APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw		6/7/2016
REPORTS & RECOMMENDATIONS	NO COST MODIFICATION TO MJD'S PROPERTY SOLUTIONS CONTRACT FOR POUR IN PLACE SURFACE FOR KAYLA'S PLAYGROUND AT FRANKLIN WOODS PARK (3723 W PUETZ RD)	ITEM NUMBER G. 9.

BACKGROUND

The poured in place surface for Kayla's Playground at Franklin Woods Nature Center was installed in the week prior to the grand opening on October 9, 2015. The surface was installed by the successful low-bidder MJD's Property Solutions- Brookfield, WI (MJD's). The bid documents specified requirements for the surface including, but not limited to:

- *The surface shall comply with the proposed head injury criteria (HIC) value of less than 700. According to the American Society for Testing and Materials (ASTM) related to playground surfacing.*
- *Shock Pad: black raw shredded rubber buffings.*
- *Surface shall be a 70% color and 30% black mix.*
- *In accordance with ASTM F1292, the contractor shall follow the procedure for testing installed playground surfaces in order to determine whether the installed playground surface meets the critical fall heights. The City must be present for the testing.*

The installed product did not fully meet the specifications and the Contractor has a proposal for the City's consideration. The City Engineer believes the proposal is in the best interest of the City and is, therefore, bringing it to the Common Council for its consideration.

ANALYSIS

Franklin Staff borrowed heavily upon specifications created by the City of Waukesha who routinely installs these surfaces. It should be noted that Waukesha requires their surfaces to meet Head Injury Criterion (HIC) 700 even though almost all other projects only require a HIC 1000. Staff was aware of the difference of HIC requirements and specified HIC 700 for Kayla's playground. Like most other projects, Waukesha specifies a 50% color and 50% black mix but Franklin Staff specified for this project a 70%/30% mix to create a cooler surface temperature.

Because of the time of the year, raw shredded rubber buffings were not available (see attached August 19, 2105 letter from American Recycling Center) and rubber chunks were substituted with Staff's permission and that the warranty on the surface was still valid.

Note that HIC is a test outlined in the attached ASTM F1292. The lower the number, the better impact absorption there is. Note that in the appendixes X1.4 *"...the limiting HIC score of 1000 is set at the threshold of fatal injury risk."* In the fall of 2015, MJD's supplied information to staff for thicknesses of the rubber chunks designed to meet HIC 700. The equipment for testing is a specialized piece of equipment which needed to be obtained from the materials supplier. Approximately $11,000 is being held from the contractor's final payment because the surface was not yet tested per the specification.

The HIC testing occurred on May 24, 2016 with Staff present. The equipment was calibrated for the actual installed fall heights. For the most part, the tests were in the range of HIC 840 to HIC 980. One location (under the high monkey bars) showed results in excess of 1200. As a result, the high monkey bars were immediately removed and will be reinstalled after the surface is properly addressed to HIC<1000. For the remainder of the areas that did not meet the HIC 700, MJD's has a proposal for the City's consideration.

MJD's is proposing that the for the areas that met HIC 1000 but not the HIC 700, they would trim a small edge in the existing half inch surface for a butt-joint, then add one inch of buffings (not chunk rubber) and another half inch of surface. Laboratory results indicate that this addition reduces HIC approximately 250-275 points. In other words, the expected HIC results could be as low as HIC 565 (840-275) and only as high as HIC 730 (980-250).

For the one area that exceeded HIC 1200, an additional two inches of buffings would be added with a half inch surface that would reduce the HIC approximately 400 points to match the other repaired surfaces. Further testing to ensure a safe surface would not be needed. This work would require total removal of the surface in this area and exact extent of removal would depend on the ADA requirement of no more than 1 inch of increased slope per 12 inches of surface traveled.

Importantly, the surface would be 100% color and 0% black. MJD's has already provided patches around the merry-go-round because of the excessive wear patterns. The color particles are more durable than the black particles. In addition, the color particles would be ordered in a smaller size to allow a compact surface which will further enhance the durability of the surface. Generally the color particles are more expensive which is why specifications do not typically call for 100% color material. Nonetheless, the contractor has offered this as part of the solution since his initial installation did not meet the lower HIC 700 specified by the City.

MJD's was very accommodating to the other work elements occurring on Kayla's Playground. They have provided the patching around the merry-go-round with a tighter surface mix. To further provide a level of comfort, MJD's is willing to contractually commit to visiting twice a year for the next five years and provide all needed patching. In addition to the any wear issues around the merry-go-round and under swings, they will fix marks caused by high heeled shoes. Staff would find this service very beneficial.

Summary:

Contractor proposes to provide at no-cost to the City:

- One inch buffings with one half inch surface in the areas of the swings and climbing wall (areas that did not meet HIC 700 but did meet HIC 1000)
- Two inches of buffings with one half inch surface in the area of the high monkey bars (area that did not meet HIC 1000)
- In the repair areas, a 100% solid color surface with smaller particles
- A five year maintenance agreement to visit the playground twice a year to fix large and small defects

In return, City will:

- Change the HIC 700 criteria to at or below HIC 800.

- Waive further testing since current testing and an additional two inches ensure an ASTM safe surface of below HIC 1000.
- Pay MJD's the balance of the contract.

OPTIONS

Staff believes that the proposed solution provides the best product for the City. Removal of the existing surface to add enough buffings in the swing areas will create a deep joint that will be a long term maintenance concern.

Adding the additional buffing will ensure the surface remains well below the ASTM standard HIC 1000, while increasing the surface composition to 100% color particles provides a durability that exceeds what could have cost effectively been incorporated into the initial specifications. In short, the contractor initially missing the more stringent HIC 700 that the City specified has led him to offer a solution that is arguably better all around. At the same time, the maintenance guarantee helps ensure the retrofit remains stable.

FISCAL NOTES

None.

RECOMMENDATION

Authorize the Mayor to execute a contract amendment, in a form as prepared by the City Attorney, which incorporates the "Summary" components as identified in the Council Action Sheet, including, but not limited to, the 5-year maintenance guarantee.

AMERICAN RECYCLING CENTER, INC.

655 Wabassee Drive
Owosso, MI 48867

1325 Veterans Road
Columbia, SC 29209

1395 E. Lexington Ave, #100
Pomona, CA 91766

August 19, 2015

To Whom It May Concern:

American Recycling Center, Inc. is a material supplier to the safety surface industry. Since 1993, we have provided quality components for the installation of playgrounds, running tracks, and other rubberized safety surface applications. We currently service the market from three shipping locations; Michigan, South Carolina and California.

This letter is to inform and advise of the current buffing raw material shortages that have impacted this industry nationwide. Playground buffings are recycled as a bi-product from the semi tire retread process. As technology has advanced in this retreading method, the supply of raw buffings has decreased significantly. This shortage is evident across the country leaving playground material suppliers with little to no inventory available.

Due to the shortage in buffings, professionals and installers alike are moving to alternative playground cushion systems. The most common alternative is industrial rubber chunk sized between 1/2" and 5/8" grind. This product is easily approved in specifications because it is fundamentally new (pre-consumer), unused rubber from post-industrial applications.

It is also important to note that the chunk rubber cushion system has been approved and installed for the last 7+ years, as professionals have moved away from tire rubber bi-products in play applications.

If you have any additional questions, please feel free to contact me at any time.

Rochelle Hall Bagwell
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Designation: F1292 – 13

An American National Standard

Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment[1]

This standard is issued under the fixed designation F1292; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Surveys by the United States Consumer Product Safety Commission (CPSC)[2] and others have shown that falls from playground equipment onto the underlying surface are a significant cause of injuries to children. Severe head injuries are the most frequently implicated cause of death in playground equipment-related falls. Use of appropriate impact-attenuating surfacing materials in the use zone of playground equipment can reduce the risk of fall-related injury. In particular, it is believed that the risk of life-threatening head injuries is reduced when appropriate surfacing materials are installed.

This specification specifies impact attenuation performance requirements for playground surfaces and surfacing materials and provides a means of determining impact attenuation performance using a test method that simulates the impact of a child's head with the surface. The test method quantifies impact in terms of *g*-max and Head Injury Criterion (HIC) scores. *G*-max is the measure of the maximum acceleration (shock) produced by an impact. The Head Injury Criterion or HIC score is an empirical measure of impact severity based on published research describing the relationship between the magnitude and duration of impact accelerations and the risk of head trauma. The standard includes procedures allowing surfacing materials to be performance-rated before installation and for installed surfacing materials to be tested for conformance with the specification.

The purpose of this specification is to reduce the frequency and severity of fall-related head injuries to children by establishing a uniform and reliable means of comparing and specifying the impact attenuation of playground surfaces. Its use will give designers, manufacturers, installers, prospective purchasers, owners, and operators of playgrounds a means of objectively assessing the performance of surfacing materials under and around playground equipment and hence of evaluating the associated injury risk.

1. Scope

1.1 This specification establishes minimum performance requirements for the impact attenuation of playground surfacing materials installed within the use zone of playground equipment.

1.2 This specification is specific to surfacing used in conjunction with playground equipment, such as that described in Specifications F1148, F1487, F1918, F1951, and F2075.

1.3 This specification establishes an impact attenuation performance criterion for playground surfacing materials; expressed as a critical fall height.

1.4 This specification establishes procedures for determining the critical fall height of playground surfacing materials under laboratory conditions. The laboratory test is mandatory for surfaces to conform to the requirements of this specification.

1.5 The laboratory test required by this specification addresses the performance of dry surfacing materials.

1.6 The critical fall height of a playground surfacing material determined under laboratory conditions does not account for important factors that have the potential to influence the actual performance of installed surfacing materials. Factors that are known to affect surfacing material performance include but are not limited to aging, moisture, maintenance, exposure to temperature extremes (for example, freezing), exposure to

[1] This specification is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.63 on Playground Surfacing Systems.

Current edition approved Nov. 1, 2013. Published November 2013. Originally approved in 1991. Last previous edition approved in 2009 as F1292 – 09. DOI: 10.1520/F1292-13.

[2] U.S. CPSC Special Study. Injuries and Deaths Associated with Children's Playground Equipment, April 2001. US Consumer Product Safety Commission, Washington DC.

ultraviolet light, contamination with other materials, compaction, loss of thickness, shrinkage, submersion in water, and so forth.

1.7 This specification also establishes a procedure for testing installed playground surfaces in order to determine whether an installed playground surface meets the specified performance criterion.

1.8 The results of a field test determine conformance of installed playground surfacing materials with the criterion of this specification and are specific to the ambient conditions under which the test was performed.

1.9 The impact attenuation specification and test methods established in this specification are specific to the risk of head injury. There is only limited evidence that conformance with the requirements of this specification reduces the risk of other kinds of serious injury (for example, long bone fractures).

NOTE 1—The relative risk of fatality and of different degrees of head injury may be estimated using the information in Appendix X1, which shows the relationships between the Head Injury Criterion (HIC) scores of an impact and the probability of head injury.

1.10 This specification relates only to the impact attenuation properties of playground surfacing materials and does not address other factors that contribute to fall-related injuries. While it is believed that conformance with the requirements of this specification will reduce the risk of serious injury and death from falls, adherence to this specification will not prevent all injuries and deaths.

1.11 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.12 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

F355 Test Method for Impact Attenuation of Playing Surface Systems and Materials

F429 Test Method for Shock-Attenuation Characteristics of Protective Headgear for Football

F1148 Consumer Safety Performance Specification for Home Playground Equipment

F1487 Consumer Safety Performance Specification for Playground Equipment for Public Use

F1918 Safety Performance Specification for Soft Contained Play Equipment

F1951 Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

F2075 Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment

2.2 *SAE Standard:*

SAE J211 Recommended Practice for Instrumentation for Impact Tests[4]

2.3 *Federal Documents:*

U.S. Consumer Product Safety Commission, Publication 325, Handbook for Public Playground Safety

U.S. Consumer Product Safety Commission, Special Study: Injuries and Deaths Associated with Children's Playground Equipment. April 2002

3. Terminology

3.1 *Definitions of Terms Related to Playground Installations:*

3.1.1 *critical fall height (CFH)*—a measure of the impact attenuation performance of a playground surface or surfacing materials; defined as the highest theoretical drop height from which a surface meets the impact attenuation performance criterion specified by this specification. The critical fall height approximates the maximum fall height from which a life-threatening head injury would not be expected to occur.

3.1.2 *designated play surface*—any elevated surface for standing, walking, sitting, or climbing, or a flat surface larger than 2.0 in. (51 mm) wide by 2.0 in. (51 mm) long having less than 30° angle from horizontal.

3.1.3 *fall height*—the vertical distance between a designated play surface and the playground surface beneath it.

3.1.3.1 *Discussion*—Fall heights for specific types of play structure are defined in Specifications F1148, F1487, and F1918.

3.1.4 *playground equipment*—any fixed physical structure installed in a designated play area that is accessible to children for activities such as climbing, swinging, sliding, rocking, spinning, crawling, creeping, or combinations thereof.

3.1.5 *playground surface*—a manufactured or natural material used to cover the ground below playground equipment, including foundations, substrates, and any compliant surfacing materials intended to attenuate impact.

3.1.6 *play structure*—a free-standing structure with one or more components and their supporting members.

3.1.7 *public use playground equipment*—a play structure anchored to the ground or not intended to be moved, for use in play areas of schools, parks, child-care facilities, institutions, multiple-family dwellings, private resorts and recreation developments, restaurants, and other areas of public use.

3.1.8 *surfacing materials*—materials used to cover the surface of the playground use zone.

3.1.8.1 *loose-fill surface*—a compliant top layer of small, independently, movable components; for example, wood fiber,

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

bark mulch, wood chips, shredded foam, shredded rubber, sand, gravel, and so forth.

3.1.8.2 *aggregate surface*—a loose fill surface in which the compliant top layer is made of particulate materials (for example, sand, gravel, crushed marble, slag, cinders, calcined materials).

3.1.8.3 *unitary surface*—a compliant top layer of one or more material components bound together to form a continuous surface; for example, urethane and rubber composites, moulded foam, moulded rubber mats.

3.1.9 *use zone*—the area beneath and immediately adjacent to a play structure or playground equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

3.1.10 *specifier*—person or entity responsible for specifying the performance requirements of a playground surface. (For example an architect, or the prospective purchaser, owner, or operator of a playground.)

3.2 *Definitions of Terms Related to Impact Testing:*

3.2.1 *acceleration*—the rate of change of velocity with time, expressed in units of ft/s^{-2} (m/s^{-2})

3.2.2 *drop height*—height from which the missile is dropped during an impact test, measured as the vertical distance between the lowest point of the elevated missile and surface under test.

3.2.3 *g*—the acceleration due to earth's gravity at sea level, having a standard value of 9.80665 m s^{-2}. The standard value may be approximated as 32.174 ft/s^{-2} (9.807 m/s^{-2}). Accelerations may be expressed in units of *g*'s, where 1 *g* = the acceleration due to gravity.

3.2.4 *g-max*—the maximum acceleration of a missile during an impact, expressed in *g* units.

3.2.5 *head injury criterion (HIC)*—a specific integral of the acceleration-time history of an impact, used to determine relative risk of head injury. See Appendix X1.

3.2.6 *HIC interval*—the time interval within the acceleration-time history of an impact over which the HIC integral is evaluated.

3.2.7 *impact*—contact caused by a moving object (for example, an impact test missile) striking another object (for example, a surface) and during which one or both bodies are subject to high accelerations.

3.2.8 *impact attenuation*—property of a playground surface that, through localized deformation or displacement, absorbs the energy of an impact in a way that reduces the magnitudes of peak impact force and peak acceleration.

3.2.9 *impact test*—a procedure in which the impact attenuation of a playground surface or surfacing materials is determined by measuring the acceleration of a missile dropped onto the surface.

3.2.9.1 *free-fall impact test*—an impact test in which the trajectory of the missile is not restrained by rails, wires, or mechanisms or structures of any type.

3.2.9.2 *guided impact test*—an impact test in which the trajectory of the missile is restrained by rails, wires, or other mechanism or structure.

3.2.9.3 *impact test results*—one or more measured or calculated values from one or more impact tests used to define the impact attenuation of a playground surface or surfacing materials.

3.2.10 *impact test site*—point on the surface of an installed playground surface that is selected as the target of an impact test.

3.2.11 *impact velocity*—the velocity (V_0) of a falling body (for example, a missile) at the instant of impact.

3.2.12 *missile*—a rigid object of specified mass having a hemispherical surface of specified radius; used to impart an impact to a surface (see Fig. 1).

3.2.13 *missile reference plane*—the plane of the flat circular face of the hemispherical missile.

3.2.14 *performance criterion*—limiting values of one or more impact test results used to specify minimum impact attenuation performance.

3.2.15 *reference drop height*—a specification of the theoretical drop height of an impact test.

3.2.16 *reference MEP pad*—a modular elastomer programmer pad with consistent and known impact attenuation properties that is used to verify proper functioning of the impact test equipment.

3.2.17 *reference temperature*—a specification of the temperature conditioning of a surfacing materials on which an impact test is performed.

3.2.18 *sample test point*—point on the surface of a sample selected as the target of an impact test.

3.2.19 *theoretical drop height*—the drop height (*h*) that, under standard conditions, would result in an impact velocity equal to a missile's measured impact velocity (V_0). The standard conditions assume that friction and air resistance do not affect the acceleration of the missile and that the acceleration due to gravity is equal to the standard value of *g* at sea level. In a free-fall impact test, the actual drop height will approximate the theoretical drop height. In a guided impact test, the theoretical drop height will be less than the actual drop height, due to the effects of friction in the guidance mechanism.

3.3 *Definitions of Terms Related to the Measurement of Acceleration:*

3.3.1 *accelerometer*—a transducer for measuring acceleration.

3.3.1.1 *transducer*—the first device in data channel, used to convert a physical quantity to be measured into a second quantity (such as an electrical voltage) which can be processed by the remainder of the channel.

3.3.1.2 *triaxial accelerometer*—a transducer or combination of transducers used for measuring the three vector components of acceleration in three dimensions, relative to three orthogonal spatial axes.

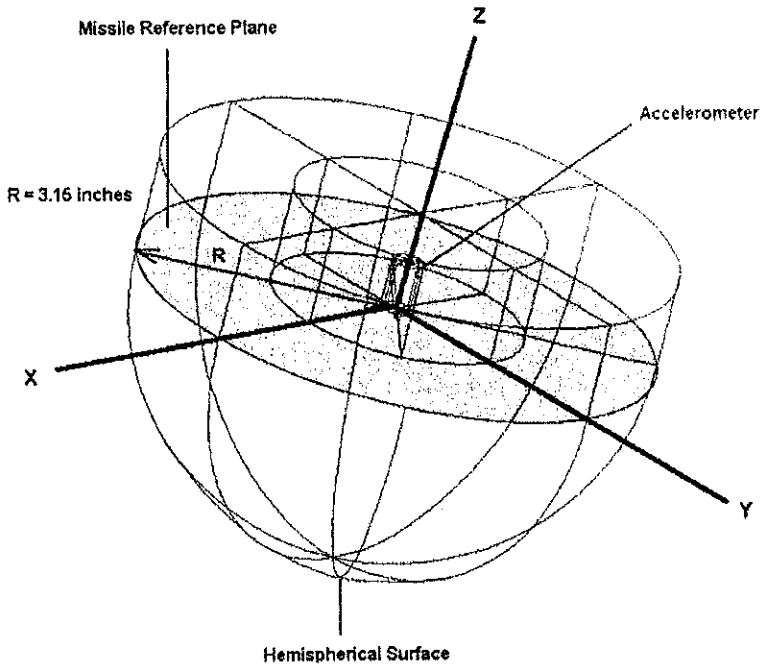


FIG. 1 Missile Reference Plane and Axes

3.3.1.3 *uniaxial accelerometer*—a transducer used to measure the component of acceleration relative to a single spatial axis.

3.3.2 *accelerometer data channel*—all of the instrumentation and procedures used to communicate information about the physical quantity of acceleration from its origin to the point of presentation. The data channel includes all transducers, signal conditioners, amplifiers, filters, digitizers, recording devices, cables and interconnectors through which the information passes and also includes the analytical software or procedures that may change the frequency, amplitude, or timing of the data.

4. Performance Requirements

4.1 *Surface Performance Parameters*—The average *g*-max and average Head Injury Criterion (HIC) scores calculated from the last two of a series of three impact tests shall be used as measures of surface performance.

4.2 *Performance Criterion*—The performance criterion used to determine conformance with the requirements of this specification shall be: a *g*-max score not exceeding 200 g and a HIC score not exceeding 1000.

4.3 *Critical Fall Height of Installed Playground Surfaces:*

4.3.1 The critical fall height of surfaces installed in the use zone of a play structure shall not be less than the fall height of the equipment. The fall height shall be determined as defined by Specifications F1148, F1487, or F1918 for play structures of specific types or in accordance with 3.1.4 of this specification for play structures of unspecified type, unless a higher height is specified.

4.3.2 The critical fall height of the playground surface shall have been determined in accordance with the requirements of Section 13 of this specification, using reference temperatures of 25, 72, and 120°F (-6, 23, and 49°C), surface performance parameters, and the performance criterion.

NOTE 2—The specified temperatures span the range experienced by most playgrounds. If higher or lower surface material temperatures prevail when the playground is used, additional tests at higher or lower temperatures may be specified.

NOTE 3—*Wet/Frozen Test*—The specifier may require that surfacing materials be tested to determine critical fall height under wet or frozen surface conditions, or both. Procedures for wet/frozen conditioning are described in Appendix X5.

4.3.3 The laboratory test used to determine critical fall height shall have been conducted on surfacing material samples identical in design, materials, components, thickness, and manufacture as the installed playground surface.

4.3.4 The laboratory test used to determine critical fall height of materials specified for use in a playground shall have been conducted no more than five years prior to the date of installation of the playground surface.

4.4 *Performance of Installed Playground Surfaces:*

4.4.1 When an installed playground surface is tested in accordance with the requirements of Sections 16 – 19 at the reference drop height, the surface performance parameters at every tested location in the use zone shall meet the performance criteria of this specification. The reference drop height shall be the greater of (*1*) the height specified by the owner/operator prior to purchase, (*2*) the critical fall height specified when the playground surface was installed, (*3*) the equipment fall height, or (*4*) the critical height of the surface at the time of installation.

4.4.2 When an installed playground surface is tested in accordance with this section, if the impact test scores at any tested location in the use zone of a play structure do not meet

the performance criterion, bring the surface into compliance with the requirements of this specification or the play structure shall not be permitted to be used until the playground surface complies.

4.4.3 *More Stringent Specifications*—The specifier is permitted to specify additional impact attenuation performance requirements, providing that such additional performance requirements are more stringent than the performance requirements of this specification.

5. Summary of Test Method

5.1 *Critical Fall Height Test*—The impact attenuation of a playground surface or surfacing materials is measured using an impact test in which a missile is dropped onto the playground surface from a predetermined drop height. The acceleration of the missile during the impact is measured using an accelerometer and associated data recording equipment. The acceleration time history is analyzed to determine *g*-max and HIC scores. For each playground surface sample at each reference temperature and drop height, scores from the second and third of three consecutive drops are averaged to give average scores.

5.2 The critical fall height of surfacing materials is determined by impact testing representative samples at a range of drop heights. The surfacing material is tested at temperatures of 25, 72, and 120°F (-6, 23, and 49°C). The critical fall height is determined as the highest theoretical drop height from which the surface performance parameters meet the performance criterion.

5.3 *Installed Surface Performance Test*—To test whether a playground surface installed within the use zone of a play structure meets the performance criterion of this specification, an impact test is performed in accordance with Sections 16 – 19 using a theoretical drop height equal to or greater than the equipment fall height of the structure. The test is performed under ambient conditions and the results reported.

6. Significance and Use

6.1 The purpose of this specification is to establish minimum impact attenuation requirements for playground surfaces in order to reduce the risk of severe head injury from falls.

6.2 This specification provides a uniform means of quantifying the impact attenuation performance of playground surfaces and is appropriately used to compare the relative performance of different playground surfacing materials.

6.3 This specification is to be used as a reference for specifying the impact attenuation performance of playground surfaces.

6.4 This specification provides a uniform means of comparing the impact attenuation performance of installed playground surfaces with the performance requirements of this specification and with other performance requirements expressed in terms of drop height. Consequently, the specification is appropriately used to determine the actual impact attenuation performance of installed playground surfaces under ambient conditions of use.

6.5 In combination with data relating impact test scores to head injury, the information generated by application of this specification is suitable to estimate the relative risk of a severe head injury due to a fall.

7. Equipment Operator Qualifications

7.1 The equipment operator shall be trained in the proper operation of the test equipment by a competent agency.

8. Test Apparatus

8.1 *Temperature Measuring Device*—The thermometer, digital temperature gage, or other sensor used to measure surface temperature shall have a functional range of at least from -20 to +130°F (-7 to +54°C), a resolution of 1.0°F (0.6°C), and an accuracy of ±1.0°F (0.6°C). The temperature sensor shall be capable of penetrating the playground surface to a depth of at least one inch.

8.2 *Impact Test System*—A device or system for performing an impact test in which an instrumented missile is dropped onto a playground surface or surfacing material from a predetermined drop height.

8.2.1 *Missile:*

8.2.1.1 The body of the missile shall be made of Aluminum Alloy 6061-T6, finished with a surface roughness of 1000 μin. (25 μm).

8.2.1.2 The missile shall have a hemispherical impacting surface with an external diameter of 6.3 ± 0.1 in. (160 ± 2 mm). The missile is defined as being in a level position when the missile reference plane is uppermost and lies in a horizontal plane.

8.2.1.3 It is possible that the missile will include cavities and additional components required to accommodate the attachment of sensors or to attach a supporting assembly. The form of any cavities or additional components shall be generally symmetrical about the *Z*-axis of the level missile such that center of mass lies within 0.08 in. (2 mm) of the *Z*-axis and the moments of inertia about any two horizontal axes do not differ by more than 5 %.

8.2.1.4 It is acceptable to rigidly attach a supporting assembly (for example, a handle or ball arm) to the missile as a means of connecting it to an external guidance system. The total mass of the drop assembly, which is the combined mass of the missile, accelerometer, and supporting assembly shall be 10.1 ± 0.05 lb (4.6 ± 0.02 kg). The mass of the supporting assembly alone shall not exceed 3.0 lb (1.4 kg).

8.2.1.5 *Missile Axes*—An axis normal to the missile's reference plane, passing through the missile's center of mass, and having its positive direction pointing upwards shall be designated the *Z*-axis. This axis is nominally perpendicular to the surface being tested. Two mutually orthogonal axes lying parallel to the missile reference plane and passing through the missile's center of mass shall be designated the *X*- and *Y*-axes (Fig. 1).

NOTE 4—In this reference frame, the acceleration due to gravity has a negative magnitude and the acceleration of the headform during an impact has a positive magnitude.

8.2.2 *Guidance Mechanism for Guided Impact Tests*—For guided impact tests, it is acceptable for the missile to be connected to low-friction guides (such as monorail, dual rails, or guide wires) using a follower or other mechanism in order

to constrain the fall trajectory of the missile to a vertically downward path. The guidance system must allow the missile to be leveled prior to a drop and must maintain the missile in a level (±5°) attitude during the drop. The guidance mechanism shall be constructed in a manner that does not impede the trajectory of the missile during its fall or during its contact with the surface being tested; other than necessary impedance caused by friction in the guidance mechanism.

8.2.3 *Support Structure for Free-Fall Impact Tests*—For free-fall impact tests, a support structure (for example, a tripod) shall be used to ensure repeatable drop height and location. The support structure shall be sufficiently rigid to support the weight of the missile without visible deformation. The support structure shall be erected in a manner that does not impede the trajectory of the missile during its fall or during its contact with the surface being tested.

8.2.4 *Drop Height Control Mechanism*—The guidance mechanism of 8.2.2 or the support structure of 8.2.3 shall incorporate a means of repeatedly positioning the missile at a predetermined drop height.

8.2.5 *Release Mechanism*—A manual or electronically operated quick-release mechanism shall be provided as a means of initiating a drop of the missile. The operation of the release mechanism shall not influence the fall trajectory of the missile following release.

8.3 *Acceleration Measurement System*—A transducer or transducers and associated equipment for measuring and recording the acceleration of the missile during an impact with an accuracy of within ±1 % of the true value.

8.3.1 *Accelerometers*—An accelerometer shall be rigidly attached at the center of mass of the missile. The sensing axis or axes of the accelerometer shall pass through the center of mass of the missile.

8.3.1.1 For a free-fall test, a triaxial accelerometer is required. The three axes of the triaxial accelerometer shall be aligned (±5°) with the missile's *Z*-, *X*-, and *Y*-axes.

8.3.1.2 For a guided test, it is acceptable to use a single uniaxial accelerometer. The accelerometer shall be rigidly attached at the center of mass of the missile with its axis of sensitivity aligned (±5°) with the missile's *Z*-axis and passing through the center of mass of the missile.

8.3.2 Accelerometers shall have a minimum sensitive range from ±500 g and be capable of tolerating accelerations of at least 1000 g along any axis.

8.3.3 *Accelerometer Calibration*—Accelerometers shall be calibrated by reference to a National Institute of Standards and Technology (NIST) traceable standard using a shaker table to excite a range of frequencies and amplitudes determined suitable by the accelerometer manufacturer. The calibration procedure shall include, as a minimum, the range of frequencies from 20 to 2000 Hz.

8.3.4 Accelerometers shall be recalibrated at a time interval recommended by the equipment manufacturer or every two years, whichever is the lesser time interval.

8.3.5 *Accelerometer Connections*—The means of providing power and signal connections to the accelerometer (for example, a cable) shall be constructed in a manner such that the connecting devices do not influence the trajectory of the missile before or during the impact test.

8.3.6 *Accelerometer Signal Conditioning*—Any signal conditioning of amplifying electronics required for proper operation of accelerometers shall be of a type recommended by the accelerometer manufacturer and shall have impedance and frequency response characteristics that are compatible with the accelerometer. Additional signal conditioning requirements are specified in Annex A1.

8.3.7 *Accelerometer Signal Filtering:*

8.3.7.1 *Anti-aliasing Filter*—To prevent aliasing in the digitized acceleration data, the acceleration signals shall be filtered with an analog low pass filter prior to digitization. The anti-aliasing filter shall have a corner frequency of 5000 ± 500 Hz or a maximum of 0.25 times the single channel sampling rate.

8.3.7.2 *Data Channel Filter*—Digitized data shall be filtered using a 4th order Butterworth Filter appropriate for the data channel specification described in 8.3.14.2 and Annex A1. It is acceptable for an analog filter to be substituted provided it has 4-pole characteristics and conforms to the data channel specification.

NOTE 5—A computer algorithm for the 4-pole digital Butterworth Filter is provided in Appendix X4.

8.3.8 *Recording Device*—A digital recording device such as a digital storage oscilloscope, a dedicated waveform analyzer of a computer equipped with an analog to digital converter shall be used to capture the acceleration time signal produced during an impact. Analog oscilloscopes and other analog recording devices shall not be used.

8.3.9 *Resolution*—The conversion from analog accelerometer signal to digital data shall be accomplished with a digitizer having a resolution of no less that twelve bits spanning the range ±500 g.

8.3.10 *Sample Rate*—Minimum sampling rate of the recording device shall be 20.0 kHz per accelerometer channel. When a triaxial accelerometer is used, three individual digitizers (one per accelerometer axis), each with a minimum sampling rate of 20 kHz is recommended. Alternatively, it is acceptable to use a single digitizer with a minimum sampling rate of 60.0 kHz if simultaneous track and hold amplifiers are provided for each accelerometer axis.

8.3.11 *Capacity*—The digitizer shall be capable of recording and storing data continuously for a minimum of 50 ms, beginning at least 5 ms before onset of the impact and ending no earlier than 5 ms after the cessation of the impact.

8.3.12 *Display*—The recording system shall have the capability of displaying the recorded acceleration-time data in order to allow inspection by the operator. A graphical display is recommended, but a tabular printout or other form of display is acceptable. The display shall allow inspection of all the data points recorded from at least 5 ms before the onset of impact until no less than 5 ms after cessation of the impact. The display shall show acceleration data in a manner that allows inspection of all data points lying in the acceleration range from -10 g to a value that exceeds the maximum recorded acceleration value.

8.3.13 *Accelerometer Data Channels*

8.3.14 *Accuracy*—The accuracy of each data channel shall be such that the maximum acceleration recorded during an impact is within ±1 % of the true value.

8.3.14.1 *Frequency Response*—All acceleration data channels, before signal filtering, shall have a flat frequency response ±0.1 dB in a range extending from below a maximum of 1.0 Hz to above a minimum of 2000 Hz.

8.3.14.2 *Channel Frequency Class*—All acceleration data channels, including signal filtering, shall conform to the requirements of a Channel Frequency Class 1000 data channel, as specified by SAE Recommended Practice J211, with the additional requirement of increased accuracy in the range from 1 to 1000 Hz, as defined in Annex A1.

8.4 *Drop Height Measurement*—A means of repeatably determining the missile's drop height with a resolution of 1 in (25 mm) and to an accuracy of ±1 % of the true value is required.

8.4.1 For a free-fall impact test, the drop height shall be measured directly, prior to release of the missile, using a measuring stick, a steel tape, or other appropriate means where possible. An indirect means of determining the theoretical drop height shall also be used. It is acceptable for such indirect means to comprise the velocity measuring system described in 8.4.2, or a means of measuring the time interval between release of the missile and the onset of impact (the fall time), in which case the time interval shall be determined with a resolution and accuracy of 1.0 ms. Both the measured drop height and the theoretical drop height shall be reported.

8.4.2 For a guided impact test, the theoretical drop height must be determined by measuring the velocity of the missile immediately prior to the onset of an impact; at a point in the missile's trajectory no more than 2.0 in. (51 mm.) above the first point of contact between the missile and the surface under test. The velocity measuring system shall be permitted to consist of a light gate device to measure the time an opaque flag interrupts a light sensor or other appropriate means. The velocity measuring device shall not interfere with or impede the trajectory of the missile and shall be capable of recording impact velocity with a resolution of 0.1 ft s^{-1} (0.03 m s^{-1}) and an accuracy of ±1 % of the true value.

NOTE 6—Since theoretical drop height is proportional to the square of impact velocity, the ±2 % tolerance on drop height measurement and the ±1 % tolerance on velocity measurement are equivalent. For a typical flag and light gate velocimeter to achieve ±1 % accuracy, the flag width must be known to an accuracy of ±0.5 % and the transit time measured with an accuracy of ±20 ms (that is, a timing device with a clock rate of at least 50 kHz is required).

8.5 *Battery-Operated Equipment*—Battery-operated equipment shall have a means of monitoring battery voltage (for example, a voltage gage or indicator).

8.6 *System Integrity Check*—Prior to and following each use, the test apparatus shall be checked for proper operation. The system integrity check shall include, as a minimum, the following steps:

8.6.1 The battery status of each piece of battery-operated equipment shall be checked to ensure adequate power availability and voltage level.

8.6.2 Test the proper operation of the equipment by performing the instrumentation check described in Section 10.

8.7 *Equipment Performance Verification*—In order to conform to the requirement of this specification, testing agencies shall acquire and maintain for inspection the following documentation:

8.7.1 *For Each Accelerometer:*

8.7.1.1 A manufacturer's certificate showing that the accelerometer's frequency response conforms to the requirements of 8.3.5.

8.7.1.2 A calibration certificate from a competent agency showing the accelerometer's sensitive range and the calibration factor to a precision of three significant figures.

8.7.2 *For Each Signal-Conditioning Device*—A manufacturer's certificate showing that the device's frequency response conforms to the requirements of 8.3.14.

8.7.3 *For the Acceleration Measurement System*—Documentation from the manufacturer of the acceleration measurement system certifying that each acceleration data channel conforms to the requirements of this specification. Alternatively, if a testing agency has assembled or manufactured its own acceleration testing system, one method to verify conformance with the requirement of this section is by performing and documenting the results of the tests described in Annex A1.

8.7.4 *For the Drop Height Measurement System*—Documentation from the manufacturer of the drop height or impact velocity measurement system certifying that it conforms to the requirements of this specification. Alternatively, if a testing agency has assembled or manufactured its system, one method to verify conformance with the requirement of this section is by performing and documenting the results of the tests described in Annex A1.

9. Calculation

9.1 *Theoretical Drop Height:*

9.1.1 The theoretical drop height, h, shall be calculated from a measurement of impact velocity, v, using the formula $h = v^2 / 2g$, where g is the acceleration due to gravity.

9.1.2 Alternatively, in a free-fall test, one method to calculate the theoretical drop height, h, s is by a measurement of fall time, t, using the formula $h = ½ gt^2$.

9.1.3 *Resultant Acceleration*—If a triaxial accelerometer is used, the resultant acceleration at each point in the time history of the impact shall be calculated as $A_R = \sqrt{A_x^2 + A_y^2 + A_z^2}$ where A_R is the resultant acceleration and A_x, A_y, and A_z are the accelerations recorded by accelerometers aligned with the X, Y, and Z missile axes.

9.2 *g-max*—The g-max of score is determined as the maximum value of acceleration recorded during an impact. If a triaxial accelerometer is used, g-max shall be determined as the maximum value of the resultant acceleration.

9.3 *Average g-max*—Determine the average g-max score by averaging the g-max score of the second and third of a series of three impact tests.

9.4 *Determination of Missile Angle*—In a free-fall impact test, the angle of the missile at the onset of impact and at the

instant of maximum acceleration shall be calculated. For the purposes of this calculation, the onset of impact shall be the data sample at which the resultant acceleration first meets or exceeds a threshold value of 5 g. The angle shall be calculated from the component accelerations. The cosine of the missile angle shall be calculated as:

$$\cos\left(\theta_{headform}\right) = \frac{A_x}{A_R}$$

9.5 *Head Injury Criterion*[5]—The HIC score of an impact shall be computed as follows:

9.5.1 In the acceleration-time history of the impact, locate the time point T_0 at a point immediately preceding the onset of the impact and the time point T_1 at a point immediately following the cessation of the impact.

9.5.2 For each time interval (t_1, t_2) for which $t_1 \geq T_0$, $t_2 > t_1$ and $t_2 \leq T_1$ evaluate and record the trial HIC integral:

$$\text{Trial HIC}(t_1, t_2) = (t_2 - t_1)\left[\frac{1}{(t_2 - t_1)}\int_{t=t_1}^{t_2} a_t\, dt\right]^{2.5}$$

where:

a_t = acceleration at time t, defined as the resultant acceleration if a triaxial accelerometer is used.

9.5.3 For each time interval (t_1, t_2) calculate and record the trial HIC interval, $t_2 - t_1$.

9.5.4 The HIC score for an impact is determined as the maximum value of all the Trial HIC(t_1, $t2$) scores.

9.5.5 The numerical procedures used to calculate HIC shall provide results that are within ±1 % of the true value.

NOTE 7—A computer algorithm for calculating HIC is provided in Appendix X3.

10. Instrumentation Check

10.1 Check the proper operation of the test apparatus by performing a series of impact tests on a reference MEP pad.

10.2 The reference MEP pad shall be provided by the equipment manufacturer or by another agency capable of ensuring reproducible reference pads and shall have been assigned a reference drop height and a nominal *g*-max score.

10.3 Perform three impact tests on the reference MEP pad from the reference drop height with an interval of 1.5 ± 0.5 min between impacts.

10.4 Determine the average *g*-max score by averaging the *g*-max scores from the second and third drops.

10.5 Compare the average *g*-max score to the nominal *g*-max score provided with the reference MEP pad.

10.6 If the difference between the recorded *g*-max score and the nominal *g*-max score exceeds either the manufacturer's specified tolerance or 5 % of the nominal *g*-max score, the equipment does not conform to the requirements of this specification and shall not be used.

11. Impact Test Procedure

11.1 *Data Recording:*

11.1.1 Determine the test point of the conditioned sample.

11.1.1.1 If the sample has nonuniform properties (due to uneven thickness, seams, fasteners, or other factors) the sample test point shall be the point on the surface of the specimen expected to show the least favorable impact attenuation properties that lies within an area no closer than 3.0 in. (75 mm) to the edge of the sample.

11.1.1.2 If the sample has uniform properties, the sample test point shall be the center of the sample's top surface.

11.1.2 Mount the sample to be tested on a flat, rigid anvil or floor beneath the impact test system.

11.1.3 Align the sample test point with the point of impact of the missile and fix the sample to the anvil or floor using an appropriate means that does not alter the sample's impact attenuation properties (for example, with double-sided adhesive tape).

NOTE 8—Tests with unitary surface samples show that the variability of *g*-max and HIC scores is increased by a factor of four or more if the sample is not fixed to the underlying surface.

11.1.4 Before the first drop in any series, elevate the missile to the reference drop height. For subsequent drops in a series, the missile shall be elevated to the same point, notwithstanding the formation of cavities of other elevation changes in the surface being tested.

11.1.5 Before the first drop in any series, measure and record the drop height.

11.1.6 Release the missile and record the outputs of the acceleration measuring system and the drop height measuring system. If the trajectory of the missile prior to and during impact is impeded by any fixtures, human intervention, or other means, data from the trial shall be discarded.

11.1.7 Record the depth of any cavity in the surface formed by the impact.

NOTE 9—The depth is conveniently determined by measuring the distance between the lowest point of the elevated missile and the surface under test. The cavity depth is the difference between this measurement and the originally measured drop height.

11.2 *Data Check:*

11.2.1 Examine the acceleration display. The recorded acceleration pulse shall conform to the following requirements:

11.2.1.1 The acceleration pulse shall consist of a single primary impact event.

11.2.1.2 Prior to the onset of impact, the recorded acceleration value needs to be 0 ± 2 g.

11.2.1.3 The acceleration waveform needs to descend from its maximum value to a stable value of 0 ± 2 g without overshooting the zero baseline by more than 2 g.

NOTE 10—Excessive overshoot of the acceleration signal after an impact is indicative of transducer or signal processing error. Overshoot is frequently symptomatic of inadequate low frequency response in the accelerometer data channel(s).

11.2.2 If the recorded acceleration pulse does not conform to the specifications of 11.2, the test shall be restarted using a freshly conditioned specimen.

11.3 *Data Analysis:*

[5] Chou, C., and Nyquist, G., "Analytical Studies of the Head Injury Criterion," *SAE Paper No. 740082*, Society of Automotive Engineers, 1974.

11.3.1 Calculate and record the *g*-max and HIC scores.

11.3.2 Calculate and record the theoretical drop height. If the calculated theoretical drop height differs from the measured drop height by more than ±3 in (±76 mm) or by more than ±2.5 % of the measured drop height, data from the trial shall be discarded.

NOTE 11—A difference between theoretical drop height and actual drop height that is greater than the specified margin may indicate an error in measurement of impact velocity, an error in the measurement of fall time, or that the fall of the missile was retarded by excessive friction in the guidance mechanism.

11.3.3 If a free-fall impact test is used, calculate the missile angle at the onset of impact and at the instant of maximum resultant acceleration, in accordance with 9.4. If the calculated missile angle at either point exceeds 10° (that is, the cosine of the missile angle is less than 0.966), data from the trial shall be discarded.

CRITICAL FALL HEIGHT TEST (Laboratory Test)

12. Temperature Conditioning

12.1 The critical fall height of a playground surface or surfacing material shall be determined under laboratory conditions by performing a series of impact tests at reference temperatures of 25, 72, and 120 ± 2°F (-6, 23, and 49 ± 1°C).

12.2 *Temperature Conditioning:*

12.2.1 Samples shall be preconditioned at 50 ± 10 % relative humidity and 72 ± 5°F (23 ± 3°C) for a minimum of 24 h prior to beginning testing.

12.2.2 For testing at each reference temperature, three samples shall be conditioned at the reference temperature ±2°F (±1°C) for a minimum of 8 h. Testing of a sample must be started within 1 min and all tests must be completed within 7 min of the sample's removal from the conditioning environment. If the testing is not started or completed within the specified interval, the sample must be conditioned for an additional 8 h.

12.3 *Temperature Stability Requirements:*

12.3.1 Surface temperature shall be measured using the temperature measuring device specified in 8.1. Temperature measurements shall be made at the sample test point before the first impact and after the third impact in any series. The probe shall be inserted to a minimum depth of 1 in. (25 mm) or 50 % of the thickness of the sample, whichever is least. During testing at the reference temperature of 25°F (-6°C), the temperature of the specimen must not exceed 30°F (-1°C). If the temperature exceeds 30°F (-1°C), the specimen must be reconditioned to the reference temperature for a period of 8 h and the test continued.

12.3.2 During testing at the reference temperature of 120°F (49°C), the temperature of the specimen must not fall below 115°F (46°C). If the temperature falls below 115°F (46°C) the specimen must be reconditioned to the reference temperature for a period of 8 h and the test continued.

13. Unitary Surfaces

13.1 *Number of Specimens*—At least nine specimens of a specific unitary surfacing material shall be submitted for testing, with each sample having minimum surface dimensions of 18 by 18 in. (460 by 460 mm). Each specimen shall represent the compliant components of the playground surface as it is intended to be used in a playground installation, including seams, partitions, corners, fasteners, anchors, or other characteristics that have the potential to result in less than optimal impact characteristics. If a surfacing material is intended for installation in combination with other materials such as wear mats, this combination must be tested as it would be installed.

NOTE 12—Samples larger than the minimum 18 by 18-in. (460 by 460-mm) size may be required to accommodate seams and other characteristics.

13.2 *Sample Preparation*—Samples of unitary surfaces shall be mounted on a concrete floor or flat, steel anvil below the impact test equipment, in accordance with 11.1.3.

13.3 *Performance Parameters*—The performance of an individual sample at each reference temperature and reference height shall be determined by performing three impact tests on the same sample test point from the same drop height using the procedure described in Section 11. The interval between impact tests shall be 1.5 ± 0.5 min. Calculate the average *g*-max and HIC scores by averaging results from the second and third impacts.

13.4 *Critical Fall Height Test*—Determine critical fall height using the procedure described in Section 15.

14. Loose Fill Surfaces

14.1 *Quantity of Sample Material*—The volume of loose-fill surfacing material submitted for testing shall, as a minimum, be twice the volume of material needed to cover an 18 by 18-in. (460 by 460-mm) area to the required depth. It is acceptable to use the same material for testing at more than one drop height or temperature provided that it is restored to its original loose state and reconditioned between tests.

14.2 *Sample Preparation*—Samples of loose-fill surfacing materials shall be contained in a rigid box with an inside dimension of 18 by 18 ± 0.5 in. (457 ± 12 mm) and side walls of sufficient height to hold the loose fill material at the thickness of intended use and to keep the loose fill materials in place during conditioning and testing. The box shall be mounted on a rigid floor or flat anvil below the impact test equipment, in accordance with 11.1.3. The box shall be constructed in a manner that allows the missile to strike the center of the sample. The materials shall be poured to a depth that will allow compaction to a depth representing the in-use condition of the material.

14.3 *Sample Conditioning*—Before any temperature conditioning, loose-fill specimens shall be conditioned using a compactor to apply a uniform pressure of 3.1 ± 0.1 psi (21.1 ± 0.7 kPa) for a period of 1.0 ± 0.1 min. For an 18 by 18-in. (460 by 460-mm) container, the applied force required to achieve this pressure will be 1004 ± 32 lb. Both uncompacted and compacted material depths shall be reported. If a compacted material depth is specified, the laboratory shall determine and report the depth of uncompacted material required to produce a compacted surface of the specified depth.

14.4 *Performance Parameters*—The performance of an individual sample at each reference temperature and reference height shall be determined by performing three impact tests on the same sample test point from the same drop height using the procedure described in Section 11. The interval between impact tests shall be 1.5 ± 0.5 min. Calculate the average *g*-max and HIC scores by averaging results from the second and third impacts.

14.5 *Critical Fall Height*—Determine critical fall height using the procedure described in Section 15.

15. Critical Fall Height Test Procedure

15.1 *Test Procedure:*

15.1.1 At each specified reference temperature; perform the required number of impact tests in accordance with Section 10 to determine performance at the series of reference drop heights. Impact tests at each combination of reference temperature and reference drop height shall be performed on a new sample.

15.1.2 The series of reference drop heights shall consist of an increasing sequence at intervals of 1 ft (0.3 m). Increment the reference drop height until the impact test results do not meet the performance criterion specified in 4.2. As a minimum, impact tests must be performed at theoretical drop heights of 1 ± 0.5 ft (0.30 ± 0.15 m) above and 1 ± 0.5 ft (0.30 ± 0.15 m) below the theoretical drop height at which the impact test results approximates the limiting performance criterion.

15.1.2.1 Record the average theoretical drop height, average *g*-max score and average HIC score at each combination of reference temperature and reference fall height.

15.2 *Critical Fall Height*—The critical fall height of the playground surface or surfacing material shall be determined as the maximum theoretical drop height at which impact test results meet the performance criterion at all of the reference temperatures and shall be rounded to the nearest whole foot (0.3 m) equal to or below the actual value.

NOTE 13—*Critical Fall Height Test—Wet and Frozen Surfaces*—Critical fall height may be determined using additional tests performed under simulated wet or frozen surface conditions, or both. The conditioning procedures are described in Appendix X5, in addition to those described in Sections 11 – 14.

INSTALLED SURFACE PERFORMANCE TEST (Field Test)

16. Test Site Selection

16.1 To determine whether an installed playground surface meets the requirements of this specification, a minimum of three different impact test sites in the use zone of each play structure shall be tested using the impact test procedure described in Section 19.

16.2 For each play structure served by the playground surface, a minimum of three impact test sites shall be selected. When play structures have overlapping use zones, test sites in the overlapping regions shall be permitted to be used for all applicable play structures. Where there is more than one type of surfacing material system in use, then each material shall be tested at a minimum of three test sites.

16.2.1 Each impact test site shall be within the use zone of the play structure.

16.2.2 The impact test sites selected shall include any sites expected to have the least impact attenuation. Examples of areas that can be expected to have less impact attenuation (that is, higher *g*-max and HIC scores) include high traffic areas; areas where the playground surface is thin or compacted; areas containing partitions, corners, fasteners, or anchors; and areas contaminated with other materials.

NOTE 14—Test site selection should also consider the potential effects of ambient conditions on impact attenuation. For example, surfacing materials of different colors may absorb and lose heat at different rates. Under some conditions, temperature sensitivity may cause otherwise identical surfacing materials of different colors to have different impact attenuation.

17. Unitary Surfaces

17.1 *Test Site Conditioning*—The playground surface shall be tested in an as-found condition and no conditioning or preparation is required.

17.2 *Performance Parameters*—Determine the performance of each impact test site by performing three impact tests on the same test point using the procedure described in Section 19. The interval between impact tests shall be 1.5 ± 0.5 min. Calculate the average *g*-max and HIC scores by averaging results from the second and third impacts.

18. Loose-Fill Surfaces

18.1 *Test Site Conditioning*—Each intended test site shall be conditioned by impacting four times with a 10 by 10-in. (250 by 250-mm) square hand tamper having a mass of 15.5 ± 0.5 lb (7 ± 1.1 kg), dropped from a height of 24 ± 1 in. (600 ± 25 mm). The tamper shall be dropped in a manner that causes it to land flat, creating a flat and approximately square impression in the surface.

18.2 *Performance Parameters*—Determine the performance of an individual impact test site by performing three impact tests on the same test point using the procedure described in Section 19. The interval between impact tests shall be 1.5 ± 0.5 min. Calculate the average *g*-max and HIC scores by averaging results from the second and third impacts.

19. Installed Surface Performance Test Procedure

19.1 *At Each Test Site:*

19.1.1 The surface temperature shall be measured using the temperature measuring device specified in 8.1. Temperature measurements shall be made at the sample test point before the first impact and after the third impact in any series. The probe shall be inserted to a minimum depth of 1 in. (25 mm) or 50 % of the thickness of the sample, whichever is least.

19.1.2 When an installed playground surface is tested in accordance with the requirements of Sections 16 – 19 of this specification at the reference drop height the surface performance parameters at every tested location in the use zone shall meet the performance criteria of this specification. The reference drop height shall be the greater of (*1*) the height specified or agreed to by the owner/operator prior to purchase, (2) the critical fall height specified when the playground surface was

installed, (3) the equipment fall height, or (4) the critical height of the surface at the time of installation.

19.2 Perform the system integrity check specified in 8.6.2 within 24 h of the test.

19.3 At each selected test site:

19.3.1 Align the test device so that the missile will impact the selected impact test site at the same location for the required number of drops. The device supporting the missile (for example, a tripod) shall be capable of ensuring that each drop takes place from the same reference drop height.

19.3.2 Perform the specified number of impact tests using the impact test described in Section 11.

19.3.3 Determine the average *g*-max and HIC scores of each impact test site.

19.3.4 Record the drop height, and average *g*-max and HIC scores calculated in accordance with 17.2 or 18.2.

19.3.5 Record the surface temperature indicated by the temperature measuring device.

20. Report

20.1 All reports shall include the following information:

20.1.1 *Requesting Agency Information:*

20.1.1.1 The name, address, and telephone number of the person or entity requesting the test.

20.1.2 *Testing Agency Information:*

20.1.2.1 The name, address, and telephone number of the testing agency.

20.1.2.2 The name and signature of the test operator.

20.1.2.3 Date(s) tests were performed.

20.1.2.4 Date of the report.

20.1.3 *Description of the Test Apparatus:*

20.1.3.1 Test equipment type and manufacturer.

20.1.3.2 Date of most recent accelerometer calibration certificate.

20.1.4 *Test Results*—The following shall be reported for each series of impact tests:

20.1.4.1 Whether the sample was dry, wet, or frozen.

20.1.4.2 The ambient air temperature, reference temperature, and surface temperature measured after the final drop in each series.

20.1.4.3 The drop height, impact velocity or fall time, and the theoretical drop height.

20.1.4.4 The *g*-max and HIC scores for each drop and the average *g*-max and HIC scores for the last two drops of each series.

20.2 *Laboratory Test for the Determination of Critical Fall Height*—The report shall also include the following information:

20.2.1 *Description of Samples:*

20.2.1.1 The number of samples submitted.

20.2.1.2 The name of the person or entity that manufactured the samples.

20.2.1.3 The commercial name of playground surface product, if one exists.

20.2.1.4 Date of sample manufacture.

20.2.1.5 Date of sample receipt by testing agency.

20.2.1.6 Any discrepancies between the samples and any description thereof provided by the manufacturer or requestor of the test.

20.2.2 *Description of Sample Materials and Construction:*

20.2.2.1 The description of the test sample shall be sufficiently detailed to distinguish differences in structure and materials that have the potential to affect performance. The description shall include, as a minimum, a description of the composition of each layer of the specimens, and the thickness of each layer to the nearest 0.1 in. (0.25 cm).

20.2.2.2 For surfacing incorporating loose-fill materials, the description shall include the type and approximate size or size distribution of particulate materials (for example, sand, gravel, crushed marble, rubber buffings, rubber crumb, wood chips, or bark mulch) in each layer.

20.2.2.3 Surfacing materials shall only be permitted to be described as "Engineered Wood Fiber" if they conform to the requirements of Specification F2075 and reference is made to an acceptable certificate or other documentation of such conformance.

20.2.2.4 For unitary surfacing materials, the sample description shall include the design and material composition of any prefabricated components (for example, rubber or plastic tiles), and the manufacturer's name or designation of the component, or both.

20.2.3 *Test Outcome*—The critical fall height, expressed to the nearest whole foot equal to or below the measured value.

20.2.4 *Statement of Specificity*—The following statement: "The results reported herein reflect the performance of the described samples at the time of testing and at the temperature(s) reported. The results are specific to the described samples. Samples of surfacing materials that do not closely match the described samples will perform differently."

20.3 *Field Test of Conformance with Performance Requirements*—The report shall include the following information:

20.3.1 *Description of the Playground Surface:*

20.3.1.1 The address of the test site.

20.3.1.2 The commercial name of the playground surface product, if one exists.

20.3.1.3 A description of the type and composition of the surfacing materials.

20.3.1.4 Names, addresses, and phone numbers of the manufacturer, supplier, and installer of the playground surface, to the extent they are available.

20.3.1.5 The area covered by the playground surface.

20.3.2 *Description of Each Use Zone:*

20.3.2.1 A description of the play structure in each use zone tested.

20.3.2.2 The location of test sites relative to the play structure in each use zone tested.

NOTE 15—Appropriately annotated photographs are an acceptable means of describing play structures and test sites.

20.3.2.3 The depth of any loose-fill surfaces or the thickness of any unitary surfaces, if known or measurable.

20.3.2.4 If a compaction procedure was used, the depth of the material both before and after compaction shall be reported.

20.3.2.5 The condition of the playground surface, including observations of excessive wear, moisture content, and so forth.

20.3.3 *Test Outcome*—A statement as to whether or not the test sites conformed to the performance specifications of this specification.

20.3.4 *Statement of Specificity*—The following statement: "The results reported herein reflect the performance of the tested playground surface at the time of testing and at the temperature(s) and ambient conditions reported. Performance will vary with temperature, moisture content, and other factors."

20.4 *Summary Report*—The preparation of a summary report is acceptable provided both the testing agency and the entity requesting the test retain copies of a complete report conforming to 20.1 – 20.3.

20.4.1 All summary reports shall include Requesting Agency Information (see 20.1.1.1) and Testing Agency Information (see 20.1.2)

20.4.2 Summary reports of laboratory tests shall also include:

20.4.2.1 The commercial name and a brief description of the surfaces tested.

20.4.2.2 The average thickness of the surfaces tested.

20.4.2.3 For each reference temperature or wet or frozen condition, or both: the average theoretical drop height, average *g*-max score, and average HIC score of the impact test series with the highest conforming scores.

20.4.2.4 The critical fall height, expressed to the nearest whole foot equal to or below the measured value.

20.4.2.5 A statement of specificity (see 20.3.4).

20.5 Summary reports of field tests shall also include:

20.5.1 A description of the playground surface according to 20.3.1 but optionally excluding the requirements of 20.3.1.4.

20.5.2 The highest average *g*-max and average HIC scores recorded in any use zone.

20.5.3 The test outcome (see 20.3.4).

20.5.4 For each use zone that did not meet the requirements of this specification:

20.5.4.1 The location of the use zone.

20.5.4.2 The highest average *g*-max and average HIC scores recorded in the use zone.

20.5.5 A statement of specificity (see 20.3.4).

21. Precision and Bias

21.1 A statement of bias cannot be made because no absolute reference samples exist.

21.2 Appendix X1 describes the relative contributions of different kinds of measurement error to errors in *g*-max, HIC, and critical fall height.

21.3 In a preliminary interlaboratory study, three samples (two reference MEP pads and a unitary surface sample) were tested by five laboratories, using a total of seven different impact test systems. Based on this study the interlaboratory reproducibility limit of the test method is estimated to be ±5 % for g-max and ±10 % for HIC. The estimate assumes that laboratories will conform to the equipment requirements of this specification and that the tested specimen has minimal inherent variability.

21.4 An interlaboratory study was conducted in 1996-97. Seven laboratories performed pairs of tests on eight surface materials using Test Method F355, Procedure C. The same laboratories also ran pairs of tests on the same surface materials using the free-fall test method. In both series of tests, *g*-max and HIC values were determined. From the results of these tests, precision statistics were calculated in compliance with Practice E691. The samples used in this test were actual playground surfacing materials, including loose-fill surfacing materials, rather than reference surfaces. Therefore, the reported precision includes variability due to the samples as well as variability due to the test method itself.

NOTE 16—Based on preliminary interlaboratory testing performed during the development of this specification, the precision of the test method in this specification is estimated to be ±5 % for *g*-max and ±10 % for HIC. In other words, future test results; intralaboratory or interlaboratory, laboratory or field, may be expected in a range from -5 to +5 % of the *g*-max result, and from -10 to +10 % of the HIC result. (For example, a 180 *g*-max indicates a *g*-max range of 171 to 189. A900 HIC indicates an HIC range of 810 to 990.) Users of this specification should be aware of this fact when establishing critical fall height.

22. Keywords

22.1 critical fall height; head impact; head injury criterion; HIC; impact; impact attenuation; impact test; injury; play; playground; play structure; shock; surface

TABLE 1 Precision Statistics for g-max[A]

Material	Average	Repeatability Standard Deviation (Sr)	Reproducibility Standard Deviation (SR)	Repeatability Limit (r)	Reproducibility Limit (R)
D	53.4	4.8	8.6	13.5	24.1
E	57.2	10.1	11.2	28.2	31.4
H	104.1	3.9	7.4	10.8	22.6
A	121.5	2.4	7.9	6.6	22.0
C	146.4	3.8	8.9	10.5	24.8
G	186.9	10.5	13.1	29.3	36.7
B	207.5	5.3	15.5	14.7	43.3
F	240.7	7.1	16.1	19.8	45.1

[A] Average of Test Method F355 Procedure C and Free-Fall Test Method of Specification F1292.

TABLE 2 Precision Statistics for HIC[A]

Material	Average	Repeatability Standard Deviation (Sr)	Reproducibility Standard Deviation (SR)	Repeatability Limit (r)	Reproducibility Limit (R)
D	144.7	19.1	33.1	53.4	92.7
E	166.0	46.6	63.6	130.4	178.1
H	592.7	24.3	95.3	67.9	266.9
A	592.9	80.6	123.7	225.7	346.2
C	749.0	28.8	107.2	80.7	300.0
G	1 212.0	59.9	185.9	167.6	520.5
B	1 381.5	110.1	191.4	308.1	535.9
F	1 849.0	156.6	293.5	438.5	821.7

[A] Average of Test Method F355 Procedure C and Free-Fall Test Method of Specification F1292.

ANNEX

(Mandatory Information)

A1. INSTRUMENTATION VERIFICATION PROCEDURES

A1.1 In order to meet acceptable levels of interlaboratory and intralaboratory repeatability and reproducibility, the instrumentation used to make tests in accordance with this specification must meet specific requirements for resolution, accuracy, precision, and calibration. Differences in instrumentation among laboratories have been identified as a major cause of poor reproducibility. This annex describes procedures for verifying that instrumentation conforms to the requirements of this specification.

A1.2 It is a requirement of this specification that testing agencies retain documentation demonstrating that the frequency response, accuracy, and resolution of the instrumentation conform to the requirements of this specification. Options include documentation in the form of calibration certificates or metrology laboratory reports.

A1.3 *Accelerometer Data Channel Verification—End-to-End Calibration*—The frequency response of accelerometers, signal conditioners, data acquisition devices, and so forth, can be determined from calibration certificates. However, the frequency response of the combination of these devices is unknown, because the interconnecting cables, connectors, and other components of the system can affect the frequency response. (These extraneous effects can often be minimized by using compatible components from the same manufacturer.) It is recommended that the accelerometer data channel be calibrated using an end-to-end calibration procedure of the whole data acquisition and processing system. It is recommended that this procedure be performed by an accredited metrology laboratory. To conform to the requirements of this specification, the frequency response of the system needs to fall within the limits shown in Table A1.1 and Fig. A1.1.

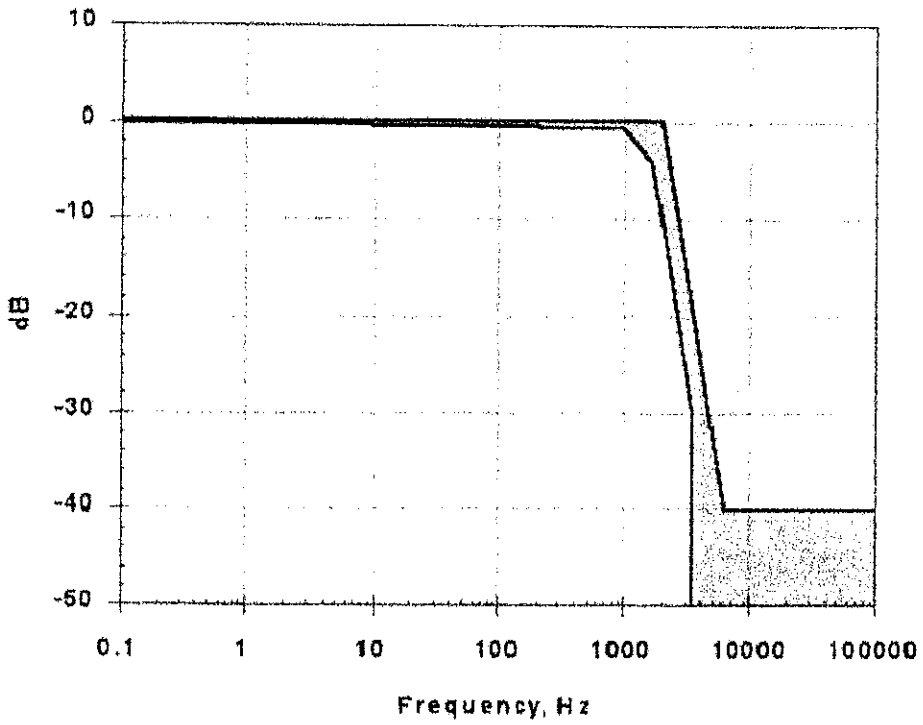
TABLE A1.1 Limits of Modified CFC 1000 Data Channel Dynamic Accuracy

Frequency, Hz	Dynamic Accuracy	
	dB, Min	dB, Max
0.1	-0.1	0.1
1	-0.1	0.1
100	-0.1	0.1
1 000	-0.2	0.1
1 650	-4	0.1
2 000	-10	0.1
3 500	-30	-19.4
5 000		-31.7
10 000		-55.7

A1.4 *Accelerometer Data Channel—Minimum Verification Requirements*—If an end-to-end calibration is not performed, testing agencies shall, as a minimum, determine that their test apparatus conforms to the low-frequency response and accuracy requirements of this specification by performing the following tests:

A1.4.1 *Accelerometer Low-Frequency Response (Time Constant) Test*—The purpose of this test is to determine that the accelerometer, signal conditioner, and analog filter have a sufficient response at low frequencies. It is acceptable to specify the required low-frequency response (8.3.14.1) in terms of minimum time constant of 2.0 s. Appendix X2.2 describes the effects of an improper time constant on accelerometer signals. To measure the time constant, perform the following procedures:

A1.4.1.1 Connect the accelerometer signal normally input to the data acquisition system to a recording device (for example, a digital oscilloscope or computer data acquisition system). This signal needs to represent the resultant output of the accelerometer signal conditioner and analog filter, as shown in Fig. A1.2. The data recording device needs to be capable of recording across the whole output range of the signal conditioner with a resolution of ±1 mV, for a minimum of 10 s at a



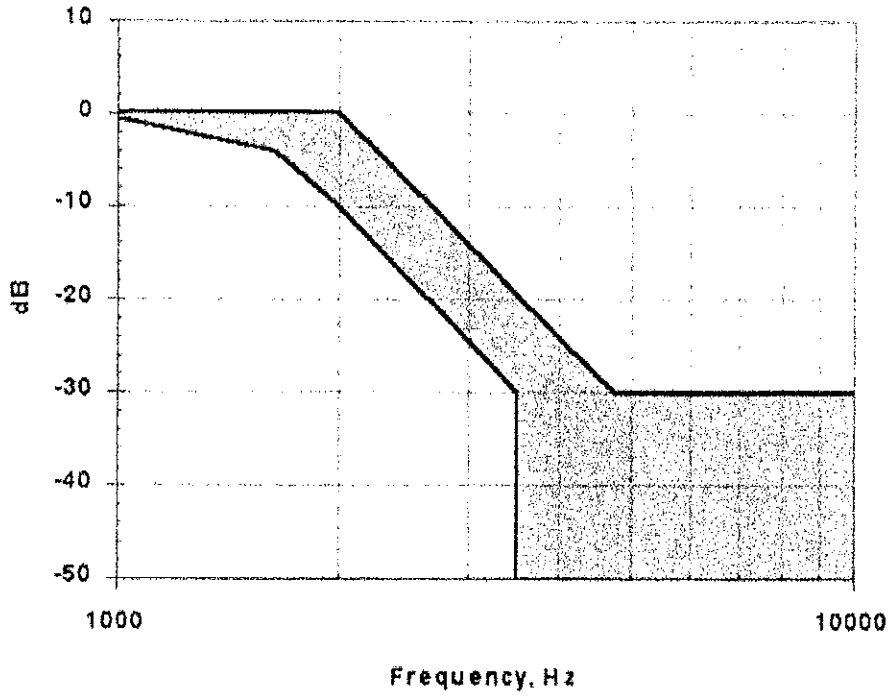


FIG. A1.1 CFC 1000 Data Channel Dynamic Accuracy

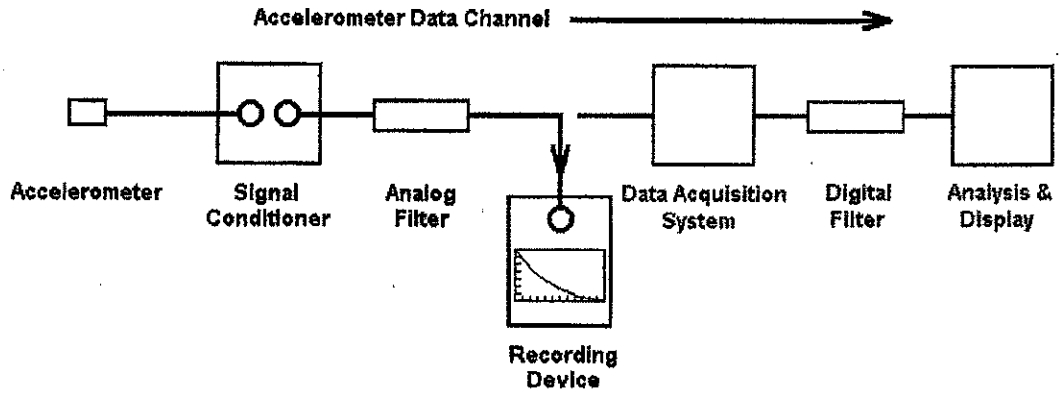


FIG. A1.2 Schematic of the Time Constant Test

minimum sample rate of 100 s^{-1}. The accelerometer shall be fixed and not subject to motion or vibration while measurements are made.

A1.4.1.2 Turn on the signal conditioner, recording device and other necessary electronics, allowing them to warm up, as recommended by the manufacturers.

A1.4.1.3 Prepare the recording device to receive the signal. Turn off the signal conditioner. After 5 ± 1 s turn on the signal conditioner and record the output for a minimum of 10 s. It is possible that a longer recording time will be required to obtain a satisfactory recording.

A1.4.1.4 If the accelerometer, signal conditioner, or analog filter have a finite low-frequency response, the recorded signal will show an exponential decay towards zero as the signal "settles" (Fig. A1.3).

A1.4.1.5 Select two points in the recorded data that fall on the exponential curve and that are separated by a minimum of 2 s and a minimum of one tenth the output range of the signal conditioner (for example, 1.0 V for a ±5 .0-V output range). Record the time and voltage at each of these two points as (T_0,V_0) and (T_1,V_1).

A1.4.1.6 Determine the time constant using the following equation:

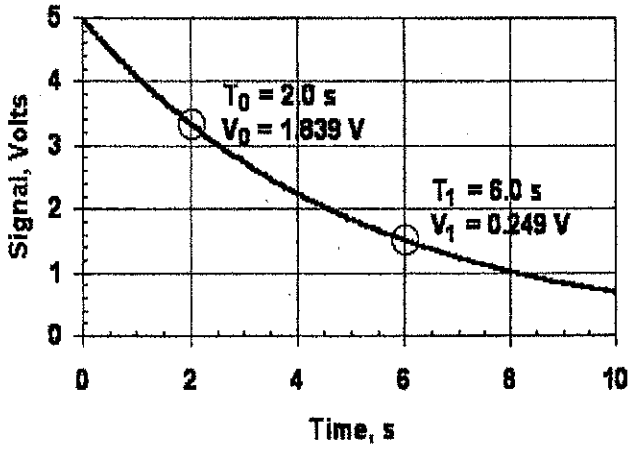


FIG. A1.3 Example Recording from Time Constant Test

$$T_C = -\frac{(T_1 - T_0)}{\log_e (V_1/V_0)}$$

For the example shown in Fig. A1.3:

$$T_C = -\frac{(6.0 - 2.0)}{\log_e (1.839/0.249)} = -\frac{4.0}{\log_e (7.386)} = 2.0 \text{ s}$$

A1.4.1.7 If the measured time constant is less than 2.0 s, the equipment does not meet the frequency response requirements of this specification.

A1.4.2 *Verification of g-max and HIC Calculations Using Known Inputs*—This test determines whether the data acquisition system, digital filter, and calculation procedures of a test system conform to the requirements of this specification. The test requires the accelerometer output to be replaced by a synthesized pulse of predetermined shape, width, and amplitude (Fig. A1.4). Options for generating a pulse include a programmable signal generator, a computer-linked digital to analog converter, or other appropriate means providing the output has a range equivalent to that of the signal conditioner output, a minimum resolution of ±1 mV, and the capability of refreshing the generated signal at a minimum rate of 50 kHz.

A1.4.2.1 The pulse to be generated is a cosine wave of the form:

$$V = A\left(1 - \cos\left(2\pi \frac{t}{T}\right)\right)$$

where:

V = the output voltage,
A = the pulse height (amplitude),
t = time, and
T = target pulse width.

The constant A is calculated from the target g-max and the accelerometer sensitivity (c) used in the calculation of g-max and HIC scores, using the formula:

$$A = c\, g_{max}$$

This function produces a waveform of the type shown in Fig. A1.5 and was selected because of its similarity to real impact waveforms. Also, the function allows HIC scores to be calculated directly from first principles.

A1.4.2.2 To perform the test, take the following steps:

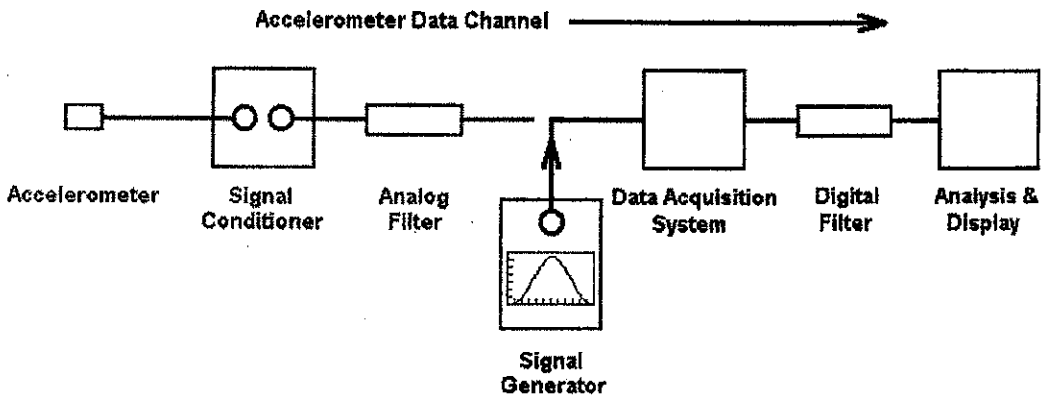


FIG. A1.4 Schematic of the Calculation Verification Test

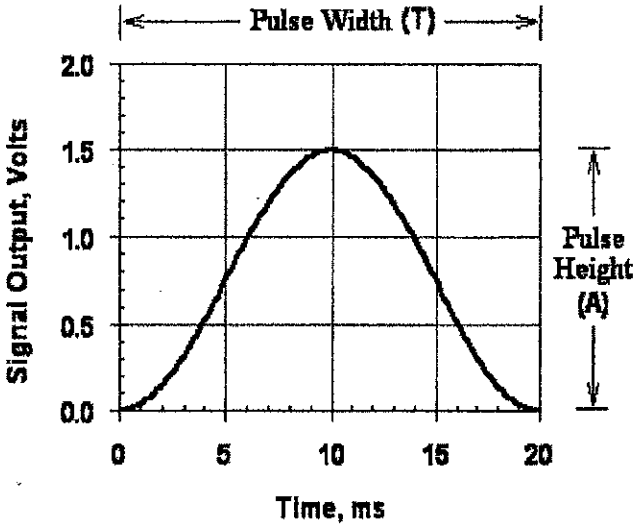


FIG. A1.5 Example of a Synthesized Impact Waveform

(1) Program the signal generating device to produce pulses of the form described in A1.4.2.1. To complete the test, pulses with each of the combination of pulse width (*T*) and the reference g-max score shown in Table A1.2 will be required. In each case, determine the amplitude (*A*) of the waveform by multiplying the reference *g*-max by the accelerometer sensitivity.

TABLE A1.2 Input Waveform Characteristics and Target Scores

Waveform		Target Scores		
Pulse Width (ms)	Reference *g*-max	*g*-max (g)	HIC	HIC Interval (ms)
10.0	100	100	302.9	5.08
10.0	150	150	834.8	5.08
10.0	200	200	1 713.7	5.08
20.0	100	100	605.9	10.15
20.0	150	150	1 669.6	10.15
20.0	200	200	3 427.4	10.15

(2) Connect the output of the signal generator to the input of the data acquisition system.

(3) Prepare the data acquisition system to receive a signal. Send the signal from the signal generator. Acquire and process the acquired data in the normal way.

(4) Record the *g*-max, HIC, and HIC interval scores reported by the test system.

(5) Repeat the test for each of the six combinations of pulse width (T) and reference g-max in Table A1.2.

(6) Compare the *g*-max, HIC, and HIC interval scores produced by the test equipment with the target scores in Table A1.2.

A1.4.2.3 If any recorded value differs from the target value by more than ±1 %, the test equipment does not conform to the requirements of this specification.

APPENDIXES

(Nonmandatory Information)

X1. INJURY RISK CURVES

X1.1 Most of what is known about the relationship between impact magnitude and head injury risk comes from experiments using cadavers and human volunteers subject to high accelerations and impacts under laboratory conditions. The data from these experiments form the basis of automotive and aircraft impact protection standards. There has been no research directly relating the magnitude of an impact from a playground fall to the severity of the injuries sustained. We, therefore, rely on data from automotive industry experiments to provide insights into injury risk.

X1.2 Fig. X1.1 shows the probability of different degrees of injury occurring as a result of impacts with a given HIC score. These "Expanded Prasad/Mertz Curves" are based on data from cadaver experiments in which the relationship between HIC scores, skull fracture, and brain damage were observed.[6,7] The two solid curves in this figure show the probabilities of no injury and of fatal head injury. Broken lines show the probability of minor, moderate, and critical head injuries, defined as follows:

X1.2.1 *Minor Head Injury*—A skull trauma without loss of consciousness; fracture of nose or teeth; superficial face injuries.

X1.2.2 *Moderate Head Injury*—Skull trauma with or without dislocated skull fracture and brief loss of consciousness. Fracture of facial bones without dislocation; deep wound(s).

X1.2.3 *Critical Head Injury*—Cerebral contusion, loss of consciousness for more than 12 h with intracranial hemorrhaging and other neurological signs; recovery uncertain.

X1.3 As an example of how Fig. X1.1 is interpreted; if a person experiences a head impact equivalent to a HIC score of 500, there is a 79 % chance that they will suffer a minor injury. At 38 %, the risk of a moderate injury at this HIC level is also significant. The risk of this impact producing a severe or fatal head injury is very low, however. It is also notable that the chance of experiencing a 500 HIC impact without suffering an injury of any kind is only 21 %.

X1.4 *Discussion*—HIC injury risk curves should be interpreted cautiously in the context of injuries resulting from playground falls. The data on which the Prasad/Mertz Curves are based are from adult cadavers subjected to frontal impact. The extent to which this data is valid for children experiencing non-frontal impacts to the head is not known. Also, a rigid missile such as that specified by this specification produces HIC scores that are somewhat higher than those generated by a cadaver or a headform with lifelike properties.[8] HIC scores determined in accordance with this specification will overestimate the probability and severity of head injury if they are interpreted using Fig. X1.2, will tend to be overestimated. Consequently, the criteria established by this specification are more conservative than if a lifelike headform were used. The more conservative criteria are warranted by the absence of specific data for the head injury tolerance of children falling from playground equipment and by the fact that the limiting HIC score of 1000 is set at the threshold of fatal injury risk. As the Prazad-Mertz curves show, a 1000 HIC criterion limits the probability of a fatal injury, but still infers a significant risk of severe, non-fatal injury. The probability of experiencing a 1000 HIC impact with no injury is very low (less than 1 %).

[6] National Highway Traffic Safety Administration (NHTSA), Department of Transportation., 1997, FMVSS201, Head Impact Protection, 49 CFR 571.201.

[7] Prasad, P. and Mertz, H. J., "The Position of the United States Delegation to the ISO Working Group on the Use of HIC in the Automotive Environment," *SAE Paper No. 851246*, Society of Automotive Engineers, Warrendale PA, 1985.

[8] Saczalski, K.J., States, J.D., Wagar, I.J, Richardson, E.Q., A Critical Assessment of the Use of Non-Human Responding Surrogates for Safety System Evaluation. SAE Paper # 760805, 1976, Society of Automotive Engineers, Warrendale PA.

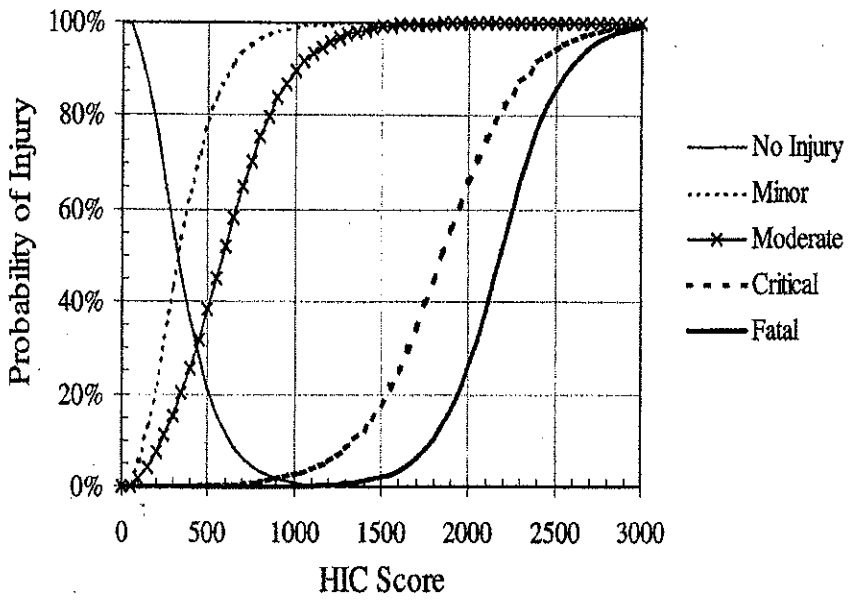
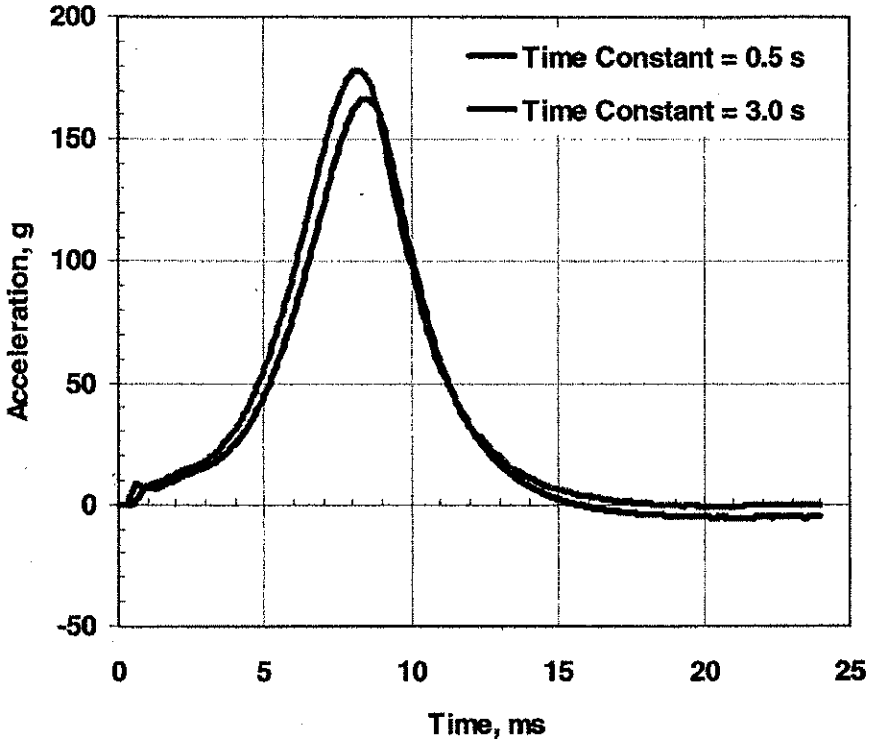


FIG. X1.1 Probability of Specific Head Injury Level for a Given HIC Score



NOTE 1—Acceleration-time curves from two accelerometers mounted on the same missile during an impact. The accelerometer with the short (0.5 s) time constant overshoots the baseline by more than 5 g after the impact and underestimates the *g*-max score by 11.5 g (6 %), compared to the accelerometer with an appropriate (3 s) time constant.

FIG. X1.2 Effects of Accelerometer Time Constant

X2. EFFECTS OF MEASUREMENT ERRORS

X2.1 This appendix documents the sensitivity of test results to different sources of measurement error.

X2.1.1 The sensitivity and error estimates were calculated using a model of the impact test. The model assumes a Hertzian impact between a rigid hemispherical headform dropped from eight feet and a linear elastic surface with properties such that *g*-max = 200 g.

X2.1.2 Table X2.1 shows the effect of ±1 % error in each component measurement on *g*-max, HIC, and CFH measurements. For example, a 1 % deviation in the missile radius results in a 0.2 % error in *g*-max, and 0.5 % error in HIC and CFH results. It is notable that any error in *g*-max is amplified in the calculation of HIC by a power of 2.5. Errors in CFH are greater than those in *g*-max and HIC because the relationship between *g*-max, HIC, and CFH. Also, the process of determining CFH compounds errors in HIC and velocity measurements, making it more sensitive to small errors. In general, test results are least sensitive to discrepancies in missile mass and geometry. Results are especially sensitive to errors in the components of impact velocity measurement. If a flag/photogate system is used, a 1 % error in either the flag width measurement or the transit time (Δt) causes an error more than 4 % in the critical fall height estimate. In a free-fall test, a 1 % error in the measurement of fall time causes a 10.8 % error in critical fall height.

X2.1.3 Table X2.2 shows the error in each component measurement that results in an error of ±3 in. in the calculated CFH.

X2.1.4 Table X2.3 shows the of the measurement tolerance limits specified by this specification on errors in *g*-max, HIC, and CFH results. The values shown assume a test with a fall height of 8 ft and a *g*-max score of 200 g. While tolerances of ±1 % are specified for acceleration and impact velocity measurements, any error in these measurements is amplified (by a power of two or greater) in the calculation of HIC and CFH. Consequently, the ±1 % tolerance implies that either measurement could contribute to an error of ±2.5 % in CFH Measurement. If both acceleration and impact velocity (or drop height) are at the limits of their specified tolerances a total error of up to ±10 % in CFH Measurement is possible.

X2.2 *Accelerometer Time Constant*:

X2.2.1 Differences in accelerometer time constant of have been identified as a major source of interlaboratory variability. The time constant determines the low frequency response of the accelerometer to mechanical inputs, with longer time constants indicating better low frequency response. A very short time constant (~0 s) results in ac response and the accelerometer is insensitive to constant or slowly changing inputs. A very long time constant (>10 s) indicates near-DC response and the accelerometer is sensitive to low frequencies, including those that vary little with time.

X2.2.2 This specification requires linear accelerometer sensitivity down to 1 Hz or below. An accelerometer with a time constant of 2 s or greater and appropriate signal conditioning will generally meet this requirement. Typically, accelerometers are manufactured for the purposes of measuring vibration, and have shorter time constants (<1 s) than the minimum required for the impact acceleration measurements required by this specification. Many accelerometers must be modified by the manufacturer in order to be conform to the requirements of this specification. As shown in Fig. X1.1, an accelerometer with a time constant that is too low produces a characteristic signal, tending to "overshoot" the zero baseline after the impact. The lack of appropriate low-frequency response also results in the underestimation of *g*-max and HIC scores.

X2.3 *Interval Between Impacts*—Variations in the time needed to conduct the test result in variable levels of recovery of the material during the room temperature tests. This variation is accentuated in non-room temperature tests by the addition of changing temperature conditions within the sample to the variable recovery of the material.

X2.4 *Impact Velocity*—Variations in the impact velocity brought about by changes in drop height or friction in the drop guidance mechanism.

X2.5 *Missiles*—Use of missiles other than those referenced in this specification may cause substantial variations in results. Missile with masses greater than the specified range will result in lower *g*-max and HIC scores.

TABLE X2.1 Effects of a 1 % Measurement Errors on g-max, HIC, and Critical Fall Height Results

Component Measurement	Missile		Acceleration	Flag Width	Velocimeter	Fall Time	Impact Velocity	Drop Height
	Mass lb	Radius in.	g	in.	Δt ms	s	fps	ft
Nominal value	10.12	3.15	200	1.00	0.0037	1.188	22.70	8.00
±1 % error	±0.10	±.03	±2.0	±0.01	±0.00004	±0.012	±0.23	±0.08
Error in ...								
g- max	±0.4 %	±0.2 %	±1.0 %	±1.2 %	±1.0 %	±2.5 %	±1.2 %	±0.6 %
HIC	±1.0 %	±0.5 %	±2.5 %	±3.0 %	±2.5 %	±6.4 %	±3.0 %	±1.5 %
Critical fall height	±1.0 %	±0.5 %	±4.9 %	±5.1 %	±4.4 %	±10.8 %	±5.1 %	±2.5 %

TABLE X2.2 Magnitude of Measurement Error Giving ±3 In. Error in Critical Fall Height Results

Component Measurement	Missile		Acceleration	Flag Width	Velocimeter	Fall Time	Impact Velocity	Drop Height
	Mass lb	Radius in.	g	in.	Δt ms	s	fps	ft
Nominal value	10.12	3.15	200	1	0.0037	1.188	22.7	8
% error	±3.0 %	±6.3 %	±1.0 %	±0.5 %	±0.5 %	±0.3 %	±0.6 %	±1.2 %
Abs error	±0.31	±0.20	±2.0	±0.006	±0.00002	±0.004	±0.14	±0.10
Error in ...								
g-max	±1.2 %	±1.2 %	±1.0 %	±0.7 %	±0.7 %	±0.7 %	±0.7 %	±0.7 %
HIC	±3.1 %	±3.1 %	±2.0 %	±1.9 %	±1.9 %	±1.9 %	±1.9 %	±1.9 %
Critical fall height	±3.1 %	±3.1 %	±3.1 %	±3.1 %	±3.1 %	±3.1 %	±3.1 %	±3.1 %
Critical fall height	±3 in.	±3 in.	±3 in.	±3 in.	±3 in.	±3 in.	±3 in.	±3 in.

TABLE X2.3 Effects of a Specified Measurement Tolerances on g-max, HIC, and Critical Fall Height Results

Component Measurement	Missile		Acceleration	Flag Width	Velocimeter	Fall Time	Impact Velocity	Drop Height
	Mass lb	Radius in.	g	in.	Δt ms	s	fps	ft
Nominal value	10.12	3.15	200	1	0.0037	1.18	22.7	8.0
Tolerance	0.1	0.05	1.0	0.005	0.00002	0.001	0.227	0.2
% Tolerance	±1 %	±2 %	±1 %	±0.5 %	±0.5 %	±0.1 %	±1.0 %	±2.0 %
Error in ...								
g-max	±0.4 %	±0.4 %	±1.0 %	±0.6 %	±0.6 %	±0.5 %	±1.2 %	±1.5 %
HIC	±1.0 %	±1.0 %	±2.5 %	±1.5 %	±1.5 %	±0.9 %	±3.0 %	±3.0 %
Critical fall height	±1.0 %	±1.0 %	±4.2 %	±2.5 %	±2.5 %	±3.2 %	±5.1 %	±5.1 %
Critical fall height	±1.0 in.	±1.0 in.	±4.1 in.	±2.4 in.	±2.4 in.	±3.1 in.	±4.9 in.	±4.9 in.

X3. COMPUTER ALGORITHM FOR CALCULATING HIC

X3.1 The following example pseudo-code computes the HIC score of an acceleration pulse to within 0.5 % of theoretical values. For clarity, the program has been written as a procedure, with filtered input data and results passed as global variables. It is also assumed that the data presented to the routine has already been filtered.

```
// GLOBAL VARIABLES
  var
  // Data Acquisition Information
    SampleFrequency: integer;  // Data acquisition rate, samples/second
    nSamples       : integer;  // Number of acquired data samples
  // Input Data
    AccelData: array [0..nSamples] of real; // Array of acceleration data in g units
// Outputs
    HICmax     : real;        // HIC score
    HICinterval  : real;      // HIC interval
// HIC CALCULATION PROCEDURE
  procedure HIC_Calculation;
  // LOCAL VARIABLES
  var
  // Intermediate Results
    integral       : array [0..nSamples-1] of real; // HIC Integral Values
    iHIC0,iHIC1    : integer;  // HIC interval boundaries
    HIC            : real;     // Intermediate HIC  result
  // Counters
    i,j            : integer;
  begin
  // Initialise results
   iHIC0 := 0;
   iHIC1 := 0;
  HICmax:=-1.0;
  // Calculate Integral
  integral [0]:=0.0;
  for i:=1 to nSamples do integral [i]: =integral [i-1] +(AccelData [i]+AccelData [i-1])/2;
  // Scan all possible HIC intervals for maximum score
  for i := 0 to nSamples-1 do
  for j := i+1 to nSamples do
  begin
    HIC:=(integral [j]-integral [i])/(j-i);
    if HIC>0.0
      then HIC:=Power (HIC,2.5)
      else HIC:=0.0;
    HIC:=HIC*(j-i)/SampleFrequency;
    if HIC>HICmax then
      begin
        HICmax:=HIC;
        iHIC0:=i;
        iHIC1:=j;
      end;
  end;
  // Calculate the HIC Interval
  HICinterval := (IHIC1-IHIC0)/SampleFrequency;
  end;
  end.
```

X3.2 *Verification*—When correctly implemented, the algorithm computes the theoretical HIC scores (within ±0.02 %) for the cosine pulses described in A1.4.2.1 and Table X3.1, assuming a sample rate of 20 000 Hz.

TABLE X3.1 Theoretical and Calculated Values of Synthesized Cosine Pulses

Pulse Width (T) ms	Reference *g*-max	Theoretical HIC	Calculated HIC	Error	Error %
10.0	100	302.9	302.9	0.0	0.013
10.0	150	834.8	834.7	-0.1	-0.012
10.0	200	1 713.7	1713.5	-0.2	-0.011
20.0	100	605.9	605.9	0.0	0.004
20.0	150	1 669.6	1669.5	-0.1	-0.006
20.0	200	3 427.4	3427.2	-0.2	-0.005

X4. ALGORITHM FOR DIGITAL BUTTERWORTH FILTER

X4.1 This specification specifies the use of a Butterworth Digital Filter for smoothing acceleration data. Also, the response spectrum of modified Channel Frequency Class (CFC) 1000 acceleration data channels is defined in terms of the Butterworth digital response. The CFC 1000 data channel requires a fourth order (4-pole) Butterworth filter with a -3dB corner frequency of 1686.1 Hz. Instead of implementing a fourth order filter, it is recommended that the data be filtered twice, once forwards and once backwards using second order (2-pole) filter twice with a -3dB corner frequency of 2077.5 Hz. This approach eliminates phase shift in the filtered data.

X4.2 The 2-pole (second order) Butterworth Digital Filter is defined by:

$$F_t = \sum_{i=0}^{2} a_i A_{t-j\Delta} + \sum_{j=1}^{2} b_j A_{t-j\Delta}$$

where:

F_t = filtered acceleration datum at time t,
A_t = input acceleration datum at time t,
Δ = sample interval, and
a_i *and* b_j = filter coefficients

The correct filter coefficients vary with the data sampling rate. Table X4.1 shows coefficients for a sample rate of 20 000 Hz. Fig. X4.1 shows the response function of the filter in relation to the specified limits of the modified CFC 100 data channel. Section X4.3 describes a computer algorithm for implementing the 4-pole filter using forward and reverse passes of the 2-pole filter.

X4.3 *Computer Algorithm for 4th Order, Zero Phase Shift, Butterworth Digital Filter*—The example pseudo-code below implements a fourth order, zero phase shift on an array containing a single channel of acceleration data. For clarity, the program has been written as a procedure, with input data and filtered data passed as global variables.

TABLE X4.1 Second Order Butterworth Filter Coefficients for a CFC 1000 Data Channel Sampling Rate = 20000 Hz

Coefficient	a_0	a_1	a_2	b_1	b_2
Value	0.071893	0.143786	0.071893	1.111586	-0.399159

```
// GLOBAL VARIABLES
const     nSamples;                  // Number of acquired data samples
var
// Data Acquisition Information
     SampleFrequency: integer;   // Data acquisition rate, samples/second
     nSamples         : integer;   // Number of acquired data samples
// Input Data which will be replaced with the filtered data
AccelData: array [0..nSamples] of real; // Array of acceleration data in g units
// Butterworth Filter
procedure Butterworth_Filter
// LOCAL VARIABLES
var   temp: array [0..nSamples] of real; // Intermediate results
     a,b:array [0..2] of real;   // Filter coefficients
   i,j: integer;                        // Counters
begin
   a [0] = 0.071893;
   a [1] = 0.143786;
   a [2] = 0.071893
   b [1] = 1.111586;
   b [2] =-0.399159;
// First pass in forward direction
temp:=AData;
for i:=2 to ScanSize-1 do
        AData [i]:=a [0]*temp [i] + a [1]*temp [i-1] + a [2]*temp [i-2]
                              + b [1]*Adata [i-1]+ b [2]*Adata [i-2];
// Second pass in backward direction
   temp:=AData;
   for i:=ScanSize-3 downto 0 do
        AData [i]:=a [0]*temp [i] + a [1]*temp [i+1] +a [2]*temp [i+2]
                              + b [1]*Adata [i+1]+b [2]*Adata [i+2];
end;
```

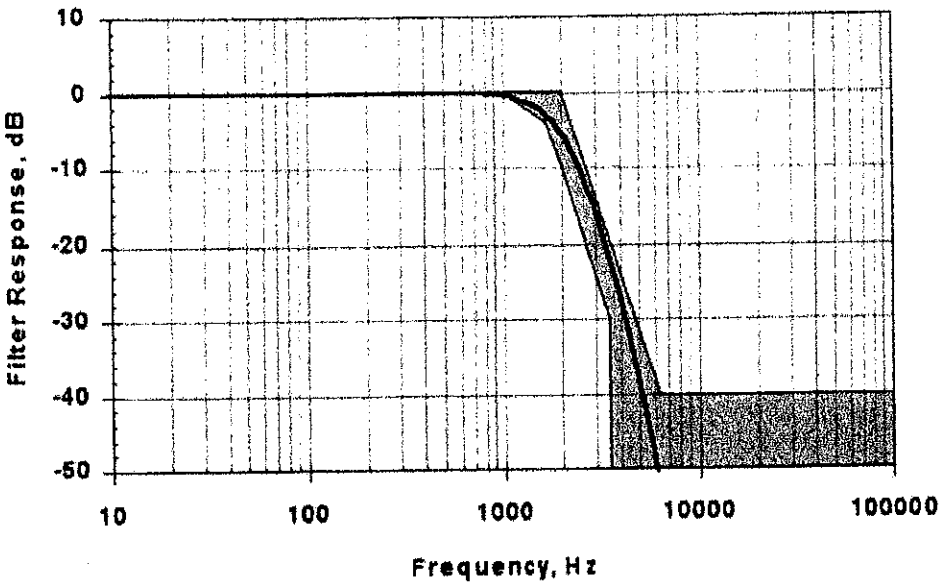


FIG. X4.1 Filter Response Function

X5. WET/FROZEN CONDITIONING

X5.1 Specifiers may optionally request that laboratory testing include additional tests that simulate the performance of the playground surface under wet or frozen conditions, or both. Such additional testing is recommended if the installed surface will be used under such conditions. For consistency among laboratories it is recommended that wet/frozen testing be performed in accordance with the following procedures.

NOTE X5.1—This test simulates playground surfaces with optimal drainage. The performance of playground surfaces with poor drainage will be adversely affected by accumulation of water.

X5.2 *Apparatus*:

X5.2.1 Fig. X5.1 (A) is a schematic of the apparatus used to condition specimens for wet/frozen testing. Samples to be conditioned are supported on an 18 by 18-in. (460 by 460-mm) rack (for example, a metal grid, expanded metal sheet or perforated metal plate) that allows free drainage of water, mounted inside a water-retaining container. The height of the container should be such that there is a minimum of 8 in. of clear space above the top surface of the sample being tested. The container shall be lined with a flexible porous material (for example, cheese cloth) that will allow free drainage of water but will not allow surface material particles to pass through.

X5.2.2 Beneath the rack, a minimum of 8 in. of vertical space is required to collect water. Alternatively, another container of appropriate volume or a drainage system may be used, provided the method used does not allow water to accumulate above the support rack.

X5.3 *Sample Preparation*:

X5.3.1 *Loose-Fill Materials*—Pour specimen material into the container, distributing it evenly to the required depth.

X5.3.2 *Unitary Materials*—Place the surface specimen in the container. Seal the edges between the walls of the container and the top edges of the sample using waterproof adhesive tape or other appropriate means.

X5.4 *Calculation of Water Volume*—This conditioning procedure uses a quantity of water equivalent to a 6 in. depth across the exposed surface of the specimen. To determine the volume of water required, measure the area of exposed surface. For square rectangular specimens of unitary surfaces, this area will be the product of the length and width of the specimen. For loose-fill surfaces, the area will be product of the internal length and internal width of the square or rectangular container. With the surface area, SA, expressed in inches, the volume of water required is $6 \times SA$ cubic inches, equivalent to $3.47 \times SA$ fluid ounces or $0.217 \times SA$ pounds of water.

X5.5 *Application of Water*:

X5.5.1 Spray or otherwise gradually distribute the required quantity of clean water uniformly over the surface of the specimen.

X5.5.2 Allow the water to drain for 15 min.

X5.5.3 Remove the sample from the container, allowing any water remaining on the surface of the specimen to drain off.

X5.5.4 For loose-fill surfacing materials, place the wet sample and liner into the test box and condition as specified in 14.2 and 14.3.

X5.6 *Wet Test*—Begin testing within 5 min of conditioning the surface.

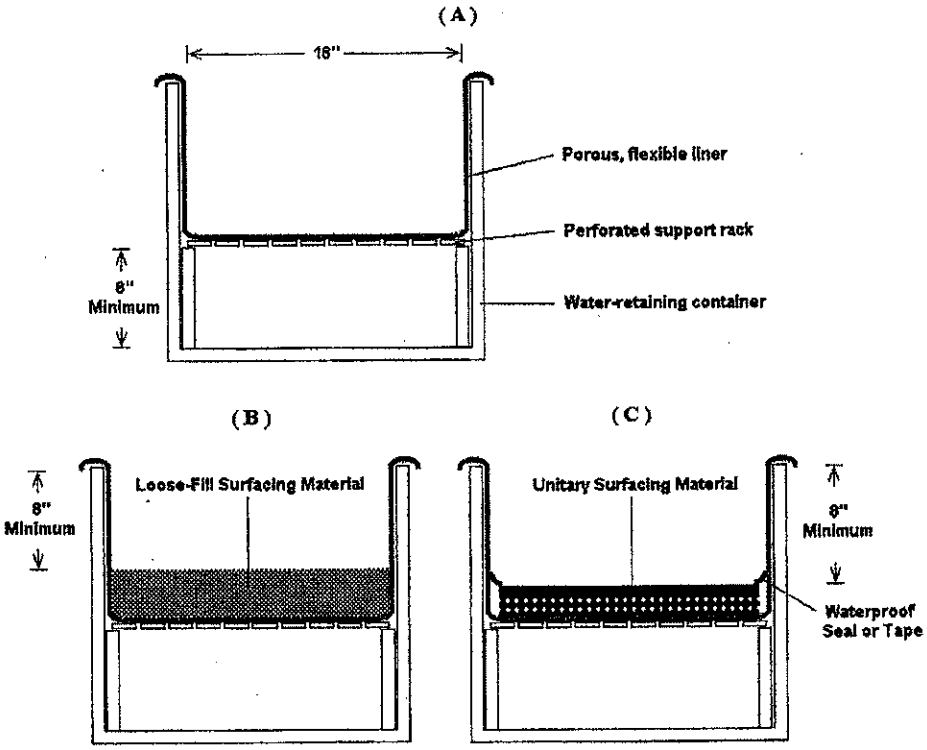


FIG. X5.1 Schematic of Apparatus for Wet/Frozen Conditioning

X5.7 *Frozen Test*—If the specimen is to be tested frozen, condition the sample in a freezer at a temperature of 15°F (-10°C) for a minimum of 24 h before testing. Begin testing within 5 min of removing the sample from the conditioning chamber. The temperature of the sample should not exceed 26°F (-3°C) during the test.

APPROVAL SLW	REQUEST FOR COUNCIL ACTION	MTG. DATE 6/7/16
Reports & Recommendations	**SUBJECT**: A resolution authorizing acceptance of a Storm Water Facilities Maintenance Agreement for Autumn Leaves of Franklin located at 9201 W. Drexel Avenue	**ITEM NO.** G.10.

BACKGROUND

The City of Franklin and MMSD require that developments which add a 0.5 acre or more impervious surface to install storm water management facilities, typically a pond(s). The DNR requires municipalities to meet quality standards as found in NR216. It is the responsibility of the development owner, or for subdivision; the homeowners association, to maintain the storm water facilities per a prescribed maintenance agreement.

OPTIONS

A maintenance agreement has been received from Propero II Franklin, LLC. In order to assure complete understanding of requirements, the City has developed a Storm Water Facilities Maintenance Agreement form (see attached).

OPTIONS

It is important to adopt and execute the development agreement to provide the proper ongoing maintenance of storm water facilities.

FISCAL NOTE

All costs associated with storm water facility maintenance are to be paid by the developer, owner or homeowners association per agreement.

RECOMMENDATION

Motion to adopt Resolution No. 2016-_____, a resolution authorizing acceptance of Storm Water Facilities Maintenance Agreement for Autumn Leaves of Franklin located at 9201 W. Drexel Avenue.

Department of Engineering ML/db
Encl.

STATE OF WISCONSIN : CITY OF FRANKLIN : MILWAUKEE COUNTY

RESOLUTION NO. 2016- _____

A RESOLUTION AUTHORIZING ACCEPTANCE
OF A STORM WATER FACILITIES MAINTENANCE AGREEMENT
FOR AUTUMN LEAVES OF FRANKLIN
LOCATED AT 9201 W. DREXEL AVENUE

WHEREAS, a maintenance agreement is required to maintain and operate storm water facilities; and

WHEREAS, Propero II Franklin, LLC has executed and submitted to the City of Franklin a Storm Water Facilities Maintenance Agreement for Autumn Leaves of Franklin located at 9201 W. Drexel Avenue; and

WHEREAS, it would be in the best interests of the City to accept this agreement.

NOW, THEREFORE BE IT RESOLVED by the Mayor and Common Council of the City of Franklin that the Mayor and City Clerk are hereby authorized to accept this agreement and therefore the Mayor and City Clerk are hereby authorized and directed to execute and accept this agreement on behalf of the City.

BE IT FURTHER RESOLVED, that the City Clerk is directed to record said easement with the Register of Deeds for Milwaukee County.

INTRODUCED at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016, by Alderman _____.

PASSED AND ADOPTED by the Common Council of the City of Franklin on the _____ day of _____, 2016.

APPROVED:

_____
Stephen R. Olson, Mayor

ATTEST:

_____
Sandra L. Wesolowski, City Clerk

AYES _____
NOES _____
ABSENT _____

ML/db

Reso\Reso. Storm water facilities maint. agreement Autumn Leaves S430-4 2016

STORM WATER FACILITIES MAINTENANCE AGREEMENT

This AGREEMENT, made and entered into this 22nd day of April, 2016, by and between PROPERO II FRANKLIN, LLC, an Ohio limited liability company, hereinafter called the "Owner", and the City of Franklin, hereinafter called the "City".

WITNESSETH:

WHEREAS, the Owner is the owner of the following described lands situated in the City of Franklin, County of Milwaukee, State of Wisconsin, to-wit:

THAT PART OF THE EAST 1/2 OF THE EAST 1/2 OF THE SE 1/4 OF SECTION 8, AND PART OF THE SW 1/4 OF SECTION 9, T 5 N, R 21 E, IN THE CITY OF FRANKLIN, MILWAUKEE COUNTY, WISCONSIN, WHICH IS BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF SAID SE 1/4 SECTION; THENCE SOUTH 88^0 09' 29" WEST ALONG THE SOUTH LINE OF SAID 1/4 SECTION 169.86 FT. TO THE POINT OF BEGINNING OF THE LANDS TO BE DESCRIBED;

THENCE CONTINUING SOUTH 88° 09' 29" WEST ALONG SAID SOUTH LINE: 490.97 FT. TO A POINT ON THE WEST LINE OF THE EAST 1/2 OF THE EAST 1/2 OF SAID SE 1/4 SECTION; THENCE NORTH 00^0 11' 57' WEST ALONG SAID WEST LINE 697.00 FT. TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 59^0 29' 08" EAST ALONG SAID SOUTH LINE 646.63 FT. TO A POINT; THENCE SOUTHEASTERLY ALONG SAID SOUTH LINE 118.81 FT. ALONG THE ARC OF A CURVE WHOSE CENTER LIES TO THE NORTHEAST WHOSE RADIUS IS 545.00 FT. AND WHOSE CHORD BEARS SOUTH 65^0 43' 50.5" EAST 118.57 FT. TO A POINT; THENCE SOUTH 71^0 58' 33" EAST 6.39 FT. TO A POINT ON THE WEST LINE OF PARCEL 1 OF CERTIFIED SURVEY MAP NO. 4122; THENCE SOUTH 30^0 30' 52" WEST ALONG SAID WEST LINE 350.75 FT. TO THE POINT OF BEGINNING.

Hereinafter called the "Property".

WHEREAS, the Owner is developing the Property; and

WHEREAS, the Site Plan/Subdivision (Site Plan, Special Use, P.D.D., CSM or Subdivision) known as Autumn Leaves of Franklin [PLEASE COMPLETE] (Name of Plan/Development) hereinafter called the "Plan", which is expressly made a part hereof, as approved or to be approved by the city, provides for on-site Storm Water Facilities within the confines of the Property; and

WHEREAS, the City and the Owner, its successors and assigns ("successors and assigns" meaning to include any homeowners' association and all owners of the property or any portion thereof), including any homeowners association, agree that the health, safety, and welfare of the residents of the City of Franklin, require that on-site Storm Water Facilities as defined in Section 5-8.0600 Unified Development Ordinance of the City of Franklin be constructed and maintained on the Property; and

WHEREAS, the City requires that on-site storm water management practices as shown on the Plan be constructed and adequately maintained by the Owner, its successors and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site storm water facilities shall be constructed by Owner in accordance with the plans and specifications which are identified as part of the storm water system plan and erosion control plan approved by the City Engineer and submitted as part of the as-built drawings approved by the City Engineer.

2. The Owner, its successors and assigns, shall comply with the ordinances and regulations which require that the Storm Water Facilities shall be regularly inspected and maintained as often as conditions may require, but in any event, at least once each year. The Standard Operation and Maintenance Report attached to this agreement as Exhibit "A" and by this reference made a part hereof shall be used for the purpose of the regular inspections of the Storm Water Facilities. The Owners, its successors and assigns, shall keep the Operation and Maintenance Reports from past inspections, as well as a log of maintenance activity indicating the date and type of maintenance completed of the Storm Water Facilities. The purpose of the inspections is to assure safe and proper functioning of the facilities. The inspections shall cover all storm water facilities, including but not limited to berms, outlet structures, pond areas and access roads. Deficiencies shall be noted in the Operation and Maintenance Report. The Reports and maintenance log shall be made available to the City for review.

3. The Owner, its successors and assigns, hereby grant permission to the City, its authorized agents and employees, to enter upon the Property and to inspect the Storm Water Facilities, whenever the City deems necessary. The purpose of inspection is to provide periodic review by City staff, to investigate reported deficiencies and/or to respond to citizen complaints. The City shall provide the Owner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary. Corrective actions shall be taken within a reasonable time frame as established by the City Engineer.

4. The Owner, its successors and assigns, shall adequately maintain the Storm Water Facilities, including but not limited to all pipes and channels built to convey storm water to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the storm water. Adequate maintenance is herein defined as keeping the Storm Water Facilities in good working condition so that these storm water facilities are performing their design functions and are in accordance with the Stormwater Basin Maintenance Standards as detailed in Section 15.8.0600 of the City of Franklin Unified Development Ordinance, and Section 13.12 (2) of the Milwaukee Metropolitan Sewerage District (MMSD) rules, and by this reference made a part hereof.

5. If the Owner, its successors and assigns fails to maintain the Storm Water Facilities in good working condition acceptable to the City and does not perform the required corrective actions in a time as established by the City Engineer in written notice, the City may:

a) Issue a citation to the Owner, its successors and assigns. Such failure constitutes a violation of Section 15.8.0600 of the Unified Development Ordinance of the City of Franklin. The penalty for such violation of Section 15.8.0600 shall be not less than $100 nor more than $2500 for each offense, together with the costs of prosecution. Each day that the violation exists shall constitute a separate offense, and

b) Perform the corrective actions identified in the inspection report and assess the Owner, its successors and assigns, for the cost of such work. The cost of such work shall be specially charged against the Property pursuant to Wisconsin Statutes Section 66.0627. If the facilities are located on an outlot owned collectively by a homeowners association, the City may specially charge each member of the homeowners association according to the ownership interest in the facilities located on the property. This provision shall not be construed to allow the City to erect any structure of permanent nature on the land of the Owner outside of the easement for the Storm Water Facilities. It is expressly understood and agreed that the City is under no obligation to routinely maintain or repair said storm water management practices and in no event shall this Agreement be construed to impose any such obligation on the City.

6. In the event the City, pursuant to this Agreement and applicable easements performs work of an emergency nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Owner, its successors and assigns, shall reimburse the City upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the City hereunder.

7. This Agreement imposes no liability of any kind whatsoever on the City and the Owner agrees to indemnify and hold the City harmless from any liability in the event the Storm Water Facilities fail to operate properly.

8. This Agreement shall be attached as an exhibit to any document which creates a homeowners association that is responsible for maintenance of the Storm Water Facilities and shall be recorded at the Milwaukee County Register of Deeds, and shall constitute a covenant running with the land, and shall be binding on the Owner, its administrators, executors, assigns, heirs and any other successors in interest, including any homeowners association and all owners of the property or any portion thereof. The owner shall provide the City with a copy of any document which creates a homeowners association that is responsible for the Storm Water Facilities.

9. The owner, its successors and assigns, is prohibited from building structures, installing play equipment, installing plants, changing grades or performing any function that inhibits care and maintenance of any Storm Water Facilities.

10. The owner, its successor and assigns shall maintain, at all times, an individual(s) who will serve as a contact person(s).

IN WITNESS WHEREOF, the City and Owner have set forth their hands and seals, effective the date first above written.

SEALED IN PRESENCE OF:

PROPERO II FRANKLIN, LLC, an Ohio limited liability company, Owner

By: _____
Name: Christian R. Mauger
Title: Authorized Signer

STATE OF OHIO)ss.
FRANKLIN COUNTY)

Personally came before me this 22nd day of Apr. 1, 2016, the above named Christian R. Mauger, an Authorized Signer for Propero II Franklin, LLC, an Ohio limited liability company, to me known to be the person who executed the foregoing instrument and acknowledged the same in the capacity indicated.

MICHAEL D. BRIDGES, Attorney At Law
NOTARY PUBLIC, STATE OF OHIO
My commission has no expiration date.
Section 147.03 R.C.

_____
Notary Public, Dallas County, TX
My commission expires:_____

CITY OF FRANKLIN

By: _____(Seal)
Name: Stephen R. Olson
Title: Mayor

COUNTERSIGNED:

By: _____(Seal)
Name: Sandra L. Wesolowski
Title: City Clerk

STATE OF WISCONSIN)ss.
MILWAUKEE COUNTY)

Personally came before me this ____ day of _____, 20__, the above named Stephen R. Olson, Mayor and Sandra L. Wesolowski, City Clerk, of the above named municipal corporation, City of Franklin, to me known to be such Mayor and City Clerk of said municipal corporation, and acknowledged that they had executed the foregoing instrument as such officers as the Deed of said municipal corporation by its authority and pursuant to the Resolution File No. _____, adopted by its Common Council on this _____ day of _____, 20__.

_____
Notary Public, Milwaukee County, WI

My commission expires: _____

This instrument was drafted by the City Engineer for the City of Franklin.

Form approved:

_____

Jesse A. Wesolowski, City Attorney

EXHIBIT "A"

OPERATION AND MAINTENANCE INSPECTION REPORT
STORMWATER MANAGEMENT PONDS
City of Franklin

Name of Development _____

Responsible Party Name _____ Address _____

Telephone No. _____ Fax No. _____ E-mail _____

Inspector Name _____ Address _____

Telephone No. _____ Fax No. _____ E-mail _____

Basin Location General Address _____ Section No. _____

Normal Pool ☐ Yes ☐ No

Items inspected (Pond components)	Checked (Yes/No/NA)	Maintenance Needed (Yes/No/NA)	Remarks
1. Embankment and Emergency spillway 1. Vegetation and ground cover adequate			
2. Embankment erosion			
3. Animal burrows			
4. Unauthorized plantings			
5. Cracking, bulging, or sliding of dam 1. Upstream face			
2. Downstream face			
3. At or beyond toe Upstream			
Downstream			
4. Emergency spillway			
6. Pond, toe & chimney drains functioning			
7. Seeps/leaks on downstream face			
8. Slope protection or riprap failures			
9. Emergency spillway clear of debris			
10. Other (specify)			
2. Riser and principal spillway Type: Reinforced concrete ____ Corrugated metal pipe ____ PVC/HDPE ____ Masonry ____			
1. Low flow orifice obstructed			
2. Primary outlet structure 1. Debris removal necessary			
2. Corrosion control			
3. Trash rack maintenance 1. Debris removal necessary			
2. Corrosion control			
3. Pond bottom			

Sediment or debris buildup in low flow Pilot channel or bottom (estimate depth)			

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APPROVAL	REQUEST FOR COUNCIL ACTION	MTG. DATE
SLW		6/7/16
Reports & Recommendations	**SUBJECT:** A resolution authorizing acceptance of easements for Autumn Leaves of Franklin for sanitary sewer and water main easements at 9201 W. Drexel Avenue (SE ¼ of the SE ¼ of Section 8)	**ITEM NO.** G. 11.

Pursuant to the development of Autumn Leaves of Franklin, please be advised that it is necessary to accept easements for sanitary sewer and water main.

RECOMMENDATION

Motion to adopt Resolution 2016-_____, a resolution authorizing acceptance of easements for Autumn Leaves of Franklin for sanitary sewer and water main easements at 9201 W. Drexel Avenue (SE ¼ of the SE ¼ of Section 8)

Department of Engineering ML/db

ca\CA ease sanitary sewer and water main for Autumn Leaves of Franklin S430-5 2016

STATE OF WISCONSIN : CITY OF FRANKLIN : MILWAUKEE COUNTY

RESOLUTION NO. 2016- _____

A RESOLUTION AUTHORIZING ACCEPTANCE OF EASEMENTS
FOR AUTUMN LEAVES OF FRANKLIN
FOR SANITARY SEWER AND WATER MAIN EASEMENTS
AT 9201 W. DREXEL AVENUE
(SE ¼ OF THE SE ¼ OF SECTION 8)

WHEREAS, easements are required to install, maintain and operate sanitary sewer and water main; and

WHEREAS, Propero II Franklin, LLC has executed easements to the City of Franklin for the installation and maintenance of sanitary sewer and water main; and

WHEREAS, it would be in the best interest of the City to accept such easements, on that part of the SE ¼ of the SE ¼ of Section 8 which is located at 9201 W. Drexel Avenue, in the City of Franklin.

NOW, THEREFORE BE IT RESOLVED by the Mayor and Common Council of the City of Franklin that the Mayor and City Clerk are hereby authorized to accept such easements and therefore the Mayor and City Clerk are hereby authorized and directed to execute the easements accepting them on behalf of the City.

BE IT FURTHER RESOLVED, that the City Clerk is directed to record said easement with the Register of Deeds for Milwaukee County.

INTRODUCED at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016, by Alderman _____.

PASSED AND ADOPTED by the Common Council of the City of Franklin on the _____ day of _____, 2016.

APPROVED:

_____
Stephen R Olson, Mayor

ATTEST:

_____
Sandra L. Wesolowski, City Clerk

AYES _____
NOES _____
ABSENT _____

SANITARY SEWER EASEMENT

AUTUMN LEAVES OF FRANKLIN

THIS EASEMENT is made by and between the CITY OF FRANKLIN, a municipal corporation of the State of Wisconsin, hereinafter referred to as "City," and Propero II Franklin, LLC, an Ohio limited liablity company, as owner (including successors and assign's of the City as may become applicable including the heirs, executors, administrators, successors and assigns of above owner(s) as may be or may become applicable), hereinafter called "Grantor," (if more than one grantor is listed above, said language herein referring thereto shall be interpreted in the plural and refer jointly and severally to such grantors).

WITNESSETH

WHEREAS, Grantor is the owner and holder of record Title to certain real property particularly described on Exhibit "A" which is attached hereto and incorporated herein (the Property); and

WHEREAS, the City desires to acquire a non-exclusive easement with the right of entry in and across a portion of the property as the same is more particularly hereinafter described, with the right to build and construct and/or operate, maintain, repair, enlarge, reconstruct, relocate and inspect as may be or may become applicable the following facilities and appurtenances thereto, hereinafter collectively called the "Facilities," in, upon and across said portion of the Property: a sanitary sewer, associated manholes, all as shown on the plan attached hereto as Exhibit "B."; any Lift Station with auxiliary power enclosed in an above ground enclosure.

NOW, THEREFORE, in consideration of the grant of the easement hereinafter described, the initial installation and maintenance of the Facilities by the Grantor, and the City, and the payment of One Dollar ($1.00) and other valuable considerations to the Grantor, the receipt whereof is hereby acknowledged, said Grantor, being the owner and person interested in the land hereinafter described, does hereby grant unto the City a perpetual, non-exclusive easement on that part of the East ½ of the East ½ of the SE ¼ of Section 8, and part of the SW ¼ of Section 9, T 5 N, R 21 E, in the City of Franklin, Milwaukee County, Wisconsin, more particularly described on Exhibit C attached hereto (the "Easement Area").

1. That said Facilities shall be maintained and kept in good order and condition by the City, at the sole cost and expense of the City. Responsibility for maintaining the ground cover and landscaping within the Easement area shall be that of the Grantor (including heirs, executors, administrators, successors, and assigns).

2. That in and during whatever construction, reconstruction, enlargement or repair work is or becomes necessary in constructing and/or maintaining of said Facilities, so much of the surface or subsurface of the Easement Area on the Property as may be disturbed will, at the expense of the City, be replaced in substantially the same condition as it was prior to such disturbance. However, the City shall indemnify and save harmless the Grantor from and against any loss, damage, claim, cost, injury or liability resulting from negligence or willful acts or omissions on the part of the City, its agents or employees in connection with said work involved in constructing and/or maintaining of said Facilities; provided that if the above loss, claim, cost, damage, injury or liability results from the joint negligence of parties hereto, then the liability therefore shall be borne by them in proportion to their respective degree of negligence; provided further, however, that these provisions are subject to the legal defenses available under law which the City or Grantor are entitled to raise, excepting the defense of so-called "sovereign immunity."

3. That no structure may be placed within the limits of the Easement Area by the Grantor except that improvement such as walks, pavements for driveways and parking lot surfacing and landscaping may be constructed or placed with the Easement Area.

4. That, in connection with the construction by the Grantor of any structure or building abutting said Easement Area, the Grantor will assume all liability for any damage to the Facilities in the above described Easement Area. The Grantor will also save and keep the City clear and harmless from any claims for personal injuries or property damage caused by any negligence or willful acts or omissions of the Grantor or persons acting on behalf of the Grantor, arising out of the construction by the Grantor of any structure or building abutting the said Easement Area, and shall reimburse the City for the full amount of such loss or damage.

5. That no charges will be made against the property for the cost of maintenance or operation of said Facilities in the property. Whenever the Grantor makes application for a service connection associated with the services provided by virtue of the Facility, the regular and customary service connection charge in effect at the time of the application shall be charged and paid. The Grantor shall be responsible for the routine maintenance of land on which the easement is located.

6. The Facilities shall be accessible for maintenance by the City at all times. The owner shall submit plans for approval to the City Engineer for any underground installation within the Easement Area, which approval shall not be unreasonably withheld, conditioned or delayed.

7. That the Grantor shall submit plans for all surface alterations of plus or minus 0.50 foot or greater within the limits of said Easement Area. Said alterations shall be made only with the approval of the City Engineer of the City of Franklin, which approval shall not be unreasonably withheld, conditioned or delayed.

8. The City and Grantor shall each use, and take reasonable measures to cause their employees, officers, customers, agents, contractors and assigns to use, the Easement Area in a reasonable manner and so as not to obstruct or otherwise use the Easement Area in a manner that would unreasonably interfere with the use thereof by the other party hereto or its employees, officers, customers, agents, contractors and assigns.

9. The City and Grantor each hereby waives all rights of subrogation that either has or may hereafter have against the other for any damage to the Easement Area or any other real or personal property or to persons covered by such party's insurance, but only to the extent of the waiving party's insurance coverage; provided, however, that the foregoing waivers shall not invalidate any policy of insurance now or hereafter issued, it being hereby agreed that such a waiver shall not apply in any case which would result in the invalidation of any such policy of insurance and that each party shall notify the other if such party's insurance would be so invalidated.

10. Either party hereto may enforce this easement by appropriate action, and should it prevail in such litigation, that party shall be entitled to recover, as part of its costs, reasonable attorneys' fees.

11. This easement may not be modified or amended, except by a writing executed and delivered by the City and Grantor or their respective successors and assigns.

12. No waiver of, acquiescence in, or consent to any breach of any term, covenant, or condition hereof shall be construed as, or constitute, a waiver of, acquiescence in, or consent to any other, further, or succeeding breach of the same or any other term, covenant, or condition.

13. If any term or provision of this easement shall, to any extent, be invalid or unenforceable under applicable law, then the remaining terms and provisions of this easement shall not be affected thereby, and each such remaining term and provision shall be valid and enforceable to the fullest extent permitted by applicable law.

14. This easement shall be construed and enforced in accordance with the internal laws of the State of Wisconsin.

IN WITNESS WHEREOF, the Grantor has hereunto set its hand and seals this

ON THIS DATE OF: April 22, 2016

PROPERO II FRANKLIN, LLC,
an Ohio limited liablity company

By: _____
Name: Christian R. Mayer
Title: Authorized Signer

STATE OF OHIO

ss

COUNTY OF FRANKLIN

Before me personally appeared on the 22nd day of April, 2016, the above named Christian R. Mayer, an Authorized Signer of Propero II Franklin, LLC, an Ohio limited liability company, to me known to be the personwho executed the foregoing Easement and acknowledged the same as the voluntary act and deed of said limited liability company.

NOTARIAL SEAL STATE OF OHIO

MICHAEL D. BRIDGES, Attorney At Law
NOTARY PUBLIC, STATE OF OHIO
My commission has no expiration date.
Section 147.03 R.C.

_____
NOTARY PUBLIC
My commission expires _____

CITY OF FRANKLIN

By: _____
Stephen R. Olson, Mayor

By: _____
Sandra L. Wesolowski, City Clerk

STATE OF WISCONSIN)
SS
COUNTY OF MILWAUKEE)

On this _____ day of _____, 201_, before me personally appeared Stephen R. Olson and Sandra L. Wesolowski, who being by me duly sworn, did say that they are respectively the Mayor and City Clerk of the City of Franklin, and that the seal affixed to said instrument is the corporate seal of said municipal corporation, and acknowledged that they executed the foregoing assignment as such officers as the deed of said municipal corporation by its authority and pursuant to resolution file No. _____adopted by its Common Council on _____, 201_.

_____
Notary Public
My commission expires _____

MORTGAGE HOLDER CONSENT

The undersigned, TCF NATIONAL BANK, a national banking association ("Mortgagee"), as Mortgagee under that certain Mortgage encumbering the Property and recorded in the Office of the Register of Deeds for Milwaukee County, Wisconsin, on April 28, 2016, as Document No. ~~X~~ 10559156, hereby consents to the execution of the foregoing easement and its addition as an encumbrance against title to the Property.

IN WITNESS WHEREOF, Mortgagee has caused these presents to be signed by its duly authorized officers, and its corporate seal to be hereunto affixed, as of the day and year first above written.

TCF NATIONAL BANK
a national banking association

By: _____
Name: Richard J. Fabian
Title: Vice President

STATE OF Illinois)
) ss
COUNTY OF Cook)

On this, the 21st day of April, 2016, before me, the undersigned, personally appeared Richard J Fabian, the Vice President of TCF NATIONAL BANK, a national banking association, and acknowledged that (s)he executed the foregoing instrument on behalf of said corporation, by its authority and for the purposes therein contained.

OFFICIAL SEAL
BARBARA KAMINSKI
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 11/18/2017

Name: _____
Notary Public Barbara Kaminski
State of Illinois
County of Cook
My commission: 11-18-2017

This instrument was drafted by the City of Franklin.

Approved as to contents
Date: _____
City Engineer

Approved as to form only
Date: _____
City Attorney

Exhibit A

(Description of the Property)

THAT PART OF THE EAST 1/2 OF THE EAST 1/2 OF THE SE 1/4 OF SECTION 8, AND PART OF THE SW 1/4 OF SECTION 9, T 5 N, R 21 E, IN THE CITY OF FRANKLIN, MILWAUKEE COUNTY, WISCONSIN, WHICH IS BOUNDED AND DESCRIBED AS FOLLOWS:

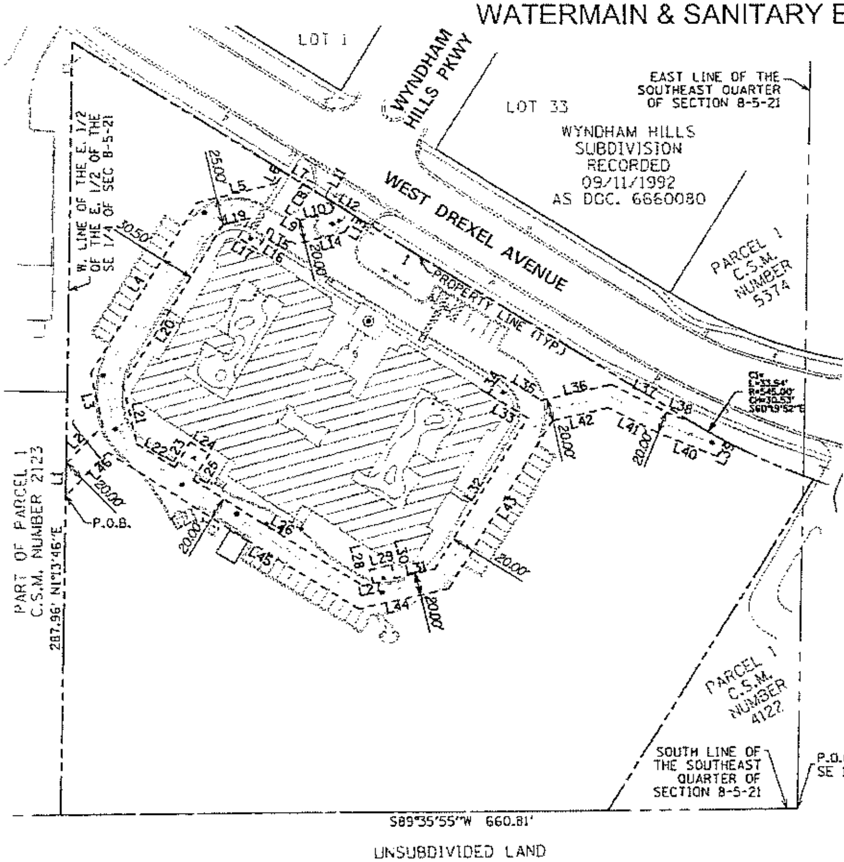
COMMENCING AT THE SOUTHEAST CORNER OF SAID SE 1/4 SECTION; THENCE SOUTH 88^0 09' 29" WEST ALONG THE SOUTH LINE OF SAID 1/4 SECTION 169.86 FT. TO THE POINT OF BEGINNING OF THE LANDS TO BE DESCRIBED;

THENCE CONTINUING SOUTH 88^0 09' 29" WEST ALONG SAID SOUTH LINE: 490.97 FT. TO A POINT ON THE WEST LINE OF THE EAST 1/2 OF THE EAST 1/2 OF SAID SE 1/4 SECTION; THENCE NORTH 00^0 11' 57' WEST ALONG SAID WEST LINE 697.00 FT. TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 59^0 29' 08" EAST ALONG SAID SOUTH LINE 646.63 FT. TO A POINT; THENCE SOUTHEASTERLY ALONG SAID SOUTH LINE 118.81 FT. ALONG THE ARC OF A CURVE WHOSE CENTER LIES TO THE NORTHEAST WHOSE RADIUS IS 545.00 FT. AND WHOSE CHORD BEARS SOUTH 65^0 43' 50.5" EAST 118.57 FT. TO A POINT; THENCE SOUTH 71^0 58' 33" EAST 6.39 FT. TO A POINT ON THE WEST LINE OF PARCEL 1 OF CERTIFIED SURVEY MAP NO. 4122; THENCE SOUTH 30^0 30' 52" WEST ALONG SAID WEST LINE 350.75 FT. TO THE POINT OF BEGINNING.

Exhibit B

(Depiction of the Facilities)

WATERMAIN & SANITARY EASEMENT EXHIBIT



LINE TABLE

NO.	BEARING	DISTANCE
L1	NORTH 01° 13' 46" EAST	28.88 FEET
L2	NORTH 45° 03' 06" EAST	46.68 FEET
L3	NORTH 12° 52' 16" WEST	48.35 FEET
L4	NORTH 32° 00' 18" EAST	182.46 FEET
L5	NORTH 76° 22' 23" EAST	73.76 FEET
L6	NORTH 31° 57' 30" EAST	11.72 FEET
L7	SOUTH 58° 02' 30" EAST	20.00 FEET
L8	SOUTH 31° 57' 30" WEST	29.30 FEET
L9	SOUTH 57° 59' 51" EAST	14.65 FEET
L10	NORTH 76° 57' 30" EAST	26.97 FEET
L11	NORTH 31° 57' 30" EAST	8.83 FEET
L12	SOUTH 58° 02' 30" EAST	20.00 FEET
L13	SOUTH 31° 57' 30" WEST	17.11 FEET
L14	SOUTH 76° 57' 30" WEST	45.55 FEET
L15	NORTH 57° 59' 51" WEST	26.47 FEET
L16	SOUTH 32° 00' 09" WEST	22.27 FEET
L17	NORTH 57° 59' 51" WEST	20.00 FEET
L18	NORTH 32° 00' 09" EAST	20.50 FEET
L19	SOUTH 76° 22' 23" WEST	25.12 FEET
L20	SOUTH 32° 00' 18" WEST	171.67 FEET
L21	SOUTH 12° 52' 16" EAST	54.45 FEET
L22	SOUTH 57° 59' 51" EAST	39.66 FEET
L23	NORTH 31° 57' 59" EAST	26.97 FEET
L24	SOUTH 57° 59' 51" EAST	20.00 FEET
L25	SOUTH 31° 57' 59" WEST	26.97 FEET
L26	SOUTH 57° 59' 51" EAST	178.50 FEET
L27	NORTH 77° 00' 09" EAST	9.67 FEET
L28	NORTH 12° 59' 51" WEST	12.62 FEET
L29	NORTH 77° 00' 09" EAST	20.00 FEET
L30	SOUTH 12° 59' 51" EAST	12.62 FEET
L31	NORTH 77° 00' 09" EAST	36.41 FEET
L32	NORTH 32° 00' 09" EAST	158.65 FEET
L33	NORTH 57° 59' 51" WEST	40.90 FEET
L34	NORTH 32° 00' 09" EAST	20.00 FEET
L35	SOUTH 57° 59' 51" EAST	42.91 FEET
L36	NORTH 77° 00' 09" EAST	63.86 FEET
L37	SOUTH 62° 50' 31" EAST	54.87 FEET
L38	SOUTH 68° 01' 27" EAST	29.60 FEET
L39	SOUTH 27° 54' 22" WEST	15.58 FEET
L40	NORTH 68° 01' 27" WEST	58.12 FEET
L41	NORTH 62° 50' 31" WEST	48.47 FEET
L42	SOUTH 77° 00' 09" WEST	51.12 FEET
L43	SOUTH 32° 00' 09" WEST	176.64 FEET
L44	SOUTH 77° 00' 09" WEST	82.65 FEET
L45	NORTH 57° 59' 51" WEST	264.91 FEET
L46	SOUTH 45° 03' 06" WEST	53.76 FEET

DATED: 04/29/2016

N

SCALE: 1" = 80'

SPACECO INC.

CONSULTING ENGINEERS
SITE DEVELOPMENT ENGINEERS
LAND SURVEYORS

9575 W. Higgins Road, Suite 700, Rosemont, Illinois 60018
Phone: (847) 696-4060 Fax: (847) 696-4065

N:\Projects\8251\EXHIBITS\8251EXH-EASE watersign Default User: JCHRISTOFI

Exhibit C

(Description of Easement Area)

PROPERTY DESCRIPTION: WATERMAIN – SANITARY EASEMENT

THAT PART OF THE EAST 1/2 OF THE EAST 1/2 OF THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 5 NORTH, RANGE 21 EAST, IN THE CITY OF FRANKLIN, MILWAUKEE COUNTY, WISCONSIN, WHICH IS BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF SAID SOUTHEAST 1/4 SECTION, BEING A CONCRETE MONUMENT WITH ALUMINUM CAP; THENCE SOUTH 89° 35' 55" WEST (BEING AN ASSUMED BEARING) ALONG THE SOUTH LINE OF SAID 1/4 SECTION, THE SOUTH QUARTER CORNER THEREOF ALSO BEING A CONCRETE MONUMENT WITH ALUMINUM CAP, 660.81 FEET TO A POINT ON THE WEST LINE OF THE EAST 1/2 OF THE EAST 1/2 OF SAID SOUTHEAST 1/4 SECTION; THENCE NORTH 01 °13' 46" WEST ALONG SAID WEST LINE 287.96 FEET TO THE POINT OF BEGINNING;

THENCE CONTINUING NORTH 01 °13' 46" WEST ALONG SAID WEST LINE 28.88 FEET;
THENCE NORTH 45 ° 03 ' 06 " EAST 46.88 FEET;
THENCE NORTH 12 ° 52 ' 16 " WEST 48.35 FEET;
THENCE NORTH 32 ° 00 ' 18 " EAST 182.46 FEET;
THENCE NORTH 76 ° 22 ' 23 " EAST 73.76 FEET;
THENCE NORTH 31 ° 57 ' 30 " EAST 11.72 FEET TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 58 ° 02 ' 30 " EAST ALONG SAID SOUTH LINE 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 30 " WEST 29.30 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 14.65 FEET;
THENCE NORTH 76 ° 57 ' 30 " EAST 28.97 FEET;
THENCE NORTH 31 ° 57 ' 30 " EAST 8.83 FEET TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 58 ° 02 ' 30 " EAST ALONG SAID SOUTH LINE 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 30 " WEST 17.11 FEET;
THENCE SOUTH 76 ° 57 ' 30 " WEST 45.55 FEET;
THENCE NORTH 57 ° 59 ' 51 " WEST 26.47 FEET;
THENCE SOUTH 32 ° 00 ' 09 " WEST 22.27 FEET;
THENCE NORTH 57 ° 59 ' 51 " WEST 20.00 FEET;
THENCE NORTH 32 ° 00 ' 09 " EAST 20.50 FEET;
THENCE SOUTH 76 ° 22 ' 23 " WEST 25.12 FEET;
THENCE SOUTH 32 ° 00 ' 18 " WEST 171.67 FEET;
THENCE SOUTH 12 ° 52 ' 16 " EAST 54.45 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 39.66 FEET;
THENCE NORTH 31 ° 57 ' 59 " EAST 26.97 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 59 " WEST 26.97 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 178.50 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 9.67 FEET;
THENCE NORTH 12 ° 59 ' 51 " WEST 12.62 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 20.00 FEET;
THENCE SOUTH 12 ° 59 ' 51 " EAST 12.62 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 36.41 FEET;
THENCE NORTH 32 ° 00 ' 09 " EAST 158.65 FEET;

THENCE NORTH 57 º 59 ' 51 " WEST 40.90 FEET;
THENCE NORTH 32 º 00 ' 09 " EAST 20.00 FEET;
THENCE SOUTH 57 º 59 ' 51 " EAST 42.91 FEET;
THENCE NORTH 77 º 00 ' 09 " EAST 63.86 FEET;
THENCE SOUTH 62 º 50 ' 31 " EAST 54.87 FEET;
THENCE SOUTH 68 º 01 ' 27 " EAST 25.60 FEET TO A POINT ON A NON-TANGENT CURVE SAID CURVE ALSO BEING THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTHEASTERLY ALONG SAID SOUTH LINE 33.54 FEET SAID LINE ALSO BEING A NON-TANGENT CIRCLE TO THE LEFT HAVING A RADIUS OF 545.00 FEET AND WHOSE CHORD BEARS SOUTH 60 º 19 ' 52" EAST 33.53 FEET TO A POINT;
THENCE SOUTH 27 º 54 ' 22 " WEST 15.59 FEET;
THENCE NORTH 68 º 01 ' 27 " WEST 58.12 FEET;
THENCE NORTH 62 º 50 ' 31 " WEST 48.47 FEET;
THENCE SOUTH 77 º 00 ' 09 " WEST 51.12 FEET;
THENCE SOUTH 32 º 00 ' 09 " WEST 176.64 FEET;
THENCE SOUTH 77 º 00 ' 09 " WEST 82.65 FEET;
THENCE NORTH 57 º 59 ' 51 " WEST 264.91 FEET;
THENCE SOUTH 45 º 03 ' 06 " WEST 53.76 FEET; TO THE POINT OF BEGINNING.

CONTAINING 0.623 ACRES OR 27,152 SQUARE FEET MORE OR LESS.

Prepared by: Spaceco, Inc.

DATE: April 28, 2016

REVISED: April 29, 2016

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WATER MAIN EASEMENT

AUTUMN LEAVES OF FRANKLIN

THIS EASEMENT, made by and between the CITY OF FRANKLIN, a municipal corporation of the State of Wisconsin, hereinafter referred to as "City," and PROPERO II FRANKLIN, LLC, an Ohio limited liablity company, owner, (including heirs, executors, administrators, successors and assigns of above owner(s) as may be or may become applicable), hereinafter called "Grantor," (If more than one grantor is listed above, said language herein referring thereto shall be interpreted in the plural and refer jointly and severally to such grantors).

WITNESSETH

WHEREAS, Grantor is the owner and holder of record Title to certain real property described on Exhibit "A" which is attached hereto and incorporated herein (the Property); and

WHEREAS, the City desires to acquire a permanent easement with the right of entry in and across the property hereinafter described with the right to build and construct and/or operate, maintain, repair, enlarge, reconstruct, relocate and inspect as may be or may become applicable the following facilities and appurtenances thereto, hereinafter called "Facilities," in, upon and across said portion of the property; a water main and associated fire hydrants, all as shown on the plan attached hereto as Exhibit "B"; and

WHEREAS, the initial construction and installation of the Facilities shall be made by Grantor at Grantor's expense and the Facilities shall be the property of the city and be deemed dedicated to the City upon the City's inspection and approval of the Facilities as installed, subject to the terms and conditions set forth below:

NOW, THEREFORE, in consideration of the grant of the easement hereinafter described and the payment of One Dollar ($1.00) and other valuable considerations to the Grantor, receipt whereof is hereby acknowledged, said Grantor, being the owner and person interested in the land hereinafter described does hereby grant unto the City a permanent easement in that part of the East ½ of the East ½ of the SE ¼ of Section 8, and part of the SW ¼ of Section 9, T 5 N, R 21 E, in the City of Franklin, Milwaukee County, Wisconsin, more particularly described on Exhibit C attached hereto (the "Easement Area").

UPON CONDITION

1. That said Facilities shall be maintained and kept in good order and condition by the City. Responsibility for maintaining the ground cover and landscaping within the easement area shall be that of the Grantor (including heirs, executors, administrators, successors and assigns).

2. That in and during whatever construction, reconstruction, enlargement or repair work is or becomes necessary in constructing and/or maintaining of said Facilities, so much of the surface or subsurface of the property as may be disturbed, will at the expense of the City be replaced in substantially the same condition as it was prior to such disturbance; except that the City will in no case be responsible for replacing or paying for replacing any aesthetic plantings or improvements other than ordinary lawns or standard walks, roadways, driveways and parking lot surfacing which were required to be removed in the course of doing the above work. However, the City shall save harmless the Grantor from any loss, damage, injury or liability resulting from negligence on the part of the City in connection with said work involved in constructing and/or maintaining of said Facilities; provided that if above loss, damage, injury or liability results from the joint negligence of parties hereto, then the liability therefore shall be borne by them in proportion to their respective degree of negligence; provided further, however, that these provisions are subject to the legal defenses with under law the City is entitled to raise excepting the defense of so-called "sovereign immunity."

3. That no structure may be placed within the limits of the easement by the Grantor except that improvements such as walks, pavements for driveways and parking lot surfacing may be constructed or placed within the Easement Area.

4. That, in connection with the construction by the grantor of any structure or building abutting said easement defined limits, the Grantor will assume all liability for any damage to the Facilities in the above described property. The Grantor will also save and keep the City clear and harmless from any claims for personal injuries or property damage caused by any negligence of the Grantor or person other than the Grantor, arising out of the construction by the Grantor of any structure or building abutting the said easement defined limits, and shall reimburse the City for the full amount of such loss or damage.

5. That no charges will be made against said lands for the cost of maintenance or operation of said Facilities in the afore-described property. Whenever the Grantor makes application for a service connection, the regular and customary service connection charge in effect at the time of the application shall be charged and paid. The Grantor shall be responsible for the routine maintenance of land on which the easement is located.

6. All conditions pertaining to the "Maintenance of Water Service Piping" as set forth in Chapter 5.12 of the "Rules and Regulations Governing Water Service" dated and subsequent amendments thereto shall apply to all water services which are within the easement defined limits and also within the limits of any adjoining easements; except that the City of Franklin Water Works, a utility owned by the City of Franklin shall in no case be responsible for maintaining at its expense any portion of said water services outside of the easement defined limits and outside the limits of any adjoining easements regardless of any statement to the contrary in said "Rules and Regulations Governing Water Service."

7. The Facilities shall be accessible for maintenance by the City at all times. The owner shall submit plans for approval to the City Engineer for any underground installation within the easement area, which approval shall not be unreasonably withheld, conditioned or delayed.

8. That the Grantor shall submit plans for all surface alterations of plus or minus 0.50 foot or greater within the limits of said easement. Said alterations shall be made only with the approval of the City Engineer of the City of Franklin, which approval shall not be unreasonably withheld, conditioned or delayed.

9. The City and Grantor shall each use, and take reasonable measures to cause their employees, officers, customers, agents, contractors and assigns to use, the Easement Area in a reasonable manner and so as not to obstruct or otherwise use the Easement Area in a manner that would unreasonably interfere with the use thereof by the other party hereto or its employees, officers, customers, agents, contractors and assigns.

10. The City and Grantor each hereby waives all rights of subrogation that either has or may hereafter have against the other for any damage to the Easement Area or any other real or personal property or to persons covered by such party's insurance, but only to the extent of the waiving party's insurance coverage; provided, however, that the foregoing waivers shall not invalidate any policy of insurance now or hereafter issued, it being hereby agreed that such a waiver shall not apply in any case which would result in the invalidation of any such policy of insurance and that each party shall notify the other if such party's insurance would be so invalidated.

11. Either party hereto may enforce this easement by appropriate action, and should it prevail in such litigation, that party shall be entitled to recover, as part of its costs, reasonable attorneys' fees.

12. This easement may not be modified or amended, except by a writing executed and delivered by the City and Grantor or their respective successors and assigns.

13. No waiver of, acquiescence in, or consent to any breach of any term, covenant, or condition hereof shall be construed as, or constitute, a waiver of, acquiescence in, or consent to any other, further, or succeeding breach of the same or any other term, covenant, or condition.

14. If any term or provision of this easement shall, to any extent, be invalid or unenforceable under applicable law, then the remaining terms and provisions of this easement shall not be affected thereby, and each such remaining term and provision shall be valid and enforceable to the fullest extent permitted by applicable law.

15. This easement shall be construed and enforced in accordance with the internal laws of the State of Wisconsin.

16. That the Grantor shall submit as-built drawings of the installed facilities on mylar for approval to the City Engineer, which approval shall not be unreasonably withheld, conditioned, or delayed.

IN WITNESS WHEREOF, the Grantor has hereunto set its hands and seals

ON THIS DATE OF: April 22, 2016

PROPERO II FRANKLIN, LLC,
an Ohio limited liability company

By: _____
Name: Christian R. Mayer
Title: Authorized Signer

STATE OF OHIO

SS

COUNTY OF FRANKLIN

Before me personally appeared on the 22nd day of April, 2016, the above named Christian R. Mayer, an Authorized Signer of Propero II Franklin, LLC, an Ohio limited liability company, to me known to be the person(s) who executed the foregoing EASEMENT and acknowledged the same as the voluntary act and deed of said limited liability company.

_____
NOTARY PUBLIC
My commission expires _____

NOTARIAL SEAL STATE OF OHIO
MICHAEL D. BRIDGES, Attorney At Law
NOTARY PUBLIC, STATE OF OHIO
My commission has no expiration date.
Section 147.03 R.C.

CITY OF FRANKLIN

By: _____
Stephen R. Olson, Mayor

By: _____
Sandra L. Wesolowski, City Clerk

STATE OF WISCONSIN

SS

COUNTY OF MILWAUKEE

On this _____ day of _____, 201__ before me personally appeared Stephen R. Olson and Sandra L. Wesolowski who being by me duly sworn, did say that they are respectively the Mayor and City Clerk of Franklin, and that the seal affixed to said instrument is the corporate seal of said municipal corporation, and acknowledged that they executed the foregoing assignment as such officers as the deed of said municipal corporation by its authority, and pursuant to resolution file No. _____ adopted by its Common Council on _____, 201__.

_____
Notary Public

My commission expires _____

MORTGAGE HOLDER CONSENT

The undersigned, TCF NATIONAL BANK, a national banking association ("Mortgagee"), as Mortgagee under that certain Mortgage encumbering the Property and recorded in the Office of the Register of Deeds for Milwaukee County, Wisconsin, on April 28, 2016, as Document No. 10559156, hereby consents to the execution of the foregoing easement and its addition as an encumbrance against title to the Property.

IN WITNESS WHEREOF, Mortgagee has caused these presents to be signed by its duly authorized officers, and its corporate seal to be hereunto affixed, as of the day and year first above written.

TCF NATIONAL BANK
a national banking association

By: _____

Name: Richard J. Fabian

Title: Vice President

STATE OF Illinois
SS
COUNTY OF Cook

On this, the 21st day of April 2016, before me, the undersigned, personally appeared Richard J. Fabian the Vice President of TCF NATIONAL BANK, a national banking association, and acknowledged that (s)he executed the foregoing instrument on behalf of said corporation, by its authority and for the purposes therein contained.

OFFICIAL SEAL
BARBARA KAMINSKI
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 11/18/2017

Name: _____
Notary Public Barbara Kaminski
State of Illinois
County of Cook
My commission expires on: 11-18-2017

This instrument was drafted by the City of Franklin.

Approved as to contents
Date:

_____
Manager of Water Works of Franklin

Approved as to form only
Date:

_____
City Attorney

Exhibit A
(Description of the Property)

THAT PART OF THE EAST 1/2 OF THE EAST 1/2 OF THE SE 1/4 OF SECTION 8, AND PART OF THE SW 1/4 OF SECTION 9, T 5 N, R 21 E, IN THE CITY OF FRANKLIN, MILWAUKEE COUNTY, WISCONSIN, WHICH IS BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF SAID SE 1/4 SECTION; THENCE SOUTH 88^0 09' 29" WEST ALONG THE SOUTH LINE OF SAID 1/4 SECTION 169.86 FT. TO THE POINT OF BEGINNING OF THE LANDS TO BE DESCRIBED;

THENCE CONTINUING SOUTH 88^0 09' 29" WEST ALONG SAID SOUTH LINE: 490.97 FT. TO A POINT ON THE WEST LINE OF THE EAST 1/2 OF THE EAST 1/2 OF SAID SE 1/4 SECTION; THENCE NORTH 00^0 11' 57' WEST ALONG SAID WEST LINE 697.00 FT. TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 59^0 29' 08" EAST ALONG SAID SOUTH LINE 646.63 FT. TO A POINT; THENCE SOUTHEASTERLY ALONG SAID SOUTH LINE 118.81 FT. ALONG THE ARC OF A CURVE WHOSE CENTER LIES TO THE NORTHEAST WHOSE RADIUS IS 545.00 FT. AND WHOSE CHORD BEARS SOUTH 65^0 43' 50.5" EAST 118.57 FT. TO A POINT; THENCE SOUTH 71^0 58' 33" EAST 6.39 FT. TO A POINT ON THE WEST LINE OF PARCEL 1 OF CERTIFIED SURVEY MAP NO. 4122; THENCE SOUTH 30^0 30' 52" WEST ALONG SAID WEST LINE 350.75 FT. TO THE POINT OF BEGINNING.

[IS THIS LAID OUT ON THE SITE PLAN OR SURVEY?]

Exhibit B
(Depiction of the Facilities)

PROPERTY DESCRIPTION: WATERMAIN – SANITARY EASEMENT

THAT PART OF THE EAST 1/2 OF THE EAST 1/2 OF THE SOUTHEAST 1/4 OF SECTION 8, TOWNSHIP 5 NORTH, RANGE 21 EAST, IN THE CITY OF FRANKLIN, MILWAUKEE COUNTY, WISCONSIN, WHICH IS BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF SAID SOUTHEAST 1/4 SECTION, BEING A CONCRETE MONUMENT WITH ALUMINUM CAP; THENCE SOUTH 89° 35' 55" WEST (BEING AN ASSUMED BEARING) ALONG THE SOUTH LINE OF SAID 1/4 SECTION, THE SOUTH QUARTER CORNER THEREOF ALSO BEING A CONCRETE MONUMENT WITH ALUMINUM CAP, 660.81 FEET TO A POINT ON THE WEST LINE OF THE EAST 1/2 OF THE EAST 1/2 OF SAID SOUTHEAST 1/4 SECTION; THENCE NORTH 01 °13' 46" WEST ALONG SAID WEST LINE 287.96 FEET TO THE POINT OF BEGINNING;

THENCE CONTINUING NORTH 01 °13' 46" WEST ALONG SAID WEST LINE 28.88 FEET;
THENCE NORTH 45 ° 03 ' 06 " EAST 46.88 FEET;
THENCE NORTH 12 ° 52 ' 16 " WEST 48.35 FEET;
THENCE NORTH 32 ° 00 ' 18 " EAST 182.46 FEET;
THENCE NORTH 76 ° 22 ' 23 " EAST 73.76 FEET;
THENCE NORTH 31 ° 57 ' 30 " EAST 11.72 FEET TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 58 ° 02 ' 30 " EAST ALONG SAID SOUTH LINE 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 30 " WEST 29.30 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 14.65 FEET;
THENCE NORTH 76 ° 57 ' 30 " EAST 28.97 FEET;
THENCE NORTH 31 ° 57 ' 30 " EAST 8.83 FEET TO A POINT ON THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTH 58 ° 02 ' 30 " EAST ALONG SAID SOUTH LINE 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 30 " WEST 17.11 FEET;
THENCE SOUTH 76 ° 57 ' 30 " WEST 45.55 FEET;
THENCE NORTH 57 ° 59 ' 51 " WEST 26.47 FEET;
THENCE SOUTH 32 ° 00 ' 09 " WEST 22.27 FEET;
THENCE NORTH 57 ° 59 ' 51 " WEST 20.00 FEET;
THENCE NORTH 32 ° 00 ' 09 " EAST 20.50 FEET;
THENCE SOUTH 76 ° 22 ' 23 " WEST 25.12 FEET;
THENCE SOUTH 32 ° 00 ' 18 " WEST 171.67 FEET;
THENCE SOUTH 12 ° 52 ' 16 " EAST 54.45 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 39.66 FEET;
THENCE NORTH 31 ° 57 ' 59 " EAST 26.97 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 20.00 FEET;
THENCE SOUTH 31 ° 57 ' 59 " WEST 26.97 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 178.50 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 9.67 FEET;
THENCE NORTH 12 ° 59 ' 51 " WEST 12.62 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 20.00 FEET;
THENCE SOUTH 12 ° 59 ' 51 " EAST 12.62 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 36.41 FEET;
THENCE NORTH 32 ° 00 ' 09 " EAST 158.65 FEET;

THENCE NORTH 57 ° 59 ' 51 " WEST 40.90 FEET;
THENCE NORTH 32 ° 00 ' 09 " EAST 20.00 FEET;
THENCE SOUTH 57 ° 59 ' 51 " EAST 42.91 FEET;
THENCE NORTH 77 ° 00 ' 09 " EAST 63.86 FEET;
THENCE SOUTH 62 ° 50 ' 31 " EAST 54.87 FEET;
THENCE SOUTH 68 ° 01 ' 27 " EAST 25.60 FEET TO A POINT ON A NON-TANGENT CURVE SAID CURVE ALSO BEING THE SOUTH LINE OF WEST DREXEL AVENUE; THENCE SOUTHEASTERLY ALONG SAID SOUTH LINE 33.54 FEET SAID LINE ALSO BEING A NON-TANGENT CIRCLE TO THE LEFT HAVING A RADIUS OF 545.00 FEET AND WHOSE CHORD BEARS SOUTH 60 ° 19 ' 52" EAST 33.53 FEET TO A POINT;
THENCE SOUTH 27 ° 54 ' 22 " WEST 15.59 FEET;
THENCE NORTH 68 ° 01 ' 27 " WEST 58.12 FEET;
THENCE NORTH 62 ° 50 ' 31 " WEST 48.47 FEET;
THENCE SOUTH 77 ° 00 ' 09 " WEST 51.12 FEET;
THENCE SOUTH 32 ° 00 ' 09 " WEST 176.64 FEET;
THENCE SOUTH 77 ° 00 ' 09 " WEST 82.65 FEET;
THENCE NORTH 57 ° 59 ' 51 " WEST 264.91 FEET;
THENCE SOUTH 45 ° 03 ' 06 " WEST 53.76 FEET; TO THE POINT OF BEGINNING.

CONTAINING 0.623 ACRES OR 27,152 SQUARE FEET MORE OR LESS.

Prepared by: Spaceco, Inc.

DATE: April 28, 2016

REVISED: April 29, 2016

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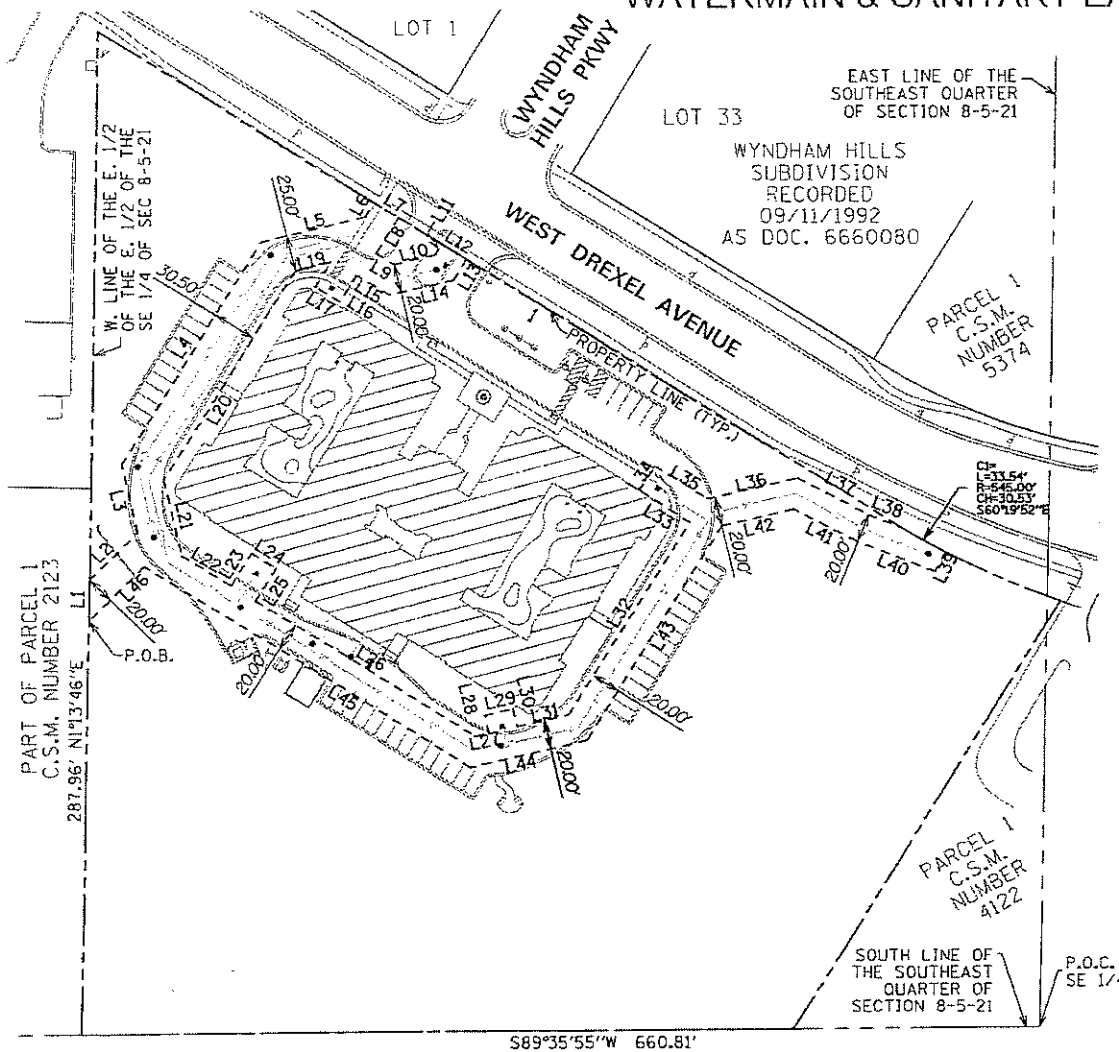
Exhibit C
(Description of Easement Area)

WATERMAIN & SANITARY EASEMENT EXHIBIT



LINE TABLE

NO.	BEARING	DISTANCE
L1	NORTH 01 º 13 ' 46 " EAST	28.88 FEET
L2	NORTH 45 º 03 ' 06 " EAST	46.88 FEET
L3	NORTH 12 º 52 ' 16 " WEST	48.35 FEET
L4	NORTH 32 º 00 ' 18 " EAST	182.46 FEET
L5	NORTH 76 º 22 ' 23 " EAST	73.76 FEET
L6	NORTH 31 º 57 ' 30 " EAST	11.72 FEET
L7	SOUTH 58 º 02 ' 30 " EAST	20.00 FEET
L8	SOUTH 31 º 57 ' 30 " WEST	29.30 FEET
L9	SOUTH 57 º 59 ' 51 " EAST	14.65 FEET
L10	NORTH 76 º 57 ' 30 " EAST	28.97 FEET
L11	NORTH 31 º 57 ' 30 " EAST	8.83 FEET
L12	SOUTH 58 º 02 ' 30 " EAST	20.00 FEET
L13	SOUTH 31 º 57 ' 30 " WEST	17.11 FEET
L14	SOUTH 76 º 57 ' 30 " WEST	45.55 FEET
L15	NORTH 57 º 59 ' 51 " WEST	26.47 FEET
L16	SOUTH 32 º 00 ' 09 " WEST	22.27 FEET
L17	NORTH 57 º 59 ' 51 " WEST	20.00 FEET
L18	NORTH 32 º 00 ' 09 " EAST	20.50 FEET
L19	SOUTH 76 º 22 ' 23 " WEST	25.12 FEET
L20	SOUTH 32 º 00 ' 18 " WEST	171.67 FEET
L21	SOUTH 12 º 52 ' 16 " EAST	54.45 FEET
L22	SOUTH 57 º 59 ' 51 " EAST	39.66 FEET
L23	NORTH 31 º 57 ' 59 " EAST	26.97 FEET
L24	SOUTH 57 º 59 ' 51 " EAST	20.00 FEET
L25	SOUTH 31 º 57 ' 59 " WEST	26.97 FEET
L26	SOUTH 57 º 59 ' 51 " EAST	176.50 FEET
L27	NORTH 77 º 00 ' 09 " EAST	9.67 FEET
L28	NORTH 12 º 59 ' 51 " WEST	12.62 FEET
L29	NORTH 77 º 00 ' 09 " EAST	20.00 FEET
L30	SOUTH 12 º 59 ' 51 " EAST	12.62 FEET
L31	NORTH 77 º 00 ' 09 " EAST	36.41 FEET
L32	NORTH 32 º 00 ' 09 " EAST	158.65 FEET
L33	NORTH 57 º 59 ' 51 " WEST	40.90 FEET
L34	NORTH 32 º 00 ' 09 " EAST	20.00 FEET
L35	SOUTH 57 º 59 ' 51 " EAST	42.91 FEET
L36	NORTH 77 º 00 ' 09 " EAST	63.86 FEET
L37	SOUTH 62 º 50 ' 31 " EAST	54.87 FEET
L38	SOUTH 68 º 01 ' 27 " EAST	25.60 FEET
L39	SOUTH 27 º 54 ' 22 " WEST	15.59 FEET
L40	NORTH 68 º 01 ' 27 " WEST	58.12 FEET
L41	NORTH 62 º 50 ' 31 " WEST	48.47 FEET
L42	SOUTH 77 º 00 ' 09 " WEST	51.12 FEET
L43	SOUTH 32 º 00 ' 09 " WEST	176.64 FEET
L44	SOUTH 77 º 00 ' 09 " WEST	82.65 FEET
L45	NORTH 57 º 59 ' 51 " WEST	264.91 FEET
L46	SOUTH 45 º 03 ' 06 " WEST	53.76 FEET

DATED: 04/29/2016

N

SCALE: 1" = 80'

SPACECO INC.

CONSULTING ENGINEERS
SITE DEVELOPMENT ENGINEERS
LAND SURVEYORS

9575 W. Higgins Road. Suite 700.
Rosemont, Illinois 60018
Phone: (847) 696-4060 Fax: (847) 696-4065

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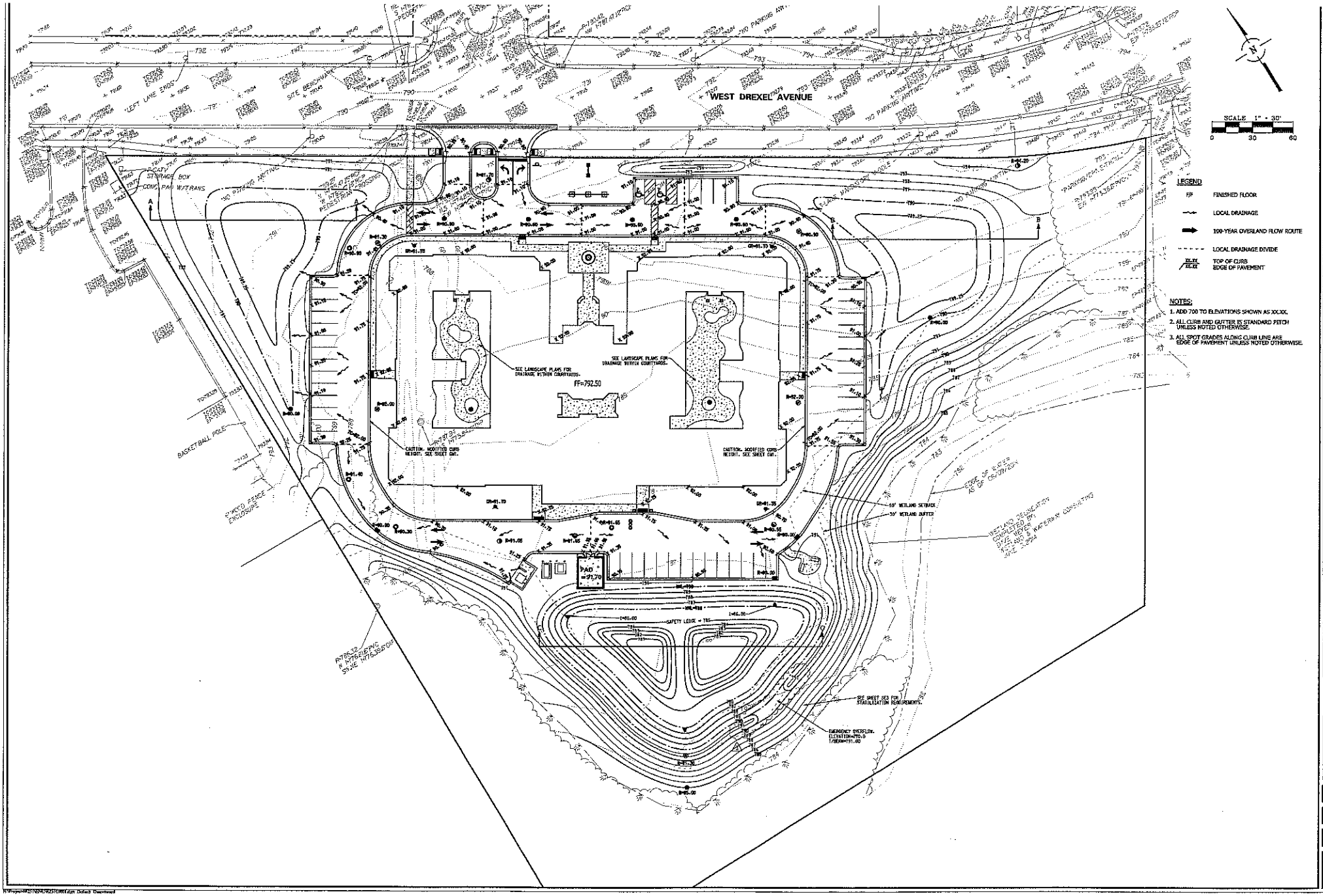

GRADING PLAN

CONSULTING ENGINEERS
SITE DEVELOPMENT ENGINEERS

FILENA
8251GF

DATE:
12/23/

JOB N
8251

SHEET
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APPROVAL Slw	REQUEST FOR COUNCIL ACTION	MTG. DATE 6/7/2016
Reports & Recommendations	**SUBJECT:** SURVEY OF AREA RESIDENTS FOR THE NEED TO EXTEND SANITARY SEWER ON S. 76TH STREET FROM A POINT 3000 FEET SOUTH OF W. RYAN ROAD AND A POINT 1400 FEET NORTH OF W. RYAN ROAD AND ON W. RYAN ROAD FROM A POINT 2400 FEET WEST OF S. 76TH STREET TO S. 76TH STREET	**ITEM NO.** G, 12,

BACKGROUND

Staff has recently received a request to extend sanitary sewer service to the S. 76th Street and W. Ryan Road area. Extension from the Ryan Creek Interceptor would provide for service to abutting properties and development areas. The City previously surveyed properties in the early part of 2013. The results, after contacting all properties, were as follows:

13 In favor
12 Opposed
3 Did not express opinion

Then early 2014 after considering the potential financing and abstinence of new development, the Finance Committee believed it to be desirable at that time to complete engineering design (plans and specifications) and easement development, this to be a valuable interim step.

The Council, after further consideration, chose to hold on proceeding with the design and easement development.

ANALYSIS

In that the previous survey occurred three years ago and given a positive turn in the economy, it could be insightful and useful for City planning to re-survey the property owners. A number of developers and their agents have recently been in contact with City staff.

OPTIONS

Proceed with a survey.
or
Table the matter for now.

FISCAL NOTE

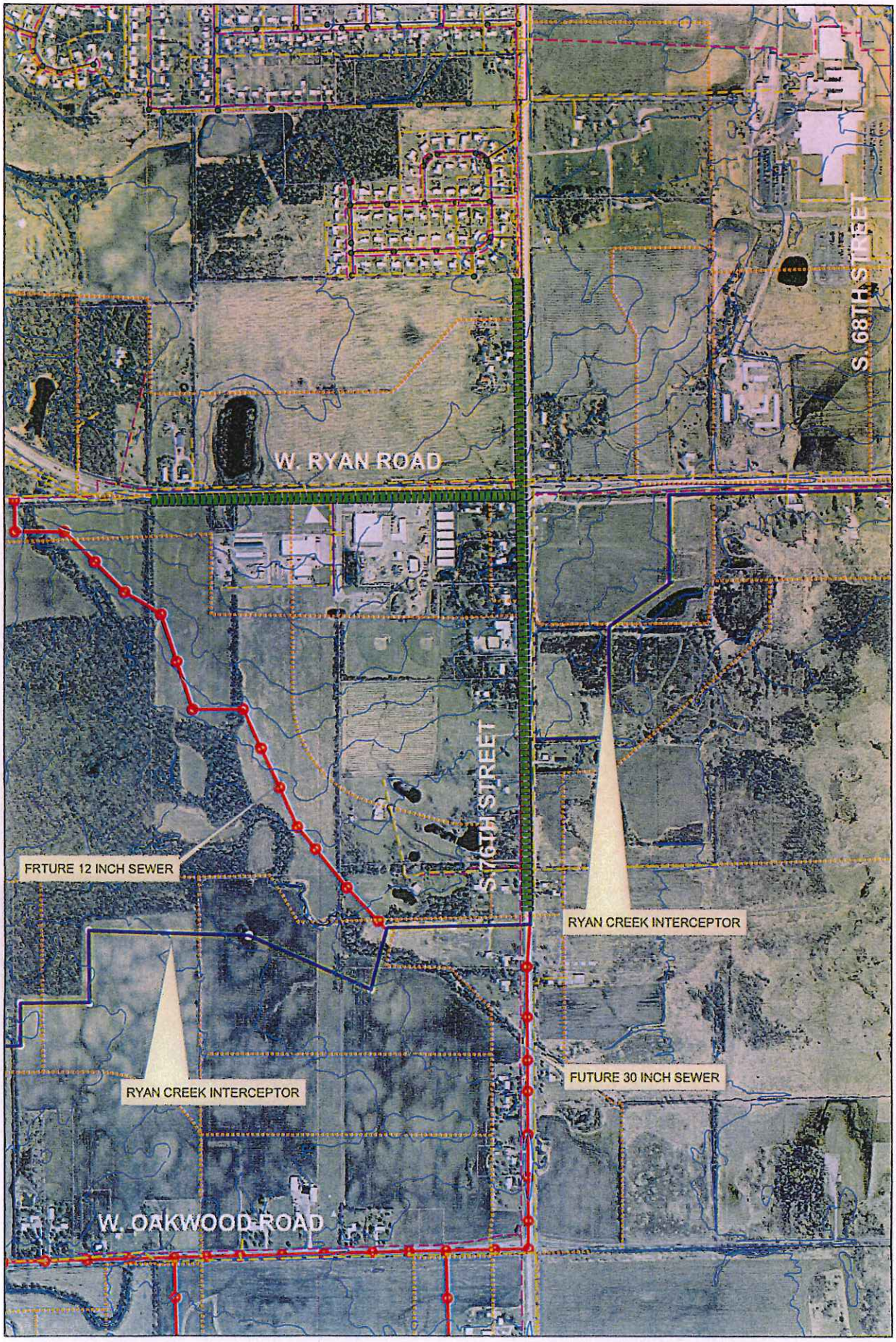
The cost of the survey is nominal and can be handled within budget. Should Council want to proceed with the $2.5+ million project, a 2016 budget amendment would be required to provide the necessary appropriation. If the project were to be completed in 2017, then consideration of the project could be included in the 20017 budget process.

In either scenario, a borrowing would be required to provide the necessary resources. Special assessments and future connection resources would then be used to partially retire the debt. Any shortfalls would then be secured via a Debt Service Tax Levy.

RECOMMENDATION

Motion to direct staff to survey for the extension of sanitary sewer as follows: S. 76th Street from a point 3000 feet south of W. Ryan Road to a point 1400 feet north of W. Ryan Road and on W. Ryan Road from a point 2400 feet west of S. 76th Street to S. 76th Street and return the results to the Common Council.

PROPOSED SANITARY SEWER EXTENSION
W. RYAN ROAD AND S. 76TH STREET



PROPOSED SANITARY SEWER EXTENSION

APPROVAL SLW	REQUEST FOR COUNCIL ACTION	MEETING DATE June 7, 2016
REPORTS & RECOMMENDATIONS	STATUS ON S. 51ST STREET AND W. DREXEL AVENUE INTERSECTION	ITEM NUMBER G.13.

BACKGROUND

The level of traffic service at the intersection of S. 51ST Street and W. Drexel Avenue is gradually being adversely affected. This is possibly due to an increase in student drivers, parking along the roadway, and an increase in school activities. In 2009, GRAEF designed the 51st St. road reconstruction and included a proposal to study this intersection for an additional fee, which design services were not selected by the City at that time. In the 2016, Engineering researched the possible use and funding for a college engineering class to study the traffic but funding was not available.

Based on a number of citizen requests, Alderperson's Wilhelm and Barber asked Staff to explore options to study the traffic flow at this intersection. Staff contacted the Southeastern Regional Planning Commission (SEWRPC) who stated they have the ability to provide this analysis without additional costs to the City.

ANALYSIS

Staff discussed the timeframe with SEWRPC and it is preferred to wait until the fall to gain a more accurate analysis of the study area since a significant amount of traffic at this intersection is school related.

SEWRPC will call Staff and set up a meeting to discuss the particulars sometime in July. Scope of the SEWRPC study is anticipated to include:

- Traffic (turn) counts for the intersection
- Projections for future traffic
- Analysis of 4-way stop, signal, and roundabout
- Recommendation on proposed solution

OPTIONS

Not Applicable

FISCAL NOTES

It is not anticipated that the SEWRPC study will incur any City costs. The Recommendation will assist in developing a project construction budget.

RECOMMENDATION

Motion to request Staff move forward with the study performed by SEWRPC of the intersection of 51st and W Drexel Avenue as needed in preparation for the fall school season.

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APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
SLW	ORDINANCE	06/07/2016
REPORTS & RECOMMENDATIONS	~~RESOLUTION~~ TO MODIFY WATER AND SEWER ASSESSMENT RATES IN SECTION 207-15 OF THE FRANKLIN CITY CODE	ITEM NUMBER G.14.

BACKGROUND

Section 207-15 of the Franklin City Code discusses special assessments. Subsection R(1) states:

> *Upon any special assessment made upon a front foot basis: no assessment for the installation of sanitary sewer main shall exceed $55 per front foot for any single-family or two-family or agriculture zoned property or $71.50 per front foot for any business, industrial, institutional or multifamily zoned property; no assessment for the installation of water main shall exceed $45 per front foot for any single-family or two-family or agriculture zoned property or $58.50 per front foot for any business, industrial, institutional or multifamily zoned property. The aforesaid maximum assessment rates shall be adjusted annually, commencing January 1, 1997, by an amount equal to the change in the Consumer Price Index (Revised Consumer Price Index for Urban Wage Earners and Clerical Workers for All Items-U.S. City Average).*

On April 19, 2016, Common Council tabled this matter asking for more background information.

ANALYSIS

Although many utility projects were fully recouped through the assessment process when the policy was first adopted in 1997, Staff has observed that recent assessments are only recovering approximately 60% of the cost of the project. This conclusion that the current method is woefully inadequate to fully recover the cost of a project was based on the following three analyses:

Analysis 1: The first approach considered evaluating the historical labor, material and equipment costs. The attached spreadsheet shows data dating back to 1995 as provided by the Wisconsin Underground Contractors Association, estimates by local contractors, and local suppliers. This analysis shows that $1.00 of construction project in 1996 would cost $2.48. In comparison, the same $1.00 project using 1995-2016 Franklin water assessment rates ($45.00 to $68.83) represents a 2016 value of $1.53 which is 62% of $2.48.

Analysis 2: A second approach and most telling is based on consideration of two Franklin projects. The first, Scepter Circle water relay was constructed in the spring of 2015. The project, although relatively small, had an eight-inch water main installed within residential with assessable frontage on both sides. As a replacement project, it was not assessed, however the actual costs are relevant for this analysis. The assessment rate based on the low bid would have been $85.85/LF and based on the average bid the assessment rate would have been $107.18/LF. The current water assessment rate of $68.83 is only 80% and 64% of the low and average bids respectively.

The second project considered was S. 46th Street. This single-family residential water main project was not carried forward to design and construction but was carefully estimated using a variety of references and based on number of fittings, hydrants, pipe materials, etc. To fully fund the project, an assessable

rate of $116.45 would have needed to be employed. The current water assessment rate of $68.83 is only 60% of the engineers estimate.

Analysis 3: The third approach involved contacting three comparable suburban communities (Oak Creek, Muskego, and Brookfield). Oak Creek and Muskego do not appear to have assessment policies intended to fully recover the cost of a project though assessments. Brookfield does recover the full amount of a project however does not have a capped limit. When presented with Franklin's data for the two projects in Analysis 2, Brookfield commented that those numbers are in line with some of their similar projects.

Since Staff has determined that the current Franklin rates are not fully capturing the costs of projects, there are many possible explanations for this trend.

- Consumer Price Index (CPI) is not equivalent to costs of construction projects.
- Material costs being relatively equal, Contractors vary their bid depending on competition from other contractors and their current workload.
- Prevailing wage rates have increased faster than the CPI.
- Equipment rates, fuel expenses, and contractor insurances are also believed to have outpaced the CPI.

As observed in Oak Creek and Muskego, other communities do not require the new customers to fully fund a project. The Wisconsin Public Service Commission (PSC) outlined procedures for financing water main extensions in Franklin's 2009 full rate case that states that the costs shall be wholly financed by the new customers [paraphrased]. Specifically see the attached pages 8, 9 and 10 from the 2009 full rate case decision.

Water mains will be extended for new customer on the following basis:

A. *... cost of the extension is to immediately be collected through assessment...*

B. ... [if] *unwilling or unable to make a special assessment, the extension will be made on a customer-financed basis...*

Because of Franklin's dwindling utility development funds, the goal for future projects should be that the assessment rates wholly pay for the project. Based on the detailed analyses and discussion with the Franklin Board of Water Commissioners, it appears that most projects should be assessed at approximately $90 for water projects and $110 for sewer projects if the goal is to recover 100% of cost of typical dual-sided projects. For unique situations such as rock excavation, lift stations, extraordinary depths, conflicts with other utilities, one-sided project, etc, can dramatically escalate costs.

The Consumer Price Index (CPI) currently referenced by the Franklin policy is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. There are other indexes more reflective of construction costs. All of the well known construction indexes appear to subscriber based. One of the more widely recognized indexes for civil projects is published by Engineering News-Record (ENR). ENR has specialized construction costs indexes (CCI) for 20 American cities. The city indexes use local prices for Portland cement and 2 X 4 lumber and the national average price for structural steel. The city's building and construction cost indexes use local union wages, plus fringes, for carpenters, bricklayers and iron workers. The city's CCI uses the same union wages for laborers. Milwaukee is not listed but Chicago is included. The 20-City average numbers appear to be more applicable to Franklin, WI.

Using the 1996 values that were first adjusted in 1997, below are the comparisons of CPI and ENR cost indexes with Staff's proposed rates.

Type of Development	Jan '96	2016 CPI	Oct '15 ENR	Staff Proposed
Residential-Type Water	$45.00	$ 68.83	$82.23	$90.00
Non-Res-Type Water	$58.50	$ 89.48	$106.90	$110.00

Residential-Type Sewer	$55.00	$ 84.13	$100.50	$110.00
Non-Res -Type Sewer	$71.50	$109.36	$130.65	$135.00

Note that neither the CPI nor the ENR values are as high as we have observed in the Staff analysis of $90 for water and $110 for sewer. Staff proposes a reset of values to be next adjusted by ENR in January 1, 2017.

Discussion on percent increase from residential uses (single-family or two-family or agriculture zoned property) to non-residential uses (business, industrial, institutional or multifamily zoned property) for water projects would suggest a similar percent increase for sewer projects.

Common Council should be reminded that just because preliminary assessment rates are based on a high (capped) project construction estimate, the assessment is lowered to reflect actual bids received. Conversely, the cap does not enable the assessment rate to increase for more expensive projects. It may be advantageous to raise the rates to ensure that more projects will be fully funded through assessments.

It is believed that a good assessment policy establishes a fair and equitable way to allocate costs for all properties. The Franklin Board of Water Commissioners discussed that the PSC's directive is to have all projects pay for themselves and the property owner is protected by a cap at the actual cost of the project based on competitive bids. To ensure that most projects have 100 percent coverage, BWC is recommending to the Common Council that the 2016 established water rates be the Staff's proposed rates plus 20 percent. Subsequent years would be modified per the ENR cost index. Below are these rates with similar philosophy for the sanitary sewer projects.

Type of Development	2016 BWC's Proposed
Residential-Type Water	$108.00
Non-Res-Type Water	$132.00
Residential-Type Sewer	$132.00
Non-Res -Type Sewer	$162.00

OPTIONS

- Leave current process with CPI in place as outlined in Ordinance 207-15 R(1); or
- Modify current process with CPI and reset 2016 figures to $90.00 (water-residential), $110.00 (water-non-residential), $110.00 (sewer-residential), and $135.00 (sewer-non-residential); or
- Change current process with ENR and reset 2016 figures to $90.00 (water-residential), $110.00 (water-non-residential), $110.00 (sewer-residential), and $135(sewer-non-residential).
- Accept the Board of Water Commissioners recommended method and change current process with ENR and reset 2016 figures to $108.00 (water-residential), $132.00 (water-non-residential), $132.00 (sewer-residential), and $162.00 (sewer-non-residential).

FISCAL NOTES

When a new utility project is undertaken, it is funded through the Utility Development fund (replacing old mains does not get funded by the Utility Development Fund). The project cost is assessed to impacted property owners. Many of whom take advantage of the payment plan offered by the ordinance.

Resources to the Utility Development fund are connection fees and collections of prior special assessments including interest.

New Debt would be sold should insufficient resources be available in the Utility Development Fund.

For the period ending 1/31/2016, the Water Utility Development fund had $352,711.84 and the Sewer reserves totaled $554,598.69. Through deferments, the water funds are owed a total of $625,039.59 and the sewer funds are owed $469,445.41.

RECOMMENDATION

Staff concurs with the Board of Water Commissioners to make a motion to adopt ~~Resolution~~ ORDINANCE No. 2016- _____ a ~~resolution~~ ordinance authorizing certain officials to modify Section 207-15 R(1) of the Franklin City Code as follows:

Upon any special assessment made upon a front foot basis: no assessment for the installation of sanitary sewer main shall exceed ~~$55~~ **$132.00** *per front foot for any single-family or two-family or agriculture zoned property or ~~$71.50~~* **$162.00** *per front foot for any business, industrial, institutional or multifamily zoned property; no assessment for the installation of water main shall exceed ~~$45~~* **$108.00** *per front foot for any single-family or two-family or agriculture zoned property or ~~$58.50~~* **$132.00** *per front foot for any business, industrial, institutional or multifamily zoned property. The aforesaid maximum assessment rates shall be adjusted annually, commencing January 1, ~~1997~~,* **2017** *by an amount equal to the change in the ~~Consumer Price Index (Revised Consumer Price Index for Urban Wage Earners and Clerical Workers for All Items-U.S. City Average)~~.* **Engineering News-Record (ENR) Construction Cost Index (CCI) 20-City National Average.**

STATE OF WISCONSIN: CITY OF FRANKLIN: MILWAUKEE COUNTY

ORDINANCE ~~RESOLUTION~~ NO. 2016 - _____

A ~~RESOLUTION~~ TO MODIFY WATER AND SEWER ASSESSMENT RATES IN SECTION 207-15 OF THE FRANKLIN CITY CODE

WHEREAS, Franklin assesses property owners for water and sanitary sewer utility projects; and

WHEREAS, assessment rates are expected to fully pay for projects; and

WHEREAS, a historical analysis of projects indicate that they current methods of establishing assessment rates are not recovering the cost of the project; and

WHEREAS, Engineering News Record (ENR) Construction Cost Index (CCI) 20-City National Average is more relevant to the construction of water and sanitary sewer projects than Consumer Cost Index (CPI); and

WHEREAS, Franklin Board of Water Commissioners and City Engineering Staff have studied this issue and have proposed values to reset for Residential-Type Water ($108.00), Non-Residential-Type Water ($132.00), Residential-Type Sewer ($132.00), and Non-Residential-Type Sewer ($162.00);

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Common Council of the City of Franklin that it would be in the best interest of the City to modify Section 207-15 R(1) of the Franklin City Code as follows:

Upon any special assessment made upon a front foot basis: no assessment for the installation of sanitary sewer main shall exceed ~~$55~~ **$132.00** *per front foot for any single-family or two-family or agriculture zoned property or ~~$71.50~~* **$162.00** *per front foot for any business, industrial, institutional or multifamily zoned property; no assessment for the installation of water main shall exceed ~~$45~~* **$108.00** *per front foot for any single-family or two-family or agriculture zoned property or ~~$58.50~~* **$132.00** *per front foot for any business, industrial, institutional or multifamily zoned property. The aforesaid maximum assessment rates shall be adjusted annually, commencing January 1, ~~1997~~,* **2017** *by an amount equal to the change in the ~~Consumer Price Index (Revised Consumer Price Index for Urban Wage Earners and Clerical Workers for All Items U.S. City Average)~~.* **Engineering News-Record (ENR) Construction Cost Index (CCI) 20-City National Average.**

INTRODUCED at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016 by Alderman _____.

PASSED AND ADOPTED at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016.

APPROVED:

_____

Stephen R. Olson, Mayor

ATTEST:

_____

Sandra L. Wesolowski, City Clerk

AYES _____ NOES _____ ABSENT _____

ANALYSIS 1:
CONSTRUCTION PERCENT INCREASE
TYPICAL UNDERGROUND (WATER/SEWER) PROJECT
CITY OF FRANKLIN

YEAR	CREW HOUR (FOREMAN/3 LABORERS/ OPERATOR)	LABOR % INCREASE ANNUALLY	ESTIMATED EQUIPMENT INCREASE	45% LABOR 55% EQUIPMENT PRORATED INCREASE	ESTIMATED MATERIAL INCREASE	MATERIAL EQUALLY AVERAGED WITH LABOR/ EQUIPMENT	Value
Source:	*Wisconsin Underground Contractors Association*	*Calculated*	*3 Local Contractors*	*Calculated From Assumed Projects*	*2 Local Suppliers*	*Calculated*	*Calculated*
1995	$141.59						$ 1.00
1996	$148.52	4.9%	3%	3.85%	4%	3.93%	$ 1.04
1997	$155.46	4.7%	3%	3.75%	4%	3.88%	$ 1.08
1998	$161.61	4.0%	3%	3.43%	4%	3.72%	$ 1.12
1999	$167.25	3.5%	3%	3.22%	4%	3.61%	$ 1.16
2000	$173.69	3.9%	3%	3.38%	4%	3.69%	$ 1.20
2001	$180.43	3.9%	3%	3.40%	4%	3.70%	$ 1.25
2002	$185.80	3.0%	3%	2.99%	4%	3.49%	$ 1.29
2003	$191.41	3.0%	3%	3.01%	4%	3.50%	$ 1.34
2004	$199.42	4.2%	3%	3.53%	4%	3.77%	$ 1.39
2005	$206.91	3.8%	3%	3.34%	4%	3.67%	$ 1.44
2006	$218.46	5.6%	3%	4.16%	4%	4.08%	$ 1.50
2007	$226.80	3.8%	3%	3.37%	4%	3.68%	$ 1.55
2008	$234.54	3.4%	3%	3.19%	4%	3.59%	$ 1.61
2009	$247.72	5.6%	3%	4.18%	4%	4.09%	$ 1.67
2010	$260.34	5.1%	3%	3.94%	4%	3.97%	$ 1.74
2011	$271.31	4.2%	3%	3.55%	4%	3.77%	$ 1.80
2012	$281.08	3.6%	8% [1]	6.02%	4%	5.01%	$ 1.90
2013	$289.96	3.2%	8%	5.82%	4%	4.91%	$ 1.99
2014	$294.41	1.5%	8%	5.09%	10% [2]	7.55%	$ 2.14
2015	$302.36	2.7%	8%	5.62%	10%	7.81%	$ 2.31
2016						7.50% [3]	$ 2.48

Notes:

[1] - Emission standards engaged

[2] - Aggregate cost increase

[3] - Assumed

APPROVAL	REQUEST FOR COUNCIL ACTION	MTG. DATE
Slw		06/07/2016
Reports & Recommendations	APPROVAL OF REVISED RATES OF SERVICE FOR STORMWATER MANAGEMENT PLAN REVIEWS AND NATURAL RESOURCE SPECIAL EXCEPTIONS FOR THE YEARS 2016 AND 2017	ITEM NO. G.15.

BACKGROUND

Please be advised that pursuant to Common Council policy, to supplement the City Engineering Department, consultant engineering firms are employed to review stormwater management plans.

The developers pay for this review from their letter of credit.

ANALYSIS

The term of consultant employment is typically for two years. The existing rates have not been increased since 2012. The City has received timely and thorough service from the current firm (GRAEF) and Staff recommeneds that the contracts be amended with new rates for 2016 and 2017.

For consistency purposes, the engineering department has used one consultant to review stormwater management plans. The original contract for GRAEF (enclosed) was signed in 2012. Comparsion of the rates are as follows:

GRAEF Staff	2012	2016-2017
Stormwater Reviewer	$99.00	
Stormwater Reviewer (P2)		$97.00
Stormwater Reviewer (P3)		$108.00
Environmental Reviewer	$95.00	-
Lead Environmental Reviewer (P3)	-	$103.00
Lead Stormwater Reviewer / PM	$129.00	-
PM Stormwater (P6)	-	$139.00
PM Environmental (P6)	-	$150.00
Principal In Charge (P7)	$139.00	$160.00

OPTIONS

Extend agreements with rates for 2016 and 2017

FISCAL NOTE

Rates of review services will be charged to developers.

RECOMMENDATION

Motion for approval of revised rates of service for storm water review services for years 2016 and 2017.

Encl.

Department of Engineering GEM

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APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw		06/07/2016
REPORTS & RECOMMENDATIONS	**Request to Continue to Retain a Part-Time Building Inspector**	ITEM NUMBER G.11e.

At the meeting of April 19, 2016, the Common Council authorized the continued use of a Part-Time Building Inspector for approximately 12 hours per week with a follow-up report to be provided at the first June meeting. An important aspect of the approval was the condition that the Director of Administration continue to find sufficient savings or reductions from within the operating budgets he oversees to cover the added costs of the Part-Time Building Inspector.

The Director of Administration recommends that the current authorization continue in place through the summer construction season. Departmental circumstances continue to apply pressures that threaten consistent and appropriate levels of customer service. Although the Department is at full authorized strength, two staff members remain new and are still partially in the training phase. The newest has the necessary commercial inspector's certificate, but does not have prior direct commercial inspector's experience. As such, continued in-field training, which means two inspectors over-lapping inspections, is occurring (although it is tapering off at this time). The second new inspector is performing well with residential inspections but is continuing to pursue his commercial inspector's certification. Lacking this certification restricts his full productivity within the department. These two factors are important reasons to retain the part-time inspector to help maintain a more complete service level, even though it is only 12 hours per week. During those 12 hours, the part-time inspector focuses on plan reviews, which frees up the other inspectors for field work. With the support of this position, commercial and residential permit approvals are generally up to date, although there is a slight backlog in sign permit approvals due to a significant number of permit requests.

Another valuable reason to maintain the part-time inspector is so that the Department Head, the Building Inspector, can continue to work on other duties and managerial responsibilities besides field inspections. Losing 12 hours of plan review would require the Building Inspector to pick-up these core requirements. In recent weeks, multiple departmental managerial issues have been addressed. For example, a recent meeting with the City Engineer resolved a permit coordination issue that has helped ensure residential permits are approved within the expected statutory standards. Similarly, significant effort has been put in toward resolving a code development issue pertaining to small, manufactured sheds. The Building Inspector is working on the issue with the City of Greendale's inspector and will be moving forward a code solution soon. The solution is a result of trying to resolve concerns for two different residents with shed permitting issues where the resident's intent conflicts with State codes. These sorts of issues will not be able to be addressed if the Building Inspector devotes all of his time to inspections, which limits addressing managerial concerns.

Lastly, retaining the part-time inspector is probably more cost effective in the long run. For example, if one considers the overtime hours worked by the First Assistant Building Inspector, who is the only other experienced commercial inspector, one can actually see the potential for cost savings from using the part-time inspector. In 2014 and 2015, the First Assistant Building Inspector had 202 and 137 hours of overtime, respectively. Nearly half way through 2016, he has less than 20 hours. His overtime hours are at a slightly higher rate and, per law, are at time and one-half. Granted, staffing changes during 2014 and 2015 don't make this a perfect analogy, and this isn't intended to suggest that the drop in overtime hours is fully attributed to the part-time building inspector. It does, however, highlight that the part-time inspector is a more cost-effective way to meet service demands and fluctuations in permit levels.

The bottom line is that the Director of Administration strongly recommends that the 12-hour per week part-time inspector be retained through the summer. Given that the cost for the limited additional service support is only approximately $1,700 per month, increasing the risks toward poorer service, negative opinions, and less time for management enhancements is simply not worth it. The Director of Administration, therefore, continues his commitment, as already incorporated into the previous approval, to find sufficient savings or reductions from within the operating budgets he oversees to cover the costs of retaining the part-time inspector for approximately 12 hours per week. A budget modification would be prepared before the end of the year to move the necessary appropriations to the appropriate personnel line items.

COUNCIL ACTION REQUESTED

Motion to grant an extension for retaining the part-time building inspector pending a follow-up report in September, 2016, and provided the Director of Administration continues to find sufficient savings or reductions from within the operating budgets he oversees to cover the costs of the position.

DOA-MWL

APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw		06/07/2016
REPORTS & RECOMMENDATIONS	Implementation Plan for the Fire Stations 2 and 3 "Climate-Controlled Security Closet Project" Using Wall-Mounted Network Cabinets	ITEM NUMBER G.17.

The Director of Information Technology, the author of this Council Action Sheet, recommends installing a wall-mounted, temperature-controlled, network cabinet within Fire Stations 2 and 3, superseding all previous proposals. I determine that a more cost-effective solution can be effectively performed without the need for any construction within the buildings.

As outlined in the Council Action Request for 12/15/2015 and approved by a budget modification on 3/1/2016, the Capital Improvement Fund has allocated $25,000 to building a security closet within Fire Station 2 and 3 to house networking and radio equipment. Currently, equipment is installed within an open-faced rack that is exposed to the external elements of the HVAC room. Due to extremely high temperatures within the summer months, there is concern that the exposed equipment may be subject to overheating and failure. The original proposal advocated building a temperature-controlled room at each facility at an estimated cost of $12,500.

The Director of IT reviewed the proposal and the conditions at each physical location. I noted that at Fire Station 3 any wall built around the circumference of the existing equipment would hamper access to the roof. The proposed area for the new wall would not only block the ceiling access, but would also have difficulty being routed around existing piping. A wall-mounted network cabinet that is temperature controlled is a more conventional method for enclosing this type of equipment and is frequently used within manufacturing facilities.

Heartland Business Systems, working with their suppliers, is able to install a wall-mounted network cabinet that is fully enclosed and contains a locked door. The cabinet is designed to route two HVAC ducts at the top, where HVAC venting will be directly connected to two separate building air conditioning units. A damper within the HVAC duct is able to prevent hot air from entering into the cabinet during the heating seasons. The cabinet is hinged to swing out from the wall and allow access to equipment and wiring at the rear of the cabinet.

On 5/25/2016, HBS and the HVAC vendor performed a site survey to confirm the work area and proposed changes to the cooling ductwork are appropriate. No problems were determined during the site survey that would require changes to the cabinet layout. Estimated costs (both sites) for the project are estimated to be:

$2,123 – Great Lakes Network Cabinet 36"H X 24"W X 24"D
$110 – Rack-mounted shelf
$200 – Cabinet mounting materials
$2,080 – Installation Fee (32 hours @ $65)
$1,000 – HVAC dual ductwork and installation

Total estimated charges (both locations) $5,513.

On Wednesday, 5/25/2016, the Technology Commission reviewed the cabinet and HVAC installation proposal and issued a motion recommending approval.

The Director of Administration concurs that this solution addresses the problem contemplated by the budgeted Capital Improvement Fund projects entitled "Climate-Controlled Security Closets." Realistically, this is an obvious, cost-effective solution. However, since the method of project implementation is arguably significantly different than originally contemplated at the time of original appropriation adoption and since the amount exceeds $5,000 (the level of authority for the Mayor to approve an alteration between capital items), the item is being brought back to the Common Council for confirmation that this solution meets their intent. Additionally, within the Capital Improvement Fund the item was initially listed as a "Project Pending Approval"; therefore, Common Council authorization was required prior to proceeding.

COUNCIL ACTION REQUESTED

Motion to approve the plan to install a wall-mounted, HVAC-controlled network cabinet at Fire Stations 2 and 3 as being consistent with and satisfying the "Climate-Controlled Security Closet Project" contemplated by the budget and to authorize the Director of Administration to execute the purchase orders and service contracts to carry out the project.

DOA/IT - MWL/JM

APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw MW		06/07/2016
REPORTS & RECOMMENDATIONS	**Authorization to purchase software licenses for cloud-based email spam and security filtering services, with Symantec Email Security.Cloud, using General Fund Contingency appropriations, for an amount not to exceed $4,500**	ITEM NUMBER G.18.

Security threats facing business and municipalities continue to advance at a pace often well beyond the technical skills of local staff and on-premise monitoring systems, offsetting long-term investments made in security appliances and detection systems. A recent analysis of City of Franklin existing security technology and IT controls outline several areas of weaknesses to be addressed. Email, because of its pervasive usage throughout every level of an organization, continues to be a primary method for hackers to deploy security and social engineering attacks.

On Wednesday, 5/25/2016, a presentation was made by the Director of IT to the Technology Commission based upon an internal review of existing City of Franklin security systems. The Technology Commission, upon review, has unanimously recommended pursuing enhancements to on-premise spam and email security monitoring, including deploying solutions to address vulnerabilities in software that may be exploited by hackers. It is the recommendation by the Director of IT and the Technology Commission that the City of Franklin implement a cloud-based (hosted) security solution that can better safeguard against advanced email-based attacks. A variety of alternatives were examined and discussed. Symantec Email Security.Cloud is better able to provide safeguards against the following security attacks that are lacking within existing on-site systems:

- Embedded ransomware links
- Embedded malware within advertisements
- Advance "spear phishing attacks"
- Malware injected within spam text
- Misrepresenting documents issued by an executive ("whaling")
- Social engineering attacks
- Attempts to gain access to sensitive employee records

It is the intention of the Director of IT and the Technology Commission, that existing email and archival systems remain on site at City Hall. Only spam filtering and security monitoring will be moved to a cloud-based solution provider. The implementation of the project will move email routing of both inbound and outbound email messages to Symantec for validation of the email's integrity and validity. The journal, or database, of existing messages will remain unchanged. Moving to a hosted-based email security solution offers the following advantages over premise-based monitoring:

- All communication between City of Franklin email servers and Symantec will be fully encrypted.
- Messages are queued at the email security provider. In the event that a City of Franklin email server is unavailable to receive messages, the email will be accepted and queued (held by Symantec). Today messages are denied if the email server is not active.

- Users will have a portal to modify spam filtering "white lists" and view messages determined to be spam.
- Advanced protection and cloud-based machine learning algorithms to detect developing security breaches, where virus signatures are not yet available.
- Advance reporting and summaries of spam and email security issues.
- Email security knowledge is outsourced to a specialized vendor instead of being relied upon by local IT staff. Email spam and security issues are constantly evolving and are best handled by a vendor that can provide highly dynamic security solution.
- Email security monitoring is a yearly contract that must be renewed. If a vendor is unable to provide satisfactory email filtering/security services, these services can easily be switched over to another provider. A capital investment in local equipment that must be used and depreciated for a period of years is not made.
- Additional services can be contracted through the same vendor (if desired) if additional levels of protection are warranted.

It is the recommendation of the Director of IT and the Technology Commission that approval should be granted to migrate email security services to Symantec Email Security.Cloud.

Fiscal Note: Licensing for such products are based upon the number of users, meaning email accounts, and can be purchased with State contract pricing from CDW, who consistently provides the City with the best software pricing. A license for 250 Exchange mailboxes for a 12-month term is $4,342.50. This project was budgeted and anticipated to be a capital expenditure; however, as proposed, the expense would be an operating budget expenditure. As such, it is proposed to authorize the expenditure from the Contingency appropriation of the General Fund. If approved, Information Services will then commit to under spend the authorized capital budget by an offsetting $5,000. Also, if approved as a contingency expenditure, the Director of Finance and Treasurer will, as is the City's common practice, bring in a budget modification at a future date to reallocate the expenditure to the Information Services line items.

COUNCIL ACTION REQUESTED

A motion to authorize the Director of Administration and Information Services to purchase annual software licenses to migrate existing on-premise email spam and security filtering services to a cloud-based service provider, with Symantec Email Security.Cloud, using General Fund Contingency appropriations for an amount not to exceed $4,500.

IS-DOA/JM-MWL

APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw		06/07/16
REPORTS & RECOMMENDATIONS	**Authorization For The Department Of Public Works To Sell Surplus Equipment**	ITEM NUMBER G.19.

At the May 10, 2016 Board of Public Works meeting board members authorized staff to post for sale the following items:

1. Unit #714, a 1998 John Deere 624H 3.5 cu yd wheel loader
2. #42, a 1985 Case International 585, Utility tractor with side flail mower
3. # 31, a 1985 Beuthling B100 1.5 ton pavement roller

Staff has posted each unit for sale on Wisconsin Surplus, an online auction surplus website (www.wisconsinsurplus.com). There is no cost to the seller. The auction will close on June 7, 2016 at 10:00a.m.. Staff will then review the highest bid for each item and make a recommendation to Council. The recommendation, along with a request for authorization to sell the surplus equipment, will be distributed at the June 7th Common Council meeting.

COUNCIL ACTION REQUESTED

Authorization for staff to accept the highest bids received on the Wisconsin Surplus website and sell the above units (per the recommendation to be distributed at the meeting).

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APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
SLW		June 7, 2016
REPORTS AND RECOMMENDATIONS	A Resolution Authorizing Certain Officials to Execute a Memorandum of Understanding for the Franklin Public School District use of the Softball Fields Located South of the City of Franklin Department of Public Works Facility at 7979 West Ryan Road	ITEM NUMBER G.20.

Attached is a copy of the proposed understanding. The provisions are the same as they have been since the prior use approvals were granted (except and excluding the 2014 provisions pertaining to the installation of the dugouts, which project was completed in 2014), starting in 2011. The Department of Public Works has no intended expansion need for the property at this time for 2016.

COUNCIL ACTION REQUESTED

A motion to adopt A Resolution Authorizing Certain Officials to Execute a Memorandum of Understanding for the Franklin Public School District use of the Softball Fields Located South of the City of Franklin Department of Public Works Facility at 7979 West Ryan Road.

jw

STATE OF WISCONSIN CITY OF FRANKLIN MILWAUKEE COUNTY

RESOLUTION NO. 2016-____

A RESOLUTION AUTHORIZING CERTAIN OFFICIALS TO EXECUTE A MEMORANDUM OF UNDERSTANDING FOR THE USE OF THE SOFTBALL FIELDS LOCATED SOUTH OF THE CITY OF FRANKLIN DEPARTMENT OF PUBLIC WORKS FACILITY AT 7979 WEST RYAN ROAD

WHEREAS, the Franklin Public School District requested approval of its use of the two softball fields located on City of Franklin property south of the City Department of Public Works facility; and

WHEREAS, the Common Council having reviewed such request and having found same to be reasonable and in the public interest.

NOW, THEREFORE, BE IT RESOLVED, by the Mayor and Common Council of the City of Franklin, Wisconsin, that the Memorandum of Understanding for the Franklin Public School District Use of the Softball Fields, in the form and content as annexed hereto, be and the same is hereby approved.

BE IT FURTHER RESOLVED, that the Mayor and City Clerk be and the same are hereby authorized to execute and deliver such agreement.

Introduced at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016.

Passed and adopted at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016.

APPROVED:

ATTEST:

_____
Stephen R. Olson, Mayor

_____
Sandra L. Wesolowski, City Clerk

AYES _____ NOES _____ ABSENT _____

MEMORANDUM OF UNDERSTANDING FOR THE FRANKLIN PUBLIC SCHOOL DISTRICT USE OF THE SOFTBALL FIELDS LOCATED SOUTH OF THE CITY OF FRANKLIN DEPARTMENT OF PUBLIC WORKS FACILITY AT 7979 WEST RYAN ROAD

WHEREAS, the Franklin Public School District requested approval of its use of the two softball fields located on City of Franklin property south of the City Department of Public Works facility located at 7979 West Ryan Road, Franklin, Wisconsin, and the Common Council having granted same.

NOW, THEREFORE, it is hereby understood and agreed, by the undersigned, as follows:

1. Franklin Public School District is hereby designated as a user of the subject softball fields for the year 2016 and in consideration thereof, agrees to provide all grass cutting reasonably and seasonably required on the property for the year 2016. The District owned aluminum team benches shall remain on the property all year. The District shall have access to the two shed-like structures (located between the fields to the north) for use related equipment storage.
2. Franklin Public School District agrees that its use and activities as set forth herein and all matters in any way related thereto shall be in compliance with all applicable governmental laws, statutes, decisions, codes, rules, orders, and ordinances, be they Federal, State, County or Local. To the fullest extent permitted by law, Franklin Public School District shall defend, indemnify and hold harmless the City, the City's officers, employees, agents, boards, commissions and agencies from and against all costs, losses, and damages caused by the negligent or intentional and wrongful acts of Franklin Public School District, its officers, directors, employees, agents and consultants with respect to this Memorandum.
3. Franklin Public School District is an independent contractor and all persons furnishing services to Franklin Public School District are employees of, or independent subcontractors of, and/or volunteers of Franklin Public School District and not of the City of Franklin.

Franklin Public School District

By: _____ Dated: _____
Sara K. Unertl, CAA
Athletic & Activities Director

City of Franklin

By: _____ Dated: _____
Stephen R. Olson, Mayor

By: _____ Dated: _____
Sandra L. Wesolowski, City Clerk

APPROVAL	REQUEST FOR COUNCIL ACTION	MEETING DATE
Slw		June 7, 2016
REPORTS AND RECOMMENDATIONS	A Resolution Authorizing Certain Officials to Execute a Memorandum of Understanding for the 2016 Use of the Softball Fields Located South of the City of Franklin Department of Public Works Facility at 7979 West Ryan Road with Franklin Force, Incorporated	ITEM NUMBER G.21.

Attached is a copy of the proposed understanding. The provisions are the same as they have been since the prior use approvals were granted, starting in 2011 (except for a reference to public use toilet facility provision by FPSD, which is not applicable at this time [was for months of April and May]). The Department of Public Works has no intended expansion need for the property at this time for 2016.

COUNCIL ACTION REQUESTED

A motion to adopt A Resolution Authorizing Certain Officials to Execute a Memorandum of Understanding for the 2016 Use of the Softball Fields Located South of the City of Franklin Department of Public Works Facility at 7979 West Ryan Road with Franklin Force, Incorporated.

jw

STATE OF WISCONSIN CITY OF FRANKLIN MILWAUKEE COUNTY

RESOLUTION NO. 2016-____

A RESOLUTION AUTHORIZING CERTAIN OFFICIALS TO EXECUTE A MEMORANDUM OF UNDERSTANDING FOR THE 2016 USE OF THE SOFTBALL FIELDS LOCATED SOUTH OF THE CITY OF FRANKLIN DEPARTMENT OF PUBLIC WORKS FACILITY AT 7979 WEST RYAN ROAD WITH FRANKLIN FORCE, INCORPORATED

WHEREAS, the Franklin Force, Incorporated requested approval of its use of the two softball fields located on City of Franklin property south of the City Department of Public Works facility for the year 2016, such use having been previously approved since 2011; and

WHEREAS, the Common Council having reviewed such request and having found same to be reasonable and in the public interest.

NOW, THEREFORE, BE IT RESOLVED, by the Mayor and Common Council of the City of Franklin, Wisconsin, that the Memorandum of Understanding for the 2016 Use of the Softball Fields Located South of the City of Franklin Department of Public Works Facility at 7979 West Ryan Road with Franklin Force, Incorporated, in the form and content as annexed hereto, be and the same is hereby approved.

BE IT FURTHER RESOLVED, that the Mayor and City Clerk be and the same are hereby authorized to execute and deliver such agreement.

Introduced at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016.

Passed and adopted at a regular meeting of the Common Council of the City of Franklin this _____ day of _____, 2016.

APPROVED:

ATTEST:

_____
Stephen R. Olson, Mayor

_____
Sandra L. Wesolowski, City Clerk

AYES _____ NOES _____ ABSENT _____

MEMORANDUM OF UNDERSTANDING FOR THE 2016 USE OF THE SOFTBALL FIELDS LOCATED SOUTH OF THE CITY OF FRANKLIN DEPARTMENT OF PUBLIC WORKS FACILITY AT 7979 WEST RYAN ROAD WITH FRANKLIN FORCE, INCORPORATED

WHEREAS, Franklin Force, Incorporated requested that its use of the softball fields located on City of Franklin property south of the City Department of Public Works facility located at 7979 West Ryan Road, Franklin, which started in 2011, be continued for the year 2016 upon the same conditions; and

WHEREAS, the property upon which the softball fields are located is City property designated for future Department of Public works facilities expansion, and is not currently needed for such purpose in the year 2016; and

WHEREAS, there is a primary public purpose served in the continuation of the use of the subject softball fields by the Franklin Force, Incorporated, as well as the Franklin School District and other resident and non-resident teams and persons, and in the undertaking of the operational and maintenance requirements by designated softball fields users, in lieu of such property remaining unused and awaiting Public Works Facility expansion, or the City undertaking the time and expense of such operational and maintenance requirements for use; and

WHEREAS, the Franklin Common Council having considered a request from Franklin Force, Incorporated, a non-stock corporation operating a youth fast-pitch softball league, with its principal office located at 6320 West River Pointe Drive, Franklin, Wisconsin 53132, to continue its use, operation and maintenance activities for the subject softball fields as were previously approved since 2011, while recognizing the Franklin Public School District priority use thereof, has determined it appropriate and reasonable to continue the authorization of such use for the year 2016.

NOW, THEREFORE, it is hereby understood and agreed, by the undersigned, as follows:

1. Franklin Force, Incorporated is hereby designated as a user of the softball fields located south of the Public Works facility at 7979 West Ryan Road, Franklin, Wisconsin, as depicted upon the map annexed hereto as Exhibit A, for the purposes of its youth fast-pitch softball league game and practice activities.
2. In consideration of such designation, Franklin Force, Incorporated, agrees as follows:
    a. It shall provide a certificate of insurance evidencing it being an insured by an authorized insurance carrier against all liability in any way arising from or pertaining to its use or activities as set forth in this Memorandum, whatsoever, in the general format of the youth sports league insurance industry standard insurance policy as was previously

approved for and maintained by it, in the minimum limit amount of $1,000,000, naming the City of Franklin as an additional insured, which certificate shall be filed with the office of the City Clerk.

b. It shall provide all scheduling services required for the use of the subject softball fields by others for youth game and practice activities, which scheduling shall provide that the use by the Franklin Public School District shall be primary.

c. It shall provide user scheduling on a first come first serve basis.

d. It shall not charge any fee to any user.

e. It shall require any user to file a certificate of insurance meeting the terms of subpar. a. above with the office of the City Clerk prior to any use.

f. It shall provide all reasonably necessary maintenance of the property supporting the softball fields, and the bleachers, benches, fences, and two shed-like structures (located between the fields to the north) thereon, including grass cutting, field marking and any other maintenance necessary so that the property is safe for users and attendees and reasonably neatly kept, except for those maintenance activities to be undertaken by the Franklin School District as set forth under par. 3. below.

g. It shall provide a portable toilet facility and the maintenance thereof to serve persons on the property at its cost, commencing June 10, 2016.

h. It shall provide all necessary trash collection and disposal services for the property at its cost.

i. It may provide for food and drink and other traditional baseball field use concessions sales on the softball fields property, provided that such use is approved in advance by the City Health Department pursuant to all laws, rules, regulations and codes.

j. It may provide signage on the softball fields property, provided that such use is approved in advance by the City Building Inspection Department and/or Architectural Review Board pursuant to all laws, rules, regulations and codes.

3. Franklin Public School District is also a designated as a user of the subject softball fields and in consideration thereof, agreed to provide all grass cutting reasonably and seasonably required on the property for the year 2016. The District owned aluminum team benches shall remain on the property all year. The District shall have access to the two shed-like structures (located between the fields to the north) for use related equipment storage.

4. Franklin Force, Incorporated agrees that its use and activities as set forth herein and all matters in any way related thereto shall be in compliance with all applicable governmental laws, statutes, decisions, codes, rules, orders, and ordinances, be they Federal, State, County or Local. To the fullest extent permitted by law, Franklin Force, Incorporated shall defend, indemnify and hold harmless the City, the City's officers, employees, agents, boards, commissions and agencies from and against all costs, losses, and damages caused by the negligent or intentional and wrongful acts of Franklin Force, Incorporated, its officers, directors, employees, agents and consultants with respect to this Memorandum.
5. Franklin Force, Incorporated acknowledges that its respective use should not encroach upon the private properties adjoining the softball fields property to the east. Franklin Force, Incorporated agrees to notify users scheduled by it of the existence of such private properties and that they should not be encroached upon.
6. Franklin Force, Incorporated is an independent contractor and all persons furnishing services to Franklin Force, Incorporated are employees of, or independent subcontractors of, and/or volunteers of Franklin Force, Incorporated and not of the City of Franklin.
7. The Franklin Force, Incorporated contact person for scheduling and all other matters hereunder shall be Jane Harmeyer, to be contacted at telephone number 414-698-1642, which information shall be publicly posted.
8. This Memorandum of Understanding shall terminate on December 31, 2016. This Memorandum of Understanding may be terminated earlier by the City of Franklin Common Council upon any determination in its sole discretion, as it may apply to any user of the subject property, individually, jointly or severally, that there has been as substantial breach of any governmental laws, statutes, decisions, codes, rules, orders, and ordinances, or any provision hereof as it may factually apply to such user(s), upon written notice to the subject user(s).

Franklin Force, Incorporated

By: _____ Dated: _____
Lawrence Victory, President

City of Franklin

By: _____ Dated: _____
Stephen R. Olson, Mayor

By: _____ Dated: _____
Sandra L. Wesolowski, City Clerk