



CITY OF KETTERING

KETTERING ICE ARENA

STRUCTURAL & MEP STUDY



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Cleveland • Columbus • Dayton • Findlay • Lawrenceburg • Indianapolis

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**TABLE OF CONTENTS**

I.	EXECUTIVE SUMMARY .....	1
II.	STRUCTURAL TECHNICAL ASSESSMENT.....	9
III.	ROOFING TECHNICAL ASSESSMENT .....	12
IV.	FIRE SUPPRESSION/PLUMBING TECHNICAL ASSESSMENT.....	14
V.	HVAC TECHNICAL ASSESSMENT .....	18
VI.	ELECTRICAL TECHNICAL ASSESSMENT.....	25
VII.	ICE MAKING AND ASSOCIATED EQUIPMENT .....	29
VIII.	APPENDIX A (SHELL AND MEYER STRUCTURAL INFORMATION) .....	35
IX.	APPENDIX B (COMMAND ROOFING INFORMATION).....	35
X.	APPENDIX C (DANIS INFORMATION).....	35
XI.	APPENDIX D (CUT SHEETS).....	35
XII.	APPENDIX E (ICE MAKING CHILLER, OPTION NO. 1, CIMCO) .....	35
XIII.	APPENDIX F (ICE MAKING CHILLER, OPTION NO. 2, SERV-ICE) .....	35
XIV.	APPENDIX G (ICE MAKING CHILLER, OPTION NO. 3, WAIBEL TRANE).....	35

## I. EXECUTIVE SUMMARY

The technical assessment of the City of Kettering, Kettering Ice Arena consists of field visits and review/evaluation of the building Structural, Roofing, Plumbing, Fire Suppression, HVAC, and Electrical systems and components. The assessment includes a description of each system and its components and, more importantly, the evaluation of each.

The following lists show the major items for each system that require attention. Under each system type, the recommendations are further categorized by the urgency for the recommended work.

### A. STRUCTURAL RECOMMENDATIONS

#### 1. Option No. 1: Maintain Current use of Existing Roof Structure

- a) The existing roof trusses and purlins over the main ice arena are currently loaded to their maximum capacity. We do not recommend adding any additional weight to the existing roof structure.
- b) The existing roof structure can safely support the weight of a new roof however; the old roof, insulation and ceiling must come off prior to re-roofing. This includes removal and replacement of the existing corrugated metal roof deck with a new metal deck of the same size and thickness to maintain the structural integrity of the roof diaphragm.
- c) The existing roof purlins should be re-evaluated by a structural engineer for damage prior to re-roofing. The purlins were not fully visible during the initial structural evaluation; therefore, the current structural conditions are unknown at this time. Given the age of the structure and the past history of roof leaks, some corrosion of the steel purlin supports is to be expected. Any existing purlins found to have suffered structural damage should be replaced before installing the new roof deck.
- d) A new insulated roof system with insulation values of either R-20 or R-30 may be safely supported by the existing roof structure.
- e) The probable construction cost of Option No. 1 is included in section I (H) of this report and is included in further detail in Appendix A of this report.

#### 2. Option No. 2: New Conventionally Framed Steel Roof

- a) Remove the existing structural steel roof framing down to the top of the sloped concrete pedestal above the existing footings. Remove the top portion of the pedestal above the floor line to provide a level surface for the new columns.
- b) Install new structural steel columns and beams to support new long-span steel bar joists, metal decking, rigid insulation and roofing across the existing ice rink.
- c) Install new structural steel braces on each side of the building to laterally brace the roof structure.
- d) Install new light-gage metal framing and siding between the new columns to enclose each side of the building.

- e) The probable construction cost of Option No. 2 is included in section I (H) of this report and is included in further detail in Appendix A of this report.
- 3. Option No. 3: New Rigid Frame and Steel Purlin Roof
  - a) This type of roof framing system is not recommended for use in existing buildings due to the extensive amount of structural modification required to reinforce the existing foundation for the additional horizontal thrust generated by the long span of the roof. A cost estimate was not provided for this option as it was not recommended for this space.
- 4. A combined structural and roofing estimate is included in section I (H) of this report.

## B. ROOFING RECOMMENDATIONS

- 1. Option No. 1: Maintain Current use of Existing Roof Structure
  - a) If structural Option No. 1 is selected, the recommendation for the roofing type would be the adhered systems because of the physical challenges of running the seam welder on the steep slope, although in later conversations, this was less of an issue.
- 2. Option No. 2: New Conventionally Framed Steel Roof
  - a) If structural Option No. 2 is selected, it will result in a more traditional 'flat' roof that will make future maintenance and replacement much easier. The total cost to the owner is obviously a lot higher but should result in a much nicer facility. One consideration to make sure was incorporated would be a roof hatch or outside access ladder with this option.
- 3. A combined structural and roofing estimate is included in section I (H) of this report.

## C. COMBINED STRUCTURAL AND ROOFING

- 1. Scope of work (Option No. 2 as discussed with Danis)
  - a) Demolish trusses and support framing/Install new steel truss system.
  - b) Demolish roof/Install new flat roof system with steel framing and supports.
  - c) Remove existing concrete pedestals above floor/Install new concrete piers for structural columns.
  - d) Furnish and install metal wall panels on all four sides.
  - e) Furnish and install perimeter beams.
  - f) Furnish and install new columns.
- 2. Exclusions to scope (Option No. 2 as discussed with Danis)
  - a) All mechanical systems are to be removed and replaced by others.
  - b) We exclude any hazardous material removal and/or remediation.
  - c) Fireproofing is not included in this estimate.
  - d) Any existing ice rink equipment is to be removed by others prior to construction.
  - e) No roof drains, scuppers or downspouts are included in this estimate.

f) Rooftop tie-offs are not included in this estimate.

3. The probable construction cost of Option No. 2 as priced by Danis is included in section I (H) of this report and is included in further detail in Appendix C of this report.

#### D. PLUMBING/FIRE SUPPRESSION RECOMMENDATIONS

1. Replace fire suppression piping with new black steel schedule 40 piping.
2. Install refrigerated air dryer for dry pipe fire suppression system.
3. Replace dry pipe sprinklers and piping in ice rink arena.
4. Replace electric water heater serving the Zamboni room.
5. The probable construction costs for the plumbing / fire suppression items listed above are included in section I (H) of this report.

#### E. HVAC RECOMMENDATIONS

1. Replace cooling tower and associated condenser water pump. Assess cooling tower's current location for proper operation relative to maintenance and clearance requirements.
2. Replace chiller and associated chilled water pumps. Provide ASHRAE 15 compliant refrigerant leak detection alarming and purge system.
3. Replace existing gas-fired infrared heating system around the perimeter of the Arena.
4. Replace indoor air handling units and associated air terminal units with new.
5. Replace existing Arena dehumidification units and exhaust fans with new.
6. The probable construction costs for the HVAC items listed above are included in section I (H) of this report.

#### F. ELECTRICAL RECOMMENDATIONS

1. Replace main switchboard MD-1 with new. Replace all original electrical distribution equipment during the replacement of MD-1. Install metering to monitor the differing loads of the Ice Rink, Water Park, Senior Center and the Work out Center.
2. Replace existing feeders and branch circuitry during gear replacement.
3. Replace the lighting in the ice rink with new energy efficient fixtures and new lighting control.
4. Replace the lighting in the rest of the facility with energy efficient fixtures.
5. The probable construction costs for the electrical items listed above are included in section I (H) of this report.

G. ICE MAKING EQUIPMENT

1. Replace the existing chiller, cooling tower, pumps, cooling tower sump, water heaters, dehumidification equipment, etc. associated with the ice making equipment.
2. The probable construction costs for the ice making equipment are as listed in section I (H) of this report. Three manufacturers were consulted and all three costs are indicated.

H. COST OPINION SUMMARY

Probable Cost of Construction for the renovation of the Kettering Ice Arena (systems as noted)			
Item	Probable Cost of Construction		Notes
	Low	High	
<b>Structural and Roofing</b>			
<b>Option 1</b>			
Structural Roofing Replacement, Option 1	\$ 82,200	\$ 82,200	a, e
Roofing Replacement, Option 1	\$ 360,000	\$ 400,000	
Removal of existing roofing system	\$ 15,000	\$ 40,000	a, e, h
Gutters and downspouts, assumes existing storm is sufficient to handle	\$ 6,150	\$ 10,000	e
Roofing Option 1 Sub Total	\$ 463,350	\$ 532,200	
<b>Option 2</b>			
Structural Roofing Replacement Option 2	\$ 765,200	\$ 765,200	b, e
Roofing Replacement Option 2	\$ 360,000	\$ 400,000	
Removal of existing roofing system	\$ 75,000	\$ 125,000	b, e, i
Gutters and downspouts, assumes existing storm is sufficient to handle	\$ 6,150	\$ 10,000	e
Roofing Option 2 Sub Total	\$ 1,206,350	\$ 1,300,200	
<b>Option 3</b>			
Roofing Option 2 as priced by Danis Building Construction	\$ 1,704,201	\$ 1,704,201	g

<b>Ice Rink Equipment</b>				
	<b>Option 1, Cimco</b>			
	Replace Chiller, cooling tower and pumps with new	NA	NA	j
	Replace ice rink dehumidification units and exhaust fans	NA	NA	j
	Labor for installation of equipment, misc piping	\$ 350,000	\$ 450,000	m
	Provide ventilation in mechanical room	\$ 10,000	\$ 10,000	
	Remove existing floor and dispose	\$ 208,140	\$ 208,140	k
	Replace floor, including piping in floor for refrigeration	\$ 479,730	\$ 479,730	k
	<b>Ice Rink Equipment Option 1 Sub Total</b>	<b>\$ 1,047,870</b>	<b>\$ 1,147,870</b>	
	<b>Option 2, Serv-Ice</b>			
	Replace Chiller, cooling tower and pumps with new	\$ 330,000	\$ 330,000	
	Replace ice rink dehumidification units and exhaust fans	\$ 144,000	\$ 144,000	
	Labor for installation of equipment, misc piping	\$ 350,000	\$ 450,000	m
	Provide ventilation in mechanical room	\$ 10,000	\$ 10,000	
	Remove existing floor and dispose	\$ 208,140	\$ 208,140	k
	Replace floor, including piping in floor for refrigeration	\$ 479,730	\$ 479,730	k
	<b>Ice Rink Equipment Option 2 Sub Total</b>	<b>\$ 1,521,870</b>	<b>\$ 1,621,870</b>	
	<b>Option 3, Waibel Trane</b>			
	Replace Chiller, cooling tower and pumps with new	\$ 387,771	\$ 387,771	
	Replace ice rink dehumidification units and exhaust fans	\$ 144,000	\$ 144,000	
	Labor for installation of equipment, misc piping	\$ 350,000	\$ 450,000	m
	Provide ventilation in mechanical room	\$ 10,000	\$ 10,000	
	Remove existing floor and dispose	\$ 208,140	\$ 208,140	k
	Replace floor, including piping in floor for refrigeration	\$ 479,730	\$ 479,730	k
	<b>Ice Rink Equipment Option 3 Sub Total</b>	<b>\$ 1,579,641</b>	<b>\$ 1,679,641</b>	

<b>Floor Replacement</b>				
	Replace existing floor with new	\$ 687,870	\$ 687,870	k
	Replace piping in floor	\$ 105,000	\$ 105,000	l
	Labor for piping replacement	\$ 50,000	\$ 75,000	
	Plumbing Sub Total	\$ 842,870	\$ 867,870	d
<b>Fire Suppression</b>				
	Replace fire suppression piping in rink (dry pipe system)	\$ 75,000	\$ 75,000	
	Replace fire suppression piping (not in ice rink)	\$ 30,250	\$ 30,250	
	Install new air dryer on fire suppression piping system	\$ 3,000	\$ 5,000	
	Install new gas line to the building	NA	NA	f
	Fire Suppression Sub Total	\$ 108,250	\$ 110,250	d
<b>Plumbing</b>				
	Add boiler to Zamboni melting pit	\$ 15,000	\$ 20,000	
	Replace electric water heater serving Zamboni	\$ 32,000	\$ 37,000	
	Plumbing Sub Total	\$ 47,000	\$ 57,000	d
<b>HVAC</b>				
	Replace cooling tower and pump	\$ 131,000	\$ 131,000	
	Replace chilled water pumps and refrigerant monitoring system	\$ 145,000	\$ 145,000	
	Replace infrared heating system	\$ 40,000	\$ 40,000	
	Replace indoor air handlers (2) and air terminal units	\$ 155,000	\$ 155,000	c
	Replace ice rink dehumidification units and exhaust fans	\$ 144,000	\$ 144,000	
	Upgrade HVAC controls to DDC, extension of existing system	\$ 150,000	\$ 250,000	
	HVAC Sub Total	\$ 765,000	\$ 865,000	d



<b>Electrical</b>				
	Replace main switchboard	\$ 68,000	\$ 68,000	
	Replace feeders and branch circuitry	\$ 370,000	\$ 370,000	
	Replace lighting in ice rink, including controls	\$ 94,500	\$ 125,000	
	Replace lighting in remainder of ice facility	\$ 48,000	\$ 60,000	
	Electrical Subtotal	\$ 580,500	\$ 623,000	d
<b>Totals (Materials and Labor only, no design costs included)</b>		<b>\$ 5,627,462</b>	<b>\$ 5,906,962</b>	
	This assumes taking worst cast for each section			
<b>Notes</b>				
a. Cost does not include temporary shoring or bracing for the demo work to take place. Also, the cost for the demolition is based upon RS Means data, a more accurate estimate will depend on the exact makeup of the roofing and structural system.				
b. Cost does not include temporary shoring or bracing for the demo work to take place. Also, the cost for the demolition is based upon RS Means data, a more accurate estimate will depend on the exact makeup of the roofing and structural system.				
c. Exact quantity of air terminal units depends on programming and design, for cost estimating purposes, ten (10) air terminal units were estimated (eight (8) units are in place today per the drawings)				
d. Cost does not include architectural adjustments or fees.				
e. Cost derived from RS Means				
f. Refer to report, not enough information at this time for pricing by Vectren.				
g. Details of this estimate are included in Appendix C of this report				
h. Cost from Danis to remove existing roof is approximately \$93,000				
i. Cost from Danis to remove existing roof and structure is approximately \$151,000				
j. As of March 3, 2014, no cost has been received from Cimco.				
k. Cost estimate from Danis				
l. Cost estimate is from ice mats, in floor piping costs perceived to be similar.				
m. Cost for installation is based on historical data. Typical installation is equal to equipment costs for receiving, setting, piping, permits, etc.				

### Summary:

The replacement of the structure and roof includes information from Shell and Meyer, Command Roofing as well as Danis Building Construction. Option No. 2 is the largest cost option and is what is included in the total.

The replacement of the chiller system to create the ice has a varied price range. The budget includes the worst case cost for the system of \$1,679,641. This cost does not include water treatment for the cooling tower system.

The floor replacement is an option but due to the age and the cost of the remainder of the replacement, is recommended.

Costs for fire suppression work are all recommended items and include areas generally pertaining to the ice arena only, unless otherwise noted. We did not include pricing for current restroom or locker room replacement work.

Costs for the plumbing work are all recommended items and include areas pertaining to the ice arena only. We did not include pricing for current restroom or locker room replacement work.

Costs for the HVAC work are all recommended items and include work throughout the ice arena as well as the remainder of the ice building.

Costs for the electrical work are all recommended items and include work throughout the ice arena as well as the remainder of the ice building.

The total cost estimate is approximately \$5.6M to \$5.9M for the items as listed above. Design costs for architectural, structural, civil, plumbing, mechanical and electrical design are estimated at 9% of the estimated construction cost for an additional \$530,000. The total cost estimate for the work highlighted in this report would be \$6.43M.

We understand that there is additional work, not included in this report that will be performed during the renovation. These areas include the locker rooms, offices, lobby, restrooms, or other similar spaces. A design cost to carry for these areas is 9% of the construction cost.