Technical Assurance

High Performance Building Enclosure Experts

Statement of Qualifications

Technical Assurance

Company Overview

Technical Assurance, Inc. is a nationally-recognized building consulting firm founded in 1993. Technical Assurance, Inc.'s current staff of professionals manages building enclosure consulting and design for assignments of varied size, scope and geographic location.

Our practice includes a considerable focus on solving a variety of building system deficiencies. Areas of expertise include roofs, façades, fenestrations (doors, windows and skylights), below-grade structures, parking areas and multi-level parking structures.

In addition, a number of the Technical Assurance clients engage the company to comprehensively manage their physical assets programmatically. These kinds of assignments generally include, predictive and preventative maintenance, capital budget integration and even client staff training.

We also have a full-service Commissioning Group to improve new construction building design and perform functional testing of the system during construction. Our Commissioning Group also performs Building Retro-Commissioning to improve existing building enclosure performance and energy loss.

Technical Assurance's success is due to our ability to lead the planning, design and implementation process for projects of any type, with a history of delivering projects on time and within budget. Our staff is committed to design excellence and client service with a team approach. Each program is approached individually, without preconceptions, and designed to serve the needs of the particular client – always with the goal of achieving excellence in delivery.

The professionals at Technical Assurance, Inc. have substantial critical facility industry experience. We have an extensive staff of consultants, engineers, field technicians, project and construction managers, database managers, GIS consultants, technical staff and office support. We maintain in-house capabilities to provide asset management and produce design drawings and project specs with complete cost estimating and budget preparation. Additionally, we continue to serve our clients with bidding services and construction administration during the entire course of the task, project, or program. Our services are sought primarily by those clients who value their building assets as "critical" in running their daily operations.

Points of Differentiation

- Established knowledge of critical facility project standards, guidelines and safety and security requirements.
- 30 years of proven work experience providing planning, assessment, technical design consultation, construction observation, asset life cycle management and building enclosure commissioning (BECx) services.
- Approximately $100 million of building envelope restoration, replacement and repair projects completed by Technical Assurance on an annual basis.
- Technical Assurance is one of the largest specialized building enclosure consulting and engineering firms in the United States.

SERVICE OVERVIEW

Building Envelope Asset Management

Technical Assurance's ON-PNT® allows facility owners the ability to manage building system inventory, condition assessments and ongoing building system data within one central location. This technology provides for robust GIS mapping and automated reporting metrics for simple data consumption.

Roof Consulting

We are your partner for total roof management. With a team of highly trained roofing specialists, we deliver comprehensive solutions for the assessment, design and implementation of roofing projects of any scope and size. Our programmatic approach to roof management ensures that your roofing investment is optimized to extend the service life of the roof system and to reduce the Total Cost of Ownership.

Façade Consulting & Structural Engineering

We offer vertical facade and structural engineering services including masonry and concrete exterior walls, curtain walls, balconies, exterior insulation finishes, fenestrations (doors, windows and skylights) and structural consulting to diagnose the cause of structural distress. We design repairs and restorative solutions that protect the structural integrity and aesthetic design of the building enclosure.

Parking Garage Consulting

Technical Assurance provides comprehensive consulting services for the restoration, repair and preventative maintenance of existing parking areas. Our deep understanding of the requirements for keeping your parking areas highly maintained and safe will help you operate with a low cost of ownership and extend the life of these necessary and valuable assets.

Exterior Hardscape Consulting

The exterior hardscape serves as a first impression and welcomes visitors to your facility. Regular maintenance of these areas will improve safety and increase the perceived value of your facility. Technical Assurance provides condition assessments, functional design consulting and durability recommendations.

Building Enclosure Commissioning

The full-serve BECx Group specializes in providing data-driven, quality improvement suggestions to new construction building design and performs functional testing during construction. Building enclosures directly affect the longevity and energy efficiency of a building. With a systematic approach to quality assurance, our BECx process improves the performance, safety and efficiency of a building and ensures that a project meets specific quality requirements.

ROOFTOP FALL PROTECTION HAZARD ASSESSMENTS

Falls from heights and working surfaces are among the leading causes of serious work-related injuries and deaths. One of an employer's first priorities is to protect its people from possible fall hazards. Fall protection safeguards employees and company assets from preventable accidents.

As part of our roof consulting services, the Technical Assurance team can perform routine rooftop fall protection hazard assessments to help keep your facilities OSHA compliant and maintain safe rooftop working environments. Our two-pronged approach includes both roof condition and fall protection hazard assessments in order to provide a comprehensive understanding of the entire roof system for clients – from both life safety and serviceability standpoints.

COMPLIANCE & STANDARDS

OSHA 1910.28 (b)(1)(i) requires employers to provide fall protection for employees performing work at heights of 4 feet or more.

ANSI 359 fall protection and fall restraint standards address fall protection equipment and systems for an array of fall hazards.

IWCA1-14.1 outlines a set of standards to protect workers in the window cleaning industry. The standard requires a certain amount of certifiable roof anchorage systems.

The Role of Fall Hazard Assessments

1. Identify fall hazards

- Access
- Perimeter Edges
- Equipment Access
- Openings
- Navigation

2. Inventory existing fall protection system and equipment

3. Assign risk values to hazards and prioritize accordingly

4. Propose solutions

These assessments are not intended to serve as a certification or recertification of fall protection.

Our Approach

At Technical Assurance, we believe that the condition and serviceability of your roof and fall protection system(s) compliance go hand in hand.

Our two-pronged approach includes assessing both systems in order to create a comprehensive understanding of how to address maintenance, remediation and/or replacement of the roof comprehensively.

What is the benefit of our approach?

Time and Cost Efficiencies
Roofing Best Practices Considered

5 STEPS TO SUSTAINABILITY

Technical Assurance's unique 5 Steps to Sustainability process ensures thorough, superior results in program assessment, planning, design and management. Our process-driven approach allows our team to systematically lead all phases of building envelope programs — providing a framework for collaboration and creative solutions.

DISCOVER

Development of Owners Facilities Requirement (OFR), inspect, test, explore, excavate, evaluate and observe existing facilities and parking structures to develop an accurate condition assessment. This step frequently involves forensic investigation for facilities problems.

PLAN

Prepare and develop repair programs and capital plans along with work schedule priorities based on discovery phase findings.

SOLVE

Meet with the Owner's Team and develop design (construction documents, plans and specifications) solutions for all building and parking conditions requiring repair, restoration and/or remediation.

MANAGE

Manage and administer the construction process to ensure cost control, energy savings, quality assurance requirements and compliance with construction documents.

SUSTAIN

Implement and monitor preventative maintenance programs based on long-range component life-cycle forecast to reduce Total Cost of Ownership.

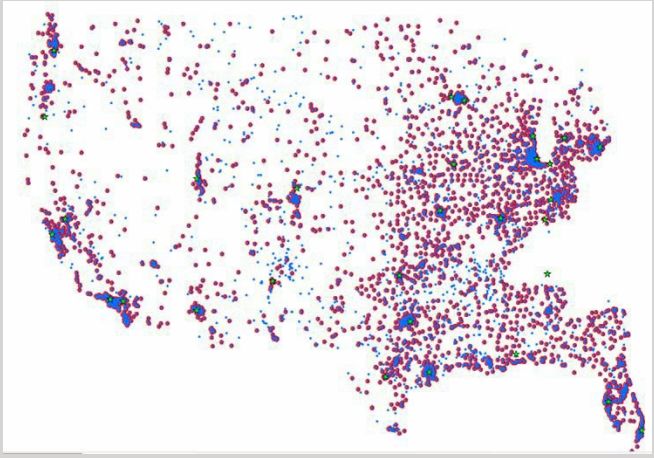
TECHNICAL ASSURANCE

Project & Program Experience

TECHNICAL ASSURANCE

United States Postal Service

Roof Asset Systems Management Program



Programmatic Value

Helped the client have a clear understanding of the condition of their massive facility portfolio and implemented ongoing preventative maintenance efforts in order to extend the service life of the assets.

Program Specifics

Size: 116+ million SF of roofing assets

Locations:
National Program
Assessed 3,170 Facilities

Overview

Technical Assurance, in partnership with Wood® Environment & Infrastructure Solutions, Inc. (team lead) and RoofConnect, was awarded the federal United States Postal Service (USPS) Roof Asset Management Systems (RAMS) program.

The USPS currently owns 8,215 facilities across the United States, totaling approximately 186 million square feet of roof assets valued over $3 billion. The purpose of the RAMS was to maintain an accurate inventory of the roofing infrastructure, to accurately and consistently assess its condition, and to develop and implement a long-term plan for maximizing its life expectancy and the associated costs for doing so.

The scope of the RAMS program includes:

- condition assessments
- biannual preventative maintenance
- repair and alterations
- emergency leak response
- roof design services
- roof restoration projects
- construction management
- quality observation

In the first year of the program, Technical Assurance assessed 3,170 facilities, totaling approximately 69.4 million SF of roof assets. Geographical coverage included the Great Lakes, Pacific, Southern and Western regions of the United States.

Additionally, the Technical Assurance team mobilized to 1,230 sites for preventative maintenance (PM) visits.

As part of the program, we provided design services for roof replacement projects and performed construction administration and quality observation on active projects.

TECHNICAL ASSURANCE

Nestle

Roof Asset Program

Programmatic Value

Helping the client inventory and assess their roof portfolio within a central location; approximately 5.5 million have been assessed to-date.

Project management and construction phase documents are housed within the ON-PNT® portal as these projects are completed.

Project Specifics

Locations:

Bakersfield, CA
City of Industry, CA
Danville, VA
Fort Wayne, IN
Freehold, NJ
Gaffney, SC
Jacksonville, IL
Laurel, MD
Little Chute, WI
Medford, WI
Morton, IL
Mount Sterling, KY
Solon, OH
Springville, UT
Waverly, IA

Overview

Technical Assurance, Inc. has worked with Nestle to perform roof assessments on nearly 5.5 million square feet of roofs over fifteen (15) food manufacturing/production sites.

The inventory and assessment data was collected using the ON-PNT® mobile field app. Our team performed (and repaired) core cuts in order to determine the full roof system make up and verify wet roof areas.

During the assessment, the following information was gathered, analyzed and included in the final reports:

- Roof deficiencies type, location and quantity
- Current leaks
- Existing defects requiring roof repair
- Wall systems that may impact roof performance
- Photographic documentation
- Condition Indices
- Total Services Life and Remaining Service Life
- Replacement Cost Estimates
- Defect Cost Estimates
- Total Cost of Ownership savings associated with performing repairs and preventative maintenance

Following the assessment, Technical Assurance provides Nestle with multi-year repair and replacement plans based on both constrained and unconstrained budgeting models.

Project prioritizations are determined by the Mission Criticality of the building and/or roof section, the condition index and the total cost of ownership.

During roof replacement projects, Technical Assurance provides project administration, management and quality observation services.

TECHNICAL ASSURANCE

Campbell's Soup Company

Roof Assessments, Design & Construction Phase Services

Roof Area B – Partial overview of roof area; ponding water over primary east/west corridor

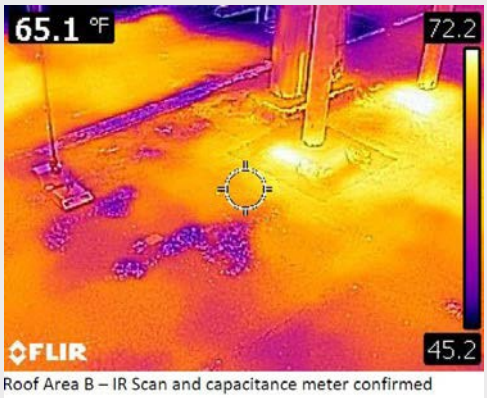
Programmatic Value

Helping the client inventory and assess their roof portfolio within a central location. Project management, design and construction phase documents are housed within the ON-PNT® portal as these projects are completed.

Project Specifics

Locations:

Pepperidge Farms Plant | Willard, OH
Snyder's of Hanover | Ashland, OH
Snyder's Lance Chips Plant | Charlotte, NC
Snyder's Snacks Pretzel Factory | Hanover, PA



Roof Area B – IR Scan and capacitance meter confirmed

Overview

Technical Assurance, Inc. has been engaged by Campbell's Soup Company to provide roof assessment, testing and quality observation services on a number of their manufacturing facilities.

During the assessment, the following information was gathered, analyzed and included in the final reports:

- Roof deficiencies type, location and quantity
- Current leaks
- Existing defects requiring roof repair
- Wall systems that may impact roof performance
- Photographic documentation
- Condition Indices
- Total Services Life and Remaining Service Life
- Replacement Cost Estimates
- Defect Cost Estimates
- Total Cost of Ownership savings associated with performing repairs and preventative maintenance

Following the assessment, Technical Assurance provides Campbell's with multi-year repair and replacement plans based on both constrained and unconstrained budgeting models. Project prioritizations are determined by the Mission Criticality of the building and/or roof section, the condition index and the total cost of ownership.

Additionally, Technical Assurance provides design, bid and quality observation services for the roof replacement project on the Pepperidge Farms, Willard, OH plant. The same services are underway at the Hanover, PA Pretzel Factory.

TECHNICAL ASSURANCE

Case Western Reserve University

Roof Sustainability Program

Programmatic Value

Because of our extensive relationship with CWRU, Technical Assurance is their go-to roof expert for any of their roofing needs. Technical Assurance's ability to simultaneously manage the design, bid and construction processes of each of the roof replacements allowed for an expedited project schedule and reduced costs.

Project Specifics

Size: 1.7 million square feet of roof assets
Location: Cleveland, OH

Overview

Technical Assurance has been working with Case Western Reserve University (CWRU) since 2003. In 2013, we were contracted by CWRU to provide a thorough roof assessment for their entire campus, including all academic and residential housing buildings. The university had been experiencing some premature roof failures and needed to gain control of this expansive facility system asset that requires so many capital renewals over the life of a building. To avoid or at least minimize future "surprises," administration decided to contract an enclosure consultant to conduct a thorough conditions assessments of the roofs.

Following the assessment, Technical Assurance worked with the university to implement a campus-wide Roof Sustainability Program on 1.7 million square feet of roofs. This program includes biannual roof preventative maintenance and assessments, reporting, emergency and non-emergency leak responses, large roof replacements and construction management.

The Sustainability Program has extended the useful service life of their roof portfolio from 5 to 12 years, affording the university over $7 million in total cost of ownership savings over the remaining service life of their roof assets with ongoing repairs and preventative maintenance.

Each year, CWRU replaces failed roof sections on the prioritized buildings. The number of replacements varies each year based on budget and needs. Technical Assurance designs each of the roof replacements, manages the bid process, serves as on-site project management, construction administration and provided quality observation throughout each replacement.

TECHNICAL ASSURANCE

Geisinger Henry Cancer Center

Building Enclosure Commissioning (BECx)

Value

The identification of issues during construction and verification that systems are being installed properly. This process ensures continuous weather and thermal barriers. The BECx services also helped the client achieve LEED Certification.

Project Specifics

Client: HF Lenz
Owner: Geisinger Wyoming Valley Medical Center
Size: +/- 92,000 GSF Addition
Cost: $80 million

Overview

Geisinger's Henry Cancer Center engaged the design team of the original building to design the significant expansion to the Wyoming Valley campus. The expansion will stand as a new main hospital entrance for the campus, reshaping the arrival experience as part of a holistic approach that focuses on health and wellness.

Technical Assurance was engaged to provide building enclosure commissioning/consulting services on the addition construction. This addition acts as a bridge between the existing campus structure and the future healthcare environment. The team is taking measures to achieve LEED certification.

Our team began involvement during the design and CD phase of the project, continuing through construction.

- Design and CD Phase – third-party review of enclosure related drawings and specifications, development of a commissioning plan
- Construction Phase – Shop drawing and technical review, periodic technical quality observation during typical installation points of the building enclosure
- 10-month post occupancy review
- Performance Testing

  ASTM D4541 Adhesion of Weather Barrier Coatings

  ASTM C1153 Roof Insulation Infrared Scanning

  ASTM E1105 Pressurized Chamber Water Infiltration Testing

  AAMA 501.2 Water Hose Testing of Window Systems

TECHNICAL ASSURANCE

GoodYear Headquarters

Facade Assessment & Recommendations

Value

Our team outlined two (2) remediation strategies for eliminating chronic water infiltration issues.

Project Specifics

Size: 7 Stories
Location: Akron, OH

Overview

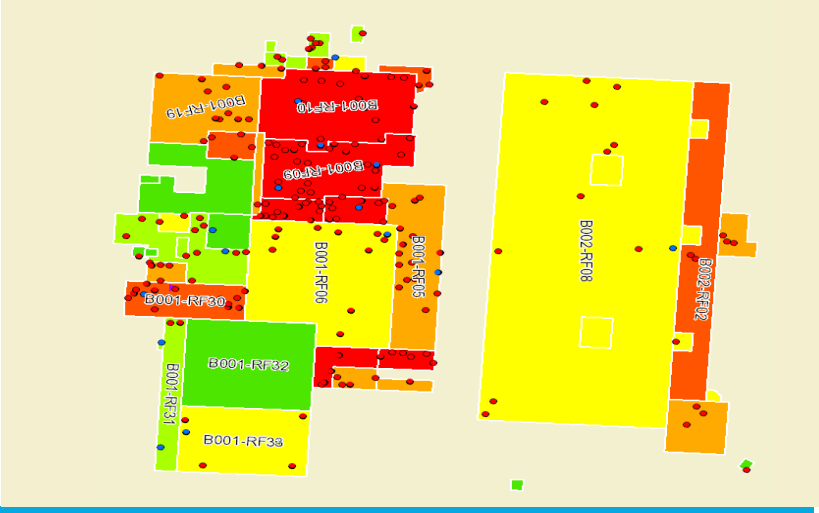
Technical Assurance, Inc. was retained by IRG Realty Advisors to provide an inspection and testing for the curtain wall system of the Goodyear Tire and Rubber Company World Headquarters in Akron, OH. The majority of the evaluation was conducted from a 125' man lift, with other portions conducted from roof sections.

The World Headquarters is a relatively new facility experiencing water intrusion issues only four (4) years after construction was complete. The curtain wall system was in mediocre condition mostly due to fabrication and installation issues. Our assessment found details that were inconsistent and appear reactionary and not part of the original design or concept.

Due to the number of fabrication and installation issues of the curtain wall system, a restoration project would be extremely expensive. At this point, it was recommended to pursue a proactive/reactive maintenance program. While this sounds contradictory, it is best to deal with issues as they arise and be positioned to quickly, thoroughly, correctly and efficiently perform the required repairs.

Technical Assurance

ON-PNT®
Simplified Asset Management



ON-PNT®

Building System Asset Management Made Simple.

01 Enable a More Efficient Field Crew Data Collection

> GIS PWA mobile app
> Increases efficiency and effectiveness
> App syncs with web portal every night

02 Brings Database to the Field & the Field to the Database

> GIS integrated database
> Easily visualize the condition of roof assets
> Analyze effects of repairs and maintenance

03 Analysis & Reporting: Performance, Metrics & Goals

> High level executive summary metrics (KPIs)
> Scorecard review of building conditions
> Custom reports & charts
> Triage scores
> Constrained budget analysis tool
> GIS mapping

04 Simplified Management

> Robust project management tool
> Document & task management
> Schedule & cost management
> Data repository
> Warranty management & reminders

ON-PNT® Five Steps to Sustainability®

The ON-PNT Enterprise Solution is a GIS-enabled database and web portal technology solution for:

- Building System Management
- Design Services and Bid Management
- Construction Management
- Sustainable Maintenance Management

ON-PNT allows facility owners the ability to manage building system inventory, condition assessments, repairs and ongoing building system data within one central location. This cutting-edge technology provides robust GIS mapping and automated reporting metrics for simplified data consumption.

ON-PNT is fully customizable per client. In fact, we build a unique ON-PNT Portal for each client program. This means we can incorporate each client's unique program nomenclature, ID system, special acronyms, custom metrics, etc.

A SCIENTIFIC APPROACH

The ON-PNT system provides repeatable and objective analysis using established facilities asset management (FAM) standards. The database is modeled using the following engineering standards:

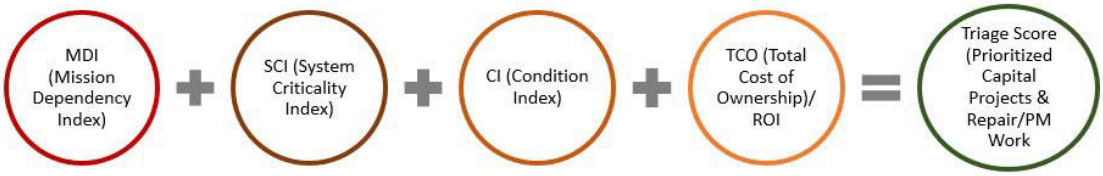
- "Asset Lifecycle Model for Total Cost of Ownership," IFMA/APPA
- ASTM E917-05 Measuring Life-Cycle Costs of Buildings and Building Systems
- ASTM E1057-06 Measuring Internal Rate of Return and Adjusted Internal Rate of Return for Investments in Buildings and Building Systems
- ASTM E1121-12 Measuring Payback for Investments in Buildings and Building Systems
- ASTM E1765-11 Standard Practice for Applying Analytical Hierarchy Process (AHP) to Multi-Attribute Decision Analysis of investments related to Buildings and Building Systems

Using these standards to work within the structure of our database, we are able to ensure consistent findings and reporting with our Asset Management solution. The standards also allow us to bring in unique characteristics and attributes important to our clients from a non-monetary perspective.

RECOMMENDATIONS & BUDGETING

ON-PNT® includes a built-in Business Intelligence for Capital and O&M budgeting and planning, along with work schedule priorities based on discovery phase findings. The automated budgeting reports include scientific methodology for ranking capital replacements and repair projects. The Triage Budget Report and Project analyzer tool is based upon the:

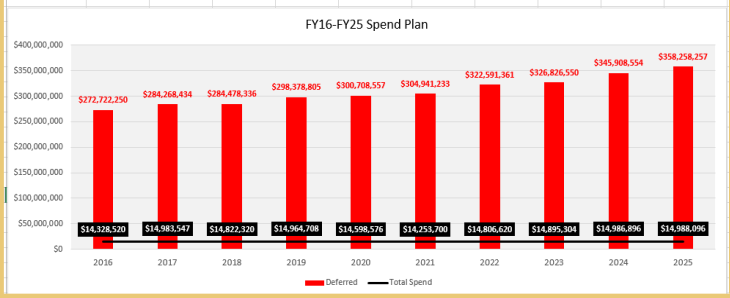
- ☑ Building or building system Condition Index (CI)
- ☑ Mission Dependency Index (MDI)
- ☑ System Component Index (SCI)
- ☑ Total Cost of Ownership (TCO)



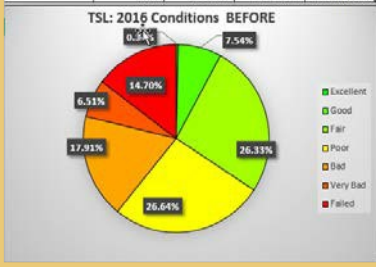
ON-PNT lets you generate ad-hoc Triage Budget Plans based upon set budget constraints. You can also set your organization's inflationary rate and/or cost of capital or value of cash percentage rate. Once constraints and other rates are set, you can easily generate Triage Budget Plan and/or special Spend Plan and Deferred Maintenance Reports.

10-YearS pend: $15 million/Year

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Spend	$14,328,520	$14,983,547	$14,822,320	$14,964,708	$14,598,576	$14,253,700	$14,806,620	$14,895,304	$14,986,896	$14,988,096
Total TSL Budget	$272,722,250	$26,529,731	$15,032,222	$28,865,177	$16,928,328	$18,486,376	$32,456,748	$19,130,493	$34,068,900	$27,337,799
Deferred	$272,722,250	$284,268,434	$284,478,336	$298,378,805	$300,708,557	$304,941,233	$322,591,361	$326,826,550	$345,908,554	$358,258,257

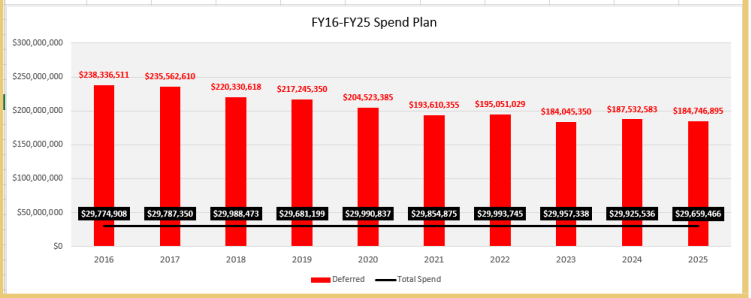


Condition-2016	Count	%	SF	CRV	Condition-2025	Count	%	SF	CRV
Excellent	19	0.36%	141,501	$5,215,598	Excellent	269	5.16%	965,418	$39,233,20
Good	393	7.54%	1,519,097	$60,841,379	Good	317	6.08%	1,007,499	$39,538,52
Fair	1372	26.33%	4,886,607	$203,565,215	Fair	482	9.25%	2,017,074	$80,994,53
Poor	1388	26.64%	5,305,070	$219,412,653	Poor	1326	25.45%	3,787,815	$169,022,56
Bad	933	17.91%	3,251,802	$128,076,573	Bad	403	7.74%	1,550,015	$65,712,98
Very Bad	339	6.51%	1,337,673	$51,012,639	Very Bad	104	2.00%	496,605	$19,251,09
Failed	766	14.70%	3,163,517	$112,813,771	Failed	2309	44.32%	9,780,841	$367,184,91
	5210	100.00%	19,605,267	$780,937,828		5210	100.00%	19,605,267	$780,937,82

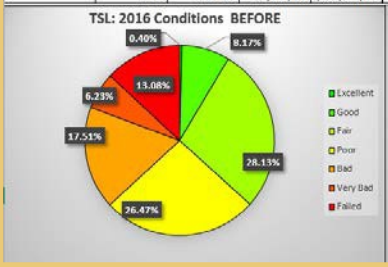


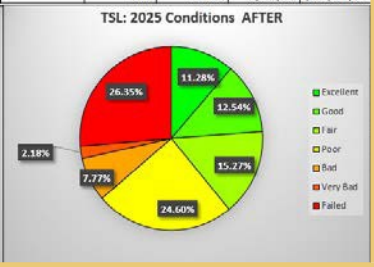
10 -Year Spend: $30 million/Year

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Spend	$29,774,908	$29,787,350	$29,988,473	$29,681,199	$29,990,837	$29,854,875	$29,993,745	$29,957,338	$29,925,536	$29,659,466
Total TSL Budget	$238,336,511	$27,001,006	$14,555,359	$26,903,204	$16,959,235	$17,622,856	$31,295,549	$18,988,066	$33,444,571	$27,139,848
Deferred	$238,336,511	$235,562,610	$220,330,618	$217,245,350	$204,523,385	$193,610,355	$195,051,029	$184,045,350	$187,532,583	$184,746,895



Condition-2016	Count	%	SF	CRV	Condition-2025	Count	%	SF	CRV
Excellent	20	0.40%	264,957	$9,900,754	Excellent	563	11.28%	1,887,177	$78,736,089
Good	408	8.17%	1,574,667	$63,700,151	Good	626	12.54%	2,188,687	$84,679,447
Fair	1404	28.13%	5,106,632	$210,494,982	Fair	762	15.27%	3,352,259	$131,195,586
Poor	1321	26.47%	4,972,542	$205,112,767	Poor	1228	24.60%	3,440,155	$152,941,882
Bad	874	17.51%	3,203,298	$125,852,664	Bad	388	7.77%	1,440,571	$61,339,598
Very Bad	311	6.23%	1,248,197	$47,475,983	Very Bad	109	2.18%	488,327	$18,441,678
Failed	653	13.08%	2,327,875	$85,563,876	Failed	1315	26.35%	5,900,992	$220,766,897
	4991	100.00%	18,698,168	$748,101,177		4991	100.00%	18,698,168	$748,101,177





N-PNT® Five Steps to Sustainability®

Building System Asset Management Made Simple.

Enable a More Efficient Field Crew | Data Collection
- GIS PWA mobile app
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Brings Database to the Field & the Field to the Database | Dynamic Mapping
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- Easily visualize the condition of roof assets
- Analyze effects of repairs and maintenance

Analysis & Reporting: Performance, Metrics & Goals | Data Consumption
- High level executive summary metrics (KPIs)
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- Custom reports & charts
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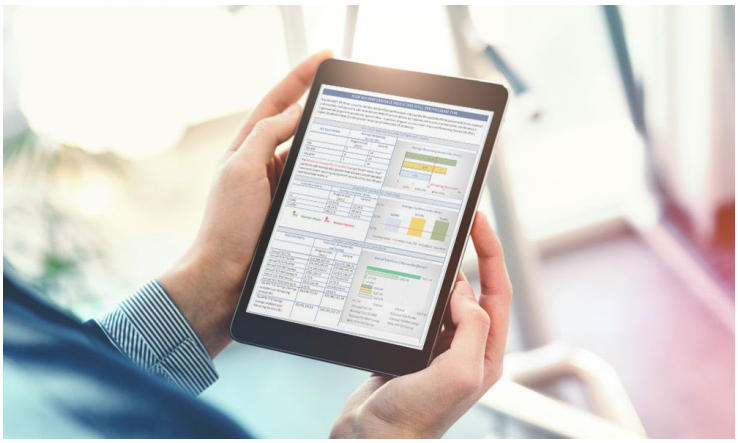
- GIS mapping



Simplified Management
- Robust project management tool
- Document & task management
- Schedule & cost management
- Data repository
- Warranty management & reminders

REQUEST A CONSULTATION

We would love to talk with you about your facility needs.
Connect with us on our **website** to request a consultation.

Or Contact:
Liam Flannery, Director of National Sales
(919) 637-1444
Lflannery@technicalassurance.com