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

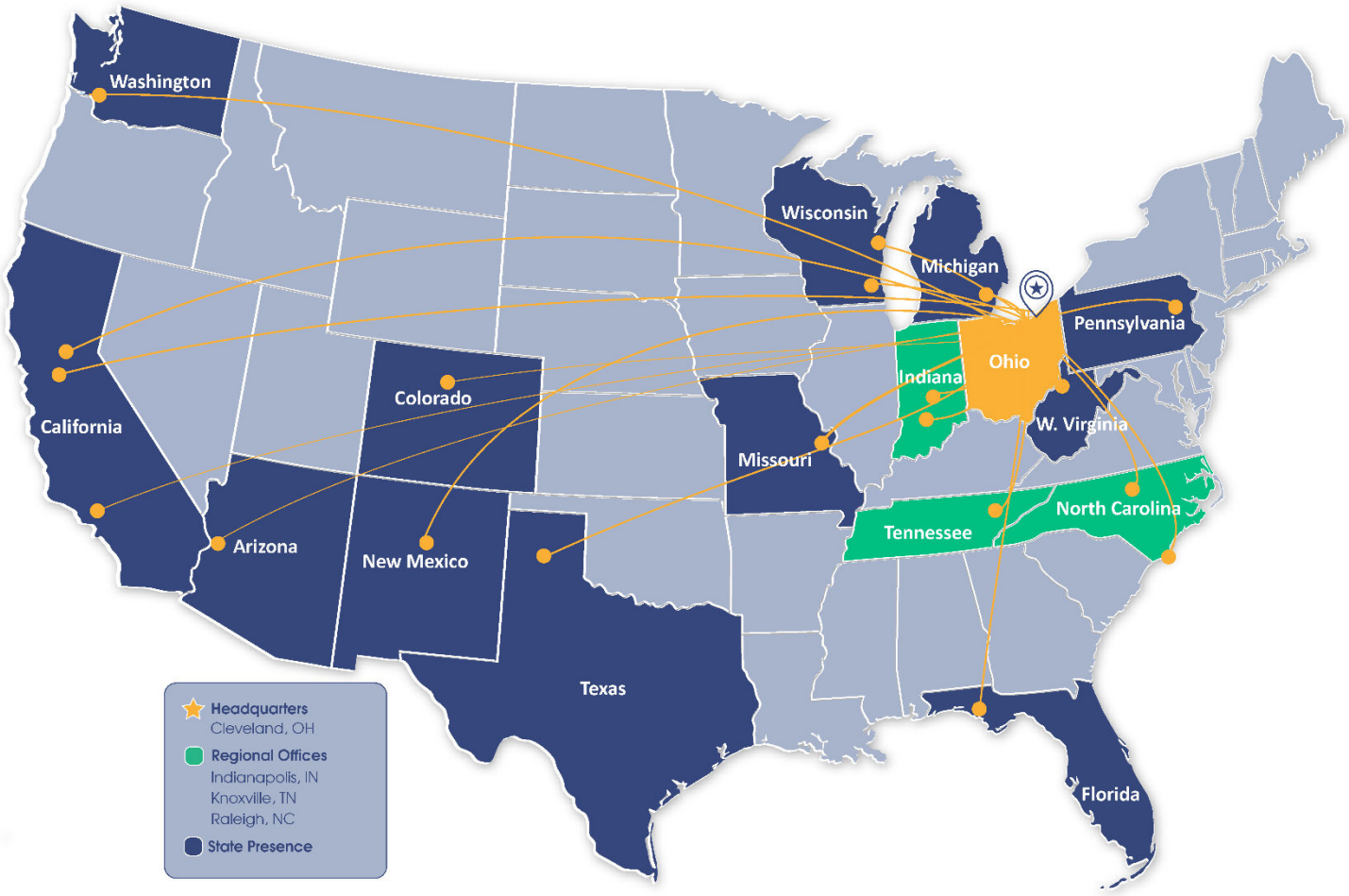
The full-serve BECx Group specializes in providing data-driven, quality improvement suggestions to new construction building design and performs functional testing during construction. Building enclosures directly affect the longevity and energy efficiency of a building. With a systematic approach to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

GEOGRAPHIC COVERAGE

Technical Assurance has the capacity to provide national building enclosure consulting services. Our project-related field teams span across the United States, as we are continuously recruiting top talent in different markets in order to efficiently staff client program needs. We have successfully delivered roofing and building envelope projects across all 50 U.S. states and in Canada.

Office Locations

Headquarters	38112 Second Street, Willoughby, OH 44094
Raleigh, NC	301 Kilmayne Drive, Suite 204, Cary, NC 27511
Knoxville, TN	10426 Jackson Oaks Way, Suite 103, Knoxville, TN 37922
Indianapolis, IN	160 West Carmel Drive, Suite 244, Carmel, IN 46032



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.

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

TECHNICAL ASSURANCE

Project & Program Experience

NESTLE

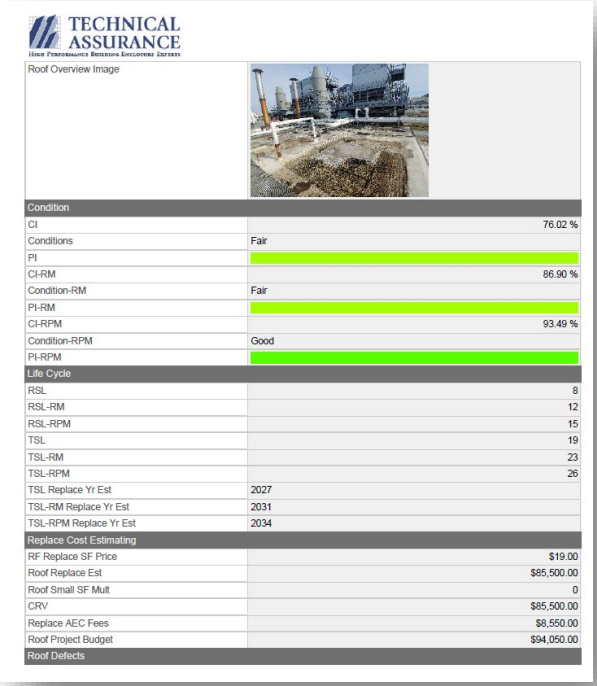
Client: Nestle

Assignment: Roof Assessment Program

Assessment Size: 5,499,288 SF Roofs

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

- 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



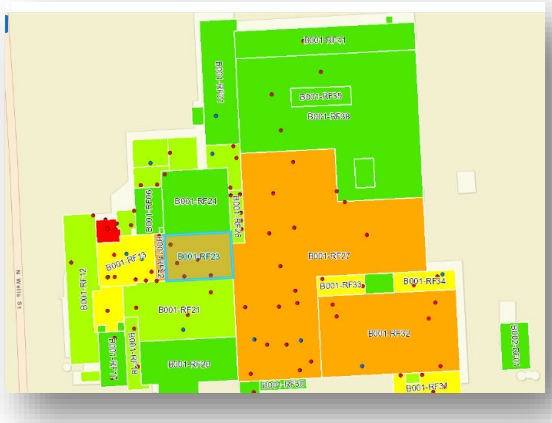
TECHNICAL ASSURANCE

Roof Overview Image	
Condition	
CI	76.02 %
Conditions	Fair
PI	
CI-RM	86.90 %
Condition-RM	Fair
PI-RM	
CI-RPM	93.49 %
Condition-RPM	Good
PI-RPM	
Life Cycle	
RSL	8
RSL-RM	12
RSL-RPM	15
TSL	19
TSL-RM	23
TSL-RPM	26
TSL Replace Yr Est	2027
TSL-RM Replace Yr Est	2031
TSL-RPM Replace Yr Est	2034
Replace Cost Estimating	
RF Replace SF Price	$19.00
Roof Replace Est	$85,500.00
Roof Small SF Mult	0
CRV	$85,500.00
Replace AEC Fees	$8,550.00
Roof Project Budget	$94,050.00
Roof Defects	

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 to 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
- Roof related 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.

CAMPBELL'S SOUP COMPANY

Client: Campbell's

Assignment: Roof Assessment & Testing

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

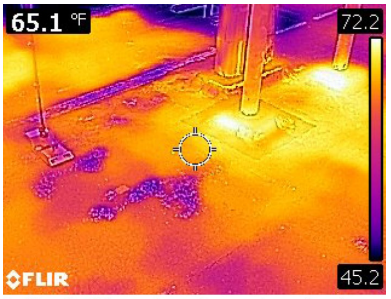
During the assessment, the following information was gathered, analyzed and included in the final reports:

- Roof deficiencies type, location and quantity
- Current leaks
- Existing defects requiring roof repair
- Roof related 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.

Pepperidge Farms – Willard, Ohio

As part of a roof condition assessment on the Pepperidge Farms production facility in Willard, Ohio, Technical Assurance performed infrared (IR) scans to help determine conditions and identify latent moisture within the roof system. The project included five (5) roof sections, totaling 213,860 square feet of roof surface area. System types included modified bitumen membrane, built-up membrane, adhered ethylene propylene diene monomer (EPDM) single-ply membrane and aggregate ballasted EPDM single-ply membrane. Since the roof was under warranty, our team utilized a capacitance meter to confirm the presence of latent moisture in the roofing system.



Roof Area B – IR Scan and capacitance meter confirmed


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

Campbell's Snack/Snyder's of Hanover – Ashland, Ohio

As part of a roof condition assessment on the Snyder's of Hanover production facility in Ashland, Ohio, Technical Assurance performed infrared (IR) scans to help determine conditions and identify latent moisture within the roof system. The project included the main facility's standing seam metal and single-ply membrane roof systems, totaling approximately 160,000 square feet of roof surface area.

The IR scan was conducted on the single membrane portion of the roof in accordance with ASTM C1153 standards. The intent of the scan was to identify potential locations where water may be present inside the roof system.

CONFIDENTIAL FORTUNE 500

Client: Fortune 500 – Manufacturer of Tissue Consumer Products, Packaging, Building Products and Related Chemicals

Assignment: Roof Consulting

A Fortune 500 Company had plans to replace $5 million in roof systems at one of their western US plant sites. They had been operating on a run-to-failure program model and were prepared for a full replacement.

Given the costs, the client engaged us to help them fully understand their investment options before moving forward with a complete replacement. After performing an initial assessment at their site, we found that only a portion of their roof sections required a complete replacement, while other sections still had useful life opportunities – provided a complete roof repair and restoration program was implemented immediately, along with annual roof maintenance. We pivoted to think about what could be done to extend the life of their assets while saving them money. The savings captured were substantial.

As a new partner, we serve as an objective third-party to financially analyze the building assets, ultimately helping our client view their buildings as a business investment. As part of our roof life cycle management program, we have established life cycle metrics for their roof assets to create accountability and set goals for savings—all while accounting for regular proactive maintenance during the life of the assets.

While this is still a fairly new partnership, we have already saved them a considerable amount of money in roof repairs and replacement projects alone. As we progress in our relationship with this company, our goals are to:
Continue to assess and monitor opportunities for savings
Keep roof systems on track with regular maintenance
Lower cost of ownership by 15-20%

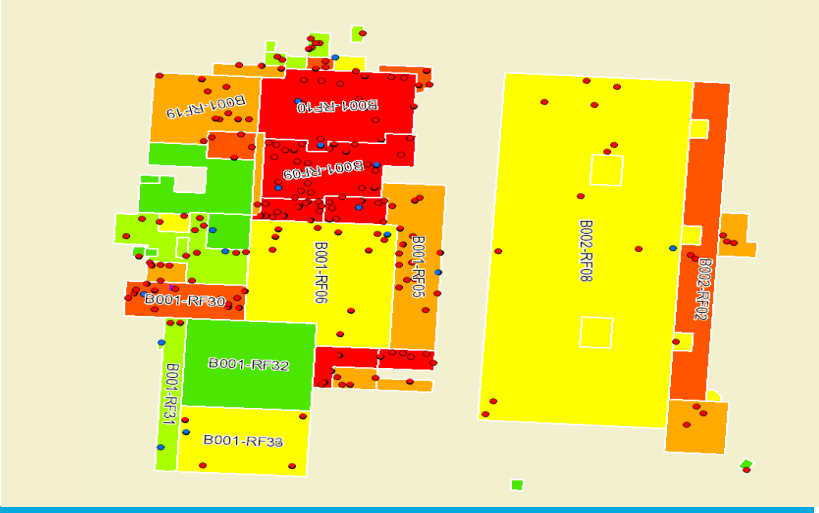
Savings & Successful Results with Life Cycle Management

The company was planning on a capital roof replacement spend of $6.4 million over 10 years at the one site with no preventative maintenance included – $4.5 million was to be spent to replace most roofs in the first year. Our professionals determined that they actually needed to spend only $1.4 million on immediate roof replacements and $1.7 million in restoration maintenance/life cycle investment in the first year, and then $30k annually on preventative maintenance for the full alternate 10-year plan.

Not only did we help them avoid unnecessary replacements and save more than $3 million over 10 years, but we also helped extend their roof assets for another 10 years.

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:

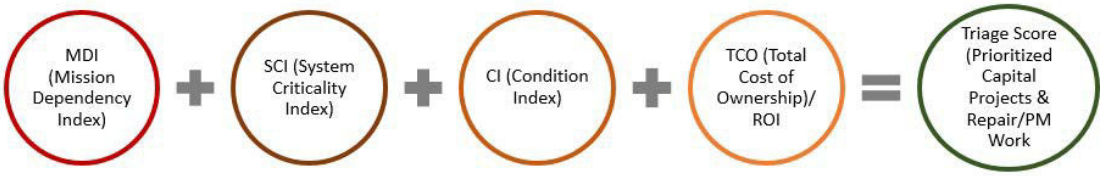
- "Asset Lifecycle Model for Total Cost of Ownership," IFMA/APPA
- ASTM E917-05 Measuring Life-Cycle Costs of Buildings and Building Systems
- ASTM E1057-06 Measuring Internal Rate of Return and Adjusted Internal Rate of Return for Investments in Buildings and Building Systems
- ASTM E1121-12 Measuring 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:

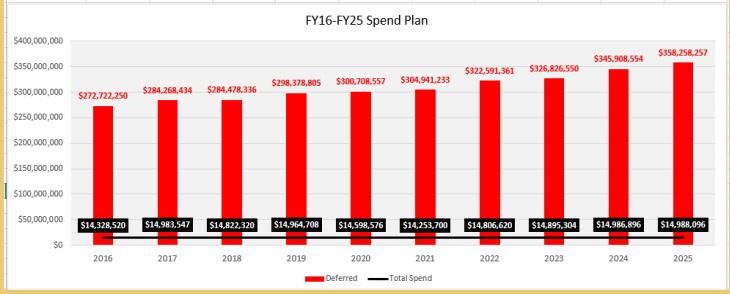
- ☑ Building or building system Condition Index (CI)
- ☑ Mission Dependency Index (MDI)
- ☑ System Component Index (SCI)
- ☑ Total Cost of Ownership (TCO)



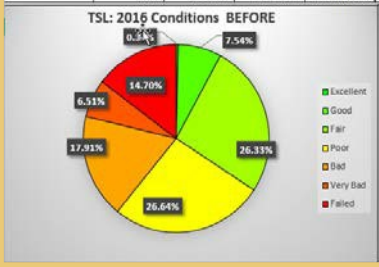
ON-PNT lets you generate ad-hoc Triage Budget Plans based upon set budget constraints. You can also set your organization's inflationary rate and/or cost of capital or value of cash percentage rate. Once constraints and other rates are set, you can easily generate Triage Budget Plan and/or special Spend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

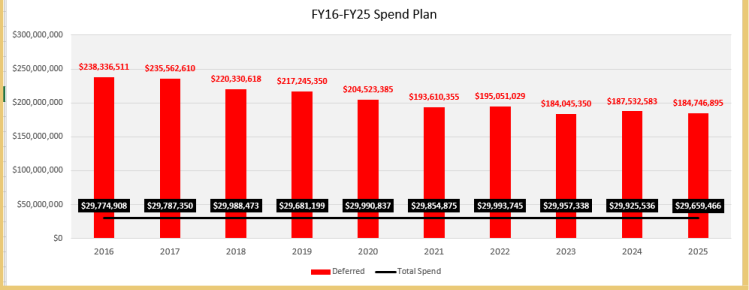


Condition-2016	Count	%	SF	CRV	Condition-2025	Count	%	SF	CRV
Excellent	19	0.36%	141,501	$5,215,598	Excellent	269	5.16%	965,418	$39,233,20
Good	393	7.54%	1,519,097	$60,841,379	Good	317	6.08%	1,007,499	$39,538,52
Fair	1372	26.33%	4,886,607	$203,565,215	Fair	482	9.25%	2,017,074	$80,994,53
Poor	1388	26.64%	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

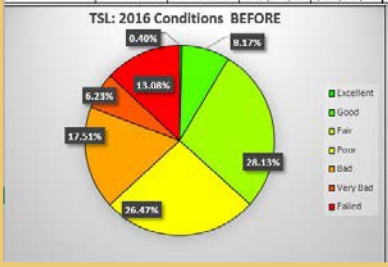


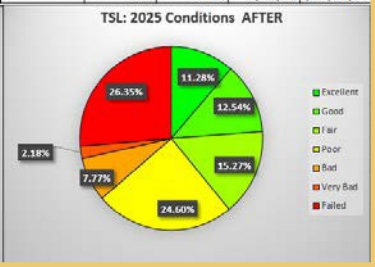
10 -Year Spend: $30 million/Year

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
- Increases efficiency and effectiveness
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Brings Database to the Field & the Field to the Database | Dynamic Mapping
- GIS integrated database
- Easily visualize the condition of roof assets
- Analyze effects of repairs and maintenance

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- High level executive summary metrics (KPIs)
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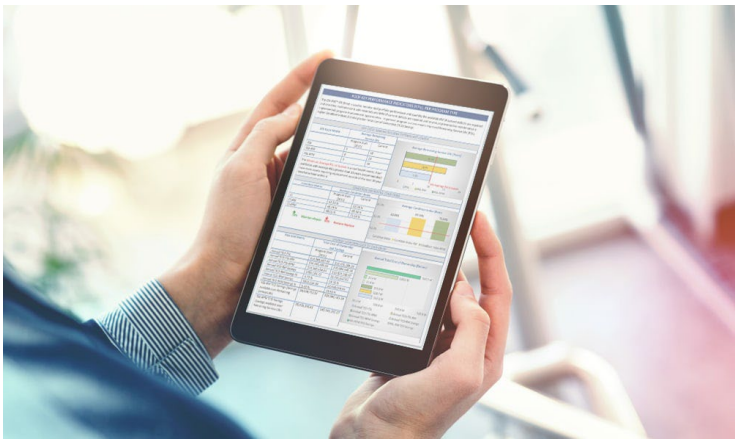

Simplified Management
- Robust project management tool
- Document & task management
- Schedule & cost management
- Data repository
- Warranty management & reminders

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