SEP 13 1994 ^{9/13/94} ^{KN} **ENGINEERING DATA TRANSMITTAL** Page 1 of 1
 Sta. 21 1. EDT 605907

2. To: (Receiving Organization) Structural Analysis	3. From: (Originating Organization) Structural Assessments	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Roof Inspections	6. Cog. Engr.: R. M. McCoy	7. Purchase Order No.: N/A
8. Originator Remarks: Photos of deficiencies found during roof inspections.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: 8/4/94

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Impact Level	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-GN-ER-30034		0	Photos of roof deficiencies	N/A	1	1	

16. KEY					
Impact Level (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
1, 2, 3, or 4 (see MRP 5.43)		1. Approval	4. Review	1. Approved	4. Reviewed no/comment
		2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment
		3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)										(G)	(H)
(G)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
3	1	Cog. Eng. R.M. McCoy	<i>R.M. McCoy</i>	8/3/94	H5-55						
3	1	Cog. Mgr. T.J. Conrads	<i>T.J. Conrads</i>	8/11/94	H5-55						
		QA									
		Safety									
		Env.									

18. R. M. McCoy <i>R.M. McCoy</i> Signature of EDT Originator Date 8-3-94	19. T. J. Conrads <i>T.J. Conrads</i> Authorized Representative for Receiving Organization Date 8/11/94	20. T. J. Conrads <i>T.J. Conrads</i> Cognizant/Project Engineer's Manager Date 8/11/94	21. DOE APPROVAL (if required) Ltr. No. N/A ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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BD-7400-172-2 (07/91) GEF097

A-6000-135 (01/93) WEF067

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Document Number: WHC-SD-GN-ER-30034, REV. 0

Document Title: PHOTOS OF DEFICIENCIES FOUND DURING ROOF INSPECTION

Release Date: 8/23/94

* * * * *

**This document was reviewed following the
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APPROVED FOR PUBLIC RELEASE

* * * * *

WHC Information Release Administration Specialist:

N. L. Solis

(Signature)

8/23/94

(Date)

SUPPORTING DOCUMENT

1. Total Pages 67 71

2. Title

Photos of Roof Deficiencies

3. Number

WHC-SD- GN-ER-30034

4. Rev No.

0

5. Key Words

roof inspection

**APPROVED FOR
PUBLIC RELEASE**
8/23/94 D. S. S.

6. Author

Name: R. M. McCoy

R. M. McCoy
Signature

Organization/Charge Code 80440/MD2GA

7. Abstract

This reports shows photos of roof deficiencies noted during roof inspections.

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10.

RELEASE STAMP

OFFICIAL RELEASE (21)

BY WHC

DATE **SEP 13 1994**

Sta. 21

SEP 13/94

9. Impact Level

NA

PHOTOS OF ROOF
DEFICIENCIES

July 1994

Prepared by: *R. M. McCoy* Date: 8-3-94
R. M. McCoy, Senior Engineer
Structural Assessments

Reviewed by: *R. A. Giller* Date: 8-3-94
R. A. Giller, Senior Engineer
Structural Assessments

Approved by: *T. J. Conrads* Date: 8/11/94
T. J. Conrads, Manager
Structural Assessments

WESTINGHOUSE HANFORD COMPANY
Hanford Operations and Engineering Contractor
for the U. S. Department of Energy

MASTER

PREFACE TO PHOTOGRAPHS OF ROOF DEFICIENCIES

The attached photographs provide a record of the kinds of roof deficiencies revealed during visual inspections conducted since 1992 at the Hanford Site. The purpose of the visual inspections is to provide preliminary structural assessments of roofs on some 1,100 Hanford Site structures, many of which date back to the 1940's. These preliminary assessments do not reflect an effort to qualify these roofs for design or in-place loads. However, the inspection process can provide a basis for reasonable estimates of roof loading capacities to support personnel access.

To ensure consistency in inspection methodology and practice and to provide for the safety of building occupants and inspectors during the inspection process, a generic inspection plan has been developed and implemented (WHC 1992). The plan specifies that inspections shall be performed by qualified structural inspectors and establishes training requirements for such inspectors. It also requires that inspectors observe the procedure for preliminary assessments as set forth in the American Society of Civil Engineers (ASCE) Standard 11-90 (ASCE 1990).

The assessment requires walkdowns by the structural inspectors after they have carefully scrutinized as-built and construction drawings and specifications to familiarize themselves with the structure and to check for design irregularities. The inspection plan itemizes the kinds of deterioration that are to be recorded during the inspection, e.g., cracks, spalls, or chips in concrete members; rust stains that might indicate corroded rebar inside concrete members; cracks, splits, rot, or holes in wooden members; evidence of leaks or other damage; and evidence of repairs. It also requires that any modifications to member configurations be checked against drawings and that inspectors keep careful records of the structural elements that were examined and those that were not. Field records are attached to inspection reports.

Each inspection results in a report that catalogues any deficiencies and determines that the structure either passes or fails the inspection. A "fails" assessment indicates that additional investigation is necessary and requires that personnel access be denied. Conservatism demands that doubt about the acceptability of the building result in a "fails" determination. On the basis of the inspector's determination, the facility representative is responsible for initiating action to establish access restrictions, report the deficiencies to the facility manager, and provide for additional evaluation or repairs.

To date some 350 buildings have been inspected. The attached photographs provide a record of the wide variety of degrading mechanisms that can result in potentially unsafe structural conditions. Facility managers are aware of the conditions; corrective actions will take place on a case-by-case basis at the facilities.

REFERENCES

- ASCE, 1990, *Guidelines for Structural Condition Assessments of Existing Buildings*, Standard 11-90, American Society of Civil Engineers, New York, New York.
- WHC, 1992, *Generic Inspection Plan for the Roof Deck and Support Structure for Buildings*, WHC-SD-GN-ER-30012, Westinghouse Hanford Company, Richland, Washington

List of Photos

- Photo 1: Deterioration of pre-cast concrete panel.
- Photo 2: Deterioration of pre-cast concrete panel.
- Photo 3: Deterioration of pre-cast concrete panel.
- Photo 4: Large deflections on deteriorated pre-cast concrete panels.
- Photo 5: Exposed rebar in pre-cast concrete panel.
- Photo 6: Large deflection in roofing membrane. Roof deck is pre-cast concrete panels (see Photo 7).
- Photo 7: Exposed rebar and failed pre-cast concrete panels. Failed panels located in area of large deflection in Photo 6.
- Photo 8: Deterioration of gypsum panels due to water.
- Photo 9: Deterioration of gypsum panel due to water. Note rotten gypsum and hole through roof deck and membrane.
- Photo 10: Deterioration of gypsum panels.
- Photo 11: Deterioration of gypsum panel due to water. Note rotten gypsum.
- Photo 12: Deterioration of gypsum panels due to extended exposure to elevated temperatures.
- Photo 13: Deterioration of gypsum panel due to extended exposure to elevated temperatures. Note pitting of gypsum.
- Photo 14: Crack in the protective coating of gypsum panel.
- Photo 15: Opening through a gypsum panel. The gypsum is damaged and the protective coating is missing along the exposed edges.
- Photo 16: Deterioration to fiberboard (tectum) due to water.
- Photo 17: Broken wood sheathing.
- Photo 18: Water stains on wood sheathing which indicates an area where rot could occur.
- Photo 19: Grain on wood sheathing at an angle to the direction of span. The sheathing is splitting along the grain.
- Photo 20: Deterioration to plywood sheathing exposed to water.
- Photo 21: Shrinkage of wood sheathing which resulted in the tongue and grooved sheathing not being fully engaged.

- Photo 22: Non-framed opening through roof decking covered with roofing material.
- Photo 23: Deterioration of metal decking due to water.
- Photo 24: Deterioration of metal decking due to water.
- Photo 25: Deterioration of metal decking due to water.
- Photo 26: A number 2 lead pencil placed through deteriorated metal (note: the lead in the pencil did not break).
- Photo 27: Damage to a pre-engineered building roof panel due to personnel access.
- Photo 28: Penetrations through metal roof deck.
- Photo 29: Broken asbestos panel.
- Photo 30: Non-engineered addition to building. Support columns do not meet AISC steel code. Note direction of beams and refer to photo 31.
- Photo 31: Close-up of metal roof panel of non-engineered addition in photo 30. Roof panels span in the wrong direction.
- Photo 32: Water ponding on roof.
- Photo 33: Damage to a wooden roof rafter due to impact.
- Photo 34: Damage to a wooden roof rafter due to impact.
- Photo 35: Improper modification to roof rafter which resulted in the rafter cracking.
- Photo 36: The bond in the rafter has broken down along the grain which resulted into the wood act as a de-laminated member. This results in a reduction of strength.
- Photo 37: Broken roof rafter.
- Photo 38: Broken roof rafter.
- Photo 39: Rotten wooden roof rafter.
- Photo 40: Rotten wooden roof rafter.
- Photo 41: Crack in knot of roof rafter (see photo 42 for opposite side of rafter) due to shrinkage.

- Photo 42: Crack in rafter due to shrinkage at a knot (see photo 41 for opposite side of rafter).
- Photo 43: Crack in wooden roof rafter due to shrinkage.
- Photo 44: Seasonal cracks in truss members which pass through the connections.
- Photo 45: View looking up at bottom connection of wooden truss (similar to photo 46). Note seasonal cracks passes completely through the wooden members.
- Photo 46: Splitting of wooden truss member.
- Photo 47: Seasonal cracking of wooden truss members.
- Photo 48: Seasonal cracking of wooden truss member.
- Photo 49: Non-engineered roof modification. The roof rafters do not meet UBC codes.
- Photo 50: Damage to a roof truss member.
- Photo 51: Non-engineered modification to roof truss system.
- Photo 52: Rotten wooden column.
- Photo 53: Splitting of wooden column.
- Photo 54: Rotten floor system.
- Photo 55: Non-engineered modification to platform.
- Photo 56: Platform not properly attached to concrete. (see photo 57).
- Photo 57: Platform not properly attached to concrete. See photo 56 for close-up of base plates.
- Photo 58: Splitting of a steel pipe column.
- Photo 59: Unrestrained abandoned tanks in attic.
- Photo 60: Unrestrained hot water tank.

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Photo 1

Photo 2

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Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

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Photo 19

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Photo 51

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Photo 54

Photo 55

Photo 56

Photo 57

Photo 58

Photo 59

Photo 60