REVISED APPLICATION SUBMITTED 2/22/24 (approved by Hearing Board Chair)

BEFORE THE HEARING BOARD
OF THE
BAY AREA AIR QUALITY MANAGEMENT DISTRICT
STATE OF CALIFORNIA

FILED
FEB 22 2024
HEARING BOARD
BAY AREA AIR QUALITY
MANAGEMENT DISTRICT

APPLICATION FOR VARIANCE

In the Matter of the Application of

FERMA Corporation

(Applicant: Insert business or organization name above)

DOCKET NO. **3750**
(Assigned by Clerk)

For a Variance from Regulation(s):

RACM Category II nonfriable ACM under some circumstance

(Applicant: Insert Regulations in form: Regulation 11 **, Rule** 2 **, Section** 303 **)**

TYPE OF VARIANCE REQUESTED (see Page 3 for further information)

☐ SHORT ☐ INTERIM ☒ REGULAR ☐ GROUP ☐ PRODUCT

VARIANCE PERIOD REQUESTED (see Page 10, No. 20):

From: March 2024 To March 2025

TOTAL NUMBER OF (CALENDAR) DAYS IN VARIANCE PERIOD: 365

(Note: Variance relief will not be granted for any period preceding the date of filing of the Application for Variance.)

[ALL DOCUMENTS FILED WITH THE CLERK'S OFFICE BECOME PUBLIC RECORD]

SUMMARY PAGE

NAME OF APPLICANT: FERMA Corporation

FACILITY ADDRESS: Hangar 3

City, State, Zip: Moffett Field, CA 94035

PLANT # or G #: ____________ SOURCE #(S): ____________

`

CONTACT: Name, title, company (if different than Applicant), address, and phone number of persons authorized to receive notices regarding this Applicant (no more than two authorized persons).

Avery Brown	Tom Bylund
Safety Director	Estimator
6639 Smith Ave	6639 Smith Ave
Newark, CA *Zip* 94560	Newark, CA *Zip* 94560
☎ (650) 961-2742 *Ext.* 3004	☎ (650) 961-2742 *Ext.* 3083
Fax ( )	*Fax* ( )
E-mail abrown@fermacorp.com	*E-mail* tbylund@fermacorp.com
California Bar #	California Bar #

BRIEFLY SUMMARIZE EQUIPMENT/ACTIVITY SUBJECT TO THIS VARIANCE REQUEST:

The use of a long reach specialized excavator to demolish a 200' tall blimp hangar where the roof, with non-friable asbestos felt paper, is in need of demolition to eliminate the risk of building collapse.

LIST DISTRICT REGULATIONS, RULES AND PERMIT CONDITIONS SUBJECT TO THIS VARIANCE REQUEST:

303.1 Wetting Method	303.3 Scheduling of Demolition Activities
303.4 Removal in Units	303.5 Removal by Chute or Container
303.6 Containment Requirements	303.7 Clean Work Site
303.10 RACM Discovered After Demolition	304.1 Waste Disposal

SUMMARY OF TOTAL EXCESS EMISSIONS:

Pollutants	Net Emissions After Mitigation (lbs/day or Opacity %)
Asbestos - Non Friable ACM Paper	The total annual emissions of asbestos will be negligible. In accordance with 8 CCR § 1529
	(c)(1) and 29 CFR § 1910.1001(c)(1), airborne concentrations of asbestos will not exceed
	0.1 fiber per cubic centimeter of air as an eight (8)-hour time-weighted average (TWA)

TYPE OF VARIANCE REQUESTED:

NOTE: The date of filing of the Application for Variance is the earliest allowed starting date for a variance. State law [California Health and Safety Code (H&SC)] imposes requirements on the amount of time to be allowed for notification of the public and air quality regulatory agencies before a hearing on a variance request can be held by the Hearing Board. Review the following descriptions of the types of variances, and select that which is most appropriate for your situation:

SHORT: If compliance with the District Rule(s) can be achieved in **90 (calendar) days or less**, request a short-term variance. [*10-day notice required to Bay Area Air Quality Management District's Air Pollution Control Officer (APCO), Applicant, California State Air Resources Board (ARB), Federal Environmental Protection Agency (EPA).]*

INTERIM: If Applicant requires immediate relief for the period between the date of filing of variance application and the date of the decision on the matter by the Hearing Board, request an interim variance. An interim variance is recommended if significant excess emissions will occur between the date of filing and the date of the fully noticed hearing by the Hearing Board. If an interim variance is required, a hearing will be scheduled as soon as possible. The period of an interim variance shall not exceed 90 days. If an interim variance is requested, Applicant must also request a short or a regular variance on the same application.

REGULAR (OR LONG-TERM): If compliance with District Rule(s) will take **more than 90 (calendar) days**, request a regular variance. *(30-day published notice required. 30 days notice to APCO, Applicant, ARB.)*

GROUP: If non-compliance with District Rule(s) by each individual Applicant comprising a group is based on issues of law and fact common to each Applicant, request a group variance. *(Noticing requirements as for Short or Regular variances depending on period of the Group variance.)*

PRODUCT: Any person who manufactures a product may petition the Hearing Board for a product variance from a District Rule or Regulation. A product variance shall be granted only when a variance is necessary for the sale, supply, distribution, or use of the product. *(Noticing requirements as for Short or Regular variances depending on period of the product variance.)*

BAAQMD Regulation 1-402: **"Status of Violation Notices During Variance Proceedings:** Where a person has applied for a variance, no notices shall be issued during the period between the date of filing for the variance application and the date of decision by the Hearing Board for violations covered by the variance application. However, during the period between the date of the filing for a variance and the date of decision by the Hearing Board, evidence of additional violations shall be collected and duly recorded. Where the variance is denied, evidence of violations collected between the filing date and decision date shall be reviewed and a notice of violation issued for violations occurring during that period shall be served upon said person. Where the variance is granted, no notice of violation shall be issued for violations occurring during that period except in extraordinary circumstances as determined by the APCO."

NOTE: The Environmental Protection Agency (EPA), a federal agency, does not recognize California's variance process, which is established by state law. The EPA considers facilities operating under a variance to be operating in violation of District regulations. Facilities that are in violation and then obtain a variance are advised that the EPA can independently pursue legal action based on federal law against the facility for continuing to be in violation.

1. Briefly describe the type of business and processes at your facility (Attach a map showing location)

Demolition. Reference document 7 - kpff Section 106 Consultation for NASA for map of project location.

See Small Business Considerations on Page 12, No. 21 before answering the following question:

Is Applicant a "Small Business" as defined by Health & Safety Code Section 42352.5(b)(1)?
Yes ☐ No ■

Is Applicant a "Major Source" as defined by the applicable provisions of the Federal Clean Air Act, 42 U.S.C. Sec. 7661(2)? Yes ☐ No ■

Is Applicant a "public agency" as defined in Health & Safety Code Section 42352(b)?
Yes ☐ No ■

2. Describe the equipment/activity for which a Variance is being sought (type of equipment/activity, source numbers, purpose, why is it essential to your business). Attach a copy of the BAAQMD Permit to Operate or Authority to construct for the subject equipment and/or facility so long as such Permit is less than 50 pages. If the Permit is greater than 50 pages, all portions relevant to the Application shall be provided.

The demolition of a 200' tall blimp hangar utilizing a long reach specialized excavator. Variance being sought for Regulation 11, Chapter 2, Section 303, for removal of non-friable ACM felt paper material sandwiched within the roof structure. Removal will be implemented in accordance with the following; Once the area has been secured, the excavator will begin removing the hangar roof structure from the top. The machine will utilize a bucket and thumb along with a processor attachment. There will be a misting machine along with water attachments that are integrated into the excavator and utilized to constantly wet the point of impact to the hangar roof, satisfying Subsection 11-2-303.1 to the extent feasible. The operator will use the attachment to remove pieces of the roof letting them descend to the ground. During this descent there will be an abundance of water saturating the material as it makes its way to the ground. This water will all be contained and collected and run through an above ground treatment system prior to discharge under applicable permit. Once the material is on the ground, it will be sprayed with water with an added industrial encapsulant (Gorilla Snot) and kept adequately wetted at all times during demolition, during handling and during loading, and shall be sealed in leak-tight containers for transport as RCRA waste to a permitted disposal site. Any material left at the end of a work day that has not yet been placed in containers for off-site disposal will be covered with a waterproof tarp. In addition, the exposed "cut area" on the structure that is left standing at the end of a day of demolition work also will be treated with the industrial encapsulant.

Is there a regular maintenance and/or inspection schedule for this equipment? Yes ☐ No ☐
NA - requesting variance related to Activity and not Equipment.
If Yes, how often?

What was the date of the last maintenance and/or inspection?____________

Are maintenance records available? Yes ☐ No ☐

Was there any indication of problems? Yes ☐ No ☐

APPLICANT'S PETITION FOR REQUIRED FINDINGS

California Health and Safety Code (H&S Code) 42352 requires the Hearing Board to make six findings for a variance to be granted. In this Section, Applicant must provide sufficient information to enable the Hearing Board to make a decision on each of the six findings:

Finding # 1: *That the Applicant for a variance is, or will be, in violation of Health and Safety Code Section 41701 or of any rule, regulation or order of the District.*

3. List all District Regulations, Rules, and/or Permit Conditions from which Applicant is seeking variance relief. Briefly explain how Applicant is or will be in violation of each rule or condition. If Applicant is requesting relief from Regulation 6, and the excess opacity during the variance period will reach or exceed 40% (Ringelmann 2), Applicant should also request relief from California Health and Safety Code Section 41701.

Regulation, Rules, Permit Conditions	Explanation
See Attached Table	

4. Has the District issued any Notice(s) of Violation (NOVs) to the Applicant concerning the subject of this variance request? Yes ☐ No ■ **If "Yes", please attach copies of the NOVs**.

5. Has the equipment in question or any other equipment at this facility been under variance protection during the last year? Yes ☐ No ■

Docket #	Variance Period	Nature of Emission	Regulation/Rule/Section
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

6. List all NOV(s) issued to equipment at the **entire** facility during the previous 12 months:

Date of Notice	NOV #	Nature of Emission	Regulation/Rule/Section
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

3. List all District Regulations, Rules, and/or Permit Conditions from which Applicant is seeking variance relief. Briefly explain how Applicant is or will be in violation of each rule or condition. If Applicant is requesting relief from Regulation 6, and the excess opacity during the variance period will reach or exceed 40% (Ringelmann 2), Applicant should also request relief from California Health and Safety Code Section 41701.

Regulation, Rules, Permit Conditions	Explanation
303.1 Wetting Method	The non-friable ACM felt paper will be sandwiched between the wood roof sheathing and aluminum corrugated panels. The exposed cut points will be adequately wetted and kept wet during the removal and load out operation, however complete saturation of the portion sandwiched is not feasible.
303.3 Scheduling of Demolition Activities	Since hangar 3 has been deemed structurally unsafe by kpff, engineer of record, the removal of the non-friable ACM felt must be done mechanically during structural demolition. Because this process makes the non-friable ACM felt paper RACM in accordance with Regulation 11-2-233.3, section 303.3 is unachievable.
303.4 Removal in Units	The sandwiched non-friable ACM felt paper will descend to the ground under wetted conditions during the removal operation, and once on the ground, the material will be managed in compliance with 11-2-303.4.
303.5 Removal By Chute or Container	The current state of the hangar's structural integrity coupled with its size will not allow a safe installment or operation of a chute or container.
303.6 Containment Requirement	The current state of the hangar's structural integrity coupled with its size will not allow a safe installment or operation of a containment.
303.7 Clean Work Site	The potential for the need to have a small portion of the material remain in a pile at the end of a shift is possible. If this occurs, the pile will be placedon top of visqueen, saturated with water containing an encapsulant, then covered.
303.10 RACM Discovered After Demolition	This section references another section for which we are seeking a variance (303.6), and thus a variance may be needed for this section as well.
304.1 Waste Disposal	This section references another section for which we are seeking a variance (303.10), and thus a variance may be needed for this section as well.

Finding # 2: That, due to conditions beyond the reasonable control of the Applicant, requiring compliance would result in either (A) an arbitrary or unreasonable taking of property, or (B) the practical closing and elimination of a lawful business.

7. Describe, in detail, the event leading to the need for a variance:

On June 17, 2022, NASA prepared and submitted an Environmental Assessment (E.A.) to the State for review regarding this project to support the deconstruction of Hangar 3 to remedy its unsafe condition and eliminate the unacceptable structural hazard it poses. The State completed its review of the E.A. on July 18, 2022 . Since Planetary Ventures, LLC commenced leasing the Hangar in 2015, ongoing efforts to rehabilitate Hangar 3 have proven to be ineffective. Significant efforts have been undertaken to repair the damaged trusses yet it was not possible to keep up with the damage progression continuously advancing throughout the structure. While a temporary internal shoring and hydraulic jacking system is in place, the building is currently unsafe for occupancy and vulnerable to further damage and collapse, especially from seismic or high wind load events. The purpose of the project is to remedy this unsafe condition and eliminate an unacceptable structural hazard. This project eliminates the risk of continued degradation or collapse of hangar 3 under normal or adverse conditions, thereby protects life and property. Reference the included sections of the environmental assessment - Appendix A.1, A.3 & A.4 prepared by kpff, the structural engineer of record.

Overall, the hangar structure -- which essentially consists entirely of a roof -- has existed well past its original design life. Varying levels of damage exist to the timber framing. The structure remains unsafe and is very vulnerable to further damage or partial collapse while left in its current state. Based on structural engineers professional opinion, the hangar is unsafe, should not be occupied and could become a potential site hazard from seismic and/or high wind forces. Structural investigations indicate that the structure is vulnerable to future collapse. Therefore the removal of the asbestos roofing felt paper within the specific sections listed above of regulation 11 rule 2 is unachievable. All roofing material will be off-hauled as asbestos containing material.

Furthermore the request for this specific activity exemption stems from the included kpff memo dated November 28, 2023 and noted below. The inability to put personnel directly on the structure makes it infeasible to abate the roofing material in place. The inability to put personnel directly beneath the structure, once truss demolition begins, makes it infeasible to lower the units in sections.

At page 1 of Exhibit 3, kpff, the structural engineer of record, stated: "Based on our team's review, I concur with your assessment that it is technically infeasible to place any personnel, equipment, fall protection anchors, or any other added loads on the existing hangar roof in its current damaged state. Further, I understand that an alternative was considered to abate the roofing material prior to structural demolition. However, since that work would involve placing personnel and equipment on the roof, I agree that this alternative would also not be feasible from a structural standpoint."

8. Has the Applicant received any complaints from the public regarding the operation of the subject equipment or activity within the last year? Yes ☐ No ■

Date of Complaint	Number of Complaints	Nature of Complaint
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

9. Explain why it is beyond Applicant's reasonable control to comply with the Regulation(s) and/or Permit Condition(s):

According to recent structural engineering monitoring, Hangar 3 is unsafe and very vulnerable to further damage or partial collapse—for example, from earthquake and/or high wind loading— while left in its current state. Based on the opinions of the project structural engineer of record, necessary repairs to return Hangar 3 to occupancy would be extensive, undefinable, and may not be successful. Therefore, Planetary Ventures, LLC is planning to demolish Hangar 3, in coordination with NASA ARC. Due to the dangerous state the Hangar 3 is in, the demolition of this massive structure involves a specialized long reach excavator that will be able to reach the top safely. However since both structure and machine are massive in size, the material will not be able to be handled in accordance with the above mentioned sections of Reg. 11, Chapter 2, Section 303.

Furthermore, the request for this specific activity exemption stems from the included kpff memo dated November 28, 2023 and discussed below. The inability to put personnel directly on the structure makes it infeasible to abate the roofing material in place. The inability to put personnel directly beneath the structure, once truss demolition begins, makes it infeasible to lower the units in sections.

At page 1 of Exhibit 3, kpff, the structural engineer of record, stated: "Based on our team's review, I concur with your assessment that it is technically infeasible to place any personnel, equipment, fall protection anchors, or any other added loads on the existing hangar roof in its current damaged state. Further, I understand that an alternative was considered to abate the roofing material prior to structural demolition. However, since that work would involve placing personnel and equipment on the roof, I agree that this alternative would also not be feasible from a structural standpoint."

10. When and how did Applicant first become aware that it was not in compliance with the Rule(s) and/or permit condition(s)?

During the preparation of the Demolition Plan and the Abatement Plan it became necessary to describe means, methods and procedures. The practicality of attaching swing stage scaffolding to the truss ridge line and adding the weight of workers and equipment started to appear questionable. Subsequent inquiries to the engineers and scaffold contractors provided additional awareness of the potential safety issues.

The structural engineer of record (kpff) has advised against adding any additional loads to the roof structure, which would have been necessary in order to facilitate the removal of the roof in units. Please see attached memos from kpff engineers.

11. What actions has Applicant taken since that time to achieve compliance with the Regulation(s) or permit condition(s)?

Complying with Reg. 11, Chapter 2, Section 303 as written would require workers and equipment to be placed on or attached to the compromised structure to abate in place or lower in sections. It also would require the installation of scaffolding above and/or below the structure. For the safety of the workforce, none of these activities are advisable, as explained in the attached memo prepared by kpff, the structural engineer of record, due to the compromised state of the structure. Thus, strict compliance with Section 303 of Reg. 11 is not achievable on this particular structure. Demo plan narratives have been prepared describing demolition utilizing wet methods including Dust Boss fog emitters added in addition to demolition machine tool mounted sprayers wetting the roof material as demolition progresses. All removed roofing material will be wetted and treated with an industrial encapsulant prior to offsite disposal as RCRA waste.

12. What would be the harm to Applicant's business if the variance were not granted?

Economic losses: $ N/A

Number of Employees laid off (if any): 0

Provide detailed information regarding economic losses, if any, (anticipated business closure, breach of contracts, hardship on customers, layoffs and/or similar impacts).

The primary driver for requesting this variance is the protection and safety of the demolition and abatement crew. Loss of life is not an economic calculation. Therefore the granting of this variance is needed to allow the demolition to proceed.

[You May Attach Additional Pages If Necessary]

Finding # 3: *That the closing or taking would be without a corresponding benefit in reducing air contaminants.*

13. List the estimated or measured excess emissions or excess opacity, if any, on a daily basis, or over a more appropriate period of time (For example: duration of requested variance period, hourly basis). Also list emissions reductions proposed by Applicant as mitigation. If no excess emissions or opacity are expected during the variance period, go to No. 16.

Pollutant	(A) Estimated Excess Emissions (lbs/day)	(B) Reduction Due to Mitigation (lbs/day)	(C)** Net Emissions After Mitigation (lbs/day)
N/A	N/A	N/A	N/A

**Column A minus Column B = Column C

14. Show the calculations used to determine the excess emissions listed in No. 13. Are the values in No. 13 based on measurements___________ or estimates_________?

15. Do the additional emissions during the variance period contain any Toxic Air Contaminants (TACs) [pursuant to Health and Safety Code Section 39655] or odorous substances? Yes ☐ No ☐

If Yes, list the TACs or odorous substances and approximate amounts:

16. List measured or estimated annual emissions from entire facility for each pollutant which is the subject of this variance application:

Pollutant	Total Emissions from Entire Facility (tons/year)
Asbestos - Non - Friable Felt Paper	The total annual emissions of asbestos will be negligible. In accordance with
	8 CCR § 1529(c)(1) and 29 CFR § 1910.1001(c)(1), airborne concentrations
	of asbestos will not exceed 0.1 fiber per cubic centimeter of air
	as an eight (8)-hour time-weighted average (TWA).

Briefly explain the basis for these facility emission values:

The total annual emissions of asbestos will be negligible. In accordance with 8 CCR § 1529(c)(1) and 29 CFR § 1910.1001(c)(1), airborne concentrations of asbestos will not exceed 0.1 fiber per cubic centimeter of air as an eight (8)-hour time-weighted average (TWA). To achieve this, a Dust Boss (misting machine) will be used to constantly apply water to the material as it descends to the ground. Along with the Dust Boss our long reach excavator has water nozzles that will spray the non-friable asbestos felt roofing paper at the point of impact by the excavator attachment. Once on the ground, the material will be loaded in leak tight containers ready for shipment and off-hauled as RCRA waste. In addition, the exposed "cut area" on the structure that is left standing at the end of a day of demolition work also will be treated with the industrial encapsulant.

Finding # 4: *That the Applicant for the variance has given consideration to curtailing operations of the source in lieu of obtaining a variance.*

17. Explain why the Applicant cannot curtail or terminate operations in lieu of obtaining a variance:

Demolition of Hangar 3 is necessary due to the danger of a potential collapse. See the attached report of the structural engineer of record.

Finding # 5: During the period that the variance is in effect, the Applicant will reduce excess emissions to the maximum extent feasible.

18. Explain how Applicant plans to reduce (mitigate) excess emissions during the variance period to the maximum extent feasible, or why reductions are not feasible (mitigation may include reductions at other sources):

During removal of the roof structure containing the non-friable asbestos felt roofing paper, a Dust Boss (misting machine) will be used to constantly apply water. Along with the Dust Boss our long reach excavator has water nozzles that will spray the non-friable asbestos felt roofing paper at the point of impact by the excavator attachment with water. Once on the ground, the material will ultimately be loaded in leak tight containers and ultimately disposed of as RCRA waste.

Finding # 6: During the period the variance is in effect, the Applicant will monitor or otherwise quantify emission levels from the source, if requested to do so by the District, and report these emissions levels to the District pursuant to a schedule established by the District.

19. Has the District requested that the Applicant monitor or otherwise quantify emissions during the variance period? Yes ☐ No ■

If Yes, please describe how Applicant will do so:

Project team will implement perimeter air monitoring plan which includes air monitoring for particulate matter having 10 microns or less (PM10) and sampling for airborne fibers and asbestos during demolition activities at Hangar 3. See P.A.M.P.

APPLICANT'S PLAN FOR ACHIEVING COMPLIANCE:

20. How does the Applicant intend to achieve compliance with the Rule(s) and/or permit condition(s)? Include a detailed description of any equipment to be installed and/or modifications or process changes to be made, a list of the dates by which the actions will be completed, and an estimate of total costs:

Detailed Description:

In lieu of strict compliance with Regulation 11, Chapter 2, Subsection 303, during removal of the roof structure containing the non-friable asbestos felt roofing paper, a commercial Dust Boss (misting machine) will be used to constantly apply water to saturate the material as it descends to the ground. In addition to the Dust Boss, our long reach excavator has water nozzles that will spray the non-friable asbestos felt roofing paper at the point of impact by the excavator attachment. Once on the ground, the removed roofing material will be wetted and treated with an industrial encapsulant (Gorilla Snot) prior to being loaded in leak tight containers and ultimately disposed offsite as RCRA waste. In addition, the exposed "cut area" on the structure that is left standing at the end of a day of demolition work also will be treated with the industrial encapsulant. All other requirements under Regulation 11, Rule 2, Section 303, Demolition, Renovation and Removal will be met.

Schedule Of Increments Of Progress:

Increment Description	Completion Date
Demolition	03/31/25

Applicant may propose operating conditions for the variance period which may be considered by the Hearing Board in its evaluation of the variance application.

PROPOSED OPERATING CONDITIONS:

N/A

Variance Period Requested: **From:** March 2024 **To:** March 2025

Total Number of (Calendar) Days in Variance Period: 365

(Note: Variance relief will not be granted for any period preceding the date of filing of the Application for Variance.)

Date of Application: 12-18-23 Original - 2/15/24 Revised

Completed By: Avery Brown Title: Safety Director
(Print Name)

The following verification must be signed by the owner, manager, director or other responsible party of the plant, business, factory, or agency requesting the Variance.

VERIFICATION

I, the undersigned, hereby declare under the penalty of perjury, under the laws of the State of California, that I have read the foregoing document, including attachments and the items therein set forth, and that I know its contents, are true.

Dated at February of 2024, on 15th original 21st revised

Signature [signature]

Print Name Avery Brown

Title Safety Director

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build DEVCON
perform DEVCON
design DEVCON
sustain DEVCON

SUBMITTAL TRANSMITTAL

Hangar 3
Moffet Federal Airfield
Mountain View, CA

Project #22-149

Devcon Construction
Date: **12/8/2023**

Transmitted To: **Puneet Moonach**
CBRE at Google

Sunnyvale, CA, USA
pmoonach@google.com

Transmitted By: **Mariela Murillo**
Devcon Construction Inc.
690 Gibralter Drive
Milpitas, CA 95035
mmurillo@rewsprojects.com

Submittal Package No	Description	Due Date
08-02 41 00-03	Ferma Demolition Narrative FRO	12/8/2023

Items	Rev	Qty	Type	Description	Item Action: NET	RN	RR	RJ
01	2	1	Supplemental Documents	Ferma Demolition Narrative	X			

Notes:

Reviewers Comments:

NET = NO EXCEPTIONS TAKEN
RN = REVISE AS NOTED
RR = REVISE AND RESUBMIT
RJ = REJECTED

CC:	Company Name	Contact	Email
	Devcon Construction	Tina Couchee	tcouchee@rewsprojects.com
	Devcon Construction	Mariela Murillo	mmurillo@rewsprojects.com
	CBRE	Puneet Moonach	pmoonach@google.com
	CBRE	Arjun Jani	arjunjani@google.com

Remarks

Devcon Construction
REVIEWED
Job #22-149 Hangar 3
Date: 12/08/23

DEVCON CONSTRUCTION, INC

Submittal has been reviewed, checked and approved, in our capacity as a Contractor, and is in Compliance with the Contract Documents to the best of our knowledge.

Review is for general compliance and does not relieve the subcontractor or supplier from responsibility for number, dimensions, errors, omissions, or deviation from the correct documents.

FERMA CORPORATION

"Clearing the way for the future" ™

DEMOLITION PLAN

HANGAR 3 DEMOLITION
MOFFETT FEDERAL AIRFIELD

PREPARED FOR:

DEVCON CONSTRUCTION INC.
690 GIBRALTAR DRIVE
MILPITAS, CA 95035

PREPARED BY:

FERMA CORPORATION
6639 SMITH AVE, NEWARK CA 94560
(650) 961-2742

REVISED 12/08/23

Table of Contents

INTRODUCTION

Ferma Corporation (Ferma) will perform the demolition of Hangar 3 for Devcon Construction Incorporated.

Elements of the Plan:

Ferma will perform the following in accordance with the terms and conditions of the contract.

1. Water utilization for dust control to the surrounding vicinity to include fire hoses, dust boss foggers, and/or other water controls to mitigate dust generation. Ferma plans to tie into an existing water source on site.

2. ABC Fire extinguishers will be on site to eliminate any fires that may erupt during the course of the demolition work. Fire extinguishers will be inside each mobile equipment (excavator, bobcat, lift, etc.). Quantity will be applicable to project requirements and amount of work in process.

3. Ferma will minimize disturbances caused by vibrations to surrounding areas. Vibration monitoring will be provided under a separate report to monitor vibration levels at Building 55 and at the perimeter of the demolition site.

4. Fuel Spills: Ferma intends to protect against spills and evaporation during fueling and lubrication of equipment and motor vehicles used in demolition procedures. Ferma will have spill kits available onsite. These kits include absorbent pads and storage drums in the event of a spill. Ferma will legally dispose of lubricants and excess oils off-site. See HASP and SWPPP for additional procedures. Note: Non-mobile fuel storage not planned for this project

5. Ferma will remove waste and surplus materials, rubbish and demolition materials from the site, in compliance with all applicable waste regulations and the Hazardous Materials Management Plan prepared for the project. Wastes from the site will be disposed of at a permitted off-site waste disposal facility that is operated in accordance with the CERCLA Off-Site Rule.

6. Exclusion Zone and control signs will be placed where construction personnel and driver activity occurs within the area of demolition work. Pedestrians will not be allowed within the demolition site. Construction personnel will not be allowed within the Hangar area during the demolition work. Certified flaggers will control traffic to allow Ferma trucking ingress/egress to the demolition site and within the traffic lanes. This will be performed throughout the duration of the demolition.

    - Reference Site Logistic Plan in Exhibit A for truck routing.

7. Removal and transport of debris/rubbish will be done so in a manner that will prevent spillage on pavements, streets, or adjacent areas. Ferma will ensure that any overflow or spillage is cleaned up from pavements, streets and adjacent areas immediately. Spotters during demolition for foreign object debris will be present. Leak tight containers will be used along with tarp system to cover loads as they leave the site.

Hours of operations

Monday – Friday: 7:00 AM – 5:00 PM
No weekend work is scheduled

If any equipment mobilization is required prior to 7:00 AM, Ferma will obtain proper permit for mobilization and notify Devcon of mobilization and make necessary notification for after hour mobilization. All other equipment moves will be made with applicable permits.

Demolition

Make Safe Program:

Every shift will begin at 7:00 AM with a meeting to review the scope of work for that day and the potential dangers associated with each work item. Any special hour requests will be approved by Devcon representatives.

Ferma will double check that all utilities have in fact been shut down by observing visual air gap. Ferma's foreman will also inspect for any potential hazardous material and hazardous energy storage devices. Once verified and made safe by Ferma and DCI, Ferma will post proper signage indicating the areas/devices are safe to remove or demolish.

Protective equipment for the operator and laborer will include: work boots (e.g. steel-toed boots, etc.), gloves, safety goggles, hard hat protection, vests, and air purifying respirators (APR) . Long sleeve shirts will be utilized if the task requires.

1. Medical exam (within past 12 months) requirement for respirator usage
2. Respirator fit testing (within the past 12 months) requirement

Note: All mechanical equipment to have manufacturer installed and OSHA approved ROP (Roll Over Protection) guards, inspected by the operator during pre-shift inspection. The demolition equipment has a cage to protect the operator from falling debris. Operators will wear seat belts when operating the equipment.

Traffic Control

Ferma will manage its own traffic throughout the duration of the project. Trucks ingress and egress are shown in Exhibit A "Site Logistic Plan". All Ferma flaggers are OSHA certified (documentation to be submitted to Devcon upon request). Traffic control within the fenced demolition site will be performed per the Devcon site logistics plan.

Pollution Control

Noise Control:

Demolition machine noise levels will generally be below 90dB at 100 ft. Concrete chipping and hammering may exceed 90 dB at 100 ft. Noise protection skids 8' high by 40' long consisting of plywood and 2" Styrofoam will be installed and moved as required between the work point and Hangar 2. If complaints arise, dB meters will be utilized to determine noise levels and adjustments can be made as necessary. Workers will utilize ear protection devices when necessary.

Dust Control:

Dust may be generated during the demolition phase of this project. During demolition activities, dust will be mitigated using machine mounted water diffusers (water diffusers are attached to each side of the cutting/crunching tool mounted at the end of the high reach arm), Dust Boss foggers (supported by high reach boom lifts and/or telescopic telehandlers), and high-pressure water delivered by a fire hose where required. All dust will be controlled in accordance with the requirements of BAAQMD. All demolition processes will be kept wet to minimize generation of dust. Fire hydrant water meter shall be obtained from the appropriate authority and paid for by Ferma. All water for dust control will come from this source. Some water may be reused after proper filtering at the Baker Tank (above ground water treatment) system. All excess water generated during dust mitigation activities will be collected and filtered prior to disposal in the sanitary sewer system (see catchment details in the Architectural drawings and see water management plan). The Hangar floor will be covered in 10 mil poly to provide water catchment and a temporary asphalt berm will be installed around the perimeter of Hangar 3 at 20' to 25' outside of the edge of the building footprint to act as secondary containment. The asphalt berm will be removed at project completion.

Erosion Control:

SWPPP measures will be installed in accordance with BKF Engineers SWPPP and the most current version of the BMP Map contained therein to prevent storm water from carrying sediment/debris/contamination into the storm water system. Straw Wattles will be used along with sandbags. Ferma to maintain all BMPs once in place for the duration of their work. Floor drains within the hangar will be plugged and area drains around the construction site will be protected per SWPPP. Erosion control material will be removed by Ferma at the end of the project. BKF will conduct all SWPPP inspections and provide reports.

Solid Waste Management and Recycling Plan

All waste that can not be recycled or salvaged will be disposed of at a permitted off-site waste disposal facility that is operated in accordance with the CERCLA Off-Site Rule.

Non-hazardous Waste:

Ferma will recycle/salvage the non-hazardous construction debris. This includes debris, concrete, and all ferrous/nonferrous metals resulting from demolition, except tin roof material.

1. Demolition debris will not be stored long-term on the site. All debris will be hauled-off the site as

soon as possible. All non-hazardous construction debris will be taken to a construction debris recycling facility. The "Shed" debris will be considered clean after completion of abatement and will be transported to Zanker for recycling.

2. Non-hazardous concrete will be separated mechanically from demolition debris by using Hydraulic Excavators. All of the separated concrete will be hauled to the off-site concrete crushing/recycling facility.

3. Beams and cross braces between truss bottom chords will be removed/salvaged before demolition of trusses and planed, stacked, bounded for potential reuse. For more information on the wood planing activity, see Ferma's Wood Planing Activity Work Plan.

Hazardous Waste:

The Hangar roof assembly debris including tin, ACM, wood decking and trusses will be manifested as RCRA, burrito wrapped and transported in closed containers to US Ecology, Beatty NV or Waste Management, Kettleman Hills, CA.

Hazardous and Non-hazardous Waste Quantities:

Estimated quantities for disposal and recycle locations:

Primary Roof structure/Hangar Doors – Roof sheathing, Trusses, Beams, Doors, Box beam:
3,503 Tons RCRA (hazardous) to Waste Management; Kettleman, or Beatty (Roof Sheathing, Trusses, Beams, Cross Braces, Decking, Battens.) **320 Tons** Tin/ACM (hazardous) to be removed in units with Lead Paint, Roof Sheathing and Trusses under wet conditions (Comingled). All Hangar roof ACM will be landfilled with truss system material at Waste Management; Kettleman or Beatty.
250 Tons of salvaged beams and cross braces to be planed, stacked, and bound for potential reuse. Note: Material planed off the salvaged beams and cross braces is RCRA to Waste Management; Kettleman, or Beatty
Sheds/Office Space – Roof, Soft Demo, CMU & Stucco, Bricks, Exterior Structure, Doors Rail Ties:
3,668 Tons Non-Hazardous to Zanker (Roof, Soft Demo, CMU & Stucco, Bricks, Exterior Structure, Door Rail Ties.)
Concrete – Towers, Bents, Amplitude Chipping, Door Rail Chipping:
6,300 Tons Concrete Towers (All Concrete to be downsized via excavator and transported to Stevens Creek Quarry for recycling, all rebar to be transported to Sims Metal, San Jose).
3,200 Tons Concrete Bents (All Concrete to be downsized and transported to Stevens Creek Quarry for recycling, all rebar to be transported to Sims Metal, San Jose)
585 Tons Concrete Chipping (All Concrete to be transported to Stevens Creek Quarry for recycling)
Shoring System/Platform, Other Steel:
280 Tons – Miscellaneous Steel – Non-Hazardous to be mostly repurposed by Ferma, some Recycled at Schnitzer (Radius Recycling) and/or US Pipe (Union City)
1,200 Tons – Power Shoring system - Non-Hazardous to be mostly repurposed by Ferma, some Recycled at Schnitzer (Radius Recycling) and/or US Pipe (Union City)
100 Tons – Power Mobile Platform - Non-Hazardous to be mostly repurposed by Ferma, some Recycled at Schnitzer (Radius Recycling) and/or US Pipe (Union City)

A final report will be provided that summarizes the quantities of material, recycling facilities and actual percent salvaged/recycled.

ASBESTOS MANAGEMENT OVERVIEW

FERMA employees involved in work with potential exposure to asbestos will be trained in the recognition, risks, and safeguards associated with work that may disturb and/or expose the worker to this health hazard. This training will be conducted by a California DOSH approved facility (DOSH is certified with the Department of Industrial Relations as an abatement firm). For work outside California, the safety department will contact the training provider for verification of employee provided training records prior to allowing them to work.

All field personnel of a supervisory level are required to have completed and passed, by written examination, an initial 40 hour training program for Asbestos Supervisors. In addition to the initial training program, these individuals must also complete an EPA required 8-hour annual update-training program.

All workers will have completed, and passed by written examination, the equivalent in curriculum, initial training program for asbestos abatement workers. As with the supervisor, the worker is also required to complete an EPA certified 8-hour annual update training program.

At least one member from the field team will be the designated "competent" person. An OSHA "competent person" is defined as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them

All training certificates will be checked to ensure they were issued by a DOSH approved training provider, by checking to make sure there is a DOSH approved number (CA-XXX) on the certificate. Certificates will also be maintained at our office and written materials relating to the employee training program will be readily available upon request.

Ferma will assume responsibility for operating the decontamination system put in place by Bayview (see Bayview Remediation Plan for more information) once demolition activities commence. The system provided by Bayview is large enough to accommodate a crew of up to 15 to 20 personnel. The Personnel Decontamination Unit will consist of an arrangement of connected rooms or spaces, designated the Clean Room, the Shower Rooms, and the Equipment Room, separated by plastic sheeting and plastic flaps. Construction materials may include portable decons, canopies, wood framing and or other suitable construction materials. The framing of the decontamination unit/s shall be wrapped or covered with a layer of 6-mil fire retardant plastic sheeting or fire retardant 6 mil poly material. In addition, each containment will have one or more waste load-out chambers installed. The location and number of loadout chambers will depend upon various factors.

Medical monitoring for lead including daily air samples and blood lead monitoring will be implemented in accordance with 29 CFR 1926.62

Suspect Material:

Upon their arrival on site, all workers will be informed as to the potential location(s) of asbestos (Hazcom). The workers will be directed not to disturb the identified ACM (with exception to the roof structure that will be removed in sections during demolition activities; see the Narrative for the demolition activities) and to abide by all the signs and labels. When suspect material is discovered, stop work, secure the scene, contain the suspect material, and notify the Field Foreman immediately. The Field Foreman shall contact the General Contractor or owner, who will in turn arrange for testing / confirmation of the suspect materials and abatement, if necessary.

Notification:

All demolition projects must notify the EPA, even if there is no ACM. FERMA must notify, in writing, the Regional Office of the Environmental Protection Agency (EPA) or a state delegated agency of the planned asbestos abatement operation and of any significant changes to the plan:

1. Notification must be received by the EPA at least 10 working days prior to beginning the project;
2. Notification must be received by the EPA at least 10 working days before the end of the calendar year for non-scheduled operations or additive amounts;
3. Notification must be received by the EPA as early as possible before, but not later than, the following working day for certain demolition or renovation operations, such as emergencies, unsafe buildings, etc.;
4. An update notice must be sent to the EPA, if the amount of asbestos noted in the original notification changes by at least 20 percent; and
5. A new notification is required to be sent to the EPA if the start dates changes. If the start date is later, the notification must be sent as soon as possible before the original start date. If the start date is earlier, the notification must be received by the EPA at least 10 days prior to the start date.

The required EPA Notification of Demolition and Renovation form must be used to notify the EPA.

Ferma will submit a separate notification to BAAQMD for demolition activities. A separate notification for abatement is also required, which would have been submitted by Bayview.

SITE SPECIFIC HAZARDOUS MATERIALS MANAGEMENT

Disposal Preparation:

ACM and RCRA materials will be loaded into designated DOT bins. Profile documents will be submitted to the authorized representative of the Generator for review and approval.

Shipping Documents:

All hazardous waste leaving the site will be recorded on shipping documents. When preparing hazardous waste documents, the approval codes will be recorded on Hazardous Waste Manifests in Box 14 with the EGR and waste material description. All applicable DOT codes and corresponding shipping names will be added to prepare the final document for review and authorized signatures.

Temporary Staging:

ACM and RCRA accumulation and bin locations/staging areas will be on the Hangar floor inside of the Shed walls. All of the waste material will be loaded directly into prepared forty-yard closed top bins.

When loaded with hazardous materials, the DOT containers will be completely sealed prior to transportation to the approved disposal facility.

Transportation:

FERMA GREEN BOX is a California hazardous waste hauler (Reg# 6582) and registrations are qualified for intra-state operations allowing shipments to additional states as necessary.
Valid evidence of registration and insurance is carried by all drivers for immediate verification and scale review by highway patrol. The trucks are verified mechanically for DOT readiness and general operational safety with pre-check and BIT inspections.

Disposal Facilities:

The following facilities have been identified as destinations for ACM combined with RCRA material

US Ecology-Beatty
P.O. Box 579
Highway 95, 12 M So. of Beatty
Beatty, NV 89003

Waste Management
Kettleman Hills Hazardous Waste
35251 Old Skyline Road
Kettleman City, CA 93239

Post Disposal:

All records are compiled for compliance with generator return dates to the DTSC and to complete the "Cradle to Grave" manifest compliance loop. As part of the post operational documentation the compiled materials will be made available to the Generator and/or a designated consultant for post reporting requirements in support of DTSC closure and long-term project filings. Copies of these documents are maintained in compliance with the Title 22 DOT transportation program and in compliance with Hazardous Waste Hauler Registration compliance program guidelines for at least three years.

PROPOSED PROJECT PERSONNEL

Duties, Responsibilities, and Authorities:

1. **Noor Obaidi (Project Manager):** Provide general management and scheduling; conduct contract and subcontract administration; oversee office-generated paperwork; conduct job-site visits; attend job-site meetings; resolve disputes unresolvable at field level; provide information and direction to field staff; review monthly billings; administrate job close out. (PHONE # 510-574-6782)

2. **Doug Rodoni (General Superintendent):** Provide overview supervision; visit jobsite; attend job-site meetings; expedite manpower, equipment, and material support; participate in direct scheduling; provide information and direction to job foreman. (PHONE # 650-245-2716)

3. **Everardo Alcazar (Safety Officer):** Perform safety inspection; provide safety liaison duties between client and Ferma; provide safety information; update and administer Safety Plan; provide all posting for specific site safety consideration; attend safety meetings. (PHONE #650-224-9267)

4. **Daniel Esparza (Field Foreman):** Provide on-site full-time job supervision; provide direct job scheduling; prepare and disseminate field communication, both written and verbal to all parties; conduct weekly safety meetings; assure timely job progress to final completion. (PHONE #650-796.5911)

SAFETY INSPECTION PROCEDURES

Risk Assessment:

The objective of safety inspections at the job site is to identify and correct any situations that might cause accidents or injuries to workers, to the public, or to the environment. Conducting regular inspections is one of the most effective ways to recognize potential hazards in the job site, making the process a critical component of any job site safety program. Inspections will include close examination of equipment used, in addition to evaluating how well employees comply with job site standards and procedures while performing their typical duties.

Inspection/Safety Team:

The Inspection/Safety team includes a safety officer, a job site superintendent, and a project foreman. These individuals are responsible for carrying out regular inspections of the physical premises and equipment as well as observing how work processes are being carried out. Anchorock will be used as our safety software to record safety inspections and recording and reporting safety incidents, Ferma will also provide reports and inspections to Devcon as required per "Devcon's SSSP". The team looks for particular hazards assessing any deficiencies and/or unsafe conditions identified on the list. In addition, the inspection team is responsible for correcting any situations that may create a threat. Incidents recorded during these inspections will also be communicated to Devcon.

Per Ferma standards, the Safety Team will conduct weekly safety inspections, and if necessary, safety concerns will be addressed during the daily pre-task plan meeting with all workers onsite . Common hazards are identified on the checklists along with areas in the job site known for a high incidence of accidents. The team is also responsible for developing control measures for assessing any risks identified in the job site. Follow-up of the corrective actions taken is then tracked via weekly audits.

Safety Hazards:

Safety inspections have a procedure for classifying hazards. The safety team will place high priority on reporting a hazard that requires immediate action to correct an unsafe condition or act, particularly one that could cause serious accidents. An example of a high-risk hazard is defective machinery or equipment, or an employee not using equipment correctly. Other hazards identified by the team might not necessarily pose an immediate threat but should be addressed as soon as possible. Although low hazard risks do not require urgent action, they should still be dealt with in a timely manner to prevent potential injury or harm to others.

Risk Assessment:

The table below helps determine which hazards are more serious than others.

Consequences		Probability / Likelihood				
People	Property	Happens several times a year at FERMA	Incident has occurred within last year at FERMA	Incident has occurred within FERMA	Heard of incident in industry	Never heard of incident in the world
Fatality	>$100,000	Extreme	Extreme	High	High	Medium
Injury requiring hospitalization	>$10,000	Extreme	High	High	Medium	Low
Injury requiring medical treatment beyond first aid	>$1,000	High	Medium	Medium	Low	Low
Injury requiring first aid	<$1,000	Med	Low	Low	Low	Low

NARRATIVE

Water Management:

Water management will be an ongoing process during the abatement and demolition of Hangar 3. The following describes the steps that are in place to remediate the water and control it from leaving the demolition area.

- Place extruded asphalt curb around the Hangar (between 20' to 25' outside the building) to act as a secondary containment for dust control water that may be oversprayed and splashed onto the shed roof or outside the hangar. The asphalt curb will be caulked as required to make watertight (Note: asphalt curb shall be removed upon completion of demolition).
- Place 10 mil poly at the interior Hangar floor, tape joints and tape at the interior perimeter wall.
- Placement of poly water catchment and water collection system including pumps, hoses, four Baker Tanks and collection labor. Includes 450,000 to 500,000 gal of water, filtering, testing and discharge fees to the sanitary sewer Note: Water collection and hoses will be installed, handled, moved as required inside of the structure prior to demolition.
- Note: all hangar truss roof demolition, including removal of ACM material, shall be performed utilizing tool mounted water sprayers and Dust Boss "water misters" mounted in tandem with high reach equipment and emitting at the work level. The misting will be with our integrating dust suppression systems on our excavators. All water supplied to the water sprayers and misters will contain manufacturer recommended amounts of non-toxic "Gorilla Snot" encapsulate (or equal) to inhibit separation of small particles and ACM.

In the event of the following contingencies, this is how the issue will be handled. Please also reference Exhibit C for the "Spill Prevention Plan"

- The poly is breached by debris hitting the floor and puncturing the containment:
    - Extra Poly will be kept to repair as needed.

- Cleanup procedures for a leak:
    - Cleanup procedures will be utilizing squeegees and vacuums.

Demolition:

Demolition by mechanical means, loading and removal including labor, equipment, material, salvage value, transportation, legal disposal described as follows:

- Demolish 7 trailers outside of Hangar.

- Clear all debris and miscellaneous material out of the Hangar

- Steel plate floor protection shall be provided at the work area and relocated as work progresses from truss bay to truss bay (not included for shed demolition areas). Steel floor protection plates will be installed and moved with manpower inside of the structure prior to demolition.

- Salvage beams and cross braces.
    - Refer to Ferma's Wood Planing Activity Work Plan for more information on the planing of salvaged beams and cross braces.

- Dust abatement of trusses prior to demolition including water sprayers, Dust Boss "water misters," and fire hose water pressure applied to trusses from elevated position (man lift). Water to be contained via construction water catchment system.

- Demolition mobilization: FE150 High Reach, 2–FE115 High Reach, 4-FE50 Excavators, Crane, Shredder, Guillotine Shear, attachments (hoe-ram, cruncher, shear), 4- Skidders and miscellaneous as required. All equipment able to reach the top and perform demo safely from outside the work footprint

- Two Boom lifts will be utilized to hoist the workers up 120' to drill access holes into the Hangar, under the door beam and near the South towers. All workers will be 100% tied off while in man-lift as required by OSHA. A 5/8 inch steel cable rope will be fed through the hole and wrapped around Truss #3 at the east and west side, and around South towers adjacent to Hangar wall, securing the two structures together.
- Stage North end of Hangar 3, start demolition at North end
- Demo North and South hangar doors in succession (utilize high reach excavator(s)). See Structural Demo Plan prepared by FBA, Inc, Structural Engineers (FBA).
- Demo hangar door support beam (utilizing high reach excavators). See structural Demo Plan prepared by FBA.
- Demo 4 concrete towers (utilizing high reach excavator with concrete crunching attachment)
- Demo remaining portion of exterior North wall exposing Truss 5
- Roof section will be demolished in a sandwich approach, with the tin roofing, ACM material, and cross braces kept "sandwiched" together as best as possible. High reach excavators will carefully drop the roof material to the Hangar floor. Roof section will be kept wet and encapsulated with manufacturer recommended amounts of Gorilla Snot (or equal) during the entire process in accordance with *BAAQMD Regulation 11 Rule 2 Sec 303.1.* Please reference Exhibit B for the roof "sandwich" buildup.
- Demolition of Truss 51:
  - Station 3 high-reach excavators and 4 Dust Boss foggers at the North end adjacent to Truss 51. Locate the FE150 excavator at the truss center (highest point) and the two FE115 excavators on each side at the approximate 120' high location. The Dust Boss foggers will be located at the fourth points (outside and between the excavators). The excavators will be positioned on steel plates.
  - The FE 150 will start demolition of Truss 51 at the center top chord and bottom chord while at the same time the FE115's are holding the truss for stability (if required). The FE150 will continue crunching East and West approaching the 120' high location at which time the FE115 excavators will crunch the balance of the truss to the bent locations. As the FE115's are working toward the bents the FE150 will be crunching slots in the roof deck toward Truss 50 at 4'+/- centers to separate the roof deck from Truss 50. The FE115's will demolish the roof deck in the same manner taking special care not to drop material on the shed structures between the bents. Any miscellaneous material inadvertently dropped on the shed structures will be removed by hand and added to the truss debris pile.
  - For additional information see FBA Demolition Plan (note: all machines demolishing Truss 51 and the intermittent elements shall be stationed outside of the footprint area).
- Truss 50 through Truss 27 shall be demolished in the same manner. The "shoring system" consisting of 36" diameter pipe columns and attachments shall be disconnected from Truss 26 by shearing/disconnecting attachments while holding (stabilizing) and laying down the pipe column with FE115. Steel elements will be dragged out of the work area and downsized for recycling. Care shall be taken to support the adjacent truss elements with the FR115 excavators during the pipe shoring system removal to prevent unintentional collapse. See structural Demo Plan prepared by FBA. Once shoring is disconnected from Truss 26 it (Truss 26) shall be demolished same as Truss 51 described above (Note: the stability of Trusses 26 through 9 will be observed while removing the pipe supports and if required will be demolished at the same time as removing the supports). Truss 25 through Truss 9 shall be demolished in the same manner as Truss 26. Truss 8 through Truss 2 shall be demolished in the same manner as Truss 51 described above. Truss 1 shall

be demolished utilizing the concrete towers as lateral support but still having assistance from FE115 if necessary.

- Once the Truss Lines have been demolished to Truss 25+/- demolition will begin at the North end of the bent/shed structures. Both sides (East and West) may be demolished simultaneously. The frame structure shall be demolished to the top of the first concrete bent at which time the bent will be demolished utilizing concrete cruncher attachment(s) while keeping the concrete separated from other materials. The demolition of the frame debris will continue from one bent to the next and the concrete bents will be crunched in the same succession.

- All truss and deck materials shall be demolished, processed, loaded, transported and disposed of as RCRA material due to the inability/impracticality of safely and efficiently removing/separating the contaminated (RCRA) battens from the tops and bottoms of the top chord and the bottom chord of the trusses. Assumed tonnage is 3000 tons.

- All shed material, bricks, steel and concrete shall be separated, loaded and transported to recycle facilities.

- The areas where concrete and brick are removed shall be hoe-rammed, hammered, bushed to 3" below adjacent slab surface for patching by others.

Additional Miscellaneous Scope:

- Plywood protection of Building 55 Includes ½" plywood attached to 2x4's flat to cover the building and stack.

- Protect Hangar 2 utilizing a 90 ton crane (or equal) to support chain link fence curtain with textile fabric attached draped from a 40' steel beam situated just outside of the work area between Hangar 3 and Hangar 2. Curtain to be moved in conjunction with the progress of the work. 60' wide x 60' high

- Site Specific Health and Safety Plan

- Provide scaled animated model of demolition from beginning through completion

- Provide stamped Engineered demolition plan.

- Obtain BAAQMD notification, OSHA and FAA permit

- Traffic and/or pedestrian control (limited to flagmen and signage) and street sweeping as required for our portion of work

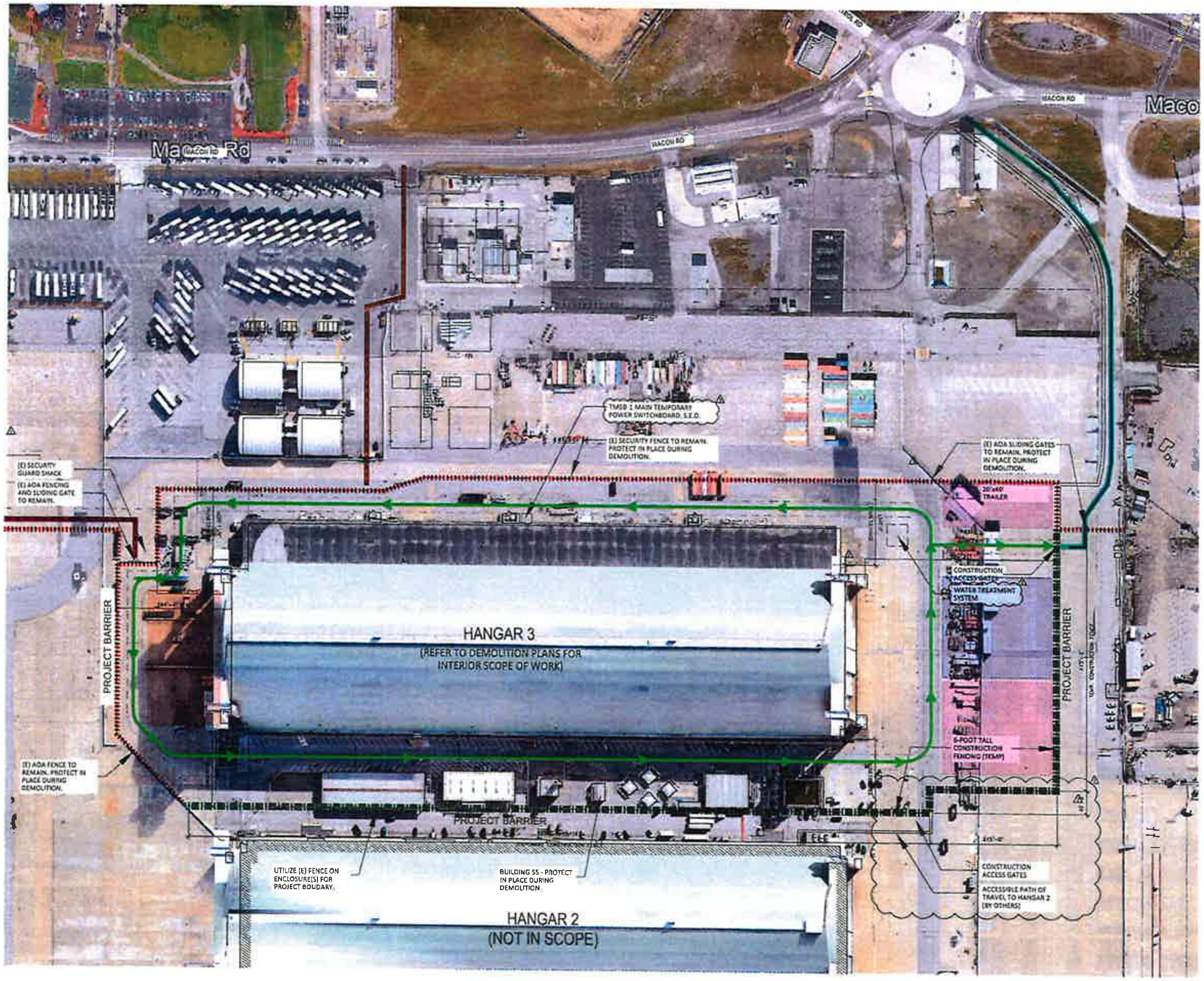
- Bent wall brace engineering and panel braces at bents

- Sound wall will consist of 8' high x 40' long x 1/2" plywood with 2" foam glued to surface (movable as work progresses)

- Debris Net

EXHIBIT A – SITE LOGISTICS PLAN

Site Logistics Plan on the following page.



1 SITE LOGISTICS PLAN - HANGAR 3

PLAN NORTH

SITE LEGEND

- EXISTING FENCE TO REMAIN / PROJECT BARRIER
- CONSTRUCTION FENCING / PROJECT BARRIER
- 25 FOOT FIRE LANE TO BE MAINTAINED DURING CONSTRUCTION
- CONSTRUCTION ACCESS (9 27/23 - 11 22/23)
- CONSTRUCTION ACCESS (STARTING 10 24 23)
- CONSTRUCTION PARKING, LAYDOWN & CONNEX
- SUBCONTRACTOR PARKING & LAYDOWN
- DEMOLITION STAGING FOR DECONSTRUCTION & WOOD SALVAGE EFFORT
- CONSTRUCTION TRUCK HAUL ROUTE

GENERAL NOTES:

1. WORK WILL BE TEMPORARILY HALTED ONCE WIND SPEEDS REACH 40 MPH. ALL WORK CREWS SHALL BE RELOCATED A DISTANCE OF 100-FT FROM THE AREA UNDER DEMOLITION AND NEAR THE SITE FENCE.

PLANETARY VENTURES, LLC

MOFFETT FEDERAL AIRFIELD

HANGAR 3

MOFFETT FIELD, CA 94035

DEVCON CONSTRUCTION INCORPORATED

THIS DRAWING MUST BE PRINTED IN COLO

CONFIDENTIAL BUSINESS INFORMATION; NOT FOR PUBLIC RELEASE

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	[illegible]	PLAN CHECK RESPONSE 1	
2	[illegible]	[illegible]	
3	[illegible]	[illegible]	

SITE LOGISTICS PLAN

JOB NO. 22-149
DATE: 8/4/2023
DRAWN: PC/CSP
CHECKED: CSP
ISSUE: FOR PERMIT

SHEET NO.

AD1.10

OF SHEETS

EXHIBIT B – Roof Buildup

Roof Buildup on the following page.

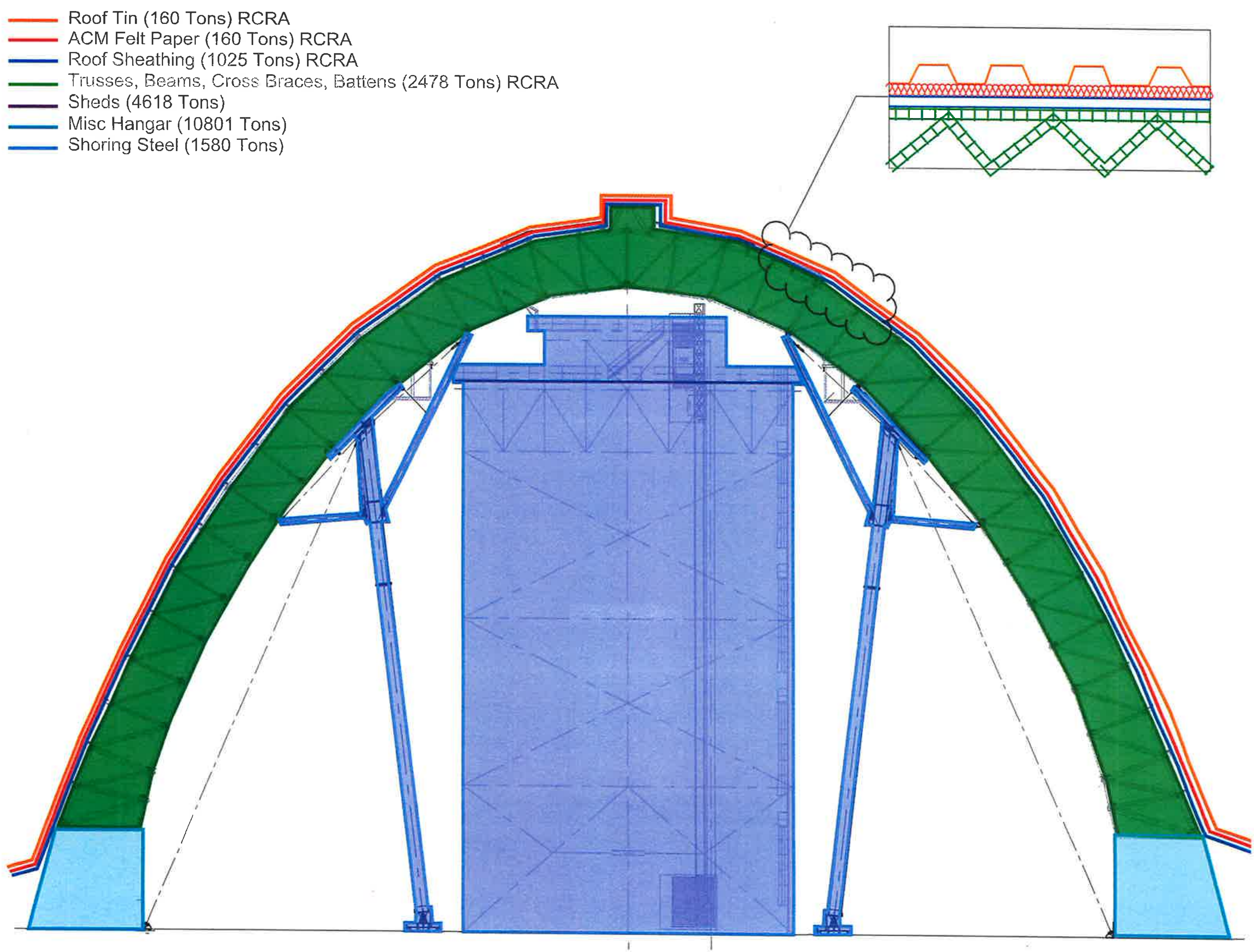

Roof Tin (160 Tons) RCRA
ACM Felt Paper (160 Tons) RCRA
Roof Sheathing (1025 Tons) RCRA
Trusses, Beams, Cross Braces, Battens (2478 Tons) RCRA
Sheds (4618 Tons)
Misc Hangar (10801 Tons)
Shoring Steel (1580 Tons)

EXHIBIT C – SPILL PREVENTION PLAN

Spill Prevention Plan on the following page.

Spill Prevention Plan

November 16th 2023

The following is a prevention plan to address spills of potentially contaminated water from dust suppression and washing of trusses during demolition activities at the Hangar 3 Demo project located at Moffett Airfield. The purpose of this plan is to identify the procedures to be followed by Ferma to prevent contaminated water spills during the course of demolition as well as the steps to take should these spills ultimately occur.

Overview

All water used for dust control and washing of trusses will be collected and treated. Please refer to the following procedure for collecting all spill water:

Place extruded asphalt curb around the Hangar at plus 20' to 25' outside the building line to act as a secondary containment of dust control water. Caulk as required to make watertight (Note: asphalt curb shall be removed upon completion of demolition). Additional asphalt curb will be placed around water treatment tanks

Placement of poly water catchment and water collection system including pumps, hoses, four Baker Tanks and collection labor. Includes 450,000 to 500,000 gal of water, filtering, testing and discharge fees to the sanitary sewer Note: Water collection and hoses will be installed, handled, moved as required inside of the structure prior to demolition.

Install and maintain SWPPP measures at all nearby storm drain inlets to ensure each is properly protected with waddles, fabric, etc. in the event of a spill.

Emergency Spill Equipment

Emergency spill equipment shall be kept with the Ferma crew onsite at all times during the course of construction. This equipment should be stored in an easily accessible location that is readily available to all crew members in the event of a spill. This includes, but is not limited to, the following:

1. Suction Pumps with Discharge Hoses

3. Generator

4. Spill Kits & Absorbent Materials

Inspections

Daily inspections of all equipment shall be conducted by the Ferma crew onsite to confirm all items are operating as intended. Potential indicators for spills include leaks on housing, tears in poly, high tank levels, and improper fitting connections.

Emergency Response Procedures

In the event of a spill, the Ferma crew onsite will immediately stop all demolition activities to assess the situation and prevent any further spillage. At this time, other crew members can ensure these spills do not infiltrate any existing storm drain systems within the project limits. Ferma will be responsible for notifying Devcon office staff, who in turn, will notify the appropriate parties at CBRE, Google EHS, Elevate and NASA, if needed.

The following employees will be the designated emergency coordinators to lead spill response procedures:

Daniel Esparza – Foreman

Ferma Corporation

(650) 796-5911

Tina Couchee – Project Executive

Devcon Construction

408-964-5625

Following any spill event, Ferma and Devcon team members will arrange a meeting with all parties to review the incident and develop a corrective action plan to ensure additional procedures, if needed, are set in place to prevent subsequent spills from occurring.

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45 Fremont Street, 28th Floor San Francisco, CA 94105 415.989.1004 **kpff.com**

November 28, 2023

Tina Couchee
Devcon Construction, Inc.
690 Gibraltar Dr
Milpitas, CA 95035

VIA Email: tcouchee@devcon-const.com

Subject: Moffett Field, Hangar 3 Demolition
Loads on Existing Damaged Roof

Dear Ms. Couchee:

As part of the Hangar 3 Demolition project, our team has completed a peer review of the demolition plans and sequence of work prepared by Devcon Construction.

Based on our team's review, I concur with your assessment that it is technically infeasible to place any personnel, equipment, fall protection anchors, or any other added loads on the existing hangar roof in its current damaged state.

Further, I understand that an alternative was considered to abate the roofing material prior to structural demolition. However, since that work would involve placing personnel and equipment on the roof, I agree that this alternative would also not be feasible from a structural standpoint.

Our previous comments and conclusions regarding the structure remain unchanged:

1. The structure remains unsafe and is very vulnerable to further damage or partial collapse while left in its current unrepaired state.
2. Overall, the hangar structure has existed well past its original design life. Varying levels of damage exist to other parts of the timber framing, beyond that of the work outlined in the prior Emergency Truss Repair work.
3. In its current unrepaired state, the structure is far more vulnerable to sustaining further damage and even experiencing partial collapse of areas from earthquake and/or high wind loading.

Based on the discussion above, it is still my professional opinion that the hangar remains unsafe, and that the existing timber roof structure is not to be used to support additional loads during demolition activities.

Very truly yours,

Blake W. Dilsworth, SE
Managing Principal

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Appendix A KPFF Structural Engineering Documents for Hangar 3

A.1 KPFF, "Building 46 (Hangar 2) & Building 47 (Hangar 3) Due Diligence Phase 1 Report" (August 9, 2013)

Building 46 (Hangar 2) and Building 47 (Hangar 3)

Due Diligence Phase 1 Report

August 9, 2013

Building history

Hangars 2 and 3 are the world's largest freestanding wood-frame structures constructed by the U.S. Navy in 1942 to aid the WWII efforts and the "lighter-than-air" (LTA) program. These hangars are integrated with a total of 17 other identical hangars that were constructed across the U.S. to house dirigibles such as the USS Macon and the USS Akron. To conserve metal resources for the war efforts, the 17 hangars were primarily constructed of wood and concrete, as shown in Figure 1. Hangars 2 and 3 are officially addressed as Buildings 46 and 47, respectively, on the NASA Ames Research Center historic properties.

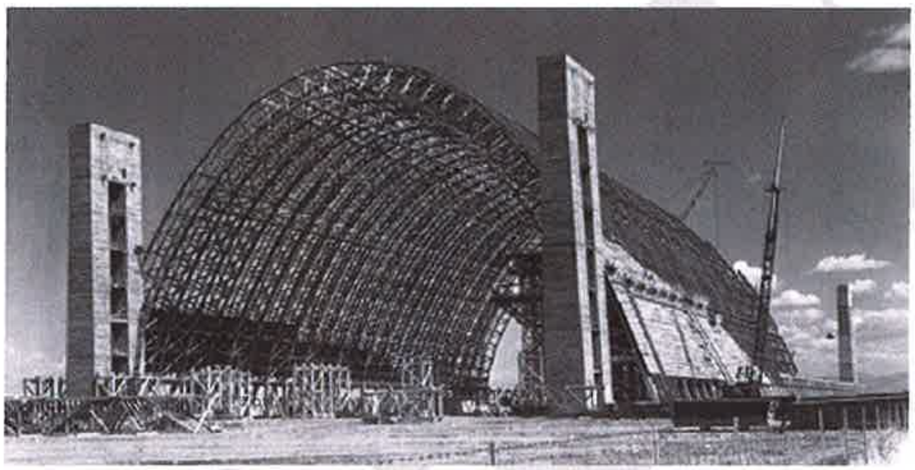

Figure 1. 1942 Hangar 2 Construction.

The primary structural aspects of Hangars 2 and 3 involve 51 timber arches that are spaced 20 feet on center and rise above the slab on grade approximately 170 feet to the arch outer chord. The timber arches are orientated in the transverse direction and connected at the base to a two-story transverse concrete bent. The concrete bents are located on concrete pile caps and timber piles with an allowable load capacity of 12 tons each. The outer and inner footings of the bent consist of 9 and 12 piles, respectively, where 3 piles in each group were battered to resist an outward dead and wind thrust loads. The arches and the concrete bents are supported in the longitudinal direction by timber cross braces. However, at various locations throughout the hangars, the cross braces have been retrofitted with either steel braces or steel cables. Two inch diagonal tongue and groove timber sheathing encloses the hangars on the outer chords of the arches, as well as the exterior roof assembly of an asphaltic material and corrugated aluminum. The latter was a replacement in 1956 for the original tarpaper rolled roofing.

The doors at the north and south ends of each hangar consist of six aluminum and wood frame sliding panels. These doors are guided by rails on slab as well as through a transverse box beam spanning between two concrete towers. The box beam is a double-height wood truss sheathed with wood diagonal tongue and groove patterns. The box beam is approximately 20 ft square and cantilevers 20 ft beyond each tower, as shown in Figure 2. The tower and box beam assembly are attached to the timber hangar through anchor bolts embedded into the concrete towers. The supporting structure for the hangar doors is a free standing structure and separated from the timber hangar by a gap separating the two structures. Similar to the concrete bents, the towers are supported on concrete pile caps and timber piles with an allowable load of 30 tons each. A total of 816 piles were used for all towers of a single hangar. The main footprint of both hangars is approximately 296'6"x1000'. A two-story annex building measuring 62'x1000' was added to the east side of Hangar 3 in 1945 for additional office and shop space.

Figure 2. 2013 Hangar 2 (nearest hangar) and Hangar 3.

Numerous problems arose during the design and construction phases of the hangars. The primary challenge at the time was the lack of knowledge in detailing, fabricating, treating, and handling the mass amount of timber required. Research and testing were not allocated by the project because it was considered part of the Accelerated Public Works Program of the Navy in aid of the war efforts.

Documents reviewed

1. Ambrose Group, Inc. (2012).
2. Page & Turnbull, Inc. (2006), "Re-use Guidelines," NASA Ames Research Center, [Hangars 2 & 3].
3. Supplements to Page & Turnbull, Inc. (2006)
   a. Degenkolb (2006) [Chapter 5]
   b. Flynn et al. (2002), "An Initial Evaluation of Douglas Fir Wood Components in Hangars 2 and 3 at the NASA/Ames Research Center," UC Forest Products Laboratory.
   c. Dolci and Team (2000), "Encompassing Synopsis of the Condition and Feasible Utility of Blimp Hangars 2 & 3."
   d. BAMSI, Inc. (1994), "Hangar 3 Exerpts of Moffett Field Hangar Life Safety Evaluation," Moffett Field Development Project, Plant Engineering Office.
   e. Rutherford & Chekene (R&C) (1992) [Analysis for only Hangar 3]
   f. R&C (1984-'85) [Analysis for only Hangar 2]
4. Neal, Donald W. (1986), "Restoration of Navy LTA (Lighter than air) Hangars", Conf. Proceed. in Evaluation and Upgrading of Wood Structures: Case Studies, ASCE, pp. 1-12.
5. Amirikian, A. (1943), "Navy Develops All-Timber Blimp Hangar," ASCE Civil Engineering, Vol. 13, No. 10 and 11.

Summary of previous reports

Numerous assessments of the wood conditions have been documented over the years. The most recent documentation was in 2012 by Ambrose Group, Inc. for only Hangar 2. A thorough non-invasive and non-destructive visual inspection was completed for the interior structural members of the hangar, as well as for the interior of the box beams and overhead catwalks. The inspection noted visual signs of warping and splitting of the main trusses, with the largest crack measured 3.5" wide by 10' in length. In addition, there were multiple cases of missing and compromised fasteners, splitting of tieback and brace members, deflection of the exterior horizontal joints, signs of water staining, and timber shedding throughout the hangar. Similarly, the condition of the box beams showed signs of water intrusion and timber shedding. Splitting was also observed on the cross bracing within the south box beam. The catwalks and ladders used to ascend to the upper catwalk appeared to be in fair and slightly less fair condition, respectively. However, both contained age cracks and showed signs of vertical and lateral deflections when walking on, according to the report.

Page & Turnbull's 2006 Re-Use Guidelines for Hangars 2 and 3 included a detailed description of the historical context, the structural and non-structural systems and their conditions, as well as the re-use methodology. Page & Turnbull advised that the hangars do not comply with the ASCE 31-03 Life Safety performance level. If an earthquake were to occur, major structural damage could result. Therefore, a Full Building Tier 2 analysis was recommended. In addition, the report stated that the members were overstressed due to wind loading. The report recommended that further analysis should follow the guidelines of the California Historical Building Code (CHBC) for seismic and ASCE 7 for wind. The CHBC states that the seismic forces to be used for evaluation and possible strengthening need not exceed 0.75 times the seismic forces prescribed by the 1995 edition of the California Building Code (CBC). The seismic forces would be computed based on R_w forces tabulated in the CBC for similar lateral force resisting systems. Based on past history with this type of construction, there is potential of complete collapse during a major earthquake, excessive wind, or small fire within the vicinity.

Page & Turnbull and the NASA Ames project managers suggested three new uses for Hangar 2 and 3. The possibly scenarios were:

Scheme 1: Missile Defense Command Center (Low Occupancy, High-Level Security)
Scheme 2: Federal Emergency and Management Agency Storage Facility (Low Occupancy, Low-Level Security)
Scheme 3: Public Use Sports Arena and Club (High Occupancy, Low-Level Security)

For each scheme, Page & Turnbull listed recommended improvements based on the level of occupancy and security. The improvements addressed issues of structural inspection/repair, fire protection, emergency systems, MEP, accessibility, egress, doors, windows, new raised topping slab, and new architectural finishes. However, it is recommended that NASA Ames compile a complete analysis for the re-use impacts regarding code issues, structural and system upgrades, accessibility requirements, hazardous materials abatement, envelope repairs, and the alterations of the historic fabric. In addition, because Hangar 2 and 3 are considered historic buildings, all work to the hangar should comply with The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.

As a section within the re-use guidelines, Page & Turnbull (2006) reference Degenkolb (2006) in Chapter 5 regarding the historical context of the structural systems and a chronological documentation of the structural retrofits and analyses conducted. The report makes note of the hangars having an original design loading, which is similar to the data presented in Amirikian (1943), of the following:

Earthquake = 10% x W
Wind = 10 psf windward + 19 psf suction at the base + 24 psf suction at top of arch
Hoist = 5 kips at panel points near catwalks
Live = Not considered

The considered load combinations were D, D+W, D+EQ, and D+Hoist+0.5W

Also, the allowable material specifications for the original timber design was:
Arch trusses = 1400 psi bending, 1100 psi compression
Other members = 1200 psi bending, 1000 psi compression

In addition, Degenkolb (2006) performed a limited ASCE 31-03 analysis, assuming Site Class D soils, to confirm the general conclusions from previous analyses. The results of this study were identical to those provided by R&C (1984-'85), who conducted a full dynamic analysis of Hangar 2. The corresponding R&C analyses assumed stick models depicting the response of the structure as well as considered foundation stiffness by springs. For a single arch frame in the transverse direction, the truss was modeled as a beam to reduce the number of members analyzed. A similar concept was conducted for the bottom chord bracing in the longitudinal direction. The concrete tower and door structures were analyzed by hand calculations.

The results from R&C analyses are summarized by the following:

- The concrete bents were severely overstressed in bending and inadequately reinforced for ductile behavior.
- All connections of the longitudinal bracing trusses were overstressed.
- The horizontal members of the longitudinal trusses were determined inadequate.
- The concrete door towers were overstressed in bending at the top and base.

The retrofit schemes presented by R&C (1984-'85) involve the addition of concrete wall infill to every third existing concrete bent, construction of a new concrete diaphragm at the top of the concrete bents, strengthening of all overstressed longitudinal bracing connections and horizontal members with steel tubes, and construction of two new concrete struts to brace each tower.

However, to preserve the historical structural context of the hangars, Degenkolb provided an alternative retrofit scheme of strengthening the concrete bents and towers along with the installation of a new pile foundation. In addition, Degenkolb addressed the inadequate spacing of the seismic joint separating the timber hangar from the tower and box beam assembly, as well as documenting that no calculations have been performed on the expandable hangar doors. R&C estimated the overall structural and non-structural repair for only Hangar 2 was [redacted] and [redacted], respectively. However, it was assumed that similar retrofit costs and analysis results were applicable for Hangar 3.

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In 1992, R&C performed an analysis of only Hangar 3 as defined by FEMA 178 (NEHRP Handbook for Seismic Evaluation of Existing Buildings, 1992). The results concluded that the structure did not satisfy the criteria for minimum NEHRP Life Safety performance. Concern was raised on a soft story in the concrete frames because of inadequate reinforcing, inadequate connections of the diagonal bracing, and a complete lack of connection from the diaphragm to the concrete foundation. In addition, it was observed that two adjacent arches contained 1" cracks on the bottom and top chords around the location of the apex. The recommendations emphasized the damaged arches were life safety hazards and must be repaired. The retrofit schemes for Hangar 3 followed the same guideline as the 1984 retrofits, but with the addition of strengthening to the two-story building annex.

Degenkolb (2006) performed an analysis considering the effects of wind and gravity. The results showed overstressed wood braces throughout the hangars under wind loading. However, Degenkolb highlighted that their analysis was limited and recommended that prior to hangar re-use, a comprehensive wind analysis must be performed using ASCE 7 wind design criteria. In addition, Degenkolb advised that Hangars 2 and 3 are susceptible to severe seismic shaking but are not located within the near-field effects of any fault systems. A site specific geotechnical analysis was not performed. However, both hangars are vulnerable to soil liquefaction as classified by the Association of Bay Area Governments.

Degenkolb also noted that Hangar 2 contains structural select Douglas-fir wood with Minalith fire retardant treatment (FRT). The latter was observed by teeth pressed incisions into the wood, as well as fibers littered on the surface of the wood and throughout the floors. On the contrary, Hangar 3 does not have the same FRT and the wood is an alternate species of Douglas-fir. This was validated in the UC Forest Products Laboratory report by Flynn et al. (2002). Further analyses of the wood in Hangar 3 indicate a darker appearance when compared to Hangar 2, as well as a lack of teeth pressed incisions. However, crystals were noted on the surface of the wood indicating a salt based FRT formulation used in Hangar 3. It was also noted that if either of the wood is burned, the low toxicity Chromium III existing within the wood converts to Chromium IV and thus is more toxic (Flynn et al., 2002).

Table 1. Retrofit cost projection for hangar code compliance (Dolci and Team, 2000)

Function	Hangar 2	Hangar 3	Total
Maintenance/Repair M.E.&P.	[redacted]		
Structural/Seismic Upgrades	[redacted]		
Fire Protection			
Roof Repair			
Hazard Remediation	[redacted]		
Code Compliance (M&E), OSHA (occupational Safety), ADA	[redacted]		
Total	[redacted]		
Demolition	[redacted]		

Dolci and Team (2000) provided retrofit cost projections for the hangars (see Table 1). In addition, they noted that Hangar 3 was in better condition than Hangar 2. KPFF Consulting Engineers do not support this statement based on the recent site visit observations. Dolci and Team also studied an alternative use for 747 aircraft and stated that the existing 10" concrete slab floor of the hangars cannot support a fully loaded 747 aircraft. It was recommended that the floor be removed and replaced with a 14.5" reinforced concrete slab if this use was being considered.

Neal (1986) discusses the 1981 assessment and retrofits for Hangars 2 and 3. Between the two hangars, there were a total of 1,513 minor repairs, 18 damaged frame members, and 36 locations of buckling at the arch frames. No structural analysis was conducted by the Navy, but rather the retrofit efforts were confined to restoring the distressed members to their original condition. The retrofit solution for buckled members involved additional glulam bypass members. Neal indicates there was no secondary buckling following the repair of a buckled chord segment.

Summary of recent site visit

KPFF conducted a site visit for Hangars 2 and 3 on July 31 and August 1, 2013, accompanied by Ronald Anthony, wood scientist of Anthony & Associates. It was observed that Hangar 3 appears to be in worse condition than Hangar 2. A large number of timber arches were strengthened by additional timber bypass members, clamps, stitch bolts, and steel cables, as shown in Figure 3. These restoration efforts were primarily completed by Power-Anderson, Inc. in 1981-'87, as mentioned in Neal (1986) and Page & Turnbull (2006), and thereafter in 1995 by Philo & Sons, Inc.

(a) (b) (c)

Figure 3. Retrofit techniques observed throughout Hangars 2 and 3 (a) Strengthening of arch chords by addition of glulam bypass members (b) Clamps and stitch bolts to close small cracks (c) Replacement of wood sag braces with steel cables and bolts.

However, to the best of our knowledge, there is no documentation within past 10 years of a full assessment to the condition of Hangar 3. Our recent site visit observed additional cracks in the wood and distortions of the main arch chords near the apex of multiple arches. This is shown in Figure 4 for the specified arch lines and nodal positions. For reference, the arch lines range from 1 to 51, where line 1 depicts the southernmost arch and line 51 represents the northernmost arch. The nodal positions describe the vertical locations of the horizontal joints. Node 0 and node 36 are respectively defined at the base of the arch on the east and west sides (top of the concrete bent). The arch apex is depicted as node 18.

As seen in Figure 4, a significant amount of cracking and out-of-plane distortion is observed on the bottom and top chords of the timber arches. The most prominent cracks are located in the bottom chord of arch 21 at node 16 and in the top chord of arch 22 at node 16. Both cracks widths are approximately 8" and contribute to the appearance of torsionally warped members. The latter could be a direct result of the out-of-plane relative distortion, as seen between nodes 16 and 17 within the bottom chord of arch 22.

This general observation is emphasized in Figure 5 with the relative lateral displacement between the apex of the arch and a theoretical reference line connecting adjacent arch nodes. Similar results are also displayed in Figure 6 for the top chord of arch 18.

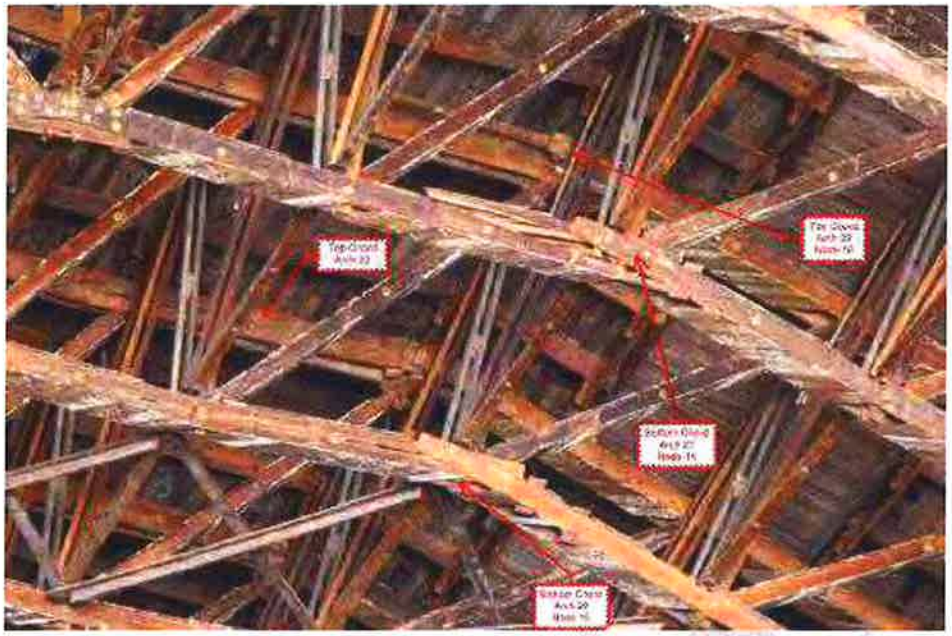


Figure 4. Observed cracks and distortion of the timber arch bottom and top chords in Hangar 3.

Figure 5. Relative lateral displacement between arch apex and reference line for Hangar 3 single arch.

Figure 6. Observed cracks and lateral displacement of arch top chord in Hangar 3.

In addition, it was observed that the apex of numerous arches contain a consistent trend of node 18 displacing relative to the adjacent nodes supporting the monitor (exterior protrusion of the hangar at the apex outer chord). This is displayed in Figure 5 for arch 11, Figure 6 for arch 18, and Figure 7 for arches 21 and 22. The latter contains blue sketch-up arrows displaying the relative lateral displacement of the nodes, where node 18 appears to display south. It is unknown whether or not if all of the observed cracks and distortions propagated from the 1995 retrofits or if their origin emanated within the past couple of months.

Figure 7. General trend of relative lateral displacement at the arch apex top chord in Hangar 3.

Hangar 2 did not have the extent of distress as seen in Hangar 3. There was only one location where the main arches where strengthened by glulam bypass members. This location was on arch line 14 and between nodes 28 and 30. The only visual signs of distress were observed through end splits of cross braces, as shown in Figure 8. This distress was common at locations where the fasteners were too close to the end grains.

Figure 8. Example location of end split in cross brace member within Hangar 2.

It was also observed while walking through the office spaces that various concrete bents in Hangar 2 are braced in the weak axis with steel HSS horizontal and cross braces. This was documented by Page &

Turnbull (2006). However, wide flange steel shapes were also observed for additional reinforcement of the concrete bents in the strong axis, as shown in Figure 9.

(a) (b)

Figure 9. Hangar 2 office space retrofits (a) Longitudinal HSS and Lateral I-Shape bracing (b) Lateral I-Shape and HSS bracing.

While on the recent site visit, it was also observed that the doors on the southwest corner of Hangar 3 were open while all other doors between both hangars were closed. Therefore, future observations must verify if the doors are operable. In addition, the existing corrugated aluminum sheathing was detached at various locations along the roof of Hangars 2 and 3, as shown by example in Figure 10.

Figure 10. Example location of detached corrugated aluminum sheathing on roof exterior of Hangar 2.

Anthony & Associates provided the following preliminary recommendations through email:

1. "For analysis purposes, the wood species appears to be Douglas-fir in both hangars.
2. For analysis purposes, the grade of the members appears to be Select Structural, Structural Joists & Planks.
3. There appears to be little distress to the timbers in Hangar 2. Some end splits are present when the fasteners are close to the end grain. Seasoning checks are common, but not problematic.
4. Access was quite limited, but there were no signs of visible deterioration due to wood decay fungi. It is likely that there are isolated areas of decay where roof leaks have occurred.
5. As we observed together, there are failures, particularly in the bottom chords of the trusses near the peak of the roof in Hangar 3, that should be further investigated.
6. The effect of the fire-retardant treatment (Minalith in Hangar 2, unknown in Hangar 3) is uncertain. I need to look into this further, but that is likely beyond the scope of this work."

Summary of recommendations

Based on our review of the existing documents and our site visits, KPFF makes the following recommendations:

1. KPFF concurs with the general retrofit recommendations provided by Rutherford & Chekene, Degenkolb, and Page & Turnbull. Associated pricing can be used as a ROM estimate scaled to today's dollars. However because of the limitations and assumptions previously presented, KPFF recommends a complete seismic and wind analysis of both hangars using current codes.
2. KPFF recommends immediate correction for the alignment and bracing of the previously mentioned arches for in and out-of-plane movement. Methods of adding glulam bypass members as well as clamps and stitch bolts to the connections provide good potential for restoring the arches back to their original strength. However, it is recommended to monitor adjacent connections and members during restoration as load redistribution could be a potential hazard.
3. KPFF recommends full documentation of all member split end locations. The retrofit techniques will involve clamps, stitch bolts, and some form of epoxy injection.
4. KPFF recommends a survey of the condition of the existing roofing, followed by proposed methods of repair or replacement.
5. KPFF recommends that the project team researches whether the hangar doors are currently operable, and for the team to assess the usable life and anticipated maintenance required for the continued operation of the hangar doors.
6. KPFF recommends a thorough investigation with full accessibility to all interior/exterior structural members and connections for condition assessment and retrofit documentation.
7. KPFF requests a complete set of structural drawings for Hangars 2 and 3, and including all documentation for the Hangar 3 building annex.
8. KPFF recommends a site specific geotechnical assessment for the risk of bay mud consolidation and/or liquefaction effects.

A.2 KPFF, “Hangar 3 Emergency Truss Repairs Narrative” (May 26, 2016)

Hangar 3 Emergency Truss Repairs Narrative

May 26, 2016

This narrative provides a summary of the current situation and background relevant to the ongoing emergency truss repairs at Moffett Federal Airfield, Hangar 3. We understand that this summary will assist in explaining the context of the Hangar 3 damage and emergency repair work to the wider group of stakeholders involved in this project, including the State Historic Preservation Officer as part of the NHPA Section 106 Consultation.

1 Conditions observed necessitating the need for emergency repair

1.1 Dates of initial and follow up observations

The distressed condition of Hangar 3 was a pre-existing condition that was first observed by the team during the pre-lease RFP Due Diligence phase. Site visits for visual observation were conducted during July and August 2013. Access for visual observations was limited to the hangar deck and some shed areas. KPFF issued a Due Diligence Condition Assessment report on August 23, 2013 documenting the existing member distress observed at the top and bottom chords of the Hangar 3 roof trusses. It is unknown how long the damage existed prior to this time.

The design team progressed with further Due Diligence Investigation activities after the February 10, 2014 selection of Planetary Ventures as the preferred lessee for MFA. Design Development findings were compiled and submitted to the State Historic Preservation Office as support information when a Section 106 consultation package was submitted in May 2015.

In April 2014, DPR Construction began 3D laser scanning operations for Hangars 2 and 3. Site access issues during ongoing lease negotiations delayed the final scan results unto a later date.

Around August 2014, detailed wood condition assessment operations began by Anthony & Associates in coordination with the design team. A combination of visual observation, in-place visual grading, material sampling and testing, and photography was conducted using aerial boom lifts during several weeks of field operations. Preliminary data from the wood condition assessment was delivered to the design team on December 1, 2014. On December 19, 2014, KPFF issued the first draft scope narrative for a Hangar 3 structural monitoring program. This program was recommended based on the severity of prior damage observed and the uncertain timeframe to perform repairs prior to Planetary Ventures' occupancy of MFA.

On February 9, 2015, KPFF was notified of a small piece of wood which fell from the trusses to the ground within Hangar 3. We understand that OSHA was notified in response to this hazard. NASA requested information on the damaged zones of trusses, and KPFF provided a summary of due diligence data collected for Trusses 17–21 on February 13, 2015.

On April 1, 2015, Planetary Ventures took over MFA from NASA. At the PV-NASA meeting on April 8, 2015 to "re kick-off the project", the Hangar 3 damage was discussed and NASA suggested that conditions reviewed to date did not warrant an expedited review process for emergency repairs.

On June 24, 2015, KPFF performed a routine site visit to observe field conditions of the shed framing in Hangar 2. During that site visit, KPFF also observed Hangar 3 trusses from the deck slab and upon observation, suspected damage progression in the Hangar 3 arched trusses. On June 30, 2015, KPFF performed a follow-up site visit to Hangar 3 with aerial boom lift access and observed severe damage progression and increased excessive truss deflections. Turner Construction provided photographs of the ridge line indicating substantial increased deflection at the roof monitor. KPFF issued findings in engineer's field report EFR-03 along with recommendations for a zone of immediate emergency shoring due to damage progression. Selected photos from EFR-03 are provided below in Figure 1, Figure 2, and Figure 3. A reference truss elevation with panel points labeled is provided in Figure 4.

On July 2, 2015, KPFF issued the Hangar 3 Emergency Truss Repairs set for permit approval. DPR Construction performed another 3D laser scan survey of the trusses at the beginning of August. The permit was received for the emergency repairs, Permit No. 15PV2.300.000, in late August. Construction also began in late August. Coordination between KPFF, Power Engineering Construction, Turner, and the design team for the implementation of shoring and emergency repairs is ongoing as of today.

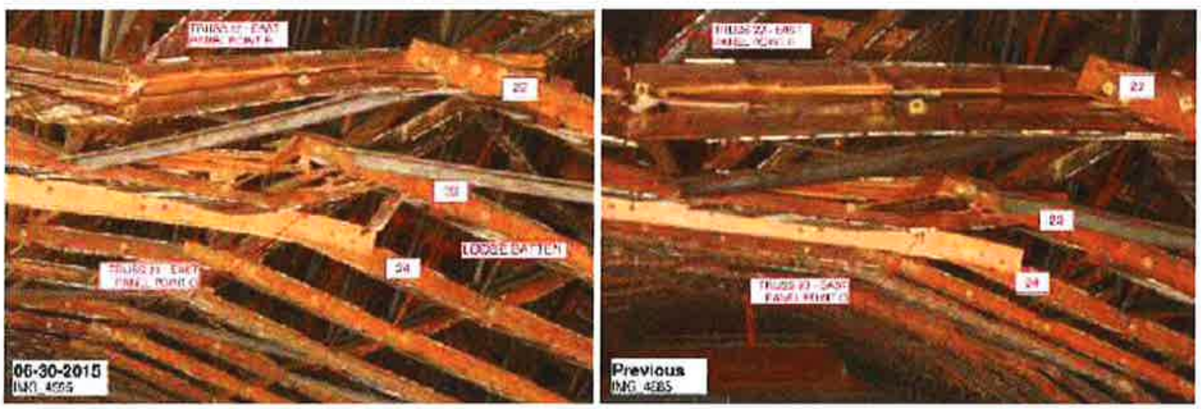


Figure 1. Truss damage progression at Trusses 22 and 23 East near Panel Points R and O.

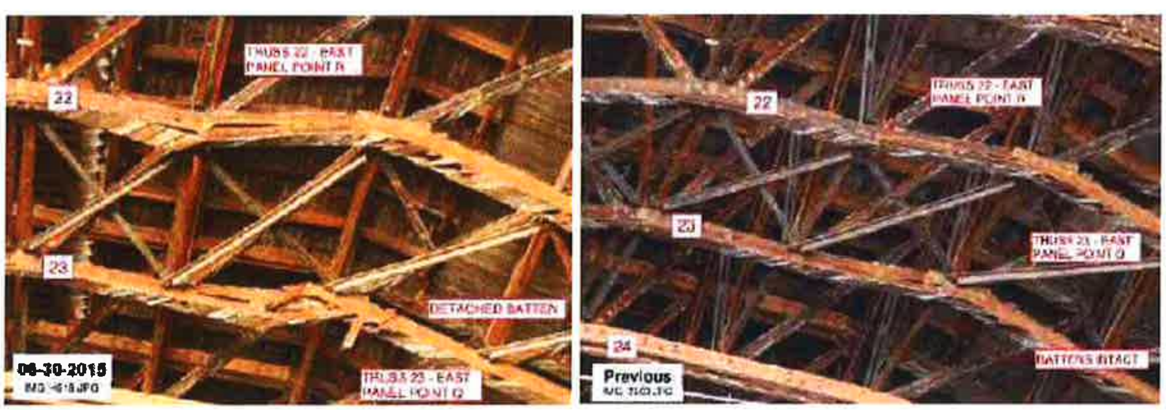


Figure 2. Truss damage progress at Trusses 22 and 23 East near Panel Points R and Q.

Figure 3. Damage observable at ridge line from building exterior.

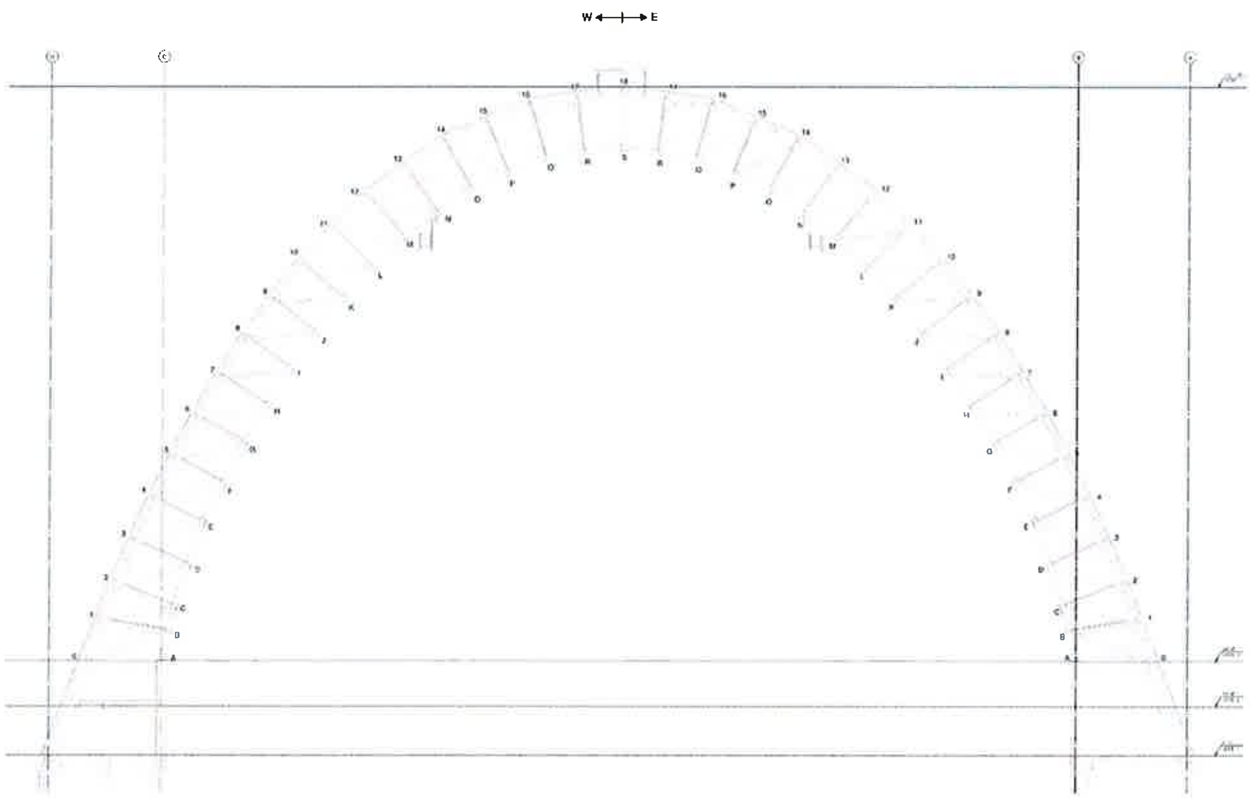


Figure 4. Typical truss elevation with labeled panel points.

1.2 Opinion regarding threat of collapse / partial collapse

Based on the progressing downward movement of the trusses observed in Hangar 3, there is a threat of partial collapse of the upper portions of the roof which may lead to progressive collapse of other portions of the truss. For this reason, temporary shoring has been installed within the most severely damaged zones to prevent any progressive collapse from occurring within the Hangar. The temporary shoring does not provide shoring to the upper most portion of the truss, since that zone needs to remain clear for accessibility by the movable access tower for the installation of truss repairs.

The following photos (Figure 5, Figure 6) demonstrate the severity of existing damage and the immediate danger of partial structure collapse.

Figure 5. Broken top chord near roof monitor at top of truss

Figure 6. Broken bottom chord near top of truss.

1.3 Data – summary of deflection and other measurements

Quantitative measurements of the truss deflections were taken from successive point cloud surveying of the hangar interior. The damage progression is shown in an example processed image from the 3D point cloud scans taken in 2014 and 2015 (Figure 7). In that figure, the black portion represents the actual position of Truss 22 between Panel Points Q-West and Q-East in 2014, while the red portion shows the position in August 2015. The measurements on the image show the increase in downward deflection between the surveys. A summary of deflections at Panel Point S indicate zones of damage concentration (Figure 8).

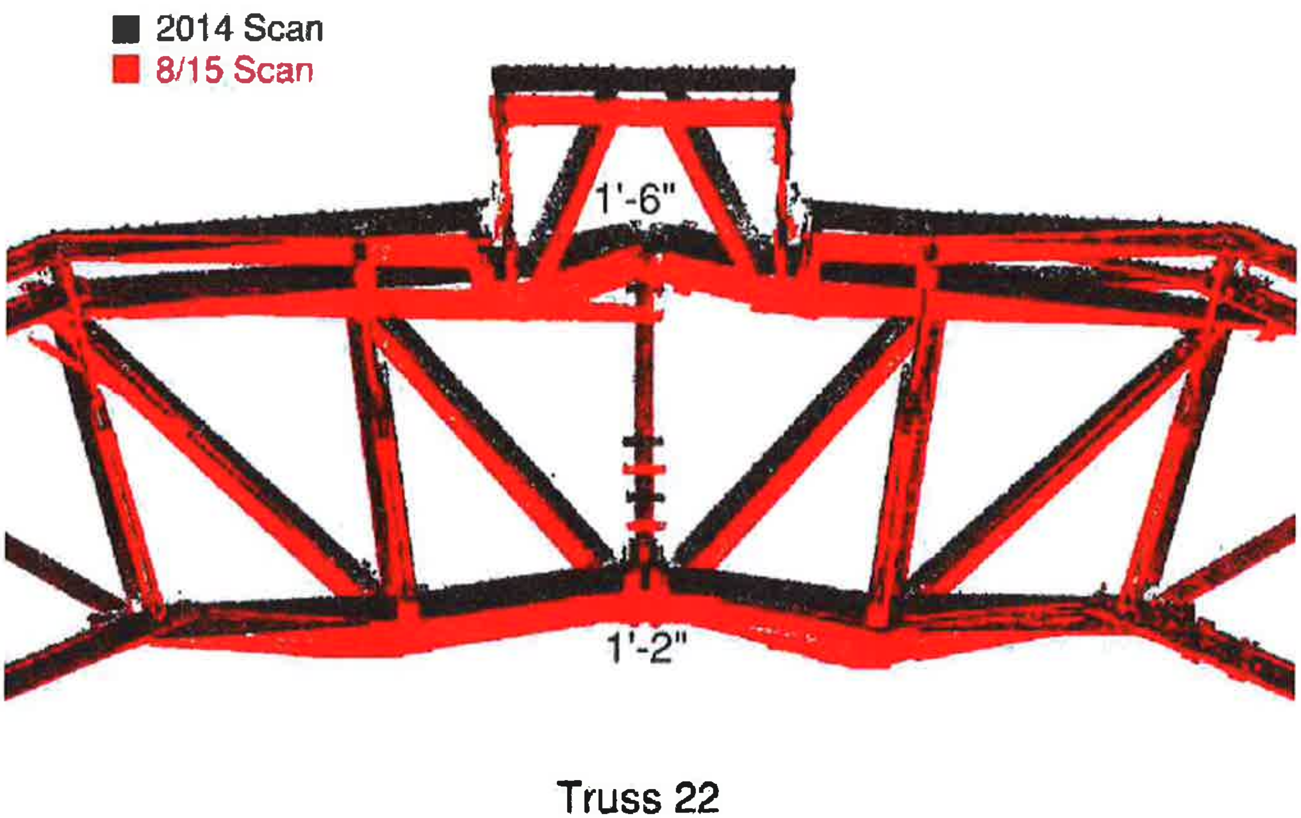


Figure 7. Approximately 18" of additional deflection observed between 2014 and 2015 point cloud surveying scan at top of truss.

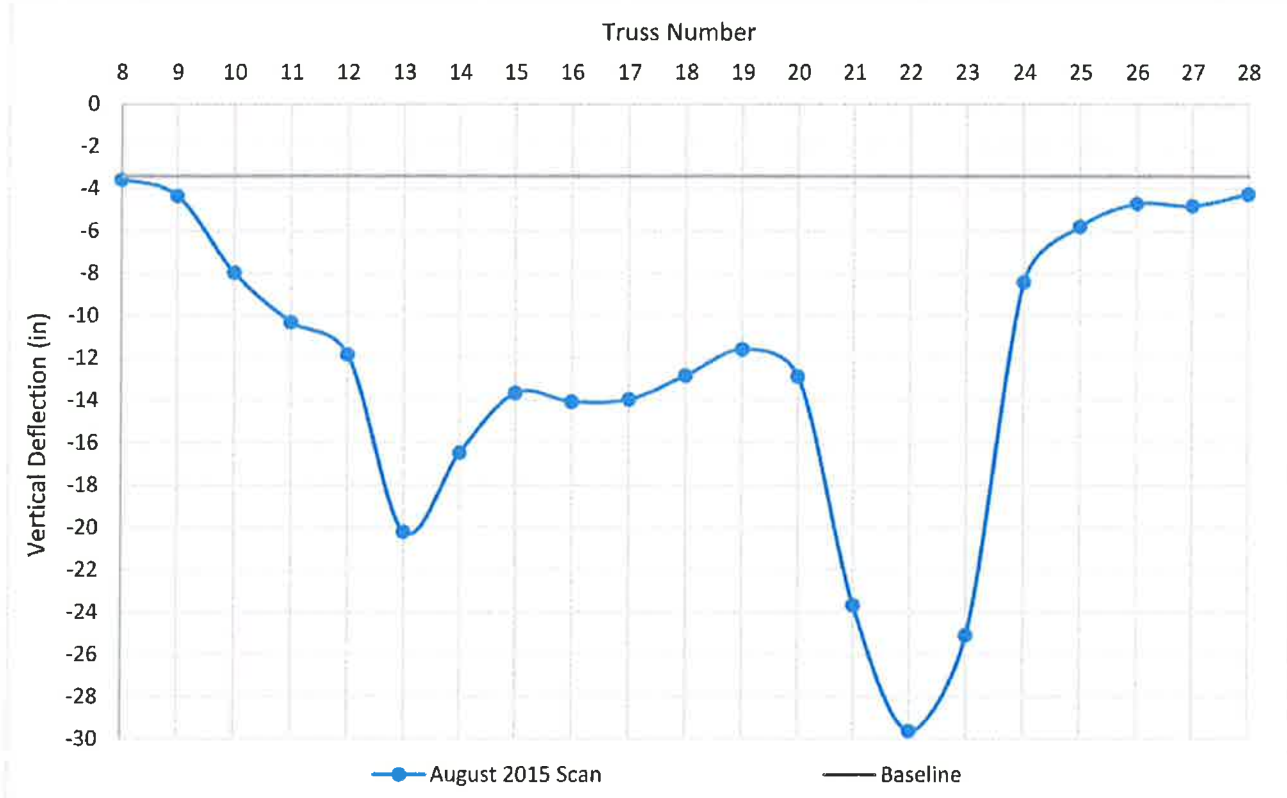


Figure 8. Deflections relative to baseline at Panel Point S.

2 Options for Emergency Repair considered

The selected scheme involving steel "exoskeleton" frames for jacking and temporary support of roof framing is described further in Section 3 of this narrative. The project team also explored several other options which were evaluated based on several factors including safety of workers during installation, construction sequence and schedule, engineering feasibility, cost, and effects to historic fabric.

For reference, the following is a list of alternatives considered:

- Jacking and shoring from traditional scaffolding: this scheme involved the installation of traditional scaffolding that would be capable of resisting additional loads due to jacking and shoring.
- Jacking and shoring from access tower: shoring and jacking from an access tower that extended to most of the severely damage zone.
- Wave Method: incrementally jacking from a smaller access tower starting at one end of the emergency repair zone and moving down (and possibly back) along the hangar deck.
- Exterior shoring: this scheme involved the installation of an exterior cable suspension system attached to the hangar roof. The cables would be supported by towers on the outside of the hangar and anchored to the ground. This type of temporary shoring system was used at the Tustin Hangars in Southern California.

In addition to selecting a method of installation, the project team also selected a target criteria for roof deflections. The number of exoskeletons and the number of jacks required depends on the amount of deflection to be reversed during the Emergency Repair process. However, full restoration back to the previous undamaged roof geometry may prove to be physically infeasible due to the complexity, risk, and timing involved in these operations due to existing field conditions. KPFF established the target deflection criteria shown in Table 1 and Figure 9 based on "Good", "Better", and "Best" scenarios.

Figure 9 was generated to illustrate the roof deflections (in blue) relative to a baseline that represents the average roof deflection at the trusses in the hangar that do not exhibit severe damage. The figure was used to compare the different deflection criteria options.

The project team selected the "Best-A" target criteria. Given the necessity of field adjustments due to the uncertain and changing existing conditions of the trusses and attachments, the project team may need to relax the acceptance criteria at specific locations. The end result could be a lower final outcome at some locations despite planning for "Best". Choosing the "Best" target reduces the risk of ending up with final deflections below even the "Good" scenario. Achieving this highest objective endeavors to restore the trusses closer to their original design geometry. This reduces the risk of residual stresses and deflections in the truss members and resulting complications for the future seismic retrofit design of the hangar wood structure. Choosing a lesser criteria would have also introduced the risk of significant added cost for the future rehabilitation of Hangar 3. Targeting a lesser deflection target could lock in a less desirable pre-deflected shape, which may complicate installation of strengthening members or prompt another phase of jacking and shoring at a later time.

Table 1. Deflection criteria options considered.

	Good	Better	Best-A	Best-B
Truss and Roof Framing Maximum Deflection Relative to Average "Undamaged" Truss Elevation	± 8"	± 4"	± 1"	± 1"
Truss and Roof Framing Deflection Relative to Adjacent Trusses	± 4"	± 3"	± 2"	± 2"
Roof Monitor Deflection between Adjacent Trusses	± 4"	± 3"	± 2"	± 2"
Exoskeleton Locations	Trusses 11.5–23.5	Trusses 9.5–24.5	Trusses 9.5–25.5	Trusses 8.5–26.5
Number of Exoskeletons	13	16	17	19
Number of Exoskeleton Jacks	104	128	136	152
Number of Bays Where Jacking from the Shoring Tower is Required	0	0	3	1

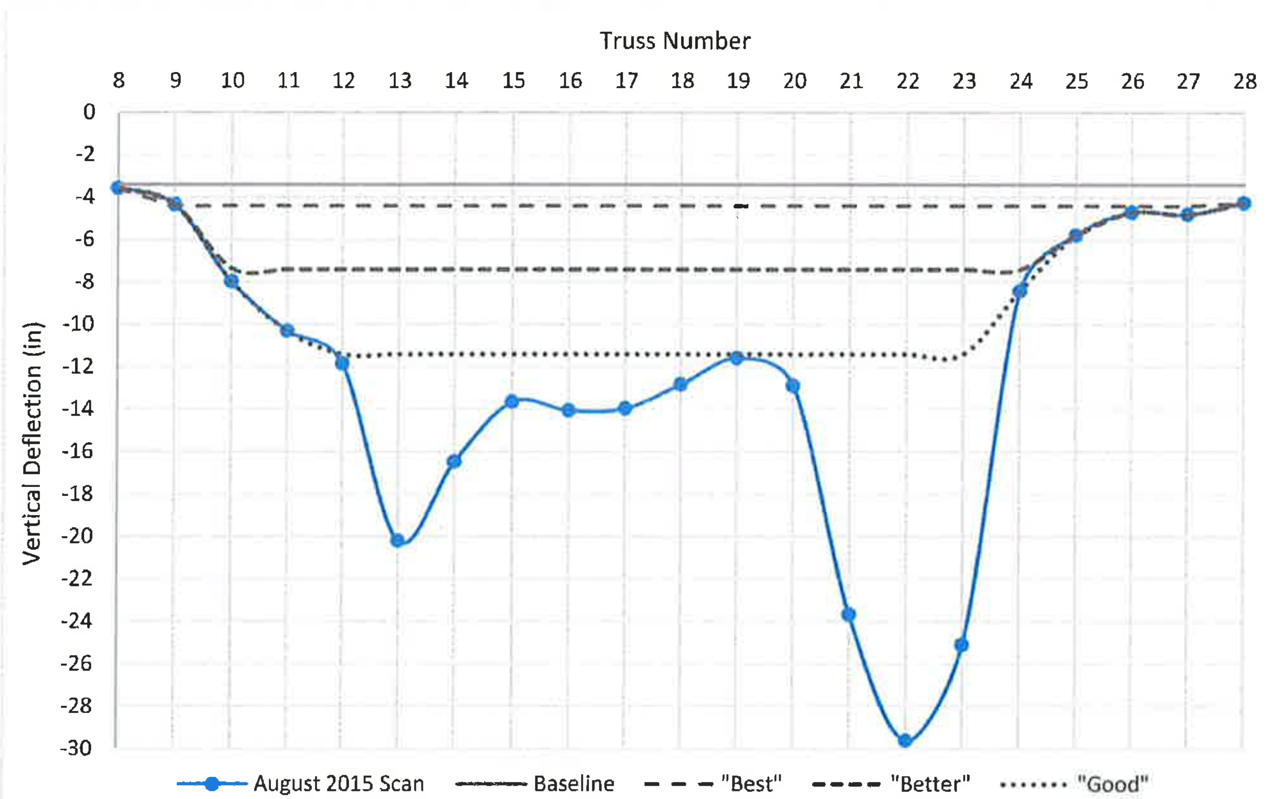


Figure 9. Hangar 3 Panel Point 18 Deflection with Deflection Criteria Options

Two options were studied by the design and construction team for the "Best" criteria. The difference between the two options is the sequence of construction and amount of Exoskeletons and jacks required. The first scenario (Best-A) utilizes both the access shoring tower and the Exoskeletons for jacking. Sequentially, the jacking at the trusses with the Exoskeletons are performed first, and then the shoring tower is moved to the ends of the severe damage zone to access the final 3 trusses (see Figure 10). In this scenario, an additional four Exoskeletons are required relative to the "Good" criteria.

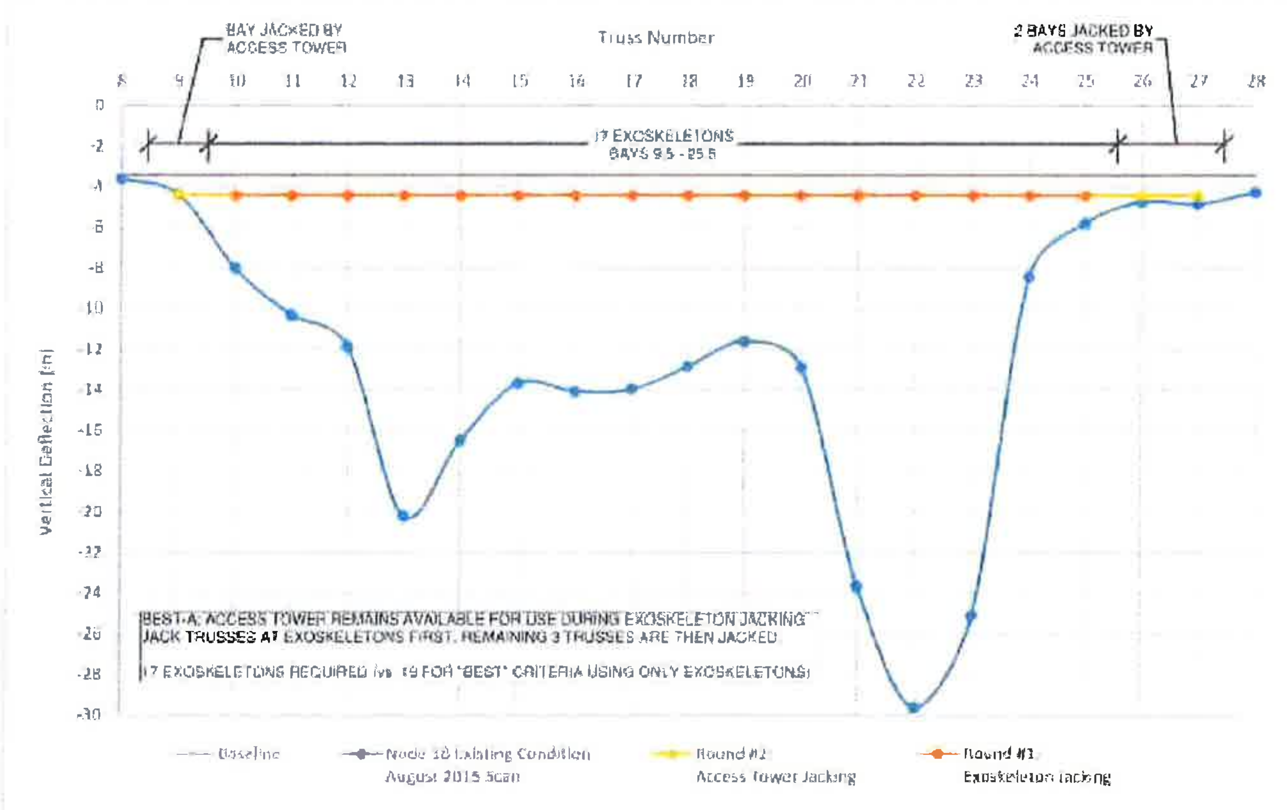


Figure 10. "Best-A" Target Deflection Criteria

The second scenario (Best-B) includes using only Exoskeletons for jacking trusses of significant deflection. In this scenario, two more Exoskeletons are required in addition to those required for the "Best-A" criteria, one between trusses 8 and 9, and one between trusses 25 and 26. Truss 27, which exhibits minor deflections, may need to be jacked from the access shoring tower to achieve the deflection criteria.

3 Emergency Repair Strategy for Selected Option

Step 1: Install temporary shoring braces to prevent full collapse of hangar (Figure 11 and Figure 12). The upper portion of the hangar remains unsupported and local damage progression and partial collapse of the upper zone is still possible.

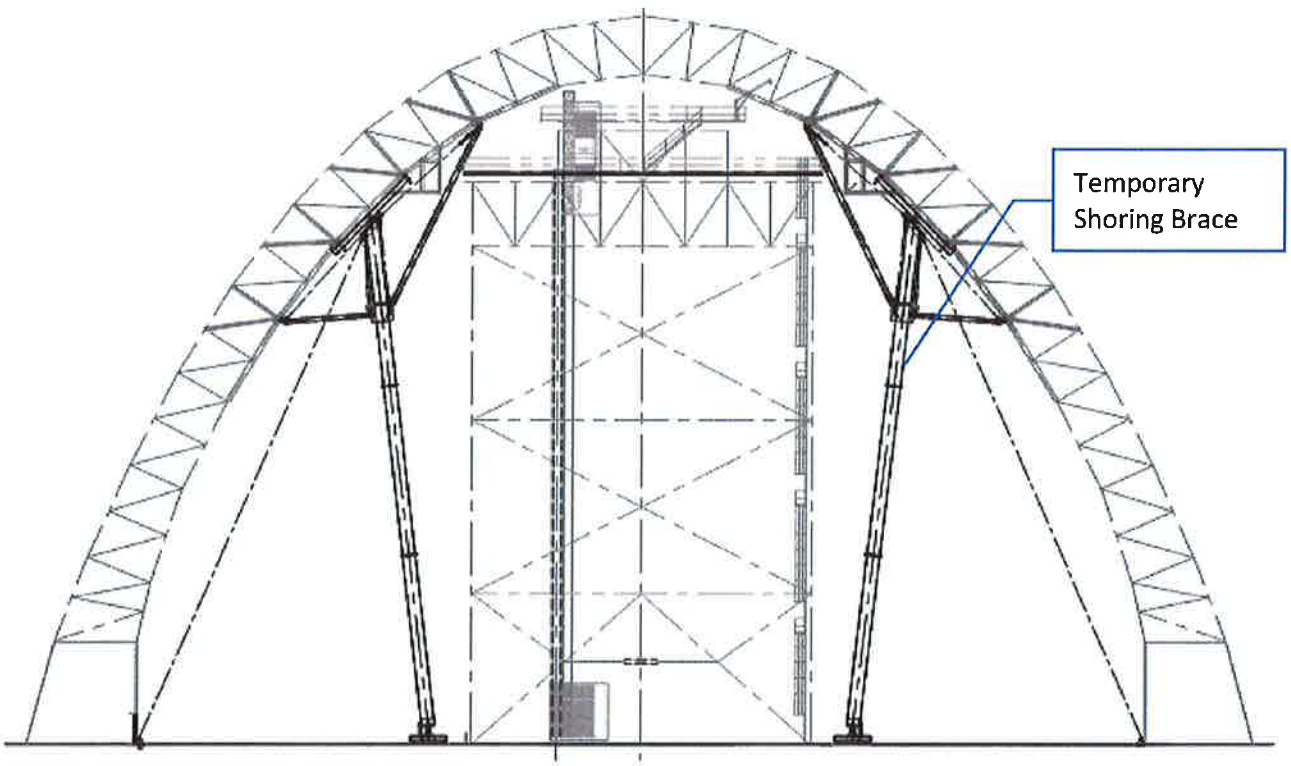


Figure 11. Temporary Shoring + Shoring Tower

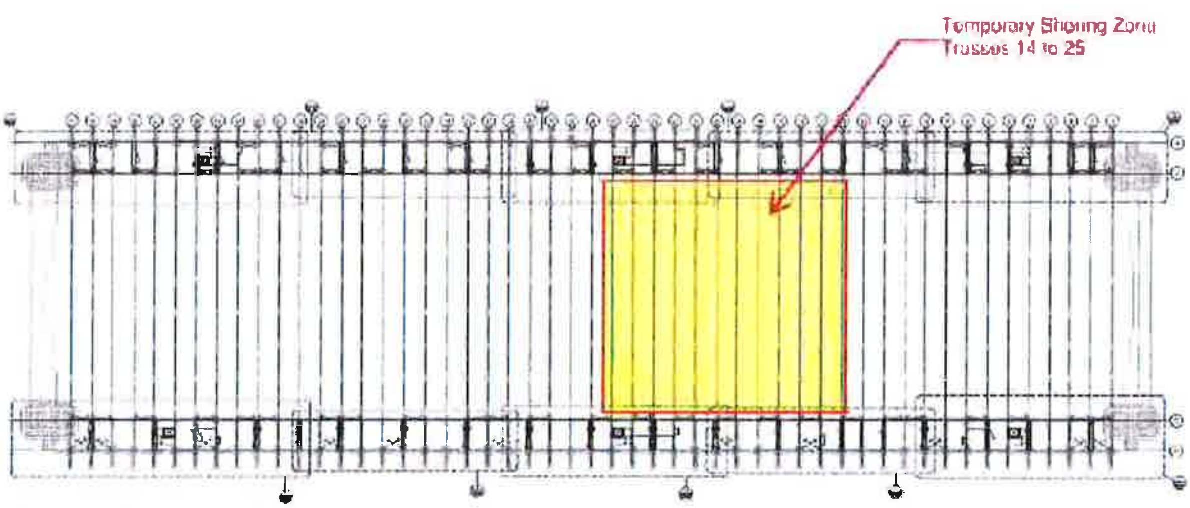


Figure 12. Zone of temporary shoring.

Step 2: Fabricate shoring tower and move shoring tower into the hangar to begin temporary support of the upper zone, and installation of support "Exoskeletons". A computer rendering by Power Engineering Construction of these pieces is shown in Figure 13.

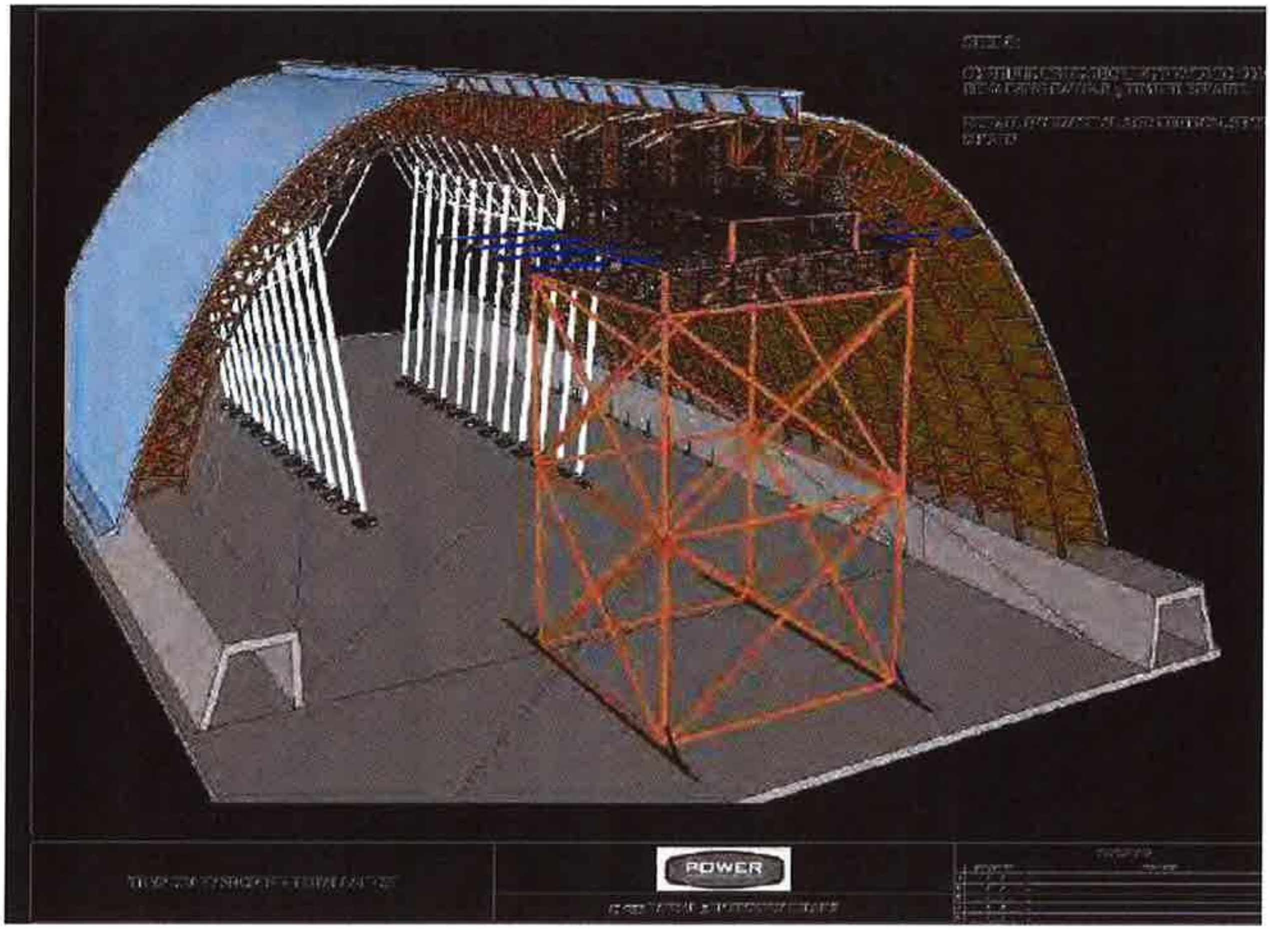


Figure 13. Isometric of Temporary Shoring & Shoring Tower

Step 3: Install steel truss support frames called "Exoskeletons" (Figure 14) in between existing wood trusses that have exhibited significant damage and deflection. The Exoskeletons are shop welded in segments which are field bolted together. The Exoskeletons are to be installed in the space between the existing trusses and will be attached to the existing trusses with bolts and steel plates (Figure 15).

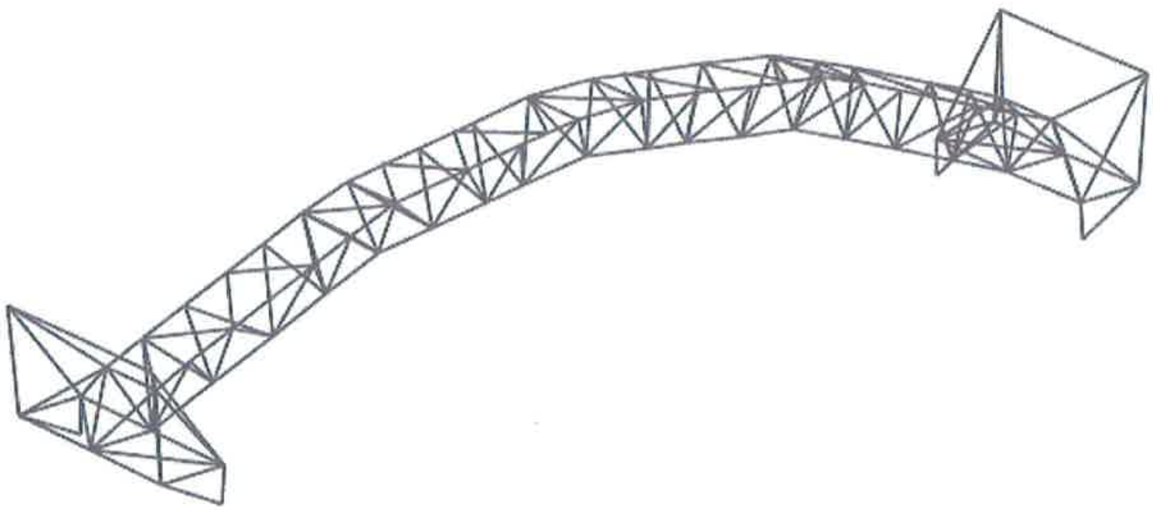


Figure 14. 3D Isometric of Steel Exoskeleton

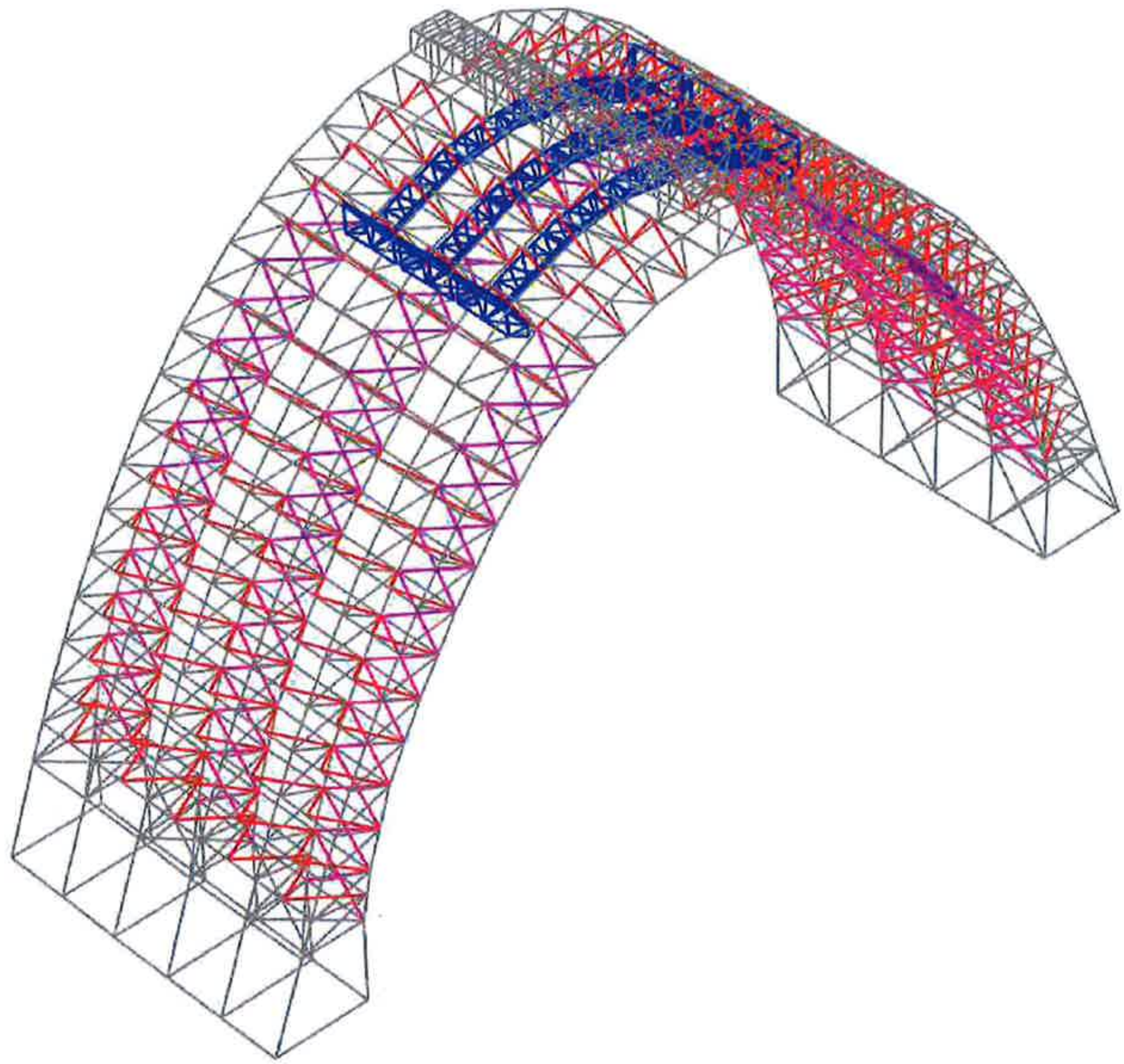


Figure 15. 3D Isometric of Exoskeletons Installed between Existing Wood Trusses

Step 4: Jack existing gravity framing from Exoskeletons to take gravity load off of the existing trusses and restore roof profile as close as possible to its undamaged state.

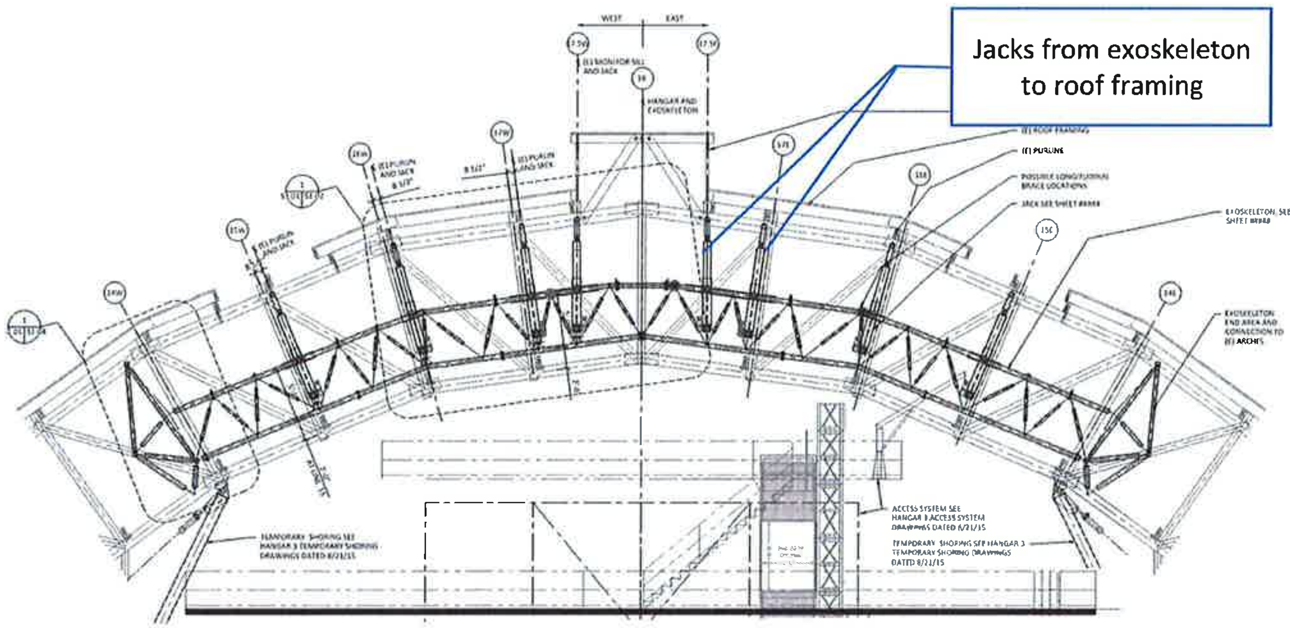


Figure 16. Exoskeleton Elevation (Preliminary Drawings)

Step 5: Perform emergency repairs to existing trusses and restore trusses as close as possible to original undamaged position from shoring tower.

Step 6: Remove jacks and Exoskeletons from the hangar. Remove connection steel plates except those portions that were used also to repair damaged existing timbers.

Step 7: Remove temporary shoring. Holes in existing concrete will be patched with a high-strength, non-shrink, non-metallic grout to match the color and texture of surrounding concrete as much as possible.

3.1 Portions that are permanent vs portions that are temporary

Temporary items include attachments and temporary wood repairs installed as part of the means and methods of construction. These items will be removed when practical in the construction sequence. Examples include the large temporary shoring tubes, tie rod bracing, jacks, access tower, and the steel Exoskeletons.

Permanent minor connection strengthening consists of stitch bolts at wood arch truss connection ends, and clamps at splits along the lengths of members (Figure 17). These have been installed in areas which require strengthening as part of the jacking sequence and emergency truss repair installation.

Figure 17. Example of new minor connection strengthening stitch bolts adjacent to existing angle clamp.

Permanent major connection strengthening consists of galvanized and painted cut HSS steel tubes, steel plates, and bolts (Figure 18). These items are currently being fabricated and coated and are pending installation. This type of repair will be installed in locations of severe damage within truss panel point connections, where the connection is damaged, but the timber is in fair condition outside the connection zone.

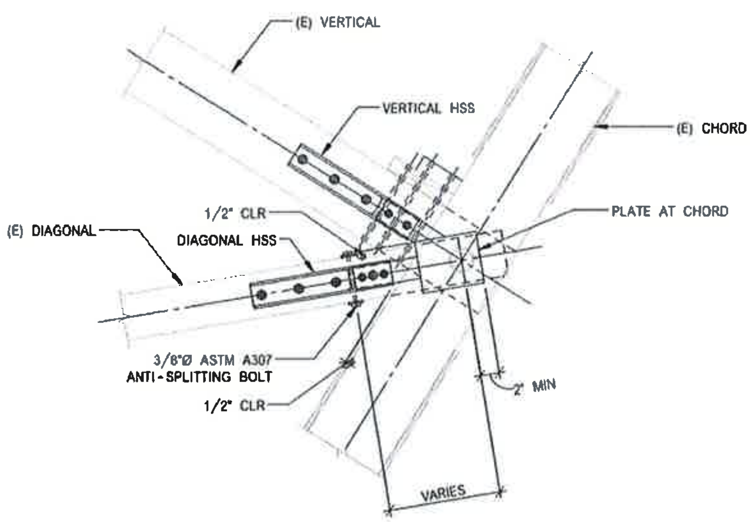


Figure 18. Permanent major connection strengthening.

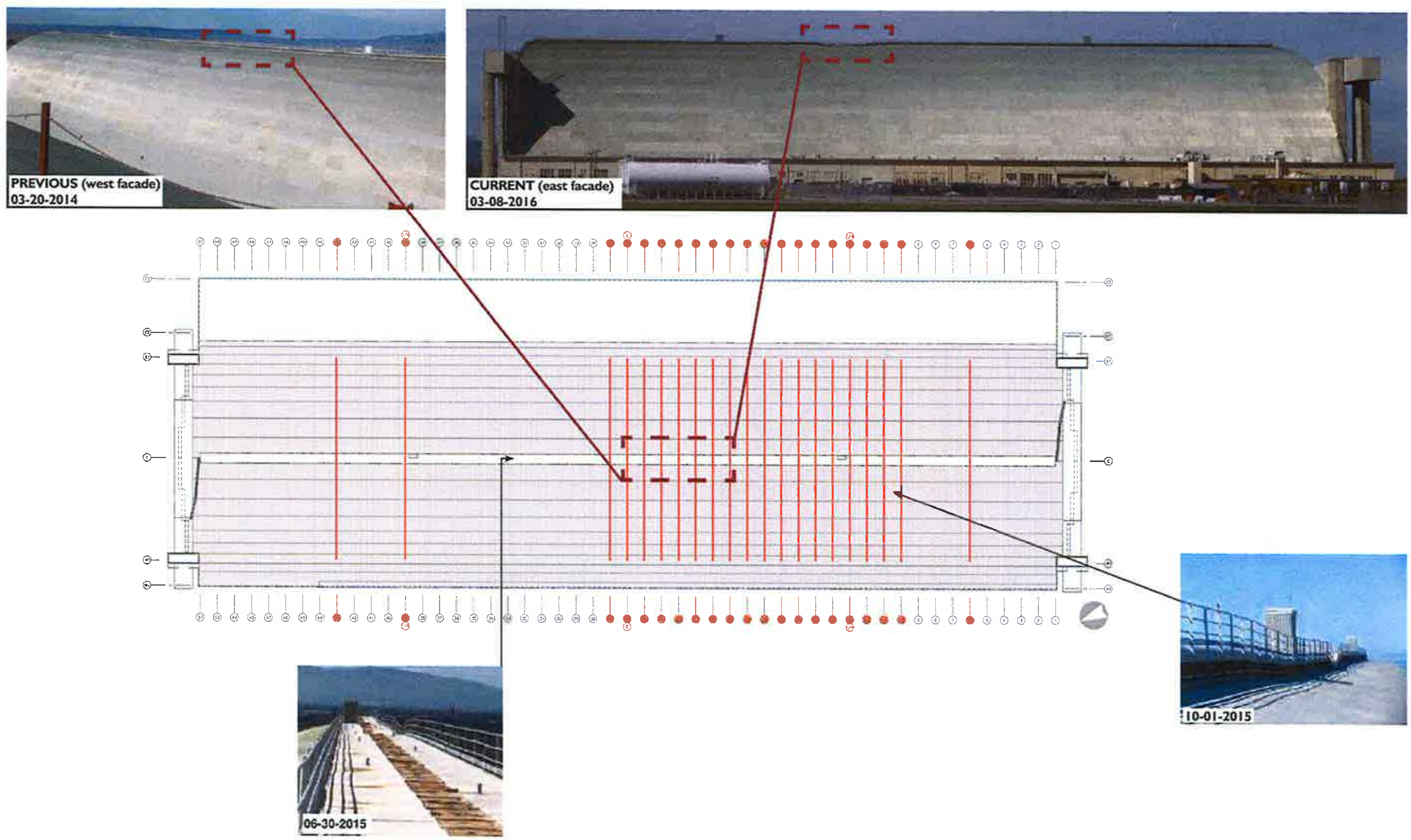
kpff

3.2 Stamping of new wood members

New wood members installed in the emergency repairs project will be labeled in order to distinguish them from existing materials within the hangar. These members are stamped with a custom fabricated branding iron pyrography stamp with the text "2015/2016" using 3/4-inch tall lettering with the Arial typeface.

3.3 Why selected option is best for preservation

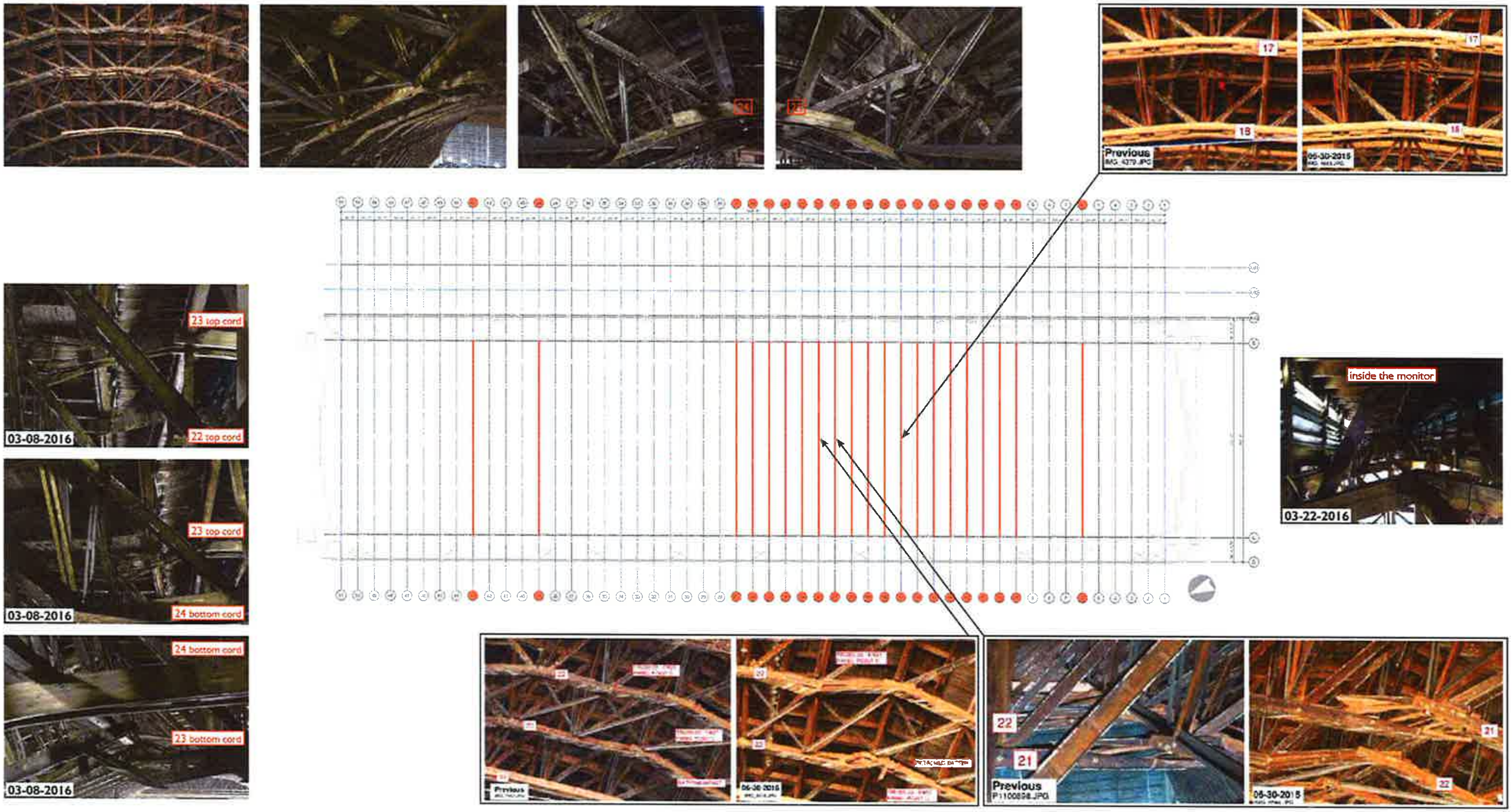
The selected emergency repair strategy is best for preservation because we are achieving the best restoration of the hangar ridge line deflection with the intent of replacing damaged truss members in-kind with timber similar to the original truss configuration. The project team decided to pursue the "Best" deflection criteria which targets restoration of the truss and roof framing nearest to the average "undamaged" truss elevation. In the event that "Best" is unachievable due to field conditions, a lesser criteria can still be achieved which is acceptable from a structural and architectural standpoint.



KEY
— Location of trusses for emergency repairs

EXTERIOR CONDITIONS

Roof plan from Hangar 3 Existing Roof Plan by Page & Turnbull on 03-30-2015, with photographs by Erin Ouborg, Steven Avelio, and Mark Caret on behalf of Page & Turnbull, as well as photographs from Engineer's Field Report by KPFF on 06-30-2015

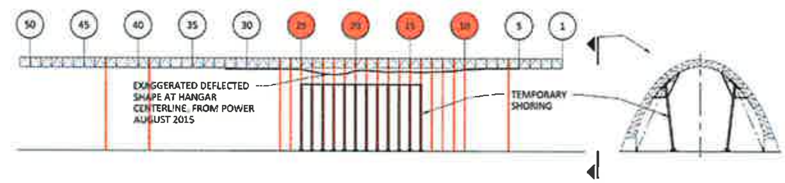


KEY
— Location of trusses for emergency repairs

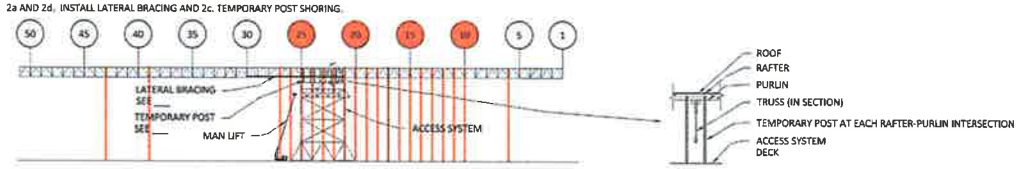
INTERIOR CONDITIONS

Foundation Plan from Moffett Federal Airfield - Hangar 3 Emergency Truss Repairs Set, Permit Revision 1 by KPFF on 03-17-2016, with photographs by Erin Ouborg and Mark Citret on behalf of Page & Turnbull, as well as photographs from Engineer's Field Report by KPFF on 06-30-2015

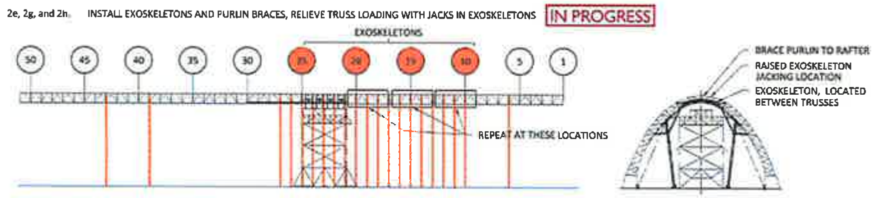
1. INSTALL TEMPORARY SHORING



2a AND 2d, INSTALL LATERAL BRACING AND 2c, TEMPORARY POST SHORING



2e, 2g, and 2h, INSTALL EXOSKELETONS AND PURLIN BRACES, RELIEVE TRUSS LOADING WITH JACKS IN EXOSKELETONS IN PROGRESS

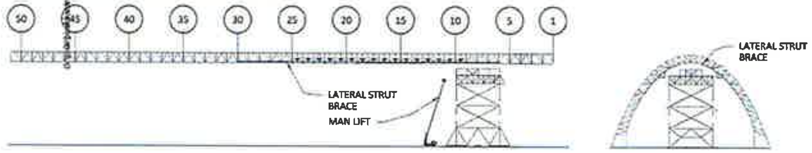


REPAIR PROCEDURES

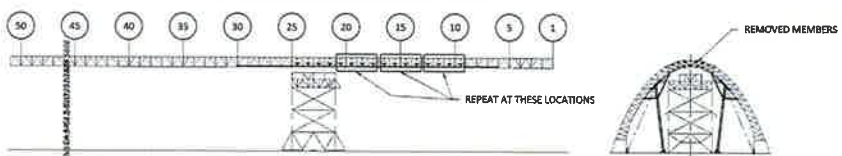
Elevations from Hangar 3 Shoring and Access System drawings by Power and Liftech on 10-06-2015, with photographs by Erin Ouborg and Mark Citret on behalf of Page & Turnbull

KEY
— Location of trusses for emergency repairs

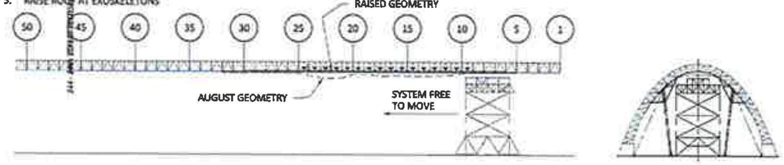
3. INSTALL LATERAL BRACING BEYOND EXOSKELETON LOCATIONS



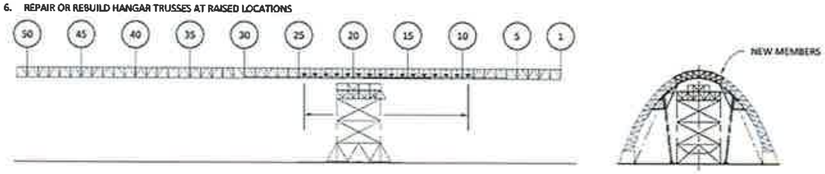
4. REMOVE HANGAR TRUSS DAMAGE AT EXOSKELETONS, AND DISCONNECT HANGAR TRUSSES FROM THE ROOF.



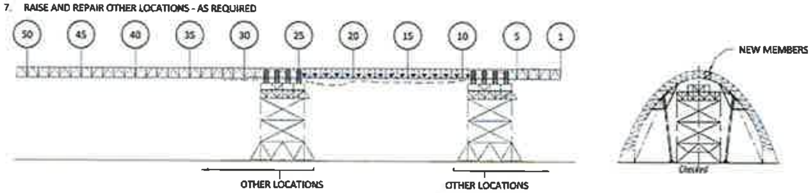
5. RAISE ROOF AT EXOSKELETONS



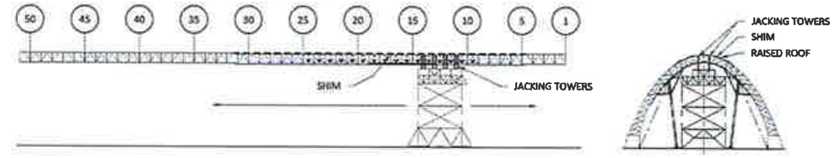
6. REPAIR OR REBUILD HANGAR TRUSSES AT RAISED LOCATIONS



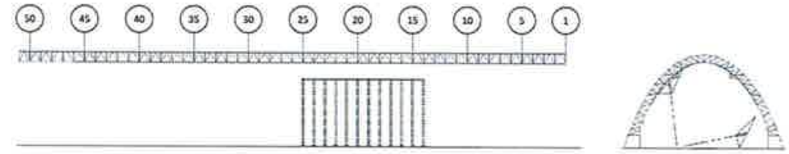
7. RAISE AND REPAIR OTHER LOCATIONS - AS REQUIRED

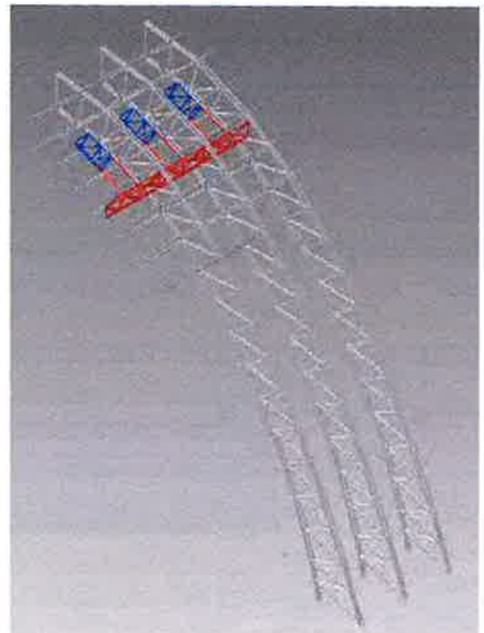


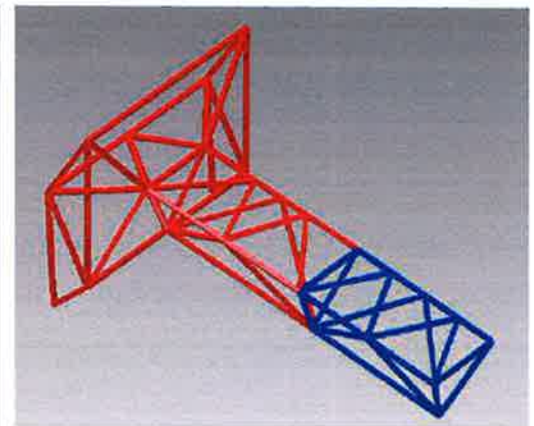
8. ADDITIONAL ROOF ELEVATION ADJUSTMENT BY SHIMMING - AS REQUIRED



9. REMOVE LATERAL BRACING AND TEMPORARY SHORING







3D Model of Exoskeleton (colors are for visual aid only)

Checked

Checked

Checked

REPAIR PROCEDURES (REMAINING STEPS)

Elevations from Hangar 3 Shoring and Access System drawings by Power and Liftech on 10-06-2015, with 3D Model of Exoskeleton by Liftech on 10-06-2015

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A.3 KPFF, "Hangar 3 Damage Progression & Repairs Timeline" (July 6, 2017)

CONSTRUCTION

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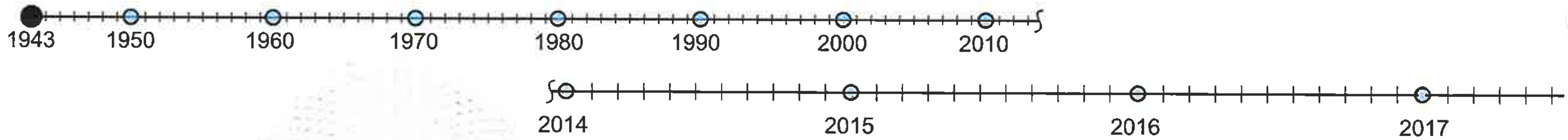
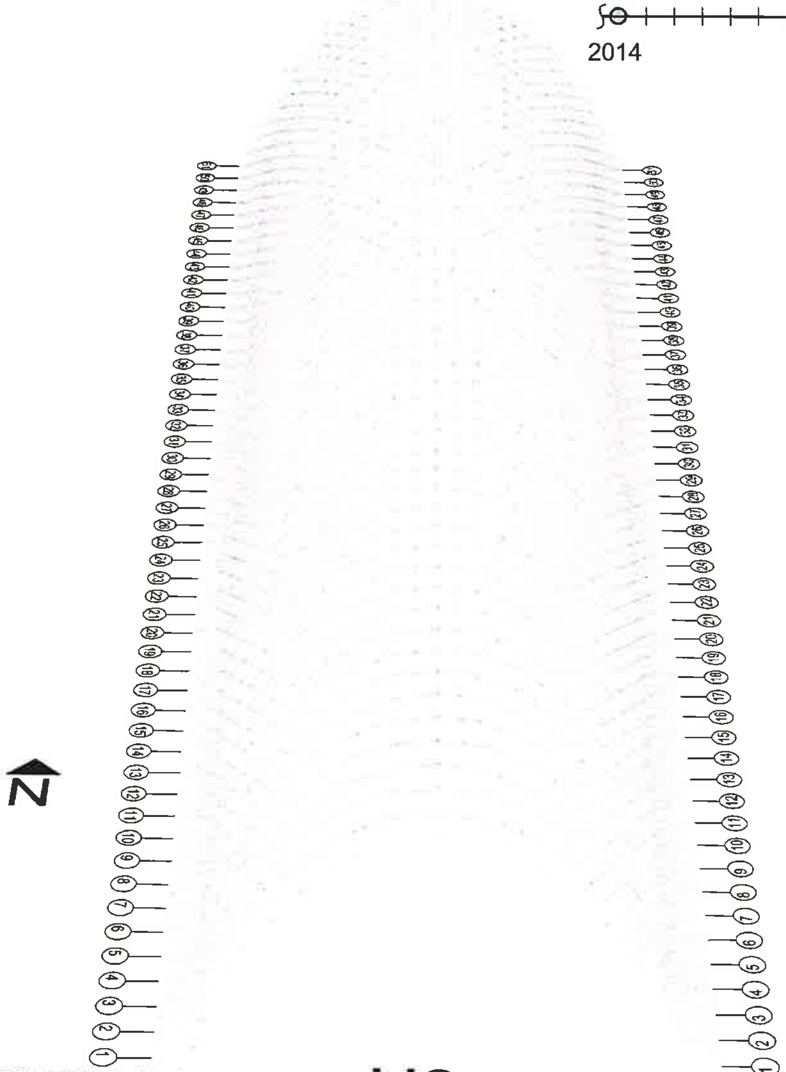
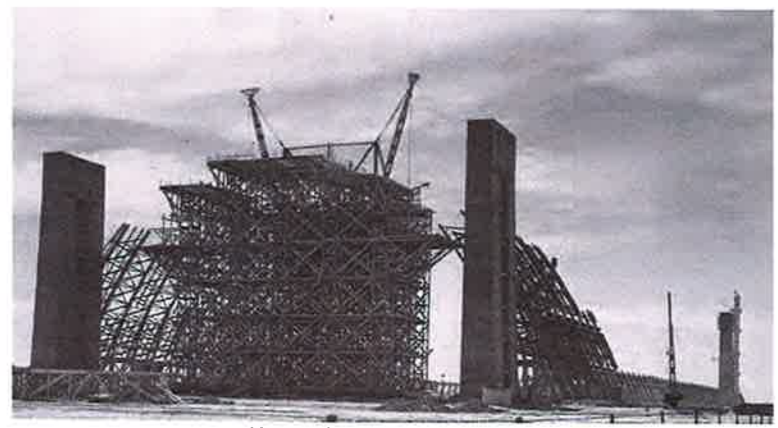
DRAFT - 7/6/2017
SED



- Built in 1943 to house the Navy LTA (Lighter than Air) program, which used blimps to provide a network for coastal submarine patrol
- Built with wood to save steel for the war effort
- Intended to be semi-permanent wartime structures



H3



Hangar 3 under construction
-US Navy Historic Photos

Pre-assembled truss panels awaiting erection
-US Navy Historic Photos

Hangars 2&3 under construction
-US Navy Historic Photos

EAST SHED ANNEX

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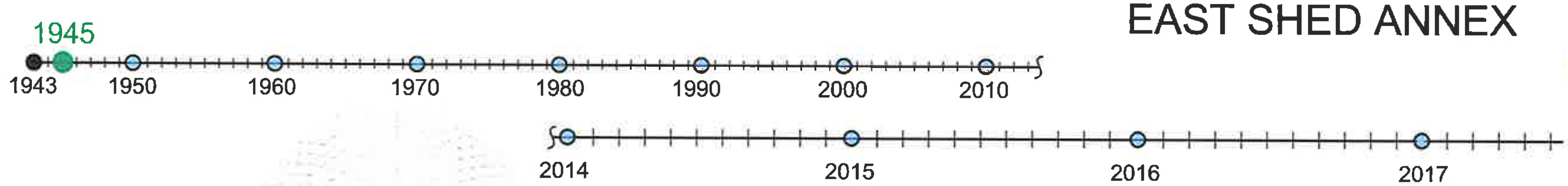
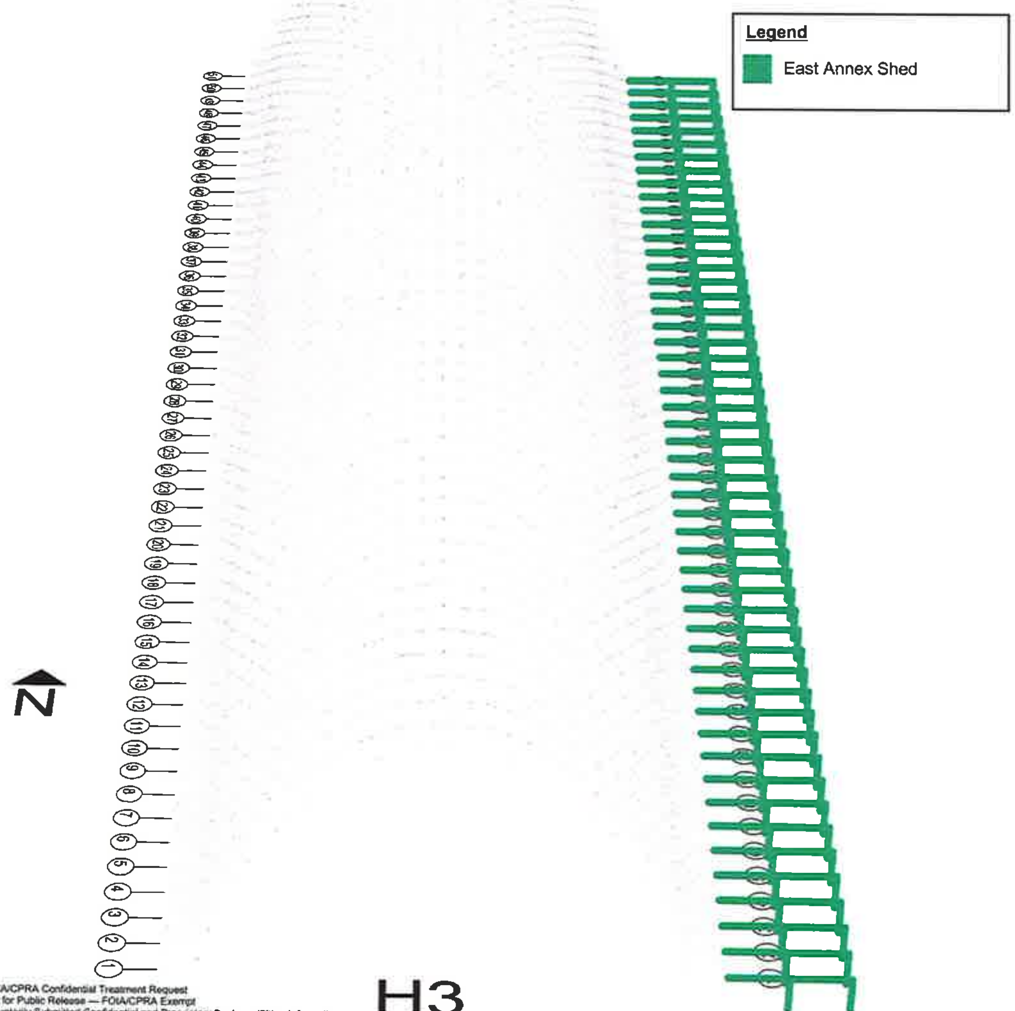
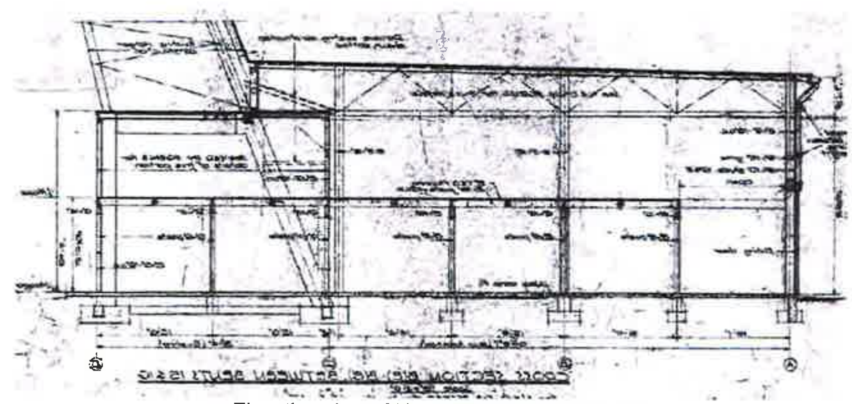




- After WW2, the east shed was expanded to support Heavier than Air (H.T.A.) operations

Interior view of Hangar 3 East Shed Annex



Elevation view of Hangar 3 East Shed Annex

BATTEN STRENGTHENING

San Francisco

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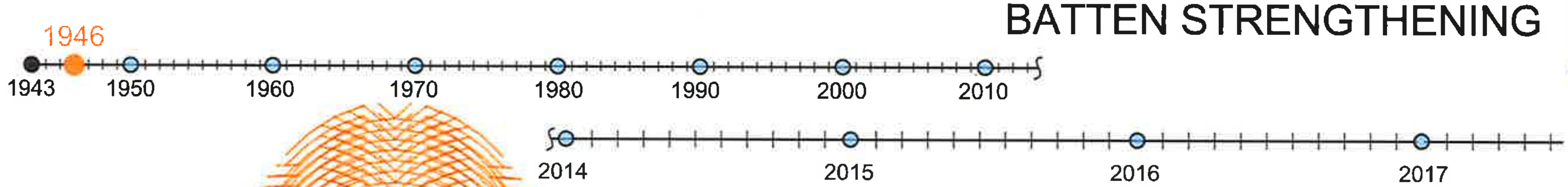
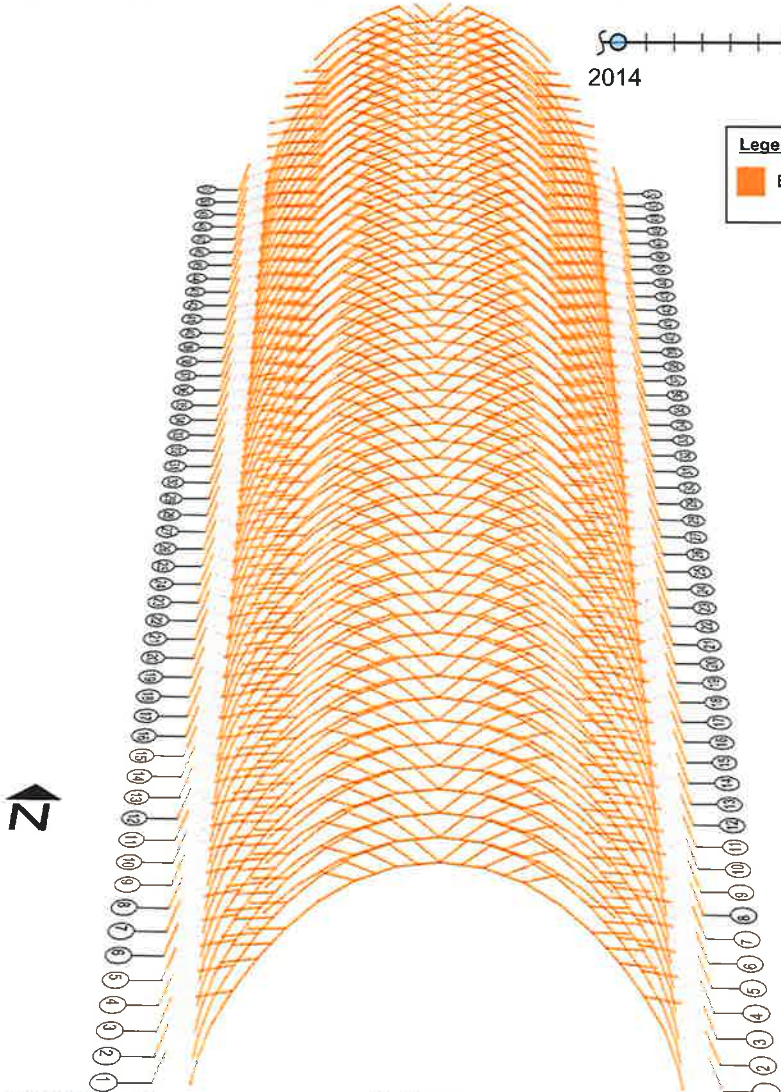
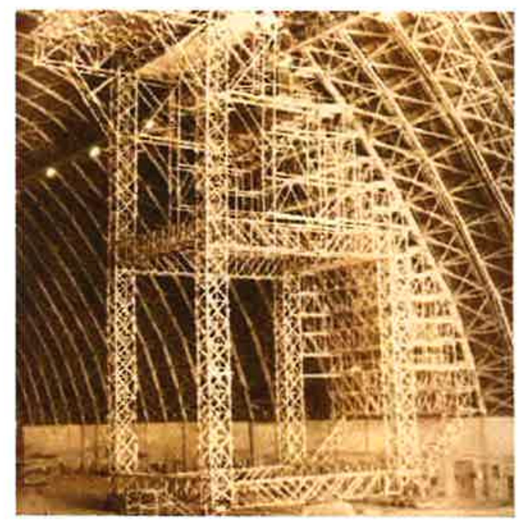




- Battens were added to bottom chords, and some top chords and diagonals to increase stability and help prevent buckling
- Upgrade was intended to increase the longevity of the temporary structure
- Battens added to **2244** members per hangar
- Batten wood was treated with a mixture of borax, white lead, and linseed oil paint.
- "These battens, with a few additional bolts and blocking at the chord splices, are the principle measures taken in strengthening and making permanent these wood buildings." "*Strengthening of LTA Hangars, Naval Air Station, Moffett Field, California*", J.S. Marsh, 1946

Typical chord member with battens



Rolling scaffold used to install battens
- Seabees Historic Photos

KNEE BRACES

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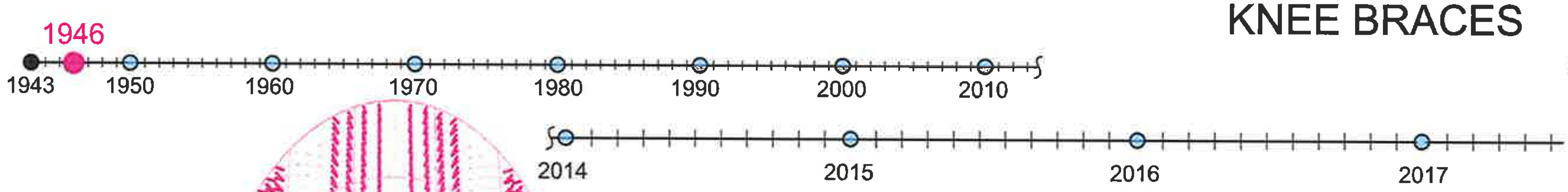

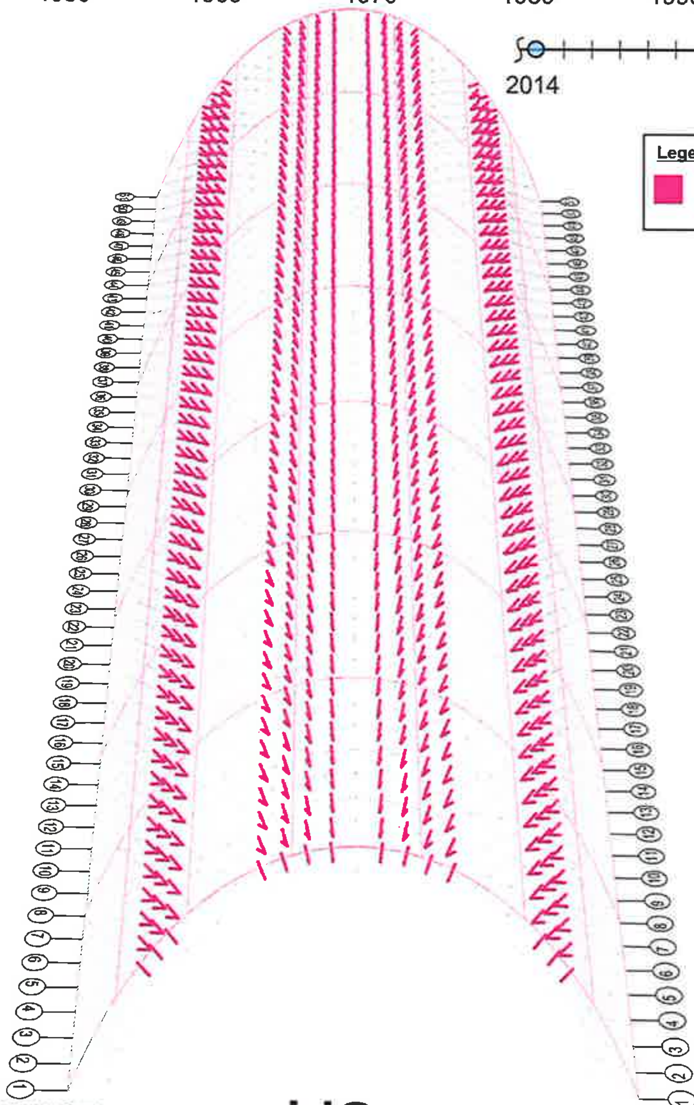

Legend
Knee Braces at Vertical Web Members

- Knee-braces were added to reduce the unbraced length of certain vertical web members
- These braces were part of the 1946 strengthening measures described by J.S. Marsh.
- Knee braces added to **700** vertical web members

Typical vertical web member with added knee-braces

H3

RE-ROOFING

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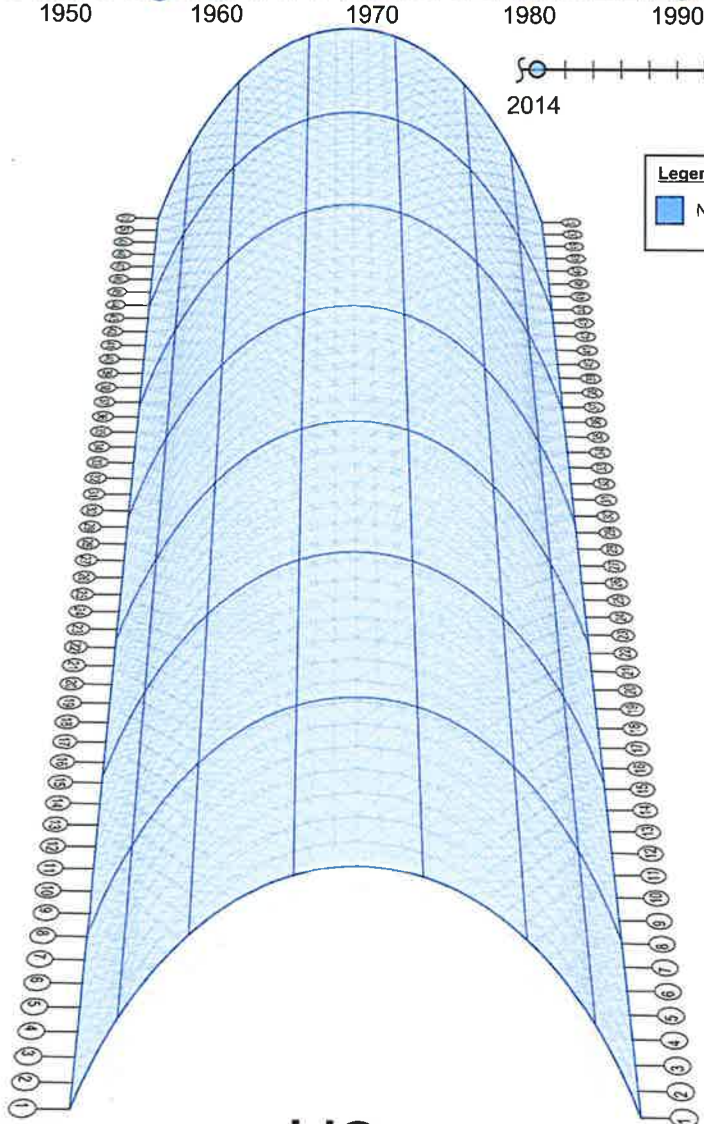


- Original roofing system was roll-roofing over panelized wood sheathing
- Roof was upgraded to corrugated aluminum panels over roofing felt in 1956
- Approximately **466,000** ft² of roofing per hangar

Original roofing system
-Seabees Historic Photos

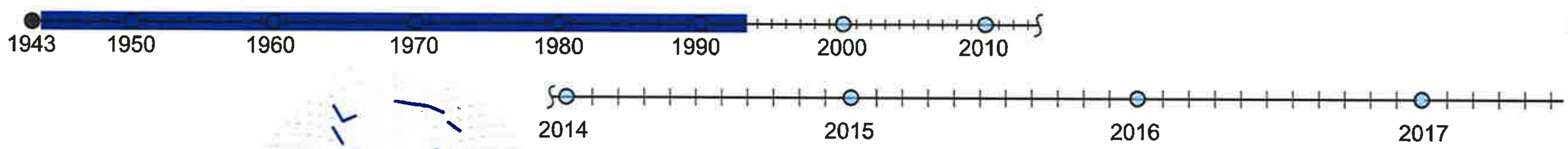
Asphalt shingles documented in 1954
-Seabees Historic Photos

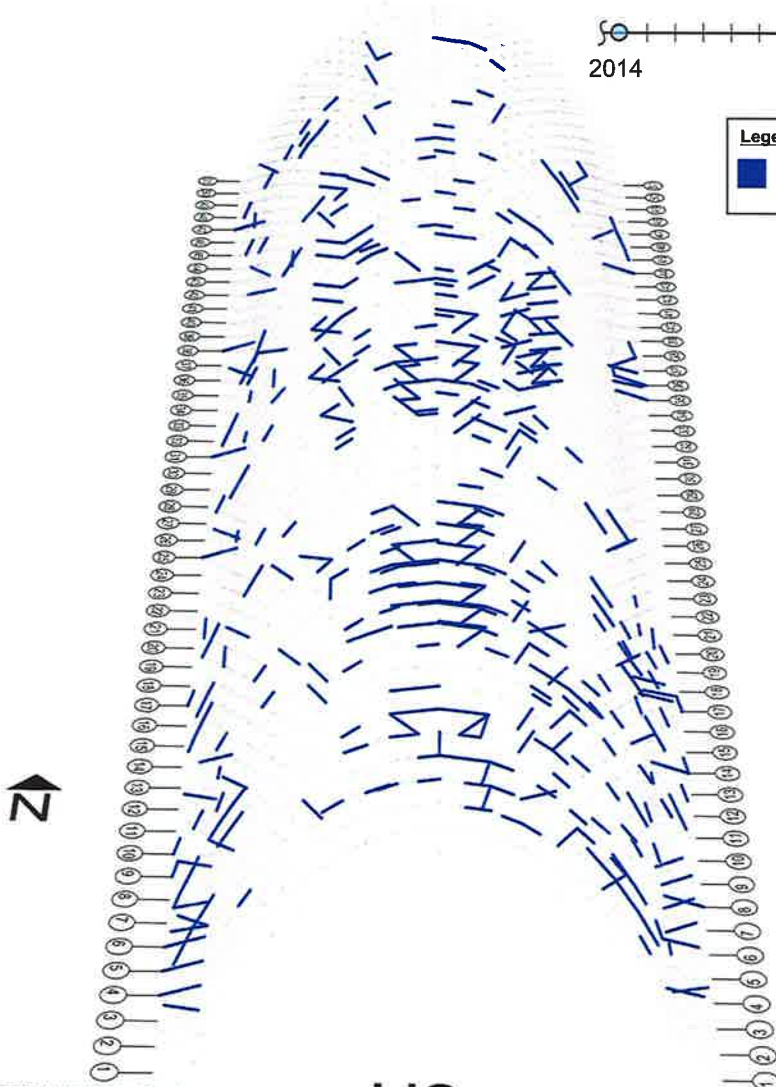
Current aluminum roofing

MAINTENANCE REPAIRS

San Francisco

DRAFT - 7/6/2017
SED





H3

Legend

Documented existing minor repairs

- Standard repairs for Navy maintenance included steel clamps and stitch bolts to fix minor splits "*Maintenance Procedure for Timber Trussed Structures*" Department of Navy Bureau of Yards and Docks, 1944
- Repairs occurred periodically throughout the service life of the hangars
- Navy records indicate that Timber Structures performed an inspection of the hangars in 1954
- The extent of these repairs is not fully documented
- Minor repairs have been documented at **541** members in H3 (many still undocumented)

Minor repairs made during Hangar 3 service life

1981 REPAIRS

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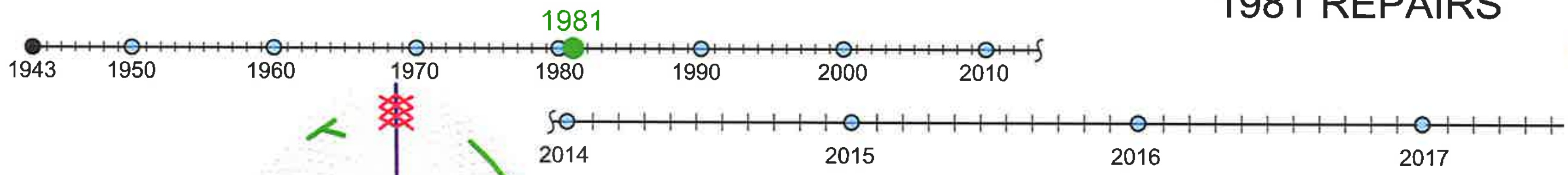
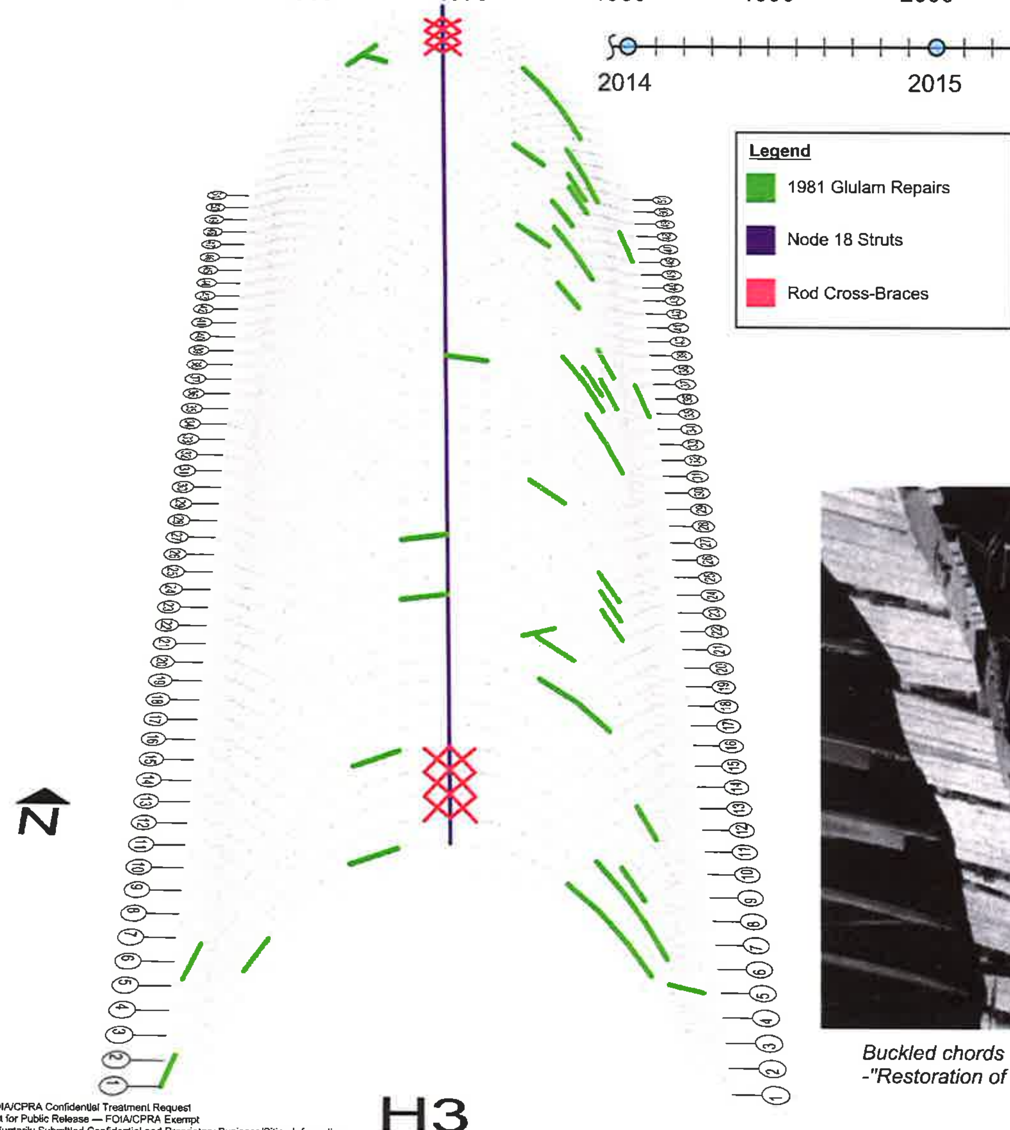
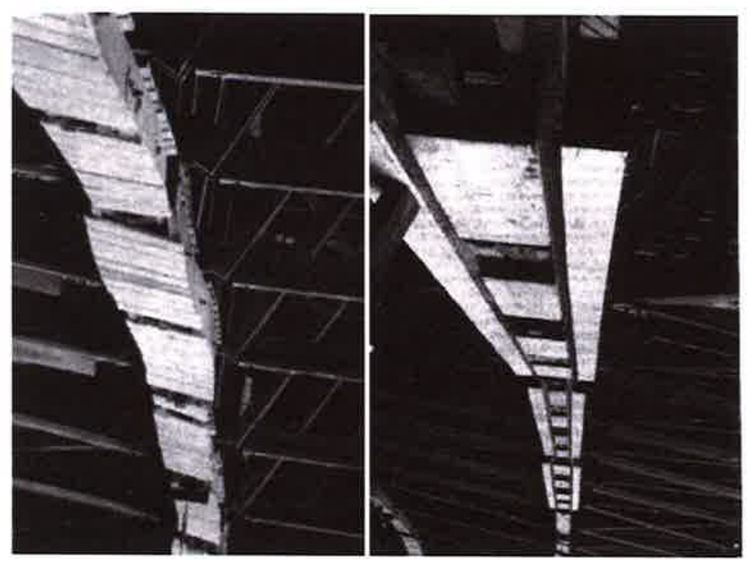
SED





- Major glulam repairs were made in 1981 to correct buckling observed in truss chords
- Glulam strongback members were installed to re-align chords, but load path remained in the original members
- Major repairs made to **49** members
- Struts added at each arch at node 18 to brace top of truss, with rod cross-bracing added at the north and south ends of the hangar
- Minor repairs were also made with clamps and stitch bolts. Many 1x6 purlin ties were replaced with steel rod ties



Buckled chords (left) and glulam strongback repairs (right)
-"Restoration of Navy LTA (Lighter than air) Hangars", Donal Neal, 1986

Node 18 struts

1993 GLULAM REPAIRS

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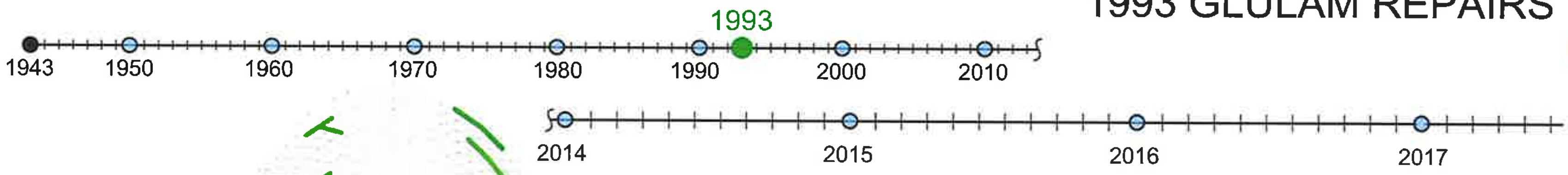

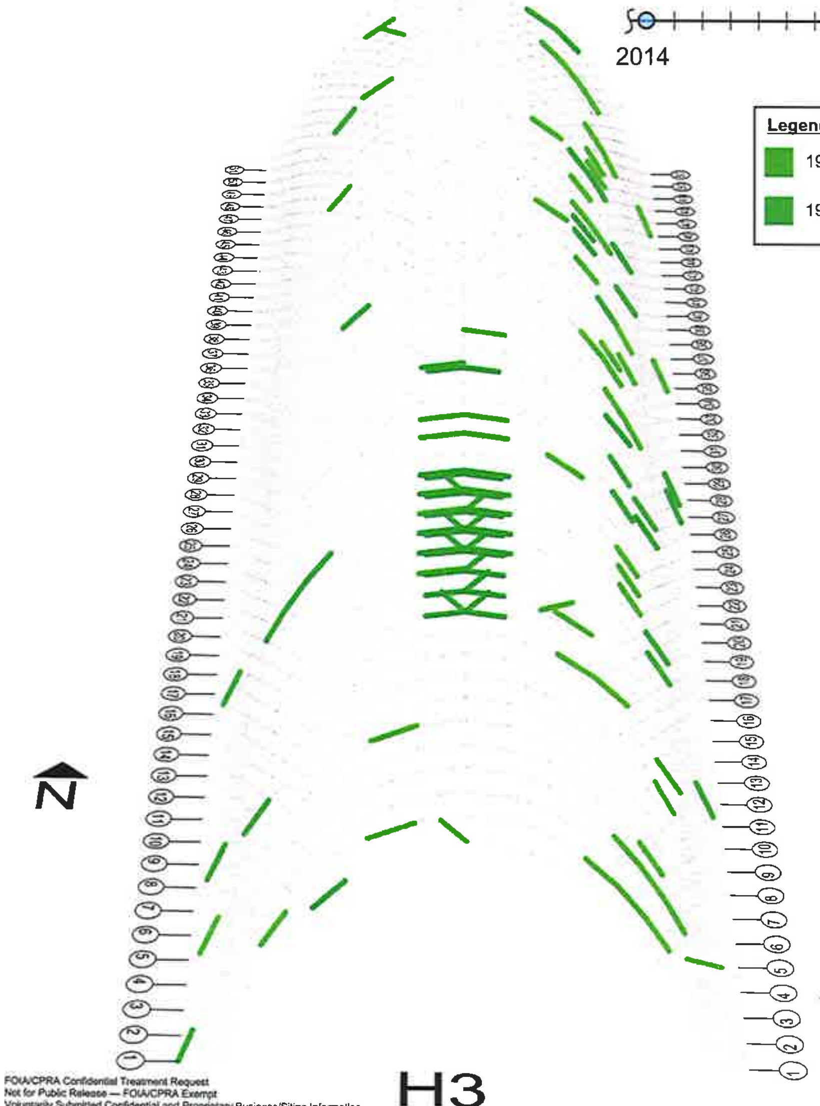

Legend

- 1981 Glulam Repairs
- 1993 Glulam Repairs

- Continued deterioration of Hangar 3 necessitated further glulam repairs in 1993
- Repairs consisted of glulam strongbacks for buckling, and multi-chord glulam sistered members
- Many of these repairs were made in the critical zone where the most severe deflections and damage were later found
- Major repairs made to 75 members
- Sistering repairs also made to roof support purlins and minor clamp repairs were again performed on arch trusses

1993 glulam sister repairs to chord members in critical zone

DUE DILIGENCE INVESTIGATIONS

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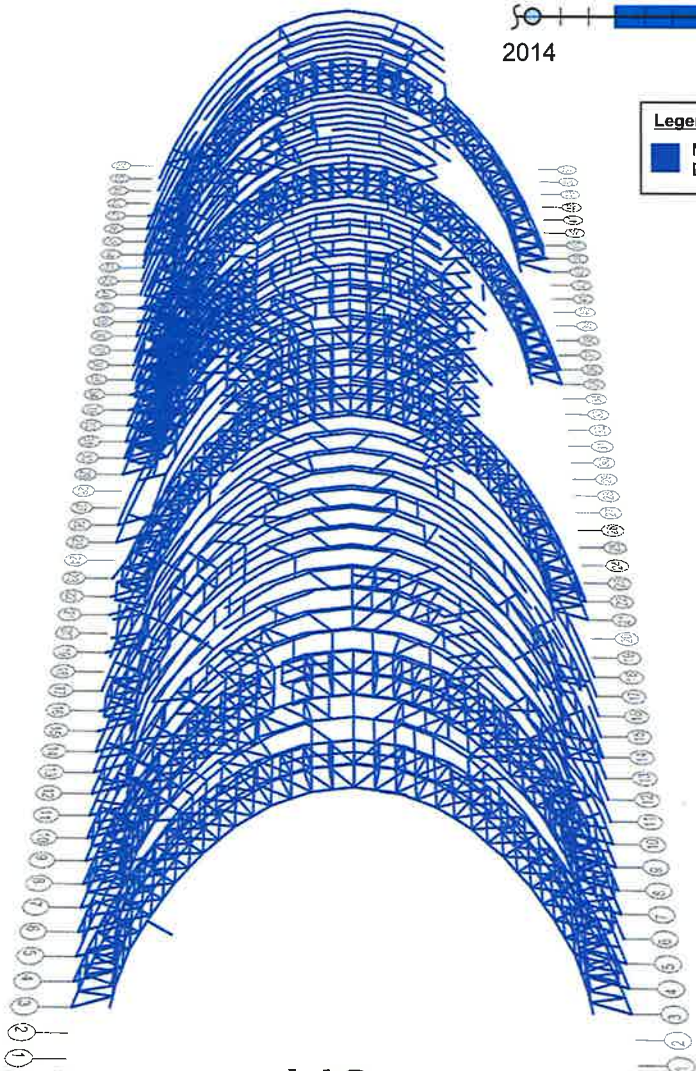
SED

1943 1950 1960 1970 1980 1990 2000 2010

2014 2015 2016 2017



Legend
Members surveyed in Due Diligence Investigations

- Data collected in the Due Diligence Investigations phase of the project included visual observations of many (but not all) of the truss members
- Observations were made regarding wood grading, existing condition, and previous repairs
- Data was logged for **5663** members in H3 through TPAS® (Tablet PC Annotation System) provided by Vertical Access
- H3 contains over **20,000** total members, including **5559** main arch members
- Results summarized in Page & Turnbull Due Diligence Investigations Findings Report (DDIF)

Boom lift used for visual observations

Visual observation of a lower chord member

H3

DDIF REPAIR SCOPE

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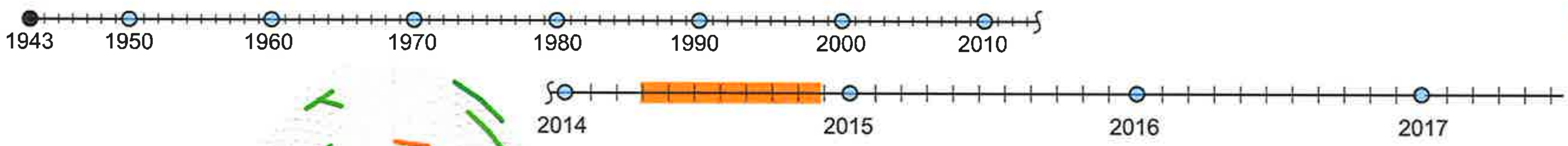
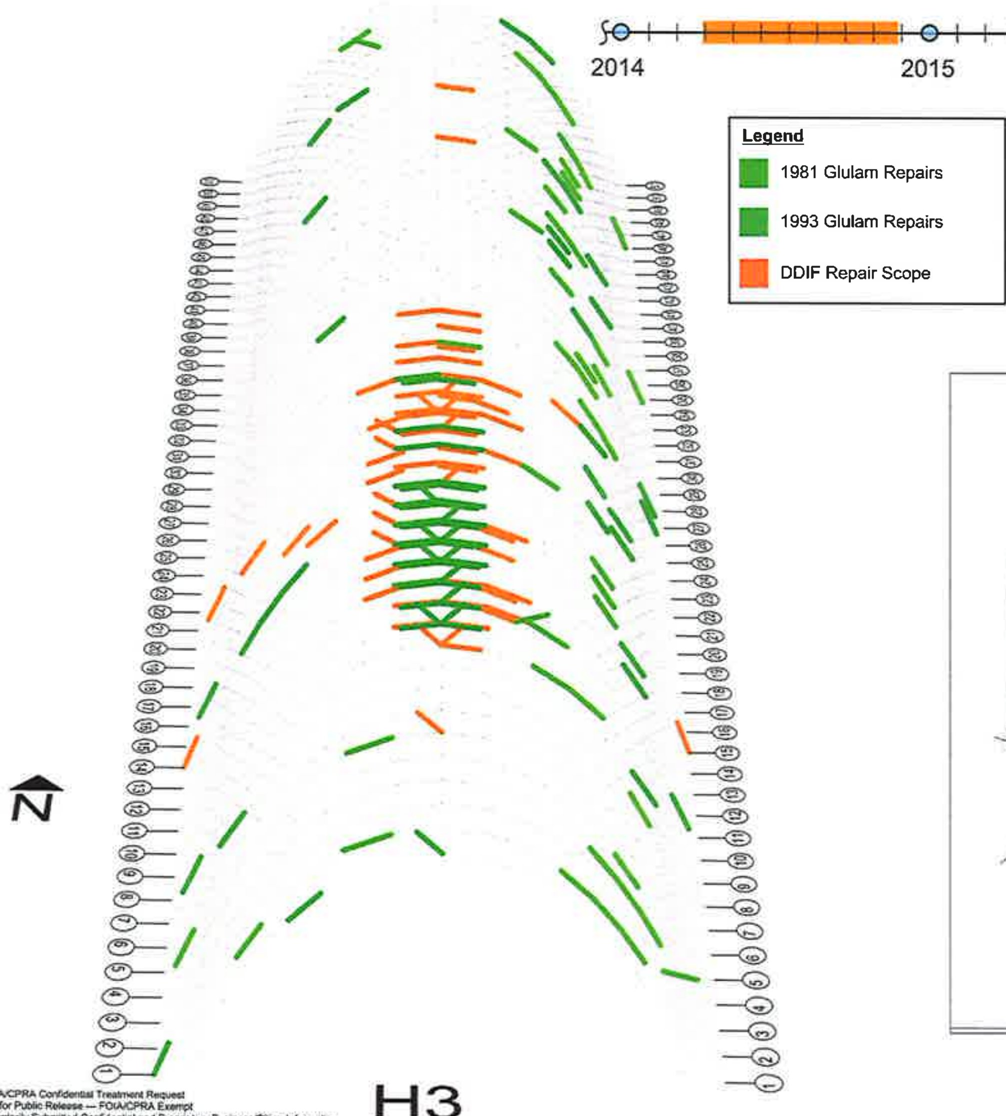
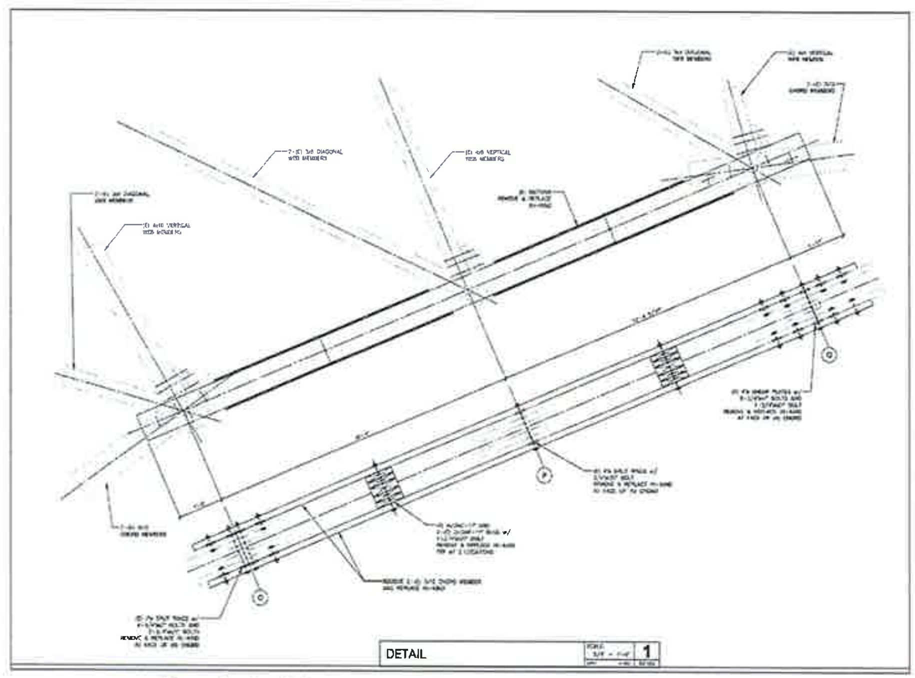




- TPAS® data was reviewed and damaged members were identified for repair
- 68 members were found to be damaged and in need of major repairs



Example detail for removal and replacement of damaged chords found in TPAS®

EMERGENCY REPAIRS

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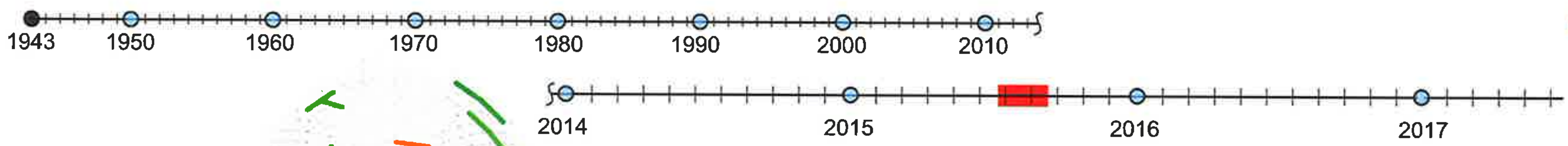
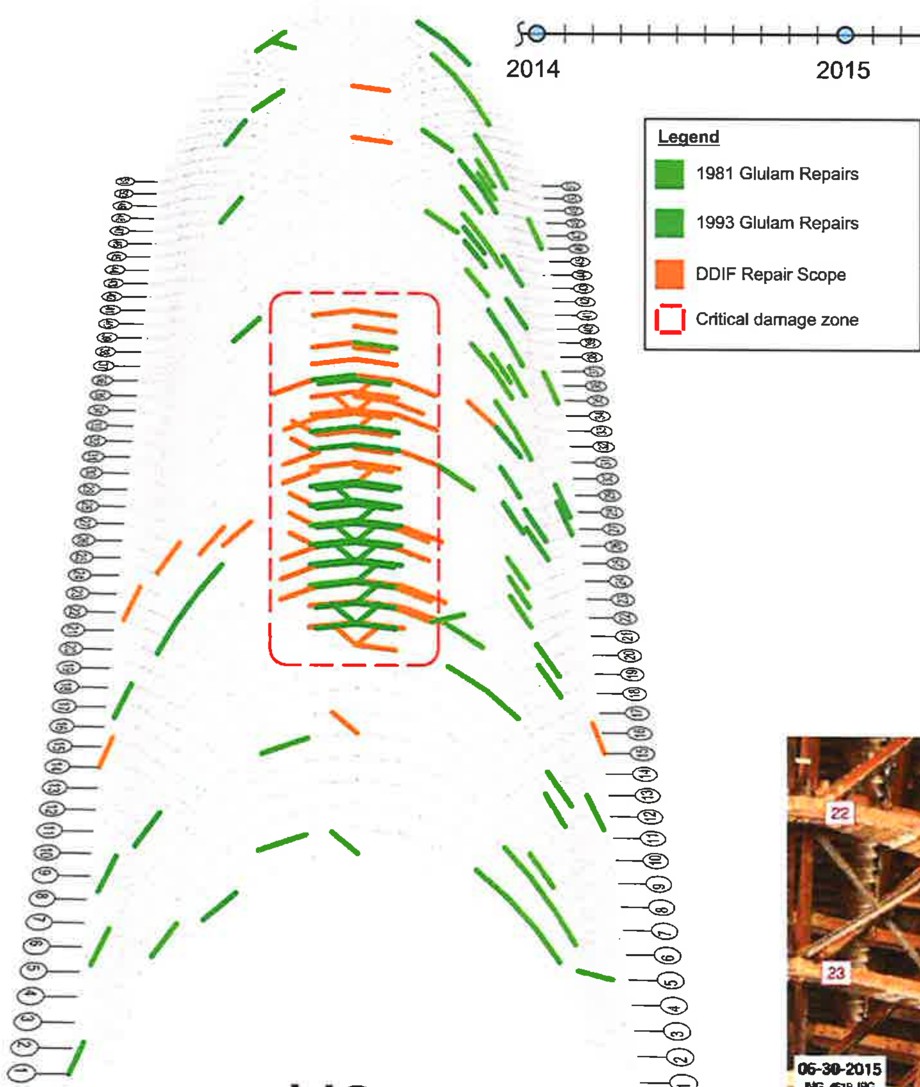
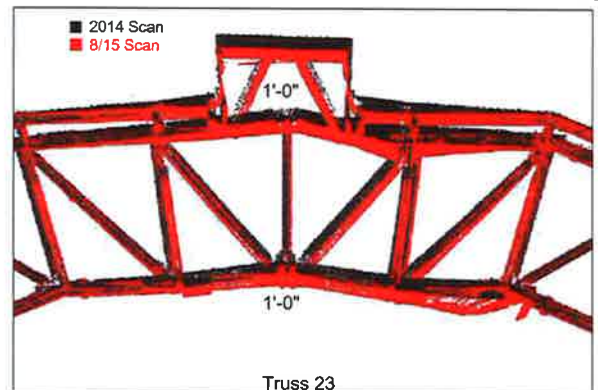


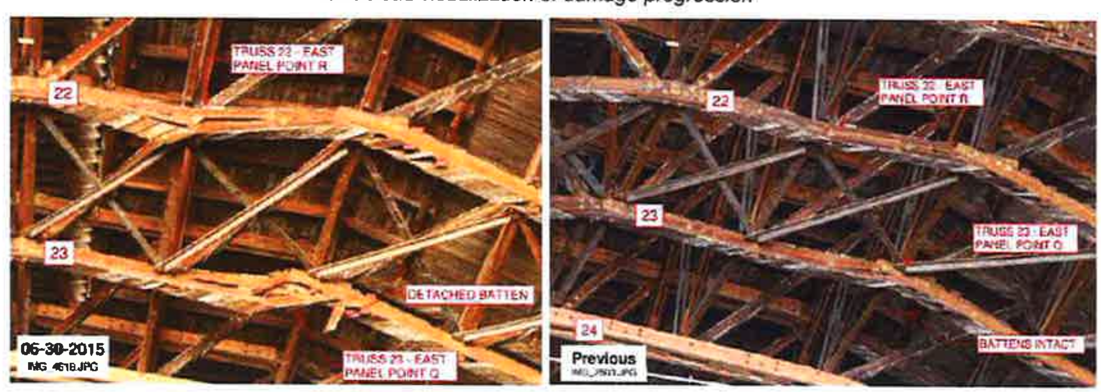


H3

- During a site visit on June 24, 2015 KPFF observed damage progression in arch trusses
- On July 2, 2015 KPFF issued an Emergency Truss Repairs permit drawing set
- KPFF, Power Engineering Construction, Turner, and Page & Turnbull coordinated work to implement shoring and emergency truss repairs
- Permit for emergency repairs was received from NASA on August 19, 2015.



Point cloud visualization of damage progression



Photos of damage progression

TEMPORARY SHORING

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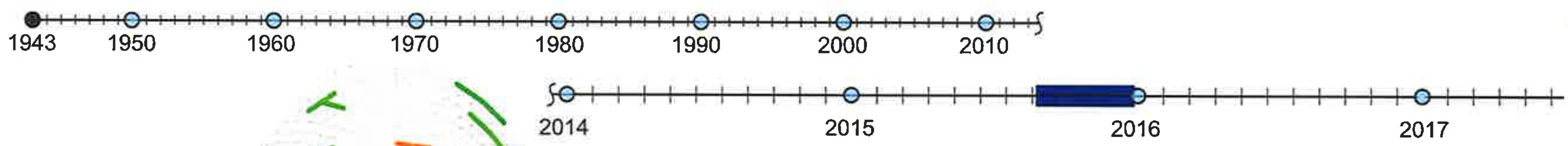
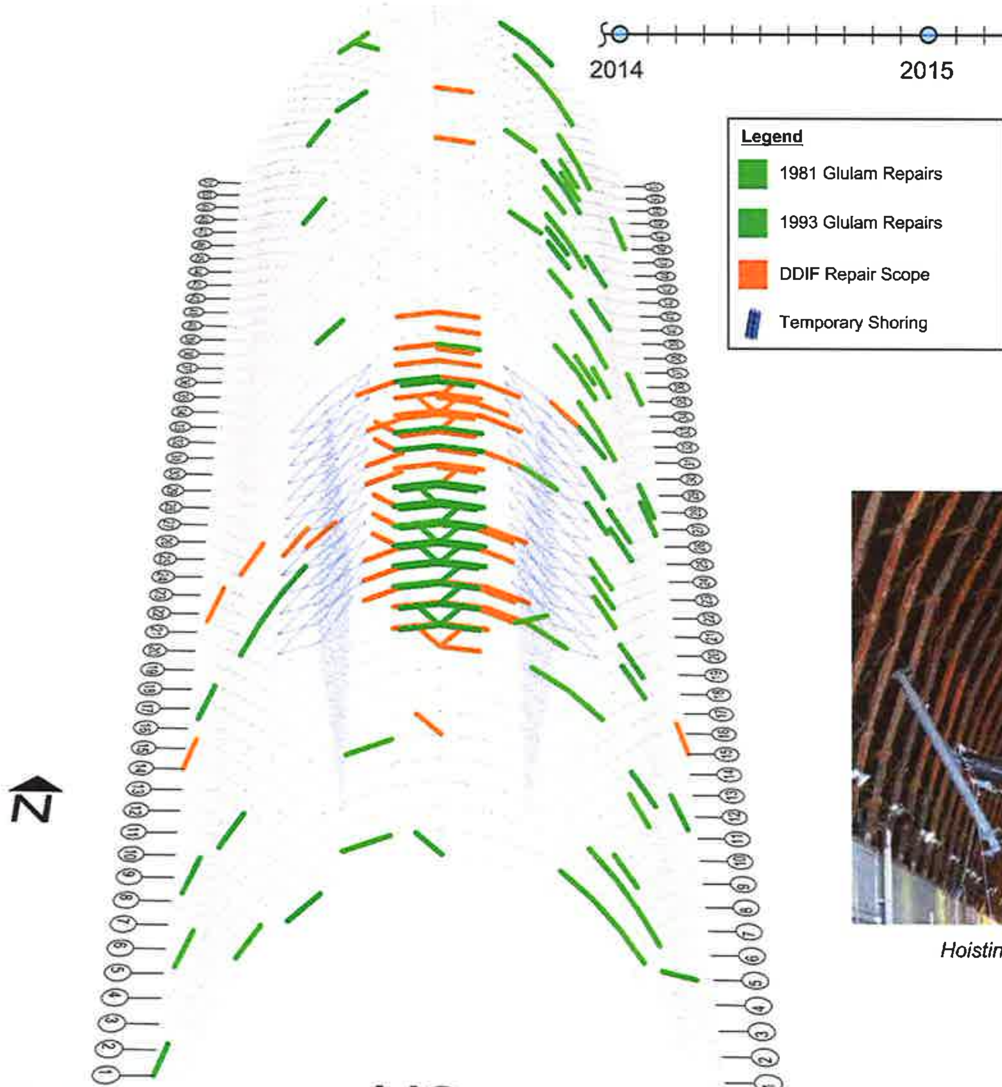


- Evidence of severe damage and progressive collapse of Hangar 3 necessitated a shoring and emergency repair program
- As part of the contractor's means and methods of performing repairs, 36"ø steel pipe shores were placed between trusses 9-26
- Pipe shores were designed to provide secondary stability in the event of progressive roof collapse during repair procedures
- Steel exoskeletons with jacks would then be placed at top to jack the roof and rebuild the critical zone



Hoisting of temporary shore segment

Temporary shores after installation

OBSERVATIONS BELOW EXOSKELETON

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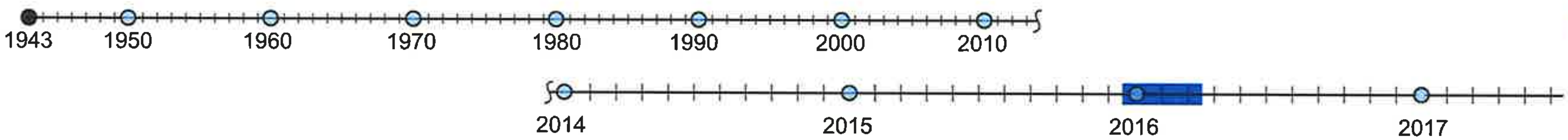
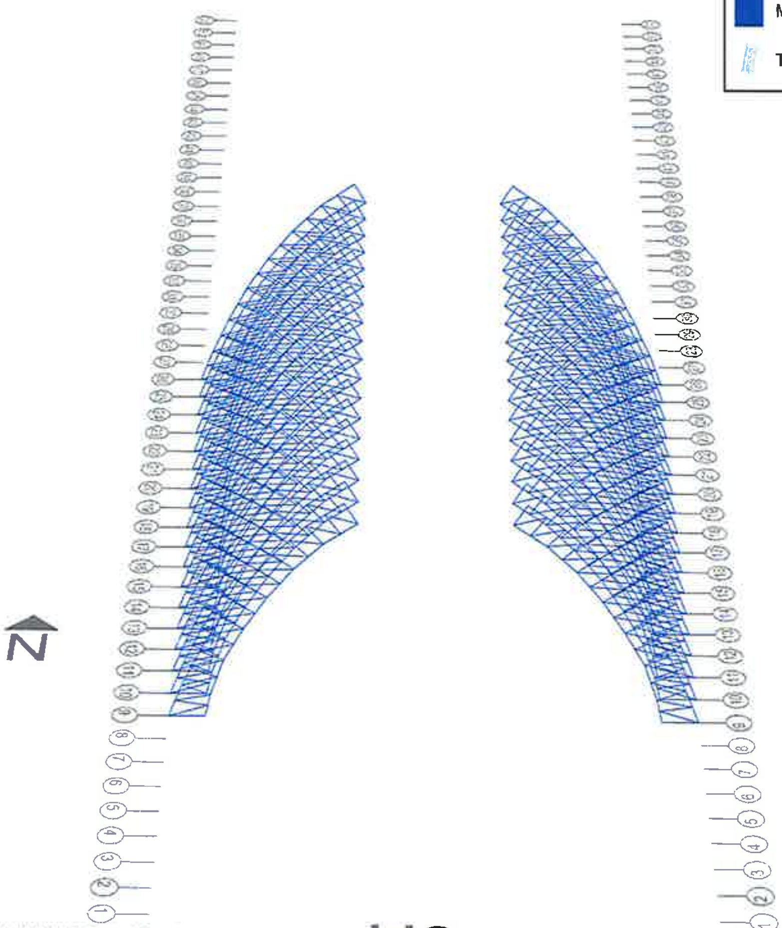


Legend

- Members surveyed below exoskeletons
- Temporary shoring

- Before the exoskeletons could be placed, the condition of the trusses below had to be verified to ensure they could take the additional weight
- Any damage of main arch members needed to be repaired prior to exoskeleton installation
- KPFF conducted a survey of main arch members between Trusses 9-26 below panel point O and 14
- 1548 main arch chords and webs were surveyed for damage



Boom lift used for visual observations

KPFF condition assessment crew

PRE-JACKING REPAIR SCOPE

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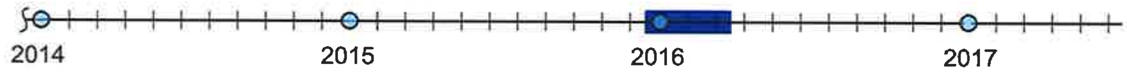

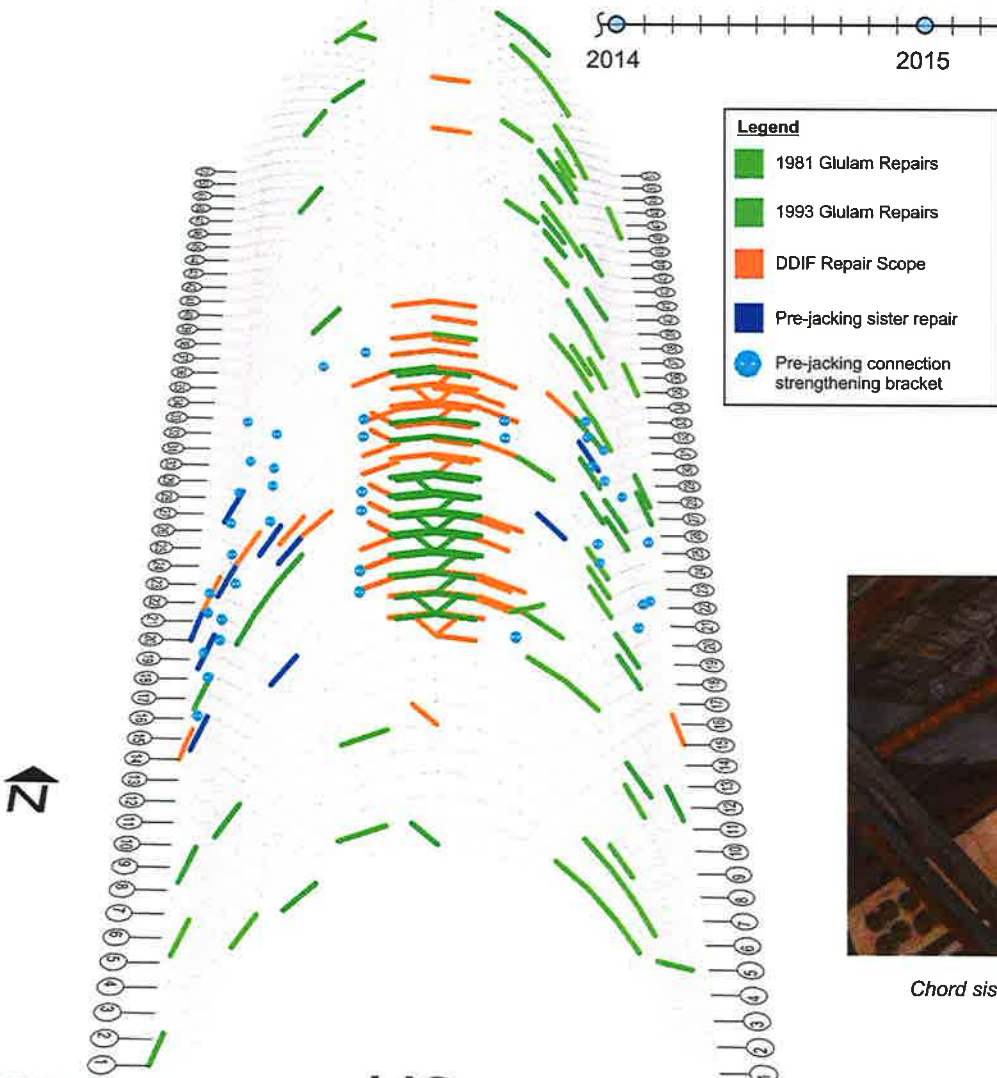

- The KPFF survey discovered chord damage which was either not observed or not present during the due diligence investigations
- The survey uncovered extensive deficiencies within the web member connections, including many plug pullout failures
- **10** additional arch members received glulam sistering repairs
- **39** chord connections received connection strengthening brackets

Chord sister repair installed prior to exoskeletons

Typical connection strengthening bracket

ACCESS TOWER OBSERVATIONS

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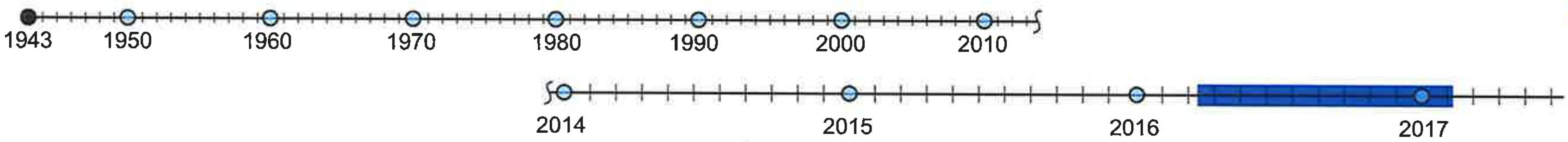

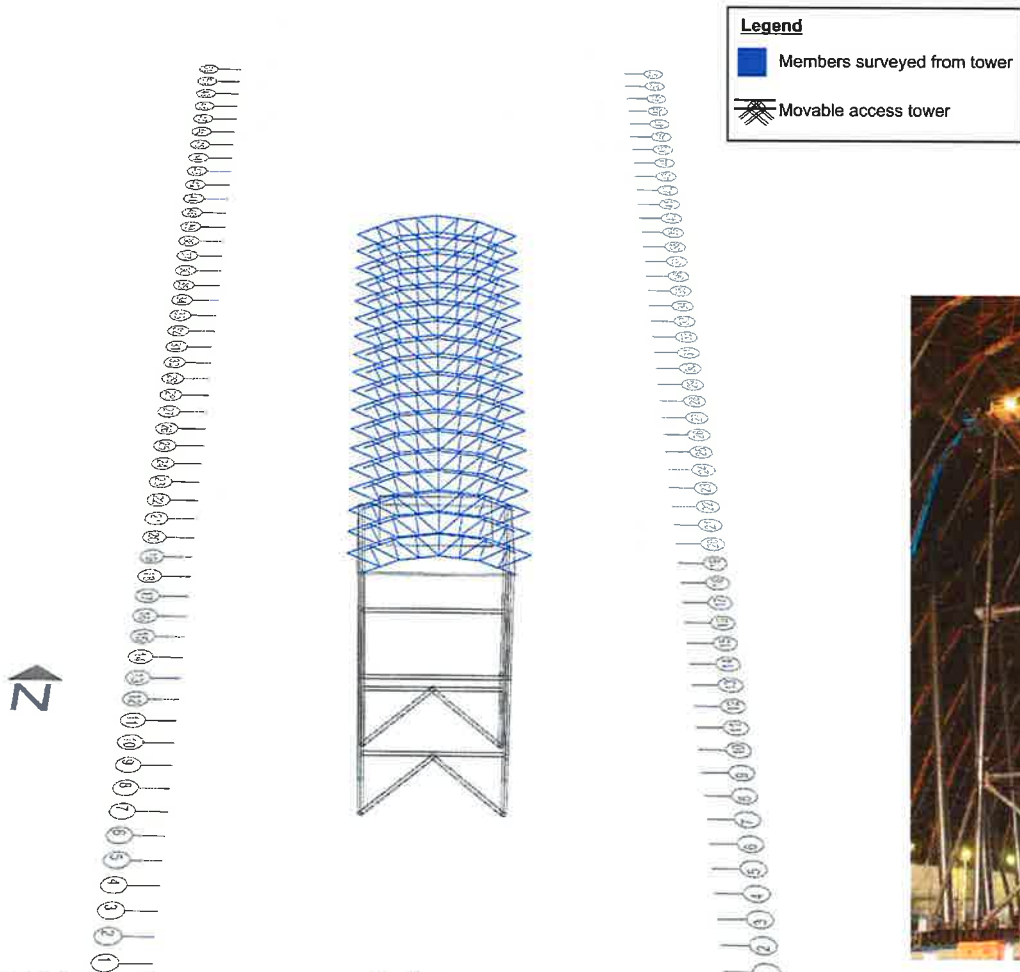

- The movable access tower provided clearance for KPFF to make additional observations in the zones above the temporary shores
- Chord and web members were observed after each tower move before the exoskeletons were installed
- Additional damage observed in this zone was planned to be repaired after roof jacking

Movable access tower

Truss observations from a boom lift on top of access tower

H3

POST-JACKING REPAIR SCOPE

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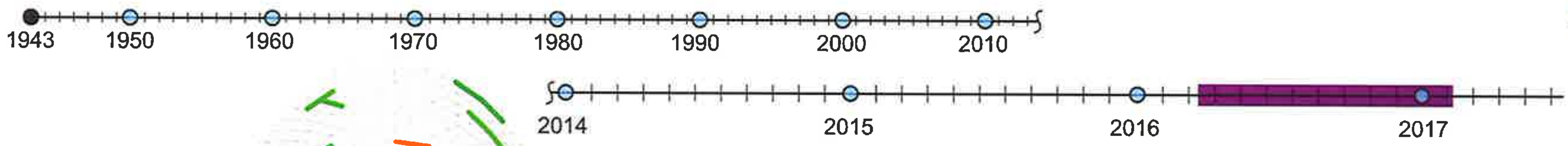
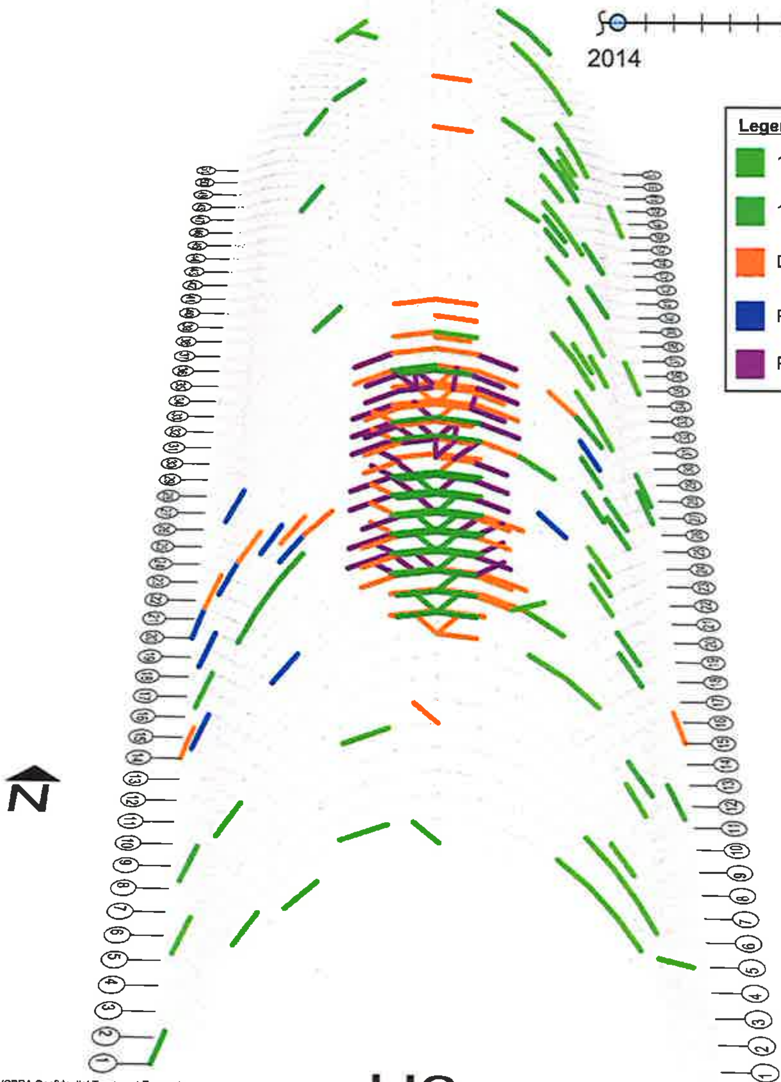




Legend

- 1981 Glulam Repairs
- 1993 Glulam Repairs
- DDIF Repair Scope
- Pre-jacking repair scope
- Post-jacking repair scope

- **50** additional members were identified as severely damaged and scheduled to be removed and replaced after roof jacking
- Before jacking and repairs were made, decision was made to defer further construction activities

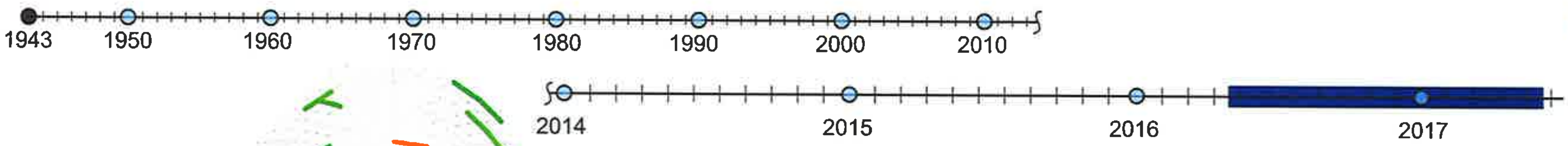
Roof monitor deflection in critical zone

Temporary strapping on chord marked for removal and replacement

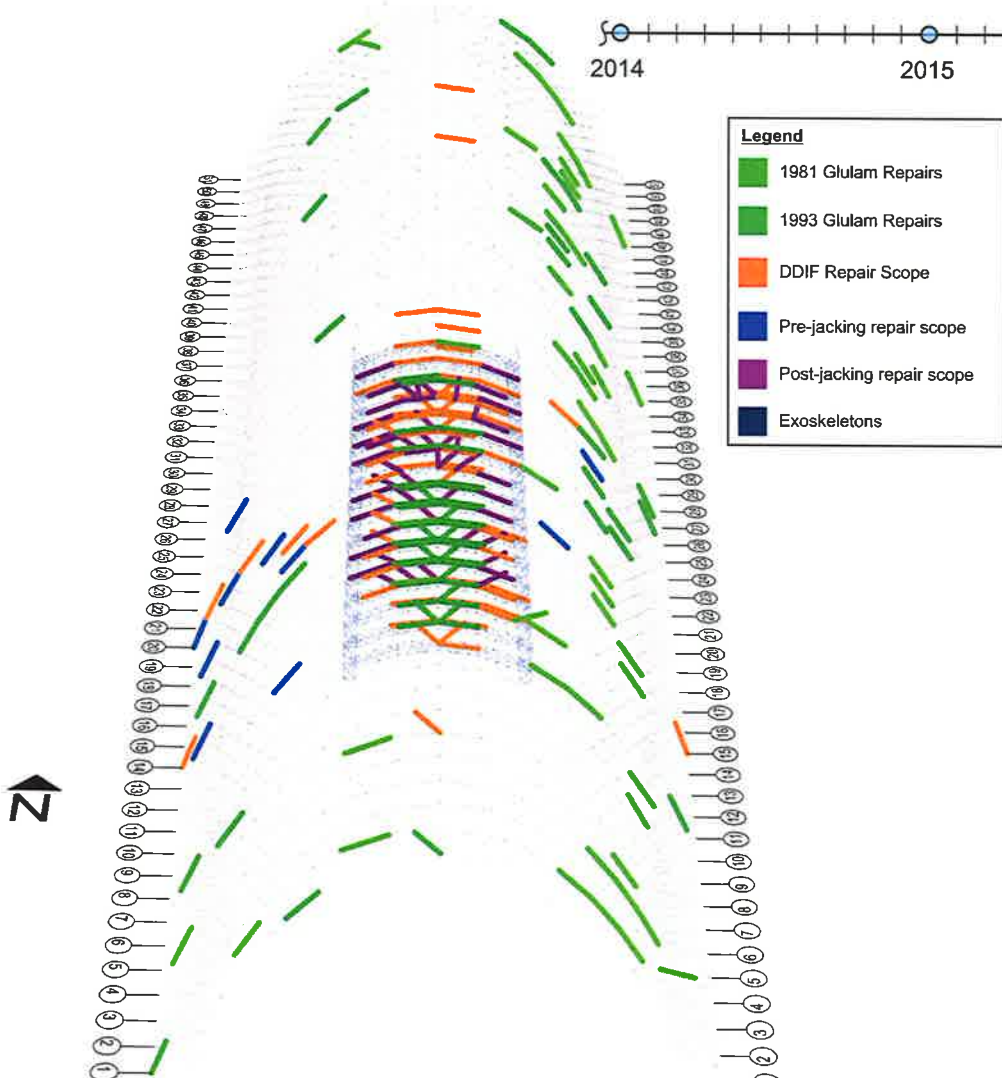
Damaged chord member viewed from access tower

EXOSKELETONS

DRAFT - 7/6/2017
SED



- Steel exoskeletons were installed at Trusses 9-26 after observations were made.



Hoisting exoskeleton segment into place

Installed exoskeletons

H3

DAMAGE PROGRESSION

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DRAFT - 7/6/2017
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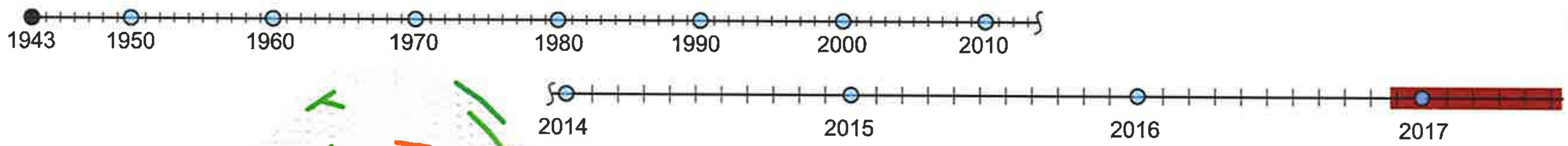

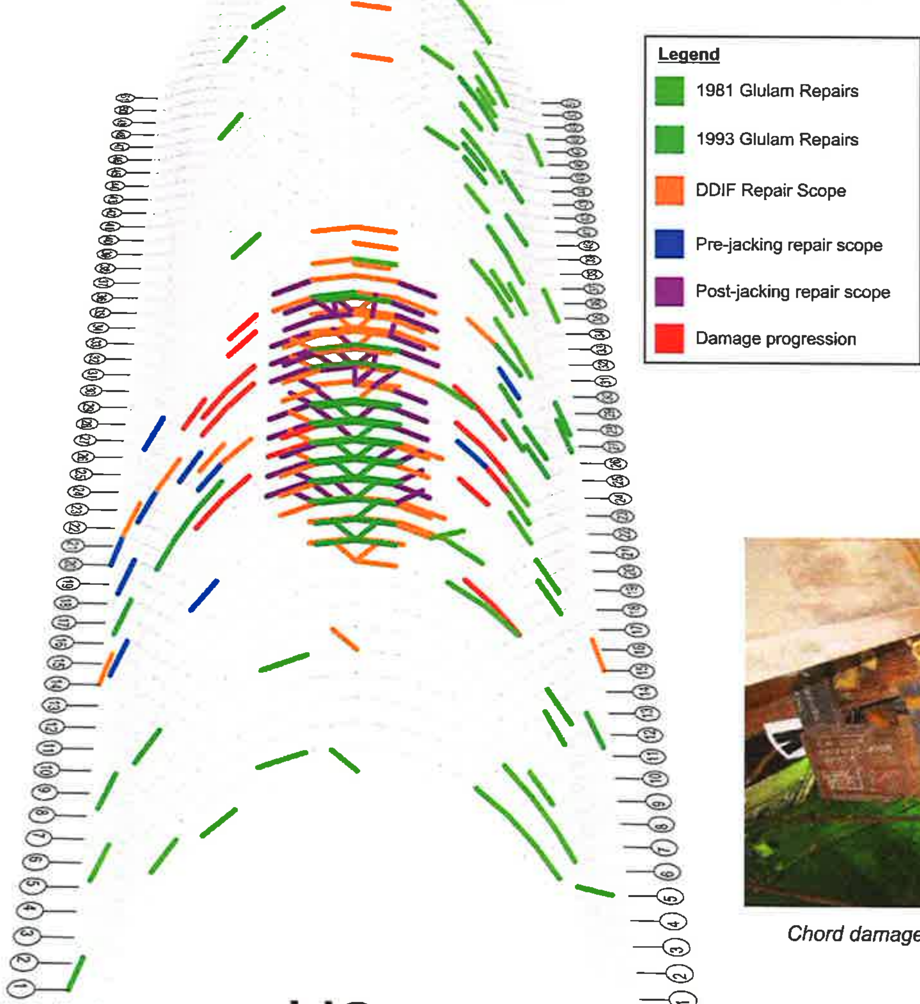

- Months after installation of exoskeletons, major splits were observed in chord members which had previously been observed and cleared.
- Major damage was observed on 19 chords, most between panel points I to M.
- Sistering repairs installed on most severe cases
- Due to the concentration of new damage at the lower chord members at panel points I to M, preemptive measures were taken to help reduce the progression of damage.
- Preemptive measures included fully-threaded screws at connections, and steel clamps.

Chord damage at node K after exoskeleton install

Preemptive screw and clamp strengthening on undamaged chord at node K

H3

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kpff

August 21, 2019

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Legal Department / Google Inc.
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Gary S. McKitterick, Esq.
Partner
Allen Matkins Leck Gamble Mallory & Natsis, LLP
1900 Main Street, 5th Floor
Irvine, CA 92614-7321 **VIA Email:** gmckitterick@allenmatkins.com

Subject: Moffett Federal Airfield Hangar 3 – Mountain View, California
Structural Site Observation

Dear Ms. Lim and Mr. McKitterick:

As part of the quarterly Hangar 3 structural assessment, I've recently conducted a site visit on behalf of Planetary Ventures to visually observe the general condition of the existing hangar structure and the temporary shoring devices that were left in place when the work was terminated. After walking the entire Hangar 3 structure, I have prepared the following comments, observations and conclusions:

Overall Comments:

1. The original intent of the emergency truss repair program was to return the damaged and broken arched trusses to their original deficient state.
2. The emergency truss repair program was ultimately abandoned due to the numerous severely damaged arched trusses as well as the damage progression to undamaged trusses which continued to occur during the installation of the required repairs.
3. Once abandoned, additional shores were installed, shoring support elements were left in place and the shoring platform was positioned in a manner to provide asset protection. These steps were meant to be a temporary or short term solution to assist with the protection of the damage elements.
4. The structure remains unsafe and is very vulnerable to further damage or partial collapse while left in its current unrepaired state.

kpff

Observations:

5. Upon arrival at the site, the hangar was locked up and not accessible as previously recommended.
6. We did not observe any wood material or other debris which had fallen from the existing framing to the hangar deck below.
7. It was not apparent that further damaged had appeared since our last site visit and the monitoring program has been discontinued.

Conclusions:

8. Overall, the hangar structure has existed well past its original design life. Varying levels of damage exist to other parts of the timber framing, beyond that of the work outlined in the Emergency Truss Repair work. Subsequently, the level of repair required to return the hangar to its original deficient state is excessive and cost prohibitive.
9. The shoring and platform shoring, which were left in place as a means of providing short term asset protection were only intended to be short term. Previous discussions had placed the time limit describing "short term" at roughly 2-3 years maximum.
10. Further, in its current unrepaired state, the structure is far more vulnerable to sustaining further damage and even experiencing partial collapse of areas from earthquake and/or high wind loading.
11. Finally, it is my professional opinion, that the structure left in its current unrepaired and unsafe condition is likely uninsurable.

Based on my discussion above, it remains my professional opinion that the hangar is unsafe, should not be occupied and could become a potential site hazard from seismic and/or high wind forces. In addition, the work required to return the hangar to a limited Occupiable use level, is extensive and undefinable and further, the necessary work required would be cost-prohibitive and is therefore not salvageable.

This concludes my structural site visit observation report and status update on the existing hangar 3 structure. Please feel free to contact me if you have further questions or comments.

Very truly yours,

Blake W. Dilsworth

Blake W. Dilsworth, S.E.
Principal

BWD/MFA Hangar 3 00 20100821 L1

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National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035

December 13, 2019

Ms. Julianne Polanco
State Historic Preservation Officer
Office of Historic Preservation
Department of Parks & Recreation
1725 23rd Street, Suite 100
Sacramento, CA 95816

Attn: Mr. Mark Beason

Subject: Initiation of Section 106 Consultation for the Hangar 3 Demolition Project at Ames Research Center, Moffett Field, Santa Clara County, California

Dear Ms. Polanco:

In support of its responsibilities under Section 106 of the National Historic Preservation Act (NHPA), the National Aeronautics and Space Administration Ames Research Center (NASA ARC) requests initiation of Section 106 consultation regarding the Hangar 3 Demolition Project (project or undertaking) located at Moffett Field, Santa Clara County, California (see attached Figures 1 and 2). Built in 1943, Hangar 3 is listed in the National Register of Historic Places (NRHP) as a contributor to the U.S. Naval Air Station Sunnyvale, California Historic District (NAS Sunnyvale Historic District). The Hangar 3 structure is structurally deficient and is closed to occupancy. NASA ARC is concurrently reviewing the proposed project and alternatives under the National Environmental Policy Act.

In 2015, NASA ARC previously consulted with the State Historic Preservation Officer (SHPO) on the Remediation and Rehabilitation of Hangars 2 and 3, Core and Shell Project, for which the SHPO concurred with NASA ARC's Finding of No Adverse Effect on August 27, 2015 (Ref. NASA_2015_0605_001). The core and shell project is intended to rehabilitate elements of Hangar 3, including abatement of hazardous materials; strengthening of structural systems; remediation; fire and life safety upgrades; systems upgrades; and accessibility upgrades. In preparation for the core and shell project, additional structural deficiencies were identified, including structural truss failure due to timber and hardware deterioration that could lead to the potential collapse of the roof. The severe extent of these damages required stabilization of multiple truss members with a temporary shoring assembly to prevent collapse. Engineering and design analysis were subsequently conducted to inform the full scope of necessary structural repairs. Due to the numerous severely damaged arched trusses and the damage progression to undamaged trusses that continued to occur during repair, the work was halted due to its cost-prohibitive scope. Temporary shoring support elements remain in place and are only a short-term solution to prevent additional structural failures.

According to recent structural engineering monitoring, Hangar 3 is unsafe and very vulnerable to further damage or partial collapse—for example, from earthquake and/or high wind loading—while left in its current state. Based on the opinions of the project structural engineer, necessary repairs to return Hangar 3 to occupancy would be extensive, undefinable, and cost-prohibitive. Therefore, NASA ARC is planning to demolish Hangar 3, which would constitute an undertaking under Section 106 of the NHPA that would result in an adverse effect.

Cultural resources specialists who meet the Secretary of the Interior's Professional Qualifications Standards (48 Federal Register 44738) are currently preparing a technical study with additional information pertinent to Section 106 review, including the Area of Potential Effects, that will inform NASA ARC's determination of adverse effect and develop and propose potential mitigation measures. NASA ARC will submit the technical study to the SHPO for review and comment.

NASA ARC is developing a list of consulting parties who may be invited to participate in the Section 106 review process for this undertaking. Potential consulting parties include:

- The Moffett Field Historical Society
- The City of Sunnyvale, California – Planning Department and/or Heritage Preservation Commission
- The City of Mountainview, California – Planning Department
- Sunnyvale Historical Society
- Mountainview Historical Association
- History San Jose
- Silicon Valley Historical Association
- California Preservation Foundation
- National Trust for Historic Preservation, San Francisco Office

NASA ARC is also making this initiation request available to the public via the NASA ARC Historic Preservation Office website (https://historicproperties.arc.nasa.gov/).

In summary, Hangar 3 currently is closed to occupancy. Structural investigations indicate that the structure is not sustainable. NASA ARC requests (1) initiation of Section 106 consultation with the SHPO for this undertaking, which would involve the demolition of Hangar 3; and (2) SHPO comments on the potential consulting parties that NASA ARC is developing. NASA ARC will provide a technical study to the SHPO for review in support of NASA ARC's determination of adverse effect for this undertaking.

In addition, NASA ARC would like to schedule a meeting with the SHPO in January 2020 (in Sacramento for the convenience of Office of Historic Preservation staff, if preferred) to discuss the project and mitigation to resolve adverse effects in a timely manner. We propose January 27, 28, or 29, if your schedule allows.

Please contact me at jonathan.d.ikan@nasa.gov or at (650) 604-6859 with your comments or questions, and to let us know of your availability for an in-person meeting in January.

Sincerely,

Jonathan Ikan
Center Cultural Resources Manager

Ames Research Center

Ames Research Center, MS 213-8
Moffett Field, California 94035

cc:
HQ/EMD/Rebecca Klein, Ph.D., RPA

Enclosures

Figure 1. Regional Project Location Map

FIGURE 1: Regional Project Location Map

Source: ESRI, AECOM, NASA

0 5 10 20 Miles

Scale: 1 = 633,600; 1 inch = 10 mile(s)