Building / Site Assessment Report

AFP3 Buildings 001, 002, 118 and 119
Spirit Aerosystems and Navistar Tenant Space
3330 N Mingo Rd
Tulsa, OK 74116

For:

Engineering Services Department
Project No. 170045.2, Amendment No.1

CITY OF Tulsa
A New Kind of Energy.

Attention: Marsha Hinds and Thomas M Chandler
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Tulsa, OK 74103
918-596-9301

Site Assessment Report Prepared by:

CYNTERGY

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Site Assessment Report Issue Date:

09 / 30 / 2019

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Introduction:

The former Air Force Plant 3 facility (identified as Building B001) constructed in the early 1940's as a bomber assembly plant during World War II is presently owned by the City of Tulsa and is used as lease space. The facility is located southeast of the Tulsa International Airport and currently is leased by two main tenants – Spirit Aerospace, a manufacturer of aircraft parts; and Navistar, a bus manufacturer (primarily school buses). The conditions of the lease require that the tenants maintain the facilities as follows:

Spirit's lease states that "Lessee, at its sole expense, shall perform all maintenance, including capital maintenance and repair to the Leased Premises, including all repairs relative to heating, electrical, plumbing and air conditioning systems. Lessee at all times shall keep in a clean and orderly condition and appearance all of the Leased Premises and all of Lessee's fixtures, equipment and personal property which are located thereon. Lessee shall perform mowing of, and snow removal from, the Leased Premises. Lessee shall not commit or suffer to be committed any nuisance on the Leased Premises. Lessee shall conduct its operations in an orderly and proper manner so as not to annoy, disturb, or be offensive to others at the Airport. Lessee, shall take all reasonable measures to keep the sound level of its operations as low as reasonably possible. Lessee shall not permit the accumulation of any rubbish, trash or other waste material. Except in tanks and in the manner approved by appropriate governmental authorities, Lessee shall not store any gasoline or other material likely to give off fumes or gases or any material likely to constitute a fire, safety or security hazard on the Leased Premises.

Navistar's lease states that "Lessee shall perform all repairs, maintenance, and preventive maintenance, including capital maintenance and repair to the Leased Premises which shall include all repairs relative to the structure, roof, heating, electrical, plumbing and air conditioning systems. Lessee at all times shall keep in a clean and orderly condition and appearance all of the Leased Premises and all of the Lessee's fixtures, equipment and personal property which are located thereon. Lessee shall perform moving of, and snow removal from, the Leased Premises. Lessee shall not commit or suffer to be committed any nuisance on the Leased Premises. Lessee shall not permit the accumulation of any rubbish, trash or other waste material. Except in tanks and in the manner approved by appropriate governmental authorities. Lessee shall not store any gasoline or other material likely to give off fumes or gases or any material likely to constitute a fire or security hazard on the Leased Premises.

The purpose of this building assessment is to determine if each tenant is maintaining their portion of the facility in accordance with the corresponding lease agreement.

Executive Summary:

Cyntergy was contracted by the Engineering Services Department of the City of Tulsa to perform this facility assessment. The scope of the assessment includes Building B001, the adjacent Buildings B002, B118 and B119, and the surrounding drives and pavement to these facilities. Refer to the General Location Map and the Site Map below for the assessment area.

Following are narratives from each discipline that performed the visual facility assessments – Civil, Structural, Mechanical/Plumbing, Electrical, Fire Protection, Architectural, Interiors and the Infrared Moisture Roof Surveys conducted by Roof Consultants. The narrative sections are divided into two volumes – Volume 1 for Spirit Aerospace Tenant Space and Volume 2 for the Navistar Tenant Space.

Items that appear to have deferred maintenance issues are paving, storm drainage, and age of mechanical and electrical equipment. Refer to the respective narratives for detailed descriptions of the current conditions of these items.

General Location Map

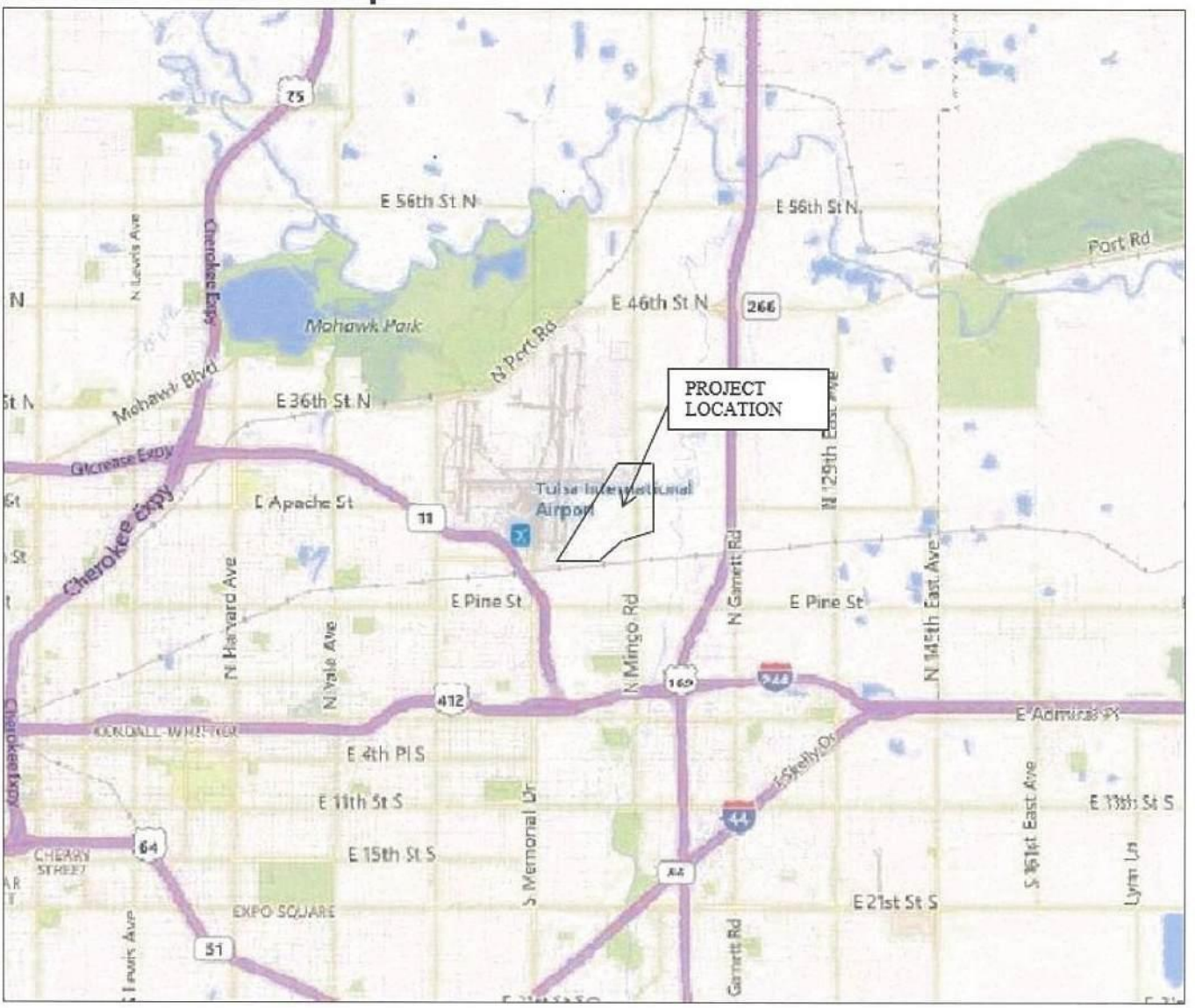
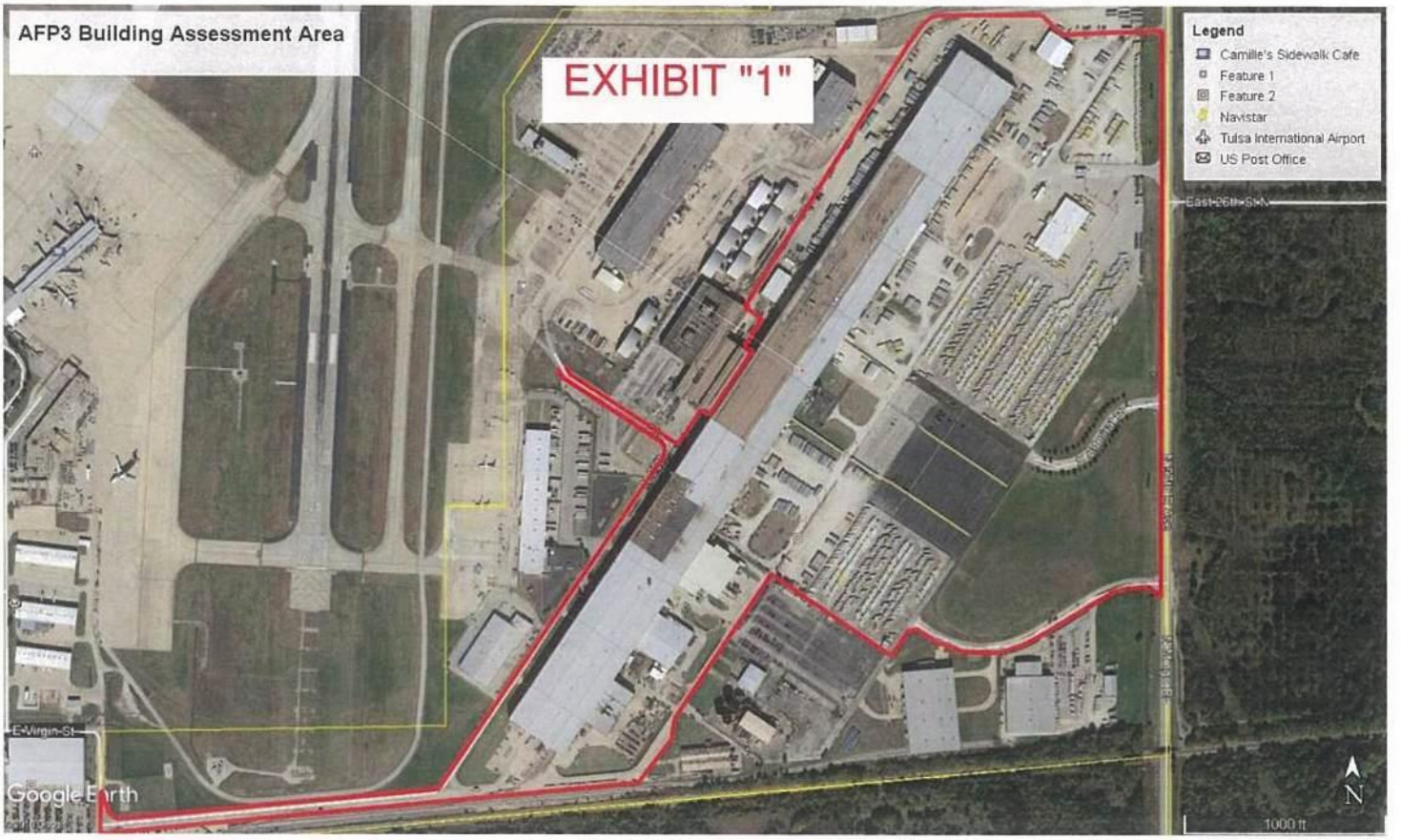


Exhibit 1 – Site Map of the Assessment Area



VOLUME 2

NAVISTAR

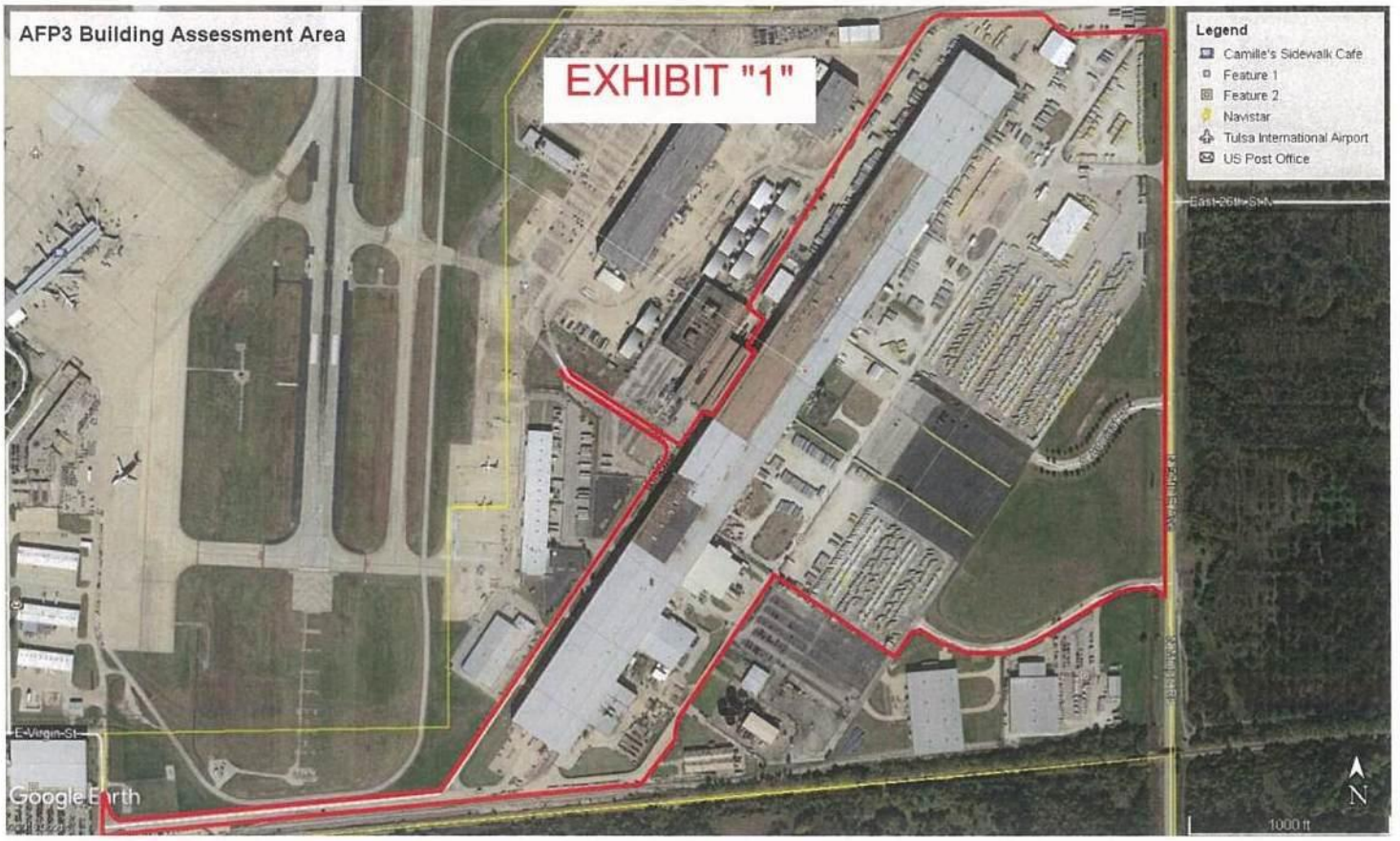
TENANT SPACE

ASSESSMENT REPORT

Navistar Assessment:

Site Orientation Map for Navistar Tenant Space

Exhibit 1 – Site Map of the Assessment Area



NAVISTAR

TENANT SPACE

CIVIL

ASSESSMENT REPORT

Civil Introduction:

The Navistar facility is located east of the Tulsa International Airport on the west side of N. Mingo Road. Refer to photos listed below. The scope of this project was to conduct visual assessments of existing pavement conditions of parking lots, driveways, truck docks, access drives, bollards, light pole bases, curb and gutters, fences, gates, and storm sewer structures for repair and/or replacement. An evaluation of the existing conditions at Navistar facility was conducted on August 19, 2019 and ended on August 24, 2019. The result of this evaluation presented within this report can be used by the City of Tulsa to help understand the existing conditions of the above referenced items.

Civil Project Summary:

The scope of this project was to conduct visual assessments of existing pavement conditions of parking lots, driveways, truck docks, access drives, bollards, light pole bases, curb and gutters, fences, gates, and storm sewer structures for repair and/or replacement. During the visual assessment, we identified signs of deterioration on the surfaces of the pavements. The types, severities, and the amounts of distress present in the pavements during the site assessment are described in the Project Report. No damage, other than ordinary wear and tear, found on fences, gates, light pole bases, bollards and storm sewer structures.

Civil Project Report:

Area 1 South Driveway (N Mingo Rd):

The asphalt pavement at the beginning of driveway on North Mingo Road has high severity reflective cracking, alligator cracking, block cracking, high severity transverse cracking, and high severity longitudinal cracking. The concrete pavement condition consists of surface deterioration, poor ride rating, deteriorated patching, longitudinal cracking, corner cracking, popouts and shattered slabs. From field assessment, it appears to be the original concrete pavement. There are several locations along the center median islands where the curbs are broken. Deteriorated pavement markings such as the yellow diagonal crosshatch, left turn and right turn arrows near Mingo Road need new paint applications. The asphalt pavement from the outer fence line to the main gate at the security check point is still in good condition. No repair needed in this area.

Area 1 Middle Driveway (N Mingo Rd):

The concrete pavement for this driveway is still in good condition but the asphalt pavement appears to have high severity fatigue cracking with spalled interconnected cracks, alligator cracking, potholes and block cracking. There is a visible sign that recent concrete patching was performed on the security check point gate.

Area 1 Closed Driveway (N Mingo Rd):

This driveway appears not to be in service. The concrete pavement condition consists of surface deterioration, spalling, block cracking, transverse cracking and shattered slab. This driveway needs to be reconstructed if used in the future.

Area 1 Parking Lots and Access Road:

The parking lot south of the middle entrance is asphalt pavement and the parking lot north of middle entrance (triangular shape) is concrete pavement. The concrete pavement is still in good condition except some corner cracking near the gate. The asphalt pavement condition consists of potholes (with weeds growing), rutting, alligator cracking, longitudinal and transverse cracking and water ponding due to inadequate pavement slopes. The concrete access road condition consists of surface deterioration, potholes, joint cracking, shattered slabs, deteriorated patching, transverse cracks and numerous broken curbs. A sign of vehicles off-tracking is evident at north intersection.

Area 2 Driveway (N Mingo Rd):

The concrete pavement for this driveway extends all the way to the gate at intersection before it transitions to asphalt pavement. The concrete pavement condition consists of surface deterioration, poor ride rating, longitudinal cracking, corner cracking, shattered slabs, deteriorated patching, and spalling. There are several locations along the center median islands where the curbs are broken. The asphalt pavement condition all the way to the end of the driveway consists of surface deterioration, rutting, block cracking, longitudinal, transverse cracking, and potholes.

Area 2 Parking Lot and Access Road:

The southwest parking lot for this area is gravel and the rest is asphalt. The northeast parking lot was rehabilitated just over two years ago as stated by Mr. Brent Odom and also by the condition and color of the pavement. Based on field assessment, the northeast parking contains potholes, pavement ruts, water ponding, alligator cracking, transverse cracking and longitudinal cracking. It appears that the last rehabilitation that was done on this area was just crack and fog sealing only. The southeast parking lot has surface deterioration and severe block cracking which resulted in tall weeds growing inside the cracks. Also, pavement slopes on the southeast parking lot need to be corrected to avoid water ponding. The access road for this area is concrete pavement. The road has surface deterioration, spalling, shattered concrete patching, transverse cracking, longitudinal cracking, corner cracking, broken slabs, water ponding and broken curbs.

Area 3:

A large portion of the northeast parking lot is gravel and the rest is concrete. The concrete pavement consists of surface deterioration, potholes, corner cracking, broken slabs, spalling, failed concrete and asphalt patching, transverse crack, longitudinal crack, ponding due to clogged trench drains (including in a loading dock area). Also, some of the loading dock walls are cracked or damaged.

Area 4:

A vast majority of this area is either gravel or grass. A small asphalt pavement on the southwest area contains surface deterioration and block cracking. The concrete pavement just outside the building entrance 1A has a visible fatigue cracking. Beside a longitudinal hairline cracks, the southwest concrete pavement is in good condition. The parking area and access road to the main lobby were recently rehabilitated. Only the curbs and gutters need to be

repair. The pavement on the exterior garage (adjacent to the covered pedestrian walkway) is primarily in fair condition. Beside hairline longitudinal and transverse cracks, only a section of concrete slab is broken (in front of the garage) and a portion of the slab west of the garage needs to be repaired due to surface deterioration, corner cracking and spalling. Also, some of the loading docks walls are cracked or damaged.

Navistar Pavement Distresses

Area 1 South Driveway (N Mingo Rd) - Asphalt (Beginning of driveway at N Mingo Rd)

Type of Deterioration	Severity
Reflective Cracking	Severe
Alligator Cracking	Moderate
Block Cracking	Moderate
Transverse Cracking	Severe
Longitudinal Cracking	Severe

Area 1 South Driveway (N Mingo Rd) – Concrete

Type of Deterioration	Severity
Surface Deterioration	Severe
Ride Rating	Poor
Patching	Poor
Longitudinal Cracking	Severe
Corner Cracking	Moderate
Popouts	Severe
Shattered Slabs	Moderate
Broken Curbs	Light
Pavement Markings	Poor

***End of Area 1 South Driveway (N Mingo Rd) – Asphalt is still in good condition. No repair needed.**

Area 1 Middle Driveway (N Mingo Rd.) - Asphalt

Type of Deterioration	Severity
Fatigue Cracking	Severe
Spalled Cracks	Light
Alligator Cracking	Light
Potholes	Moderate
Block Cracking	Severe

Area 1 Closed Driveway (N Mingo Rd)

Type of Deterioration	Severity
Surface Deterioration	Severe
Spalling	Severe
Block Cracking	Severe
Transverse Cracking	Severe
Shattered Slabs	Severe

Area 1 Parking Lot (Triangular Shape) - Concrete

Type of Deterioration	Severity
Corner Cracking (Asphalt)	Light

Area 1 Access Road - Concrete

Type of Deterioration	Severity
Surface Deterioration	Light
Potholes	Moderate
Joint Cracking	Light
Shattered Slabs	Moderate
Patching	Poor
Traverse Cracking	Light
Broken Curbs	Moderate

Area 1 Parking Lot - Asphalt

Type of Deterioration	Severity
Potholes	Severe
Rutting	Severe
Alligator Cracking	Moderate
Longitudinal Cracking	Severe
Transverse Cracking	Severe
Water Ponding	Moderate
Broken Curbs	Moderate
Pavement Markings	Poor

Area 2 Driveway (N Mingo Rd) – Asphalt

Type of Deterioration	Severity
Surface Deterioration	Moderate
Rutting	Severe
Block Cracking	Moderate
Longitudinal Cracking	Severe
Transverse Cracking	Severe
Potholes	Light

Area 2 Driveway (N Mingo Rd) - Concrete

Type of Deterioration	Severity
Surface Deterioration	Moderate
Ride Rating	Moderate
Longitudinal Cracking	Moderate
Corner Cracking	Moderate
Shattered Slabs	Moderate
Patching	Poor
Spalling	Moderate
Broken Curbs	Light

Area 2 – Northeast Parking Lot – Asphalt

Type of Deterioration	Severity
Potholes	Moderate
Rutting	Moderate
Water Ponding	Moderate
Alligator Cracking	Moderate
Transverse Cracking	Light
Longitudinal Cracking	Light

Area 2 Southeast Parking Lot - Asphalt

Type of Deterioration	Severity
Surface Deterioration	Light
Block Cracking	Severe
Pavement Slopes	Moderate

Area 3

Type of Deterioration	Severity
Surface Deterioration	Light
Potholes	Moderate
Corner Cracking	Severe
Broken Slabs	Moderate
Spalling	Severe
Patching	Poor
Transverse Crack	Moderate
Longitudinal Crack	Moderate
Clogged Drains	Severe
Loading Dock Walls	Moderate

Area 2 Access Road - Concrete

Type of Deterioration	Severity
Surface Deterioration	Moderate
Spalling	Moderate
Concrete Pathing	Severe
Transverse Cracking	Light
Longitudinal Cracking	Light
Corner Cracking	Moderate
Broken Slabs	Light
Water Ponding	Moderate
Broken Curbs	Severe

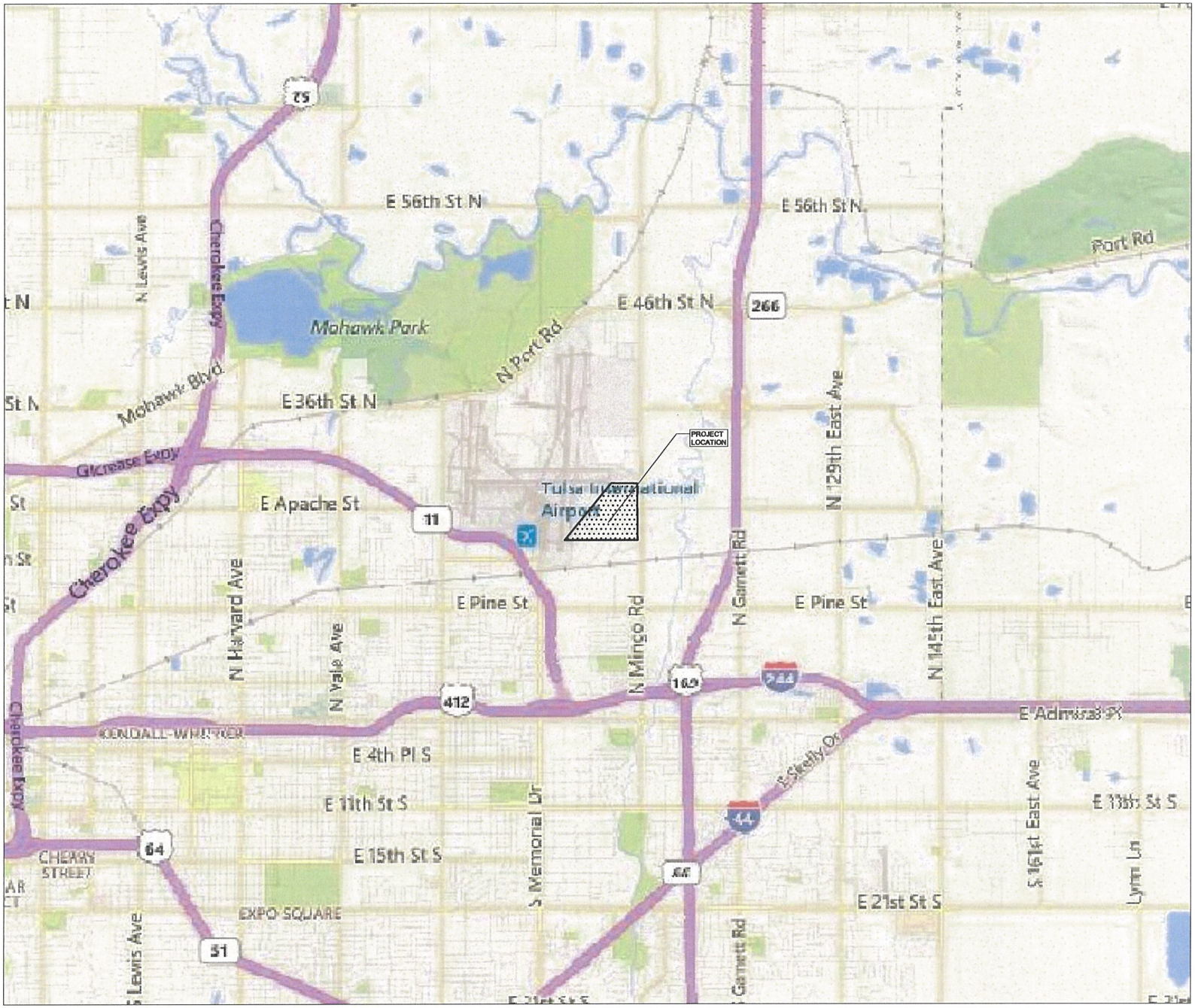
Area 4 (Concrete Pavement)

Type of Deterioration	Severity
Longitudinal Crack	Light
Transverse Crack	Light
Broken Slab	Moderate
Surface Deterioration	Light
Corner Cracking	Moderate
Spalling	Light
Loading Dock Walls	Moderate

Area 4 (Asphalt Pavement)

Type of Deterioration	Severity
Surface Deterioration	Severe
Block Cracking	Moderate
Curbs and Gutters	Light

Site Photos:



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EXPIRES 6/30/2019
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ENGINEER OF RECORD

AFP3 Building (Navistar) Assessment

CITY OF TULSA
2222 N MINGO RD., TULSA, OK 74116

ISSUE / REVISION

	MO/YYYY	REVISION

ISSUE DATE:
PROJECT NO: M00083.0101

CHECKED BY: WCM
DRAWN BY: XXX

SHEET NAME
GENERAL LOCATION MAP

SHEET NUMBER

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AFP3 Building (Spirit) Assessment
CITY OF TULSA
2302 N MINGO RD, TULSA, OK, 74116

NO	DD/YYYY	REVISION

ISSUE DATE:
PROJECT NO: M00083.0101

CHECKED BY: WCM
DRAWN BY: XXX

SHEET NAME
OVERALL PROJECT LAYOUT

SHEET NUMBER
CSP01

Area 1 Middle Driveway (N Mingo Rd) - Asphalt

Area 1 Middle Driveway (N Mingo Rd) - Asphalt

Area 1 North Driveway (N Mingo Rd)

Area 1 Parking Lot – Concrete (Triangular Shape)

Area 1 Parking Lot - Asphalt

Area 1 Parking Lot - Asphalt

Area 1 Parking Lot - Asphalt

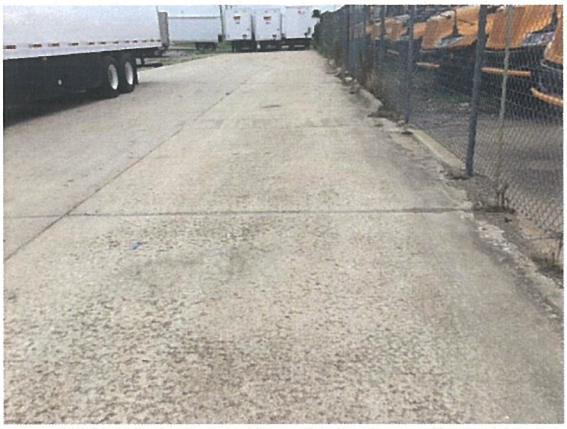
Area 1 Parking Lot - Asphalt

Area 1 Parking Lot - Asphalt

Area 1 Parking Lot - Asphalt

Area 1 Access Road – Asphalt and Concrete

Area 1 Parking Lot - Asphalt



Area 1 Access Road - Concrete

Area 1 Access Road - Concrete

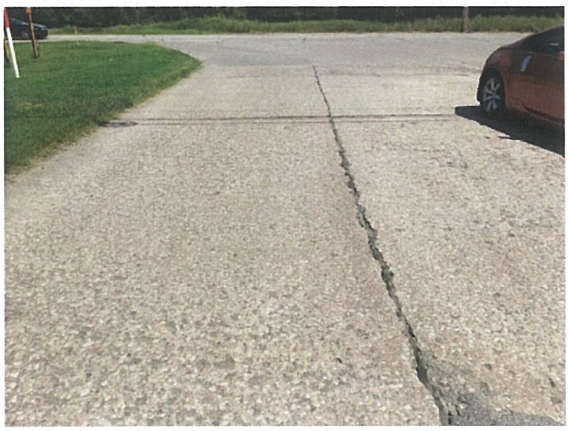
Area 1 Access Road - Concrete

Area 1 South Driveway (N Mingo Rd) – Asphalt Beginning of Driveway

Area 1 South Driveway (N Mingo Rd) - Concrete

Area 1 South Driveway (N Mingo Rd) - Concrete

Area 1 South Driveway (N Mingo Rd) – Concrete (End of Driveway new Asphalt Pavement)



Area 2 Driveway (N Mingo Rd) - Concrete

Area 2 Driveway (N Mingo Rd) - Concrete

Area 2 Driveway (N Mingo Rd) - Concrete

Area 2 Driveway (N Mingo Rd) – Asphalt and Concrete

Area 2 – Access Road Concrete

Area 2 – Access Road Concrete and Asphalt Parking Lot

Area 2 – Asphalt Parking Lot

Area 2– – Asphalt Parking Lot and Asphalt Access Road

Area 2 – Asphalt Parking Lot

Area 2 – Asphalt Parking Lot

Area 2 – Asphalt Parking Lot

Area 2 – Asphalt Parking Lot

Area 2 – Asphalt Parking Lot

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 3 - Concrete

Area 4 – Concrete and Asphalt

Area 4 - Concrete

Area 4 - Concrete

NAVISTAR

TENANT SPACE

STRUCTURAL

ASSESSMENT REPORT

Structural Assessment:

General Description:

As noted in Section 1, building B001 is a 320 feet wide x 4000 feet long facility consisting of steel clear span roof trusses spanning over the 200 foot wide high bay with similar steel trusses spanning over the 120 foot wide lower bay. There are two mezzanine levels within the low bay area including a catwalk system at the elevation of the bottom chord of the roof trusses. The length of the building consists of 160 – 25 foot wide bays starting at the south end at column row 1 and ending at the north end at column row 161.The Navistar tenant space occupies the northern 3/4 of B001 from the demising wall at column row 44 to the north end wall at column row 161.

Observations – B001

1. Distress was found in the concrete curb at the access stair to the 2nd Level Mezzanine near column line 88. Refer to Photo S1. Although it does not appear to affect the structural system, loose fragments of the slab could present hazard to occupants below.

2. Floor flatness was checked with a large steel sphere. Locations observed flat were mezzanine 3 near column line 88F, ground floor near column 104 F, mezzanine 2 near column line 148, ground floor near crack in floor near column line 188M, ground floor between heavy storage racks between column lines 131 and 132 east of grid M (refer to Photo S2), ground floor between grids 136M and 137M, ground floor at cracks in floor between grids 140M and 141M (refer to Photo S3) and between 141M and 142M, ground floor near grid 145M and ground floor between grids 155M and 156M. A 3 foot long depression was found in the slab near grid 150M.

3. The Freight Elevators in the Navistar tenant space are not in working order. Currently the elevators are being used as additional storage areas. Refer to Photo S4.

4. There are plastic sheets suspended from the roof framing for the purpose of catch leaks from the roof it appears. Refer to Photo 5. Much of the roof has been replaced so these may be left over rain screens in areas that have been reroofed. Refer to the attached roof inspection report by Roof Consultants. No water was observed in these sheeted areas.

5. The base of the perimeter CMU wall was damaged between column lines 125 and 126 along grid M. Refer to Photo S6.

6. The grout at the base of the column a grid 126M is in disrepair. Refer to Photo S7.

7. There are sections of the slab that have numerous cracks. Some have been routed and filled (refer to Photo S8), others have not (refer to Photo S9). From the flatness check with a steel sphere the cracks do not appear due to slab heave because the area near the crack is relatively flat.

8. The threshold at the exterior OH door between grids 124M and 125M is badly deteriorated. Refer to Photo S10.

9. An overhead door between grids 91M and 92M showed signs of distress and appeared inoperable. Refer to Photos S11 and S12. Another OH door between grids 108M and 109M appeared damaged.

10. There were several sections of damaged stone cap and exterior brick veneer on the exterior base wall below the metal side. Refer to Photos S13 and S14 respectively. There were also rusty sections of the metal siding above the exterior stone cap (refer also to Photo S14).

Site Photos:

S2

S4

S1

S3

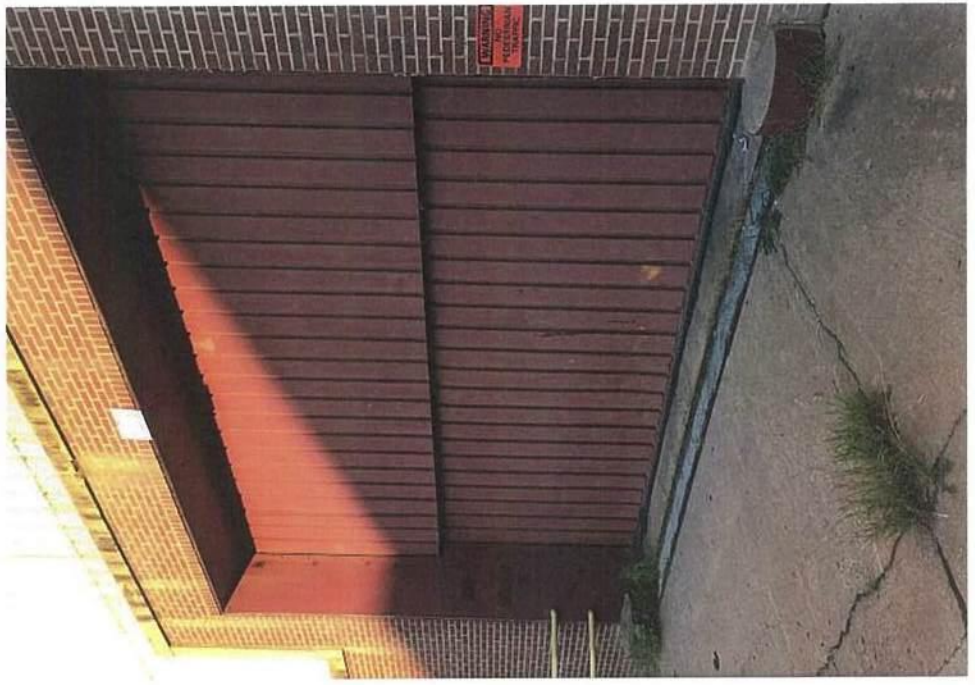
S6

S8

S5

S7

S10



S12

S9

S11

S14

S13

NAVISTAR

TENANT SPACE

MECHANICAL / PLUMBING

ASSESSMENT REPORT

Mechanical Project Summary:

The majority of the Navistar tenant space is not conditioned. It is ventilated by exhaust fans and make-up air units (MAUs). The make-up air units are gas-fired and provide heat during the winter. Some degree of comfort cooling is provided in the larger shop areas by a multitude of large high-velocity low-speed (HVLS) fans. Most of the mezzanine areas are cooled, and some are heated. Heating and cooling for the mezzanine areas are provided by two (2) hydronic air-handling units (AHU) and a large number of small, low-maintenance packaged DX equipment, including dozens of residential-style window units. The HVAC systems date from various decades and are in varying states of repair, ranging from brand new equipment to decades-old window units. Although virtually all equipment was observed to be operational, staff working in the mezzanine complained of unsatisfactory comfort conditions in their offices, and the less recently remodel portions of the mezzanine were warmer at the time of the site visit.

Mechanical Detailed Description and Assessment:

A. BUILDING 001 - ASSESSMENT

1. Exhaust Fans:

Per Navistar staff, the Navistar portion of Building 001 has over 150 exhaust fans high up at the connection from the higher roof level to the lower roof level (Photo 1). Only 50 fans can be run at one time without creating building pressurization issues. The fans are installed and operate in banks of four, and they differ in age and state of repair. Several fans were observed to possess damaged back-draft dampers (Photo 2), and some fans were observed to be inoperable. Invasive inspection and testing would be required to ascertain how many of the 150 exhaust fans are not operational. A detailed survey of the state of the exhaust fans is recommended. One downblast exhaust fan was noted on the roof; it was not operating (Photo 3). A small downblast exhaust fan was also noted on the lobby roof.

2. Make-Up Air Units:

Unconditioned make-up air is provided by twenty (20) gas-fired MAUs installed on raised platforms throughout the shop (Photos 4, 5). The MAUs provide heating in the winter. Of the six inspected, five were operating and one was locked out and tagged out (Photo 6). The age of the units is unclear, but they appear to be about 20 years old, which is near or exceeding their expected median service life. It is recommended that the decomissioned unit be repaired.

3. Air-Handling Units:

The northernmost mezzanine is served by two (2) hydronic AHUs (Photos 7, 8). Only one was observed to be operating. The age of the units is unclear but they appear to be 25 years old or more, which is at or greater than the median expected service life of their coils and motors. It was necessary to traverse an abandoned area strewn with debris in order to approach the AHUs, and spider-webs indicated that this area is not often accessed. The operating AHU exhibited significant condensation (Photo 9). It is recommended that the leaving-air temperature be adjusted or the AHU and ductwork be better insulated. Like the Spirit Aerosystems side of the Building 001, the Navistar side possesses several of the large hydronic AHUs original to the building, but unlike Spirit they are not in service. Navistar staff indicated that there is no intention to put them in service, due to a fear of potential asbestos insulation in some part of the AHUs or air-distribution system. Cyntergy did

not perform invasive inspection to ascertain how the original AHUs or original ductwork are insulated.

4. Air-Cooled Chiller:
The AHUs are provided with chilled water by a brand new air-cooled chiller (Photo 10). It was operating at the time of the site visit.

5. Packaged Rooftop Air Handling Units:
The lobby area was served primarily by four (4) packaged rooftop air handling units (RTUs) in varying states of age and repair (Photos 11, 12, 13). The age of the RTUs was unclear but they appeared to be between 10 and 20 years old, putting them at or near their median expected service life of 15 years. Some were operating at the time of the site visit.

6. Split-System DX Equipment:
The lobby area was served by several pieces of split-DX type equipment, most of which was brand new (Photos 14, 15). Three out of the four units appeared to be for computer rooms, and the fourth appeared to be a traditional residential-style split system. The brand new equipment was operating at the time of the site visit.

7. Hydronic Pumps:
Chilled water for the hydronic AHUs is circulated by two small in-line pumps (Photo 16). They appeared to be 10 or more years old, which is the median service life expectancy of this type of pump. It appeared the pumps had not been touched in some time.

8. Condensate Receiver and Pumps:
A condensate receiver and associated condensate pumps for the hydronic AHUs were observed on-site, and did not appear to be in working condition.

9. Hydronic Piping and Insulation:
The amount of exterior hydronic piping was minimal but in excellent condition. The interior hydronic piping in the AHU mechanical room was dirty but generally appeared to be in adequate condition. Condensation on the insulation was observed in some areas, primarily near the pumps (Photo 16). This condensation was accompanied by evidence of local corrosion and microbiological growth. It is recommended that the insufficient insulation be repaired and the microbiological growth be removed.

10. Packaged Air Conditioners:
Packaged air conditioners are installed in several locations throughout the mezzanines (Photo 17) and are ducted to the specific spaces they serve. Their ages were unclear and variable, and a brand new unit was observed to be stored and ready for potential installation. Navistar staff indicated that the new packaged unit was being added because the current units were not sufficient to meet their needs.

11. Window Units:
The mezzanines were dotted with dozens of residential style window units (Photos 18, 19, 20, 21) ranging from brand new to decades-old. It is unclear how many units were still in operation. Because these units are relatively expensive to repair, it is recommended simply to replace them as they break.

12. Restroom Ventilation Fans: Restrooms on the first floor were equipped with ventilation fans (Photo 22) that introduce large quanitites of air from the shop into the restroom. It is unclear why this is done. The restrooms are also connected to exhaust ductwork (Photo 23), though no functioning restroom exhaust fans were observed. The fan serving the restroom near the intersection of Column F and Column 74 exhibited a loud squealing noise at the time of the site visit.

13. Dock-Heaters and Unit Heaters:
The shop floor is equipped with a multitude of gas-fired dock-heaters (Photo 24) and unit-heaters (Photo 25) all throughout the building near exterior doors. They vary in age from what appears to be brand new to what appears to be 20 years old or more. The expected median service life of gas-fired unit heaters is 13 years. Without invasive system inspection is is unclear how many units are operational, but none were observed to be in a severe condition.

14. Gas Piping:
Where interior gas piping was accessible it appeared to in an adequate condition, but a great deal of pipe was mounted too high for its condition to be assessed. Exterior gas piping appeared to be in good condition (Photo 26). It is recommended that the unpainted portions of the gas entry piping be painted to prevent corrosion.

15. Storm Drains and Storm Drain Piping:
Interior storm drain piping appeared to be in adequate condition. Most roof drains appeared to be in adequate condition but several exhibited partial clogging and ponding (Photos 27, 28). Its recommended that a thorough walk of the roof be performed and clogged roof drains be unclogged or replaced.

16. Plumbing Piping and Insulation:
Domestic water piping appeared to date from different years depending on location. The condition of observed piping appeared to be adequate (Photo 29).

17. Plumbing Fixtures:
Standard plumbing fixtures include lavatory sinks (Photo 30), water closets (Photo 31), urinals (Photo 32), electric water coolers (Photo 33, 34), and large wash sinks (Photo 35). In general the fixtures were observed to operate satisfactorily, with a few exceptions:

- The large wash sink at the intersection of Column F and Column 137 was not served with warm water.
- Some of the water closets in the men's restroom at the intersection of Column F and Column 137 were not functional at the time of the site visit; it is recommended that they be repaired.
- One water closet in the men's restroom on the mezzanine at the intersection of Column F and Column 158 was observed be blocked off, presumably due to inoperation. It is recommended that it be repaired.
- The lavatory sinks in the men's restroom on the mezzanine at the intersection of Column F and Column 158 did not appear to be provided with hot water.

Abandoned plumbing fixtures were observed in some mezzanine areas (Photos 36, 37). It is unclear to what extent these are operable or how dry-trap issues are currently prevented in these areas.

The only emergency plumbing fixtures present were combined shower/eye-wash stations located periodically throughout the facility (Photo 38). An inspection tag for an emergency shower/eye-wash station indicated that inspection takes place roughly once per month.

18. Water Heaters:
Electric tank-type water heaters (Photos 39, and 40) were observed to serve the first floor mezzanine restrooms and wash areas. They appeared to vary in age from brand new to 15 years, which is near or greater than the median life expectancy of this type of water heater.

19. Ductwork:
Ductwork was observed to be in various states of age depending on the location in the building. The southern end of the space includes ductwork original to the building (Photo 41) and its insulation appears to be in poor condition. It is not clear if this ductwork is in service. Unless it is in service, it is recommended that this ductwork remain undisturbed. The more northern areas of the facilty include progressively new ductwork. In occupied mezzanine areas, uninsulated round duct has been added in an attempt to get more airfow into individual offices (Photo 42). Navistar staff indicated that this was insuficient and comfort conditions are not consistently maintained.

Site Photos:

Photo #1

Photo #2

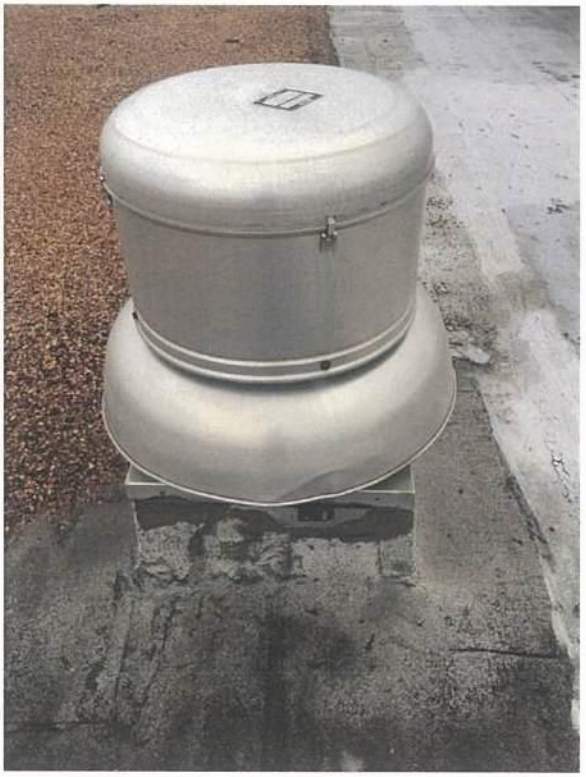


Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photo #10

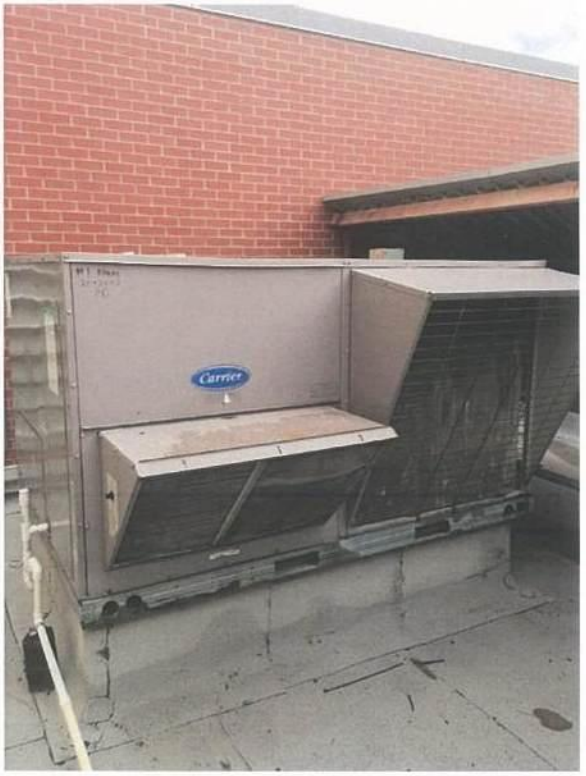


Photo #11

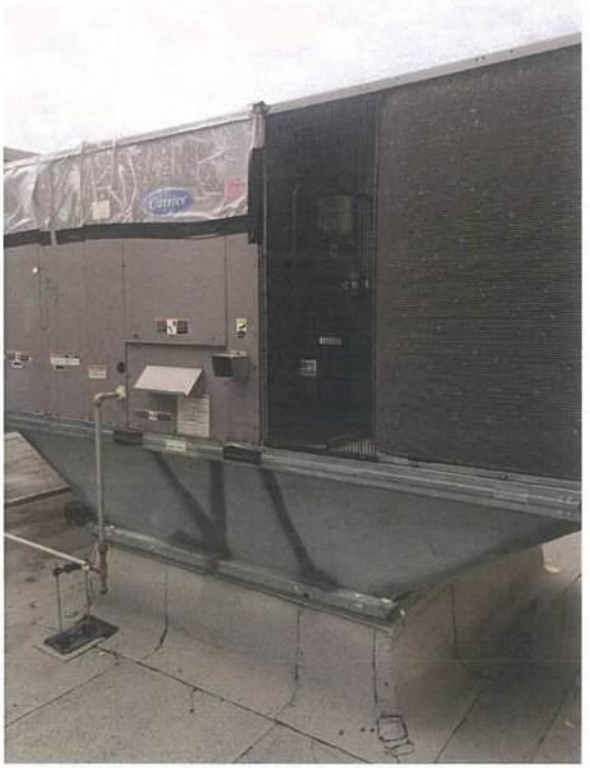


Photo #12

Photo #13

Photo #14

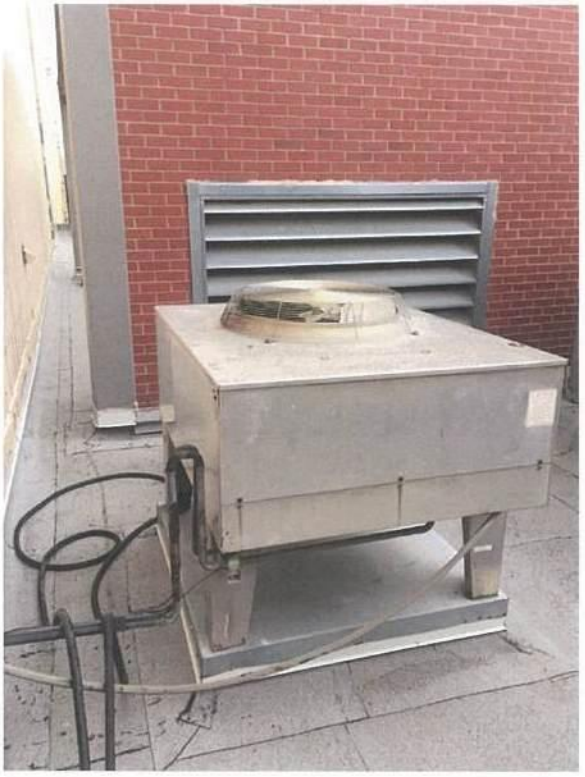


Photo #15

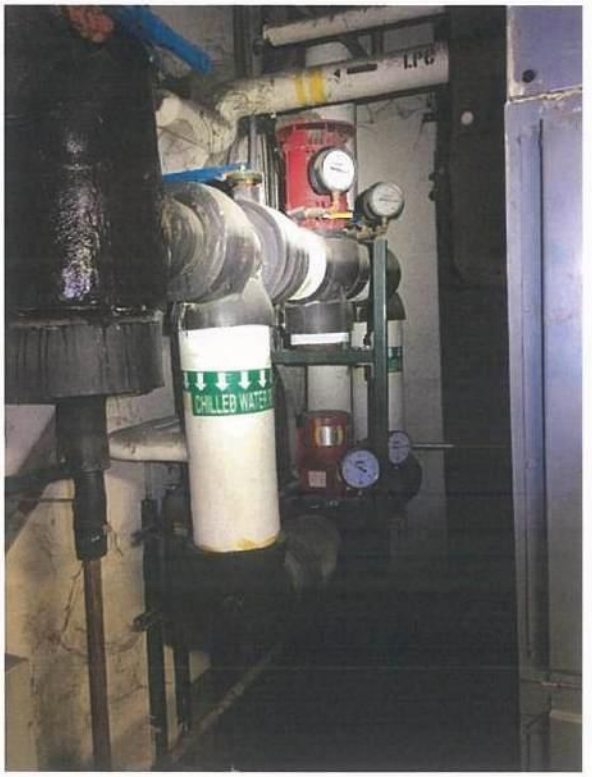


Photo #16

Photo #17

Photo #18

Photo #19

Photo #20

Photo #21

Photo #22

Photo #23

Photo #24

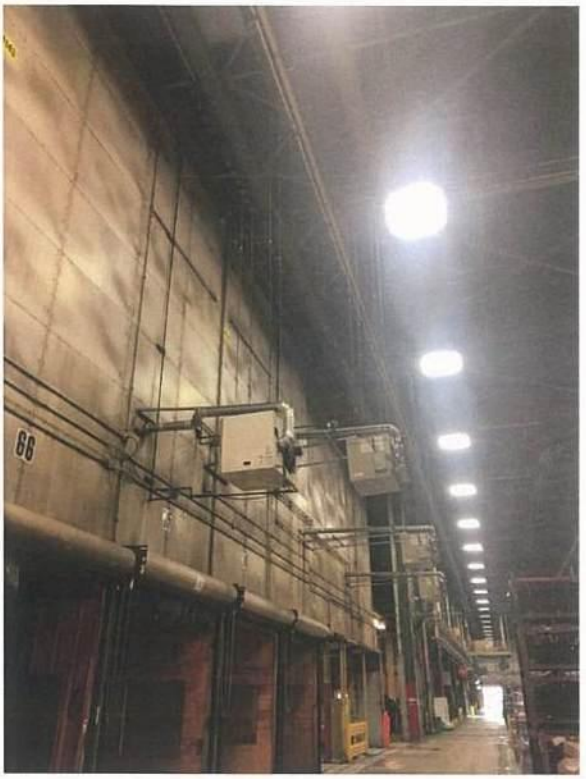


Photo #25

Photo #26

Photo #27

Photo #28

Photo #29

Photo #30

Photo #31

Photo #32

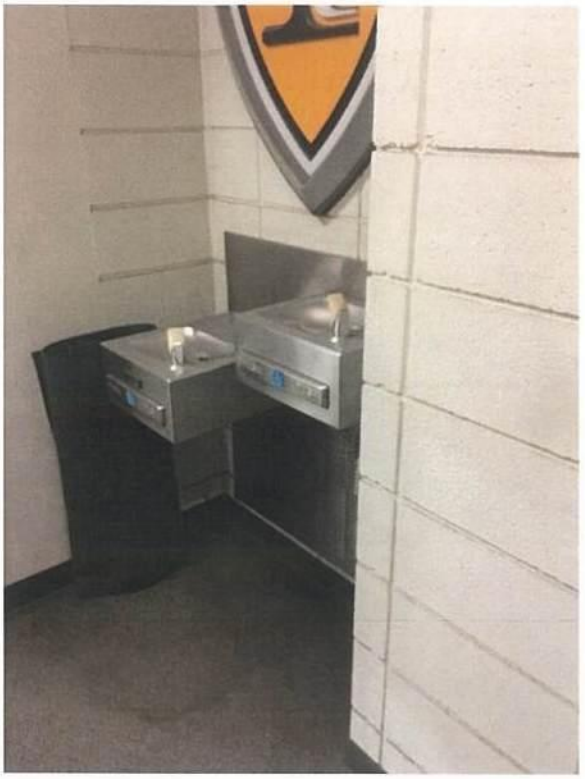


Photo #33

Photo #34

Photo #35

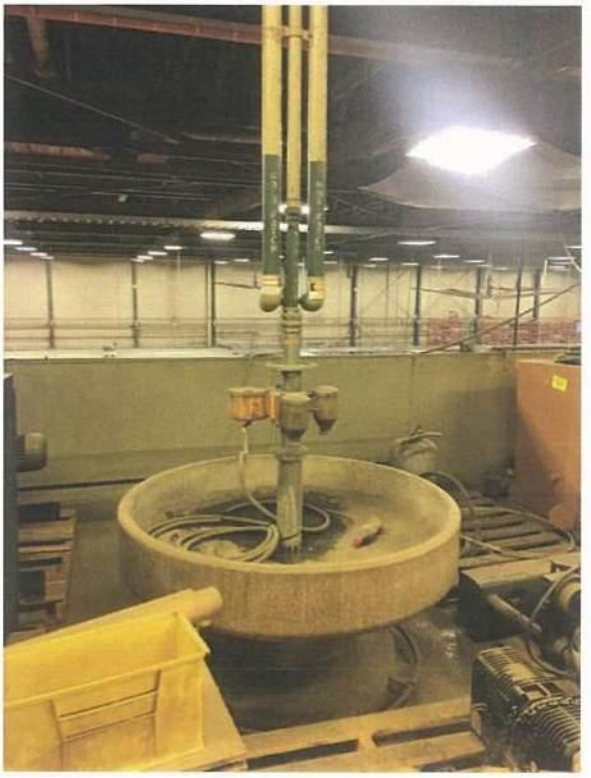


Photo #36

Photo #37

Photo #38

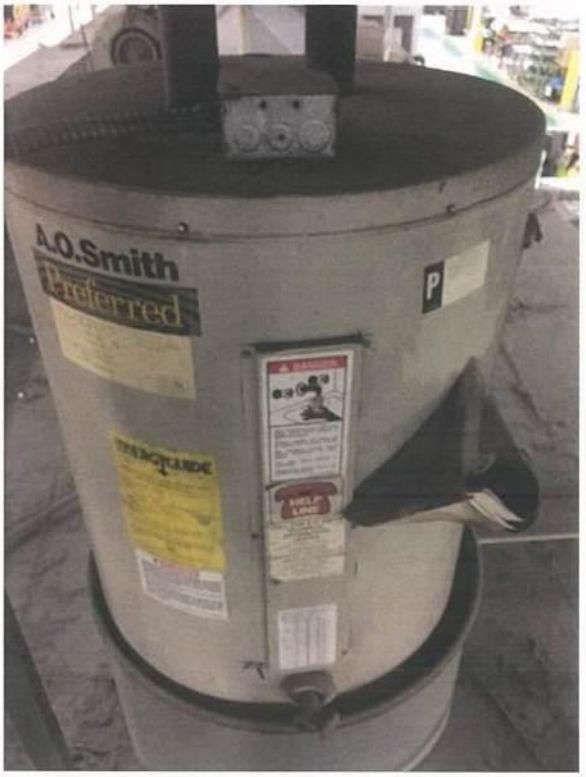


Photo #39

Photo #40

Photo #41

Photo #42

NAVISTAR

TENANT SPACE

ELECTRICAL

ASSESSMENT REPORT

Electrical Systems - Overview

Generally, the observed lighting and electrical distribution systems appear to be operating properly. Although a fairly significant portion of the distribution system is outdated.

The facility operates on a medium voltage 4160 Volt system served by Public Service Company of Oklahoma (PSO). PSO has two 13,200V-4160V pad mount transformers which then feed a main switchgear located inside the facility. The main switchgear then feeds unit substations located throughout the facility which step down the voltage from 4160V to 480Y/277V. 480/277V distribution equipment distributes 480V to miscellaneous large loads and to 480/277V panelboards throughout the plant. These 480/277V panelboards serve 480V circuits in the adjacent areas as well as transformers to further step the voltage from 480-208Y/120V. The 208Y/120V panelboards serve circuits in the adjacent areas.

The plant was constructed in several phases beginning in the 1940's and the electrical distribution systems that were observed vary in age. Some of the distribution equipment is original 1940's, while the majority has been replaced up to the present.

The estimated median useful life for the some of the distribution equipment has been exceeded or will be exceeded within the next few years. However, the equipment appears to be operating properly at the time of the observations. Estimated median life of equipment has many variables including: maintenance, environment (corrosive, heat/cold, dust, moisture, etc.), loading, etc. References to estimated median life in this report are general and do not include the detailed analysis as recommended by organizations such as IEEE.

The majority of the exterior lighting appears to be fairly old HID fixtures. The exterior lighting is controlled by photocells, although at least one of the photocells was not operating at the time of the visit. The interior lighting is primarily fluorescent. The majority of the manufacturing area lighting is controlled by a contactor time clock system. The majority of the interior light fixtures in the manufacturing area are operating.

Electrical Systems Description and Assessment:

A. Electrical Distribution (4160V Medium Voltage)

1. An analysis and report of the medium voltage system and unit substations was done in 2017 by another consultant (Ghafari). Therefore, this report will not discuss the medium voltage system. The only updates to the 2017 report are that substations TD-5, TD-7, and TD-8 and their associated medium voltage feeders are being replaced in current project.

B. Electrical Distribution (480/277 and 208/120 Volt)

1. The 480V switchboards on the secondary of the 4160-480Y/277V transformers in the substations distribute power to 480/277V panelboards as well as other 480V loads throughout the plant.

2. In the manufacturing areas there are typically groups of 277/480V panelboards, 480-208Y/120V transformers, and 120/208V panelboards at the perimeter walls and along the center mezzanine column line for general distribution of branch circuits. In multiple locations along the columns, panelboards have sustained damage from forklift traffic.

    a) Panelboards that have received damage should be replaced. In an effort to limit damage in the future bollards should be installed if not already. Distribution equipment should be relocated if bollards do not provide adequate protection.

3. There were no surge protection devices (i.e. transient voltage surge suppressor) observed in the facility.

    a) To increase power quality, it is recommended that tiered surge protection devices be provided at the 480V distribution panelboards and the first panelboard on the secondary of the 480-208Y/120V transformers.

4. Posted arc-flash warning labels were not observed on the equipment.

    a) It is recommended that an arc-flash analysis performed and arc flash labels be installed on distribution equipment. As the system is modified the arc flash analysis should be updated.

5. The distribution equipment observed is a primarily Square D, with some Cutler Hammer. In general, panelboards, switchboards, and motor control centers have a median useful life of about 20-25 years. Low voltage transformers are 25-30 years. Depending on the manufacturer and model, some equipment may no longer have parts available.

    a) It is recommended to replace equipment that has exceeded the median life. Navistar prefers Square D brand for new equipment. Standardizing to one brand could make maintenance easier.

6. Feeder and branch circuit conductors are installed in both conduit and cable tray.

    a) It is recommended as equipment is replaced, to evaluate the condition of the conductors and replace as needed.

C. Standby Generator/ATS/Distribution

1. A 150kW, 0.80 power factor, 480/277 volt, 3-phase natural gas emergency generator is installed outside to serve egress lighting. The automatic transfer switch is installed immediately inside the building, with life safety panelboards located on select transformer decks. It appears the distribution is installed so that the egress lights only operate when the generator is operating.

    a) It is recommended to consider revising the generator life safety distribution to simplify and provide a fully coordinated system. This would increase the reliability.

2. Service information on the generator shows the generator is tested weekly. The generator and ATS were installed within the past year. Pending proper installation, environmental conditions, operations, loading, maintenance, etc. the median life for generators is approximately 20-25 years. A remote annunciator panel is installed adjacent to the ATS.

    a) It is recommended to relocate or add another annunciator panel located in a staffed area where building personal can monitor the generator status.

3. A 40kW, 0.80 power factor, 480/277 volt, 3-phase natural gas standby generator is installed outside to serve the data center. The automatic transfer switch is installed in the office area electrical room, with IT panelboards located in the same electrical room and data center. These panels serve the data center UPSs, and CRAC units.

4. Service information on the generator shows the generator is tested weekly. The generator and ATS were installed within the past couple years. Pending proper installation, environmental conditions, operations, loading, maintenance, etc. the median life for generators is approximately 20-25 years.

D. Lighting

1. Exterior building lighting is primarily HID High Pressure Sodium, and is in need of repair and or replacement. HID flood lights are installed on the building with HID wall packs above exterior doors and truck docks. Some wall packs have been replaced with LED. Several fixtures are not aimed correctly and not secured properly.

2. Exterior parking lot lighting is HID high pressure sodium. A separate pad mount transformer and distribution panel serves the parking lot lighting.

    a) To improve energy efficiency, light fixtures could be replaced with LED.

3. Exterior lighting is controlled by photocells. Approximately half the lights were operating during bright daylight.

    a) The lighting control system should be repaired or replaced. Astronomic time clocks should be considered instead of photocells where lighting is not required from dusk to dawn.

4. Exterior egress lighting was not observed.

    a) Code required egress lighting powered from a battery or generator source should be provided.

5. Office lighting in the mezzanine consisted of recessed 2x4 fluorescent acrylic air troffers. The office space on the ground level consists of suspended linear indirect fixtures, 2x2 fluorescent parabolics, some recessed downlights and decorative lighting. Utility areas in the mezzanine use fluorescent strip fixtures.

a) To improve energy efficiency, light fixtures could be replaced with LED and an automatic lighting control system be added.

6. The manufacturing area utilizes 12 lamp T8 high bay fluorescent fixtures. The original 8' fluorescent fixtures have been abandoned in place. The tenant has installed task lighting in places for their processes. Task lighting was not assessed in this report.

   a) To improve energy efficiency, light fixtures could be replaced with LED.

7. The manufacturing area lighting is controlled by a contactor and time clock system. Lighting circuits are fed from fused panelboards located along the catwalk. Override switches are located along the center mezzanine column line.

   a) For energy efficiency lighting controls such as occupancy sensors with dimming can be implemented with LED lights.

8. Select fixtures are connected to the generator power distribution system. These fixtures only operate when the generator is running. Operation of these fixtures could not be verified. Exit signs are installed at exterior doors, however in locations the signs are blocked by equipment

   a) It is recommended that the operation of exit and emergency fixtures be tested. Additional exit signage should be added to meet building code.

E. Electrical Miscellaneous

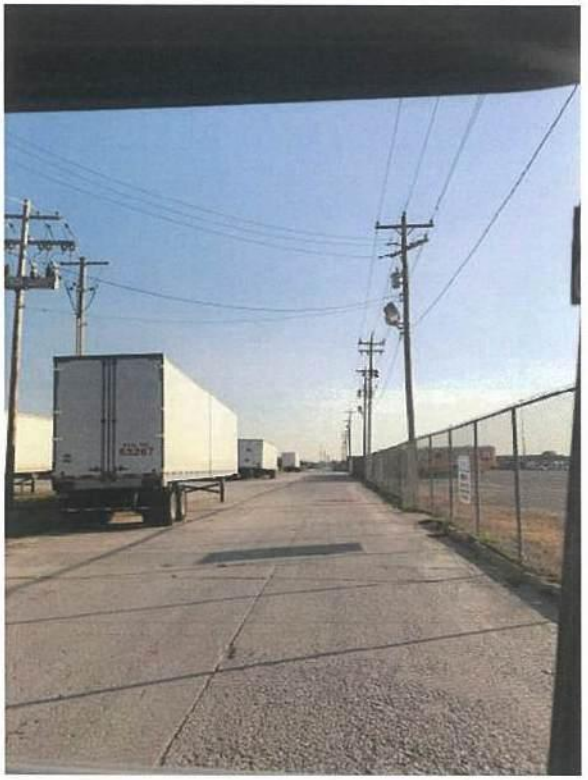
1. In multiple locations, working space in front of panels is obstructed by objected being stored.

2. Airfield obstruction lighting is installed on the west side of the building. Operation could not be verified at the time of the observation.

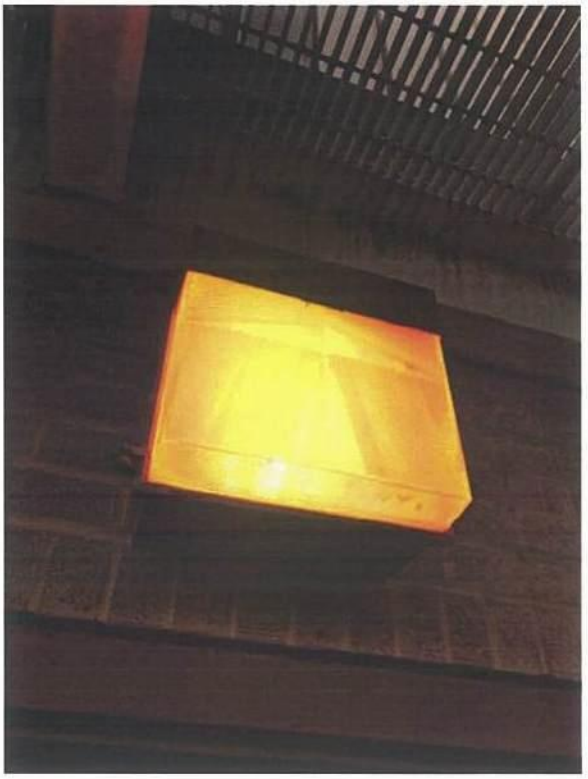
3. Preventive maintenance such as thermal scans and proper torqueing has not been performed within the last several years.

   a) It is recommended that proper torquering be performed and thermal scanning be performed to identify potential connections and equipment which may fail.

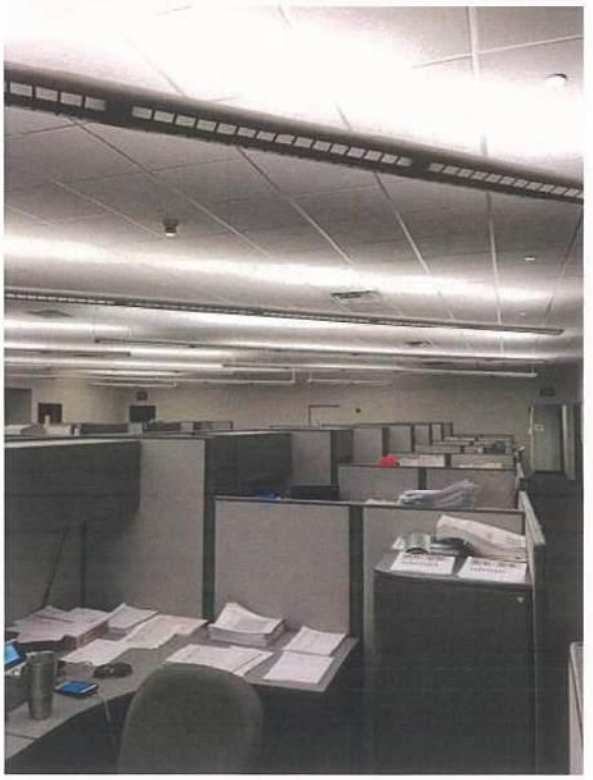
Site Photos:



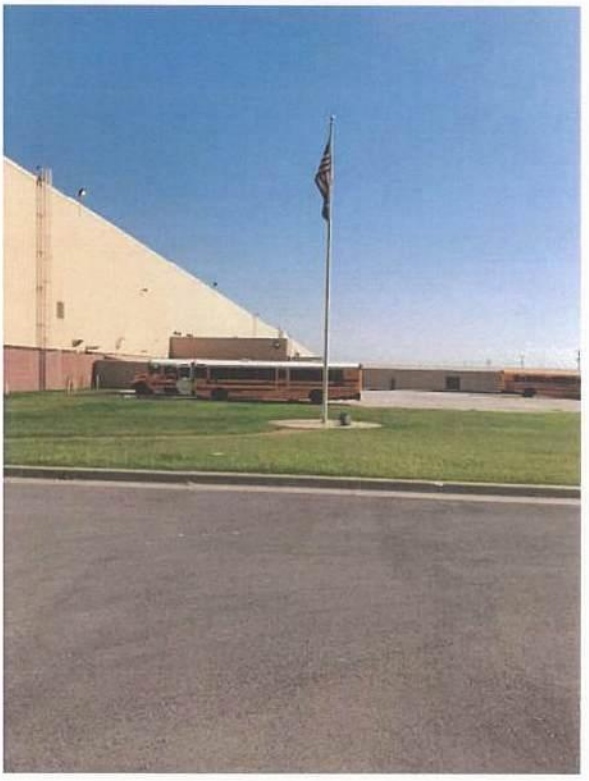

1/8
MILE

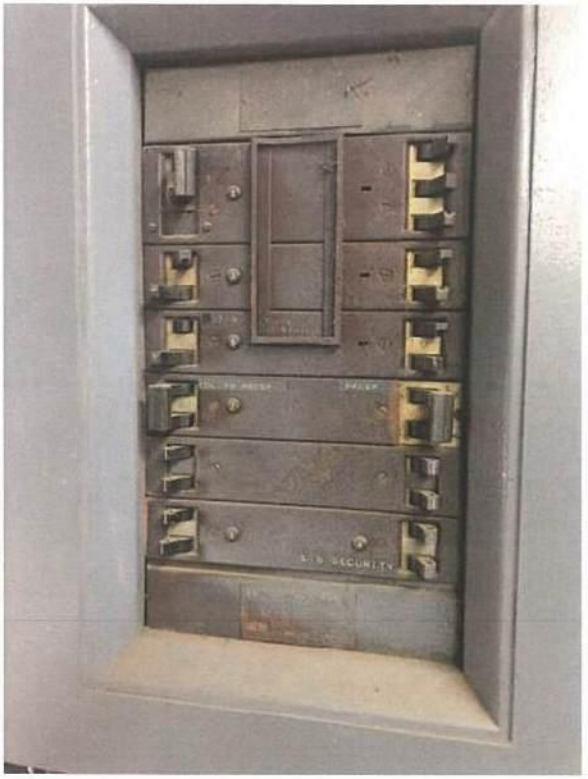



GENERAC

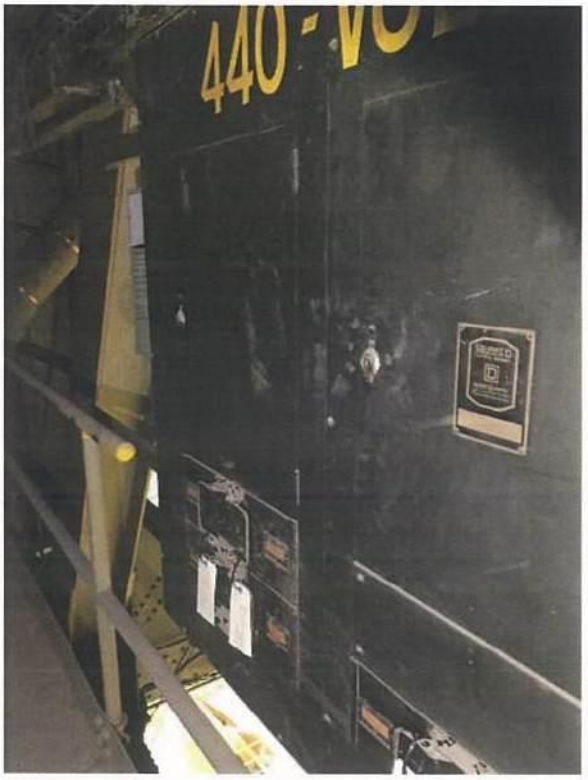



VERTIV






CIR#1 POWER TO MCC
FOR MAIN LINE
CHAIN MOTOR AT
PAINT BOOTH #13


440-V

NAVISTAR

TENANT SPACE

FIRE PROTECTION

ASSESSMENT REPORT

Fire Protection Systems – Overview

Generally, the observed Fire Suppression systems and they appear to be operating properly.

The majority of the interior piping appears to be original.

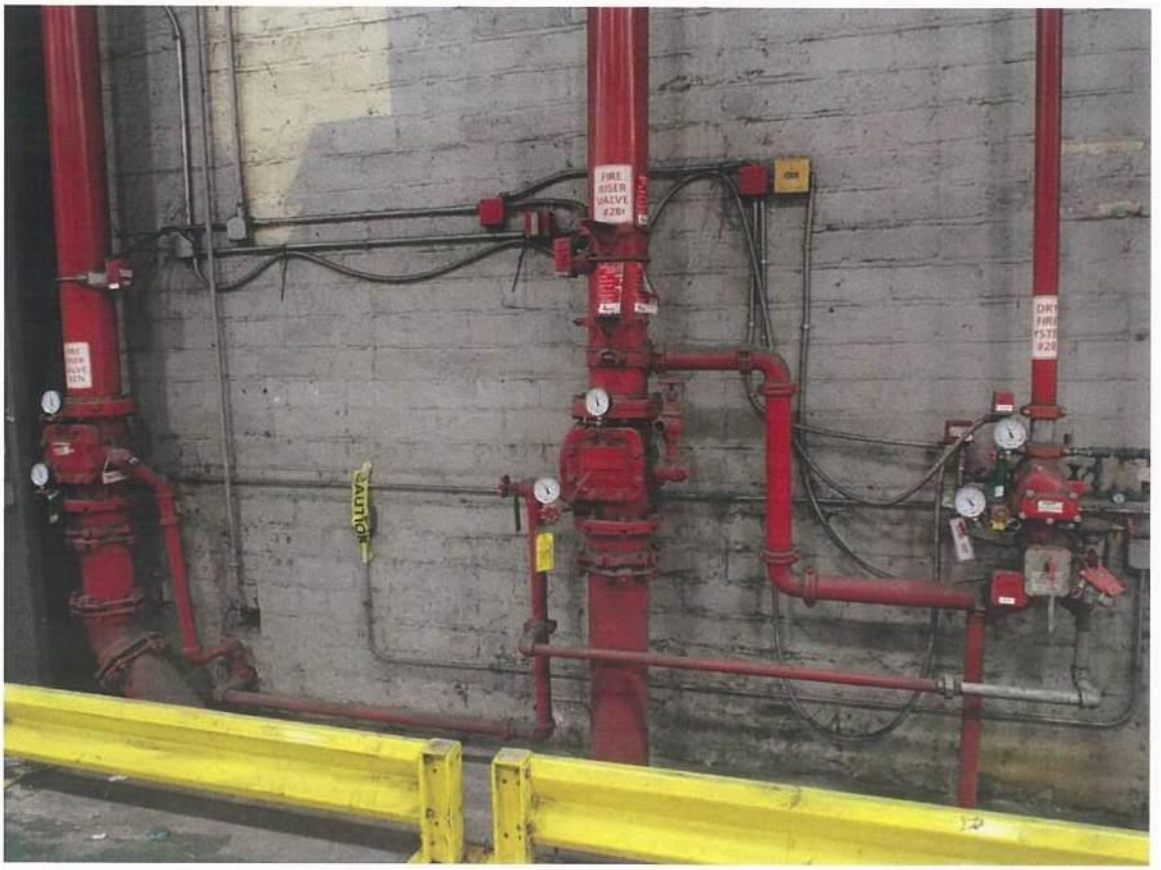
The original 1940's sprinklers have been replaced with modern 1990s sprinklers.

Records of sprinkler and alarm inspections were not provided.

Fire Protection Systems - Description and Assessment:

A. Fire Protection Piping

1. The fire suppression risers appear to be original.



2. The shut off valves are post indicating valves located outside.

B. Sprinkler Heads

1. Sprinklers will need to be recertified or replaced by the time they are 50 years old.
2. The original 1940's sprinklers have been replaced with more recent 1988 and 2007 sprinklers.

C. Fire Alarm, Fire Extinguishers, and Flammable Liquid Cabinets

1. Fire alarm system is installed. Records of the alarm inspections were not provided. More than a visual inspection would be required to see if in full working order.

2. Fire extinguishers are located throughout.

NAVISTAR

TENANT SPACE

ARCHITECTURAL

ASSESSMENT REPORT

Architecture Introduction:

This project is located southeast of Tulsa International Airport. The goal of this project is to provide Tulsa Public Works the condition of Air Force Plant 3 mezzanines, restrooms, offices, walls, doors, floors, and ceilings to help them identify interior related needs and the cost of the repair and/or replacement. An evaluation of the interior conditions at Navistar was conducted on September 5, 2019. The result of this evaluation presented within this report can be used by the Tulsa Public Works to schedule for renovation updates and maintenance to be completed for overall area.

Project Summary:

The project is located southeast of Tulsa International Airport and just north of the railroad.

Building B001 is a 320 feet wide x 4000 feet long facility consisting of steel clear span roof trusses spanning over the 200 foot wide high bay with similar steel trusses spanning over the 120 foot wide lower bay.

The exterior façade is composed of brick capped with a precast concrete trim which completes the base whereby a vertical ribbed metal skin rises to terminate with a metal capped parapet.

In addition to the ground floor slab on grade, there are two mezzanine levels within the high bay, additionally, a catwalk system is placed at the elevation of the bottom chord of the roof trusses.

Navistar is a manufacturer of buses. During the inspection, Cyntergy noticed signs of normal wear and tear due to use. The types, severities, and the amounts of distress and deterioration present on site during the assessment are described in the project report.

Refer to Site Photos attached taken during the site inspection.

Project Report:

Exterior

Brick façade needs to be cleaned. There are several places where brick joint repointing has produced a mismatch of joint colors; these need to be raked out and replaced with mortar in the color and texture to match the original.

The precast concrete trim has discolored through weathering and or by being subjected to water runoff from the metal panels above. This trim needs to be cleaned and possibly sealed with a clear breathable sealer.

The vertical metal panels above the precast concrete trim are faded in color, sometimes rusted, sometimes streaked with oils and or dirt, and sometimes patched where holes once were present. Old attachments to the panels are left hanging. Almost all look to exhibit mild rusting along the lower edge above the precast concrete trim. These panels need to be cleaned, repaired where damaged and painted. The joint between the panels and the precast concrete trim should be sealed with sealant.

Reception Area and Office Area

Items in the interiors report could be restated here, however, the reception and office area appear to be newer construction than the rest of the facility and therefore does not reflect the condition of the rest of the property. In general, any areas currently in use by office personnel is well maintained.

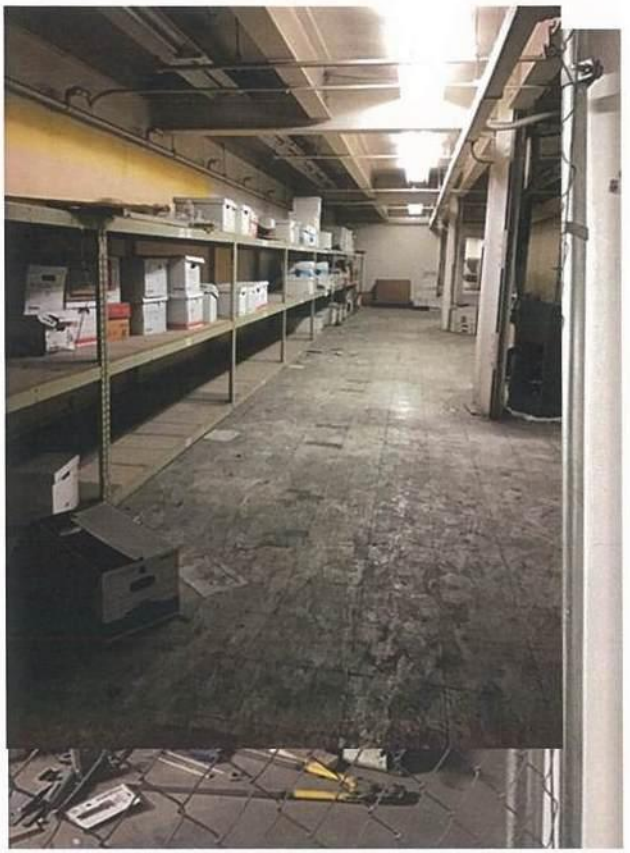
First, Second, and Third Floor Mezzanines

Items in the interiors report could be restated here, however, in general, any areas currently in use by office and or other personnel is well maintained; all other spaces are left as is, it appears these spaces have been untouched for many years. These same untouched spaces, when they are used, have become a repository for unused furniture, fixtures, and parts. The two freight elevators serving the Navistar mezzanines are not in service making these levels inaccessible for those with mobility challenges.

Ground Floor

Items in the interiors report could be restated here, however, the space as a whole shows signs of neglect. The floors have not been resurfaced, sealed or painted. The interior painted surfaces of exterior walls have dulled with age. The entire environment is in sharp contrast with Spirit Aerosystems side of the facility.

Site Photos:




POWERADE


57B
STOP

NAVISTAR

TENANT SPACE

INTERIORS

ASSESSMENT REPORT

Interiors Introduction:

This project is located southeast of Tulsa International Airport. The goal of this project is to provide Tulsa Public Works the condition of Air Force Plant 3 mezzanines, restrooms, offices, walls, doors, floors, and ceilings to help them identify interior related needs and the cost of the repair and/or replacement. An evaluation of the interior conditions at Navistar was conducted on September 5, 2019. The result of this evaluation presented within this report can be used by the Tulsa Public Works to schedule for renovation updates and maintenance to be completed for overall area.

Interiors Summary:

This report documents the results of the visual evaluation of existing interior conditions of mezzanines, restrooms, offices, walls, doors, floors, and ceilings. The project is located southeast of Tulsa International Airport and just north of the railroad which is the location of the Navistar facility. During the inspection, Cyntergy noticed signs of normal wear and tear due to use in the office and mezzanine areas. The types, severities, and the amounts of distress and deterioration present on site during the assessment are described in the project report.

Listed below, presents photos taken during the site inspection.

Interiors Description and Assessment:

Reception Area:
Carpet is worn and painted walls are in good shape. Logo behind desk is outdated. Acoustical ceiling tiles are not sagging and are free from stains, area is well lit. This area has been well maintained for guests, has seating area with viewing area of safety video before entering further into the building or the production floor. See pictures 1-4.

Office Area:
Carpet is worn and there are different patterns installed depending on the open office space, individual workstations, and conference rooms. Walls are covered with wall covering from handrail height to top of door frame height with wood cap top trim and wood bottom handrail. Conference rooms have wall protection band above handrail height. There are multiple places where acoustical ceiling tiles have stains. The millwork has been maintained. When walking through to reach the production area it felt like the floor was raised to maybe hold electrical wires running underneath, this could not be confirmed by our escort. See pictures 5-14.

First and Second Floor Mezzanines:
Two of the mezzanines are used for storage of old equipment and files; they do not contain or provide use for office workers. There are a few rooms used for training or hold parts used for maintenance. None of the freight elevators work in the facility, some of the ground floor spaces in these areas have been converted to workshops or storage. One room houses computers and is well ventilated, maybe used as a diagnostic or networking room. See pictures 15-21, 43. UAW Office has carpet flooring and ceiling is to top of beam. Next UAW has 9" x 9" VCT flooring underneath chipping epoxy flooring. Walls and ceilings are covered with square perforated panels. See pictures 22-28. Restrooms could be updated, currently mosaic tile

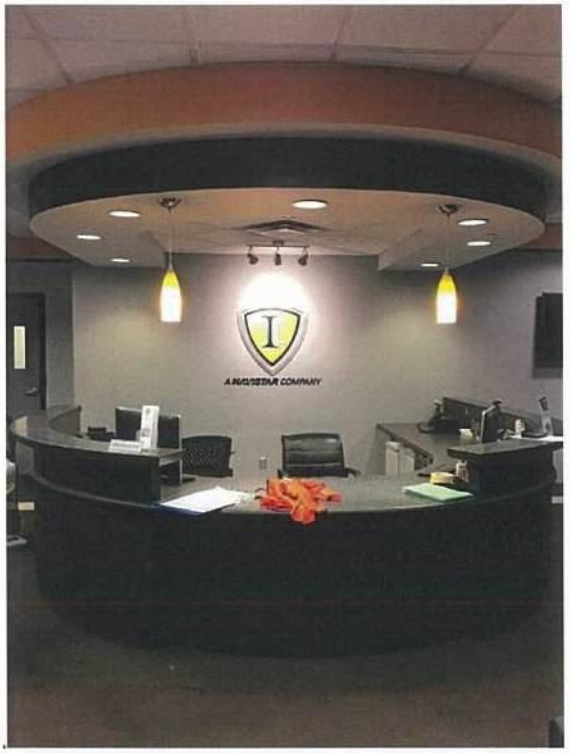
flooring with curved base, wall hung sinks with no mirrors, and stalls are outdated, and an ADA stall does not exist, just an ambulatory stall. See pictures 29-33. Office space near column 96 has a large air unit and breakroom area, paint is chipping on columns, carpet is worn. See pictures 34-36. Other offices have been built in mezzanine areas have suspended ceilings, with old mezzanine lights still in place above ceiling, ceiling tiles are stained. Insulation is coming into rooms used for storage. See pictures 37-42. The most populated office space holds a conference room at Column 143 with uneven ceiling tiles and slot diffusers. Open office area has broken, stained, and uneven ceiling tiles. This area has several breakroom areas with ceramic tile and a wall of millwork with equipment, the flooring transition is chipped. Women's restroom has newer wall hung sinks and mirrors with older mosaic tile flooring and outdated stalls, fixtures could be updated, and an accessible stall does not exist, just an ambulatory stall. There is a roof leak by column 118. See pictures 44-63.

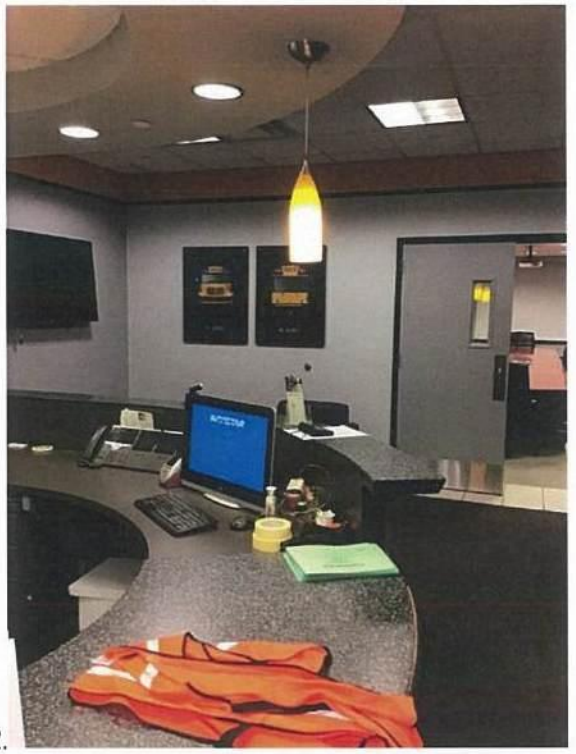
Third Floor Mezzanines:
Used for storage of old parts, tools, and restrooms no longer in use. The fixtures and stalls are old, the handwashing foot powered stations may not be connected to work. Restroom ceilings are falling into the space. See pictures 64 and 65.

Ground Floor:
In restroom areas separated off by handrails the epoxy flooring is wearing off. The communal sinks are leaking. The wall mounted air conditioning unit is leaking; maintenance has provided a trash bin to collect the run-off. Restrooms double as a tornado shelter at the core of the building and are built from CMU blocks. Restrooms have a metal paneled ceiling and narrow passage between stalls on one side and urinals on the other in the men's, stalls on one side and sinks on the other in the women's. See pictures 65-72. Vending machine areas are dispersed along the length of the building underneath the mezzanines. See pictures 73-75. Some of the overhead doors are blocked off with plywood and are not in use. See pictures 76 and 77. By column 89 a break area exists with seating, vending machines, restrooms doubling as tornado shelters and a few offices, this area is blocked off with protective handrails. See pictures 78-83. The flooring is epoxy in some areas for directing pedestrian traffic and unfinished concrete in others. There are multiple tarps hanging from the ceiling to catch roof leaks and/or condensation dripping from roof units, preventative measures to not interfere with production areas. Outdoor covered areas exist for workers break areas, near boiler room. Another break area exists from exterior door 84 leading to outdoor covered area. See pictures 84-88.

Site Photos:

Site Photos - Interiors

1. 

2. 

3. 

4. 

Reception Area

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8. 

Office Area

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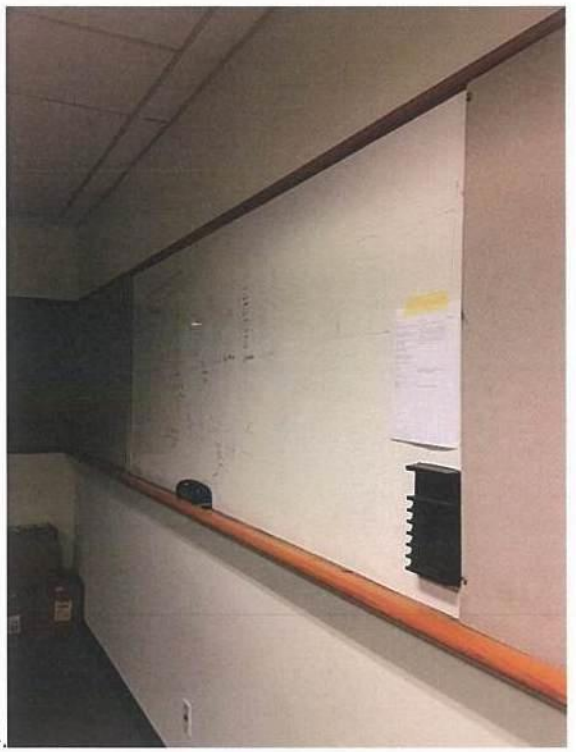
10. 

11. 

12. 

Office Area

13. 

14. 

Office Area

15. 

16. 

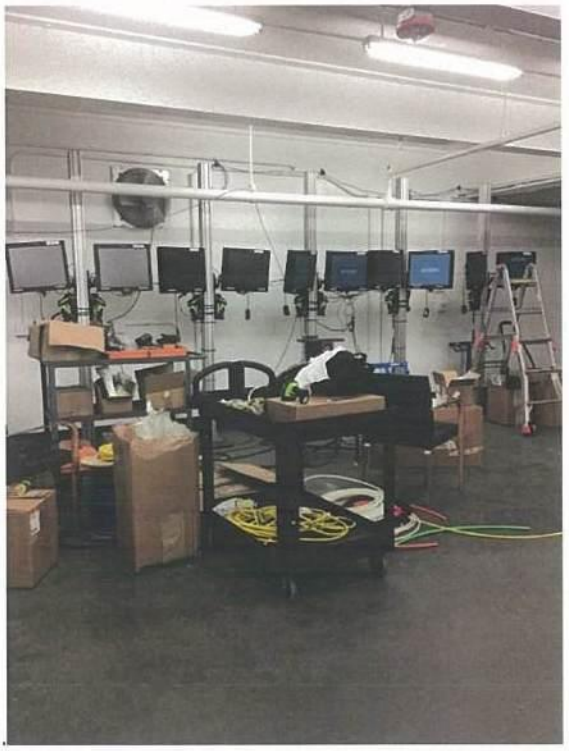
17. 

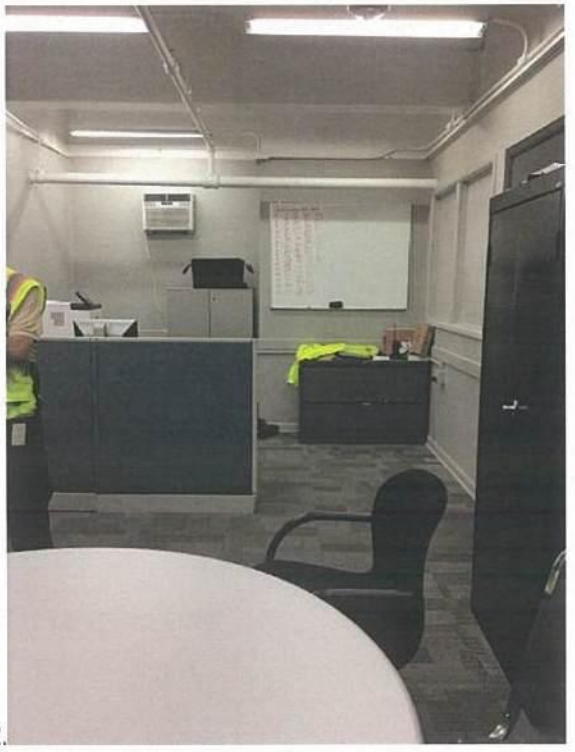
18. 

First and Second Floor Mezzanines

19. 

20. 

21. 

22. 

First and Second Floor Mezzanines

23. 

24. 

25. 

26. 

First and Second Floor Mezzanines

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First and Second Floor Mezzanines

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First and Second Floor Mezzanines

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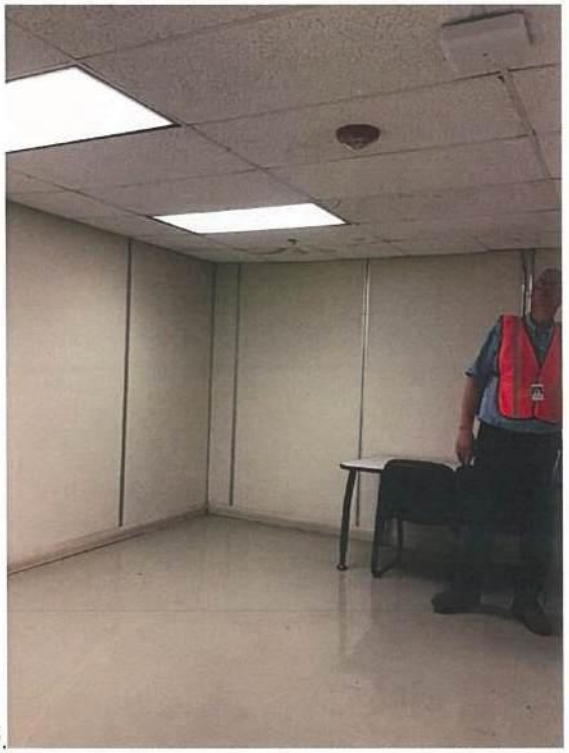
38. 

First and Second Floor Mezzanines

39. 

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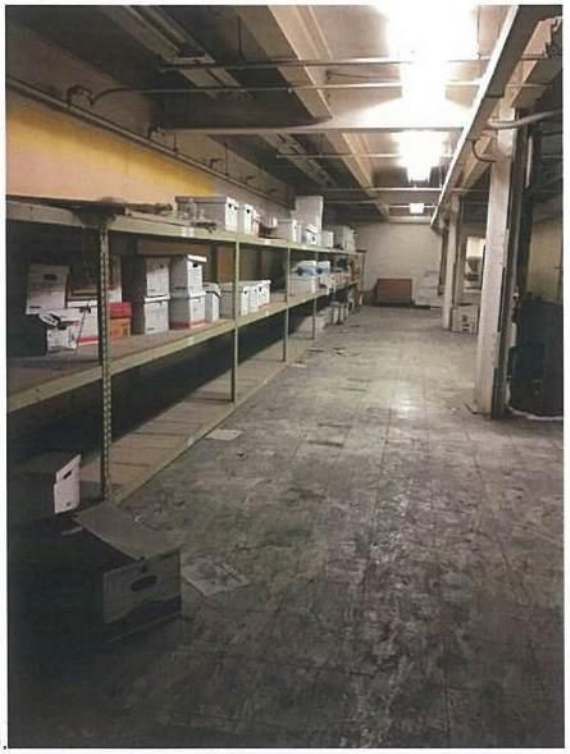
41. 

42. 

First and Second Floor Mezzanines

43. 

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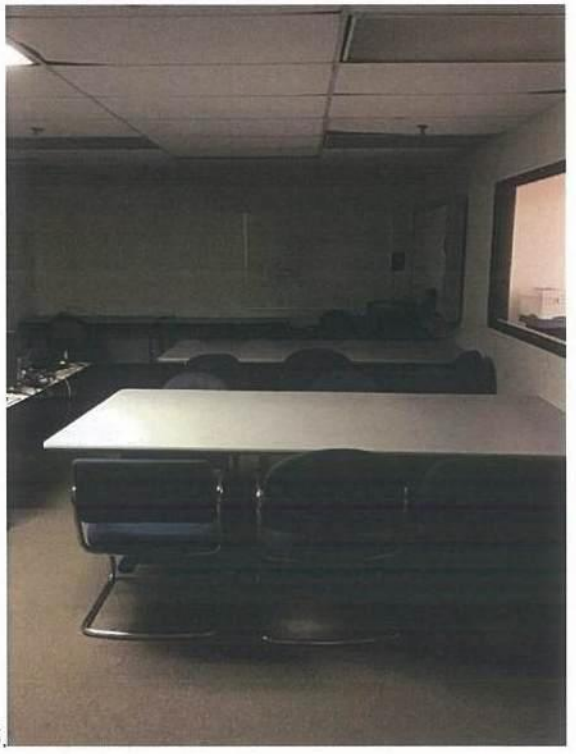
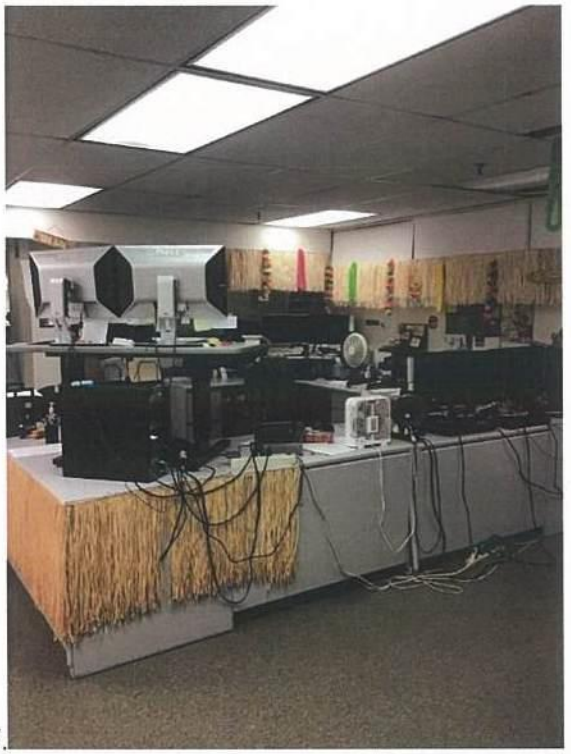
45. 

46. 

First and Second Floor Mezzanines

47. 

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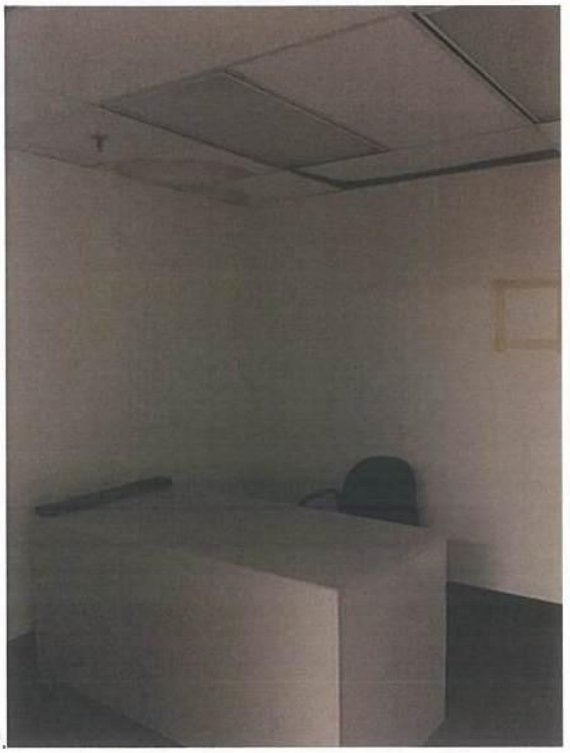
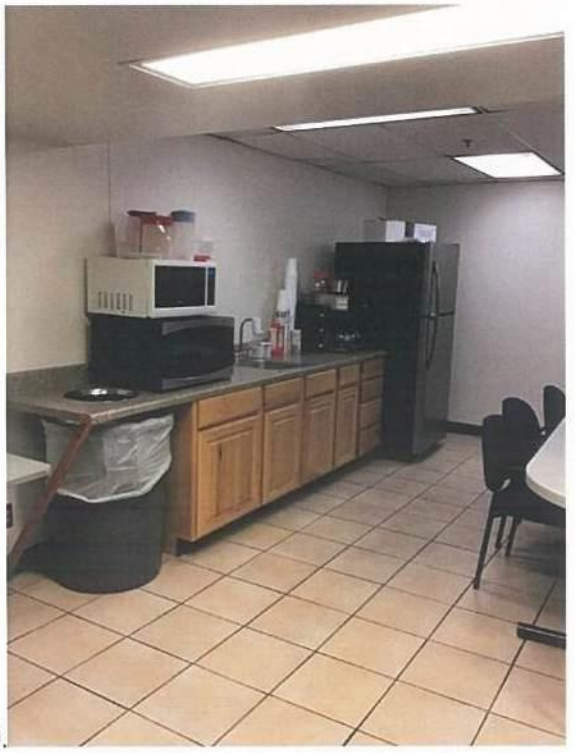
49. 

50. 

First and Second Floor Mezzanines

51. 

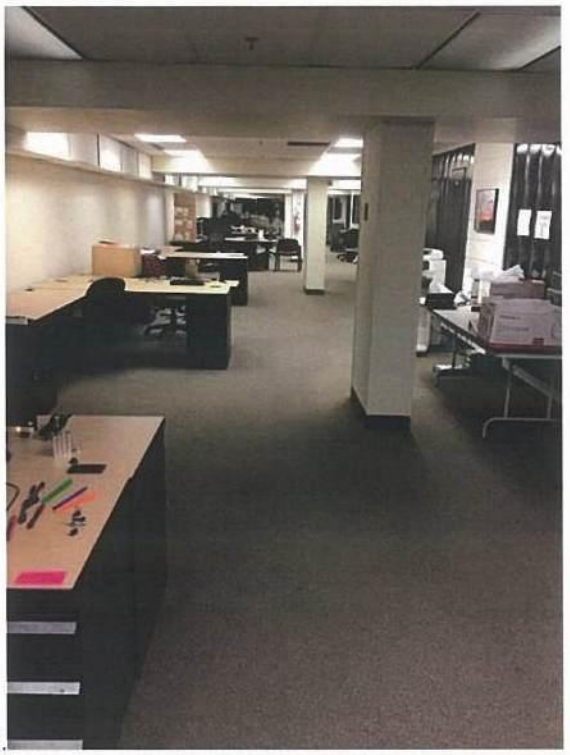
52. 

53. 

54. 

First and Second Floor Mezzanines

55.



56.

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58.

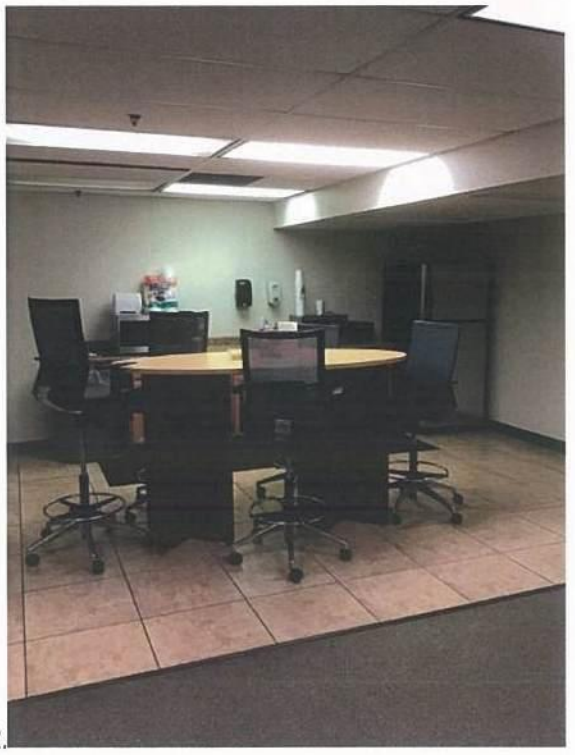
First and Second Floor Mezzanines

59.

60.

61.

62.



First and Second Floor Mezzanines

63. 

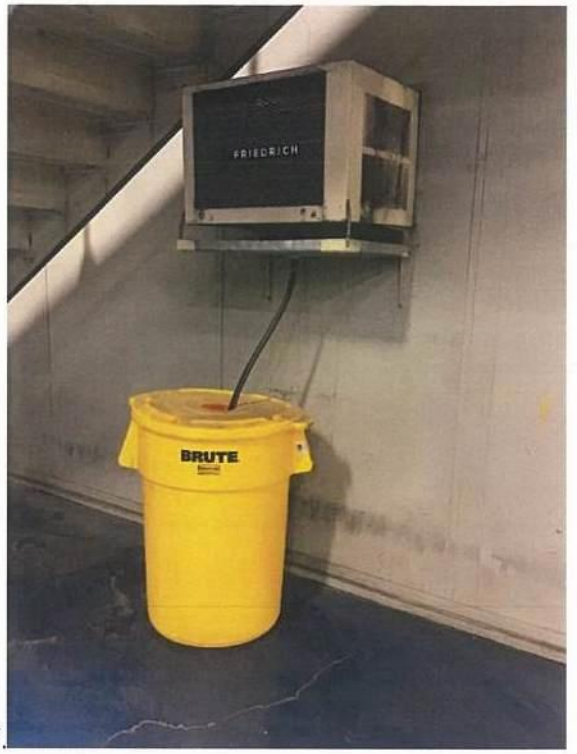
First and Second Floor Mezzanines

64. 

65. 

Third Floor Mezzanines

66. 

67. 

68. 

69. 

Ground Floor

70.

71.

72.

73.

Ground Floor

74.

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Ground Floor

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79. 

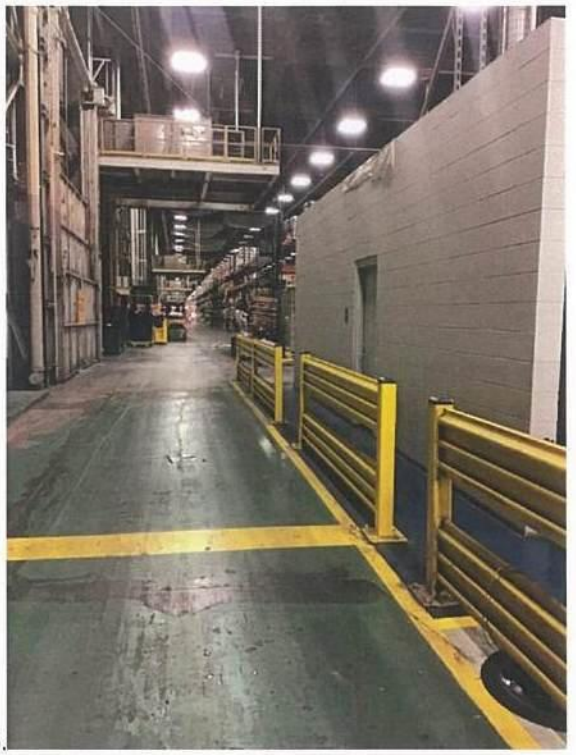
80. 

81. 

Ground Floor

82.

83.



84.

85.

Ground Floor

Infrared Moisture Roof Survey Report

For

AFP3 Building B001
Navistar IC Bus, LLC
3000 North Mingo Road
Tulsa, Oklahoma

For

The City of Tulsa
Engineering Services Department
2317 South Jackson Avenue
Tulsa, Oklahoma 74107

For

Cyntergy
810 South Cincinnati Avenue, Suite 200
Tulsa, Oklahoma 74119

ROOF CONSULTANTS
5350 E. 46th St., Suite 116
Tulsa, OK 74135
(918) 660-6844

1 Narrative Report & Recommendations

2 Roof Plan Drawings

3 Infrared Photos Daylight Photos

4 Eagle View Reports

5 Recommended Roof Repair & Replacement Products

ROOF CONSULTANTS

5350 East 46th Street, Suite 116
Tulsa, Oklahoma 74135
(918) 660-6844

September 25, 2019

Larry Vorba, P.E.
Cyntergy AEC
810 S. Cincinnati Avenue, Suite 200
Tulsa, OK 74119

Reference: **AFP3 Navistar IC Bus, LLC Plant Building B001**
Infrared Roof Moisture Scan Report and Recommendations
3000 North Mingo Road
Tulsa, Oklahoma
Project No.: 201913

Dear Mr. Vorba:

We have recently completed an Infrared Moisture Survey of the roofs on the **AFP3 B001 building** in which **Navistar IC Bus, LLC Plant** resides in Tulsa. The onsite work was conducted on the evenings and early mornings of September 4, 6 & 18. Follow up daylight photos were taken on the mornings of September 9 & 19, 2019. This Report contains our Recommendations for how to deal with areas found with entrapped moisture. We met with Mr. Brent Odom, Navistar to gain access to the roof through the interior of the building. During our daylight inspection, Mr. Odom conveyed information concerning the age of various portions of the roof and the manufacturers who are responsible for the roof warranty obligations.

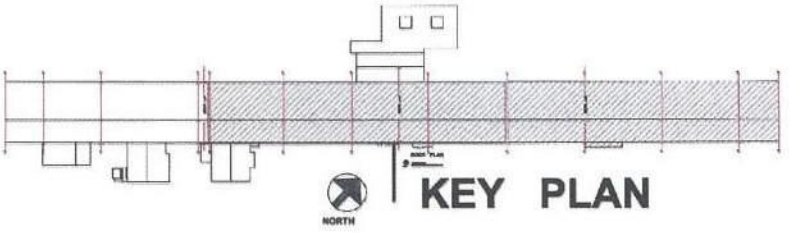
Aerial View of Roof. Navistar IC Bus, LLC Plant is in Sections 1,2,3 & 4 of the B001 Bldg.

Reference: **AFP3 Navistar IC Bus, LLC Plant Building B001**
Infrared Roof Moisture Scan Report and Recommendations
3000 North Mingo Road
Tulsa, Oklahoma
Project No.: 201913
September 25, 2019

This Report includes information in 5 Tabs:
TAB 1 Narrative of Roof Infrared Moisture Survey Process.
TAB 2 Roof Plan Drawings.
TAB 3 Infrared & Daylight Roof Photos.
TAB 4 Eagle View Reports.
TAB 5 Recommended Roof Replacement Products.

This Report contains a narrative describing the process of our onsite Investigation and the result of our Infrared Moisture Survey. It also contains Roof Plan Drawings and a series of Daylight and Infrared Photos of the 40 roof locations where entrapped moisture was found. We recommend removal and replacement of the roof in a spot repair program at locations that were marked with green paint on the roof. The Roof Plan Drawings were produced by overlaying Computer Aided Drafting files obtained from Eagle View Technologies, Inc. that were generated from satellite photos of the building through 4 separate Reports contained in TAB 4. Roof Area Calculations are also provided in TAB 4 in the Eagle View Reports. 4 Eagle View Reports were required to cover the roofs of the Navistar tenant space.

No statements in this Report should be construed to imply a warranty of the water tightness of these roofs or the exterior walls of this building. Roof Consultants reserves the right to publish amendments to this report and recommendations if additional information is discovered. Liability for this report is limited to the fees charged for this service.



ROOF KEY PLAN DRAWING
Because the B001 building is more than 4,000 feet long, we have subdivided the spaces by numbering roof expansion joints at approximately 400 feet on center represented by red lines on the above Key Plan Drawing. The shaded areas from expansion joint #4 to #12 on the above drawing represent the Navistar IC Bus, LLC Plant. Unshaded areas of the Main Building from expansion joint #0 to #4 and 3 smaller areas on the southeast side are occupied by Spirit Aero Systems. The B001 Building has High roofs on the west side and low roofs on the east side separated by an offset wall represented by a black line running the length of the building.

The Roof Plan Drawings in TAB 2 show areas of entrapped moisture as red shaded areas. The locations are numbered in a circle with an arrow showing the direction that photos were taken for the Photo Report in TAB 3.

ROOF CORE CUTS

No Roof Core cuts were allowed during this investigation. Therefore, we must make assumptions of the composition of the roof construction from visual observations and verbal report of Mr. Odom. It is believed that all roofs rest on metal roof decks. Most roof areas represented by light gray color in the photos are mineral surfaced modified bitumen installed in hot asphalt. (The installation year and Manufacturer are listed in each roof area ranging from 2008 to 2018.) Brown colored roof areas represented in the Daylight photos are older Gravel Surfaced Asphalt Built-Up Roofs. The age of the Gravel Surfaced Roofs is not known. Without Core Cuts, we cannot report on whether there are more than one roof in place or the type and thickness of roof insulation between the roof and the roof deck.

ENTRAPPED MOISTURE IN ROOF
MOISTURE SCAN PROCESS

The Infrared Moisture Scan was performed with a Flir E40bx Infrared Camera. This work was performed between the hours of 10 pm and 3:30 am. The Infrared Camera locates entrapped moisture by locating the retained heat in the roof insulation. During the daylight hours the sun's energy warms the moisture that has collected in insulation at locations of leaks. The retained moisture has a higher mass than the roof insulation. After the sun goes down the surfaces of the dry insulation areas of the roof cool down more rapidly, but the entrapped moisture retains heat which can be seen as a different color with the Infrared camera. The camera measures temperatures of the roof surface and renders them in different colors ranging from dark blue for the coolest to red and white for the warmest. Some elements of the roof construction collect and hold heat but are not a result of leaks, such as metal flashings and lumps of asphalt. Since the purpose of our Moisture Scan is to identify moisture damage from roof leaks, we must ignore items holding heat that do not represent leaks. We call these items "anamolies".

During the Infrared Scan we used a Tramex "Leak Seeker" Electrocapacitance Moisture Scanner to check locations that the Infrared Camera showed with higher retained heat. This instrument allows us to rule out "anamolies" in the Infrared images. As roof leaks develop and moisture collects in roof insulation materials under the roof, dry roofing materials are not good conductors of electricity. Materials with moisture show up with this Electrical Capacitance scanner when it is placed on the roof surface. Areas with entrapped moisture conduct electricity better than dry materials. This unit sends a low voltage electrical signal into the roof. An audible alarm sounds and an analog meter registers a positive response when materials that conduct electricity are encountered.

We checked areas that showed up with retained heat with the Electrical Scanner to verify that we were reading moisture and not an "Anamolie". We marked the boundary of areas of entrapped moisture with green spray paint lines and a green number from 11-50 to identify the location. Roof Photos were taken in the daylight to show the location of green paint boundary lines where entrapped moisture was detected during the Infrared Scan at night. Infrared photos were taken of the same locations.

On the following pages are shown a few of the typical areas of entrapped moisture. For additional Infrared photos of each area of entrapped moisture that was found refer to photo pages in TAB 3 of this Report. Extensive areas of moisture was detected in Upper Roof valleys at the Gravel Surfaced Roof.

Reference: **AFP3 Navistar IC Bus, LLC Plant Building B001**
Infrared Roof Moisture Scan Report and Recommendations
3000 North Mingo Road
Tulsa, Oklahoma
Project No.: 201913
September 25, 2019

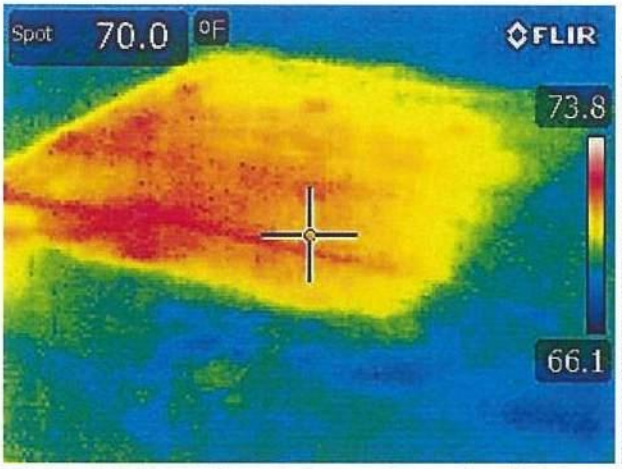


Photo #00466 Infrared photo of Location #13 in The Lower Roof between expansion joints #5 & 6.

Photo #9710 Entrapped moisture Location #13. Size 12'x20'.

DETERIORATED ROOFING CAUSED BY PONDING CONDENSATE WATER

Photo #9760 Ponding in valley line caused by Condensate allowed to drain on roof.

Photo #9761 Delaminated capsheet due to long term exposure to ponding condensate water.

Photo #9764 Condensate draining on roof.

Photo #9767 Split Built-Up Roof near valley.

Long term exposure of the Modified Bitumen capsheet to ponding water and ultraviolet sunlight has caused delamination and cracking of the capsheet surface and premature failure of its weather resistance. **Recommendation:** Remove and replace roof at areas of entrapped moisture to assist in future leak troubleshooting. It is likely that entrapped moisture in the Modified Bitumen patches that are installed in Upper Roof Gravel Surfaced Valley Areas between roof expansion joints 7 and 10 are caused by moisture migrating from the adjacent Gravel Surfaced Roofs. These Gravel Surfaced Roofs were reported to be the oldest roofs on the building and should be scheduled for replacement.

SPOT REPAIRS
Spot repairs with Modified Bitumen roofing should consist of removal and replacement of roof membrane and insulation at areas found with entrapped moisture. Although spot repairs might be successful in reducing some active leaks, no warranty could be expected from a spot repair program. Construction traffic on the existing adjacent roofs could cause failure in adjacent weakened areas. Spot repairs should be considered as an emergency measure to stop immediate leaks at critical areas.

ROOF RECOVER OPTION
The Modified Bitumen patched areas in valleys at the Gravel Surfaced Roofs might be recovered roofs over older Built-Up Roofs. If Roof Core Cuts reveal that these areas are recovered, they cannot be recovered again. The Building Code does not allow a 2nd roof recovering. If there is only one roof in place, it can be recovered after removal of all entrapped moisture. A recover roof should be less expensive that full replacement.

ROOF REPLACEMENT OPTION
The 2015 IBC Energy Code requires an upgrade to a minimum R=25 thermal insulation. New roof membrane choices include 3 or 4 ply Asphalt Built-up, 2 & 3 ply Modified Bitumen, EPDM, TPO, PVC & KEE Single Ply Systems as well as Fluid Applied Systems.

In the Tulsa commercial roofing market TPO Systems are most economical providing 10-30 year water tightness warranties with up to 4" hail resistance warranties. Adhered Systems out perform loose laid, ballasted and mechanically fastened systems. Adhered Systems are installed with hot asphalt or contact adhesives. FleeceBack membranes are installed with foam adhesives or Velcro attachments. TPO Membrane color choices are White, Tan & Gray. TPO membrane thicknesses available include 45, 60 & 80 mil. A White Adhered 60 mil TPO roof on tapered Isocyanurate foam insulation could produce a 20 year manufacturer's warranty.

RECOMMENDATION
All recently replaced roof areas have been installed with Modified Bitumen ranging in age from 1 to11 years as reported by Mr. Odom. Therefore, it would be most practical to use Modified Bitumen for repairs, recovering or replacement so that future repairs can be done with the same materials.

Remove and replace the Gravel Surfaced Roofs of with new Modified Bitumen Roofs with mechanically fastened insulation providing R=25 thermal insulation. When the existing roof membranes are removed exposing metal roof deck areas, rust damage might be discovered. Structurally damaged metal deck should be removed and replaced. Some rusted metal deck might be overlaid with new deck or minor rust damage could be sealed with a rust sealer before covering with new insulation. Damaged deck should be reviewed by an Engineer or Architect.

Reference: **AFP3 Navistar IC Bus, LLC Plant Building B001**
Infrared Roof Moisture Scan Report and Recommendations
3000 North Mingo Road
Tulsa, Oklahoma
Project No.: 201913

September 25, 2019

ESTIMATE

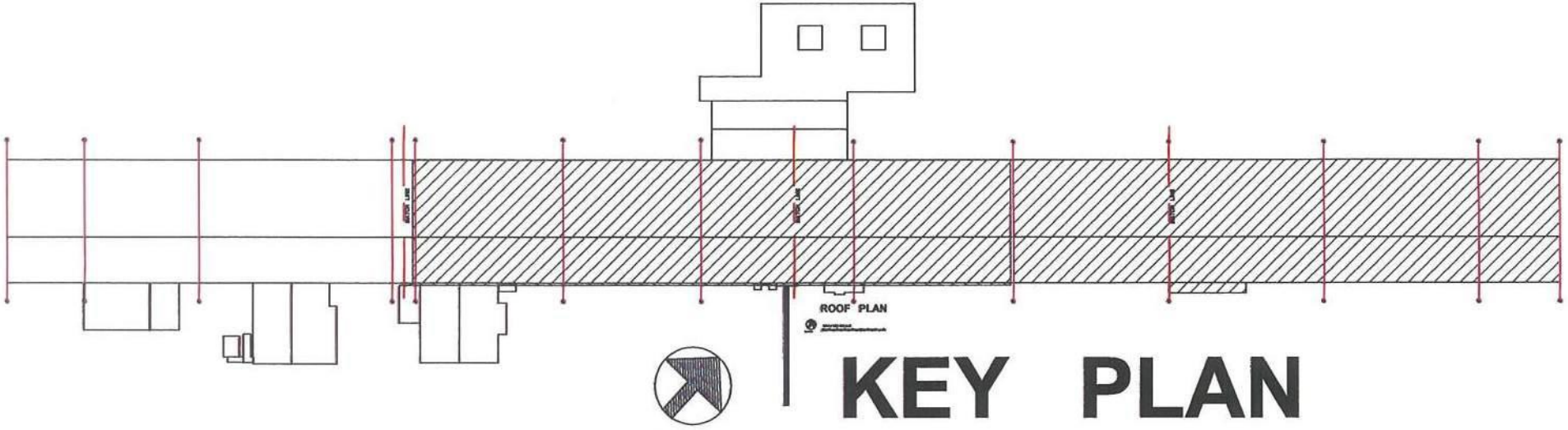
	ROOF AREA	SPOT REPAIRS	RECOVER	REPLACEMENT
Entrapped Moisture	8,434 s.f.	$ 181,000		
Gravel Valleys	40,241 s.f.		$ 560,000	$ 865,000
Gravel Surfaced Roofs	340,918 s.f.		$ 4,432,000	$ 7,434,000

This concludes our Roof Infrared Moisture Survey Report with Recommendations. If there are questions concerning our findings in this report, please call our office. We stand ready to proceed to develop Bid Documents for competitive bidding of Spot Repairs or a Roof Replacement System upon a selection of a roof system to be bid.

Yours very truly,
ROOF CONSULTANTS

R. Edward Owen, AIA, RRC, CCS, CCCA, Inc.
Registered Roof Consultant #0089
Registered Architect OK #1302
Oklahoma Certificate of Authority #911 Expires 7-30-2021

Attachments
Roof Plan Drawing
Roof Photos
Eagle View Reports
Modified Bitumen Roof Product Literature



KEY PLAN

ROOF AREA 4

EAGLE VIEW ROOF AREA 4
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 4
NAVISTAR IC BUS, LLC PLANT

AFP3 B007 BLDG.
GRAVEL SURFACED BUILT-UP ROOF

EAGLE VIEW ROOF
NAVISTAR IC BUS, LLC

MATCH LINE

MATCH LINE

2018 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

2018 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

GRAVEL SURFACED BUILT-UP ROOF

2018 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

2018 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

GRAVEL SURFACED BUILT-UP ROOF

9732 & 9733

SPLIT IN METAL HOOD

MISSING WEATHER HOOD

2011 TREMCO MINERAL SURFACED MODIFIED BITUMEN ROOF

2015 MANVILLE MINERAL SURFACED MODIFIED BITUME

2011 TREMCO MINERAL SURFACED MODIFIED BITUMEN ROOF

2015 MANVILLE MINERAL SURFACED MODIFIED BITUMEN

NO EXP. JT. ONLY

EAGLE VIEW ROOF AREA 4
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 4
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF
NAVISTAR IC BUS, LLC

AFP3 B119 BLDG.
METAL ROOF
SPIRIT AERO SYSTEMS PLANT

ROOF PLAN

KEY PLAN

NORTH

ROOF PLAN

GRAPHIC SCALE

1"=5' 20' 40' 60' 80' 100' 20' 40' 60' 80' 200'
0 3' 10' 30' 50' 70' 90' 10' 30' 50' 70' 90'

NORTH

SYMBOLS LEGEND

- FH — FIRE HOSE CABINET
- LADDER
- RD ⊕ — ROOF DRAIN
- SLOPE — EXISTING ROOF SLOPE
- EF — EXHAUST FAN
- E — ELECTRICAL CONDUIT
- V — PLUMBING VENT
- J-BOX — JUNCTION BOX
- S — SURVEILANCE CAMERA MOUNT
- 1 — PHOTO NUMBER
- D — DELAMINATED M.B. ROOF MEMBRANE
- S — SPLIT IN METAL HOOD OR ROOF MEMBRANE
- AREA OF ENTRAPPED MOISTURE
- A — ANCHOR POST
- PP — PIPE PENETRATION BOX
- F — FLUE STACK
- DUCT PENETRATION
- INSULATED DUCT ABOVE ROOF
- HATCH — ROOF HATCH
- EQUIPMENT TO REMAIN
- ABANDONED EQUIPMENT CURB TO BE REMOVED REF. 8/R5

MARK	REVISION	BY	DATE

ROOF MOISTURE SCAN
AFP3 NAVISTAR BUS PLANT
PROJECT #201913
PROJECT NO. SP CONTRACT #

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

PLANS AND ESTIMATES PREPARED BY:
CYNTERGY, L.L.C.
ROOF CONSULTANTS
5350 E. 46th St. Suite 116
Tulsa, OK 74135 (918) 660-6844

PLAN SCALE: AS NOTED	DRAWN	REO	9/20/19
	DESIGNED	REO	8/22/19
	SURVEY		
PROFILE SCALE: HORIZONTAL: 1 IN = VERTICAL 1 IN =	PROJ. MGR.		
	LEAD ENGR.		
	FIELD MGR.		
	RECOMMENDED: DESIGN MANAGER		
FILE:	DRAWING:		
ATLAS PAGE NO:			
GENERAL NOTES			

APPROVED:

CITY ENGINEER

DATE 9/20/2019

SHEET A-1 OF 3 SHEETS

SHEET NO. A-1

BLDG.
BUILT-UP ROOF

VIEW ROOF AREA 3
AR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 3
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 2
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 2
NAVISTAR IC BUS, LLC PLANT

7 8 9

MATCH LINE

MATCH LINE

BUILT-UP ROOF

ACED MODIFIED BITUMEN ROOF

GRAVEL SURFACED BUILT-UP ROOF

MINERAL SURFACED MODIFIED BITUMEN ROOF PATCH

2015 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

SPLIT BUR MEMBRANE

CONDENSATE ON ROOF

FANS

VALLEY

EXP. JT.

OFFSET WALL

22 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 9760 9761 9764

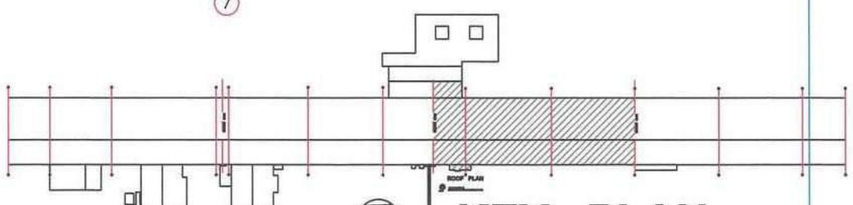
VIEW ROOF AREA 3
AR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 3
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 2
NAVISTAR IC BUS, LLC PLANT

EAGLE VIEW ROOF AREA 2
NAVISTAR IC BUS, LLC PLANT

7 8 9



NORTH

KEY PLAN

NORTH

ROOF PLAN

GRAPHIC SCALE

1"=5' 20' 40' 60' 80' 100' 20' 40' 60' 80' 200'
0 5' 10' 30' 50' 70' 90' 10' 30' 50' 70' 90'

SYMBOLS LEGEND

- FH — FIRE HOSE CABINET
- LADDER
- RD ⊕ — ROOF DRAIN
- SLOPE — EXISTING ROOF SLOPE
- 35 — EXHAUST FAN
- E — ELECTRICAL CONDUIT
- V — PLUMBING VENT
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- EQUIPMENT TO REMAIN
- ABANDONED EQUIPMENT CURB TO BE REMOVED REF. B/R5

MARK	REVISION	BY	DATE

ROOF MOISTURE SCAN
AFP3 SPIRIT AERO SYSTEMS & NAVISTAR BUS PLANT

PROJECT #201913
PROJECT NO. SP CONTRACT #

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

PLANS AND ESTIMATES PREPARED BY:

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5350 E. 46th St. Suite 116
Tulsa, OK 74135 (918) 660-6844

PLAN SCALE: AS NOTED
PROFILE SCALE:
HORIZONTAL: 1 IN =
VERTICAL 1 IN =

DRAWN	RED	9/20/19	APPROVED:
DESIGNED	RED	8/22/19	
SURVEY			
PROJ. MGR.			
LEAD ENGR.			
FIELD MGR.			

RECOMMENDED:
DESIGN MANAGER

CITY ENGINEER

FILE: DRAWING:

DATE 9/20/2019

ATLAS PAGE NO:

SHEET A-2 OF 3 SHEETS

GENERAL NOTES

SHEET NO. **A-2**

EAGLE VIEW ROOF AREA 1
NAVISTAR IC BUS, LLC PLANT

9 | 10 | 11 | 12

MATCH LINE

GRAVEL SURFACED BUILT-UP ROOF

2015 MANVILLE MINERAL SURFACED MODIFIED BITUMEN ROOF

2008 GARLAND MINERAL SURFACED MODIFIED BITUMEN ROOF

VALLEY

EXP. JT.

OFFSET WALL

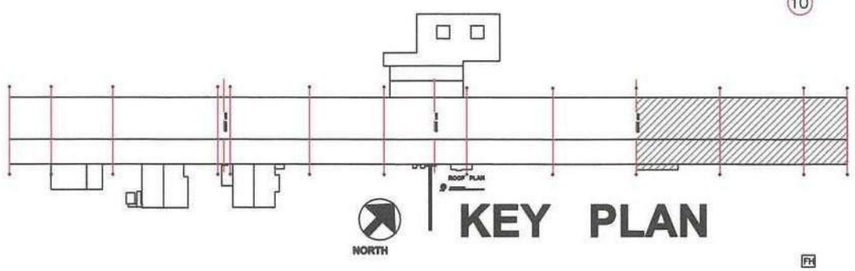
SPLIT BUR MEMBRANE

MISSING STRAINER BASKET

RD

EF

45 46 47 48 49 50



KEY PLAN

NORTH

ROOF PLAN

GRAPHIC SCALE

NORTH

SYMBOLS LEGEND

- FH — FIRE HOSE CABINET
- LADDER
- RD ⊕ — ROOF DRAIN
- SLOPE — EXISTING ROOF SLOPE
- EXHAUST FAN
- ELECTRICAL CONDUIT
- OV — PLUMBING VENT
- J-BOX — JUNCTION BOX
- S — SURVEILANCE CAMERA MOUNT
- PHOTO NUMBER
- D — DELAMINATED M.B. ROOF MEMBRANE
- S — SPLIT IN METAL HOOD OR ROOF MEMBRANE
- AREA OF ENTRAPPED MOISTURE
- A — ANCHOR POST
- PP — PIPE PENETRATION BOX
- OF — FLUE STACK
- DUCT PENETRATION
- INSULATED DUCT ABOVE ROOF
- HATCH — ROOF HATCH
- EQUIPMENT TO REMAIN
- ABANDONED EQUIPMENT CURB TO BE REMOVED REF. B/R5

MARK	REVISION	BY	DATE

ROOF MOISTURE SCAN
AFP3 NAVISTAR BUS PLANT
PROJECT #201913
PROJECT NO. SP CONTRACT #

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

PLANS AND ESTIMATES PREPARED BY:
CYNTERGY, L.L.C.
ROOF CONSULTANTS
5350 E. 46th St. Suite 116
Tulsa, OK 74135 (918) 660-6844

PLAN SCALE: AS NOTED	DRAWN	REO	9/20/19	APPROVED:
	DESIGNED	REO	8/22/19	
	SURVEY			
PROFILE SCALE: HORIZONTAL: 1 IN = VERTICAL 1 IN =	PROJ. MGR.			
	LEAD ENGR.			
	FIELD MGR.			
	RECOMMENDED: DESIGN MANAGER			CITY ENGINEER

FILE: DRAWING: DATE 9/20/2019

ATLAS PAGE NO: SHEET A-3 OF 3 SHEETS

GENERAL NOTES SHEET NO. A-3

Photo #9702 View of entrapped moisture location #11 at between a plumbing vent and the rim of an exhaust fan curb at the Upper Roof near the east eave north of expansion joint #4.

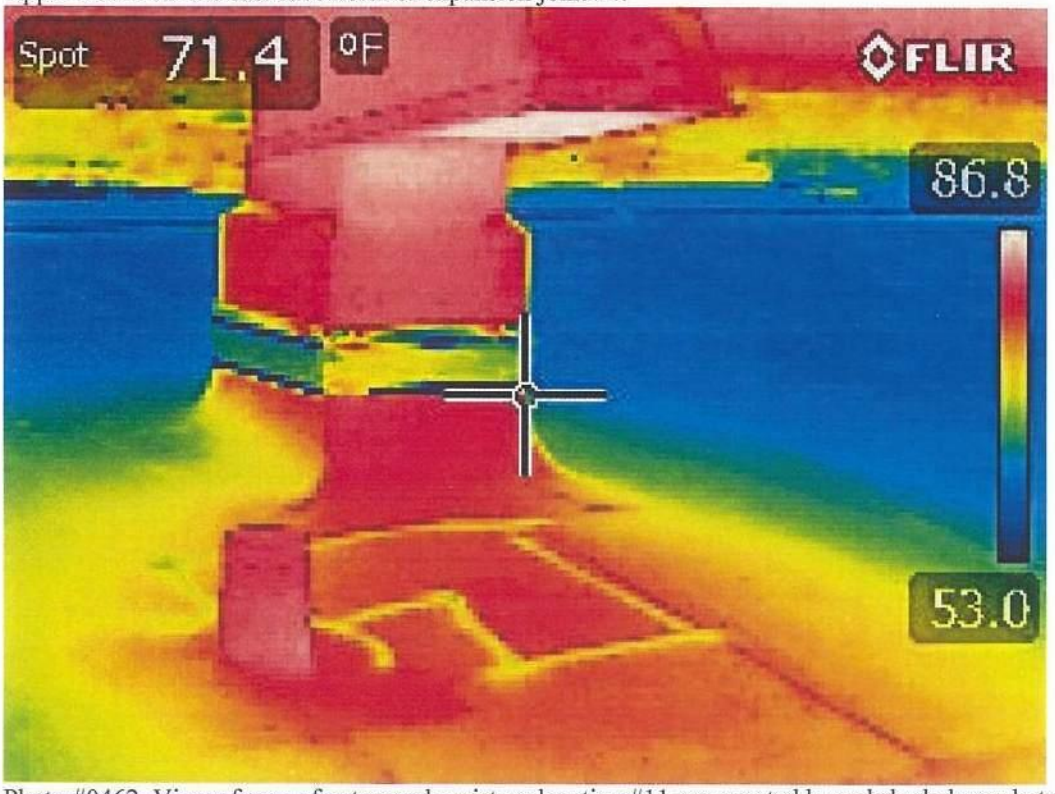


Photo #0462 View of area of entrapped moisture location #11 represented by red shaded area between plumbing vent and exhaust fan curb near the east eave of the Upper roof north of expansion joint #4.

Photo #9701 View of entrapped moisture #12 at the base of an abandoned exhaust fan curb near the east eave of the Upper Roof north of Expansion joint #4.

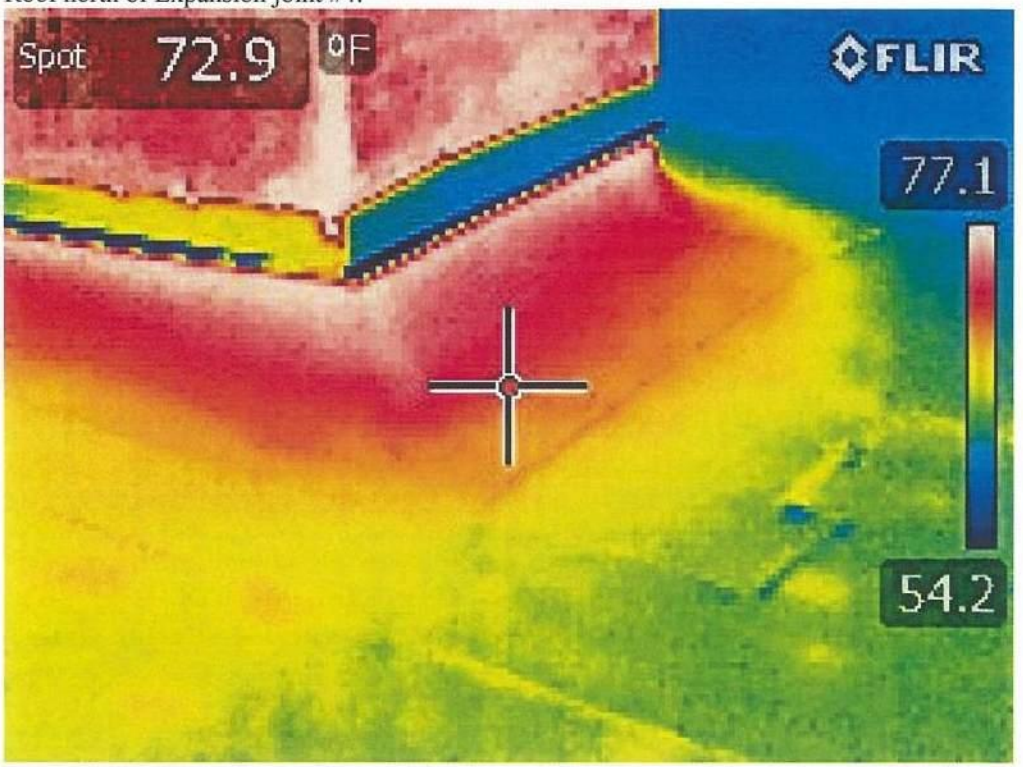


Photo #0464 View of area of entrapped moisture #12 represented by red, orange and yellow shaded area near an abandoned exhaust fan curb near the east eave of the Upper roof north of expansion joint #4.

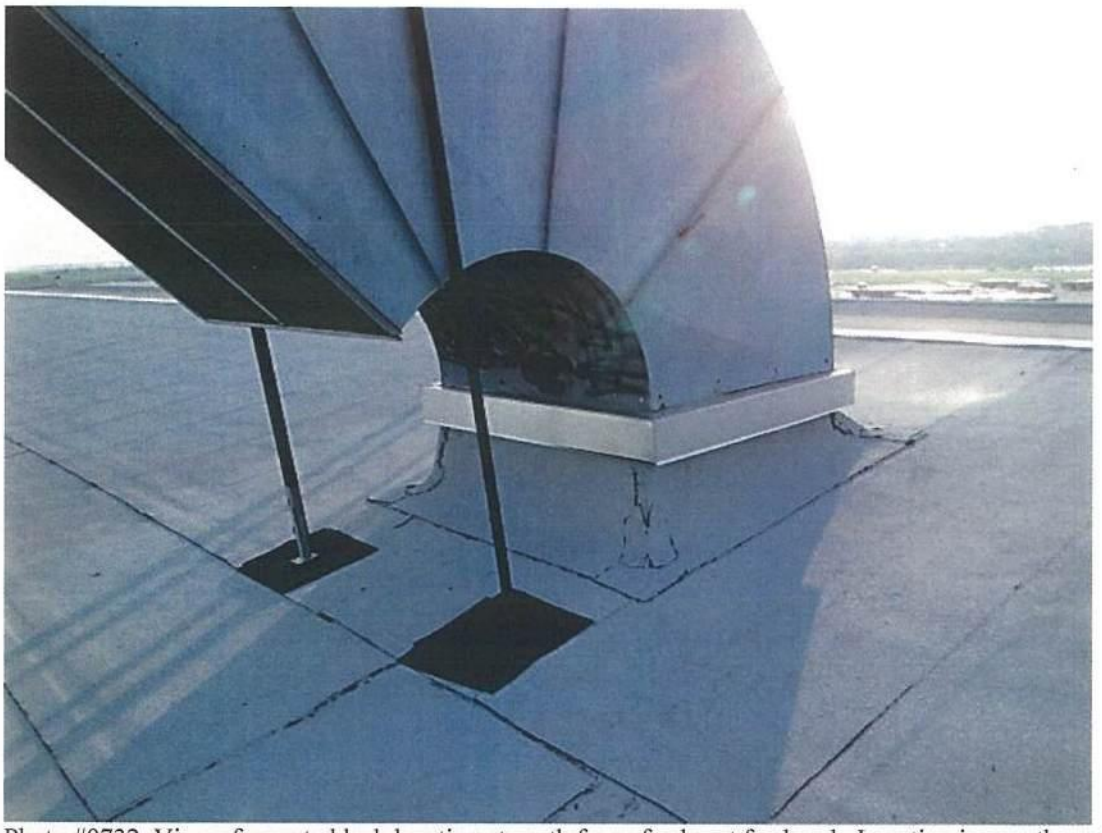


Photo #9732 View of reported leak location at south face of exhaust fan hood. Location is near the east eave of the Upper Roof between expansion joint #4 & 5.

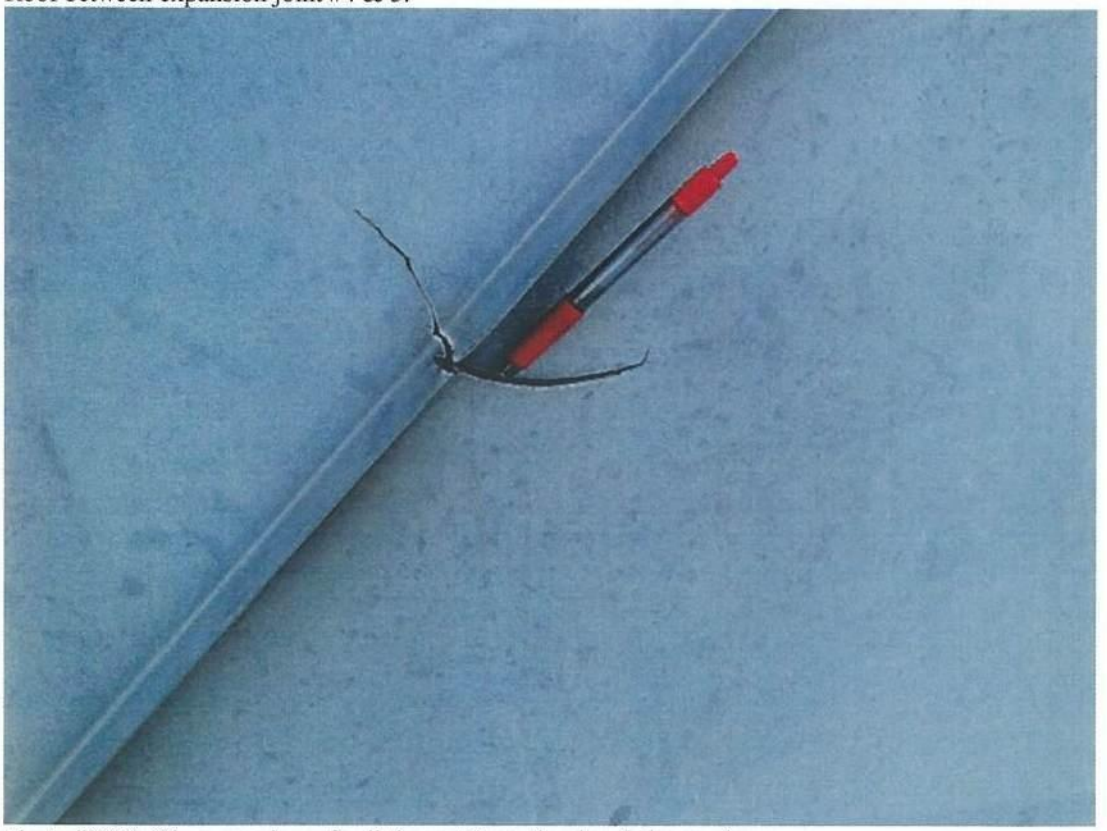


Photo #9733 Close-up view of split in metal weather hood shown above.

Photo #9710 View of entrapped moisture location #13 at the east ½ of the Lower Roof south of Expansion joint #6.

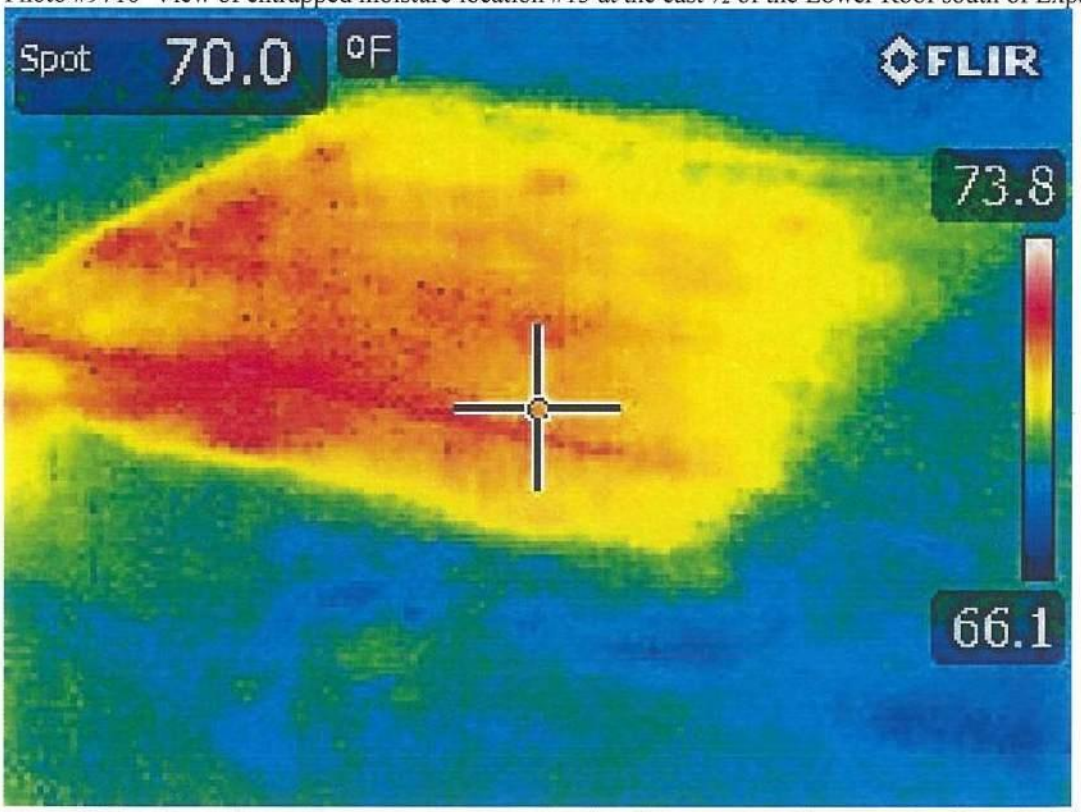


Photo #0466 View of area of entrapped moisture location #13 represented by red and yellow shaded areas at the east ½ of the Lower Roof area south of expansion joint #6.

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9-4-2019 & 9/9/2019 #2001913

Photo #9703 View of Upper roof expansion joint #5.

Photo #9711 View of large area of entrapped moisture #14 South of expansion joint #6 at the Lower East roof.

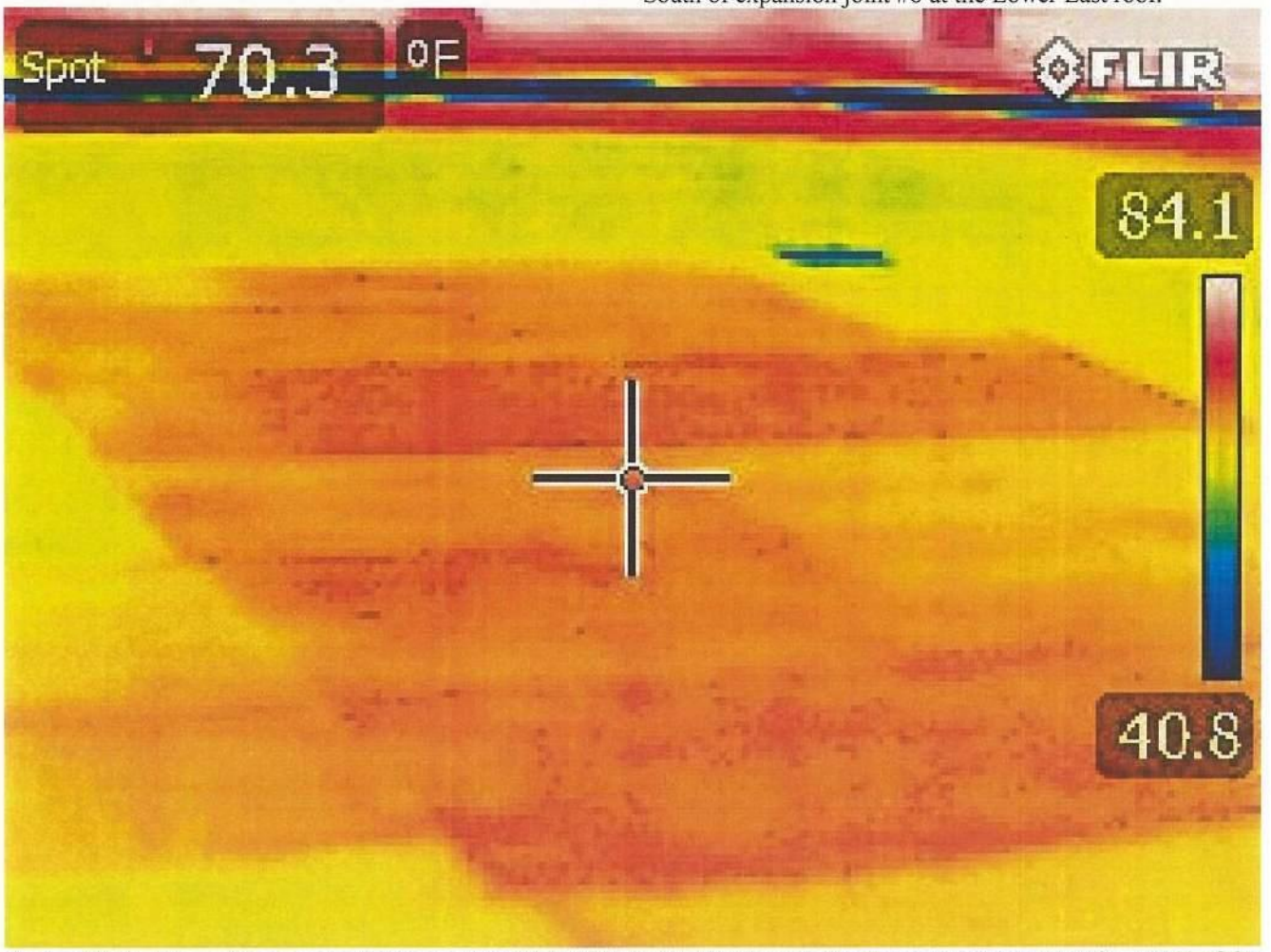

Photo #0468 View of large area of entrapped moisture #14 represented by red and orange shaded areas at the east ½ of the Lower Roof area south of expansion joint #6.

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9-4-2019 & 9/9/2019 #2001913

Photo #9712 View of entrapped moisture location #15 at base of a flue stack at the Lower roof south of expansion joint #6.

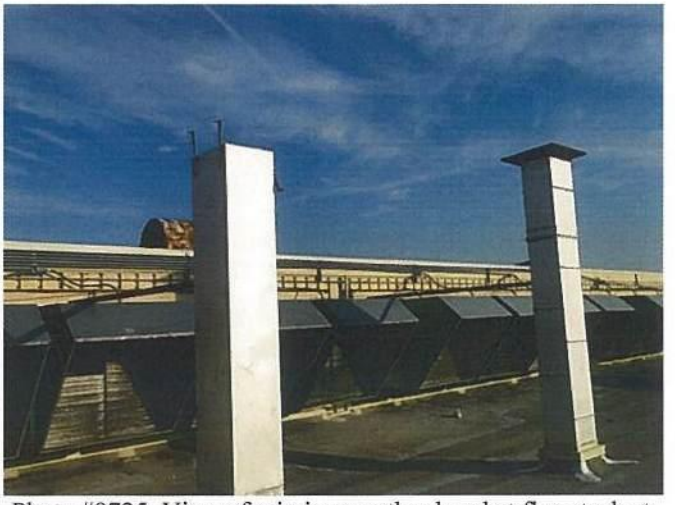

Photo #9725 View of missing weather hood at flue stack at Entrapped moisture location #15.

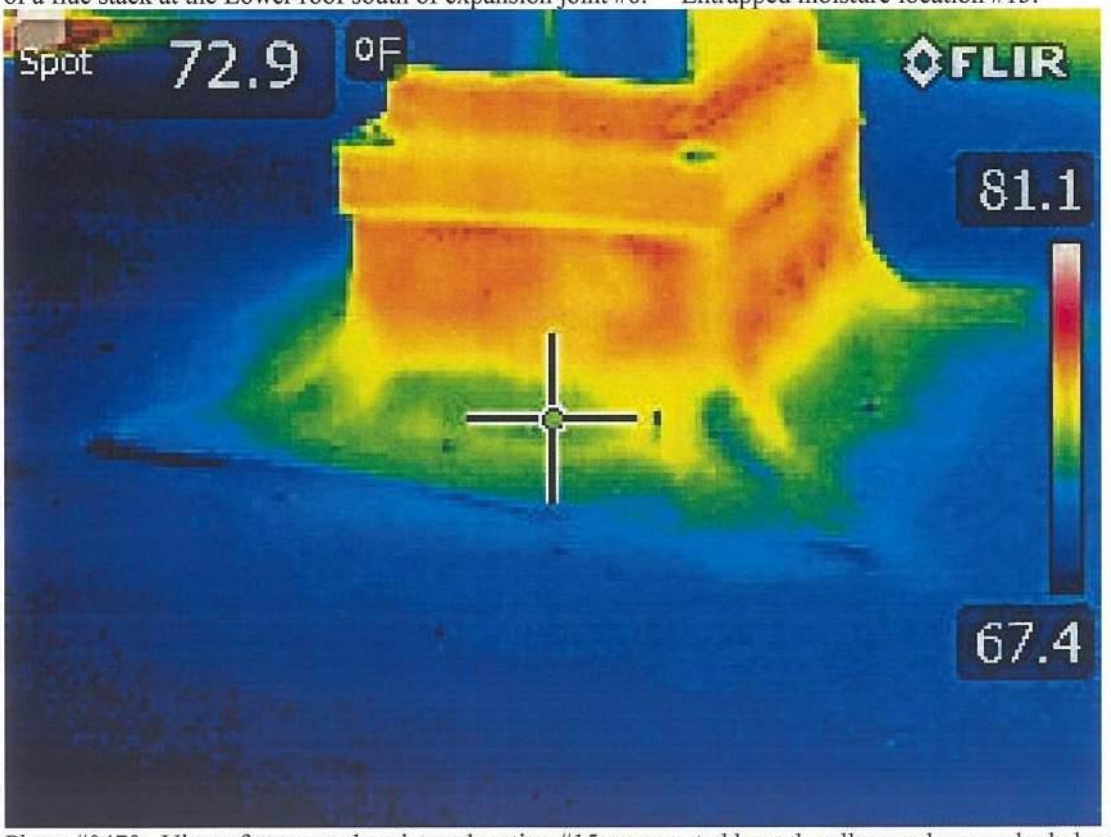

Photo #0470 View of entrapped moisture location #15 represented by red, yellow and green shaded areas at the base of a flue curb at the west ½ of the Lower Roof area south of expansion joint #6.

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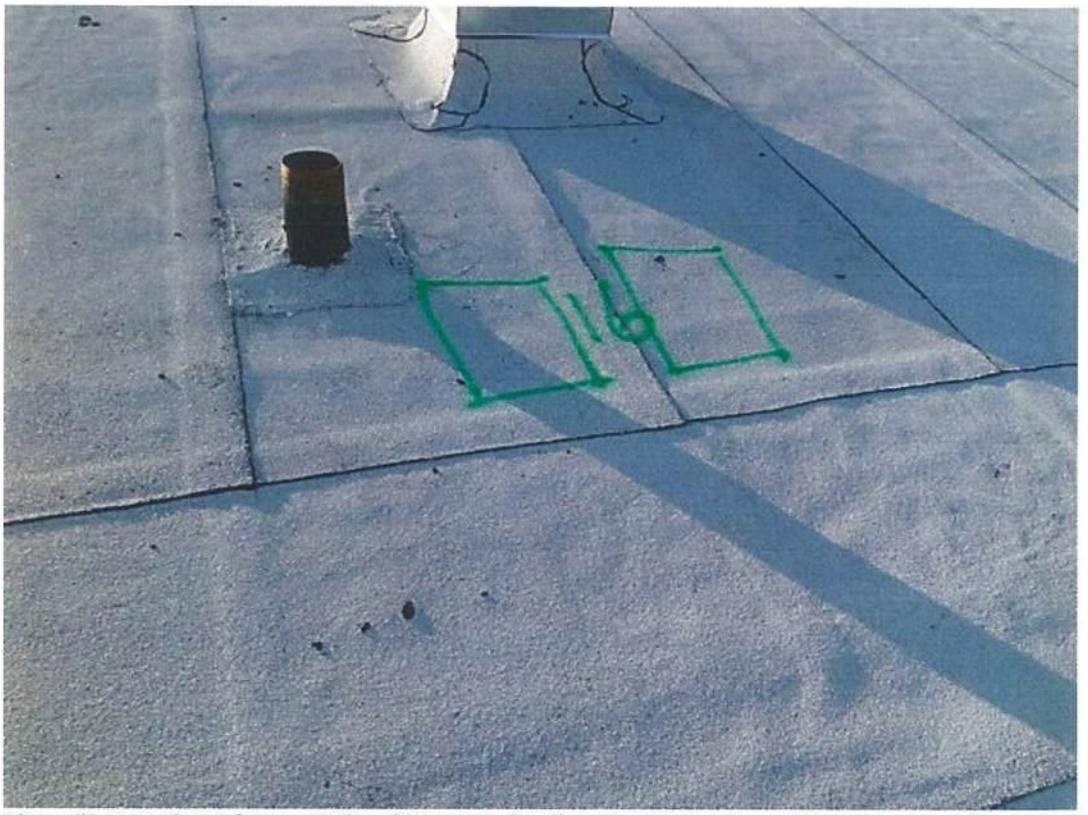

Photo #9708 View of entrapped moisture location #16 near base of an exhaust fan curb and a plumbing vent at the east side of the Upper Roof south of expansion joint #6.

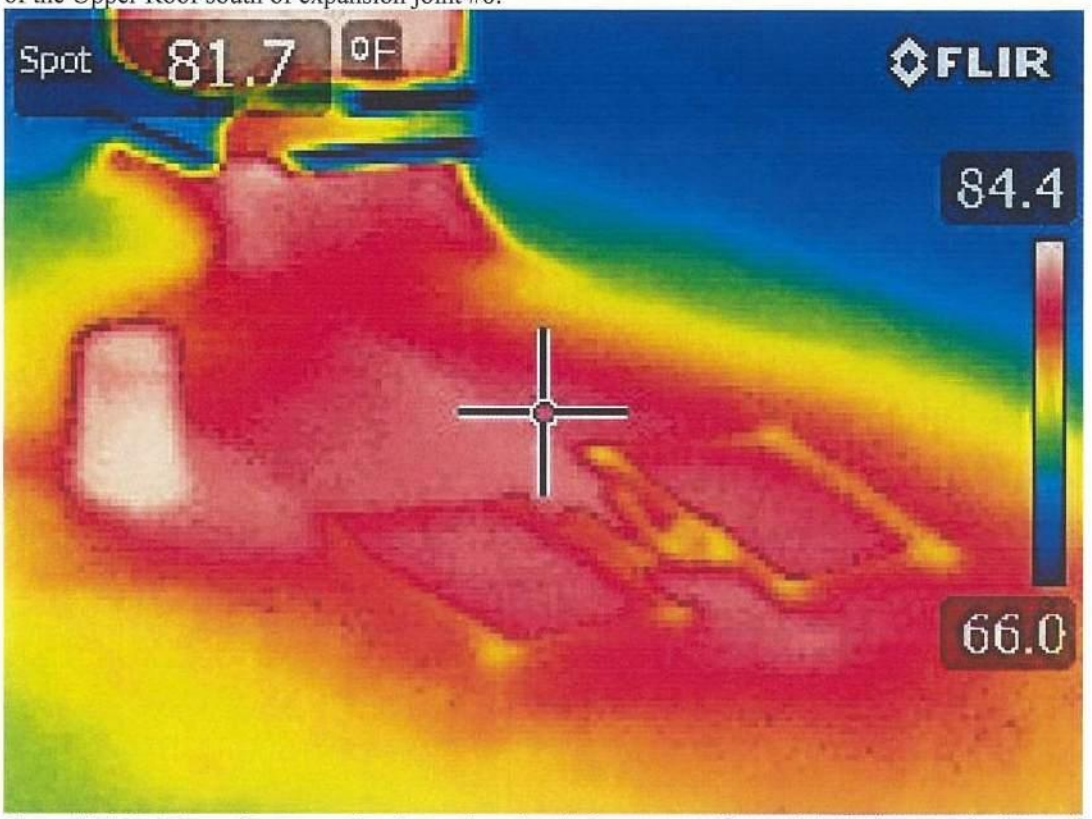

Photo #0472 View of entrapped moisture location #16 represented by red shaded area at the base of a plumbing vent and exhaust fan curb at the east side of the Upper Roof area south of expansion joint #6.

Photo #9709 View of entrapped moisture location 17 near base of an exhaust fan curb at the east side of the Upper Roof south of expansion joint #6.

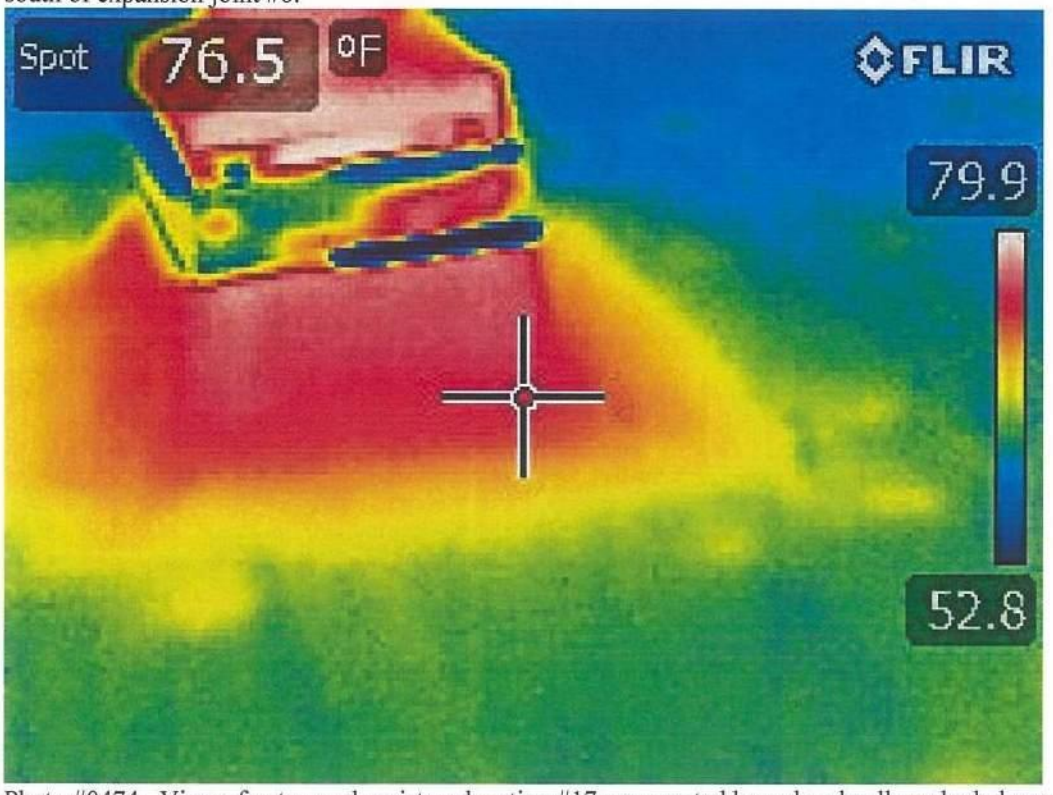

Photo #0474 View of entrapped moisture location #17 represented by red and yellow shaded areas at the base of an exhaust fan curb at the east ½ of the Upper Roof area south of expansion joint #6.

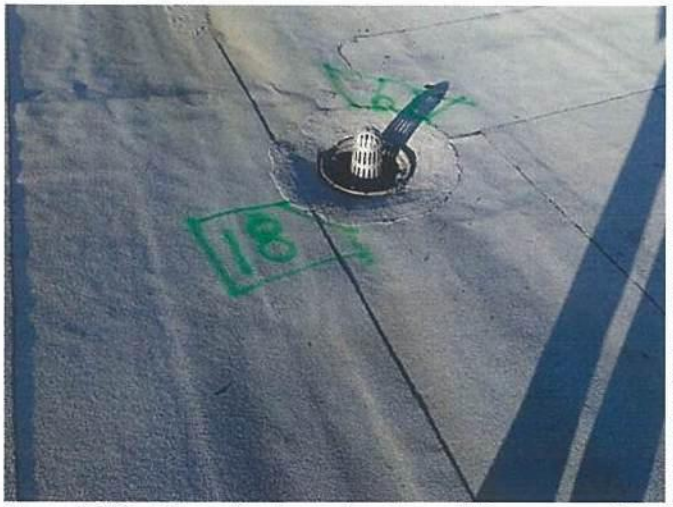

Photo #9704 View of entrapped moisture #18 near a roof drain Near the north side of the Upper Roof expansion joint #5.

Photo #9705 View of entrapped moisture #19 at roof drain Near the north side of the Upper Roof expansion joint #5.

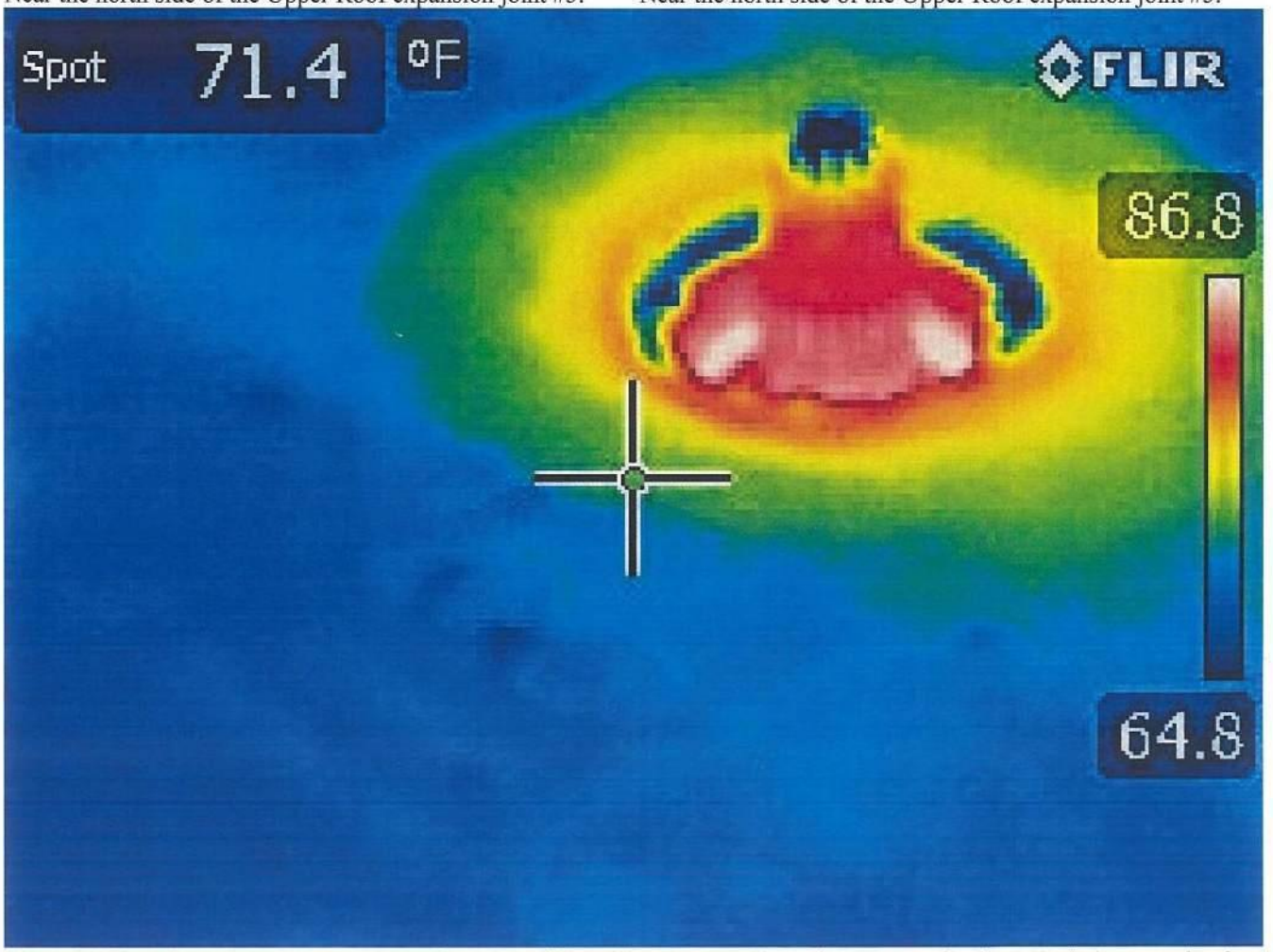

Photo #0476 View of entrapped moisture locations #18 & 19 represented by red, orange and yellow shaded area at the rim of a roof drain at the east ½ of the Upper Roof area north of expansion joint #5.

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Photo #9706 View of entrapped moisture location #20 near a roof drain at the west side of the Upper roof north of expansion joint #5.

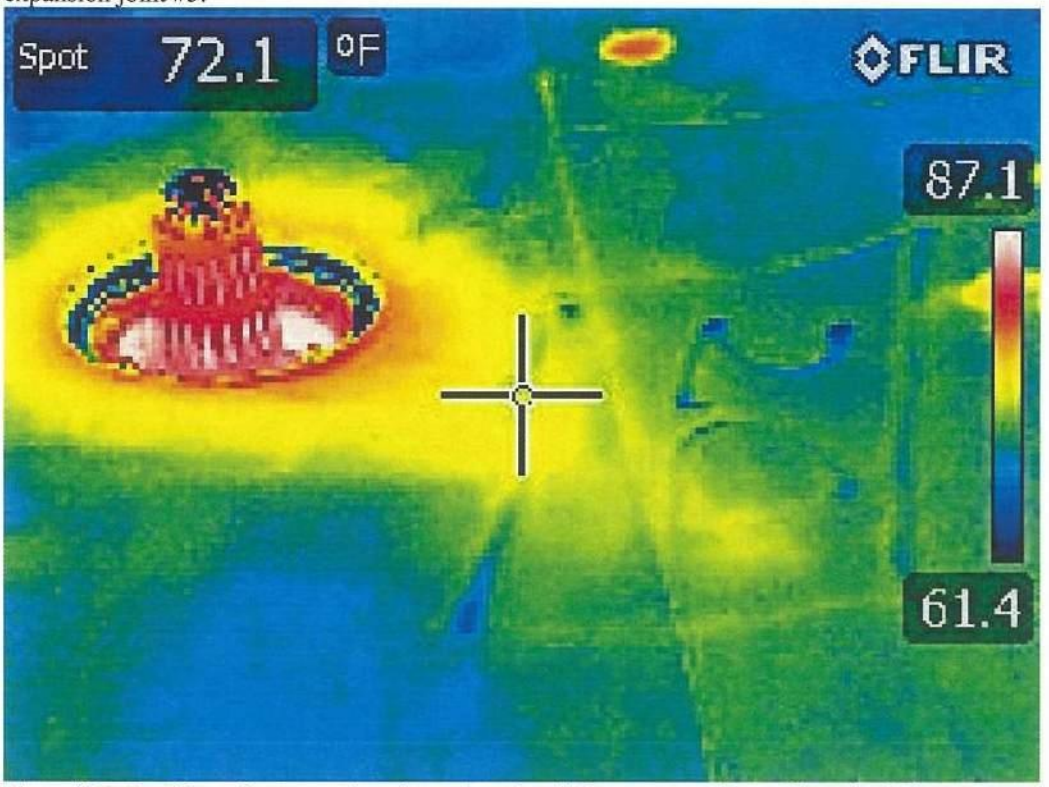

Photo #0478 View of entrapped moisture location #20 represented by yellow shaded area near the rim of a roof drain at the west valley of the Upper Roof area north of expansion joint #5.

Photo #9707 View of entrapped moisture #21 near a roof drain at the west side of the Upper roof south of expansion joint #6.

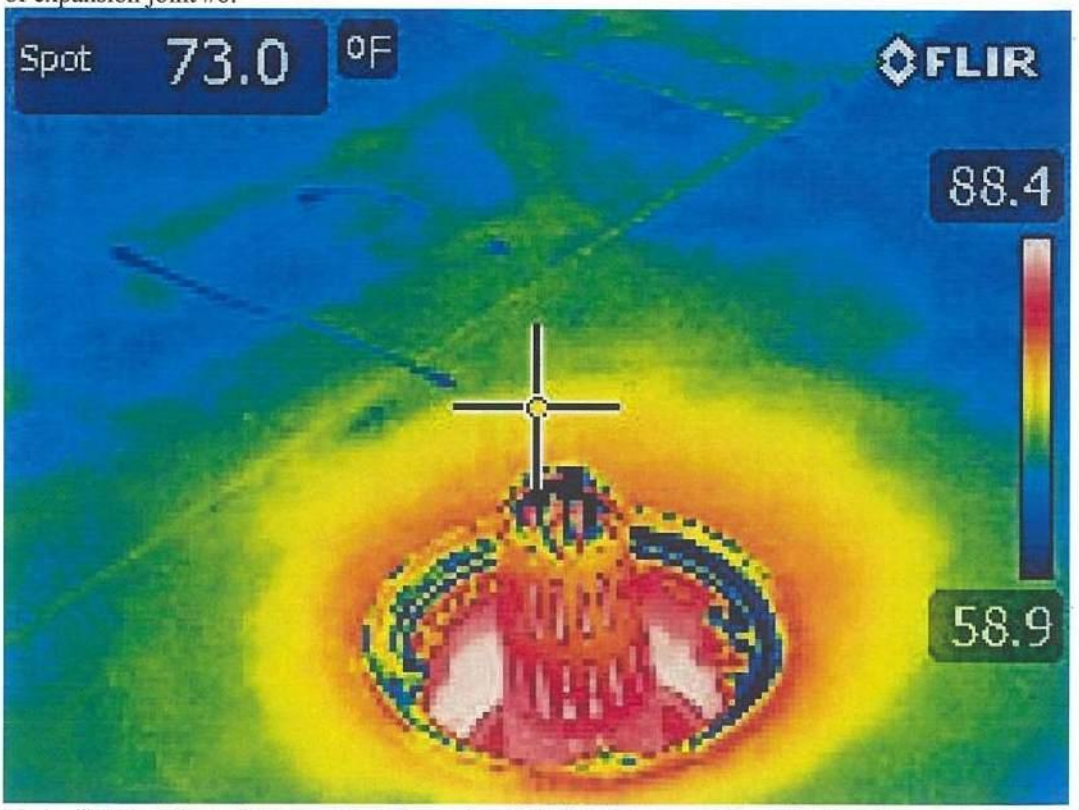

Photo #0480 View of entrapped moisture location #21 represented by yellow and green shaded areas near the rim of a roof drain at the west valley of the Upper Roof area south of expansion joint #6.

Photo #9715 View of entrapped moisture location #22 at the gravel surfaced built up roof area at the Upper roof north of expansion joint #6.

Photo #9737 Entrapped moisture location #22

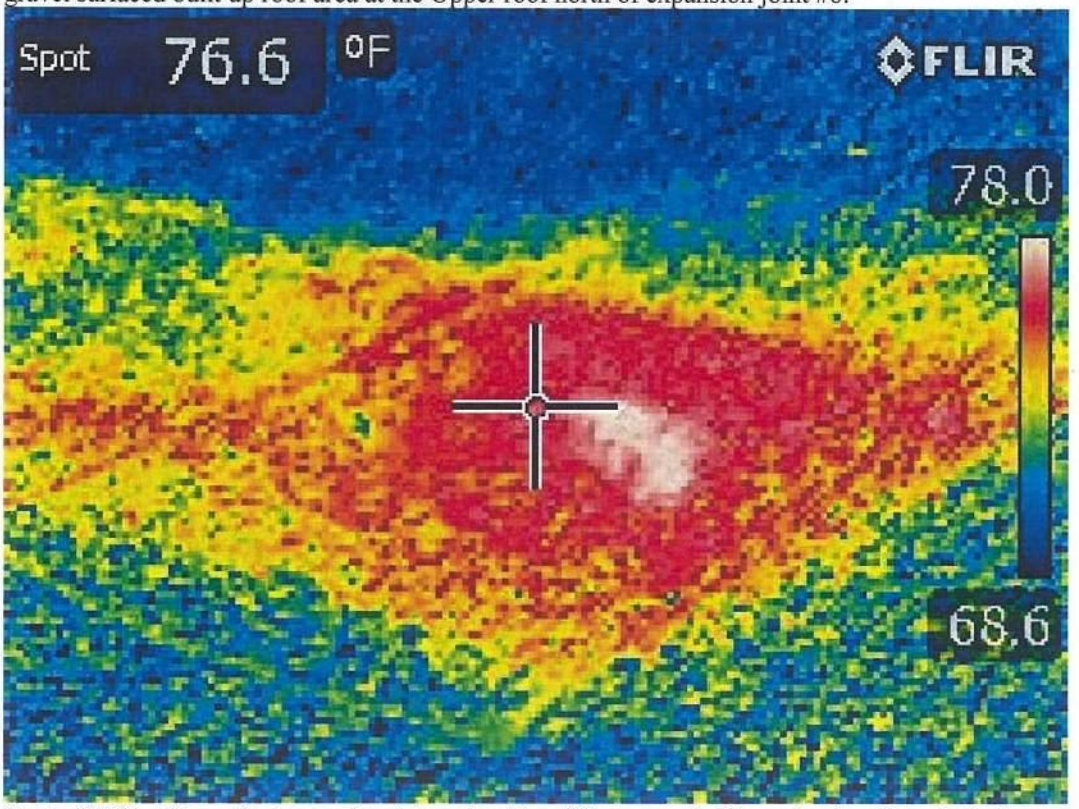

Photo #0490 View of entrapped moisture location #22 represented by red and yellow shaded areas at the gravel surfaced roof at the north side of expansion joint #6.

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Photo #9716 View of entrapped moisture location #23 at the gravel surfaced built up roof area at the Upper roof north of expansion joint #6.

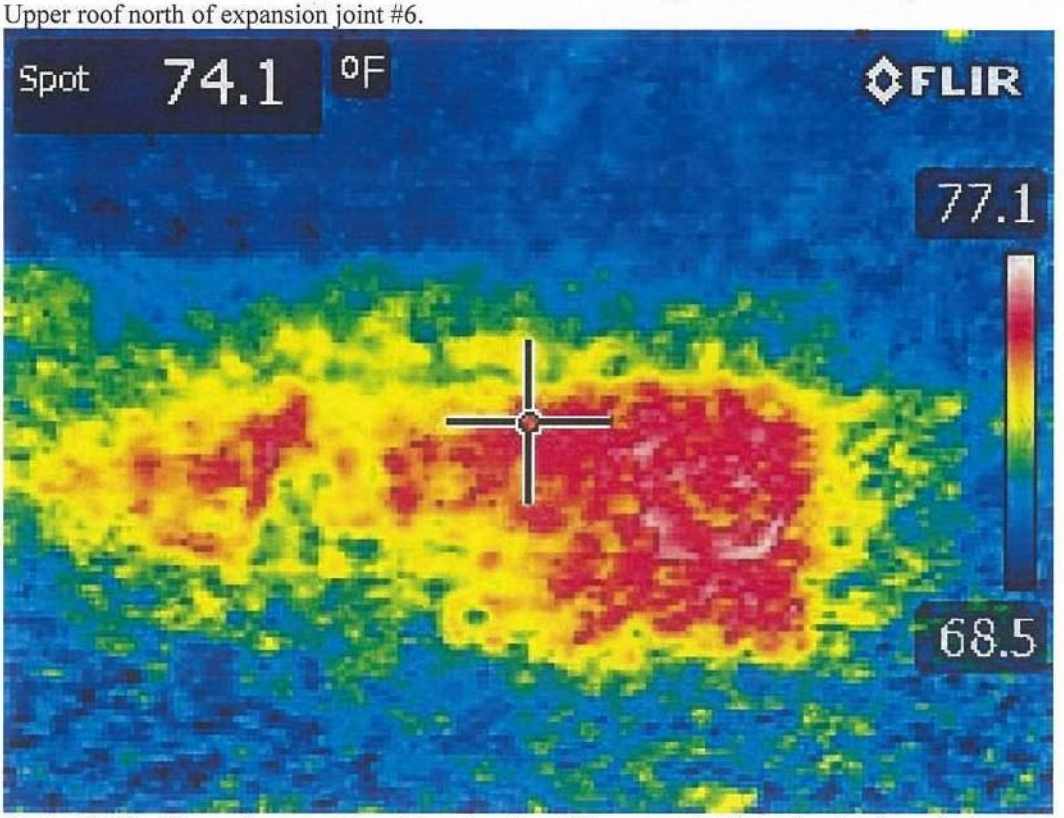

Photo #0486 View of entrapped moisture location #23 represented by red and yellow shaded areas at the gravel surfaced Upper Roof at the north side of expansion joint #6.

Photo #9713 View of entrapped moisture location #24 at the gravel surfaced Upper Roof north of expansion joint #6.

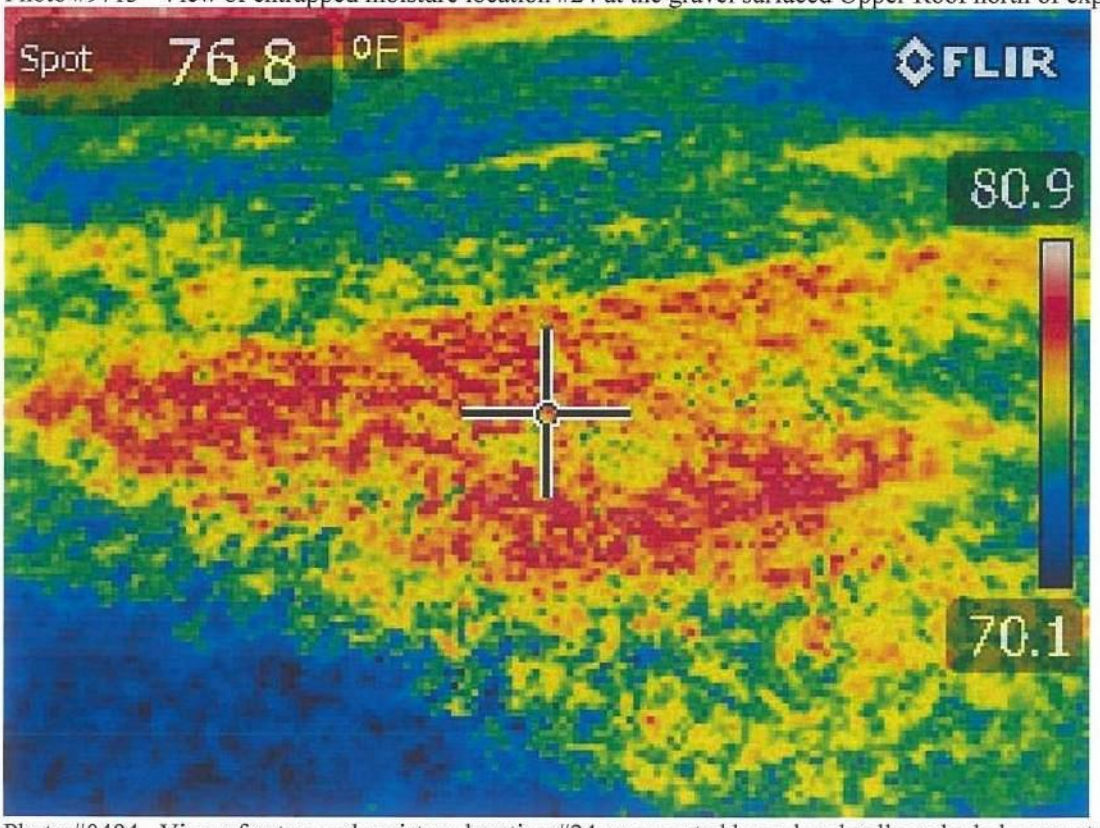

Photo #0484 View of entrapped moisture location #24 represented by red and yellow shaded areas at the gravel surfaced built up roof at the north side of expansion joint #6 at the Upper roof.

Photo #9714 View of entrapped moisture location #25 at the gravel surfaced built up roof area at the east side of the Upper roof north of expansion joint #6.

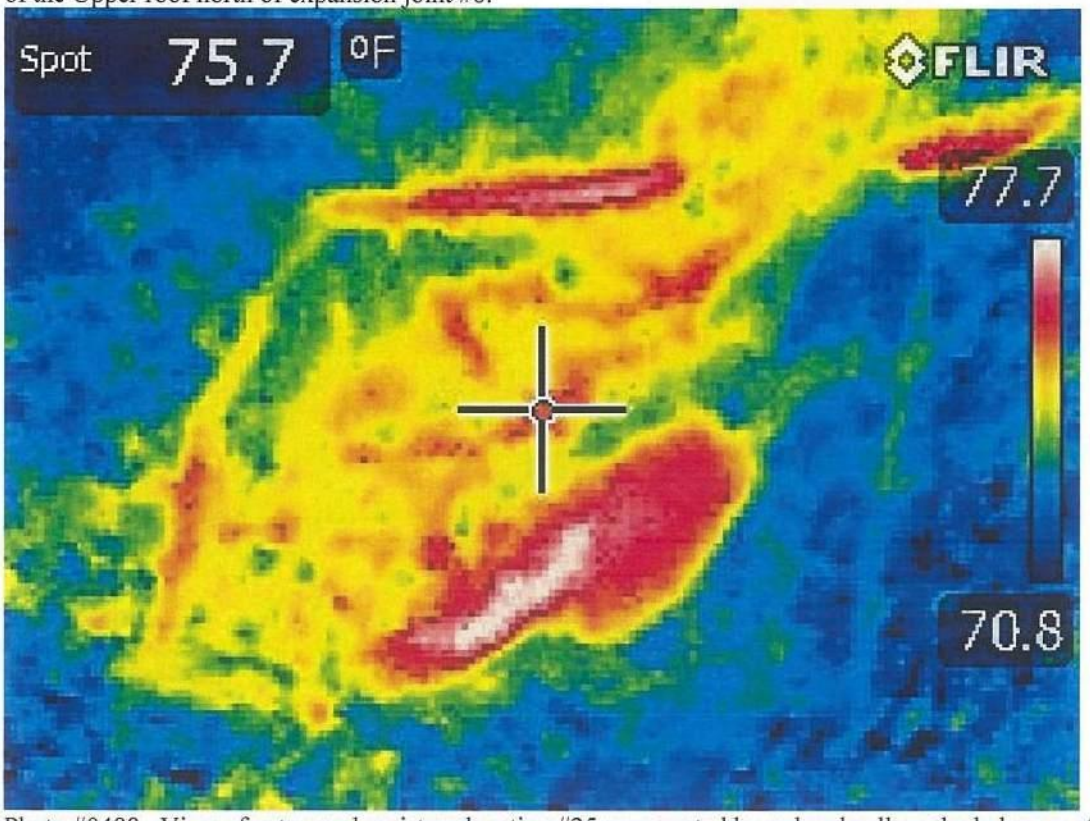

Photo #0488 View of entrapped moisture location #25 represented by red and yellow shaded areas at the gravel surfaced built-up roof at the north side of expansion joint #6.

Photo #9718 View of entrapped moisture location #26 at the mineral surfaced modified bitumen roof at the east valley line of the Lower Roof north of expansion joint #7.

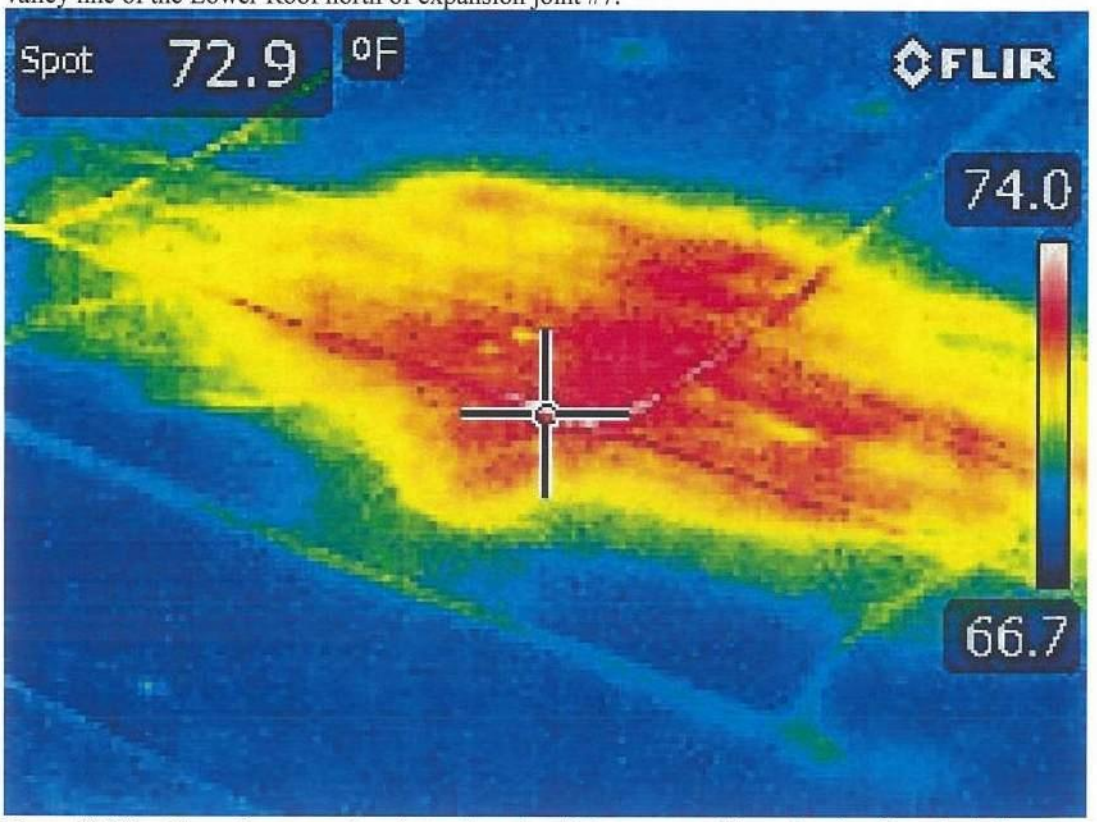

Photo #0492 View of entrapped moisture location #26 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof at the east valley north of expansion joint #7 at the Lower roof.

Photo #9717 View of entrapped moisture location #27 at the mineral surfaced modified bitumen patched roof area at the Upper roof east valley north of expansion joint #7.

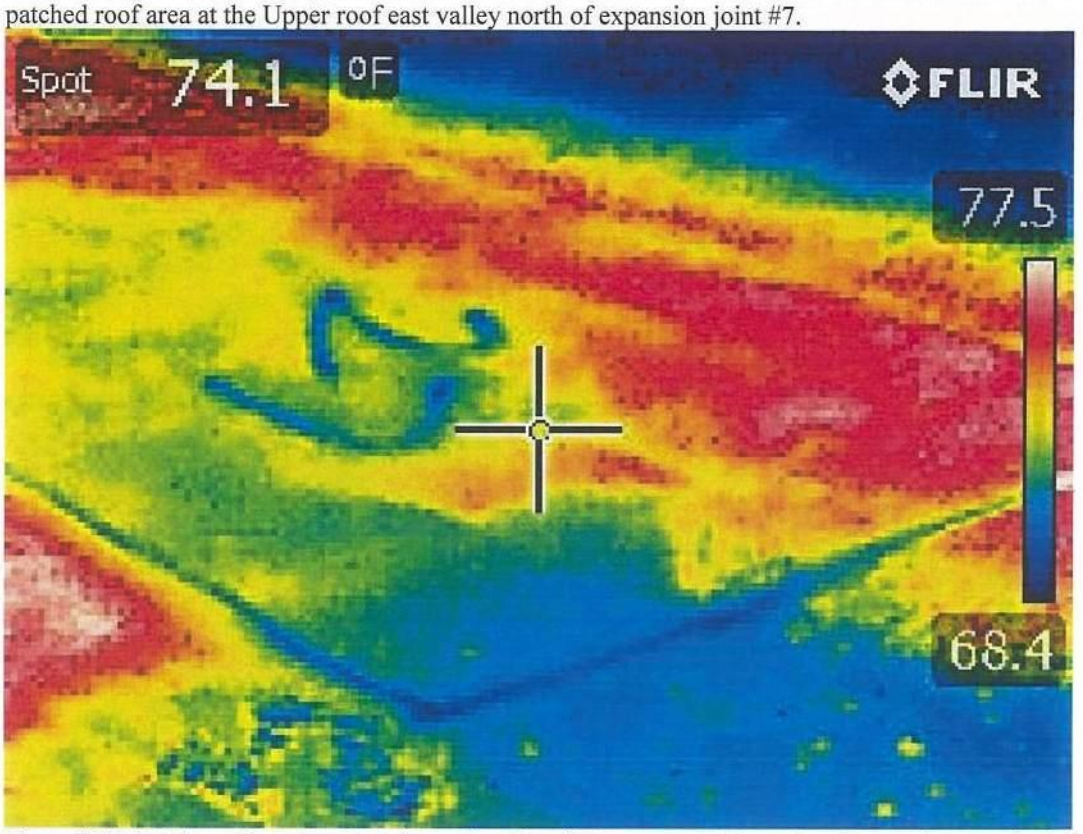

Photo #0494 View of entrapped moisture location #27 represented by red, yellow and green shaded areas at the mineral surfaced modified bitumen patched roof area at the north side of expansion joint #7 at the Upper Roof east valley.

Photo #9749 View of entrapped moisture location #28 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof south of expansion joint #8.

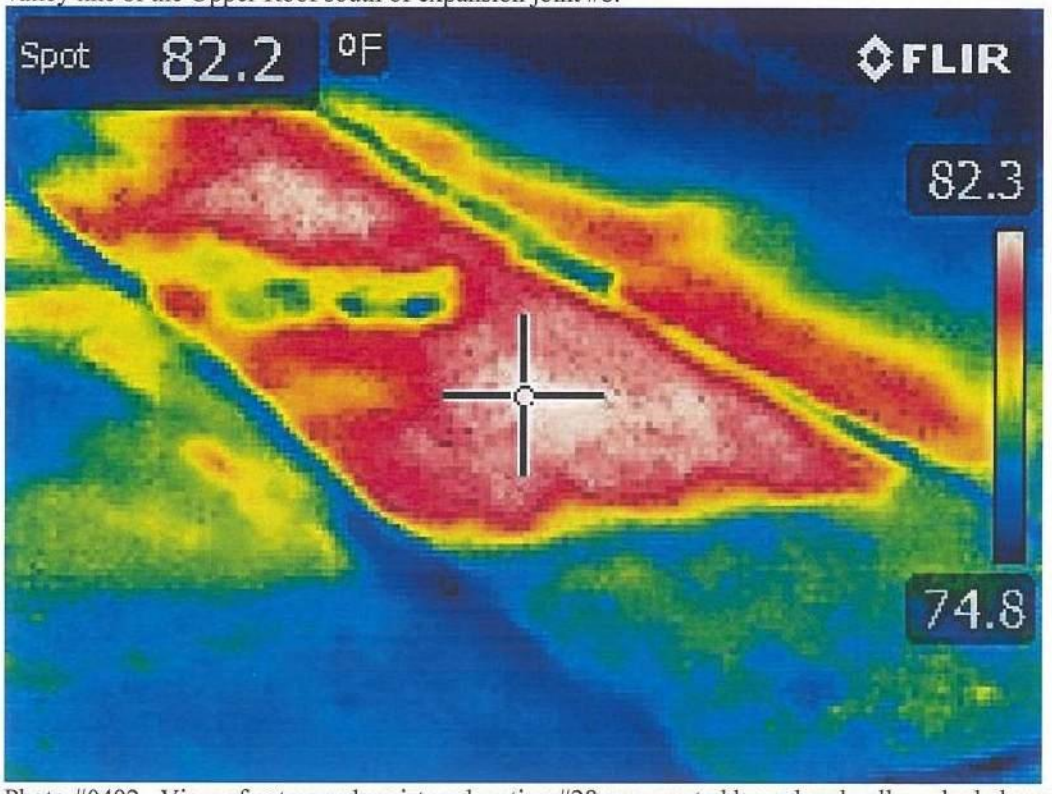

Photo #0492 View of entrapped moisture location #28 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley south of expansion joint #8 at the Upper Roof.

Photo #9742 View of entrapped moisture location #29 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof north of expansion joint #7.

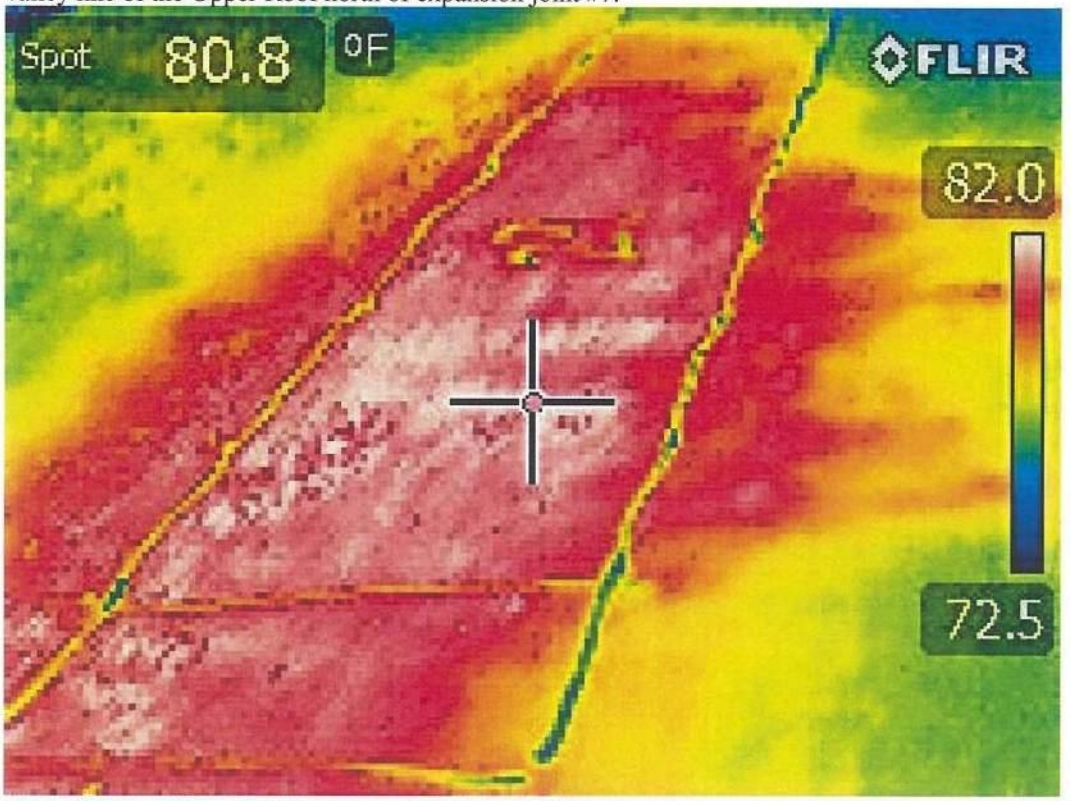

Photo #0498 View of entrapped moisture location #29 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley north of expansion joint #7 at the Upper Roof.

Photo #9743 View of entrapped moisture location #30 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof south of expansion joint #8.

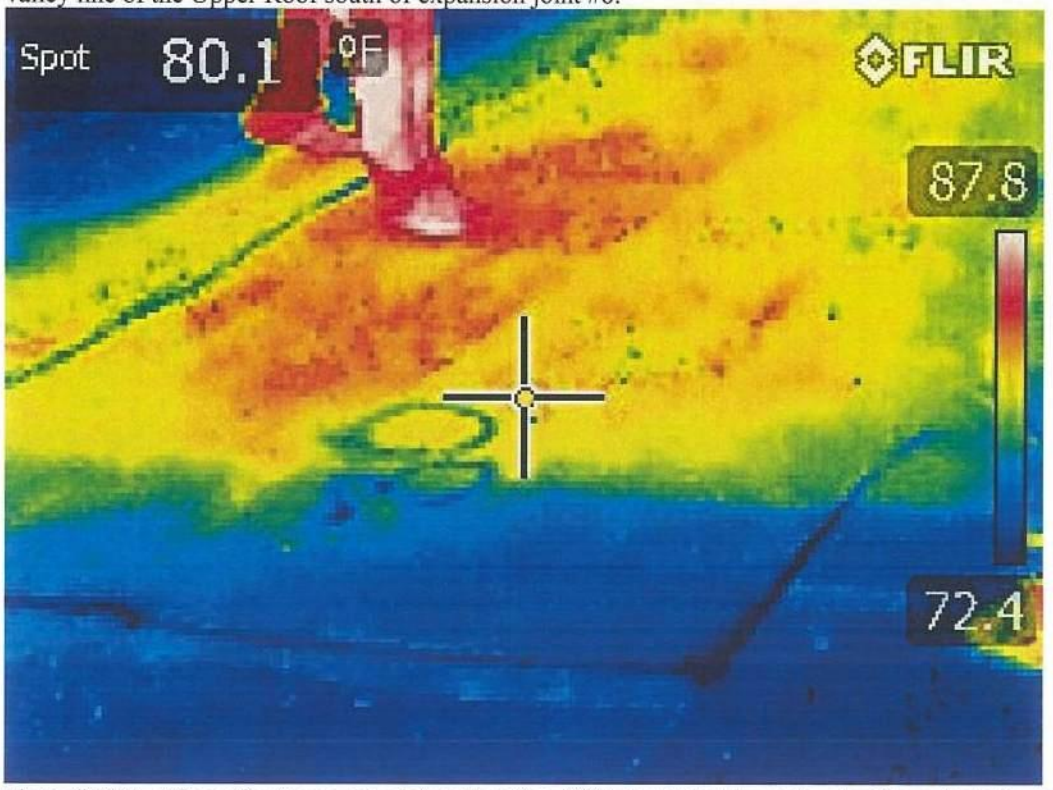

Photo #0500 View of entrapped moisture location #30 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley south of expansion joint #8 at the Upper Roof.

Photo #9744 View of entrapped moisture location #31 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof south of expansion joint #8.

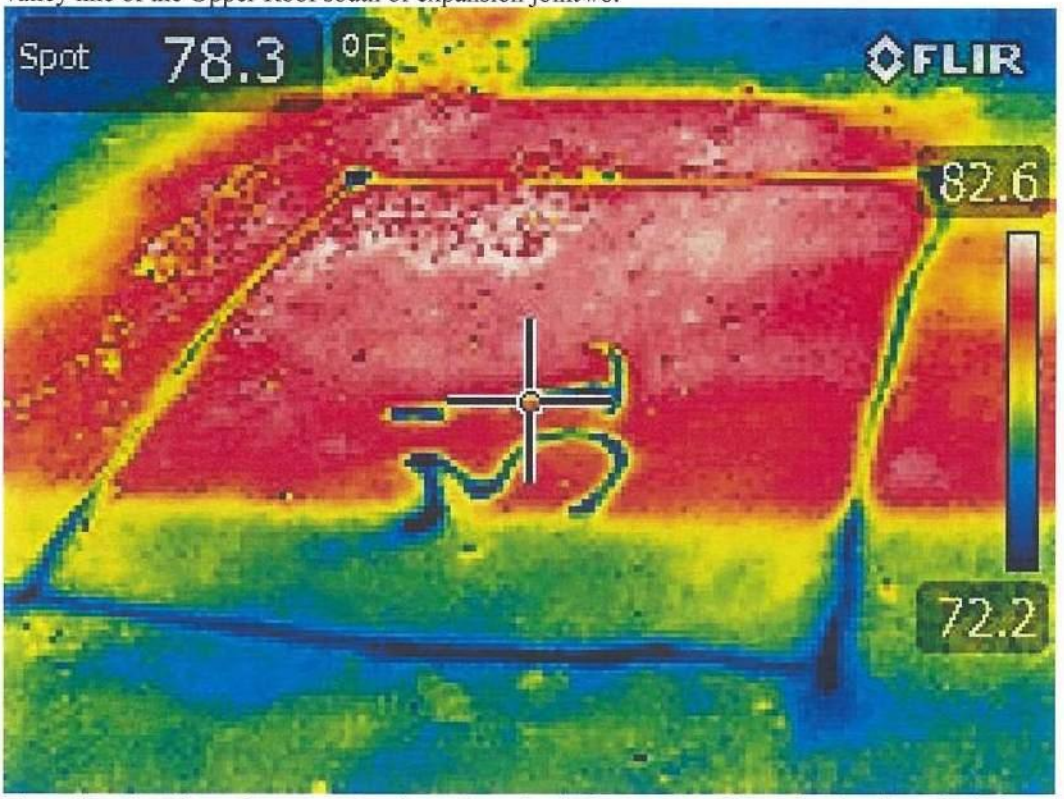

Photo #0502 View of entrapped moisture location #31 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley south of expansion joint #8 at the Upper Roof.

Photo #9745 View of entrapped moisture location #32 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof south of expansion joint #8.

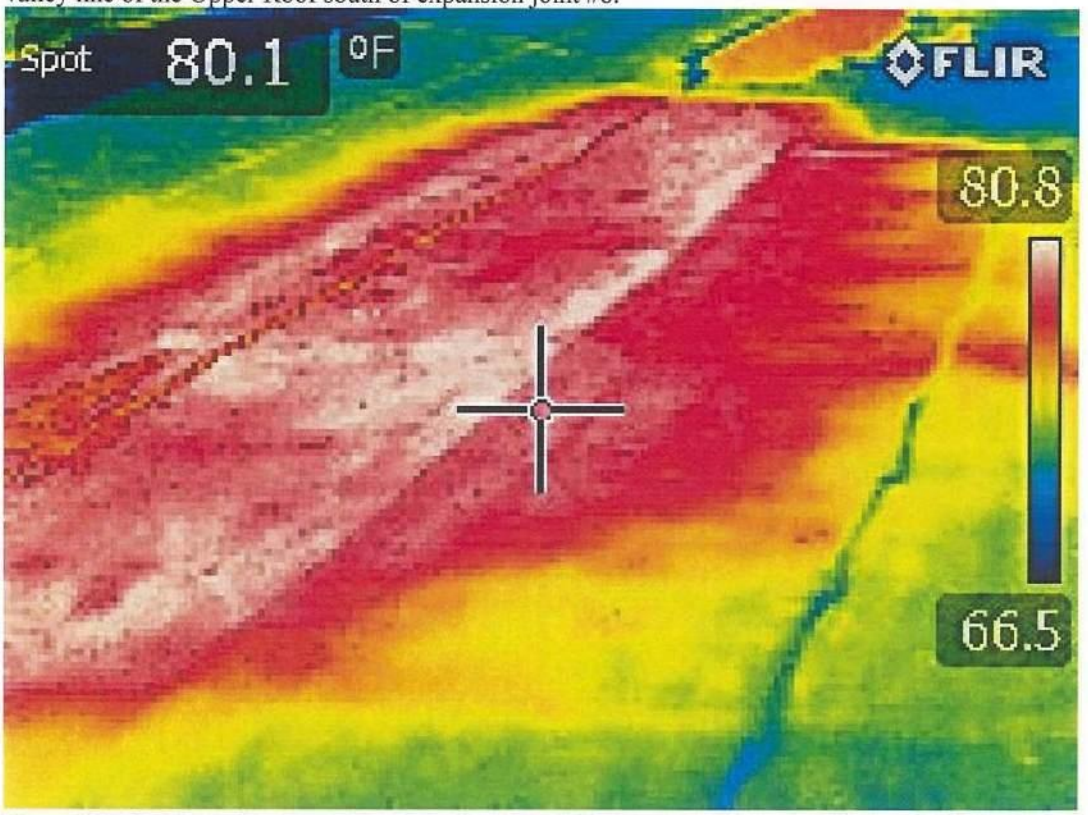

Photo #0504 View of entrapped moisture location #32 represented by red, white and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley south of expansion joint #8 at the Upper Roof.

Photo #9746 View of entrapped moisture location #33 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof south of expansion joint #8.

Photo #9747 View of entrapped moisture location #33 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof south of expansion joint #8

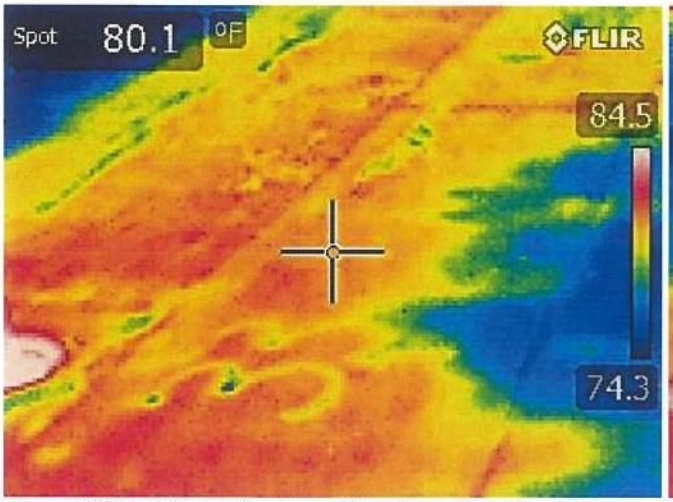

Photo #0506 View of entrapped moisture location #33. represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley south of expansion joint #8 at the Upper Roof.

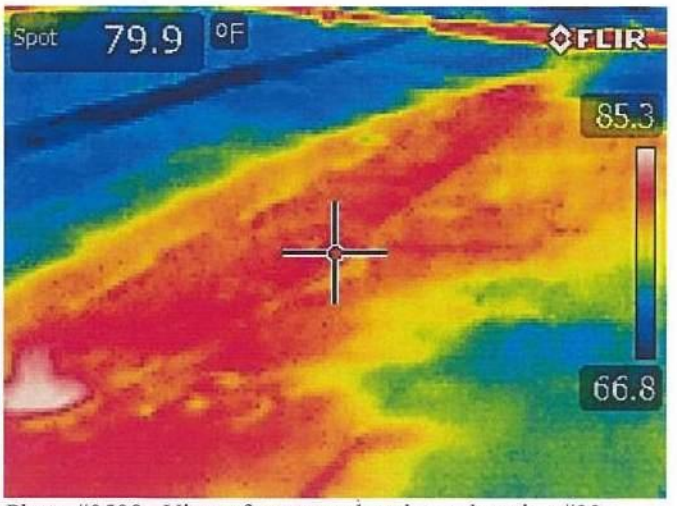

Photo #0508 View of entrapped moisture location #33 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley south of expansion joint #8 at the Upper Roof.

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Photo #9750 View of entrapped moisture location #34 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

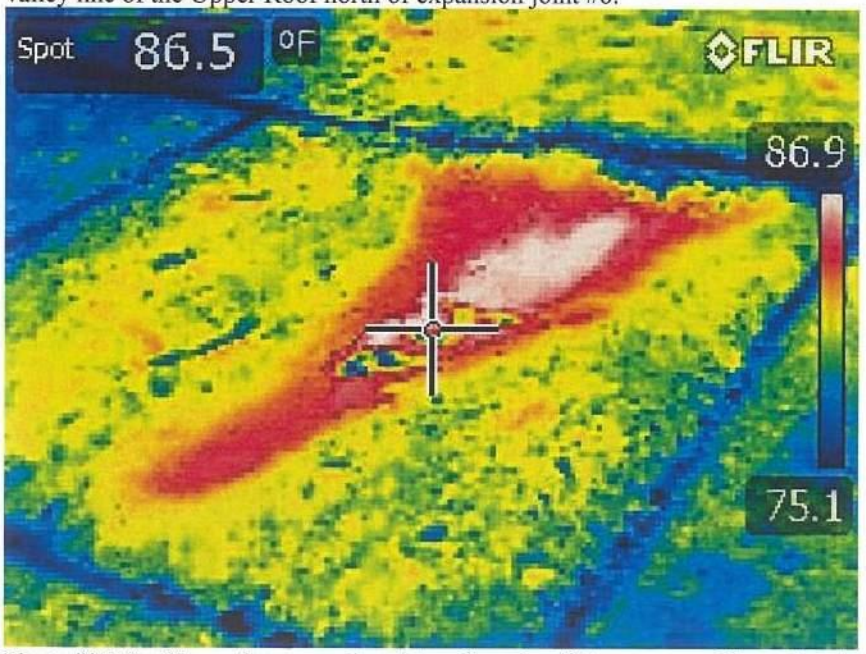

Photo #0510 View of entrapped moisture location #34 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

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Photo #9751 View of entrapped moisture location #35 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

Photo #0512 View of entrapped moisture location #35 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

Photo #9752 View of entrapped moisture location #36 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

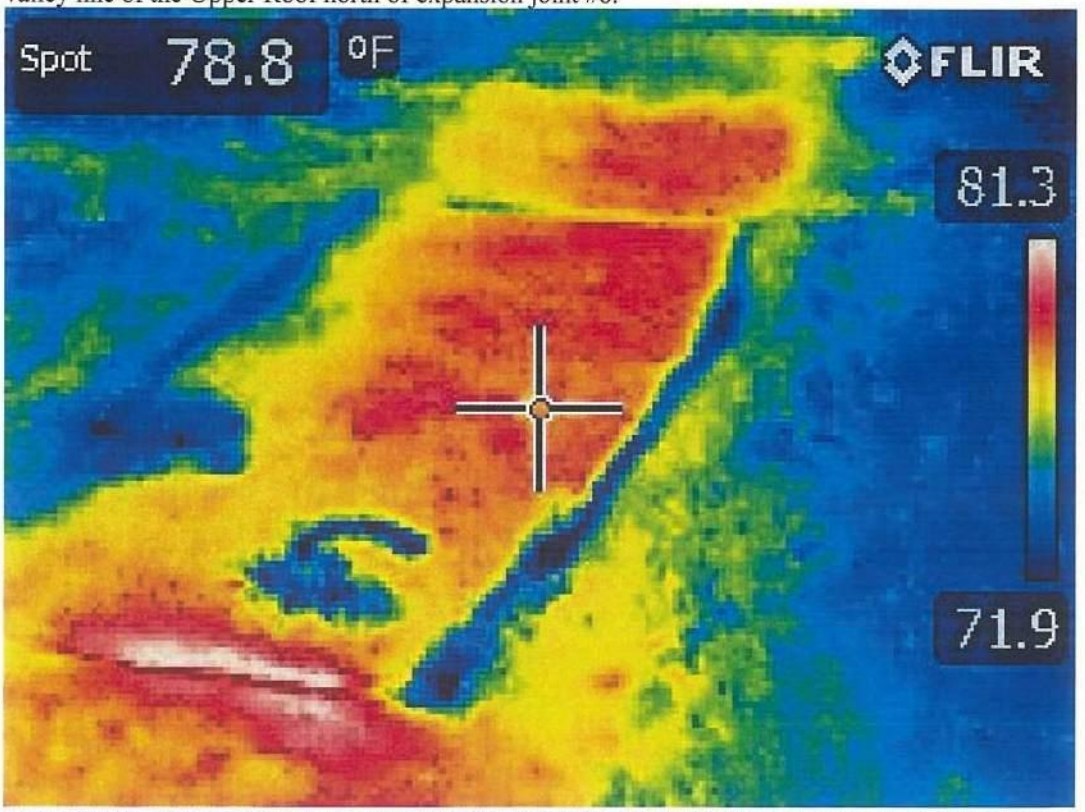

Photo #0514 View of entrapped moisture location #36 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

Photo #9753 View of entrapped moisture location #37 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

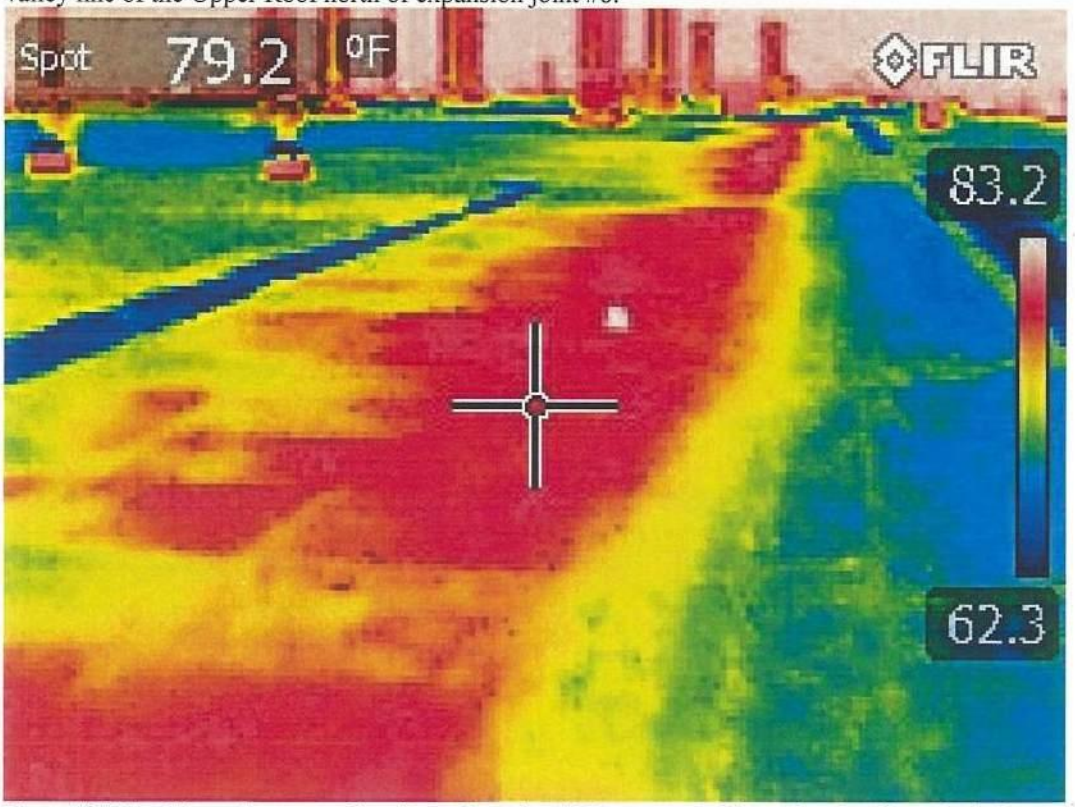

Photo #0514 View of entrapped moisture location #37 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

Photo #9754 View of entrapped moisture location #38 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

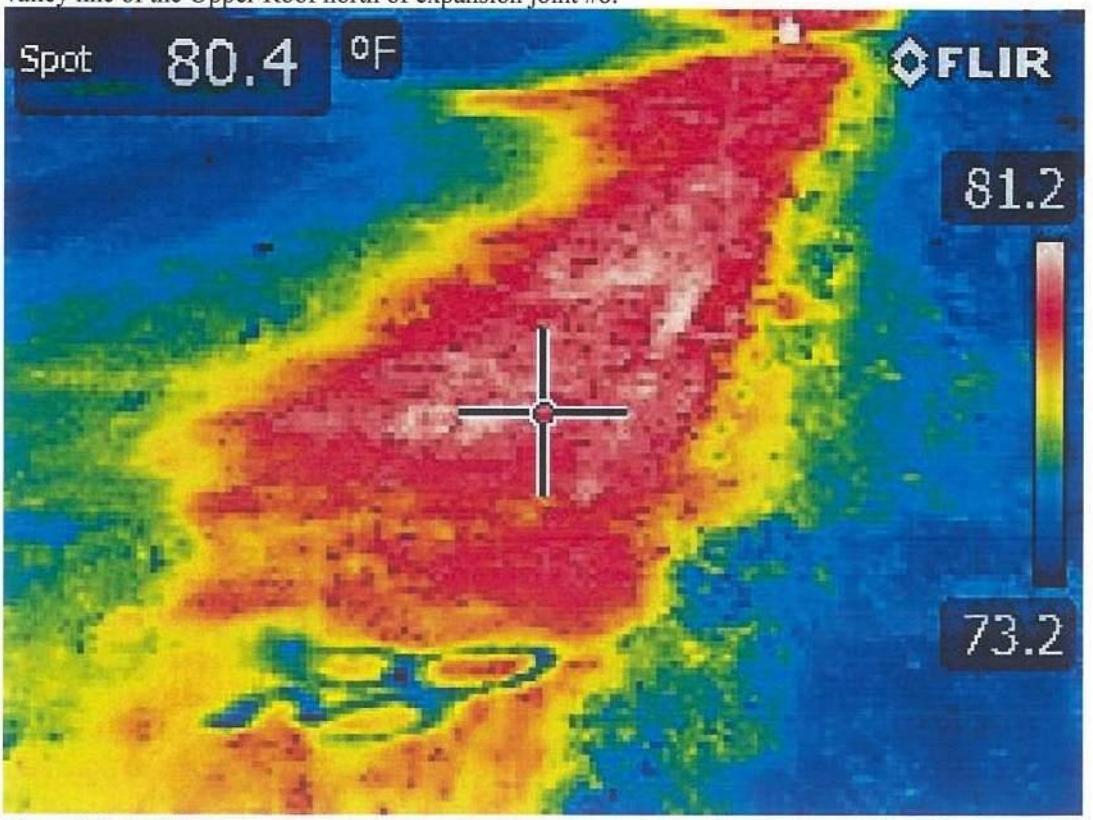

Photo #0518 View of entrapped moisture location #38 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

Photo #9755 View of entrapped moisture location #39 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof north of expansion joint #8.

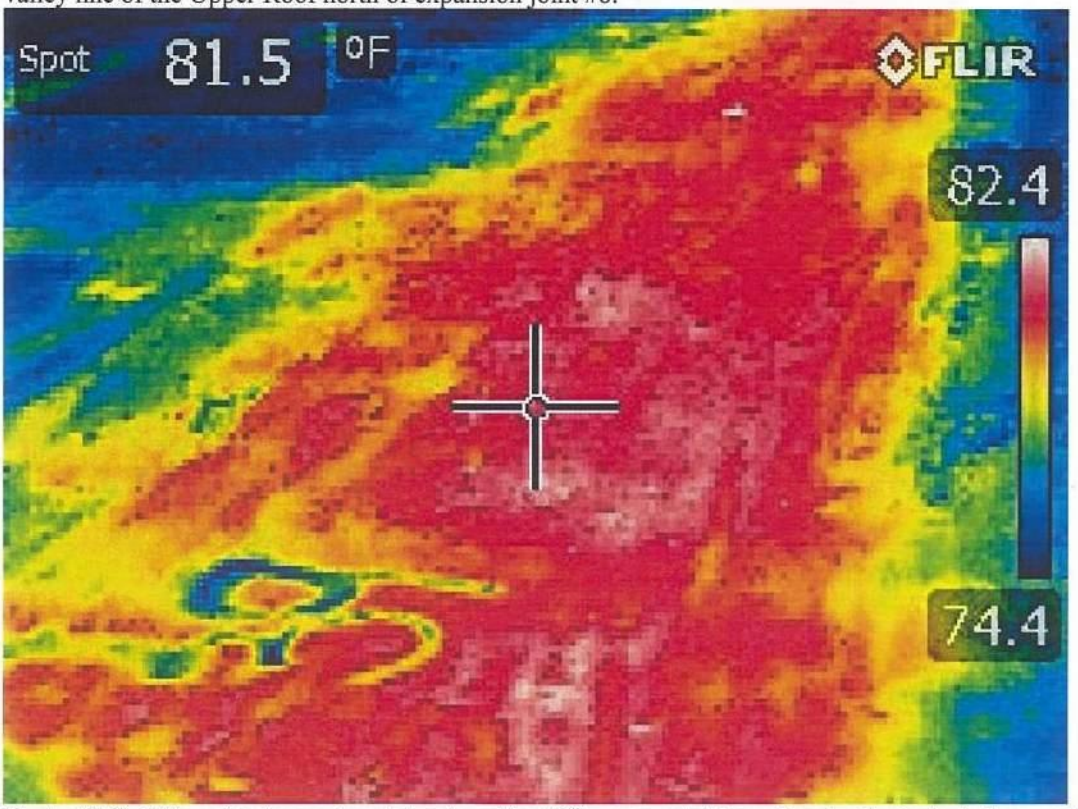

Photo #050 View of entrapped moisture location #39 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley north of expansion joint #8 at the Upper Roof.

Photo #9756 View of entrapped moisture location #40 at the mineral surfaced modified bitumen roof patch at the east valley line of the Upper Roof south of expansion joint #9.

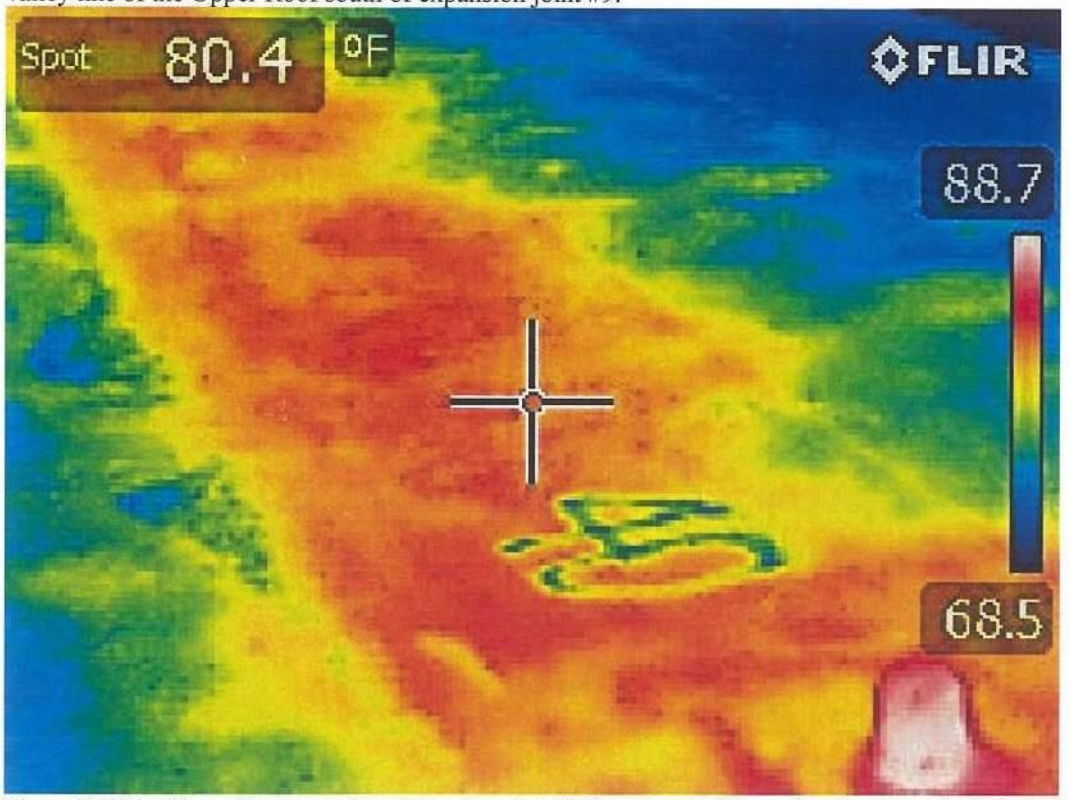

Photo #0522 View of entrapped moisture location #39 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the east valley south of expansion joint #9 at the Upper Roof.

Photo #9763 View of entrapped moisture location #41 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof north of expansion joint #8.

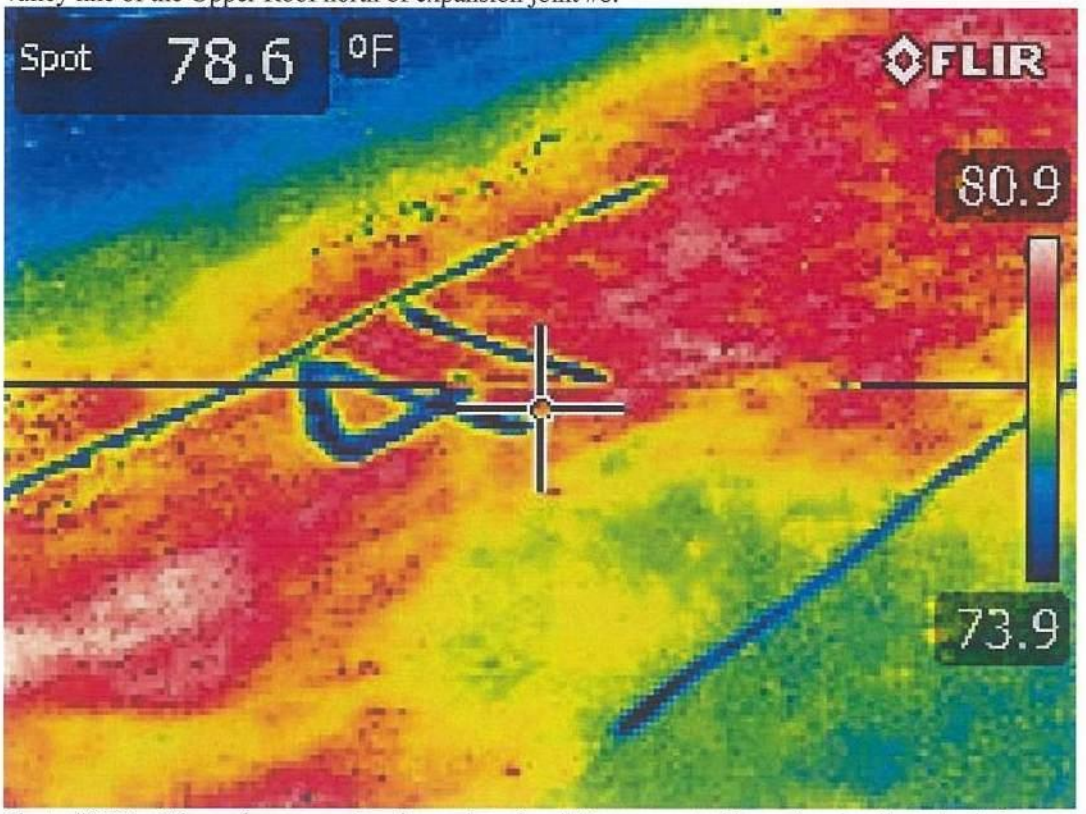

Photo #0524 View of entrapped moisture location #41 represented by red and yellow shaded areas at the mineral surfaced modified bitumen roof patch at the west valley north of expansion joint #8 at the Upper Roof.

Photo #9767 View of split and deteriorated built-up roof membrane near area of entrapped moisture location #42.

Photo #9765 View of entrapped moisture location #42 in the west valley at the Upper Roof north of expansion joint 8.

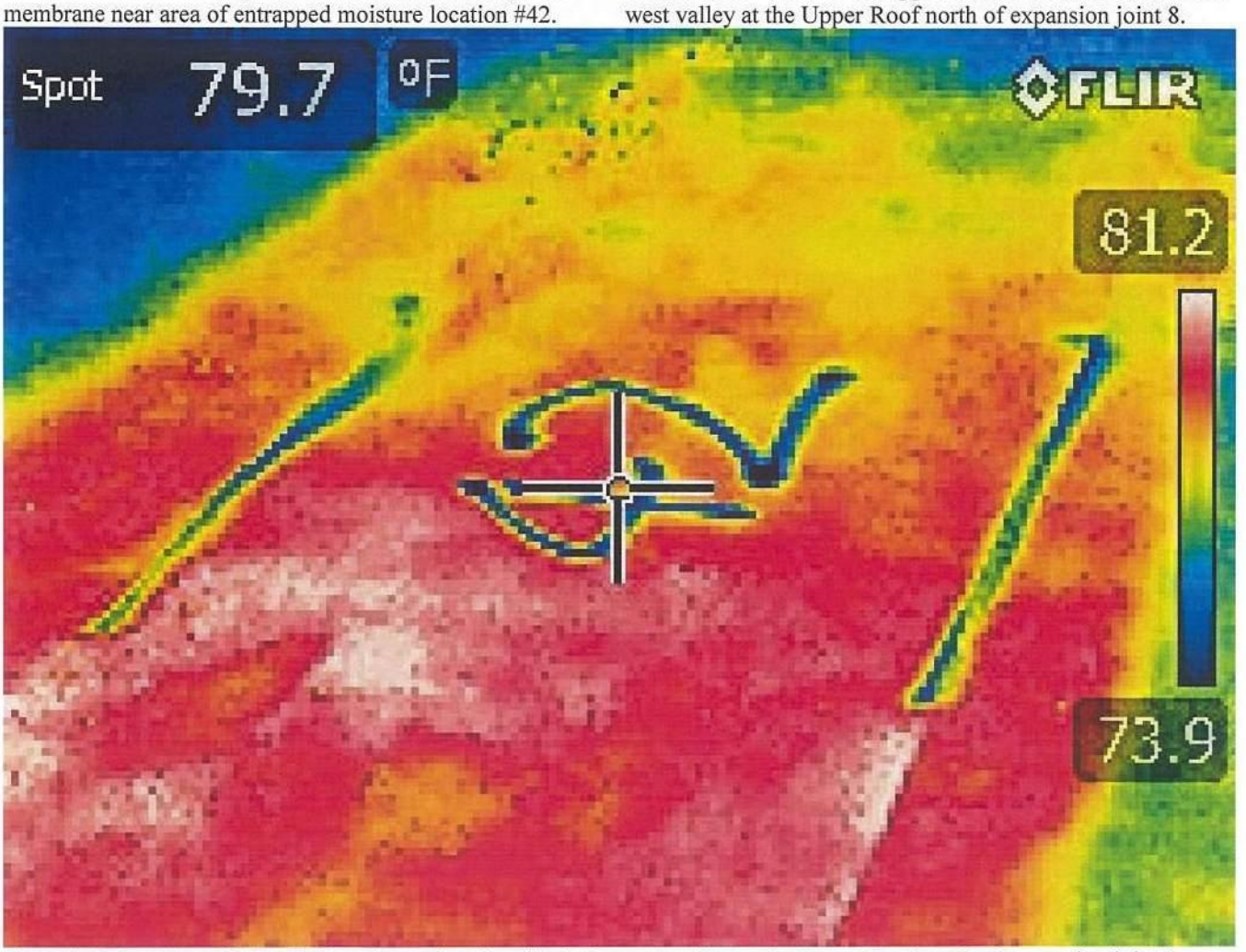

Photo #0526 View of entrapped moisture location #42 in the west valley at the Upper Roof north of expansion joint 8.

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9-6-2019 & 9/19/2019 #2001913

Photo #9760 View of ponding condensate water which has drained across the roof and ponding in valley near location #41 & 42 at the mineral surfaced modified bitumen roof patch at the west valley line of the Upper Roof north of expansion joint #9.

Photo #9761 View of delaminated mineral surfaced modified bitumen roof patch at the west valley north of expansion joint #8 at the Upper Roof due to long time exposure to ponding water.

Photo #9764 Condensate water piped through curb at Duct roof penetration. Water drains across the roof Causing roof membrane rotting and leaks at location #41.

Photo #9766 View of area of entrapped moisture location #43 in west valley modified bitumen patch at the Upper Roof south of expansion joint #9.

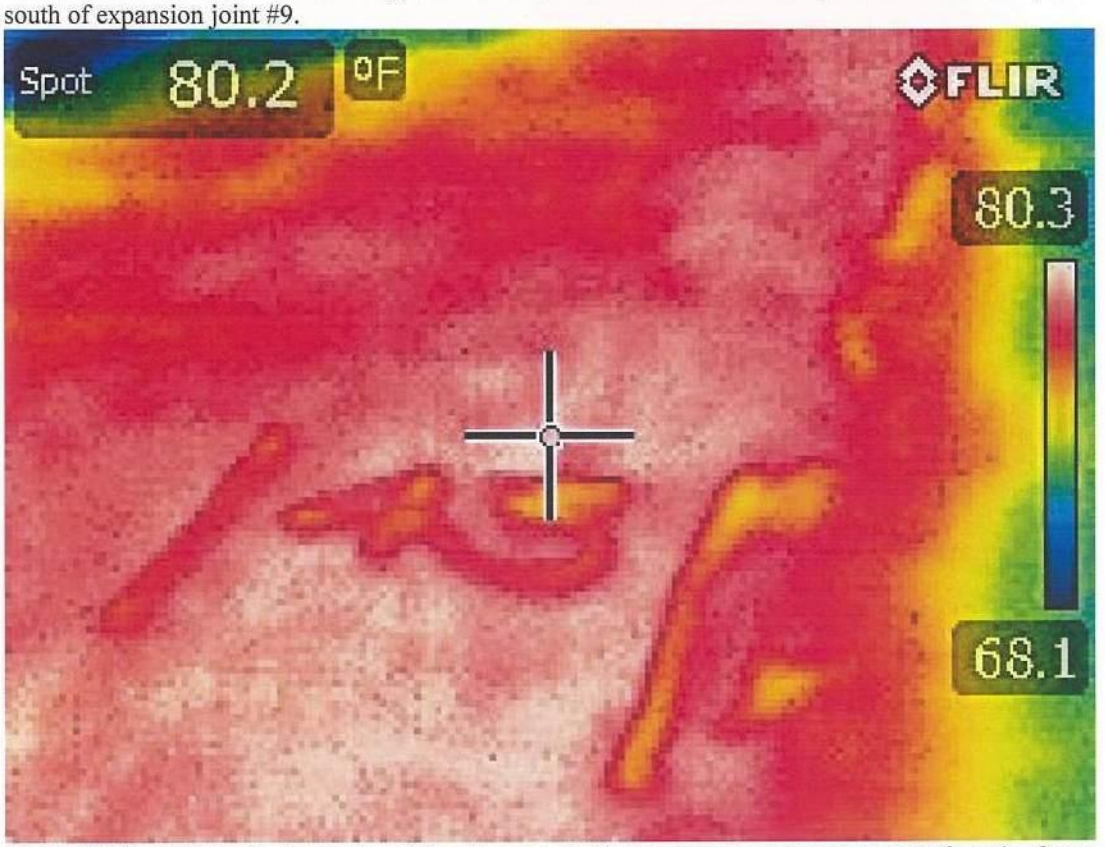

Photo #0528 View of entrapped moisture location in the west valley at the Upper Roof south of expansion joint 9.

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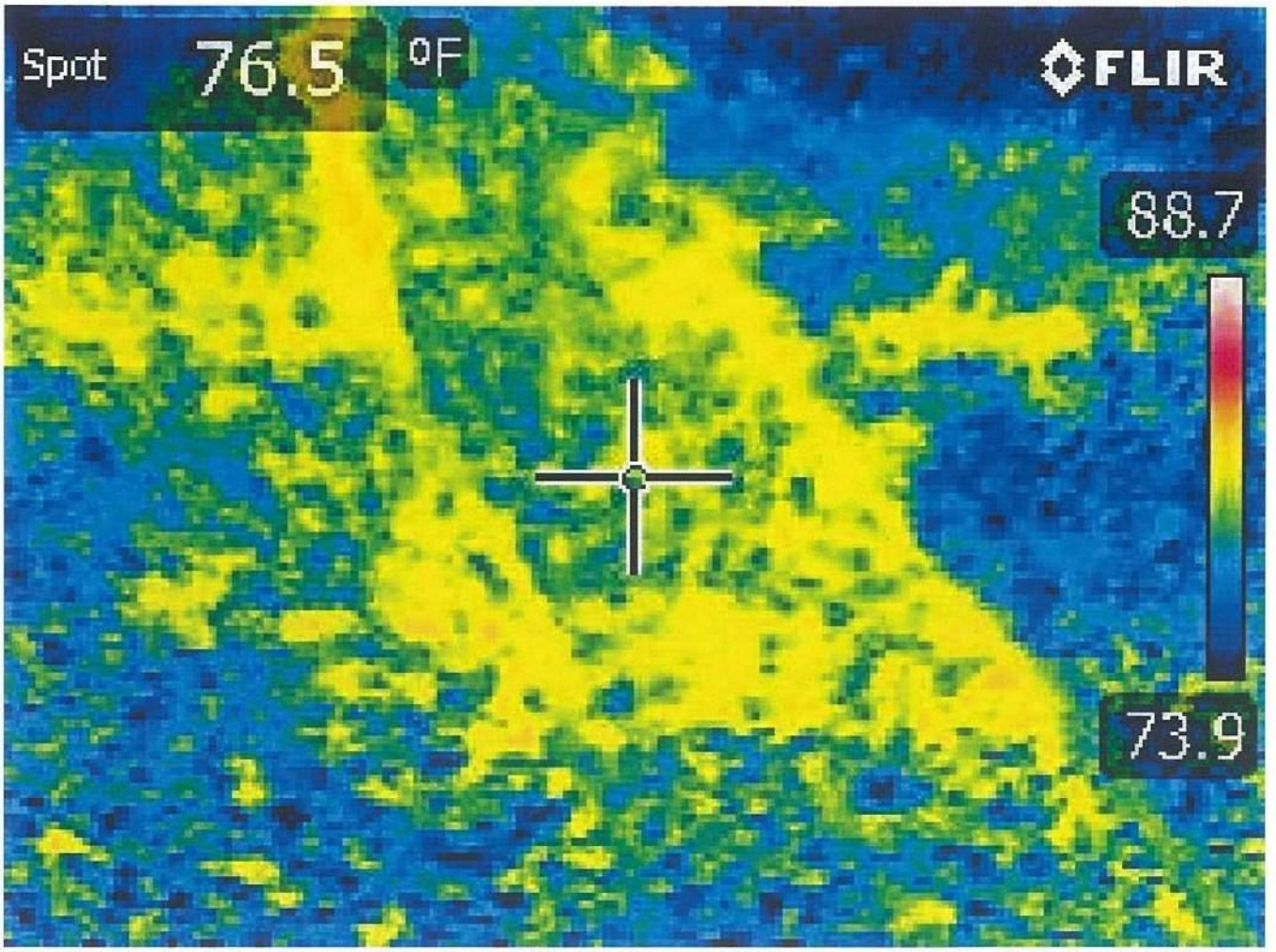

Photo #0530 View of entrapped moisture location #44 near the west valley at the Upper Roof south of expansion joint 9.

Photo #9769 View of area of entrapped moisture location #45 in east valley modified bitumen patch at the Upper Roof north of expansion joint #9.

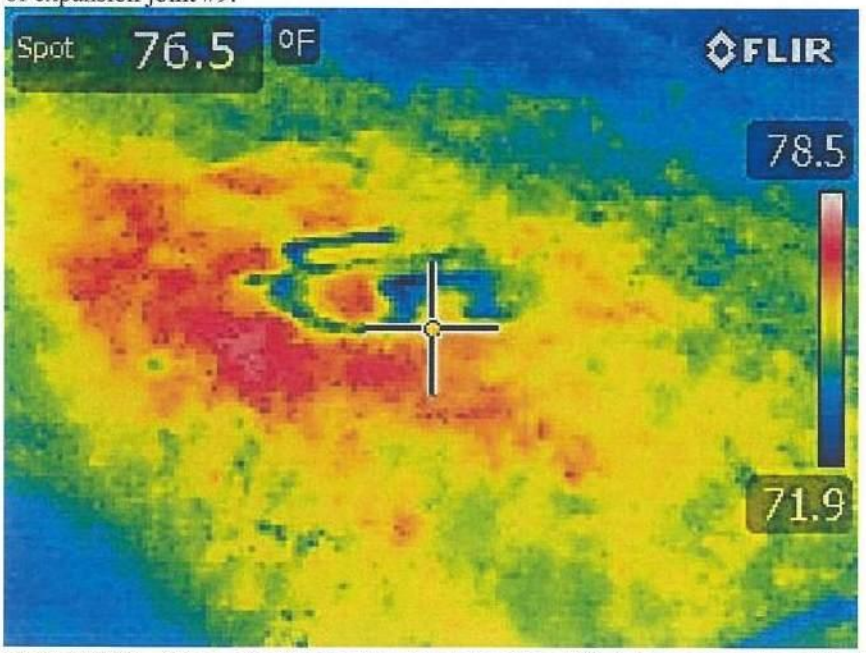

Photo #0532 View of entrapped moisture location #45 in the east valley at the Upper Roof north of expansion joint 9.

Photo #9770 View of area of entrapped moisture location #46 in east valley modified bitumen patch at the Upper Roof north of expansion joint #9.

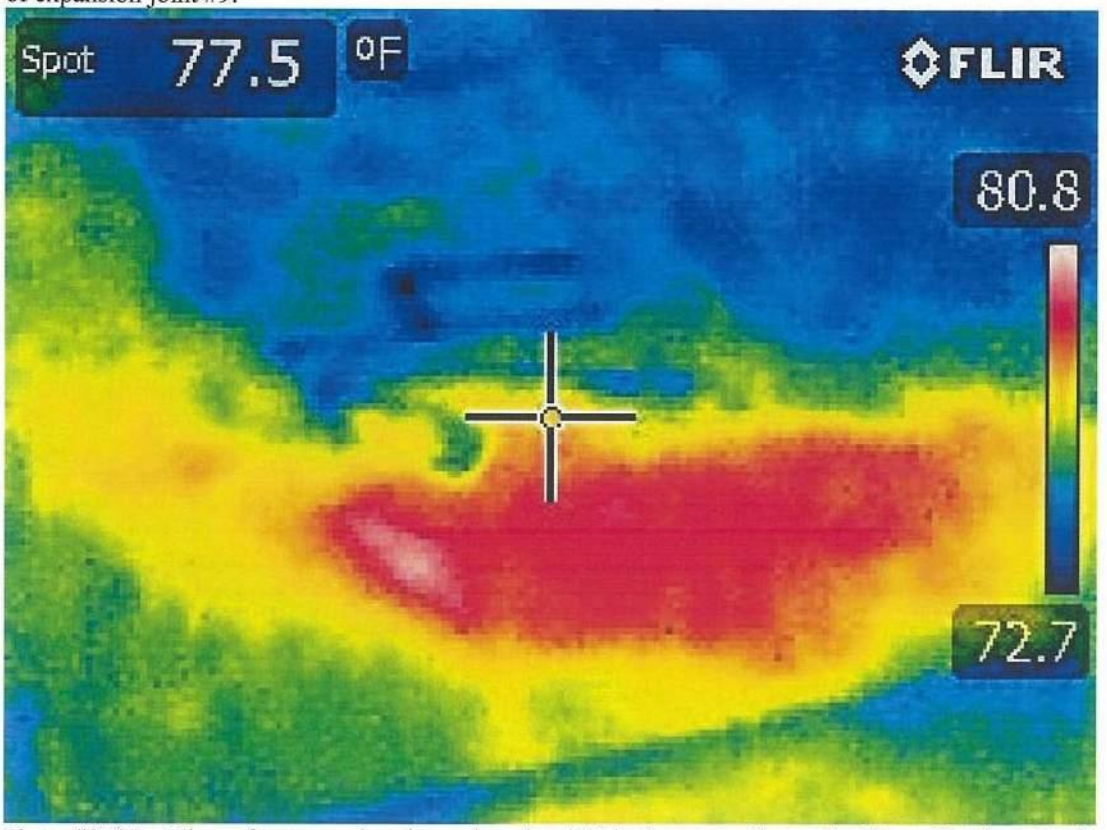

Photo #0534 View of entrapped moisture location #46 in the east valley at the Upper Roof north of expansion joint 9.

Photo #9768 View of area of entrapped moisture location #47 in west valley modified bitumen patch at the Upper Roof south of expansion joint #10.

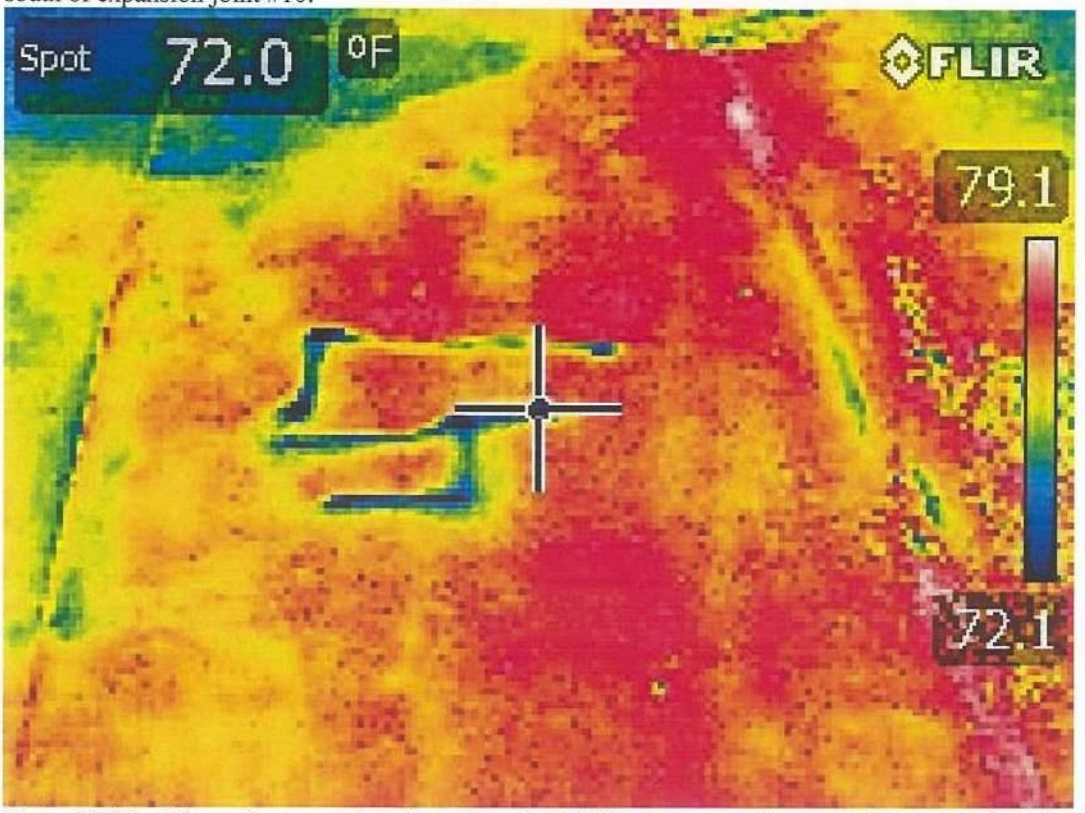

Photo #0536 View of entrapped moisture location #47 in the west valley at the Upper Roof south of expansion joint 10.

Photo #9765 View of area of entrapped moisture location #48 in west valley modified bitumen patch at the Upper Roof north of expansion joint #9.

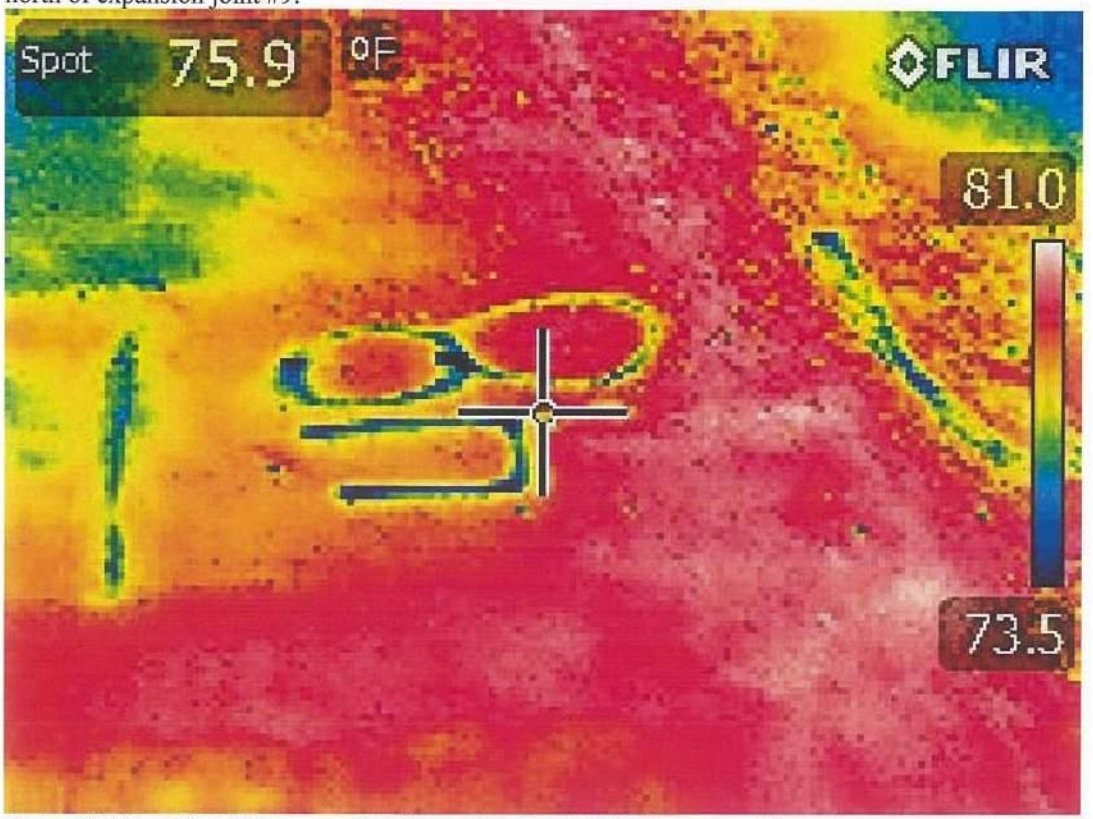

Photo #0538 View of entrapped moisture location #48 in the west valley at the Upper Roof south of expansion joint 9.

Photo #9770 View of area of entrapped moisture location #49 in west valley modified bitumen patch at the Upper Roof north of expansion joint #9.

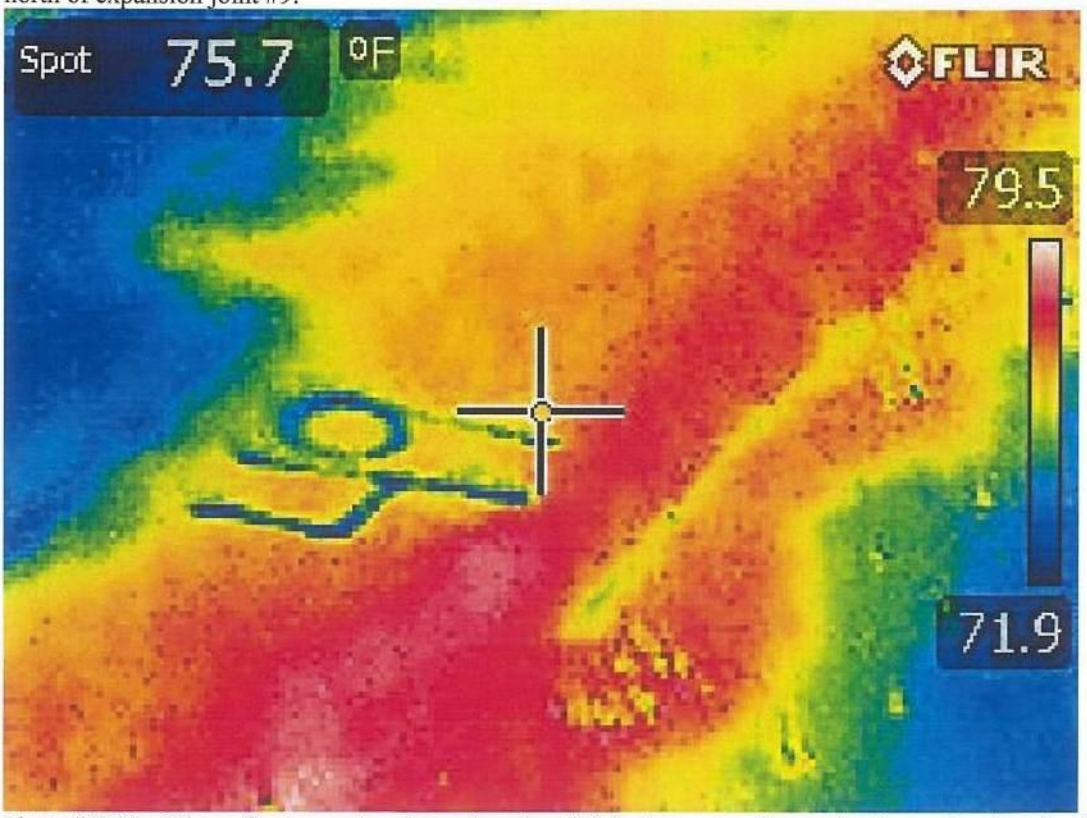

Photo #0540 View of entrapped moisture location #49 in the west valley at the Upper Roof north of expansion joint 9

Photo #9772 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

Photo #9773 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

Photo #0546 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

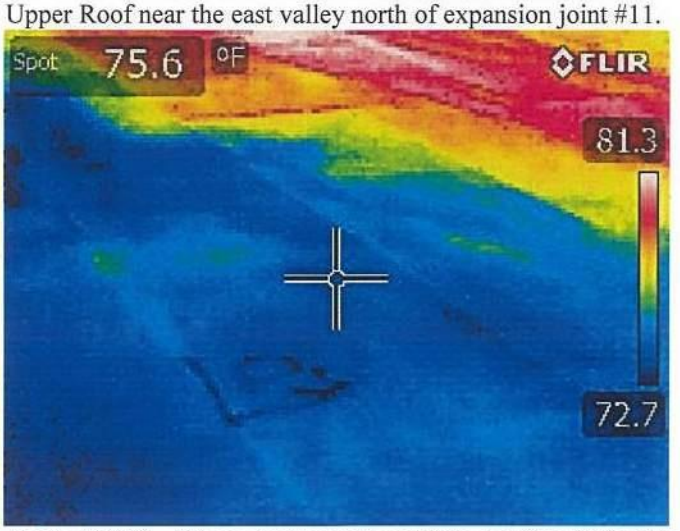

Photo #0548 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

Photo #9774 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

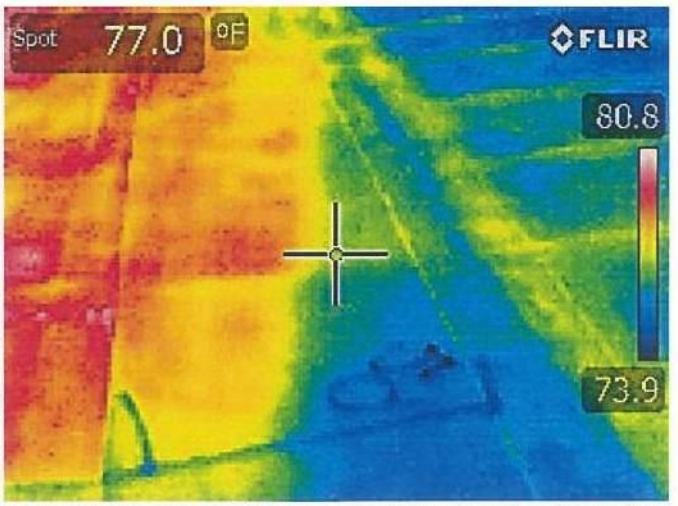

Photo #0550 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

Photo #9775 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

Photo #0552 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

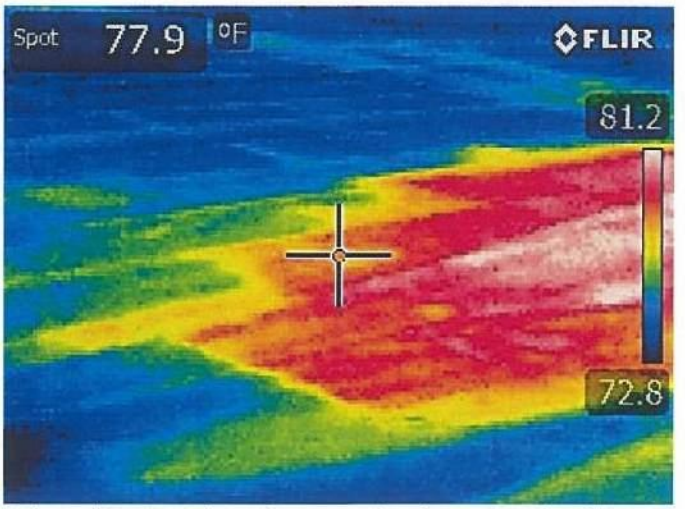

Photo #0554 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

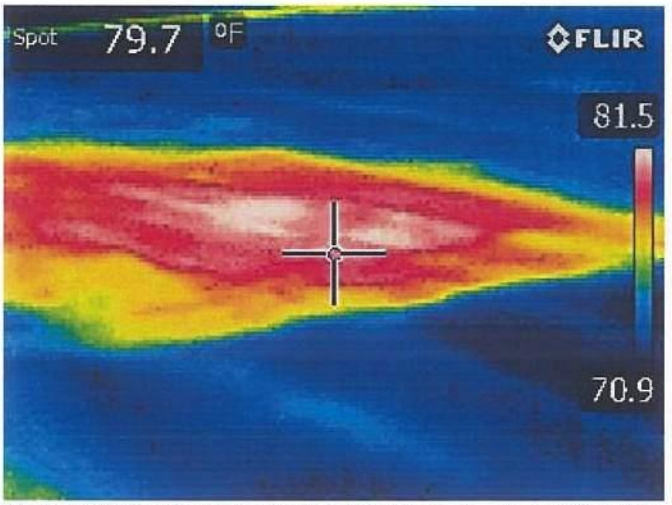

Photo #0556 View of entrapped moisture location #50 at the Upper Roof near the east valley north of expansion joint #11.

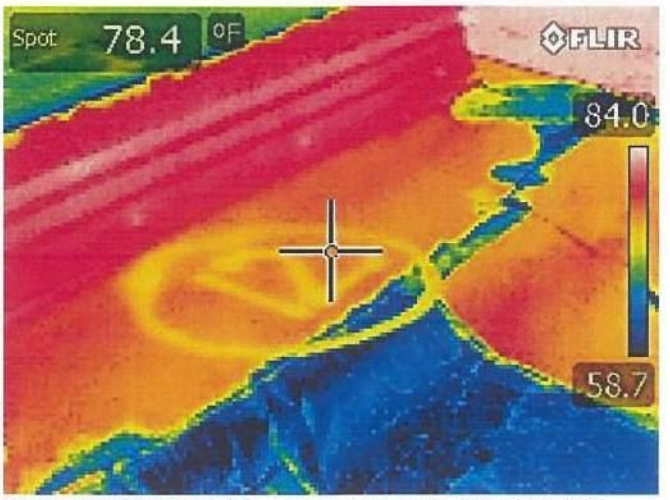

Photo #0558 View of the north end wall of the building.

Photo #9771 View of roof drain missing strainer basket at the east valley modified bitumen at the Upper Roof south of expansion joint #10.

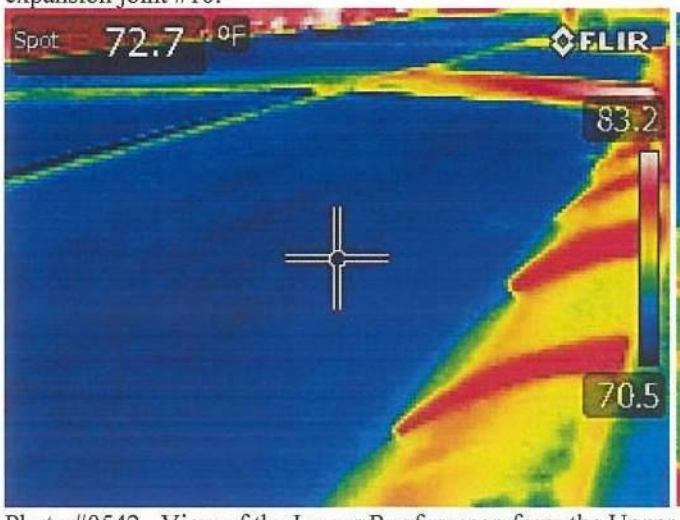

Photo #0542 View of the Lower Roof as seen from the Upper Roof. Exhaust fan hoods in offset wall beneath the Upper Roof Retain heat, but the Lower Roof north of expansion joint is cool.

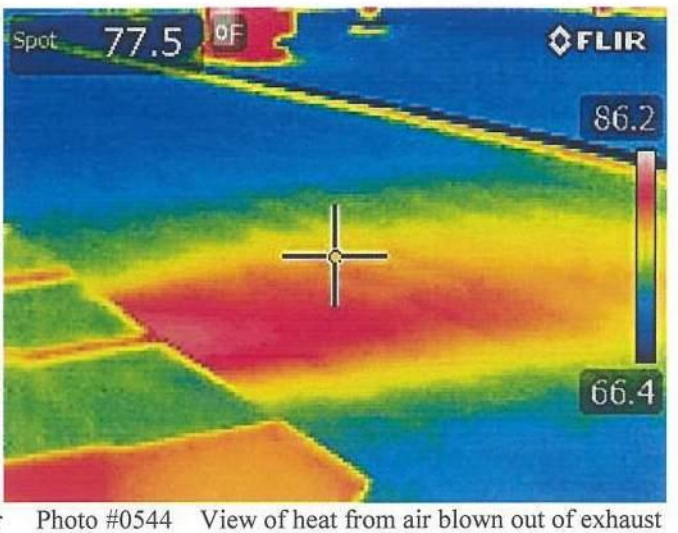

Photo #0544 View of heat from air blown out of exhaust fans in the offset wall at the Lower Roof north of expansion joint 10 as seen from the east eave of the Upper Roof.

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Photo #9721 View of tarps suspended from the roof structure at the Upper Roof Area to prevent roof leaks from damaging manufacturing equipment and products.

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9-6-2019 & 9/19/2019 #2001913

eagleview™

Premium Report
8/27/2019

N 85th E Ave, Tulsa, OK 74116-1211 Report: 29958096

In this 3D model, facets appear as semi-transparent to reveal overhangs.

Building: 1

PREPARED FOR

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Company:	Roof Consultants
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Phone:	918-630-9555

TABLE OF CONTENTS

MEASUREMENTS

Total Roof Area =334,763 sq ft
Total Roof Facets =23
Predominant Pitch =0/12
Number of Stories >1
Total Ridges/Hips =0 ft
Total Valleys =0 ft
Total Rakes =58 ft
Total Eaves =717 ft
Total Penetrations =94
Total Penetrations Perimeter = 1,881 ft
Total Penetrations Area = 2,723 sq ft

Measurements provided by www.eagleview.com

Certified Accurate

www.eagleview.com/Guarantee.aspx

IMAGES

The following aerial images show different angles of this structure for your reference.

Top View

IMAGES

North Side

South Side

IMAGES

East Side

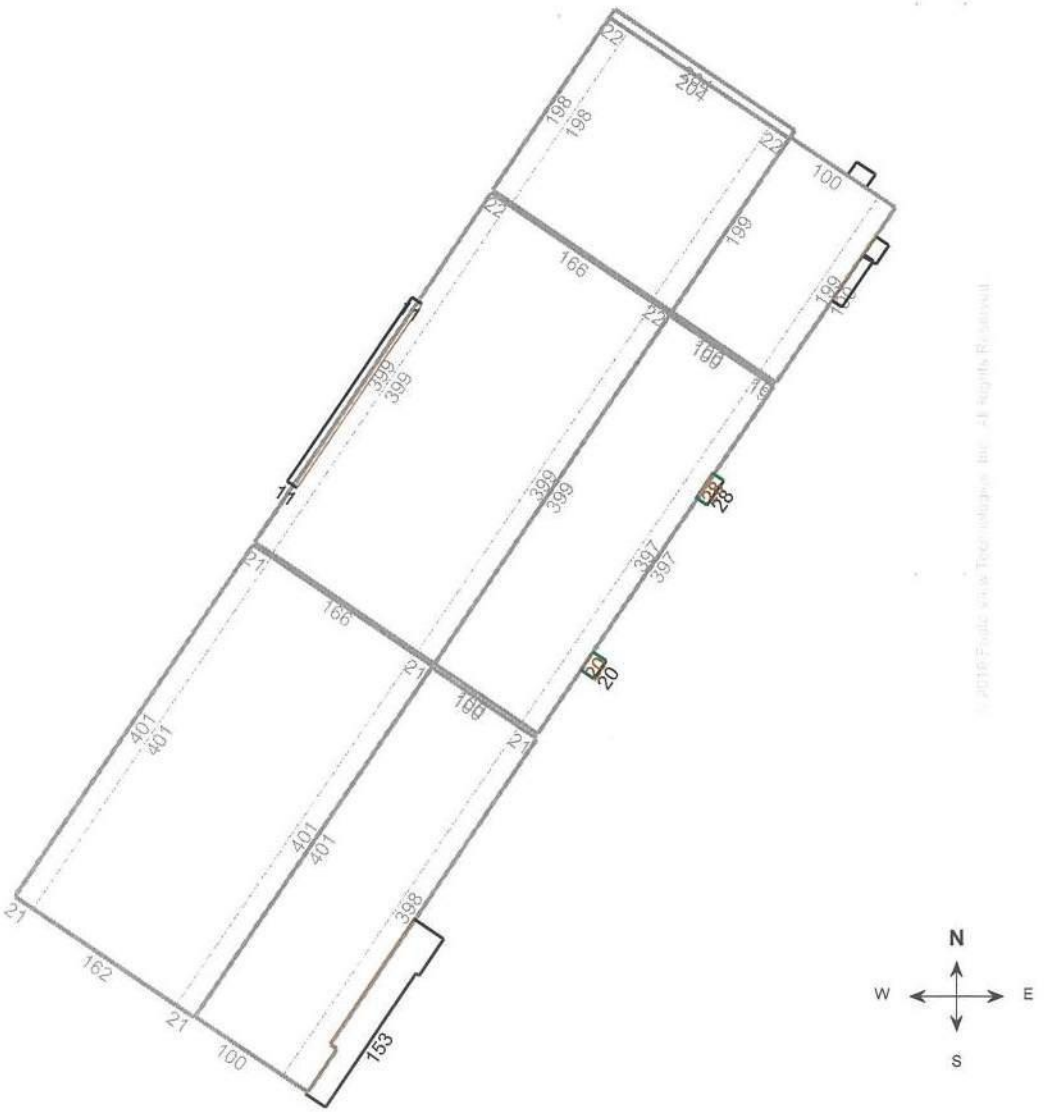
West Side

LENGTH DIAGRAM

Total Line Lengths:
Ridges = 0 ft
Hips = 0 ft

Valleys = 0 ft
Rakes = 58 ft
Eaves = 717 ft

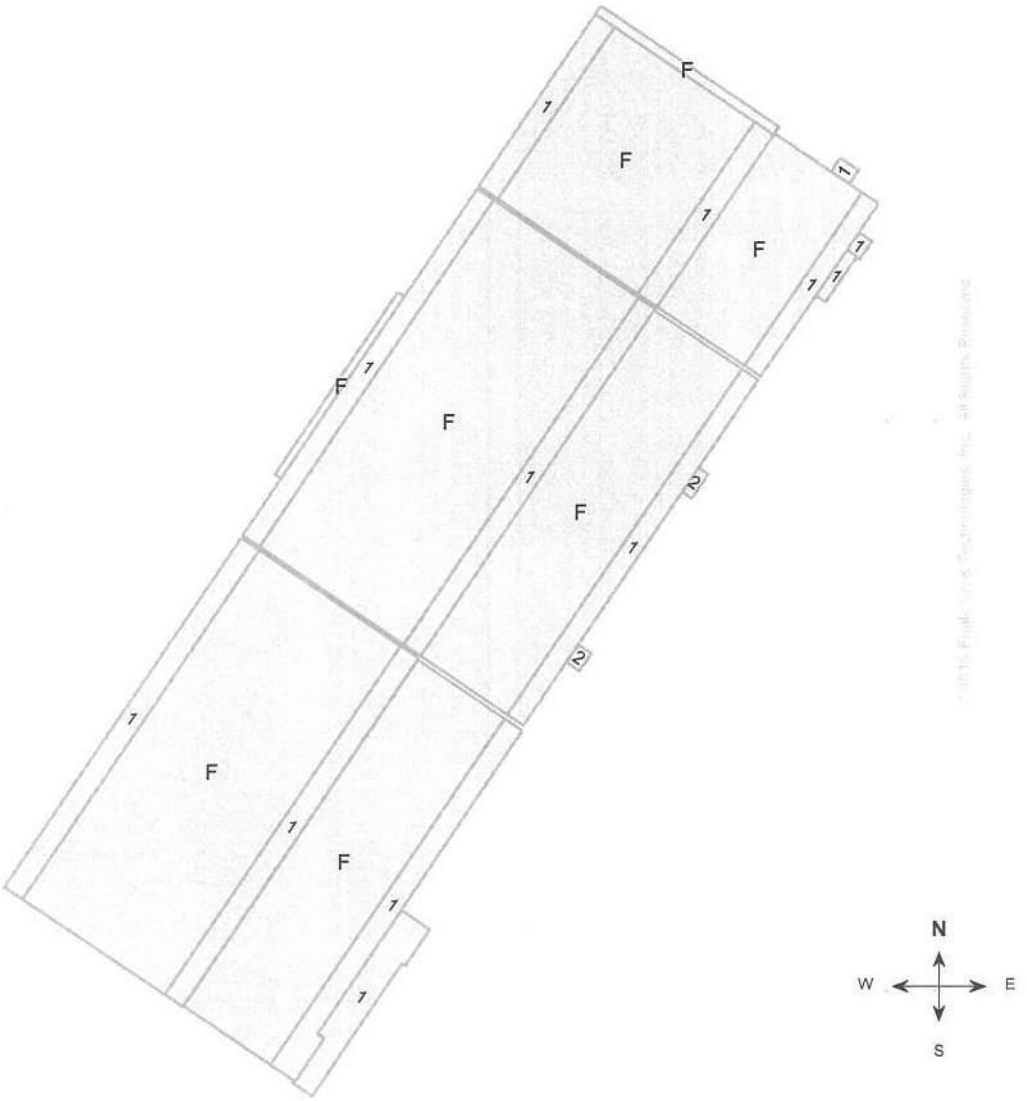
Flashing = 556 ft
Step flashing = 0 ft
Parapets = 6,368 ft



Note: This diagram contains segment lengths (rounded to the nearest whole number) over 5.0 Feet. In some cases, segment labels have been removed for readability. Plus signs preface some numbers to avoid confusion when rotated (e.g. +6 and +9). Refer to the Detailed Length Diagram, in the Appendix at the end of this report, for more details

PITCH DIAGRAM

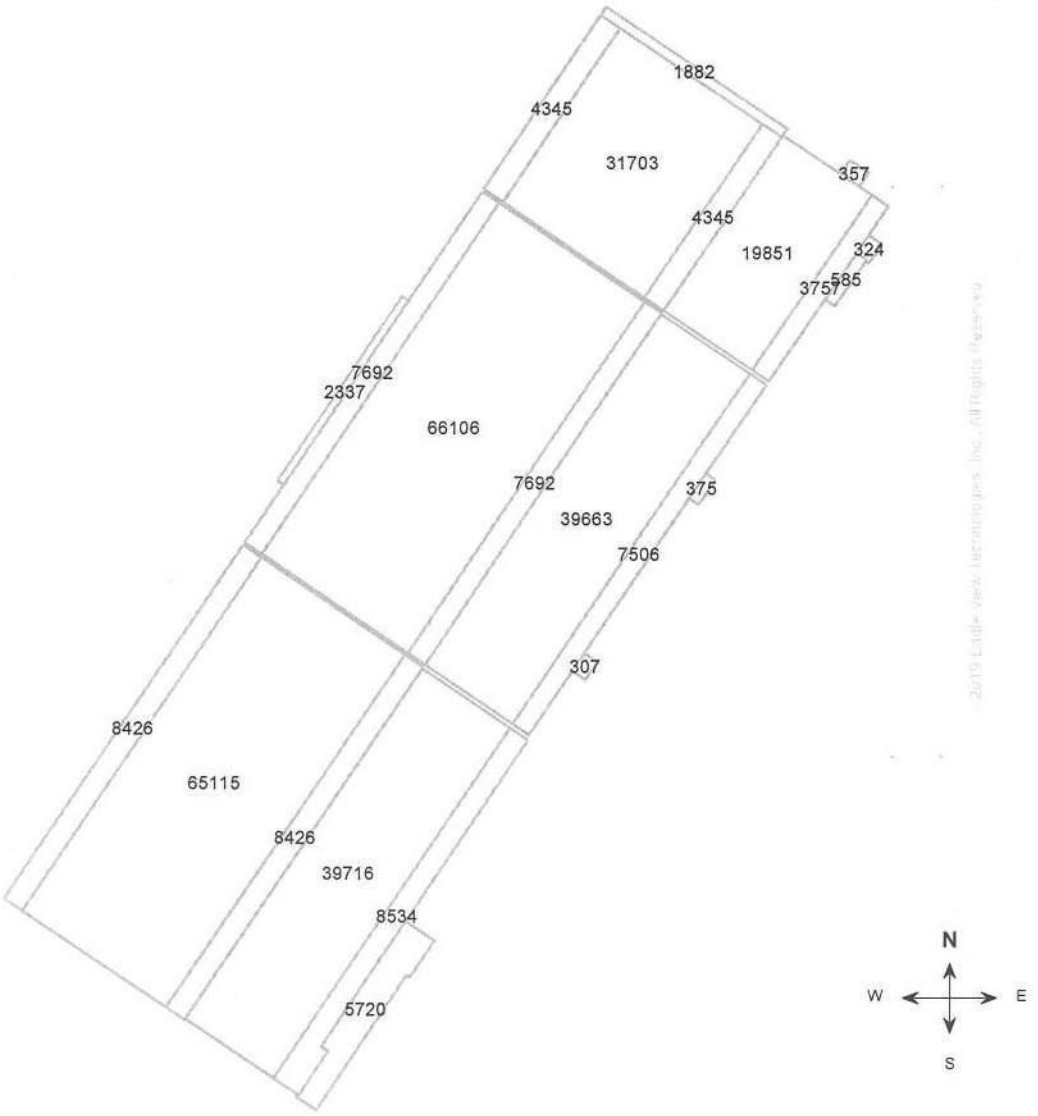
Pitch values are shown in inches per foot, and arrows indicate slope direction. The predominant pitch on this roof is 0/12



Note: This diagram contains labeled pitches for facet areas larger than 20.0 square feet. In some cases, pitch labels have been removed for readability. Gray shading indicates flat, 1/12 or 2/12 pitches. If present, a value of "F" indicates a flat facet (no pitch).

AREA DIAGRAM

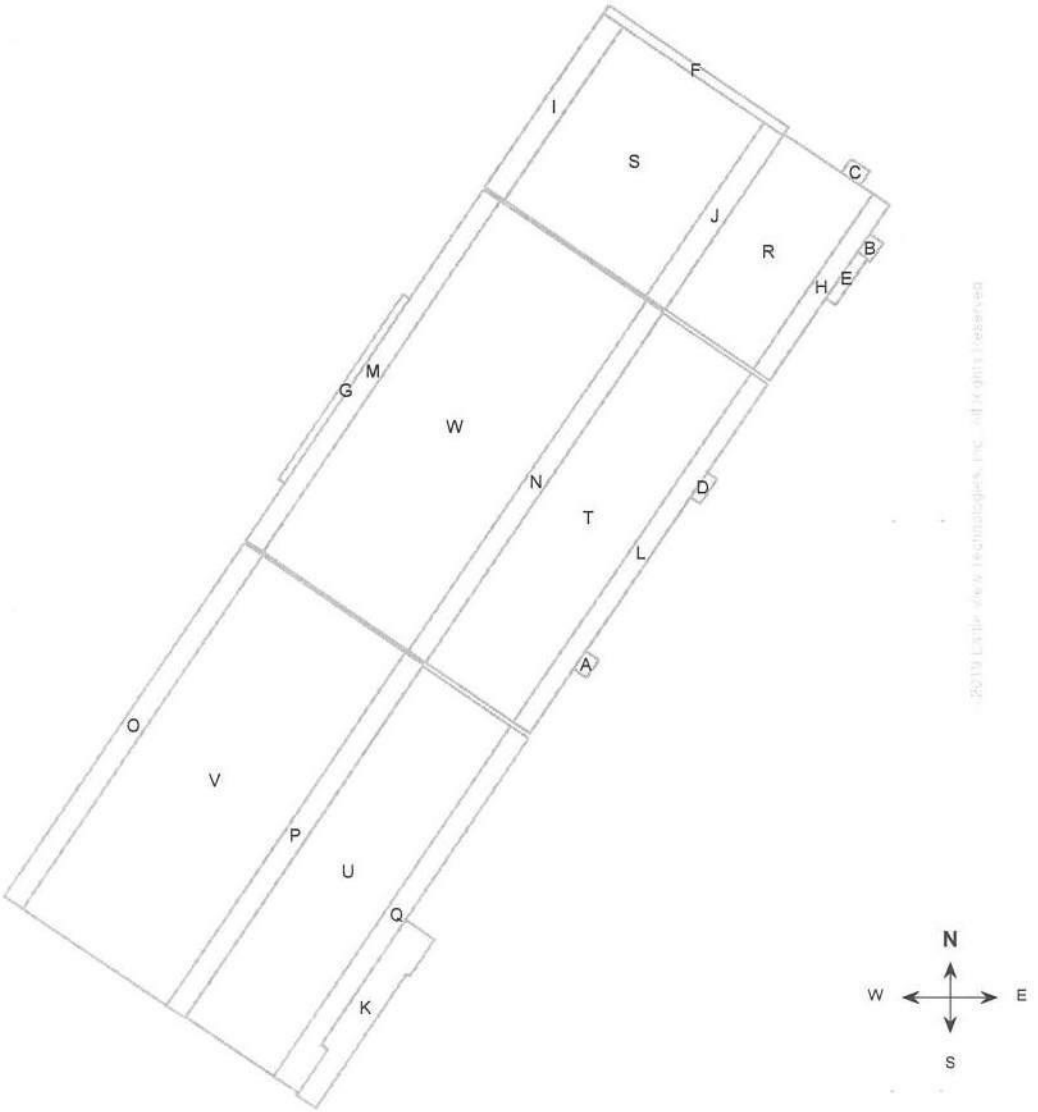
Total Area = 334,763 sq ft, with 23 facets.



Note: This diagram shows the square feet of each roof facet (rounded to the nearest Foot). The total area in square feet, at the top of this page, is based on the non-rounded values of each roof facet (rounded to the nearest square foot after being totaled).

NOTES DIAGRAM

Roof facets are labeled from smallest to largest (A to Z) for easy reference.



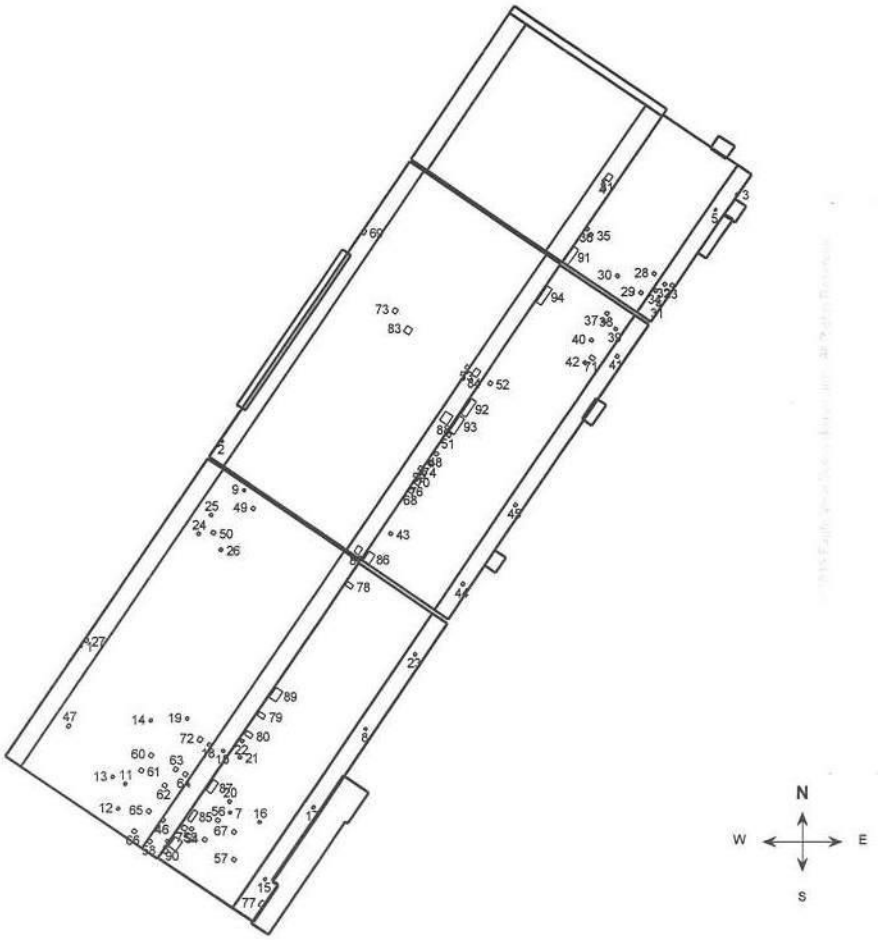
Note: This diagram also appears in the Property Owner Report.

PENETRATIONS NOTES DIAGRAM

Penetrations are labeled from smallest to largest for easy reference.

Total Penetrations = 94
Total Penetrations Perimeter = 1,881 ft

Total Penetrations Area = 2,723 sq ft
Total Roof Area Less Penetrations = 332,040 sq ft



REPORT SUMMARY

All Structures

Areas per Pitch			
Roof Pitches	0/12	1/12	2/12
Area (sq ft)	266371.7	67708.6	682.5
% of Roof	79.6%	20.2%	0.2%

The table above lists each pitch on this roof and the total area and percent (both rounded) of the roof with that pitch.

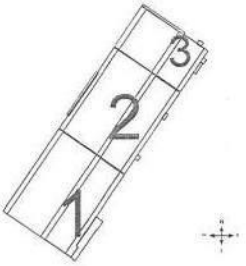
Waste Calculation Table							
Waste %	**0%**	**10%**	**12%**	**15%**	**17%**	**20%**	**22%**
Area (sq ft)	334,763	368,239	374,935	384,977	391,673	401,716	408,411
Squares	3347.6	3682.4	3749.3	3849.8	3916.7	4017.2	4084.1

This table shows the total roof area and squares (rounded up to the nearest decimal) based upon different waste percentages. The waste factor is subject to the complexity of the roof, individual roofing techniques and your experience. Please consider this when calculating appropriate waste percentages. Note that only roof area is included in these waste calculations. Additional materials needed for ridge, hip, valley, and starter lengths are not included.

Penetrations	1	2	3	4-6	7-9	10	11-17	18	19	20
Area (sq ft)	5.7	7.4	8.3	8.7	9	10.4	10.5	11.5	12	12.2
Perimeter (ft)	9.8	11	11.8	12	12	13	13	13.6	14	14
	21-24	25-26	27	28-45	46-47	48-49	50-57	58	59	60
Area (sq ft)	12.2	12.3	13.5	14	15.7	16	18	20	19.8	20.2
Perimeter (ft)	14	14	15	15	16	16	17	17.8	18	18
	61	62-67	68	69-70	71	72-74	75	76	77	78
Area (sq ft)	20.2	20.3	24.2	25	27	27.5	30.3	32.5	38.5	40
Perimeter (ft)	18	18	20	20	21	21	22	23	25	26

Any measured penetration smaller than 3.0x3.0 Feet may need field verification. Accuracy is not guaranteed. The total penetration area is not subtracted from the total roof area.

All Structures Totals



Total Roof Facets = 23
Total Penetrations =94

Lengths, Areas and Pitches
Ridges = 0 ft (0 Ridges)
Hips = 0 ft (0 Hips).
Valleys = 0 ft (0 Valleys)
Rakes† = 58 ft (4 Rakes)
Eaves/Starter‡ = 717 ft (19 Eaves)
Drip Edge (Eaves + Rakes) = 775 ft (23 Lengths)
Parapet Walls = 6,368 (48 Lengths).
Flashing = 556 ft (9 Lengths)
Step flashing = 0 ft (0 Lengths)
Total Area = 334,763 sq ft
Total Penetrations Area = 2,723 sq ft
Total Roof Area Less Penetrations = 332,040 sq ft
Total Penetrations Perimeter = 1,881 ft
Predominant Pitch = 0/12

Property Location
Longitude = -95.8733787
Latitude = 36.1913163

Notes
This was ordered as a commercial property. There were no changes to the structure in the past four years.

Measurements by Structure

Structure	Area (sq ft)	Ridges (ft)	Hips (ft)	Valleys (ft)	Rakes (ft)	Eaves (ft)	Flashing (ft)	Step Flashing (ft)	Parapets (ft)
1	135936	0	0	0	0	255	203	0	2263
2	131678	0	0	0	58	280	258	0	2239
3	67149	0	0	0	0	182	96	0	1867

All values in this table are rounded up to the nearest Foot for each separate structure. Measurement totals displayed elsewhere in this report are added together before rounding which may cause totals to differ.

The table above lists each pitch on this roof and the total area and percent (both rounded) of the roof with that pitch.

Parapet Wall Area Table

Wall Height (ft)	1	2	3	4	5	6	7
Vertical Wall Area	6368	12736	19104	25472	31840	38208	44576

This table provides common parapet wall heights to aid you in calculating the total vertical area of these walls. Note that these values assume a 90 degree angle at the base of the wall. Allow for extra materials to cover cant strips and tapered edges.

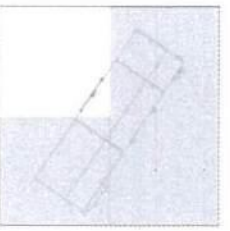
Online Maps

Online map of property
http://maps.google.com/maps?f=g&source=s_q&hl=en&geocode=&q=N+85th+E+Ave,Tulsa,OK,74116-1211
Directions from Roof Consultants to this property
http://maps.google.com/maps?f=d&source=s_d&saddr=5350+E.+46th+Street,+Suite+116,Tulsa,OK,74135&daddr=N+85th+E+Ave,Tulsa,OK,74116-1211

† Rakes are defined as roof edges that are sloped (not level).
‡ Eaves are defined as roof edges that are not sloped and level.

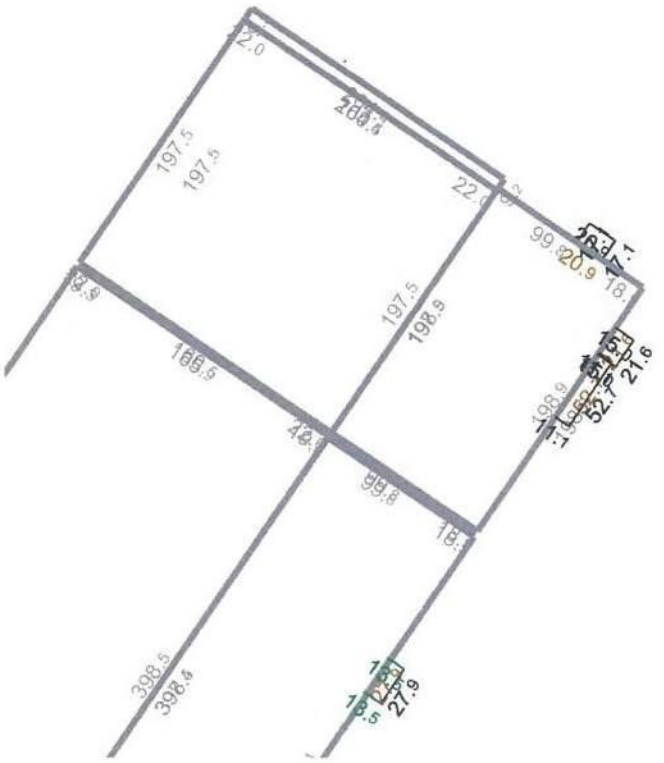
APPENDIX: DETAILED LENGTH DIAGRAM

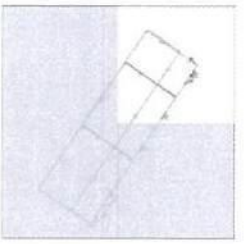
Top Left Corner of the Length Diagram



APPENDIX: DETAILED LENGTH DIAGRAM

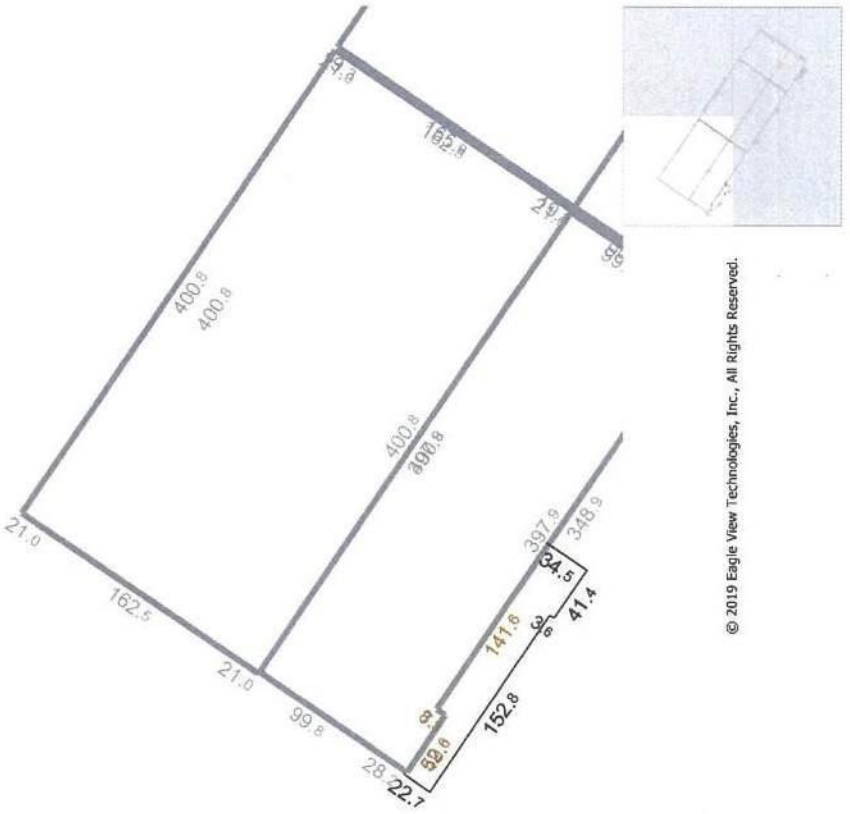
Top Right Corner of the Length Diagram





APPENDIX: DETAILED LENGTH DIAGRAM

Bottom Left Corner of the Length Diagram



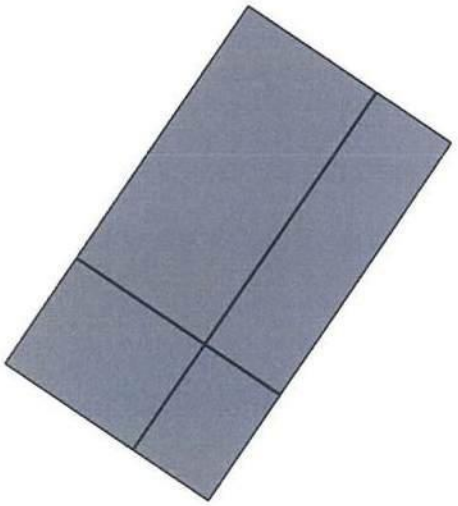
APPENDIX: DETAILED LENGTH DIAGRAM

Bottom Right Corner of the Length Diagram

eagleview™

Premium Report
8/27/2019

N 85th E Ave, Tulsa, OK 74116-1211 Report: 30028507



In this 3D model, facets appear as semi-transparent to reveal overhangs.

Building: 2

PREPARED FOR

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Company:	Roof Consultants
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Phone:	918-630-9555

TABLE OF CONTENTS

MEASUREMENTS

Total Roof Area =184,455 sq ft
Total Roof Facets =4
Predominant Pitch =0/12
Number of Stories >1
Total Ridges/Hips =0 ft
Total Valleys =0 ft
Total Rakes =0 ft
Total Eaves =0 ft
Total Penetrations =126
Total Penetrations Perimeter = 2,318 ft
Total Penetrations Area = 3,749 sq ft

Measurements provided by www.eagleview.com

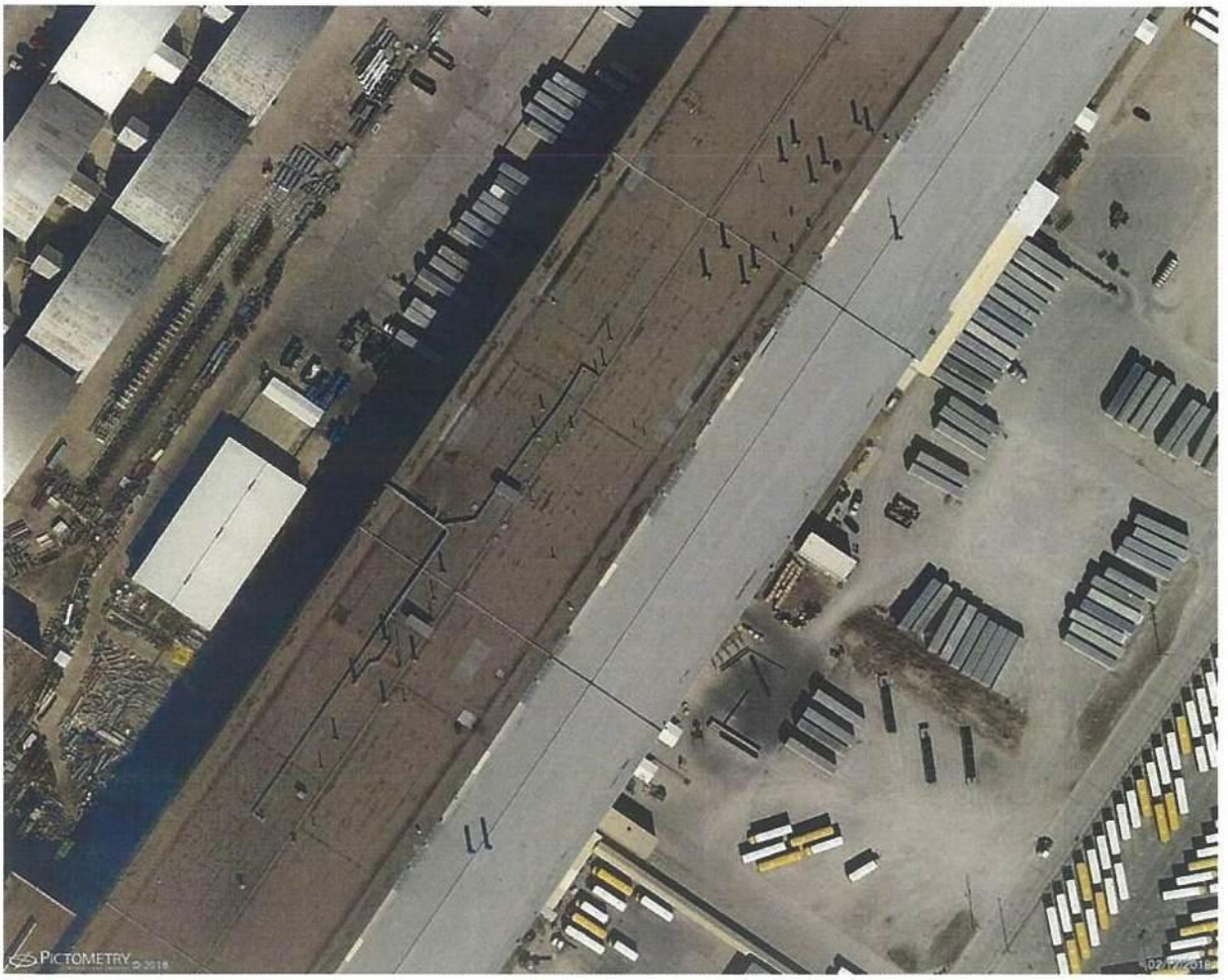
Certified Accurate

www.eagleview.com/Guarantee.aspx

IMAGES

The following aerial images show different angles of this structure for your reference.

Top View



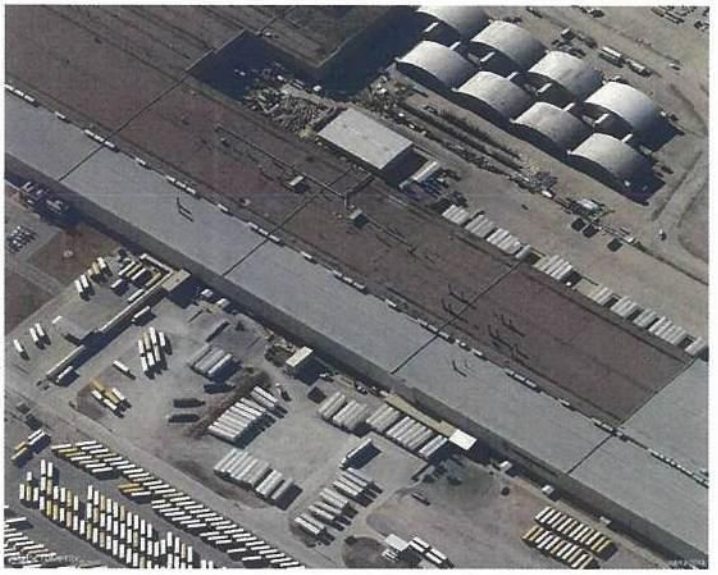
IMAGES

North Side

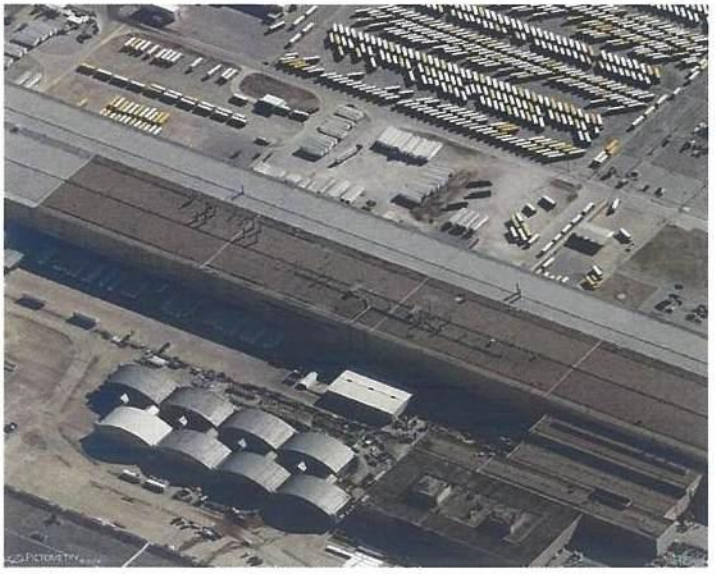
South Side

IMAGES

East Side



West Side

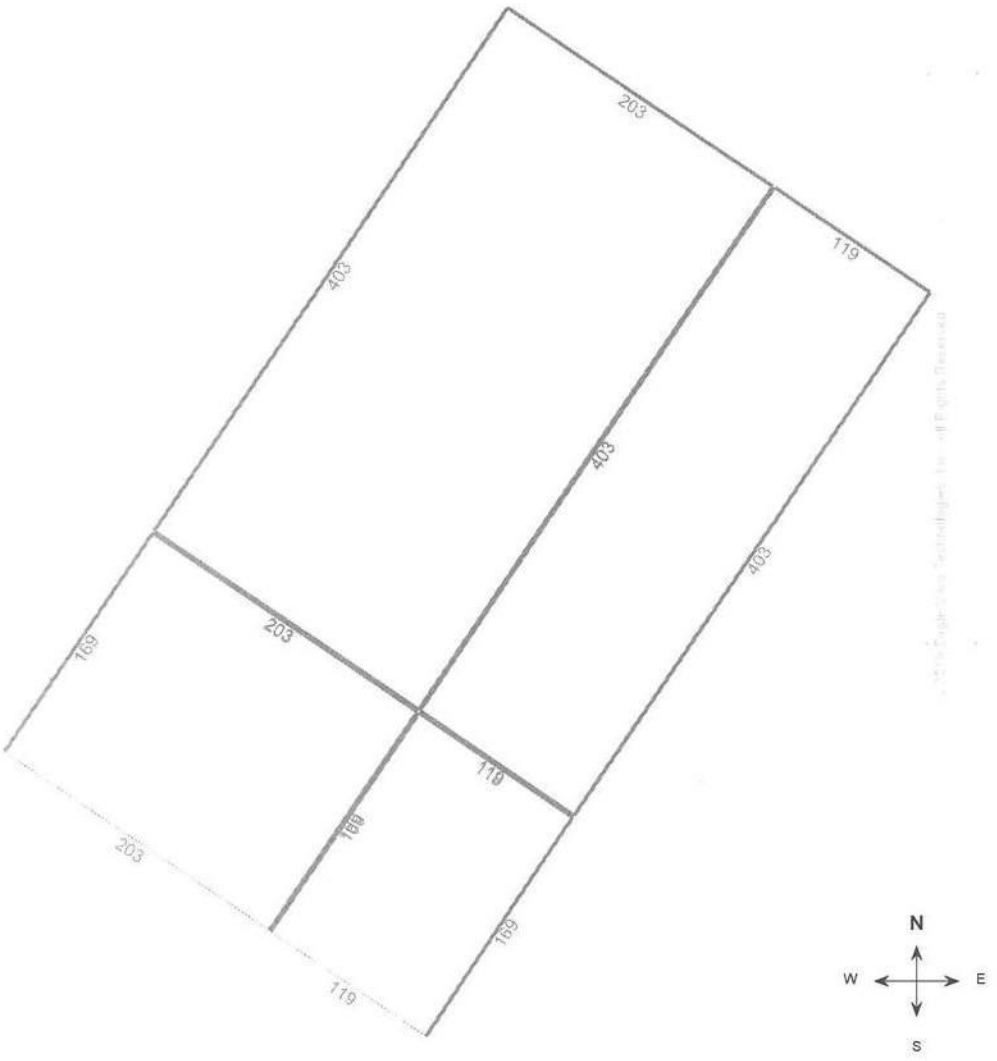


LENGTH DIAGRAM

Total Line Lengths:
Ridges = 0 ft
Hips = 0 ft

Valleys = 0 ft
Rakes = 0 ft
Eaves = 0 ft

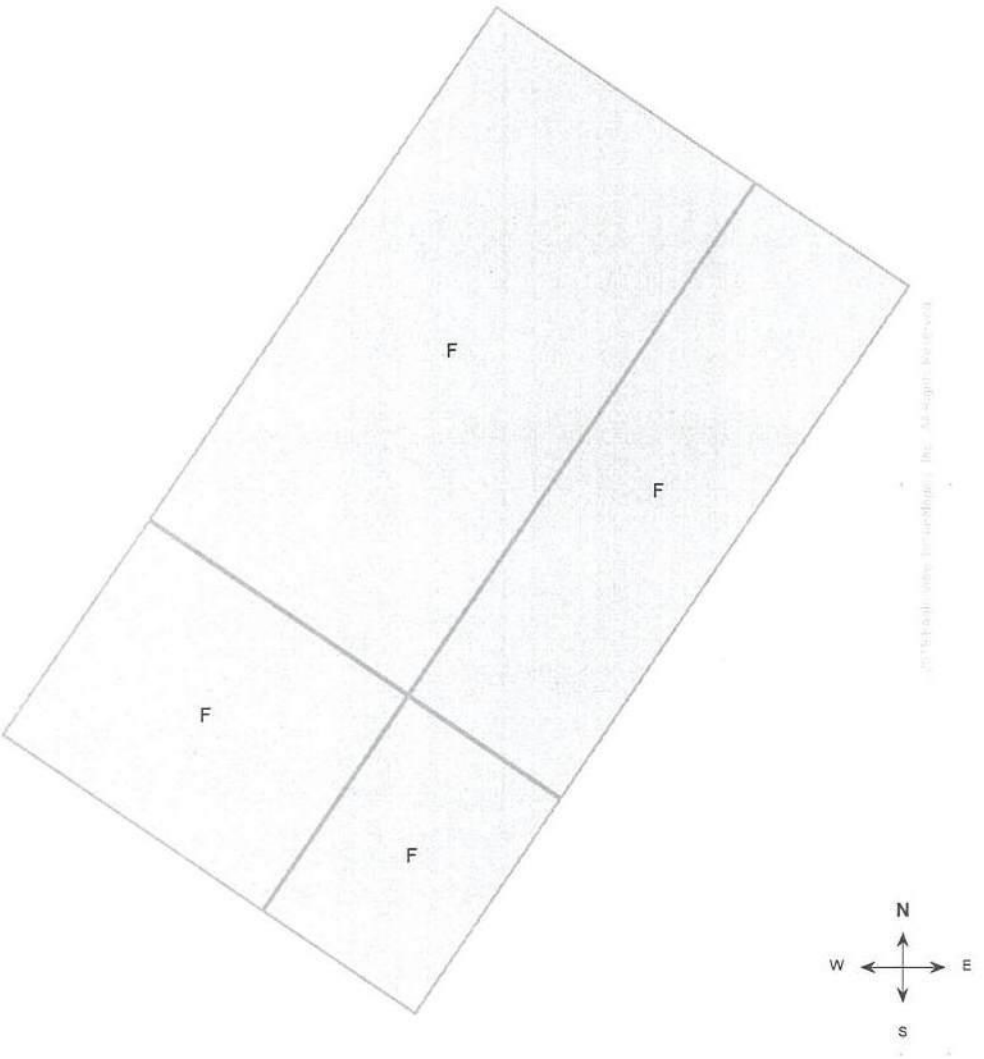
Flashing = 0 ft
Step flashing = 0 ft
Parapets = 3,255 ft



Note: This diagram contains segment lengths (rounded to the nearest whole number) over 5.0 Feet. In some cases, segment labels have been removed for readability. Plus signs preface some numbers to avoid confusion when rotated (e.g. +6 and +9).

PITCH DIAGRAM

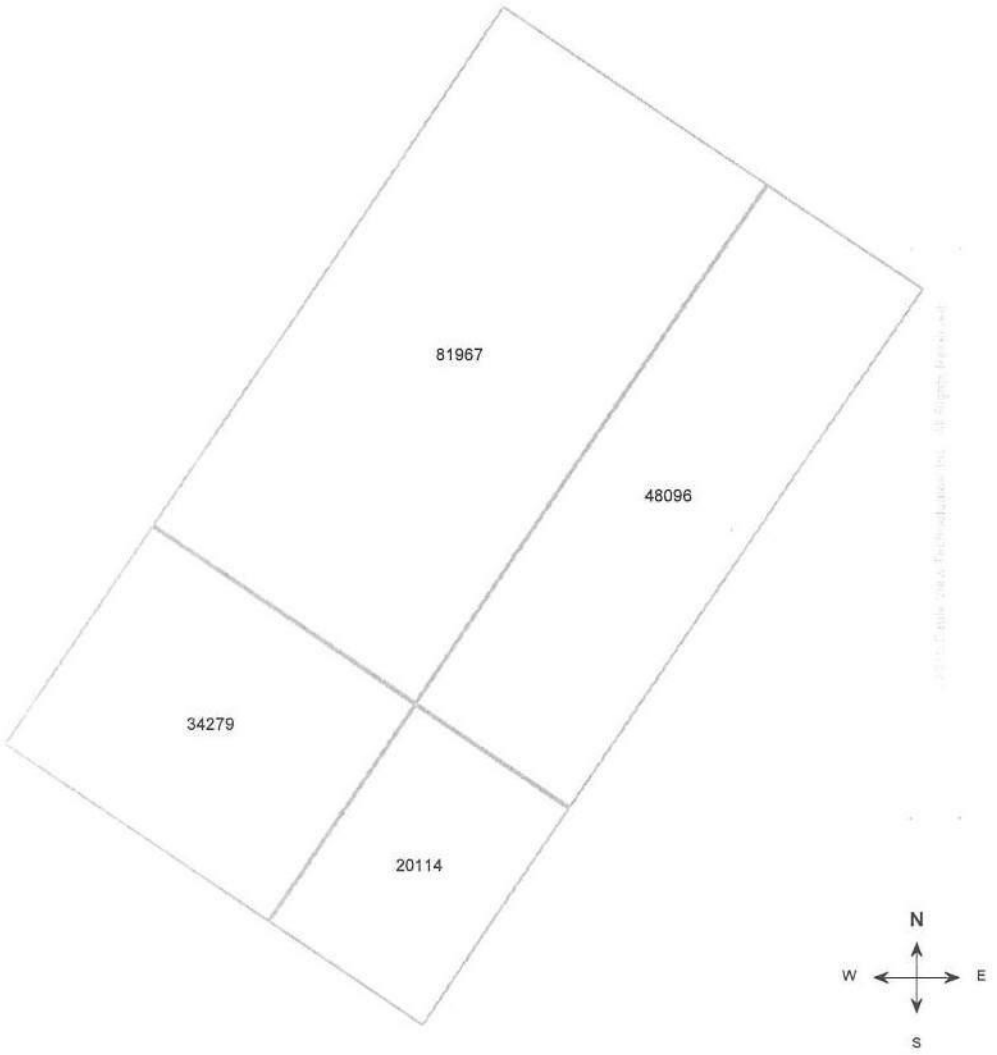
Pitch values are shown in inches per foot, and arrows indicate slope direction. The predominant pitch on this roof is 0/12



Note: This diagram contains labeled pitches for facet areas larger than 20.0 square feet. In some cases, pitch labels have been removed for readability. Gray shading indicates flat, 1/12 or 2/12 pitches. If present, a value of "F" indicates a flat facet (no pitch).

AREA DIAGRAM

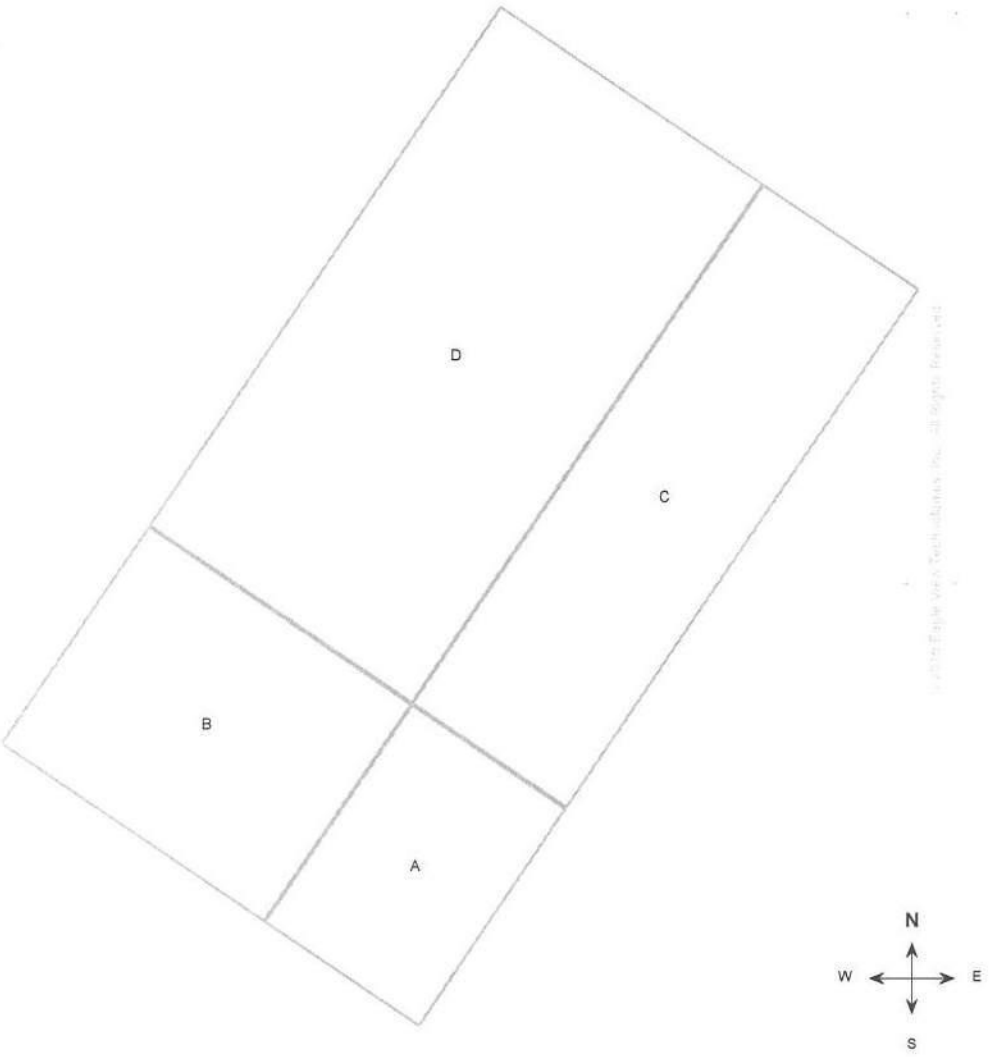
Total Area = 184,455 sq ft, with 4 facets.



Note: This diagram shows the square feet of each roof facet (rounded to the nearest Foot). The total area in square feet, at the top of this page, is based on the non-rounded values of each roof facet (rounded to the nearest square foot after being totaled).

NOTES DIAGRAM

Roof facets are labeled from smallest to largest (A to Z) for easy reference.



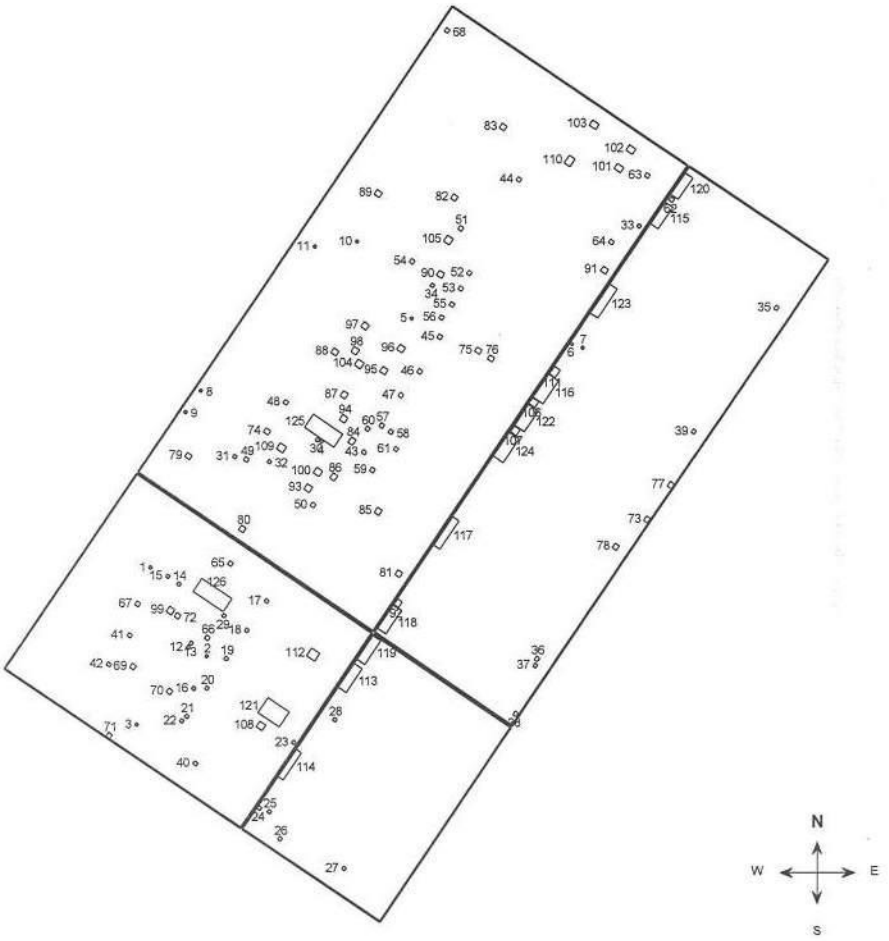
Note: This diagram also appears in the Property Owner Report.

PENETRATIONS NOTES DIAGRAM

Penetrations are labeled from smallest to largest for easy reference.

Total Penetrations = 126
Total Penetrations Perimeter = 2,318 ft

Total Penetrations Area = 3,749 sq ft
Total Roof Area Less Penetrations = 180,706 sq ft



REPORT SUMMARY

All Structures

Areas per Pitch	
Roof Pitches	0/12
Area (sq ft)	184454.9
% of Roof	100%

The table above lists each pitch on this roof and the total area and percent (both rounded) of the roof with that pitch.

Waste Calculation Table							
Waste %	**0%**	**10%**	**12%**	**15%**	**17%**	**20%**	**22%**
Area (sq ft)	184,455	202,901	206,590	212,123	215,812	221,346	225,035
Squares	1844.5	2029.0	2065.9	2121.2	2158.1	2213.5	2250.4

This table shows the total roof area and squares (rounded up to the nearest decimal) based upon different waste percentages. The waste factor is subject to the complexity of the roof, individual roofing techniques and your experience. Please consider this when calculating appropriate waste percentages. Note that only roof area is included in these waste calculations. Additional materials needed for ridge, hip, valley, and starter lengths are not included.

Penetrations	1-11	12-28	29-34	35-43	44-68	69-70	71-72	73	74-79	80
Area (sq ft)	4	6.2	6.3	7.5	9	12.2	12.3	13	14	16
Perimeter (ft)	8	10	10	11	12	14	14	14.4	15	16
	81-83	84-91	92	93-99	100	101-103	104-108	109	110	111
Area (sq ft)	16	18	20	20.2	23.3	24.8	25	27.5	32.3	32.5
Perimeter (ft)	16	17	18	18	19.4	20	20	21	23	23
	112	113-114	115	116	117-118	119	120	121	122	123
Area (sq ft)	45.5	120.3	153	143.1	143.5	105.7	170	174.3	134.7	238.4
Perimeter (ft)	27	50	53	54.4	55	56	57	58	60	62.8

Any measured penetration smaller than 3.0x3.0 Feet may need field verification. Accuracy is not guaranteed. The total penetration area is not subtracted from the total roof area.

All Structures Totals

Total Roof Facets = 4
Total Penetrations =126

Lengths, Areas and Pitches
Ridges = 0 ft (0 Ridges)
Hips = 0 ft (0 Hips).
Valleys = 0 ft (0 Valleys)
Rakes† = 0 ft (0 Rakes)
Eaves/Starter‡ = 0 ft (0 Eaves)
Drip Edge (Eaves + Rakes) = 0 ft (0 Lengths)
Parapet Walls = 3,255 (14 Lengths).
Flashing = 0 ft (0 Lengths)
Step flashing = 0 ft (0 Lengths)
Total Area = 184,455 sq ft
Total Penetrations Area = 3,749 sq ft
Total Roof Area Less Penetrations = 180,706 sq ft
Total Penetrations Perimeter = 2,318 ft
Predominant Pitch = 0/12

Property Location
Longitude = -95.8743023
Latitude = 36.1904110

Notes
This was ordered as a commercial property. There were no changes to the structure in the past four years.

Parapet Wall Area Table							
Wall Height (ft)	1	2	3	4	5	6	7
Vertical Wall Area	3255	6510	9765	13020	16275	19530	22785

This table provides common parapet wall heights to aid you in calculating the total vertical area of these walls. Note that these values assume a 90 degree angle at the base of the wall. Allow for extra materials to cover cant strips and tapered edges.

Online Maps

Online map of property
http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=N+85th+E+Ave,Tulsa,OK,74116-1211
Directions from Roof Consultants to this property
http://maps.google.com/maps?f=d&source=s_d&saddr=5350+E.+46th+Street,+Suite+116,Tulsa,OK,74135&daddr=N+85th+E+Ave,Tulsa,OK,74116-1211

† Rakes are defined as roof edges that are sloped (not level).
‡ Eaves are defined as roof edges that are not sloped and level.

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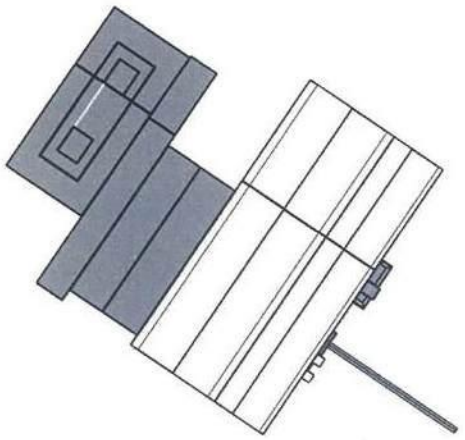
Premium Report
8/26/2019

N 85th E Ave, Tulsa, OK 74116-1211 Report: 30071799



In this 3D model, facets appear as semi-transparent to reveal overhangs.

Building: 3

PREPARED FOR

Contact:	R. Edward Owen
Company:	Roof Consultants
Address:	5350 E. 46th Street, Suite 116 Tulsa, OK 74135
Phone:	918-630-9555

TABLE OF CONTENTS

MEASUREMENTS

Total Roof Area =378,204 sq ft
Total Roof Facets =37
Predominant Pitch =1/12
Number of Stories >1
Total Ridges/Hips =1,622 ft
Total Valleys =1,289 ft
Total Rakes =112 ft
Total Eaves =3,449 ft
Total Penetrations =298
Total Penetrations Perimeter = 4,563 ft
Total Penetrations Area = 6,804 sq ft

Measurements provided by www.eagleview.com

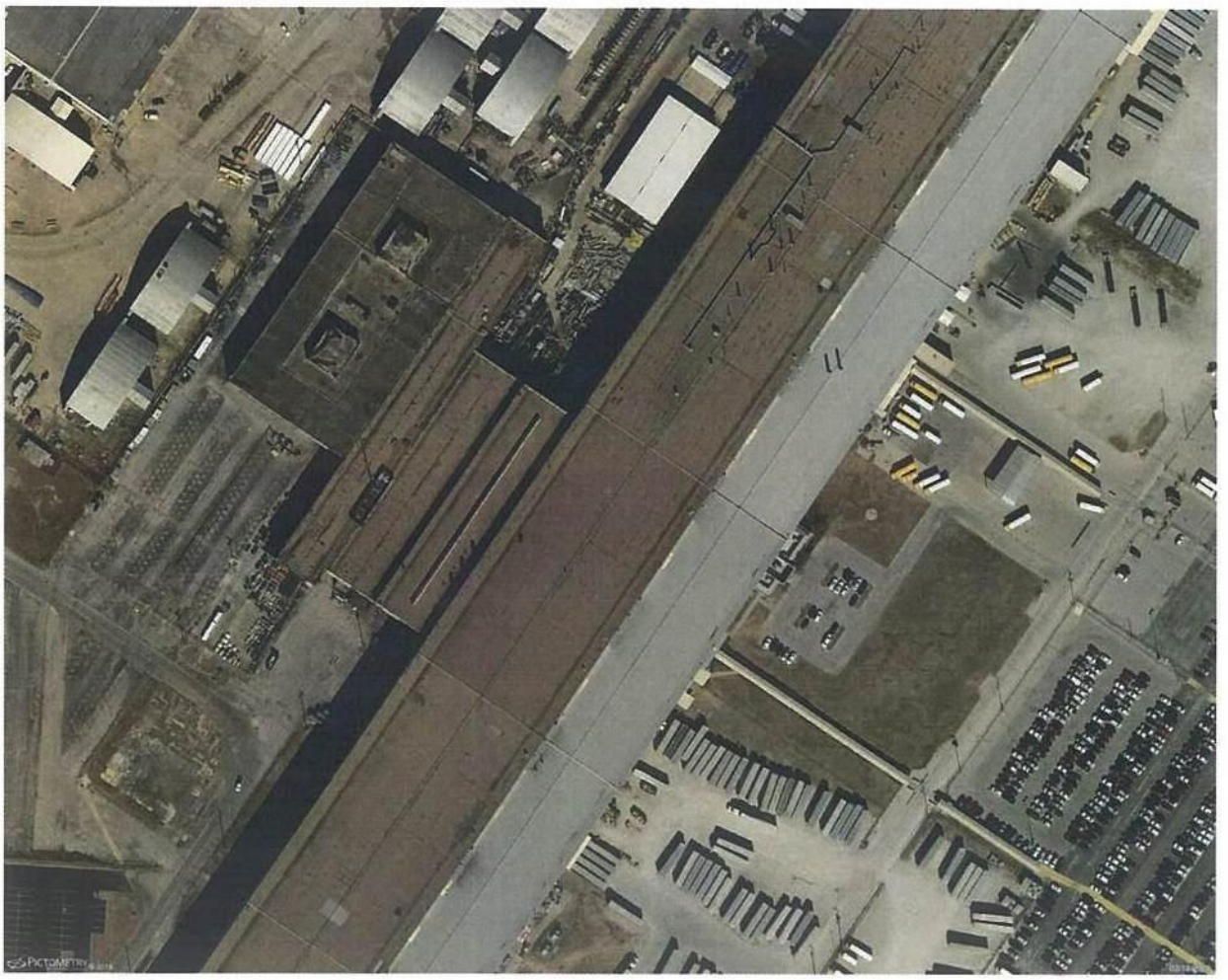
Certified Accurate

www.eagleview.com/Guarantee.aspx

IMAGES

The following aerial images show different angles of this structure for your reference.

Top View



IMAGES

North Side

South Side

IMAGES

North Side

South Side

IMAGES

East Side

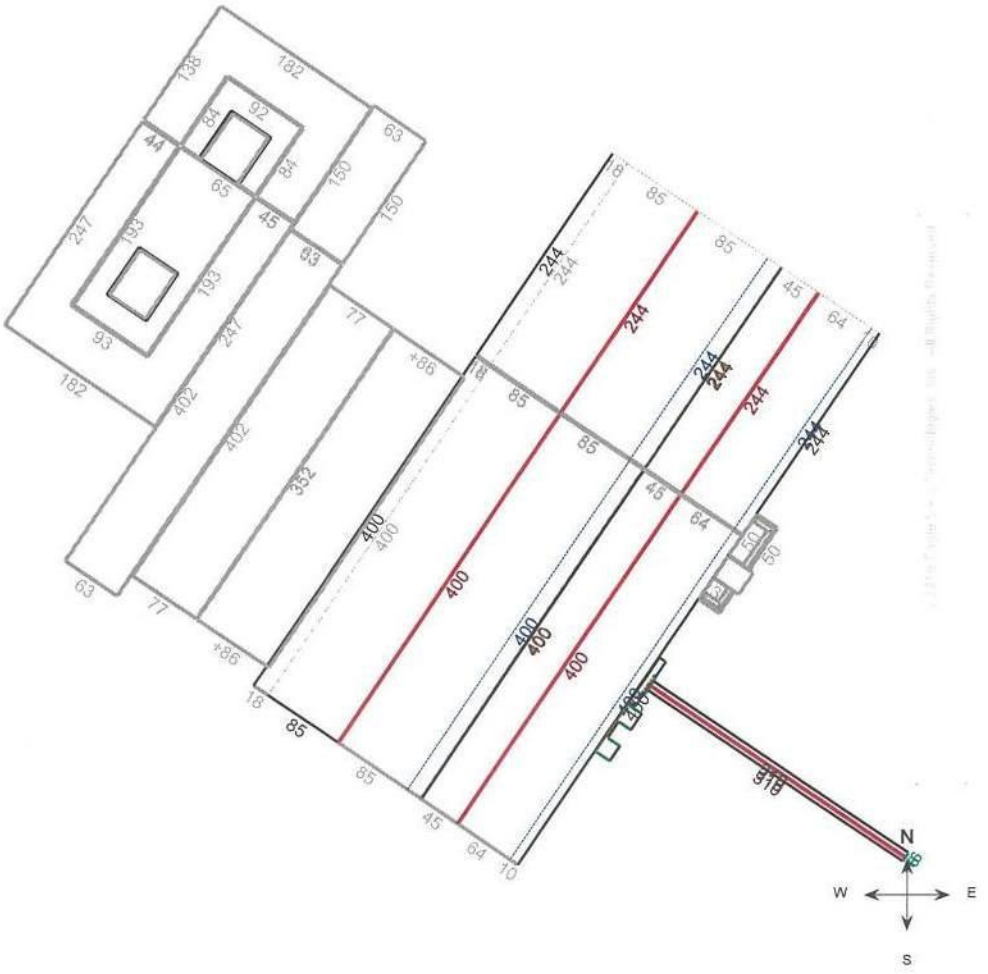
West Side

LENGTH DIAGRAM

Total Line Lengths:
Ridges = 1,602 ft
Hips = 20 ft

Valleys = 1,289 ft
Rakes = 112 ft
Eaves = 3,449 ft

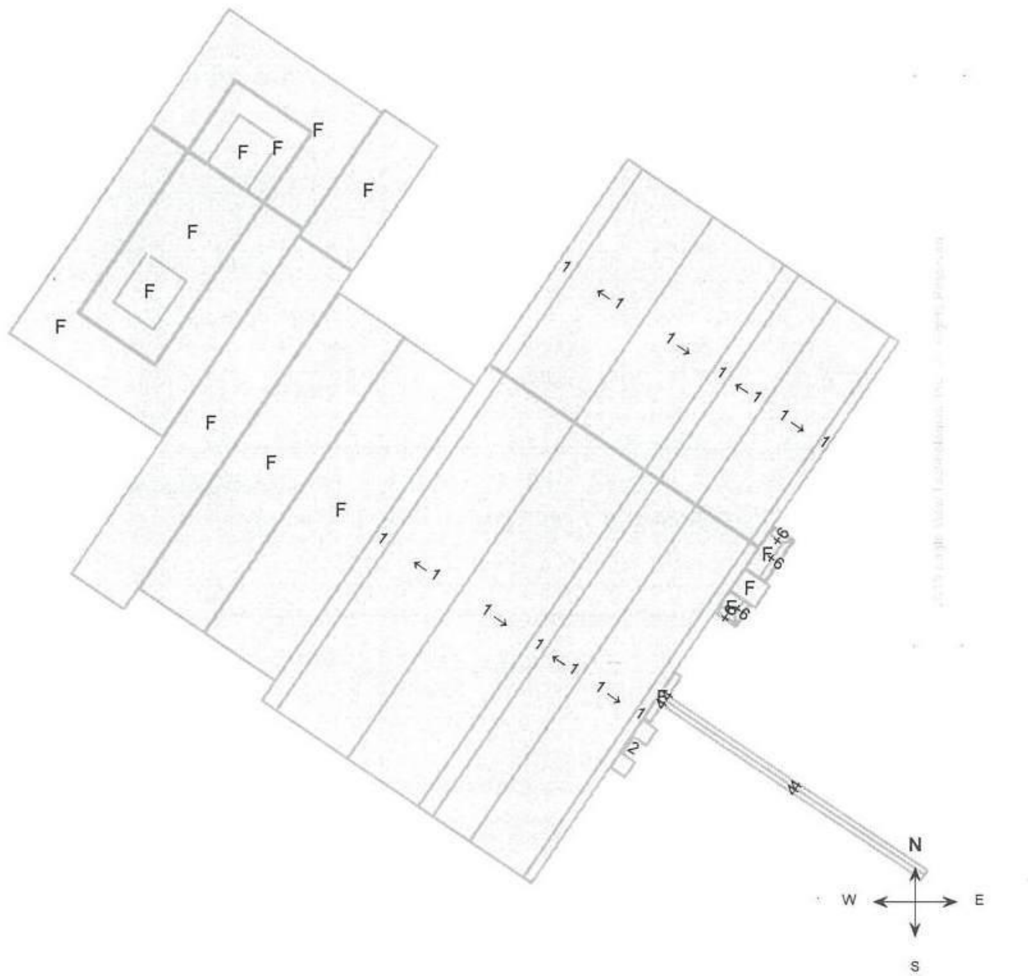
Flashing = 702 ft
Step flashing = 47 ft
Parapets = 7,808 ft



Note: This diagram contains segment lengths (rounded to the nearest whole number) over 5.0 Feet. In some cases, segment labels have been removed for readability. Plus signs preface some numbers to avoid confusion when rotated (e.g. +6 and +9).

PITCH DIAGRAM

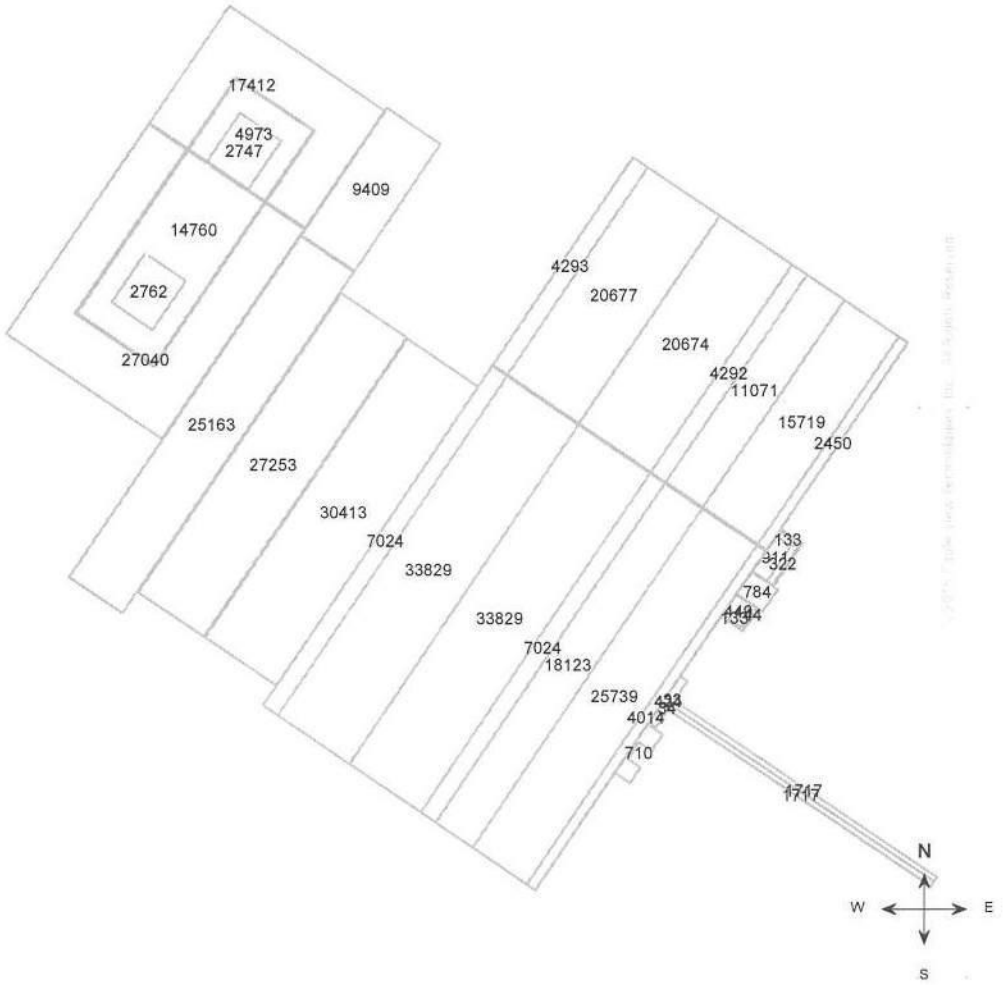
Pitch values are shown in inches per foot, and arrows indicate slope direction. The predominant pitch on this roof is 1/12



Note: This diagram contains labeled pitches for facet areas larger than 20.0 square feet. In some cases, pitch labels have been removed for readability. Blue shading indicates a pitch of 3/12 and greater. Gray shading indicates flat, 1/12 or 2/12 pitches. If present, a value of "F" indicates a flat facet (no pitch).

AREA DIAGRAM

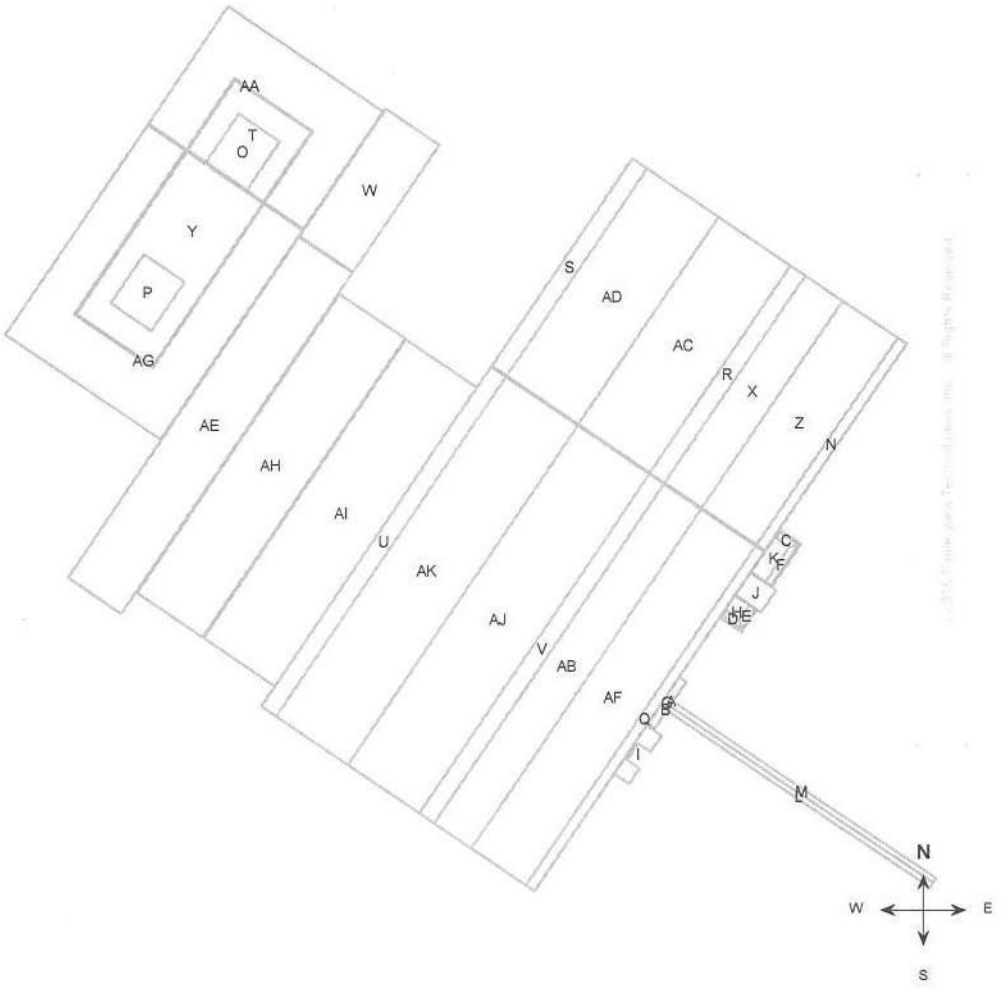
Total Area = 378,204 sq ft, with 37 facets.



Note: This diagram shows the square feet of each roof facet (rounded to the nearest Foot). The total area in square feet, at the top of this page, is based on the non-rounded values of each roof facet (rounded to the nearest square foot after being totaled).

NOTES DIAGRAM

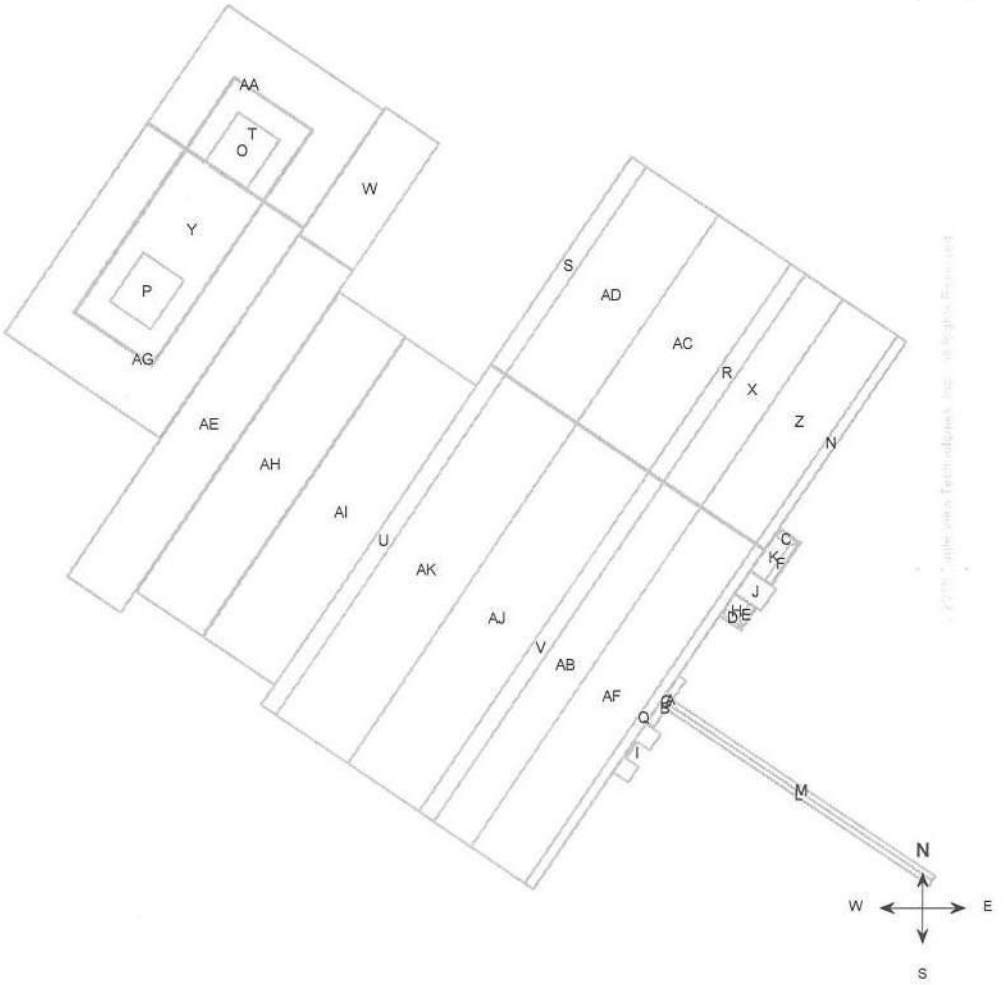
Roof facets are labeled from smallest to largest (A to Z) for easy reference.



Note: This diagram also appears in the Property Owner Report.

NOTES DIAGRAM

Roof facets are labeled from smallest to largest (A to Z) for easy reference.



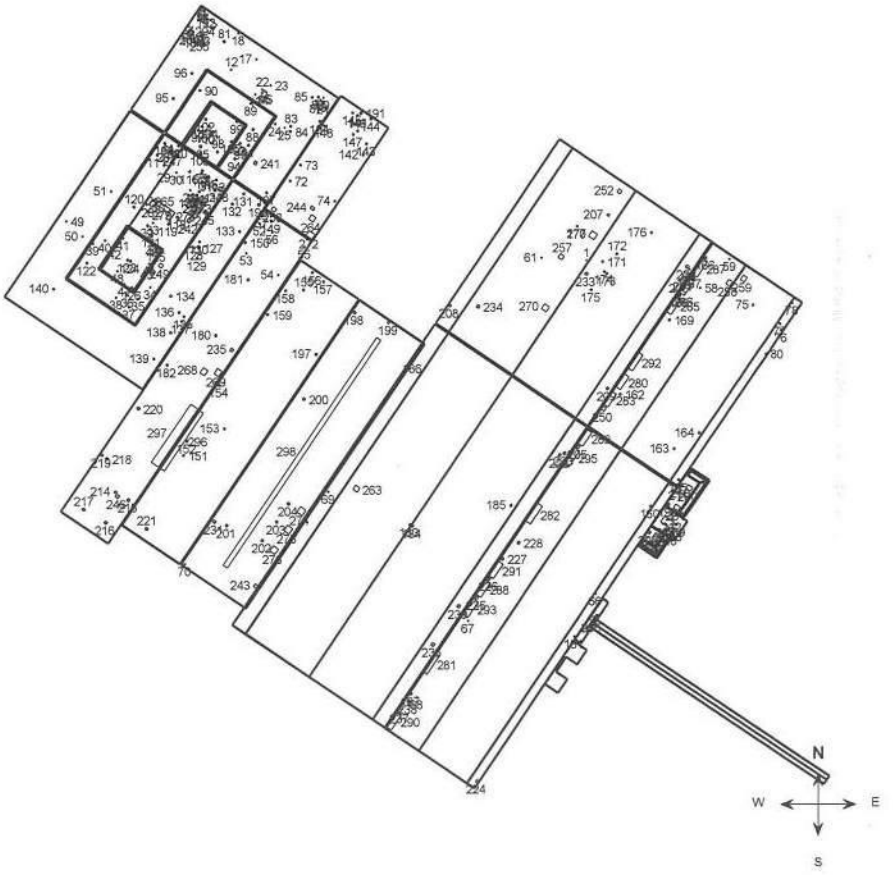
Note: This diagram also appears in the Property Owner Report.

PENETRATIONS NOTES DIAGRAM

Penetrations are labeled from smallest to largest for easy reference.

Total Penetrations = 298
Total Penetrations Perimeter = 4,563 ft

Total Penetrations Area = 6,804 sq ft
Total Roof Area Less Penetrations = 371,400 sq ft



REPORT SUMMARY

All Structures

Areas per Pitch					
Roof Pitches	0/12	1/12	2/12	4/12	6/12
Area (sq ft)	164501.0	208759.6	710.2	3501.5	730.8
% of Roof	43.5%	55.2%	0.2%	0.9%	0.2%

The table above lists each pitch on this roof and the total area and percent (both rounded) of the roof with that pitch.

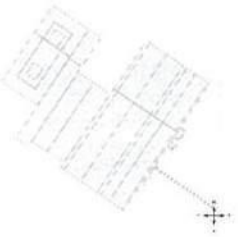
Waste Calculation Table							
Waste %	**0%**	**10%**	**12%**	**15%**	**17%**	**20%**	**22%**
Area (sq ft)	378,204	416,024	423,588	434,935	442,499	453,845	461,409
Squares	3782.0	4160.2	4235.9	4349.3	4425.0	4538.4	4614.1

This table shows the total roof area and squares (rounded up to the nearest decimal) based upon different waste percentages. The waste factor is subject to the complexity of the roof, individual roofing techniques and your experience. Please consider this when calculating appropriate waste percentages. Note that only roof area is included in these waste calculations. Additional materials needed for ridge, hip, valley, and starter lengths are not included.

Penetrations	1-2	3-13	14-70	71-78	79	80	81-176	177-190	191	192
Area (sq ft)	1	2.2	2.3	3	3.5	3.8	4	5	6	6.2
Perimeter (ft)	4	6	6	7	7.6	8	8	9	10	10
	193-202	203-212	213-228	229-233	234	235-239	240	241-243	244	245
Area (sq ft)	6.2	6.3	7.5	9	9	10.5	12	12.3	13.5	14
Perimeter (ft)	10	10	11	12	13	13	14	14	15	15
	246	247-252	253	254-255	256-257	258-261	262	263	264	265
Area (sq ft)	14	16	18	20.2	25	30	30.2	30.3	36	34
Perimeter (ft)	15	16	17	18	20	22	22	22	24	25

Any measured penetration smaller than 3.0x3.0 Feet may need field verification. Accuracy is not guaranteed. The total penetration area is not subtracted from the total roof area.

All Structures Totals



Total Roof Facets = 37
Total Penetrations =298

Lengths, Areas and Pitches
Ridges = 1,602 ft (6 Ridges)
Hips = 20 ft (2 Hips).
Valleys = 1,289 ft (4 Valleys)
Rakes† = 112 ft (10 Rakes)
Eaves/Starter‡ = 3,449 ft (34 Eaves)
Drip Edge (Eaves + Rakes) = 3,561 ft (44 Lengths)
Parapet Walls = 7,808 (93 Lengths).
Flashing = 702 ft (3 Lengths)
Step flashing = 47 ft (6 Lengths)
Total Area = 378,204 sq ft
Total Penetrations Area = 6,804 sq ft
Total Roof Area Less Penetrations = 371,400 sq ft
Total Penetrations Perimeter = 4,563 ft
Predominant Pitch = 1/12

Property Location
Longitude = -95.8759539
Latitude = 36.1895352

Notes
This was ordered as a commercial property. There were no changes to the structure in the past four years.

Parapet Wall Area Table							
Wall Height (ft)	1	2	3	4	5	6	7
Vertical Wall Area	7808	15616	23424	31232	39040	46848	54656

This table provides common parapet wall heights to aid you in calculating the total vertical area of these walls. Note that these values assume a 90 degree angle at the base of the wall. Allow for extra materials to cover cant strips and tapered edges.

Online Maps

Online map of property
http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=N+85th+E+Ave,Tulsa,OK,74116-1211
Directions from Roof Consultants to this property
http://maps.google.com/maps?f=d&source=s_d&saddr=5350+E.+46th+Street,+Suite+116,Tulsa,OK,74135&daddr=N+85th+E+Ave,Tulsa,OK,74116-1211

† Rakes are defined as roof edges that are sloped (not level).
‡ Eaves are defined as roof edges that are not sloped and level.

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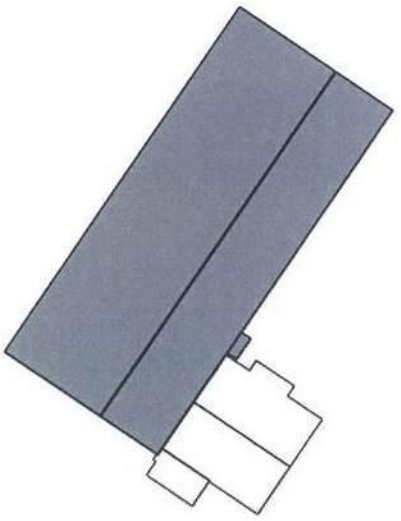
Premium Report
8/26/2019

N 85th E Ave, Tulsa, OK 74116-1211 Report: 30071800



In this 3D model, facets appear as semi-transparent to reveal overhangs.

Building: 4

PREPARED FOR

Contact:	R. Edward Owen
Company:	Roof Consultants
Address:	5350 E. 46th Street, Suite 116 Tulsa, OK 74135
Phone:	918-630-9555

TABLE OF CONTENTS

MEASUREMENTS

Total Roof Area =287,584 sq ft
Total Roof Facets =6
Predominant Pitch =0/12
Number of Stories <=1
Total Ridges/Hips =206 ft
Total Valleys =0 ft
Total Rakes =300 ft
Total Eaves =595 ft
Total Penetrations =34
Total Penetrations Perimeter = 414 ft
Total Penetrations Area = 342 sq ft

Measurements provided by www.eagleview.com

Certified Accurate

www.eagleview.com/Guarantee.aspx

IMAGES

The following aerial images show different angles of this structure for your reference.

Top View

IMAGES

North Side

South Side

IMAGES

East Side

West Side

LENGTH DIAGRAM

Total Line Lengths:
Ridges = 206 ft
Hips = 0 ft

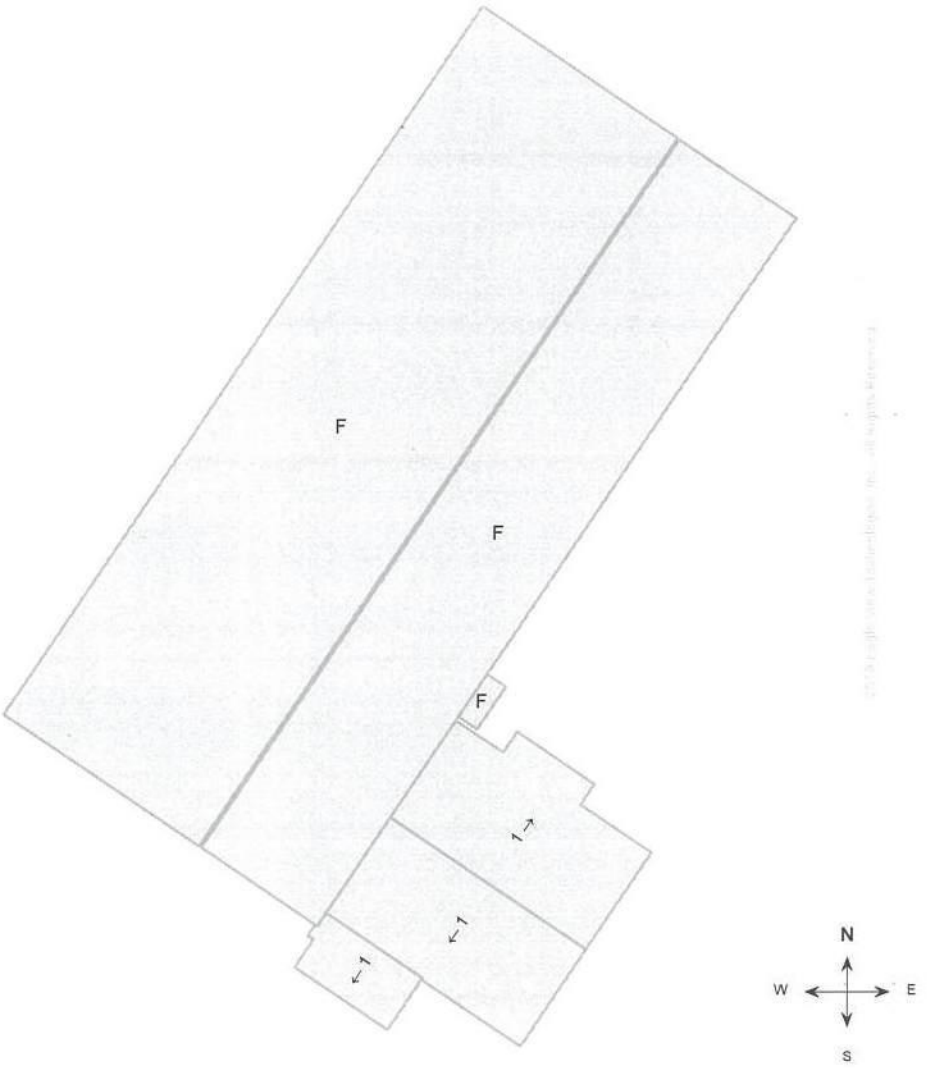
Valleys = 0 ft
Rakes = 300 ft
Eaves = 595 ft

Flashing = 153 ft
Step flashing = 257 ft
Parapets = 2,941 ft

Note: This diagram contains segment lengths (rounded to the nearest whole number) over 5.0 Feet. In some cases, segment labels have been removed for readability. Plus signs preface some numbers to avoid confusion when rotated (e.g. +6 and +9).

PITCH DIAGRAM

Pitch values are shown in inches per foot, and arrows indicate slope direction. The predominant pitch on this roof is 0/12



Note: This diagram contains labeled pitches for facet areas larger than 20.0 square feet. In some cases, pitch labels have been removed for readability. Gray shading indicates flat, 1/12 or 2/12 pitches. If present, a value of "F" indicates a flat facet (no pitch).

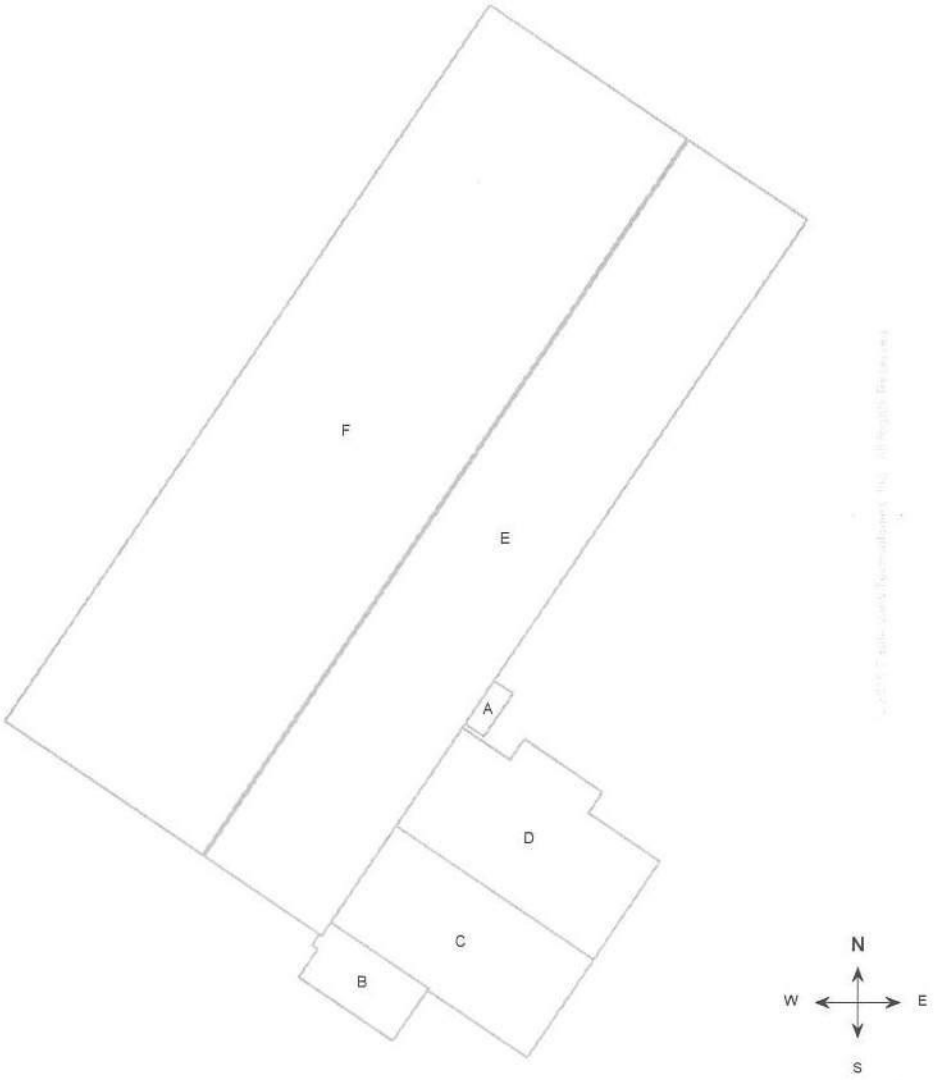
AREA DIAGRAM

Total Area = 287,584 sq ft, with 6 facets.

Note: This diagram shows the square feet of each roof facet (rounded to the nearest Foot). The total area in square feet, at the top of this page, is based on the non-rounded values of each roof facet (rounded to the nearest square foot after being totaled).

NOTES DIAGRAM

Roof facets are labeled from smallest to largest (A to Z) for easy reference.



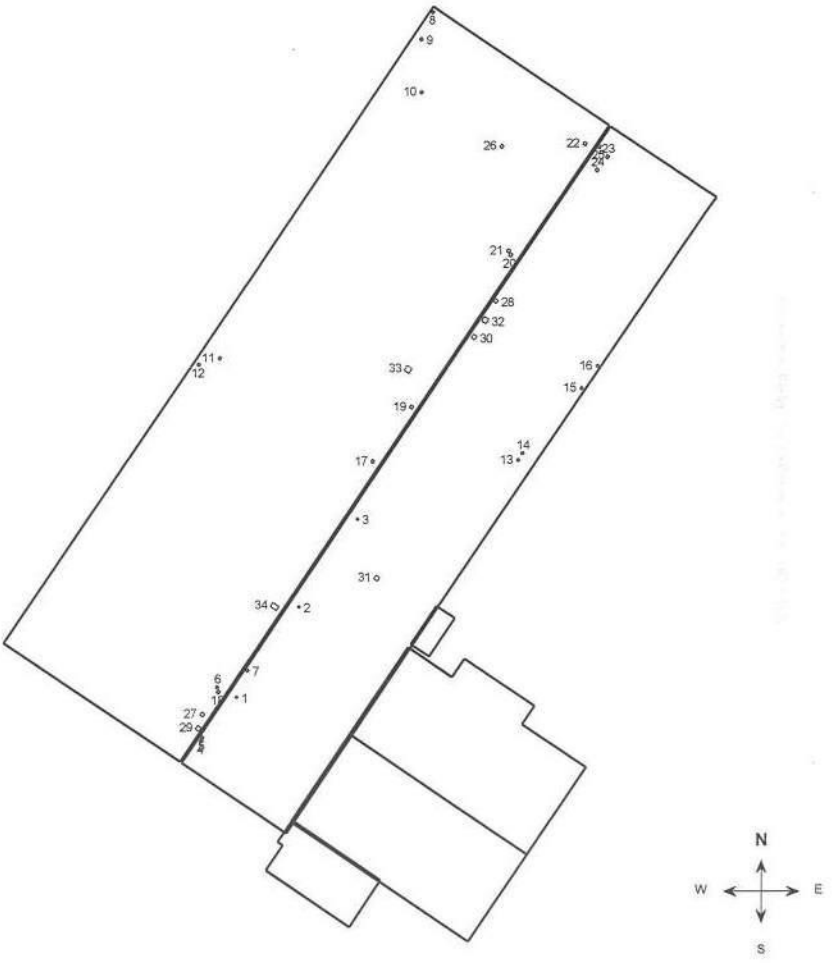
Note: This diagram also appears in the Property Owner Report.

PENETRATIONS NOTES DIAGRAM

Penetrations are labeled from smallest to largest for easy reference.

Total Penetrations = 34
Total Penetrations Perimeter = 414 ft

Total Penetrations Area = 342 sq ft
Total Roof Area Less Penetrations = 287,242 sq ft



REPORT SUMMARY

All Structures

Areas per Pitch		
Roof Pitches	0/12	1/12
Area (sq ft)	238887.6	48695.6
% of Roof	83.1%	16.9%

The table above lists each pitch on this roof and the total area and percent (both rounded) of the roof with that pitch.

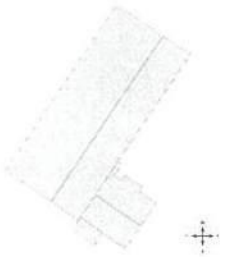
Waste Calculation Table							
Waste %	**0%**	**10%**	**12%**	**15%**	**17%**	**20%**	**22%**
Area (sq ft)	287,584	316,342	322,094	330,722	336,473	345,101	350,852
Squares	2875.8	3163.4	3220.9	3307.2	3364.7	3451.0	3508.5

This table shows the total roof area and squares (rounded up to the nearest decimal) based upon different waste percentages. The waste factor is subject to the complexity of the roof, individual roofing techniques and your experience. Please consider this when calculating appropriate waste percentages. Note that only roof area is included in these waste calculations. Additional materials needed for ridge, hip, valley, and starter lengths are not included.

Penetrations	1-3	4-8	9-16	17	18-26	27-28	29-31	32	33	34
Area (sq ft)	4	6.2	6.3	7.5	9	12.3	16	25	30.3	31.5
Perimeter (ft)	8	10	10	11	12	14	16	20	22	23

Any measured penetration smaller than 3.0x3.0 Feet may need field verification. Accuracy is not guaranteed. The total penetration area is not subtracted from the total roof area.

All Structures Totals



Total Roof Facets = 6
Total Penetrations =34

Lengths, Areas and Pitches
Ridges = 206 ft (1 Ridges)
Hips = 0 ft (0 Hips).
Valleys = 0 ft (0 Valleys)
Rakes† = 300 ft (5 Rakes)
Eaves/Starter‡ = 595 ft (8 Eaves)
Drip Edge (Eaves + Rakes) = 895 ft (13 Lengths)
Parapet Walls = 2,941 (4 Lengths).
Flashing = 153 ft (3 Lengths)
Step flashing = 257 ft (4 Lengths)
Total Area = 287,584 sq ft
Total Penetrations Area = 342 sq ft
Total Roof Area Less Penetrations = 287,242 sq ft
Total Penetrations Perimeter = 414 ft
Predominant Pitch = 0/12

Property Location
Longitude = -95.8765211
Latitude = 36.1874029

Notes
This was ordered as a commercial property. There were no changes to the structure in the past four years.

Parapet Wall Area Table							
Wall Height (ft)	1	2	3	4	5	6	7

† Rakes are defined as roof edges that are sloped (not level).
‡ Eaves are defined as roof edges that are not sloped and level.

Vertical Wall Area	2941	5882	8823	11764	14705	17646	20587

This table provides common parapet wall heights to aid you in calculating the total vertical area of these walls. Note that these values assume a 90 degree angle at the base of the wall. Allow for extra materials to cover cant strips and tapered edges.

Online Maps

Online map of property
http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=N+85th+E+Ave,Tulsa,OK,74116-1211
Directions from Roof Consultants to this property
http://maps.google.com/maps?f=d&source=s_d&saddr=5350+E.+46th+Street,+Suite+116,Tulsa,OK,74135&daddr=N+85th+E+Ave,Tulsa,OK,74116-1211

Johns Manville

Specification 2CID/2FID/2PID

Two Ply Hot Mopped Modified Bitumen Mineral Surfaced Roofing System. For use over Johns Manville (JM) insulation, approved decks, or other approved insulations on inclines up to 3" per foot (250 mm/m).

For Regions 1, 2 and 3

Materials per 100 sq. ft. (9.3 m²) of Roof Area

Primer (if required):	
JM Concrete Primer	1 gallon (3.8 liters)
Base Felts:	
DynaBase, DynaPly, DynaLastic 180 S, GlasBase, GlasBase Plus, GlasPly Premier, GlasPly IV or PermaPly 28	1 layer
Cap: ◆	
2CID—DynaKap, DynaKap FR, DynaMax or DynaMax FR	
2FID—DynaGlas, DynaGlas FR or DynaGlas 30 FR*	
2PID—DynaLastic 180, DynaLastic 180 FR, DynaLastic 250 or DynaLastic 250 FR	1 layer

* DynaGlas 30 FR must be used in conjunction with DynaBase, DynaLastic 180 S or DynaPly only.

Asphalt (Refer to Para. 7A.8): Trumbull or other JM Approved Asphalt

Incline per foot	Asphalt	Total Weight
Up to ½"	190°F, Type III, Steep	46 lbs. (21 kg)
½" to 3"	220°F, Type IV, Special Steep	46 lbs. (21 kg)

Approximate installed weight: 145 - 255 lbs. (66 - 116 kg).

General

This specification is for use over any type of approved structural deck which is not nailable and which provides a suitable surface to receive the roof. Poured and pre-cast concrete decks require priming with JM Concrete Primer prior to application of hot asphalt.

This specification is also for use over JM roof insulations, or other approved roof insulations which are not nailable and which provide a suitable surface to receive the roof. Specific written approval is required for any roof insulation that is not supplied by JM. Insulation should be installed in accordance with the appropriate JM Insulation Specification detailed in the JM Commercial/ Industrial Roofing Systems Manual. This specification can also be used in certain reroofing situations. Refer to the "Reroofing" section of the JM Commercial/Industrial Roofing Systems Manual. This specification is not to be used directly over gypsum, either poured or pre-cast, or lightweight, insulating concrete decks or fills.

Design and installation of the deck and/or roof substrate must result in the roof draining freely, to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Roofing System Guarantee.

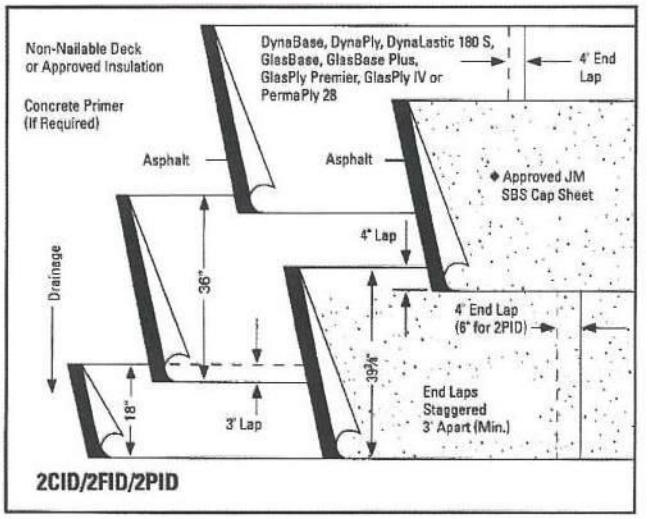
Note: All general instructions contained in the current JM Commercial/ Industrial Roofing Systems Manual shall be considered part of this specification.

Flashings

Flashing details can be found in the "Bituminous Flashings" section of the JM Commercial/Industrial Roofing Systems Manual.

Application

On roof decks with slopes up to ½" per foot (41.6 mm/m), the roofing felts and modified bitumen sheets may be installed either perpendicular or parallel to the roof incline.



2CID/2FID/2PID

Roll an 18" (457 mm) wide piece of one of the base felts listed into a full mopping of asphalt. The remaining felts are to be applied full width, in the same manner, with 3" (76 mm) side and 4" (102 mm) end laps over the preceding sheets.

Apply a full width piece of one of the cap sheets listed into a full mopping of asphalt. Subsequent sheets are to be applied in the same manner, with 4" (102 mm) side and end laps over the preceding sheets (6" [152 mm] end laps for DynaLastic products).

Apply all felts so that they are firmly and uniformly set, without voids, into the hot asphalt. Asphalt temperature should be at the Equiviscous Temperature (EVT), ±25°F (±14°C), at the point of application. All felt edges shall be well sealed. The asphalt shall be applied just before the felt, at a nominal rate of 23 lbs. per square (1.1 kg/m²). When applying over insulations, more than 23 lbs. per square (1.1 kg/m²) of asphalt may be needed due to the absorbency of the insulation. For modified bitumen sheets, the asphalt temperature shall be at a minimum of 400°F (204°C), or at the EVT, whichever is higher, when the sheet is set into it. This higher temperature maximizes the bonding of the modified bitumen sheet.

Note: When using metric and English sized base and cap sheets in the same system, care must be taken to avoid lap over lap configurations.

Base sheets and cap sheets with polyester reinforcement must be allowed to relax in an unrolled position prior to installation.

For cold weather application techniques, refer to **Paragraph 7A.31**.

Steep Slope Requirements

Special procedures are required on inclines over ½" per foot (41.6 mm/m). Refer to **Paragraph 7A.29**.

Surfacing

No additional surfacing is required.

Asphalt

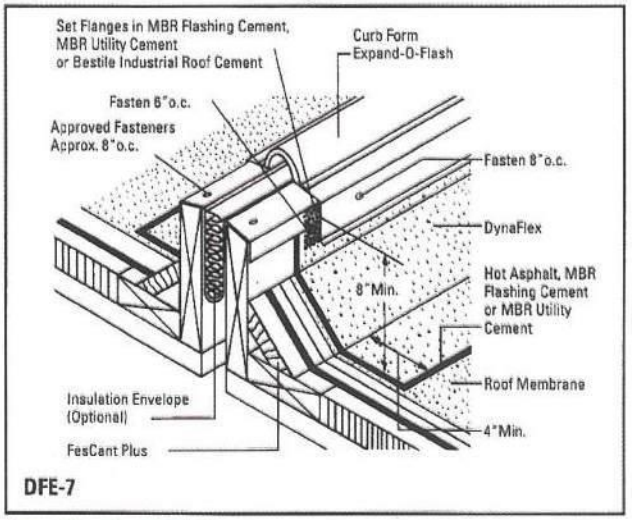
Asphalt should meet the requirements of ASTM D 312.

JM Guarantees require the use of Trumbull asphalt or another JM Approved Asphalt. The Contractor must provide an Asphalt Confirmation Number (ACN) on projects which require a JM Guarantee. The ACN will indicate that the asphalt was registered with the approved asphalt source.

For an identical copy of this specification, ask for RS-4203.

Johns Manville

Specifications DFE-7, DFE-8, DFE-9, DFE-10



DFE-7

Specification DFE-7

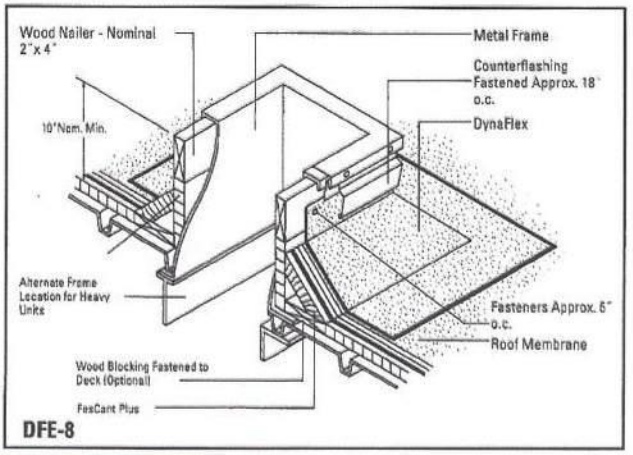
General

Note: All general instructions contained in the current JM Commercial/ Industrial Roofing Systems Manual shall be considered part of this specification.

Curb mounted roof-to-roof expansion joint cover

Expansion Joint Cover: Application of the base flashing is outlined in Specification DFE-1 (NLB). Install and splice Expand-O-Flash in accordance with the installation instructions provided with the product.

Prefabricated intersections, as well as horizontal-to-vertical transitions, are available to complete the Expand-O-Flash installation. Refer to Section 10 on "Roofing Accessories" in the current JM Commercial/ Industrial Roofing Systems Manual.

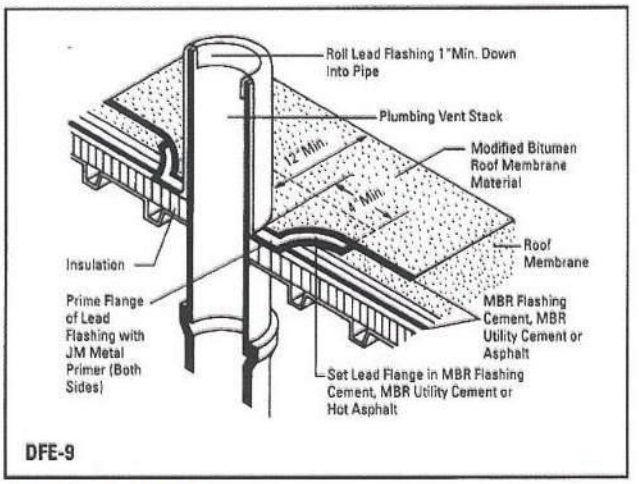


DFE-8

Specification DFE-8

Flashing to prefabricated curb

Prefabricated Curb: Refer to Flashing Specification DFE-1 (NLB) for detailed instructions on application of the base flashing. Base flashing felts should extend as far up the prefabricated curb as practicable, but not less than 8" (203 mm). Install the flashing receiver and metal counter-flashing in accordance with the prefabricated curb manufacturer's specifications and details, or in accordance with the DFE-8 detail.

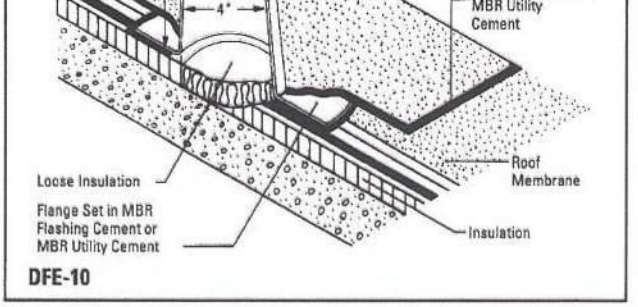


DFE-9

Specification DFE-9

Plumbing vent flashing

Plumbing Vent Flashing: Prime both sides of the flange of the lead boot with JM Metal Primer. Set the flange into a bed of MBR Flashing Cement, MBR Utility Cement, or a mopping of hot asphalt. Cover the flange with a layer of modified bitumen membrane sheet, set in MBR Flashing Cement, MBR Utility Cement, or hot asphalt. Roll the top edge of the lead boot down into the pipe a minimum of 1" (25 mm). Minimum weight of lead sheet: 2½ lbs. per square foot (12.2 kg/m²).



DFE-10

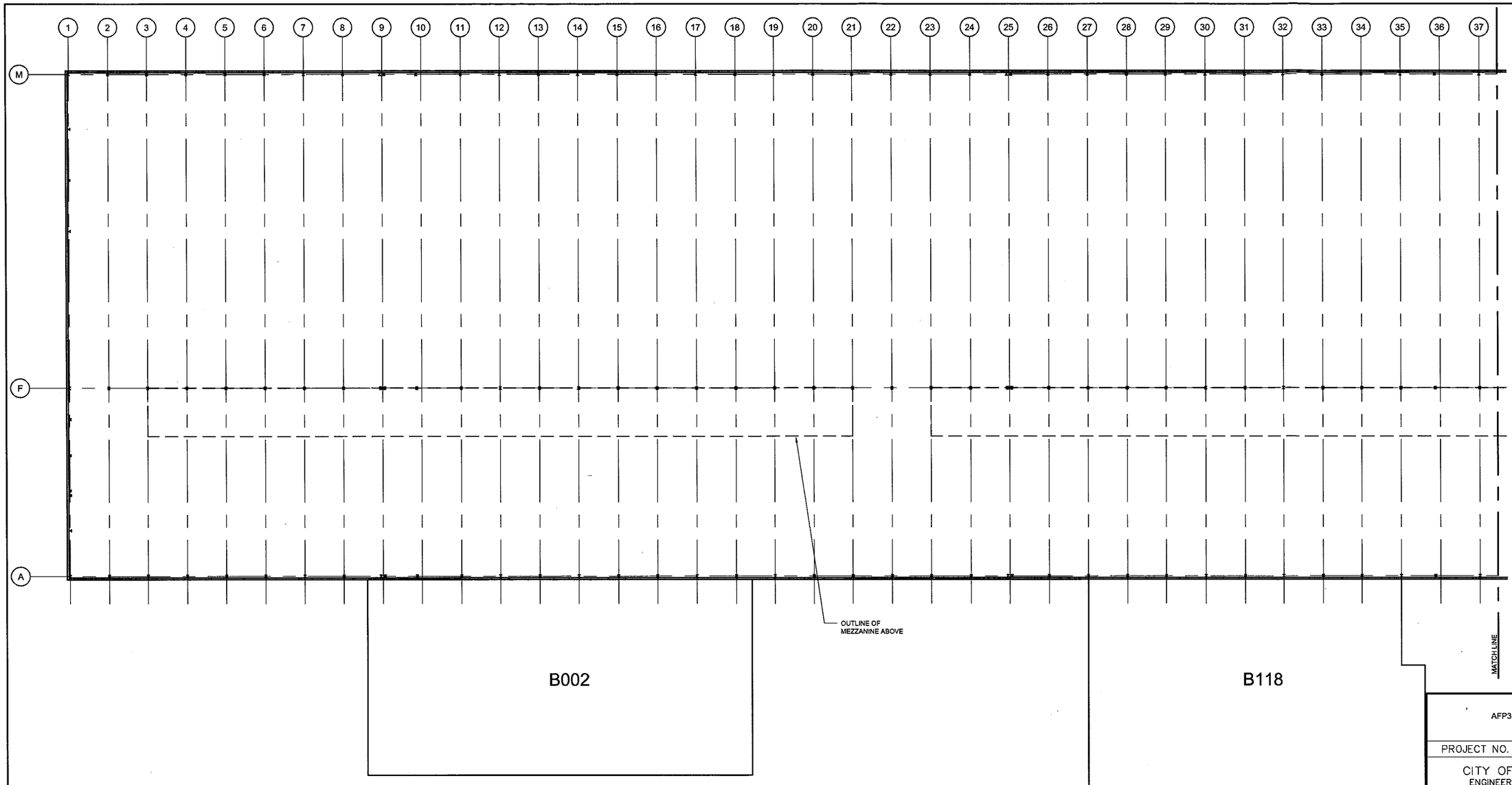
Specification DFE-10

FP-10 One-Way Roof Vent

FP-10 One Way Roof Vent: Cut a 5" (127 mm) diameter hole in membrane. Remove all or part of the insulation, as necessary to facilitate venting; replace with loose insulation to prevent possible condensation. Apply a layer of MBR Flashing Cement or MBR Utility Cement around the 5" (127 mm) hole and press the vent flange into place. Flash in the vent with a layer of modified bitumen membrane sheet, set in MBR Flashing Cement or MBR Utility Cement.

Note: Hot asphalt may be used in lieu of the MBR Flashing or Utility Cements to set and flash in the vent, however, do not mix the two methods of application.

For an identical copy of this specification, ask for RS-4226.



1 KEYPLAN
1/32" = 1'-0"

N

AFP3 BUILDING ASSESSMENT

PROJECT NO. 170045.2 AMENDMENT NO. 1

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

PLANS AND ESTIMATES PREPARED BY:
CYNTERGY, L.L.C.

ROOFING CONSULTANTS:
R. EDWARD OWEN
RRC, AIA, CCS, CCCA

MARK	REVISION	BY	DATE

PLAN SCALE: AS NOTED
PROFILE SCALE:
HORIZONTAL 1" =
VERTICAL 1" =

DRAWN: EAE
DESIGNED: LLV
SURVEY:
PROJ. MGR.:
LEAD ENGR: LLV
FIELD MGR.:
RECOMMENDED:
DESIGN MANAGER

APPROVED:
CITY ENGINEER

FILE: DRAWING:
DATE:
ATLAS PAGE NO.
SHEET NAME: KEYPLAN
SHEET OF 22 SHEETS
SHEET NO. S-1

37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74

OUTLINE OF MEZZANINE ABOVE

MATCH LINE

MATCH LINE

B119

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DRAWN	EAE
DESIGNED	LLV
SURVEY	
PROJ. MGR.	
LEAD ENGR.	LLV
FIELD MGR.	
RECOMMENDED	
DESIGN MANAGER	

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APPROVED:
CITY ENGINEER
DATE:
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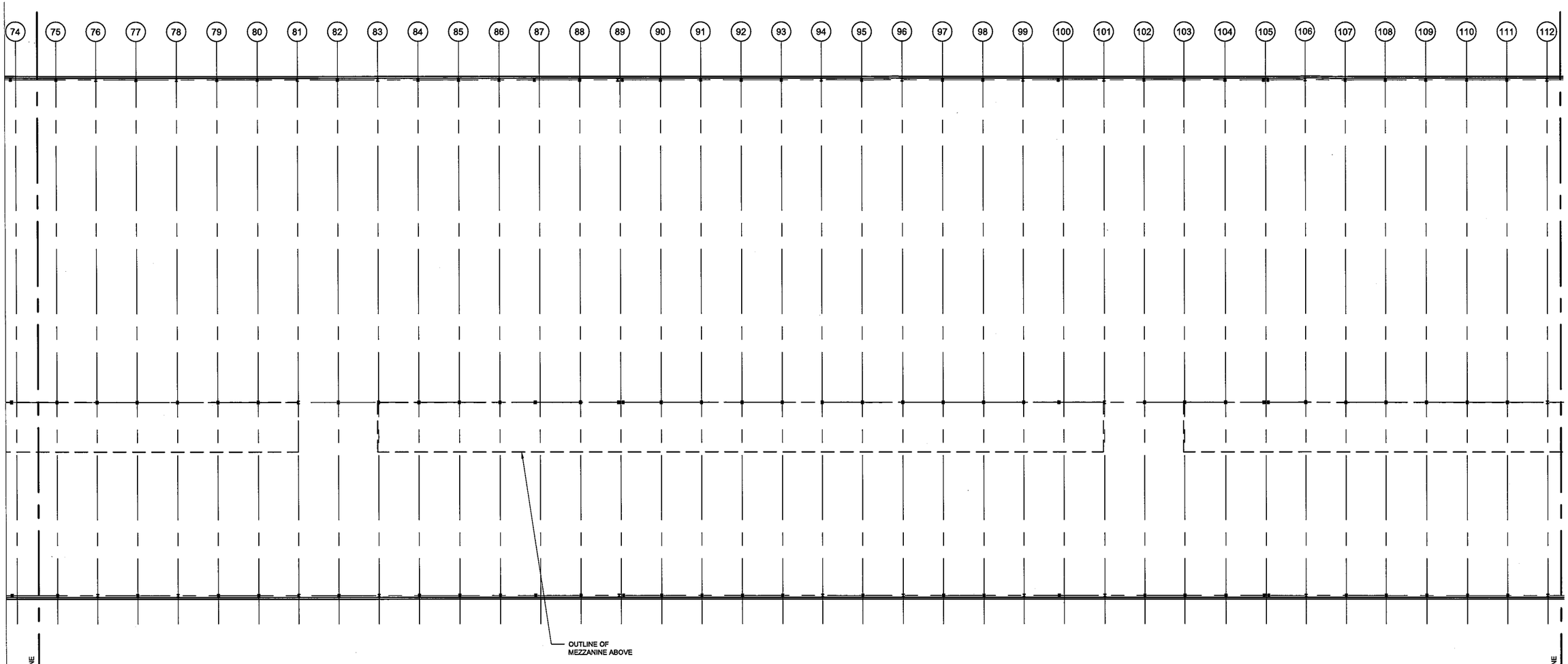
SHEET NO. S-2



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PLAN SCALE: AS NOTED	DRAWN	EAE	
	DESIGNED	LLV	
	SURVEY		
PROFILE SCALE:	PROJ. MGR.		
HORIZONTAL: 1" =	LEAD ENGR.	LLV	
	FIELD MGR.		
VERTICAL 1" =	RECOMMENDED: DESIGN MANAGER		
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CITY ENGINEER

DATE:

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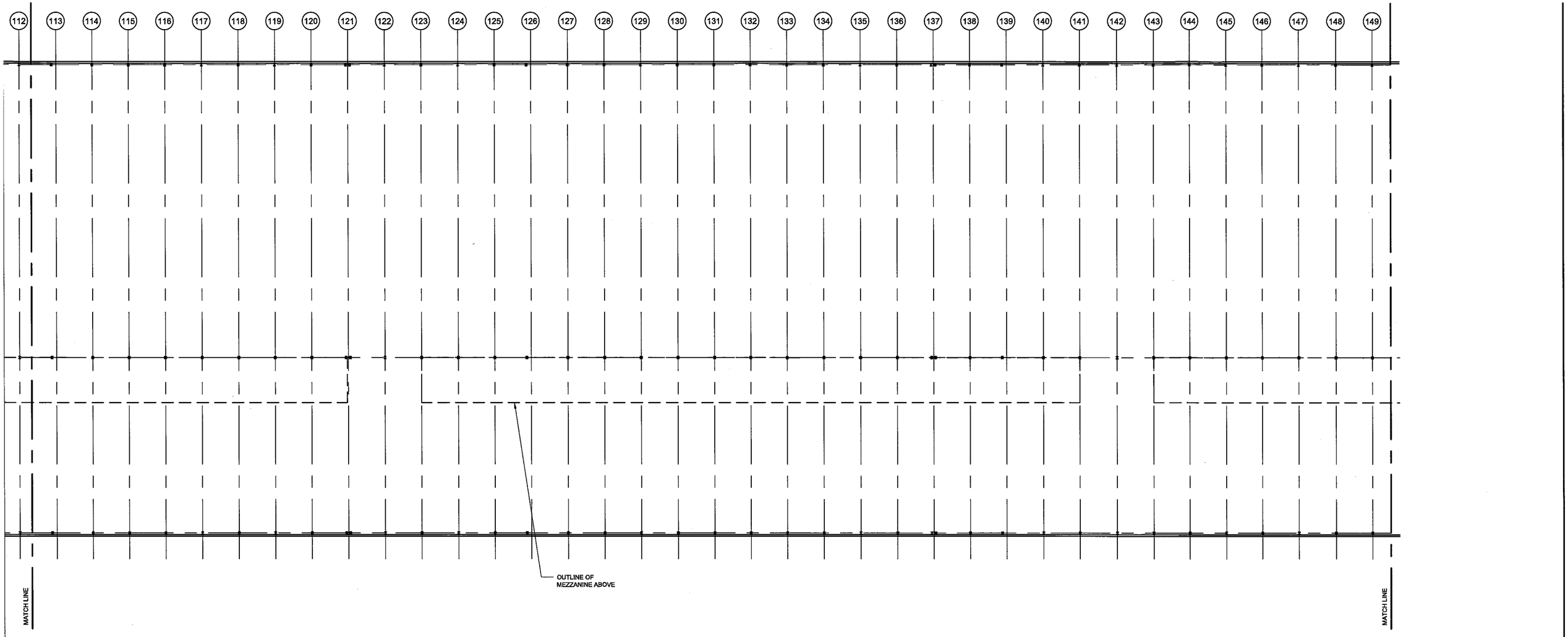
SHEET NO. S-3



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MARK	REVISION	BY	DATE

PLAN SCALE: AS NOTED
PROFILE SCALE:
HORIZONTAL: 1" =
VERTICAL 1" =

DRAWN	EAE	
DESIGNED	LLV	
SURVEY		
PROJ. MGR.		
LEAD ENGR.	LLV	
FIELD MGR.		

RECOMMENDED:
DESIGN MANAGER

APPROVED:
CITY ENGINEER

FILE: DRAWING:
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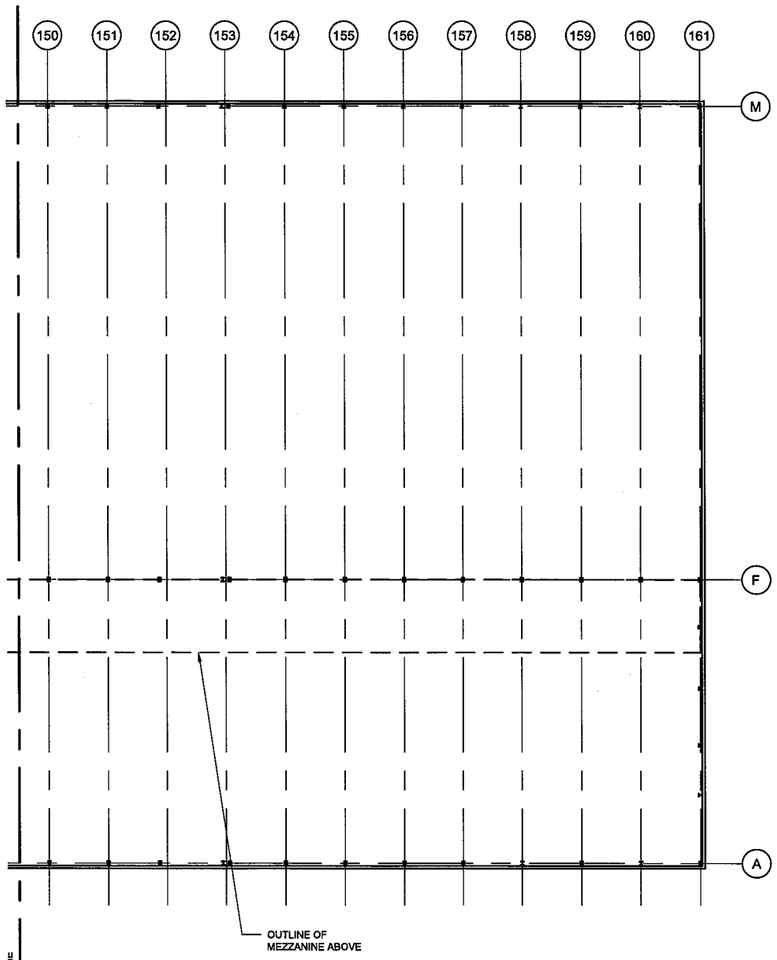

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	DESIGNED	LLV	
	SURVEY		
PROFILE SCALE:	PROJ. MGR.		
HORIZONTAL: 1" =	LEAD ENGR.	LLV	
	FIELD MGR.		
VERTICAL 1" =	RECOMMENDED: DESIGN MANAGER		

APPROVED:

CITY ENGINEER

FILE: DRAWING:

DATE:

ATLAS PAGE NO:

SHEET OF 22 SHEETS

SHEET NAME:
KEYPLAN

SHEET NO.
S-5