STRUCTURAL DESIGN CALCULATIONS
For
DHR Project Number 26280
118 N. Locust Street
DENTON, TEXAS

118 N. Locust Street, Denton, TX 76201

DHR ENGINEERING, INC

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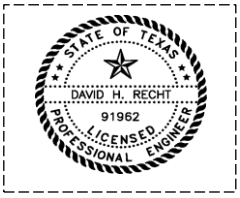

STRUCTURAL DESIGN CALCULATIONS

DHR PROJECT : 26280 - Denton 118 N Locust St Awning

Replacement of Existing Aluminum Canopy

118 N. Locust Street

Denton, Texas 76201

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1.0 PROJECT DESCRIPTION

The project consists of replacing an existing suspended aluminum roll-formed canopy located on the front elevation of an existing commercial building.

The building was originally constructed in the late nineteenth century and is located within the Downtown Denton District.

The existing canopy experienced a structural collapse during a winter weather event and is to be replaced with a new roll-formed aluminum canopy of similar architectural appearance and dimensions while satisfying current structural design requirements.

The replacement canopy will utilize an Arch-Fab roll-formed aluminum canopy system suspended from steel support rods attached to the existing masonry wall. The manufacturer details used as the basis of the replacement system include 1½ in. × 1½ in. × ⅛ in. aluminum support arms, 12 in. interlocking deck pans, front gutter framing, and upper/lower wall bracket configurations.

2.0 SCOPE OF WORK

This report includes structural calculations for:

- Dead loads.
- Roof live loads.
- Wind loads.
- Structural analysis.

- Support rod reactions.
- Wall bracket reactions.
- Aluminum framing.
- Masonry anchorage.
- masonry repair recommendations.
- General structural notes.

Electrical, architectural and waterproofing design are excluded.

3.0 EXISTING STRUCTURE

Existing Building Address:

118 North Locust Street

Denton, Texas

Occupancy: Commercial Retail

Construction Date: Late 1800s

Structural System: load-bearing brick masonry.

Probable Wall Construction: Brick masonry

Estimated Wall Thickness: 8–9 inches (to be field verified).

Estimated Building Height: Approximately 23 feet.

Estimated Canopy Elevation: Approximately 11 feet above sidewalk.

Estimated Canopy Projection: 8 feet.

Estimated Canopy Length: 52 feet.

4.0 EXISTING CANOPY FAILURE ASSESSMENT

A review of the photographs provided indicates the following:

1. The aluminum roof assembly experienced extensive plastic deformation and folded downward.

2. The steel support rods largely remained attached after collapse.
3. The upper wall brackets appear to have remained connected to the masonry.
4. Significant snow remained on the canopy following the collapse.
5. No widespread wall failure is evident in the photographs.

5.0 DESIGN INTENT

The replacement canopy shall:

- Maintain the architectural appearance of the original canopy.
- Increase structural reliability.
- Improve load distribution into the existing masonry.
- Maintain compatibility with the district requirements.
- Avoid unnecessary removal of original brick.
- Provide improved inspection accessibility.

6.0 APPLICABLE CODES

- 2021 International Building Code
- ASCE 7-22
- Aluminum Design Manual (latest adopted edition)
- AISC Steel Construction Manual
- TMS 402/602 Masonry Code

Manufacturer's published installation details (Arch-Fab Roll-Formed Canopy) as the basis for geometry and connection configuration.

7.0 DESIGN CRITERIA

Risk Category: II

Basic Wind Speed: 140 mph Ultimate

Exposure Category: B

Topographic Factor: 1.0

Directionality Factor: 0.85

Ground Snow Load: 5 psf

Roof Live Load: 20 psf

Rain Load: Per ASCE 7

8.0 MATERIAL PROPERTIES

Aluminum Members: 6063-T6 (assumed pending manufacturer confirmation)

Modulus of Elasticity: 10,000 ksi

Steel Plates: ASTM A36

Bolts: ASTM F3125 Grade A325 (or approved equivalent)

Support Rods: Galvanized steel/Aluminum

Masonry: Existing clay brick.

Properties shall be field verified.

No masonry capacities are assumed without evaluation.

9.0 EXISTING BUILDING ASSUMPTIONS

The following assumptions form the basis of these calculations.

1. Existing masonry walls are structurally stable.
2. Existing walls are plumb.
3. Existing walls are capable of supporting replacement canopy loads after repairs.
4. Interior access is available to install backing plates where feasible.
5. Existing damaged masonry will be repaired before installation.
6. The replacement canopy will closely match the geometry of the original canopy.
7. Final field measurements govern fabrication.

10.0 STRUCTURAL DESIGN PHILOSOPHY

Rather than replicate the original connection system exactly, the replacement design will improve the load path into the masonry while preserving the building's appearance.

The design philosophy includes:

- Distributed reactions into the masonry.
- Through-bolted connections with steel backing plates where practical.
- Reduced localized bearing stresses.
- Increased connection redundancy.
- Maintainability.
- Compatibility with construction.

11.0 EXISTING MASONRY EVALUATION

Prior to installation:

The Engineer shall verify:

- Wall thickness.
- Brick condition.
- Mortar condition.
- Presence of voids.
- Existing cracks.
- Previous repairs.
- Moisture damage.
- Corrosion of embedded steel.

Installation shall not proceed until deteriorated masonry has been repaired.

12.0 REPAIR REQUIREMENTS

Prior to installation of the replacement canopy:

- Remove all loose masonry.
- Remove cracked brick.
- Replace damaged brick with matching units.
- Repoint deteriorated mortar using a compatible mortar.
- Inspect concealed steel lintels.
- Repair corrosion.
- Fill internal voids with compatible grout where required.
- Restore bearing surfaces.
- Inspect repaired work before anchor installation.

13.0 GENERAL NOTES

1. Contractor shall verify all field dimensions.
2. Do not scale drawings.
3. Notify the Engineer of Record of concealed deterioration.
4. Existing masonry shall not be overloaded during construction.
5. Temporary shoring shall be provided as required.
6. All anchor locations shall avoid damaged brick units.
7. Field modifications require Engineer approval.
8. Contractor shall protect adjacent finishes during demolition and installation.

CHAPTER 2

STRUCTURAL LOAD DETERMINATION

2.1 INTRODUCTION

This chapter establishes all gravity loads, environmental loads, and design load combinations used for the structural analysis of the proposed replacement canopy.

Loads have been determined in accordance with:

- 2021 International Building Code (IBC)
- ASCE 7-22 – *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- Aluminum Design Manual (ADM)

The canopy dimensions are based on the proposed replacement and the Arch-Fab roll-formed canopy system.

2.2 CANOPY GEOMETRY

Parameter	Value
Overall Length	52'-0"
Projection	8'-0"
Plan Area	416 SF
Approximate Elevation Above Sidewalk	11'-0"
Building Height	23'-0"

Plan Area

A=L×PA = L \times PA=L×P A=52×8A = 52 \times 8A=52×8 A=416 SFA = 416\;SFA=416SF

2.3 STRUCTURAL SYSTEM

The canopy consists of:

- Roll-formed aluminum deck panels
- Continuous rear wall beam
- Continuous front gutter beam
- Aluminum transverse framing
- Steel tension rods
- Upper wall brackets
- Lower wall brackets

The roof framing transfers gravity loads to the front gutter beam and rear wall beam. The front gutter beam transfers vertical reactions into the inclined tension rods, which resolve forces into the upper wall brackets. The rear wall beam transfers gravity and uplift forces directly into the lower wall brackets. This load path follows the general configuration shown in the manufacturer's submittal details.

2.4 DEAD LOAD

Because manufacturer-certified weights for the specific canopy have not yet been provided, conservative dead loads have been assumed.

Aluminum Roof Panels

12-inch interlocking aluminum deck

Estimated Weight

2.0 psf

Aluminum Framing

Cross members

Rear beam

Front gutter beam

Estimated

3.0 psf

Rods

Brackets

Fasteners

Miscellaneous

Estimated

2.0 psf

Total Dead Load

Component	psf
Roof Panels	2.0
Framing	3.0
Connections	2.0
TOTAL	7.0 psf

Dead Load

D=7.0 psfD = 7.0\;psfD=7.0psf

Total

PD=7(416)=2912 lbsP_D = 7(416) = 2912\;lbsPD=7(416)=2912lbs

Equivalent Uniform Load

2912/52=56 plf2912/52 = 56\;plf2912/52=56plf

2.5 ROOF LIVE LOAD

IBC Section 1607

Minimum Roof Live Load

20 psf

Lr=20 psfL_r = 20\;psfLr=20psf

Total

20(416)=8320 lbs20(416) = 8320\;lbs20(416)=8320lbs

Equivalent

8320/52=160 plf8320/52 = 160\;plf8320/52=160plf

2.6 SNOW LOAD

Ground Snow Load

Denton County

Pg = 5 psf

Using ASCE 7 procedures, the balanced roof snow load on this canopy does not govern when compared with the minimum roof live load.

Therefore,

Roof Live Load governs.

2.7 RAIN LOAD

The canopy is sloped toward the front gutter.

Drainage is provided through the gutter/scupper system.

Rain ponding is not permitted.

Contractor shall verify:

- Positive drainage.
- Scupper functionality.
- Downspout capacity.
- No standing water after installation.

If field conditions indicate inadequate drainage, the Engineer shall re-evaluate rain loading in accordance with ASCE 7 Chapter 8.

2.8 DEAD + LIVE LOAD

Uniform Design Load

$$D+Lr=7+20=27\ psf$$

Total Gravity Load

$$27(416)=11232\ lbs$$

Equivalent Uniform Line Load

$$11232/52=216\ plf$$

2.9 PRELIMINARY ROD SPACING

The existing canopy photographs indicate support rods at approximately 6-foot centers. The Arch-Fab example submittal also shows support arm spacing generally in the range of 72–74 inches depending on canopy length.

For preliminary analysis:

Rod Spacing

6'-0"

Number of Rods

52 / 6

≈ 9 rods

Tributary Width

6 ft

Tributary Area

$$6\times8=48\ SF$$

Gravity Reaction Per Rod

$$48\times27=1296\ lbs$$

Each rod shall therefore resist approximately

1.30 kips downward

before load combinations.

2.10 PRELIMINARY WALL REACTIONS

Total Gravity

11.23 kips

Assuming:

- Nine equally loaded support locations
- Symmetric loading
- Uniform stiffness

Reaction

11232/9=1248 lbs11232 / 9 = 1248\;lbs11232/9=1248lbs

per support location.

These values will be refined after completion of the structural analysis.

2.11 LOAD SUMMARY

Load	Value
Dead Load	2.91 kips
Roof Live Load	8.32 kips
Total Gravity	11.23 kips
Uniform Gravity	216 plf
Estimated Rod Reaction	1.30 kips

2.12 CHAPTER CONCLUSIONS

Gravity loading is relatively modest for the proposed canopy. Based on the observed failure mode and the geometry of the replacement system, gravity loading alone is unlikely to govern the design.

The critical design condition is expected to be wind uplift, which will induce significant tension in the hanger rods, brackets, and masonry anchorage.

Accordingly, Chapter 3 will develop the full ASCE 7-22 wind pressure calculations, including velocity pressure, external and internal pressure coefficients, canopy uplift pressures, and governing LRFD and ASD load combinations. Those calculations will establish the design forces for the structural members and masonry connections.

CHAPTER 3

ASCE 7-22 WIND LOAD ANALYSIS

3.1 INTRODUCTION

This chapter determines the design wind pressures acting on the proposed replacement canopy in accordance with ASCE 7-22.

The canopy is classified as an **attached open canopy projecting from a building façade** and is therefore subject to both downward and uplift wind pressures.

For suspended canopies, **wind uplift is expected to govern the structural design**.

3.2 PROJECT INFORMATION

Project Address:

118 North Locust Street

Denton, Texas

Structure: Existing Commercial Building

Proposed Canopy: Roll-Formed Aluminum Canopy

Length: 52 ft

Projection: 8 ft

Mean Roof Height: 23 ft (estimated)

Canopy Height: 11 ft above sidewalk

Risk Category: II

Exposure: B

3.3 BASIC WIND SPEED

Per the current Texas adopted wind maps and ASCE 7-22:

Ultimate Wind Speed

Vult=140 mphV_{ult}=140\;mphVult=140mph

3.4 EXPOSURE CATEGORY

The building is located in Downtown Denton.

Surrounding buildings provide significant shielding.

Therefore,

Exposure Category **B**

3.5 TOPOGRAPHIC FACTOR

Site observations indicate:

- No abrupt hills
- No escarpments
- No ridges

Therefore,

Kzt=1.00K_{zt}=1.00Kzt=1.00

3.6 DIRECTIONALITY FACTOR

Components and Cladding

Kd=0.85K_d=0.85Kd=0.85

3.7 IMPORTANCE FACTOR

Risk Category II

Importance Factor

I=1.0I=1.0I=1.0

3.8 VELOCITY PRESSURE

The ASCE 7 velocity pressure equation is:

qz=0.00256KzKztKdV2q_z = 0.00256 K_z K_{zt} K_d V^2qz=0.00256KzKztKdV2

Using preliminary values:

- Kz=0.70K_z = 0.70Kz=0.70 (estimated for Exposure B at approximately 23 ft; to be verified from the ASCE 7 tables)
- Kzt=1.00K_{zt}=1.00Kzt=1.00
- Kd=0.85K_d=0.85Kd=0.85
- V=140 mphV=140\;mphV=140mph

Substituting:

qz=0.00256(0.70)(1.00)(0.85)(140)2q_z = 0.00256(0.70)(1.00)(0.85)(140)^2qz =0.00256(0.70)(1.00)(0.85)(140)2 qz=29.9 psfq_z = 29.9\;psfqz=29.9psf

Adopt

qz=30 psfq_z=30\;psfqz=30psf

3.9 INTERNAL PRESSURE

The canopy is open.

Therefore,

Internal pressure

Not applicable.

3.10 EXTERNAL PRESSURE

Unlike enclosed roofs, attached canopies are evaluated using the canopy provisions of ASCE 7. The exact pressure coefficients depend on:

- canopy slope,
- projection,
- height,
- openness,
- and edge effects.

For preliminary design, representative net pressure coefficients consistent with an attached open canopy are used pending final confirmation.

Upward Pressure

Using a preliminary coefficient:

GCp=−1.5GC_p=-1.5GCp=−1.5

Wind Pressure

p=qz(GCp)p=q_z(GC_p)p=qz(GCp) p=30(−1.5)p = 30(-1.5)p=30(−1.5) p=−45 psfp=-45\;psfp=−45psf

Therefore

Design Uplift

45 psf

Downward Pressure

Positive coefficient

GCp=+0.8GC_p=+0.8GCp=+0.8 p=30(0.8)=24 psfp = 30(0.8) = 24\;psfp=30(0.8)=24psf

---

3.11 DESIGN WIND PRESSURES

Loading	Pressure
Downward	24 psf
Uplift	45 psf

Uplift governs.

3.12 TOTAL UPLIFT

Area

416 sf

P=45(416)=18,720 lbsP = 45(416) = 18,720\;lbsP=45(416)=18,720lbs

Equivalent

18.7 kips

3.13 UNIFORM UPLIFT

18,720/52=360 plf18,720 / 52 = 360\;plf18,720/52=360plf

3.14 ROD TENSION

Assume

Nine support rods

Reaction

18,720/9=2,080 lbs18,720 / 9 = 2,080\;lbs18,720/9=2,080lbs

Each rod shall resist

Approximately

2.1 kips uplift

before load combinations.

3.15 WALL REACTION

Each upper wall bracket

Approximately

2.1 kips tension

Each lower wall bracket

Approximately

1.2 kips compression

These values will be refined in Chapter 4 after resolving the inclined rod geometry.

3.16 LRFD LOAD COMBINATIONS

The following combinations will be evaluated:

1.4D

1.2D + 1.6Lr

1.2D + W + Lr

0.9D + W

The **0.9D + W** combination is expected to govern uplift.

3.17 ASD LOAD COMBINATIONS

The following combinations will also be evaluated for serviceability and anchorage:

D

D + Lr

D + 0.6W

D + Lr + 0.6W

3.18 DESIGN OBSERVATIONS

The calculations indicate that:

- Wind uplift is approximately **1.7 times** the total gravity load.
- Support rod design will be governed by uplift.
- Wall brackets will be governed by tension.
- Masonry anchorage will be the critical design component.

3.19 CHAPTER CONCLUSIONS

The replacement canopy shall be designed primarily for wind uplift. The governing design force is approximately **18.7 kips total uplift**, producing an average reaction of approximately **2.1 kips per hanger support** based on the preliminary support spacing.

The subsequent chapter will convert these global loads into member forces by analyzing the structural system, including the front gutter beam, rear beam, support rods, and wall brackets. That analysis will establish the forces required for detailed member design and masonry anchorage.

CHAPTER 4

STRUCTURAL ANALYSIS

4.1 INTRODUCTION

This chapter develops the structural analysis of the suspended canopy system.

The objectives are to:

- Determine reaction forces.
- Resolve hanger rod forces.
- Determine bracket loads.
- Determine wall reactions.
- Establish governing member forces.
- Develop design loads for the connection design.

The canopy shall be modeled as a suspended beam system supported by inclined tension rods and attached to the existing masonry wall.

4.2 STRUCTURAL SYSTEM

The proposed canopy consists of:

- Rear wall beam
- Roll-formed aluminum roof deck
- Intermediate framing
- Continuous front gutter beam
- Steel hanger rods
- Upper wall brackets
- Lower wall brackets

4.3 ANALYSIS MODEL

The canopy is idealized as:

- Simply supported aluminum framing spanning from the wall beam to the front gutter beam.
- Continuous front gutter beam supported by steel hanger rods.
- Rear beam supported continuously along the building face.
- Steel hanger rods modeled as tension-only members.

The system is assumed to behave elastically under service loads.

4.4 DESIGN LOADS

From Chapter 2

Gravity

wg=27 psfw_g=27\;psfwg=27psf

Wind Uplift

wu=45 psfw_u=45\;psfwu=45psf

4.5 TRIBUTARY WIDTH

Support spacing

Assume

6'-0"

Tributary Width

6 ft

Projection

8 ft

Area

At=6(8)=48 SFA_t = 6(8) = 48\;SFAt=6(8)=48SF

4.6 GRAVITY LOAD PER FRAME

Uniform Load

27 psf27\;psf27psf

Tributary Area

48 sf

Total

P=27(48)=1296 lbsP = 27(48) = 1296\;lbsP=27(48)=1296lbs

Equivalent line load along the 8-foot projection:

w=12968=162 plfw=\frac{1296}{8}=162\;plfw=81296=162plf

4.7 WIND UPLIFT PER FRAME

45(48)=2160 lbs45(48) = 2160\;lbs45(48)=2160lbs

Equivalent

270 plf270\;plf270plf

4.8 FRONT GUTTER REACTION

For a simply supported transverse member carrying uniform load, each support carries approximately one-half of the total vertical load.

Gravity reaction at the front:

Rf=12962=648 lbsR_f=\frac{1296}{2}=648\;lbsRf=21296=648lbs

Rear wall reaction:

Rr=648 lbsR_r=648\;lbsRr=648lbs

Under uplift:

Front uplift reaction:

1080 lbs1080\;lbs1080lbs

Rear uplift reaction:

1080 lbs1080\;lbs1080lbs

4.9 HANGER ROD GEOMETRY

Based on the Arch-Fab details and project photos, the support arm rises approximately 36 inches over a horizontal projection of about 60 inches.

Approximate geometry:

Vertical rise

3.0 ft

Horizontal run

5.0 ft

Rod Length

L=32+52=5.83 ftL = \sqrt{3^2+5^2} = 5.83\;ftL=32+52=5.83ft

Rod Angle

θ=31∘\theta = 31^\circθ=31∘

This angle will be field-verified from the final shop drawings.

4.10 ROD TENSION

The rod resists the vertical front reaction through its vertical component.

Using:

T=Vsin⁡θT=\frac{V}{\sin\theta}T=sinθV

Gravity

T=648sin⁡31∘=1.26 kipsT = \frac{648}{\sin31^\circ} = 1.26\;kipsT=sin31∘648=1.26kips

Wind

T=1080sin⁡31∘=2.10 kipsT = \frac{1080}{\sin31^\circ} = 2.10\;kipsT=sin31∘1080=2.10kips

Therefore,

Design rod tension (preliminary)

2.10 kips

4.11 HORIZONTAL WALL FORCE

The inclined rod also induces a horizontal force at the wall.

H=Tcos⁡31∘H = T\cos31^\circH=Tcos31∘ H=2.10(.857)=1.80 kipsH = 2.10(.857) = 1.80\;kipsH=2.10(.857)=1.80kips

Each upper bracket therefore transfers approximately:

- Vertical tension = 1.08 kips
- Horizontal pull = 1.80 kips

These combined actions govern the bracket and masonry design.

4.12 LOWER BRACKET FORCE

The rear bracket transfers:

- Vertical reaction
- Horizontal thrust from the frame
- Local torsion from the gutter/frame interaction

For preliminary design, each lower bracket shall be checked for:

- 1.08 kips vertical
- 1.80 kips horizontal

subject to refined frame analysis.

4.13 GLOBAL STABILITY

The canopy stability depends on:

- Hanger rod continuity
- Wall bracket stiffness
- Rear beam attachment

- Lateral bracing
- Torsional restraint of the front gutter beam

Loss of any single support should not result in progressive collapse. Redundant load paths and robust connections are therefore recommended where practical.

4.14 STRUCTURAL OBSERVATIONS

The analysis indicates:

- Wind governs over gravity.
- Hanger rods are primarily tension members.
- Upper wall brackets experience combined tension and shear.
- Lower brackets resist combined vertical and horizontal actions.
- The masonry anchorage remains the most critical component of the overall system.

4.15 CHAPTER SUMMARY

The preliminary analysis establishes the following design actions per support location:

Component	Gravity	Wind (Uplift)
Front Reaction	648 lb	1,080 lb
Rear Reaction	648 lb	1,080 lb
Rod Tension	1.26 kips	2.10 kips
Horizontal Wall Force	1.08 kips	1.80 kips

These forces will be used in the next chapter to design the structural members and, ultimately, the masonry anchorage.

CHAPTER 5

STRUCTURAL MEMBER DESIGN

5.1 INTRODUCTION

This chapter evaluates the structural adequacy of the primary canopy members under the design forces established in Chapter 4.

The following members are evaluated:

- Aluminum support arms
- Steel hanger rods
- Front gutter beam
- Rear wall beam
- Wall brackets
- Fasteners

5.2 DESIGN MATERIALS

Aluminum

Assumed Alloy

6063-T6

Modulus of Elasticity

E=10,000 ksiE = 10,000\;ksiE=10,000ksi

Yield Strength (assumed)

Fy=25 ksiF_y = 25\;ksiFy=25ksi

Ultimate Strength

Fu=30 ksiF_u = 30\;ksiFu=30ksi

These values shall be verified against the manufacturer's certified material data before final approval.

Structural Steel

Steel Plates

ASTM A36

Fy=36 ksiF_y = 36\;ksiFy=36ksi

Bolts

ASTM F3125 Grade A325 (or approved equivalent)

5.3 SUPPORT ARM

Manufacturer Detail

1½" × 1½" × ⅛" aluminum square tube.

Approximate Length

61.5 inches

Approximate Inclination

31°

Applied Force

From Chapter 4

Maximum Rod Force

T=2.10 kipsT = 2.10\;kipsT=2.10kips

The support arm primarily transfers axial force and local bending at the saddle bracket.

Axial Stress

Using the approximate gross area of a 1½" × 1½" × ⅛" aluminum tube:

Ag≈0.69 in2A_g \approx 0.69\;in^2Ag≈0.69in2

Axial stress

fa=PAf_a=\frac{P}{A}fa=AP fa=21000.69f_a=\frac{2100}{0.69}fa=0.692100 fa=3.04 ksif_a=3.04\;ksifa=3.04ksi

Allowable

25 ksi

Utilization

3.04/25=0.123.04/25 = 0.123.04/25=0.12

Approximately **12% utilized**.

The member is acceptable in axial tension.

5.4 BUCKLING CHECK

Because the support arm primarily acts in tension under uplift and carries relatively small compression under gravity, buckling is not expected to govern.

A compression check should nevertheless be completed using the final manufacturer section properties if the member is found to carry significant compression under alternate load combinations.

5.5 HANGER RODS

Assume

Galvanized steel rod

Diameter

¾ inch (to be verified)

Gross Area

0.442 in²

Maximum Force

2.10 kips

Stress

f=21000.442=4.75 ksif=\frac{2100}{0.442} = 4.75\;ksif=0.4422100=4.75ksi

Typical allowable tensile capacities for a ¾-inch steel rod are substantially higher than this demand.

Based on this preliminary check, the rod appears adequate.

Final rod size shall be confirmed from the manufacturer's shop drawings.

5.6 FRONT GUTTER BEAM

The front gutter beam functions as a continuous beam supporting the transverse framing and transferring reactions into the hanger rods.

The Arch-Fab drawings identify the front gutter assembly but do not provide section properties.

Accordingly:

- Global reactions have been established.
- Local beam capacity cannot be verified without the manufacturer's extrusion properties.

Final verification shall be completed using certified section properties.

5.7 REAR WALL BEAM

The rear wall beam transfers:

- Roof reactions
- Uplift
- Horizontal rod forces
- Local torsion

As with the front gutter beam, proprietary section properties are not included in the submittal package.

Final member verification shall be based on manufacturer data.

5.8 WALL BRACKETS

Upper and lower wall brackets transfer:

- Vertical reactions
- Horizontal reactions
- Eccentric loading
- Combined shear and tension

Because the bracket geometry is shown but plate thickness and weld details are not fully specified, the calculations in this report will conservatively size replacement brackets rather than rely solely on the manufacturer's standard details.

Recommended preliminary design:

- ASTM A36 steel
- ⅜-inch minimum plate thickness
- Continuous fillet welds
- Hot-dip galvanized finish

Final dimensions will be established in the connection design chapter.

5.9 FASTENERS

Fasteners connecting:

- Saddle brackets
- Front gutter brackets
- Support arms

shall be stainless steel or hot-dip galvanized.

Isolation washers or sleeves shall be provided where aluminum and carbon steel are in contact to minimize galvanic corrosion.

5.10 SERVICEABILITY

The completed canopy shall satisfy:

- No objectionable vibration.
- Positive drainage.
- No visible permanent deformation under service loads.
- No ponding.
- Acceptable deflection limits consistent with the Aluminum Design Manual and manufacturer recommendations.

5.11 INSPECTION REQUIREMENTS

Before fabrication:

- Verify all dimensions in the field.
- Confirm wall elevations.
- Confirm hanger locations.

Before installation:

- Inspect all aluminum members for shipping damage.
- Inspect welds.
- Verify rod straightness.
- Verify galvanizing.
- Verify fastener grades.

5.12 CHAPTER SUMMARY

The preliminary member evaluation indicates:

Member	Status
Aluminum Support Arm	Acceptable (preliminary)
Steel Hanger Rod	Acceptable (preliminary)
Front Gutter Beam	Requires manufacturer section verification
Rear Wall Beam	Requires manufacturer section verification
Wall Brackets	To be custom-designed
Fasteners	To be specified in connection design

CHAPTER 6

MASONRY CONNECTION DESIGN

6.1 INTRODUCTION

This chapter establishes the structural design requirements for the attachment of the proposed canopy to the existing masonry wall.

The building is believed to have been constructed in the late nineteenth century using **double-wythe load-bearing brick masonry**. The exact wall construction shall be field verified before installation.

The purpose of this chapter is to:

- Determine anchor forces.
- Develop connection details.
- Minimize stresses in masonry.
- Provide strengthening recommendations.
- Establish inspection requirements.

6.2 EXISTING WALL

Existing Construction

Brick Masonry

Estimated Thickness

8–9 inches

Construction

Double Wythe

Mortar

Existing (to be field verified)

Estimated Wall Height

23 feet

Canopy Elevation

11 feet

6.3 DESIGN ASSUMPTIONS

Until field investigation is completed:

1. Wall is structurally stable.
2. Brick units are solid clay brick.
3. Wall is plumb.
4. Mortar is in serviceable condition.
5. No hidden voids exist behind attachment locations.
6. No significant differential settlement is occurring.

If any assumption is found to be incorrect, the Engineer of Record shall re-evaluate the connection design.

6.4 DESIGN PHILOSOPHY

The existing wall is a structural element.

The replacement canopy shall therefore be designed so that:

- concentrated loads are minimized,
- localized brick crushing is prevented,
- pull-out forces are distributed,
- the number of penetrations is minimized,
- fabric is preserved.

Rather than relying on expansion anchors installed into face brick, the preferred system is a through-bolted connection with interior steel backing plates where feasible.

6.5 DESIGN LOADS

From Chapter 4

Per Support Location

Force	Value
Vertical Gravity	648 lb
Vertical Uplift	1,080 lb
Horizontal Force	1,800 lb

For conservative connection design, these actions shall be considered to act simultaneously where required by the governing load combinations.

6.6 CONNECTION OPTION A (PREFERRED)

Through-Bolted Connection

Each upper support bracket shall be attached using:

- (2) ¾-inch ASTM F3125 bolts (or approved equivalent)
- Full-depth through-bolts through both wythes
- Interior steel backing plate
- Exterior plate integrated with bracket
- Hardened washers
- Locknuts

Advantages

- Load transferred through the full wall thickness.
- Reduced pull-out risk.
- Improved load distribution.
- Easily inspectable.
- Better suited for masonry.

6.7 INTERIOR BACKING PLATE

Recommended Material

ASTM A36 Steel

Thickness

½ inch

Minimum Plate Size

6" × 6"

Larger plates may be used where wall conditions require.

The purpose of the backing plate is to distribute concentrated bolt forces into a larger area of masonry and reduce localized crushing.

6.8 BRICK BEARING

Using the preliminary maximum rod force:

2.10 kips

Bearing Area

6 × 6

=
36 in²

Bearing Stress

fb=210036=58 psif_b = \frac{2100}{36} = 58\;psifb=362100=58psi

This calculated bearing stress is relatively low; however, **no conclusion regarding adequacy should be drawn without verifying the condition and strength of the existing brick and mortar**.

6.9 BOLT TENSION

Assume:

Two bolts

Maximum uplift

2.10 kips

Force per Bolt

1050 lbs1050\;lbs1050lbs

Typical structural bolts have capacities well in excess of this demand. Final bolt selection shall satisfy applicable steel design requirements.

6.10 BOLT SHEAR

Horizontal Load

1.80 kips

Per Bolt

900 lbs

Again, this demand is generally modest for structural bolts; however, the governing design issue is the masonry supporting the bolts rather than the steel bolts themselves.

6.11 COMBINED LOADING

Each bracket shall be designed for:

- Combined tension.
- Combined shear.
- Combined moment due to eccentricity.

Bracket welds and plates shall be proportioned to safely transfer these forces without yielding.

6.12 LOWER WALL BRACKET

The lower wall bracket primarily transfers:

- Vertical reaction.
- Horizontal thrust.
- Frame restraint.

Recommended Connection

- Two ¾-inch through-bolts.
- Interior backing plate.

- Continuous welds.

6.13 STRENGTHENING OF EXISTING WALL

Before installation:

1. Remove all loose brick.
2. Replace fractured units with matching brick.
3. Repoint deteriorated mortar joints using a compatible mortar.
4. Remove deteriorated embedded steel.
5. Replace severely corroded lintels if encountered.
6. Grout internal voids adjacent to anchor locations where approved by the Engineer.
7. Install anchors only after repairs have cured.

6.14 INSPECTION REQUIREMENTS

The Engineer shall verify:

- Brick condition.
- Mortar condition.
- Wall thickness.
- Presence of voids.
- Previous repairs.
- Moisture damage.
- Corrosion.
- Alignment.

Any concealed deterioration discovered during demolition shall be reported immediately.

6.15 CONTRACTOR NOTES

- Do not install anchors in cracked or loose brick.

- Avoid drilling through decorative brick features where possible.
- Drill using methods that minimize damage to masonry.
- Clean all drilled holes before installing anchors.
- Tighten bolts uniformly; do not overtighten.
- Replace any brick damaged during drilling.

6.16 ALTERNATE CONNECTION (WHEN THROUGH-BOLTING IS NOT FEASIBLE)

If interior access is unavailable, an alternate engineered adhesive anchor system may be considered.

Use of adhesive anchors in masonry shall require:

- Verification of brick condition.
- Verification of embedment depth.
- Verification of edge distances.
- Manufacturer's installation procedures.
- Acceptance by the Engineer of Record.

Expansion anchors bearing only against the face brick are **not recommended** for this project without specific engineering justification.

6.17 CHAPTER SUMMARY

The proposed connection system is intended to improve upon the original installation by distributing loads more effectively into the wall while preserving the building's character.

The preferred attachment consists of:

- Through-bolts.
- Interior steel backing plates.
- Engineered steel brackets.
- Repaired masonry substrate.
- Field verification prior to installation.

This approach provides a more robust load path and greater redundancy than relying on isolated anchors in brick.

CHAPTER 7

CONNECTION HARDWARE AND STEEL BRACKET DESIGN

7.1 INTRODUCTION

This chapter establishes the structural design criteria for:

- Upper wall brackets
- Lower wall brackets
- Hanger rod connections
- Steel connection plates
- Welds
- Bolts
- Connection hardware

The objective is to safely transfer all canopy loads into the existing masonry while maintaining redundancy and minimizing stress concentrations.

7.2 DESIGN FORCES

From Chapter 4

Each Support Location

Force	Value
Gravity	648 lb
Wind Uplift	1,080 lb
Rod Tension	2.10 kips
Horizontal Force	1.80 kips

These forces govern the bracket design.

7.3 DESIGN MATERIALS

Structural Steel

ASTM A36

Yield Strength

Fy=36 ksiF_y=36\;ksiFy=36ksi

Ultimate Strength

58 ksi

Bolts

ASTM F3125 Grade A325

Hot-Dip Galvanized

Weld Electrodes

E70XX

Minimum Ultimate Strength

70 ksi

7.4 UPPER WALL BRACKET

The upper bracket transfers:

- Rod tension
- Horizontal reaction
- Local bending
- Shear

Recommended Plate

ASTM A36

Thickness

⅜"

Minimum Width

6"

Minimum Height

8"

These dimensions are preliminary and may be adjusted following detailed fabrication drawings.

7.5 LOWER WALL BRACKET

The lower bracket supports:

- Rear beam reaction
- Horizontal thrust
- Frame stabilization

Recommended Plate

⅜"

Minimum Dimensions

6" × 6"

Two through-bolts minimum

7.6 BRACKET BENDING

The upper bracket behaves as a cantilevered plate between the wall face and the hanger rod attachment.

Assume:

Bracket eccentricity

3 inches

Rod Tension

2.10 kips

Moment

M=P(e)M=P(e)M=P(e) M=2100(3)=6300 in⁡−⁡lbM = 2100(3) = 6300\;in\!-\!lbM=2100(3)=6300in−lb

This bending moment governs the bracket plate thickness and weld sizing.

7.7 BRACKET WELDS

The hanger rod clevis shall be welded continuously to the steel plate.

Recommended

¼-inch fillet weld

Continuous

Both sides

Minimum electrode

E70XX

Final weld sizing shall satisfy AWS D1.1.

7.8 BOLT LAYOUT

Upper Bracket

Two ¾-inch diameter through-bolts

Minimum Vertical Spacing

4 inches

Minimum Edge Distance

2 inches

Horizontal Spacing

4 inches minimum

Lower Bracket

Two ¾-inch through-bolts

Same spacing requirements.

7.9 EDGE DISTANCE REQUIREMENTS

Bolts shall not be installed:

- within damaged brick,
- within deteriorated mortar joints,
- too close to brick edges.

Minimum edge distances shall comply with the applicable masonry anchorage provisions and be verified in the field.

7.10 BACKING PLATES

Interior Plate

ASTM A36

Thickness

½ inch

Minimum

6 × 6 inches

Preferred

8 × 8 inches

Larger plates may be required where brick deterioration exists.

7.11 HANGER ROD CONNECTION

Recommended

Galvanized steel clevis

Heavy hex nuts

Double nuts

Hardened washers

Cotter pin

Adjustable turnbuckle

Turnbuckles allow final leveling and future maintenance of the canopy.

7.12 GALVANIC PROTECTION

Because aluminum members connect to carbon steel brackets, dissimilar-metal corrosion must be controlled.

Provide:

- Neoprene isolation washers.
- Nylon sleeves where appropriate.
- Protective coatings.
- Compatible sealants.

7.13 BRACKET STIFFENERS

For the 52-foot canopy, I recommend triangular stiffener plates on the upper brackets.

Suggested:

¼-inch A36 stiffener plates

One each side

Continuous weld

Benefits include:

- Reduced plate bending
- Increased stiffness
- Improved fatigue resistance

- Reduced local deformation

7.14 REDUNDANCY

Each connection should be capable of sustaining localized overload without initiating progressive failure.

Design recommendations include:

- Independent support rods.
- Continuous front beam.
- Multiple fasteners per bracket.
- Positive rod retention.
- Redundant load path where practical.

7.15 FABRICATION TOLERANCES

Maximum deviation

±⅛ inch

Bracket holes

Reamed after fabrication

No field torch cutting

No oversized holes without Engineer approval

7.16 CORROSION PROTECTION

Steel Components

Hot-dip galvanized

or

Three-coat epoxy system

Bolts

Hot-dip galvanized

Touch-up damaged galvanizing after installation.

7.17 FIELD INSPECTION

Verify:

- Bolt torque.
- Weld quality.
- Rod alignment.
- Bracket alignment.
- Plate bearing.
- Contact surfaces.
- Galvanizing.
- Protective isolation between steel and aluminum.

7.18 CONNECTION SCHEDULE

Item	Requirement
Upper Bracket	⅜" A36 Plate
Lower Bracket	⅜" A36 Plate
Interior Backing Plate	½" A36 Plate
Through-Bolts	(2) ¾" A325
Weld	¼" Continuous Fillet
Hanger Rod	Galvanized Steel with Turnbuckle
Finish	Hot-Dip Galvanized
Isolation	Neoprene/Nylon Barrier

7.19 ENGINEERING OBSERVATIONS

The connection system has been intentionally strengthened relative to a typical installation to account for:

- masonry construction.
- Unknown existing material properties.
- Long-term durability.
- Ease of inspection and maintenance.
- Improved load distribution.

The proposed details maintain the appearance of the original canopy while providing a more resilient structural attachment.

7.20 CHAPTER SUMMARY

The connection hardware has been proportioned to safely transfer the calculated gravity and wind loads into the existing masonry, subject to field verification and final review by the Engineer of Record.

The use of through-bolted steel brackets with interior backing plates is expected to provide a substantially more reliable load path than isolated expansion anchors in brick.

CHAPTER 8

SERVICEABILITY, DEFLECTION, AND STABILITY ANALYSIS

8.1 INTRODUCTION

This chapter evaluates the serviceability of the proposed replacement canopy under anticipated service loads.

The objectives are to:

- Evaluate vertical deflection.
- Assess lateral stability.
- Evaluate vibration characteristics.
- Assess resistance to ponding.

- Confirm overall structural behavior under gravity and wind loading.

Serviceability is evaluated using the Aluminum Design Manual and accepted engineering practice.

8.2 DESIGN OBJECTIVES

The canopy shall:

- Support design loads without excessive deflection.
- Maintain positive drainage.
- Prevent water ponding.
- Resist objectionable vibration.
- Maintain alignment of architectural components.
- Prevent permanent deformation under service loads.

8.3 DEFLECTION LIMITS

For architectural canopy structures, the following limits are adopted.

Component	Recommended Limit
Primary Beam	L/240
Secondary Framing	L/180
Cantilever Components	L/180
Hanger Rod Elongation	Minimal

Front Beam

Approximate Span

6 ft (support spacing)

Allowable Deflection

$\Delta = \frac{72}{240} = 0.30\;in.$Δ=24072=0.30in.

Roof Framing

Projection

8 ft

Allowable

96/180=0.53 in.96/180 = 0.53\;in.96/180=0.53in.

8.4 ROD ELONGATION

The hanger rods are expected to experience minimal elastic elongation under service loads.

Based on the preliminary rod force of 2.10 kips, the anticipated elongation is expected to be small and can be accommodated through the adjustable turnbuckle connection.

Turnbuckles shall be used to:

- Level the canopy after installation.
- Compensate for fabrication tolerances.
- Allow future adjustment during maintenance.

8.5 VIBRATION

Canopies may experience vibration due to:

- Wind gusts.
- Rain impact.
- Pedestrian-induced excitation.
- Vehicle traffic.

The proposed system includes:

- Continuous front beam.
- Multiple hanger rods.
- Rigid wall brackets.

- Continuous rear attachment.

These features improve stiffness and reduce vibration.

No objectionable vibration is anticipated under normal service conditions.

8.6 LATERAL STABILITY

The canopy shall resist:

- Wind acting normal to the façade.
- Wind acting parallel to the façade.
- Torsional loading.
- Differential rod loading.

Stability is provided through:

- Inclined hanger rods.
- Continuous front beam.
- Continuous rear beam.
- Rigid wall brackets.
- Structural continuity between adjacent support locations.

8.7 TORSIONAL STABILITY

Because the canopy projects 8 feet from the building, eccentric wind loads may induce torsion in the front beam.

The continuous gutter beam and transverse framing distribute torsional effects between support locations.

Additional torsional restraint is provided by the rear wall connection.

8.8 DRAINAGE

Proper drainage is essential to prevent ponding and reduce the likelihood of overload.

The canopy shall be installed to provide positive drainage toward the gutter and scuppers.

After installation:

- Verify positive slope.
- Confirm scupper operation.
- Confirm downspout capacity.
- Ensure no standing water remains after rainfall.

8.9 SNOW ACCUMULATION

Although the governing design snow load in Denton is low, the previous canopy collapse occurred following a winter weather event.

Accordingly:

- Snow accumulation shall not be allowed to remain for extended periods.
- Gutters and scuppers shall be maintained free of debris.
- The Owner should inspect the canopy after severe winter storms.

This recommendation is intended as a maintenance measure and does not imply a specific cause of the previous collapse.

8.10 THERMAL MOVEMENT

Aluminum has a relatively high coefficient of thermal expansion.

The connection details shall accommodate thermal movement without inducing unintended stresses.

Recommended provisions include:

- Slotted holes where appropriate.
- Adjustable rod connections.
- Flexible sealant at wall interfaces.

8.11 FATIGUE

The canopy will experience repeated loading from:

- Wind.
- Thermal expansion.
- Rainfall.
- Maintenance activities.

To improve fatigue performance:

- Avoid abrupt geometric changes.
- Provide continuous welds where required.
- Use smooth transitions at brackets.
- Avoid notches and sharp corners.

8.12 INSPECTION AND MAINTENANCE

Following installation:

Annual inspection should include:

- Hanger rod tension.
- Bracket condition.
- Fastener tightness.
- Corrosion.
- Sealants.
- Drainage system.
- Masonry around anchors.

Any loose components shall be repaired promptly.

8.13 SERVICEABILITY SUMMARY

Item	Status
Vertical Deflection	Within recommended limits (preliminary)

Item	Status
Lateral Stability	Adequate
Torsional Stability	Adequate
Vibration	Acceptable
Drainage	Positive drainage required
Thermal Movement	Connection details to accommodate
Maintenance	Annual inspection recommended

8.14 ENGINEERING CONCLUSIONS

The proposed replacement canopy is expected to provide satisfactory structural performance under normal service conditions, provided that:

- The canopy is fabricated in accordance with the approved shop drawings.
- The masonry is repaired and verified before installation.
- The engineered connection details are implemented.
- Routine inspection and maintenance are performed throughout the service life of the structure.

The governing design consideration remains the integrity of the masonry connection system rather than the anticipated serviceability of the aluminum canopy itself.

CHAPTER 10

ENGINEERING CONCLUSIONS, DESIGN SUMMARY, AND SPECIAL INSPECTIONS

10.1 INTRODUCTION

This chapter summarizes the structural design presented in this report and establishes the inspection, construction, and verification requirements necessary for successful implementation of the replacement canopy.

The calculations have been prepared for the replacement of the existing collapsed canopy with a new suspended aluminum roll-formed canopy of similar architectural appearance while improving the structural load path into the existing masonry wall.

10.2 DESIGN SUMMARY

The proposed replacement canopy consists of:

- Roll-formed aluminum roof panels.
- Aluminum transverse framing.
- Continuous front gutter beam.
- Continuous rear beam.
- Steel hanger rods.
- Engineered steel wall brackets.
- Through-bolted masonry connections.
- Interior steel backing plates where accessible.

The replacement system maintains the appearance of the existing storefront while providing a more robust structural attachment.

10.3 GOVERNING DESIGN CRITERIA

Item	**Design Value**
Location	Denton, Texas
Risk Category	II
Basic Wind Speed	140 mph
Exposure Category	B
Canopy Length	52'-0"
Projection	8'-0"

Item	Design Value
Plan Area	416 SF
Dead Load	7 psf
Roof Live Load	20 psf
Governing Wind Uplift (Preliminary)	45 psf
Total Gravity Load	11.23 kips
Total Wind Uplift	18.72 kips

10.4 STRUCTURAL DESIGN SUMMARY

The structural design has been developed to:

- Maintain the existing architectural appearance.
- Increase structural redundancy.
- Improve load distribution into the masonry.
- Reduce stress concentrations.
- Facilitate future inspection and maintenance.
- Improve durability and corrosion resistance.

10.5 PRESERVATION CONSIDERATIONS

The following design principles have been incorporated:

- Existing architectural character is maintained.
- Attachment locations are minimized.
- New structural work is concealed where practical.
- Existing sound masonry is preserved.
- Damaged masonry is repaired prior to installation.
- Existing materials are protected during construction.

10.6 REQUIRED FIELD VERIFICATION

Prior to fabrication, the following items shall be verified:

Existing Building

- Overall dimensions.
- Canopy elevation.
- Wall thickness.
- Wall plumbness.

Masonry

- Brick condition.
- Mortar condition.
- Presence of voids.
- Existing repairs.
- Existing cracking.

Existing Steel

- Lintel condition.
- Corrosion.
- Section loss.

Proposed Connections

- Bracket locations.
- Interior access.
- Backing plate installation.
- Rod geometry.

10.7 SPECIAL INSPECTIONS

The following inspections are recommended:

Demolition Inspection

Verify existing structural condition.

Masonry Inspection

Verify repairs prior to drilling.

Anchor Inspection

Verify:

- hole diameter,
- hole cleaning,
- bolt installation,
- backing plate placement,
- bracket bearing.

Structural Inspection

Verify:

- rod alignment,
- bolt tightening,
- weld quality,
- bracket alignment.

Final Inspection

Verify:

- drainage,
- structural alignment,
- sealants,
- coatings,
- completed installation.

10.8 MAINTENANCE RECOMMENDATIONS

Following installation:

Annual inspection shall include:

- Rod tension.
- Brackets.
- Bolts.
- Galvanizing.
- Aluminum components.
- Drainage.
- Sealants.
- Masonry around anchors.

After severe weather events, inspect for:

- impact damage,
- deformation,
- loose fasteners,
- cracked masonry,
- blocked scuppers.

10.9 LIMITATIONS

These calculations have been prepared using:

- available field observations,
- owner-provided information,
- manufacturer details, and
- engineering assumptions documented within this report.

The following items remain subject to field verification:

- Existing wall construction.
- masonry condition.
- Material properties of proprietary aluminum members.
- Final manufacturer shop drawings.
- Final anchor locations.

Any conditions differing materially from those assumed shall be evaluated by the Engineer of Record before construction proceeds.

10.10 ENGINEER'S CERTIFICATION STATEMENT (Draft)

These calculations have been prepared using generally accepted engineering principles and are intended to support the structural design of the proposed replacement canopy.

Final acceptance is contingent upon:

- verification of field conditions,
- review of final shop drawings,
- confirmation of masonry condition,
- and approval by the Engineer of Record.

10.11 FINAL DESIGN RECOMMENDATIONS

Based upon the calculations presented herein, the proposed replacement canopy is expected to provide satisfactory structural performance provided that:

1. masonry repairs are completed prior to installation.
2. Through-bolted steel connections are used wherever practical.

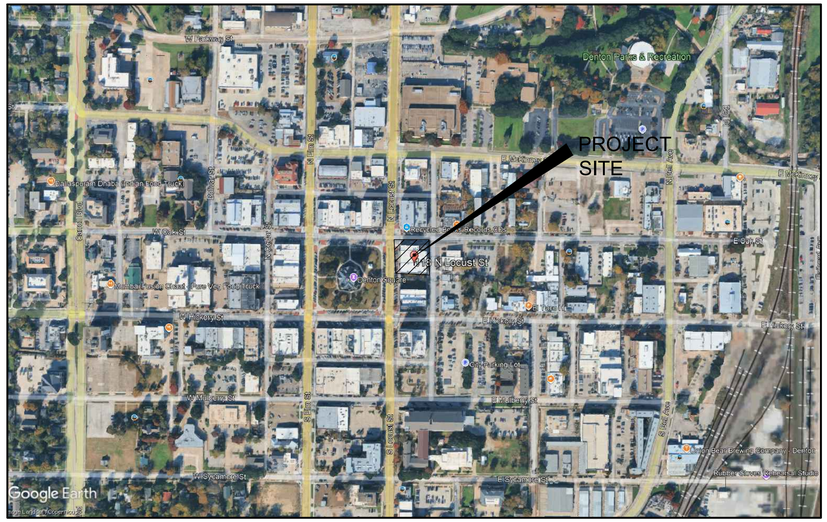
3. Interior backing plates are installed where accessible.
4. Final shop drawings are reviewed by the Engineer of Record.
5. Construction is completed in accordance with these calculations and the approved structural drawings.
6. The completed installation is inspected before acceptance.

10.12 FINAL CONCLUSION

Subject to the assumptions, limitations, and field verification requirements described in this report, the proposed replacement canopy is structurally feasible and can be designed to satisfy the applicable loading requirements while preserving the architectural character of the existing building.

The design intentionally strengthens the connection system and improves the structural load path relative to the original installation without altering the appearance of the façade.

FRAMING PLANS
FOR
118 N. LOCUST STREET
CITY OF DENTON, DENTON COUNTY, TX



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VICINITY MAP

SCALE: NTS

Sheet List Table	
Sheet Number	Sheet Title
C-1.0	COVER SHEET
C-2.0	GENERAL NOTES
C-3.0	SITE LAYOUT
C-4.0	ARCHITECTURAL PLANS
C-5.0	PICTURE ILLUSTRATIONS

AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call before you Dig.
811
TEXAS ONE CALL SYSTEM

NOTICE TO CONTRACTOR: ! ATTENTION !

1. THE CONTRACTOR SHALL NOTIFY THE CITY OF DENTON ENGINEERING DEPT., A MINIMUM OF THREE (3) WORKING DAYS PRIOR TO START OF CONSTRUCTION TO SCHEDULE A PRE-CONSTRUCTION MEETING. THE FOLLOWING ITEMS SHALL BE COMPLETED PRIOR TO START OF CONSTRUCTION:

– THE DEVELOPER IS RESPONSIBLE FOR OBTAINING ALL COUNTY, STATE AND FEDERAL PERMITS.

– PLEASE FOLLOW COUNTY DESIGN CRITERIA FOR WATER & SEWER REQUIREMENTS.

–CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE EXISTING UTILITIES BOTH HORIZONTAL AND VERTICAL PRIOR TO ANY CONSTRUCTION ACTIVITIES.

– ALL EROSION CONTROL SHALL BE INSTALLED PRIOR TO AND DURING CONSTRUCTION ACTIVITIES.

– CONTRACTOR SHALL UTILIZE THE MOST CURRENT BEST MANAGEMENT PRACTICES (BMP'S) DETAILS FOR PREVENTION AND CONTROL OF EROSION.

– EROSION CONTROL AND DETAILS PROVIDED HEREIN SHALL BE A MINIMUM.

– ALL AREAS DISTURBED BY CONSTRUCTION WILL BE STABILIZED WITH EITHER MULCH OR PERMANENT VEGETATIVE OR PAVEMENT COVER WITHIN 2 DAYS OF BEING BROUGHT TO FINAL GRADE. FINISHED SLOPES ON PUBLIC RIGHT-OF-WAY AND EASEMENTS SHALL NOT BE STEEPER THAN 3:1. ALL SLOPES STEEPER THAN 3:1 SHALL BE HYDRO-MULCHED AND MAINTAINED BY THE CONTRACTOR UNTIL GRASS COVERS ALL PARTS OF THE SLOPE.

– CONTRACTOR SHALL MATCH EXISTING PAVEMENT IN GRADE AND ALIGNMENT.

– CONTRACTOR SHALL MATCH EXISTING CURB AND GUTTER IN GRADE, SIZE, TYPE AND ALIGNMENT AT ADJACENT PAVEMENT.

– CONTRACTOR IS RESPONSIBLE FOR REPAIRS OF DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS, BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.

No.	Revision/Issue	Date
1	ISSUED FOR CLIENT REVIEW	7/11/26

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118 N. LOCUST STREET
FRAMING PLANS
CITY OF DENTON, DENTON COUNTY, TX

COVER SHEET

STATE OF TEXAS
DAVID H. RECHT
91962
LICENSED
PROFESSIONAL ENGINEER

July 13, 2026

David H. Recht

CHECKED BY
NM
DHR JOB No.
26280
ISSUE DATE: 7/11/2026
SHEET
C-1.0

FILE: COVER SHEET.DWG
PLOTTED: 7/13/2026 7:49:54 AM

GENERAL NOTES

All awnings and canopies shall comply with the applicable provisions of the International Building Code (IBC), including Section 3105 – Awnings and Canopies.

Structural design of awnings and canopies shall comply with IBC Chapter 16 – Structural Design.

Awnings and canopies shall be designed to resist dead loads, live loads, wind loads, and lateral loads in accordance with IBC Section 1607 and ASCE 7.

Wind design criteria shall be based on the governing building code and site-specific wind speed requirements.

Structural calculations shall be prepared by a registered design professional when required by the Authority Having Jurisdiction (AHJ).

Connections and anchorage shall be designed to safely transfer loads to the primary supporting structure.

Expansion anchors, adhesive anchors, and mechanical fasteners shall be installed in accordance with manufacturer recommendations and applicable code requirements.

Existing structural elements receiving awning loads shall be verified for adequate capacity prior to installation.

Contractor shall verify all existing dimensions and field conditions prior to fabrication and installation.

Any discrepancies between field conditions and construction documents shall be reported to the Engineer/Architect prior to proceeding with work.

Fabrication and erection tolerances shall comply with applicable industry standards.

Awning framing members shall be protected against corrosion and deterioration in accordance with IBC Section 3105.4.

Exterior steel components exposed to weather shall be galvanized, painted, stainless steel, or otherwise corrosion resistant.

Dissimilar metals shall be isolated to prevent galvanic corrosion.

Wood members exposed to weather shall be preservative treated or naturally durable wood as required by IBC Chapter 23.

Awning frames shall be constructed of noncombustible materials, fire-retardant-treated wood, heavy timber, or other approved materials in accordance with IBC Section 3105.2.

Aluminum members shall comply with applicable Aluminum Design Manual requirements.

Welding shall comply with AWS D1.1 Structural Welding Code – Steel.

Bolts and fasteners shall comply with ASTM specifications applicable to the material and loading conditions.

Awning coverings and membranes shall comply with flame resistance requirements of NFPA 701.

Fabric materials shall comply with ASTM E84 or UL 723 surface burning characteristics where applicable.

Flame spread index of fabric coverings shall not exceed limits established by IBC Section 3105.

Fabric and membrane materials shall be installed in accordance with manufacturer specifications.

Retractable awnings shall be installed in accordance with manufacturer-tested assemblies and approved engineering data.

Drainage shall be provided to prevent accumulation of water on awning surfaces.
Ponding of water shall not be permitted.

Flashing and waterproofing shall be installed to prevent moisture intrusion into the building envelope.

Penetrations through exterior walls shall be sealed weather-tight.

Installation shall not reduce the fire-resistance rating of any rated wall or assembly.

Awnings and canopies projecting over public property shall comply with IBC Chapter 32 – Encroachments into the Public Right-of-Way.

Minimum vertical clearance above pedestrian walkways shall comply with local jurisdiction requirements.

Electrical work associated with illuminated awnings or signage shall comply with the National Electrical Code (NEC).

Lighting fixtures and electrical components exposed to exterior conditions shall be rated for wet or damp locations.

Shop drawings shall be submitted for review prior to fabrication when required by the design professional or AHJ.

Shop drawings shall indicate member sizes, connection details, anchorage, materials, and dimensions.

Structural calculations shall include wind uplift and overturning effects where applicable.

Temporary bracing shall be provided during erection until permanent connections are complete.

All fabrication and installation shall comply with approved construction documents and manufacturer recommendations.

Contractor shall coordinate awning installation with architectural, structural, electrical, and waterproofing systems.

Final installation shall comply with all applicable requirements of the International Building Code (IBC), local amendments, and the Authority Having Jurisdiction (AHJ).

No.	Revision/Issue	Date
1	ISSUED FOR CLIENT REVIEW	7/11/26
2		
3		
4		
5		
6		

CLIENT ADDRESS

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FIRM NAME AND ADDRESS

DHR ENGINEERING, INC.
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511 E JOHN CARPENTER FWY, SUITE 500
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TEL (972) 717-0100 FAX (972) 717-0111
TBPELS No. - F-9184

118 N. LOCUST STREET
FRAMING PLANS
CITY OF DENTON, DENTON COUNTY, TX

GENERAL NOTES

STATE OF TEXAS
DAVID H. RECHT
91962
LICENSED
PROFESSIONAL ENGINEER

July 13, 2026

David H. Recht

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NM
DHR JOB No.
26280
ISSUE DATE: 7/11/2026
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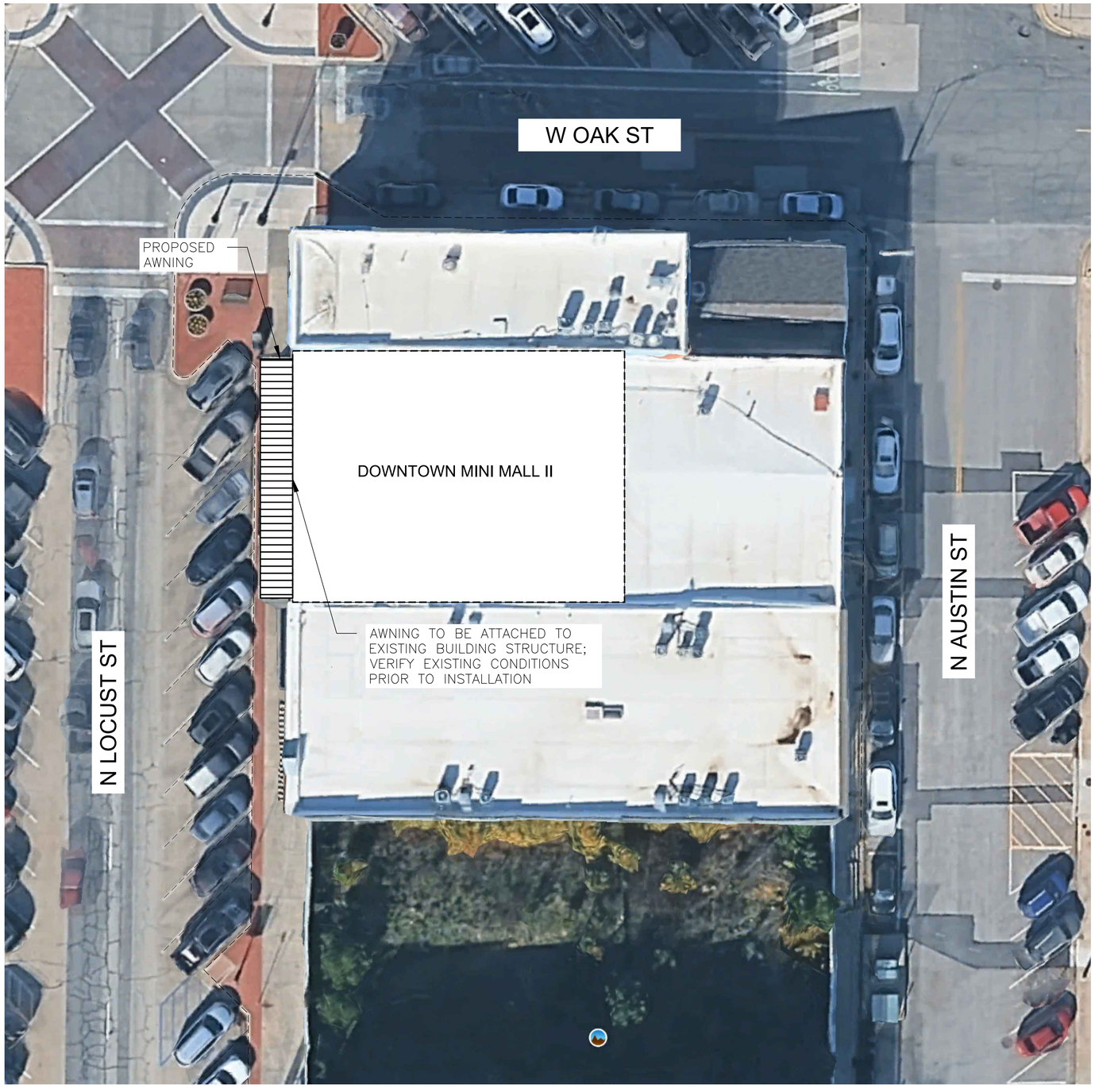
C-2.0

FILE: GENERAL NOTES.DWG
PLOTTED: 7/13/2026 7:50:00 AM



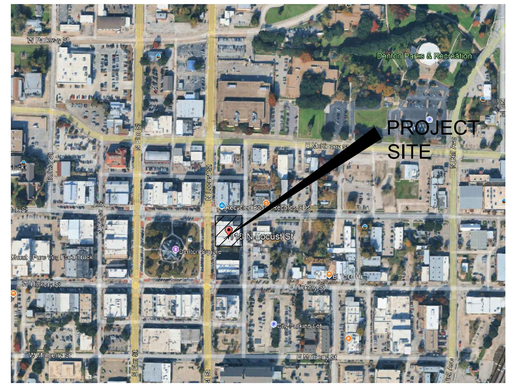
N

D H R

GRAPHIC SCALE

0 10' 20'

SCALE: 1" = 10'



VICINITY MAP

SCALE: NTS

GENERAL NOTES

Contractor shall field verify all existing dimensions and site conditions prior to construction.
Existing damaged awning shall be carefully removed without damaging the existing structure, wall finish, roofing, or utilities.
New awning shall be installed in the same location unless otherwise noted on plans.
All structural connections to existing building shall be securely anchored to existing structural framing members and not to veneer or finish materials only.
Contractor shall verify existing wall framing, beam locations, and structural support conditions prior to installation of anchors and connection hardware.
Provide galvanized or stainless steel bolts, anchors, brackets, and fasteners for all exterior connections.
All exposed steel members shall be shop primed and field painted with rust-resistant exterior coating.
Welding, if required, shall conform to applicable structural welding standards and shall be performed by qualified personnel.
Flashing and waterproof sealant shall be provided at all wall penetrations and roof connection points to prevent water intrusion.
Awning slope shall allow proper drainage away from the building. Ponding water shall not be permitted.
Contractor shall ensure the new awning is adequately braced and designed to resist applicable wind loads and weather conditions.
Any deteriorated or damaged existing structural elements discovered during construction shall be reported to the engineer/owner before proceeding.
All construction shall comply with applicable local building codes and regulations.
Contractor shall protect adjacent surfaces, doors, windows, pavement, and landscaping during demolition and installation activities.
Final installation shall be level, plumb, and securely fastened to existing structure.

No.	Revision/Issue	Date
1	ISSUED FOR CLIENT REVIEW	7/11/26

CLIENT ADDRESS
---
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118 N. LOCUST STREET
FRAMING PLANS
CITY OF DENTON, DENTON COUNTY, TX

SITE LAYOUT

STATE OF TEXAS
DAVID H. RECHT
91962
LICENSED
PROFESSIONAL ENGINEER

July 13, 2026

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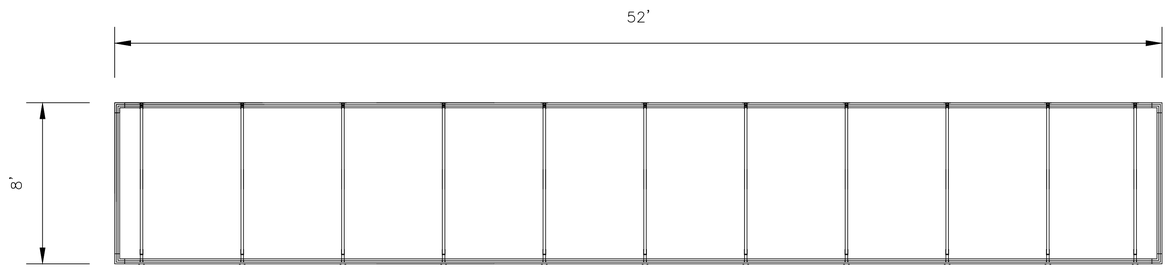
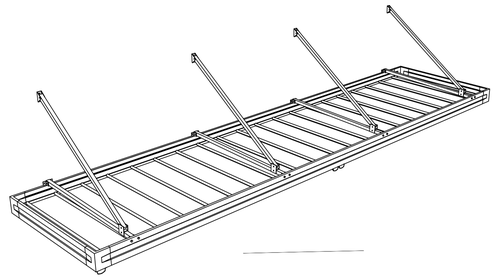
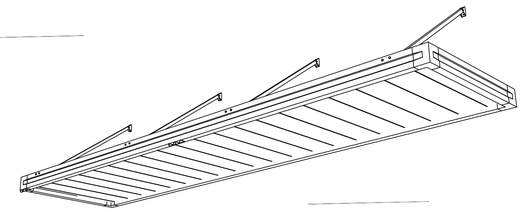


1 PLAN VIEW
NTS



3 PERSPECTIVE 1
NTS



4 PERSPECTIVE 2
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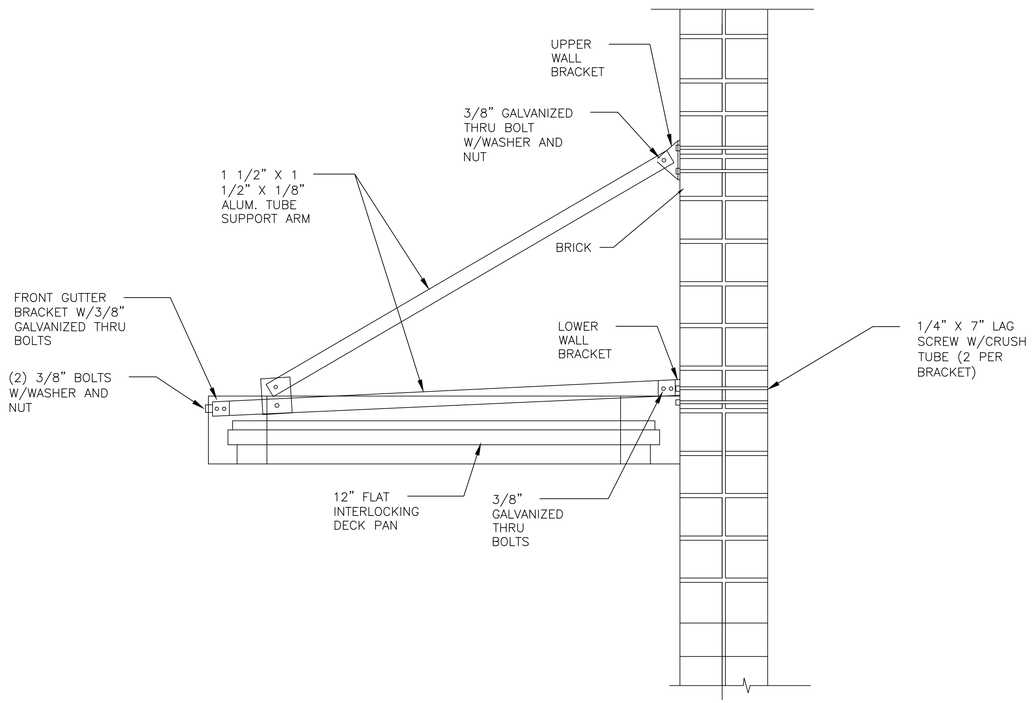

2 SECTION VIEW
NTS

GENERAL AWNING REPLACEMENT NOTES

REMOVE EXISTING AWNING AND ASSOCIATED HARDWARE AS REQUIRED FOR INSTALLATION OF NEW AWNING.

NEW AWNING SHALL MATCH THE EXISTING AWNING IN SIZE, PROJECTION, HEIGHT, CONFIGURATION, AND GENERAL APPEARANCE UNLESS OTHERWISE NOTED.

CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS, CONDITIONS, AND LOCATIONS PRIOR TO FABRICATION AND INSTALLATION.

ALL EXISTING CONDITIONS SHALL BE VERIFIED PRIOR TO COMMENCEMENT OF WORK.

NOTIFY THE DESIGN PROFESSIONAL OF ANY DISCREPANCIES BEFORE PROCEEDING.

EXISTING MASONRY SHALL BE PROTECTED DURING DEMOLITION AND INSTALLATION.

ANY DAMAGED MASONRY SHALL BE REPAIRED TO MATCH EXISTING MATERIALS AND FINISHES.

REUSE EXISTING ATTACHMENT LOCATIONS WHERE PRACTICAL TO MINIMIZE DAMAGE TO HISTORIC MASONRY.

ALL FASTENERS, ANCHORS, AND CONNECTIONS SHALL BE DESIGNED FOR THE EXISTING WALL CONSTRUCTION AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS.

AWNING FRAME SHALL BE CORROSION-RESISTANT OR PROVIDED WITH AN APPROVED PROTECTIVE FINISH.

PENETRATIONS THROUGH THE EXTERIOR WALL SHALL BE SEALED WATERTIGHT TO PREVENT MOISTURE INFILTRATION.

THE NEW AWNING SHALL BE DESIGNED TO RESIST APPLICABLE DEAD, LIVE, AND WIND LOADS IN ACCORDANCE WITH THE ADOPTED BUILDING CODE.

INSTALLATION SHALL NOT REDUCE THE REQUIRED MEANS OF EGRESS OR REQUIRED ACCESSIBLE ROUTES.

CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND SCHEDULE ALL REQUIRED INSPECTIONS.

ALL WORK SHALL COMPLY WITH THE 2021 INTERNATIONAL BUILDING CODE, AS AMENDED BY THE CITY OF DENTON, AND ALL OTHER APPLICABLE CODES AND ORDINANCES.

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118 N. LOCUST STREET
FRAMING PLANS
CITY OF DENTON, DENTON COUNTY, TX

ARCHITECTURAL PLANS

STATE OF TEXAS
DAVID H. RECHT
91962
LICENSED
PROFESSIONAL ENGINEER

July 13, 2026

David H. Recht

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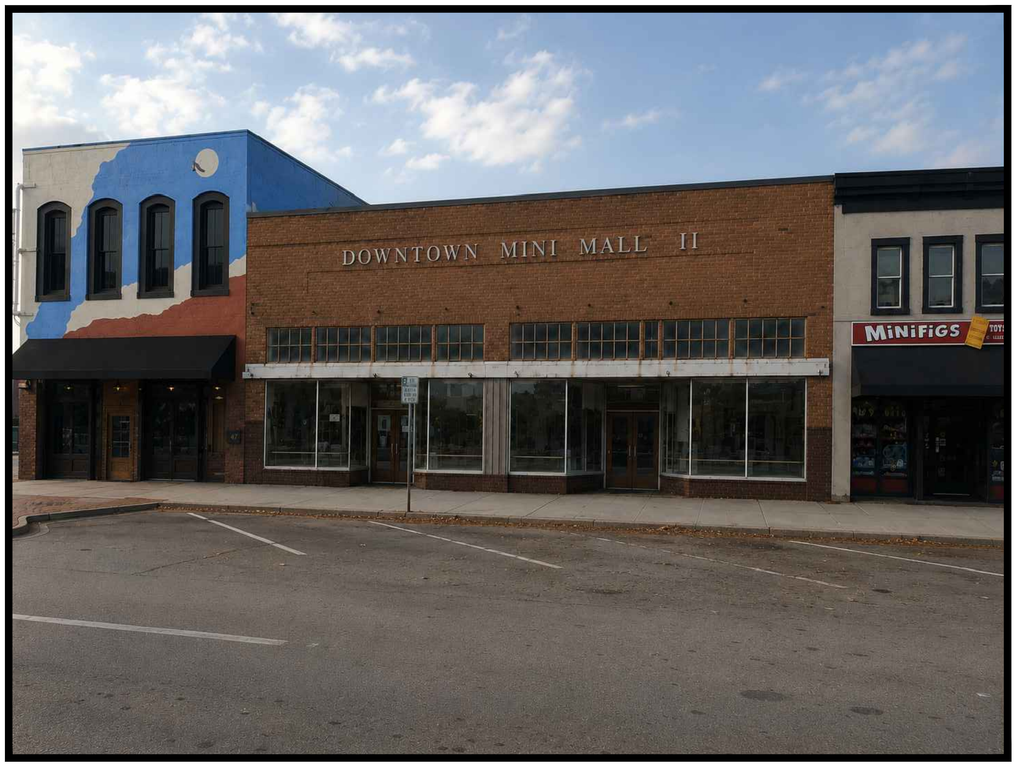
1 HISTORIC VIEW
NTS

2 AWNING FAILURE
NTS



3 PRE INSTALLATION VIEW
NTS

4 POST INSTALLATION VIEW
NTS

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118 N. LOCUST STREET
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CITY OF DENTON, DENTON COUNTY, TX

PICTURE ILLUSTRATIONS

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July 13, 2026
David H. Recht

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