

March 27<sup>th</sup>, 2019

## Certificate of Appropriateness

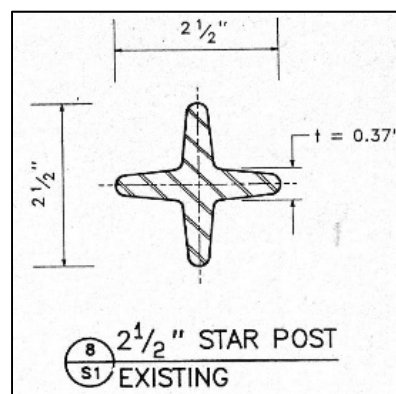
Moonlight Tower Inspection, Restoration, & Repair  
NA150000018

The City of Austin contract for the Moonlight Tower Inspection, Restoration, and Repair includes the decommission, inspection, restoration, and re-installation of a total of seventeen (17) towers. The process of restoring a Moonlight Tower begins with the decommission of an existing tower, disassembly of tower to individual components, sandblasting, visual inspection and non-destructive testing of all existing components. Following the inspection, the passing components are painted and used in the re-installation of the tower. Components that fail the structural inspection cannot be used in the re-assembled tower and to date, have typically been replaced with passing components from other decommissioned towers.

While the individual component failure rate is variable between towers, the results thus far have consumed three total towers to complete and reinstall five towers. With nine towers still waiting to be taken down for restoration, plus the three full towers that have been consumed, the completion of the remaining contract scope will require fabrication of replacement materials. We are requesting to make use of new fabricated parts to replicate the existing members while maintaining structural integrity and historical appearance.

The original Moonlight Tower components were made of cast iron using a method known as 'green-sand casting'. This method has fallen out of common use for larger parts, and we have been unable to locate a vendor capable and willing to produce the replacement tower leg members due to the member size. For these reasons, we are unable to reproduce tower leg members using the original production methods.

The original Moonlight Tower leg members, known as Star-Posts, have a unique geometry in terms of modern tower members. One alternative to the original casting method that was explored was steel extrusion, which is the process of forcing steel through a cross-sectional mold in order to create the desired shape. There are technical challenges which would arise with this method related to maintaining the correct cross-section and keeping the material straight. The technical challenges, along with the higher cost of materials have made it difficult to find a foundry willing to take on the task.



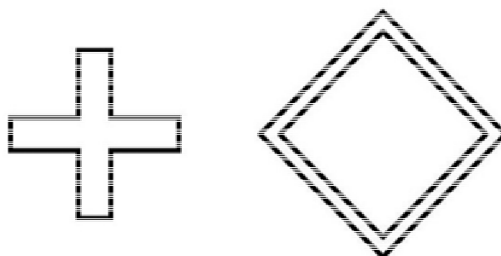
A method identified to fabricate new star-posts requires the use of a large solid-rod bar that is then machined down into the shape of the star-post. While more practical than extrusion, this method results in large amounts of wasted material, extended production times, and additional material expense.



Milled Star-Post End Adapter

Another option is the use of standard square-tube replacements for the star-post members, which is a more efficient production and less costly with less material waste than the milled option. These members would also use end adapters to fit the square-tube with the star-post receiver, allowing the use of existing knuckles and reducing overall changes to the towers.

The square tube members are equivalent in terms of structural properties such as resistance to bending and compressive loads and unit weight.



The square tube members have been demonstrated to be visually similar to the hard-lines produced by the star posts at the expected viewing distance from ground level. Refer to Photo 1 and Photo 2 for visual comparison of original star post member vs. new modern square tube equivalent.

Square Tube Tower Section  
Approx. Viewing Distance – 6ft



Original Star Post Tower Section  
Approx. Viewing Distance – 6ft



A cost comparison of new square tube members versus milled star post members from 2016 determined that there is a significant difference in the expected overall program costs between the two options.

Star Post Production One Full Tower			
Members			
Type	Qty	Unit Cost	Price
2 1/2" Star Post (Leg)	30	\$1,118.00	\$ 33,540.00
2" Star Post (Leg)	18	\$ 976.00	\$ 17,568.00
2" Star Post (Hz)	33	\$ 976.00	\$ 32,208.00
1 1/2" Star Post (Hz)	18	\$ 874.00	\$ 15,732.00
Total:			\$ 99,048.00
Freight			\$ 1,000.00
Machined & Cut			\$ 7,500.00
Subtotal			\$ 107,548.00
+10%			\$ 10,754.80
Sales Price			\$ 118,302.80
Casting Knuckles			
Description	Qty	Unit Cost	Cost
Type A (Bottom)	3	\$ 833.89	\$ 2,501.67
Type B	27	\$ 258.89	\$ 6,990.03
Type C (Transition)	3	\$ 833.89	\$ 2,501.67
Type D	15	\$ 333.89	\$ 5,008.35
Type E (Top)	3	\$ 833.89	\$ 2,501.67
Total:			\$ 19,503.39
Sales Price (Cost +10%):			\$ 21,453.73
Total Sales Price			\$ 139,756.53

*The costs above assume one full tower's worth of materials using machined star post members. For the total program, it is estimated that roughly 7.5 full tower's worth of components will be needed due to the towers already consumed, as well as future inspection failures.*

Square Tube Production One Full Tower			
Members			
Type	Qty	Unit Cost	Price
2 1/2" Star Post (Leg)	30	\$ 255.00	\$ 7,650.00
2" Star Post (Leg)	18	\$ 200.00	\$ 3,600.00
2" Star Post (Hz)	33	\$ 184.00	\$ 6,072.00
1 1/2" Star Post (Hz)	18	\$ 158.00	\$ 2,844.00
Total:			\$ 20,166.00
Freight			\$ 1,000.00
Machined			\$ 5,000.00
Subtotal			\$ 26,166.00
+10%			\$ 2,616.60
Sales Price			\$ 28,782.60
Casting Knuckles			
Description	Qty	Unit Cost	Cost
Type A (Bottom)	3	\$ 833.89	\$ 2,501.67
Type B	27	\$ 258.89	\$ 6,990.03
Type C (Transition)	3	\$ 833.89	\$ 2,501.67
Type D	15	\$ 333.89	\$ 5,008.35
Type E (Top)	3	\$ 833.89	\$ 2,501.67
Total:			\$ 19,503.39
Sales Price (Cost +10%):			\$ 21,453.73
		Total Sales Price	\$ 50,236.33

*The costs above assume one full tower's worth of materials using the square tube replacement member.*

As shown in the estimated pricing above, the square tube represents roughly one third of the cost of machining new star post members.

On January 29<sup>th</sup>, 2019 Austin Energy met with the Texas Historic Commission and Preservation Austin to consider all aspects of the milled star post and square tube options. We verified that the contractor conducted thorough research and considered all available options. Considering all aspects, it was decided that the milled star option would be the closest resemblance to the original moonlight tower star post and is the preferred option for replacement of failed parts.

In summary, the existing Moonlight Tower components are failing, and cannot be reproduced using the original casting methods. We are requesting to use a visually and structurally similar milled start post with casting knuckle end weldments as replacements for failing members.