

WPB Operations Fuel Canopy

STRUCTURAL INSPECTION REPORT

Prepared For:

**Florida Department of Transportation
District 4**



APPROVED BY

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INDEX

1. EXISTING PERMITS AND PLANS.....	1
2. WPB FUEL OPERATIONS STRUCTURAL INSPECTION	1
3. CANOPY STRUCTURE DESCRIPTION	2
4. INSPECTION FINDINGS	2
4.1 SUBSTRUCTURE	2
4.2 STEEL SUPERSTRUCTURE	3
4.3 ROOF FRAMING SECONDARY MEMBERS:	3
4.4 ROOF DRAINAGE SYSTEM:	3
5. PHOTO INVENTORY:	4
6. INSPECTION SUMMARY AND REPAIR RECOMMENDATIONS	11
7. BUILDING CODE CRITERIA FOR THE PROPOSED REPAIRS.....	12
8. COST ESTIMATE – REPAIRS ONLY	12
9. COST ESTIMATE – CANOPY REPLACEMENT.....	13
10. COST EVALUATION	13
11. CONCLUSION.....	13

APPENDICES

APPENDIX A – PRPOSED REPAIR PLANS

APPENDIX B – EXISTING CANOPY FOUNDATION PLAN

APPENDIX C – FDOT INSPECTION REPORT

1. EXISTING PERMITS AND PLANS

The existing canopy was built in 1993. As-built plans were not available at the time of inspection. We have conducted a search and determined that permits for the construction were processed in West Palm Beach County, Planning Zoning & Building Department, in 1993. The permits were recorded as follow:

Control #: 1993-00043

Exhibit: 0001

Control Name: FDOT Operations Center

Application Name: FDOT Operations Center

Plan Type: FSP

2. WPB FUEL OPERATIONS STRUCTURAL INSPECTION

Bolton Perez & Associates (BPA) conducted a visual structural inspection of the WPB operations fuel Canopy on August 28, 2013. The purpose of the inspection was to determine the structural integrity of the existing building, and also to verify the findings of the inspection report performed by FDOT on March 28, 2013. The BPA inspectors were Roberto Vasquez, P.E. and Luis Pinillos, CBI, EI.

During the site visit, Mr. Anthony Puccio with FDOT maintenance provided BPA with the existing canopy foundation structural plans.

The existing canopy south and north elevations are shown below:

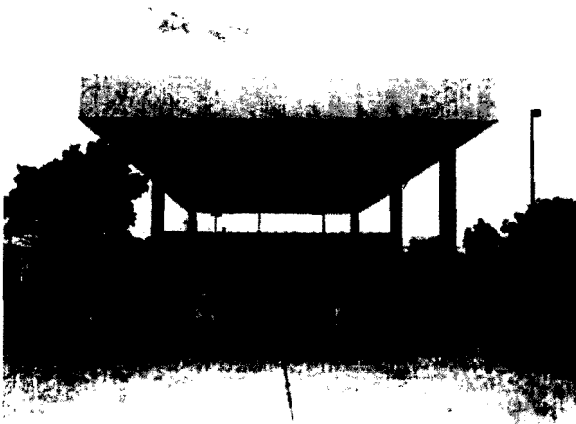


Photo No. 1 - Canopy South Elevation

Photo No. 2 - Canopy North Elevation

3. CANOPY STRUCTURE DESCRIPTION

The existing canopy frame structure consists of 6 - 12 inch by 12 inch steel columns supported on spread footings. The Roof framing system is composed of 3 steel beams spanning between the columns in the transverse direction (east to west) and 6 steel stringers connected to the bottom flange of the beams spanning in the longitudinal direction (north to south). The roof canopy secondary members consist of steel channels providing lateral bracing to the stringers top flange and angles used to provide attachment of the roof fascia panels. The canopy roof system consists of metal panels spanning in the transverse direction attached to the stringers bottom flange. The roof drainage system is composed of a main longitudinal flume (gutter) that collects the rain water and distributes it to secondary transverse flumes which discharge the runoff through the columns. The canopy structure height is approximately 16'-9" from top of slab.

4. INSPECTION FINDINGS

4.1 SUBSTRUCTURE

The foundation is covered with a concrete slab and is not visible for inspection. The steel columns appear generally in good condition with the following noted deficiencies:

1. Column No. 2, east face, has a corroded area 12" W x H" with up to 1/8" section loss. Photo No. 3
2. Column No. 1, north face, has a corroded area 2.5"H x 7"W x 10"L with up to 1/16" section loss around drainage gutter. Photo No. 4
3. Column No. 4, east face at base, has corrosion and section loss due to water accumulation. A repair plate has been previously attached to the column bottom. Photo No. 5
4. Column No. 4, top east face, has a corroded area 6"W x 3"H with up to 1/16" section loss. Photo No. 6
5. Column no. 3, top east face, has a corroded area 3"W x 5"H with 100% section loss. Photo No. 7
6. Column No. 5, top east face, with typical corrosion due to water leakage at the gutter to column connection. Photo No. 8

As seen in the referenced photos columns 3 and 4 show corrosion and section loss due to the accumulation of water draining through the columns. At the top the damage occurs at the gutter to column connection for all columns. Only columns 3 and 4 show signs of corrosion at the base around the drainage holes. For the south and north columns the drainage pipes run through the footing pedestals and no apparent damage is visible. See Photo No. 9

4.2 STEEL SUPERSTRUCTURE

The roof framing system exhibits moderate surface corrosion with localized areas exhibiting heavy corrosion in the form of pitting, scaling and minor section loss. The following additional deficiencies are noted.

1. Stringer No. 4 at north end is bent approximately 2.5 inches. Photo No. 10
2. Stringer No. 3 at north end exhibits 20% section loss along the top section of the east bottom flange. The corrosion extends for approximately 22 feet of the beam flange. Photo No. 11

4.3 ROOF FRAMING SECONDARY MEMBERS:

The canopy (fascia) bracing/framing exhibits extensive corrosion in the form of scaling and section loss. Section loss due to failure of the protective paint system and lack of maintenance is present over the entire roof. The bracing system consists 2" x 2" x 3/16" angles spaced at 5'-0" center to center extending from the fascia panels to the first and second stringers along the east and west sides of the roof and from the fascia panel to the last beam on the north and south side of the roof. Refer to Photo Nos. 12 thru 15.

4.4 ROOF DRAINAGE SYSTEM:

The roof drainage system consists of a longitudinal flume (gutter) running from north to south along the center of roof serving as a main water collector. Transverse flumes to each column are used to drain the roof runoff through the columns. The flumes show signs of water ponding, corrosion and leakage. Refer to Photo Nos. 16 and 17.

5. PHOTO INVENTORY:

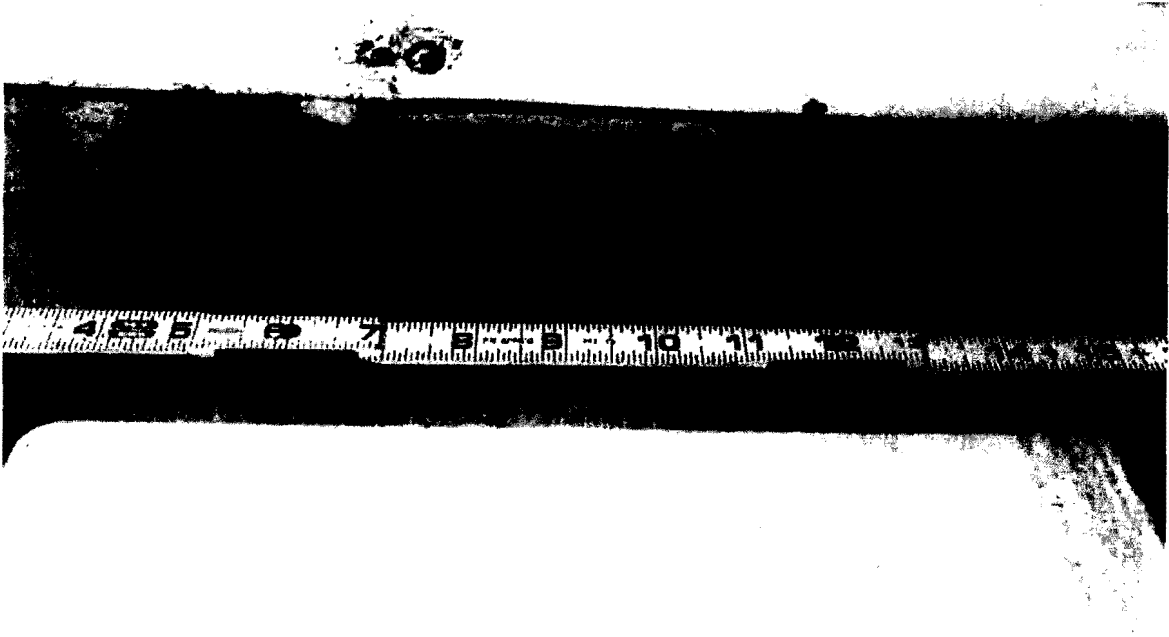


Photo No. 3

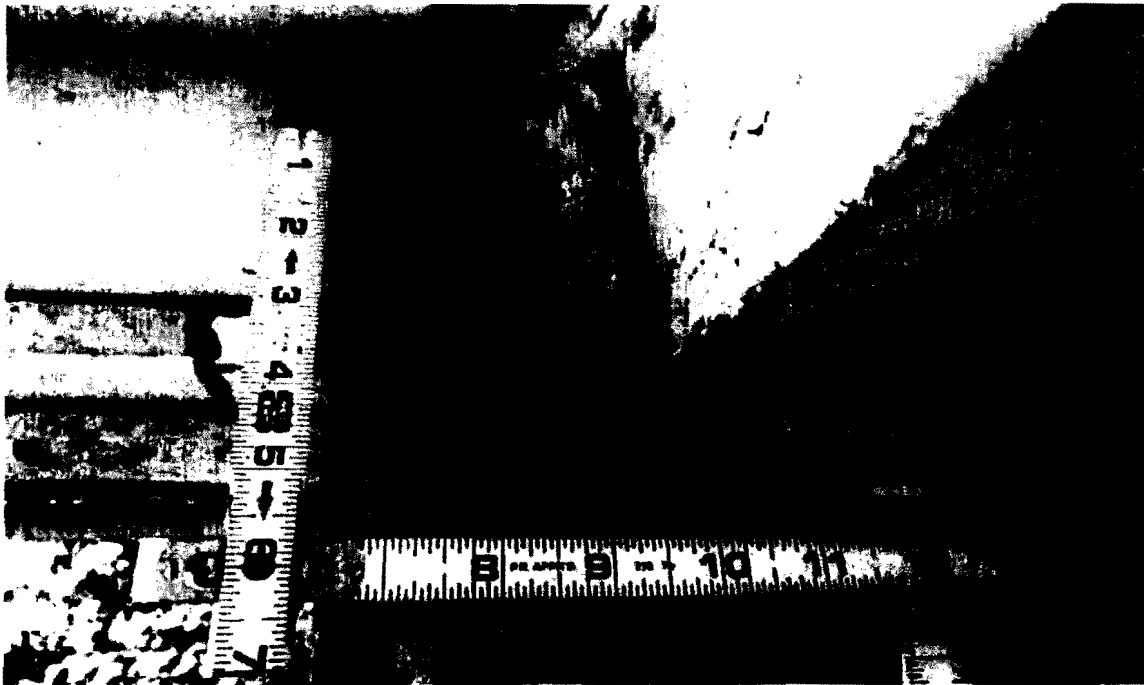


Photo No. 4



Photo No. 5

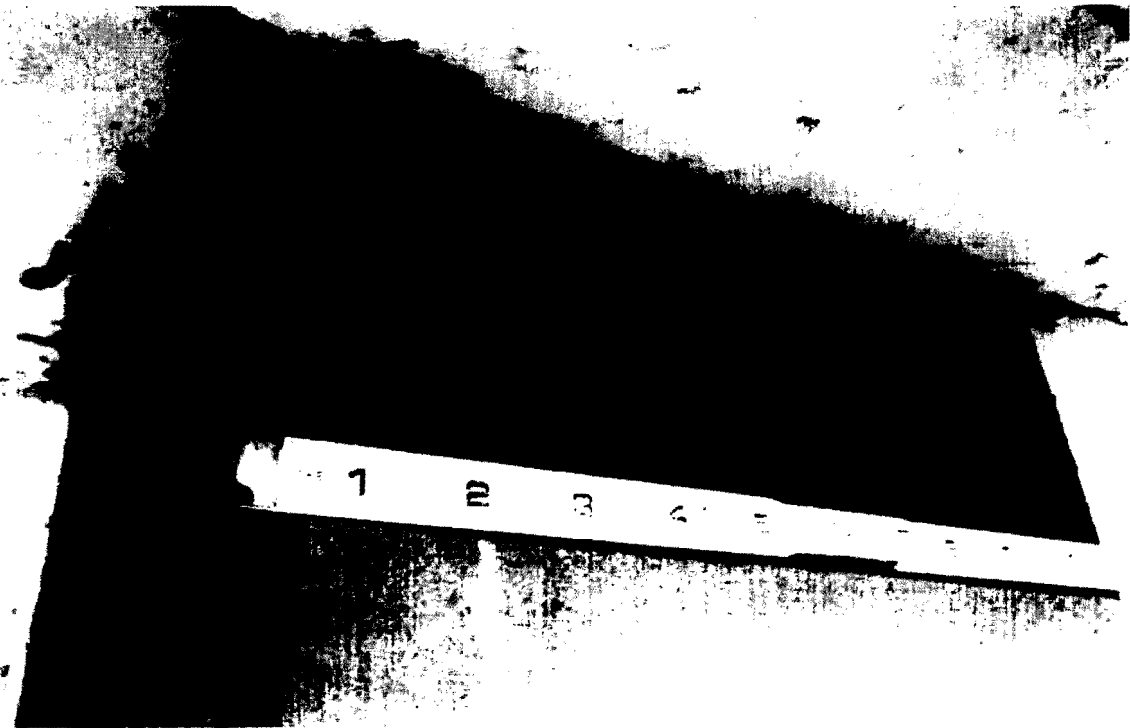


Photo No. 6

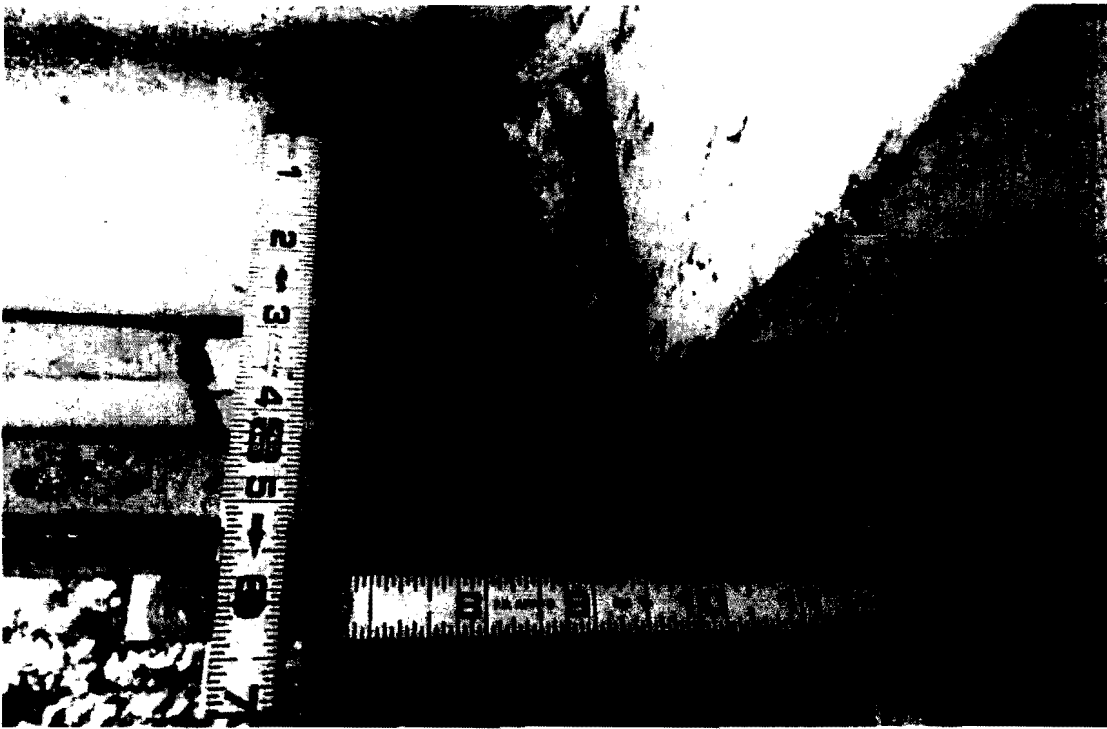


Photo No. 7



Photo No. 8



Photo No. 9

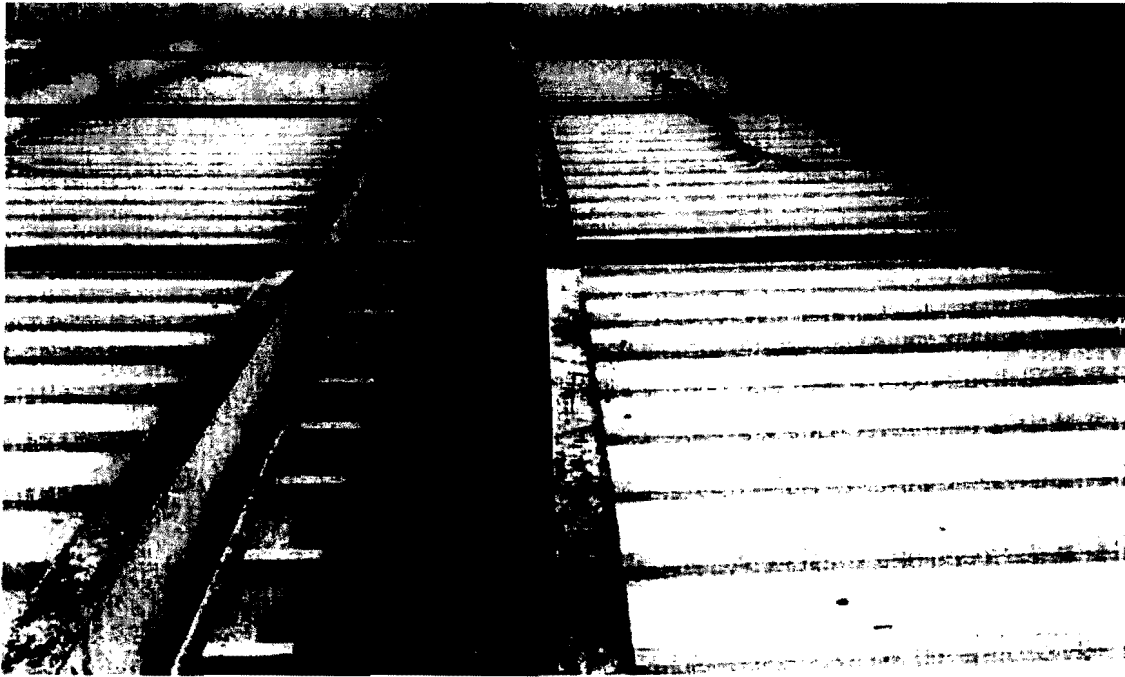


Photo No. 10

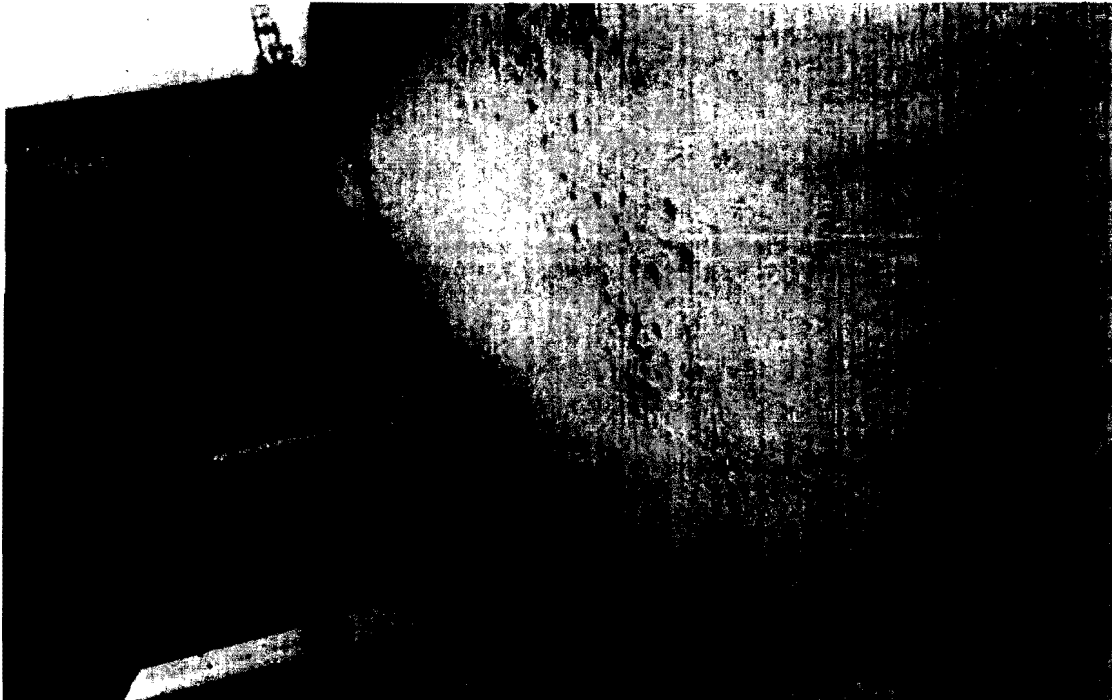


Photo No. 11



Photo No. 12



Photo No. 13



Photo No. 14



Photo No. 15



Photo No. 16

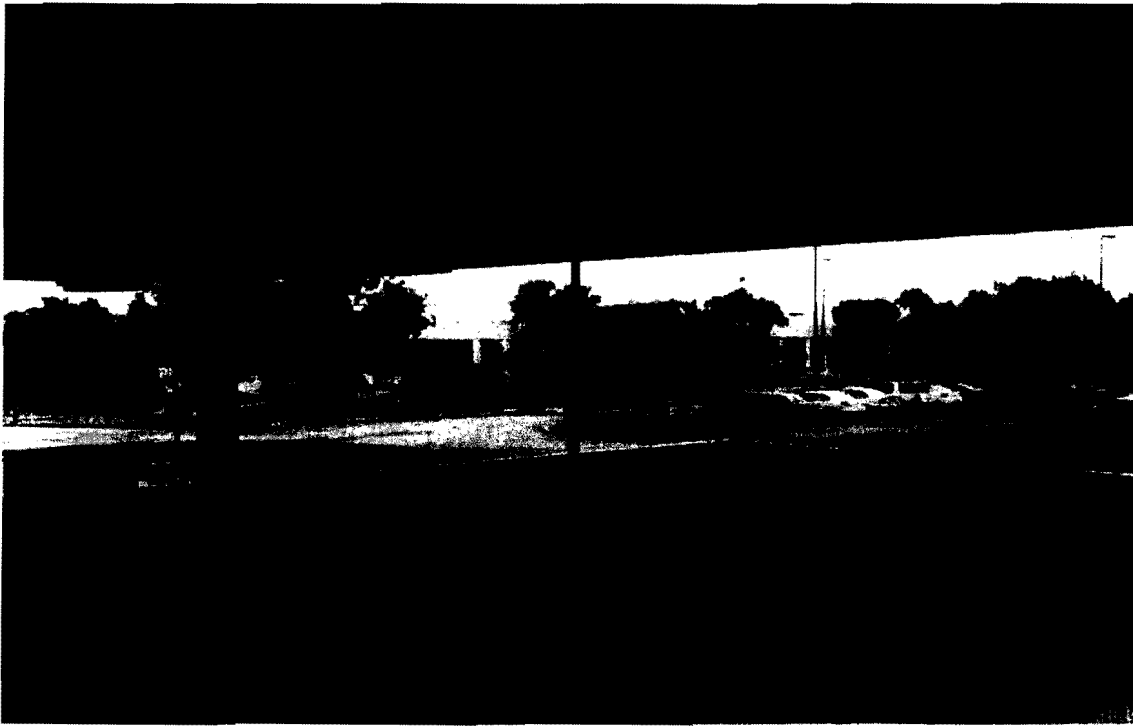


Photo No. 17

6. INSPECTION SUMMARY AND REPAIR RECOMMENDATIONS

Based on the field inspection and the findings contained in the FDOT Structural Inspection of the WPB operations Fuel Canopy dated April 15, 2013 the damage to the existing canopy steel frame structure can be categorized as damage less than substantial structural damage since only minor repairs are required to restore the capacity of the steel members to pre-damage condition.

Two repair details have been prepared to restore the capacity of the steel columns to pre-damage conditions. Refer to Repair Details Nos.1 and 2 in Appendix A.

The canopy roof frame system structural steel shall be cleaned and coated in its entirety as per FDOT Specification Section 561. Repair to the damaged stringer bottom flange shall be performed as per Repair Detail No. 3 in Appendix A.

The roof metal panel ceiling system and fascia panels shall be replaced completely with a similar roof fascia system. Replacing the entire roof system is necessary since partial repairs are not practical. The roof panels, the drainage flumes and fascia panel secondary members are extensively corroded at random locations. Replacement of the existing roof

system shall be completed following the guidelines of Section 611, Reroofing, of the 2010 Florida Building Code (Existing Building).

7. BUILDING CODE CRITERIA FOR THE PROPOSED REPAIRS

The proposed repairs have been prepared considering the requirement of the 2010 Florida Building Code (Existing Building) Section 506.2, Repairs to Damaged Buildings.

According to Section 506.2.1 of the Code, Repairs for Less Than Substantial Structural Damage, the damaged elements shall be permitted to be restored to their pre-damage condition. Therefore, following the Code guidelines the canopy steel frame structure shall be permitted to be restored to its pre-damage condition.

The roof system shall be replaced with a system of similar size, materials and configuration. The installation shall comply with Section 611 of the Code.

8. COST ESTIMATE – REPAIRS ONLY

The following cost estimates have been prepared for structural improvements only. They don't include cost for civil, lighting, mechanical and fueling work, engineering design fees and plans and building permits. Improvements to the existing maintenance building below the canopy are also not included. Repair work includes repairs to existing columns and beams and cleaning and coting existing structural steel. The new roof system includes fascia panels.

COST ESTIMATE - REPAIRS ONLY				
ELEMENT	Quantity	Unit	Cost/Unit	Cost
Column Repairs	2	EA	\$2,000	\$4,000
Beam Repair	1	EA	\$1,000	\$1,000
Clean and Coat Steel	1	LS	\$12,000	\$12,000
Existing Roof Removal	1	EA	\$4,000	\$4,000
New Roof System	1	EA	\$25,400	\$25,400
Mobilization	1	LS	\$4,000	\$4,000
Total Cost				\$50,400
Contingency 15%				\$7,560
Grand Total				\$57,960

9. COST ESTIMATE – CANOPY REPLACEMENT

COST ESTIMATE - REPLACEMENT				
ELEMENT	Quantity	Unit	Cost/Unit	Cost
Structural Steel - Misc.	22,540	LB	2.0	\$45,000
Removal of Existing Structure	1	EA	\$6,000	\$6,000
Class II Concrete	94	LS	\$400	\$37,520
Reinforcing Steel	4,417	EA	\$1.25	\$5,521
New Roof System	1	EA	\$25,400	\$25,400
Mobilization	1	LS	\$6,000	\$6,000
Total Cost				\$125,441
Contingency 15%				\$18,816
Grand Total				\$144,257

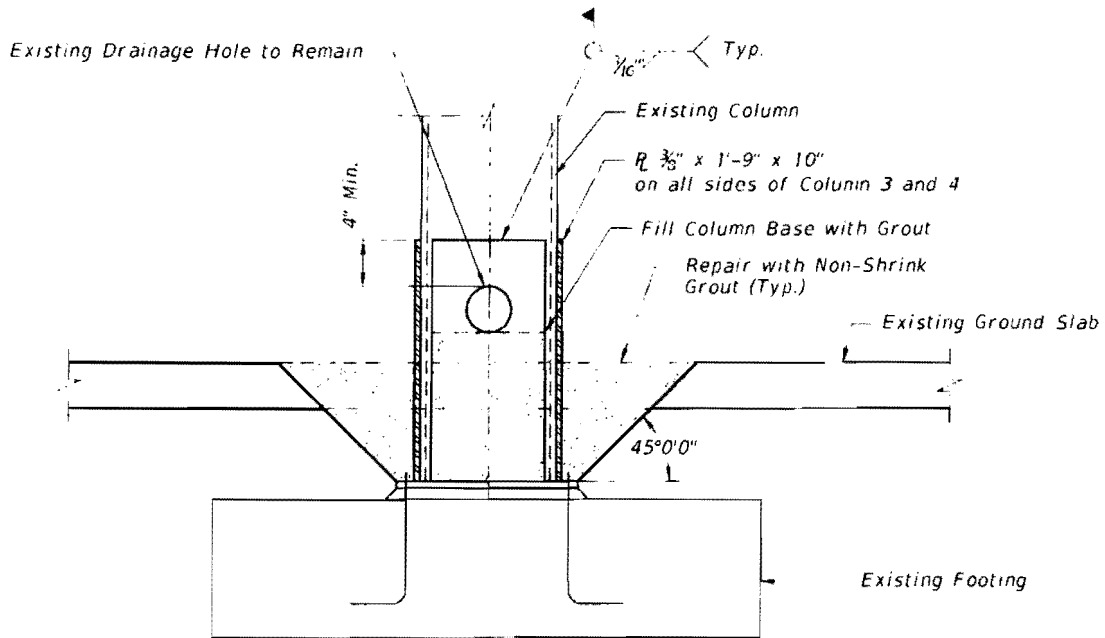
10. COST EVALUATION

Preliminary quantities and estimated probable construction costs have been tabulated in the above tables. The quantities for the replacement option are based on a canopy structure layout using similar steel members and roof panel system, but with larger foundations to account for more severe wind load requirements of the current Florida Building Code. As shown in the tables, the repairs cost are approximately 0.40% of the total replacement cost. The proposed repairs can be easily performed and can also extend the service life of the canopy structure for another 15 to 20 years.

11. CONCLUSION

Repairs to the existing canopy are feasible and cost effective. Based on the above cost estimates, and the actual condition of the canopy structural steel, the existing canopy structure should be repaired using the proposed repair details provided in this report. In addition, the roof system structural steel shall be cleaned and coated to prevent further corrosion. The roof system shall be replaced with a new system of similar size and configuration.

APPENDIX A

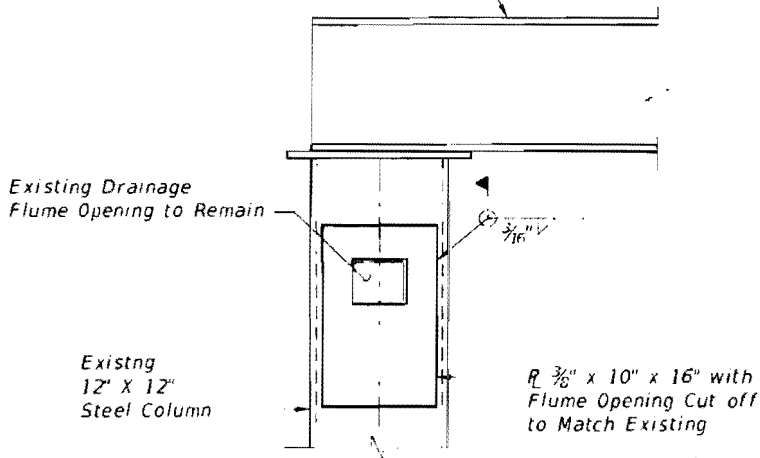


STEEL COLUMN REPAIR DETAIL No.1
(2 Location Required)

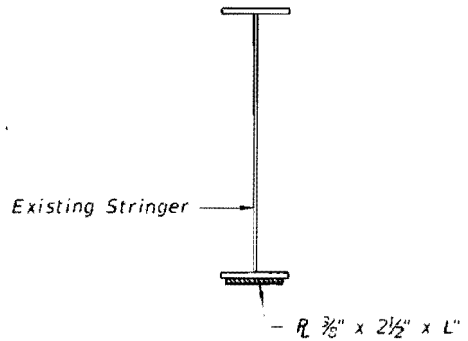
REPAIR PROCEDURE:

1. Saw cut Ground Slab and remove concrete to the limits shown.
2. Clean existing steel column to remove protective paint coating.
3. Weld steel plates as indicated in the repair detail. Provide a drainage cut-out to match the existing drainage hole.
4. Fill bottom of steel column with grout to the limits shown.
5. Paint Column base and repair plates as per the Specifications.
6. Repair Slab Concrete with non-shrink grout.

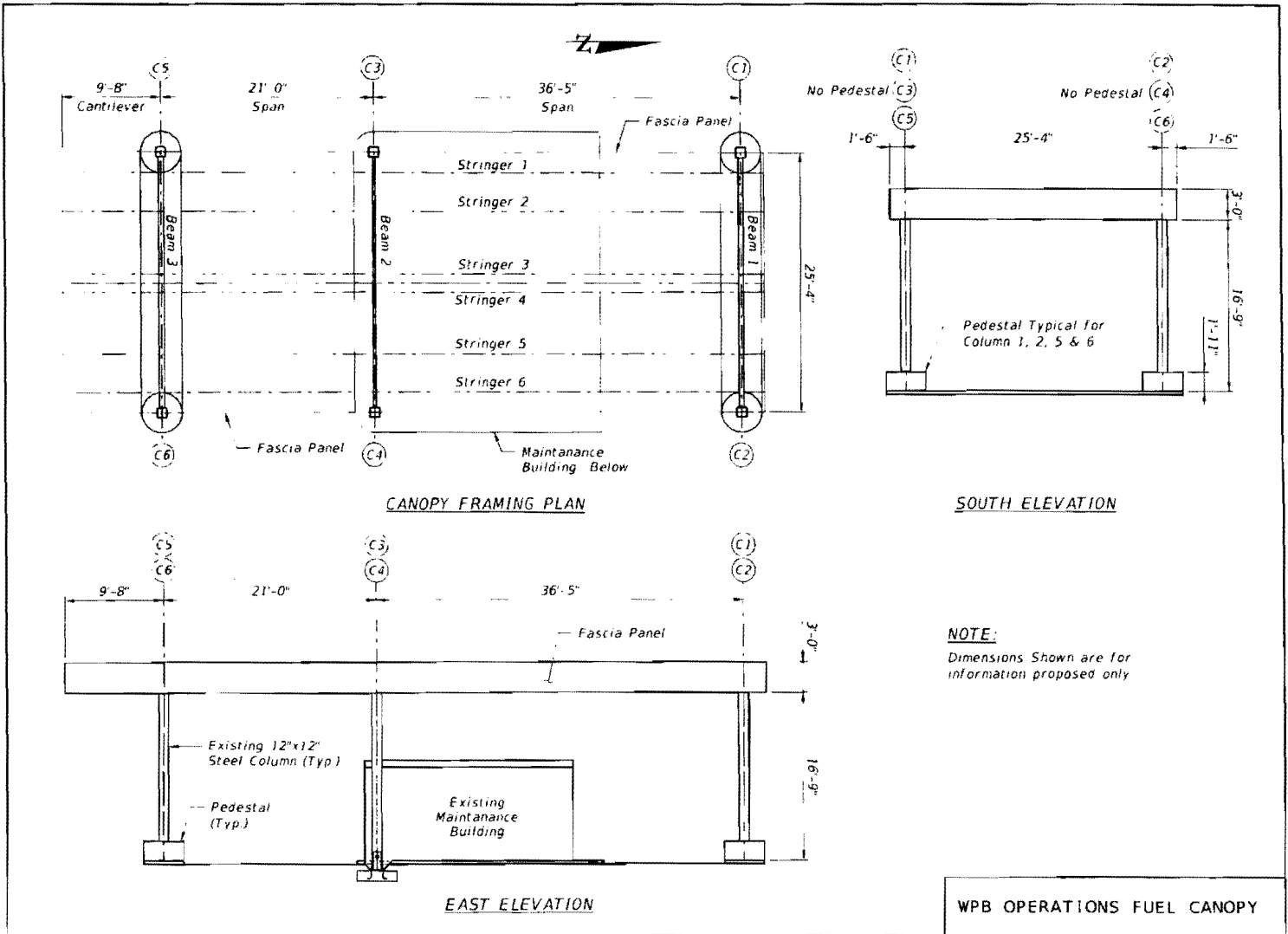
Existing Steel Beam to Remain



REPAIR DETAIL No.2
(6 Repair Locations Required)



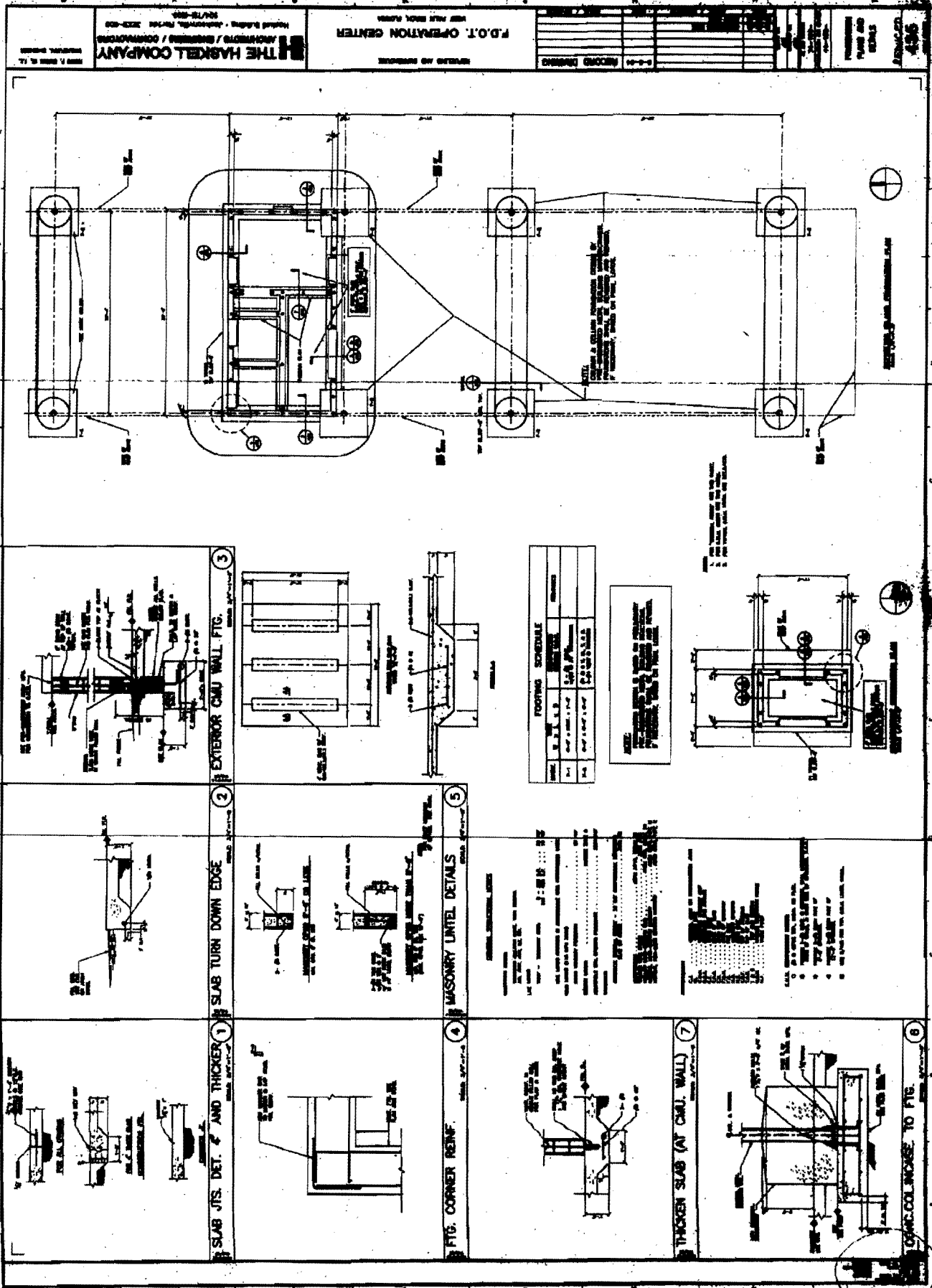
REPAIR DETAIL No.3
(1 Repair Location Required)
L = Length of steel plate. Field verify



NOTE:
 Dimensions Shown are for information proposed only

WPB OPERATIONS FUEL CANOPY

APPENDIX B



APPENDIX C



Florida Department of Transportation

**RICK SCOTT
GOVERNOR**

3400 West Commercial Boulevard
Fort Lauderdale, FL 33309

**ANANTH PRASAD, P.E.
SECRETARY**

MEMORANDUM

DATE: April 15, 2013

TO: Hector Kinda, P.E. Structure & Facilities Engineer/Bridge Inspection; Robert McQuarrie, CBI Bridge Inspections Supervisor.

FROM: Blas Barrero, C.B.I.

COPIES:

SUBJECT: Structural Inspection of the WPB Operations Fuel Canopy.

Attached, please find, a copy of the Structural Inspection of the WPB Operations Fuel Canopy dated 4/15/2013 for your review and distribution as needed.

Sincerely,

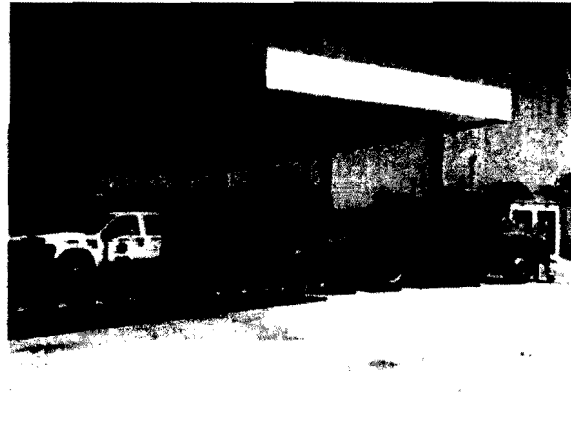
Blas Barrero, C.B.I.

STRUCTURAL INSPECTION OF THE WPB OPERATIONS FUEL CANOPY

As per the request of Robert McQuarrie, Bridge Inspections Supervisor; on March 28, 2013 the FDOT team of Blas Barrero, CBI (Lead) and Russ Coffey, CBI (Assisting) performed a structural inspection of the existing WPB Operations Fuel Canopy with the bucket truck support of the WPB yard.

No structural plans were provided for this inspection. The inspection consisted in visually inspecting the top (roof) steel supporting members and the steel supporting columns.

The following findings are offered as a result of this inspection.

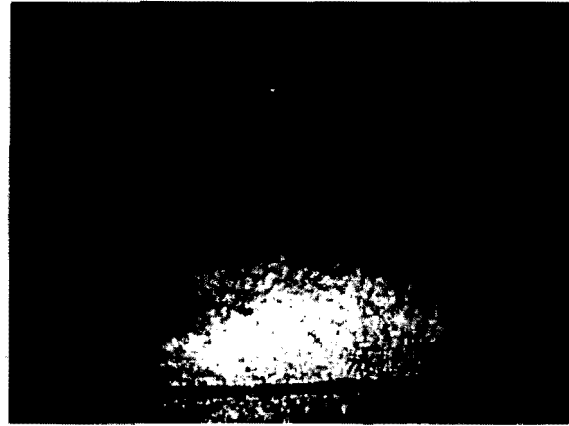
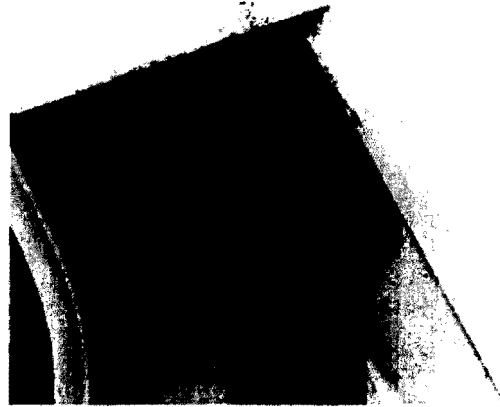


SUBSTRUCTURE:

1. As we approach the fueling station right in front of the northeast corner column an area 5'x3' is covered by steel flaking coming out of an adjacent drainage opening. These corroding flakes are what prompted this inspection and can be seen also and the opposite end of the island.

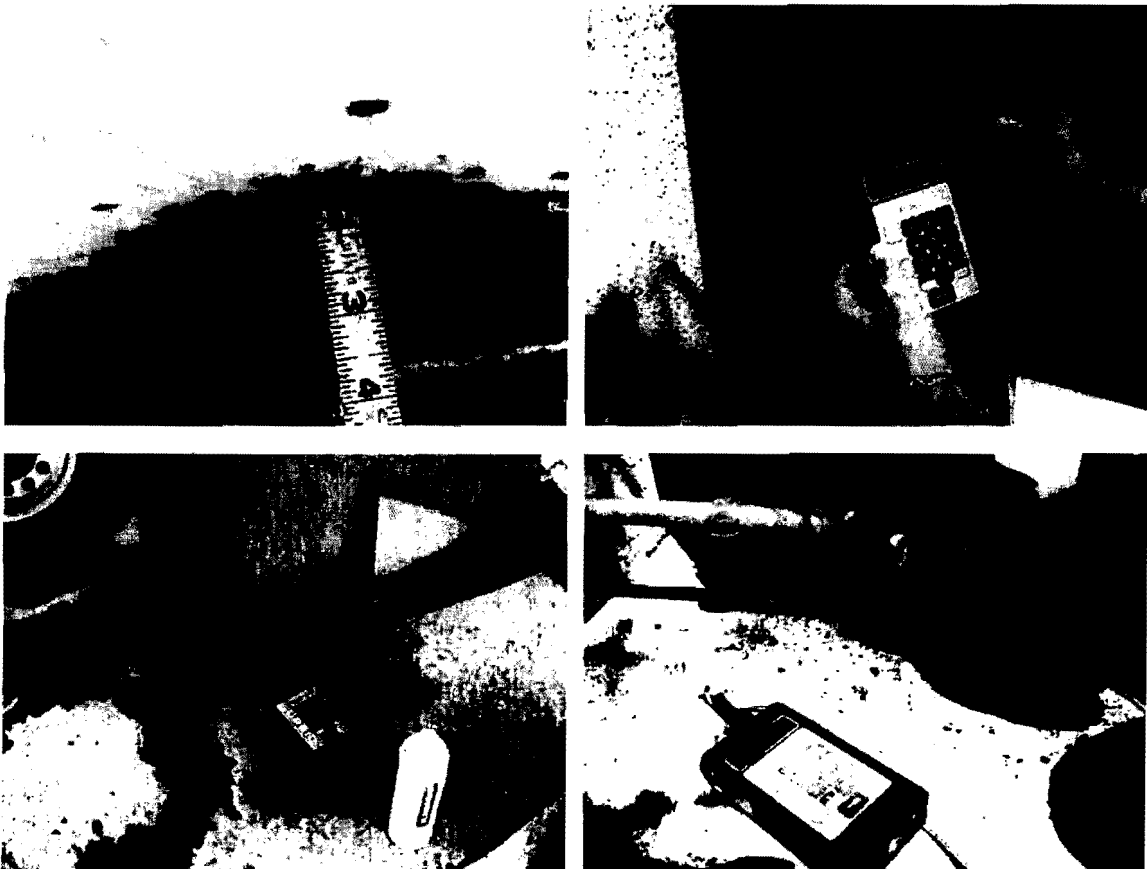


2. The outside of the columns below the canopy exhibit few spots of moderate surface corrosion adjacent to the ceiling panels and drainage flumes, where sealants have been used to stop leakage. The bottom of the columns shows areas of moderate to severe surface corrosion in the form of pitting and flaking. These columns are holding water inside the base as shown in a view through the drainage hole.



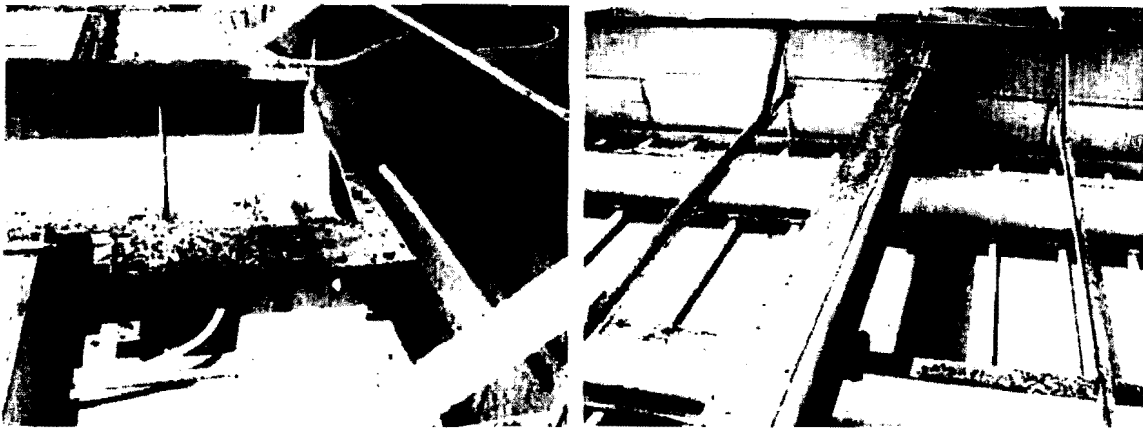
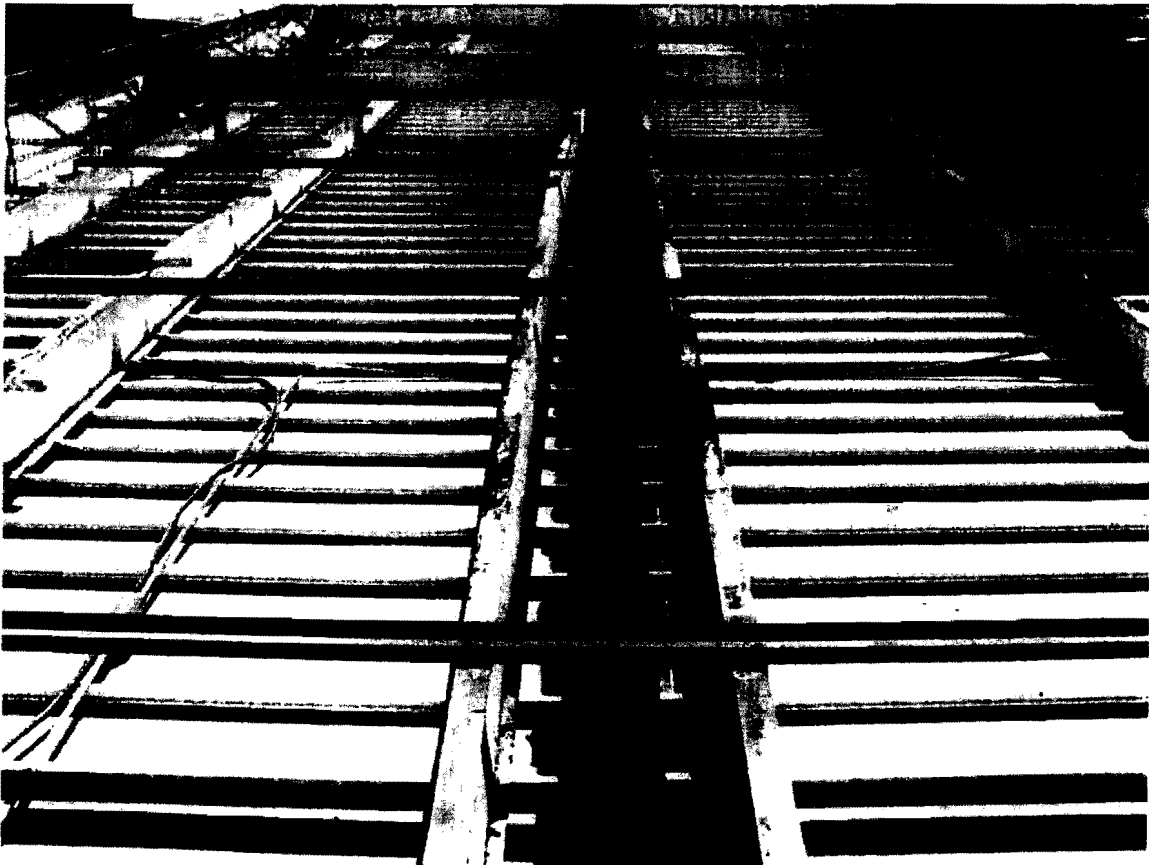
3. The columns were struck with a chipping hammer and the sound of substantial flaking raining down inside was heard. An ultrasound (non-destructive) test was performed to all the columns to determine/estimate their wall thickness at different points. Readings as follows starting left to right and south to north from the southwest column:
- Southwest column readings [.240, .250, .236 & .245]
 - Southeast column readings [.221, .221, .220 & .216]
 - Center Left column readings [.178, .161, 162, & .211]
 - Center Right readings [.235, .225, .230 & .230]
 - Northwest column readings [.207, .207, .206 & .208]
 - Northeast column readings [. 229, .234, .236 & .236]

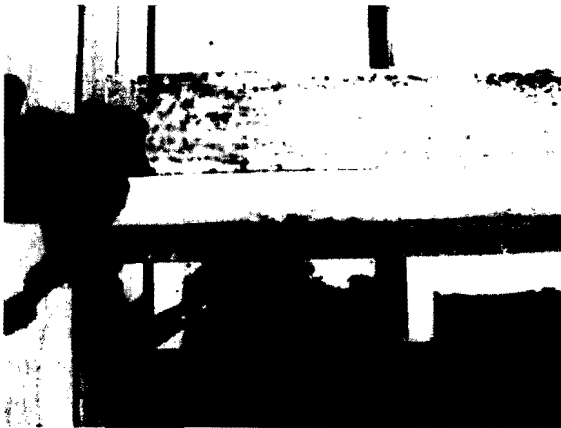
NOTE: An in depth structural review of the columns present conditions may be in order at this time.



4. The outside of the columns above the canopy show signs of minor surface corrosion and moderate surface corrosion exists in the bearing plates.

SUPER STRUCTURE:

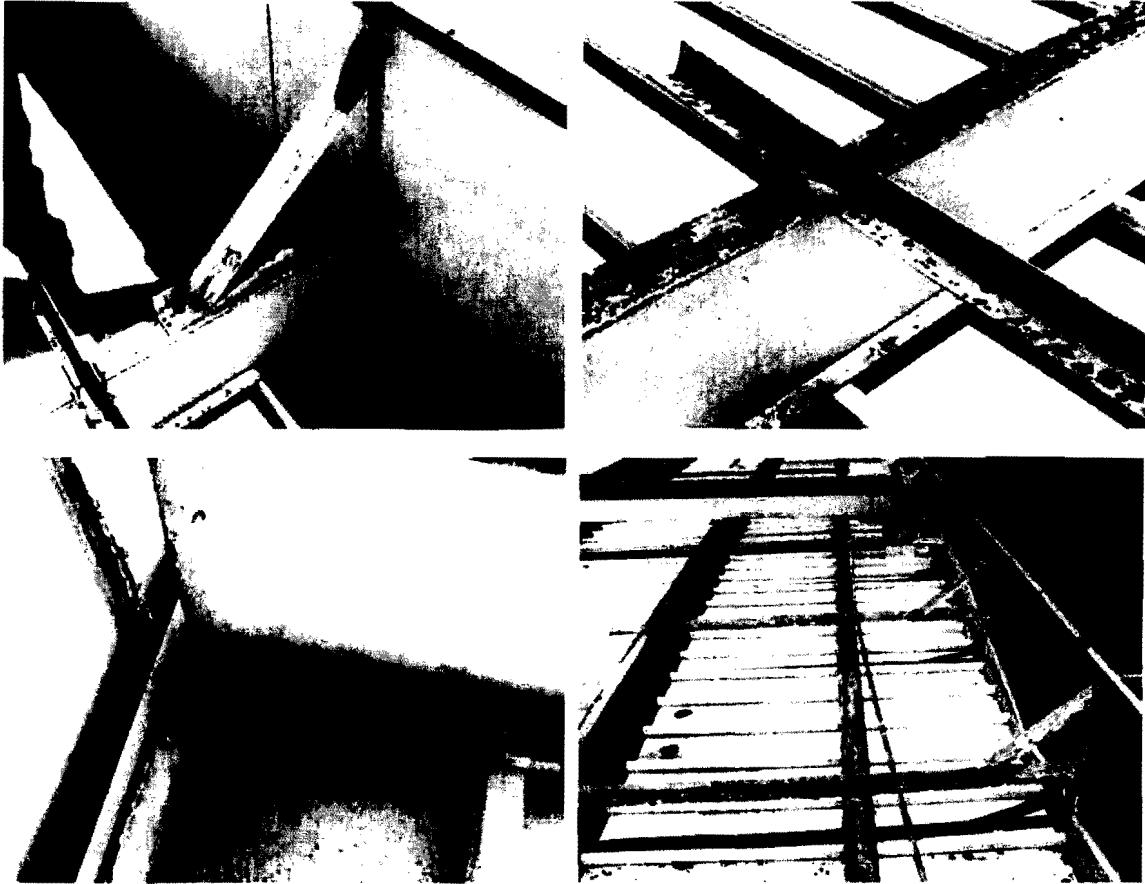




5. The super structure constructed of steel beams supported at the ends by the columns in a transverse direction (west to east) and steel stringers in a longitudinal direction (north to south) attached (hanging) to the bottom flange of the transverse beams. The beams, in general, are exhibiting minor surface corrosion of the web and flanges. The stringers, in general, are showing minor surface corrosion of the web and minor to moderate surface corrosion of the flanges with a localized area of the bottom flange with moderate to heavy surface corrosion in the form of pitting, scaling and section loss in the most severe spots due to the lack of a good protective recoating program of the steel surface.

SECONDARY MEMBERS:

6. The canopy false work (fascia) bracing/framing and ceiling panels supporting members are exhibiting areas of heavy to severe surface corrosion in the form of heavy scaling and section loss, also due to the lack of a good protective recoating program of the steel surface and its resistance to storm winds may have been compromised due to its general condition. Illustrative photos of these deficiencies are offered below.



Blas Barrero, CBI

April 15, 2013

