LEGACY BUILDING SOLUTIONS

# CASE STUDY

## *Reducing Heat Stress with Legacy Building Solutions' Shade & Airflow System*

## INTRODUCTION

Heat stress occurs when the body cannot cool itself effectively, leading to fatigue, heat exhaustion, or even heat stroke. Outdoor athletes—particularly student-athletes—are especially vulnerable, with thousands suffering time-loss heat illnesses annually. This risk is driven by rising temperatures and frequent extreme weather events. According to CDC data from 2005–2009, high school athletes experienced an estimated average of **9,200 time-loss heat illnesses per year**, mostly in August during preseason football practice, and especially in football—by far the most affected sport.[1]

According to the U.S. Bureau of Labor Statistics, thousands of heat-related illnesses are reported annually, with dozens of deaths linked to heat exposure.[2] The University Interscholastic League (UIL) in Texas has implemented strict heat safety guidelines, using the Wet-Bulb Globe Temperature (WBGT) to evaluate safe playing conditions.[3] WBGT accounts for temperature, humidity, solar radiation, and wind speed, providing a far more accurate measure of heat stress than temperature alone.[4]

To explore the potential of shade and ventilation in reducing heat stress, Legacy Building Solutions conducted a field study comparing WBGT and turf surface temperatures in two environments:

- **Outdoors in full sun** (typical game/practice conditions)
- **Indoors within a Legacy Building Solutions structure** (shaded and ventilated conditions)

### RESEARCH QUESTIONS

1. How effective is a Legacy Building Solutions structure at reducing WBGT?
2. What is the impact of the structure on turf surface temperature?
3. How does increased airflow improve WBGT reduction?

## DATA COLLECTION METHODOLOGY

- **Location:** Texas athletic facility
- **Measurement Tool:** Calibrated Kestrel 5400 Heat Stress Tracker[5]
- **Testing Window:** Peak heat hours (3:20 PM – 4:30 PM)
- **Environment Control:** Indoor and outdoor testing locations within 50 feet of each other, identical synthetic turf surfaces
- **Surface Temperature:** Measured using infrared thermal imaging[6]
- **Additional WBGT Calculations:** Cross-checked using UIL and OSHA online WBGT calculators[78]

## TEST CONDITIONS

**OUTDOOR:**
Full sun, no shade, natural airflow

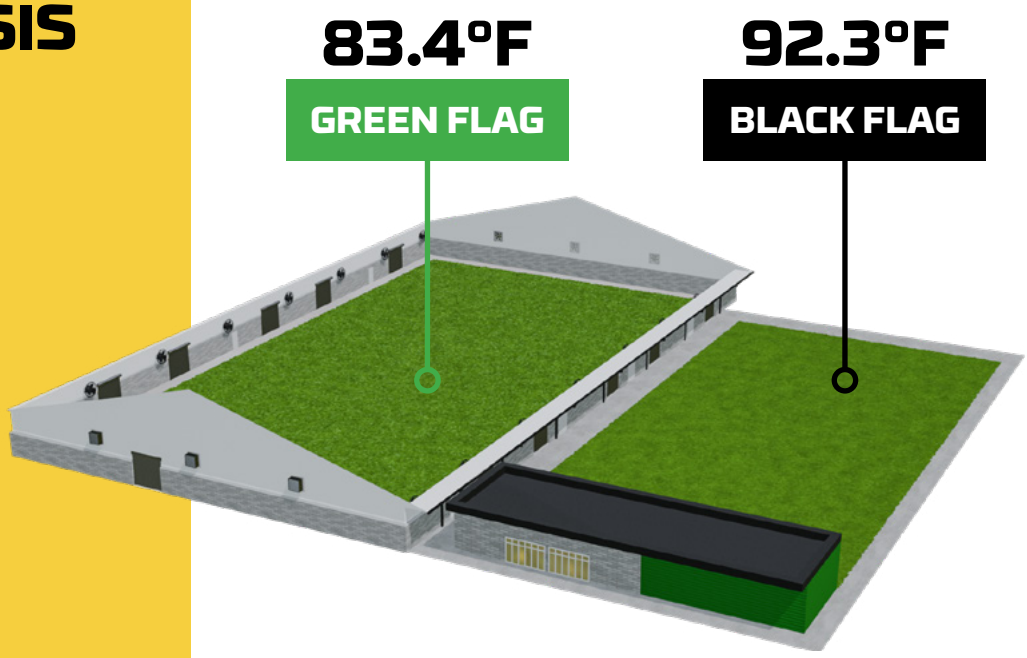
**INDOOR:**
Inside Legacy Building (passive shade design, ventilated)

**INDOOR + FANS:**
Legacy Building with high-volume air circulators to enhance airflow

# WBGT ANALYSIS

## KEY FINDING

At the **Southlake facility in August 2025**, a real-world case study demonstrated that a Legacy structure, **without the recommended Legacy ventilation system**, reduced the WBGT by approximately **9°F** compared to full-sun conditions. This reduction was enough to shift UIL guidelines from **“Black Flag” (no play allowed)** to **“Green Flag” (play allowed with restrictions)**.

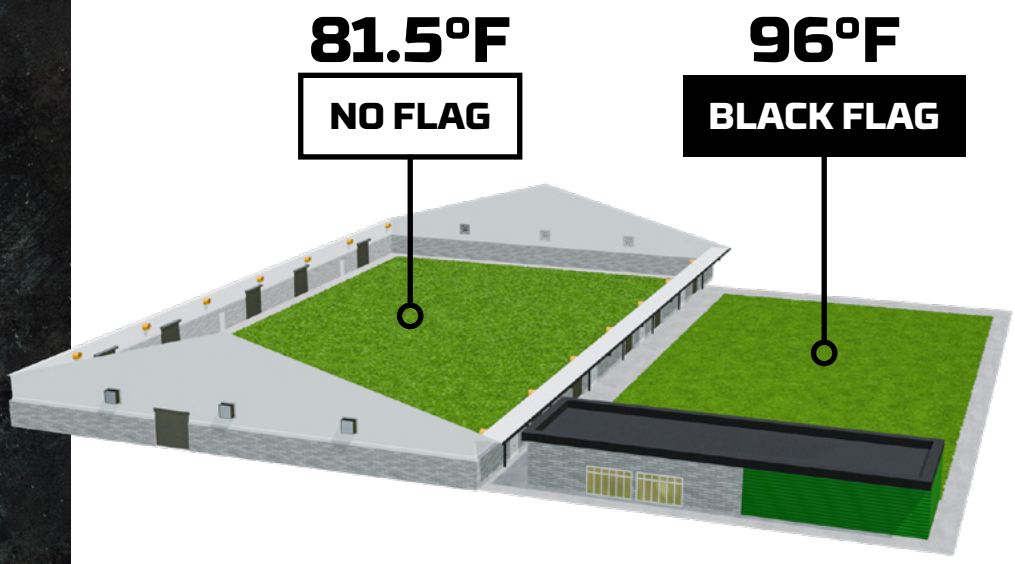


**9°F**

**WITHOUT the Recommended Legacy Ventilation System**

**14.5°F**

**WITH the Recommended Legacy Ventilation System**




Separately, a model simulation was performed using the most extreme heat day in recent years **(August 2024)**.[9] The simulation calculated that a Legacy structure **with the Legacy ventilation system** could collectively reduce WBGT by as much as **14.5°F** under those peak conditions. In most cases, this would move the category to **"No Flag,"** allowing full, unrestricted athletic activity.

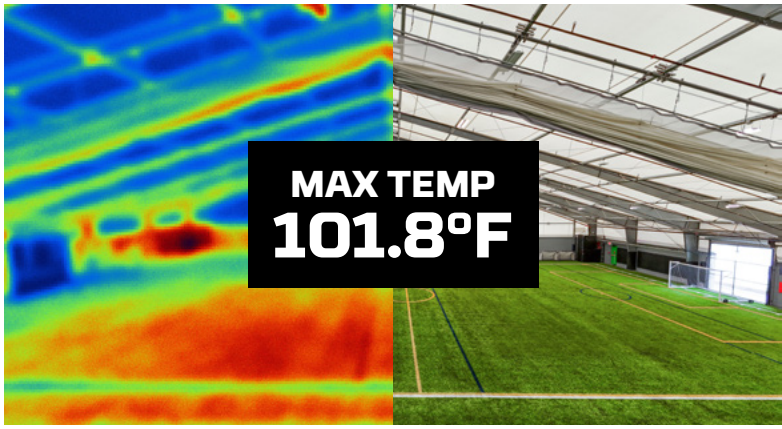
Together, these results show that the real-world data from **2025 validates the accuracy of Moffitt's earlier model**,[10] confirming that Legacy structures—especially when paired with the ventilation system—provide significant and reliable improvements in athlete safety during extreme heat.

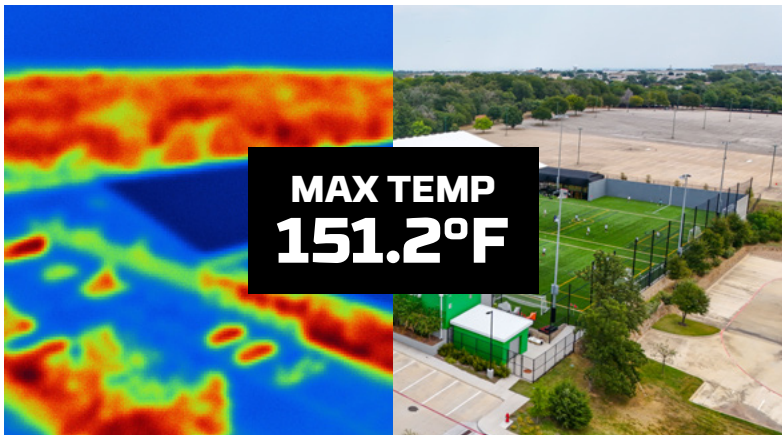
**NO FLAG**

## TURF SURFACE TEMPERATURE ANALYSIS

Infrared imaging revealed that the Legacy building's shade reduced **maximum turf temperatures by ~50°F and average turf temperatures by ~30°F**. This dramatic reduction in radiant heat:

- Lowers the risk of contact-related heat injuries
- Improves athlete comfort and performance
- Reduces heat re-radiation, further aiding in core temperature management




## COMPUTATIONAL FLUID DYNAMICS (CFD) ANALYSIS

Three simulated scenarios were modeled:

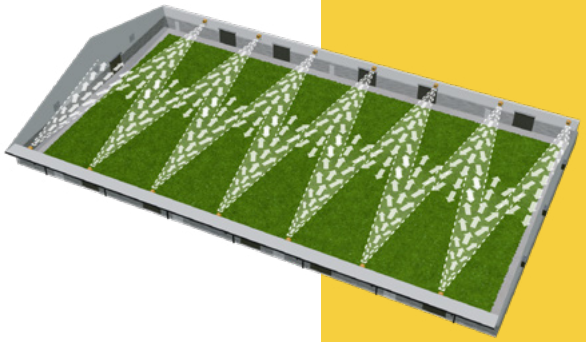
1. Outdoor, full sun
2. Indoor, shaded (Legacy building, passive airflow)
3. Indoor, shaded + high-volume circulation fans

# LEGACY'S UNIQUE ADVANTAGE

## INDEPENDENT CFD MODELING CONFIRMED WHAT MAKES LEGACY'S SYSTEM UNLIKE ANYTHING ELSE ON THE MARKET

### PROVEN HEAT REDUCTION

Legacy's specialized building shell—engineered to deliver full shade while still allowing in natural daylight—reduced WBGT by up to **12.8°F** on its own.[11]



### OPTIMIZED AIR MOVEMENT

Legacy's custom-designed ventilation system further enhanced performance, delivering uniform airflow that eliminated stagnant hot zones and pushed the total WBGT reduction to **as much as 14.5°F**.

### UNMATCHED ATHLETE SAFETY

Unlike simple shading or basic fan add-ons, **Legacy's integrated building + ventilation solution** creates a consistently cooler, safer environment—even on extreme heat days—while preserving the bright, open feel athletes and spectators prefer.


### THE RESULT

A safer playing environment, validated by real-world studies and advanced modeling—only achievable with **Legacy's unique building and ventilation package**.

# SUMMARY OF FINDINGS

| CONDITION | WBGT REDUCTION | UIL CATEGORY | TURF TEMP REDUCTION |
|---|---|---|---|
| **Outdoor, Full Sun** | N/A | **Black Flag** No Play | N/A |
| **Indoor, Shaded (Legacy)** | 8.9°F–12.8°F | **Green Flag** Modified Play | ~30°F Average, ~50°F Max |
| **Indoor, Shaded + Fans (Legacy)** | ~14.5°F | **No Flag** Full Play | ~30°F Average, ~50°F Max |

# UIL ACTIVITY IMPACT

## TARRANT COUNTY, TEXAS

Under forecasted UIL WBGT conditions, outdoor athletes would be restricted most of the week (Black, Red, or Yellow Flag days).[3] Moving practices indoors to a **Legacy building with airflow** would keep athletes in the **No Flag** category, enabling safe, unrestricted participation all week long.

# CONCLUSION

Legacy Building Solutions' structures—paired with an engineered airflow package—offer a **proven, data-backed solution** to mitigate heat stress risks. By combining **passive shade design** with **active air circulation**, these buildings:

- **Lower WBGT** to safe ranges
- Keep turf surfaces **dramatically cooler**
- **Extend safe play times** during extreme heat
- **Support com ---pliance** with UIL and OSHA heat safety standards[78]

## THE RESULT

**SAFER ATHLETES**

**MORE PRACTICE TIME**

**YEAR-ROUND FACILITY USE**

LEGACY
BUILDING SOLUTIONS

**ENGINEERED FABRIC STRUCTURES | PROVEN PERFORMANCE | SAFER ATHLETICS**

---

**LEGACY**BUILDINGSOLUTIONS.COM | **320.258.0500**

EpoxxiShield™ FRAME PROTECTION · EXCLUSIVE ExxoTec PVC FABRIC · CWB CERTIFIED CSA A660 · 9001:2015 ISO CERTIFIED

## REFERENCES


[1] Centers for Disease Control and Prevention – High School Athlete Heat Illness Study (2005–2009)

[2] U.S. Bureau of Labor Statistics – Outdoor Exposure Report: BLS Blog

[3] UIL Heat Stress Guidelines: UIL Website

[4] WBGT Definition: OSHA Technical Manual, Section III: Chapter 4

[5] Kestrel 5400 Heat Stress Tracker Product Specification Sheet

[6] Infrared Thermal Imaging Report – Texas Field Measurements, 2025

[7] UIL WBGT Calculator: UIL Tool

[8] OSHA WBGT Calculator: OSHA Tool

[9] NOAA Weather Data Archive – August 2024 Heat Event

[10] Moffitt, J. (2023). Predictive WBGT Modeling for Shaded Athletic Structures.

[11] Independent CFD Analysis Report – Legacy Building Solutions, 2025