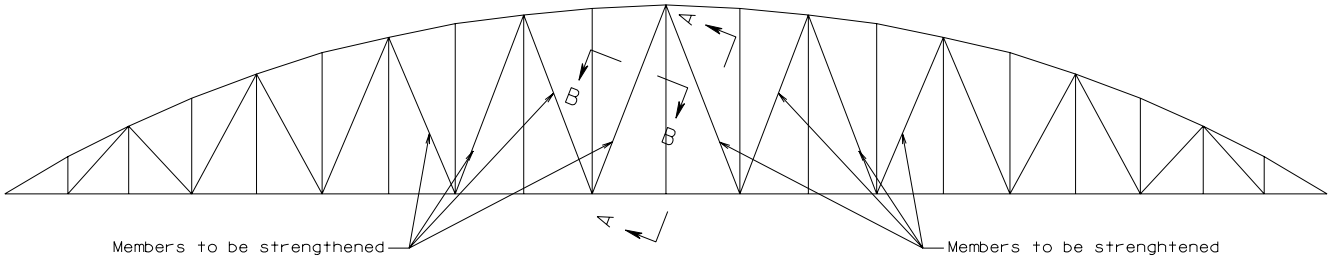
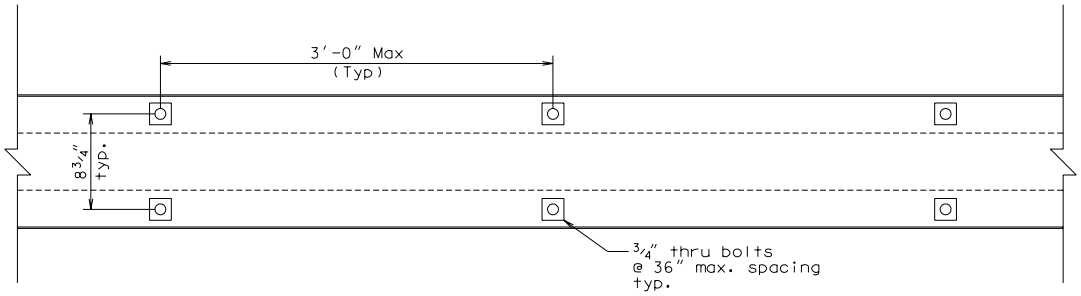
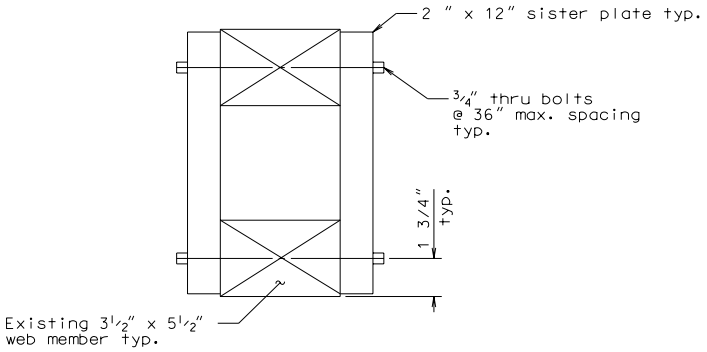
CONSULTING ENGINEERS
UNITED STATES ARMY
FORT WAINWRIGHT, ALASKA



Typical Interior Truss Elevation



Section A-A typ.



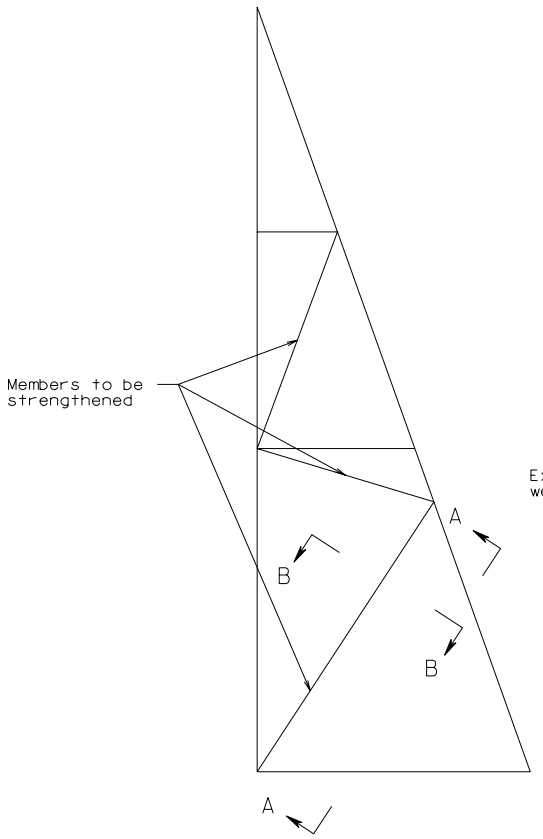
Section B-B typ.

Notes:
1. Apply strengtheing technique to inner 8 web members of all interior truesses. Also apply to any other cracked or damaged web members.
2. Required for 2003IBC only

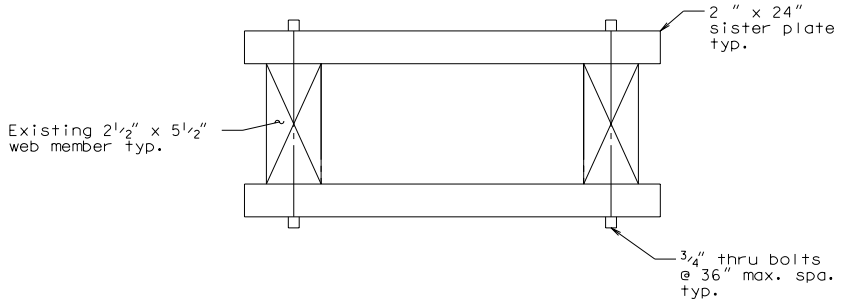
Detail 3

For information only. Not intended as a construction document.

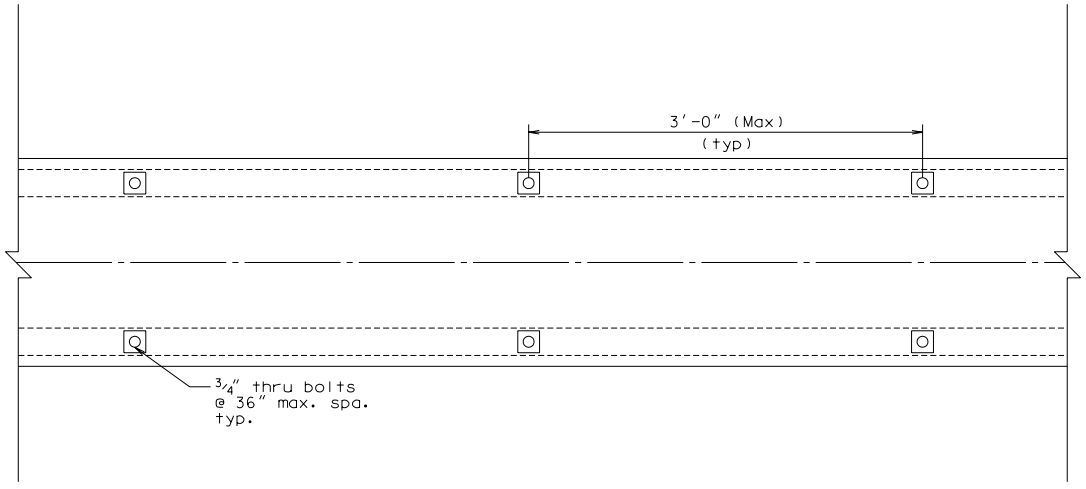
HANGARS 2 & 3 REPAIR DETAILS TRUSS DIAGONAL WEB STRENGTHENING	AMMANN & WHITNEY CONSULTING ENGINEERS UNITED STATES ARMY FORT WAINWRIGHT, ALASKA



Buttress Elevation



Section B-B typ.



Elevation View A-A typ.

Detail 4

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HANGARS 2 & 3 REPAIR DETAILS
BUTTRESS STRENGTHENING

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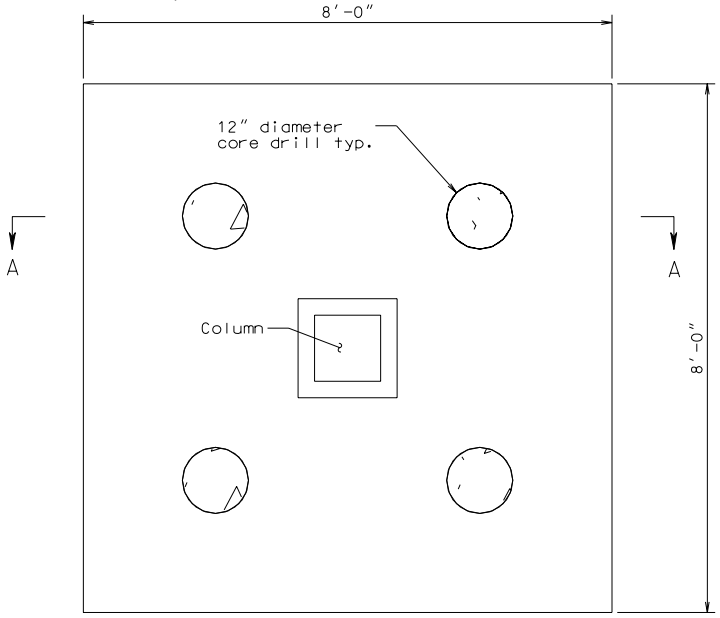
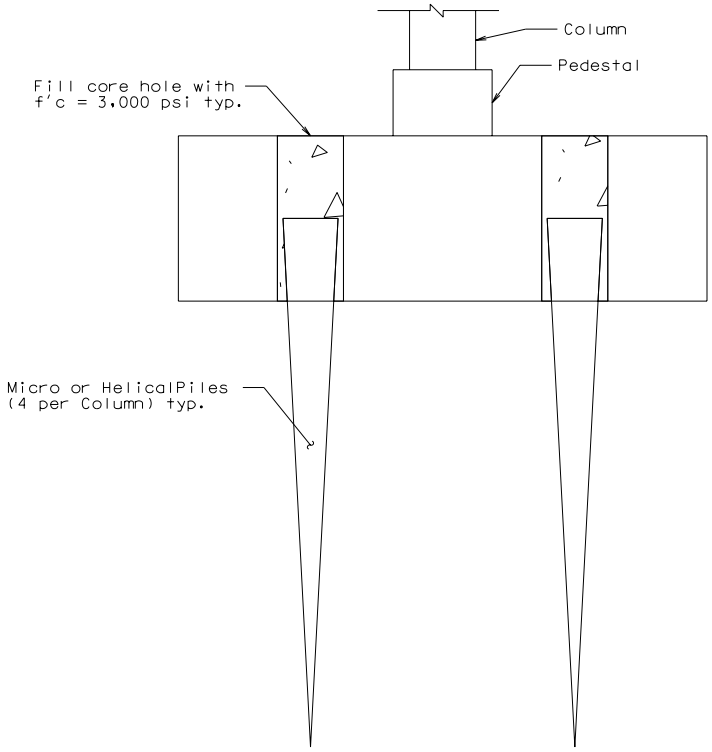


Elevation Section A-A



Section A-A

Notes:
1. Number of piles to be determine after placement of test piles.
2. Footings under primary columns shown. Footings under outer edges of wind braces similar, but only two piles are presumed to be required at those footings.

Detail 5

For information only. Not intended as a construction document.

HANGARS 2 & 3 REPAIR DETAILS

TYPICAL EPOXY INJECTION REPAIR

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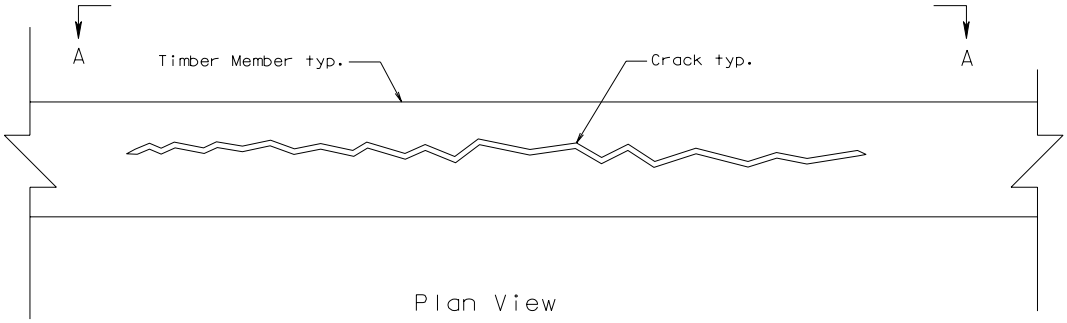
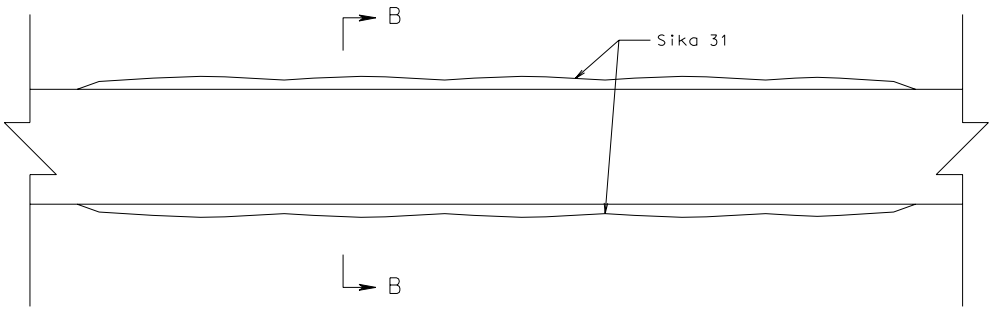
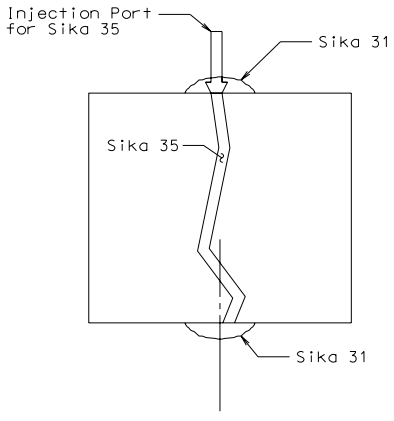


Plan View



Elevation Section A-A



Typical Section B-B

Notes:
1. Use low pressure grouting techniques, such as caulking guns, for placement of epoxy.

Detail 6

For information only. Not intended as a construction document.

HANGARS 2 & 3 REPAIR DETAILS

TYPICAL EPOXY INJECTION REPAIR

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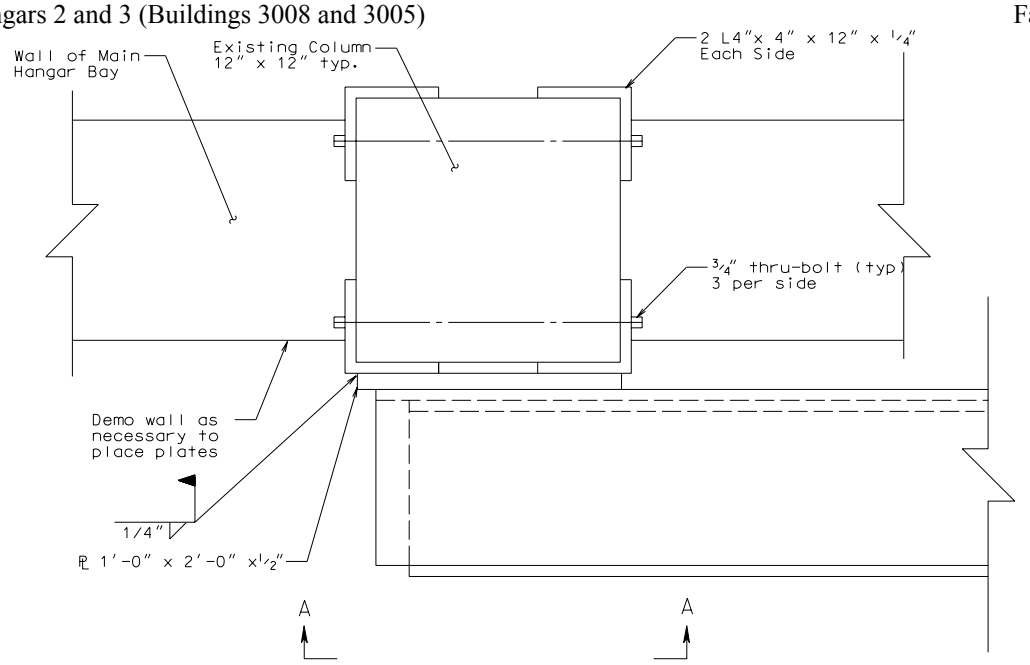
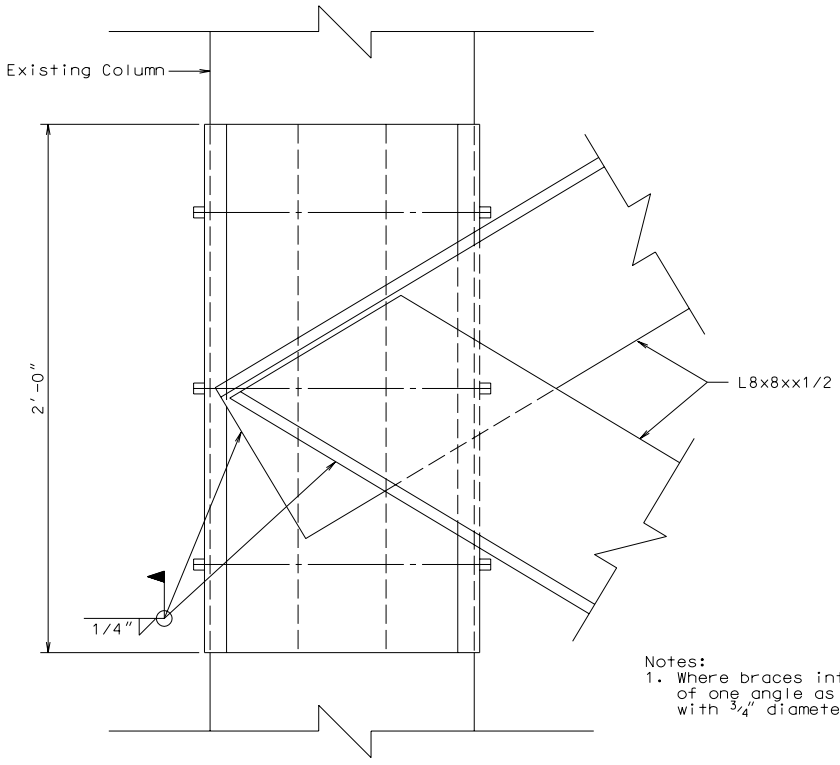
CONSULTING ENGINEERS

UNITED STATES ARMY
FORT WAINWRIGHT, ALASKA



PLAN



Notes:
1. Where braces intersect mid-bay, cope flange of one angle as necessary and connect angles with 3/4" diameter bolt.

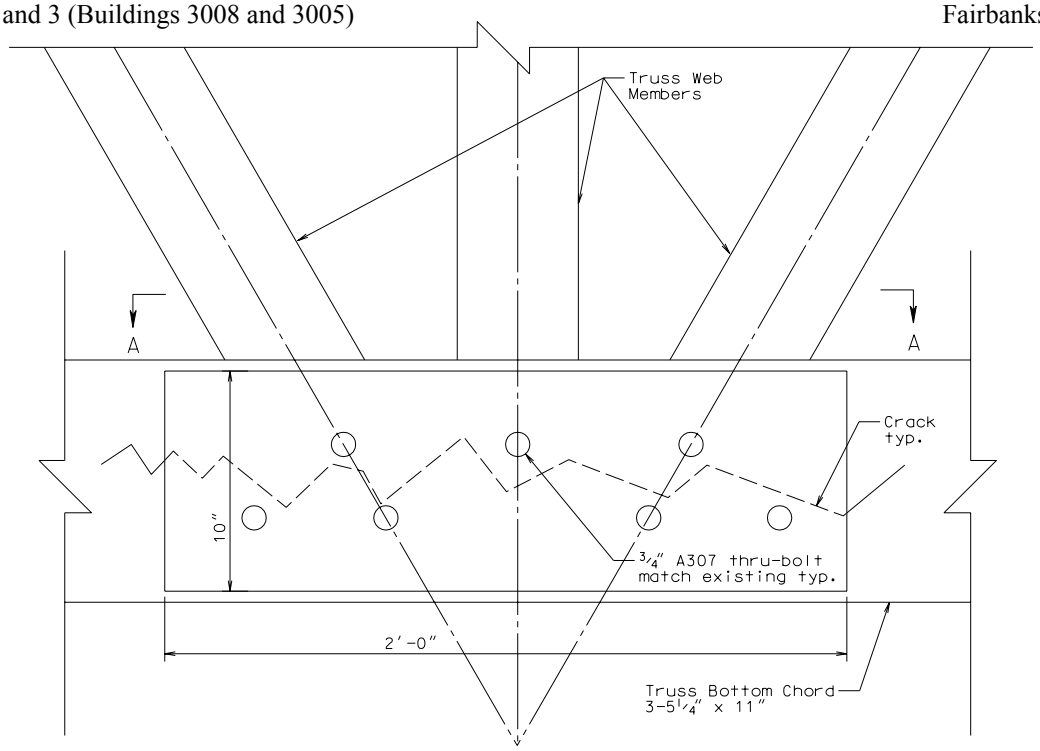
VIEW A-A

Detail 7

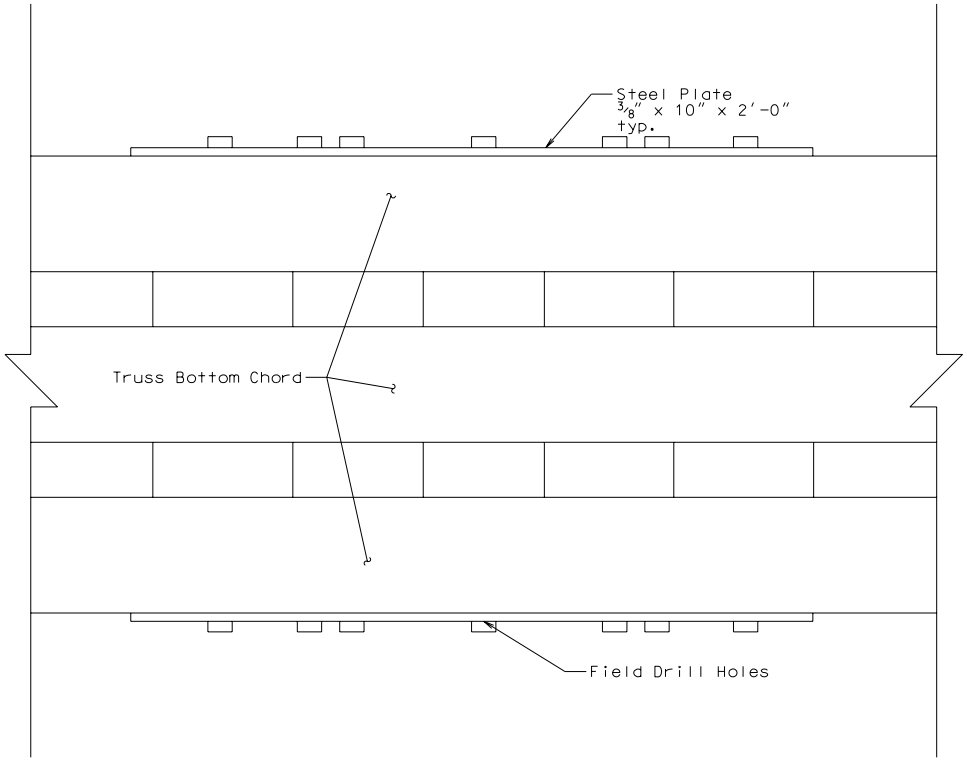
For information only. Not intended as a construction document.

HANGARS 2 & 3 REPAIR DETAILS
TRANSVERSE BRACING AT COLUMNS

AMMANN & WHITNEY
CONSULTING ENGINEERS
UNITED STATES ARMY
FORT WAINWRIGHT, ALASKA



Elevation



Plan View A-A

Detail 8

For information only. Not intended as a construction document.

HANGARS 2 & 3 REPAIR DETAILS TRUSS BOTTOM CHORD STRENGTHENING PLATE	AMMANN & WHITNEY CONSULTING ENGINEERS UNITED STATES ARMY FORT WAINWRIGHT, ALASKA

- End of Section -

6 MECHANICAL

6.1 EXISTING SYSTEM DESCRIPTION AND CONDITION

The mechanical condition assessment is authored by Robin J. Rader, P.E. The assessment is based on the record drawings provided to us and on inspections dated 6 September 2006, 16 November 2006, and 5 December 2006.

6.1.0 General

6.1.0.1 Mechanical Equipment Maintenance

Both Hangars 2 and 3 suffer from poor maintenance. Except for the fire suppression system it appears that maintenance on these facilities is work order driven and not subject to a periodic preventive maintenance program. It appears that unless mechanical equipment failure significantly impacts the larger mission of maintaining helicopters it is ignored. For example restroom fans that have been covered with plastic to block winter back drafts with this plastic remaining well into the fall of the next season (see Fig. 6.1). The fire suppression system is maintained and tested on a regular basis.

6.1.0.2 Compliance with SECINC

We do not believe modifications to the mechanical system will have a significant impact on compliance with the Secretary of the Interior's Standards for Rehabilitation. We have provided estimates for replacement of existing perimeter heating terminal units, a new ventilation system within the office / shop areas, and a new ventilation system within the hangar bays. The ductwork and some of the ventilation equipment will be exposed however we believe this equipment is consistent with the original industrial use of the hangar. The new perimeter heating finned tube cabinets can match the original cabinets closely.

6.1.1 Utilities

We reviewed the Public Works Utilidor Distribution System Drawings, dated June 2003, indicating the following utility sizes:

Sewer Size: 4" gravity sewer for Hangar 2. Outlet for Hangar 3 not indicated, assume 4".

Domestic Water: Two 4" domestic water mains, 1-1/2" recirculated cold water.

Steam and Condensate: 6" steam, 4" condensate.

Fire Water: 16" deluge water with 1-1/2" recirulated cold water.

The deluge water is provided from a tank located across the street north of Hangar 2 in building 3011. This tank is listed as 500,000 gallons. Fire water is distributed to the Hangars through four 240 hp diesel pumps rated at 2000 gpm flow and 103 psi head pressure.

The above utilities are adequate to support the existing facility and are adequate to support conversion of the system to match the level of standard at Hangar 267 (new replacement building for Hangar 6). The existing fire pumps however do not provide adequate head pressure to support an AFFF foam system as is used at Hangar 267. The existing pumps are rated at 103 psi whereas the Hangar 267 pumps are rated at 140 psi.

6.1.2 Plumbing

Piping systems are original and after 60 years of service would be considered past their useful life. Service pits located in the hangar bays have been abandoned. These pits included waste drain, electrical outlets, and possibly compressed air or domestic water. It also appears that significant portions of the compressed air piping system have been replaced.

The original drawings show the sewer exiting on the north, or flight line side of the hangars. The currently existing services exit to the south, or street side of the hangars. The concrete above the waste mains has been cut and patched indicating that the direction and slope change, happened sometime after original construction.

The existing plumbing fixtures appear to be a mixture of original and modern fixtures. Most of the water closets have been replaced with water saving 1.6 gallons per flush (gpf) units. The configuration of the restrooms has changed from the original layout. We suspect this happened at the time the waste piping was replaced. There appears to be no standard type used when replacing toilets.

An above ground oil water separator has been added to both hangars. This unit incorporates pumps which draw out of an open sump covered with a grating.

6.1.2.1 Standard or Code Deficiencies

1. Electric water heaters are not seismically braced (see Fig. 6.2).

2. Emergency eyewash and showers are not equipped with mixing valve and do not meet current ANSI standards (see Fig. 6.3). Hangar 3 is equipped with 4 emergency showers spaced evenly throughout the hangar. Hangar 2 has only one emergency shower.

6.1.3 Heating

6.1.3.1 System Description

The original heating system consisted primarily of steam unit heaters and finned tube radiation terminal units. The offices on the second floor are heated with the finned tube radiation units while the shops on the first floor are heating with unit heaters. The original drawings show steam piping serving the perimeter terminal units with steam and condensate piping mains running below the hangar bay door track.

As part of a hangar door replacement project the steam converter and hydronic piping were replaced including the under slab door track piping. As Built drawings show this project

occurring in 1987 for Hangars 2 and 6. This same work was done in Hangar 3; however it is unclear when it occurred.

In 1993 the steam heating system was converted to a hydronic heating system in general limiting the use of steam to within the main mechanical room in both hangars. All existing unit heaters in the hangar bays were replaced at this time. The terminal units in the office and shop spaces on each side of the hangar bay appear to be original.

There are no existing steam traps associated with the original terminal units serving the office and shop spaces. At what point this departure from the original design occurred is somewhat mysterious. The 1987 door project drawings show removal of the steam and condensate piping mains below the door track but do not show connection to the existing terminal units serving the office and shop spaces. Therefore we conclude that the terminal units were served by hydronic piping crossing over the top of the hangar bay before 1987. The ECI/HYER report indicates the conversion from steam to hydronic occurred in 1977.

6.1.3.2 System Condition

The heating system within the hangar bay appears to be adequate both from a steady state stand point and the ability to recover after the hangar doors are opened.

There are many places within the office and shop spaces that do not provide adequate heat. In Hangar 2 in the second floor office area on both sides of the hangar bay every other original finned tube cabinet has been replaced with a cabinet unit heater (see Fig. 6.4). The cabinet unit heaters are sized so that they are able to provide significant heat despite the low available flow. In Hangar 3 this conversion has not occurred. There is however a steam unit heater that has been installed on the second floor above the existing mechanical room.

We inspected the facility on 16 November 2006 to get a better understanding of how the heating system performed when it was loaded. At that time the ambient outdoor temperature was about minus 15F. During that time temporary equipment was operating in Hangar 3 consisting of floor fans to distribute the heat from the above steam fired unit heater, and electric spot heaters were being used in the north side shops (see Fig. 6.5).

The ECI/HYER report indicates ice builds up at the hangar doors. This was not voiced as a concern by any of the users we talked with. The system on paper appears adequate and similar to designs used at Eielson Air Force Base. We saw no signs of ice build up during our November inspection although little snow had accumulated up to that time. From the information we have the door track heating system appears adequate.

6.1.3.3 Standard or Code Deficiencies

1. Hangar 3: The 1993 converter and associated piping and pumps are installed so that the access path is restricted down to about 16".

2. The hydronic and steam piping and equipment appear to have been installed with seismic restraint capacity. However it does not appear to meet current IBC or TI 809 requirements in all instances.

6.1.4 Ventilation

The ventilation system is limited to toilet exhaust. For the most part these exhaust fans are not operational.

The hangar bays are not ventilated. During a November inspection, the air within Hangar 2 was noticeably foul. Small diesel tractors are used to move the helicopters and small gasoline powered ATV carts are used to transport supplies throughout the bay and apron area (see Figs. 6.6 and 6.7).

Air conditioning within the hangars is non existent except for window units in Hangar 3 serving overnight dorm rooms. These units reject heat into the hangar bay.

6.1.4.1 Standard or Code Deficiencies

1. No ventilation is provided in the shops or second floor offices as required by the International Mechanical (IMC) Code. These spaces do not meet provisions for passive ventilation as the window opening area is not 1/20th of the connected area and some areas are blocked from passive ventilation that would be provided by existing windows by an intervening corridor and corridor doors.

6.1.5 Temperature Controls

The existing temperature controls are a mixture of self contained valves controlling finned tube radiation, electric thermostats controlling unit heaters, and electronic controls used to reset steam converter discharge temperature.

A pneumatic valve is used to control the steam valve on the main steam converter at Hangar 2. This appears to have been done as a stop gap measure as the control panel uses electronic controls.

6.2 FORCE PROTECTION

With respect to the mechanical system the two primary issues are protection of the ventilation intakes and protection of the utility systems. There are virtually no outdoor intakes serving the hangars. Force protection guidelines indicate that utilities should not be on the outside wall so that systems are more likely to survive damage to the exterior walls. This requirement is not interpreted beyond the above statement in the guidelines. To some degree utilities must be on the outside wall. One example of such a system would be the fire department connection for the sprinkler system. The existing utility pits are located adjacent to the outside walls.

6.3 ENERGY CONSERVATION

The existing facilities are equipped with minimal ventilation. Therefore in the current configuration energy conservation measures are limited to increasing envelope insulation.

Our recommendations are based on upgrading the existing building envelope to the level performance of Hanger 267. Additional measures could be pursued if the recommended

ventilation upgrades are performed such has air to air heat recovery. These measures were not included in the our estimate or course system design as we believe they would not be economically viable due to only intermittent use of high volumes of outside air. Reference the architectural section of this report for further discussion on the building envelope (see Fig. 6.8).

6.4 BASIS OF ESTIMATE

The mechanical estimate addresses existing code, standards and function deficiencies. The function deficiencies were identified using two tests: one; will a system or component last an additional mechanical system generation, approximately 30 years, and two; does a system provide a similar level of function as that provided at the Hangar 6 replacement hangar, Aircraft Maintenance Hangar FY05 FTW 267, currently under construction.

Square footage estimates were used where they could reasonably be applied such as is the case for a new ventilation system to serve the office / shop areas. Where square footage costs would not provide a reasonable basis for cost individual components were identified and estimated based on a course design matching the performance levels provided at Hangar 267. Where square footage costs were used, temperature control system replacement was not separately estimated.

We interviewed Grinnell, the contractor providing the fire suppression for Hangar 267, and were given their contract price of $620,000.00 to the general contractor. Our estimate for conversion of the existing deluge fire suppression system to an AFFF system meeting current ETL standards was based on that information.

6.5 RECOMMENDATIONS

6.5.1 Utilities

- No utilities work recommended except for fire pump upgrades addressed under Tab 8.

6.5.2 Plumbing

1. Address indicated deficiencies including the addition of 4 emergency showers in Hangar 2.

2. Cap abandoned services to service pits. Fill in service pits (see Fig. 6.9).

3. Replace domestic water, compressed air, waste, and vent piping throughout the facility to provide an additional 30 year service life. Our estimate includes fixture replacement since fixtures must be removed to perform plumbing modifications. In addition a trench drain must be added to the hangar bay to meet current ETL requirements for fire suppression. See Tab 8 for further discussion. Our estimate shows replacement of the entire waste piping system. If it was determined that the age of the waste piping was on the order of 40 years rather than 60 years, we would not recommend its replacement

6.5.3 Heating

1. Except for the existing unit heaters and door track heating in the hangar bays we recommend total replacement of the hydronic heating system. Replacement of the existing central heat exchangers and associated equipment is necessary to support the additional load imposed by the ventilation equipment. Replacement of the existing perimeter heating system is recommended due to its inadequacy and age.

6.5.4 Ventilation

1. Provide ventilation to shops and offices to meet IMC requirements. Provide new restroom exhaust fans.

2. The hangar bays are configured with doors meeting the 1/20th door area requirement for passive ventilation meeting the letter of code requirements. However, from an industrial hygiene point of view, ventilation should be provided. Also hangar bay ventilation was provided at Hangar 267. Therefore we recommend ventilation of the hangar bays at a rate of about 1 cfm per square foot matching the ventilation rate provided at Hangar 267. Carbon monoxide detection was also provided at Hangar 267. While these safety devices are difficult to argue against due to the presence of gasoline fueled carts we doubt there will ever be a scenario where the level of CO rises to a detectable level unless the carts are idled directly beneath a sensor. The diesel vehicles produce relatively low levels of CO and would case significant occupant discomfort from fume smell long before the CO reached detectable levels.

3. Air conditioning was provided to the Administration/Crew spaces in Hangar 267. We concur with the application of air conditioning in administrative areas. While not absolutely necessary in the Fairbanks environment, it provides increased comfort which translates to increased productivity. Air conditioning was not provided in the hangar bay area for Hangar 267 and is not recommended by us as hangar doors could be opened providing a shaded work area that should be reasonably comfortable in even record conditions.

6.5.5 Temperature Controls

1. We recommend use of direct digital controls (DDC) to control central mechanical equipment, such as the main steam converter and air handling units, to control finned tube radiation at the building perimeter, and use of non DDC line voltage thermostats to control cabinet unit heaters. Low voltage thermostats could also be used to effectively control finned tube radiation; however if used then the temperature sensed at the thermostat cannot be monitored, we therefore recommend that these also be controlled through DDC controls. We strongly recommend against use of the existing self contained valves as these devices are not positive control devices making them inferior from a comfort stand point. They are also difficult to trouble shoot.

6.5.6 Force Protection

1. Any modifications to the ventilation systems should be made with intakes 10' above grade or higher.

2. Any modifications to central heating equipment, and fire suppression system should be made so that piping and equipment is not supported off the outside wall. Additional measures might also be considered such as locating the utilidor pits and mechanical rooms to interior spaces; however these extreme measures were not adopted in the design of Hangar 267.

6.6 PHOTOGRAPHS

Figure 6.1 Bathroom Exhaust Made Non-Operable at Hangar 2

Figure 6.2 Electric Water Heater w/o Seismic Bracing - Hangar 2

Figure 6.3 Emergency Eye Wash w/o Tempering Valve Hangar 2

Figure 6.4 Cabinet Unit Heater at Hangar 2

Figure 6.5 Electric Heater at Hangar 3

Figure 6.6. Diesel Tug Used at Hangars 2 & 3

Figure 6.7 Diesel Tractor Used at Both Hangars 2 & 3

Figure 6.8 Window Reduced in Size Both Hangar 2 & 3

Figure 6.9 Abandoned Services Pit, Hangar 2

- End of Section -

7 ELECTRICAL

7.1 EXISTING CONDITIONS ASSESSMENT

7.1.1 General

Electrical Equipment Overview

Electrical equipment in both Hangars 2 and 3 is a mixture of old and new. Panel distribution, lighting, receptacles, and communications equipment exhibit a wide range between antiquated and current construction. Substantial modifications to the existing electrical system are recommended in this report. The recommendations are based on life and building safety, energy efficiency, and the useful life of the equipment.

Secretary of the Interior's Standards for Rehabilitation

Modifications to the electrical system should not have a significant impact on compliance with the Secretary of the Interior's Standards for Rehabilitation. Replacement of original electrical equipment as it exists in some locations is necessary to keep this facility safe and operating properly.

7.1.2 Power Distribution

Hangars 2 and 3 are fed by pole mounted transformers in the parking lot (see Fig. 7.1). Secondary service entrance conductors run underground from the service pole to a 1600 ampere, 208Y/120 volt switchboard in an electrical room inside the building. Some of the service feeders on the pole have been hit by a vehicle and are damaged (see Fig. 7.2). Feeders from the main switchboards to panelboards distributed through the hangars have a mixture of primarily thermoplastic and cross-linked polyethylene, but some braided cloth insulation still exists. There are some original panelboards still in operation. Panelboard manufacturers range from Fouch Electric Mfg Co., I.T.E. Imperial Corporation, General Electric, and Square D. The first two listed manufacturers do not exist anymore.

Standard or Code Deficiencies

1. Outdated panelboards are a fire hazard due to improper operation of overcurrent protective devices and are difficult to maintain.

2. Braided cloth insulated feeders and branch circuit are likely to be cracked and frayed in concealed locations. Such insulated conductors pose the risk of short circuiting, arcing, and starting fires. This risk is compounded by item no. 1 mentioned above.

3. Damaged pole mounted service feeders created arcing hazard and could cause sudden unexpected loss of power.

7.1.3 Lighting

Interior Lighting

Both open hangar areas are lit with metal halide high-bay fixtures and the perimeter rooms by fluorescent lights. Lighting levels and equipment conditions vary between the two hangars.

Hangar 2 Lighting

Open hangar area lighting levels range from 15 to 30 footcandles. Many of the perimeter rooms have been recently upgraded with new wraparound fluorescent fixtures and T8 lamps with electronic ballasts. Office lighting levels average 70 footcandles.

Hangar 3 Lighting

Open hangar area lighting levels range from 35 to 40 footcandles. The perimeter room lighting fixtures are outdated. Office lighting levels average 70 footcandles.

Emergency Egress Lighting and Exit Signs

Emergency egress lighting consists of battery operated emergency lighting units. The units are sparsely placed (see Figs. 7.3 and 7.4). Exit signs vary widely. Some are red, some are green, some flash on loss of power, and some remain steady burning. One of the exit signs in Hangar 3 was inoperative.

Exterior Lighting

Exterior lighting is limited to floodlights mounted on the roof at the four corners of the buildings, typically three floodlights on the north corners and two floodlights on the south corners. There is no soffit lighting, nor is there wall mounted lighting over the mandoors. Parking lot lighting does not exist as well.

Standard or Code Deficiencies

1. The critical nature of the work performed in the open hangar areas in both Hangars 2 and 3, and the small parts that are assembled there, warrant higher lighting levels than what exists. The Illuminating Engineering Society of North America recommends a target minimum of 75 foot candles for aircraft hangars.

2. Required emergency egress illumination of one footcandle along path of egress does not exist except in the immediate vicinity of the emergency lighting units. Emergency lighting in the stairwells from the second floors to outside does not exist.

3. Exit signs are required to be lit at all times, including during loss of normal power.

4. Lighting levels do not meet the standards for exterior lighting. In addition, the floodlights do not have cutoff optics typical to airport apron lighting.

7.1.4 Wiring Devices

A number of the wiring devices are old and worn out (see Figs. 7.5 and 7.6). Many have been painted over and the paint is peeling. Spot testing (open ground, open neutral, open hot, hot and ground reversed, hot and neutral reversed) of the power receptacles was performed with no deficiencies found.

7.1.5 Communications

Phone system connects to the base-wide telephone switch. The faceplates, station and trunk lines, and telephone blocks are aging.

Data system cabling has been added to the hangars in recent years. Cabling is a mixture of Category 5 and 5e. Some communications cabinets have coils of unconnected cables spilling out of the enclosures. Cabinets are located in common use areas such as open hangar spaces or in break rooms (see Figs. 7.7 through 7.9).

Standard or Code Deficiencies

1. The servers, switches, and hubs that are installed in plain view in easily accessible office spaces pose a security risk.

7.1.6 Fire Alarm System

Existing fire alarm systems are non-addressable, manufactured by Honeywell. The Fire Alarm Control Panels (FACP) in both hangars are located in the main hangar areas on the south wall. Smoke detectors are installed in the small rooms on both north and south wings. There is no detection in the open bay areas. Annunciation in each hangar is accomplished with a total of eight interior bells, four in the open hangar area, and two in each of the second floor wings. The existing fire alarm system is installed in metal conduit (see Fig. 7.10).

Standard or Code Deficiencies

1. Manual stations are not located immediately adjacent to exits and some are not mounted at the proper height. In some cases the manual station is more than thirty feet from an exit door.

2. Code requires audible signals to sound 15 dBA above ambient noise levels in the alarm condition. Given the size of the structures, the quantities of bells, and the noisy machinery that operates in the hangars, insufficient audible annunciation exists.

3. Strobe annunciation does not exist.

4. Numerous Fire Inspection Reports conducted by the Fort Wainwright Fire Department that are issued monthly list fire doors being held open with non-approved devices.

7.2 SUMMARY OF RECOMMENDATIONS

7.2.1 Power Distribution

Replace outdated panelboards.

Typically a building this size would contain a dual-voltage distribution of 480Y/277 volt and 208Y/120 volt systems. Substantial cost savings can be realized with a dual-voltage system due to long feeder runs, large motor starters and disconnect switches, and hangar lighting systems.

Replace braided cloth insulated feeders and branch circuit conductors with thermoplastic and cross-linked polyethylene insulated conductors.

Replace pole mounted service conduits and place bollards around the service poles to protect the conduits.

7.2.2 Lighting

Interior Lighting

The critical nature of the work performed in the open hangar areas in both Hangars 2 and 3, and the small parts that are assembled there, warrant higher lighting levels than what exists. The Illuminating Engineering Society of North America recommends a target minimum of 75 foot candles for aircraft hangars.

Hangar 3 perimeter room lighting should be replaced to match or exceed the quality that exists in Hangar 2.

Existing exit signs should be replaced and emergency lighting equipment should be augmented to provide Code required emergency lighting levels.

Exterior Lighting

Provide wall mounted mandoor lighting to assist in safe building entry and exit. Provide minimum 1.0 foot-candle average parking lot lighting per UFC guidelines. Replace floodlights with area lighting fixtures with sharp cutoff optics 80 degrees above nadir.

7.2.3 Wiring Devices

Replace wiring devices throughout both hangars.

Communications

Combine telephone and data outlets into a single modular faceplate. Route telephone and data lines to a common telecommunications rack. Data and telephone systems are essential to facility operations and the rack-mounted equipment that controls the systems should be kept secure. Relocate communication racks to lockable communication closets that permit access only to authorized information technology specialists.

7.2.4 Fire Alarm System

Provide horn/strobes throughout both hangars as required to achieve a signal strength 15 dBA above ambient and mounted in locations to provide complete building coverage. Additional annunciator device drivers will be required to be installed adjacent to the fire alarm control panels, and new alarm circuits will need to be pulled. The existing raceway system could be partially utilized, but that would require that all of the existing fire alarm conductors be replaced. In that case, new raceway will branch off to new annunciator locations. An alternative solution is to provide a new raceway system throughout the hangars just to the new horn/strobe locations.

Relocate manual pull stations to within five feet of the exits. Mount at 48 inches above the floor, or 54 inches where side access by a wheel chair is available, in accordance with ADA.

Fire doors should be installed with magnetic door holder and controlled by the fire alarm control panel.

Considering the scope of fire alarm work that is required, a new addressable fire alarm system should be considered. Addressable systems for buildings this size are more cost effective compared to conventional non-addressable systems, better annunciate alarm and trouble conditions, and provide more versatility for future modifications. The new fire alarm system should be addressable and self testing, and be installed in compliance with current UFC 3-600 requirements.

Flame detectors should be considered for the open hangar areas. Flame detectors provide better early warning detection than beam detectors and are not susceptible to structural movement that is typical to large open buildings.

Duct mounted smoke detectors (ionization or photoelectric detectors) should be provided in the return air system locations at the mechanical return air duct for any piece of HVAC equipment that carries more than 2000 cfm.

Additional automatic fire alarm initiating devices should be heat detectors in areas such as the bathrooms, mechanical and electrical rooms, and janitor closets where the local conditions of excessive dirt, dust, and/or moisture, and humidity may cause excessive nuisance alarms in an ionization detector.

All new fire alarm system wiring should be installed in conduit.

7.3 Photographs

Figure 7.1 General view of transformer service pole.

Figure 7.2 Damaged service conduits.

Figure 7.3 Stairway lighting is not emergency powered.

Figure 7.4. Typical sparsely placed unit emergency lighting and exit signs.

Figure 7.5 Typical panelboard wiring with mixture of braided cloth and thermoplastic insulated conductors.

Figure 7.6 Poorly placed conductors on catwalk impede normal progress.

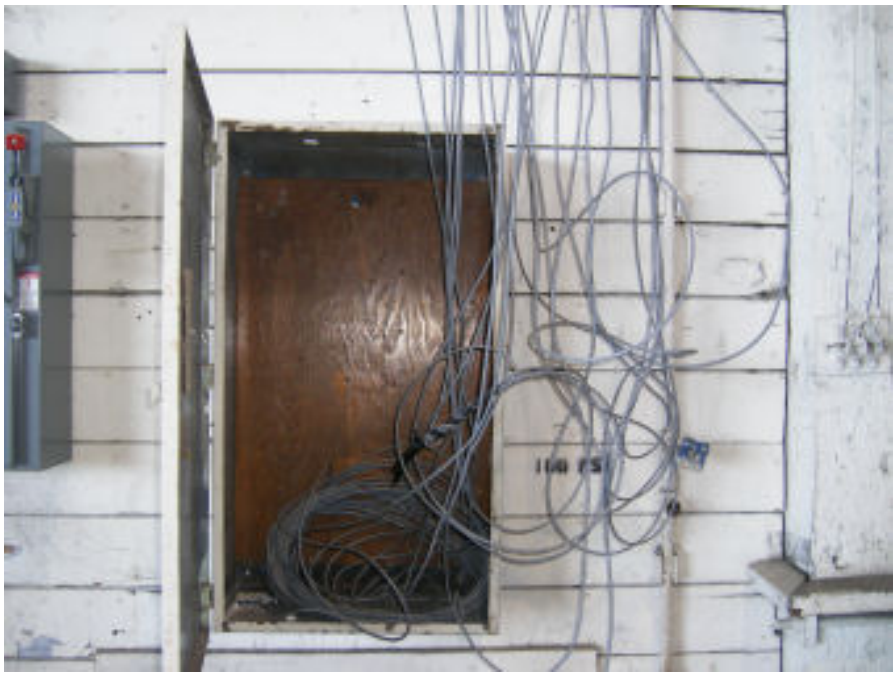


Figure 7.7 Communications cabinet with coils of unconnected cables spilling out of the enclosure.

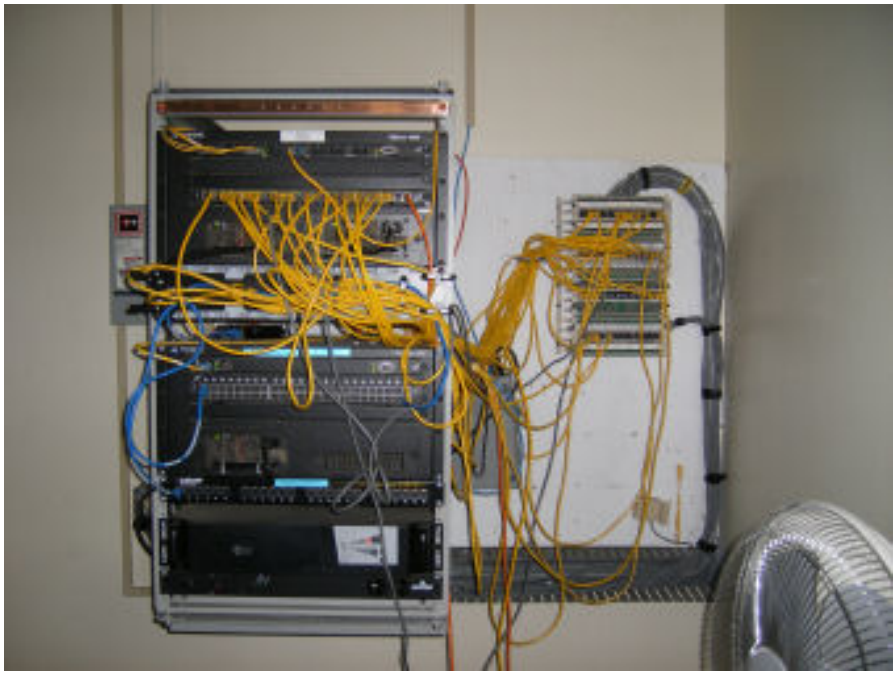


Figure 7.8 Communications cabinet located in break room: A common use area.

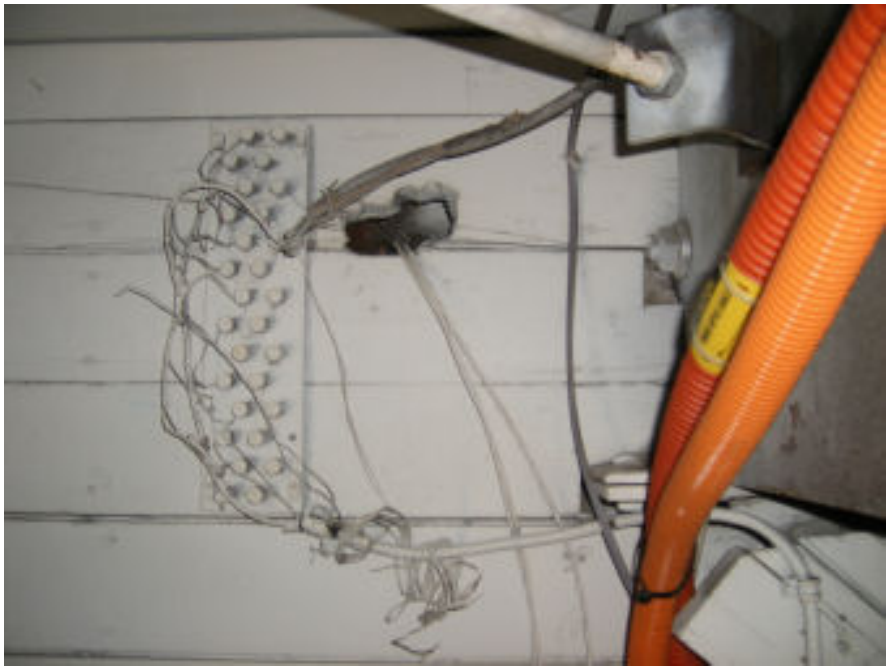


Figure 7.9 Antiquated telephone blocks. Recommend new telephone wiring be terminated in communications cabinets.

Figure 7.10 Fire alarm system with bell annunciation.

- End of Section -

8 FIRE PROTECTION

8.1 GENERAL PARAMETERS

8.1.1 Military Criteria, Codes, and Standards

- Engineering Technical Letter (ETL) ETLll10-3-484, Aircraft Hangar Fire Protection Systems.
- ETL 1110-3-485, Fire Protection for Helicopter Hangars.
- Unified Facilities Criteria (UFC) UFC 3-600-01 Design: Fire Protection Engineering for Facilities.
- International Building Code (lBC) - 2003.
- UFC 4-010-01, Mass Notification Systems.
- UFC 1-200-01, Design: General Building Requirements.
- UFC 4-021-1 Design and O&M: Mass Notification System.
- UFC 4-211-01N, Design, aircraft Maintenance Hangars, Type I and Type II< Chapter 5 - Fire Protection.
- National Institute of Standards and Technology (NIST), Technical Note *(TN)* 1423, Analysis of High Bay Hangar Facilities for Fire Detector Sensitivity and Placement.
- Technical Instructions (TI) TI 800-01, Design Criteria.
- TI 809-04, Seismic Design for Buildings.
- National Fire Protection Association (NFP A) NFP A 1, Uniform Fire Code.
- NFPA 10, Portable Fire Extinguishers.
- NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam.
- NFPA 13, Installation of Sprinkler Systems.
- NFPA 16, Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems.
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.
- NFPA 22, Standard for Water Tanks for Private Fire Protection.
- NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.
- NFPA 30, Flammable and Combustible liquids Code.
- NFPA 70, National Electrical Code.
- NFPA 72, National Fire Alarm Code (1999)
- NFPA 90A, Installation of Air-Conditioning Systems.
- NFPA 101, Life Safety Code.

- NFPA 110, Standard for Emergency and Standby Power Systems.
- NFPA 170, Fire Safety Symbols.
- NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.
- NFPA 291, Fire Flow Testing and Marking of Hydrants.
- NFPA 409, Standard on Aircraft Hangars.
- NFPA 1963, Fire Hose Connections .
- American National Standards Institute (ANSI) S3.41, Audible Emergency Evacuation Signals.
- Engineering Manual (EM) 385-1-1, Safety and Health Requirements Manual.
- American Water Works Association (AWW A) Manual M14, Recommended Practice for Backflow Prevention Cross Connection Control.
- A WW A Manual M31, Distribution System Requirements for Fire Protection
- Technical manual (I'M) 5-813-5, Water Supply, Water Distribution, Volume 5 • UFGS (Uniform Facilities Guide Specifications):
- UFGS 10520, Portable Fire Extinguishers UFGS 13209, Water Storage Steel Tanks
- UFGS 13851A, Fire Detection and Alarm System, Addressable. UFGS 13920A Fire Pumps.
- UFGS 13930A, West Pipe Sprinkler System, Fire Protection .
- UFGS 13955A Aqueous Film-Forming Foam (AFFF) Fire Protection System.

8.1.2 Existing Fire Suppression System Description

The fire suppression section of the condition assessment is authored by Robin J. Rader, P.E. and is based on site inspections performed 6 September 2006, 17 November 2006, and 5 December 2006.

The existing fire suppression system consists of a deluge system protecting the hangar bay and a wet sprinkler system protecting the office and shop areas. The age of this system is unclear as it does not appear to have been provided during the original construction.

Fire water is provided from a remote building named Building 3011 located across the street from the hangars. This building provides fire water for both Hangar 2 and Hangar 3 through a 16" water main. The storage tank is manually filled from the base utility domestic water system. After the fire tank the systems are independent of each other. Four diesel fired pumps rated at 2000 gpm at 103 psi are used to provide fire water flow in the event of a loss of pressure in the deluge system. These pumps have a date code indicating a manufacture date of 1977. A single electric and gasoline fired pump also exist within building 3011. These two pumps were replaced by the four pump set (see Figs. 8.1 through 8.4).

8.1.3 Code or Standard Deficiencies

The current standard for army helicopter hangars is ETL 1110-3-485 Engineering and Design - Fire Protection for Helicopter Hangars. This standard calls for hangars located in a geographic area where the 99% dry bulb temperature is less than -18C (0.0F) to be protected by an AFFF suppression system rather than the existing deluge system. Additional deficiencies with respect to this standard are as follows:

1. Roof coverings will be listed as Class "A" or "B". See the Architectural Assessment (Tab 3) for further discussion.

2. Draft curtains shall be non combustible. Hangars 2 & 3 utilize combustible draft curtains. See the Architectural Assessment for further discussion.

3. Interior finish will have a flame spread rating less than 25 and a smoke developed rating of 50 or less. Hangars 2 and 3 are finished inside with wood siding. See the Architectural Assessment for further discussion.

4. The floor must drain at a slope not less than 0.5% (1/16" per foot). While most of the hangar bay floors do slope at a 1/16" slope to drain there are exceptions. For instance, the area around the man doors in the corners of the bays has typically settled, reducing the effective slope to about 0.2% and even collects water right at the doors.

5. Ancillary spaces must be protected from fire water that may have burning fuel on top through use of ramps or curbs. The shops and offices at best are dead level with the hangar doors. In some cases they are below the hangar door threshold.

6. Fire water with burning fuel must travel from the hangar floor at a rate matching the fire suppression supply. This water must travel to a safe area or into tanks. There are no such provisions at these facilities.

7. In addition to the above deficiencies there is a pocket made by the roof above the office shop area where the hangar roof extends over the office shop area. This area is accessible and is combustible but is not protected by sprinkler protection.

8.2 RECOMMENDATIONS FOR THE EXISTING FIRE SUPPRESSION SYSTEM

We recommend replacement of the existing deluge system protecting the hangar bay with a dry preaction AFFF system meeting ETL requirements and matching the system provided at Hangar 267. A preaction system is recommended as it provides a double safety in that both an electronic smoke or fire sensor as well as the fusible link on a closed sprinkler head must release before flow is initiated. We recommend reuse of the existing water storage tank located in Building 3011. We recommend replacing the existing diesel pumps in building 3011. It might be possible to upgrade the existing pumps with new pump heads allowing them to achieve the increase pressure required for an AFFF system (140 psi at Hangar 267). However these pumps are also nearing the limit of their useful age. The estimate for conversion of the AFFF system includes both a diesel fired and an electric pump.

We recommend reusing the existing wet sprinkler system in the office and shop area and extending the system to protect the combustible area above the office and shop area.

Containing and routing the fire water for these facilities is a significant challenge. We recommend the addition of a topping slab within the first floor shops and offices to protect these spaces from fire water. This in combination with the trench drain recommended under Tab 6 would provide floor slopes of 1/16" slope or better. Controlling the fire water flow is the most difficult of these issues. In the case of Hangar 267, fire water flow was controlled by allowing it to flow out two side garage doors in the axis of the trench drain on to what appears to be a low hazard area of the ramp. In the case of Hangar 2 and 3, the trench drain also would travel in the direction of each door. But in this case the fire water would partially or fully block the doors if allowed to flow in these directions. In addition the apron slope does not appear to be significant which would make the area exposed to burning fuel large. NFPA 409, Standard for Aircraft Hangars, indicates use of underground tanks to contain this fire water. However, these tanks would have to match the capacity of the fire suppression supply which is 167,000 gallons for Hangar 267. We do not believe such a system is feasible. We have included an estimated cost for a 10" waste drain that would travel south 400' beneath the adjacent roadway to a ditch running parallel to the roadway. Note that the drain lines must cross a road and an existing utilidor. The bottom of the ditch appears to be lower than the bottom of the utilidor making this run feasible.

8.3 PHOTOGRAPHS

Figure 8.1 Bldg 3011 Defunct Diesel Fire Pump

Figure 8.2 Defunct make Up Valve at Bldg 3011.
Tank in now filled manually.

Figure 8.3 1 of 4 Operational Fire Pumps in Bldg 3011
Serving Hangars 2 & 3

Figure 8.4 Super Structure Over 500,000 Gallon Tank in Bldg 3011

- End of Section -

9 GEOTECHNICAL ANALYSIS

As part of the Condition Assessment and Rehabilitation Plan, a subsurface investigation and geotechnical analysis of the soils surrounding Hangars 2 and 3 was conducted by the firm of Soils Alaska, P.C. of Fairbanks, Alaska.

The attached letter report summarizes the observations, findings, conclusions and recommendations on issues relating to the subsurface and soils conditions at the Hangars. Also included are individual boring reports and particle size distribution notes.

- End of Section -

[INSERT LETTER, TAB 9]

- End of Section -

PROJECT CONSTRUCTION COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FT. WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: SUMMARY - BASE BID

21-Dec-07

Prepared by: JMM FOR: EPR

DESCRIPTION		QUANTITY	UNIT		LABOR			TOTAL
GENERAL CONTRACTOR			COST	HRS/ UNIT	LABOR RATE	LABOR COST		
ARCHITECTURAL CONTRACT TOTAL								$6,211,207
SUBCONTRACTOR WORK			HANGER 3- HANGAR 2 SIMILAR					
CIVIL SITE WORK CONTRACTOR			$630,232					$630,232
STRUCTURAL CONTRACTORS			$1,602,520					$1,602,520
MECHANICAL CONTRACTORS			$1,452,108					$1,452,108
FIRE PROTECTION CONTRACTOR			$608,313					$608,313
ELECTRICAL CONTRACTOR			$1,945,918					$1,945,918
GEN.CONTRACTOR OHMARKUP	10.0%						$6,239,091	$623,909
SUBTOTAL								$13,074,207
GENERAL CONDITIONS	15.0%							$1,961,131
SUBTOTAL								$15,035,338
ESTIMATING CONTINGENCY	35.0%							$5,262,368
SUBTOTAL								$20,297,707
ESCALATION-CONSTR.COST	15.0%	TO 2010						$3,044,656
TOTAL CONSTRUCTION COST								$23,342,363

BASE BID (PER HANGER) **$23,342,363**

NOTES REGARDING THE PREPARATION OF THIS COST ESTIMATE

THIS ESTIMATE IS PREPARED USING CURRENT CONSTRUCTION COSTS & ASSUMES WILL RECEIVE AN OPEN COMPETITIVE BID.

THIS ESTIMATE DOES NOT CONTAIN AN ALLOWANCE FOR NEGOTIATED NON-COMPETITIVE CONTRACTS.

THIS ESTIMATE HAS AN ESCALATION ALLOWANCE.

THIS ESTIMATE DOES NOT HAVE AN ALLOWANCE TO TREAT / REMOVE ANY HAZARDOUS MATERIALS OR CONTAMINATED SOIL.

THIS ESTIMATE DOES NOT INCLUDE ANY PLAN CHECK FEES CHARGED BY THE STATE OF ALASKA OR ANY OTHER ENTITY CLAIMING JURISDICTION OVER THE WORK PAID DIRECTLY BY THE OWNER.

THIS ESTIMATE DOES NOT INCLUDE THE A/E FEES, SHOP EQUIPMENT OR COSTS FOR ANY WORK NOT INDICATED.

THIS ESTIMATE IS BASED ON A NORMAL WORK WEEK WITH SOME PROVISIONS FOR OVERTIME.

ESTIMATING CONTINGENCY - AN ALLOWANCE FOR CONSTRUCTION DOCUMENT REQUIREMENTS THAT ARE NOT INCLUDED

EITHER THE 2006 R.S. MEANS FACILITIES CONSTRUCTION COST DATA MANUAL, THE 2006 R.S. MEANS ASSEMBLIES COST DATA MANUAL PAST HISTORICAL DATA HAVE BEEN USED AS RESOURCES TO COMPILE THIS ESTIMATE.

ARCHITECTURAL CONSTRUCTION COST ESTIMATE

PROJECT: FT WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FT. WAINWRIGHT, ALASKA
PHASE: CONCEPT — PREPARED BY: JB/JMM
DESCRIPTION: ARCHITECTURAL - BASE BID — FOR: EPR

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR

SUMMARY OF COSTS

GENERAL CONTRACTOR

DESCRIPTION	%	EQUIPMENT COSTS	MATERIAL COSTS	LABOR HOURS	LABOR COSTS	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB		$21,417	$1,504,004	39,054.07	$2,464,897	$3,990,318
REGIONAL FACTOR (MEANS)	10.0%		$150,400			$150,400
FREIGHT	10.0%		$150,400			$150,400
OVERTIME	12.5%				$308,112	$308,112
COMPLEXITY	15.0%				$369,735	$369,735
SUBTOTAL		$21,417	$1,804,805		$3,142,744	$4,968,966
CONTRACTORS OVERHEAD	15.0%					$745,345
CONTRACTORS PROFIT	10.0%					$496,897
SUBTOTAL						$6,211,207
ARCHITECTURAL CONTRACT TOTAL						**$ 6,211,207**

ARCHITECTURAL CONSTRUCTION COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FT. WAINWRIGHT, ALASKA
PHASE: CONCEPT — PREPARED BY: JB/JMM
DESCRIPTION: ARCHITECTURAL - BASE BID — FOR: EPR

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
DIRECT COSTS BY CSI DIVISIONS													
DIVISION 2 - SITE WORK													
SITE													
remove (e) asphalt	0.0	ea	0.30	0	0.000	0	.200	1	-	$57.81	0	#DIV/0!	$0
excavate perimeter - hand	0.0	cy	0.00	0	0.000	0	2.000	1	-	$57.81	0	#DIV/0!	$0
BUILDING													
demo stair tower stairs	4.0	ea	0.00	0	2500.000	10,000	.000	1	-	$57.81	0	2,500.00	$10,000
demo stair tower walls	2,760.0	sf	0.00	0	0.000	0	.030	1	82.80	$57.81	4,787	1.73	$4,787
demo finishes to stud ext. wall	40,200.0	sf	0.00	0	0.000	0	.030	1	1,206.00	$57.81	69,722	1.73	$69,722
demo walls - interior	5,000.0	sf	0.00	0	0.000	0	.030	1	150.00	$57.81	8,672	1.73	$8,672
demo roof epdm	44,880.0	sf	0.00	0	0.000	0	.025	1	1,122.00	$62.97	70,652	1.57	$70,652
demo roof recovery board	44,880.0	sf	0.00	0	0.000	0	.010	1	448.80	$62.97	28,261	0.63	$28,261
demo roof insul. (below deck)	44,880.0	sf	0.00	0	0.000	0	.010	1	448.80	$57.81	25,946	0.58	$25,946
demo roof asphalt	20,000.0	sf	0.00	0	0.000	0	011	1	220.00	$62.97	13,853	0.69	$13,853
demo metal siding	32,850.0	sf	0.00	0	0.000	0	.020	1	657.00	$57.81	37,983	1.16	$37,983
demo metal flashing	1,500.0	lf	0.00	0	0.000	0	.010	1	15.00	$57.81	867	0.58	$867
demo wood fascia	1,500.0	lf	0.00	0	0.000	0	.010	1	15.00	$57.81	867	0.58	$867
demo concrete - SUPPORT SPACES	5,000.0	sf	0.00	0	0.500	2,500	.030	1	150.00	$57.81	8,672	2.23	$11,172
demo concrete curbs at ext.drs.	1.0	ls	0.00	0	500.000	500	18.000	1	18.00	$57.81	1,041	1,540.63	$1,541
demo mortar/concrete in restrooms	450.0	sf	0.00	0	0.500	225	.030	1	13.50	$57.81	780	2.23	$1,005
excavate restroom floors	50.0	bcy	1.39	70	0.000	0	2.560	1	128.00	$57.81	7,400	149.39	$7,470
demo entry canopy roof	3.0	ea	0.00	0	750.000	2,250	.025	1	0.08	$57.81	4	751.45	$2,254
demo interior catwalk & stairs/ladders	3,000.0	sf	0.00	0	0.000	0	.030	1	90.00	$57.81	5,203	1.73	$5,203
demo interior wall finish- HANGAR	26,752.0	sf	0.00	0	0.000	0	.015	1	401.28	$57.81	23,199	0.87	$23,199
demo interior wall finish- SUPP.SP.	12,500.0	sf	0.00	0	0.000	0	.015	1	187.50	$57.81	10,840	0.87	$10,840
demo tile	20,000.0	sf	0.00	0	0.000	0	.016	1	320.00	$57.81	18,500	0.93	$18,500
demo carpet	10,000.0	sf	0.00	0	0.000	0	.008	1	80.00	$57.81	4,625	0.46	$4,625
demo ceramic tile, floor	550.0	sf	0.00	0	0.000	0	.024	1	13.20	$57.81	763	1.39	$763
demo ceramic tile, wall	650.0	sf	0.00	0	0.000	0	.020	1	13.00	$57.81	752	1.16	$752
demo exterior drs & frames	16.0	ea	0.00	0	0.000	0	.400	1	6.40	$57.81	370	23.13	$370
demo interior drs & frames	70.0	ea	0.00	0	0.000	0	.400	1	28.00	$57.81	1,619	23.13	$1,619
demo hangar drs & frames(26'x72')	1,950.0	sf	1.03	2,009	0.000	0	.040	1	78.00	$57.81	4,509	3.34	$6,518
demo exterior windows	63.0	ea	0.00	0	0.000	0	.400	1	25.20	$57.81	1,457	23.13	$1,457
demo interior relites	14.0	ea	0.00	0	0.000	0	.400	1	5.60	$57.81	324	23.13	$324
demo interior stair handrails	150.0	lf	1.03	155	0.000	0	.040	1	6.00	$57.81	347	3.34	$501
excavate hangar trench	66.7	bcy	0.00	0	0.000	0	2.560	1	170.75	$57.81	9,872	148.00	$9,872
SUBTOTAL				$2,233		$15,475			6,099.91		$361,887		$379,595
DIVISION 3 - CONCRETE													
concrete floor-HANGAR (2" topping)	30,400.0	sf	0.01	304	2.500	76,000	.022	1	668.80	$71.97	48,133	4.09	$124,437
concrete floor-1st flr restrms	450.0	sf	0.01	5	2.500	1,125	.022	1	9.90	$71.97	713	4.09	$1,842
concrete floor-SUPPORT SP. (6")	5,000.0	sf	0.01	50	2.500	12,500	.022	1	110.00	$71.97	7,917	4.09	$20,467
SUBTOTAL				$359		$89,625			788.70		$56,763		$146,746
DIVISION 5 - METAL													
floor exp.joints (exist.conc.jts.)	800.0	lf	0.01	8	25.000	20,000	.211	1	168.80	$71.97	12,148	40.20	$32,156
stair tower- metal stair	100.0	risers	2.98	298	500.000	50,000	1.067	1	106.70	$71.99	7,681	579.79	$57,979
stair tower - handrail	240.0	lf	0.00	0	32.000	7,680	.200	1	48.00	$71.99	3,455	46.40	$11,135
stair tower - guardrail	100.0	lf	0.00	0	32.000	3,200	.200	1	20.00	$71.99	1,440	46.40	$4,640
floor trench	600.0	lf	0.00	0	19.000	11,400	.229	1	137.40	$71.97	9,889	35.48	$21,289
hangar door ext.roof platforms	240.0	sf	0.00	0	15.000	3,600	.010	1	2.40	$71.99	173	15.72	$3,773
hangar door ext. roof platforms g'rl	184.0	lf	0.00	0	32.000	5,888	.200	1	36.80	$71.99	2,649	46.40	$8,537
stairs interior - handrail	140.0	lf	0.00	0	32.000	4,480	.200	1	28.00	$65.60	1,837	45.12	$6,317
catwalk interior - PLATFORM	2,500.0	sf	0.00	0	22.000	55,000	.010	1	25.00	$71.99	1,800	22.72	$56,800
catwalk interior - STRUCTURE	2,500.0	sf	0.00	0	28.000	70,000	.025	1	62.50	$71.99	4,499	29.80	$74,499
catwalk interior - guardrail	200.0	lf	0.00	0	32.000	6,400	.200	1	40.00	$71.99	2,880	46.40	$9,280
catwalk interior - ladders/stairs	150.0	risers	0.00	0	250.000	37,500	.050	1	7.50	$71.99	540	253.60	$38,040
misc.connections	1.0	ls	0.00	0	2500.000	2,500	.000	1	-	$71.99	0	2,500.00	$2,500
SUBTOTAL				$306		$277,648			683.10		$48,991		$326,945
DIVISION 7 - THERMAL AND MOISTURE													
EPDM roof - HANGAR	24,880.0	sf	0.00	0	5.650	140,572	.343	1	8,533.84	$62.97	537,370	27.25	$677,942
EPDM roof - SUPPORT SPACES	20,000.0	sf	0.00	0	5.650	113,000	.343	1	6,860.00	$62.97	431,969	27.25	$544,969
METAL SIDING	32,850.0	sf	0.00	0	5.000	164,250	.034	1	1,116.90	$65.60	73,270	7.23	$237,520
FIBER CEMENT BOARD	20,100.0	sf	0.00	0	1.500	30,150	.038	1	763.80	$65.60	50,106	3.99	$80,256
install ice&water shield-wall base	1,600.0	sf	0.00	0	0.300	480	.300	1	480.00	$62.97	30,225	19.19	$30,705
roof fascia	1,500.0	lf	0.00	0	2.250	3,375	.015	1	22.50	$62.97	1,417	3.19	$4,792
metal flashing	1,500.0	lf	0.00	0	2.000	3,000	.015	1	22.50	$62.97	1,417	2.94	$4,417

ARCHITECTURAL CONSTRUCTION COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FT. WAINWRIGHT, ALASKA
PHASE: CONCEPT — PREPARED BY: JB/JMM
DESCRIPTION: ARCHITECTURAL - BASE BID — FOR: EPR

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
conc.flr.moisture barrier- HANGAR	30,400.0	sf	0.00	0	1.500	45,600	.020	1	608.00	$60.99	37,081	2.72	$82,681
conc.flr.moisture barrier- SUPP.SP.	50,400.0	sf	0.00	0	1.500	75,600	.020	1	1,008.00	$60.99	61,477	2.72	$137,077
stair towers - asphalt shingles	781.0	sf	0.00	0	0.590	461	.680	1	531.08	$62.97	33,442	43.41	$33,903
replace rotten studs, sheathing	1.0	ls	0.00	0	5000.000	5,000	250.000	1	250.00	$65.60	16,400	21,400.30	$21,400
replace rotten sheathing	600.0	sf	0.00	0	1.250	750	.010	1	6.00	$65.60	394	1.91	$1,144
bird screen	1,200.0	sf	0.00	0	0.200	240	.250	1	300.00	$65.60	19,680	16.60	$19,920
METAL ROOF (hangar dr.overhang)	1,200.0	sf	0.00	0	3.470	4,164	.348	1	417.60	$62.97	26,296	25.38	$30,460
entry canopy roofs	3.0	ea	0.00	0	750.000	2,250	14.000	1	42.00	$62.97	2,645	1,631.57	$4,895
snow guards	400.0	lf	0.00	0	2.500	1,000	.055	1	22.00	$62.97	1,385	5.96	$2,385
SUBTOTAL				$0		$589,892			20,984.22		$1,324,575		$1,914,467
DIVISION 8 - DOORS & WINDOWS													
ADA barrier free entrances	10.0	ea	0.00	0	1000.000	10,000	30.000	1	300.00	$65.60	19,680	2,968.04	$29,680
doors- ext.insul.-drs.,fr.,hardware	16.0	ea	0.00	0	1800.000	28,800	1.250	1	20.00	$65.60	1,312	1,882.00	$30,112
doors- hangar int.-drs.,fr.,hdwre	22.0	ea	0.00	0	1200.000	26,400	1.500	1	33.00	$65.60	2,165	1,298.40	$28,565
doors- nonrated supp.spaces int.	22.0	ea	0.00	0	1150.000	25,300	1.500	1	33.00	$65.60	2,165	1,248.40	$27,465
doors- rated supp.spaces int.	26.0	ea	0.00	0	1450.000	37,700	1.500	1	39.00	$65.60	2,558	1,548.40	$40,258
hangar doors (26'x75')	3,900.0	sf	0.00	0	25.000	97,500	.080	1	312.00	$65.60	20,468	30.25	$117,968
exterior insul.access drs. & frames	16.0	ea	0.00	0	400.000	6,400	.900	1	14.40	$65.60	945	459.04	$7,345
turn tilt vinyl windows	63.0	ea	0.00	0	400.000	25,200	.840	1	52.92	$57.81	3,059	448.56	$28,259
SUBTOTAL				$0		$257,300			804.32		$52,352		$309,652
DIVISION 9 - FINISHES													
upgrade hangar wall to 2 hr.rated	26,752.0	sf	0.00	0	2.590	69,288	.114	1	3,049.73	$65.60	200,066	10.07	$269,354
upgrade int.walls occup.separation	1,650.0	sf	0.00	0	0.740	1,221	.063	1	103.95	$65.60	6,819	4.87	$8,040
upgrade ext.walls support spaces	20,100.0	sf	0.00	0	2.690	54,069	.086	1	1 728.60	$65.60	113,398	8.33	$167,467
vapor retarder - roof	44,880.0	sf	0.00	0	0.030	1,346	.002	1	89.76	$62.97	5,652	0.16	$6,999
vapor retarder - exterior wall	32,850.0	sf	0.00	0	0.030	0	.002	1	65.70	$65.60	4,310	0.13	$4,310
stair tower - walls	2,760.0	sf	0.00	0	2.250	6,210	.035	1	96.60	$65.60	6,337	4.55	$12,547
replace improperly framed walls	1.0	ls	0.00	0	5000.000	5,000	250.000	1	250.00	$65.60	16,400	21,400.30	$21,400
floor clean and prep	70,400.0	sf	0.00	0	0.250	17,600	.008	1	563.20	$60.99	34,349	0.74	$51,949
ceramic tile - floor 2 colors	550.0	sf	0.00	0	6.500	3,575	.087	1	47.85	$59.18	2,832	11.65	$6,407
ceramic tile - wall 2 colors, 4' w'scot	650.0	sf	0.00	0	4.800	3,120	.070	1	45.50	$59.18	2,693	8.94	$5,813
VCT - 2nd floor, static dissipative	1,000.0	sf	0.00	0	2.500	2,500	.500	1	500.00	$59.18	29,590	32.09	$32,090
carpet tiles - 2nd floor, 26 oz.,18x18	10,000.0	sf	0.00	0	5.000	50,000	.053	1	530.00	$60.99	32,324	8.23	$82,324
rubber base	3,950.0	ea	0.00	0	1.000	3,950	.020	1	79.00	$60.99	4,818	2.22	$8,768
rubber stair treads,risers,stringers	200.0	sf	0.00	0	8.750	1,750	.100	1	20.00	$60.99	1,220	14.85	$2,970
seal concrete - HANGAR	30,400.0	sf	0.00	0	0.060	1,824	.003	1	91.20	$60.99	5,562	0.24	$7,386
epoxy paint concrete - SUPP.SP.	19,550.0	sf	0.00	0	0.250	4,888	.065	1	1,270.75	$60.99	77,502	4.21	$82,390
paint ceiling - SUPP.SPACES	20,000.0	sf	0.00	0	0.020	400	.010	1	200.00	$65.85	13,170	0.68	$13,570
patch, prep walls for finish	1.0	ls	0.00	0	4000.000	4,000	120.000	1	120.00	$65.85	7,902	11,901.81	$11,902
paint walls up to 12' - SUPP.SP.	39,500.0	ea	0.00	0	0.010	395	.010	1	395.00	$65.85	26,010	0.67	$26,405
paint walls above 12'- HANGAR	14,820.0	sf	1.00	14,820	0.013	193	.014	1	207.48	$65.85	13,662	1.93	$28,675
paint large hangar numbers	400.0	sf	1.00	400	0.013	5	.014	1	5.60	$65.85	369	1.93	$774
hangar draft curtains	3,300.0	sf	1.00	3,300	5.740	18,942	.025	1	82.50	$65.60	5,412	8.38	$27,654
SUBTOTAL				$18,520		$250,275			9,542.42		$610,398		$879,193
DIVISION 10 - SPECIALTIES													
interior signs	50.0	ea	0.00	0	75.000	3,750	.500	1	25.00	$65.60	1,640	107.80	$5,390
window blinds	63.0	ea	0.00	0	2.900	183	014	1	0.88	$65.60	58	3.82	$241
toilet partitions	10.0	ea	0.00	0	320.000	3,200	2.286	1	22.86	$65.60	1,500	469.96	$4,700
privacy screens	10.0	ea	0.00	0	160.000	1,600	2.000	1	20.00	$65.60	1,312	291.20	$2,912
shower curtain rod & curtain	2.0	ea	0.00	0	115.000	230	2.000	1	4.00	$65.60	262	246.20	$492
retractable shower seat	2.0	ea	0.00	0	383.000	766	1.000	1	2.00	$65.60	131	448.60	$897
lockers	10.0	ea	0.00	0	160.000	1,600	1.000	1	10.00	$65.60	656	225.60	$2,256
grab bars	10.0	ea	0.00	0	50.000	500	.400	1	4.00	$65.60	262	76.24	$762
undercounter lav piping protection	8.0	ea	0.00	0	50.000	400	.400	1	3.20	$65.60	210	76.24	$610
soap dispensers	8.0	ea	0.00	0	65.000	520	3.200	1	25.60	$65.60	1,679	274 92	$2,199
toilet tissue dispensers	10.0	ea	0.00	0	85.000	850	1.000	1	10.00	$65.60	656	150.60	$1,506
paper towel dispensers	8.0	ea	0.00	0	150.000	1,200	.800	1	6.40	$65.60	420	202.48	$1,620
waste receptacles	4.0	ea	0.00	0	180.000	720	.800	1	3.20	$65.60	210	232.48	$930
full mirrors	4.0	ea	0.00	0	750.000	3,000	.800	1	3.20	$65.60	210	802.48	$3,210
sanitary napkin dispenser	1.0	ea	0.00	0	135.000	135	.530	1	0.53	$65.60	35	169.77	$170
sanitary napkin disposal	1.0	ea	0.00	0	135.000	135	.530	1	0.53	$65.60	35	169.77	$170
fire extinguishers & cabinets	20.0	ea	0.00	0	250.000	5,000	.500	1	10.00	$65.60	656	282.80	$5,656
SUBTOTAL				$0		$23,789			151.40		$9,932		$33,721
TOTAL DIRECT COST				$21,417		$1,504,004			39,054.07		$2,464,897		$3,990,318

PROJECT: FT.WW HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: WALL TYPES ARCHITECTURAL PREPARED BY: JB/JM FOR: EPR

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS							
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR	
WALL TYPE EXTERIOR	not including metal siding finish													
PLYWOOD SHEATHING	1.0	SF	0.00	0	1.250	1.25	.010	1	0.01	$65.60	1	1.91	1.91	
BUILDING PAPER	1.0	SF	0.00	0	0.640	0.64	.009	1	0.01	$65.60	1	1.23	1.23	
BATT INSULATION (R-19)	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74	
VAPOR RETARDER	1.0	SF	0.00	0	0.06	0.06	.004	1	0.0	$57.81	0	0.29	$0	
TEXTURE GYPSUM BOARD	1.0	SF	0.00	0	0.050	0.05	.003	1	0.00	$70.88	0.21	0.26	0.26	
5/8" GYP, HANG & TAPE	1.0	SF	0.00	0	0.281	0.28	.017	1	0.02	$70.88	1	1.49	1.49	
PAINT GYP BD	1.0	SF	0.00	0	0.050	0.05	.006	1	0.01	$65.85	0	0.45	0.45	
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18	
														$/SF
TOTALS					2.69	2.67	0.086		0.06				6.54	$0.52
WALL TYPE INTERIOR														
5/8" GYP, HANG & TAPE	2.0	SF	0.00	0	0.281	0.56	.017	1	0.03	$70.88	2	1.49	2.97	
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$70.88	0.43	0.26	0.53	
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$65.85	1	0.45	0.89	
2X6 STUD	1.0	SF	0.00	0	1.000	1.00	.148	1	0.15	$65.60	10	10.71	10.71	
BATT INSULATION- ACOUSTICAL	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74	
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18	
														$/SF
TOTALS					1.74	2.10	0.211	6.00	0.21				16.02	$1.28
WALL UPGRADE - HANGAR 2-hr construction and vapor retarder at exterior wall														
5/8" GYP, HANG & TAPE(2 ea.side)	4.0	SF	0.00	0	0.281	1.13	.017	1	0.07	$70.88	5	1.49	5.94	
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$70.88	0.43	0.26	0.53	
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$65.85	1	0.45	0.89	
FURRING	1.0	LF	0.00	0	0.210	0.21	.030	1	0.03	$65.60	2	2.18	2.18	
BATT INSULATION (R-19)	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74	
VAPOR RETARDER	1.0	SF	0.00	0	0.06	0.06	.004	1	0.0	$57.81	0	0.29	$0	
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18	
STN.STEEL WAINSCOT-8' (26 GA)	0.2	SF	0.00	0	1.579	0.38	.017	1	0.00	$65.60	0	2.68	0.64	
														$/SF
TOTALS					2.59	2.32	0.114	8.00	0.13				11.39	$0.91
WALL UPGRADE - occupancy separation														
5/8" GYP, HANG & TAPE(2 ea.side)	2.0	SF	0.00	0	0.281	0.56	.017	1	0.03	$70.88	2	1.49	2.97	
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$70.88	0.43	0.26	0.53	
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$65.85	1	0.45	0.89	
BATT INSULATION- ACOUSTICAL	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74	
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18	
														$/SF
TOTALS					0.74	1.10	0.063	5.00	0.06				5.31	$0.42
STAIR TOWER WALL	not including metal siding finish													
PLYWOOD SHEATHING	1.0	SF	0.00	0	1.250	1.25	.010	1	0.01	$65.60	1	1.91	1.91	
8" x 18 ga METAL STUD 24" OC	1.0	SF	0.00	0	1.000	1.00	.025	1	0.15	$65.60	10	10.84	10.84	
														$/SF
TOTALS					2.25	2.25	0.035	2.00	0.16				12.75	$1.02
EPDM ROOFING														
EPDM 60 MILS	1.0	SF	0.00	0	2.500	2.50	.028	1	0.03	$62.97	2	4.26	4.26	
ADHESIVE/FASTENERS	1.0	SF	0.00	0	0.011	0.01	.000	1	0.00	$62.97	0	0.02	0.02	
RECOVERY BOARD	1.0	SF	0.00	0	0.281	0.28	.003	1	0.00	$62.97	0	0.47	0.47	
INSULATION (R-38) 10" (under deck)	1.0	SF	0.00	0	2.500	2.50	.008	1	0.01	$62.97	1	3.00	3.00	
VAPOR RETARDER (under deck)	1.0	SF	0.00	0	0.06	0.06	.004	1	0.0	$62.97	0	0.31	$0	
ICE & WATER SHIELD	1.0	SF	0.00	0	0.300	0.30	.300	1	0.03	$62.97	2	2.19	2.19	
														$/SF
TOTALS					5.65	5.65	0.343	6.00	0.07				10.26	$0.82

METAL ROOFING at canopies

METAL ROOFING (24 GA)	1.0	SF	0.00	0	2.500	2.50	.034	1	0.03	$62.97	2	4.64	4.64	
RECOVERY BOARD	1.0	SF	0.00	0	0.281	0.28	.003	1	0.00	$62.97	0	0.47	0.47	
PLYWOOD SHEATHING	1.0	SF	0.00	0	0.390	0.39	.011	1	0.01	$65.60	1	1.11	1.11	
ICE & WATER SHIELD	1.0	SF	0.00	0	0.300	0.30	.300	1	0.03	$62.97	2	2.19	2.19	
														$/SF
TOTALS					3.47	3.47	0.348	4.00	0.08				8.41	$0.67

DRAFT CURTAIN

METAL SIDING	1.0	SF	0.00	0	5.000	5.00	.031	1	0.03	$65.60	2	7.03	7.03	
METAL STUDS	1.0	SF	0.00	0	0.720	0.72	.025	1	0.03	$65.60	2	2.36	2.36	
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18	
														$/SF
TOTALS					5.74	5.72	0.086	3.00	0.06				9.57	

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT — PREPARED BY: JMM
DESCRIPTION: CIVIL — BASE BID HANGER 3, HANGAR 2 SIMILAR — FOR: NJD

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR

SUMMARY OF COSTS

GENERAL CONTRACTOR

DESCRIPTION	%	EQUIPMENT COSTS	MATERIAL COSTS	LABOR HOURS	LABOR COSTS	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB		$0	$413,988	4.00	$760	$414,748
REGIONAL COST FACTOR	10%		$41,399			$41,399
FREIGHT	10%		$41,399			$41,399
OVERTIME / STAGING	12.5%				$ 95.00	$95
COMPLEXITY	15%				$114	$114
	SUBTOTAL	$0	$496,786		$969	$497,755
CONSTRUCTION INSPECTIONS	1 DAY			$520.00		$520
CONTRACTOR OVER HEAD	15%					$74,663
	SUBTOTAL					$572,938
CONTRACTOR PROFIT	10%					$57,294
	SUBTOTAL					$630,232
TOTAL ESTIMATED COST						$630,232

COST ESTIMATE

PROJECT: FT WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT — PREPARED BY: JMM
DESCRIPTION: CIVIL — BASE BID HANGER 3, HANGAR 2 SIMILAR — FOR: NJD

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
DIRECT COSTS BY CSI DIVISIONS													
DIVISION 1													
SURVEYING, 3-MAN CREW	4.0	HR	0.00	0	0.00	0	1.000	1	4.00	$190.00	760	190.00	$760
SUBTOTAL				$0		$0			4.00		$760		$760
DIVISION 2 - SITE WORK													
02200 DEMOLITION													
SAWCUT ASPHALT PAVING(3")	1,200.0	LF	0.00	0	0.95	1,140	.000	1	-	$75.50	0	0.95	$1,140
DEMO ASPHALT PAVING	18,667.0	SY	0.00	0	6.70	125,069	.000	1	-	$75.50	0	6.70	$125,069
02510 WATER DISTRIBUTION													
6" DUCTILE IRON WATER MAIN	300.0	LF	0.00	0	26.68	8,004	.000	1	-	$75.50	0	26.68	$8,004
HYDRANT INSTALLATION	3.0	EA	0.00	0	1420.00	4,260	.000	1	-	$75.50	0	1,420.00	$4,260
02700 BASES AND PAVEMENTS													
2740 - FLEXIBLE PAVEMENT													
D1, PARKING, SPRD, COM, GRAD	1,556.0	CY	0.00	0	13.02	20,259	.000	1	-	$75.50	0	13.02	$20,259
ASPHALT PAVING, 3", [PARKING LOT	168,000.0	SF	0.00	0	1.18	198,240	.000	1	-	$75.50	0	1.18	$198,240
PARKING PAINT STRIPING, 4"	5,800 0	LF	0.00	0	0.27	1,566	.000	1	-	$75.50	0	0.27	$1,566
PAVEMENT MK, HNDCP, SYMB	0.0	EA	0.00	0	70.49	0	.000	1	-	$75.50	0	#DIV/0!	$0
2800 - SITE IMPROVEMENTS													
FENCE, CHAIN LINK, 6' ASSY.	1,600.0	LF	0.00	0	32.45	51,920	.000	1	-	$75.50	0	32.45	$51,920
GATE, 4' WIDE, 5' HIGH, 2" FRAME, G	3.0	EA	0.00	0	324.50	974	.000	1	-	$75.50	0	324.50	$974
LINE POST, 6'X 2 1/2" SET IN CONC.	53.0	EA	0.00	0	48.24	2,557	.000	1	-	$75.50	0	48.24	$2,557
SUBTOTAL				$0		$413,988			-		$0		$413,988
TOTAL DIRECT COST				$0		$413,988			4.00		$760		$414,748

CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: MECHANICAL ESTIMATE SUMMARY LIST

PREPARED BY: RJR
FOR: JMM

21-Dec-07

MECHANICAL ESTIMATE SUMMARY

NOTE THAT GENERAL CONTRACTOR MARK UPS ARE ITEMIZED UNDER ARCHITECTURAL SUMMARY

ITEMIZED COMPONENT ESTIMATES	
OFFICE / SHOP HYDRONIC SYSTEM INCLUDING CONTROLS	$660,000.00
HANGAR BAY VENTILATION	$414,028.00
UNDERFLOOR PIPING REPLACEMENT	$152,985.00
ABOVE GRADE PLUMBING REPLACEMENT	$225,095.00
TOTAL FOR SINGLE HANGAR	$1,452,108.00

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: OFFICE VENTILATION

PREPARED BY: JMM
CHECKED BY: RJR

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$0			0.00		$0		$0
REGIONAL FACTOR (MEANS)	10.0%				$0							$0
FREIGHT	10.0%				$0							$0
OVERTIME	12.5%									$0		$0
COMPLEXITY	15.0%									$0		$0
SUBTOTAL			$0		$0					$0		$0
CONTRACTORS OVERHEAD	15.0%											$0
CONTRACTORS PROFIT	15.0%											$0
SUBTOTAL												$0
MECHANICAL CONTRACT TOTAL												**$660,000**

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
ESTIMATE NOTES	SQ.FT	COST/SQ.FT						TOTAL				
OFFICE / SHOP VENTILATION INCLUDING CONTROLS	20000	$33						"$660,000				
COLUMN TOTALS:			**$0**		**$0**			**0.00**		**$0**		**$0**

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: HANGAR BAY VENTILATION

PREPARED BY: JMM
CHECKED BY: RJR
21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$87,606			########		$167,338		$254,944
REGIONAL FACTOR (MEANS)	10.0%				$8,761							$8,761
FREIGHT	10.0%				$8,761							$8,761
OVERTIME	12.5%									$20,917		$20,917
COMPLEXITY	15.0%									$25,101		$25,101
SUBTOTAL			$0		$105,127					$213,357		$318,483
CONTRACTORS OVERHEAD	15.0%											$47,772
CONTRACTORS PROFIT	15.0%											$47,772
SUBTOTAL												$414,028
MECHANICAL CONTRACT TOTAL												**$414,028**

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
EQUIPMENT												
16,000 CFM SUPPLY FAN	2 Each	$0	$0	$23000	$46,000	200.00	1	400	$67.82	$27,130	36564.9	$73,130
8,000 CFM PROPELLER FAN	4 Each	$0	$0	$2700	$10,800	30.00	1	120	$67.82	$8,139	4734.7	$18,939
ELECTRICAL CONNECTION	6 Each	$0	$0	$500	$3,000	30.00	1	180	$67.82	$12,208	2534.7	$15,208
18" SUPPLY FAN PLATFORM	2 Each	$0	$0	$500	$1,000	40.00	1	80	$67.82	$5,426	3213.0	$6,426
PIPING												
2" TYPE 'L' COPPER	240 Lin.Ft	$0	$0	$15.71	$3,771	0.19	1	45.60	$69.06	$3,149	28.8	$6,920
FITTINGS	1 Elbow/20'		$0	$0.95	$227	0.40	1	4.80	$69.06	$331		$559
3" BLACK STEEL	600 Lin.Ft	$0	$0	$14.50	$8,697	0.37	1	223.20	$69.06	$15,413	40.2	$24,110
FITTINGS	1 Elbow/20'		$0	$26.65	$800	2.30	1	69.00	$69.06	$4,765		$5,564
2" HYDRONIC INSULATION	240 Lin.Ft	$0	$0	$2.77	$665	0.09	1	22	$63.60	$1,374	8.5	$2,039
FITTINGS	15% Allow		$0		$100		1	3	$63.60	$206		$306
3" HYDRONIC INSULATION	600 Lin.Ft	$0	$0	$3.54	$2,124	0.10	1	60	$63.60	$3,816	9.9	$5,940
FITTINGS	15% Allow		$0		$319		1	9	$63.60	$572		$891
DUCTWORK												
36" dia.	400 Lin.Ft	$0	$0	$7.75	$3,100	1.55	1	620	$67.82	$42,051	112.9	$45,151
110" SEMI-PERIMETER	80 Lin.Ft	$0	$0	$33.67	$2,693	3.13	1	250	$67.82	$16,963	245.7	$19,656
2" RIGID INSULATION	1500 Sq.Ft	$0	$0	$1.26	$1,890	0.13	2	390	$63.60	$24,804	17.8	$26,694
12"X48" SUPPLY REGISTERS	20 Each	$0	$0	$121	$2,420	0.73	1	15	$67.82	$990	170.5	$3,410
COLUMN TOTALS:			**$0**		**$87,606**			**2491.14**		**$167,338**		**$254,944**

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: UNDERFLOOR PIPING REPLACEMENT

PREPARED BY: JMM
CHECKED BY: RJR

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$45,750			722.60		$49,240		$94,990
REGIONAL FACTOR (MEANS)	10.0%				$4,575							$4,575
FREIGHT	10.0%				$4,575							$4,575
OVERTIME	12.5%									$6,155		$6,155
COMPLEXITY	15.0%									$7,386		$7,386
SUBTOTAL			$0		$54,900					$62,781		$117,680
CONTRACTORS OVERHEAD	15.0%											$17,652
CONTRACTORS PROFIT	15.0%											$17,652
SUBTOTAL												$152,985
MECHANICAL CONTRACT TOTAL												**$152,985**

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
WASTE & VENT SYSTEM												
PIPING												
4" CAST IRON	600 Lin.Ft	$0	$0	$16.33	$9,800	0.29	1	174.60	$69.06	$12,057	36.4	$21,857
FITTINGS	1 Elbow/20'		$0	$1.13	$677	0.40	1	12.00	$69.06	$829		$1,506
TRENCH DRAIN	200 Lin.Ft	$0	$0	$96	$19,200	1.00	1	200	$67.82	$13,565	163.8	$32,765
CONCRETE DEMO	2800 Sq.Ft	$0	$0	$0.24	$672	0.06	1	168	$67.82	$11,395	4.3	$12,067
CONCRETE PATCH & TRENCH	2800 Each	$0	$0	$5.5	$15,400	0.06	1	168	$67.82	$11,395	9.6	$26,795
COLUMN TOTALS:			**$0**		**$45,750**			**722.60**		**$49,240**		**$94,990**

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: ABOVE GRADE PLUMBING REPLACEMENT

PREPARED BY: JMM
CHECKED BY: RJR

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$37,887			########		$100,145		$138,032
REGIONAL FACTOR (MEANS)	10.0%				$3,789							$3,789
FREIGHT	10.0%				$3,789							$3,789
OVERTIME	12.5%									$12,518		$12,518
COMPLEXITY	15.0%									$15,022		$15,022
SUBTOTAL			$0		$45,464					$127,685		$173,150
CONTRACTORS OVERHEAD	15.0%											$25,972
CONTRACTORS PROFIT	15.0%											$25,972
SUBTOTAL												$225,095
MECHANICAL CONTRACT TOTAL												**$225,095**

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: ABOVE GRADE PLUMBING REPLACEMENT

PREPARED BY: JMM
CHECKED BY: RJR
21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
PLUMBING FIXTURES												
TANK, WALL, 1 PIECE	3 Each	$0	$0	$579.84	$1,740	10.20	3	91.80	$69.06	$6,339	2693.0	$8,079
FLUSH VALVE, WALL	4 Each	$0	$0	$410.45	$1,642	13.40	3	160.80	$69.06	$11,104	3186.5	$12,746
WALL HUNG LAV	4 Each	$0	$0	$853.47	$3,414	12.00	3	144.00	$69.06	$9,944	3339.5	$13,358
SERVICE, FLOOR, STONE	2 Each	$0	$0	$650.20	$1,300	16.30	3	97.80	$69.06	$6,754	4027.0	$8,054
WALL SS, SINGLE COOLER	2 Each	$0	$0	$963.57	$1,927	10.00	3	60.00	$69.06	$4,143	3035.3	$6,071
SHOWER	2 Each	$0	$0	$865.19	$1,730	16.00	3	96.00	$69.06	$6,629	4179.9	$8,360
7360 BT EYEWASH, SS	1 Each	$0	$0	$183.72	$184	8.00	2	16.00	$69.06	$1,105	1288.6	$1,289
8300 SHOWER/EYEWASH, SS	4 Each	$0	$0	$658.02	$2,632	8.00	2	64.00	$69.06	$4,420	1762.9	$7,052
9202 TEMPERING VALVE	2 Each	$0	$0	$1,710.00	$3,420	4.00	2	16.00	$69.06	$1,105	2262.4	$4,525
TEMPERING VALVE PANEL	2 Each	$0	$0	$510.00	$1,020	2.00	2	8.00	$69.06	$552	786.2	$1,572
DOMESTIC WATER MAINS												
1" TYPE 'L' COPPER	200 Lin.Ft	$0	$0	$5.88	$1,176	0.12	1	23.60	$69.06	$1,630	14.0	$2,806
FITTINGS:	1 Elbow/20'		$0	$4.05	$41	0.50	1	5.00	$69.06	$345		$386
2" TYPE 'L' COPPER	150 Lin.Ft	$0	$0	$16.64	$2,496	0.19	1	28.50	$69.06	$1,968	29.8	$4,464
FITTINGS:	1 Elbow/20'		$0	$17.33	$130	0.73	1	5.45	$69.06	$377		$507
2 1/2" GALV. STEEL	200 Lin.Ft	$0	$0	$18.40	$3,679	0.26	1	51.60	$69.06	$3,563	36.2	$7,242
FITTINGS:	1 Elbow/20'		$0	$12.68	$127	0.89	1	8.89	$69.06	$614		$741
COMPRESSED AIR PIPING												
3/4" BLACK STEEL	480 Lin.Ft	$0	$0	$2.73	$1,310	0.13	1	62.88	$69.06	$4,342	11.8	$5,653
FITTINGS	1 Elbow/20'		$0	$4.11	$99	0.57	1	13.70	$69.06	$946		$1,045
2" BLACK STEEL	550 Lin.Ft	$0	$0	$8.32	$4,576	0.25	1	137.50	$69.06	$9,495	25.6	$14,071
FITTINGS	1 Elbow/20'		$0	$14.56	$400	0.89	1	24.48	$69.06	$1,690		$2,091
FIXTURE PIPING												
3/4" TYPE 'L' COPPER	300 Lin.Ft	$0	$0	$4.11	$1,233	0.11	3	94.50	$69.06	$6,526	25.9	$7,759
FITTINGS:	1 Elbow/20'		$0	$1.62	$24	0.42	1	6.32	$69.06	$436		$460
1" TYPE 'L' COPPER	300 Lin.Ft	$0	$0	$5.88	$1,764	0.12	3	106.20	$69.06	$7,334	30.3	$9,098
FITTINGS:	1 Elbow/20'		$0	$4.05	$61	0.50	1	7.50	$69.06	$518		$579
INSULATION - HYDRONIC SYSTEM												
1" CW INSULATION	200 Lin.Ft	$0	$0	$1.20	$240	0.08	2	32	$63.60	$2,035	11.4	$2,275
FITTINGS	15% Allow		$0		$36		1	5	$63.60	$305		$341
2" CW INSULATION	250 Lin.Ft	$0	$0	$2.77	$693	0.09	2	45	$63.60	$2,862	14.2	$3,555
FITTINGS	15% Allow		$0		$104		1	7	$63.60	$429		$533
2 1/2" CW INSULATION	200 Lin.Ft	$0	$0	$3.00	$600	0.09	2	36	$63.60	$2,290	14.4	$2,890
FITTINGS	15% Allow		$0		$90		1	5	$63.60	$343		$433
COLUMN TOTALS:			**$0**		**$37,887**			**1460.47**		**$100,145**		**$138,032**

CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: FIRE PROTECTION ESTIMATE SUMMARY LIST

PREPARED BY: RJR
FOR: JMM

21-Dec-07

FIRE SUPPRESSION SYSTEM ESTIMATES

NOTE THAT GENERAL CONTRACTOR MARK UPS ARE ITEMIZED UNDER ARCHITECTURAL SUMMARY

FIRE SUPPRESSION SYSTEM	$464,600.00
FIRE WATER DRAINAGE	$143,713.00
TOTAL FOR SINGLE HANGAR	$608,313.00

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: FIRE SUPPRESSION SYSTEM

PREPARED BY: RJR
CHECKED BY: RJR
21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$0			0.00		$0		$0
REGIONAL FACTOR (MEANS)	10.0%				$0							$0
FREIGHT	10.0%				$0							$0
OVERTIME	12.5%									$0		$0
COMPLEXITY	15.0%									$0		$0
SUBTOTAL			$0		$0					$0		$0
CONTRACTORS OVERHEAD	15.0%											$0
CONTRACTORS PROFIT	15.0%											$0
SUBTOTAL												$0
MECHANICAL CONTRACT TOTAL												**$464,600**

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
ESTIMATE NOTES												
FIRE SUPPRESSION COST BASED ON HANGAR 267 CONTRACT PRICE TO GENERAL CONTRACTOR AND ADJUSTED FOR SQUARE FOOTAGE DIFFERENCES AND FOR REUSE OF EXISTING WET SYSTEM PROTECTING OFFICE SHOP AREA. SPRINKLER PROTECTION ADDED ABOVE OFFICE SHOP AREA IN COMBUSTABLE LEAN TO AREA. COMMERCIAL RATE OF $4.00 PER SQ.FT USED FOR ADJUSTMENT AN ADDITIONAL 15% FACTOR WAS INCLUDED TO ACCOUNT FOR DEMOLITION COSTS AND FOR WORK IN AN EXISTING FACILITY.											
ABOVE COSTS INCLUDE BOTH A DIESEL FIRE PUMP AND ELECTRIC FIRE PUMP TO BE INSTALLED IN BUILDING BUILDING 3011. ABOVE COSTS DO NOT INCLUDE FIRE WATER TANK. EXISTING 500,000 GALLON FIRE WATER TANK TO BE REUSED.												
COLUMN TOTALS:			**$0**		**$0**			**0.00**		**$0**		**$0**

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 &3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: FIRE WATER DRAINAGE

PREPARED BY: RJR
CHECKED BY: RJR
21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		$42,400			690.00		$46,799		$89,199
REGIONAL FACTOR (MEANS)	10.0%				$4,240							$4,240
FREIGHT	10.0%				$4,240							$4,240
OVERTIME	12.5%									$5,850		$5,850
COMPLEXITY	15.0%									$7,020		$7,020
SUBTOTAL			$0		$50,880					$59,669		$110,549
CONTRACTORS OVERHEAD	15.0%											$16,582
CONTRACTORS PROFIT	15.0%											$16,582
SUBTOTAL												$143,713
MECHANICAL CONTRACT TOTAL												**$143,713**

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL DIRECT COST ITEM	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
PIPING												
10" DUCTILE IRON	500 Lin.Ft	$0	$0	$44	$22,000	0.60	1	300	$67.82	$20,347	84.7	$42,347
14" SLEAVE AT RD CROSSING	50 Lin.Ft	$0	$0	$100	$5,000	0.60	3	90	$67.82	$6,104	222.1	$11,104
UTILIDOR CROSSING	1 Each	$0	$0	$10000	$10,000	100.00	3	300	$67.82	$20,347	30347.4	$30,347
ASPHALT DEMO/REPLACE	1800 Sq.Ft	$0	$0	$3	$5,400	0.00	1	0	$67.82	$0	3.0	$5,400
COLUMN TOTALS:			**$0**		**$42,400**			**690.00**		**$46,799**		**$89,199**

CONSTRUCTION COST ESTIMATE

PROJECT: FTW HANGARS 2 & 3
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: ELECTRICAL

PREPARED BY: EDR
CHECKED BY:

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					TOTAL	
ESTIMATE ELECTRICAL SUBCONTRACTOR	No. UNITS	UNIT PRICE	EQUIP COST	UNIT PRICE	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB			$8,450		$570,537			9,362		$621,455		$1,191,992
REGIONAL FACTOR (MEANS)	10.0%				$57,054							$57,054
FREIGHT	12.0%				$68,464							$68,464
OVERTIME	12.5%									$77,682		$77,682
COMPLEXITY	15.0%									$93,218		$93,218
SUBTOTAL			$8,450		$696,055					$792,355		$1,496,860
CONTRACTORS OVERHEAD	15.0%											$224,529
CONTRACTORS PROFIT	15.0%											$224,529
SUBTOTAL												$1,945,918

DIVISION 16 - ELECTRICAL													
REPLACE PANELBOARDS													
PANELBOARDS, 200A, 208Y/120V	12	Each	$0	$0	$1,925.00	$23,100	28.57	1	343	$66.38	$22,758	$3,821.48	$45,858
FEEDERS, (4) 4/0, 2-1/2" RSC	3,000	Lin.Ft	$0	$0	$27.14	$81,420	0.37	1	1123	$66.38	$74,566	$52.00	$155,986
LIGHTING													
HANGAR LIGHTING, 400W MH	338	Each	$25	$8,450	690.00	$233,220	5.00	1	1690.0	$66.38	112,182	$1,021.90	$345,402
OFFICE LIGHTING	480	Each	$0	$0	110.00	$52,800	3.40	1	1632.0	$66.38	$108,332	$335.69	$161,132
EMERGENCY LIGHTING	64	Each	$0	$0	180.00	$11,520	3.00	1	192.0	$66.38	12,745	$379.14	$24,265
EXIT SIGNS	48	Each	$0	$0	160.00	$7,680	3.00	1	144.0	$66.38	$9,559	$359.14	$17,239
EXTERIOR LIGHTING	1	L.S.	$0	$0	20,000.00	$20,000	400.00	1	400.0	$66.38	$26,552	$46,552.00	$46,552
WIRING	1	L.S.	$0	$0	40,000.00	$40,000	680.00	1	680.0	$66.38	$45,138	$85,138.40	$85,138
REPLACE WIRING DEVICES													
20A, 120V OUTLET W/ COVERPLATE	480	Each	$0	$0	10.68	$5,126	0.40	1	190.1	$66.38	12,618	$36.97	$17,744
20A, 120V LIGHT SWITCH W/ COVER	96	Each	$0	$0	8.95	$859	0.40	1	38.0	$66.38	$2,524	$35.24	$3,383
COMMUNICATIONS													
COMMUNICATIONS RACK	4	EA	$0	$0	3,300.00	$13,200	48.00	1	192.0	$66.38	12,745	$6,486.24	$25,945
CAT 5E WIRING	768	C.L.F.	$0	$0	15.30	$11,750	1.14	1	877.8	$66.38	58,270	$91.17	$70,020
DATA OUTLETS	380	EA	$0	$0	0.95	$361	2.00	1	760.0	$66.38	50,449	$133.71	$50,810
FIRE ALARM SYSTEMS													
FIRE ALARM SYSTEMS	1	L.S.	$0	$0	48,000.00	$48,000	800.00	1	800	$66.38	$53,104	$101,104.00	$101,104
MECHANICAL SYSTEMS EQUIPMENT													
MOTOR STARTERS/DISC SW.	1	L.S.	$0	$0	13,000.00	$13,000	120.00	1	120.0	$66.38	$7,966	$20,965.60	$20,966
WIRING	1	L.S.	$0	$0	8,500.00	$8,500	180.00	1	180.0	$66.38	$11,948	$20,448.40	$20,448
COLUMN TOTALS:				$8,450		$570,537			9,362		$621,455		$1,191,992

11 LAYAWAY PLAN

11.1 INTRODUCTION

As part of the Condition Assessment and Rehabilitation Plan (CARP) for Hangars 2 and 3, the design team was tasked with developing a Layaway Plan in accordance with military guidelines or procedures for buildings that do not currently meet mission needs. The Layaway Plan for each hangar includes a listing and description of immediate repairs needed for life safety, fire protection, structural repairs, mechanical repairs and electrical repairs in order to ensure that the buildings are safeguarded while not being actively used. The Layaway Plan for each hangar includes a cost estimate.

As part of the investigation related to the development of this document, a search was undertaken to determine if any Layaway Plans have been developed for other cold-weather military installations. There are no known Layaway Plans for U.S. Army facilities. However, the U.S. Navy has published a Unified Facilities Criteria (UFC) document entitled "Operation and Maintenance: Inactive Care and Closure of Shore Facilities," (Document UFC 4-911-01N, dated 16 January 2004). This document defines four different types of layaway:

1. *Inactive* layaway
   a. physical condition - ready for use
   b. reactivation time - 0 to 72 hours
   c. length of inactivity - 0 to 3 years
   d. level of maintenance – maintain economically to ensure full, safe and support and to fulfill facility mission for duration of facility life or mission.
   e. inspection category and frequency – quarterly PM; control inspection as required.
2. *Standby* layaway
   a. physical condition – preserved, unused, stand-by
   b. reactivation time – 60 to 90 days (in some cases, long lead time items such as major equipment purchases may require additional time).
   c. length of inactivity – 3 to 5 years
   d. level of maintenance – limited maintenance on basis of planned remaining useful life. Eliminate fire, health, and safety hazards. Patch and reinforce instead of replacing wherever economical. Consider breakdown maintenance.
   e. inspection category and frequency – control inspection annually
3. *Reserve* layaway
   a. physical condition – cannibalized; minimal upkeep
   b. reactivation time – 12 to 18 months (in some cases, long lead time items such as major equipment purchases may require additional time).
   c. length of inactivity – 5 to 7 years

d. level of maintenance – limited maintenance to ensure weathertightness, structural stability, protection from fire or erosion, elimination of safety or health hazards, and to permit reactivation within the period prescribed under mobilization plan.
e. inspection category and frequency – control inspection annually

4. A*bandoned/closed* layaway
   a. physical condition – unusable
   b. reactivation time - none, replace
   c. length of inactivity – permanent
   d. level of maintenance – eliminate fire, safety and health hazards. Prevent pilferage or loss of items affecting final disposal action.
   e. Inspection category and frequency – no inspection or maintenance; avoid expenditure of resources on the facility.

For the purposes of this report, it shall be assumed that the *Reserve* Layaway, with a Reactivation Time of 12 to 18 months and a Length of Inactivity of 5 to 7 years is appropriate. This classification stipulates a specific limited level of maintenance to ensure weathertightness, structural stability, protection from fire or erosion, elimination of safety or health hazards, and to permit reactivation within the period prescribed under mobilization plan.

Members of the consultant team who contributed to this section of the report are: Adam Matteo, P.E., Principal Structural Engineer of Ammann & Whitney; Janet M. Matheson, A.I.A., L.E.E.D., Architect of Design Alaska, Inc.; James Bartlett, A.I.A., Architect of Design Alaska, Inc.; Robin J. Rader, P.E., Mechanical Engineer of Design Alaska, Inc.; Evan Roberts, P.E., of Roberts-Kaneko Electrical Consultants, Inc.; and John R. Bowie, A.I.A., Historical Architect of John Bowie Associates.

11.2 DESIGN PARAMETERS OF THE LAYAWAY PLAN

Hangars 2 and 3 have been kept in a heated, maintained state since their initial construction in the 1940s. By being kept heated, the interior environments in both the support bays and the hangar bays contain a certain amount of moisture which typically gets absorbed into the finishes and surfaces of plaster and drywall ceilings and walls. Likewise, the relatively heated environment of the hangar bays enables the fire protection systems for both the helicopters and the building elements to remain functional. In addition, there are limited amounts of moisture in the wooden roof framing members (trusses, collars, purlins, and so on) that do not get exposed to the harshness of freezing while the buildings are kept heated. Finally, there is a certain amount of moisture in the partially thawed earthen sub-grade beneath the concrete floor slabs, both in the hangar bays and in the flanking support bays. Because this earthen sub-grade has been kept above freezing temperatures all these years, the concrete slabs have been subjected to only limited amounts of heaving, cracking, displacement and settlement (outlined in Tab 3 of this report).

If either Hangar were placed in layaway without a certain minimum amount of heat during the winter months, the following adverse conditions would occur – most likely within the first winter or two:

- Architectural finishes on plaster and drywall surfaces would degrade, crack and spall off the substrates due to the freezing of moisture within the materials; many of the finishes in the support bays would be damaged;

- All fire protection elements – particularly the sprinkler systems serving the buildings, would be completely shut off and fully drained – dramatically increasing the exposure of the buildings to fire;

- Thermal expansion and contraction in the roof framing system would place the trusses at risk of failure. The timber trusses have been heavily retrofitted with steel plates and tensioning rods. Steel and timber have vastly different coefficients of thermal expansion. If the structures were left unheated, they would experience unprecedented fluctuations in temperature, which would expose the steel and timber members to unacceptably high thermal stresses. This would jeopardize the timber members adjacent to the steel. The lack of redundancy within the timber trusses means that joint failure in a particular location could lead to a progressive failure of the damaged trusses.

- Concrete foundations and floor slabs would be susceptible to heaving and cracking. During the investigation for this project, borings could not be taken directly below the footings; however, the boring taken adjacent to the footings showed evidence of susceptibility to frost heave. Frost heave could cause large movements of the footings, which in turn, could cause commensurate movement of the building's frames. Floor slabs, while non-structural, could heave, crack, and lose functionality in a matter of several seasons if the structure were left unheated.

For the hangars to be effectively, safely, and properly placed into layaway, they should be kept at a reasonable, above-freezing temperature. It is recommended that the temperature at the floor level of the hangar bays be kept at a minimum of 45 degrees F., in order to provide an appropriate amount of time to provide a response and to effect repairs to the heating system should it malfunction or break during the winter.

In addition, as part of the layaway, the following are recommended (in addition to the life safety and code compliance work to be outlined): a) the hangar bay doors should be insulated with a temporary insulation system to reduce the amount of heat loss, and b) a DDC monitoring system should be installed, including low-temperature sensors placed in several locations along the floor in the hangar bay to provide notification when the indoor temperature drops below a pre-determined level.

Finally, it is important to stipulate that all layaway work affecting historic materials, surfaces and finishes shall be undertaken in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* to preserve said historic materials, surfaces and finishes. No work shall be performed that would compromise the historic character or integrity of the buildings or their features without review and approval of the relevant agencies, including but not

limited to the State Historic Preservation Office (AK SHPO) and the National Park Service (NPS).

11.3 NECESSARY WORK ITEMS ASSOCIATED WITH THE LAYAWAY

These are the first and second priority issues (life safety issues and building code issues, respectively) that directly and immediately affect the safety of any person who might be inside either hangar at any time while it is in layaway, as well as issues that specifically affect the hangars. Some of the issues are derived from Tab 1, the Summary Recommendations and Cost Estimate.

It is important to note that only certain life safety and building code items are listed herein – because the hangars will not be occupied, they do not need to be fully upgraded to current life safety standards for public buildings. It is equally important to note, however, that all deferred life safety and code compliance upgrades will need to be put into place when the hangars are placed back on the active use list.

Third priority (energy conservation) issues and fourth priority (historic integrity, preservation and maintenance) issues are not included as part of the layaway plan. These items are appropriate to keeping the buildings in well-maintained and fully-operational condition; however, they are not necessary for a layaway plan.

Items Required for Inactivation:

Architectural

- Life Safety: Repair exit doors & frames, and rated walls, doors & hardware to provide safe exiting from interior spaces into the hangar area and through at-grade exit doors to the outside. Exit doors to the stair towers to be permanently locked, and opening at base of stair towers closed to prevent entry or egress.

- Life Safety: Barricades to be installed to catwalks and exterior balconies; no unauthorized egress to these areas except for maintenance personnel. Provide signage on building closure.

- Building Envelope: Repair any broken glazing and board over exterior windows on the outside.

- Code Compliance: Close off all interior openings in the walls between the hangar bay and 1st or 2nd floor support bay rooms or attics.

- Roofs: Inspect roof membranes and patch existing roof membranes where required. Acquire extended warranty from roof installer.

- Repair eaves, fascias, & canopies to provide correct drainage of water onto aprons.

- Patch all cracks in concrete slabs with appropriate mortar to maintain waterproof condition. Repair failed caulking at door frames, window frames or other exterior joints.

- Construct a removable, temporary insulated thermal barrier on the interior of each large hangar door in both buildings to provide insulation and reduce heat loss.

- Identify, remove and store all unused equipment and accessories from the buildings. All hazardous wastes, flammable materials, explosives or fuels should be removed to an appropriate storage facility.

Civil

- Life Safety: Install new fire hydrants around exterior of the two hangars, number as required by code.

Fire Protection

- Life Safety: Upgrade and expand the existing fire suppression system to include new coverage in the area above the second floor ceilings on both support bays for each hangar. For the layaway, it is not necessary to replace the existing deluge fire suppression system above the hangar bay in each building with a new AFFF suppression system; nor is it necessary to upgrade or replace the fire pumps in Building 3011 to provide 140 psi rated pressure.

Mechanical

- Provide DDC monitoring system, including low temperature monitors, which would annunciate back to Fort Wainwright's existing central control station.
-
- Close all HVAC openings in the building envelope (eg – remove existing bathroom exhaust fans and patch penetrations).

Electrical

- Replace all exit signs and increase the number of emergency lights employed throughout the building.

Items Required for Caretaker Maintenance:
(Costs to be assumed by Fort Wainwright)

- Roof repairs, as needed.
- Regular security patrols.
- Deactivate all building utility systems not used for minimal inspections, operation/maintenance, or fire protection. Steam heat, fire water, power and communication services to be continued, maintained, and monitored. Maintain cathodic protection for underground utility systems and tanks, and sanitary and storm sewer systems as for active facilities.

- Pest management precautions:
  - Seal openings, install self closing access doors, and install utilidor control barriers.
  - Enclose or screen all roof soffits, eaves, and vents. Enclose or screen all wall vents or other openings.

11.4 INSPECTION AND MAINTENANCE ISSUES ASSOCIATED WITH THE LAYAWAY

A monitoring and inspection program for the building structure would need to be developed. This would entail a thorough examination of the building systems of each hangar on a regular basis. Checklists and inspection schedules would need to be developed to ensure that no significant deterioration of the structures was taking place during the layaway period. During the inspection for this report, there were no emergency repairs identified that would be required prior to the layaway period. However, there are areas of susceptibility that require regular inspection. These areas would need to be incorporated into the inspection checklist.

The inspection and maintenance issues outlined in the *Reserve Layaway* category (described above) specify an annual control inspection. Ordinarily, this would be appropriate for the routine inspection of a building not located in such a harsh climate. However, since the integrity of the hangars is dependent on the proper functioning of the exterior materials, structural framing elements and fire suppression/detection components, it is recommended that visual inspections be conducted on a quarterly basis. Every three months, a visual inspection should be conducted by a professional engineer or registered architect, licensed in the State of Alaska. These visual inspections should include the site around each building, plus the entire roof, cornices, exterior walls, windows, and doors. On the interior, each visual inspection should include structural roof framing and trusses, as well as floor areas for evidence of water infiltration.

Each year, the fire suppression and detection systems should be totally inspected, cleaned and tested in accordance with the standards of NFPA 13 and 72 by a firm with at least eight years of demonstrated maintenance/upkeep experience in similarly-sized/configured systems. It is crucial that the fire suppression and detection components in the buildings be fully maintained and kept up-to-date.

Maintenance on the general exterior elements of the building should be undertaken on an as-needed basis, depending on the findings of the inspections. In general, maintenance should consist of those measures necessary to keep the buildings watertight (i.e. replacing broken glass, caulking and patching cracks and openings – especially at the cornice lines and where the siding covers portions of the windows on the first and second floors), and sound (i.e. where the covered porches attach to the north and south elevations of the hangars). All repairs should be performed in such a manner as to not damage or further alter the historic character of the buildings.

On the interior of the building, maintenance should also be undertaken on an as-needed basis on those elements that affect the life safety of persons who occasionally enter the buildings (for any reason – with or without permission), including, but not limited to replacing lamps, checking and cleaning emergency light systems and exit lights, and the operability of panic hardware on doors. Scheduled maintenance should also be performed on all furnaces, blowers, fan units, pumps, and operating components of the heating system. In addition, the inspection and maintenance protocol should include careful examination for pests, such as mice, birds, insects, and other types

of vermin that can damage wiring or insulation (thus creating a fire hazard) and spread respiratory illnesses to persons in the buildings.

Required Periodic Inspections

1. Roofs, joints at door & window frames, other caulked exterior joints.
2. Major building systems, after severe storms or earthquakes.
3. Roof trusses.
4. Operate motors & generators under light load for two hours each month.
5. Check HVAC controls and moving parts twice yearly to prevent corrosion damage.
6. Inspect traps and flush; test main valves in water & sanitation systems.
7. Maintain storm sewers and drainage ditches adjacent to buildings.
8. Maintain force protection setback requirements.
9. Test alarm systems quarterly.

11.5 COSTS

A detailed cost estimate follows.

PROJECT CONSTRUCTION COST ESTIMATE

PROJECT: FT.WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: LAYAWAY PLAN - TAB 11 - BASE BID — Prepared by: JB — FOR: JMM

DESCRIPTION	QUANTITY	UNIT		LABOR			TOTAL
GENERAL CONTRACTOR			COST	HRS/ UNIT	LABOR RATE	LABOR COST	
ARCHITECTURAL CONTRACT TOTAL							$297,132
SUBCONTRACTOR WORK							
CIVIL CONTRACTOR			$21,154				$21,154
MECHANICAL CONTRACTOR & FIRE PROTECTION CONTRACTOR			$77,097				$77,097
ELECTRICAL CONTRACTOR			$144,818				$144,818
GEN.CONTRACTOR OH MARKUP	10.0%					$243,069	$24,307
SUBTOTAL							$564,508
GENERAL CONDITIONS	15.0%						$84,676
SUBTOTAL							$649,184
ESTIMATING CONTINGENCY	35.0%						$227,214
SUBTOTAL							$876,398
ESCALATION THRU 2010	15.0%						$131,460
TOTAL ESTIMATED COST							**$1,007,858**

NOTES REGARDING THE PREPARATION OF THIS COST ESTIMATE

THIS ESTIMATE IS PREPARED USING CURRENT CONSTRUCTION COSTS & ASSUMES WILL RECEIVE AN OPEN COMPETITIVE BID.

THIS ESTIMATE DOES NOT CONTAIN AN ALLOWANCE FOR NEGOTIATED NON-COMPETITIVE CONTRACTS.

THIS ESTIMATE HAS AN ESCALATION ALLOWANCE.

THIS ESTIMATE DOES NOT HAVE AN ALLOWANCE TO TREAT / REMOVE ANY HAZARDOUS MATERIALS OR CONTAMINATED SOIL.

THIS ESTIMATE DOES NOT INCLUDE ANY PLAN CHECK FEES CHARGED BY THE STATE OF ALASKA OR ANY OTHER ENTITY CLAIMING JURISDICTION OVER THE WORK PAID DIRECTLY BY THE OWNER.

THIS ESTIMATE DOES NOT INCLUDE THE A/E FEES, SHOP EQUIPMENT OR COSTS FOR ANY WORK NOT INDICATED.

THIS ESTIMATE IS BASED ON A NORMAL WORK WEEK WITH SOME PROVISIONS FOR OVERTIME.

ESTIMATING CONTINGENCY - AN ALLOWANCE FOR CONSTRUCTION DOCUMENT REQUIREMENTS THAT ARE NOT INCLUDED.

EITHER THE 2006 R.S. MEANS FACILITIES CONSTRUCTION COST DATA MANUAL, THE 2006 R.S. MEANS ASSEMBLIES COST DATA MANUAL PAST HISTORICAL DATA HAVE BEEN USED AS RESOURCES TO COMPILE THIS ESTIMATE.

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FT. WAINWRIGHT, ALASKA
PHASE: CONCEPT — PREPARED BY: JB
DESCRIPTION: LAYAWAY PLAN - TAB 11 - BASE BID — FOR: JMM

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR

SUMMARY OF COSTS

GENERAL CONTRACTOR

DESCRIPTION	%	EQUIPMENT COSTS	MATERIAL COSTS	LABOR HOURS	LABOR COSTS	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB		$101	$112,222	1,456.80	$96,947	$209,271
REGIONAL COST FACTOR	10.0%		$11,222			$11,222
FREIGHT	10.0%		$11,222			$11,222
OVERTIME / STAGING	12.5%				$12,118	$12,118
COMPLEXITY	15.0%				$14,542	$14,542
SUBTOTAL		$101	$134,666		$123,608	$258,376
CONTRACTOR OVER HEAD	15%					$38,756
CONTRACTOR PROFIT	10%					$29,713
SUBTOTAL						$297,132
ARCHITECTURAL CONTRACT TOTAL						$297,132

DIRECT COSTS BY CSI DIVISIONS

DIVISION 3 - CONCRETE													
concrete floor - PATCH	10,125.0	sf	0.01	101.25	2.50	25,313	.022	1	222.750	$71.97	16,031	4.09	$41,445
SUBTOTAL				$101		$25,313			222.75		$16,031		$41,445
DIVISION 7 - THERMAL & MOISTURE PROTECTION													
EPDM roof - inspect and patch	7,600.0	SF	0.00	0	2.00	15,200	.015	1	114.00	$65.60	7,479	2.98	$22,679
EPDM roof - extended warranty	1.0	LS	0.00	0	5000.00	5,000	.000	1	-	$65.60	0	5,000.00	$5,000
Roof fascia - repair	1,500.0	LF	0.00	0	2.25	3,375	015	1	22.50	$65.60	1,476	3.23	$4,851
metal flashing - repair	1,500.0	LF	0.00	0	2.00	3,000	.015	1	22.50	$65.60	1,476	2.98	$4,476
stair tower - asphalt roof - patch	5,600.0	SF	0.00	0	1.50	8,400	.020	1	112.00	$65.60	7,347	2.81	$15,747
support bay - conc.flr. - patch	11,200.0	SF	0.00	0	1.50	16,800	.020	1	224.00	$65.60	14,695	2.81	$31,495
SHINGLE roof (hangar dr overhangs)	1,200.0	SF	0.00	0	2.49	2,988	.052	1	62.40	$65.60	4,094	5.90	$7,082
SUBTOTAL				$0		$54,763			557.40		$36,566		$91,329
DIVISION 8 - DOORS AND WINDOWS													
doors - exterior insulated - repair	16.0	EA	0.00	0	150.00	2,400	.250	1	4.00	$65.60	262	166.40	$2,662
doors - hangar interior - repair	22.0	EA	0.00	0	150.00	3,300	.250	1	5.50	$65.60	361	166.40	$3,661
doors-nonrated support bays-repair	22.0	EA	0.00	0	150.00	3,300	.250	1	5.50	$65.60	361	166.40	$3,661
doors-rated support bays- repair	26.0	EA	0.00	0	150.00	3,900	.250	1	6.50	$65.60	426	166.40	$4,326
Hangar doors(26'X75') -cover	3900	sf	0.00	0	2.70	10,530	.060	1	234.00	$65.60	15,351	6.64	$25,881
ext. insul. access doors- cover (above d	16	ea	0.00	0	50.00	800	.250	1	4.00	$65.60	262	66.40	$1,062
windows - repair and cover	56.0	EA	0.00	0	50.00	2,800	.500	1	28.00	$65.60	1,837	82.80	$4,637
SUBTOTAL				$0		$27,030			287.50		$18,860		$45,890
DIVISION 9 - FINISHES													
barricades-catwalks,ext.balconies	6.0	EA	0.00	0	250.00	1,500	6.000	1	36.00	$65.60	2,362	643.61	$3,862
ungrade interior walls at occup.sep.	1,650.0	SF	0.00	0	1.74	2,866	.211	1	348.15	$65.60	22,839	15.58	$25,706
SUBTOTAL				$0		$4,366			384.15		$25,201		$29,567
DIVISION 10 - SPECIALTIES													
signs - No entry	10	EA	0.00	0	75.00	750	.500	1	5.00	$57.81	289	103.91	$1,039
SUBTOTAL				$0		$750			5.00		$289		$1,039
TOTAL DIRECT COST				$101		$112,222			1,456.80		$96,947		$209,271

PROJECT: FT WW Hanger 2 & 3 Property Condition Report
LOCATION: FT WW
PHASE: Concept
DESCRIPTION: CIVIL CONSTRUCTION COST ESTIMATE

SUMMARY OF COSTS

DESCRIPTION	%	%	
TOTAL DIRECT COST, MATL & LAB			$12,263
LOCATION FACTOR		10%	$1,226
FREIGHT		10%	$1,533
OVER TIME - SOME		12.5%	$1,533
COMPLEXITY		15.0%	$1,840
			$18,395
CONTRACTOR OVER HEAD	15.0%		$2,759
CONTRACTOR PROFIT	12.0%		$2,539
SUBTOTAL			$21,154
TOTAL ESTIMATED COST			$21,154

	QUANTITY		UNIT COST	COST
	No.	UNITS		
DIRECT COSTS BY CSI DIVISIONS				
DIVISION 2 - SITE WORK				
02510 WATER DISTRIBUTION				
6" DUCTILE IRON WATER MAIN	300	LF	$26.68	$8,003
HYDRANT INSTALLATION	3	Each	$1,420	$4,260
SUBTOTAL				$12,263

CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: LAYAWAY - TAB 11 - MECHANICAL

PREPARED BY: RJR
FOR: JMM

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					TOTAL EQUIPMENT
PLUMBING SUBCONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	UNIT PRICE	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB.			$0		$8,200			136.0		$9,194		$17,394
FREIGHT	10.0%				$820							
SUBTOTAL			$0		$9,020					$9,194		$18,214
CONTRACTORS OVERHEAD	15.0%		$0		$1,353					$1,379		
SUBTOTAL			$0		$10,373					$10,573		$20,946
SUBCONTRACTOR TOTALS												
MEZZANINE SPRINKLER PROTECTION: $4.00/SQ.FT FOR 10,000 SQ. FT.												$40,000
SUB #2.....												$0
SUB #3.....												$0
SUBTOTAL												$60,946
CONTRACTORS PROFIT	10.0%											$6,095
SUBTOTAL												$67,040
CONTINGENCY	15.0%											$10,056
CONTRACT TOTAL												**$77,097**

MONITORING CONTROLS												
NETWORK CONTROLLER	1 Each	$0	$0	$5000	$5,000	20.00	1	20	$67.60	$1,352	6352.0	$6,352
POINT COST	8 Each	$0	$0	$400	$3,200	12.00	1	96	$67.60	$6,490	1211.2	$9,690
DEMO EXHAUST FANS												
REMOVE EXHAUST FANS	4 Each	$0	$0	$0	$0	2.00	1	8	$67.60	$541	135.2	$541
PATCH / SEAL OUTLETS	4 Each	$0	$0	$0	$0	3.00	1	12	$67.60	$811	202.8	$811
COLUMN TOTALS:			**$0**		**$8,200**			**136**		**$9,194**		**$17,394**

CONSTRUCTION COST ESTIMATE

PROJECT: FTW HANGARS 2 & 3
LOCATION: FORT WAINWRIGHT, ALASKA
TAB - 11 - LAYAWAY
DESCRIPTION: ELECTRICAL

PREPARED BY: EDR
CHECKED BY:

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					TOTAL	
ESTIMATE ELECTRICAL SUBCONTRACTOR	No. UNITS	UNIT PRICE	EQUIP COST	UNIT PRICE	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB.			$0		$49,200			916		$60,361		$109,561
FREIGHT	10.0%				$4,920							
SUBTOTAL					$54,120					$60,361		$114,481
CONTRACTORS OVERHEAD	15.0%											$17,172.12
SUBTOTAL												$131,653
CONTRACTORS PROFIT	10.0%											$13,165
TOTAL ELECTRICAL COST (2007)												**$144,818**

DIVISION 16 - ELECTRICAL													
LIGHTING													
EMERGENCY LIGHTING	64	Each	$0	$0	180.00	$11,520	3.00	1	192.0	$65.90	12,652	$377.69	$24,172
EXIT SIGNS	48	Each	$0	$0	160.00	$7,680	3.00	1	144.0	$65.90	$9,489	$357.69	$17,169
WIRING	1	L.S.	$0	$0	10,000.00	$10,000	680.00	1	280.0	$65.90	$18,451	$28,450.89	$28,451
MECHANICAL SYSTEMS EQUIPMENT													
MOTOR STARTERS/DISC SW	1	L.S.	$0	$0	12,000.00	$12,000	120.00	1	120.0	$65.90	$7,908	$19,907.52	$19,908
WIRING	1	L.S.	$0	$0	8,000.00	$8,000	180.00	1	180.0	$65.90	$11,861	$19,861.29	$19,861
COLUMN TOTALS:				$0		$49,200			916		$60,361		$109,561

NOTES:

1. FIRE ALARM SYSTEM COST IS FOR HORNS, STROBES, MANUAL STATION RELOCATION, AND MAGNETIC DOOR HOLDERS. IT DOES NOT INCLUDE THE COST OF NEW ADDRESSABLE SYSTEMS. NEW SYSTEMS WOULD BE ABOUT DOUBLE WHAT IS SHOWN.

12 ADAPTIVE USE PLAN

12.1 INTRODUCTION

As part of the Condition Assessment and Rehabilitation Plan (CARP) for Hangars 2 and 3, the design team was tasked with developing an Adaptive Use Plan that considers current Army requirements and standards for administrative or other facilities. The Adaptive Use Plan considers adaptive use alternatives for converting the hangars to another use; they are general in nature, but they demonstrate how the hangars can be altered to meet that use. The Adaptive Use Plan takes into consideration that the hangars are an integral part of the National Historic Landmark for Ladd Field.

The Adaptive Use Plan integrates certain recommendations from Tab 1 – Compiled Recommendations and Cost Estimate – as appropriate for the use option presented.

Members of the consultant team who contributed to this section of the report are: Adam Matteo, P.E., Principal Structural Engineer of Ammann & Whitney; Janet M. Matheson, A.I.A., L.E.E.D., Architect of Design Alaska, Inc.; Patrice Buck, Staff Civil Engineer of Design Alaska, Inc.; Robin J. Rader, P.E., Mechanical Engineer of Design Alaska, Inc.; Evan Roberts PE of Roberts-Kaneko Electrical Consultants, Inc.; and John R. Bowie, A.I.A., Historical Architect of John Bowie Associates.

12.2 OPTION "A" – USE AS WARM STORAGE

Hangars 2 and 3 may be used as storage facilities for moderate-hazard materials, such as paper goods, books, clothing, cardboard, furniture, lumber, or tires. This would be an occupancy classification of S-1, the same classification as their present use as aircraft repair hangars. Or they could be used to store low-hazard materials, such as parking aircraft (no repair functions), storing vehicles (POVs), batteries, electrical equipment, food products, glass materials, metal furniture or parts, or appliances. This would be an occupancy classification of S-2. However, the building code (2003 IBC Table 302.3.2) requires a 3 hour occupancy separation between S1 and S2 uses, which can be reduced to 2 hours with an automatic sprinkler option. This should be considered if different hazard materials are stored in the same building.

As was described in Tab 11, it is critical that both hangars be maintained and heated to a certain minimum level to avoid irreversible damage to structural elements, foundations, architectural finishes, utility systems and fire suppression system components. This level of environmental control provides an adequate setting for use of the hangars for storage. The following design principles are established to accomplish the reuse of the hangars for warm storage:

- Floor loading: The existing 2nd floor structure in the support bays (1x4 fir boards over 1x8s diagonal over 2x10s @ 16"o.c.) can only support 50 psf. Loads on the upper floors will have to be limited to this capacity, or additional floor support added to provide up to 125 psf.

- Seismic Upgrades: Because the importance factor of the building and its occupants has decreased, it is not necessary to undertake the seismic upgrades along the column base lines.

- Concrete Floor Slab Damage: It is acceptable to leave the current concrete floor slabs in the hangar bays in place. However, the heaved and displaced slabs in the office bay areas will need to be repaired or replaced. No additional corrective work or repairs need to be made to the hangar bay floor slabs.

- Hangar Doors: Provide insulation barrier on the large hangar doors, to reduce heat loss.

- Heating & Ventilating System: The types of materials to be stored in the buildings and required temperatures for their long-term storage need to be identified so heating & ventilating improvements can be proposed to the existing systems. At present, the existing heating & ventilating systems do not meet the needs of the hangars as aircraft repair facilities and offices. However, they do keep the buildings above freezing temperatures, although there is great variation in temperature between areas, and poor temperature control.

- Fire Protection: In the hangar bay of each building, remove the existing deluge fire suppression system and install in its place a standard, commercial-grade, NFPA-13 sprinkler system. The present deluge system is not necessary for a storage-related usage; however, it is important to install a commercial-grade system capable of protecting the building and contents, and providing suppression for fires that might start in a storage area.

- Lighting: Adjust the illumination level in each hangar bay to a level appropriate to a storage facility.

Utilizing these design principles, it is possible to develop a flexible storage scheme for the hangars that provides a wide range of options, including secure (lockable) storage and small object storage in both floors of both office bays, plus vehicular and large object storage in the hangar bays.

Boxes containing paper may be stored in the hangars; however, papers requiring archival and humidity-controlled environments should not be placed anywhere in the hangar buildings. The lack of continuous vapor barriers in the walls, floors, ceilings and openings precludes any of the spaces in the hangars from providing an adequately uniform humidity level needed for archival paper storage.

In addition, the following work items need to be included in order for the hangars to be compliant with current codes as they relate to warm storage facilities:

Architectural

- Life Safety: Repair exit doors & frames, and rated walls, doors & hardware to provide safe exiting from interior spaces into the hangar area and through at-grade exit doors to the outside.

- Code Compliance: Close off all interior openings in the walls between the hangar bay and 1st or 2nd floor support bay rooms or attics.

- Roofs: Inspect roof membranes and patch existing roof membranes where required.

- Roofs: Repair eaves, fascias & canopies to provide correct drainage of water onto aprons.

- Building Envelope: Repair failed caulking at door frames, window frames or other exterior joints.

Civil

- Life Safety: Install additional fire hydrants, minimum 3, around the perimeter of the site, to provide full coverage of both hangars, and meet required flow requirements.

- Drainage: Modify north aprons to provide positive drainage away from the hangars' north walls.

- Parking Area: Patch and repave asphalt.

- Force Protection: Provide required force protection fencing at both hangars.

Fire Protection

- Fire Suppression Systems: In addition to the sprinkler system upgrade for the hangar bays cited in Design Principle #6 above, expand the existing wet sprinkler system in the office bays to include the attic spaces directly above.

Mechanical

- Controls: Provide DDC monitoring system of the existing HVAC system, including low temperature monitors, which would annunciate back to Fort Wainwright's existing central control station.

Electrical

- Fire Alarm System: Modify the existing fire alarm system by:
    - Moving the manual pull stations closer to existing exterior exits.
    - Add visual indicating devices (strobes) to the notification appliance circuits; only horn devices exist at this time.
    - Add addressable components to the existing fire alarm system in accordance with Fort Wainwright system requirements.
- Emergency Lighting: Replace all exit signs and increase the number of emergency lights to correspond with the locations of corridors in the side bays or aisles in the hangar bays.

A detailed cost estimate for Adaptive Use Option A-Warm Storage is attached.

12.3 OPTION "B" – USE AS OFFICES

Option B for offices utilizes the space in the hangars more intensively than Option A. Although the current office bay areas are marginally acceptable for continued office usage, the hangar bay areas would require upgrades in environmental control, lighting, electrical distribution and communication wiring. However, it would be a relatively straightforward task to install an organized network of prefabricated, modular office components, with or without a floor/ceiling assembly added into the hangar bays to form a flexible and easy-to-change office layout.

Use of the hangars for mission related functions such as classroom instruction, conferences or other training activities is compatible with general office use (B occupancy). However, further analysis of these related uses requires program information on space usage not available to the consultant team at this time. The following design principles are established to accomplish the reuse of the hangars as offices:

- Seismic Upgrades: Although the military importance factor of the building and its occupants, when used for offices, is not as low as a storage building, it is still decreased; it will not be necessary to undertake the seismic upgrades along the column base lines.

- Concrete Slab Floor Damage: It is acceptable to leave the current concrete floor slabs in the hangar bays in place. However, the heaved and displaced slabs in the existing office bay areas will need to be replaced. No additional corrective work or repairs need to be made to the hangar bay floor slabs. Additional floor coverings may be added for acoustics or comfort.

- Building Envelope: Install insulated stud walls for interior arctic entries at each hangar bay exit door, and insulated barriers over each hangar door.

- Heating & Ventilating System: Replace the entire heating & ventilating system with a system suitable for office use.

- Fire Suppression Systems: In the hangar bay of each building, remove the existing deluge fire suppression system and install in its place a standard, commercial-grade, NFPA-13 sprinkler system. The present deluge system is not appropriate or required for offices. It is important to install a commercial-grade system capable of protecting the building and contents, and providing suppression of fires that might start in office areas.

- Lighting: Increase the illumination level in each hangar bay to levels required for office lighting. The hangar bay lighting is already minimal, at 4-15 foot-candles across the floor. If light-colored furnishings or floor coverings are added over the concrete slab, the lighting level with the existing fixtures would rise to 25-30 foot-candles. However, it consists of metal halide fixtures, not suitable for office lighting. Replace the existing MH fixtures with appropriate fixtures. Increased lighting for individual offices and circulation areas can also be addressed as part of the office partition installation.

In addition, the following need to be included in the Office Option project in order for the hangars to comply with current code requirements as they relate to office facilities:

Architectural

- Demolition: exterior tower stairs (4), asphalt roofs, canopies with flashings & fascias, concrete curbs at exterior doors, restroom floors, interior wall finish at exterior walls, floor finishes where degraded, exterior & interior doors & frames, hangar doors & frames, exterior windows, & concrete hangar slab at trench locations.

- New concrete: repairs at side bay slabs where damaged; new hangar bay trenches.

- New metal exterior stairs with handrails & guardrails, new roof platforms, new interior stair handrails, repairs to catwalks & access.

- Roofs: new ice & water shield, fascias, flashings, new asphalt & shingle roofs at accessory roof locations, bird screen & vents as required, snow guards.

- Remove existing insulation below roof deck, and replace with modern insulation, including lower membrane to contain materials.

- Code Compliance: Repair rated doors & frames, walls & window openings to meet code requirements for spaces.

- Code Compliance: Repair stairs, exit corridors, restrooms and exterior canopies to meet requirements for proposed use and continued occupancy. Rated wall separations to be confirmed and constructed between the side bays and hangar bay. If a new 2nd floor is installed in the hangar bay, the required floor/ceiling separation must be constructed.

- Building Envelope: Replace exterior windows and doors with new units, replicating original appearance.

- Vapor retarder for exterior walls, new insulation below roof decking, new finishes where degraded.

- Signage for interior rooms, blinds at exterior windows, new restroom fixtures & accessories, lockers, fire extinguishers & cabinets.

Structural

- Structural repairs to roof purlins, truss members, buttresses, epoxy repairs, inter-column bracing, tension rods, & joint repairs.

Civil

- Life Safety: Install additional fire hydrants, minimum 3, around the perimeter of the site, to provide full coverage of both hangars, as required by UFC 3-600-01, and meet required flow requirements.

- Drainage: Modify north aprons to provide positive drainage away from the hangars' north walls.

- Parking Area: Regrade, resurface and repaint the asphalt parking lot. Provide parking stalls for projected office occupancy.

- Force Protection: Provide required force protection fencing at both hangars.

Mechanical

- Correct code deficiencies noted in plumbing and hydronic systems.

- Replace domestic water, waste and vent piping throughout the facilities, including fixture replacement. Remove compressed air system.

- Controls: Install DDC control system, with low temperature monitors, in both hangars.

Fire Protection

- Fire Suppression Systems: In addition to the fire suppression upgrades cited for the hangar bays in Design Principle #5 above, expand the existing fire suppression system in the side bays to include the attic spaces directly above them.

Electrical

- Power Distribution: Replace outdated panelboards, braided cloth insulated feeders and branch circuit conductors, and pole mounted service conduits. Add bollards to protect conduits on poles.

- Emergency Lighting: Replace all exit signs and increase the number of emergency lights to correspond with the locations of corridors in the side bays or aisles in the hangar bays.

- Exterior Lighting: Provide man door lighting & parking lot lighting as recommended in Tab 7.

- Wiring Devices: Replace throughout the facilities.

- Communications: Provide additional communication outlets of suitable density for office use. Combine telephone and data outlets into a single modular faceplate. Route telephone and data lines to common telecommunications racks. Data and telephone systems are essential to facility operations and the rack-mounted equipment that controls the systems should be kept secure. Relocate communication racks to lockable communication closets that permit access only to authorized information technology specialists.

- Fire Alarm System: Modify the existing fire alarm system by:
    - Moving the manual pull stations closer to existing exterior exits.
    - Add visual indicating devices (strobes) to the notification appliance circuits; only horn devices exist at this time.

- Add addressable components to the existing fire alarm system in accordance with Fort Wainwright system requirements.

It is possible to develop two types of office use options for the hangar bay areas: 1) modular offices with a floor/ceiling between the lower and upper level, which will provide a uniform level of temperature control, ambient air-borne dust filtration, task lighting, privacy and security for workers, and 2) modular offices without a ceiling, which will take advantage of the impressive openness of the hangar spaces – an extraordinary architectural distinction unique to these buildings alone.

A detailed cost estimate for Adaptive Use Option B – Use as Offices, is attached.

- End of Section -

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: ADAPTIVE USE PLANS - TAB 12A - STORAGE — Prepared by: JB — FOR: JMM

ARCHITECTURAL CONTRACT TOTAL					$237,891
SUBCONTRACTOR WORK					
CIVIL SITE WORK CONTRACTOR		$704,021			$704,021
MECHANICAL CONTRACTOR &					$0
FIRE PROTECTION CONTRACTOR		$478,400			$478,400
ELECTRICAL CONTRACTOR		$268,025			$268,025
GEN.CONTRACTOR OH MARKUP	10.0%			$1,450,446	$145,045
SUBTOTAL					$1,833,381
GENERAL CONDITIONS	15.0%				$275,007
SUBTOTAL					$2,108,389
ESTIMATING CONTINGENCY	35.0%				$737,936
SUBTOTAL					$2,846,325
ESCALATION THRU 2010	15.0%				$426,949
TOTAL ESTIMATED COST					**$3,273,273**

NOTES REGARDING THE PREPARATION OF THIS COST ESTIMATE

THIS ESTIMATE IS PREPARED USING CURRENT CONSTRUCTION COSTS & ASSUMES WILL RECEIVE AN OPEN COMPETITIVE BID.

THIS ESTIMATE DOES NOT CONTAIN AN ALLOWANCE FOR NEGOTIATED NON-COMPETITIVE CONTRACTS.

THIS ESTIMATE HAS AN ESCALATION ALLOWANCE.

THIS ESTIMATE DOES NOT HAVE AN ALLOWANCE TO TREAT / REMOVE ANY HAZARDOUS MATERIALS OR CONTAMINATED SOIL.

THIS ESTIMATE DOES NOT INCLUDE ANY PLAN CHECK FEES CHARGED BY THE STATE OF ALASKA OR ANY OTHER ENTITY CLAIMING JURISDICTION OVER THE WORK PAID DIRECTLY BY THE OWNER.

THIS ESTIMATE DOES NOT INCLUDE THE A/E FEES, SHOP EQUIPMENT OR COSTS FOR ANY WORK NOT INDICATED.

THIS ESTIMATE IS BASED ON A NORMAL WORK WEEK WITH SOME PROVISIONS FOR OVERTIME.

ESTIMATING CONTINGENCY - AN ALLOWANCE FOR CONSTRUCTION DOCUMENT REQUIREMENTS THAT ARE NOT INCLUDED IN THE ESTIMATE.

EITHER THE 2006 R.S. MEANS FACILITIES CONSTRUCTION COST DATA MANUAL, the 2006 R.S. MEANS ASSEMBLIES COST DATA MANUAL, OR PAST HISTORICAL DATA HAVE BEEN USED AS RESOURCES TO COMPILE THIS ESTIMATE.

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT — PREPARED BY: JB
DESCRIPTION: ADAPTIVE USE - TAB 12A - STORAGE — FOR: JMM

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR

SUMMARY OF COSTS

GENERAL CONTRACTOR

DESCRIPTION	%	EQUIPMENT COSTS	MATERIAL COSTS	LABOR HOURS	LABOR COSTS	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB		$101	$88,379	1,295.40	$86,359	$174,840
REGIONAL COST FACTOR	10.0%		$8,838			$8,838
FREIGHT	10.0%		$8,838			$8,838
OVERTIME / STAGING	12.5%				$ 10,795	$10,795
COMPLEXITY	15.0%				$12,954	$12,954
SUBTOTAL		$101	$106,055		$110,108	$216,264
CONTRACTOR OVERHEAD	15%					$21,626
CONTRACTOR PROFIT	10%					$237,891
SUBTOTAL						
ARCHITECTURAL CONTRACT TOTAL						$237,891

DIRECT COSTS BY CSI DIVISIONS

DIVISION 2 - SITE WORK													
SITE													
hydrant	0.0	cy	0.00	0	0.00	0	.000	1	-	$65.60	0	#DIV/0!	$0
SUBTOTAL				$0		$0			-		$0		$0
DIVISION 3 - CONCRETE													
concrete floor - PATCH	10,125.0	sf	0.01	101.25	2.50	25,313	.022	1	222.750	$71.97	16,031	4.09	$41,445
SUBTOTAL				$101		$25,313			222.75		$16,031		$41,445
DIVISION 7 - THERMAL & MOISTURE PROTECTION													
EPDM roof - inspect and patch	7,600.0	SF	0.00	0	2.00	15,200	.015	1	114.00	$65.60	7,479	2.98	$22,679
EPDM roof - extended warranty	1.0	LS	0.00	0	5000.00	5,000	.000	1	-	$65.60	0	5,000.00	$5,000
EPDM roof -repair eaves, fascias and canopies for drainage	2,200.0	SF	0.00	0	2.25	4,950	.015	1	33.00	$65.60	2,165	3.23	$7,115
SUBTOTAL				$0		$25,150			147.00		$9,643		$34,793
DIVISION 8 - DOORS AND WINDOWS													
doors - repair exit doors	16.0	EA	0.00	0	250.00	4,000	.500	1	8.00	$65.60	525	282.80	$4,525
doors - rated support spaces interior (in	26.0	EA	0.00	0	250.00	6,500	.500	1	13.00	$65.60	853	282.80	$7,353
Hanger doors(26'X75') - insulation barri	3900	sf	0.00	0	5.00	19,500	.125	1	487.50	$65.60	31,981	13.20	$51,481
windows repair and board up	56.0	EA	0.00	0	50.00	2,800	.500	1	28.00	$65.60	1,837	82.80	$4,637
SUBTOTAL				$0		$32,800			536.50		$35,195		$67,995
DIVISION 9 - FINISHES													
barracades catwalks and ext balconies	6.0	EA	0.00	0	250.00	1,500	6.000	1	36.00	$65.60	2,362	643.61	$3,862
ungrade interior walls occupancy separ	1,650.0	SF	0.00	0	1.74	2,866	.211	1	348.15	$65.60	22,839	15.58	$25,706
SUBTOTAL				$0		$4,366			384.15		$25,201		$29,567
DIVISION 10 - SPECIALTIES													
signs - No entry	10	EA	0.00	0	75.00	750	.500	1	5.00	$57.81	289	103.91	$1,039
SUBTOTAL				$0		$750			5.00		$289		$1,039
TOTAL DIRECT COST				$101		$88,379			1,295.40		$86,359		$174,840

PROJECT: FT WW Hanger 2 & 3 Property Condition Report
LOCATION: FT WW
PHASE: Concept
DESCRIPTION: CIVIL COST ESTIMATE - TAB 12A

SUMMARY OF COSTS

DESCRIPTION	%		
TOTAL DIRECT COST, MATL & LAB			$415,045
LOCATION FACTOR		10%	$41,505
FREIGHT		10%	$41,505
OVER TIME - SOME		12.5%	$51,881
COMPLEXITY		15.0%	$62,257
			$612,192
CONTRACTOR OVER HEAD	15.0%		$91,829
CONTRACTOR PROFIT	12.0%		$84,482
SUBTOTAL			$704,021
TOTAL ESTIMATED COST			$704,021

	QUANTITY		UNIT	
	No.	UNITS	COST	COST
DIRECT COSTS BY CSI DIVISIONS				
DIRECT COSTS BY CSI DIVISIONS				
DIVISION 1				
SURVEYING, 3-MAN CREW	4	HR	$190.00	$760
SUBTOTAL				$760
DIVISION 2 - SITE WORK				
02200 - SITE DEMOLITION				
SAWCUT ASPHALT PAVING (3")	1,200	LF	$0.95	$1,135
DEMO ASPHALT PAVING	18,667	SY	$6.70	$125,085
SUBTOTAL				$126,220

PROJECT: FT WW Hanger 2 & 3 Property Condition Report
LOCATION: FT WW
PHASE: Concept
DESCRIPTION: CIVIL COST ESTIMATE - TAB 12A

02510 WATER DISTRIBUTION				
6" DUCTILE IRON WATER MAIN	300	LF	$26.68	$8,003
HYDRANT INSTALLATION	3	Each	$1,420	$4,260
SUBTOTAL				$12,263
02700-BASES AND PAVEMENTS				
02740-FLEXIBLE PAVEMENT				
D1, PARKING, SPRD, COMP, GRAD	1,556	CY	$13.02	$20,257
ASPHALT PAVING, 3", PARKING LOTS	168,000	SF	$1.18	$198,516
PARKING PAINT STRIPING, 4"	5,800	LF	$0.27	$1,580
PAVEMENT MK, HNDCP, SYMB	0	EA	$70.49	$0
SUBTOTAL				$220,352
2800 - SITE IMPROVEMENTS				
FENCE, CHAIN LINK, 6' ASSY.	1,600.0	LF	$32.45	$51,920
GATE, 4' WIDE, 5' HIGH, 2" FRAME, GALV. ST	3.0	EA	$324.50	$974
LINE POST, 6'X 2 1/2" SET IN CONC.	53.0	EA	$48.24	$2,557
SUBTOTAL				$55,450
TOTAL ESTIMATED COST				$415,045

CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: TAB 12 OPTION A - WARM STORAGE ESTIMATE SUMMARY LIST

PREPARED BY: RJR
FOR: JMM

21-Dec-07

MECHANICAL ESTIMATE SUMMARY

SQUARE FOOTAGE COSTS:	SQ.FT	COST/SQ.FT	ESCALATION FACTOR	TOTAL
SIDE BAY ATTIC FIRE SUPPRESSION SYSTEM, INCLUDING CONTROLS	11,200	$5.00	1.15	$64,400.00
HANGAR BAY FIRE SUPPRESSION SYSTEM INCLUDING ACCESSORIES, RACK STORAGE	30,000	$12.00	1.15	$414,000.00
TOTAL FOR SINGLE HANGAR				$478,400.00

Design Alaska

CONSTRUCTION COST ESTIMATE

PROJECT: FTW HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: ELECTRICAL - Tab 12a

PREPARED BY: EDR
CHECKED BY:

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					TOTAL	
ESTIMATE ELECTRICAL SUBCONTRACTOR	No. UNITS	UNIT PRICE	EQUIP COST	UNIT PRICE	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB.			$2,000		$101,200			1,526		$100,557		$201,757
FREIGHT	10.0%				$10,120							
SUBTOTAL					$111,320					$100,557		$211,877
CONTRACTORS OVERHEAD	15.0%											$31,781.60
SUBTOTAL												$243,659
CONTRACTORS PROFIT	10.0%											$24,366
TOTAL ELECTRICAL COST (2007)												**$268,025**

DIVISION 16 - ELECTRICAL													
LIGHTING													
HANGAR LIGHTING	1	L.S.	$2000	$2,000	6,000.00	$6,000	50.00	1	50.0	$65.90	3,295	$9,294.80	$9,295
EMERGENCY LIGHTING	64	Each	$0	$0	180.00	$11,520	3.00	1	192.0	$65.90	12,652	$377.69	$24,172
EXIT SIGNS	48	Each	$0	$0	160.00	$7,680	3.00	1	144.0	$65.90	$9,489	$357.69	$17,169
WIRING	1	L.S.	$0	$0	8,000.00	$8,000	40.00	1	40.0	$65.90	$2,636	$10,635.84	$10,636
FIRE ALARM SYSTEMS													
FIRE ALARM SYSTEMS (NOTE 1)	1	L.S.	$0	$0	48,000.00	$48,000	800.00	1	800	$65.90	$52,717	$100,716.83	$100,717
MECHANICAL SYSTEMS EQUIPMENT													
MOTOR STARTERS/DISC SW.	1	L.S.	$0	$0	12,000.00	$12,000	120.00	1	120.0	$65.90	$7,908	$19,907.52	$19,908
WIRING	1	L.S.	$0	$0	8,000.00	$8,000	180.00	1	180.0	$65.90	$11,861	$19,861.29	$19,861
COLUMN TOTALS:				$2,000		$101,200			1,526		$100,557		$201,757

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: ADAPTIVE USE PLANS - TAB 12B - OFFICES — Prepared by: JB — FOR: JMM

ARCHITECTURAL CONTRACT TOTAL					$3,403,321
SUBCONTRACTOR WORK					
CIVIL SITE WORK CONTRACTOR		$704,021			$704,021
STRUCTURAL CONTRACTORS		$1,892,280			$1,892,280
MECHANICAL CONTRACTOR & FIRE PROTECTION CONTRACTOR		$4,166,220			$4,166,220
ELECTRICAL CONTRACTOR		$787,044			$787,044
GEN.CONTRACTOR OH MARKUP	10.0%			$7,549,565	$754,957
SUBTOTAL					$11,707,842
GENERAL CONDITIONS	15.0%				$1,756,176
SUBTOTAL					$13,464,018
ESTIMATING CONTINGENCY	35.0%				$4,712,406
SUBTOTAL					$18,176,425
ESCALATION THRU 2010	15.0%				$2,726,464
TOTAL ESTIMATED COST					**$20,902,889**

NOTES REGARDING THE PREPARATION OF THIS COST ESTIMATE

THIS ESTIMATE IS PREPARED USING CURRENT CONSTRUCTION COSTS & ASSUMES WILL RECEIVE AN OPEN COMPETITIVE BID.

THIS ESTIMATE DOES NOT CONTAIN AN ALLOWANCE FOR NEGOTIATED NON-COMPETITIVE CONTRACTS.

THIS ESTIMATE HAS AN ESCALATION ALLOWANCE.

THIS ESTIMATE DOES NOT HAVE AN ALLOWANCE TO TREAT / REMOVE ANY HAZARDOUS MATERIALS OR CONTAMINATED SOIL.

THIS ESTIMATE DOES NOT INCLUDE ANY PLAN CHECK FEES CHARGED BY THE STATE OF ALASKA OR ANY OTHER ENTITY CLAIMING JURISDICTION OVER THE WORK PAID DIRECTLY BY THE OWNER.

THIS ESTIMATE DOES NOT INCLUDE THE A/E FEES, SHOP EQUIPMENT OR COSTS FOR ANY WORK NOT INDICATED.

THIS ESTIMATE IS BASED ON A NORMAL WORK WEEK WITH SOME PROVISIONS FOR OVERTIME.

ESTIMATING CONTINGENCY - AN ALLOWANCE FOR CONSTRUCTION DOCUMENT REQUIREMENTS THAT ARE NOT INCLUDED IN THE ESTIMATE.

EITHER THE 2006 R.S. MEANS FACILITIES CONSTRUCTION COST DATA MANUAL, the 2006 R.S. MEANS ASSEMBLIES COST DATA MANUAL, OR PAST HISTORICAL DATA HAVE BEEN USED AS RESOURCES TO COMPILE THIS ESTIMATE.

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT — PREPARED BY: JB
DESCRIPTION: ADAPTIVE USE - TAB 12B - OFFICES — FOR: JMM

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR

SUMMARY OF COSTS

GENERAL CONTRACTOR

DESCRIPTION	%		EQUIPMENT COSTS	MATERIAL COSTS	LABOR HOURS	LABOR COSTS	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB			$92,876	$1,427,927	15,489.38	$1,009,836	$2,530,638
REGIONAL COST FACTOR		10.0%		$142,793			$142,793
FREIGHT		10.0%		$142,793			$142,793
OVERTIME / STAGING		12.5%				$ 126,229	$126,229
COMPLEXITY		15.0%				$151,475	$151,475
		SUBTOTAL	$92,876	$1,713,512		$1,287,540	$3,093,928
CONTRACTOR OVERHEAD	15%						
CONTRACTOR PROFIT	10%						$309,393
		SUBTOTAL					$3,403,321

ARCHITECTURAL CONTRACT TOTAL — $3,403,321

DIRECT COSTS BY CSI DIVISIONS

DIVISION 2 - SITE WORK

BUILDING													
demo stair tower stairs	4.0	ea	0.00	0	2500.00	10,000	.000	1	-	$57.81	0	2,500.00	$10,000
demo roof (below deck)	30,400.0	sf	0.00	0	0.00	0	.010	1	304.00	$57.81	17,575	0.58	$17,575
demo roof asphalt	20,000.0	sf	0.00	0	0.00	0	.011	1	220.00	$57.81	12,719	0.64	$12,719
demo metal flashing	1,500.0	lf	0.00	0	0.00	0	.010	1	15.00	$57.81	867	0.58	$867
demo wood fascia	1,500.0	lf	0.00	0	0.00	0	.010	1	15.00	$57.81	867	0.58	$867
demo concrete - SUPPORT SPACES	5,000.0	sf	15.00	75,000	0.50	2,500	.030	1	150.00	$57.81	8,672	17.23	$86,172
demo concrete curbs at exterior doors	1.0	LS	0.00	0	500.00	500	18.000	1	18.00	$57.81	1,041	1,540.63	$1,541
demo mortar/concrete-restrooms	450.0	SF	0.00	0	0.50	225	.030	1	13.50	$57.81	780	2.23	$1,005
excavate bathroom floor	50.0	BCY	1.39	70	0.00	0	2.560	1	128.00	$65.60	8,397	169.33	$8,466
demo entry canopy roof	3.0	ea	0.00	0	750.00	2,250	.025	1	0.08	$57.81	4	751.45	$2,254
demo interior wall finish support spaces	12,500.0	sf	0.00	0	0.00	0	015	1	187.50	$57.81	10,840	0.87	$10,840
demo vct	20,000.0	sf	0.00	0	0.00	0	.016	1	320.00	$57.81	18,500	0.93	$18,500
demo exterior doors and frames	16.0	ea	0.00	0	0.00	0	.400	1	6.40	$57.81	370	23.13	$370
demo interior doors and frames	70.0	ea	0.00	0	0.00	0	.400	1	28.00	$57.81	1,619	23.13	$1,619
demo hangar doors and frames(26'X72	1,950.0	sf	1.03	2,009	0.00	0	.040	1	78.00	$57.81	4,509	3.34	$6,518
demo windows	1.0	ea	0.00	0	0.00	0	.400	1	0.40	$57.81	23	23.13	$23
SUBTOTAL				$77,078		$15,475			1,483.88		$86,784		$179,337
DIVISION 3 - CONCRETE													
concrete floor - first floor restrooms(san	450.0	sf	0.01	4.50	2.50	1,125	.022	1	9.900	$71.97	713	4.09	$1,842
concrete floor - SUPPORT SPACES (6	5,000.0	sf	0.01	50.00	2.50	12,500	.022	1	110.000	$71 97	7,917	4.09	$20,467
SUBTOTAL				$0		$11,400			137 40		$9,891		$22,309
DIVISION 5 - METALS													
Floor construction: new open office space (40 lb/sf) incl. open web steel joist, decking, concrete, columns	30,200.0	SF	0.00	0	6.25	188,750	060	1	1,812.00	$71.97	130,409	10.57	$319,159
FLOOR EXP JOINTS (existing conc jol	800.0	LF	0.00	0	25.00	20,000	.211	1	168.80	$71.97	12,148	40.19	$32,148
stair tower - metal stair, concrete treAd	100.0	RISERS	2.98	298	500.00	50,000	1.067	1	106.70	$71.99	7,681	579.79	$57,979
stair tower - handrail	240.0	LF	0.00	0	32.00	7,680	.200	1	48.00	$71.99	3,455	46.40	$11,135
stair tower - guardrail	100.0	LF	0.00	0	32.00	3,200	.200	1	20.00	$71.99	1,440	46.40	$4,640
floor trench	600.0	LF	0.00	0	19.00	11,400	.229	1	137.40	$71.99	9,891	35.49	$21,291
hangar door exterior roof platforms(GAI	240.0	SF	0.00	0	15.00	3,600	.010	1	2.40	$71.99	173	15.72	$3,773
hangar door exterior roof platforms gua	184.0	LF	0.00	0	32.00	5,888	.200	1	36.80	$71.99	2,649	46.40	$8,537
stair interior - handrail	140.0	LF	0.00	0	32.00	4,480	.200	1	28.00	$71.99	2,016	46.40	$6,496
catwalk interior PLATFORM	2,500.0	sf	0.00	0	22.00	55,000	.010	1	25.00	$71.99	1,800	22.72	$56,800
catwalk interior STRUCTURE	2,500.0	sf	0.00	0	28.00	70,000	.025	1	62.50	$71.99	4,499	29.80	$74,499
catwalk interior - guardrail	200.0	LF	0.00	0	32.00	6,400	.200	1	40.00	$71.99	2,880	46.40	$9,280
catwalk interior - ladders/stairs	150.0	RISERS	1.50	225	250.00	37,500	.050	1	7.50	$71.99	540	255.10	$38,265
misc connections	1.0	LS	0.00	0	2500.00	2,500	.000	1	-	$71.99	0	2,500.00	$2,500

COST ESTIMATE

PROJECT: FT. WW HANGARS 2 & 3 CONDITION ASSESSMENT — 21-Dec-07
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT — PREPARED BY: JB
DESCRIPTION: ADAPTIVE USE - TAB 12B OFFICES — FOR: JMM

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
SUBTOTAL				$523		$277,648			683.10		$49,172		$327,343
DIVISION 7 - THERMAL & MOISTURE PROTECTION													
EPDM roof-inspect & patch	7,600.0	SF	0.00	0	2.00	15,200	.015	1	114.00	$65.60	7,479	2.98	$22,679
EPDM roof- extended warranty	1.0	LS	0.00	0	5000.00	5,000	.000	1	-	$65.60	0	5,000.00	$5,000
install new ice & water shield(at base o	1,600.0	SF	0.00	0	0.30	480	.030	1	48.00	$65.60	3,149	2.27	$3,629
Roof fascia	1,500.0	LF	0.00	0	2.25	3,375	015	1	22 50	$65.60	1,476	3.23	$4,851
metal flashing	1,500.0	LF	0.00	0	2.00	3,000	015	1	22.50	$65.60	1,476	2.98	$4,476
stair tower - asphalt roof	22,400.0	SF	0.00	0	1.50	33,600	.020	1	448.00	$65.60	29,389	2.81	$62,989
REPLACE ROTTEN STUDS, SHEATH	1.0	LS	0.00	0	5000.00	5,000	250.000	1	250.00	$65.60	16,400	21,400.30	$21,400
REPLACE ROTTEN SHEATHING at h	600.0	sf	0.00	0	1.25	750	.010	1	6.00	$65.60	394	1.91	$1,144
bird screen	1,200.0	SF	0.00	0	0.20	240	.250	1	300.00	$65.60	19,680	16.60	$19,920
SHINGLE roof (at hangar door overhan	1,200.0	SF	0.00	0	2.49	2,988	.052	1	62.40	$65.60	4,094	5.90	$7,082
entry canopy roof and fascia	3.0	EA	0.00	0	750.00	2,250	14.000	1	42.00	$65.60	2,755	1,668.42	$5,005
snow fall guards	400.0	LF	0.00	0	2.50	1,000	.055	1	22.00	$65.60	1,443	6.11	$2,443
SUBTOTAL				$0		$72,883			1,337.40		$87,735		$160,618
DIVISION 8 - DOORS AND WINDOWS													
ada barrier free entrances	10.0	EA	0.00	0	1000.00	10,000	30.000	1	300.00	$65.60	19,680	2,968.04	$29,680
doors - exterior insulated-repair	16.0	EA	0.00	0	1800.00	28,800	1.250	1	20.00	$65.60	1,312	1,882.00	$30,112
doors - hangar interior-repair	22.0	EA	0.00	0	1200.00	26,400	1.500	1	33.00	$65.60	2,165	1,298.40	$28,565
doors - nonrated support spaces interic	22.0	EA	0.00	0	1150.00	25,300	1.500	1	33.00	$65.60	2,165	1,248.40	$27,465
doors - rated support spaces interior (ir	26.0	EA	0.00	0	1450.00	37,700	1.500	1	39.00	$65.60	2,558	1,548.40	$40,258
Hangar doors(26'X75')	3900	sf	0.00	0	2.70	10,530	.060	1	234.00	$65.60	15,351	6.64	$25,881
exterior insulated access doors and fra	16	ea	0.00	0	400.00	6,400	900	1	14.40	$65.60	945	459.04	$7,345
turn tilt vinyl windows	56.0	EA	0.00	0	400.00	22,400	.840	1	47.04	$65.60	3,086	455.11	$25,486
SUBTOTAL				$0		$167,530			720.44		$47,262		$214,792
DIVISION 9 - FINISHES													
ungrade hanger wall to 2hr construction	26,752.0	SF	0.00	0	2.59	69,193	.114	1	3,044.38	$65.60	199,715	10.05	$268,908
ungrade exterior walls support spaces	20,100.0	SF	0.00	0	2.69	54,014	.086	1	1,728.60	$65.60	113,398	8.33	$167,412
vapor retarder roof	50,400.0	SF	0.00	0	0.03	1,512	.002	1	100.80	$65.60	6,613	0.16	$8,125
vapor retarder exterior wall	20,100.0	SF	0.00	0	0.03	603	.002	1	40.20	$65.60	2,637	0.16	$3,240
replace improperly framed walls	1.0	LS	0.00	0	5000.00	5,000	250.000	1	250.00	$65.60	16,400	21,400.30	$21,400
floor clean and prep	70,400.0	SF	0.00	0	0.25	17,600	.008	1	563.20	$60.99	34,349	0.74	$51,949
ceramic tile - floor 2 colors	550.0	SF	0.00	0	6.50	3,575	.087	1	47.85	$60.99	2,918	11.81	$6,493
ceramic tile - wall 2 colors, 4'-0" wainsc	650.0	SF	0.00	0	4.80	3,120	.070	1	45.50	$60.99	2,775	9.07	$5,895
VCT - second floor, static dissipative,	1,000.0	SF	0.00	0	2.50	2,500	500	1	500.00	$60.99	30,495	32.99	$32,995
carpet tiles, second floor, 26 OZ, 18X1	9,000.0	SY	0.00	0	55.00	495,000	.053	1	477.00	$60.99	29,092	58.23	$524,092
rubber base	3,950.0	LF	0.00	0	1.00	3,950	.020	1	79.00	$60.99	4,818	2.22	$8,768
rubber stair,treads,stringers	200.0	SF	0.00	0	8.75	1,750	100	1	20.00	$60.99	1,220	14.85	$2,970
seal concrete ,hangar	30,400.0	SF	0.00	0	0.06	1,824	.003	1	91.20	$60.99	5,562	0.24	$7,386
epoxy paint concrete	19,550.0	SF	0.00	0	0.25	4,888	065	1	1,270.75	$60.99	77,502	4.21	$82,390
paint ceiling support spaces	20,000.0	SF	0.00	0	0.02	300	.010	1	200.00	$65.85	13,170	0.67	$13,470
patch, prep walls for finish	1.0	LS	0.00	0	4000.00	4,000	120.000	1	120.00	$65.60	7,872	11,872.14	$11,872
paint walls up to 12'-0" (office)	39,500.0	SF	0.00	0	0.01	395	.010	1	395.00	$65.85	26,010	0.67	$26,405
paint walls above 12'-0" (hangar)	14,820.0	SF	1.00	14,820	0.013	185	.014	1	207.48	$65.85	13,662	1.93	$28,667
paint large hangar numbers	400.0	SF	1.00	400	0.013	5	.014	1	5.60	$65.85	369	1.93	$774
SUBTOTAL				$15,220		$669,413			9,186.56		$588,577		$1,273,211
DIVISION 10 - SPECIALTIES													
signs	50	EA	0.00	0	75.00	3,750	.500	1	25.00	$57.81	1,445	103.91	$5,195
BLINDS	56	SF	0.00	0	2.90	162	.014	1	0.78	$57.81	196	3.76	$359
TOILET PARTITIONS	10	EA	0.00	0	320.00	3,200	2.286	1	22.86	$57.81	563	460.70	$3,763
PRIVACY SCREEN	10	EA	0.00	0	160.00	1,600	2.000	1	20.00	$57.81	123	283.10	$1,723
SHOWER CURTAIN ROD & CURTAIN	2	EA	0.00	0	115.00	230	2.000	1	4.00	$57.81	492	238.10	$722
LOCKERS	10	EA	0.00	0	160.00	1,600	1.000	1	10.00	$57.81	1,477	221 55	$3,077
GRAB BARS	10	EA	0.00	0	50.00	500	.400	1	4.00	$57.81	21	71.26	$521
UNDERCOUNTER PROTECTION	8	EA	0.00	0	0.00	0	0 00	1	-	$57.81	0	0.00	$0
SOAP DISPENSER	8	EA	0.00	0	65.00	520	3.200	1	25.60	$57.81	4,207	161.84	$4,727
ROLL PAPER HOLDER	10	EA	0.00	0	85.00	850	1 000	1	10.00	$57.81	455	135.57	$1,305
PAPER TOWEL DISPENSERS	8	EA	0.00	0	150.00	1,200	.800	1	6.40	$57.81	1,052	40.47	$2,252
WASTE RECEPTACLE	4	EA	0.00	0	180.00	720	.800	1	3.20	$57.81	364	40.50	$1,084
FULL MIRROR	4	EA	0.00	0	750.00	3,000	.800	1	3.20	$57.81	364	40.50	$3,364
SANITARY NAPKIN DISPENSER	1	EA	0.00	0	135.00	135	.530	1	0.53	$57.81	161	26.87	$296
SANITARY NAPKIN DISPOSAL	1	EA	0.00	0	135.00	135	.530	1	0.53	$57.81	161	26.87	$296
FIRE EXTINGUSHERS AND CAB	20	EA	0.00	0	250.00	5,000	.500	1	10.00	$57.81	185	280.77	$5,185
SUBTOTAL				$0		$22,602			146.10		$11,267		$33,869
TOTAL DIRECT COST				$92,876		$1,427,927			15,489.38		$1,009,836		$2,530,638

PROJECT: FT.WW HANGARS 2 & 3 CONDITION ASSESSMENT 11-06
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: WALL TYPES - TAB 12B PREPARED BY: JB FOR: JMM

	QUANTITY		EQUIP		MATERIAL		LABOR HOURS						
	No.	UNITS	UNIT PRICE	COST	UNIT PRICE	COST	HRS	UNITS	TOTAL HOURS	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
WALL TYPE EXTERIOR	not including metal siding finish												
PLYWOOD SHEATHING	1.0	SF	0.00	0	1.250	1.25	.010	1	0.01	$57.81	1	1.83	1.83
BUILDING PAPER	1.0	SF	0.00	0	0.640	0.64	.009	1	0.01	$57.81	1	1.16	1.16
BAT INSULATION (R-19)	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74
VAPOR RETARDER	1.0	SF	0.00	0	0.06	0.06	.004	1	0.0	$57.81	0	0.29	$0
TEXTURE GYPSUM BOARD	1.0	SF	0.00	0	0.050	0.05	.003	1	0.00	$57.81	0.17	0.22	0.22
5/8" GYP, HANG & TAPE	1.0	SF	0.00	0	0.281	0.28	.017	1	0.02	$57.81	1	1.26	1.26
PAINT GYP BD	1.0	SF	0.00	0	0.050	0.05	.006	1	0.01	$57.81	0	0.40	0.40
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18
TOTALS					2.69	2.67	0.086		0.06				6.08
WALL TYPE INTERIOR													
5/8" GYP, HANG & TAPE	2.0	SF	0.00	0	0.281	0.56	.017	1	0.03	$57.81	2	1.26	2.53
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$57.81	0.35	0.22	0.45
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$57.81	1	0.40	0.79
2X6 STUD	1.0	SF	0.00	0	1.000	1.00	.148	1	0.15	$57.81	9	9.56	9.56
BAT INSULATION-ACOUSTICAL	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74
SEALANT	0.1	LF		0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18
			0.00										
TOTALS					1.74	2.10	0.211	6.00	0.21				14.24
WALL UPGRADE - HANGAR 2-hr construction and vaport retarder at exterior wall													
5/8" GYP, HANG & TAPE(2 layer each	4.0	SF	0.00	0	0.281	1.13	.017	1	0.07	$57.81	4	1.26	5.06
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$57.81	0.35	0.22	0.45
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$57.81	1	0.40	0.79
FURRING	1.0	LF	0.00	0	0.210	0.21	.030	1	0.03	$57.81	2	1.94	1.94
BAT INSULATION (R-19)	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74
VAPOR RETARDER	1.0	SF	0.00	0	0.06	0.06	.004	1	0.0	$57.81	0	0.29	$0
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18
STAINLESS STEEL WAINSCOT (26 G	0.2	SF	0.00	0	1.579	0.38	.017	1	0.00	$57.81	0	2.55	0.61
TOTALS					2.59	2.32	0.114	8.00	0.13				10.06
WALL UPGRADE - occupancy separation													
5/8" GYP, HANG & TAPE(2 layer each	2.0	SF	0.00	0	0.281	0.56	.017	1	0.03	$57.81	2	1.26	2.53
TEXTURE GYPSUM BOARD	2.0	SF	0.00	0	0.050	0.10	.003	1	0.01	$57.81	0.35	0.22	0.45
PAINT GYP BD	2.0	SF	0.00	0	0.050	0.10	.006	1	0.01	$57.81	1	0.40	0.79
BAT INSULATION-ACOUSTICAL	1.0	SF	0.00	0	0.340	0.34	.007	1	0.01	$57.81	0	0.74	0.74
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18
TOTALS					0.74	1.10	0.063	5.00	0.06				4.69
STAIR TOWER WALL	not including metal siding finish												
PLYWOOD SHEATHING	1.0	SF	0.00	0	1.250	1.25	.010	1	0.01	$57.81	1	1.83	1.83
8" x 18 ga METAL STUD 24" OC	1.0	SF	0.00	0	1.000	1.00	.000	1	0.15	$57.81	9	9.67	9.67
TOTALS					2.25	2.25	0.010	2.00	0.16				11.50
EPDM ROOFING													
EPDM 60 MILS	1.0	SF	0.00	0	2.500	2.50	.028	1	0.03	$57.81	2	4.12	4.12
ADHESIVE	1.0	SF	0.00	0	0.011	0.01	.000	1	0.00	$57.81	0	0.02	0.02
RECOVERY BOARD	1.0	SF	0.00	0	0.281	0.28	.003	1	0.00	$57.81	0	0.45	0.45
INSULATION (R-38) 10"	1.0	SF	0.00	0	2.500	2.50	.008	1	0.01	$57.81	0	2.96	2.96
PLYWOOD SHEATHING	1.0	SF	0.00	0	0.390	0.39	.011	1	0.01	$57.81	1	1.03	1.03
ICE AND WATER SHIELD(VAPOR RE	1.0	SF	0.00	0	0.300	0.30	.300	1	0.03	$57.81	2	2.03	2.03
TOTALS					5.98	5.98	0.350	6.00	0.08				10.62

METAL ROOFING

METAL ROOFING (24 GA)	1.0	SF	0.00	0	2.500	2.50	.034	1	0.03	$57.81	2	4.47	4.47
RECOVERY BOARD	1.0	SF	0.00	0	0.281	0.28	.003	1	0.00	$57.81	0	0.45	0.45
BAT INSULATION(R-38) 2 layers 6"	2.0	SF	0.00	0	0.340	0.68	.007	1	0.01	$57.81	1	0.74	1.49
PLYWOOD SHEATHING	1.0	SF	0.00	0	0.390	0.39	.011	1	0.01	$57.81	1	1.03	1.03
ICE AND WATER SHIELD(VAPOR RE	1.0	SF	0.00	0	0.300	0.30	.300	1	0.03	$57.81	2	2.03	2.03
5/8" GYP, HANG & TAPE	2.0	SF	0.00	0	0.281	0.56	.017	1	0.03	$57.81	2	1.26	2.53
TOTALS					4.09	4.71	0.372	6.00	0.13				12.00

DRAFT CURTAIN

METAL SIDING	1.0	SF	0.00	0	5.000	5.00	.031	1	0.03	$57.81	2	6.79	6.79
2X6 STUD	1.0	SF	0.00	0	1.000	1.00	.148	1	0.15	$57.81	9	9.56	9.56
SEALANT	0.1	LF	0.00	0	0.016	0.00	.030	1	0.00	$57.81	0	1.75	0.18
TOTALS					1.02	1.00	0.178	2.00	0.15				9.73

PROJECT: FT WW Hanger 2 & 3 Property Condition Report
LOCATION: FT WW
PHASE: Concept
DESCRIPTION: CIVIL COST ESTIMATE - TAB 12B

SUMMARY OF COSTS

DESCRIPTION	%	%	
TOTAL DIRECT COST, MATL & LAB			$415,045
LOCATION FACTOR		10%	$41,505
FREIGHT		10%	$41,505
OVER TIME - SOME		12.5%	$51,881
COMPLEXITY		15.0%	$62,257
			$612,192
CONTRACTOR OVER HEAD	15.0%		$91,829
CONTRACTOR PROFIT	12.0%		$84,482
SUBTOTAL			$704,021
TOTAL ESTIMATED COST			$0

	QUANTITY No.	UNITS	UNIT COST	COST
DIRECT COSTS BY CSI DIVISIONS				
DIVISION 1				
SURVEYING, 3-MAN CREW	4	HR	$190.00	$760
SUBTOTAL				$760
DIVISION 2 - SITE WORK				
02200 - SITE DEMOLITION				
SAWCUT ASPHALT PAVING (3")	1,200	LF	$0.95	$1,135
DEMO ASPHALT PAVING	18,667	SY	$6.70	$125,085
SUBTOTAL				$126,220
02510 WATER DISTRIBUTION				
6" DUCTILE IRON WATER MAIN	300	LF	$26.68	$8,003
HYDRANT INSTALLATION	3	Each	$1,420	$4,260
SUBTOTAL				$12,263
02700-BASES AND PAVEMENTS				
02740-FLEXIBLE PAVEMENT				
D1, PARKING, SPRD, COMP, GRAD	1,556	CY	$13.02	$20,257
ASPHALT PAVING, 3", PARKING LOTS	168,000	SF	$1.18	$198,516
PARKING PAINT STRIPING, 4"	5,800	LF	$0.27	$1,580
PAVEMENT MK, HNDCP, SYMB	0	EA	$70.49	$0

PROJECT: FT WW Hanger 2 & 3 Property Condition Report
LOCATION: FT WW
PHASE: Concept
DESCRIPTION: CIVIL COST ESTIMATE - TAB 12B

SUBTOTAL				$220,352
2800 - SITE IMPROVEMENTS				
FENCE, CHAIN LINK, 6' ASSY.	1,600.0	LF	$32.45	$51,920
GATE, 4' WIDE, 5' HIGH, 2" FRAME, GALV. ST	3.0	EA	$324.50	$974
LINE POST, 6'X 2 1/2" SET IN CONC.	53.0	EA	$48.24	$2,557
SUBTOTAL				$55,450
DIRECT COST				$415,045

CONSTRUCTION COST ESTIMATE

PROJECT: HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT
PHASE: CONCEPT
DESCRIPTION: TAB 12 OPTION B - OFFICES ESTIMATE SUMMARY LIST

PREPARED BY: RJR
FOR: JMM

21-Dec-07

MECHANICAL ESTIMATE SUMMARY

SQUARE FOOTAGE COSTS:	SQ.FT	COST/SQ.FT	ESCALATION FACTOR	TOTAL
SIDE BAY OFFICE VENTILATION SYSTEM INCLUDING CONTROLS	11,200	$32.00	1.15	$412,160.00
SIDE BAY OFFICE HYDRONIC SYSTEM INCLUDING CONTROLS	11,200	$32.00	1.15	$412,160.00
SIDE BAY OFFICE ATTIC FIRE SUPPRESSION SYSTEM, INCLUDING CONTROLS	11,200	$5.00	1.15	$64,400.00
HANGAR BAY VENTILATION SYSTEM INCLUDING CONTROLS	30,000	$40.00	1.15	$1,380,000.00
HANGAR BAY HYDRONIC SYSTEM INCLUDING CONTROLS	30,000	$40.00	1.15	$1,380,000.00
HANGAR BAY FIRE SUPPRESSION SYSTEM INCLUDING ACCESSORIES	30,000	$10.00	1.15	$345,000.00
HANGAR BAY FIRE SUPPRESSION SYSTEM, FOR OPTIONAL SECOND LEVEL OFFICE SPACE	30,000	$5.00	1.15	$172,500.00
TOTAL FOR SINGLE HANGAR				$4,166,220.00

CONSTRUCTION COST ESTIMATE

PROJECT: FT WW HANGARS 2 & 3 CONDITION ASSESSMENT
LOCATION: FORT WAINWRIGHT, ALASKA
PHASE: CONCEPT
DESCRIPTION: ELECTRICAL TAB 12B

PREPARED BY: EDR
CHECKED BY:

21-Dec-07

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR					TOTAL	
ESTIMATE ELECTRICAL SUBCONTRACTOR	No. UNITS	UNIT PRICE	EQUIP COST	UNIT PRICE	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	MATERIAL & LABOR
TOTAL DIRECT COST, MATL & LAB.			$0		$205,821			6,006		$395,766		$601,587
FREIGHT	10.0%				$20,582							
SUBTOTAL					$226,403					$395,766		$622,169
CONTRACTORS OVERHEAD	15.0%											$93,325.41
SUBTOTAL												$715,495
CONTRACTORS PROFIT	10.0%											$71,549
TOTAL ELECTRICAL COST (2007)												**$787,044**

DIVISION 16 - ELECTRICAL													
LIGHTING													
OFFICE LIGHTING	480	Each	$0	$0	110.00	$52,800	3.40	1	1632.0	$65.90	$107,542	$334.05	$160,342
EMERGENCY LIGHTING	64	Each	$0	$0	180.00	$11,520	3.00	1	192.0	$65.90	12,652	$377.69	$24,172
EXIT SIGNS	48	Each	$0	$0	160.00	$7,680	3.00	1	144.0	$65.90	$9,489	$357.69	$17,169
EXTERIOR LIGHTING	1	L.S.	$0	$0	15,000.00	$15,000	300.00	1	300.0	$65.90	$19,769	$34,768.81	$34,769
WIRING	1	L.S.	$0	$0	20,000.00	$20,000	580.00	1	580.0	$65.90	$38,220	$58,219.70	$58,220
REPLACE WIRING DEVICES													
20A, 120V OUTLET W/ COVERPLATE	480	Each	$0	$0	10.68	$5,126	0.40	1	190.1	$65.90	12,526	$36.77	$17,652
20A, 120V LIGHT SWITCH W/ COVER	96	Each	$0	$0	8.95	$859	0.40	1	38.0	$65.90	$2,505	$35.04	$3,364
COMMUNICATIONS													
COMMUNICATIONS RACK	4	EA	$0	$0	3,200.00	$12,800	48.00	1	192.0	$65.90	12,652	$6,363.01	$25,452
CAT 5E WIRING	768	C.L.F.	$0	$0	15.30	$11,750	1.14	1	877.8	$65.90	57,845	$90.62	$69,596
DATA OUTLETS	380	EA	$0	$0	0.75	$285	2.00	1	760.0	$65.90	50,081	$132.54	$50,366
FIRE ALARM SYSTEMS													
FIRE ALARM SYSTEMS (NOTE 1)	1	L.S.	$0	$0	48,000.00	$48,000	800.00	1	800	$65.90	$52,717	$100,716.83	$100,717
MECHANICAL SYSTEMS EQUIPMENT													
MOTOR STARTERS/DISC SW.	1	L.S.	$0	$0	12,000.00	$12,000	120.00	1	120.0	$65.90	$7,908	$19,907.52	$19,908
WIRING	1	L.S.	$0	$0	8,000.00	$8,000	180.00	1	180.0	$65.90	$11,861	$19,861.29	$19,861
COLUMN TOTALS:				$0		$205,821			6,006		$395,766		$601,587

APPENDIX A -

Table of Visually Observed Deficiencies

The appended five page table is a compilation of notes of the visual inspection of the structural components of the hangars. It is visual in nature, and is intended to provide a general level of understanding of the condition of the superstructural systems of the buildings. No destructive investigation was conducted, and many elements could only be examined from a distance using field glasses and binoculars.

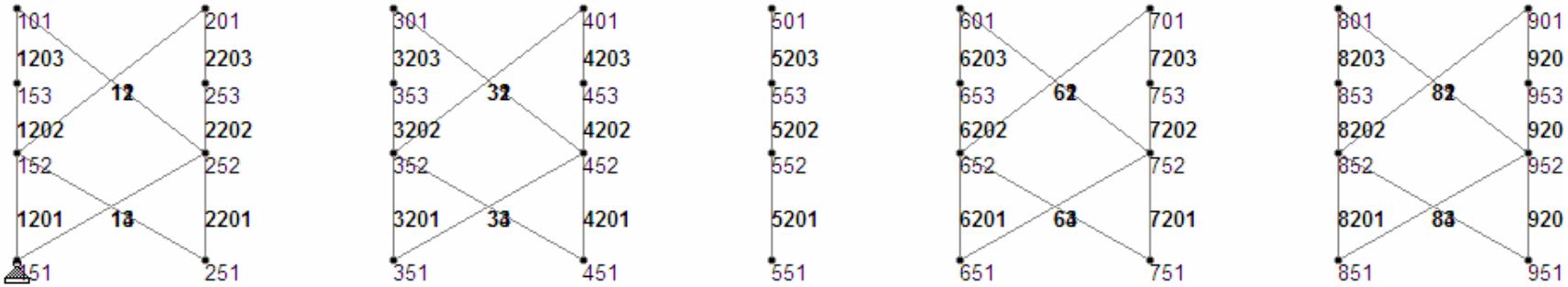
During the design phases of any anticipated projects at the hangars, it is recommended that a direct, hands-on examination of each affected member be conducted, in order to refine and more carefully analyze its condition.

Appendix A - Table of Visually Observed Deficiencies

Hangar #	Element	B/L #	Bay #	Member #	LEVEL #	Panel Pt. #	Deficiency	Thickness	Length	Severity	Deficiency
2	Column	1		South	2		Splits				Splits at X-brace
2	Column	1		North	1		Split		LOCAL		Split at end connection of X-brace
2	Column	1		North	2		Inaccessible				Inacessible
2	Column	1		North	4		Inaccessible				Inacessible
2	Column	1		South	1		Inaccessible				Inacessible
2	Column	1		South	4		Inaccessible				Inacessible
2	Column	1		South	2		Checks		LOCAL		Checks & knots in X-brace
2	Column	2		South	4		Splits				X-brace splits
2	Column	2		North	1		Split				Column split
2	Column	2		North	1		Split		LOCAL		Split at buttress connection
2	Column	2		South	1		Split		LOCAL		X-brace split at split ring connection
2	Column	2		South	1		Missing		LOCAL		Missing X-brace, cut short
2	Column	2		South	4		Loose Collar Bolts		LOCAL		Loose collar bolts
2	Column	2		North	1		Cut		LOCAL		Cut X-brace
2	Column	3		North	1		Split				Column split
2	Column	3		South	4		Split				Column split
2	Column	3		South	2		Split		FULL		Split & checks in column
2	Column	3		North	4		Damage				Major damage
2	Column	3		North	2		Checks		FULL		Timber checks
2	Column	4		South	1		Split		FULL		Column split along full length
2	Column	4		South	2		Split		FULL		Column split along full length
2	Column	4		South	2		Split		LOCAL		Split at X-brace
2	Column	4		South	4		Split		LOCAL		Split at X-brace connection
2	Column	4		North	1		Split				X-brace split
2	Column	4		North	1		Inaccessible				Inacessible
2	Column	4		North	2		Checks		LOCAL		Checks & splits at column lap splice
2	Column	4		North	2		Checks		LOCAL		Checks & splits at X-brace connection
2	Column	4		North	4		Checks		FULL		Checks and splits
2	Column	5		South	4		Split		LOCAL		Column split at buttress
2	Column	5		South	1		Split		LOCAL		Column split at connection
2	Column	5		South	2		Split		LOCAL		Column split at mid-height
2	Column	5		South	1		Split		1/2		X-brace split up to mid-height
2	Column	5		North	4		Checks		FULL		Shrinkage checks
2	Column	5		South	2		Checks		FULL		X-brace w/ knots & checks, 80% section remaining
2	Column	5		North	2		Check		LOCAL		Check and splits at column lap splice
2	Column	6		South	2		Splits		LOCAL		Splits at X-brace connection
2	Column	6		North	1		Split		7 LF		Column split, 7' length
2	Column	6		North	1		Split		1/2		Split at buttress connection to column
2	Column	6		South	1		Split		1/2		Split at buttress connection to column
2	Column	6		South	1		Missing		LOCAL		Missing X-brace at connection
2	Column	6		South	2		Missing		LOCAL		Missing X-brace at connection
2	Column	6		North	1		Hole		LOCAL		Hole on X-brace, 2" diameter
2	Column	6		North	4		Checks		FULL		Shrinkage checks
2	Column	6		North	1		Bent Bolt				Bent bolt
2	Column	6		North	2		Alignment				Bolts not centered on X-brace connection, X-braces reposition
2	Column	7		South	1		Split				Column split
2	Column	7		North	2		Split		LOCAL		Column split near lap splice
2	Column	7		South	2		Missing		LOCAL		Missing X-brace at connection
2	Column	7		South	2		Checks		1/2		Checks and splits up to column lap splice
2	Column	7		North	4		Checks		FULL		Shrinkage checks
2	Column	8		North	1		Split				Column split
2	Column	8		South	1		Split				Column split
2	Column	8		South	2		Split				Column split
2	Column	8		North	2		Split		LOCAL		Split at column lap splice
2	Column	8		North	2		Split		LOCAL		Split at X-brace connection
2	Column	8		North	4		Split		LOCAL		Split at X-brace connection between bolts
2	Column	8		North	1		Notched		LOCAL		Notched X-brace, 25% section remaining
2	Column	8		South	1		Missing		LOCAL		Missing split rings & nuts
2	Column	8		South	1		Missing		LOCAL		Missing/cut X-brace
2	Column	8		South	2		Missing		LOCAL		No X-brace
2	Column	8		South	4		Checks		FULL		Timber checks
2	Column	9		South	2		Split				Column & X-brace split
2	Column	9		North	2		Split		LOCAL		Split at X-brace connection
2	Column	9		North	1		Inaccessible				Inacessible
2	Column	9		North	4		Inaccessible				Inacessible
2	Column	9		South	1		Inaccessible				Inacessible
2	Column	9		South	4		Inaccessible				Inacessible
2	Column	9		South	2		Cut		LOCAL		X-brace cut
2	Perp. Hrz. Brace	n/a	1	n/a		13	Split			Severe	Split
2	Perp. Hrz. Brace	n/a	2	n/a		3	Split			Severe	Split
2	Perp. Hrz. Brace	n/a	3	n/a		3	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	1	n/a		3	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	2	n/a		17	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	5	n/a		17	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	6	n/a		3	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	8	n/a		3	Split			Moderate	Split
2	Perp. Hrz. Brace	n/a	4	n/a		17	Damage			Severe	Damage - at Connection
2	Perp. Hrz. Brace	n/a	8	n/a		7	Checks			Severe	Checks (Consider Replacing)
2	Perp. Hrz. Brace	n/a	5	n/a		7	Checks			Severe	Checks
2	Perp. Hrz. Brace	n/a	1	n/a		17	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	3	n/a		17	Checks			Moderate	Checks

Hangar #	Element	B/L #	Bay #	Member #	LEVEL #	Panel Pt. #	Deficiency	Thickness	Length	Severity	Deficiency
2	Perp. Hrz. Brace	n/a	4	n/a		3	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	5	n/a		10	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	6	n/a		7	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	6	n/a		17	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	7	n/a		3	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	7	n/a		7	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	7	n/a		13	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	6	n/a		10	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	4	n/a		13	Checks			Moderate	Checks
2	Perp. Hrz. Brace	n/a	4	n/a		7	Checks			Light	Checks
2	Purlin	n/a	4	n/a		10	Checks		Full	Severe	Checks - Full Length
2	Purlin	n/a	2	n/a		14	Checks		Full	Severe	Checks - Full Length
2	Purlin	n/a	2	n/a		15	Checks		Full	Severe	Checks - Full Length
2	Purlin	n/a	1	n/a		17	Checks		Full	Severe	Checks - Full Length
2	Purlin	n/a	1	n/a		11.1	Checks		Half	Severe	Checks - Half Length
2	Purlin	n/a	2	n/a		19	Checks		Half	Severe	Checks - Half Length
2	Purlin	n/a	2	n/a		20	Checks		Half	Severe	Checks - Half Length
2	Purlin	n/a	1	n/a		2	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	3	n/a		2	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	3	n/a		3	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	8	n/a		3	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	6	n/a		5	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	4	n/a		7	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	5	n/a		7	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	8	n/a		12	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	8	n/a		13	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	5	n/a		14	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	8	n/a		14	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	3	n/a		15	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	5	n/a		15	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	8	n/a		15	Checks		Full	Moderate	Checks - Full Length
2	Purlin	n/a	7	n/a		10	Checks		Half	Moderate	Checks - Half Length
2	Purlin	n/a	6	n/a		12	Checks		Half	Moderate	Checks - Half Length
2	Purlin	n/a	3	n/a		16	Checks		Half	Moderate	Checks - Half Length
2	Purlin	n/a	5	n/a		4	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	7	n/a		6	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	8	n/a		6	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	3	n/a		7	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	8	n/a		8	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	6	n/a		9	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	8	n/a		9	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	6	n/a		10	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	7	n/a		14	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	8	n/a		18	Checks		Full	Light	Checks - Full Length
2	Purlin	n/a	4	n/a		3	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	6	n/a		4	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	8	n/a		5	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	5	n/a		8	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	6	n/a		8	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	3	n/a		12	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	5	n/a		16	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	3	n/a		17	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	7	n/a		18	Checks		Half	Light	Checks - Half Length
2	Purlin	n/a	7	n/a		19	Checks		Half	Light	Checks - Half Length
2	Truss	1		B6(E)			Cracks	1/2 IN	1 LF		1/2" x 12", series of cracks
2	Truss	1		6E(E)			Crack	1/2 IN	1/4		1/2" crack, 1/4 length of member
2	Truss	1		7E(E)			Crack	1/4 IN	3/4		1/4" crack, 3/4 length of member
2	Truss	1		B5			Crack	1/2 IN	8 LF		1/2" x 8' crack, middle of member
2	Truss	2		9E(W)			Crack	1/2 IN	1/6		1/2" crack, at 15% end of member
2	Truss	2		10E(W)			Crack	1/2 IN	1/2		1/2" crack, 1/2 length of member
2	Truss	2		B2(E)			Crack	1/8 IN	16 LF		1/8" x 8' crack at end of member
2	Truss	2		5E(E)			Crack	1/4 IN	2 LF		1/4" crack at 1' at each end
2	Truss	2		1E(W)			Crack	1/2 IN	FULL		1/2" full length crack
2	Truss	2		2E(W)			Crack	1/2 IN	FULL		1/2" full length crack
2	Truss	2		8E(W)			Crack	1/2 IN	FULL		1/2" full length crack
2	Truss	2		M5(E)			Crack	1/2 IN	?		1/2" crack
2	Truss	2		M61			Crack	1/2 IN	?		1/2" crack
2	Truss	3		B5(E)			Cracks	3/4 IN	2 LF		3/4" x 2' cracks, each end
2	Truss	3		M75(W)			Cracks	1/4 IN	LOCAL		1/4" spot cracks
2	Truss	3		1E(W)			Crack	1/2 IN	1/2		1/2" crack, middle of member
2	Truss	3		2E(W)			Crack	1/2 IN	5 LF		1/2" x 3' crack (middle), 1/4" x 2' crack (end)
2	Truss	3		B2(E)			Crack	1/2 IN	6 LF		1/2" x 6' crack (reinforced w/ tie-rods)
2	Truss	3		6E(W)			Crack	1/2 IN	FULL		1/2" crack, entire length
2	Truss	3		7E(W)			Crack	1/2 IN	FULL		1/2" crack, entire length
2	Truss	3		B3(E)			Crack	1/2 IN	FULL		1/2" crack, full length
2	Truss	4		5E(E)			Crack	1/2 IN	3/4		1/2" crack, 3/4 length of member
2	Truss	4		1E(E)			Crack	3/4 IN	3/4		3/4" crack, 3/4 length of member
2	Truss	4		7E(E)			Crack	1/4 IN	7 LF		1/4" crack, 5' at 1 end & 2' at other end
2	Truss	4		M69			Crack	1/2 IN	?		1/2" crack
2	Truss	5		M47			Split		?		Split crack
2	Truss	5		5E(E)			Cracks	1/4 IN	2 LF		3 - 1/4" x 2' cracks.
2	Truss	5		M23(W)			Crack		?	Severe	Complete crack (failed)
2	Truss	5		M61(W)			Crack		?	Severe	Complete crack (failed)
2	Truss	5		1E(W)			Crack	1/4 IN	2 LF		1/4" x 2' crack at end
2	Truss	5		B3(W)			Crack	1/2 IN	2 LF		1/2" x 2' crack, north end
2	Truss	5		7E(W)			Crack	1/4 IN	2 LF		crack at 1/4" that is 2' length

Hangar #	Element	B/L #	Bay #	Member #	LEVEL #	Panel Pt. #	Deficiency	Thickness	Length	Severity	Deficiency
2	Truss	5		7E(W)			Crack	1/4 IN	2 LF		crack at 1/4" that is 2' length
2	Truss	5		10E(W)			Crack	1/2 IN	3 LF		1/2" x 3' crack at end
2	Truss	5		9E(W)			Crack	1/2 IN	3 LF		crack, 1/2" x 2 1/2' in length
2	Truss	5		9E(W)			Crack	1/2 IN	3 LF		crack, 1/2" x 2 1/2' in length
2	Truss	5		2B(E)			Crack	1/2 IN	4 LF		1/2" crack, 4' in length, under node M27
2	Truss	5		4E(W)			Crack	3/8 IN	4 LF		2-3/8" crack, one 4' length
2	Truss	5		4E(W)			Crack	3/8 IN	8 LF		2-3/8" crack, one 8' length
2	Truss	5		10E(E)			Crack	1/2 IN	FULL		1/2" crack, full length
2	Truss	5		M11			Crack	1/2 IN	?		1/2" crack
2	Truss	6		B5(W)			Crack	3/4 IN	1/2		3/4" crack, 1/2 length of member, on top
2	Truss	6		8E(W)			Crack	3/8 IN	3/4		3/8" - 1/2" crack, 3/4 length of member, not cont
2	Truss	6		10E(W)			Crack	1/2 IN	1 LF		1/2" x 1' crack at north end
2	Truss	6		9E(W)			Crack	1/2 IN	1 LF		1/2" x 1' crack at north end
2	Truss	6		M31			Crack	1/2 IN	FULL		1/2" crack, full length
2	Truss	7		6E(W)			Crack	1/2 IN	3/4		1/2" - 3/4" crack, 3/4 length of member
2	Truss	7		B2(E)			Crack	1/2 IN	3/4		1/2" crack, 3/4 length of member, discont
2	Truss	7		3E(W)			Crack	1/2 IN	1 LF		1/2" x 1' crack on bolt
2	Truss	7		B3(M)			Crack	1/2 IN	?		1/2" crack at base of M43
2	Truss	8		7E(W)			Cracks	1/2 IN	FULL		1/2" - 3/4" series of cracks, full length
2	Truss	8		8E(W)			Cracks	1/2 IN	FULL		1/2" - 3/4" series of cracks, full length
2	Truss	8		9E(E)			Cracks	1/2 IN	FULL		1/2" series of cracks, full length
2	Truss	8		1E(E)			Cracks	1/2 IN	FULL		1/2" series of cracks, full length
2	Truss	8		3E(W)			Crack	1/2 IN	3/4		1/2" crack, 3/4 length of member
2	Truss	8		6E(E)			Crack	1/2 IN	1 LF		1/2" x 1' crack at north end
2	Truss	8		B3(E)			Crack	1/4 IN	4 LF		1/4" x 4' crack at north end
2	Truss	8		B4(W)			Crack	Hairline	FULL		Hairline crack at bottom of mid member, full length
2	Truss	8		M67(W)			Crack		?		Crack
2	Truss	8		2E(E)			Crack		?		Stress crack
2	Truss	9		B1			Crack	3/4 IN	1 LF		3/4" x 1' crack at south end at gussett pl
2	Truss	9		M29			Crack	1/4 IN	1 LF		1/4" crack in middle of 2.5" x13" sister pl
2	Truss	9		M49			Crack	1/4 IN	1 LF		1/4" crack in middle of 2.5" x13" sister pl
2	Truss	9		M67			Crack	1/4 IN	1 LF		1/4" crack in middle of 2.5" x13" sister pl
2	Truss	9		M71			Crack	1/4 IN	1 LF		1/4" crack in middle of 2.5" x13" sister pl
2	Truss	9		8E(W)			Crack	3/2 IN	1 LF		1 1/2" x 1' crack at south end
2	Vert. X Brace	n/a	8	n/a		7	Damage			Severe	Damage - at Connection
3	Column	1		North	1		Split		LOCAL		Split at splice plate at X-brace
3	Column	1		South	1		Split		LOCAL		Split at X-brace
3	Column	1		North	1		Split		LOCAL		Split at X-brace at end column
3	Column	1		South	2		Split		LOCAL		Split at X-brace connection
3	Column	1		North	1		Notched		LOCAL		Notched glulam
3	Column	1		South	1		Inaccessible				Column hidden
3	Column	1		South	2		Cut		LOCAL		Glulam connection notched
3	Column	1		North	4		Checks		LOCAL		Checks at X-brace splice plate
3	Column	2		North	1		Split		LOCAL		Connection plate damage, split
3	Column	2		South	2		Split		LOCAL		Split at X-brace connection
3	Column	2		North	2		Split		LOCAL		Split at X-brace connection plate
3	Column	2		North	2		Checks		FULL		Checking at column, up & down
3	Column	2		South	4		Checks		LOCAL		Checks below truss
3	Column	2		North	4		Checks		FULL		Timber checks
3	Column	2		South	1		Checks		4 LF		Timber checks, 4'
3	Column	3		South	1		Splits		LOCAL		Splits at bottom connection
3	Column	3		North	1		Split		FULL		Column splits
3	Column	3		South	2		Split		LOCAL		Split at column splice
3	Column	4		South	2		Split		1/2		Split below column splice
3	Column	4		South	4		Checks		LOCAL		Checks at X-brace plate
3	Column	4		South	1		Checks		LOCAL		Local checks at X-brace
3	Column	4		North	1		Checks		FULL		Timber checks and surface damage
3	Column	4		North	2		Checks		FULL		Timber checks and surface damage
3	Column	4		North	4		Checks		FULL		Timber checks and surface damage
3	Column	5		North	1		Split		FULL		Severe split all way up
3	Column	5		North	2		Split		FULL		Severe split all way up
3	Column	5		North	4		Split		FULL		Severe split all way up
3	Column	5		North	2		Checks		LOCAL		Checking at connection
3	Column	5		South	1		Checks		LOCAL		Checks at X-brace
3	Column	5		South	4		Checks		LOCAL		Checks at X-brace ends
3	Column	5		South	2		Checks		1/2		Severe checks above column splice, all the way up
3	Column	6		South	2		Split		LOCAL		Split above splice
3	Column	6		South	1		Missing		LOCAL		Missing X-brace
3	Column	6		South	2		Cut		LOCAL		Cut connection
3	Column	6		South	1		Checks		LOCAL		Checks at bottom/buttress
3	Column	6		South	4		Checks				Sever timber checks
3	Column	7		North	2		Split		1/2		Wide split to column lap splice then checks
3	Column	7		North	1		Split		1/2		Wide split to X-brace at bottom
3	Column	7		South	2		Checks		1/2		Checking from splice to top
3	Column	7		South	1		Checks		FULL		Timber checking
3	Column	8		South	1		Split		LOCAL		Split at buttress connection
3	Column	8		South	2		Checks		1/2		Checking from splice to top
3	Column	8		South	2		Checks		LOCAL		Checks at X-brace
3	Column	8		North	2		Check		LOCAL		Check above splice
3	Column	9		North	4		Split				Split
3	Column	9		South			Inaccessible				Column Inaccessible
3	Column	9		South	4		Inaccessible				Inacessible
3	Column	9		South	2		Checks		LOCAL		Checking at X-brace connection
3	Column	9		South	1		Checks		LOCAL		Checks at X-brace connection
3	Column	9		North	2		Checks		FULL		Timber checks
3	Perp. Hrz. Brace	n/a	6	n/a		13	Warped			Moderate	Warped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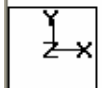
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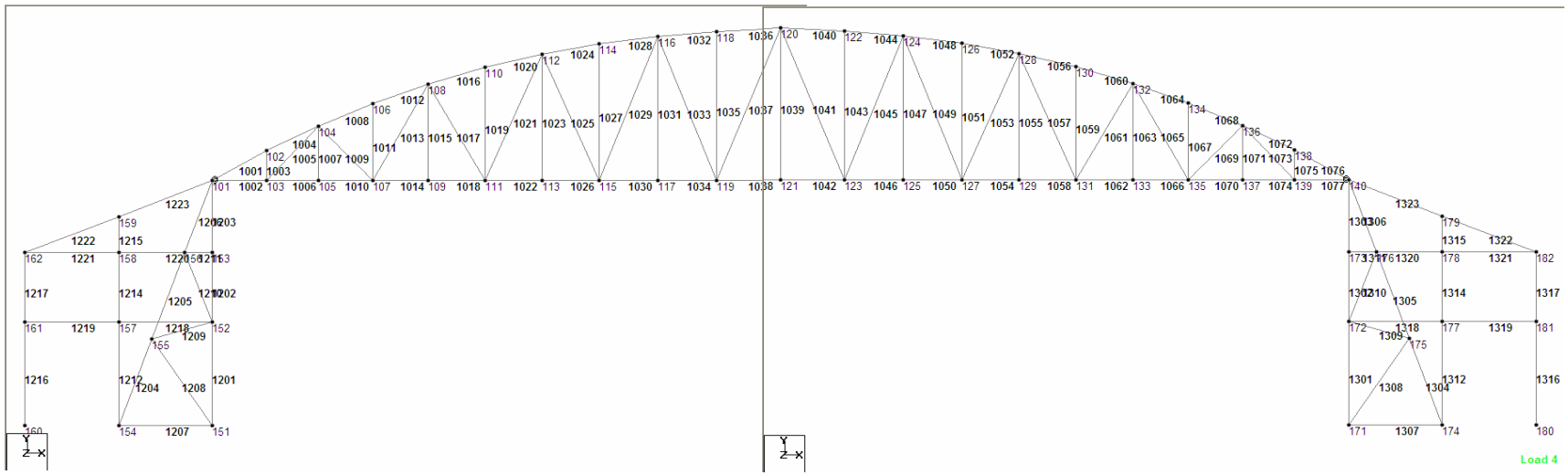
Load 51

Hangar #	Element	B/L #	Bay #	Member #	LEVEL #	Panel Pt. #	Deficiency	Thickness	Length	Severity	Deficiency
3	Perp. Hrz. Brace	n/a	7	n/a		3	Split		LOCAL	Severe	Split (at Bolt)
3	Perp. Hrz. Brace	n/a	1	n/a		3	Split			Moderate	Split
3	Perp. Hrz. Brace	n/a	1	n/a		7	Split			Moderate	Split
3	Perp. Hrz. Brace	n/a	7	n/a		7	Split			Moderate	Split
3	Perp. Hrz. Brace	n/a	3	n/a		3	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	3	n/a		7	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	3	n/a		17	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	4	n/a		13	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	4	n/a		17	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	5	n/a		3	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	5	n/a		13	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	6	n/a		7	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	6	n/a		17	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	7	n/a		13	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	8	n/a		10	Checks			Severe	Checks
3	Perp. Hrz. Brace	n/a	1	n/a		13	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	1	n/a		17	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	2	n/a		3	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	2	n/a		17	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	4	n/a		7	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	6	n/a		3	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	7	n/a		17	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	8	n/a		17	Checks			Moderate	Checks
3	Perp. Hrz. Brace	n/a	5	n/a		7	Checks			Moderate	Checks (Top of Member)
3	Purlin	n/a	5	n/a		19	Rot		Local	?	Rot - Local
3	Purlin	n/a	6	n/a		16	Rot			?	Rot
3	Purlin	n/a	6	n/a		17	Rot			?	Rot
3	Purlin	n/a	5	n/a		18	Rot			?	Rot
3	Purlin	n/a	6	n/a		18	Rot			?	Rot
3	Purlin	n/a	1	n/a		19	Rot			?	Rot
3	Purlin	n/a	8	n/a		3	Checks		Full	Severe	Checks - Full Length
3	Purlin	n/a	1	n/a		14	Checks		Full	Severe	Checks - Full Length
3	Purlin	n/a	1	n/a		16	Checks		Full	Severe	Checks - Full Length
3	Purlin	n/a	1	n/a		2	Checks		Full	Moderate	Checks - Full Length
3	Purlin	n/a	1	n/a		3	Checks		Full	Moderate	Checks - Full Length
3	Purlin	n/a	2	n/a		12	Checks		Full	Moderate	Checks - Full Length
3	Purlin	n/a	1	n/a		13	Checks		Full	Moderate	Checks - Full Length
3	Purlin	n/a	1	n/a		18	Checks		Full	Moderate	Checks - Full Length
3	Purlin	n/a	3	n/a		15	Checks		Half	Moderate	Checks - Half Length
3	Purlin	n/a	1	n/a		20	Checks		Half	Moderate	Checks - Half Length
3	Purlin	n/a	7	n/a		4	Checks		Full	Light	Checks - Full Length
3	Purlin	n/a	2	n/a		8	Checks		Full	Light	Checks - Full Length
3	Purlin	n/a	1	n/a		15	Checks		Full	Light	Checks - Full Length
3	Purlin	n/a	8	n/a		16	Checks		Full	Light	Checks - Full Length
3	Purlin	n/a	3	n/a		17	Checks		Full	Light	Checks - Full Length
3	Purlin	n/a	1	n/a		4	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	6	n/a		4	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	8	n/a		4	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	1	n/a		6	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	5	n/a		9	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	4	n/a		10	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	7	n/a		10	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	3	n/a		12	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	3	n/a		13	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	8	n/a		15	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	7	n/a		17	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	6	n/a		19	Checks		Half	Light	Checks - Half Length
3	Purlin	n/a	5	n/a		20	Checks		Half	Light	Checks - Half Length
3	Truss	1		B1(W)			Crack	1/2 IN	2 LF	Light	1/2" x 2' crack, south end, confined
3	Truss	1		M9(E)			Crack	1/2 IN	1 LF		1/2" x 1' crack on south end of ???
3	Truss	1		M27			Crack	3/4 IN	1 LF		3/4" in bottom 12' cover plate
3	Truss	1		M51			Crack	1/1 IN	2 LF		1" x 2' crack in north cover plate
3	Truss	1		M43			Crack	1/2 IN	8 LF		1/2" x 8' crack in south cover plate
3	Truss	1		B5(E)			Crack	1/2 IN	FULL		1/2" crack, full length
3	Truss	1		B4			Crack	1/2 IN	FULL		1/2" crack, full length
3	Truss	1		B5			Crack	1/2 IN	FULL		1/2" crack, full length. Lower splice board bwt
3	Truss	1		M59			Crack	1/2 IN	FULL		full length 1/2" crack in north cover plate
3	Truss	1		M67			Crack	Hairline	FULL		Hairline crack, full length, south cover plate
3	Truss	1		M71			Crack	Hairline	FULL		Hairline crack, full length
3	Truss	1		M21			Crack	3/4 IN	FULL		1/2" - 3/4" full length crack
3	Truss	1		M19			Crack	3/4 IN	FULL		1/2" - 3/4" full length crack
3	Truss	1		M11			Crack	3/4 IN	FULL		1/2" - 3/4" full length crack
3	Truss	1		M7			Crack	3/4 IN	FULL		1/2" - 3/4" full length crack
3	Truss	1		M3			Crack	3/4 IN	FULL		1/2" - 3/4" full length crack
3	Truss	1		2E(E)			Crack	1/2 IN	FULL		1/2" full length crack
3	Truss	1		M39			Crack		LOCAL		Crack in north cover plate (size ??? In notes)
3	Truss	2		4E(W)			Cracks	Hairline	FULL		Full length cracks, fully confined
3	Truss	2		B1(E)			Cracks	1/2 IN	FULL		1/2" series of cracks, full length
3	Truss	2		8E(W)			Crack	Hairline	3/4	Moderate	Thin, deep crack, 3/4 length of member
3	Truss	2		3E(W)			Crack	Hairline	1 LF	Light	Hairline crack, 1' at north end, confined
3	Truss	2		5E(W)			Crack	Hairline	2 LF		Hairline crack, 2' at south end, 2' at north end
3	Truss	2		7E(W)			Crack	1/2 IN	4 LF		1/2" x 4' crack, south end
3	Truss	2		B2(W)			Crack	Hairline	FULL		Full length hairline crack
3	Truss	2		6E(W)			Crack	Hairline	FULL		Full length crack, thin
3	Truss	2		3E(E)			Crack		FULL		Full length deep crack
3	Truss	3		8E(W)			Cracks	1/2 IN	FULL		1/2" series of cracks, full length, confined

Hangar #	Element	B/L #	Bay #	Member #	LEVEL #	Panel Pt. #	Deficiency	Thickness	Length	Severity	Deficiency
3	Truss	3		B2(W)			Cracks	3/4 IN	LOCAL		1/2" - 3/4" cracks, over crane
3	Truss	3		7E(E)			Crack		FULL	Light	Full length, deep crack, confined
3	Truss	3		6E(E)			Crack		FULL	Light	Full length, deep crack, confined
3	Truss	3		5E(E)			Crack	1/4 IN	1/2		1/4" - 3/8" crack, 1/2 length of member, middle
3	Truss	3		6E(W)			Crack		FULL		Full length crack, deep.
3	Truss	3		B4(W)			Crack	1/2 IN	FULL		1/2" -1" full length crack
3	Truss	3		M71(E)			Crack		LOCAL		Cracked in box with cover plate each side
3	Truss	4		4E(E)			Cracks		FULL		Full length cracks
3	Truss	4		8E(E)			Cracks	Hairline	FULL		Full length cracks, confined
3	Truss	4		10E(W)			Crack	1/2 IN	1 LF	Light	1/2" x 1' crack, confined
3	Truss	4		M67(E)			Crack		FULL		Full length crack
3	Truss	4		10E(E)			Crack	3/4 IN	FULL		3/4" full length crack
3	Truss	4		B5			Crack		FULL		Full crack, middle of member
3	Truss	5		1E			Split		FULL		Split along center of whole section
3	Truss	5		M69			Split		LOCAL		Split at connection
3	Truss	5		M27			Split		LOCAL		Split at spacer bolt
3	Truss	5		8E(W)			Cracks	1/2 IN	3/4		1/4" series of cracks, 3/4 length of member
3	Truss	5		9E(W)			Cracks	1/3 IN	FULL		1/2" series of cracks, full length
3	Truss	5		B1			Cracks		LOCAL		Shrinkage cracks ext., Interior, severe crack
3	Truss	6		2E			Split		LOCAL		Split at connection
3	Truss	7		B1			Split		LOCAL	Light	Split with collar attached
3	Truss	7		3E			Split		FULL		Split at whole length
3	Truss	8		B4(E)			Split		LOCAL		Split along splice plate
3	Truss	8		4E			Checks		LOCAL		Checks at all bolts
3	Truss	8		7E			Checks		LOCAL		Checking & splitting at connection. Checking on middle face
3	Truss	8		8E			Checks		LOCAL		Checking at connections
3	Truss	9		All Vert			Splits		?		Vert. posts in truss with splits
3	Truss	9		M31			Section Loss		LOCAL		Section missing
3	Truss	9		M47			Section Loss		LOCAL		Cut section missing
3	Truss	9		All Vert			Checks		FULL		Vert. posts in truss with checks
3	Vert. X Brace	n/a	1	n/a		13	Rot		LOCAL	?	Rot - at Connection


Load 4

Task: Estimate Quanties for Proposed Repair Details

Transverse Bracing:

Approach: All Transverse Bracing to Be replaced by Angles

Calculate Work Plan:

Labor:

	Qty	# Days	$/HR	Total Cost
Laborer	3	5	$ 40.00	$ 4,800
Lift Operator	1	5	$ 45.00	$ 1,800
Welder	1	5	$ 45.00	$ 1,800
Superintendan	1	5	$ 80.00	$ 3,200
			Total Labor	$ 11,600

Material:

Material =	Steel	
Grade =	A36 or better	
Shape =	L 8x8x1/2	
Unit Wieght =	26.4	LB/FT
Length of Bracing =	93.18	LF Per Bay
Use =	100.00	LF Per Bay
Weight (Per Bay) =	2640	LB
No. Bays per Hangars =	16	Bays/Hangars
Total Weight =	42,240	LB
Cost of Steel =	$ 2.00	$/LB
Total Cost of Material =	$ 84,480.00	
Miscellaneous Material =	Welding Material, Bolts	
Grade =	A316	
Shape =	3/4" Bolts	
Lump Sum =	$ 1,000	
Total Material	$ 85,480	

Equipment:

1. Heavy Duty Lift
2. Flat Bed Truck
3. Personal Vehicles
4. Welder

1. Heavy Duty Lift

Quantity	1	EA
Rental Period	1	Week
Rental Charge	$ 3,000.00	$/Week
Subtotal =	$ 3,000.00	

2. Flat Bed Truck

Quantity	1	EA
Rental Period	1	Day
Rental Charge	$ 250.00	$/Day
Subtotal =	$ 250.00	

3. Personal Vehicles

Quantity	6	EA
Rental Period	5	Day
Rental Charge	$ 50.00	$/Day
Subtotal =	$ 1,500.00	

4. Welder

Quantity	1	EA
Rental Period	5	Day
Rental Charge	$ 100.00	$/Day
Subtotal =	$ 500.00	

Total Equipment $ 5,250.00

Inspection/Quality Control:

		Qty	# Days	$/HR	Total Cost
Inspector		1	5	$ 75.00	$ 3,000.00
Expenses	Travel				$ 2,000.00
	Lodging				$ 1,000.00
				Inspection Subtotal:	$ 6,000.00

Recap:

Labor		$ 11,600.00
Material		$ 85,480.00
Equipment		$ 5,250.00
	Subtotal:	$ 102,330.00
Contractor Ma	15%	$ 15,349.50
Contractor Base Price		$ 117,679.50
Contingency	20%	$ 23,535.90
Inspection		$ 6,000.00
	Total:	$ 150,000.00

Special Repairs:

Approach:

Repair Detail 4, Typical Epoxy Injection Repair

Approach: All splits and cracks to be repaired with epoxy injection material.

Using field assessment chart, determine quantity of splits and cracks.

Contact Contractors in Fairbanks, Timber Restoration, to find if there are any prefferred units of measure

Make assumptions about dimensions of crack, to determine a quantitied of void space to be filled.

Make assumptions about extent of cracks to determin quantity of sealer material needed.

CAUTION: Rich Mattri at Timber Restoration strongly recommend that we not use Epoxy in these hangars. His judgement was that

The trusses are in good enough shape to be serviceable without epoxy. His main concern was out of plane bending, and

unual deformations, and severe split situations away outside the neutral axis.

This vastly reduces amount of Epoxy Injection to be reused on site, and perphap we can now reclassify these in the

"Special" member category

Epoxy Injection Repair:

Severe Splits, From deficiency Chart:

Hangar #	Element	B/L # or Bay #	Member or P/Pt #	Deficiency	Dimensions	Void (Gallons)	Seal area (sf)	Seal Th (in)	Seal (Gallons)
2	Perp. Hrz. Brace	1	13	Split	1/2"x25"x10"	6.49	41.67	0.25	0.54
2	Perp. Hrz. Brace	2	3	Split	1/2"x25"x10"	6.49	41.67	0.25	0.54
3	Perp. Hrz. Brace	7	3	Split (at Bolt)	1/2"x1"x10"	0.26	1.67	0.25	0.02
2	Perp. Hrz. Brace	4	17	Damage - at Connection	1/2"x3"x10"	0.78	5.00	0.25	0.06
2	Vert. X Brace	8	7	Damage - at Connection	1/2"x3"x10"	0.78	5.00	0.25	0.06
2	Truss	5	M23(W)	Complete crack (failed)	1/2"x10"x10"	0.22	1.39	0.25	0.02
2	Truss	5	M61(W)	Complete crack (failed)	1/2"x10"x10"	0.22	1.39	0.25	0.02
					Total:	15.24			1.27

Labor:

	Qty	# Days	$/HR	Total Cost
Laborer	3	2	$ 40.00	$ 1,920
Lift Operator	1	2	$ 45.00	$ 720
Superintendan	1	2	$ 80.00	$ 1,280
			Total Labor	$ 3,920

Material:

Material =	Epoxy	
Grade =	Sika 31 & 35	
Units of Measure =	Gallons	
Total Quanity of Material =	16.51	Gallons
Use =	20.00	Gallons
Cost of Material =	$ 100.00	$/Gallon
Total Cost of Material =	$ 2,000.00	
Miscellaneous Material =	Injectors gun, scoring equipment	
Grade =		
Shape =		
Lump Sum =	$ 1,000	
Total Material	$ 3,000	

Equipment:

1. Light Duty Lift
2. Personal Vehicles

1. Light Duty Lift

Quantity	1	EA
Rental Period	2	Days
Rental Charge	$ 400.00	$/Day
Subtotal =	$ 800.00	

3. Personal Vehicles

Quantity	5	EA
Rental Period	2	Day
Rental Charge	$ 50.00	$/Day
Subtotal =	$ 500.00	
Total Equipment	$ 1,300.00	

Inspection/Quality Control:

		Qty	# Days	$/HR	Total Cost
Inspector		1	2	$ 75.00	$ 1,200.00
Expenses	Travel				$ 2,000.00
	Lodging				$ 1,000.00
				Inspection Subtotal:	$ 4,200.00

Recap:

Labor		$ 3,920.00
Material		$ 3,000.00
Equipment		$ 1,300.00
	Subtotal:	$ 8,220.00
Contractor Ma	15%	$ 1,233.00
Contractor Base Price		$ 9,453.00
Contingency	20%	$ 1,890.60
Inspection		$ 4,200.00
	Total:	$ 20,000.00

Other Repairs: (NOT on Deficiency Chart!!)

Hangar #	Element	B/L # or Bay #	Member or P/Pt #	Deficiency	Proposed Repair
3	Truss	5	N. Saddle Plate	Bottom Chord fracture at saddle plate	Install V Plates
2	Truss	8	South End	Top Chord - local crushing	TBD

Bottom Chord Fracture:

Labor:

	Qty	# Days	$/HR	Total Cost
Laborer	1	1	$ 40.00	$ 320
Lift Operator	1	1	$ 45.00	$ 360
Welder	1	1	$ 45.00	$ 360
Superintendan	1	1	$ 80.00	$ 640
			Total Labor	$ 1,680

Material:

Material =	Steel	
Grade =	Structural Grade	
Dimensions=	2 Plates = 5"x1/2"x10'	
Volume of Steel =	2.08	CF
Density of Steel =	490.00	LB/CF
Weight of Steel =	1020.83	LB
Cost of Material =	$ 2.00	$/LB
Total Cost of Material =	$ 2,041.67	
Miscellaneous Material =	Bolts, Welding Equipment	
Grade =		
Shape =		
Lump Sum =	$ 1,000	
Total Material	$ 3,042	

Equipment:

1. Light Duty Lift
2. Personal Vehicles
3. Welder

1. Light Duty Lift

Quantity	1	EA
Rental Period	2	Days
Rental Charge	$ 400.00	$/Day
Subtotal =	$ 800.00	

2. Personal Vehicles

Quantity	4	EA
Rental Period	2	Day
Rental Charge	$ 50.00	$/Day
Subtotal =	$ 400.00	

3. Welder

Quantity	1	EA
Rental Period	1	Day
Rental Charge	$ 100.00	$/Day
Subtotal =	$ 100.00	
Total Equipment	$ 1,300.00	

Inspection/Quality Control:

	Qty	# Days	$/HR	Total Cost
Inspector	1	1	$ 75.00	$ 600.00
Expenses	Travel			$ 2,000.00
	Lodging			$ 1,000.00
			Inspection Subtotal:	$ 3,600.00

Recap:

Labor		$ 1,680.00
Material		$ 3,041.67
Equipment		$ 1,300.00
	Subtotal:	$ 6,021.67
Contractor Ma	15%	$ 903.25
Contractor Base Price		$ 6,924.92
Contingency	20%	$ 1,384.98
Inspection		$ 3,600.00
	Total:	$ 10,000.00

Purlin Repair:

Approach: All Purlins to be Strengthened with 2 sister plates

NOTE: Consider refining analysis and only strengthening a portion of the purlins

Calculate Work Plan:

Labor:

	Qty	1 HR	$/HR	Total Cost
Laborer	3	1	$ 40.00	$ 120
Lift Operator	1	1	$ 45.00	$ 45
Superintendan	1	1	$ 80.00	$ 80
			Crew Hour	$ 245

Estimate 1/2 Crew Hour per Purlin

Number of Purlins = 320 EA

Crew Hours = Purlins * 1/2 160 Crew Hours

Total Labor Cost = $ 39,200.00

Material:

Material =	Glue Laminated Lumber	
Grade =	?	
Shape =	3 1/2" x 14"	
Length =	25	LF
Approximate Cost Each =	$ 100.00	
Qty per Purlin =	2	EA
Number of Purlins =	320	EA
Total number of Glulams =	640	EA
Total Cost of Material =	$ 64,000.00	
Miscellaneous Material =	ThruBolts, Other	
Thrubolts		
Qty per purlin =	11	EA
Total Qty =	3520	EA
Cost Each =	$ 3.00	
Total Cost of Bolts =	$ 10,560.00	
Other		
Lump Sum =	$ 1,000	
Total Material	$ 75,560	

Equipment:

1. Light Duty Lift
2. Personal Vehicles
3. Welder

1. Light Duty Lift

Quantity	1	EA
Rental Period	20	Days
Rental Charge	$ 400.00	$/Day
Subtotal =	$ 8,000.00	

2. Flat Bed Truck

Quantity	1	EA
Rental Period	1	Day
Rental Charge	$ 250.00	$/Day
Subtotal =	$ 250.00	

3. Personal Vehicles

Quantity	5	EA
Rental Period	20	Day
Rental Charge	$ 50.00	$/Day
Subtotal =	$ 5,000.00	
Total Equipment	$ 13,250.00	

Inspection/Quality Control:

	Qty	# Days	$/HR	Total Cost
Inspector	1	20	$ 75.00	$ 12,000.00
Expenses	Travel			$ 2,000.00
	Lodging			$ 1,000.00
			Inspection Subtotal:	$ 15,000.00

Recap:

Labor		$ 245.00
Material		$ 75,560.00
Equipment		$ 13,250.00
	Subtotal:	$ 89,055.00
Contractor Ma	15%	$ 13,358.25
Contractor Base Price		$ 102,413.25
Contingency	20%	$ 20,482.65
Inspection		$ 15,000.00
	Total:	$ 140,000.00

Task: Estimate Quanties for Proposed Repair Details

Repair Detail 1, Transverse Bracing at Columns

Approach: All Transverse Bracing to Be replaced by Angles

Count number of Bracing Joints at Colums, this will determin number of Plates, Bolts, etc.

4 Bays per side, 2 sides per hangars,

Each Bay has 4 single connections and 2 double connections

Each Bay has a certain length of brace:

L = 2*(25/COS38.66)+2*(25/COS30.96)

122.3 LF (At EACH BAY)

Size the proposed angles due to compression loading.. (preliminary)

Assume angles to be pinned at intersection. Therefore, Max Unbraced Lu =

Lu = 0.5*(25/COS(38.66))

16.01 LF

Max Compression, from output:

39.06 Kips Axial Compression

Example 11, Determine whether the angle strut show can carry a 7-kip axial compression load.

This example includes consideration of local, flexural, and flexural-torsional buckling.

A36 Steel

Ix = Iy =	3.04	in^4	
A =	1.94	in^2	
x = y =	1.09	in	
rz =	0.795	in	
ct = x*2^.5	1.54	in	
cc = see ->	1.377	in	cc =(4+(.25/2))/2^.5-ct
Ecc. of load at:	1.45	in	Assume Eccentricy of load at 1.45 in
Iz	1.226	in^4	

Solution:

Kl =	64	in	Unbraced Length
(Kl/r) =	80.5		Unbraced Length / rz, (i33/f26)

Check Local Buckling:

b/t =	16		Width divided by Thickness of Angle
76/(36)^0.5	8.85		
Q =	0.91		1.34-0.00447(16)*(36)^.5
C'c =	132.1		(2*3.14159^2*(29,000)/(Q*36))^.5

For equal leg angles, flexural-torsional buckling will control if:

(Kl/r)max < 5.4 (b/t) / Q

(Kl/r)max =	80.5		
5.4(b/t)/Q =	94.9		
Controls?	**Yes flexural-torsional buckling controls**		

Determine (Kl/r) equiv = Pi*(E/Fe)^.5

wo =	1.365	in	(2^.5)*(x-th/2)
ro2 =	4.996	in	wo^2+2*(Ix) / A
H =	0.627		1-(wo)^2/ro2
J =	0.0404	in^4	At^2/3
Iz+Iw=Ix+Iy			
Iw =	4.85	in^4	Iw=Ix+Iy-Iz
rw =	1.58	in^4	(Iw/A)^.5

Calculate Work Plan:

		Labor:								
				Qty	# Days	$/HR	Total Cost			
			Laborer	3	5	$ 40.00	$ 4,800			
			Lift Operator	1	5	$ 45.00	$ 1,800			
			Welder	1	5	$ 45.00	$ 1,800			
			Superintendan	1	5	$ 80.00	$ 3,200			
						Total Labor	$ 11,600			
		Material:								
			Material =		Steel					
			Grade =		A36 or better					
			Shape =		L 8x8x1/2					
			Unit Wieght =		26.4	LB/FT				
			Length of Bracing =		93.18	LF Per Bay				
				Use =	100.00	LF Per Bay				
			Weight (Per Bay) =		2640	LB				
			No. Bays per Hangars =		16	Bays/Hangars				
			Total Weight =		42,240	LB				
			Cost of Steel =		$ 2.00	$/LB				
			Total Cost of Material =		$ 84,480.00					
			Miscellaneous Material =		Welding Material, Bolts					
			Grade =		A316					
			Shape =		3/4" Bolts					
			Lump Sum =		$ 1,000					
				Total Material	$ 85,480					
		Equipment:								
			1. Heavy Duty Lift							
			2. Flat Bed Truck							
			3. Personal Vehicles							
			4. Welder							
			1. Heavy Duty Lift							
				Quantity	1	EA				
				Rental Period	1	Week				
				Rental Charge	$ 3,000.00	$/Week				
				Subtotal =	$ 3,000.00					
			2. Flat Bed Truck							
				Quantity	1	EA				
				Rental Period	1	Day				
				Rental Charge	$ 250.00	$/Day				
				Subtotal =	$ 250.00					
			3. Personal Vehicles							
				Quantity	6	EA				
				Rental Period	5	Day				
				Rental Charge	$ 50.00	$/Day				
				Subtotal =	$ 1,500.00					
			4. Welder							
				Quantity	1	EA				
				Rental Period	5	Day				
				Rental Charge	$ 100.00	$/Day				

				Subtotal =	$ 500.00					
				Total Equipment	$ 5,250.00					
		Inspection/Quality Control:								
				Qty	# Days	$/HR	Total Cost			
			Inspector	1	5	$ 75.00	$ 3,000.00			
			Expenses	Travel			$ 2,000.00			
				Lodging			$ 1,000.00			
Everet	Crooks					Inspection Subtotal:	$ 6,000.00			
		Recap:								
			Labor		$ 11,600.00					
			Material		$ 85,480.00					
			Equipment		$ 5,250.00					
				Subtotal:	$ 102,330.00					
			Contractor Mar	15%	$ 15,349.50					
			Contractor Base Price		$ 117,679.50					
			Contingency	20%	$ 23,535.90					
			Inspection		$ 6,000.00					
				Total:	$ 150,000.00					

Repair Detail 4, Typical Epoxy Injection Repair

	Approach:	All splits and cracks to be repaired with epoxy injection material.
		Using field assessment chart, determine quantity of splits and cracks.
		Contact Contractors in Fairbanks, Timber Restoration, to find if there are any prefferred units of measure
		Make assumptions about dimensions of crack, to determine a quantitied of void space to be filled.
		Make assumptions about extent of cracks to determin quantity of sealer material needed.
	CAUTION:	Rich Mattri at Timber Restoration strongly recommend that we not use Epoxy in these hangars. His judgement was that
		The trusses are in good enough shape to be serviceable without epoxy. His main concern was out of plane bending, and
		unual deformations, and severe split situations away outside the neutral axis.
		This vastly reduces amount of Epoxy Injection to be reused on site, and perphap we can now reclassify these in the
		"Special" member category

Special Repairs:

Epoxy Injection Repair:

Severe Splits, From deficiency Chart:

Hangar #	Element	B/L # or Bay #	Member or P/Pt #	Deficiency	Dimensions	Void (Gallons)	Seal area (sf)	Seal Th (in)	Seal (Gallons)
2	Perp. Hrz. Brace	1	13	Split	1/2"x25"x10"	6.49	41.67	0.25	0.54
2	Perp. Hrz. Brace	2	3	Split	1/2"x25"x10"	6.49	41.67	0.25	0.54
3	Perp. Hrz. Brace	7	3	Split (at Bolt)	1/2"x1"x10"	0.26	1.67	0.25	0.02
2	Perp. Hrz. Brace	4	17	Damage - at Connection	1/2"x3"x10"	0.78	5.00	0.25	0.06
2	Vert. X Brace	8	7	Damage - at Connection	1/2"x3"x10"	0.78	5.00	0.25	0.06
2	Truss	5	M23(W)	Complete crack (failed)	1/2"x10"x10"	0.22	1.39	0.25	0.02
2	Truss	5	M61(W)	Complete crack (failed)	1/2"x10"x10"	0.22	1.39	0.25	0.02

						Total:	15.24			1.27
		Labor:								
				Qty	# Days	$/HR	Total Cost			
			Laborer	3	2	$ 40.00	$ 1,920			
			Lift Operator	1	2	$ 45.00	$ 720			
			Superintendan	1	2	$ 80.00	$ 1,280			
						Total Labor	$ 3,920			
		Material:								
			Material =		Epoxy					
			Grade =		Sika 31 & 35					
			Units of Measure =		Gallons					
			Total Quanity of Material =		16.51	Gallons				
				Use =	20.00	Gallons				
			Cost of Material =		$ 100.00	$/Gallon				
			Total Cost of Material =		$ 2,000.00					
			Miscellaneous Material =		Injectors gun, scoring equipment					
			Grade =							
			Shape =							
			Lump Sum =		$ 1,000					
				Total Material	$ 3,000					
		Equipment:								
			1. Light Duty Lift							
			2. Personal Vehicles							
			1. Light Duty Lift							
				Quantity	1	EA				
				Rental Period	2	Days				
				Rental Charge	$ 400.00	$/Day				
				Subtotal =	$ 800.00					
			3. Personal Vehicles							
				Quantity	5	EA				
				Rental Period	2	Day				
				Rental Charge	$ 50.00	$/Day				
				Subtotal =	$ 500.00					
				Total Equipment	$ 1,300.00					
		Inspection/Quality Control:								
				Qty	# Days	$/HR	Total Cost			
			Inspector	1	2	$ 75.00	$ 1,200.00			
			Expenses	Travel			$ 2,000.00			
				Lodging			$ 1,000.00			
						Inspection Subtotal:	$ 4,200.00			
		Recap:								
			Labor		$ 3,920.00					
			Material		$ 3,000.00					

			Equipment		$ 1,300.00						
				Subtotal:	$ 8,220.00						
			Contractor Mar	15%	$ 1,233.00						
			Contractor Base Price		$ 9,453.00						
			Contingency	20%	$ 1,890.60						
			Inspection		$ 4,200.00						
				Total:	$ 20,000.00						

Other Repairs: (NOT on Deficiency Chart!!)

Hangar #	Element	B/L # or Bay #	Member or P/Pt #	Deficiency	Proposed Repair
3	Truss	5	N. Saddle Plate	Bottom Chord fracture at saddle plate	Install V Plates
2	Truss	8	South End	Top Chord - local crushing	TBD

Bottom Chord Fracture:

Labor:

	Qty	# Days	$/HR	Total Cost
Laborer	1	1	$ 40.00	$ 320
Lift Operator	1	1	$ 45.00	$ 360
Welder	1	1	$ 45.00	$ 360
Superintendan	1	1	$ 80.00	$ 640
			Total Labor	$ 1,680

Material:

Material =	Steel	
Grade =	Structural Grade	
Dimensions=	2 Plates = 5"x1/2"x10'	
Volume of Steel =	2.08	CF
Density of Steel =	490.00	LB/CF
Weight of Steel =	1020.83	LB
Cost of Material =	$ 2.00	$/LB
Total Cost of Material =	$ 2,041.67	
Miscellaneous Material =	Bolts, Welding Equipment	
Grade =		
Shape =		
Lump Sum =	$ 1,000	
Total Material	$ 3,042	

Equipment:

1. Light Duty Lift
2. Personal Vehicles
3. Welder

1. Light Duty Lift

Quantity	1	EA
Rental Period	2	Days
Rental Charge	$ 400.00	$/Day
Subtotal =	$ 800.00	

			2. Personal Vehicles								
				Quantity	4	EA					
				Rental Period	2	Day					
				Rental Charge	$ 50.00	$/Day					
				Subtotal =	$ 400.00						
			3. Welder								
				Quantity	1	EA					
				Rental Period	1	Day					
				Rental Charge	$ 100.00	$/Day					
				Subtotal =	$ 100.00						
				Total Equipment	$ 1,300.00						
		Inspection/Quality Control:									
				Qty	# Days	$/HR	Total Cost				
			Inspector	1	1	$ 75.00	$ 600.00				
			Expenses	Travel			$ 2,000.00				
				Lodging			$ 1,000.00				
						Inspection Subtotal:	$ 3,600.00				
		Recap:									
			Labor		$ 1,680.00						
			Material		$ 3,041.67						
			Equipment		$ 1,300.00						
				Subtotal:	$ 6,021.67						
			Contractor Mar	15%	$ 903.25						
			Contractor Base Price		$ 6,924.92						
			Contingency	20%	$ 1,384.98						
			Inspection		$ 3,600.00						
				Total:	$ 10,000.00						

Repair Detail 2, Footing Repair

Approach: Between 1 and 4 helical or micro piles will be installed at each footer
Count number of footers, and estimate total number of piles to be installed (high to low range)
Misc. quantities such as core drilling and concrete patch to be determined.

Repair Detail 3, Truss Bottom Chord strengthening Plates

Approach: All panel points to be strengthed at bottom chord to ensure sound connection.
First, splits to be repaired (epoxy injection.) These quantites should be covered in Repair Detail 4.
Measure Steel plates, multiply by number of panel points to determine weight of steel.

		Misc. quantities such as field drilling and bolts to be determined.								
Repair Detail 4, Typical Epoxy Injection Repair										
	Approach:	All splits and cracks to be repaired with epoxy injection material.								
		Using field assessment chart, determine quantity of splits and cracks.								
		Contact Contractors in Fairbanks, Timber Restoration, to find if there are any prefferred units of measure								
		Make assumptions about dimensions of crack, to determine a quantitied of void space to be filled.								
		Make assumptions about extent of cracks to determin quantity of sealer material needed.								

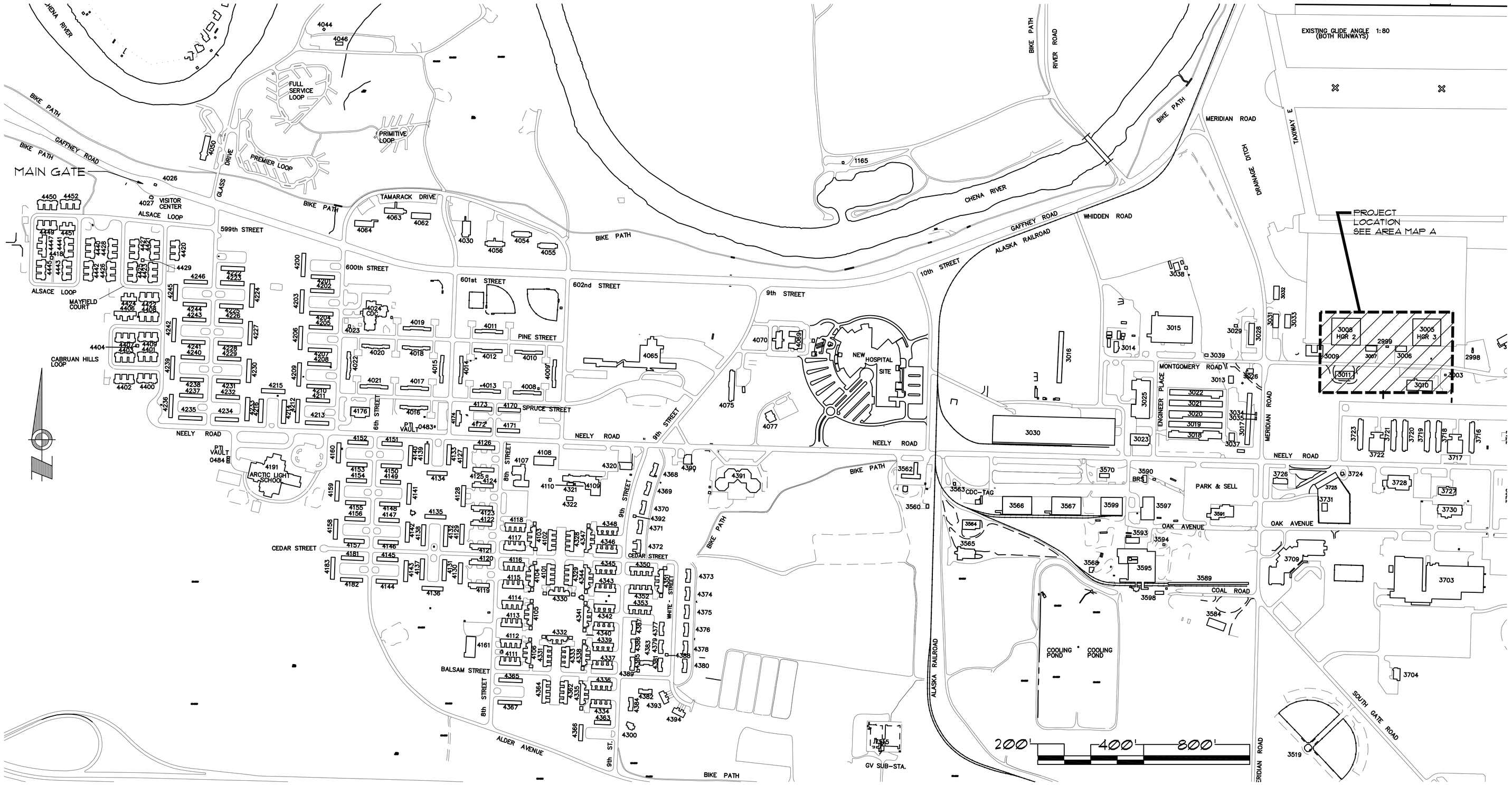
APPENDIX B -

SITE PLAN AND FLOOR PLANS OF HANGARS 2 AND 3

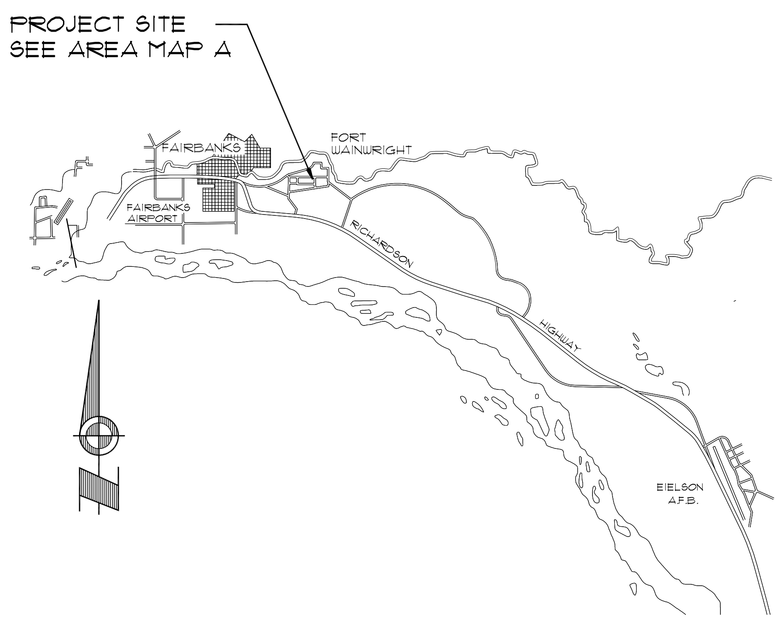
The appended five sheets of drawings show the location of the hangars in the context of the rest of the Base, as well as the existing condition floor plans of each building.

The drawings are as follows:

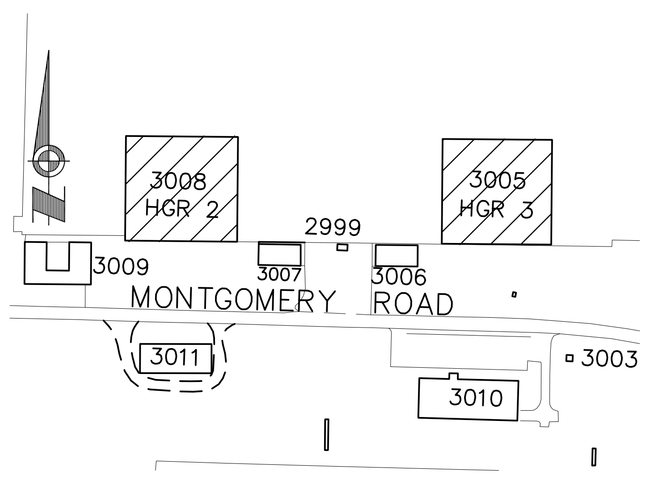
T1.1 Base Site Plan
A1.1 Hangar 2 – First Floor Plan – Existing
A1.2 Hangar 2 – Second Floor & Walkway Plan – Existing
A1.1 Hangar 3 – First Floor Plan – Existing
A1.2 Hangar 3 – Second Floor & Walkway Plan - Existing



BASE MAP



VICINITY MAP



PROJECT AREA MAP A

DRAWING INDEX

T1.1	HANGAR 2 & 3
A1.1	HANGER 2 BLDG. 3008 FIRST FLOOR PLAN EXISTING
A1.2	HANGAR 2 BLDG. 3008 2ND FLOOR & WALKWAY PLAN EXISTING
A1.1	HANGER 3 BLDG. 3005 FIRST FLOOR PLAN EXISTING
A1.2	HANGAR 3 BLDG. 3005 2ND FLOOR & WALKWAY PLAN EXISTING

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FT. Wainwright Hangars 2 & 3 Condition Assessment

Fort Wainwright
Alaska

U.S. Army Environmental Center
5179 Hoadley Rd.
Aberdeen Proving Ground, MD 21010-5401

Revision Date No.

HANGAR 2 & 3

Date 21 DEC 07 Comm. No. 000621
In Charge JMM
Drawn By TJY
Checked By

T1.1

15-07
3-AUG-07
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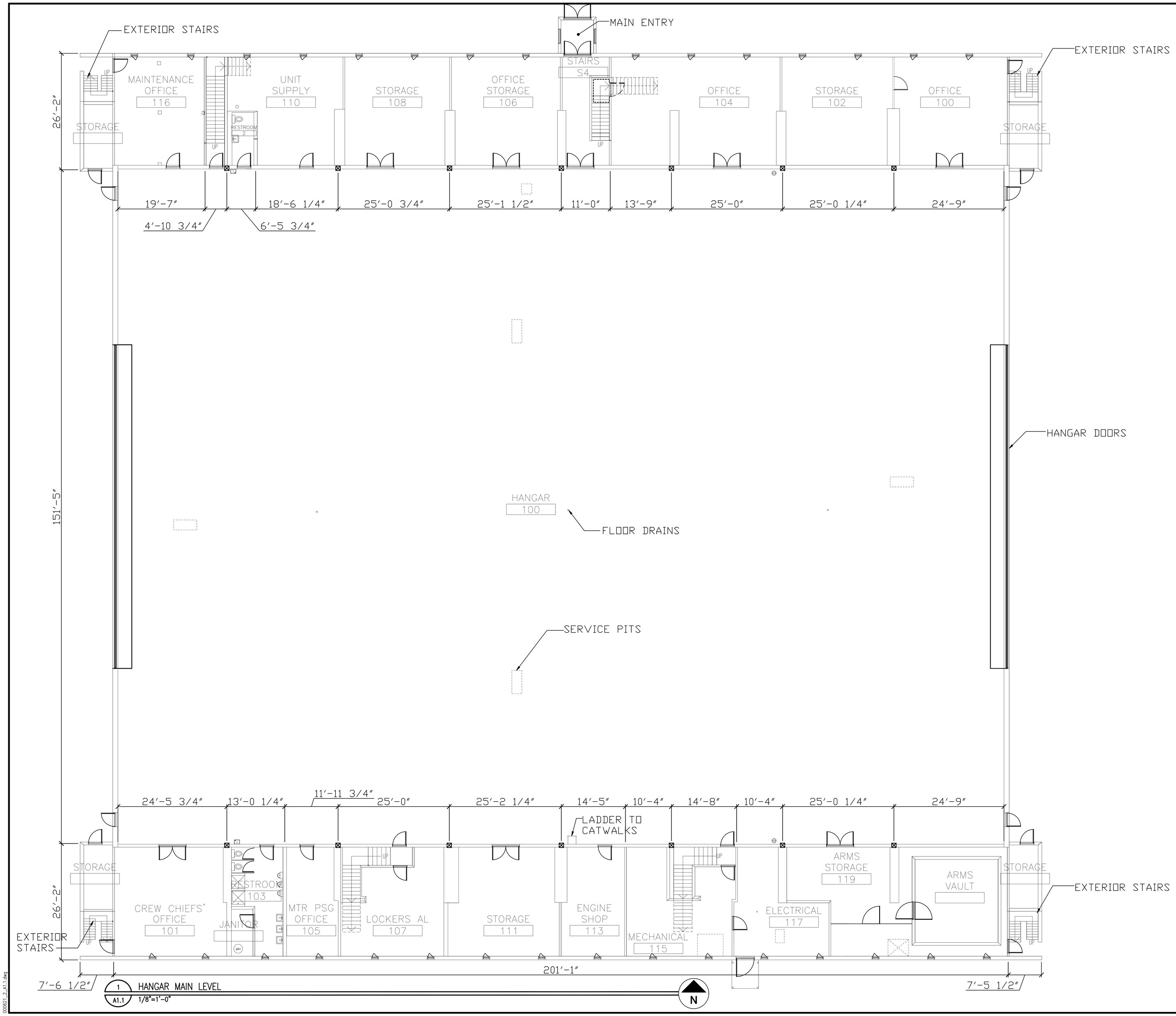

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Fort Wainwright
Alaska

U.S. Army Environmental Center
5179 Hoadley Rd.
Aberdeen Proving Ground, MD 21010-5401

Revision Date No.

HANGAR 2 BLDG. 3008 FIRST FLOOR PLAN EXISTING

Date 21 DEC 07 Comm. No. 000621
In Charge JMM
Drawn By TJY
Checked By

A1.1

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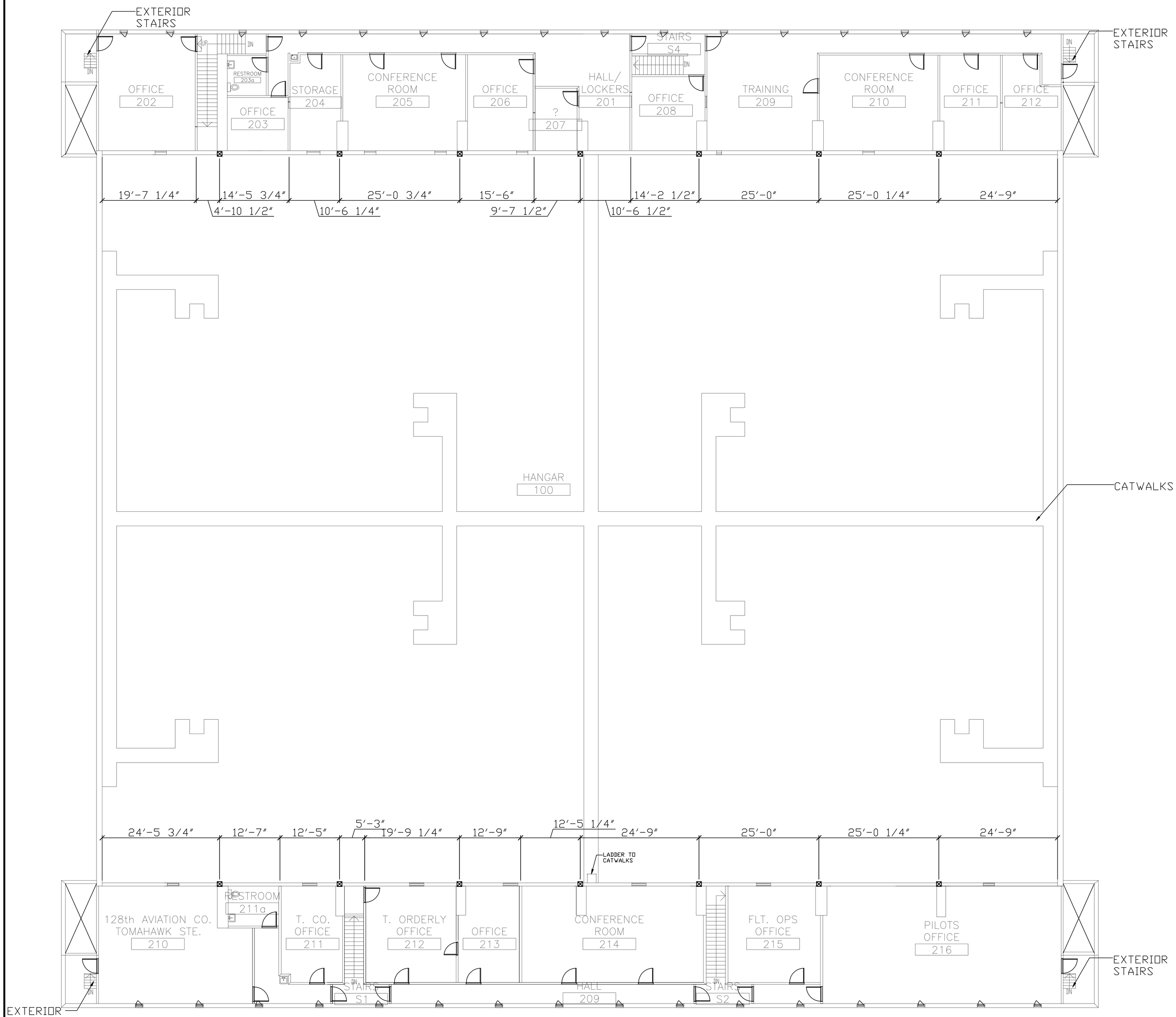

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FT. Wainwright Hangars 2 & 3 Condition Assessment

Fort Wainwright
Alaska

U.S. Army Environmental Center
5179 Hoadley Rd.
Aberdeen Proving Ground, MD 21010-5401

Revision Date No.

HANGAR 2 BLDG. 3008 2ND FLOOR & WALKWAY PLAN EXISTING

Date 21 DEC 07 Comm. No. 000621
In Charge JMM
Drawn By TJY
Checked By

A1.2

1704
20 DEC 07
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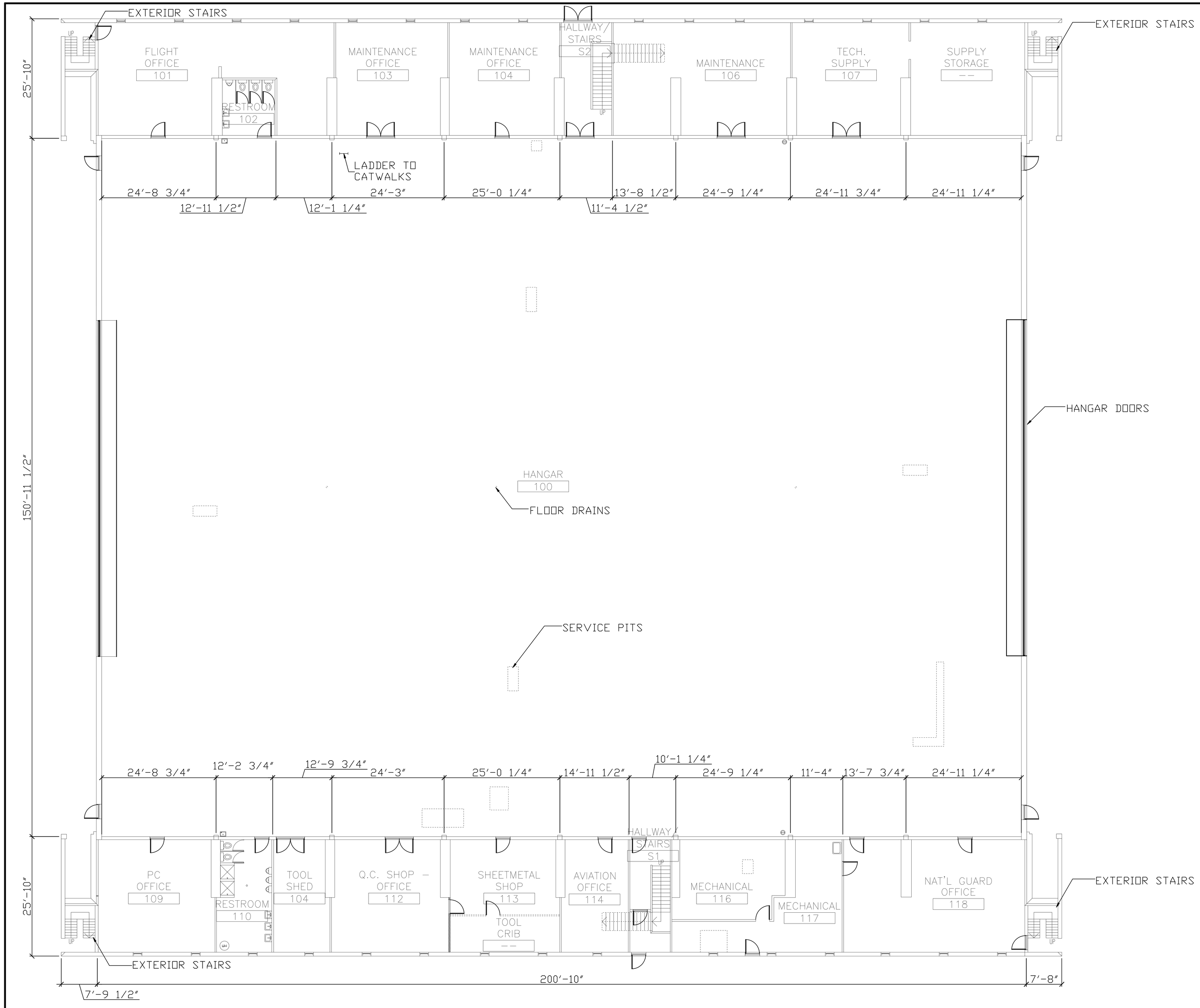

1 / A1.1 HANGAR MAIN LEVEL
1/8"=1'-0"

N

15:30
3 AUG 07
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FT. Wainwright Hangars 2 & 3 Condition Assessment

Fort Wainwright
Alaska

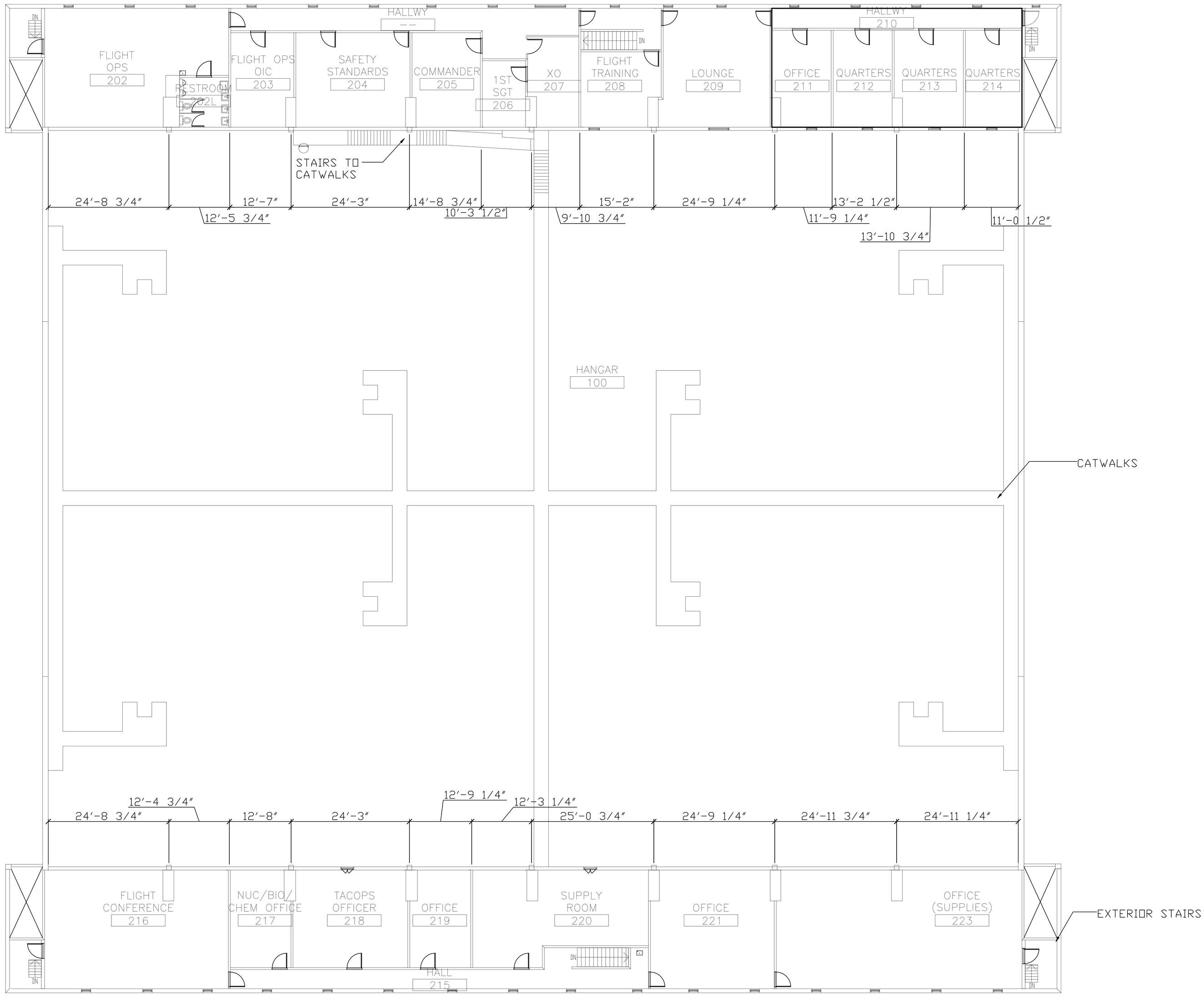
U.S. Army Environmental Center
5179 Hoadley Rd.
Aberdeen Proving Ground, MD 21010-5401

Revision Date No.

HANGAR 3 BLDG. 3005 FIRST FLOOR PLAN EXISTING

Date 21 DEC 07 Comm. No. 000621
In Charge JMM
Drawn By REW
Checked By

A1.1



1 / A1.2 HANGAR SECOND LEVEL & WALKWAYS
1/8"=1'-0"

N

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FT. Wainwright Hangars 2 & 3 Condition Assessment

Fort Wainwright
Alaska

U.S. Army Environmental Center
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Aberdeen Proving Ground, MD 21010-5401

Revision Date No.

HANGAR 3 BLDG 3005 2ND FLOOR & WALKWAY PLAN EXISTING

Date 21 DEC 07 Comm. No. 000621
In Charge JMM
Drawn By REW
Checked By

A1.2

14:26
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